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**Μελέτη Παγκοσμίου συστήματος θεσιθεσίας(GPS)
Επεξεργασία δεδομένων από σταθμούς βάσης**

ΠΤΥΧΙΑΚΗ ΕΡΓΑΣΙΑ

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ΠΡΟΛΟΓΟΣ

Η επιλογή του θέματος της παρούσας διπλωματικής εργασίας πραγματοποιήθηκε με γνώμονα τις εξελίξεις στον τομέα της δορυφορικής θεσιθεσίας και την εφαρμογή της σε όλο και περισσότερους τομείς της καθημερινότητας. Με την ολοκλήρωσή της , κάποιος με απλά προγράμματα ανοιχτού κώδικα θα μπορεί να δει τα ποιοτικά χαρακτηριστικά όπως το λόγο σήματος προς θόρυβο τα διάφορα φαινόμενα πολυδιαδρομών που επηρεάζουν την σωστή λήψη και τις καθυστερήσεις στο σήμα που προκαλούνται από την ιονόσφαιρα και την τροποσφαιρα , μιας εγκατάστασης μόνιμου ή φορητού σταθμού GPS (Global Positioning System).Επίσης λόγω του εύρους της συγκεκριμένης διπλωματικής θα ήταν εφικτή η συνέχιση της και η δημιουργία ενός λογισμικού με GUI ώστε να χρησιμοποιείται στο πεδίο όπου γίνονται η εγκαταστάσεις και να γίνεται άμεσα η όποια χωροταξική διόρθωση ώστε να υπάρχει ικανοποιητική βελτίωση στα χαρακτηριστικά της λήψης οπότε και της περαιτέρω επεξεργασίας σε πραγματικό ή μεταγενέστερο χρόνο.

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ΠΕΡΙΛΗΨΗ

Το GPS είναι ένα σύγχρονο δορυφορικό σύστημα θεσιθεσίας το οποίο έλυσε βασικά προβλήματα και βοήθησε στην καθημερινότητα της ανθρωπότητας. Η τεχνολογική έκρηξη στον τομέα της διαστημικής τεχνολογίας έφερε άλματα προόδου στην κατασκευή και την τοποθέτηση δορυφόρων στον αστερισμό (διάταξη δορυφόρων) του GPS (Global Navigation System). Βέβαια πέρα από το Αμερικάνικο GPS (Global Navigation System) όλο και περισσότερες χώρες πραγματοποίησαν τα δικά τους συστήματα πλοήγησης με αποτέλεσμα την μεγαλύτερη ευελιξία των χρηστών στην ακριβέστερη εύρεση της θέσης τους σε οποιοδήποτε σημείο του κόσμου και να βρίσκονται. Οι βασικές αρχές του , τα συστήματα συντεταγμένων, καθώς και τα σήματα που παράγονται στον δορυφόρο αλλά και οι συχνότητες που παράγονται στον δέκτη θα μας απασχολήσουν ιδιαίτερα ώστε να καταλάβουμε πώς ακριβώς λειτουργούν από τους πιο φθηνούς δέκτες μέχρι και του πιο ακριβούς. Επίσης η ιστορία και η κατανόηση της προτυποποίησης του τύπου των δεδομένων που παράγονται από έναν δέκτη είναι πρωταρχικής σημασίας για την περαιτέρω διερεύνηση με προγράμματα ανοιχτού κώδικα όπως το TEQC ώστε να έχουμε μια πλήρη εικόνα των διαφόρων φαινομένων που μας προκαλούν προβλήματα στην λήψη. Η δημιουργία πολικών διαγραμμάτων για το μέγεθος των πολυδιαδρομών με προγράμματα όπως το QC2SKY μας δίνει την δυνατότητα να μπορούμε και με την χρήση προγραμμάτων GIS να οπτικοποιούμε αυτά τα φαινόμενα (πολυδιαδρομές) και να μπορούμε να προσδιορίσουμε άμεσα την πηγή από την οποία προκαλούνται.

ABSTRACT

The GPS is a modern satellite system which solved basic problems in everyday life and helped humanity. The technological explosion in the field of space technology has brought great strides in manufacturing and installation of the satellite constellation (order satellites) of GPS (Global Navigation System). Course over the American GPS (Global Navigation System) more and more countries have made their own navigation systems resulting in greater flexibility for users to accurately find their location anywhere in the world they are. The basic principles, the coordinate systems and the signals generated in the satellite and the frequencies generated in the receiver will be concerned particularly to understand exactly how most of the receivers so cheap and more expensive. Also the history and understanding of the standardization of the type of data produced by a receiver is of prime importance for further investigation with open source projects like TEQC to have a complete picture of the various phenomena that cause us problems in the creation of polar lipsi.l diagrams for the size of polydiadromon with programs like QC2SKY gives us the possibility to enable and use GIS programs to visualize these phenomena (multipath) and we can readily identify the source from which it caused.

Κεφάλαιο 1:ΓΕΝΙΚΑ ΓΙΑ ΤΟ GPS

1.1 ΕΙΣΑΓΩΓΗ



Εικόνα 1

Το παγκόσμιο σύστημα θεσιθεσίας (Global Positioning System) αναπτύχθηκε από το Αμερικανικό υπουργείο άμυνας (DOD), τον Ivan Getting¹ και το MIT (Massachusetts Institute of Technology). Η αρχική του ονομασία ήταν NAVSTAR² (NAVigation System with Timing And Ranging) και αποτελούνταν από έντεκα (11) δορυφόρους. Η πρώτη εκτόξευση έγινε το 1978 από το DOD με στόχο καθαρά τη στρατιωτική χρήση. Η βασική ιδέα για την ανάπτυξη του συστήματος GPS απαντά στα θεμελιώδη πανανθρώπινα ερωτήματα “που βρίσκομαι;”, “ποιά η θέση μου στο σύμπαν;”

Στο πρώτο κεφάλαιο θα γίνει μία ιστορική αναδρομή για το παγκόσμιο σύστημα θεσιθεσίας μαζί με αναφορά για τους διάφορους τύπους δορυφόρων και επίσης θα γίνει εκτενή αναφορά στα διάφορα τμήματα που το αποτελούν , στο δεύτερο κεφάλαιο θα δειχθεί η θεωρητική βάση και οι διάφοροι φυσικοί νόμοι που διέπουν το σύστημα GPS , στο τρίτο κεφάλαιο θα γίνει αναφορά και ανάλυση στα διάφορα συστήματα συντεταγμένων καθώς και τις μετατροπές αυτών , στο τέταρτο κεφάλαιο θα αναφερθούν τα διάφορα σήματα του GPS και πως αυτά παράγονται , στο πέμπτο κεφάλαιο θα γίνει αναλυτική αναφορά στις εξισώσεις υπολογισμού θέσης του GPS όπως επίσης και στα διάφορα συστήματα χρόνου και σφάλματα που δημιουργούνται στο σήμα μέχρι να φτάσει στον δέκτη , στο έκτο κεφάλαιο θα γίνει ανάλυση της δομής των διαφόρων μηνυμάτων που παράγονται στους δορυφόρους και στέλνονται στο δέκτη , στο έβδομο κεφάλαιο θα γίνει ανάλυση των διαμορφώσεων που χρησιμοποιούνται στο GPS και επίσης θα αναφερθούν μελλοντικές αναβαθμίσεις αυτών , στο όγδοο κεφάλαιο θα γίνει ανάλυση των αρχείων RINEX και της δομής αυτών , στο ένατο κεφάλαιο θα γίνει αναλυτική αναφορά στο πρόγραμμα ελέγχου ποιότητας TEQC και πώς αυτό κάνει τις διάφορες αναλύσεις , στο δέκατο κεφάλαιο θα έχουμε μία εκτενή περιγραφή του μόνιμου δικτύου GPS του E.A.A. από το οποίο θα παρθούν δεδομένα για την περαιτέρω επεξεργασία , στο ενδέκατο κεφάλαιο θα γίνει αναλυτική περιγραφή της μεθοδολογίας από την οποία θα προκύψουν τα διάφορα αποτελέσματα ελέγχου ποιότητας από τους σταθμούς βάσης του NOANET και τέλος στο δωδέκατο κεφάλαιο θα αναφερθούν τα τελικά συμπεράσματα από τα παραπάνω αποτελέσματα.

¹ Ivan Alexander Getting (January 18, 1912—October 11, 2003)

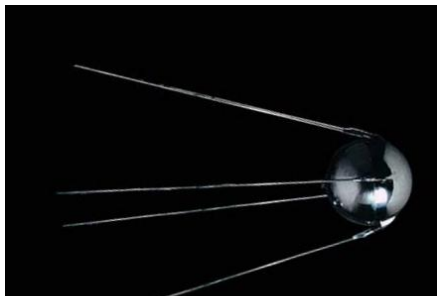
² Jorgensen, P. S., "NAVSTAR/GLOBAL POSITIONING SYSTEM 18-SATELLITE CONSTELLATIONS", NAVIGATION, Vol. 27, No. 2, Summer 1980, pp. 89-100.

1.2 ΙΣΤΟΡΙΚΗ ΑΝΑΔΡΟΜΗ

Τεχνολογικά το σύστημα GPS³ άρχισε να αναπτύσσεται από το 1950. Το 1957 η Ρωσία (τότε Ένωση Σοβιετικών Σοσιαλιστικών Δημοκρατιών) εκτόξευσε τον δορυφόρο Sputnik στο διάστημα. Οι ερευνητές του MIT παρατήρησαν τον παραπάνω δορυφόρο και είδαν ότι όσο είναι σε γεωστατική τροχιά γύρω από την Γή η ισχύς του ραδιοσήματος μεταβαλλόταν. Όταν πλησίαζε την θέση τους η ένταση του σήματος αυξανόταν ενώ το αντίθετο γίνονταν όταν απομακρυνόταν. Από αυτή την αυξομείωση οι ερευνητές ήταν σε θέση να υπολογίσουν με ακρίβεια τα χαρακτηριστικά της τροχιάς του Sputnik. Η αναγνώριση ότι οι μεταβολές του ραδιοσήματος από τον δορυφόρο μπορούσαν να προσδιορίσουν διακεκριμένες θέσεις στο έδαφος ήταν η αρχή του συστήματος GPS.

Πριν από αυτό όμως, το 1951 ο Dr Ivan Getting ένας απόφοιτος φοιτητής του MIT⁴ και του Rhodes Scholar της Οξφόρδης διέθεσε το PHD του στην αστροφυσική στην υπηρεσία της Raytheon. Η Αμερικανική πολεμική αεροπορία ζήτησε ένα σύστημα καθοδήγησης για διηπειρωτικούς βαλλιστικούς πυραύλους το οποίο θα μπορούσε να λειτουργήσει πάνω σε σιδηροδρόμους. Ανταποκρινόμενος σε αυτό ο Dr Getting ανέπτυξε ένα σύστημα τρισδιάστατου εντοπισμού θέσης βασισμένο στην διαφορά του χρόνου άφιξης από τον χρόνο γέννησης του σήματος, γεγονός που αποτέλεσε

την αρχή λειτουργίας για τα GPS.



Εικόνα 2

Το 1973 ελήφθει η απόφαση για την ανάπτυξη ενός δορυφορικού συστήματος πλοήγησης βασισμένο στην ήδη υπάρχουσα τεχνολογία της Αμερικανικής πολεμικής αεροπορίας.



Εικόνα 3

Πραγματοποιήθηκαν εκτεταμένες δοκιμές για τα επόμενα 3 χρόνια και το 1977 έγινε η πρώτη εγκατάσταση σταθμών στην Γή, παρόλο που δεν είχαν εκτοξευθεί δορυφόροι. Μεταξύ 1978 και 1985 εκτοξεύτηκαν και μπήκαν σε τροχιά έντεκα (11) δορυφόροι. Το 1979 ο αριθμός τους αυξήθηκε σε δεκαοχτώ (18) και το 1980 πραγματοποιήθηκε η πρώτη εκτόξευση δορυφόρου τύπου Block I, ο οποίος είχε ειδικά συστήματα για την ανίχνευση ατομικών εκρήξεων και ετέθει με σκοπό να επιβλέπει εάν η Ρωσία ανταποκρίνεται θετικά στη συμφωνία για την παύση των πυρηνικών δοκιμών.

Επίσης, το 1980 ενεργοποιήθηκαν τα πρώτα ενσωματωμένα ατομικά ρολόγια τα οποία ήταν τα πλέον ακριβή στο κόσμο. Ανεπτυγμένα από φυσικούς, μετρούσαν το χρόνο από την αλλαγή στα ενεργειακά επίπεδα των ηλεκτρονίων. Ήταν σταθερά, συνεχή και ακριβή στο επίπεδο του nanosecond (ns). Το 1983 το GPS έπαψε να χρησιμοποιείται αποκλειστικά για στρατιωτική χρήση και έγινε διαθέσιμο στο ευρύ

³ http://en.wikipedia.org/wiki/Global_Positioning_System

⁴ <http://web.mit.edu/>

κοινό. Ο τότε πρόεδρος των ΗΠΑ Ronald Reagan⁵ αποχαράκτηρισε το σύστημα GPS από τη αποκλειστικά στρατιωτική του χρήση σαν συνέπεια του τραγικού αεροπορικού δυστυχήματος της Κορεατικής πτήσης 007. Το αεροσκάφος εισήλθε σε Ρωσική περιοχή και καταρρίφθηκε από Σοβιετικά πολεμικά αεροσκάφη.

Το 1986 η τραγωδία του Challenger⁶ είχε ως συνέπεια την προσωρινή απαγόρευση της εκτόξευσης δορυφόρων και για αυτό καθυστέρησε η ανάπτυξη του συστήματος GPS, λόγω του ότι δεν μπορούσαν να μεταφερθούν συστήματα Block II (τύπος δορυφόρου ο οποίος αναφέρεται σε παρακάτω κεφάλαιο).

Τελικά, η επαναχρησιμοποίηση των πυραύλων Delta⁷ για εκτόξευση δορυφόρων ήταν αρκετή ώστε το 1988 να ληφθεί η απόφαση αύξησης του αριθμού των δορυφόρων από δέκα οκτώ (18) σε είκοσι τέσσερις (24), ώστε το σύστημα να γίνει πλήρως λειτουργικό. Το 1990 έγινε προσωρινή διακοπή λειτουργίας του GPS για το ευρύ κοινό λόγω του πολέμου στον Περσικό Κόλπο. Το 1993 επανήλθε και η χρήση του (FOC, Full Operational Capacity) και διετέθη δωρεάν στο ευρύ κοινό παγκοσμίως το 1995, μετά την ενεργοποίηση και του εικοστού τέταρτου δορυφόρου. Από το 1995 και μετά υπήρξε μια αλματώδη πρόοδος στην ανάπτυξη του GPS. Περισσότεροι δορυφόροι ετέθησαν σε τροχιά και αύξησαν την διαθεσιμότητα και την ακρίβεια των υπολογισμών από την τάξη των εκατό (100) μέτρων στην τάξη των εκατοστών. Οι εφαρμογές πλέον είναι πάρα πολλές και περιλαμβάνουν την αεροπλοΐα, τη ναυσιπλοΐα, τη γεωδαισία, την εδαφική παραμόρφωση, την παρατήρηση στη μεταβολή των κινήσεων των τεκτονικών πλακών, κα.



Εικόνα 4

1.3 ΒΑΣΙΚΑ ΜΕΡΗ ΤΟΥ GPS

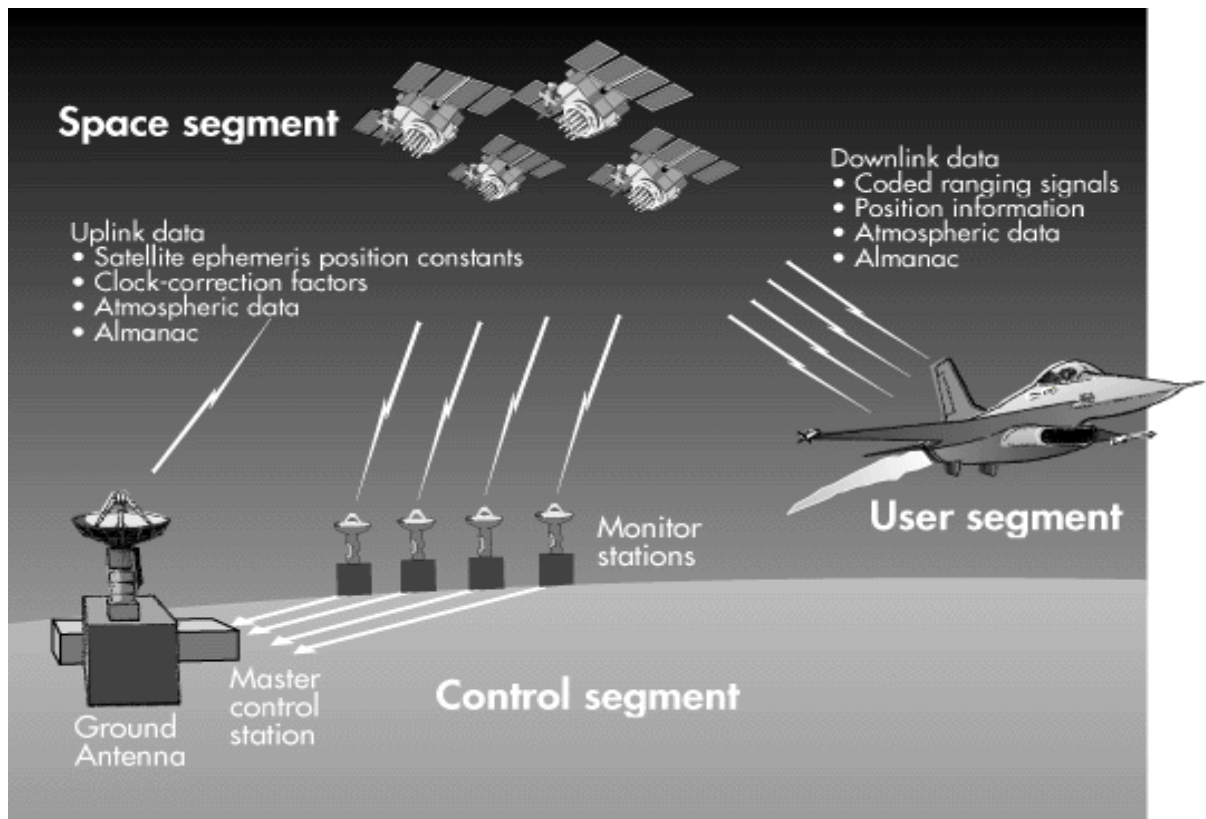
Το GPS αποτελείται από εικοσιτέσσερις (24) δορυφόρους και πέντε (5) επίγειους σταθμούς.

Οι επίγειοι σταθμοί είναι υπεύθυνοι μεταξύ των άλλων στο να διατηρούν οι δορυφόροι ακριβή τροχιά. Οι δορυφόροι είναι τοποθετημένοι 20.200 χιλιόμετρα από την επιφάνεια της Γης και ο καθένας ζυγίζει περίπου δύο (2) τόνους, το δε πλάτος τους είναι 5,6 μέτρα και κάνουν την πλήρη περιστροφή της Γής σε λιγότερο από δώδεκα ώρες.

⁵ <http://www.whitehouse.gov/about/presidents/ronaldreagan>

⁶ <http://space.about.com/cs/challenger/a/challenger.htm>

⁷ http://www.spacetoday.org/Rockets/Delta4_Atlas5.html



Εικόνα 5

Τα βασικά μέρη του συστήματος GPS είναι τα εξής:

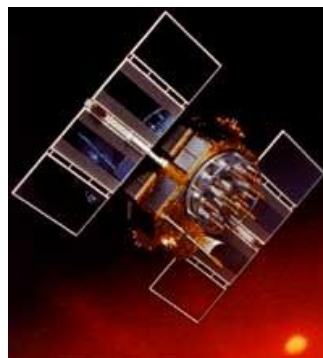
- Το τμήμα διαστήματος (Space Segment)
- Το τμήμα ελέγχου (Control Segment)
- Το τμήμα χρήστη (User Segment)

1.4 ΤΟ ΔΙΑΣΤΗΜΙΚΟ ΤΜΗΜΑ (GPS)

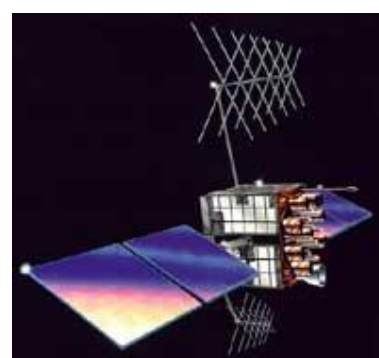
Το τμήμα διαστήματος αποτελείται από εικοσιτέσσερις (24) δορυφόρους, οι τύποι των οποίων είναι (Block I , Block II, Block IIA , Block IIR και Block IIF).



Block I



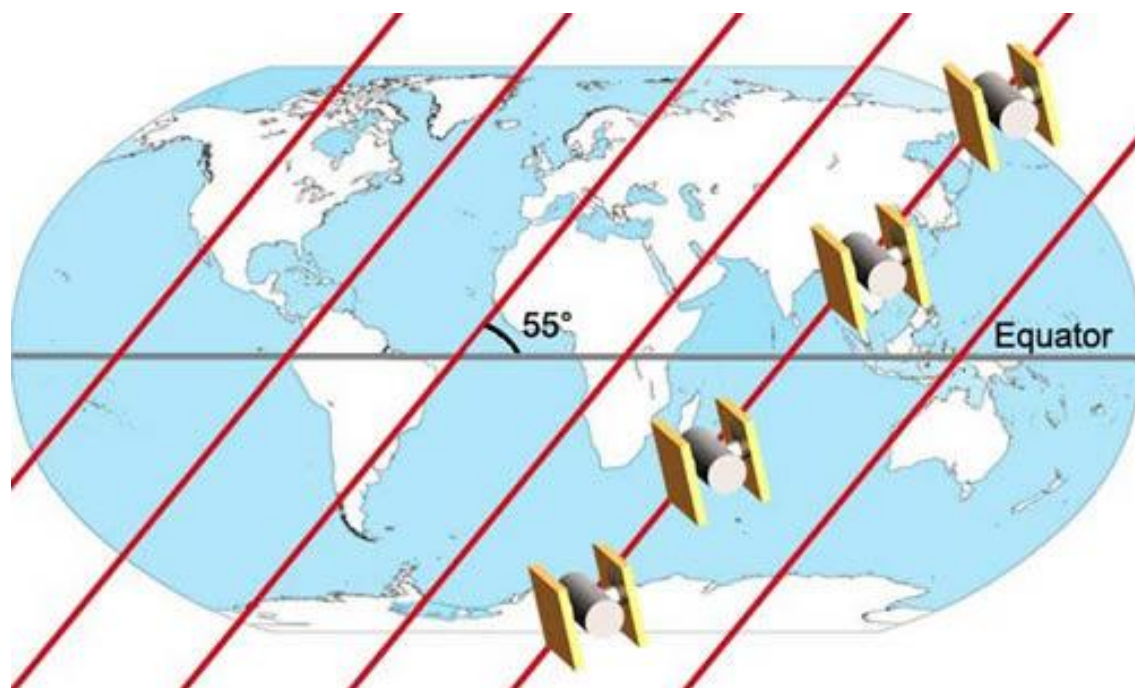
Block II



Block IIR

Υπάρχουν 3-4 παροπλισμένοι δορυφόροι ("κατάλοιπα") οι οποίοι μπορούν να ενεργοποιηθούν αν χρειαστεί. Αυτοί οι δορυφόροι είναι μεσαίας γήινης τροχιάς όπως έχει προαναφερθεί στην προηγούμενη παράγραφο σε ένα ύψος 20.200 χιλιομέτρων και κάθε ένας τους κάνει την ημέρα δύο πλήρης περιστροφές γύρω από τη Γη.

Στον αστερισμό τους οργανώνονται σε έξι ισαπέχουσα τροχιακά επίπεδα που το καθένα από αυτά περιέχει τέσσερις θέσεις δορυφόρων και αυτό εξασφαλίζει ότι θα έχουμε επαφή κατ'ελάχιστο με τέσσερις δορυφόρους από οποιοδήποτε σημείο του πλανήτη. (Εικόνα 6)



Εικόνα 6

Ο αστερισμός GPS είναι μία μίξη από παλιούς και νέους δορυφόρους. Παρακάτω θα παρουσιαστούν διάφοροι τύποι που είναι ήδη σε τροχιά μέχρι και αυτοί που κατασκευάζονται σήμερα.

1.5 ΔΟΡΥΦΟΡΟΙ BLOCK I⁸

Από το 1976 έως το 1985 εκτοξεύθηκαν έντεκα (11) δορυφόροι Block I από την Καλιφόρνια και ο καθένας από αυτούς ζύγιζε 845 kg, ενώ κανένας από αυτούς δεν είναι σε λειτουργία σήμερα. Ο μέσος χρόνος ζωής τους ήταν τα 4.5 χρόνια και οι περισσότεροι έχουν υπερβεί το χρόνο αυτό κατά 5 χρόνια. Ο αρχαιότερος από τους δορυφόρους αυτούς ήταν σε χρήση για 13 χρόνια. Όλα τα σήματα του Block I ήταν

⁸ http://www.spaceandtech.com/spacedata/constellations/navstar-gps-block1_conspects.shtml

διαθέσιμα δημόσια. Τα ηλιακά πάνελ έδιναν ισχύ 400W, ενώ όταν ήταν στη σκιά της γης τροφοδοτούνταν από μπαταρίες νικελίου – καδμίου. Οι προωθητήρες στροφής λειτουργούσαν με Υδραζίνη. Περισσότερες πληροφορίες για τους δορυφόρους Block I βρίσκονται στο Παράρτημα Α.

1.6 ΔΟΡΥΦΟΡΟΙ BLOCK II⁹

Οι δορυφόροι Block II ζύγιζαν περισσότερο από 1500 kg. Ο πρώτος μπήκε σε τροχιά το 1998 από το Ακρωτήριο Κανάβεραλ. Είχαν άνοιγμα φτερών 5.1 μέτρα και κατασκευάστηκαν για χρόνο ζωής 7.5 χρόνια. Συνολικά 9 Block II και 18 Block IIA είχαν εκτοξευθεί μέχρι το τέλος Σεπτεμβρίου 1996. Παρόλο που οι δορυφόροι είναι σε έξι διαφορετικές τροχιές, η κάθε μια με ίδια γωνία προς τον ισημερινό, οι νεότεροι Block IIA έχουν ελάχιστο διαφορετικό αστερισμό. Το 1990 εκτοξεύθηκε ο πρώτος Block IIA (A= Advance) και περισσότερες πληροφορίες για αυτόν βρίσκονται στο Παράρτημα Α.

Το Σεπτέμβριο του 2005 εκτοξεύθηκε ο πρώτος δορυφόρος νέας γενιάς (IIR-M Replacement, Modernized). Οι δορυφόροι αυτού του τύπου έχουν τη χωρητικότητα να συμπεριλάβουν ένα δεύτερο δημόσιο σήμα (L2C) πέρα από το L1 που υπάρχει ήδη και ένα νέο στρατιωτικό σήμα με κώδικα (M-code L1M και L2M), τα παραπάνω είναι μικροκυματικά φέροντα σήματα και έχουν διάφορα μηνύματα και κώδικες που είναι χρήσιμοι για τον εντοπισμό θέσης. Επίσης θα πρέπει να αναφερθεί ότι ζυγίζουν 2 τόνους και κοστίζουν γύρω στα 75 εκατομμύρια δολάρια. Οι Block II και Block IIA είναι εξοπλισμένοι με δύο ατομικά ρολόγια ρουμπιδίου και δύο ατομικά ρολόγια καισίου με σταθερότητα 10^{-13} sec. Από τη βασική συχνότητα των ατομικών ρολογιών (10,23 MHz) προκύπτουν όλες οι άλλες συχνότητες που χρειάζονται από τον δορυφόρο GPS . Οι νεότεροι δορυφόροι IIR και IIRM είναι εξοπλισμένοι με τρία ατομικά ρολόγια ρουμπιδίου. Η εξαιρετική ακρίβεια ± 1 δευτερόλεπτο κάθε 1 εκατομμύριο χρόνια είναι απολύτως απαραίτητη για τη λειτουργία του συστήματος. Ξεκινώντας από τους Block IIR δορυφόρους μόνο ο κώδικας C/A (Coarse/Acquisition) είναι διαθέσιμος για δημόσια χρήση, ο οποίος κώδικας διαμορφώνει την φάση της L1 και είναι διαφορετικός για κάθε δορυφόρο GPS και συμβάλλει στην αναγνωρισή του

⁹ http://www.spaceandtech.com/spacedata/constellations/navstar-gps-block2_conspects.shtml

κάθε δορυφόρου , εκτενή αναφορά γίνεται σε επόμενα κεφάλαια για τον συγκεκριμένο κώδικα.

Η τροφοδοσία και το σύστημα προώθησης είναι ίδιο με τα Block I, παρόλα αυτά τα ηλιακά στοιχεία έχουν ισχύ 750W. Αρχικά οι δορυφόροι Block IIR, τοποθετήθηκαν σε τροχιά σε γκρουπ των τριών (3), αλλά μετά την τραγωδία του Challenger το 1986 αποφασίστηκε να μπαίνουν σε τροχιά σε ζευγάρια με πυραύλους Delta. Κατά παράδοξο τρόπο οι δύο πρώτοι δορυφόροι χάθηκαν μετά από δυσλειτουργία του πυραύλου Delta η οποία είναι η πρώτη που σημειώθηκε σε πύραυλο αυτού του τύπου.

1.7 ΔΟΡΥΦΟΡΟΙ BLOCK IIF¹⁰

Η σειρά IIF διευρύνει τις δυνατότητες της σειράς (IIR(M)) μ' ένα επιπλέον σήμα για το ευρύ κοινό. Το F στο IIF σημαίνει Follow – on. Συγκρινόμενοι οι δορυφόροι Block IIF με προηγούμενης γενιάς δορυφόρους GPS, έχουν μεγαλύτερη διάρκεια ζωής και μεγαλύτερη ακρίβεια στην ώρα που εκπέμπουν. Κάθε δορυφόρος χρησιμοποιεί μία μίξη από ατομικά ρολόγια ρουμπιδίων και καισίου για να κρατήσει το χρόνο ακριβή έως και 8 εκατομμυριοστά του δευτερολέπτου. Αναπτύχθηκαν από την Boeing δώδεκα (12) δορυφόροι SYN- 62 έως SYN– 73. Ο πρώτος μπήκε σε τροχιά τον Μάιο του 2010. Μέχρι τον Ιανουάριο του 2012 δύο δορυφόροι αυτού του τύπου ήταν στον αστερισμό του GPS.

1.8 ΔΟΡΥΦΟΡΟΙ BLOCK III¹¹

Οι δορυφόροι αυτού του τύπου κατασκευάζονται από την Lockheed Martin και είναι η νεότερη γενιά δορυφόρων SYN-74.

Παρέχουν πιο ισχυρά σήματα και επιπρόσθετα σαφώς αναβαθμισμένη αξιοπιστία και ακρίβεια.

Πολλά από τα παραπάνω σήματα υποστηρίζουν πλοήγηση και υπηρεσίες χρονισμού.

¹⁰ http://www.spaceandtech.com/spacedata/constellations/navstar-gps-block2f_conspecs.shtml

¹¹ http://www.spaceandtech.com/spacedata/constellations/navstar-gps-block3_conspecs.shtml

Στο κατασκευαστικό μέρος υπάρχει σχέδιο για ανάπτυξη 4 δορυφόρων αυτού του τύπου με την προοπτική για άλλους 8.

Επιπρόσθετα δίνεται η δυνατότητα παροχής L1C (τέταρτο δημόσιο σήμα). Το L1C θα χρησιμοποιεί τη διαμόρφωση MBOC (Multiplexed Binary Offset Code Modulation) αναφορά της γίνεται στο 7.1.3.

1.9 GLONASS (Global Navigation Satellite System)¹²

Βασίζεται σε αστερισμό ενεργών δορυφόρων που συνεχώς εκπέμπουν κωδικοποιημένα σήματα σε 2 συχνότητες.

Το σύστημα είναι ομόλογο του Αμερικάνικου GPS και χρησιμοποιεί τις ίδιες αρχές και μεθόδους για εκπομπή και θεσιθεσία.

Διαχειρίζεται από τη Ρωσία (Russian Federation Government – Russian Space Forces) και λειτουργεί από το κέντρο συντονισμού επιστημονικής ενημέρωσης (Coordination Scientific Information Center – KNITS) του υπουργείου άμυνας της Ρωσίας.

Αποτελείται από 21 δορυφόρους σε 3 τροχιακά επίπεδα με 3 τροχιές. Τα τρία τροχιακά επίπεδα χωρίζονται σε 120° και οι δορυφόροι στην ίδια τροχιά χωρίζονται σε 45°.

Κάθε δορυφόρος λειτουργεί σε κυκλική τροχιά 19.100 km σε γωνία κλίσης 64.8° και ολοκληρώνει μία τροχιά σε περίπου 11 ώρες.

Ο πρώτος δορυφόρος μπήκε σε τροχιά το 1982. Δύο γεωδαιτικοί δορυφόροι είχαν επίσης πετάξει στα 19.100 km στην τροχιά GLONAS1 ώστε να χαρακτηριστεί πλήρως το βαρυτικό πεδίο στο συγκεκριμένο ύψος και κλίση. Τα αυθεντικά πλάνα έκαναν λόγω, για ένα πλήρες λειτουργικό σύστημα έως το 1991. Ωστόσο δεν ολοκληρώθηκε ως το 1995 αλλά στις αρχές του 1996. Χρίστηκε λειτουργικό στις 24/9/1983.

¹² http://www.spaceandtech.com/spacedata/constellations/glonass_consum.shtml

1.10 GALILEO¹³

Το Galileo είναι το ευρωπαϊκό σύστημα πλοήγησης το οποίο παρέχει εξασφαλισμένη υψηλή ακρίβεια.

Παρέχοντας διπλή συχνότητα σαν στάνταρτ, πετυχαίνει ακρίβεια σε πραγματικό χρόνο κάτω του μέτρου.

Εγγυάται διαθεσιμότητα κάτω από ακραίες συνθήκες όπως όταν υπάρχουν τοπικές παρεμβολές και πληροφορεί τους χρήστες μέσα σε δευτερόλεπτα αν υπάρχει διακοπή σε κάποιο δορυφόρο.

Οι δύο πρώτοι δορυφόροι της ESA GLOVE – A και B εκτοξεύθηκαν το 2005 και 2008 έχοντας ραδιοσυχνότητα δεσμευμένη από την διεθνή ένωση τηλεπικοινωνιών για τον Galileo και για να ελεγχθούν τεχνολογίες κλειδιά για το Galileo.

Στις 21 Οκτωβρίου του 2011 οι δύο από του τέσσερις υπηρεσιακούς δορυφόρους έγιναν διαθέσιμοι για την επιβεβαίωση του σχεδίου Galileo.

Οι δύο επόμενοι θα γίνουν διαθέσιμοι το 2012.

Όταν ολοκληρωθεί η επιβεβαίωση των τροχιών έχουν προγραμματιστεί επιπλέον εκτοξεύσεις για να επιτευχθεί η αρχική προγραμματισμένη λειτουργικότητα του συστήματος, η οποία υπολογίζεται να ολοκληρωθεί στα μέσα της τρέχουσας δεκαετίας.

Το πλήρη σύστημα Galileo θα αποτελείται από τριάντα (30) δορυφόρους από τους οποίους οι είκοσι επτά (27) θα είναι επιχειρησιακοί και τρεις (3) θα είναι ενεργοί για την περίπτωση που κάποιος από τους επιχειρησιακούς δορυφόρους υποστεί βλάβη.

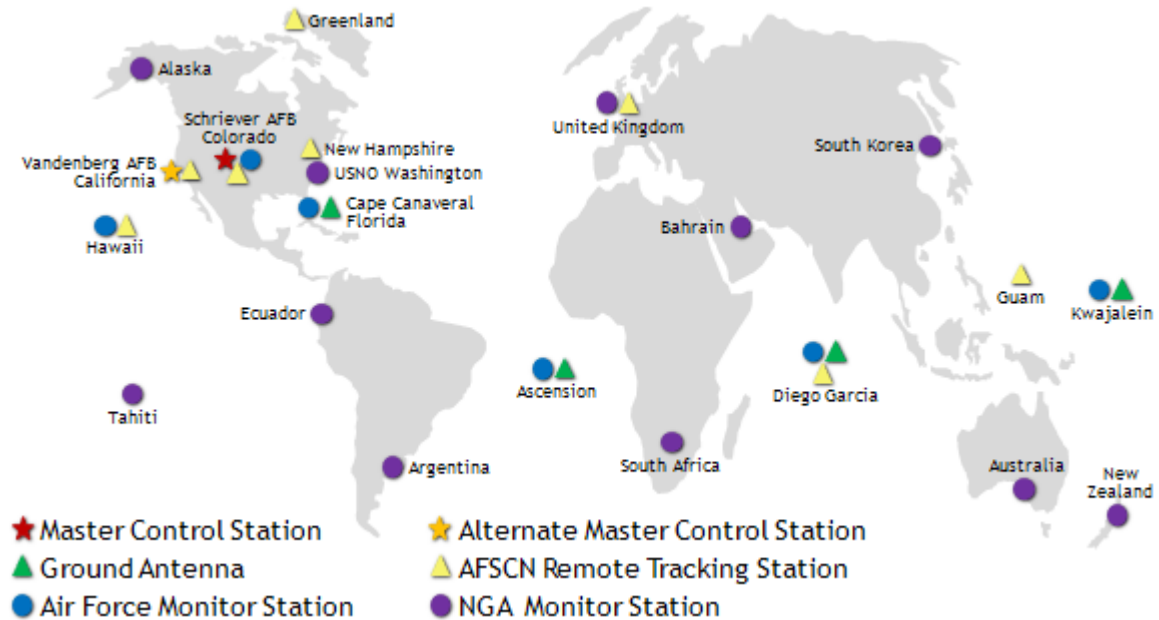
Ο αστερισμός τους θα αποτελείται από 3 μεσαίας τροχιάς (MEO) κυκλικά επίπεδα τα οποία θα βρίσκονται στα 23,222 χιλιόμετρα από την επιφάνεια της Γής.

Η γωνία ανύψωσης των τροχιακών επιπέδων θα είναι 56° ως προς τον ισημερινό.

¹³ <http://www.esa.int/esaNA/galileo.html>

1.11 ΤΜΗΜΑ ΕΛΕΓΧΟΥ

Το τμήμα ελέγχου του GPS αποτελείται από ένα παγκόσμιο δίκτυο επίγειων εγκαταστάσεων το οποίο παρακολουθεί τους δορυφόρους, ελέγχει τις εκπομπές τους, κάνει αναλύσεις και στέλνει εντολές και δεδομένα στον αστερισμό.



Εικόνα 7

Το παρόν επιχειρησιακό τμήμα ελέγχου περιλαμβάνει έναν κεντρικό σταθμό ελέγχου, έναν εναλλακτικό σταθμό ελέγχου, δώδεκα (12) κεραιές που αποστέλλουν τις εντολές στον αστερισμό και δεκαέξι (16) σταθμούς παρακολούθησης.



2nd Space Operations Squadron (2SOPS)¹⁴

Η 2SOPS (2nd Space Operations Squadron) βρίσκεται στο Colorado Springs και είναι υπεύθυνη για τον καθημερινό έλεγχο του αστερισμού GPS.

¹⁴ http://en.wikipedia.org/wiki/2d_Space_Operations_Squadron

ΣΤΟΙΧΕΙΑ ΤΜΗΜΑΤΟΣ ΕΛΕΓΧΟΥ MCS (Master Control Station - MCS)

Ο κύριος σταθμός ελέγχου στο Colorado είναι εκεί που η 2SOPS (2nd Space Operations Squadron) λειτουργεί το πρωταρχικό τμήμα ελέγχου.



Εικόνα 8

Το MCS δημιουργεί και φορτώνει μηνύματα πλοήγησης (navigation) και εξασφαλίζει την καλή λειτουργία και ακρίβεια θέσης του αστερισμού (εικόνα 9). Λαμβάνει πληροφορίες πλοήγησης από τους σταθμούς παρακολούθησης και επεξεργάζεται αυτές τις πληροφορίες για να υπολογίσει τις ακριβείς θέσεις των δορυφόρων του αστερισμού στο διάστημα και έπειτα αποστέλλει τα αποτελέσματα των παραπάνω πληροφοριών στους δορυφόρους. Σε περίπτωση απώλειας ενός δορυφόρου το MCS μπορεί να τον αντικαταστήσει με άλλον που είναι στον αστερισμό ως μη ενεργός ώστε να είναι ολοκληρωμένο το σύστημα. Οι σταθμοί παρακολούθησης, επιβλέπουν τους δορυφόρους GPS καθώς διέρχονται από πάνω τους και διοχετεύουν τις παρατηρήσεις τους πίσω στο MCS, συλλέγουν ατμοσφαιρικά δεδομένα, και μετρήσεις απόστασης/φέροντος. Οι σταθμοί αυτοί χρησιμοποιούν εξελιγμένους δέκτες GPS και ελέγχονται από το MCS. Οι επίγειες κεραιές εκτελούν την επικοινωνία με τους δορυφόρους GPS. Οι συγκεκριμένες κεραιές υποστηρίζουν συστήματα ζεύξεων στη ζώνη συχνοτήτων S, τα οποία εκπέμπουν και λαμβάνουν δεδομένα πλοήγησης, φορτώνουν επεξεργασμένα προγράμματα, καθώς επίσης συλλέγουν και τηλεμετρικά δεδομένα και είναι υπεύθυνες επίσης για την ομαλή εκπομπή εντολών στους δορυφόρους.

Υπάρχουν τέσσερις (4) αφοσιωμένες κεραιές εδάφους GPS συστεγαζόμενες με τους σταθμούς παρακολούθησης στα εξής μέρη: Kwajalein Atoll, Ascension Island, Diego Garcia, και Ακρωτήριο Κανάβεραλ (εικόνα 8).

1.12 ΤΜΗΜΑ ΧΡΗΣΤΗ

Το τμήμα χρήστη τυπικά περιλαμβάνει έναν δέκτη GPS ο οποίος επεξεργάζεται σήματα που μεταδίδονται από δορυφόρους στην ζώνη συχνοτήτων L και από αυτή την επεξεργασία μπορεί να μας δώσει με ακρίβεια την θέση μας, τον χρόνο και την ταχύτητα που κινούμαστε, επίσης αξίζει να τονιστεί ότι ο δέκτης που έχουμε δεν εκπέμπει τίποτα πίσω στον δορυφόρο.

ΚΕΦΑΛΑΙΟ 2:ΘΕΩΡΙΑ ΘΕΣΙΘΕΣΙΑΣ

Σε αυτό το κεφάλαιο θα δειχθούν οι βασικές αρχές της δορυφορικής πλοήγησης πώς γίνεται υπολογισμός με βάση τον χρόνο μετάδοσης του σήματος, πώς γίνεται ο καθορισμός της θέσης, θα μελετηθούν οι νόμοι του Kepler και θα δειχθούν με σαφήνεια οι διάφοροι παράμετροι των τροχιών.

2.1 ΔΟΡΥΦΟΡΙΚΗ ΠΛΟΗΓΗΣΗ ΒΑΣΙΚΕΣ ΑΡΧΕΣ

Όλα τα συστήματα δορυφορικής πλοήγησης χρησιμοποιούν τις ίδιες βασικές αρχές για να προσδιορίσουν τις συντεταγμένες θέσης.

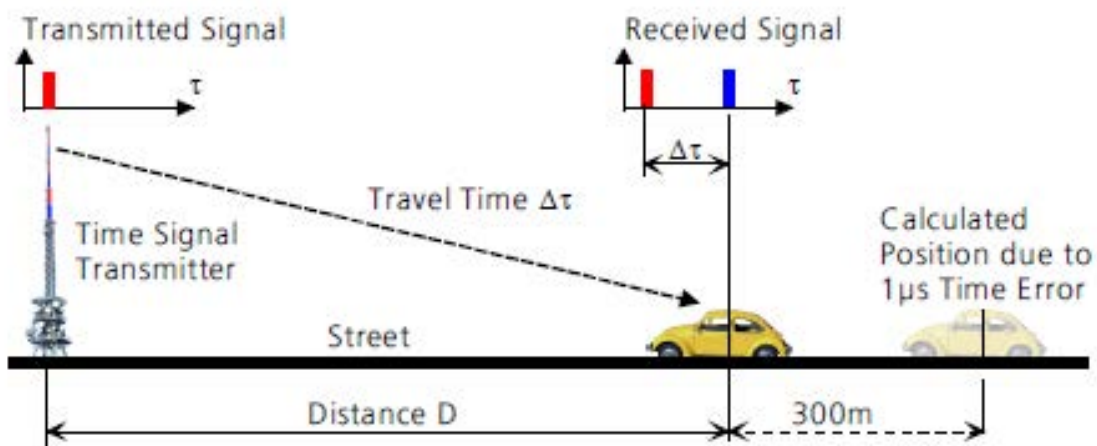
A. Δορυφόροι με γνωστή θέση εκπέμπουν ένα σήμα χρόνου.

B. Εφόσον είναι γνωστή η ταχύτητα με την οποία μεταδίδονται τα ραδιοκύματα στο κενό ($3 \cdot 10^8 \text{ m/s}$), είναι δυνατό να υπολογιστεί η απόσταση του δέκτη.

Με ένα απλό μοντέλο μπορεί να δειχθεί πιο καθαρά πως γίνεται αυτό. Ένα όχημα κινείται σε έναν ευθύ δρόμο και πρέπει να υπολογιστεί η θέση του.

Έστω ότι στο τέλος του δρόμου υπάρχει ένας πομπός που μας στέλνει έναν παλμό κάθε δευτερόλεπτο και επίσης στο όχημα είναι δεδομένη η ύπαρξη ενός ρολογιού το οποίο έχει συγχρονιστεί με το ρολόι του πομπού.

Μετρώντας το χρόνο μετάδοσης του σήματος που πέρασε από τον πομπό έως το όχημα, είναι εφικτό να υπολογιστεί η μεταξύ τους απόσταση (Σχήμα 1).



Σχήμα 1

Αυτή μας δίνεται από τον τύπο :

$$D = \Delta t \cdot c$$

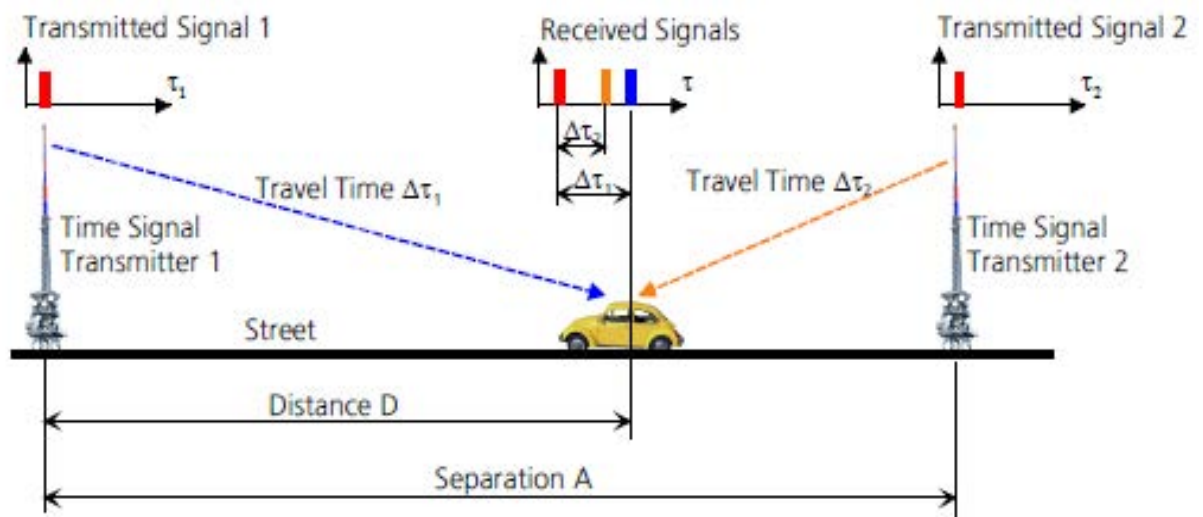
D = Απόσταση

Δt = Χρόνος μετάδοσης σήματος

c = ταχύτητα φωτός

Επειδή το ρολόι του οχήματος δε μπορεί να συγχρονιστεί ακριβώς με το ρολόι του πομπού, είναι δυνατό να υπάρχει μια απόκλιση της υπολογιζόμενης απόστασης σε σχέση με την πραγματική. Στην πλοήγηση, αυτή η παρατηρούμενη απόσταση με αναφορά ως προς το τοπικό ρολόι καλείται ψευδοαπόσταση (pseudo range). Στο παράδειγμα που αναφέρθηκε παραπάνω ένας χρόνος μετάδοσης σήματος Δt 1μs (microsecond) δημιουργεί ψευδοαπόσταση 300m. Η χρησιμοποίηση ενός πολύ σταθερού και ακριβούς ατομικού ρολογιού θα έλυne το πρόβλημα αλλά αυτό θα ήταν μία πολύ δαπανηρή λύση. Μια εναλλακτική λύση περιλαμβάνει ένα δεύτερο συγχρονισμένο χρονικά πομπό, σε απόσταση (A) από τον πρώτο πομπό, η οποία θεωρείται γνωστή.

Μετρώντας και τους δύο χρόνους μετάδοσης του σήματος είναι δυνατό να προσδιοριστεί με ακρίβεια η απόσταση D, παρά το γεγονός ότι υπάρχει στο όχημα ένα μη ακριβές ρολόι (Σχήμα 2).



Σχήμα 2

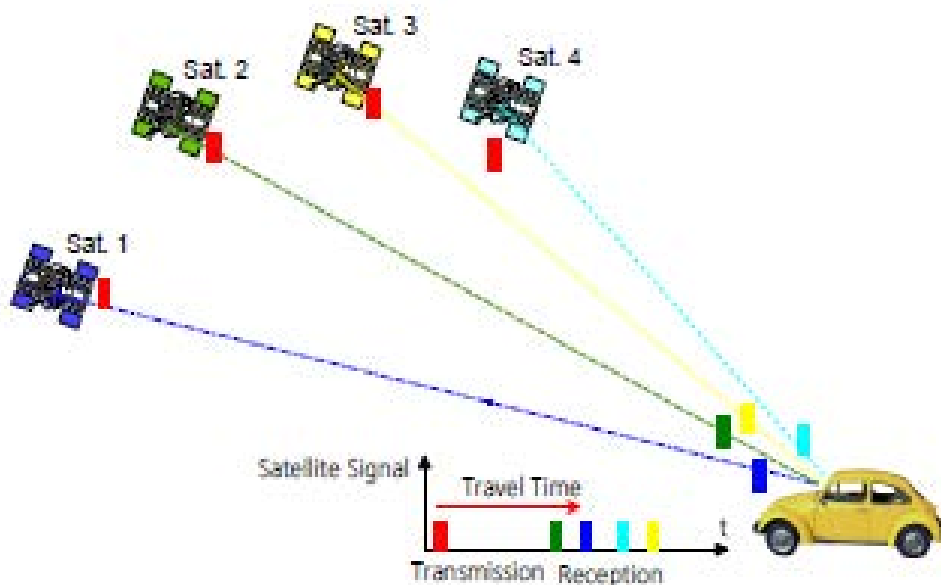
$$D = \frac{(\Delta t_1 - \Delta t_2) * c + A}{2}$$

Όπως έχει δείχθει ο υπολογισμός με ακρίβεια της θέσης και του χρόνου κατα μήκος μιας ευθείας γραμμής (εξ ορισμού μια γραμμή επεκτείνεται σε μια διάσταση), απαιτεί δύο πομπούς μετάδοσης σήματος. Από αυτό είναι δυνατό να εξαχθούν τα εξής συμπεράσματα. Όταν εμπλέκεται στην διαδικασία υπολογισμού θέσης ένα ασυγχρόνιστο μη ακριβές ρολόι, είναι απαραίτητο ο αριθμός των πομπών μετάδοσης σήματος να υπερβαίνει τον αριθμό των άγνωστων διαστάσεων κατά ένα. Για παράδειγμα σε ένα αεροπλάνο (επέκταση σε δύο διαστάσεις) χρειαζόμαστε τρεις πομπούς μετάδοσης σήματος, ενώ στον τρισδιάστατο χώρο χρειαζόμαστε τέσσερις.

Τα δορυφορικά συστήματα πλοήγησης χρησιμοποιούν δορυφόρους ως πομπούς μετάδοσης σήματος.

Επικοινωνία με τουλάχιστον τέσσερις δορυφόρους είναι αναγκαία προκειμένου να καθοριστούν οι τρεις επιθυμητές συντεταγμένες (γεωγραφικό μήκος, πλάτος, ύψος) καθώς και ο ακριβής χρόνος (Σχήμα 3).

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Σχήμα 3

2.2 ΧΡΟΝΟΣ ΔΙΑΔΟΣΗΣ ΣΗΜΑΤΟΣ

Τα συστήματα δορυφορικής πλοήγησης απασχολούν δορυφόρους που βρίσκονται σε τροχιά γύρω από την Γή και όπως είχε προαναφερθεί διανέμονται κατά τέτοιο τρόπο ώστε από οποιαδήποτε σημείο στο έδαφος να είναι εφικτό να υπάρχει οπτική επαφή με κατ'ελάχιστο 4 δορυφόρους.

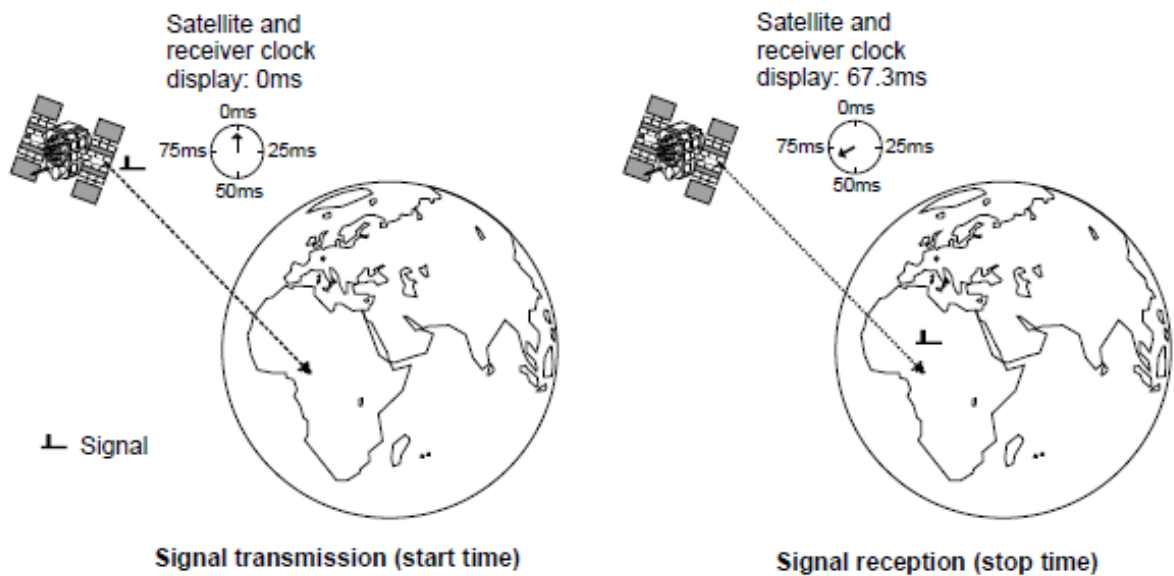
Κάθε ένας από αυτούς τους δορυφόρους έχει εφοδιαστεί με ατομικά ρολόγια. Για την αύξηση της ακρίβειάς τους αναπροσαρμόζονται ή συγχρονίζονται με διάφορα σημεία ελέγχου στην Γη.

Όλοι οι δορυφόροι GNSS (Global Navigation Satellite System) μεταδίδουν την ακριβή θέση τους και τον χρόνο του ρολογιού τους προς τη Γη.

Τα σήματα αυτά διαβιβάζονται με την ταχύτητα του φωτός και ως εκούτου απαιτούν περίπου 67,3ms ώστε να φτάσουν στην επιφάνεια της Γης ακριβώς κάτω από τον δορυφόρο (Σχήμα 4).

Επιπλέον, τα παραπάνω σήματα απαιτούν περαιτέρω 3,33μs για κάθε επιπλέον χιλιόμετρο διαδρομής.

Για την εύρεση της θέσης το μόνο που απαιτείται είναι ένας δέκτης και ένα ακριβές ρολόι. Συγκρίνοντας το χρόνο άφιξης του δορυφορικού σήματος με το ενσωματωμένο ρολόι και την ώρα που το σήμα εκπέμφθηκε, είναι δυνατόν να προσδιοριστεί ο χρόνος μετάδοσης του σήματος.



Σχήμα 4

Όπως με το παράδειγμα του οχήματος που προαναφέρθηκε, η απόσταση D ως το δορυφόρο μπορεί να καθοριστεί από τον γνωστό χρόνο μετάδοσης του σήματος Δt .

Απόσταση = χρόνος ταξιδιού σήματος * ταχύτητα φωτός

$$D = \Delta t * c$$

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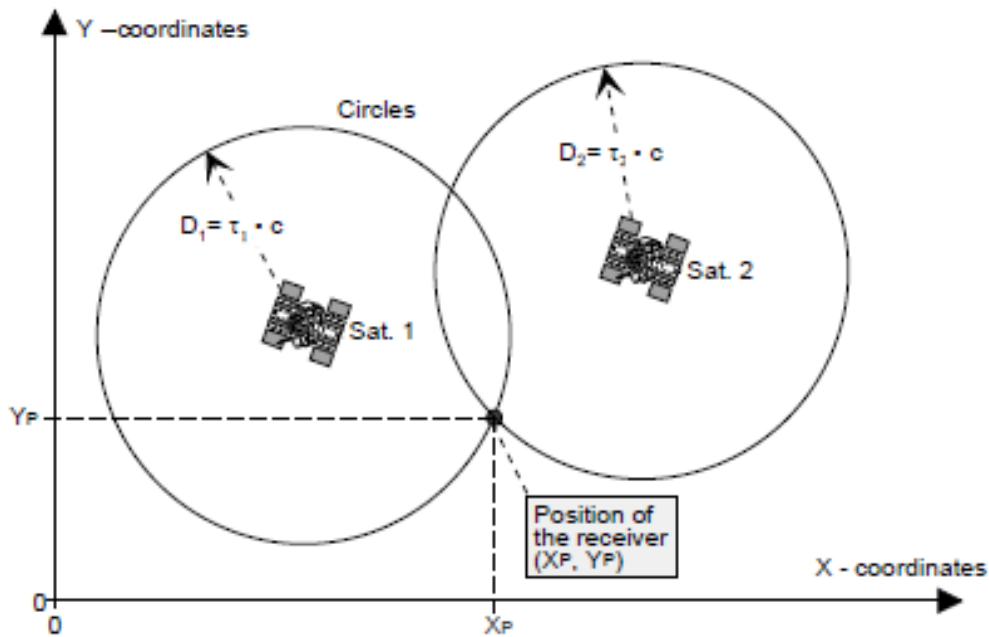
2.3 ΚΑΘΟΡΙΣΜΟΣ ΘΕΣΗΣ

Η εφαρμογή ενός παραδείγματος κατά το οποίο πρέπει να δειχθεί η θέση μας σε ένα τεράστιο οροπέδιο θα ήταν αρκετό για να κατανοηθεί πώς γίνεται ο καθορισμός της θέσης από το GPS.

Επίσης είναι δεδομένη η ύπαρξη δύο δορυφόρων σε τροχιά όπου εκπέμπουν συνέχεια την θέση τους και το σήμα χρόνου.

Χρησιμοποιώντας το χρόνο μετάδοσης του σήματος και στους δύο δορυφόρους, μπορούν να χαραχθούν δύο κύκλοι με ακτίνες D_1 και D_2 γύρω από τους δορυφόρους, κάθε ακτίνα αντιστοιχεί στην υπολογιζόμενη απόσταση ως τον δορυφόρο.

Όλες οι πιθανές θέσεις σχετικές με τους δορυφόρους βρίσκονται σε αυτούς τους κύκλους.



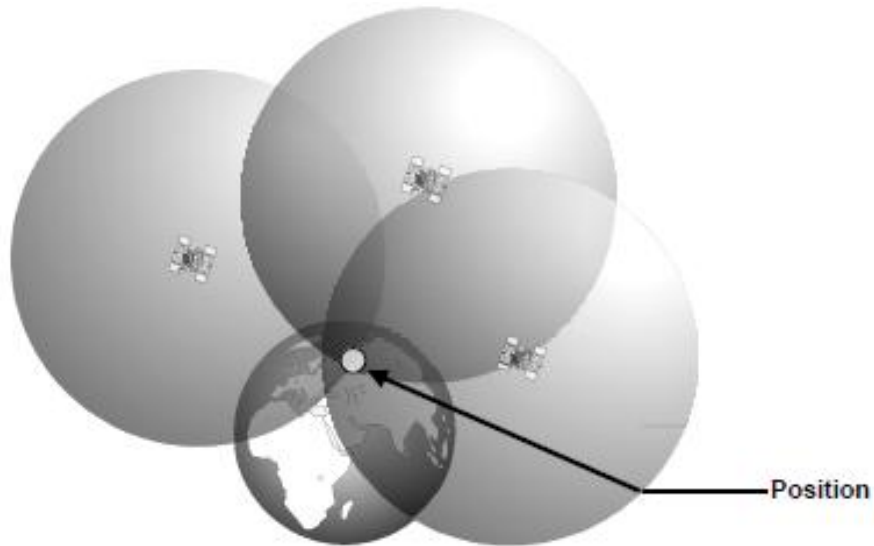
Σχήμα 5

Αν η θέση πάνω από τους δορυφόρους δεν λαμβάνεται υπόψη, η θέση του δέκτη είναι στο ακριβές σημείο όπου οι δύο κύκλοι διασταυρώνονται κάτω από τους δορυφόρους και ως εκτούτου οι δύο δορυφόροι είναι επαρκείς για να προσδιορίσουμε μια θέση στο XY επίπεδο. (Σχήμα 5)

Στον πραγματικό κόσμο μια θέση πρέπει να καθορίζεται στον τρισδιάστατο χώρο και όχι στο επίπεδο. Δεδομένου ότι η διάφορα ανάμεσα στο επίπεδο και στον τρισδιάστατο χώρο αποτελείται από μια επιπλέον διάσταση (ύψος Z), η ύπαρξη ενός τρίτου δορυφόρου για να προσδιοριστεί η πραγματική θέση είναι αναγκαία. Αν η απόσταση στους 3 δορυφόρους είναι γνωστή όλες οι πιθανές θέσεις βρίσκονται στην επιφάνεια των τριών σφαιρών των οποίων η ακτίνα αντιστοιχεί στην υπολογιζόμενη απόσταση.

Η θέση είναι το σημείο όπου οι τρεις σφαίρες τέμνονται. (Εικόνα 6)

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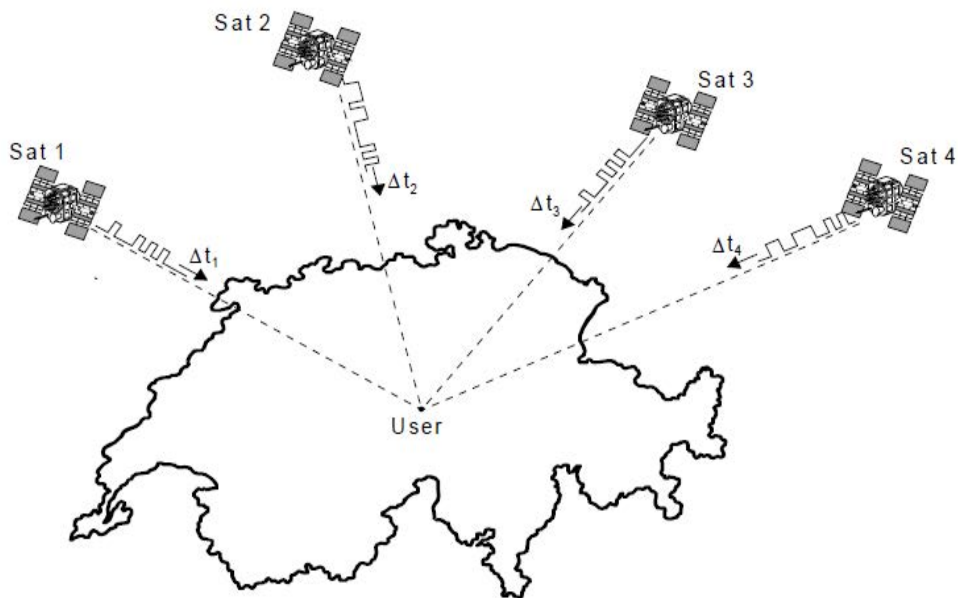


Σχήμα 6

2.4 ΥΠΟΛΟΓΙΣΜΟΣ ΘΕΣΗΣ

Για να μπορέσει ένας δέκτης να καθορίσει την θέση, πρέπει να παίρνει σήματα από 4 διαφορετικούς δορυφόρους (Sat1...Sat4), προκειμένου να μπορέσει να υπολογίσει τον χρόνο διάδοσης του καθενός από αυτά $\Delta t_1, \dots, \Delta t_4$.

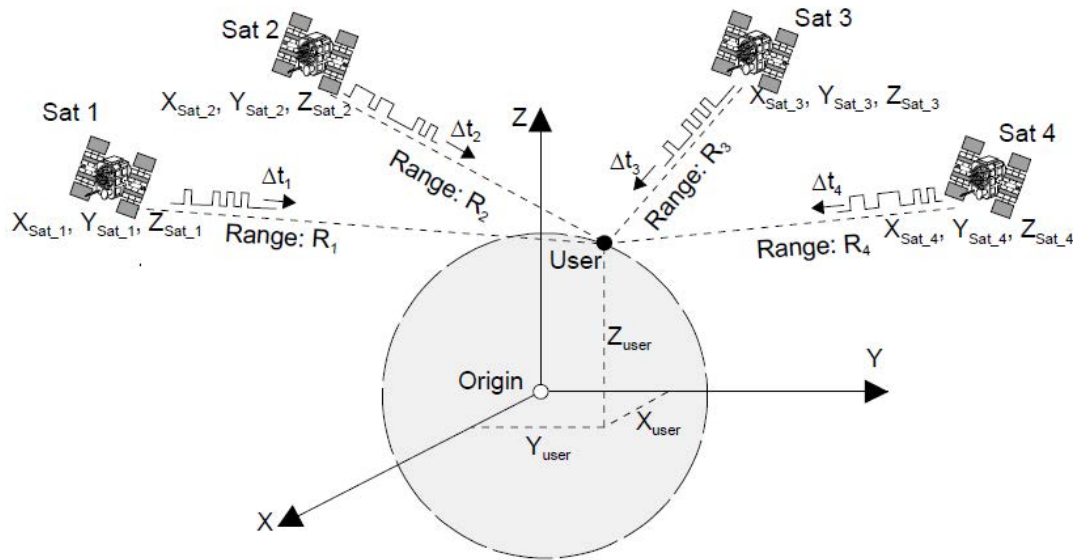
(Σχήμα 21)



Σχήμα 21

Οι υπολογισμοί γίνονται σε ένα Καρτεσιανό τρισδιάστατο σύστημα συντεταγμένων με γεωκεντρική προέλευση.

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Σχήμα 22

Η απόσταση του χρήστη από καθέναν από τους 4 δορυφόρους R_1, R_2, R_3, R_4 μπορεί να προσδιοριστεί με τους χρόνους διάδοσης του σήματος $\Delta t_1, \dots, \Delta t_4$ μεταξύ χρήστη και δορυφόρου. (Σχήμα 22). Εφόσον είναι γνωστές οι θέσεις $X_{sat}, Y_{sat}, Z_{sat}$ των τεσσάρων δορυφόρων, μπορούν άνετα να υπολογιστούν οι συντεταγμένες του χρήστη. Λόγω των ατομικών ρολογιών των δορυφόρων ο χρόνος εκπομπής του σήματος είναι γνωστός με ακρίβεια. Όλα τα δορυφορικά ρολόγια είναι ρυθμισμένα και συγχρονισμένα μεταξύ τους σε UTC (Coordinated Universal Time)¹⁵. Σε αντίθεση, το ρολόι του δέκτη δεν είναι συγχρονισμένο σε UTC και έτσι είναι πιο γρήγορο ή πιο αργό κατά Δt_0 . Όταν είναι πιο γρήγορο το Δt_0 είναι θετικό. Επίσης το Δt_0 προκαλεί σφάλματα στην μέτρηση του χρόνου διάδοσης και της απόστασης R .

$$\Delta t_{measured} = \Delta t + \Delta t_0 \quad (1)$$

$$PSR = \Delta t_{measured} \cdot c = (\Delta t + \Delta t_0) \cdot c \quad (2)$$

$$PSR = R + \Delta t_0 \cdot c \quad (3)$$

R = πραγματική απόσταση δορυφόρου από χρήστη

c = ταχύτητα του φωτός

¹⁵ http://en.wikipedia.org/wiki/Coordinated_Universal_Time

Δt = Χρόνος μετάδοσης σήματος από τον δορυφόρο στον χρήστη

Δt_0 = Διαφορά ρολογιού χρήστη με ρολόι δορυφόρου

PSR = ψευδοαπόσταση

Η απόσταση R από τον δορυφόρο στον χρήστη μπορεί να υπολογιστεί στο Καρτεσιανό σύστημα σαν:

$$R = \sqrt{(X_{sat} - X_{user})^2 + (Y_{sat} - Y_{user})^2 + (Z_{sat} - Z_{user})^2} \quad (4)$$

οπότε

$$PSR = R + c \cdot \Delta t_0 \quad (5)$$

Για να προσδιορίσουμε τις 4 άγνωστες μεταβλητές (Δt_0 , X_{user} , Y_{user} και Z_{user}) είναι απαραίτητες 4 ανεξάρτητες εξισώσεις.

Η παρακάτω ισχύει για τους 4 δορυφόρους ($i = 1 \dots 4$)

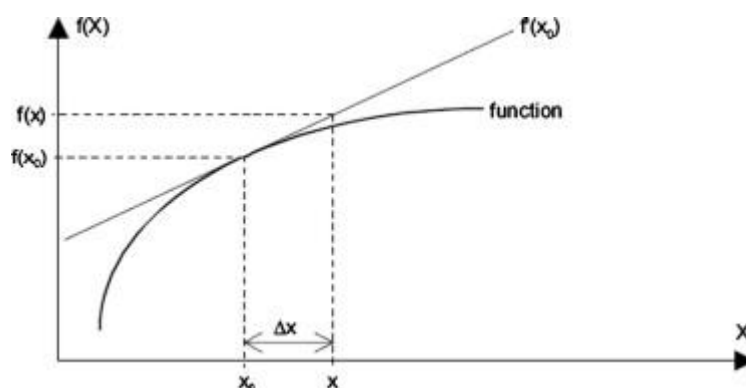
$$PSR_i = \sqrt{(X_{sat,i} - X_{user})^2 + (Y_{sat,i} - Y_{user})^2 + (Z_{sat,i} - Z_{user})^2} + c \cdot \Delta t_0 \quad (6)$$

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2.5 ΓΡΑΜΜΙΚΟΠΟΙΗΣΗ ΕΞΙΣΩΣΕΩΝ

Οι τέσσερις ανεξάρτητες εξισώσεις παράγουν ένα μη γραμμικό σύστημα.

Για να το λύσουμε βάσει των σειρών Taylor γραμμικοποιούμε την ρίζα της συνάρτησης χρησιμοποιώντας μόνο τον πρώτο όρο.



Γενικά με ($\Delta x = x - x_0$)

$$f(x) = f(x_0) + \frac{f'(x_0)}{1!} \Delta x + \frac{f''(x_0)}{2!} (\Delta x)^2 + \frac{f'''(x_0)}{3!} (\Delta x)^3 + \dots \quad (5)$$

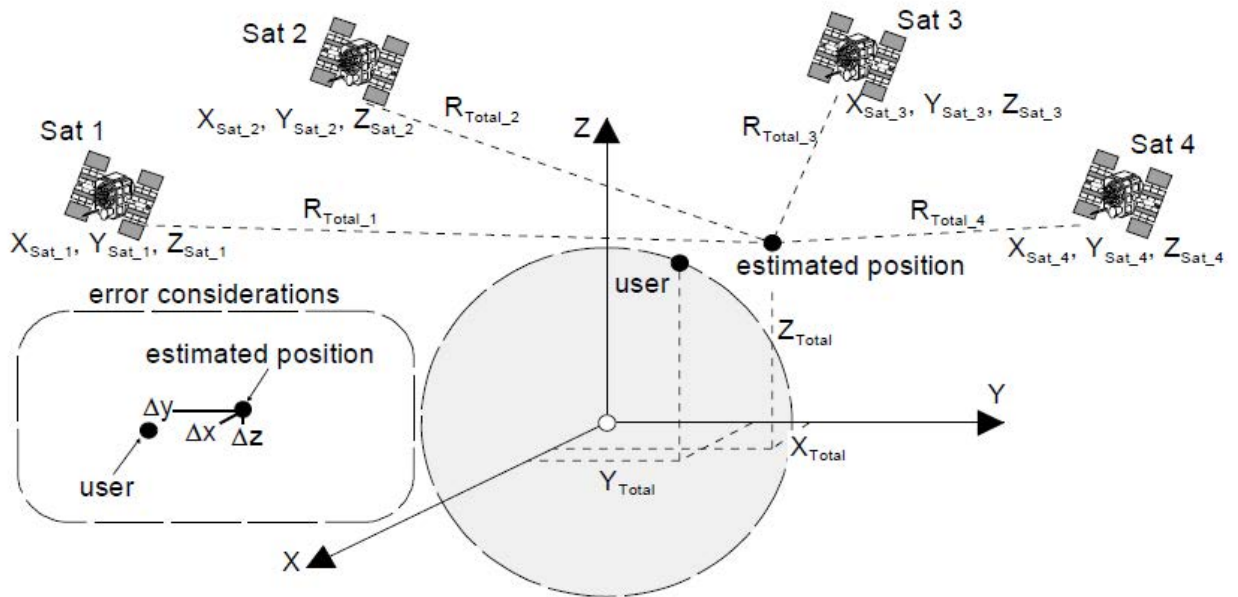
Απλοποιημένο

$$f(x) = f(x_0) + f'(x_0) \cdot \Delta x \quad (6)$$

Για να κάνουμε τη γραμμικοποίηση των τεσσάρων εξισώσεων μια αδιάστατη υπολογισμένη τιμή x_0 πρέπει να ενσωματωθεί στην περιοχή του x .

Αυτό σημαίνει ότι αντί να υπολογίσουμε κατευθείαν τα X_{user} , Y_{user} , Z_{user} , χρησιμοποιούμε μια εκτίμηση θέσης X_{total} , Y_{total} , Z_{total} .

(Σχήμα 23)



Σχήμα 23

Η εκτίμηση της θέσης περιλαμβάνει ένα σφάλμα, το οποίο δημιουργείται από τις άγνωστες μεταβλητές Δ_x , Δ_y και Δ_z .

$$X_{user} = X_{total} + \Delta x$$

$$Y_{user} = Y_{total} + \Delta y$$

$$Z_{user} = Z_{total} + \Delta z$$

Η απόσταση R_{total} από τους 4 δορυφόρους στην προ – εκτιμημένη θέση μπορεί να υπολογιστεί με παρόμοιο τρόπο σαν την εξίσωση (4α)

$$R_{TOTAL_i} = \sqrt{(x_{sat_i} - x_{total})^2 + (y_{sat_i} - y_{total})^2 + (z_{sat_i} - z_{total})^2}$$

Με συνδυασμό των παραπάνω εξισώσεων:

$$PSR_i = R_{TOTAL_i} + \frac{\partial(R_{TOTAL_i})}{\partial x} \Delta x + \frac{\partial(R_{TOTAL_i})}{\partial y} \cdot \Delta y + \frac{\partial(R_{TOTAL_i})}{\partial z} \cdot \Delta z + c \cdot \Delta t_0$$

Αφού υπολογίσουμε τις μερικές παραγώγους παίρνουμε τα εξής:

$$PSR_i = R_{TOTAL_i} + \frac{x_{TOTAL} - x_{sat,i}}{R_{TOTAL_i}} \cdot \Delta x + \frac{y_{TOTAL} - y_{sat,i}}{R_{TOTAL_i}} \cdot \Delta y + \frac{z_{TOTAL} - z_{sat,i}}{R_{TOTAL_i}} \cdot \Delta z + c \cdot \Delta t_0$$

Αφού μετατρέψουμε τις 4 εξισώσεις για $i = 1, 2, 3, 4$ οι 4 μεταβλητές ($\Delta x, \Delta y, \Delta z$ και Δt_0) μπορούν να λυθούν σύμφωνα με τους κανόνες επίλυσης γραμμικών εξισώσεων.

Η λύση των $\Delta x, \Delta y$ και Δz χρησιμοποιείται για τον επαναυπολογισμό των εκτιμημένων θέσεων, x_{total}, y_{total} και z_{total} σύμφωνα με την εξίσωση (8^α)

$$X_{TOTAL_NEW} = X_{TOTAL_OLD} + \Delta x$$

$$Y_{TOTAL_NEW} = Y_{TOTAL_OLD} + \Delta y$$

$$Z_{TOTAL_NEW} = Z_{TOTAL_OLD} + \Delta z$$

Οι παραπάνω τιμές μπορούν να εισαχθούν στο σύνολο των εξισώσεων (13α) ακολουθώντας την κανονική επαναληπτική διαδικασία έως ότου οι συνιστώσες σφαλμάτων $\Delta x, \Delta y, \Delta z$ είναι μικρότερες από ένα επιθυμητό σφάλμα (για παράδειγμα 0,1 m).

Εξαρτώμενο από την αρχική εκτίμηση (3) έως (5), χρειάζονται επαναληπτικοί υπολογισμοί για ένα σφάλμα μικρότερο του 1cm.

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2.6 ΘΕΜΕΛΙΑ ΤΗΣ ΔΟΥΡΥΦΟΡΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

2.6.1 ΝΟΜΟΙ ΚΕΠΛΕΡ¹⁶

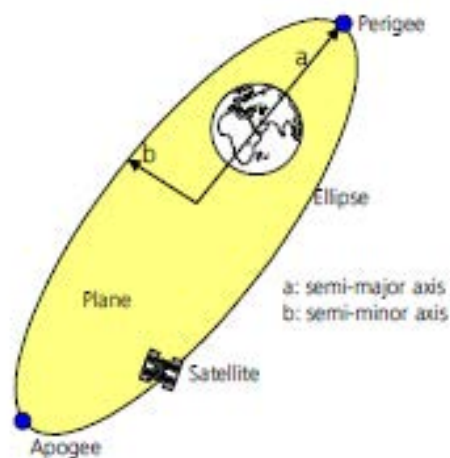
Η κίνηση των δορυφόρων στο διάστημα καθορίζεται από τους Νόμους της πλανητικής κίνησης, οι οποίοι περιγράφηκαν από τον Johannes Kepler (1571 – 1630).

Ο Kepler παρατήρησε ότι η κίνηση των σωμάτων στο διάστημα περιγράφεται από τρεις σχετικά απλούς μαθηματικούς κανόνες.

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2.6.2 ΠΡΩΤΟΣ ΝΟΜΟΣ ΚΕΠΛΕΡ:

Σύμφωνα με τον Kepler, η πλανητική τροχιά είναι σ' ένα επίπεδο. Σχηματίζει έλλειψη με τον ήλιο σε μία από τις εστίες. Ο νόμος εφαρμόζεται επίσης στους δορυφόρους (σαν τροχιακή οντότητα στο διάστημα). Οι δορυφόροι έχουν επίσης τροχιά σε επίπεδο (σχήμα 7).



Σχήμα 7

Η τροχιά γύρω από τη γη σχηματίζει μια έλλειψη με τη Γή στη μια εστία.

- ο Το απόγειο εκφράζει το μακρινότερο σημείο της ελλειπτικής τροχιάς από το κέντρο της γης. Εάν αφαιρεθεί η τιμή της ακτίνας της Γης (περίπου 6378 km), από αυτήν την τιμή, μπορεί να υπολογιστεί το μέγιστο ύψος του δορυφόρου πάνω από την επιφάνεια της γης.

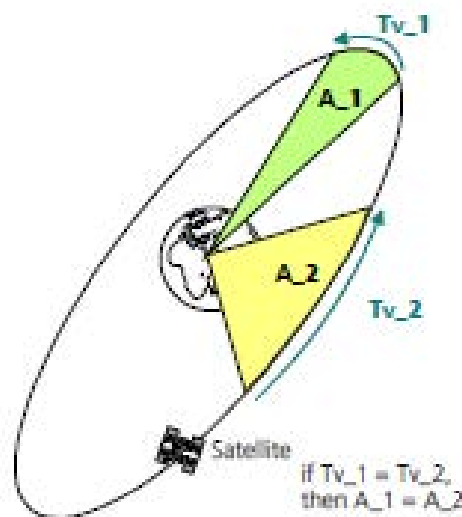
¹⁶ <http://csep10.phys.utk.edu/astr161/lect/history/kepler.html>

- Περίγειο είναι το κοντινότερο σημείο της ελλειπτικής τροχιάς στη Γή. Εάν κάποιος αφαιρέσει την ακτίνα της γης μπορεί να βρει το ελάχιστο ύψος του δορυφόρου πάνω από την επιφάνεια της γης.

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2.6.3 ΔΕΥΤΕΡΟΣ ΝΟΜΟΣ KEPLER:

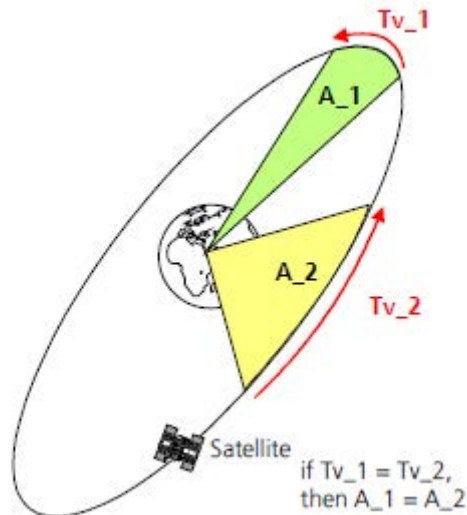
Ο δεύτερος νόμος του Kepler λέει ότι μία γραμμή που ενώνει έναν πλανήτη και τον ήλιο εξωτερικά σαρώνει ίσο εμβαδό κατά ίσα διαστήματα χρόνου'. Είναι γνωστός ως ο νόμος των ισοδύναμων επιφανειών. (Σχήμα 8)



Σχήμα 8

Για τους δορυφόρους αυτό σημαίνει ότι μια γραμμή που ενώνει έναν δορυφόρο με τη γη σαρώνει εξωτερικά ισοδύναμες επιφάνειες σε ισοδύναμα διαστήματα χρόνου. Γι αυτό εάν οι χρόνοι T_{a_1} και T_{a_2} είναι ίσοι τότε και οι επιφάνειες A_1 και A_2 είναι ίσες (σχήμα 9).

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Σχήμα 9

2.6.4 ΤΡΙΤΟΣ ΝΟΜΟΣ KEPLER:

Ο τρίτος νόμος Kepler λέει ότι το τετράγωνο των τροχιακών περιόδων των πλανητών είναι ευθεία ανάλογο του κύβου του ημικύριου άξονα της τροχιάς Αυτό σημαίνει ότι όχι μόνο μεγάλα αντικείμενα έχουν μεγαλύτερες τροχιές, αλλά και ότι η ταχύτητα ενός πλανήτη σε μακρύτερη τροχιά είναι χαμηλότερη από έναν σε μικρότερη τροχιά.

$\frac{P^2}{a^3}$ είναι σταθερό για όλους τους πλανήτες όπου P η περίοδος τροχιάς και a ο ημικύριος άξονας της τροχιακής έλλειψης

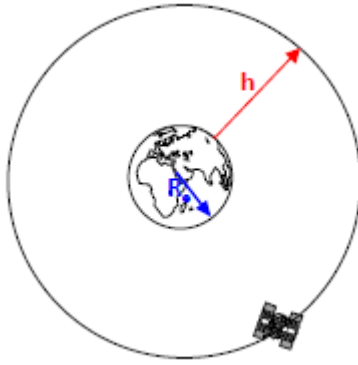
Από αυτό το νόμο το ύψος της τροχιάς του δορυφόρου (h) (σχήμα 10) πάνω από την επιφάνεια της γης, μπορεί να προέλθει από τον τύπο:

$$h = \sqrt[3]{3.9860042 \cdot 10^{14} \frac{m}{s^2} \cdot \left(\frac{P}{2\pi}\right)^2 - R_e(m)}$$

Όπου R_e : η ακτίνα της γης (6378,137 km)

P: η περίοδος τροχιάς δορυφόρου γύρω από τη γη

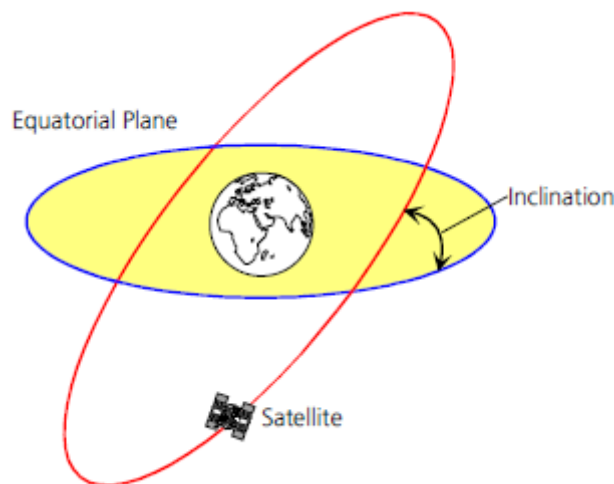
[Essentials of Satellite Navigation Compendium Copyright © 2009, u-blox AG]



Σχήμα 10

2.7 ΤΡΟΧΙΕΣ ΔΟΡΥΦΟΡΩΝ:

Η τροχιά περιγράφει τη θέση ενός δορυφόρου στο διάστημα. Οι δορυφόροι που χρησιμοποιούνται για πλοήγηση κινούνται γύρω από τη γη σε ατέρμονες κυκλικές ή ελλειπτικές τροχιές. Ο χωροταξικός προσανατολισμός (π.χ. τροχιακή κλίση, εκκεντρότητα, μήκος, ύψος πάνω από το έδαφος) και οι παράμετροι κίνησης (π.χ. τροχιακή περίοδος) έχουν σημαντικό αντίκτυπο στη λειτουργικότητα και την απόδοση αυτών των δορυφόρων (σχήμα 11).



Σχήμα 11

- Η κλίση που αλλιώς αναφέρεται σαν γωνία κλίσης ή αξονική κλίση εκφράζει την κλίση της κυκλικής ή ελλειπτικής τροχιάς του δορυφόρου γύρω από τη Γη σε σχέση με το επίπεδο του ισημερινού. Για παράδειγμα με μια γωνία κλίσης 90° η τροχιά θα περνούσε ακριβώς πάνω από τους πόλους, όλες οι

δορυφορικές τροχιές που δε βρίσκονται κατά μήκος του ισημερινού επιπέδου αναφέρονται σαν 'τροχιές κλίσης'.

Οι εφημερίδες ενός δορυφόρου είναι μια μαθηματική περιγραφή της τροχιάς του. Η υψηλή ακρίβεια των δεδομένων τροχιάς των δορυφόρων είναι απαραίτητη για έναν δέκτη για να υπολογίσει την ακριβή θέση του δορυφόρου στο διάστημα μια δεδομένη χρονική στιγμή. Δεδομένα τροχιάς με μειωμένη ακρίβεια αναφέρονται ως ημερολόγιο (Almanac).

***** Week 670 almanac for PRN-01 *****

ID: 01
Health: 000
Eccentricity: 0.8454322815E-003
Time of Applicability(s): 147456.0000
Orbital Inclination(rad): 0.9597230957
Rate of Right Ascen(r/s): -0.7794610391E-008
SQRT(A) (m 1/2): 5153.599609
Right Ascen at Week(rad): -0.1734337928E+001
Argument of Perigee(rad): 0.242665200
Mean Anom(rad): -0.2438403277E+001
Af0(s): 0.2632141113E-003
Af1(s/s): 0.0000000000E+000
week: 670

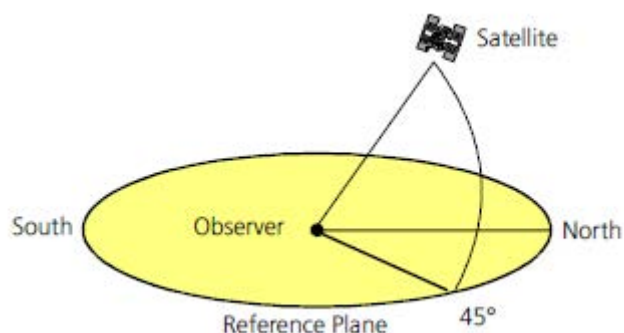
***** Week 670 almanac for PRN-02 *****

ID: 02
Health: 000
Eccentricity: 0.1128768921E-001
Time of Applicability(s): 147456.0000
Orbital Inclination(rad): 0.9382713331
Rate of Right Ascen(r/s): -0.7954617056E-008

<i>SQRT(A) (m 1/2):</i>	5153.660645
<i>Right Ascen at Week(rad):</i>	-0.1748708512E+001
<i>Argument of Perigee(rad):</i>	-2.767253779
<i>Mean Anom(rad):</i>	-0.1566843405E+001
<i>Af0(s):</i>	0.3948211670E-003
<i>Af1(s/s):</i>	0.0000000000E+000
<i>week:</i>	670

Με τη βοήθεια του Almanac ο δέκτης μπορεί να υπολογίσει ποιος δορυφόρος είναι ορατός στον ορίζοντα από μια κατά προσέγγιση θέση και χρόνο. Κάθε δορυφόρος εκπέμπει τις δικές του εφημερίδες καθώς επίσης και Almanac όλων των υφιστάμενων δορυφόρων. Τα τρέχοντα δεδομένα Almanac μπορούν επίσης να προβληθούν στο διαδίκτυο.

- Η ανύψωση περιγράφει τη γωνία ενός δορυφόρου σε σχέση με το οριζόντιο επίπεδο. Εάν ένας δορυφόρος είναι ακριβώς από πάνω από το σημείο παρατήρησης στο έδαφος τότε η ανύψωση θα είναι 90°, εάν είναι στον ορίζοντα τότε η ανύψωση θα είναι 0°.
- Το αζιμούθιο είναι η γωνία μεταξύ του επιπέδου αναφοράς και ενός σημείου. Στην περίπτωση των δορυφόρων το επίπεδο αναφοράς είναι το επίπεδο του ορίζοντα βασισμένο στον αληθινό βορρά. Το αζιμούθιο είναι η γωνία μεταξύ του δορυφόρου και του αληθινού βορρά (Βόρεια = 0°, Ανατολικά = 90°, Νότια = 180°, Δυτικά = 270°). (Σχήμα 12)



Σχήμα 12

- Εκκεντρότητα ορίζει το λεγόμενο αριθμητικό έκκεντρο 'c', η οποία είναι η απόκλιση από μια ελλειπτική δορυφορική τροχιά (έκκεντρη τροχιά) από μια γεωμετρικά ακριβή τροχιά και ορίζεται από την εξίσωση:

$$c = \sqrt{\frac{a^2 - b^2}{a^2}}$$

όπου α είναι ο ημι – μείζων άξονας και β ο ημι – ελάσσων άξονας της ελλειπτικής τροχιάς για πλήρη κυκλική τροχιά. Η τιμή του c είναι 0 και

προσεγγίζει το 1 όσο περισσότερο το μήκος του ημι – μείζων άξονα της έλλειψης τεντώνεται σε σχέση με τον ημι – ελάσσων άξονα.

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2.8 ΤΡΟΧΙΑΚΟ ΥΨΟΜΕΤΡΟ:

Το τροχιακό υψόμετρο δίνει το υψόμετρο πάνω από την επιφάνεια της γης ενός σημείου μιας κυκλικής ή ελλειπτικής δορυφορικής τροχιάς. Αρχικά εμπορικοί δορυφόροι τηλεπικοινωνιών είχαν προτιμηθεί να τεθούν σε κυκλικές ισημερινές τροχιές (κλίση 0°) με υψόμετρο περίπου 36.000 km πάνω από το έδαφος. Οι δορυφόροι σε αυτήν την τροχιά περιστρέφονται γύρω από τη γη σε 24 ώρες (τροχιακή περίοδος: 24 ώρες) έτσι ώστε να μην υπάρχει σχετική κίνηση σε σχέση με τη γη. Γι αυτόν το λόγο αυτοί οι δορυφόροι αναφέρονται επίσης ως γεωσύγχρονοι δορυφόροι (GEO) με τροχιά που αναφέρεται σαν γεωστατική. Οι δορυφόροι GEO χρησιμοποιούνται στις τηλεπικοινωνίες Inmarsat Thuraya SBAS WAAS και EGNOS.

Επιπρόσθετα από το σχετικά μεγάλο υψόμετρο των GEO δορυφόρων, το οποίο μπορεί να παρέχει κάλυψη σε μεγάλες περιοχές την επιφάνεια της γης, άλλα δορυφορικά συστήματα (Iridium, Globalstar, GPS και GALILEO) χρησιμοποιούν δορυφόρους με χαμηλότερο τροχιακό ύψος.

Αυτοί οι χαμηλότερου ύψους δορυφόροι πρέπει να είναι σε τροχιά γύρω από τη γη με αυξημένη ταχύτητα προκειμένου να τους παρέχει την αναγκαία φυγόκεντρο δύναμη για να αντισταθμίσει την αύξηση της βαρυτικής έλξης, η οποία υπάρχει σε χαμηλότερα υψόμετρα.

Σε αντίθεση με τους δορυφόρους GEO αυτοί οι δορυφόροι κινούνται σε σχέση με τη Γη και περιστρέφονται στις λεγόμενες μη γεωστατικές δορυφορικές τροχιές (N650). Οι τροχιές σε γενικές γραμμές ταξινομούνται σε έξι διαφορετικές κατηγορίες:

1. Γεωσύγχρονες (GEO): γεωστατική τροχιά με ύψος 36.000 km
2. Τροχιά μεσαίου ύψους (MEO): κεκλιμένη τροχιά με μέτριο ύψος 10.000 km
3. Τροχιά χαμηλού ύψους (LEO): χαμηλού ύψους τροχιά 1.000 km
4. Υψηλή κεκλιμένη ελλειπτική τροχιά (HEO)
5. Κεκλιμένη γεωσύγχρονη τροχιά (IGSO)
6. Πολική τροχιά (PEO): τροχιά χαμηλού ύψους πάνω από τους πόλους

Παράδειγμα 1: καθορισμός ύψους GEO δορυφόρου

Δορυφόροι με γεωστατική τροχιά έχουν πολύ ακριβή υψόμετρο το οποίο μπορεί να υπολογιστεί.

Η μέση γήινη ημέρα (σε σχέση με τη σταθερή θέση των άστρων) έχει διάρκεια 23 ώρες 56 λεπτά και 4099 δεύτερα=86164,099 sec και αναπαριστά μια πλήρη γεωμετρική περιστροφή της Γης (360°) σ' ένα σύστημα με απλανή αστέρες.

$$h = \sqrt[3]{3.9860042 \cdot 10^{14} \frac{m}{s^2} \cdot \left(\frac{P}{2\pi}\right)^2 - R_e(m)} = 35.786,035km$$

Παράδειγμα 2: Προσδιορίζοντας την τροχιακή περίοδο ενός δορυφόρου GPS

Οι δορυφόροι GPS έχουν μέτριου ύψους υψόμετρο 20184,5 km πάνω από τη γη. Η μέση τροχιακή περίοδος ενός δορυφόρου GPS προσδιορίζεται από:

$$T = 2\pi \cdot \sqrt{\frac{(h + R_c)^3}{3.9860042 \cdot 10^{14} \frac{m^2}{s^2}}} = 11h58 \text{ min}$$

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ΚΕΦΑΛΑΙΟ 3:ΣΥΣΤΗΜΑΤΑ ΣΥΝΤΕΤΑΓΜΕΝΩΝ

Στο κεφάλαιο αυτό θα μελετηθούν τα συστήματα συντεταγμένων, διάφορες προσεγγίσεις όπως το γεωειδές το ελλειψοειδές θα γίνει αναφορά στο σύστημα WGS84 και θα μελετηθούν οι μετατροπές των διαφόρων συστημάτων συντεταγμένων.

3.1 ΒΑΣΙΚΑ ΣΥΣΤΗΜΑΤΑ ΣΥΝΤΕΤΑΓΜΕΝΩΝ

3.1.1 ΓΕΩΕΙΔΕΣ

Ο υπολογισμός του σχήματος της Γης ήταν πάντα το πιο δύσκολο επιστημονικό πρόβλημα. Με το πέρασμα των αιώνων εμφανιστήκαν διαφορετικές προσεγγίσεις για τον υπολογισμό του πραγματικού σχήματος της Γης. Το γεωειδές αναπαριστά το πραγματικό σχήμα της Γης και αυτό προσδιορίζεται από την βαρύτητα και γ'αυτό είναι δύσκολο να περιγραφεί. Το γεωειδές συνήθως χρησιμοποιείται σαν επίπεδο αναφοράς για την μέτρηση του ύψους.

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3.1.2 ΕΛΛΕΙΨΟΕΙΔΕΣ

Για τις καθημερινές τοπογραφικές παρατηρήσεις χρειάζεται ένα πιο απλό μοντέλο από το Γεωειδές. Ένα τέτοιο είναι το Ελλειψοειδές. Εάν η επιφάνεια μιας έλλειψης περιστραφεί γύρω από τον συμμετρικό άξονα βορρά νότου έχουμε ως αποτέλεσμα ένα σφαιροειδές.(Σχήμα 13)

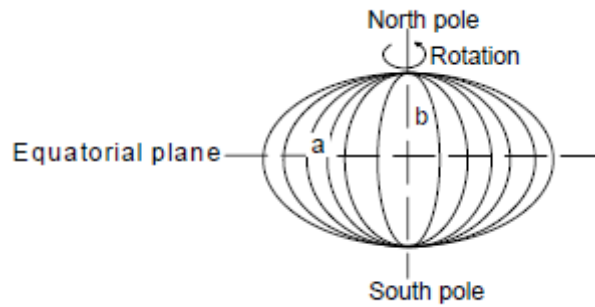
Προσδιορίζεται από 2 παράγοντες.

Ημι-κύριο άξονα (α) (στο επίπεδο του ισημερινού)

Ημι-ελάσσων άξονα (β) (στον άξονα βορρά νότου)

Η τυπική απόκλιση του σχήματος που προκύπτει από την ιδανική σφαίρα ονομάζεται επιπεδοποίηση (f)

$$f = \frac{a-b}{a}$$



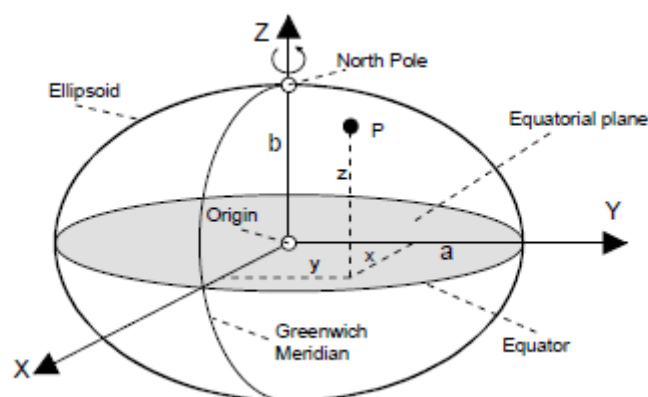
Σχήμα 13

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3.1.3 WGS84¹⁷

Όλοι οι υπολογισμοί οι οποίοι γίνονται από έναν δέκτη GNSS περιλαμβάνουν κυρίως το σύστημα αναφοράς WGS84 (World Geodetic System 1984). Το συγκεκριμένο σύστημα είναι γεωκεντρικά τοποθετημένο ως προς το κέντρο της Γης. Τέτοιο σύστημα καλείται ECEF¹⁸ (earth centered earth fixed). Είναι ένα τρισδιάστατο καρτεσιανό σύστημα συντεταγμένων με το κεντρικό σημείο του συστήματος τοποθετημένο στο κέντρο της μάζας (γεωκεντρικό) ενός ελλειψοειδούς το οποίο προσεγγίζει την συνολική μάζα της Γης.

Ο θετικός X άξονας του ελλειψοειδούς είναι στο επίπεδο του ισημερινού και εκτείνεται από το κέντρο της μάζας δια μέσου από το σημείο όπου ο ισημερινός και ο Μεσημβρινός Greenwich συναντώνται. (Σχήμα 14)



Σχήμα 14

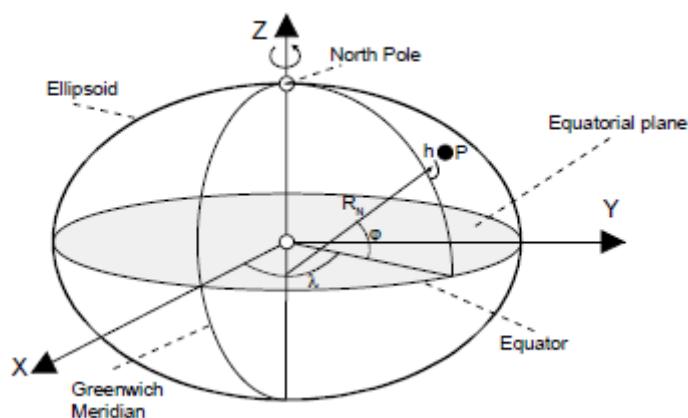
¹⁷ <http://spatialreference.org/ref/epsg/4326/>

¹⁸ <http://en.wikipedia.org/wiki/ECEF>

Ο Y άξονας είναι επίσης στο επίπεδο του ισημερινού με απόκλιση 90 μοίρες ανατολικά από τον άξονα X. Ο Z άξονας είναι κάθετος στον X,Y και εκτείνεται από τον γεωγραφικό Βόρειο Πόλο.

Οι ελλειψοειδείς συντεταγμένες (φ, λ, h) χρησιμοποιούνται σε επεξεργασία πιο συχνά παρά οι καρτεσιανές. (Σχήμα 15)

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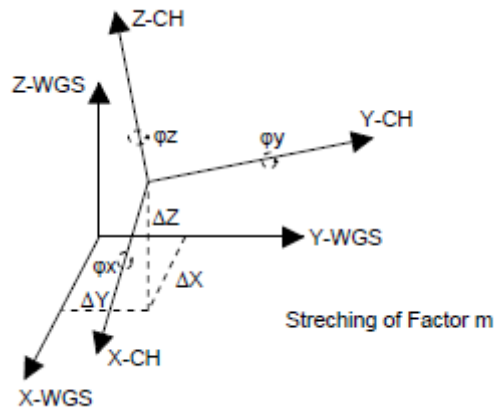
Σχήμα 15

3.2 ΜΕΤΑΤΡΟΠΗ ΑΠΟ ΤΟ ΤΟΠΙΚΟ ΣΕ ΠΑΓΚΟΣΜΙΟ ΕΛΛΙΠΣΟΕΙΔΕΣ

Γεωδαιτικά Datum.

Η σχέση μεταξύ τοπικών και παγκόσμιων γεωκεντρικών δεδομένων λέγεται γεωδαιτικό datum. Οι άξονες του τοπικού και του παγκόσμιου ελλειψοειδούς είναι παράλληλοι τα δεδομένα που χρειάζονται για την μετάβαση είναι οι τρεις παράμετροι μετατόπισης γνωστοί ως δεδομένα μετατόπισης $\Delta x, \Delta y, \Delta z$. Επιπλέον προστίθενται στην ολοκλήρωση της φόρμουλας μετατροπής οι τρεις γωνίες περιστροφής $\varphi_x, \varphi_y, \varphi_z$ και ένας παράγοντας κλιμάκωσης m . (Σχήμα 16)

Τα γεωδαιτικά datum προσδιορίζουν την τοποθεσία ενός τοπικού τρισδιάστατου καρτεσιανού συστήματος συντεταγμένων σε σχέση με το παγκόσμιο σύστημα.



Σχήμα 16

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3.3 ΜΕΤΑΤΡΟΠΗ ΣΥΣΤΗΜΑΤΩΝ ΣΥΝΤΕΤΑΓΜΕΝΩΝ

Οι τύποι μετατροπής των καρτεσιανών και των ελλειψοειδών παρατίθενται παρακάτω.

$$e^2 = \frac{a^2 - b^2}{a^2}$$

$$R_N = \frac{a}{\sqrt{1 - e^2 \sin^2 \varphi a^2}}$$

$$\varphi = \arctan \left[\frac{z}{\sqrt{x^2 + y^2}} \cdot \frac{1}{1 - \frac{R_N}{R_N + h}} e^2 \right]$$

$$\lambda = \tan^{-1} \left(\frac{y}{x} \right)$$

$$h = \frac{\sqrt{x^2 + y^2}}{\cos(\varphi)} - R_N$$

Όπως επίσης και από ελλειψοειδής σε καρτεσιανές

$$x = [R_N + h] \cdot \cos(\varphi) \cdot \cos(\lambda)$$

$$y = [R_N + h] \cdot \cos(\varphi) \cdot \sin(\lambda)$$

$$z = [R_N \cdot [1 - e^2] + h] \cdot \sin(\varphi)$$

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ΚΕΦΑΛΑΙΟ 4: ΑΝΑΛΥΣΗ ΣΗΜΑΤΩΝ GPS

4.1 ΣΗΜΑΤΑ GPS

Οι παρακάτω πληροφορίες (μηνύματα πλοήγησης) εκπέμπονται από τον δορυφόρο με ρυθμό 50bits/sec:

- Σήματα χρόνου που δημιουργούνται στον δορυφόρο και σήματα συγχρονισμού.
- Δεδομένα ακριβής τροχιάς (ephemeris)¹⁹
- Πληροφορίες διόρθωσης χρόνου για να προσδιοριστεί ο ακριβής χρόνος που εκπέμπεται το σήμα χρόνου από τον δορυφόρο
- Κατά προσέγγιση τροχιές για όλους τους δορυφόρους (almanac)²⁰
- Σήματα διόρθωσης για τον υπολογισμό του χρόνου διέλευσης του σήματος από τον δορυφόρο έως τον δέκτη.
- Δεδομένα ιονόσφαιρας
- Πληροφορία κατάστασης λειτουργίας δορυφόρου

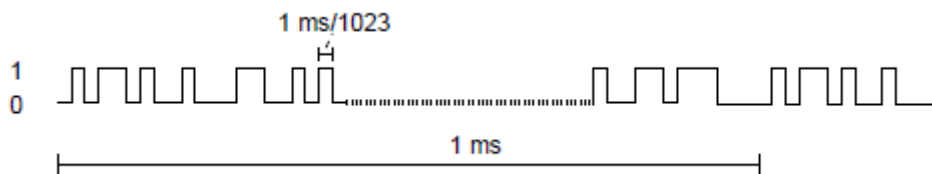
Ο χρόνος για την μετάδοση όλων των πληροφοριών είναι 12,5 λεπτά.

Ο δέκτης χρησιμοποιώντας αυτές τις πληροφορίες είναι ικανός να προσδιορίσει το χρόνο εκπομπής του κάθε δορυφορικού σήματος και την ακριβή θέση του δορυφόρου τη στιγμή της εκπομπής.

Κάθε δορυφόρος εκπέμπει μια μοναδική υπογραφή που είναι προσαρμοσμένη σε αυτόν.

Αυτή αποτελείται από κώδικα ψευδοτυχαίου θορύβου (PRN) 1023 άσσοι και μηδενικά εκπέμπονται σε διάστημα 1ms συνεχώς επαναλαμβανόμενα

(Σχήμα 17).



Σχήμα 17

Ο κώδικας αυτός εξυπηρετεί δύο σκοπούς

- A. Αναγνώριση δορυφόρου από μοναδική υπογραφή
- B. Μέτρηση χρόνου μετάδοσης σήματος

¹⁹ <http://navcen.uscg.gov/?pageName=gpsEphemerisInfo>

²⁰ <http://www.gpsworld.com/gnss-system/almanac/almanac-4265>

4.2 ΑΠΛΟΠΟΙΗΜΕΝΟ ΜΠΛΟΚ ΔΙΑΓΡΑΜΜΑ ΔΗΜΙΟΥΡΓΙΑΣ ΣΗΜΑΤΩΝ

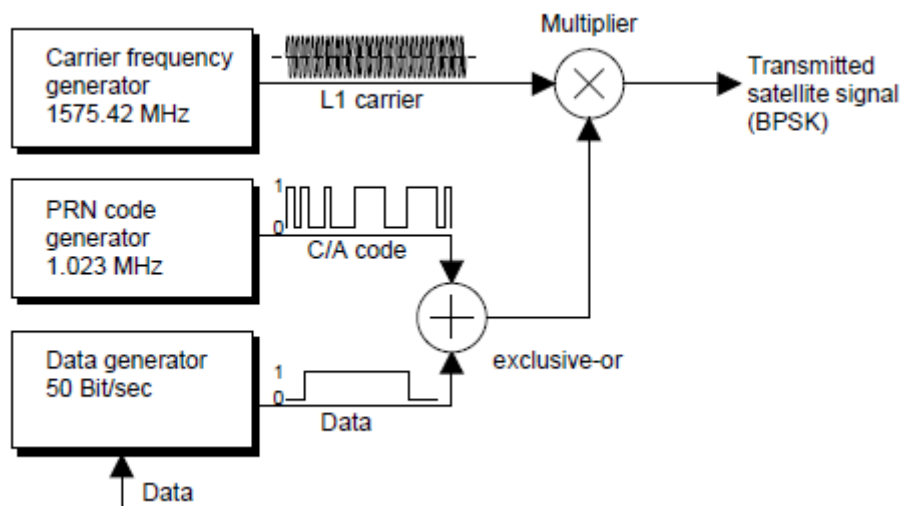
Κάθε δορυφόρος έχει 4 υψηλής ακριβείας ατομικά ρολόγια.

Η συχνότητα συντονισμού ενός από αυτά τα ρολόγια δημιουργεί τους ακόλουθους παλμούς χρόνου και συχνότητας οι οποίοι απαιτούνται για τη λειτουργία:

- 50Hz παλμός δεδομένων
- C/A (Coarse/Acquisition) κώδικας (ένας κώδικας PRN μεταδιδόμενος στα 1.023MHz) ο οποίος διαμορφώνει τα δεδομένα χρησιμοποιώντας μια λειτουργία EX-OR και διασκορπίζει αυτά σε εύρος ζώνης 2MHz
- Την συχνότητα φέροντος L1 (1575,42MHz)

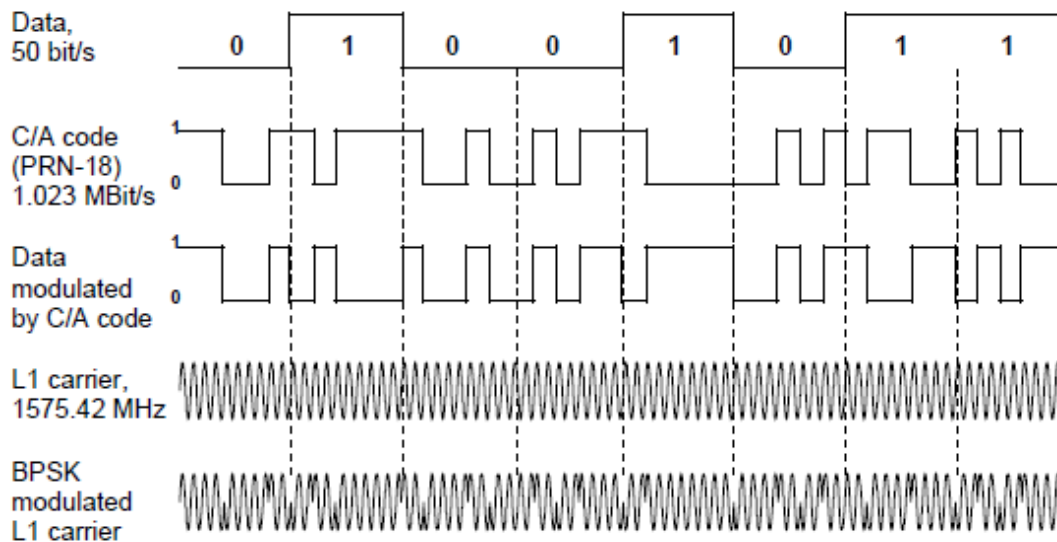
Τα δεδομένα που διαμορφώνονται από τον C/A κώδικα διαμορφώνουν την φέρουσα της L1 σε σειρά χρησιμοποιώντας BPSK²¹. (Σχήμα 18)

Με κάθε αλλαγή στην διαμορφωμένη πληροφορία υπάρχει αλλαγή 180 μοιρών στη φάση της φέρουσας της L1 (Σχήμα 19).



Σχήμα 18

²¹ http://en.wikipedia.org/wiki/Phase-shift_keying



Σχήμα 19

4.3 ΛΕΠΤΟΜΕΡΕΣ ΜΠΛΟΚ ΔΙΑΓΡΑΜΜΑ

Τα δορυφορικά σήματα δημιουργούνται με μια διαδικασία που είναι γνωστή ως DSSS (Direct Sequence Spread Spectrum). Είναι μια διαδικασία στην οποία μια επικρατούσα συχνότητα σκοπίμως απλώνεται πάνω από ένα μεγαλύτερο εύρος ζώνης υπερθέτοντας ένα σήμα υψηλότερης συχνότητας. Η αρχή της διαμόρφωσης διευρυμένου φάσματος επινοήθηκε για πρώτη φορά το 1940 στην Αμερική από την ηθοποιό Hedy Lamarr²² και τον πιανίστα George Antheil αυτή η διαδικασία επιτρέπει την ασφαλή ραδιοζεύξη ακόμα και στα πιο δύσκολα περιβάλλοντα.

Η κεντρική συχνότητα των 10,23MHz δημιουργείται από την συχνότητα συντονισμού ενός από τα 4 ατομικά ρολόγια. Με την σειρά του η συχνότητα φέροντος η συχνότητα παλμών δεδομένων και ο κώδικας C/A δημιουργούνται από την παραπάνω συχνότητα (Σχήμα 20).

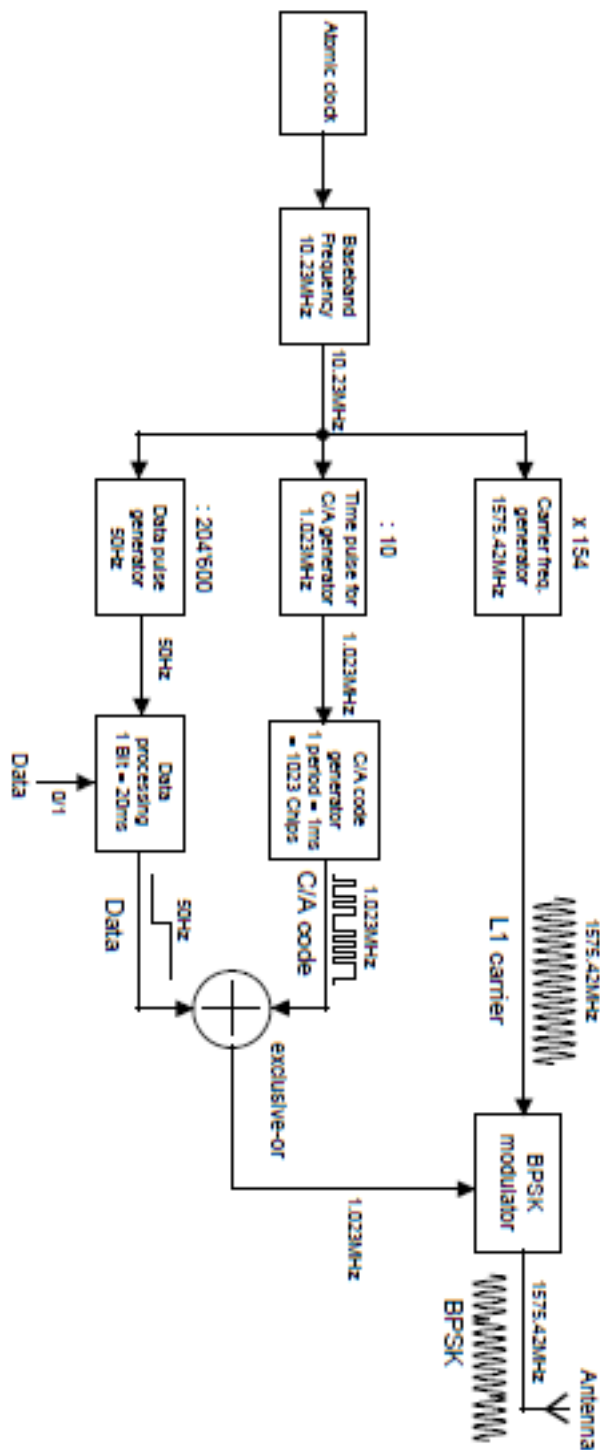
Τελικά το GPS εκπέμπει στα 1575,42MHz με μια διαδικασία γνωστή ως πολυπλεξία CDMA²³. Ο κώδικας C/A παίζει έναν σημαντικό ρόλο στην πολυπλεξία και τη διαμόρφωση. Είναι μια επαναλαμβανόμενη αλληλουχία 1023bits γνωστή ως PRN κώδικας. Είναι μοναδική για κάθε δορυφόρο σαν υπογραφή αναγνώρισης. Δημιουργείται χρησιμοποιώντας έναν καταχωρητή ολίσθησης με ανάδραση. Η γεννήτρια έχει συχνότητα 1.023MHz και περίοδο 1023chips το οποίο αντιστοιχεί σε 1msec. Ο C/A κώδικας είναι ένας χρυσός κώδικας ο οποίος έχει τα πλεονεκτήματα

²² <http://www.women-inventors.com/Hedy-Lamarr.asp>

²³ http://en.wikipedia.org/wiki/Code_division_multiple_access

ιδιοτήτων συσχέτισης και αυτό έχει επίδραση αργότερα στην διαδικασία πλοήγησης και στον υπολογισμό θέσης.

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Σχήμα 20

ΚΕΦΑΛΑΙΟ 5:ΣΦΑΛΜΑΤΑ GPS

Θα μελετηθούν σε αυτό το κεφάλαιο τα διάφορα συστήματα χρόνου που είναι κρίσιμα για την δορυφορική θέσιθεσία καθώς επίσης τα διάφορα σφάλματα του GPS και θα γίνει εκτενή ανάλυση στο DOP (Delution of precision)

5.1 ΣΥΣΤΗΜΑΤΑ ΧΡΟΝΟΥ:

- UTC (Coordinate Universal Time)
- GPS Time: χρόνος για GPS σύστημα.
Διαφέρει από τον χρόνο UTC για μερικά δευτερόλεπτα (για το έτος 2008 η διαφορά ήταν 14 δεύτερα). Η διαφορά μεταξύ GPS χρόνου και UTC και τα παρών χαρακτηριστικά αυτής της διαφοράς συμπεριλαμβάνονται στο μήνυμα πλοήγησης (υποπλάσιο 4, σελίδα 18)
- Ώρα δορυφόρου: ο ώρα που έχει το ενσωματωμένο ρολόι του κάθε δορυφόρου. Η διαφορά αυτού με το χρόνο GPS και τα χαρακτηριστικά αυτής της διαφοράς περιλαμβάνονται στο μήνυμα πλοήγησης (υποπλάσιο 1, σελίδες 1 – 25).
- Ώρα δέκτη: ο ώρα στον δέκτη
Αυτή προσδιορίζεται από ένα εσωτερικό quartz ταλαντωτή και είναι διαφορετική από την ώρα GPS και/ή UTC. Η διαφορά της είναι γνωστή στην αρχή της λειτουργίας ενός δέκτη GPS, αλλά μπορεί να ελαττωθεί μετά από μερικές μετρήσεις δορυφόρων.

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5.2 ΣΦΑΛΜΑΤΑ GPS:

Εισαγωγή:

Στην τεχνολογία GNSS διαφορετικοί παράγοντες μπορεί να συμβάλλουν στο συνολικό σφάλμα.

- Ρολόι Δορυφόρου: Σφάλμα 10nsec αρκετά για να δώσει σφάλμα θέσης 3m
- Τροχιές Δορυφόρων: Γνωστές θέσεις με απόκλιση 1 – 5m
- Ταχύτητα Φωτός: Σήματα διαδίδονται με την ταχύτητα του φωτός αλλά επειδή περνάνε μέσα από τροπόσφαιρα – ιονόσφαιρα η ταχύτητα δεν είναι σταθερή.
- Μέτρηση χρόνου διάδοσης σήματος: Ο δέκτης είναι ικανός να καθορίσει το χρόνο εισερχόμενου δορυφορικού σήματος με περιορισμένη ακρίβεια
- Πολυδιαδρομές: Το επίπεδο σφάλματος αυξάνει περαιτέρω με τη λήψη ανακλώμενων σημάτων
- Γεωμετρία Δορυφόρου: ο καθορισμός της θέσης είναι πιο δύσκολος εάν οι 4 δορυφόροι είναι κοντά. Το φαινόμενο της γεωμετρίας των δορυφόρων καλείται αραίωση – διασπορά ακρίβειας (DOP).

Ο παρακάτω πίνακας μας δείχνει το αποτέλεσμα του οριζόντιου σφάλματος από διαφορετική πηγή.

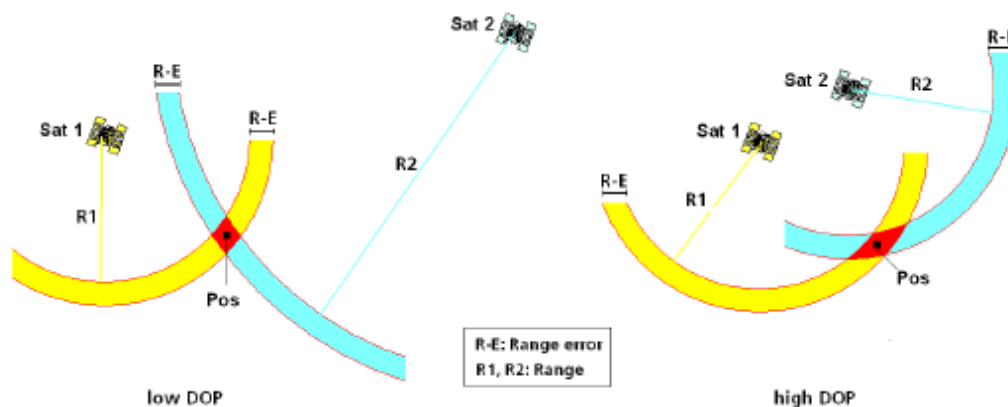
Error cause	Error without DGPS
Ephemeris data	1.5m
Satellite clocks	1.5m
Effect of the ionosphere	3.0m
Effect of the troposphere	0.7m
Multipath reception	1.0m
Effect of the receiver	0.5m
Total RMS value	4.0m

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5.3 DOP (Dilution of Precision)

Η τιμή DOP περιγράφει την αδυναμία ακρίβειας και γι αυτό είναι ένας παράγοντας της εξαρτώμενης ασάφειας του αστερισμού. Εάν η τιμή DOP είναι υψηλή τότε η αναμενόμενη ασάφεια θα είναι μεγαλύτερη. Υπάρχει μια ποικιλία παραμέτρων DOP.

- GDOP (Γεωμετρικό – DOP): περιγράφει την επιρροή της γεωμετρίας των δορυφόρων στο 3D χώρο και μέτρησης χρόνου.
- PDOP (DOP θέσης) το ίδιο χωρίς χρόνο
- HDOP (Horizontal DOP): περιγράφει τη γεωμετρία των δορυφόρων σε θέση 2D δηλαδή σε επίπεδο.
- VDOP (Vertical DOP): περιγράφει τη γεωμετρία των δορυφόρων στο ύψος (1D)
- TDOP (Time DOP): περιγράφει το χρόνο μέτρησης



Σχήμα 24

Στο (σχήμα 24) διακρίνουμε την επίδραση της ασάφειας στη γεωμετρία των δορυφόρων. Όταν οι δύο είναι αραιά χωρισμένοι, το σφάλμα θέσης είναι μικρότερο, όταν είναι κοντά ο ένας στον άλλον η επιφάνεια σφάλματος είναι μεγαλύτερη. Αυτό ισχύει όταν η αβεβαιότητα για τον προσδιορισμό θέσης, που είναι γνωστή ως εύρος σφάλματος είναι το ίδιο και για τους 2 δορυφόρους. $R_1 - R_2$ αναφέρεται στην μετρημένη απόσταση των δορυφόρων ως προς τον χρήστη (ψευδοαπόσταση). Η μετρούμενη ακρίβεια είναι εξαρτώμενη ανάλογα από την τιμή DOP. Αυτό σημαίνει ότι όταν η τιμή DOP διπλασιάζεται, το σφάλμα θέσης είναι δύο φορές μεγαλύτερο.

Γενικά ισχύει:

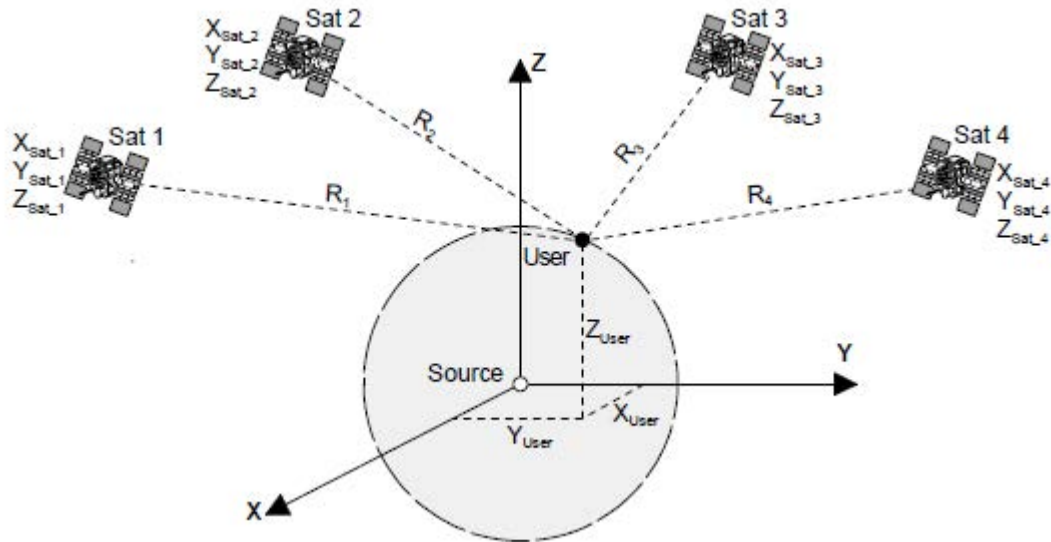
Σφάλμα (1σ) = 1 * Συνολική Τιμή RMS * DCP τιμή

Σφάλμα (2σ) = 2 * Συνολική Τιμή RMS * DOP τιμή

Οι τιμές DOP καθορίζονται βάση των θέσεων των δορυφόρων και του χρήστη

GPS. Με το παρακάτω σχήμα (σχήμα 25) μας δίνει ένα ιδανικό παράδειγμα,

$R_i (i=1..4)$ είναι η απόσταση χρήστη από τον δορυφόρο



Σχήμα 25

$$R_i = \sqrt{(X_{sat_i} - X_{user})^2 + (Y_{sat_i} - Y_{user})^2 + (Z_{sat_i} - Z_{user})^2}$$

Με τις λεπτομέρειες από το παραπάνω σχήμα μπορούμε να παραχθεί ο παρακάτω πίνακας ο οποίος μας υπολογίζει μέσα από τα στοιχεία του, τα οποία είναι οι λόγοι της τρισδιάστατης θέσης του δορυφόρου προς την ακτίνα έως τον χρήστη, την ακρίβεια της υπολογιζόμενης θέσης.

$$P = \begin{bmatrix} \frac{X_{user} - X_{sat_1}}{R_1} & \frac{Y_{user} - Y_{sat_1}}{R_1} & \frac{Z_{user} - Z_{sat_1}}{R_1} & 1 \\ \frac{X_{user} - X_{sat_2}}{R_2} & \frac{Y_{user} - Y_{sat_2}}{R_2} & \frac{Z_{user} - Z_{sat_2}}{R_2} & 1 \\ \frac{X_{user} - X_{sat_3}}{R_3} & \frac{Y_{user} - Y_{sat_3}}{R_3} & \frac{Z_{user} - Z_{sat_3}}{R_3} & 1 \\ \frac{X_{user} - X_{sat_4}}{R_4} & \frac{Y_{user} - Y_{sat_4}}{R_4} & \frac{Z_{user} - Z_{sat_4}}{R_4} & 1 \end{bmatrix}$$

Μέσα από τις διαδικασίες της μετάθεσης του πολλαπλασιασμού και της αντιστροφής του πίνακα μπορεί να υπολογιστεί ο πίνακας D ή αλλιώς πίνακας DOP

$$D = \left[[P]^T \bullet [P] \right]^{-1}$$

Σύμφωνα με τους κανόνες υπολογισμού των πινάκων τα 16 στοιχεία του πίνακα DOP παίρνουν την εξής μορφή

$$D = \begin{bmatrix} D_{11} & D_{12} & D_{13} & D_{14} \\ D_{21} & D_{22} & D_{23} & D_{24} \\ D_{31} & D_{32} & D_{33} & D_{34} \\ D_{41} & D_{42} & D_{43} & D_{44} \end{bmatrix}$$

Οπότε οι τιμές των διαφόρων ειδών DOP έχουν την εξής μορφή από τον παραπάνω πίνακα

$$GDOP = \sqrt{D_{11} + D_{22} + D_{33} + D_{44}}$$

$$PDOP = \sqrt{D_{11} + D_{22} + D_{33}}$$

$$HDOP = \sqrt{D_{11} + D_{22}}$$

$$VDOP = \sqrt{D_{33}}$$

$$TDOP = \sqrt{D_{44}}$$

Κάποιες τιμές DOP μπορούν να υπολογιστούν από κάποιες άλλες

$$GDOP = \sqrt{(PDOP)^2 + (TDOP)^2}$$

Εάν υπάρχουν παραπάνω από 4 δορυφόροι ορατοί το GPS υπολογίζει την θέση από τους 4 δορυφόρους με τις καλύτερες τιμές DOP.

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ΚΕΦΑΛΑΙΟ 6:ΣΥΧΝΟΤΗΤΕΣ ΚΑΙ ΜΗΝΥΜΑΤΑ GPS

Σε αυτό το κεφάλαιο θα μελετηθούν οι συχνότητες που χρησιμοποιεί το GPS η δομή του μηνύματος πλοήγησης καθώς και τα διάφορα υποπλάσια που το αποτελούν όπως επίσης θα δειχθεί και οι λέξεις τηλεμετρίας και οι λέξεις παράδοσης-μεταβίβασης

6.1 ΧΡΗΣΙΜΟΠΟΙΟΥΜΕΝΕΣ ΣΥΧΝΟΤΗΤΕΣ GPS

L1 (1575,42MHz) Εμπεριέχει κώδικα C/A (Coarse/Acquisition) και κώδικες P(Y), οι κώδικες P(Y) είναι κώδικες κρυπτογραφημένοι όπου ένας P (Precise) κώδικας που διαμορφώνει τις L1 και L2 κρυπτογραφείται σε ένα Y κώδικα και θέλει επιπλέον μονάδα στον δέκτη για να αποκρυπτογραφηθεί, και επιπλέον στους νεότερους δορυφόρους BLOCK III υπάρχουν οι L1C και M (Military) για στρατιωτική χρήση

L2 (1227,60MHz) Εμπεριέχει Κώδικα P(Y) και L2C και επίσης στρατιωτικούς κώδικες στους δορυφόρους BLOCK II R M και νεότερους

L3 (1381,05MHz) Χρησιμοποιείται για την ανίχνευση πυρηνικών εκρήξεων (NUDET)

L4 (1379,913MHz) Είναι σε πειραματικό στάδιο για περαιτέρω ιονοσφαιρικές διορθώσεις

L5 (1176,45MHz) Η χρήση της είναι για περιπτώσεις διάσωσης και εκτάκτου ανάγκης.

Band	Frequency (MHz)	Phase	Original Usage	Modernized Usage
L1	1575.42 10.23×154	In-Phase (I)	Encrypted Precision P(Y) code	
		Quadrature-Phase (Q)	Coarse-acquisition (C/A) code	C/A, L1 Civilian (L1C), and Military (M) code
L2	1227.60 10.23×120	In-Phase (I)	Encrypted Precision P(Y) code	
		Quadrature-Phase (Q)	Unmodulated carrier	L2 Civilian (L2C) code and Military (M) code
L3	1381.05 10.23×135		Used by Nuclear Detonation (NUDET) Detection System Payload (NDS); signals nuclear detonations/ high-energy infrared events. Used to enforce nuclear test ban treaties.	
L4	1379.913 10.23×1214/9		(No transmission)	Being studied for additional ionospheric correction
L5	1176.45 10.23×115	In-Phase (I)	(No transmission)	Safety-of-Life (SoL) Data signal
		Quadrature-Phase (Q)		Safety-of-Life (SoL) Pilot signal

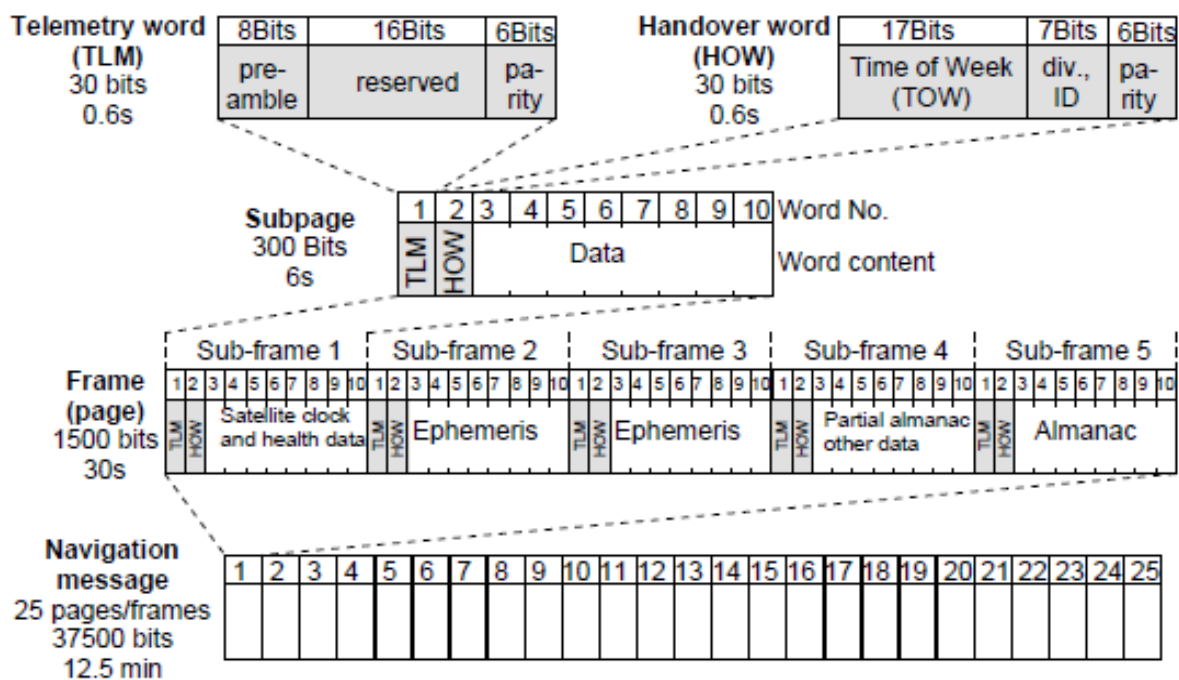
Εικόνα 9

Στην (Εικόνα 9) έχουμε μια πλήρη περιγραφή των διαφόρων συχνοτήτων και χρήσεων αυτών που χρησιμοποιούνται στο σύστημα GPS, όπως για παράδειγμα βλέπουμε στην ζώνη L1 η οποία έχει συχνότητα 1575.42MHz, έχει σε φάση I και φάση τετραγωνισμού Q και διαμορφώνεται από κώδικες P(Y) και C/A για κύρια χρήση και για μελλοντική L1C και M κώδικα.

6.2 ΔΟΜΗ ΜΗΝΥΜΑΤΟΣ ΠΛΟΗΓΗΣΗΣ

Το μήνυμα πλοήγησης είναι 50Hz και αποτελείται από bits δεδομένων τα οποία περιγράφουν τις τροχιές των δορυφόρων, διορθώσεις ρολογιού και διάφορες άλλες παραμέτρους. Το πλαίσιο ενός τέτοιου μηνύματος είναι 1500bits και θέλει 30sec για να εκπεμφθεί στον δέκτη. Όπως βλέπουμε στην (Εικόνα 10) τα 1500bits χωρίζονται σε 5 υποπλάισια των 300bits (6sec διάρκεια εκπομπής). Το κάθε ένα από τα 5 αυτά πλαίσια χωρίζεται σε 10 λέξεις και η κάθε μία περιλαμβάνει 30bits. Κάθε υποπλάισιο ξεκινάει με μια λέξη τηλεμετρίας και μία λέξη παράδοσης (HOW). Ένα πλήρες μήνυμα πλοήγησης αποτελείται από 25 πλαίσια (σελίδες).

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Εικόνα 10

6.3 ΠΛΗΡΟΦΟΡΙΕΣ ΠΟΥ ΠΕΡΙΕΧΟΝΤΑΙ ΣΕ ΚΑΘΕ ΥΠΟΠΛΑΙΣΙΟ.

Ένα πλαίσιο χωρίζεται σε 5 υποπλάισια και κάθε υποπλάισιο εκπέμπει διαφορετικές πληροφορίες.

Το 1^ο υποπλάισιο περιέχει τιμές χρόνου από τις εκπομπές του δορυφόρου συμπεριλαμβανομένου των παραμέτρων για την διόρθωση της μετατόπισης χρόνου του σήματος και τον χρόνο του ενσωματωμένου ρολογιού, επίσης πληροφορίες για την κατάσταση του δορυφόρου και εκτίμηση της ακρίβειας της θέσης του δορυφόρου. Επίσης εκπέμπει το αποκαλούμενο 10bit αριθμό εβδομάδας. (Ο GPS χρόνος ξεκίνησε 6 Ιανουαρίου 1980 00:00:00 ώρα) κάθε 1024 εβδομάδες ο αριθμός αυτός πάει στο 0. Αυτό αποκαλείται μετακύλιση εβδομάδας. Τα υποπλάισια 2 και 3 περιέχουν τα δεδομένα εφημερίδων από τον δορυφόρο όπως ακριβώς βλέπουμε και στην (Εικόνα 10). Αυτά περιέχουν ακριβή πληροφορία για την τροχιά του δορυφόρου. Το υποπλάισιο 4 περιέχει τα δεδομένα almanac των δορυφόρων 25-32 την διαφορά μεταξύ GPS και UTC χρόνου και πληροφορίες σχετικά με τα σφάλματα που προκαλούνται από την ιονόσφαιρα. Το υποπλάισιο 5 περιέχει τα δεδομένα almanac των δορυφόρων 1-24. Όλες οι 25 σελίδες εκπέμπονται μαζί με πληροφορίες κατάστασης των δορυφόρων 1-24.

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6.4 TLM και HOW

Η πρώτη λέξη κάθε ενός πλαισίου, είναι η λέξη τηλεμετρίας (TLM) και περιέχει μια αλληλουχία 8bits η οποία χρησιμοποιείται για σκοπούς συγχρονισμού και ακολουθείται από 16bits τα οποία είναι για εγγεγραμμένους χρήστες.

Όπως όλες οι λέξεις τα τελευταία 6bits της λέξης τηλεμετρίας είναι bits ισοτιμίας.

Η λέξη παράδοσης-μεταβίβασης (HOW) ακολουθεί την λέξη τηλεμετρίας σε κάθε υποπλάισιο.

Είναι 17bits και περιέχει στη δομή της το χρόνο εκκίνησης του επόμενου υποπλαισίου, το οποίο εκπέμπεται σαν χρόνος της εβδομάδας (TOW)

Η αρίθμηση TOW ξεκινάει με την τιμή 0 στην αρχή της εβδομάδας GPS και αυξάνει την τιμή κατά 1 κάθε 6 sec.

Επειδή υπάρχουν 604.800 δευτερόλεπτα σε μία εβδομάδα ο μετρητής πάει από 0 έως 100.799 μέχρι να ξαναπάει στο 0.

Μία ξεχωριστή “υπογραφή” μπαίνει σε κάθε ροή δεδομένων κάθε 6 sec και εκπέμπεται το HOW, ώστε να επιτρέψει το συγχρονισμό με τον P κώδικα.

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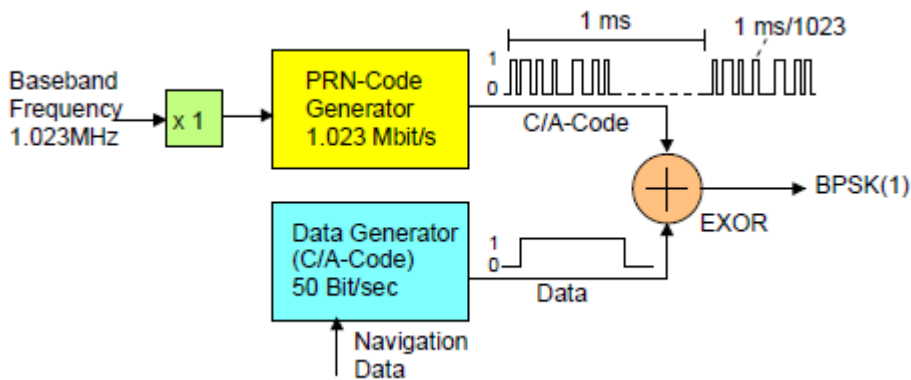
ΚΕΦΑΛΑΙΟ 7:ΕΙΔΗ ΔΙΑΜΟΡΦΩΣΕΩΝ

Σε αυτό το κεφάλαιο θα μελετηθούν τα συστήματα διαμορφώσεων όπως η BPSK και η νεότερη BOC και MBOC .

7.1 ΣΥΣΤΗΜΑΤΑ ΔΙΑΜΟΡΦΩΣΕΩΝ ΤΟΥ GPS

7.1.1 BPSK ΔΙΑΜΟΡΦΩΣΗ

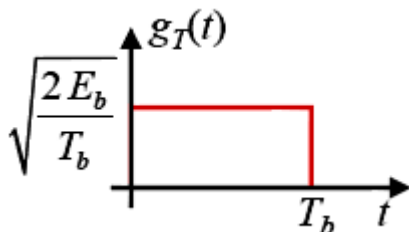
Για να μπορούν οι δορυφόροι GPS να εκπέμπουν στην ίδια συχνότητα, το σήμα GPS διαμορφώνεται με έναν ειδικό κώδικα, ο οποίος ονομάζεται Κώδικας Ψευδοτυχαίου Θορύβου (PRN)²⁴ και ο οποίος έχει 1023 μηδενικά και άσσους και είναι γνωστός σαν κώδικας C/A. Η διαμόρφωση αυτού του σήματος επιτυγχάνεται με την χρήση μιας δυαδικής πύλης αποκλειστικού Ή (EXOR).



Εικόνα 11

Το αποτέλεσμα είναι γνωστό σαν διαμόρφωση διευρυμένου φάσματος. Στην διαμόρφωση αυτή η πληροφορία “κρύβεται” στην φάση του φέροντος, χρησιμοποιούνται ημίτονα $g_T(t)$ διάρκειας T_b

$$g_T(t) = \begin{cases} \sqrt{\frac{2E_b}{T_b}}, & 0 \leq t < T_b \\ 0, & \text{αλλού} \end{cases}$$



Εικόνα 12

²⁴ <http://www.losangeles.af.mil/library/factsheets/factsheet.asp?id=8618>

Για το bit “1” ισχύει η κυματομορφή

$$u_0(t) = B \cos(2\pi F_c t), 0 \leq t < T_b$$

και για το bit “0” ισχύει η κυματομορφή

$$u_1(t) = B \cos(2\pi F_c t + \pi) = -B \cos(2\pi F_c t), 0 \leq t < T_b$$



Εικόνα 13

με $B = \sqrt{2E_g / T_b}$

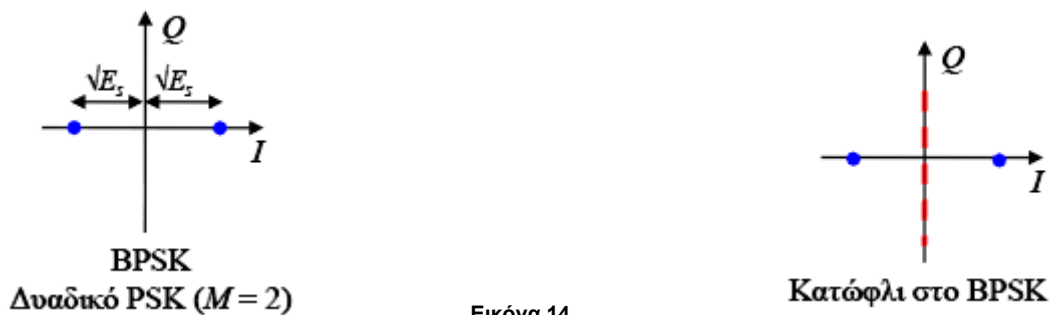
Η ενέργεια ανά σύμβολο είναι

$$E_m = \int_{-\infty}^{+\infty} u_m^2(t) dt = B^2 \int_0^{T_s} \cos^2(2\pi F_c t + \theta_m) dt = \frac{E_s}{T_s} \int_0^{T_s} [1 + \cos(4\pi F_c t + \theta_m)] dt =$$

$$\frac{E_s}{T_s} \int_0^{T_s} \cos(4\pi F_c t + \theta_m) dt + \frac{E_s}{T_s} \int_0^{T_s} 1 dt = E_s$$

με αποτέλεσμα όλα τα σύμβολα να έχουν την ίδια ενέργεια.

Το διάγραμμα αστερισμού και το κατώφλι απόφασης της διαμόρφωσης BPSK φαίνονται στο παρακάτω σχήμα²⁵



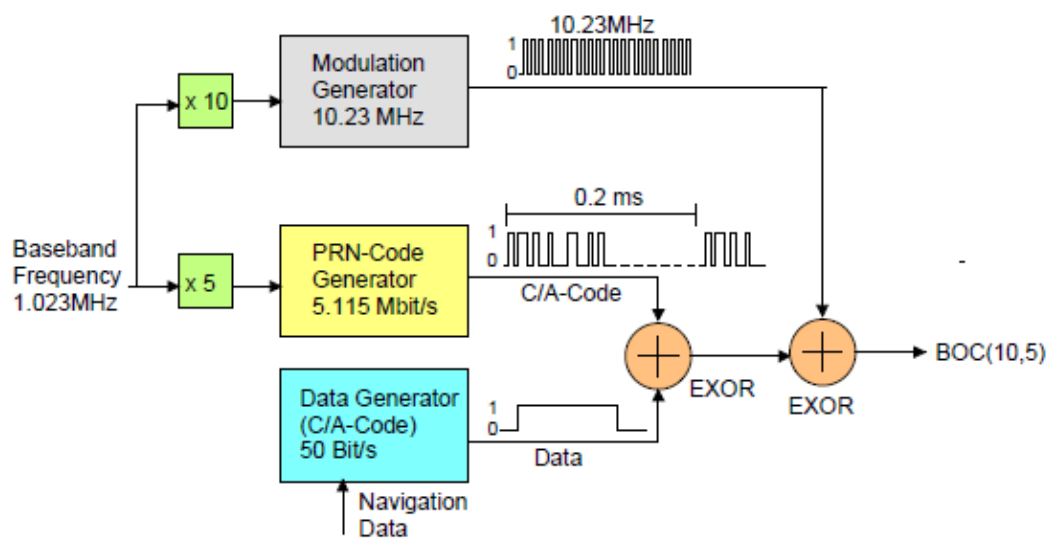
Εικόνα 14

²⁵ Ψηφιακές Επικοινωνίες ΜΔΕ Προηγμένα Τηλεπικοινωνιακά Συστήματα και Δίκτυα Νικόλαος Χ. Σαγιας.

7.1.2 ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΔΙΑΜΟΡΦΩΣΗ BOC (BINARY OFFSET CODE MODULATION)

Στο μέλλον η διαμόρφωση που θα χρησιμοποιείται από το GPS και το GALILEO θα είναι η BOC (Binary Offset Code)²⁶. Με αυτή το BPSK σήμα θα υποστεί μία περαιτέρω διαμόρφωση. Η συχνότητα διαμόρφωσης είναι πάντα πολλαπλάσιο της βασικής συχνότητας 1.023MHz.

Ως παράδειγμα είναι δυνατόν να αναφερθεί ότι BOC(10,5) σημαίνει ότι ο παράγοντας διαμόρφωσης είναι 10 φορές η βασική συχνότητα ($10 \cdot 1023\text{MHz}$) και το chip rate του κώδικα C/A είναι 5 φορές η βάση ($5 \cdot 1023\text{Mbit/s}$)

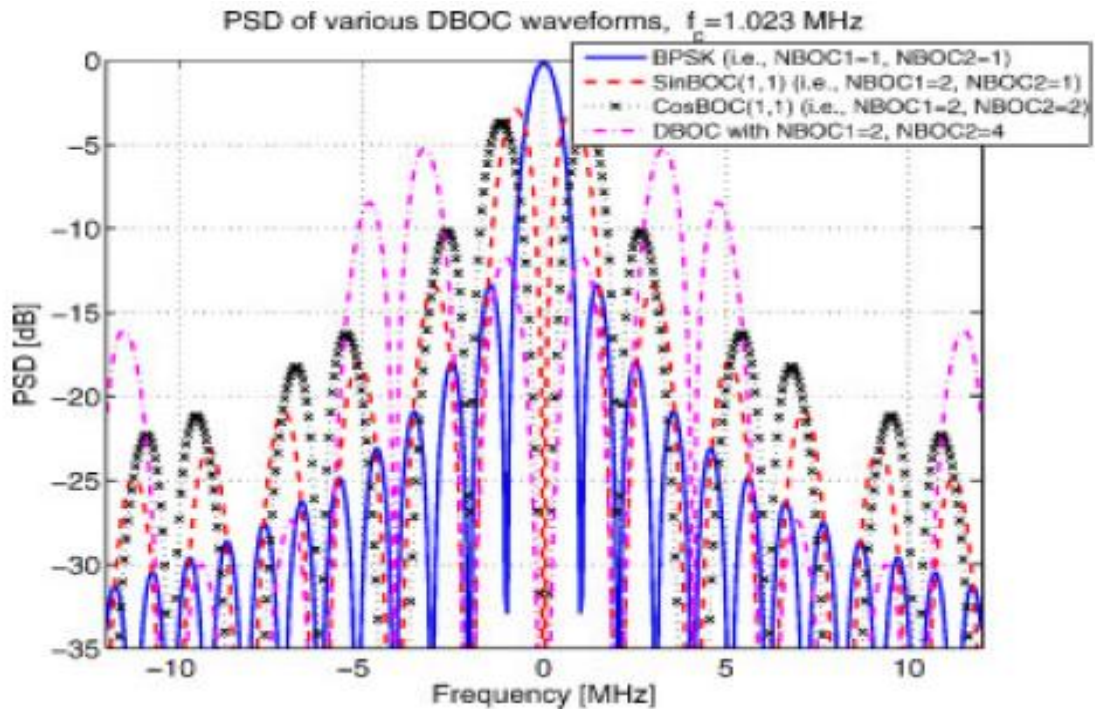


Σχήμα 26

Με την BOC το σήμα κατανέμεται καλύτερα στο ευρος συχνοτητων και η επιδραση των αντιθετων σηματον λόγω πολυδιαδρομών (mutlipath) στη λήψη μειώνεται σε σχέση με τη BPSK.

Η BPSK και η BOC δεν επηρεάζει η μία την άλλη όπως φαίνεται στα παρακάτω φασματα συχνοτήτων.

²⁶ Binary-Offset-Carrier modulation techniques with applications in satellite navigation systems‡
Elena Simona Lohan*, †, Abdelmonaem Lakhzouri and Markku Renfors
Institute of Communications Engineering, Tampere University of Technology, P.O. Box 553, FIN-33101 Finland



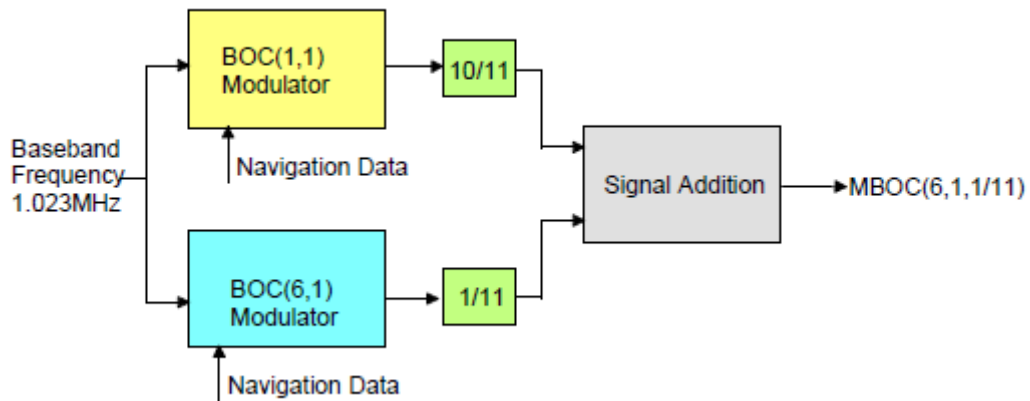
Σχήμα 27

7.1.3 MBOC (MULTIPLEXED BOC, MBOC(6,1,1/11))

Στις 26 Ιουλίου το 2007, Αμερική και Ευρώπη αποφάσισαν ότι GPS και GALILEO θα χρησιμοποιούν την ίδια διαμόρφωση. Η νέα διαμόρφωση γνωστή και σαν MBOC(6,1,1/11) θα χρησιμοποιηθεί με το νέο L1C GPS σήμα και με το L1 OS (Open Service). Η MBOC μία επέκταση της BOC και συνδιάζει 2 διαμορφωτές BOC που προσθέτουν τα σημάτά τους με διαφορετικό βάρος

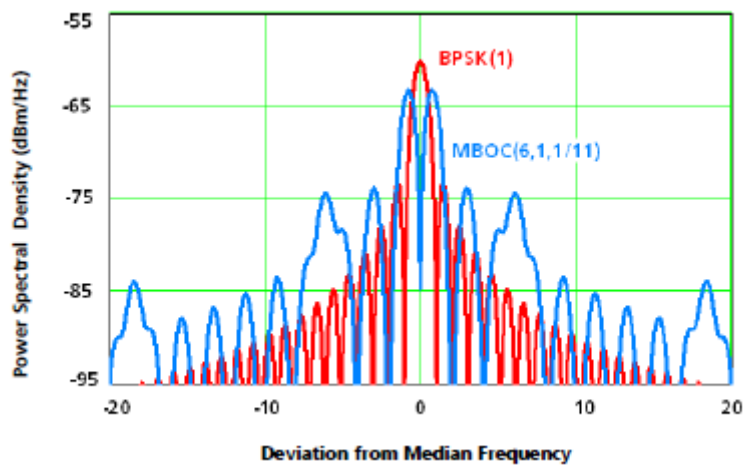
$$MBOC(6,1,1/11) = \frac{10}{11} BOC(1,1) + \frac{1}{11} BOC(6,1)$$

Συνδιάζοντας τα 2 BOC σήματα έχουμε καλύτερη απόδοση σε υψηλότερη συχνότητα.



Σχήμα 28

Ως αποτέλεσμα αυτού ο δέκτης είναι λιγότερο επιρρεπής στον θόρυβο και η διαδικασία εντοπισμού της θέσεως του δέκτη είναι σαφώς καλύτερη. Για να μπορούμε να λάβουμε όλα τα πλεονεκτήματα αυτά το εύρος ζώνης του δέκτη πρέπει να είναι περίπου 20MHz (BPSK περίπου 2MHz)



Σχήμα 29

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ΚΕΦΑΛΑΙΟ 8:RINEX

Σε αυτό το κεφάλαιο θα παρουσιαστούν με λεπτομέρεια τα αρχεία RINEX η ιστορία τους καθώς και η δομή τους και τα διάφορα χαρακτηριστικά τους.

8.1 ΑΡΧΕΙΑ RINEX

8.1.1 ΦΙΛΟΣΟΦΙΑ ΚΑΙ ΙΣΤΟΡΙΑ ΤΩΝ RINEX

Η πρώτη πρόταση για την ανάπτυξη των RINEX(**Receiver Independent Exchange Format**) έγινε από το Αστρονομικό Ινστιτούτο του Πανεπιστημίου της Βέρνης για την εύκολη ανταλλαγή δεδομένων GPS τα οποία συλλέγονταν από μία μεγάλη Πανευρωπαϊκή καμπάνια EUREF89 στην οποία ενεπλάκησαν πάνω από 60 δέκτες GPS από 4 διαφορετικούς κατασκευαστές.

Η κύρια ιδέα για την ανάπτυξη τους ήταν το γεγονός ότι τα περισσότερα γεωδαιτικά προγράμματα GPS χρησιμοποιούν ένα καλά διευκρινισμένο σετ παρατηρήσεων.

- Μέτρηση φάσης φέροντος στην μία ή και στις δύο φέρουσες του GPS (είναι η διαφορά που προκύπτει μεταξύ της εκπεμπόμενης από τον δορυφόρο συχνότητα φέρουσας και της παραγόμενης από τον δέκτη)
- Η μέτρηση κώδικα ψευδοαπόστασης που ισούται με την διαφορά στον χρόνο λήψης και στον χρόνο εκπομπής του δορυφορικού σήματος
- Ο χρόνος παρατήρησης ο οποίος δημιουργείται από το ρολόι του δέκτη σε συνάρτηση με τις μετρήσεις κώδικα και φάσης.

Συνήθως τα προγράμματα αυτά χρειάζονται μόνο την φάση, τον κώδικα και τον χρόνο με τους ορισμούς που προαναφέρθηκαν παραπάνω και μερικές πληροφορίες όπως το όνομα του σταθμού, το ύψος της κεραίας κ.α.

8.2 ΓΕΝΙΚΗ ΠΕΡΙΓΡΑΦΗ ΜΟΡΦΟΠΟΙΗΣΗΣ²⁷

Η μορφοποίηση RINEX V3.00 αποτελείται από 3 τύπους ASCII αρχείων.

- Αρχείο δεδομένων παρατηρήσεων
- Αρχείο μηνύματος πλοήγησης
- Αρχείο μετεωρολογικών δεδομένων

Κάθε τύπος αποτελείται από μια περιοχή κεφαλίδας και μια περιοχή δεδομένων.

Η περιοχή κεφαλίδας περιέχει γενικές πληροφορίες όλου του αρχείου και τοποθετείται στην αρχή και αποτελείται από 61-80 στήλες.

Κάθε αρχείο παρατήρησης και κάθε μετεωρολογικό αρχείο βασικά περιέχει δεδομένα από έναν σταθμό και από μία σύνοδο.

²⁷ RINEX The Receiver Independent Exchange Format Version 3.00
Werner Gurtner Astronomical Institute University of Bern gurtner@aiub.unibe.ch
Lou Estey UNAVCO Boulder, Co. lou@unavco.org

8.3 ΒΑΣΙΚΟΙ ΟΡΙΣΜΟΙ

8.3.1 ΧΡΟΝΟΣ

Ο χρόνος μέτρησης είναι ο χρόνος του δέκτη την ώρα που λαμβάνει σήματα από τον δορυφόρο.

Είναι ίδιος για τις μετρήσεις φάσεις και απόστασης και όμοιος για όλους τους υπό παρατήρηση δορυφόρους την συγκεκριμένη εποχή.

Για αρχεία δεδομένων ενός απλού συστήματος πρέπει να είναι εκφραζόμενα στο σύστημα χρόνου του αντιστοίχου δορυφορικού συστήματος.

Αλλιώς ο πραγματικός χρόνος θα πρέπει να περιγράφεται στην αρχή της κεφαλίδας με ένδειξη Start Time.

8.3.2 ΨΕΥΔΟ-ΑΠΟΣΤΑΣΗ

Η ψευδοαπόσταση είναι η απόσταση από την κεραία του δέκτη ως την κεραία του δορυφόρου και συμπεριλαμβάνει και της αποκλίσεις ρολογιού δορυφόρου και δέκτη (και άλλες ασάφειες όπως καθυστέρηση από την ατμόσφαιρα).

$$PR = \text{distance} + c * (\text{receiver clock offset} - \text{satellite clock offset} + \text{other biases})$$

Έτσι η ψευδοαπόσταση αντικατοπτρίζει την πραγματική συμπεριφορά των ρολογιών του δέκτη και του δορυφόρου και αποθηκεύεται σε μονάδες μέτρων.

8.3.3 ΦΑΣΗ

Η φάση είναι η φάση φέροντος μετρημένη σε ολόκληρους κύκλους. Η φάση αλλάζει με το ίδιο νόημα όπως η απόσταση (αρνητικό Doppler). Οι παρατηρήσεις φάσεων μεταξύ εποχών πρέπει να είναι συνδεδεμένες μεταξύ τους περιλαμβάνοντας τον ακέραιο αριθμό κύκλων. Οι παρατηρήσεις δεν είναι διορθωμένες για εξωτερικούς παράγοντες όπως η ατμοσφαιρική διάθλαση, αποκλίσεις ρολογιών δορυφόρου κλπ.

8.3.4 DOPPLER

Το πρόσημο της μετατόπισης Doppler σαν επιπλέον παρατήρηση προσδιορίζεται σαν : Θετικό στους δορυφόρους που πλησιάζουν.


```

ssssdddhmm.yy0
|
| | | |
| | | | +- 0: observation file
| | | | +--- yy: two-digit year
| | | | +----- mm: starting minute within the hour (00, 15, 30, 45)
| | | | +----- h: character for the n-th hour in the day
| | | |         a = 1st hour: 00h-01h; b = 2nd hour: 01h-02h;
| | | |         . . . x = 24th hour: 23h-24h.
| | | | +----- ddd: day of the year
| | | | +----- ssss: 4-char station ID or ID for the LEO
| | | | receiver/antenna

```

Όταν οι χρόνοι μετάδοσης δεδομένων ή ο αποθηκευτικός χώρος είναι κρίσιμος προτείνεται η συμπίεση των αρχείων. Το IGS²⁸ χρησιμοποιεί UNIX συμπίεση²⁹ η οποία είναι ένα είδος συμπίεσης το οποίο ελατώνει κατά πολύ το μέγεθος του αρχείου και δημιουργεί νέα αρχεία με κατάληξη .Z .

File Types	All platforms uncompressed	UNIX	VMS compressed	DOS
Obs Files	.yy0	.yy0.Z	.yy0_Z	.yyY
Obs Files (Hatanaka compressed)	.yyD	.yyD.Z	.yyD_Z	.yyE
GPS Nav Message Files	.yyN	.yyN.Z	.yyN_Z	.yyX
GLONASS Nav Message File	.yyG	.yyG.Z	.yyG_Z	.yyV
Galileo Nav Message File	.yyL	.yyL.Z	.yyL_Z	.yyT
Mixed GNSS Nav Message File	.yyP	.yyP.Z	.yyP_Z	.yyQ
GEO SBAS Nav Message Files	.yyH	.yyH.Z	.yyH_Z	.yyU
GEO SBAS Broadcast Files (sep. doc.)	.yyB	.yyB.Z	.yyB_Z	.yyA
Met Data Files	.yyM	.yyM.Z	.yyM_Z	.yyW
Clock Files (see sep.doc.)	.yyC	.yyC.Z	.yyC_Z	.yyK

Για μεγαλύτερη συμπίεση των αρχείων παρατηρήσεων ο Yuki Hatanaka ανέπτυξε ένα λογισμικό το οποίο χρησιμοποιεί τα πλεονεκτήματα της δομής rinex και σχηματίζει μεγαλύτερης τάξης διαφορές στο χρόνο μεταξύ των παρατηρήσεων ίδιου τύπου δορυφόρων. Έπειτα από αυτό ισχύουν τα παραπάνω για την περαιτέρω συμπίεση.

8.3.7 ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ RINEX V3.00

Κώδικες παρατηρήσεων

²⁸ <http://igsceb.jpl.nasa.gov/>

²⁹ <http://www.computerhope.com/unix/ucompres.htm>

Η δομή των νέων σημάτων GPS και GALILEO έκαναν εφικτό την παραγωγή παρατηρήσεων κώδικα και φάσης βασιζόμενη σε ένα ή συνδυασμό καναλιών: Σήμα από δύο κανάλια αποτελείται από I και Q συνιστώσες, σήμα από τρία κανάλια από A, B και C συνιστώσες.

Ο κώδικας παρατηρήσεων tna αποτελείται από 3 μέρη:

t: τύπος παρατηρήσεων (c=ψευδοαπόσταση, L=φάση φέροντος, D=Doppler, S=ισχύς σήματος)

n: μπάντα/συχνότητα 1,2,...,8

a: χαρακτηριστικά λειτουργία εντοπισμού ή καναλιού π.χ. I,Q κλπ.

Παράδειγμα:

α.) L1C:

L1: κώδικας C/A από την φάση φέροντος L1(GPS, GLONASS)

C: φάση φέροντος E2-L1-E1 από κανάλι C(Galileo)

β) C2L: ψευδοαπόσταση προερχόμενη από το κανάλι L (GPS)

System	Freq. Band	Frequency	Channel or Code	Observation Codes			
				Pseudo Range	Carrier Phase	Doppler	Signal Strength
GPS	L1	1575.42	C/A	C1C	L1C	D1C	S1C
			L1C (M)	C1S	L1S	D1S	S1S
			L1C (L)	C1L	L1L	D1L	S1L
			L1C (M+L)	C1X	L1X	D1X	S1X
			P	C1P	L1P	D1P	S1P
			Z-tracking and similar (AS on)	C1W	L1W	D1W	S1W
			Y	C1Y	L1Y	D1Y	S1Y
			M	C1M	L1M	D1M	S1M
			codeless	--	L1N	D1N	S1N
	L2	1227.60	C/A	C2C	L2C	D2C	S2C
			L1(C/A)+(P2-P1) (semi-codeless)	C2D	L2D	D2D	S2D
			L2C (M)	C2S	L2S	D2S	S2S
			L2C (L)	C2L	L2L	D2L	S2L
			L2C (M+L) ¹	C2X	L2X	D2X	S2X
			P	C2P	L2P	D2P	S2P
			Z-tracking and similar (AS on)	C2W	L2W	D2W	S2W
			Y	C2Y	L2Y	D2Y	S2Y
			M	C2M	L2M	D2M	S2M
			codeless	--	L2N	D2N	S2N

	L5	1176.45	I	C5I	L5I	D5I	S5I
			Q	C5Q	L5Q	D5Q	S5Q
			I+Q	C5X	L5X	D5X	S5X
GLONASS	G1	1602+k*9/16 k=-7...+12	C/A	C1C	L1C	D1C	S1C
			P	C1P	L1P	D1P	S1P
	G2	1246+k*7/16	C/A (GLONASS M)	C2C	L2C	D2C	S2C
			P	C2P	L2P	D2P	S2P
Galileo	E1	1575.42	A PRS	C1A	L1A	D1A	S1A
			B I/NAV OS/CS/SoL	C1B	L1B	D1B	S1B
			C no data	C1C	L1C	D1C	S1C
			B+C	C1X	L1X	D1X	S1X
			A+B+C	C1Z	L1Z	D1Z	S1Z
	E5a	1176.45	I F/NAV OS	C5I	L5I	D5I	S5I
			Q no data	C5Q	L5Q	D5Q	S5Q
			I+Q	C5X	L5X	D5X	S5X
	E5b	1207.140	I I/NAV OS/CS/SoL	C7I	L7I	D7I	S7I
			Q no data	C7Q	L7Q	D7Q	S7Q
			I+Q	C7X	L7X	D7X	S7X
	E5 (E5a+E5b)	1191.795	I	C8I	L8I	D8I	S8I
			Q	C8Q	L8Q	D8Q	S8Q
			I+Q	C8X	L8X	D8X	S8X
	E6	1278.75	A PRS	C6A	L6A	D6A	S6A
			B C/NAV CS	C6B	L6B	D6B	S6B
			C no data	C6C	L6C	D6C	S6C
			B+C	C6X	L6X	D6X	S6X
			A+B+C	C6Z	L6Z	D6Z	S6Z
	SBAS	L1	1575.42	C/A	C1C	L1C	D1C
L5		1176.45	I	C5I	L5I	D5I	S5I
			Q	C5Q	L5Q	D5Q	S5Q
Compass	E1	1589.74	?	?	?	?	
	E2	1561.098	I	C2I	L2I	D2I	S2I
			Q	C2Q	L2Q	D2Q	S2Q
			I+Q	C2X	L2X	D2X	S2X
	E5b	1207.14	I	C7I	L7I	D7I	S7I
			Q	C7Q	L7Q	D7Q	S7Q
			I+Q	C7X	L7X	D7X	S7X
	E6	1268.52	I	C6I	L6I	D6I	S6I
			Q	C6Q	L6Q	D6Q	S6Q
			I+Q	C6X	L6X	D6X	S6X

Παρακάτω θα παρατεθούν πίνακες με όλα τα χαρακτηριστικά της μορφοποίησης RINEX HEADER και DATA FILES.

Στον πρώτο πίνακα έχουμε την διάταξη της κεφαλίδας ενός αρχείου RINEX:

- RINEX VERSION/TYPE: τύπος και είδος αρχείων και δορυφορικό σύστημα.
- PGM/RUN BY/DATE: όνομα προγράμματος που δημιουργεί τα αρχεία, όνομα διαχειριστή και πληροφορίες για το σύστημα ώρας.
- COMMENT: διάφορα σχόλια.
- MARKER NAME: Όνομα σημείου
- MARKER NUMBER: Αριθμός σημείου.
- MARKER TYPE: Είδος σημείου γεωδαιτικό, μη γεωδαιτικό κλπ.
- OBSERVER AGENCY: Όνομα διαχειριστή.
- REC # /TYPE/VERS: σειριακός αριθμός δέκτη τύπος και version firmware.
- ANT # /TYPE: Σειριακός και τύπος κεραίας.
- APPROX POSITION XYZ:Γεωκεντρική θέση σημείου.
- ANTENNA DELTA H/E/N: Ύψος κεραίας σημείου αναφοράς πάνω από τον δέκτη.
- ANTENNA ΔΕΛΤΑ XYZ:Θέση αναφοράς κεραίας που είναι πάνω σε όχημα.
- ANTENNA PHASECENTER:Κέντρο φάσης κεραίας
- ANTENNA B.SIGHT XYZ: Κατεύθυνση του κάθετου άξονα της κεραίας ως προς τους δορυφόρους GNSS
- ANTENNA ZERODIR AZI: Αζιμούθιο σημείου μηδενισμού μιας κεραίας σε μόνιμο σταθμό
- ANTENNA ZERODIR XYZ: Σημείο μηδενισμού σε κεραία που βρίσκεται σε οχημα.
- CENTER OF MASS XYZ: Κέντρο μάζας κεραίας σε σταθερό σύστημα συντεταγμένων.
- SYS / # / OBS TYPE: Δορυφορικό σύστημα , αριθμός διαφορετικών τύπου παρατηρήσεων . περιγραφείς παρατηρήσεων.
- SIGNAL STRENGTH UNIT: Μονάδα ισχύος σήματος των παρατηρήσεων.
- INTERVAL: Διάστημα παρατηρήσεων σε δευτερόλεπτα.
- TIME OF FIRST OBS: Χρόνος πρώτης παρατήρησης και σύστημα χρόνου.
- TIME OF LAST OBS: Χρόνος τελευταίας παρατήρησης και σύστημα χρόνου.
- RCV CLOCK OFFS APPL: διόρθωση εποχής κώδικα και φάσης αφού εφαρμοστούν οι αντισταθμίσεις ρολογιού του δέκτη.
- SYS/DCBS APPLIED: Δορυφορικό σύστημα,ονομα προγράμματος για την εφαρμογή των DCB(Differential Code Biases) διορθώσεων.

- SYS / PCVS APPLIED: Δορυφορικό σύστημα , πρόγραμμα για την εφαρμογή διορθώσεων μεταβολής κέντρου φάσης επαναλαμβανόμενο για κάθε δορυφόρο.
- SYS / SCALE FACTOR: Δορυφορικό σύστημα , παράγοντας για διαχωρισμό αποθηκευμένων παρατηρήσεων.
- SYS / PHASE SHIFTS: Διορθώσεις μετατόπισης φάσης , χρησιμοποιούνται για παραγωγή σταθερών φάσεων.
- LEAP SECOND: Αριθμός μεταπηδήσεων δευτερολέπτων από τις 6 Ιανουαρίου το 1980.
- # OF SATELLITES: Αριθμός δορυφόρων για τους οποίους έχουν αποθηκευτεί παρατηρήσεις στο αρχείο.
- PRN / # OF OBS: Αριθμοί δορυφόρων , αριθμοί παρατηρήσεων για κάθε τύπο παρατήρησης ο οποίος δείχνεται στο SYS / # / OBS TYPE.
- END OF HEADER: Τελευταίος τομέας στην κεφαλίδα.

TABLE A1
GNSS OBSERVATION DATA FILE - HEADER SECTION DESCRIPTION

HEADER LABEL (Columns 61-80)	DESCRIPTION	FORMAT
RINEX VERSION / TYPE	- Format version : 3.01 - File type: O for Observation Data - Satellite System: G : GPS R : GLONASS E : Galileo S : SBAS payload M : Mixed	F9.2,11X, A1,19X, A1,19X
PGM / RUN BY / DATE	- Name of program creating current file - Name of agency creating current file - Date and time of file creation Format: <code>yyyymmdd hhmmss zone</code> zone: 3-4 char. code for time zone. UTC recommended! LCL if local time with unknown local time system code	A20, A20, A20
* COMMENT	Comment line(s)	A60
MARKER NAME	Name of antenna marker	A60
* MARKER NUMBER	Number of antenna marker	A20
MARKER TYPE	Type of the marker: GEODETIC : Earth-fixed, high-precision monumentation NON_GEODETIC : Earth-fixed, low-precision monumentation NON_PHYSICAL : Generated from network processing SPACEBORNE : Orbiting space vehicle AIRBORNE : Aircraft, balloon, etc. WATER_CRAFT : Mobile water craft GROUND_CRAFT : Mobile terrestrial vehicle FIXED_BUOY : "Fixed" on water surface FLOATING_BUOY : Floating on water surface FLOATING_ICE : Floating ice sheet, etc. GLACIER : "Fixed" on a glacier BALLISTIC : Rockets, shells, etc ANIMAL : Animal carrying a receiver HUMAN : Human being Record required except for GEODETIC and NON_GEODETIC marker types. Users may define other project-dependent keywords.	A20,40X
OBSERVER / AGENCY	Name of observer / agency	A20,A40
REC # / TYPE / VERS	Receiver number, type, and version (Version: e.g. Internal Software Version)	3A20
ANT # / TYPE	Antenna number and type	2A20
APPROX POSITION XYZ	Geocentric approximate marker position (Units: Meters, System: ITRS recommended)	3F14.4

	Optional for moving platforms		
ANTENNA: DELTA H/E/N	- Antenna height: Height of the antenna reference point (ARP) above the marker - Horizontal eccentricity of ARP relative to the marker (east/north) All units in meters	F14.4, 2F14.4	
* ANTENNA: DELTA X/Y/Z	Position of antenna reference point for antenna on vehicle (m): XYZ vector in body-fixed coord. system	3F14.4	*
* ANTENNA: PHASECENTER	Average phase center position w/r to antenna reference point (m) - Satellite system (G/R/E/S) - Observation code - North/East/Up (fixed station) or X/Y/Z in body-fixed system (vehicle)	A1, 1X,A3, F9.4, 2F14.4	*
* ANTENNA: B.SIGHT XYZ	Direction of the "vertical" antenna axis towards the GNSS satellites. Antenna on vehicle: Unit vector in body-fixed coord. system Tilted antenna on fixed station: Unit vector in N/E/Up left-handed system	3F14.4	*
* ANTENNA: ZERODIR AZI	Azimuth of the zero-direction of a fixed antenna (degrees, from north)	F14.4	*
* ANTENNA: ZERODIR XYZ	Zero-direction of antenna Antenna on vehicle: Unit vector in body-fixed coord. system Tilted antenna on fixed station: Unit vector in N/E/Up left-handed system	3F14.4	*
* CENTER OF MASS: XYZ	Current center of mass (X,Y,Z, meters) of vehicle in body-fixed coordinate system. Same system as used for attitude.	3F14.4	*
SYS / # / OBS TYPES	- Satellite system code (G/R/E/S) - Number of different observation types for the specified satellite system - Observation descriptors: - Type - Band - Attribute Use continuation line(s) for more than 13 observation descriptors. In mixed files: Repeat for each satellite system. These records should precede any SYS / SCALE FACTOR records (see below). The following observation descriptors are defined in RINEX Version 3.00: Type: C - Code / Pseudorange L - Phase D - Doppler S - Raw signal strength I - Ionosphere phase delay X - Receiver channel numbers Band: 1 - L1 (GPS, SBAS) G1 (GLO) E2-L1-E1 (GAL) 2 - L2 (GPS)	A1, 2X,I3, 13(1X,A3) 6X, 13(1X,A3)	

	<p>G2 (GLO)</p> <p>5 - L5 (GPS, SBAS)</p> <p>E5a (GAL)</p> <p>6 - E6 (GAL)</p> <p>7 - E5b (GAL)</p> <p>8 - E5a+b (GAL)</p> <p>0 for type X (all)</p> <p>Attribute:</p> <p>P - P code-based (GPS, GLO)</p> <p>C - C code-based (SBAS, GPS, GLO)</p> <p>Y - Y code-based (GPS)</p> <p>M - M code-based (GPS)</p> <p>N - codeless (GPS)</p> <p>A - A channel (GAL)</p> <p>B - B channel (GAL)</p> <p>C - C channel (GAL)</p> <p>I - I channel (GPS, GAL)</p> <p>Q - Q channel (GPS, GAL)</p> <p>S - M channel (L2C GPS)</p> <p>L - L channel (L2C GPS)</p> <p>X - B+C channels (GAL)</p> <p>I+Q channels (GPS, GAL)</p> <p>M+L channels (GPS)</p> <p>W - based on Z-tracking (GPS)</p> <p>(see text)</p> <p>Z - A+B+C channels (GAL)</p> <p>blank : for types I and X (all)</p> <p>or unknown tracking mode</p> <p>All characters in uppercase only!</p> <p>Units : Phase : full cycles</p> <p>Pseudorange : meters</p> <p>Doppler : Hz</p> <p>SNR etc : receiver-dependent</p> <p>Ionosphere : full cycles</p> <p>Channel # : See text</p> <p>Sign definition: See text.</p> <p>The sequence of the observations in the observation records has to correspond to the sequence of the types in this record of the respective satellite system.</p> <p>The attribute can be left blank if not known. See text!</p>		
* SIGNAL STRENGTH UNIT	- Unit of the signal strength observables Snn (if present)	A20,40X	*
	DBHZ : S/N given in dbHz		
	...		
* INTERVAL	Observation interval in seconds	F10.3	*
TIME OF FIRST OBS	- Time of first observation record (4-digit-year, month, day, hour, min, sec)	5I6, F13.7,	
	- Time system: GPS (-GPS time system)	5X, A3	
	GLO (-UTC time system)		
	GAL (-Galileo System Time)		
	Compulsory in mixed GNSS files		
	Defaults: GPS for pure GPS files		
	GLO for pure GLONASS files		
	GAL for pure Galileo files		
* TIME OF LAST OBS	- Time of last observation record (4-digit-year, month, day, hour, min, sec)	5I6, F13.7,	*
	- Time system: Same value as in	5X, A3	
	TIME OF FIRST OBS record		

* RCV CLOCK OFFS APPL	Epoch, code, and phase are corrected by applying the realtime-derived receiver clock offset: 1=yes, 0=no; default: 0=no Record required if clock offsets are reported in the EPOCH/SAT records	I6	*
* SYS / DCBS APPLIED	- Satellite system (G/R/E/S) - Program name used to apply differential code bias corrections - Source of corrections (URL) Repeat for each satellite system. No corrections applied: Blank fields or record not present.	A1, 1X,A17, 1X,A40	*
* SYS / PCVS APPLIED	- Satellite system (G/R/E/S) - Program name used to apply phase center variation corrections - Source of corrections (URL) Repeat for each satellite system. No corrections applied: Blank fields or record not present.	A1, 1X,A17, 1X,A40	*
* SYS / SCALE FACTOR	- Satellite system (G/R/E/S) - Factor to divide stored observations with before use (1,10,100,1000) - Number of observation types involved. 0 or blank: All observation types - List of observation types Use continuation line(s) for more than 12 observation types. Repeat record if different factors are applied to different observation types. A value of 1 is assumed if record is missing.	A1, 1X,I4, 2X,I2, 12(1X,A3) 10X, 12(1X,A3)	*
SYS / PHASE SHIFTS	Phase shift correction used to generate phases consistent w/r to cycle shifts - Satellite system (G/R/E/S/C) - Carrier phase observation code - Type - Band - Attribute - Correction applied (cycles) - Number of satellites involved 0 or blank: All satellites of system - List of satellites Use continuation line(s) for more than 10 satellites. Repeat the record for all affected codes. Leave observation code and rest of the field blank if applied corrections for the respective satellite system are unknown. phase(RINEX) = phase(orig) + correction See chapter 9.1!	A1,1X, A3,1X, PB.5 2X,I2.2, 10(1X,A3) 18X, 10(1X,A3)	
* GLONASS SLOT / FRQ #	Glomass slot and frequency numbers - Number of satellites in list - List of	I3,1X,	*

	- Satellite numbers (system code, slot) - Frequency numbers (-7...+6)	8(A1,I2.2, 1X,I2)	
	Use continuation lines for more than 8 Satellites	4X,8(A1, I2.2,1X,I2)	
* LEAP SECONDS	- Number of leap seconds since 6-Jan-1980 as transmitted by the GPS almanac Δt LS - Future or past leap seconds Δt LSF - Respective week number WN_LSF (continuous number) - Respective day number DN (see ICD-GPS-200C 20.3.3.5.2.4) Zero or blank if not known	I6, I6, I6, I6	*
* # OF SATELLITES	Number of satellites, for which observations are stored in the file	I6	*
* PRN / # OF OBS	Satellite numbers, number of observations for each observation type indicated in the SYS / # / OBS TYPES record. If more than 9 observation types: Use continuation line(s) In order to avoid format overflows, 99999 indicates >= 99999 observations in the RINEX file. This record is (these records are) repeated for each satellite present in the data file	3X, A1,I2.2, 9I6 6X,9I6	*
END OF HEADER	Last record in the header section.	60X	

Στο αρχείο που περιέχει τα δεδομένα παρατηρήσεων έχουμε τα εξής:

- ΕΠΟΧΗ διευκρινιστής εγγραφής : >
εποχή: χρόνια : 4 Ψηφία
μήνας, μέρα, ώρα, λεπτά : 2 ψηφία
Σήμανση εποχής : 0 OK ,1 απώλεια ισχύος, > 1 ειδικό γεγονός.
Αριθμός δορυφόρων στην ίδια εποχή.
Ολίσθηση ρολογιού δέκτη (δευτερόλεπτα)
- Σήμανση εποχής : 0 ή 1 ακολουθούν καταγραφές παρατηρήσεων
Αριθμός δορυφόρου
παρατηρήσεις όπως ορίζονται στο SYS / # / OBS TYPE
LLI(Loss of Lock Indicator) ένδειξη απώλειας κλειδώματος δέκτη
παρατηρήσεις: χαμένες παρατηρήσεις γράφονται ως κενά ή 0,0.
Υπερχειλίση τιμών φάσεων στρογγυλοποιούνται σε σταθερά
μορφοποίησης F14.3
LLI (Loss of Lock Indicator): 0 ή κενό σημαίνει OK ή όχι γνωστό
Bit 0: χάσιμο κλειδώματος μεταξύ προηγούμενης και τωρινής

παρατήρησης πιθανή ολίσθηση φάσης.

Bit 1: Μισός κύκλος ασάφειες / ολισθίσεις πιθανές.

Bit 2 : Galileo BOC παρακολούθηση σήματος MBOC

Ένταση σήματος προβαλλόμενο σε διαστήματα 1-9

1: ελάχιστο σήμα

5: μέτριο σήμα

9: μέγιστη δυνατή ένταση σήματος

0 ή κενό: αδιάφορο

- Σήμανση εποχή 2-5
 - 2: έναρξη μετακίνησης κεραίας
 - 3: Κατάληψη νέας θέσης
 - 4: Ακολουθούν πληροφορίες κεφαλίδας
 - 5: εξωτερικό συμβάν
- Σήμανση εποχής 6
 - 6: ολισθίσεις κύκλων

TABLE A2 GNSS OBSERVATION DATA FILE - DATA RECORD DESCRIPTION	
DESCRIPTION	FORMAT
EPOCH record	
- Record identifier : >	A1,
- Epoch :	
- year (4 digits)	1X,I4,
- month,day,hour,min (two digits)	4(1X,I2.2),
- sec	F11.7,
- Epoch flag	2X,I1,
0: OK	
1: power failure between previous and current epoch	
>1: Special event	
- Number of satellites observed in current epoch (reserved)	I3, 6X,
- Receiver clock offset (seconds, optional)	F15.12,
Epoch flag - 0 or 1: OBSERVATION records follow	
- Satellite number	A1,I2.2,
- Observation	repeat within record for each observation
- LLI	m(F14.3, I1,
- Signal strength	type (same sequence as given in the I1) respective SYS / # / OBS TYPES record)

This record is repeated for each satellite having been observed in the current epoch. The record length is given by the number of observation types for this satellite.

Observations: Definition see text.

Missing observations are written as 0.0 or blanks.

Phase values overflowing the fixed format F14.3 have to be clipped into the valid interval (e.g add or subtract 10^{**9}), set bit 0 of LLI indicator.

Loss of lock indicator (LLI).

0 or blank: OK or not known

Bit 0 set : Lost lock between previous and current observation: Cycle slip possible.
For phase observations only.

Bit 1 set : Half-cycle ambiguity/slip possible.
Software not capable of handling half cycles should skip this observation.
Valid for the current epoch only.

Bit 2 set : Galileo BOC-tracking of an MBOC-modulated signal (may suffer from increased noise).

Signal strength projected into interval 1-9:

1: minimum possible signal strength

5: average S/N ratio

9: maximum possible signal strength

0 or blank: not known, don't care

Standardization for S/N values given in dBHz: See text.

Epoch flag 2-5: **EVENT**: *Special records* may follow

- Epoch flag

2: start moving antenna

3: new site occupation (end of kinem. data)
(at least **MARKER NAME** record follows)

4: header information follows

5: external event (epoch is significant,
same time frame as observation time tags)

[2X, I1]

- "Number of satellites" contains number of special records to follow. 0 if no special records follow.
Maximum number of records: 999

[I3]

For events without significant epoch the epoch fields in the EPOCH RECORD can be left blank

Epoch flag - 6: **EVENT**: *Cycle slip records* follow

- Epoch flag

6: cycle slip records follow to optionally report detected and repaired cycle slips (same format as **OBSERVATIONS** records;

- slip instead of observation;

- LLI and signal strength blank or zero)

[2X, I1]

TABLE A3
GNSS OBSERVATION DATA FILE - EXAMPLE

```

-----|---1|0---|---2|0---|---3|0---|---4|0---|---5|0---|---6|0---|---7|0---|---8|0-
      3.01      OBSERVATION DATA      M      RINEX VERSION / TYPE
G - GPS R - GLONASS E - GALILEO S - GEO M - MIXED      COMMENT

XXRINEXO V9.9      AIUB      20060324 144333 UTC PGM / RUN BY / DATE
EXAMPLE OF A MIXED RINEX FILE VERSIOIN 3.01      COMMENT
The file contains L1 pseudorange and phase data of the      COMMENT
geostationary AOR-E satellite (PRN 120 - S20)      COMMENT
A 9080      MARKER NAME
9080.1.34      MARKER NUMBER
BILL SMITH      ABC INSTITUTE      OBSERVER / AGENCY
X1234A123      GEODETIC      1.3.1      REC # / TYPE / VERS
G1234      ROVER      ANT # / TYPE
4375274.      587466.      4589095.      APPROX POSITION XYZ
      .9030      .0000      .0000      ANTENNA: DELTA H/E/N
0      RCV CLOCK OFFS APPL
G 5 C1C L1W L2W C1W S2W      SYS / # / OBS TYPES
R 2 C1C L1C      SYS / # / OBS TYPES
E 2 L1B L5I      SYS / # / OBS TYPES
S 2 C1C L1C      SYS / # / OBS TYPES
18.000      INTERVAL
G APPL DCB      xyz.uvw.abc//pub/dcb gps.dat      SYS / DCBS APPLIED
DBHZ      SIGNAL STRENGTH UNIT
2006 03 24 13 10 36.0000000 GPS      TIME OF FIRST OBS
END OF HEADER
> 2006 03 24 13 10 36.0000000 0 5 -0.123456789012
G06 23629347.915 .300 8 -.353 4 23629347.158 24.158
G09 20891534.648 -.120 9 -.358 6 20891545.292 38.123
G12 20607600.189 -.430 9 .394 5 20607600.848 35.234
E11 .324 8 .178 7
S20 38137559.506 335849.135 9
> 2006 03 24 13 10 54.0000000 0 7 -0.123456789210
G06 23619095.450 -53875.632 8 -41981.375 4 23619095.008 25.234
G09 20886075.667 -28688.027 9 -22354.535 7 20886076.101 42.231
G12 20611072.689 18247.789 9 14219.770 6 20611072.410 36.765
R21 21345678.576 12345.567 5
R22 22123456.789 23456.789 5
E11 65432.123 5 48861.586 7
S20 38137559.506 335849.135 9
> 2006 03 24 13 11 12.0000000 2 2
*** FROM NOW ON KINEMATIC DATA! ***      COMMENT
TWO COMMENT LINES FOLLOW DIRECTLY THE EVENT RECORD      COMMENT
> 2006 3 24 13 11 12.0000000 0 4 -0.123456789876
G06 21110991.756 16119.980 7 12560.510 4 21110991.441 25.543
G09 23588424.398 -215050.557 6 -167571.734 6 23588424.570 41.824
G12 20869878.790 -113803.187 8 -88677.926 6 20869878.938 36.961
G16 20621643.727 73797.462 7 57505.177 2 20621644.276 15.368
>
A 9081      MARKER NAME
9081.1.34      MARKER NUMBER
      .9050      .0000      .0000      ANTENNA: DELTA H/E/N
--> THIS IS THE START OF A NEW SITE <--      COMMENT
> 2006 03 24 13 12 6.0000000 0 4 -0.123456987654
G06 21112589.384 24515.877 6 19102.763 4 21112589.187 25.478
G09 23578228.338 -268624.234 7 -209317.284 6 23578228.398 41.725
G12 20625218.088 92581.207 7 72141.846 5 20625218.795 35.143
G16 20864539.693 -141858.836 8 -110539.435 2 20864539.943 16.345
> 2006 03 24 13 13 1.2345678 5 0
>
AN EVENT FLAG 5 WITH A SIGNIFICANT EPOCH      COMMENT
AND AN EVENT FLAG 4 TO ESCAPE FOR THE TWO COMMENT LINES      COMMENT
> 2006 03 24 13 14 12.0000000 0 4 -0.123456012345
G06 21124965.133 0.30213 -0.62614 21124965.275 27.528
G09 23507272.372 -212616.150 7 -165674.789 7 23507272.421 42.124
G12 20828010.354 -333820.093 6 -260119.395 6 20828010.129 37.002
G16 20650944.902 227775.130 7 177487.651 3 20650944.363 18.040
>
*** LOST LOCK ON G 06      COMMENT
.
.
.
>
4 1
END OF FILE      COMMENT
-----|---1|0---|---2|0---|---3|0---|---4|0---|---5|0---|---6|0---|---7|0---|---8|0-

```

Επίσης παρατίθεται πίνακας με τα στοιχεία από μήνυμα πλοήγησης κεφαλίδα και δεδομένων.

TABLE A4 GNSS NAVIGATION MESSAGE FILE - HEADER SECTION DESCRIPTION		
HEADER LABEL (Columns 61-80)	DESCRIPTION	FORMAT
RINEX VERSION / TYPE	- Format version : 3.01 - File type ('N' for navigation data) - Satellite System: G: GPS R: GLONASS E: Galileo S: SBAS Payload M: Mixed	F9.2,11X, A1,19X, A1,19X
PGM / RUN BY / DATE	- Name of program creating current file - Name of agency creating current file - Date and time of file creation Format: yyyymmdd hhmmss zone zone: 3-4 char. code for time zone. 'UTC ' recommended! 'LCL ' if local time with unknown local time system code	A20, A20, A20
* COMMENT	Comment line(s)	A60
* IONOSPHERIC CORR	Ionospheric correction parameters - Correction type GAL - Galileo a10 - a12 GPSA - GPS alpha0 - alpha3 GPSB - GPS beta0 - beta3 - Parameters GPS: alpha0-alpha3 or beta0-beta3 GAL: a10, a11, a12, zero	A4,1X, 4D12.4
* TIME SYSTEM CORR	Corrections to transform the system time to UTC or other time systems - Correction type GAUT - GAL to UTC a0, a1 GPUT - GPS to UTC a0, a1 SBUT - SBAS to UTC a0, a1 GLUT - GLO to UTC a0-TauC, a1-zero GPGA - GPS to GAL a0-A0G, a1-A1G GLGP - GLO to GPS a0-TauGPS, a1-zero - a0,a1 Coefficients of 1-deg polynomial (a0 sec, a1 sec/sec) CORR(s) = a0 + a1*DELTAT - T Reference time for polynomial (Seconds into GPS/GAL week) - W Reference week number (GPS/GAL week, continuous number) T and W zero for GLONASS. - S EGNOS, WAAS, or MSAS ... (left-justified) Derived from MT17 service provider. If not known: Use Snn with nn = PRN-100 of satellite broadcasting the MT12 - U UTC Identifier (0 if unknown) 1-UTC(NIST), 2-UTC(USNO), 3-UTC(SU), 4-UTC(BIPM), 5-UTC(Europe Lab), 6-UTC(CRL), >6 - not assigned yet S and U for SBAS only.	A4,1X, D17.10, D16.9, I7, I5, 1X,A5,1X I2,1X
* LEAP SECONDS	- Number of leap seconds since 6-Jan-1980 as transmitted by the GPS almanac Δt LS - Future or past leap seconds Δt LSF - Respective week number WN_LSF	I6, I6, I6,

	(continuous number) - Respective day number DN (see ICD-GPS-200C 20.3.3.5.2.4) Zero or blank if not known	I6
END OF HEADER	Last record in the header section.	60X

TABLE A5 GNSS NAVIGATION MESSAGE FILE - GPS DATA RECORD DESCRIPTION		
OBS. RECORD	DESCRIPTION	FORMAT
SV / EPOCH / SV CLK	- Satellite system (G), sat number (PRN) - Epoch: Toc - Time of Clock (GPS) - year (4 digits) - month, day, hour, minute, second - SV clock bias (seconds) - SV clock drift (sec/sec) - SV clock drift rate (sec/sec ²)	A1, I2.2, 1X, I4, 5 (1X, I2.2), 3D19.12 *)
BROADCAST ORBIT - 1	- IODE Issue of Data, Ephemeris - Cra (meters) - Delta n (radians/sec) - M0 (radians)	4X, 4D19.12 ***)
BROADCAST ORBIT - 2	- Cuc (radians) - e Eccentricity - Cus (radians) - sqrt(A) (sqrt(m))	4X, 4D19.12
BROADCAST ORBIT - 3	- Toe Time of Ephemeris (sec of GPS week) - Cic (radians) - OMEGA0 (radians) - Cis (radians)	4X, 4D19.12
BROADCAST ORBIT - 4	- I0 (radians) - Cra (meters) - omega (radians) - OMEGA DOT (radians/sec)	4X, 4D19.12
BROADCAST ORBIT - 5	- IDOT (radians/sec) - Codes on L2 channel - GPS Week # (to go with TOE) Continuous number, not mod(1024)! - L2 P data flag	4X, 4D19.12
BROADCAST ORBIT - 6	- SV accuracy (meters) - SV health (bits 17-22 w 3 sf 1) - TGD (seconds) - IODC Issue of Data, Clock	4X, 4D19.12
BROADCAST ORBIT - 7	- Transmission time of message (**) (sec of GPS week, derived e.g. from Z-count in Hand Over Word (HOW)) - Fit interval (hours) (see ICD-GPS-200, 20.3.4.4) Zero if not known - spare - spare	4X, 4D19.12

TABLE A6
GPS NAVIGATION MESSAGE FILE - EXAMPLE

```

-----|---1|0---|---2|0---|---3|0---|---4|0---|---5|0---|---6|0---|---7|0---|---8|
      3.01          N: GNSS NAV DATA      G: GPS          RINEX VERSION / TYPE
XXRINEXN V3       AIUB                    19990903 152236 UTC PGM / RUN BY / DATE
EXAMPLE OF VERSION 3.00 FORMAT              COMMENT
GPSA  .1676D-07  .2235D-07  .1192D-06  .1192D-06  IONOSPHERIC CORR
GPSB  .1208D+06  .1310D+06  -.1310D+06  -.1966D+06  IONOSPHERIC CORR
GPUT  .1331791282D-06  .107469589D-12  552960 1025  TIME SYSTEM CORR
      13                                     LEAP SECONDS
                                           END OF HEADER
G06 1999 09 02 17 51 44 -.839701388031D-03 -.165982783074D-10 .000000000000D+00
      .910000000000D+02 .934062500000D+02 .116040547840D-08 .162092304801D+00
      .484101474285D-05 .626740418375D-02 .652112066746D-05 .515365489006D+04
      .409904000000D+06 -.242143869400D-07 .329237003460D+00 -.596046447754D-07
      .111541663136D+01 .326593750000D+03 .206958726335D+01 -.638312302555D-08
      .307155651409D-09 .000000000000D+00 .102500000000D+04 .000000000000D+00
      .000000000000D+00 .000000000000D+00 .000000000000D+00 .910000000000D+02
      .406800000000D+06 .000000000000D+00
G13 1999 09 02 19 00 00 .490025617182D-03 .204636307899D-11 .000000000000D+00
      .133000000000D+03 -.963125000000D+02 .146970407622D-08 .292961152146D+01
      -.498816370964D-05 .200239347760D-02 .928156077862D-05 .515328476143D+04
      .414000000000D+06 -.279396772385D-07 .243031939942D+01 -.558793544769D-07
      .110192796930D+01 .271187500000D+03 -.232757915425D+01 -.619632953057D-08
      -.785747015231D-11 .000000000000D+00 .102500000000D+04 .000000000000D+00
      .000000000000D+00 .000000000000D+00 .000000000000D+00 .389000000000D+03
      .410400000000D+06 .000000000000D+00
-----|---1|0---|---2|0---|---3|0---|---4|0---|---5|0---|---6|0---|---7|0---|---8|

```

Πίνακες με κεφαλίδες και δεδομένα μετεωρολογικών αρχείων

TABLE A13 METEOROLOGICAL DATA FILE - HEADER SECTION DESCRIPTION		
HEADER LABEL (Columns 61-80)	DESCRIPTION	FORMAT
RINEX VERSION / TYPE	- Format version : 3.01 - File type: M for Meteorological Data	F9.2,11X, A1,39X
PGM / RUN BY / DATE	- Name of program creating current file - Name of agency creating current file - Date of file creation	A20, A20, A20
* COMMENT	Comment line(s)	A60 *
MARKER NAME	Station Name (preferably identical to MARKER NAME in the associated Observation File)	A60
* MARKER NUMBER	Station Number (preferably identical to MARKER NUMBER in the associated Observation File)	A20 *
# / TYPES OF OBSERV	- Number of different observation types stored in the file - Observation types The following meteorological observation types are defined in RINEX Version 2: PR : Pressure (mbar) TD : Dry temperature (deg Celsius)	I6, 9(4X,A2)
	HR : Relative humidity (percent) ZW : Wet zenith path delay (mm) (for WVR data) ZD : Dry component of zen.path delay (mm) ZT : Total zenith path delay (mm) WD : Wind azimuth (deg) from where the wind blows WS : Wind speed (m/s) RI : "Rain increment" (1/10 mm): Rain accumulation since last measurement HI : Hail indicator non-zero: Hail detected since last measurement The sequence of the types in this record must correspond to the sequence of the measurements in the data records If more than 9 observation types are being used, use continuation lines with format (6X,9(4X,A2))	
SENSOR MOD/TYPER/ACC	Description of the met sensor - Model (manufacturer) - Type - Accuracy (same units as obs values) - Observation type Record is repeated for each observation type found in # / TYPES OF OBSERV record	A20, A20,6X, F7.1,4X, A2,1X
SENSOR POS XYZ/H	Approximate position of the met sensor - Geocentric coordinates X,Y,Z (ITRF) - Ellipsoidal height H or WGS-84) - Observation type Set X,Y,Z to zero if not known. Make sure H refers to ITRF or WGS-84! Record required for barometer, recommended for other sensors.	3F14.4, 1F14.4, 1X,A2,1X
END OF HEADER	Last record in the header section.	60X

TABLE A14 METEOROLOGICAL DATA FILE - DATA RECORD DESCRIPTION		
OBS. RECORD	DESCRIPTION	FORMAT
EPOCH / MET	- Epoch in GPS time (not local time!) year (2 digits, padded with 0 if necessary) month,day,hour,min,sec The 2-digit years are understood to represent 80-99: 1980-1999 and 00-79: 2000-2079	1X,I2.2, 5(1X,I2),
	- Met data in the same sequence as given in the header	mF7.1
	More than 8 met data types: Use continuation lines	4X,10F7.1,3X

TABLE A15 METEOROLOGICAL DATA FILE - EXAMPLE							
----	----	----	----	----	----	----	----
3.01	METEOROLOGICAL DATA			RINEX VERSION / TYPE			
XXRINEXM V9.9	AIUB	1996-04-02 00:10:12			PGM / RUN BY / DATE		
EXAMPLE OF A MET DATA FILE				COMMENT			
A 9080				MARKER NAME			
3	PR	TD	HR	# / TYPES OF OBSERV			
PAROSCIENTIFIC		740-16B		0.2	PR SENSOR MOD/TYPE/ACC		
HAENNI				0.1	TD SENSOR MOD/TYPE/ACC		
ROTRONIC		I-240W		5.0	HR SENSOR MOD/TYPE/ACC		
	0.0	0.0	0.0	1234.5678	PR SENSOR POS XYZ/H		
END OF HEADER							
96	4	1	0	0	15	987.1	10.6 89.5
96	4	1	0	0	30	987.2	10.9 90.0
96	4	1	0	0	45	987.1	11.6 89.0
----	----	----	----	----	----	----	----

ΚΕΦΑΛΑΙΟ 9

9.1 TEQC³⁰

Τον Ιανουάριο του 1996 στις εγκαταστάσεις της UNAVCO στο Boulder του Κολοράντο αποφασίστηκε να ξαναγραφεί το πρόγραμμα ελέγχου ποιότητας (QC) το οποίο αναπτύχθηκε από τον Chris Rocken και τον James Johnson.

Ο νέος κώδικας έπρεπε να γραφτεί από την αρχή χρησιμοποιώντας γλώσσα C και θα είχε δυνατότητες για ανάγνωση και εγγραφή RINEX σε απόλυτη συμβατότητα με το V.2

Επίσης άλλο ένα κριτήριο ήταν το γεγονός ότι θα έπρεπε να είναι συμβατό με UNIX shell, θα παρείχε υποστήριξη GLONASS και GPS.

Ο κώδικας αναπτύχθηκε σε Solaris 2.3 χρησιμοποιώντας ANSI C μεταγλωττιστή και με την πάροδο του χρόνου προστίθενται συνέχεια και νέες δυνατότητες.

Μπορεί να μεταφράσει τα binary δεδομένα των δεκτών σε συμβατά RINEX και επίσης μπορεί να κάνει διαμόρφωση της κεφαλίδας των RINEX αρχείων. Μόνο τα δεδομένα που συλλέγονται από έναν απλό δέκτη, συμπεριλαμβανομένου και των προαιρετικών πληροφοριών εφημερίδων, χρειάζονται για να επιτρέψουν στον χρήστη να κάνει εκτίμηση ελέγχου ποιότητας, κατά την διάρκεια του ελέγχου ποιότητας γραμμικοί συνδυασμοί ψευδοαπόστασης και φάσης φέροντος χρησιμοποιούνται για τον υπολογισμό πολυδιαδρομών ψευδοαπόστασης L1 για C/A ή παρατηρήσεις P κώδικα, L2 πολυδιαδρομές ψευδοαπόστασης ή παρατηρήσεις P κώδικα. Διάφορες πληροφορίες όπως ολισθήσεις ρολογιού δέκτη, γωνίες αζιμούθιου κ.α. γράφονται στο report αρχείο το οποίο είναι ένα αρχείο αναφοράς που δημιουργείται μετά την επεξεργασία ποιότητας που γίνεται από το TEQC και έχει κατάληξη .xxS.

Οι βασικοί αλγόριθμοι ελέγχου ποιότητας είναι οι εξής:

Οι μετρήσεις φάσης και ψευδοαπόστασης μοντελοποιούνται σύμφωνα με τα παρακάτω:

$$L_i = R + c(dt_r + dt_s) - I_i + N + m_i + n_i \lambda_i$$

$$P_i = R + c(dt_r + dt_s) + I_i + N + M_i$$

Όπου:

L_i = παρατηρήσεις φάσης για συχνότητα i (π.χ. RINEX L1 ή L2 μετατρεπόμενο σε απόσταση)

c = ταχύτητα του φωτός

³⁰ Estey LH, Meertens CM (1999) TEQC: the multi-purpose toolkit for GPS/GLONASS data. GPS Solut 3(1):42–49

dt_r = σφάλμα ρολογιού δέκτη

dt_s = σφάλμα ρολογιού δορυφόρου

I_i = σφάλμα ιονόσφαιρας για συχνότητα i

N = ουδέτερη ατμοσφαιρική καθυστέρηση

m_i = πολυδιαδρομές φάσης για συχνότητα i

M_i = πολυδιαδρομές ψευδοαπόστασης για συχνότητα i

$n_i \lambda_i$ = ακέραιο μήκος κύματος και ασάφειες φάσης για συχνότητα i

Όπου οι δύο συχνότητες είναι 1575,42MHz ($i=1$) και 1227,60 ($i=2$) για το GPS.

1602,00+ $k * 9/16$ MHz ($i=1$) και

1246,00+ $k * 7/16$ MHz ($i=2$) όπου k είναι ο ακέραιος αριθμός συχνότητας για το GLONASS.

Ξεκινώντας με τις L1-L2 και υποθέτοντας ότι η διαδρομή από την ατμόσφαιρα που διέρχονται τα δύο σήματα είναι περίπου η ίδια ισχύουν:

$$I_1 + \frac{1}{\alpha - 1} [n_1 \lambda_1 - n_2 \lambda_2 + m_1 - m_2] = \frac{1}{\alpha - 1} (L_1 - L_2)$$

$$I_2 + \frac{\alpha}{\alpha - 1} [n_1 \lambda_1 - n_2 \lambda_2 + m_1 - m_2] = \frac{\alpha}{\alpha - 1} (L_1 - L_2)$$

και διευκρινίζουμε τον ρυθμό μεταβολής του χρόνου σαν την παράγωγο της ιονοσφαιρικής καθυστέρησης.

$$I_{(2)OD} \equiv \frac{a}{a-1} [(L_1 - L_2)_j - (L_1 - L_2)_{j-1}] / (t_j - t_{j-1})$$

Για να πάρουμε τις εξισώσεις πολυδιαδρομών ξεκινάμε με Pi-Li και αντικαθιστούμε τα I_1, I_2 υποθέτοντας πάλι ότι έχω τις ίδιες ατμοσφαιρικές διαδρομές και για τις δύο συχνότητες. Οι γραμμικοί συνδυασμοί

$$MP1 \equiv P_1 - \left(1 + \frac{2}{a-1}\right) L_1 + \left(\frac{2}{a-1}\right) L_2 = M_1 + B_1 - \left(1 + \frac{2}{a-1}\right) m_1 + \left(\frac{2}{a-1}\right) m_2$$

$$MP2 \equiv P_2 - \left(\frac{2a}{a-1}\right) L_1 + \left(\frac{2a}{a-1} - 1\right) L_2 = M_2 + B_2 - \left(\frac{2a}{a-1}\right) m_1 + \left(\frac{2a}{a-1} - 1\right) m_2$$

και οι όροι απόκλισης που προκύπτουν από τις γραμμικές ασάφειες φάσης.

$$B_1 \equiv -\left(1 + \frac{2}{a-1}\right)n_1\lambda_1 + \left(\frac{2}{\alpha-1}\right)n_2\lambda_2$$

$$B_2 \equiv -\left(\frac{2\alpha}{a-1}\right)n_1\lambda_1 + \left(\frac{2\alpha}{\alpha-1} - 1\right)n_2\lambda_2$$

Οι γραμμικοί συνδυασμοί MP1 και MP2 υπολογίζονται και παρακολουθούνται στον αλγόριθμο ελέγχου ποιότητας και ποικίλουν στον χρόνο σύμφωνα με τους όρους Mi και Bi. Οι αποκλίσεις θεωρούνται ότι είναι σταθερές εκτός αν υπάρχει ολίσθηση στην παρακολούθηση των L1 και L2. Στην πράξη η DC συνιστώσα των MP1 και MP2 αφαιρείται και αναφέρεται μόνο η απόκλιση της μέσης τετραγωνικής ρίζας των γραμμικών συνδυασμών.

Υπάρχει ακόμα επιπλέον επίδραση από πολυδιαδρομές φάσης αλλά είναι σαφώς μικρότερου πλάτους από την πολυδιαδρομή του P-κώδικα. Εάν οι παρατηρήσεις ψευδοαπόστασης Pi είναι μη διαθέσιμες τότε χρησιμοποιείται η ψευδοαπόσταση C/A. Το TEQC έχει έναν αριθμό από παραμέτρους ώστε να ελεγχθεί ο αλγόριθμος ελέγχου ποιότητας. Συνήθως στον χρήστη προτείνεται να χρησιμοποιήσει τις προεπιλεγμένες παραμέτρους. Βέβαια κάποιοι παράμετροι θα πρέπει που θα πρέπει να προσεχθούν είναι οι εξής:

++sym: παραγωγή ιεραρχικών ASCII χαρακτήρων που χρησιμοποιούνται στο διάγραμμα χρόνου του QC.

-plot: καταστολή δημιουργίας “compact” αρχείων σχεδιασμού.

-report: καταστολή δημιουργίας report αρχείων

-nav filename: χρήση συγκεκριμένου RINEX nav αρχείου

-set_mask value: μάσκα γωνίας αποκοπής πάνω από το οριζόντιο επίπεδο

+ssv: παραγωγή ξεχωριστών SUM αρχείων για κάθε δορυφόρο.

ΚΕΦΑΛΑΙΟ 10:ΠΕΡΙΓΡΑΦΗ ΔΙΚΤΥΟΥ ΝΟΑΝΕΤ

10.1 ΔΙΚΤΥΟ ΝΟΑΝΕΤ³¹

Η παρακολούθηση της παραμόρφωσης του φλοιού της Γης είναι ένας από τους νέους στόχους του Εθνικού Αστεροσκοπείου Αθηνών . Η Ελλάδα είναι από τις πιο ενεργές περιοχές του πλανήτη με κινήσεις φλοιού μεγέθους cm ανά χρόνο. Σύγχρονες τεχνικές τοπογραφίας συμπεριλαμβανομένου και της Διαστημικής Γεωδαισίας έχουν την ευαισθησία να ανιχνεύουν κινήσεις και μεγέθη μέσα σε λίγα χρόνια γι'αυτό και είναι ενδεδειγμένη η χρήση τους για την παρακολούθηση της παραμόρφωσης της τεκτονικής πλάκας στην Ελλάδα σήμερα. Το Εθνικό Αστεροσκοπείο Αθηνών ξεκίνησε να εγκαθιστά μόνιμους σταθμούς GPS το 2006 συμπεριλαμβανομένου και του μόνιμου σταθμού NOA1 ,στο κτήριο του Αστεροσκοπείου στην Πεντέλη ,που έχει ενταχθεί στο EUREF³². Σήμερα υπάρχουν 13 σταθμοί σε συνεχή λειτουργία με περίοδο δειγματοληψίας 1sec και μεταδίδουν δεδομένα σε πραγματικό χρόνο στον κεντρικό σταθμό συλλογής ο οποίος βρίσκεται στην Αθήνα.

Όλοι οι σταθμοί είναι εφοδιασμένοι με δέκτες της Leica³³ και αντίστοιχες κεραίες εκτός από τον σταθμό ATAL στην Αταλάντη Φθιοιώτιδας ο οποίος έχει δέκτη ASHTECH³⁴

Τα αρχεία RINEX 30s είναι διαθέσιμα ελεύθερα στην ηλεκτρονική διεύθυνση:

http://egelados.gein.noa.gr/services/GPS/GPS_DATA/

Στην εικόνα 15 βλέπουμε τον χάρτη της κατανομής των σταθμών του δικτύου μόνιμων σταθμών GPS με γεωλογικό υπόβαθρο και επίσης στο δεξί άκρο υπάρχουν σύνδεσμοι με τα ονόματα των σταθμών και μέσα σε αυτά αναλυτικές πληροφορίες σχετικά με τους σταθμούς.Στην εικόνα 16 έχουμε τις αναλυτικές συντεταγμένες όλου του δικτύου την λιθολογία του υποβάθρου που έχει επιλεγεί για την εγκατάσταση τους καθώς επίσης και τον τύπο της κεραίας και του δέκτη που χρησιμοποιούνται στον κάθε σταθμό όπως επίσης και τον σειριακό του δέκτη.

Αξίζει να τονιστεί ότι το δίκτυο NOANET συνεχώς αυξάνεται σε πλήθος σταθμών και αναβαθμίζεται συχνά με τα τελευταία λογισμικά των δεκτών.Επίσης ελέγχεται επι 24ώρου βάσεως για την ομαλή λειτουργία του έτσι ώστε να αποτελεί ένα από τα πιο αξιόπιστα δίκτυα που υπάρχουν αυτή την στιγμή στην Ελλάδα.

³¹ Ganas, A., G. Drakatos, S. Rontogianni, C. Tsimi, P. Petrou, M. Papanikolaou, P. Argyrakis, K. Boukouras, N. Melis and G. Stavrakakis, 2008. NOANET: the new permanent GPS network for Geodynamics in Greece. Geophysical Research Abstracts, Vol. 10, EGU2008-A-04380.

³² <http://www.epncb.oma.be/>

³³ <http://www.leica-geosystems.com/en/index.htm>

³⁴ <http://www.ashtech.com/welcome-85.kjsp?RF=PRO-EN>

Περαιτέρω πληροφορίες για το δίκτυο NOANET θα μπορούσαμε να βρούμε στην επίσημη ιστοσελίδα του η οποία είναι:

<http://www.gein.noa.gr/gps.html>



Εικόνα 15



NOA GPS permanent network: Description of each individual station as of 24 August 2011

No	SITE	Location	DATE ¹	Latitude ²	Longitude	Elevation ³	Lithology	Antenna type	Receiver S/N	Receiver Type
1	VLSM	Valsamata, Cephalonia	14/02/06	38 10 36.57729	20 35 19.11740	437.857	Limestone	AX 1202 GG	462019	LEICA GRX1200PRO
2	NOA1	Pendeli, Attica	13/03/06	38 02 49.42865	23 51 50.51878	537.812	Marble	AT504 LEIS	462590	LEICA GRX1200PRO
3	RLS_	Rioulos Achaia	29/07/06	38 03 21.00536	21 27 53.07259	132.896	Sandstone	AX 1202 GG	452163	LEICA GRX1200PRO
4	PONT	Ponti Lefkas	15/02/07	38 37 08.33042	20 35 06.66228	48.527	Limestone	AX 1202 GG	462661	LEICA GRX1200PRO
6	KASI	Kassiopi Corfu	01/04/07	39 44 46.92506	19 56 07.95572	103.851	Limestone	AX 1202 GG	465462	LEICA GRX1200PRO
5	SPAN	Spanohori Lefkas	22/05/07	38 46 52.69841	20 40 25.11708	447.857	Schist	AX 1202 GG	465460	LEICA GRX1200PRO
7	LEMN	Lemnos (Agarionos)	16/06/07	39 53 50.02428	25 10 50.05172	104.555	Andesite	AX 1202 GG	351610	LEICA GRX1200PRO
8	PRKV	Agia Paraskevi (Lesvos)	30/06/07	39 14 44.52574	26 15 54.04156	169.346	Andesite	AX 1202 GG	465459	LEICA GRX1200PRO
9	NVRK	Nevrokopion Drama	12/07/07	41 20 12.76080	23 52 11.18640	579.000	Sandstone	AX 1202 GG	351602	LEICA GRX1200PRO
10	KLOK	Klokotos (Thessaly)	17/07/08	39 33 53.07722	22 00 51.78134	137.457		AT504 LEIS	463363	LEICA GRX1200PRO
11	ATAL	Atalanti (Fthiotis)	27/03/09	38 39 11.00898	22 59 57.67584	135.130	Alluvium	NOV533	IR120030 4026	ASYTECH UZ-12
12	KIPO	Kipouria (Cephalonia)	31/8/10	38 12 11.46877	20 20 54.06252	128.197	Limestone	AX 1203+GNSS	120160	GMX902 GG
13	PYLO	Fylos (Messinia)	24/8/11	36 54 51.02581	21 41 43.10394	39.114	Limestone	AS10	1700407	GR10

¹Date of first observation

²Geographic Coordinate in WGS84 (preliminary solution)

³Elevation in m (ellipsoidal height)

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Εικόνα 16

ΚΕΦΑΛΑΙΟ: 11 ΑΠΟΤΕΛΕΣΜΑΤΑ ΑΠΟ ΣΤΑΘΜΟΥΣ ΒΑΣΗΣ ΝΟΑΝΕΤ

11.1 ΜΕΘΟΔΟΛΟΓΙΑ ΑΝΑΛΥΣΗΣ ΑΠΟΤΕΛΕΣΜΑΤΑ ΑΠΟ ΣΤΑΘΜΟΥΣ ΒΑΣΗΣ

Έπειτα από αυστηρά κριτήρια στην επιλογή του δικτύου μονίμων σταθμών GPS και εύρεσης των κατάλληλων ημερομηνιών μέγιστης λειτουργίας του δικτύου έγινε χρήση αρχείων και των 13 σταθμών του μόνιμου δικτύου GPS ΝΟΑΝΕΤ.

Συλλέχθηκαν συνολικά 52 αρχεία Unix compressed .Z τα οποία περιείχαν observation files (αρχεία παρατηρήσεων) συμπιεσμένα με την μέθοδο hatanaka που αναφέρθηκε στο προηγούμενο κεφάλαιο καθώς επίσης και αρχεία πλοήγησης (navigation).

Έγινε έλεγχος ποιότητας στα δεδομένα όσο αφορά την πληρότητα των δεδομένων, την σηματοθορυβική αναλογία και τους δείκτες πολυδιαδρομών με το πρόγραμμα TEQC και από τα αρχεία αναφοράς (report files) έγινε εξαγωγή των τιμών MP1 και MP2(Multipath L1 και Multipath L2).

Η περίοδος της επεξεργασίας είναι από την εγγραφή των δεδομένων της ημέρας 10 Μαΐου από τα έτη 2009 2010 2011 και 2012.

Τα αποτελέσματα συγκρίθηκαν με το paper του Bruyninx et al. (2003) και αφορά το αποτέλεσμα των 50% σταθμών του IGS³⁵.

11.2 ΑΝΑΛΥΣΗ ΑΠΟΤΕΛΕΣΜΑΤΩΝ

Αναλυτικά τα αρχεία που πάρθηκαν είναι τα εξής όπως φαίνονται από τον παρακάτω πίνακα , στην πρώτη στήλη είναι το όνομα του αρχείου στην δεύτερη τα δύο ψηφία του έτους και το είδος του αρχείου (hatanaka xhd και αρχείο πλοήγησης xhn) και στην τρίτη στήλη η κατάληξη της συμπίεσης UNIX .Z :

ΕΤΟΣ 2012 Ημέρα 127

VLSM1270	12d,12n	.Z
NOA11270	12d,12n	.Z
RLSO1270	12d,12n	.Z
PONT1270	12d,12n	.Z
KAS11270	12d,12n	.Z

³⁵ Bruyninx, C., Carpentier, G., and Roosbeek, F. (2003). Today's EPN and Its Network Coordination. *EUREF Symposium*, 4-6 June, Toledo, Spain. 13 (33), 38-49. EUREF Publication

SPAN1270	12d,12n	.Z
LEMN1270	12d,12n	.Z
PRKV1270	12d,12n	.Z
NVRK1270	12d,12n	.Z
KLOK1270	12d,12n	.Z
ATAL1270	12d,12n	.Z
KIPO1270	12d,12n	.Z
PYLO1270	12d,12n	.Z

ΕΤΟΣ 2011 Ημέρα 127

VLSM1270	11d,11n	.Z
NOA11270	11d,11n	.Z
RLSO1270	11d,11n	.Z
PONT1270	11d,11n	.Z
KASI1270	11d,11n	.Z
SPAN1270	11d,11n	.Z
LEMN1270	11d,11n	.Z
PRKV1270	11d,11n	.Z
NVRK1270	11d,11n	.Z
KLOK1270	11d,11n	.Z
ATAL1270	11d,11n	.Z
KIPO1270	11d,11n	.Z

ΕΤΟΣ 2010 Ημέρα 127

VLSM1270	10d,10n	.Z
NOA11270	10d,10n	.Z

PONT1270	10d,10n	.Z
KASI1270	10d,10n	.Z
SPAN1270	10d,10n	.Z
LEMN1270	10d,10n	.Z
PRKV1270	10d,10n	.Z
NVRK1270	10d,10n	.Z
KLOK1270	10d,10n	.Z
ATAL1270	10d,10n	.Z

ΕΤΟΣ 2009 Ημέρα 127

VLSM1270	09d,09n	.Z
NOA11270	09d,09n	.Z
RLSO1270	09d,09n	.Z
PONT1270	09d,09n	.Z
SPAN1270	09d,09n	.Z
LEMN1270	09d,09n	.Z
PRKV1270	09d,09n	.Z
NVRK1270	09d,09n	.Z
KLOK1270	09d,09n	.Z
ATAL1270	09d,09n	.Z

Αποσυμπίεστηκαν τα παραπάνω αρχεία με το πρόγραμμα Unzip και επίσης μετατράπηκαν τα xhd (Hatanaka Compressed) στον αρχικό τους μορφότυπο xho (observations).

11.3 ΕΠΕΞΕΡΓΑΣΙΑ ΜΕ ΤΕQC.

Τα αρχεία με καθαρό μορφότυπο observation επεξεργάστηκαν σειριακά με το πρόγραμμα TEQC για τα ποιοτικά τους χαρακτηριστικά.

Σύνοψη όλων των εντολών υπάρχει στο παράρτημα Β.

Η εντολή κονσόλας που δόθηκε μέσα από το TEQC για την επεξεργασία τους ήταν η εξής

```
teqc +plot2 +nav +qc +report όνομα αρχείου.extension
```

Αναλυτικά με την εντολή

+plot 2: παράγει COMPACT2 τύπου αρχεία γραφημάτων σύμφωνα με την παρακάτω οδηγία της UNAVCO

For anyone that uses or is interested in teqc's qc ASCII plot files:

In the first serious overhaul of this part of the code in about 13 years, the next version of teqc will have a slightly different plot file format for GNSS data. This will automatically kick into gear if the input data is recognized by teqc as having data from SV constellations other than GPS, or if you use a new "+plot2" option.

The new (still ASCII) format looks like (compare with the traditional plot format described at <http://ls.unavco.org/pipermail/teqc/2007/000566.html>):

```
COMPACT2
T_SAMP      30.0
START_TIME_MJD  54466.000347
13 G06 G07 G08 G09 G10 G15 G18 G21 G24 G29 G26 R07 R08
   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
14 G06 G07 G08 G09 G10 G15 G18 G21 G24 G29 G26 R07 R08 R23
  -0.124   0.494  -0.679   0.096  -0.016  -0.008  -0.062
-0.022   0.056   0.511  -0.022  -0.021  -0.138   0.000
14 G06 G07 G08 G09 G10 G15 G18 G21 G24 G29 G26 R06 R07 R08
  -0.489   0.234  -0.204   0.623   0.034   0.010   0.199
0.106  -0.030  -1.057   0.028   0.000  -0.031  -0.050
13 G06 G07 G08 G09 G10 G15 G18 G21 G24 G26 R06 R07 R08
  -0.177  -0.590  -0.345  -0.504  -0.421   0.017   0.239
0.086  -0.036  -0.048   0.119  -0.089   0.760
14 G06 G07 G08 G09 G10 G15 G18 G21 G24 G26 R06 R07 R08 R24
  -0.595  -0.209  -1.365  -1.391   0.198   0.075  -0.038
-0.089  -0.134  -0.011   0.012  -0.035  -0.590   0.000
-1
   0.426  -0.166   0.002   0.781  -0.041   0.039   0.131
-0.065  -0.030   0.024   0.119  -0.107  -0.724  -1.204
...
```

1st line: always says "COMPACT2"

2nd line: the time sample interval between epochs in seconds

3rd line: start time of first epoch in modified Julian days (note:
6.0 Jan 1980 is equivalent to the modified Julian day of 44244.0)

4th line: first epoch; the first number is the number of SVs for data
at
this epoch, and the SV IDs afterward are the same as used in RINEX
2.11

5th line: data of first epoch for the N SVs; the units should be
semi-obvious:
 mp1 and mp2: meters
 elevation and azimuth: degrees
 ion and iod: meters and meters/sec (I think)

following pairs of lines if the SV count is non-zero: same as 4th and
5th lines
for the following epochs, except a -1 for the number of SVs means the
SV list
is the same as the previous epoch, unless:

if the epoch lines lists 0 SVs, then there is no following data line

Same tricky little detail: the format of each datum on the data lines
is (in C):
"%8.3lf%c ". The %c is sometimes used to output a non-space ASCII
character
indicating some special attention to that SV at that epoch, such as a
slip.

A few notes on both the traditional COMPACT and new GNSS COMPACT2:

* the missing data line if the SV number is zero also has and
continues to
 apply to the traditional COMPACT format (just forgot to document
that
 fact in the previous email)

* the start time in modified Julian days is now labeled
"START_TIME_MJD"

* a bit of work has gone into making sure that you should now get the
same
 plot files from different teqc builds using the same data, e.g.
the use
 of "-1" for the SV count, the SV listing, the number of data
points per
 epoch matching the number of SVs listed

* the only difference that has been noticed between the same nominal
plot
 file from different teqc builds: the actual data may vary by +/-
0.001
 unit, though this is still vary rare but can ever occur between,
say, Solaris
 Sparc (big endian processor) vs. Solaris x86 (little-endian
processor).

cheers,
--lou

~~~~~

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<http://jules.unavco.org>

"If the universe is the answer, what is the question?"

-- Leon Lederman<sup>36</sup>

+nav : περιλαμβάνει αρχεία πλοήγησης στην επεξεργασία, συγκεκριμένα με την εισαγωγή του observation file το TEQC ψάχνει αυτόματα να βρει το αντίστοιχο αρχείο πλοήγησης.

+qc: ενεργοποιεί τον έλεγχο ποιότητας στα observation αρχεία

+report: παράγει αρχεία xXS τα οποία είναι report files που περιέχουν όλες τις πληροφορίες σχετικά με την επεξεργασία από το TEQC.

Τα αποτελέσματα των report files παρατίθενται αναλυτικά στο παράρτημα Γ.

Οι τιμές πολυδιαδρομών των συχνοτήτων L1 και L2 (MP1 και MP2) τοποθετήθηκαν σε έναν πίνακα και έγινε γραφική απεικόνιση των αποτελεσμάτων τα οποία παρουσιάζονται παρακάτω.

| Station | Mp1(m) 2009 | Mp2(m) 2009 |
|---------|-------------|-------------|
| ATAL    | 0.17        | 0.24        |
| KASI    | 0.00        | 0.00        |
| KIPO    | 0.00        | 0.00        |
| KLOK    | 0.24        | 0.32        |
| LEMN    | 0.20        | 0.30        |
| NOA1    | 0.24        | 0.30        |
| NVRK    | 0.25        | 0.32        |
| PONT    | 0.24        | 0.32        |
| PRKV    | 0.27        | 0.30        |
| PYLO    | 0.00        | 0.00        |
| RLSO    | 0.37        | 0.44        |
| SPAN    | 0.32        | 0.40        |
| VLSM    | 0.29        | 0.36        |

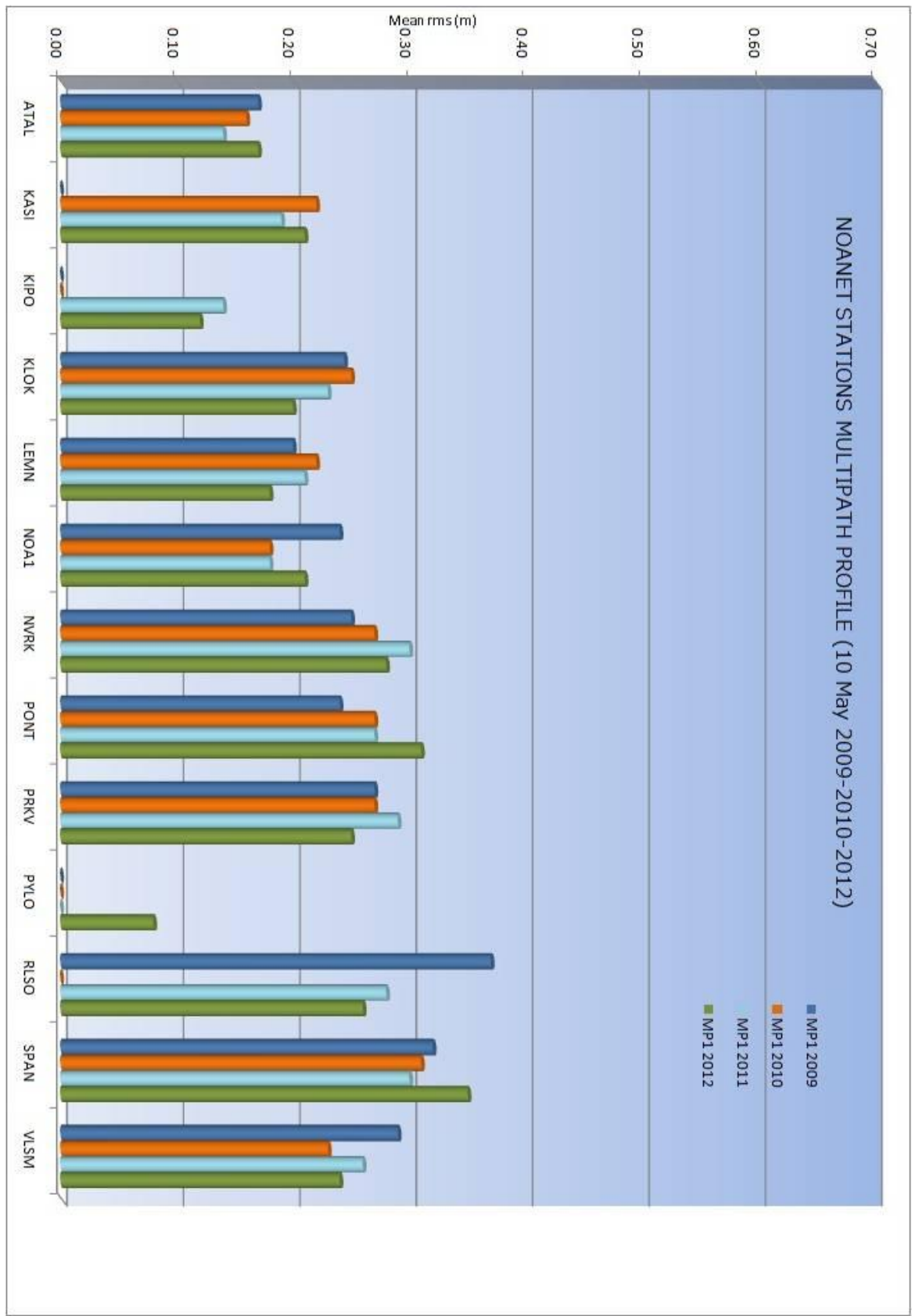
<sup>36</sup> <http://ls.unavco.org/pipermail/teqc/2009/000827.html>

| <b>Station</b> | <b>Mp1(m) 2010</b> | <b>Mp2(m) 2010</b> |
|----------------|--------------------|--------------------|
| ATAL           | 0.16               | 0.24               |
| KASI           | 0.22               | 0.25               |
| KIPO           | 0.00               | 0.00               |
| KLOK           | 0.25               | 0.29               |
| LEMN           | 0.22               | 0.27               |
| NOA1           | 0.18               | 0.22               |
| NVRK           | 0.27               | 0.32               |
| PONT           | 0.27               | 0.33               |
| PRKV           | 0.27               | 0.32               |
| PYLO           | 0.00               | 0.00               |
| RLSO           | 0.00               | 0.00               |
| SPAN           | 0.31               | 0.37               |
| VLSM           | 0.23               | 0.28               |

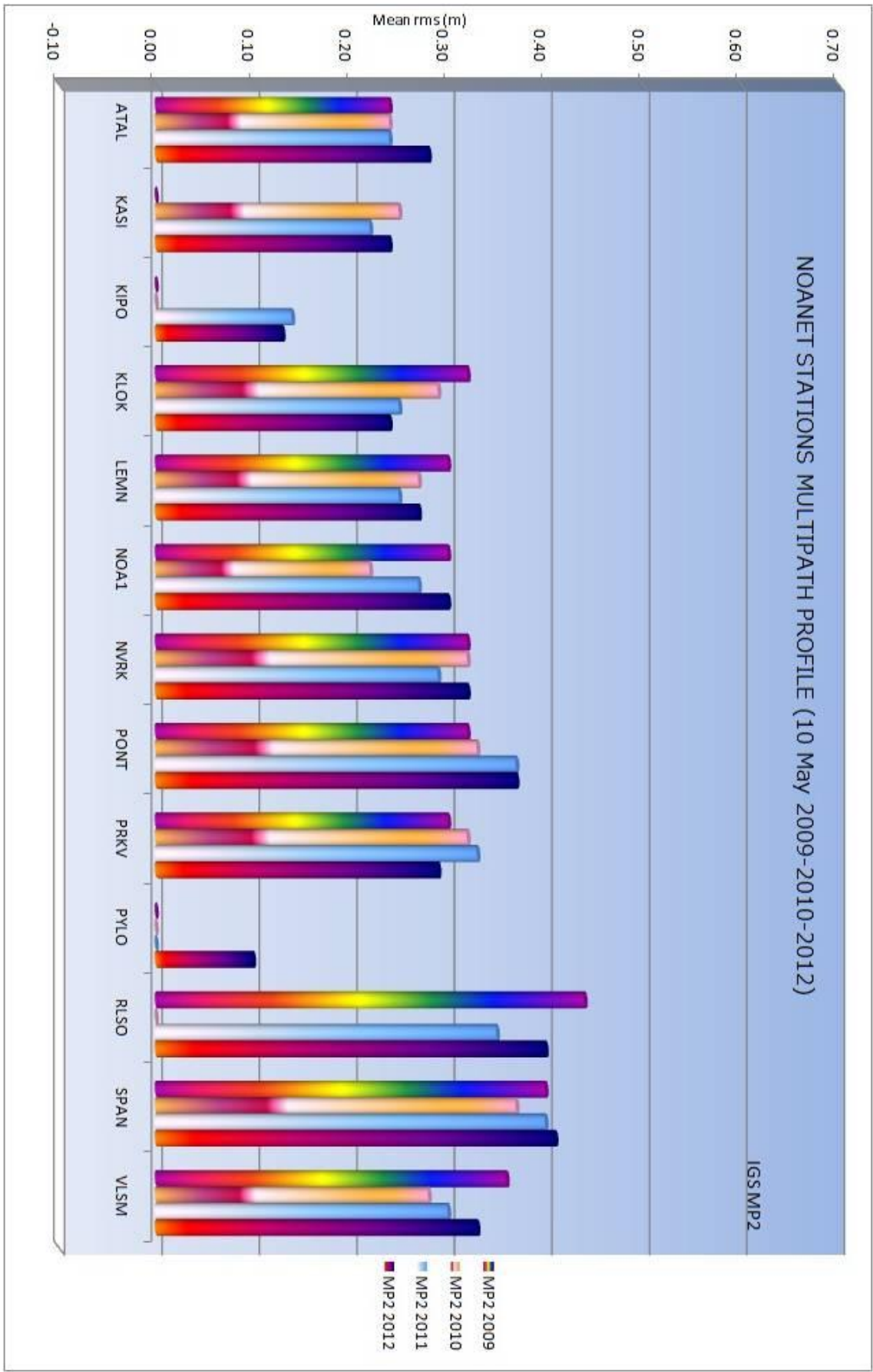
| <b>Station</b> | <b>Mp1(m) 2011</b> | <b>Mp2(m) 2011</b> |
|----------------|--------------------|--------------------|
| ATAL           | 0.14               | 0.24               |
| KASI           | 0.19               | 0.22               |
| KIPO           | 0.14               | 0.14               |
| KLOK           | 0.23               | 0.25               |
| LEMN           | 0.21               | 0.25               |
| NOA1           | 0.18               | 0.27               |
| NVRK           | 0.30               | 0.29               |
| PONT           | 0.27               | 0.37               |
| PRKV           | 0.29               | 0.33               |
| PYLO           | 0.00               | 0.00               |
| RLSO           | 0.28               | 0.35               |
| SPAN           | 0.30               | 0.40               |
| VLSM           | 0.26               | 0.30               |

| <b>Station</b>                             | <b>Mp1(m) 2012</b> | <b>Mp2(m) 2012</b> |
|--------------------------------------------|--------------------|--------------------|
| ATAL                                       | 0.17               | 0.28               |
| KASI                                       | 0.21               | 0.24               |
| KIPO                                       | 0.12               | 0.13               |
| KLOK                                       | 0.20               | 0.24               |
| LEMN                                       | 0.18               | 0.27               |
| NOA1                                       | 0.21               | 0.30               |
| NVRK                                       | 0.28               | 0.32               |
| PONT                                       | 0.31               | 0.37               |
| PRKV                                       | 0.25               | 0.29               |
| PYLO                                       | 0.08               | 0.10               |
| RLSO                                       | 0.26               | 0.40               |
| SPAN                                       | 0.35               | 0.41               |
| VLSM                                       | 0.24               | 0.33               |
| IGS 50% Stations<br>Bruyninx et al. (2003) | 0.4                | 0.6                |





Εικόνα 17



Εικόνα 11

## 11.4 Πολικό διάγραμμα σταθμού NOA1 και επεξεργασία με GIS

Επιλέχθηκε ο σταθμός NOA1 ο οποίος είναι μόνιμος σταθμός GPS σε κτήριο του Αστεροσκοπείου στην Πεντέλη και επίσης είναι δηλωμένος στο EUREF ώστε να παραχθούν τα διαγράμματα MP1 και MP2.

Τα φαινόμενα πολυδιαδρομών προκαλούνται κυριώς από ανακλάσεις του δορυφορικού σήματος σε μια επιφάνεια που έχει υψηλή ανακλαστική ικανότητα. Για τα σήματα GPS L1 και L2 αυτό το φαινόμενο εμφανίζεται σε περιπτώσεις όπως κοντινά στην κεραία του δέκτη κτήρια, μεταλλικές επιφάνειες και επιφάνειες με νερό. Το δορυφορικό σήμα δεν οδεύει κατευθείαν προς την κεραία του δέκτη αλλά χτυπά σε διπλανά αντικείμενα και ανακλάται στην κεραία ως αποτέλεσμα αυτού είναι να δημιουργείται μία ψευδή μέτρηση. Το σφάλμα της μέτρησης αυτής εξαρτάται βέβαια και από την γωνία ανύψωσης του δορυφόρου. Όσο κατεβαίνει στον ορίζοντα ο δορυφόρος η ισχύς του σήματός του ελλατώνεται και τα φαινόμενα των πολυδιαδρομών αυξάνονται (*Misra and Enge, 2001*).

Για να μειωθούν τα φαινόμενα των πολυδιαδρομών χρησιμοποιούνται κεραίες με δακτυλίους στραγγαλισμού, ευρέος φάσματος λήψης κεραίες και ψηφιακά φίλτρα. Επίσης υπάρχει και μία τεχνική η οποία βασίζεται στα προσαρμοζόμενα φίλτρα και χρησιμοποιεί τον αλγόριθμο των ελαχίστων τετραγώνων η οποία προτάθηκε από τον Ge *et al.* (2000)

Όστόσο η καλύτερη μέθοδος είναι απλά να αποφεύγονται σημεία εγκατάστασης τα οποία έχουν έντονα προβλήματα φαινομένων πολυδιαδρομών.<sup>37</sup> Οπότε από την προηγούμενη ανάλυση με το TEQC έχουν παραχθεί αρχεία MP1 και MP2 που μας δίνουν την δυνατότητα να μπορούμε να τα σχεδιάσουμε. Χρησιμοποιήθηκε το πρόγραμμα του Roggero Marco QC2SKY<sup>38</sup> για να παραχθούν τα πολικά διαγράμματα αναφορά σχετικά με αυτά τα διαγράμματα γίνεται αμέσως μετά. Το συγκεκριμένο πρόγραμμα γράφτηκε σε Fortran90 και είναι διαθέσιμο ελεύθερα. Παράγει αρχεία BMP και μπορεί να σχεδιάσει όλα τα αρχεία ελέγχου που παράγει το TEQC.

Η εντολή που χρησιμοποιούμε είναι η

**qc2sky filename cutoff linewidth background**

και πιο συγκεκριμένα

**qc2sky noa11270 10 2 b**

---

<sup>37</sup> Site-specific Multipath Characteristic of GPS ISKANDAR Network NOOR SURYATI M. S. & MUSA, T. A. UTM-GNSS & Geodynamics Research Group, Faculty of Geoinformation Science & Engineering, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor, MALAYSIA.

<sup>38</sup> <https://sites.google.com/site/roggeroresearch/home/software/qc2sky>

*μάσκα αποκοπής: 10 μοίρες*

*πάχος γραμμής: 2*

*χρώμα πίνακα: μαύρο*

και για τα 4 έτη

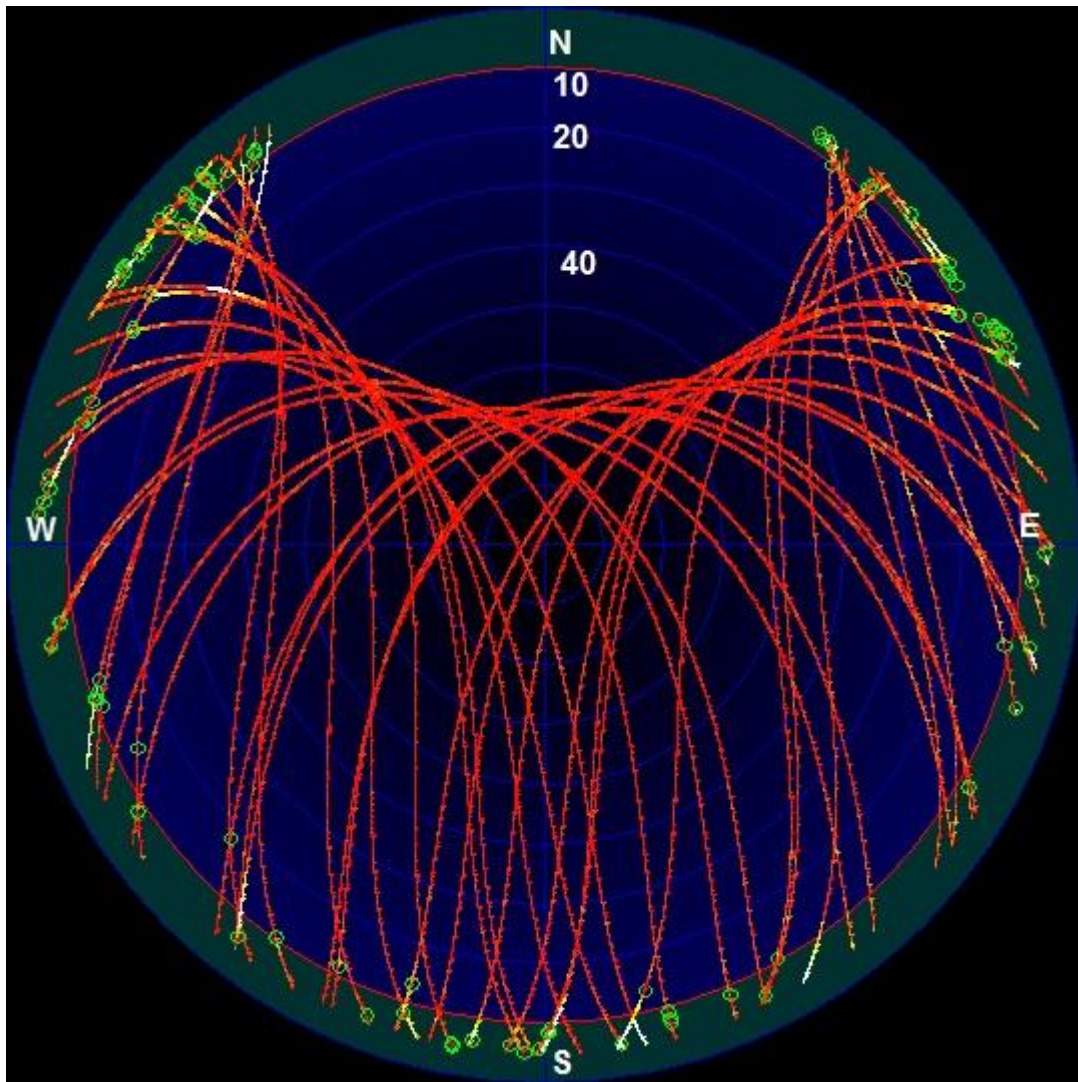
τα αποτελέσματα είναι τα παρακάτω:

αναλυτικά στην εικόνα 19 βλέπουμε οπτικά τα φαινόμενα πολυδιαδρομών στην συχνότητα L1 παρατηρούμε το πολικό διάγραμμα ότι έχει Βορρα Νότο Ανατολή και Δύση και όλα αυτά έχουν αζιμουθιακή γωνία 360 μοιρών επίσης οι ομόκεντροι κύκλοι στο διάγραμμα εκφράζουν τις γωνίες ανύψωσης ξεκινώντας από τον εξωτερικό ομόκεντρο κύκλο με γωνία ανύψωσης 0 μοίρες και αυξάνεται η συγκεκριμένη γωνία κατά 10 μοίρες ανά ομόκεντρο κύκλο μέχρι και 90 μοίρες στο κέντρο όπου είναι η κεραία του δέκτη μας , επίσης παρατηρούμε το διάστημα 0-10 μοίρες ότι είναι διαφορετικό χρώμα από τα υπόλοιπα και αυτό συμβαίνει διότι είχαμε ορίσει μάσκα αποκοπής για τους δορυφόρους τις 10 μοίρες δηλαδή δεν λαμβάνει υπόψη του στην ανάλυση και στο διάγραμμα τους δορυφόρους που εισέρχονται στο πεδίο λήψης της κεραίας πριν από τις 10 μοίρες.Οι γραμμές στο διάγραμμα αναπαριστούν τις τροχιές των διάφορων δορυφόρων και η εναλλαγή των χρωμάτων το μέγεθος του φαινομένου των πολυδιαδρομών.

Τα παραπάνω ισχύουν ακριβώς τα ίδια για την εικόνα 20 αλλά για την συχνότητα L2.

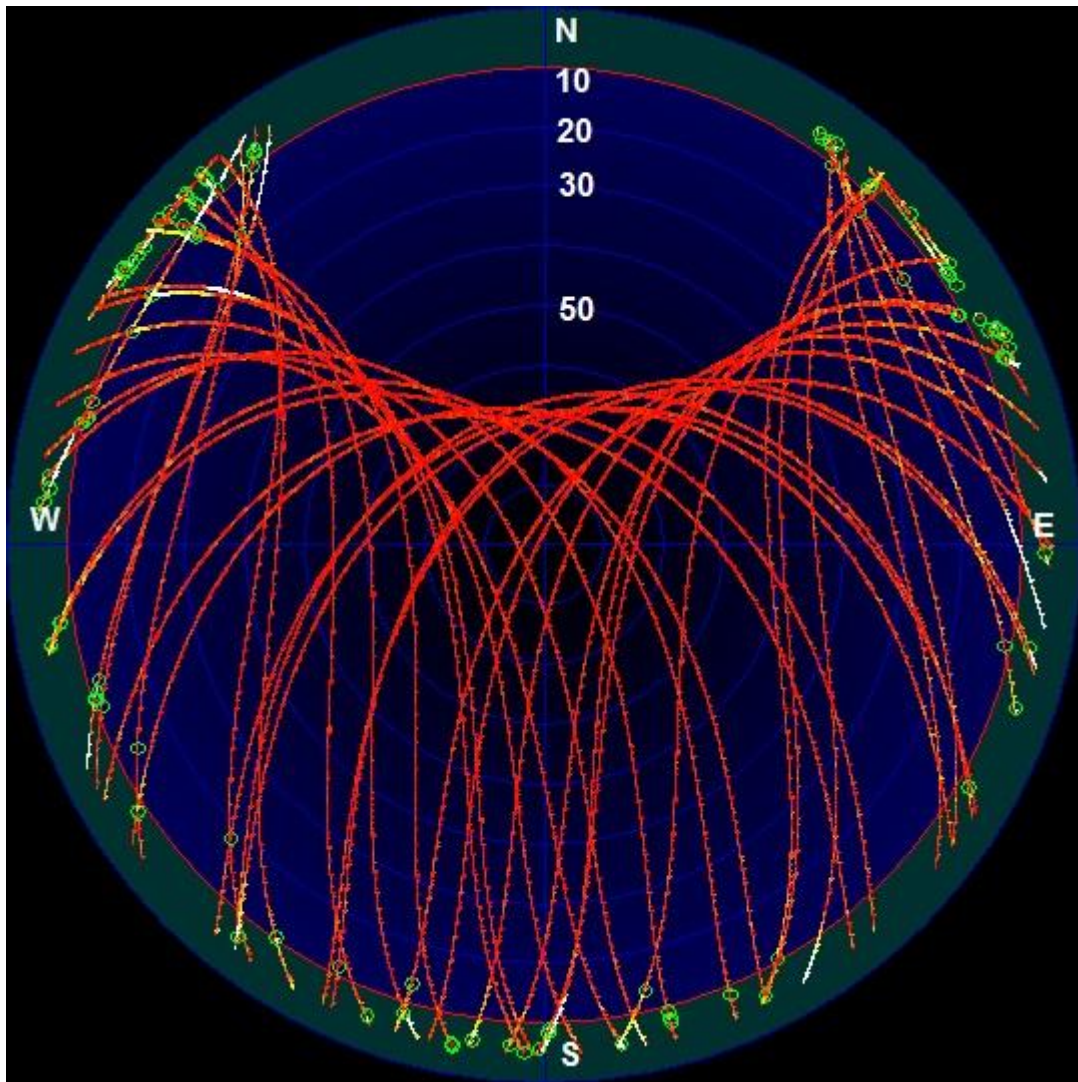
Επίσης οι εικόνες 21-22 τα ίδια ακριβώς με παραπάνω αλλά για το έτος 2010,οι εικόνες 23-24 τα ίδια με παραπάνω για το έτος 2011 και οι εικόνες 25-26 τα ίδια για το έτος 2012.

Επίσης στην εικόνα 27 φαίνεται η αντιστοιχία των χρωμάτων με συγκεκριμένες τιμές μήκους πολυδιαδρομών.



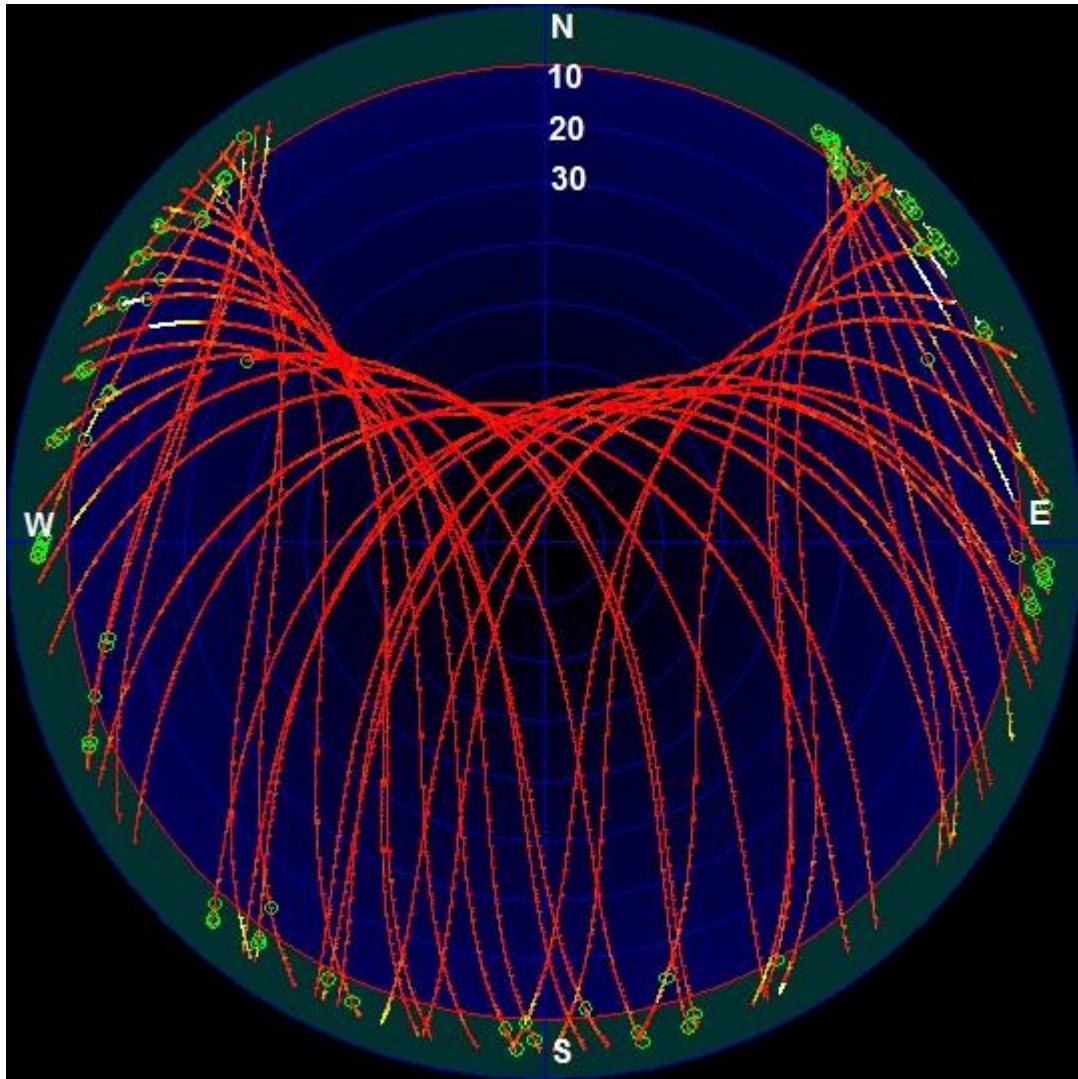
Εικόνα 19

MP1 2009



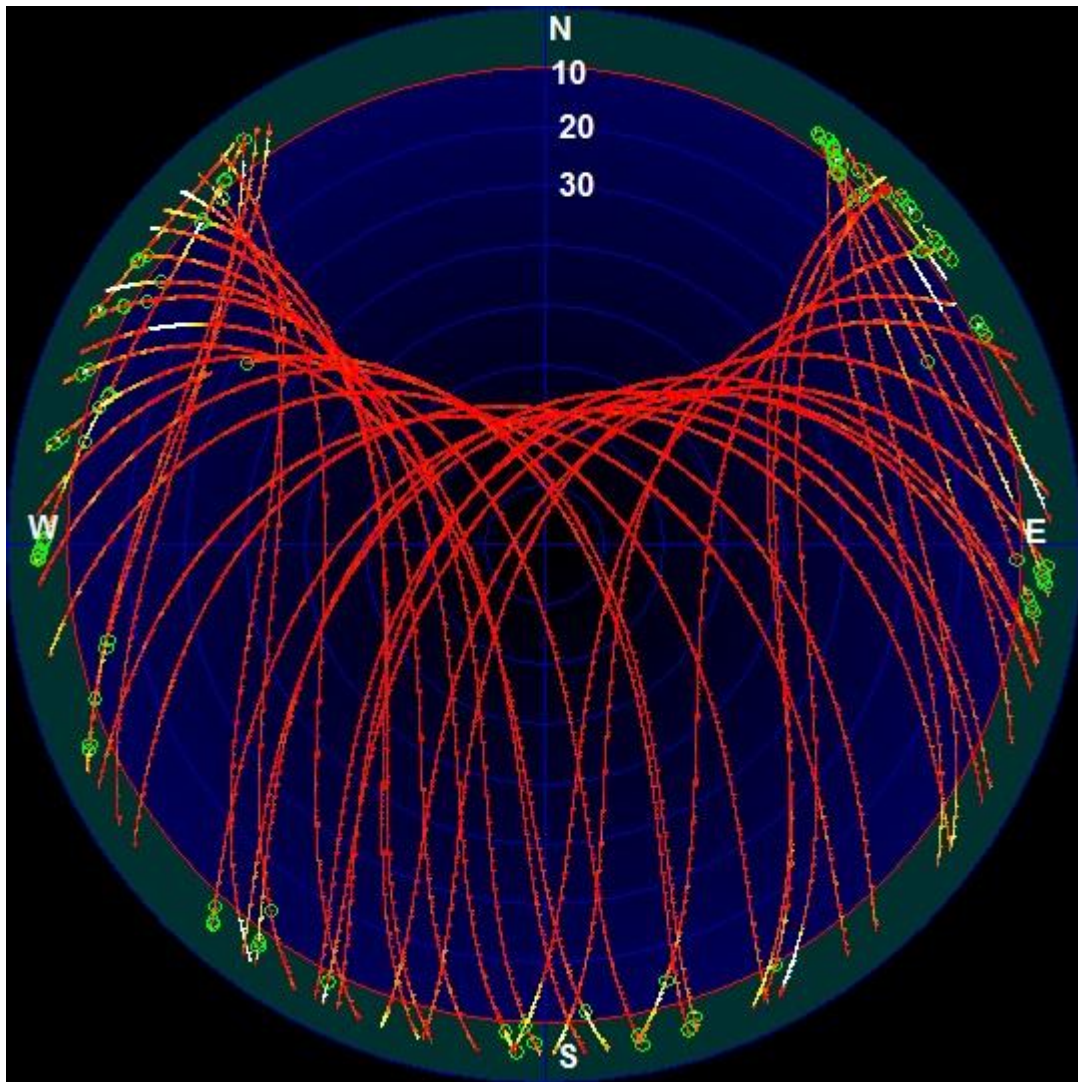
Εικόνα 20

MP2 2009



Εικόνα 21

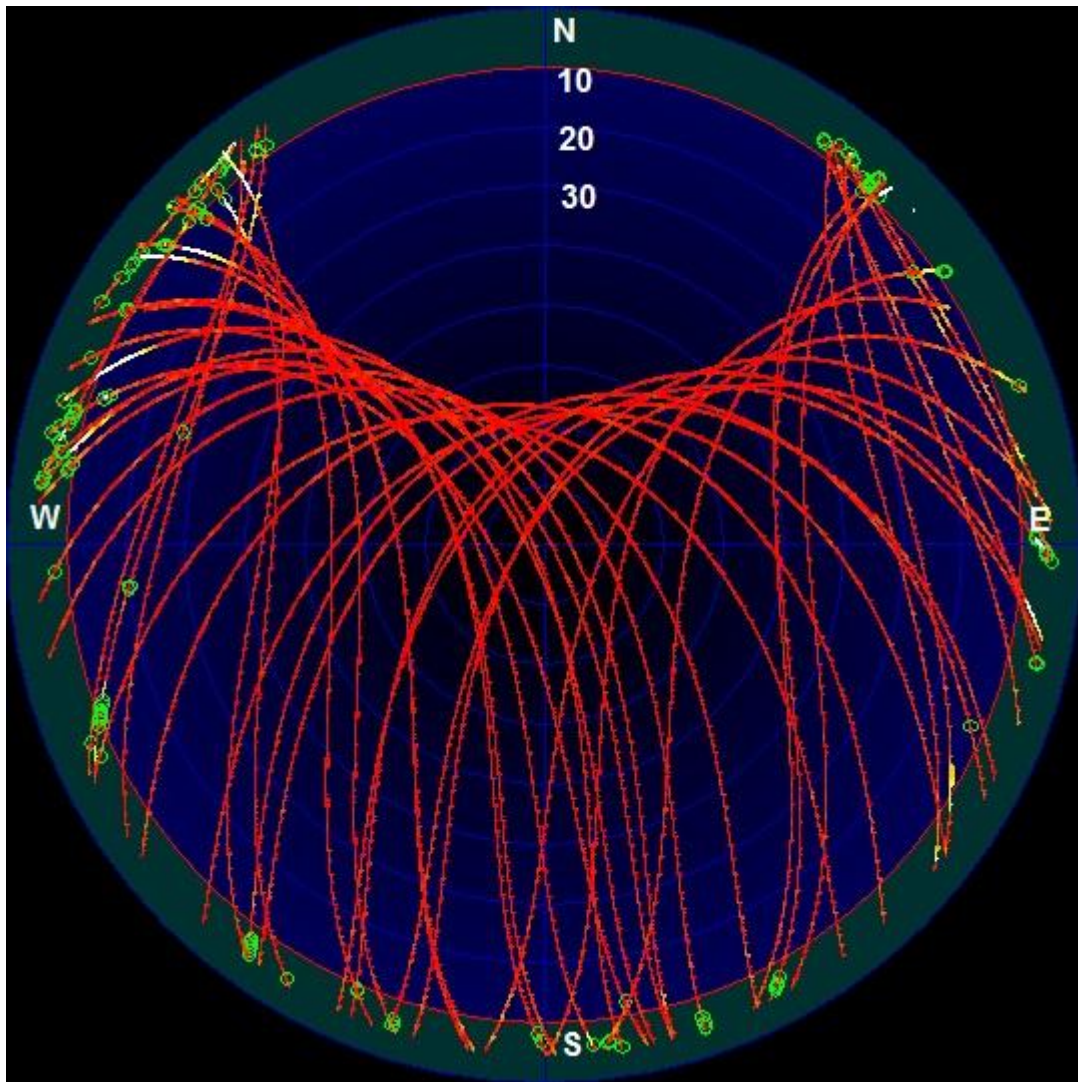
MP1 2010



Εικόνα 22

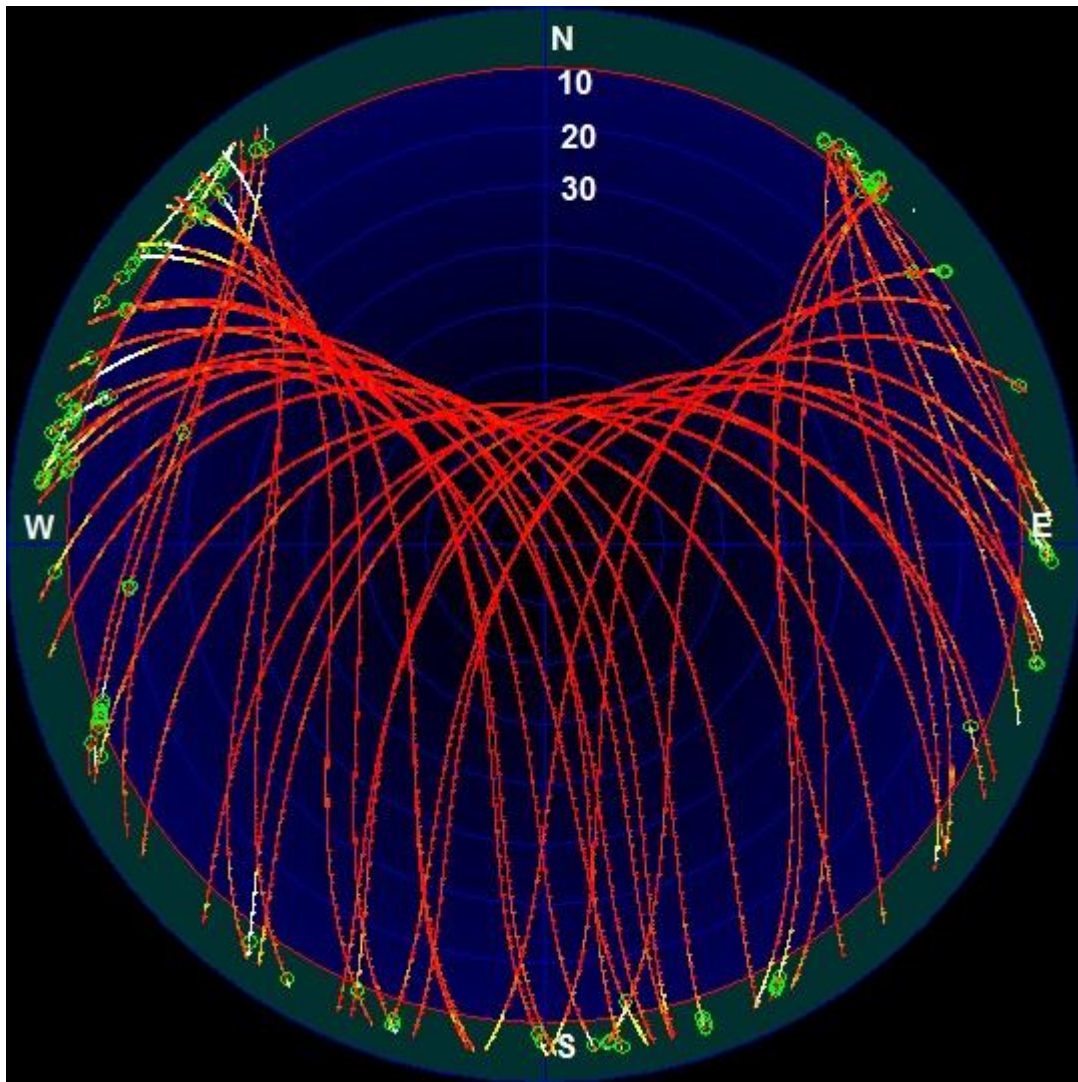
MP2 2010





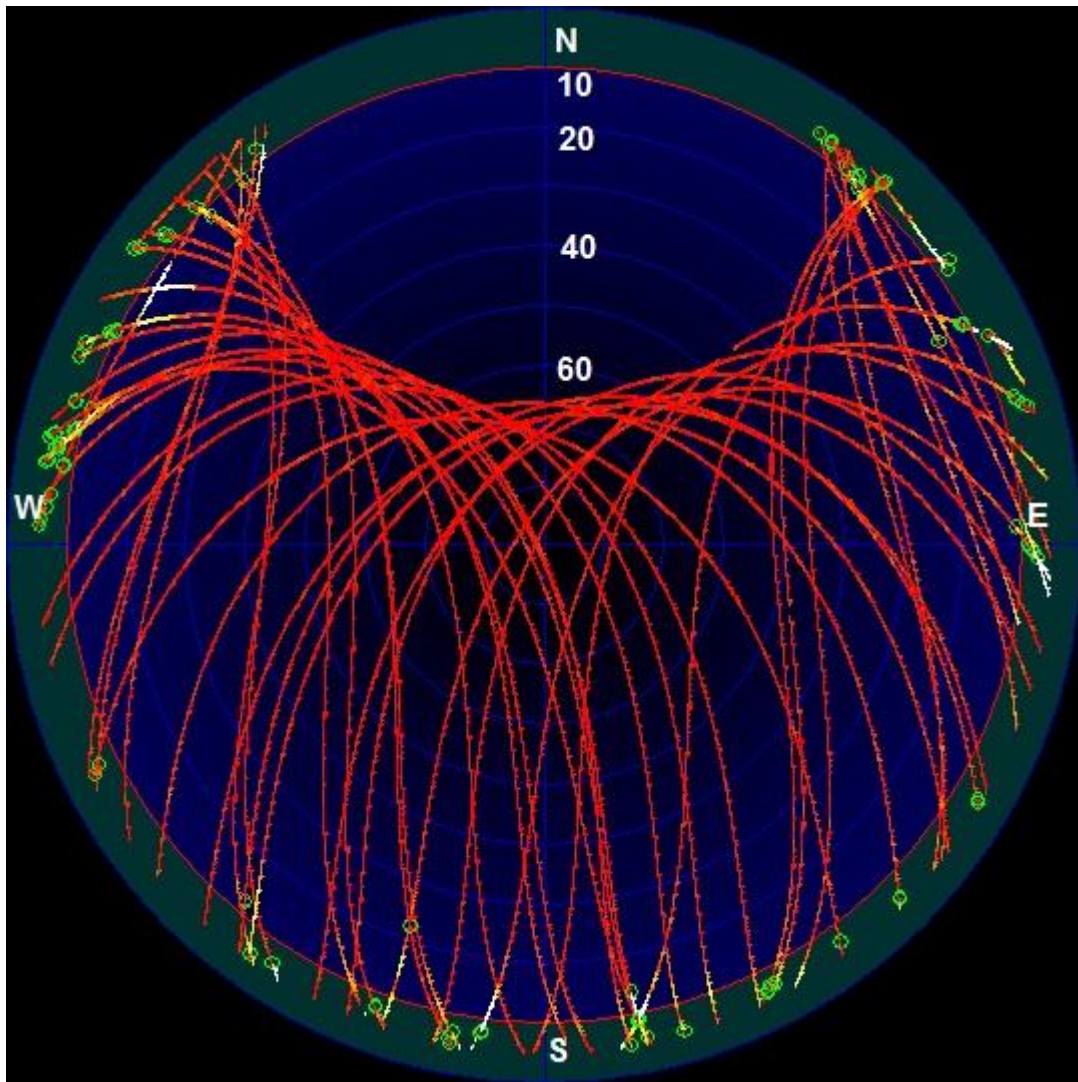
Εικόνα 23

MP1 2011



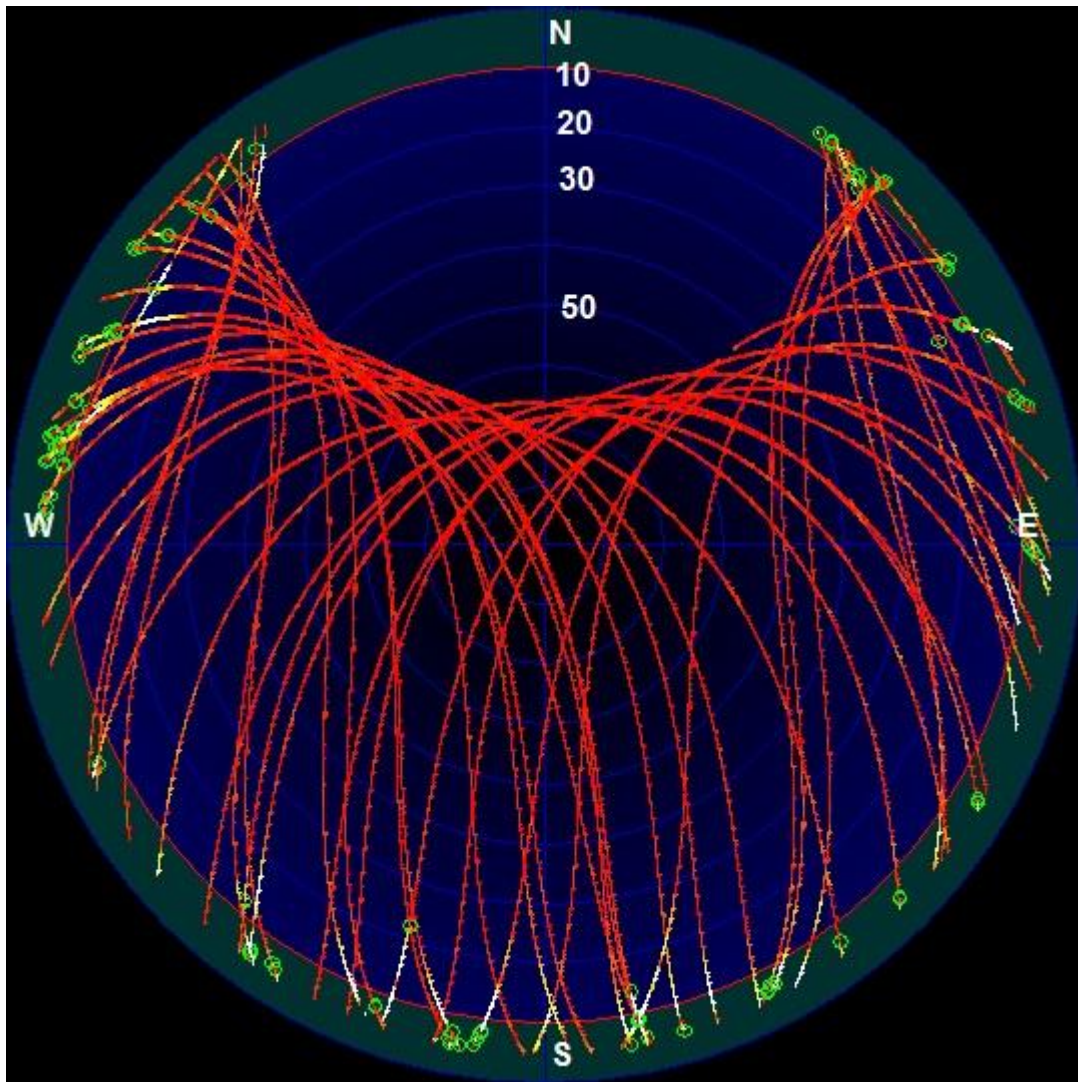
Εικόνα 24

MP2 2011



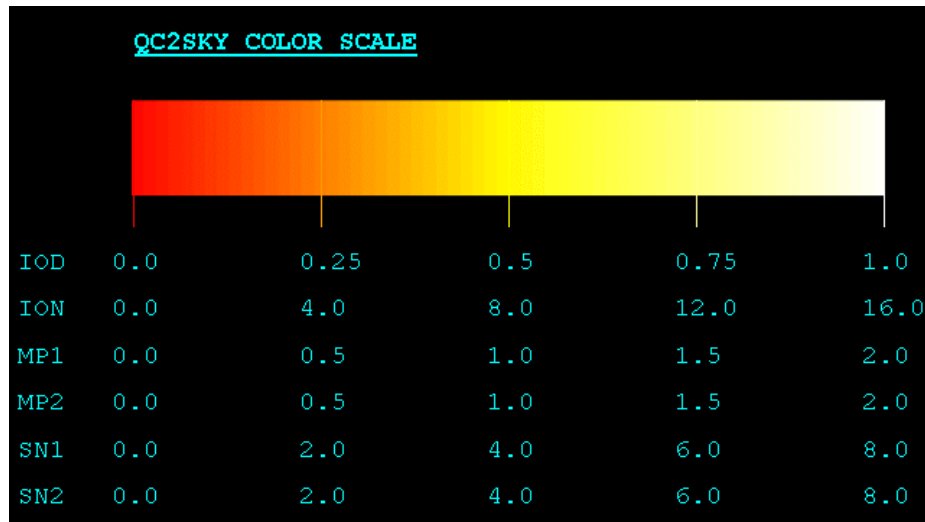
Εικόνα 25

MP1 2012



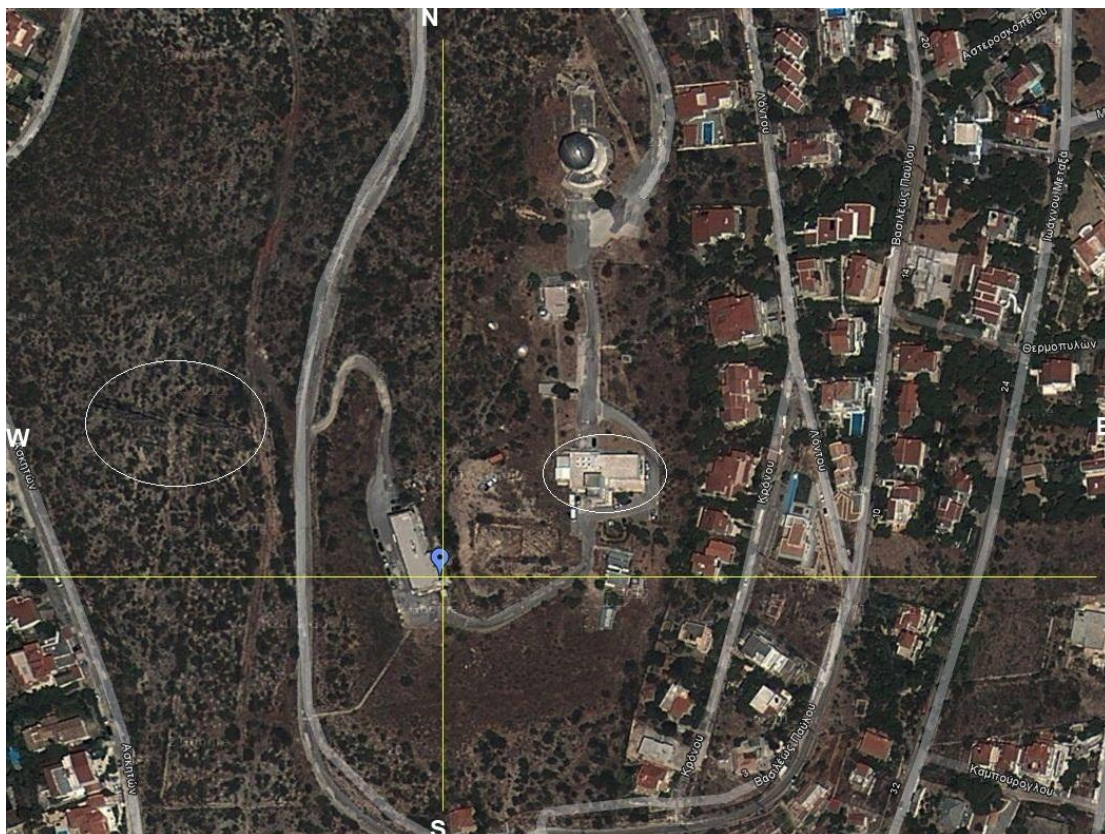
Εικόνα 26

MP2 2012



Εικόνα 27

Διακρίνουμε σε όλα τα έτη παρεμβολές περίπου στα 2m στο Βορειοδυτικό τμήμα με Αζιμούθιο 300 με 315 μοίρες και γωνία αποκοπής 10 έως 20 μοίρες. Στον χάρτη google αναλυτικά φαίνεται ότι στην συγκεκριμένη περιοχή υπάρχουν πυλώνες της ΔΕΗ που προκαλούν αυτά τα φαινόμενα και επίσης κάποια ελαφρά συνεισφορά φαίνεται να παρουσιάζεται Βορειοανατολικά όπου όπως φαίνεται στον χάρτη προκαλούνται από ένα κτήριο.



Εικόνα 28



**Εικόνα 29**



**Εικόνα 30**



**Εικόνα 31**

Στην εικόνα 29 δείχνεται μία άποψη της ταράτσας του κτηρίου που φιλοξενεί τον σταθμό NOA1 στην Πεντέλη και δείχνονται επίσης τα διάφορα μηχανήματα που χρησιμοποιήθηκαν για την ακριβή εγκατάσταση της κεραίας AT504LEIS της Leica.

Στην εικόνα 30 έχουμε μία άποψη της προαναφερθείσας κεραίας από το έδαφος του κτηρίου όπου φαίνεται ο τρόπος με τον οποίο έχει γίνει η στερέωση της στο τοιχίο.

Στην εικόνα 31 φαίνεται καθαρά το εσωτερικό της ίδιας κεραίας χωρίς το προστατευτικό κάλυμμα (RADOME).

## **ΚΕΦΑΛΑΙΟ 12**

### **ΣΥΜΠΕΡΑΣΜΑΤΑ**

Σε αυτό το κεφάλαιο θα παρουσιαστούν τα συμπεράσματα των αποτελεσμάτων από τον ποιοτικό έλεγχο ολόκληρου του δικτύου ΝΟΑΝΕΤ και επίσης τα συμπεράσματα από την μέθοδο για τον προσδιορισμό του φαινομένου τον πολυδιαδρομών.

#### **12.1 ΓΕΝΙΚΗ ΠΟΙΟΤΙΚΗ ΕΙΚΟΝΑ ΔΙΚΤΥΟΥ ΝΟΑΝΕΤ**

Με την επεξεργασία των δεδομένων συγκεκριμένης ημέρας (127) χρονικού διαστήματος 4 χρόνων και σύμφωνα με Bruyninx et al. (2003) που λέει ότι το 75% των Ευρωπαϊκών σταθμών EUREF έχουν τιμές mp1 κάτω από 0.57m και mp2 κάτω από 1m επιπλέον 50% των σταθμών IGS ανά τον κόσμο έχουν τιμές rms mp1 κάτω από 0.4m και 75% κάτω από 0.5m ενώ αντίστοιχα rms mp2 50% τιμές κάτω από 0.6m και 75% τιμές κάτω από 0.75m καταλήγουμε εύκολα από τα γραφήματα στις εικόνες 17 και 18 ότι η γενική εικόνα όλου του δικτύου πληρεί απόλυτα τις ποιοτικές προδιαγραφές των Ευρωπαϊκών σταθμών EUREF και είναι αξιόπιστο για την επεξεργασία δεδομένων σε πραγματικό χρόνο αλλά και για μετεπεξεργασία και ιδανικό για την μελέτη και έρευνα γεωλογικών αλλά και γεωδαιτικών εφαρμογών.

#### **12.2 ΜΕΘΟΔΟΣ ΠΡΟΣΔΙΟΡΙΣΜΟΥ ΠΟΛΥΔΙΑΔΡΟΜΩΝ**

Με απλά προγράμματα όπως το TEQC και το QC2SKY μπόρεσαν εύκολα να εξαχθούν. Με το TEQC αρχεία gerort αλλά και αρχεία γραφημάτων για τον κάθε σταθμό ξεχωριστά, συγκεκριμένα για τον σταθμό ΝΟΑ1 ο οποίος έχει ενταχθεί στο EUREF τα αποτελέσματα ήταν τα εξής:

2009:

mean MP1 rms : 0.244258 m

mean MP2 rms : 0.303425 m

2010:

mean MP1 rms : 0.183531 m

mean MP2 rms : 0.223326 m

2011:

mean MP1 rms : 0.181400 m

mean MP2 rms : 0.272020 m

2012:

mean MP1 rms : 0.210515 m

mean MP2 rms : 0.303126 m



τα οποία είναι εντός της αποδεκτής περιοχής ποιότητας του EUREF. Περαιτέρω με την χρησιμοποίηση του QC2SKY βγήκαν πολικά διαγράμματα από τα οποία παρατηρήθηκε η δημιουργία πολυδιαδρομών σε συγκεκριμένη γωνία ανύψωσης αλλά και αζιμουθιακή γωνία συγκεκριμένα σε γωνία ανύψωσης 10 έως 20 μοίρες και σε αζιμουθιακή γωνία 300 με 315 μοίρες, επίσης πιο αδύναμα φαινόμενα πολυδιαδρομών εμφανίστηκαν και στις 45 μοίρες αζιμουθιακά με γωνία ανύψωσης πάλι 10 έως 20 μοίρες.

Εφόσον έχουμε αυτά τα δεδομένα τα εφαρμόσαμε σε χάρτη της google και μπορέσαμε να δούμε που και τι ακριβώς ευθύνεται για τα φαινόμενα αυτά και από την μελέτη που έγινε είδαμε ότι ευθύνονται Βορειοδυτικά πυλώνες της ΔΕΗ και Βορειοανατολικά ένα κτήριο.

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Ψηφιακές Επικοινωνίες ΜΔΕ Προηγμένα Τηλεπικοινωνιακά Συστήματα και Δίκτυα  
Νικόλαος Χ. Σαγιάς.

Binary-Offset-Carrier modulation techniques with applications in satellite navigation systems‡  
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*Institute of Communications Engineering, Tampere University of Technology, P.O. Box 553, FIN-33101 Finland*

RINEX The Receiver Independent Exchange Format Version 3.00  
Werner Gurtner Astronomical Institute University of Bern [gurtner@aiub.unibe.ch](mailto:gurtner@aiub.unibe.ch)  
Lou Estey UNAVCO Boulder, Co. [lou@unavco.org](mailto:lou@unavco.org)

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# ΠΑΡΑΡΤΗΜΑΤΑ

# ΠΑΡΑΡΤΗΜΑ Α.

UNITED STATES NAVAL OBSERVATORY (USNO)

## BLOCK I SATELLITE INFORMATION

\*\*\*\*\*

### GPS BLOCK I SATELLITES

=====

The satellite vehicle numbers (SVN) 1 through 11 are designated as Block I. The Block I satellites were launched from 1978 to 1985 at Vandenberg AFB, California using the Atlas E/F. Block I are referred to as the original concept validation satellites developed by Rockwell International and reflect various stages of system development.

The Block I satellites operated in circular 10,900 nm orbits, with a 12-hour period, the same as the Block II satellites. The Block I satellites are/were positioned in the same orbital planes as the Block II, but at an inclination angle of 63 degrees. Each Block I satellite contained one cesium and two rubidium atomic clocks. The design life of the Block I satellites was 5 years, but a majority performed well beyond their life expectancy.

### BLOCK I SATELLITES

|     | LAUNCH | US SPACE** |         |
|-----|--------|------------|---------|
| SVN | PRN    | DATE       | COMMAND |
| *01 | 04     | 22 FEB 78  | 10684   |
| *02 | 07     | 13 MAY 78  | 10893   |
| *03 | 06     | 06 OCT 78  | 11054   |
| *04 | 08     | 10 DEC 78  | 11141   |
| *05 | 05     | 09 FEB 80  | 11690   |
| *06 | 09     | 26 APR 80  | 11783   |
| *07 |        | NONE       |         |
| *08 | 11     | 14 JUL 83  | 14189   |
| *09 | 13     | 13 JUN 84  | 15039   |
| *10 | 12     | 08 SEP 84  | 15271   |
| *11 | 03     | 09 OCT 85  | 16129   |

\* Satellite is no longer in service.

\*\* US Space Command, previously known as the NORAD Object No.; also referred to as the NASA catalog number.

### HISTORY OF BLOCK I SATELLITES AND STATUS

=====

SVN01/PRN04 Launched 22 FEB 78; usable 29 MAR 78; no longer in service.  
Last onboard frequency standard failed 17 Jul 85, 1730 UT

SVN02/PRN07 Launched 13 May 78; usable 14 JUL 78; no longer in service.  
L1 signal power permanently turned off in week 8-12 FEB 88

SVN03/PRN06 Launched 06 OCT 78; usable 13 NOV 78; no longer in service.  
Operations terminated 18 MAY 92 at 2341 UT

SVN04/PRN08 Launched 10 DEC 78; usable 08 JAN 79; no longer in service.  
Crystal oscillator activated 27 OCT 86, 2105 UT  
L-band permanently turned off on 14 OCT 89, 1857 UT

L-band enabled 20 FEB 90 1615 UT for testing; disabled  
sometime in MAY 1990

SVN05/PRN05 Launched 09 FEB 80; usable 27 FEB 80; no longer in service.  
Turned off 11 MAY 84

SVN06/PRN09 Launched 26 APR 80; usable 16 MAY 80; no longer in service.  
Operations terminated 06 MAR 91, 0342 UT

SVN07 Unsuccessful launch 18 DEC 81

SVN08/PRN11 Launched 14 JUL 83; usable 10 AUG 83; no longer in service.  
Changed operational frequency std from Cs to Rb 4 APR 92.  
Changed operational frequency std to its last usable Rb  
between 29 Sep 92 1943 UT to 6 Oct 92 1430 UT.  
Set unusable 04 MAY 93 at 0020 UT and will not return  
to service.

SVN09/PRN13 Launched 13 JUN 84; usable 19 JUL 84; no longer in service.  
Changed operational frequency std from Cs to Rb during  
period 30 Sep 93 to 09 Oct 93  
Unusable 4 Nov 93 1640 UT to 13 Dec 93 2130 UT for  
maintenance  
Unusable beginning 28 Feb 94 1345 UT due to end of life  
testing; PRN13 was boosted to a higher orbit for disposal  
on 20 Jun 94 at 1817 UT

SVN10/PRN12 Launched 08 SEP 84; usable 03 OCT 84; no longer in service.  
Changed operational frequency std from Cs to Rb 6 FEB 92.  
Unusable beginning 18 Nov 95 1845 UT due to end of life  
testing; PRN12 was boosted to a higher orbit for disposal  
on 26 Mar 96 (NANUs 242-95325, 051-96086)

SVN11/PRN03 Launched 09 OCT 85; usable 30 OCT 85; no longer in service.  
Set unusable since 27 Feb 94 0233 UT and permanently set  
unusable 13 Apr 94 1500 UT due to navigation payload shutdown  
in preparation for final disposal. PRN03 was thrust out of  
orbit 14 Apr 94 2100 UT.

#### REPOSITIONING MANEUVERS

=====

1. Reconfiguration of Block I satellites to a five-vehicle constellation that optimized continental US system performance occurred October 29, 1986 to October 22, 1987 with the repositioning of PRN03/SVN11 to another in-plane location.
2. Reconfiguration of the GPS constellation to increase two-dimensional (2-D) and three-dimensional (3-D) capabilities occurred March 15, 1990 to December 20, 1990. The Block I satellites involved in the maneuver were: PRNs 3 and 11. The Block II satellites involved in the maneuver were: PRNs 2, 14, 16, 18 and 19.

For information concerning: CURRENT STATUS see file . . . . . gpstd.txt  
GPS SYSTEM see file . . . . . gpssy.txt  
TIME TRANSFER see file . . . . . gpstt.txt  
BLOCK II see file . . . . . gpsb2.txt

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File gpsb1.txt  
last updated  
Fri Apr 12 23:05:00 UTC 1996

Πηγή: <ftp://tycho.usno.navy.mil/pub/gps/gpsb1.txt>

UNITED STATES NAVAL OBSERVATORY (USNO)

BLOCK II SATELLITE INFORMATION

GPS OPERATIONAL SATELLITES (BLOCK II/IIA/IIR/IIR-M/IIF)

=====  
The operational GPS satellites are designated BLOCK II, BLOCK IIA, BLOCK IIR, BLOCK IIR-M, and BLOCK IIF.

The BLOCK II satellites, space vehicle numbers (SVN) 13 through 21, are the first full scale operational satellites developed by Rockwell International. Block II satellites were designed to provide 14 days of operation without contact from the Control Segment (CS). The Block IIs were launched from February 1989 through October 1990.

The BLOCK IIA satellites, SVNs 22 through 40, are the second series of operational satellites, also developed by Rockwell International. Block IIA satellites were designed to provide 180 days of operation without contact from the CS. During the 180 day autonomy, degraded accuracy will be evident in the navigation message. The Block IIAs were launched November 1990 through November 1997.

The design life of the Block II/IIA satellite is 7.3 years; each contain four atomic clocks: two Cesium (Cs) and two Rubidium (Rb); and have the Selective Availability (SA) and Anti-Spoof (A-S) capabilities. The Block II/IIA satellites were launched from Cape Canaveral Air Force Station, Florida, aboard the Delta II medium launch vehicle (MLV).

The BLOCK IIR satellites, SVNs 41 through 61, are the operational replenishment satellites developed by Lockheed Martin and will carry the GPS well into the next century. Block IIR satellites are designed to provide at least 14 days of operation without contact from the CS and up to 180 days of operation when operating in the autonomous navigation (AUTONAV) mode. Full accuracy will be maintained using a technique of ranging and communication between the Block IIR satellites. The cross-link ranging will be used to estimate and update the parameters in the navigation message of each Block IIR satellite without contact from the CS. The design life of the Block IIR satellite is 7.8 years; each contains three Rb atomic clocks and have the SA and A-S capabilities. Launching of the Block IIRs began in January 1997.

The BLOCK IIR-M satellites transmit a second civil signal L2C on the L2 frequency and the military M signal on the L1 and L2 frequencies. SVN 49 also transmits on the L5 frequency.

The BLOCK IIF satellites transmit all signals including on the L5 frequency, intended for safety-of-life applications. Launching of the Block IIFs began in May 2010.

Projected Future: 11 more BLOCK IIF satellites and 30 BLOCK III.

LAUNCHES

=====  
GPS IIF-1 (SVN62/PRN25) was launched on 28 MAY 2010 at 0300 UT from Cape Canaveral, Florida.



CURRENT BLOCK II/IIA/IIR/IIR-M SATELLITES

```

=====
LAUNCH      LAUNCH      FREQ      US SPACE
ORDER  PRN  SVN   DATE      STD   PLANE  COMMAND **
-----
*I1-1      14   14 FEB 1989      19802
*I1-2      13   10 JUN 1989      20061
*I1-3      16   18 AUG 1989      20185
*I1-4      19   21 OCT 1989      20302
*I1-5      17   11 DEC 1989      20361
*I1-6      18   24 JAN 1990      20452
*I1-7      20   26 MAR 1990      20533
*I1-8      21   02 AUG 1990      20724
*I1-9      15   01 OCT 1990      20830
IIA-10    32  23   26 NOV 1990  Rb    E5   20959
*IIA-11    24   04 JUL 1991  Cs    21552
*IIA-12    25   23 FEB 1992  Rb    21890
*IIA-13    28   10 APR 1992      21930
IIA-14    26  26   07 JUL 1992  Rb    F5   22014
IIA-15    27  27   09 SEP 1992  Cs    A6   22108
IIA-16    24  32   22 NOV 1992      22231
*IIA-17    29   18 DEC 1992      22275
*IIA-18    22   03 FEB 1993      22446
*IIA-19    31   30 MAR 1993      22581
*IIA-20    37   13 MAY 1993      22657
IIA-21    09  39   26 JUN 1993  Cs    A1   22700
IIA-22    30  35   30 AUG 1993  Rb    B5   22779
IIA-23    04  34   26 OCT 1993  Rb    D4   22877
IIA-24    06  36   10 MAR 1994  Rb    C6   23027
IIA-25    03  33   28 MAR 1996  Cs    C2   23833
IIA-26    10  40   16 JUL 1996  Cs    E6   23953
IIA-27    30  30   12 SEP 1996  Cs    B2   24320
IIA-28    08  38   06 NOV 1997  Cs    A3   25030
***IIR-1   42   17 JAN 1997
IIR-2     13  43   23 JUL 1997  Rb    F3   24876
IIR-3     11  46   07 OCT 1999  Rb    D5   25933
IIR-4     20  51   11 MAY 2000  Rb    E1   26360
IIR-5     28  44   16 JUL 2000  Rb    B3   26407
IIR-6     14  41   10 NOV 2000  Rb    F1   26605
IIR-7     18  54   30 JAN 2001  Rb    E4   26690
IIR-8     16  56   29 JAN 2003  Rb    B1   27663
IIR-9     21  45   31 MAR 2003  Rb    D3   27704
IIR-10    22  47   21 DEC 2003  Rb    E2   28129
IIR-11    19  59   20 MAR 2004  Rb    C3   28190
IIR-12    23  60   23 JUN 2004  Rb    F4   28361
IIR-13    02  61   06 NOV 2004  Rb    D1   28474
IIR-14M   17  53   26 SEP 2005  Rb    C4   28874
IIR-15M   31  52   25 SEP 2006  Rb    A2   29486
IIR-16M   12  58   17 NOV 2006  Rb    B4   29601
IIR-17M   15  55   17 OCT 2007  Rb    F2   32260
IIR-18M   29  57   20 DEC 2007  Rb    C1   32384
IIR-19M   07  48   15 MAR 2008  Rb    A4   32711
*IIR-20M   49   24 MAR 2009  Rb                    34661
IIR-21M   05  50   17 AUG 2009  Rb                    E3   35752
IIF-1     25  62   28 MAY 2010  Rb    B2   36585
IIF-2     01  63   16 JUL 2011  Rb    D2   36585

```

\* Satellite is no longer in service.

\*\* US SPACE COMMAND, previously known as the NORAD object number;

also referred to as the NASA Catalog number. Assigned at successful launch. Catalog numbers retrieved from SPACEWARN Bulletins: <http://nssdc.gsfc.nasa.gov/spacewarn/>

\*\*\* Unsuccessful launch.

#### HISTORY OF BLOCK II/IIA/IIR/IIR-M/IIF SATELLITES AND STATUS

##### SVN PRN

- 13 02 Launched 10 JUN 1989; usable 10 AUG 1989; decommissioned 12 MAY 2004  
Set unusable 22 Feb 2004 at 1037 UT (NANU 2004025)  
Decommissioned from active service 12 MAY 2004 at 1701 UT.
- 14 14 Launched 14 FEB 1989; usable 15 APR 1989; decommissioned 14 APR 2000  
Unusable 29 AUG 1992 2030 UT to 01 SEP 1992 1425 UT due to the failure of its operational frequency standard and change to its second Cs frequency standard.  
Unusable 26 JAN 2000 0130 UT to 03 FEB 2000 1816 UT due to change in operational frequency standard from Cs to Rb.  
Set unusable 26 MAR 2000 at 2348 UT.  
Decommissioned from active service 14 APR 2000 at 1347 UT.
- 15 15 Launched 01 OCT 1990; usable 15 OCT 1990; decommissioned 15 MAR 2007  
Unusable 10 NOV 1992 1604 UT to 13 NOV 1992 1910 UT due to change in operational Cs frequency standards.  
Set as a test vehicle on 17 NOV 2006.  
Decommissioned from active service 14 MAR 2007.
- 16 16 Launched 18 AUG 1989; usable 14 OCT 1989; decommissioned 13 OCT 2000  
Unusable 07 JAN 1991 1200 UT to 09 JAN 1991 1639 UT due to change in operational frequency standard from Rb to Cs.  
Unusable 06 FEB 1996 0556 UT to 21 FEB 1996 1648 UT due to change in operational Cs frequency standards.  
Unusable 04 MAR 2000 0955 UT to 07 APR 2000 2112 UT due to change in operational frequency standard from Cs to Rb.  
Decommissioned from active service 13 Oct 2000 at 0045 UT.
- 17 17 Launched 11 DEC 1989; usable 06 JAN 1990; decommissioned 23 FEB 2005  
Unusable 06 APR 2001 1848 UT to 16 APR 2001 2253 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 07 OCT 2002 0110 UT to 15 OCT 2002 1626 UT due to change in operational frequency standard from Rb to Cs.  
Unusable 26 JUN 2003 1942 UT to 22 JUL 2003 1600 UT due to change in operational frequency standard from Cs to Rb.  
Decommissioned from active service 23 Feb 2005 at 2200 UT.
- 18 18 Launched 24 JAN 1990; usable 14 FEB 1990; decommissioned 18 AUG 2000  
Unusable 07 MAY 1996 0406 UT to 09 MAY 1996 1737 UT due to change in operational Cs frequency standards.  
Decommissioned from active service 18 Aug 2000 at 0742 UT.
- 19 19 Launched 21 OCT 1989; usable 23 NOV 1989; decommissioned 11 SEP 2001  
Unusable 16 OCT 1994 0545 UT to 19 OCT 1994 1354 UT due to change in operational frequency standard from Cs to Rb.  
The course acquisition (C/A) code deficiency problem on PRN19 was corrected effective 04 JAN 1994 at 0000 UT; performance no longer degraded.  
Unusable 30 DEC 1994 0536 UT to 04 JAN 1995 1740 UT due to change in operational Rb frequency standards.  
Unusable 22 SEP 1999 1715 UT to 04 OCT 1999 1727 UT due to change in operational frequency standard from Rb to Cs.  
Unusable beginning 16 MAR 2001 at 0126 UT and will remain unusable until further notice.  
Decommissioned from active service 11 SEP 2001 at 2200 UT.
- 20 20 Launched 26 MAR 1990; usable 18 APR 1990; decommissioned 13 DEC 1996  
Unusable 06 AUG 1994 0000 UT to 17 AUG 1994 1908 UT due to change in operational frequency standard from Cs to Rb.

- Unusable 13 JAN 1996 0937 to 1355 UT due to change in operational frequency standard from Rb to Cs.  
Set unusable 21 MAY 1996 at 2242 UT and will not return to service.  
Boosted out of the GPS constellation 13 Dec 1996.
- 21 21 Launched 02 AUG 1990; usable 22 AUG 1990; decommissioned 27 JAN 2003  
Unusable 07 OCT 1996 1430 UT to 10 OCT 1996 2152 UT due to change in operational Cs frequency standards.  
Set unusable 25 SEP 2002 at 1830 UT and decommissioned from active service 27 JAN 03 at 2200 UT.
- 22 22 Launched 03 FEB 1993; usable 04 APR 1993; decommissioned 06 AUG 2003  
Unusable 07 OCT 1998 1102 UT to 14 OCT 1998 2229 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 28 JUL 2001 2358 UT to 11 AUG 2001 0413 UT due to change in operational Rb frequency standards.  
Unusable 05 NOV 2002 1756 UT to 18 NOV 2002 1403 UT due to change in operational frequency standard from Rb to Cs.  
Set unusable 03 DEC 2002 at 1402 UT and decommissioned from active service 06 AUG 2003 at 2200 UT.
- 23 23 Launched 26 NOV 1990; usable 10 DEC 1990; decommissioned 13 FEB 2004  
Unusable 04 JAN 1991 1600 UT to 06 JAN 1991 2049 UT due to change in operational Cs frequency standards.  
Unusable 13 NOV 2003 0121 UT to 25 NOV 2003 2104 UT due to change in operational frequency standard from Cs to Rb.  
Set unusable 05 FEB 2004 at 2030 UT and decommissioned from active service 13 FEB 2004 at 2200 UT.
- 23 32 Launched 26 NOV 1990; Usable 26 FEB 2008; Operates on Rb std  
An initial assessment period for SVN23 utilizing PRN32 was accomplished 01 DEC to 06 DEC 2006; SVN23 is no longer transmitting L-band. During this assessment period SVN23 was broadcasting L-band and set unhealthy. SVN23 was not included in the operational constellation almanac. (NANU 2006155)  
On 02 APR 2007, SVN23 will resume transmitting L-band utilizing PRN32. At L-band activation, SVN23/PRN32 will be unusable until further notice. Additionally, no broadcast almanacs will include SVN23/PRN32. (NANU 2007051)  
On 27 JUN 2007, after 2200 ZULU, GPS will transition SVN23/PRN32 into the broadcast almanacs for all satellites. Before, during, and after transition, PRN32/SVN23 will remain unusable until further notice. (NANU 2007081)  
Set usable 26 FEB 2008 at 1801 UT (NANU 2008024)  
Anyone experiencing problems with PRN32 should contact the appropriate agency listed below:  
CIVILIAN - NAVCEN AT COMM 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://WWW.NAVCEN.USCG.GOV)  
MILITARY - GPS OPERATIONS CENTER AT DSN 560-2541 OR COMM 719-567-2451,  
[HTTP://GPS.AFSPC.AF.MIL/GPSOC/](http://GPS.AFSPC.AF.MIL/GPSOC/)  
MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994  
OR  
COMM 805-606-9994, EMAIL:  
[JSPOC\\_COMBAT\\_OPS@VANDENBERG.AF.MIL](mailto:JSPOC_COMBAT_OPS@VANDENBERG.AF.MIL)
- 24 24 Launched 04 JUL 1991; usable 30 AUG 1991; Operates on Cs std  
Unusable 23 JAN 1994 1745 UT to 01 FEB 1994 1516 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 01 JUL 1995 0750 UT to 07 JUL 1995 2223 UT due to change in operational Rb frequency standards.  
Unusable 07 SEP 2000 1742 UT to 11 SEP 2000 2020 UT due to change in operational frequency standard from Rb to Cs.  
Will be transitioned out of the broadcast almanac after 12 Sept 2009 at 2200 UT (NANU 2009065)

- Unusable 12 Sept 2009 at 2017 UT until further notice  
(NANU 2009066)
- 25 25 Launched 23 FEB 1992; usable 24 MAR 1992; Operates on Rb std  
Unusable 01 DEC 1993 1904 UT to 05 DEC 1993 1941 UT due to  
change in operational frequency standard from Rb to Cs  
on 02 DEC 1993.  
Unusable 07 JAN 1995 1938 UT to 12 JAN 1995 1821 UT due to  
change in operational Cs frequency standards.  
Unusable 22 Mar 2006 0149 UT to 28 Mar 2006 0144 UT due to  
change in operational frequency standard from Cs to Rb.  
Set unusable 20 Aug 2009 at 1514 UT and decommissioned from  
active service 20 Aug 2009 at 1514 UT.  
Will be transitioned into the broadcast almanac after  
12 Sept 2009 at 2200 UT; Usable during transition (NANU 2009065)  
Set usable 12 Sept 2009 at 2212 UT  
(NANU 2009067)  
Set unusable 18 Dec 2009 at 1522 UT and decommissioned from  
active service 18 Dec 2009 at 2228 UT. (NANU 2009131)
- 26 26 Launched 07 JUL 1992; usable 23 JUL 1992; Operates on Rb std  
Unusable 10 Mar 1998 1541 UT to 16 Mar 1998 1818 UT due to  
change in operational frequency standard from Cs to Rb.
- 27 27 Launched 09 SEP 1992; usable 30 SEP 1992; Operates on Cs std  
Unusable 10 Jun 2002 1516 UT to 20 Jun 2002 1402 UT due to  
change in operational frequency standard from Cs to Rb.  
Unusable 14 MAY 2005 1955 UT to 31 MAY 2005 1749 UT due to  
change in operational frequency standard from Rb to Cs.
- 28 28 Launched 10 APR 1992; usable 25 APR 1992; decommissioned 15 AUG 1997  
Unusable beginning 04 NOV 1996 1634 UT and will remain unusable  
until further notice (NANU 179-96309)  
Removed from broadcast almanac of all GPS satellites 15 AUG 1997.
- 29 29 Launched 18 DEC 1992; usable 05 JAN 1993; decommissioned 23 OCT 2007  
Unusable 21 MAY 1997 1504 UT to 31 MAY 1997 0355 UT due to  
change in operational frequency standard from Cs to Rb.  
Unusable 01 MAR 2007 1445 UT to 12 MAR 2007 2124 UT due to  
change in operational frequency standard from Rb to Cs.
- 30 30 Launched 12 SEP 1996; usable 01 OCT 1996; Operates on Cs std  
Unusable 29 Aug 2001 2102 UT to 04 Sep 2001 2055 UT due to  
change in operational frequency standard from Cs to Rb.  
Unusable 02 JUN 2006 to 07 JUN 2006 due to change in  
operational frequency standard from Rb to Cs.
- 31 31 Launched 30 MAR 1993; usable 13 APR 1993; decommissioned 24 OCT 2005  
Unusable 17 JAN 1995 1705 UT to 25 JAN 1995 2013 UT due to  
change in operational frequency standard from Cs to Rb  
on 18 JAN 1995.  
The MCS and P-code users experienced intermittent lock  
on the L2 navigation signal of PRN31 from 13 Apr 1993 2053 UT  
to 16 Jun 1993 0824 UT. Since corrective maintenance was  
performed on 16 Jun 1993, the MCS has not experienced lock  
problems on PRN31's L2 navigation signal.  
Change in operational frequency standard from Rb to Cs  
on 23 JUL 1997.  
Unusable 15 APR 2002 1431 UT to 23 APR 2002 2018 UT due to  
change in operational frequency standard from Cs to Rb.  
Unusable 28 DEC 2004 0042 UT to 04 APR 2005 0913 UT, during the  
outage a change in operational frequency standard from Rb to Cs.
- 32 01 Launched 22 NOV 1992; usable 11 DEC 1992; decommissioned 17 MAR 2008  
Unusable 28 JAN 1993 2000 to 2200 UT for maintenance and changed  
the Pseudo Range Number (PRN) from 32 to 01.  
Unusable 03 MAY 1995 0604 UT to 12 MAY 1995 1528 UT due to  
change in operational frequency standard from Cs to Rb.

- Unusable 16 AUG 1996 1655 UT to 22 AUG 1996 1620 UT due to change in operational frequency standard from Rb to Cs.  
Set unusable 17 Mar 2008 at 1953 UT (NANU 2008030)  
Decommissioned from active service 17 MAR 2008 at 2200 UT.
- 33 03 Launched 28 MAR 1996; usable 09 APR 1996; Operates on Cs std  
Unusable 18 JUN 2006 to 29 JUN 2006 due to change in operational frequency standard from Cs to Rb.  
Unusable 27 DEC 2006 0120 UT to 08 JAN 2007 1723 UT due to change in operational frequency standard from Rb to Cs.
- 34 04 Launched 26 OCT 1993; usable 22 NOV 1993; Operates on Rb std  
Unusable 13 Sep 1998 1728 UT to 21 Sep 1998 2214 UT due to change in operational frequency standard from Cs to Rb.
- 35 05 Launched 30 AUG 1993; usable 28 SEP 1993; Operates on Rb std  
Unusable 02 Jun 2003 1518 UT to 09 Jun 2003 1417 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 26 Sep 2003 0745 UT to 14 Oct 2003 1633 UT due to change in operational frequency standard from Rb to Cs.  
Unusable 08 SEP 2005 0032 UT to 16 SEP 2005 1945 UT due to change in operational frequency standard from Cs to Rb.  
Set unusable 26 Mar 2009 at 1320 UT and decommissioned from active service 26 Mar 2009 at 2031 UT.
- 36 06 Launched 10 MAR 1994; usable 28 MAR 1994; Operates on Rb std  
Unusable 27 Apr 1995 1447 UT to 03 May 1995 0541 UT due to change in operational frequency standard from Rb to Cs.  
Unusable 17 Mar 2004 1531 UT to 29 Mar 2004 1558 UT due to change in operational frequency standard from Cs to Rb.
- 37 07 Launched 13 MAY 1993; usable 12 JUN 1993; decommissioned 20 DEC 2007  
Unusable 20 Apr 1999 0437 UT to 26 Apr 1999 1533 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 30 MAR 1994 0730 UT to 04 APR 1994 1330 UT due to change in operational Cs frequency standards.  
Unusable 20 Apr 1999 0437 UT to 26 Apr 1999 1533 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 17 Aug 2007 0748 UT to 17 Sep 2007 2122 UT due to change in operational Rb frequency standards.
- 37 01 Will Resume Transmission of L-Band on PRN01 on approx 23 Oct 2008.  
Unusable Until Further Notice (NANU 2008031)  
Discontinued Transmission of L-Band on PRN01 on 06 Jan 2009.
- 38 08 Launched 06 NOV 1997; usable 18 DEC 1997; Operates on Cs std  
Unusable 05 May 2004 0906 UT to 18 May 2004 0142 UT due to change in operational frequency standard from Rb to Cs.
- 39 09 Launched 26 JUN 1993; usable 21 JUL 1993; Operates on Cs std  
Unusable 15 Oct 1993 1200 UT to 07 Dec 1993 1940 UT due to testing  
Unusable 31 Oct 2005 1506 UT to 15 Nov 2005 0026 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 19 Dec 2005 1449 UT to 24 Dec 2005 0738 UT due to change in operational Cs frequency standards.
- 40 10 Launched 16 JUL 1996; usable 15 AUG 1996; Operates on Cs std  
Unusable 28 Nov 1996 2018 UT to 01 Dec 1996 2325 UT due to change in operational frequency standard from Rb to Cs.  
Unusable 24 Aug 2007 1751 UT to 18 Sep 2007 2028 UT due to change in operational frequency standard from Cs to Rb.  
Unusable 25 Mar 2008 0230 UT to 27 Mar 2008 2349 UT due to change in operational frequency standard from Rb to Cs.
- 41 14 Launched 10 NOV 2000; usable 10 Dec 2000; Operates on Rb std
- 43 13 Launched 23 JUL 1997; usable 31 Jan 1998; Operates on Rb std
- 44 28 Launched 16 JUL 2000; usable 17 Aug 2000; Operates on Rb std
- 45 21 Launched 31 MAR 2003; usable 12 Apr 2003; Operates on Rb std
- 46 11 Launched 07 OCT 1999; usable 03 Jan 2000; Operates on Rb std
- 47 22 Launched 21 DEC 2003; usable 12 Jan 2004; Operates on Rb std

48 07 Launched 15 MAR 2008; usable 24 Mar 2008; Operates on Rb std  
 49 01 Launched 24 MAR 2009; ; Operates on Rb std  
     Decommissioned from active service 06 MAY 2011  
 50 05 Launched 17 AUG 2009; usable 27 AUG 2009; Operates on Rb std  
 51 20 Launched 11 MAY 2000; usable 01 Jun 2000; Operates on Rb std  
 52 31 Launched 25 SEP 2006; usable 12 Oct 2006; Operates on Rb std  
 53 17 Launched 26 SEP 2005; usable 16 Dec 2005; Operates on Rb std  
 54 18 Launched 30 JAN 2001; usable 15 Feb 2001; Operates on Rb std  
 55 15 Launched 17 OCT 2007; usable 31 Oct 2007; Operates on Rb std  
 56 16 Launched 29 JAN 2003; usable 19 Feb 2003; Operates on Rb std  
 57 29 Launched 21 DEC 2007; usable 02 Jan 2008; Operates on Rb std  
 58 12 Launched 17 NOV 2006; usable 13 Dec 2006; Operates on Rb std  
 59 19 Launched 20 MAR 2004; usable 05 Apr 2004; Operates on Rb std  
 60 23 Launched 23 JUN 2004; usable 09 Jul 2004; Operates on Rb std  
 61 02 Launched 06 JUN 2004; usable 22 Nov 2004; Operates on Rb std  
 62 25 Launched 28 MAY 2010; usable 27 AUG 2010; Operates on Rb std

#### PERIODIC MAINTENANCE AND MANEUVERS

=====

The backup cesiums on-board each Block II/IIA satellite require periodic, approximately twice per year, pumping of the beam tube to maintain working order. This maintenance requires, on average, 18 hours of unusable time for each satellite.

Once per year each satellite requires a stationkeeping maneuver, also referred to as repositioning or Delta-V, to move the satellite back to its original orbital position. The satellites have a tendency to "drift" from their assigned orbital positions, one reason being the earth's gravitational pull. These maneuvers require, on average, 12 hours of unusable time for each satellite.

#### CURRENT GPS CONSTELLATION

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The current GPS constellation consists of 31 Block IIA/IIR/IIR-M satellites. The first operational, Block II, satellite was launched in February 1989.

For information concerning: CURRENT STATUS see file . . . . gpstd.txt  
                           GPS SYSTEM see file . . . . gpssy.txt  
                           TIME TRANSFER see file . . . . gpstt.txt  
                           BLOCK I see file . . . . gpsb1.txt

*Πηγή ftp://tycho.usno.navy.mil/pub/gps/gpsb2.txt*

## **ΠΑΡΑΡΤΗΜΑ Β.**

Usage: teqc [opts] file1 [file2 [...]]  
or: teqc [opts] < stdin  
where [opts]:

- ver[sion] or +ver[sion] dump program version and build to stderr
- id or +id dump program id to stderr
- help or +help dump the entire on-line help to stderr
- +relax allow relaxed requirements on RINEX header fields
- relax strict requirements on RINEX header fields (default)
- +reformat allow reading of misformatted RINEX data fields
- reformat strict requirements on RINEX data fields (default)
- +err name write stderr directly to file "name"
- ++err name append stderr directly to file "name"
- +out name write stdout directly to file "name"
- ++out name append stdout directly to file "name"
- config name read file(s) "name" as configuration

file(s)

- +config dump all set parameters as a configuration to stdout
- ++config dump all known parameters as a superset configuration to stdout
- +bcf dump all known parameters as a BINEX configuration to stdout
- ++igs dump all IGS receiver/antenna/dome designations to stdout
- ++sym dump all ASCII QC plot symbols to stdout
- max\_rx\_ch[annels] # set maximum # of receiver channels based on receiver type  
(default = 12 unless found by matching with IGS designation)
- max\_rx\_SVs # set maximum # of SVs trackable (per OBS epoch) based on receiver type  
(default = 12 unless found by matching with IGS designation)
- n\_GPS # set maximum expected GPS SV PRN to 0 < # < 256 (default = 32)
- n\_GLONASS # set maximum expected GLONASS SV # to 0 < # < 256 (default = 24)
- n\_SBAS # set maximum expected SBAS SV # to 0 < # < 256 (default = 19)
- n\_Galileo # set maximum expected Galileo SV # to 0 < # < 256 (default = 32)
- +igs check rx and ant designations with IGS list (default)
- igs don't check rx and ant designations with IGS list

IGS list

- +ch use all channels (default)
- ch# don't use channel #
- +NaN\_obs use all OBS data (default)
- NaN\_obs # don't use SV w/ NaN data in obs list #
- +G use all GPS SVs (default)
- G# don't use GPS SV PRN #
- +R use all GLONASS SVs (default)
- R# don't use GLONASS SV slot #
- +S use all SBAS SVs (default)

```

-S#                don't use SBAS SV PRN #
+E                use all Galileo SVs (default)
-E#                don't use Galileo SV PRN #
+svo              order SVs by PRN or slot #
-svo              SV detection ordering (default)
-st[art_window] str set start time to str ==
[[[[[[YY]YY]MM]DD]hh]mm]ss[.sssss]
+dX #             delta X time of # from start time; X ==
Y, M, d, h, m, s for year,...,second
-dX #             delta X time of # from end time; X == Y,
M, d, h, m, s for year,...,second
-e[nd_window] str set end time to str ==
[[[[[[YY]YY]MM]DD]hh]mm]ss[.sssss]
-hole name        read file "name" to establish list of
window holes
-tbin # str       time binned output with # delta and
filename prefix "str"
-ast str          set aligned time binned start time to
str == [[[[[[YY]YY]MM]DD]hh]mm]ss[.sssss]
... or str = - or _ to start alignment
with the first observation epoch
+win_mo[nument] # window filter on monument/marker name
string #, maximal match
-win_mo[nument] # window filter on monument/marker name
string #, minimal match
+win_mn #         window filter on monument/marker number
string #, maximal match
-win_mn #         window filter on monument/marker number
string #, minimal match
+xdr              attempt to use NMEA XDR strings as
met data (default)
-xdr              do not attempt to use NMEA XDR
strings as met data
-delim#           change delimiter to # for seperating
file names (default = ,)
+obs[file(s)] name output any OBS records in native format
to file "name"
+nav[file(s)] name output any NAV records in native format
to file "name"
+met[file(s)] name output any MET records in native format
to file "name"
+event[s_out]     output event info with observations
-event[s_out]     don't output event info with
observations (default)
+dump_i[on]       dump all ionosphere model parameters to
stderr
-dump_i[on]       don't dump ionosphere model parameters
to stderr (default)
+dump_u[tc]       dump all UTC model parameters to stderr
-dump_u[tc]       don't dump UTC model parameters to
stderr (default)
+diag             dump parsing and other diagnostics to
stderr
-diag             don't dump parsing and other diagnostics
to stderr (default)
+doy              format certain dates such as metadata in
year day-of-year
-doy              dates formatted in year month day
(default)
+smtt            smooth time tag (ms jumps in phase and
range) (default)

```



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        -smtt                ms jumps in time tag (smooth phase and
range)
        -aoa code            input is from AOA (JPL) receiver, record
type "code":
                                code = cb for ConanBinary survey data
from TurboRogue or TurboStar rxs
                                code = tb for TurboBinary survey data
from TurboRogue or TurboStar rxs
                                code = tbY for TurboBinary survey data
from Benchmark ACT rx ("Y-codeless")
        -ash[tech] code      input is from Ashtech receiver, record
type "code":
                                code = d for B-file survey data
                                code = s for streamed (MBEN/DBEN) data
                                code = r for R-file format data
                                code = u for U-file format data
        -cmc code            input is from Canadian Marconi (CMC)
receiver, record type "code":
                                code = b for CMC binary
        -jav[ad] code        input is from Javad receiver, record
type "code":
                                code = jps for Javad JPS
        -lei[ca] code        input is from Leica receiver, record
type "code":
                                code = ds for Leica DS format
                                code = lb2 for Leica LB2 format
                                code = mdb for Leica MDB format
        -mot[orola] code     input is from Motorola receiver, record
type "code":
                                code = oncore for Oncore binary
        -nct code            input is from NavCom Technologies
receiver, record type "code":
                                code = b for NavCom binary
        -roc[kwell] code     input is from Rockwell receiver, record
type "code":
                                code = z for Zodiac format
        -sep[tentrio] code    input is from Septentrio receiver,
record type "code":
                                code = sbf for Septentrio Binary
Format
        -top[con] code        input is from Topcon receiver, record
type "code":
                                code = tps for Topcon TPS
        -tr[imble] code       input is from Trimble receiver, record
type "code":
                                code = d for .dat survey data
                                code = s for streamed RT17 data
        -ti code              input is from Texas Instruments
receiver, record type "code":
                                code = gesar for TI-4100 GESAR &
BEPP/CORE format survey data
                                code = rom for TI-4100 TI-ROM format
survey data
        -ubl[ox] code         input is from u-blox AG receiver, record
type "code":
                                code = ubx for u-blox UBX binary
        -binex                input is BINEX format
+binex <record_types>        output to be BINEX
                                <record_types> = - for default types
        -rtigs                input is IGS RTWG (RTIGS) format
        -soc                  input is JPL Soc format

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        -argo                input is ARGO format
        -P[codes]           P-codeless (L2-squaring) or C/A-L1-only
receiver
        +P[codes]           normal dual-frequency receiver
(including L2C-capable) (default)
        +C2                 LC2 code pseudorange to be included in
observables
        -C2                 LC2 code pseudorange not to be included
in observables (default)
        +L2                 expect and use L2-carrier data (default)
        -L2                 don't expect L2-carrier data
        +L1_2               keep L1 cycle data if L1 is squared
(default)
        -L1_2               delete L1 cycle data if L1 is squared
        +L2_2               keep L2 cycle data if L2 is squared
(default)
        -L2_2               delete L2 cycle data if L2 is squared
        +CA_L1              use phase value in C/A code block as L1
        -CA_L1              use phase value in P1 code block as L1
(default)
        +L2C_L2             use phase value in L2C code block as L2
        -L2C_L2             use phase value in P2 code block as L2
(default)
        +msec_phs_adj       include ms adjustment to phase values at
rx ms resets
        -msec_phs_adj       don't include ms adjustment to phase
values at rx ms resets (default)
        +leap[_seconds]     subtract current leap seconds from
GLONASS pseudoranges (default)
        -leap[_seconds]     no leap second adjustments to GLONASS
pseudoranges
        +rds                 reverse Doppler sign
        -rds                 keep current Doppler sign (default)
        +smooth[ing]        include smoothing correction to
pseudoranges
        -smooth[ing]        don't include smoothing correction to
pseudoranges (default)
        +rx_clk_off[set]     include receiver clock offset to RINEX
OBS and certain BINEX
        -rx_clk_off[set]     don't include receiver clock offset
(default)
        -r[everse]          normal processor endianness on binary
data output (default)
        +r[everse]          reverse processor endianness on binary
data output (BINEX only for now)
        +Ashtech_qd          include all "questionable" data when
translating
        -Ashtech_qd          exclude all "questionable" data
(default)
        +Ashtech_B_file_adjust Ashtech B-file is corrupted
        -Ashtech_B_file_adjust normal Ashtech B-file (default)
        +Ashtech_old_clk_reset use old Ashtech clock reset scheme
        -Ashtech_old_clk_reset use modern Ashtech clock reset scheme
(default)
        +lb2_fe              ignore Leica LB2 records until 0xfe
record is read
        -lb2_fe              use all Leica LB2 records (default)
        +skip_init_LB2_03    skip initial Leica LB2 0x03 record
        -skip_init_LB2_03    use initial Leica LB2 0x03 record
(default)

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        -sbfofs #           specify Septentrio Binary Format
observation record to use; # = 5889|5890|5944
        +geod_p           data from Trimble Geodesist-P receiver
        -geod_p           not from Geodesist-P (default)
        +TBnr             use 0x68 TurboBinary data (normal-rate
observable record) (default)
        -TBnr             don't use 0x68 TurboBinary data
        +TBLC             use LC (0xde) TurboBinary data
        -TBLC             don't use LC (0xde) TurboBinary data
(default)
        +TB1s             use 1-sec (0x1a) TurboBinary data)
        -TB1s             don't use 1-sec (0x1a) TurboBinary data
(default)
        +TBhr             use high-rate (0xdb, 0xdc) TurboBinary
data
        -TBhr             don't use high-rate (0xdb, 0xdc)
TurboBinary data (default)
        +TBfe_ff          recognize header/trailer records (0xff,
0xfe) TurboBinary records (default)
        -TBfe_ff          ignore 0xff, 0xfe records
        +TB_ca_fix        apply CA offset fix to 0x68 TurboBinary
records (before ~1 Dec 92)
        -TB_ca_fix        use modern (post-1 Dec 92) CA
translation of 0x68 TurboBinary records (default)
        +v[erify]         verify conformance to RINEX standard
        -v[erify]         stream out RINEX standard or other (such
as qc output) (default)
        -week #           set GPS week to initial value # for
native format translation (default = best guess)
        +warn[ings]       dump any warnings to stderr (default)
        -warn[ings]       don't dump any warnings to stderr
        +notice[s]        dump any notices to stderr (default)
        -notice[s]        don't dump any notices to stderr
        +quiet            quiet stdout/stderr qc mode;
automatically sets -warn[ings] and -notice[s]
        -quiet            normal stdout/stderr qc output (default)
        +meta[data]       produce UNAVCO archive raw metadata
table
        -meta[data]       don't produce UNAVCO archive raw
metadata table (default)
        +mds              show short metadata summary
        -mds              don't show short metadata summary
(default)
        +mdf              show probable format
        -mdf              don't show probable format (default)
        +phc              output all RINEX post-header comments
(default)
        -phc              suppress RINEX post-header comments
        -base[year] #     change epoch base year to # A.D.
(default = 1980)

        -O.{opt} arg(s)   override any existing OBS header {opt}
with arg(s):
        -O.sum[mary] s     for OBS file(s) and stdin
not used as input, put summary at beginning of output (two passes)
        -O.sum[mary] e     for OBS file(s), put summary
at end of output (requires only one pass)
        -O.an "str"       set OBS antenna number to
"str"
        -O.at "str"       set OBS antenna type to
"str"

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```

-O.px[WGS84xyz,m] x y z set OBS antenna WGS 84
position to x y z (in meters)
-O.pg[eo,ddm] lat lon el set OBS antenna WGS 84
position to lat lon elevation (degrees degrees meters)
-O.pe[hEN,m] h E N set OBS antenna position
eccentricities to h E N (in meters)
-O.mov[ing] 1 force OBS antenna position
to be in kinematic (roving) state initially
-O.ag[ency] "str" set OBS operating agency to
"str"
+O.c[omment] "str" append OBS comment "str"
-O.dec[imate] # modulo decimation of OBS
epochs to # time units # = 30s results in epochs
nominally at 00 and 30 seconds
-O.def_wf i j set OBS default wavelength
factors to i and j
-O.mod_wf i j n {SV1 SV2 ... SVn} set OBS modified
wavelength factors to i and j of n SVs
-O.e[nd] Y M D h m s set OBS end time (last
epoch) to Y M D h m s
-O.int[erval,sec] # set OBS observation interval
to # (> 0.) seconds
-O.leap # set OBS leap seconds to #
-O.mn "str" set OBS monument number to
"str"
-O.mo[nument] "str" set OBS monument name to
"str"
-O.o[perator] "str" set OBS operator name to
"str"
-O.rename_obs "str" rename OBS observables to
"str"
"str" = L1L2C1P2 renames 4
observables to be L1 L2 C1 P2, and in that order
-O.obs[_types] "str" change OBS observables to
"str"
"str" = L1L2C1P2 sets 4
observables to be L1 L2 C1 P2, and in that order
-O.rn "str" set OBS receiver number to
"str"
-O.rt "str" set OBS receiver type to
"str"
-O.rv "str" set OBS receiver firmware
version to "str"
-O.r[un_by] "str" set OBS run by to "str"
-O.s[ystem] # set OBS satellite system to
# (= G, R, S, T, or M)
-O.sl[ant] s d dh set OBS antenna position
eccentricities to dh+sqrt(s^2 - (d/2)^2) 0 0 (in meters)
-O.st[art] Y M D h m s set OBS start time (first
epoch) to Y M D h m s
-N.{opt} arg(s) override any existing NAV header {opt}
with arg(s):
-O.a[lpha] a0 a1 a2 a3 set NAV ionosphere alpha
parameters to a0 a1 a2 a3
-O.b[eta] b0 b1 b2 b3 set NAV ionosphere beta
parameters to b0 b1 b2 b3
+N.c[omment] "str" append NAV comment "str"
-N.corr[_GLO] yr mon day secset GLONASS NAV
correction to system time to yr mon day sec

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```

-N.corr_SBAS yr mon day sec set SBAS NAV correction
to system time to yr mon day sec
-N.dec[imate] # modulo decimation of NAV ToE
epochs to # time units # = 12h results in ToE
epochs at 00 and 12 hours
-N.leap # set NAV leap seconds to #
-N.r[un_by] "str" set NAV run by to "str"
-N.s[ystem] # set NAV satellite system to
# (= G, R, S)
-N.UTC A0 A1 t w set NAV UTC time model to A0
A1 t w
-M.{opt} arg(s) override any existing MET header {opt}
with arg(s):
+M.c[omment] "str" append MET comment "str"
-M.dec[imate] # modulo decimation of MET
epochs to # time units # = 15m results in epochs
at 00, 15, 30, and 45 minutes
-M.int[erval,sec] # set MET observation interval
to # (> 0.) seconds
-M.l[ast_epoch] <GPSweek>:<dow>:<sec> set MET last
epoch to <GPSweek>:<dow>:<sec>
-M.mn "str" set MET monument number to
"str"
-M.mo[nument] "str" set MET monument name to
"str"
+M.mod[el/type/acc] "obs" "model" "type" accuracy
set "obs" MET sensor mod/type/acc to "model" "type" accuracy
"obs" = HR, PR, TD, or ZW
-M.rename_obs "str" rename MET observables to
"str"
"str" = TD+HR+PR renames 3
observables to be TD HR PR, and in that order
-M.obs[_types] "str" change MET observables to
"str"
"str" = TD+HR+PR sets 3
observables to be TD HR PR, and in that order
+M.pos[ition] "obs" x y z h set "obs" MET sensor
XYZ/H to x y z h
"obs" = HR, PR, TD, or ZW
-M.r[un_by] "str" set MET run by to "str"
-qc don't do quality check (default)
+qc quality checking (w/ following options):
+ap turn average position on
-ap don't do average position
(default)
+eep turn every epoch position
(silent) on
-eep don't do silent every epoch
position (default)
+eepx turn every epoch position
(xyz cartesian) on
-eepx don't do xyz every epoch
position (default)
+eepg turn every epoch position
(geographical) on
-eepg don't do geographical every
epoch position (default)
+cct report coarse code
pseudorange observable totals (default)

```

```

-cct report coarse code
pseudorange subtotals (no precise code pseudorange)
+cl[ock_slips] turn clock n-msec slip
detection on (default)
-cl[ock_slips] don't do clock n-msec slip
detection
-code_sigmas # set maximum tolerace for
code rejection to # (default = 2.0)
+data[indicators] turn data indicators on qc
ASCII plot on (default)
-data[indicators] don't use data indicators on
qc ASCII plot
-eps[ilon] # set machine epsilon to #
(default = 1.387779e-17)
+hor[izon] when possible, show SV
information down to horizon (default)
-hor[izon] show only observed SV
information
+ion compute L2-ionospheric
observable (default)
-ion don't compute L2-ionospheric
observables
+iod compute L2-ionospheric
derivative (default)
-iod don't compute L2-ionospheric
derivative
+tec compute TEC observable
-tec don't compute TEC
observables (default)
-bins # use # elevation bins between
horizon and zenith for all ion, mp, and sn observables (default = 18)
-ion_bins # use # elevation bins between
horizon and zenith for ionospheric observable (default = 18)
-ion_jump[cm] # set maximum L2-ionospheric
change to be # cm (default = 1.000e+35)
-iod_jump[cm/min] # set maximum L2-ionospheric
time-rate of change to be # cm/minute (default = 400.0)
-gap_mn[min] # set minimum gap allowed #
minutes (default = 10.0)
-gap_mx[min] # set maximum gap allowed w/o
NAV info to # minutes (default = 90.0)
-qlonass_n str str = GLONASS SV and
frequency number file
+l[ong_report] write a long report file
segment (default)
-l[ong_report] don't write a long report
file segment
+lli turn Loss-of-Lock indicator
on (default)
-lli don't show Loss-of-Lock
indicator
+ma turn multipath moving
average on (default)
-ma don't use multipath moving
average
+mask when possible, show SV
information down to elevation mask
-mask show normal SV information
(default)
-min_L1 # set minimum allowable L1 S/N
RINEX code to 0 <= # <= 9 (default = 0)

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```

        -min_L2 #                set minimum allowable L2 S/N
RINEX code to 0 <= # <= 9 (default = 0)
        -min_SVs #              set minimum allowable SVs w/
2 codes (per OBS epoch) to # for position attempt (default = 5)
        +mp                      compute L1 and L2 multipath
observables (default)
        -mp                      don't compute L1 and L2
multipath observables
        -mp1_rms[cm] #          set expected MP1 rms to # cm
(default = 50.00)
        -mp2_rms[cm] #          set expected MP2 rms to # cm
(default = 65.00)
        -mp_bins #              use # elevation bins between
horizon and zenith for multipath (default = 18)
        +mp_raw                  show raw multipath (no slip
removal)
        -mp_raw                  show multipath (if being
done) w/ slip removal (default)
        -mp_sigmas #            set minimum sigma threshold
for mp slips to # sigmas (default = 4.0)
        -mp_win #               set multipath moving average
window to # (< 65536) points (default = 50)
        -mp_CA_AS[%rms] #       set % increase of multipath
rms to # if CA or AS present (default = 100.0)
        -msec_tol[msec] #       set millisecond clock slip
tolerance to # msec (default = 1.00e-02)
        -nav[file(s)] name      input NAV file(s) "name" for
ephemeris data (to perform position calculations)
        -p[ortrait]#[u]        qc ASCII plot plot in
"portrait" mode; bin length in # units u (default u == m[inutes])
        -path_dt[min] #         set sampling of SV cubic
spline fit to # minutes (default = 10)
        +pl                      compute L1 and L2
pseudorange-phase observables
        -pl                      don't compute L1 and L2
pseudorange-phase observables (default)
        +plot                    write plot file(s) (default)
        -plot                    don't write plot file(s)
        +pos[ition]              find antenna position and
terminate teqc ASAP
        -pos[ition]              run teqc normally (default)
        -pos_conv[m] #           set position convergence to
# ( > 0) meters (default = 1.000000e+00 m)
        -pos_jump[m] #          set position jump detection
to # ( > 0) meters (default = 1.000000e+05 m)
        +rep[ort]                write a report file
(default)
        -rep[ort]                don't write any report file
        +reset                    find antenna position and
re-qc RINEX OBS file (default)
        -reset                    only one pass of each RINEX
OBS file allowed (default if using stdin)
        -root str                 supply filename root for
ancillary files as str
        +rs                       compute rise and set times
of each SV w/ NAV info (default)
        -rs                       don't compute rise and set
times
        +s[hort_report]          write a short report file
segment (default)

```

```

-s[hort_report]                don't write a short report
file segment
-set_hor[izon,deg] #          set elevation horizon to #
degrees (default = 0.00)
-set_mask[deg] #             set elevation mask to #
degrees (default = 10.00)
-set_comp[arison,deg] #      set elevation comparison to
# degrees (default = 25.00)
-slips name                   slip details written to file
name
+sn[ratio]                    compute S/N observables
(default)
-sn[ratio]                    don't compute S/N
observables
-sn_bins #                    use # elevation bins between
horizon and zenith for S/N (default = 18)
+ssv                          give individual SUM lines
for each SV
-ssv                          no individual SUM lines for
each SV (default)
+sym[bol_codes]              dump symbol codes and
hierarchy for short report ASCII time plot
-sym[bol_codes]              don't dump symbol codes and
hierarchy (default)
-w[idth] #                    set time width of qc ASCII
plot to 0 < # < 256 (default = 72)
+Y[-code]                    Y-code receiver expected
-Y[-code]                    P-code receiver expected
(possible tracking of P-codes w/ A/S on) (default)
-qcq                          don't do quality check,
quick or otherwise (default)
+qcq                          do quality check w/ no plots
or report unless explicitly specified

```



## ΠΑΡΑΡΤΗΜΑ Γ.

### TEQC REPORT FILES

*Έτος 2009 ημέρα 127*

\*\*\*\*\*

QC of RINEX file(s) : atal1270.09o

input RnxNAV file(s) : atal1270.09n

\*\*\*\*\*

4-character ID : ATAL

Receiver type : ASHTECH UZ-12 (# = IR1200304026)

Antenna type : GPPNULLANTENNA (# = 32871)

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4591114.5663 1948781.5915 3962407.4548 (m)

antenna WGS 84 (geo) : N 38 deg 39' 11.03" E 22 deg 59' 58.82"

antenna WGS 84 (geo) : 38.653063 deg 22.999673 deg

WGS 84 height : 151.7666 m

[qc - header] position : 28.1568 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 32

NAVSTAR GPS SVs w/o OBS :

NAVSTAR GPS SVs w/o NAV : 1 5

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2873

Epochs repeated : 0 (0.00%)  
 Possible obs > 0.0 deg: 30253  
 Possible obs > 10.0 deg: 23812  
 Complete obs > 10.0 deg: 21884  
 Deleted obs > 10.0 deg: 0  
 Masked obs < 10.0 deg: 1865  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.165902 m  
 Moving average MP2 : 0.243753 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 0.00 (sd=0.00 n=0) 0.00 (sd=0.00 n=0)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 2 (: 348) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 21  
 IOD slips > 10.0 deg : 128  
 IOD or MP slips < 10.0\*: 27  
 IOD or MP slips > 10.0 : 144  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 09 5 7 00:00 09 5 7 23:59 23.94 30 23812 21884 92 0.17 0.24 152

Processing parameters are:

Receiver tracking capability : 12 SVs

Maximum ionospheric rate (L1) : 400.00 cm/min

Report data gap greater than : 10.00 min

Expected rms of MP1 multipath : 50.00 cm

Expected rms of MP2 multipath : 65.00 cm

Multipath slip sigma threshold : 4.00 cm

% increase in MP rms for C/A | A/S : 100.00 %

Points in MP moving averages : 50

Minimum signal to noise for L1 : 0

Minimum signal to noise for L2 : 0

Elevation mask (cutoff) : 10.00 degrees

Elevation comparison threshold : 25.00 degrees

Orbit path spline fit sample time : 10 min

SVs w/ code data for position try : 5

Width of ASCII summary plot : 72

Data indicators on summary plot : yes

Do ionospheric observable : yes

Do ionospheric derivative : yes

Do high-pass ionosphere observable : no

Do multipath observables : yes

Do 1-ms receiver clock slips : yes

Tolerance for 1-ms clock slips : 1.00e-02 ms

Do receiver LLI slips : yes

Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G24 | 1063 | 29.78 | 673 | 44.17 | 607 | 607 | 607 | 607 | 0 | 607 | 607 | 0 |
| G12 | 952  | 39.74 | 842 | 44.28 | 813 | 813 | 813 | 813 | 0 | 813 | 813 | 0 |
| G10 | 1154 | 24.22 | 895 | 29.79 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |
| G30 | 907  | 40.60 | 790 | 45.88 | 752 | 752 | 752 | 752 | 0 | 752 | 752 | 0 |
| G16 | 1137 | 25.61 | 863 | 32.12 | 794 | 794 | 794 | 794 | 0 | 794 | 794 | 0 |
| G18 | 1124 | 26.20 | 813 | 34.23 | 677 | 677 | 677 | 677 | 0 | 677 | 677 | 0 |
| G21 | 892  | 42.45 | 776 | 48.06 | 706 | 706 | 706 | 706 | 0 | 706 | 706 | 0 |
| G29 | 947  | 40.49 | 837 | 45.16 | 783 | 783 | 783 | 783 | 0 | 783 | 783 | 0 |
| G31 | 1187 | 23.09 | 944 | 27.75 | 895 | 895 | 895 | 895 | 0 | 895 | 895 | 0 |
| G06 | 863  | 40.91 | 736 | 47.16 | 632 | 632 | 632 | 632 | 0 | 632 | 632 | 0 |
| G22 | 1018 | 31.73 | 690 | 45.09 | 627 | 627 | 627 | 627 | 0 | 627 | 627 | 0 |
| G03 | 985  | 32.50 | 685 | 45.29 | 606 | 606 | 606 | 606 | 0 | 606 | 606 | 0 |
| G15 | 1063 | 29.20 | 659 | 43.81 | 587 | 587 | 587 | 587 | 0 | 587 | 587 | 0 |
| G26 | 1092 | 27.36 | 814 | 34.96 | 750 | 750 | 750 | 750 | 0 | 750 | 750 | 0 |
| G19 | 1055 | 29.94 | 670 | 44.33 | 593 | 593 | 593 | 593 | 0 | 593 | 593 | 0 |
| G14 | 1162 | 23.99 | 918 | 29.04 | 860 | 860 | 860 | 860 | 0 | 860 | 860 | 0 |
| G32 | 952  | 40.48 | 843 | 45.06 | 795 | 795 | 795 | 795 | 0 | 795 | 795 | 0 |
| G11 | 830  | 40.03 | 711 | 45.90 | 615 | 615 | 615 | 615 | 0 | 615 | 615 | 0 |
| G20 | 934  | 40.32 | 821 | 45.18 | 786 | 786 | 786 | 786 | 0 | 786 | 786 | 0 |
| G28 | 1065 | 30.41 | 684 | 44.71 | 622 | 622 | 622 | 622 | 0 | 622 | 622 | 0 |
| G23 | 907  | 40.72 | 791 | 45.97 | 734 | 734 | 734 | 734 | 0 | 734 | 734 | 0 |
| G17 | 1169 | 23.24 | 919 | 28.21 | 871 | 871 | 871 | 871 | 0 | 871 | 871 | 0 |

|      |      |       |     |       |     |     |     |     |   |     |     |   |
|------|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G13  | 931  | 39.23 | 820 | 43.86 | 766 | 766 | 766 | 766 | 0 | 766 | 766 | 0 |
| G25  | 987  | 34.71 | 715 | 46.75 | 658 | 658 | 658 | 658 | 0 | 658 | 658 | 0 |
| G04  | 1175 | 22.60 | 921 | 27.48 | 844 | 844 | 844 | 844 | 0 | 844 | 844 | 0 |
| G07  | 849  | 41.44 | 730 | 47.39 | 665 | 665 | 665 | 665 | 0 | 665 | 665 | 0 |
| G02  | 1180 | 22.39 | 929 | 27.11 | 881 | 881 | 881 | 881 | 0 | 881 | 881 | 0 |
| G08  | 906  | 40.50 | 790 | 45.72 | 731 | 731 | 731 | 731 | 0 | 731 | 731 | 0 |
| G27  | 926  | 41.38 | 812 | 46.49 | 778 | 778 | 778 | 778 | 0 | 778 | 778 | 0 |
| G09  | 841  | 40.96 | 721 | 46.95 | 639 | 639 | 639 | 639 | 0 | 639 | 639 | 0 |
| G01* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G05* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

\* = SV with no NAV info

Obs below mask ( 10.00 deg) : 2698

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 0

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 0

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24582

Obs deleted (any reason) : 2698

Obs complete : 21884

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 133       | 0            | 0.000000 |     |      |     |
| 80 - 85    | 243       | 0            | 0.000000 |     |      |     |
| 75 - 80    | 777       | 0            | 0.000000 |     |      |     |
| 70 - 75    | 1118      | 0            | 0.000000 |     |      |     |
| 65 - 70    | 1517      | 0            | 0.000000 |     |      |     |
| 60 - 65    | 1411      | 0            | 0.000000 |     |      |     |
| 55 - 60    | 1323      | 1            | 0.000000 |     |      |     |
| 50 - 55    | 1385      | 5            | 0.000000 |     |      |     |
| 45 - 50    | 1565      | 11           | 0.000000 | =   |      |     |
| 40 - 45    | 1771      | 18           | 0.000000 | ==  |      |     |
| 35 - 40    | 1605      | 31           | 0.000000 | === |      |     |
| 30 - 35    | 1738      | 26           | 0.000000 | ==  |      |     |
| 25 - 30    | 2167      | 15           | 0.000000 | =   |      |     |
| 20 - 25    | 1992      | 13           | 0.000000 | =   |      |     |
| 15 - 20    | 1713      | 6            | 0.000000 |     |      |     |
| 10 - 15    | 1401      | 2            | 0.000000 |     |      |     |
| 5 - 10     | 1226      | 12           | 0.000000 | =   |      |     |
| 0 - 5      | 3         | 0            | 0.000000 |     |      |     |
| < 0        | 0         | 0            | 0.000000 |     |      |     |

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | < 25  | < 25  | < 25  | > 25  | > 25  | > 25  |
|-----|--------|-------|--------|-------------|-------|-------|-------|-------|-------|-------|
|     |        |       |        |             | slips | L1 rx | L2 rx | slips | L1 rx | L2 rx |
| G24 | 607    | 0     | 47.12  | 0.256802    | 0     | 0     | 1     | 4     | 0     | 0     |
| G12 | 813    | 0     | 45.50  | 0.127755    | 0     | 1     | 1     | 4     | 0     | 0     |
| G10 | 817    | 0     | 31.33  | 0.210780    | 0     | 0     | 2     | 4     | 0     | 0     |
| G30 | 752    | 0     | 47.64  | 0.359752    | 1     | 0     | 1     | 3     | 0     | 0     |

|      |     |   |       |          |   |   |   |   |   |   |
|------|-----|---|-------|----------|---|---|---|---|---|---|
| G16  | 794 | 0 | 33.30 | 0.290074 | 2 | 1 | 2 | 2 | 0 | 0 |
| G18  | 677 | 0 | 38.25 | 0.226495 | 1 | 0 | 5 | 4 | 0 | 0 |
| G21  | 706 | 0 | 50.72 | 0.111649 | 0 | 1 | 1 | 4 | 0 | 0 |
| G29  | 783 | 0 | 47.14 | 0.146498 | 1 | 3 | 3 | 4 | 0 | 0 |
| G31  | 895 | 0 | 28.55 | 0.163198 | 4 | 0 | 0 | 4 | 0 | 0 |
| G06  | 632 | 0 | 52.44 | 0.134491 | 0 | 0 | 3 | 4 | 0 | 0 |
| G22  | 627 | 0 | 47.99 | 0.114507 | 0 | 0 | 1 | 4 | 0 | 0 |
| G03  | 606 | 0 | 49.30 | 0.125017 | 0 | 1 | 1 | 4 | 0 | 0 |
| G15  | 587 | 0 | 47.30 | 0.180934 | 0 | 0 | 1 | 4 | 0 | 0 |
| G26  | 750 | 0 | 36.59 | 0.192270 | 1 | 0 | 1 | 4 | 0 | 0 |
| G19  | 593 | 0 | 48.26 | 0.134802 | 0 | 1 | 2 | 4 | 0 | 0 |
| G14  | 860 | 0 | 30.29 | 0.202271 | 2 | 1 | 3 | 4 | 0 | 0 |
| G32  | 795 | 0 | 46.97 | 0.136523 | 2 | 1 | 2 | 4 | 0 | 0 |
| G11  | 615 | 0 | 50.87 | 0.146755 | 1 | 1 | 2 | 4 | 0 | 0 |
| G20  | 786 | 0 | 46.75 | 0.133736 | 0 | 1 | 1 | 4 | 0 | 0 |
| G28  | 622 | 0 | 47.52 | 0.140977 | 0 | 0 | 1 | 4 | 0 | 0 |
| G23  | 734 | 0 | 48.39 | 0.094284 | 0 | 1 | 1 | 4 | 0 | 0 |
| G17  | 871 | 0 | 29.11 | 0.187479 | 4 | 0 | 1 | 4 | 0 | 0 |
| G13  | 766 | 0 | 46.04 | 0.095755 | 0 | 1 | 1 | 4 | 0 | 0 |
| G25  | 658 | 0 | 49.49 | 0.098229 | 0 | 0 | 1 | 4 | 0 | 0 |
| G04  | 844 | 0 | 28.82 | 0.184157 | 4 | 3 | 4 | 4 | 0 | 0 |
| G07  | 665 | 0 | 50.47 | 0.087383 | 0 | 1 | 1 | 4 | 0 | 0 |
| G02  | 881 | 0 | 27.94 | 0.161959 | 4 | 0 | 1 | 4 | 0 | 0 |
| G08  | 731 | 0 | 48.21 | 0.107423 | 0 | 1 | 1 | 4 | 0 | 0 |
| G27  | 778 | 0 | 48.05 | 0.137428 | 1 | 0 | 1 | 3 | 0 | 0 |
| G09  | 639 | 0 | 51.30 | 0.114249 | 1 | 1 | 2 | 4 | 0 | 0 |
| G01* | 690 | 0 | 0.00  | 0.169972 | 6 | 1 | 1 | 0 | 0 | 0 |
| G05* | 774 | 0 | 0.00  | 0.279926 | 5 | 1 | 2 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP1 rms : 0.165894 m

total mean elevation : 42.60 degrees

# MP1 obs > 10 : 23348

# qc MP1 slips < 25 : 40

# Rvr L1 slips < 25 : 22

# Rvr L2 slips < 25 : 51

# qc MP1 slips > 25 : 116

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m

85 - 90 133 0 0.044347 |

80 - 85 243 0 0.046916 |

75 - 80 777 0 0.050554 |

70 - 75 1118 0 0.057308 |

65 - 70 1517 0 0.068059 |

60 - 65 1411 0 0.070516 |

55 - 60 1323 1 0.076297 ||

50 - 55 1385 5 0.083076 ||

45 - 50 1565 11 0.087338 #|

40 - 45 1771 20 0.100750 ##

35 - 40 1605 33 0.123785 ##==

30 - 35 1738 29 0.140170 ###

25 - 30 2167 17 0.182023 #||

20 - 25 1992 16 0.186444 #||

15 - 20 1713 8 0.252882 ||||



10 - 15 1401 5 0.451180 |||||  
 5 - 10 1226 17 0.484550 ##|||  
 0 - 5 3 0 0.505365 |||||  
 < 0 0 0 0.000000

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G24 | 607    | 0     | 47.12  | 0.198486 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G12 | 813    | 0     | 45.50  | 0.205567 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G10 | 817    | 0     | 31.33  | 0.285853 | 0       | 0     | 2    | 4     | 0    | 0     |      |       |      |
| G30 | 752    | 0     | 47.64  | 0.220367 | 1       | 0     | 1    | 3     | 0    | 0     |      |       |      |
| G16 | 794    | 0     | 33.30  | 0.289917 | 2       | 1     | 2    | 2     | 0    | 0     |      |       |      |
| G18 | 677    | 0     | 38.25  | 0.379044 | 1       | 0     | 5    | 4     | 0    | 0     |      |       |      |
| G21 | 706    | 0     | 50.72  | 0.186617 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G29 | 783    | 0     | 47.14  | 0.265264 | 1       | 3     | 3    | 4     | 0    | 0     |      |       |      |
| G31 | 895    | 0     | 28.55  | 0.266434 | 4       | 0     | 0    | 4     | 0    | 0     |      |       |      |
| G06 | 632    | 0     | 52.44  | 0.233060 | 0       | 0     | 3    | 4     | 0    | 0     |      |       |      |
| G22 | 627    | 0     | 47.99  | 0.182768 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G03 | 606    | 0     | 49.30  | 0.215153 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G15 | 587    | 0     | 47.30  | 0.358461 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G26 | 750    | 0     | 36.59  | 0.313363 | 2       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G19 | 593    | 0     | 48.26  | 0.207991 | 0       | 1     | 2    | 4     | 0    | 0     |      |       |      |
| G14 | 860    | 0     | 30.29  | 0.250000 | 2       | 1     | 3    | 4     | 0    | 0     |      |       |      |
| G32 | 795    | 0     | 46.97  | 0.309145 | 1       | 1     | 2    | 4     | 0    | 0     |      |       |      |
| G11 | 615    | 0     | 50.87  | 0.182121 | 1       | 1     | 2    | 4     | 0    | 0     |      |       |      |
| G20 | 786    | 0     | 46.75  | 0.245319 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G28 | 622    | 0     | 47.52  | 0.183053 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |

|      |     |   |       |          |   |   |   |   |   |   |
|------|-----|---|-------|----------|---|---|---|---|---|---|
| G23  | 734 | 0 | 48.39 | 0.178552 | 0 | 1 | 1 | 4 | 0 | 0 |
| G17  | 871 | 0 | 29.11 | 0.237900 | 4 | 0 | 1 | 4 | 0 | 0 |
| G13  | 766 | 0 | 46.04 | 0.240519 | 0 | 1 | 1 | 4 | 0 | 0 |
| G25  | 658 | 0 | 49.49 | 0.198893 | 0 | 0 | 1 | 4 | 0 | 0 |
| G04  | 844 | 0 | 28.82 | 0.272403 | 4 | 3 | 4 | 4 | 0 | 0 |
| G07  | 665 | 0 | 50.47 | 0.204782 | 0 | 1 | 1 | 4 | 0 | 0 |
| G02  | 881 | 0 | 27.94 | 0.251255 | 4 | 0 | 1 | 4 | 0 | 0 |
| G08  | 731 | 0 | 48.21 | 0.184712 | 0 | 1 | 1 | 4 | 0 | 0 |
| G27  | 778 | 0 | 48.05 | 0.208822 | 1 | 0 | 1 | 3 | 0 | 0 |
| G09  | 639 | 0 | 51.30 | 0.221307 | 1 | 1 | 2 | 4 | 0 | 0 |
| G01* | 690 | 0 | 0.00  | 0.230438 | 6 | 1 | 1 | 0 | 0 | 0 |
| G05* | 774 | 0 | 0.00  | 0.335995 | 5 | 1 | 2 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP2 rms : 0.243741 m

total mean elevation : 42.60 degrees

# MP2 obs > 10 : 23348

# qc MP2 slips < 25 : 40

# Rvr L1 slips < 25 : 22

# Rvr L2 slips < 25 : 51

# qc MP2 slips > 25 : 116

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 133       | 0            | 0.092385 |     |      |     |
| 80 - 85    | 243       | 0            | 0.156153 |     |      |     |
| 75 - 80    | 777       | 0            | 0.105905 |     |      |     |

```

70 - 75 1118 0 0.156442 |||
65 - 70 1517 0 0.184000 ||||
60 - 65 1411 0 0.156660 |||
55 - 60 1323 1 0.190943 ||||
50 - 55 1385 5 0.207146 ||||
45 - 50 1565 11 0.227327 #|||
40 - 45 1771 20 0.232053 ##||
35 - 40 1605 33 0.233105 ####|
30 - 35 1738 29 0.218349 ###|
25 - 30 2167 17 0.222464 #||
20 - 25 1992 16 0.255623 #|||
15 - 20 1713 8 0.359215 |||||
10 - 15 1401 5 0.458685 |||||
5 - 10 1226 19 0.471339 ###|||
0 - 5 3 0 0.345674 |||||
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

| elev (deg) | tot | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|-----|-------|-------|------|-----|-----|
| 85 - 90    | 0   | 0.000 | 0.000 |      |     |     |
| 80 - 85    | 0   | 0.000 | 0.000 |      |     |     |
| 75 - 80    | 0   | 0.000 | 0.000 |      |     |     |
| 70 - 75    | 0   | 0.000 | 0.000 |      |     |     |
| 65 - 70    | 0   | 0.000 | 0.000 |      |     |     |
| 60 - 65    | 0   | 0.000 | 0.000 |      |     |     |
| 55 - 60    | 0   | 0.000 | 0.000 |      |     |     |
| 50 - 55    | 0   | 0.000 | 0.000 |      |     |     |
| 45 - 50    | 0   | 0.000 | 0.000 |      |     |     |

|         |   |       |       |
|---------|---|-------|-------|
| 40 - 45 | 0 | 0.000 | 0.000 |
| 35 - 40 | 0 | 0.000 | 0.000 |
| 30 - 35 | 0 | 0.000 | 0.000 |
| 25 - 30 | 0 | 0.000 | 0.000 |
| 20 - 25 | 0 | 0.000 | 0.000 |
| 15 - 20 | 0 | 0.000 | 0.000 |
| 10 - 15 | 0 | 0.000 | 0.000 |
| 5 - 10  | 0 | 0.000 | 0.000 |
| 0 - 5   | 0 | 0.000 | 0.000 |
| < 0     | 0 | 0.000 | 0.000 |

S/N L2 summary (per elevation bin):

| elev (deg) | tot | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|-----|-------|-------|------|-----|-----|
| 85 - 90    | 0   | 0.000 | 0.000 |      |     |     |
| 80 - 85    | 0   | 0.000 | 0.000 |      |     |     |
| 75 - 80    | 0   | 0.000 | 0.000 |      |     |     |
| 70 - 75    | 0   | 0.000 | 0.000 |      |     |     |
| 65 - 70    | 0   | 0.000 | 0.000 |      |     |     |
| 60 - 65    | 0   | 0.000 | 0.000 |      |     |     |
| 55 - 60    | 0   | 0.000 | 0.000 |      |     |     |
| 50 - 55    | 0   | 0.000 | 0.000 |      |     |     |
| 45 - 50    | 0   | 0.000 | 0.000 |      |     |     |
| 40 - 45    | 0   | 0.000 | 0.000 |      |     |     |
| 35 - 40    | 0   | 0.000 | 0.000 |      |     |     |
| 30 - 35    | 0   | 0.000 | 0.000 |      |     |     |
| 25 - 30    | 0   | 0.000 | 0.000 |      |     |     |
| 20 - 25    | 0   | 0.000 | 0.000 |      |     |     |
| 15 - 20    | 0   | 0.000 | 0.000 |      |     |     |

10 - 15 0 0.000 0.000

5 - 10 0 0.000 0.000

0 - 5 0 0.000 0.000

< 0 0 0.000 0.000

\*\*\*\*\*

QC of RINEX file(s) : klok1270.09o

input RnxNAV file(s) : klok1270.09n

\*\*\*\*\*

4-character ID : KLOK

Receiver type : LEICA GRX1200PRO (# = 463363) (fw = 4.03/2.122)

Antenna type : LEIAT504 (# = 103396)

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4564741.4120 1845642.2866 4040943.3627 (m)

antenna WGS 84 (geo) : N 39 deg 33' 53.12" E 22 deg 00' 53.10"

antenna WGS 84 (geo) : 39.564755 deg 22.014749 deg

WGS 84 height : 148.9008 m

[qc - header] position : 34.1033 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30317

Possible obs > 10.0 deg: 23734

Complete obs > 10.0 deg: 21029  
 Deleted obs > 10.0 deg: 15  
 Masked obs < 10.0 deg: 3504  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.237422 m  
 Moving average MP2 : 0.316019 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.98 (sd=1.11 n=21044) 6.62 (sd=1.68 n=21029)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 64) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 1  
 IOD slips > 10.0 deg : 30  
 IOD or MP slips < 10.0\*: 1  
 IOD or MP slips > 10.0 : 32  
 \* or unknown elevation

| first epoch      | last epoch   | hrs   | dt | #expt | #have | %  | mp1  | mp2  | o/slps |
|------------------|--------------|-------|----|-------|-------|----|------|------|--------|
| SUM 09 5 7 00:00 | 09 5 7 23:59 | 24.00 | 30 | 23734 | 21029 | 89 | 0.24 | 0.32 | 657    |

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)



SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1178 | 22.45 | 929 | 27.14 | 694 | 686 | 694 | 686 | 0 | 686 | 694 | 0 |
| G03 | 985  | 32.69 | 687 | 45.46 | 584 | 584 | 584 | 584 | 0 | 584 | 584 | 0 |
| G04 | 1170 | 22.82 | 918 | 27.73 | 831 | 830 | 831 | 830 | 0 | 830 | 831 | 0 |
| G06 | 862  | 41.13 | 736 | 47.35 | 618 | 617 | 618 | 617 | 0 | 617 | 618 | 0 |
| G07 | 928  | 37.57 | 723 | 47.35 | 723 | 723 | 723 | 723 | 0 | 723 | 723 | 0 |
| G08 | 896  | 40.89 | 782 | 46.13 | 782 | 782 | 782 | 782 | 0 | 782 | 782 | 0 |
| G09 | 840  | 41.08 | 722 | 46.98 | 607 | 607 | 607 | 607 | 0 | 607 | 607 | 0 |
| G10 | 1149 | 24.50 | 892 | 30.12 | 808 | 807 | 808 | 807 | 0 | 807 | 808 | 0 |
| G11 | 830  | 40.21 | 712 | 46.05 | 605 | 604 | 605 | 604 | 0 | 604 | 605 | 0 |
| G12 | 946  | 40.01 | 835 | 44.66 | 774 | 774 | 774 | 774 | 0 | 774 | 774 | 0 |
| G13 | 924  | 39.54 | 811 | 44.36 | 811 | 810 | 811 | 810 | 0 | 810 | 811 | 0 |
| G14 | 1163 | 24.00 | 922 | 28.97 | 542 | 542 | 542 | 542 | 0 | 542 | 542 | 0 |
| G15 | 1062 | 29.46 | 662 | 44.04 | 568 | 568 | 568 | 568 | 0 | 568 | 568 | 0 |
| G16 | 1134 | 25.90 | 862 | 32.47 | 765 | 765 | 765 | 765 | 0 | 765 | 765 | 0 |
| G17 | 1170 | 23.23 | 922 | 28.15 | 539 | 539 | 539 | 539 | 0 | 539 | 539 | 0 |
| G18 | 1131 | 25.91 | 829 | 33.44 | 632 | 632 | 632 | 632 | 0 | 632 | 632 | 0 |
| G19 | 1056 | 30.15 | 672 | 44.59 | 572 | 572 | 572 | 572 | 0 | 572 | 572 | 0 |
| G20 | 927  | 40.64 | 817 | 45.44 | 732 | 732 | 732 | 732 | 0 | 732 | 732 | 0 |
| G21 | 884  | 42.48 | 767 | 48.20 | 767 | 767 | 767 | 767 | 0 | 767 | 767 | 0 |
| G22 | 1036 | 30.90 | 683 | 44.76 | 682 | 682 | 682 | 682 | 0 | 682 | 682 | 0 |
| G23 | 897  | 41.10 | 783 | 46.35 | 783 | 783 | 783 | 783 | 0 | 783 | 783 | 0 |
| G24 | 1076 | 29.22 | 666 | 43.83 | 666 | 666 | 666 | 666 | 0 | 666 | 666 | 0 |
| G25 | 1013 | 33.56 | 708 | 46.56 | 708 | 708 | 708 | 708 | 0 | 708 | 708 | 0 |
| G26 | 1089 | 27.65 | 813 | 35.29 | 728 | 727 | 728 | 727 | 0 | 727 | 728 | 0 |
| G27 | 923  | 41.60 | 810 | 46.70 | 679 | 678 | 679 | 678 | 0 | 678 | 679 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1077 | 29.87 | 677 | 44.38 | 676 | 676 | 676 | 676 | 0 | 676 | 676 | 0 |
| G29 | 938  | 40.86 | 828 | 45.62 | 827 | 827 | 827 | 827 | 0 | 827 | 827 | 0 |
| G30 | 904  | 40.76 | 788 | 46.03 | 659 | 659 | 659 | 659 | 0 | 659 | 659 | 0 |
| G31 | 1185 | 23.27 | 943 | 27.97 | 856 | 856 | 856 | 856 | 0 | 856 | 856 | 0 |
| G32 | 944  | 40.81 | 835 | 45.48 | 826 | 826 | 826 | 826 | 0 | 826 | 826 | 0 |
| G05 | 926  | 40.26 | 814 | 45.11 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 35

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 15

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 15

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 21079

Obs deleted (any reason) : 50

Obs complete : 21029

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 132 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 258 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 779 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1229 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

65 - 70 1477 0 0.000000  
 60 - 65 1370 0 0.000000  
 55 - 60 1327 0 0.000000  
 50 - 55 1325 0 0.000000  
 45 - 50 1617 0 0.000000  
 40 - 45 1725 0 0.000000  
 35 - 40 1600 0 0.000000  
 30 - 35 1752 3 0.000000  
 25 - 30 1643 4 0.000000  
 20 - 25 1465 3 0.000000  
 15 - 20 1601 3 0.000000  
 10 - 15 1706 17 0.000000 =  
 5 - 10 28 1 0.000000 =====  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 694    | 8     | 30.08  | 0.334483 | 5       | 3     | 5    | 4     | 7    | 7     |      |       |      |
| G03 | 584    | 0     | 50.20  | 0.133861 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G04 | 831    | 1     | 28.81  | 0.440287 | 0       | 1     | 1    | 1     | 1    | 2     |      |       |      |
| G06 | 618    | 1     | 52.82  | 0.118092 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G07 | 723    | 0     | 47.35  | 0.147780 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 782    | 0     | 46.13  | 0.156418 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G09 | 607    | 0     | 52.32  | 0.126139 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G10 | 808    | 1     | 31.48  | 0.746497 | 0       | 2     | 2    | 0     | 1    | 1     |      |       |      |
| G11 | 605    | 1     | 50.91  | 0.114686 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G12 | 774 | 0 | 47.06 | 0.160740 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 811 | 1 | 44.50 | 0.174734 | 1 | 4 | 4 | 0 | 0 | 0 |
| G14 | 542 | 0 | 34.09 | 0.575028 | 2 | 4 | 4 | 0 | 0 | 0 |
| G15 | 568 | 0 | 48.39 | 0.130287 | 0 | 0 | 0 | 0 | 1 | 1 |
| G16 | 765 | 0 | 34.35 | 0.272877 | 3 | 4 | 4 | 0 | 1 | 1 |
| G17 | 539 | 0 | 32.97 | 0.250454 | 2 | 2 | 2 | 0 | 0 | 0 |
| G18 | 632 | 0 | 39.83 | 0.233561 | 2 | 2 | 2 | 0 | 0 | 0 |
| G19 | 572 | 0 | 49.21 | 0.129277 | 0 | 0 | 0 | 0 | 1 | 1 |
| G20 | 732 | 0 | 48.80 | 0.179049 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 767 | 0 | 48.23 | 0.169673 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 682 | 0 | 44.81 | 0.160371 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 783 | 0 | 46.46 | 0.160711 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 666 | 0 | 43.87 | 0.497121 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 708 | 0 | 46.56 | 0.197704 | 1 | 1 | 1 | 0 | 0 | 0 |
| G26 | 728 | 1 | 37.47 | 0.268276 | 1 | 2 | 2 | 0 | 1 | 1 |
| G27 | 679 | 1 | 52.02 | 0.277246 | 2 | 2 | 2 | 0 | 1 | 2 |
| G28 | 676 | 0 | 44.55 | 0.158916 | 1 | 2 | 2 | 0 | 0 | 0 |
| G29 | 827 | 0 | 45.70 | 0.175567 | 1 | 2 | 2 | 0 | 0 | 0 |
| G30 | 659 | 0 | 51.15 | 0.162576 | 0 | 0 | 0 | 0 | 1 | 1 |
| G31 | 856 | 0 | 29.03 | 0.236490 | 0 | 0 | 0 | 0 | 2 | 2 |
| G32 | 826 | 0 | 45.95 | 0.169111 | 6 | 7 | 7 | 0 | 0 | 0 |

mean MP1 rms : 0.237417 m

total mean elevation : 43.24 degrees

# MP1 obs > 10 : 21029

# qc MP1 slips < 25 : 27

# Rvr L1 slips < 25 : 41

# Rvr L2 slips < 25 : 43

# qc MP1 slips > 25 : 5

# Rvr L1 slips > 25 : 21

# Rvr L2 slips > 25 : 23

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=%   | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-------|-----|------|-----|
| 85 - 90    | 132      | 0    | 0.092446 |       |     |      |     |
| 80 - 85    | 258      | 0    | 0.087767 |       |     |      |     |
| 75 - 80    | 779      | 0    | 0.087465 |       |     |      |     |
| 70 - 75    | 1229     | 0    | 0.089638 |       |     |      |     |
| 65 - 70    | 1477     | 0    | 0.090000 |       |     |      |     |
| 60 - 65    | 1370     | 0    | 0.098349 |       |     |      |     |
| 55 - 60    | 1327     | 0    | 0.091782 |       |     |      |     |
| 50 - 55    | 1325     | 0    | 0.104180 |       |     |      |     |
| 45 - 50    | 1617     | 0    | 0.113229 |       |     |      |     |
| 40 - 45    | 1725     | 0    | 0.133678 |       |     |      |     |
| 35 - 40    | 1600     | 0    | 0.145652 |       |     |      |     |
| 30 - 35    | 1752     | 3    | 0.265053 |       |     |      |     |
| 25 - 30    | 1643     | 2    | 0.375291 |       |     |      |     |
| 20 - 25    | 1465     | 3    | 0.244297 |       |     |      |     |
| 15 - 20    | 1601     | 3    | 0.335939 |       |     |      |     |
| 10 - 15    | 1706     | 21   | 0.732947 | ##### |     |      |     |
| 5 - 10     | 28       | 1    | 0.998092 | ##### |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |       |     |      |     |
| < 0        | 0        | 0    | 0.000000 |       |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 694 | 8 | 30.08 | 0.638082 | 3 | 3 | 5 | 4 | 7 | 7 |
| G03 | 584 | 0 | 50.20 | 0.137759 | 0 | 0 | 0 | 0 | 1 | 1 |
| G04 | 831 | 1 | 28.81 | 0.268533 | 0 | 1 | 1 | 1 | 1 | 2 |
| G06 | 618 | 1 | 52.82 | 0.120538 | 0 | 0 | 0 | 0 | 1 | 1 |
| G07 | 723 | 0 | 47.35 | 0.164123 | 0 | 0 | 0 | 0 | 0 | 0 |
| G08 | 782 | 0 | 46.13 | 0.151946 | 0 | 0 | 0 | 0 | 0 | 0 |
| G09 | 607 | 0 | 52.32 | 0.140213 | 0 | 0 | 0 | 0 | 1 | 1 |
| G10 | 808 | 1 | 31.48 | 0.828242 | 0 | 2 | 2 | 0 | 1 | 1 |
| G11 | 605 | 1 | 50.91 | 0.139684 | 0 | 0 | 0 | 0 | 1 | 1 |
| G12 | 774 | 0 | 47.06 | 0.227656 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 811 | 1 | 44.50 | 0.307646 | 1 | 4 | 4 | 0 | 0 | 0 |
| G14 | 542 | 0 | 34.09 | 0.248914 | 3 | 4 | 4 | 0 | 0 | 0 |
| G15 | 568 | 0 | 48.39 | 0.134787 | 0 | 0 | 0 | 0 | 1 | 1 |
| G16 | 765 | 0 | 34.35 | 0.432976 | 2 | 4 | 4 | 0 | 1 | 1 |
| G17 | 539 | 0 | 32.97 | 0.228050 | 2 | 2 | 2 | 0 | 0 | 0 |
| G18 | 632 | 0 | 39.83 | 0.348998 | 2 | 2 | 2 | 0 | 0 | 0 |
| G19 | 572 | 0 | 49.21 | 0.113575 | 0 | 0 | 0 | 0 | 1 | 1 |
| G20 | 732 | 0 | 48.80 | 0.153064 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 767 | 0 | 48.23 | 0.202591 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 682 | 0 | 44.81 | 0.181903 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 783 | 0 | 46.46 | 0.168622 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 666 | 0 | 43.87 | 0.635523 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 708 | 0 | 46.56 | 0.333465 | 1 | 1 | 1 | 0 | 0 | 0 |
| G26 | 728 | 1 | 37.47 | 0.378563 | 1 | 2 | 2 | 0 | 1 | 1 |
| G27 | 679 | 1 | 52.02 | 0.221415 | 2 | 2 | 2 | 1 | 1 | 2 |
| G28 | 676 | 0 | 44.55 | 0.275212 | 1 | 2 | 2 | 0 | 0 | 0 |
| G29 | 827 | 0 | 45.70 | 0.538221 | 1 | 2 | 2 | 0 | 0 | 0 |
| G30 | 659 | 0 | 51.15 | 0.638030 | 0 | 0 | 0 | 0 | 1 | 1 |

G31 856 0 29.03 0.591059 0 0 0 0 2 2  
 G32 826 0 45.95 0.257558 5 7 7 0 0 0

mean MP2 rms : 0.316032 m

total mean elevation : 43.24 degrees

# MP2 obs > 10 : 21029

# qc MP2 slips < 25 : 24

# Rvr L1 slips < 25 : 41

# Rvr L2 slips < 25 : 43

# qc MP2 slips > 25 : 6

# Rvr L1 slips > 25 : 21

# Rvr L2 slips > 25 : 23

| elev (deg) | tot slps | <MP2 rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 132      | 0            | 0.077535 |     |      |     |
| 80 - 85    | 258      | 0            | 0.092328 |     |      |     |
| 75 - 80    | 779      | 0            | 0.095627 |     |      |     |
| 70 - 75    | 1229     | 0            | 0.091578 |     |      |     |
| 65 - 70    | 1477     | 0            | 0.091409 |     |      |     |
| 60 - 65    | 1370     | 0            | 0.097983 |     |      |     |
| 55 - 60    | 1327     | 0            | 0.107895 |     |      |     |
| 50 - 55    | 1325     | 0            | 0.111099 |     |      |     |
| 45 - 50    | 1617     | 0            | 0.111624 |     |      |     |
| 40 - 45    | 1725     | 0            | 0.122213 |     |      |     |
| 35 - 40    | 1600     | 0            | 0.199200 |     |      |     |
| 30 - 35    | 1752     | 3            | 0.492560 |     |      |     |
| 25 - 30    | 1643     | 3            | 0.559805 |     |      |     |
| 20 - 25    | 1465     | 3            | 0.269969 |     |      |     |

```

15 - 20 1601 3 0.389672 |||||
10 - 15 1706 18 0.937028 ##|||||
5 - 10 28 1 0.858848 #####|
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 132 0.803 8.894 ###|||||
80 - 85 258 0.560 8.965 ##|||||
75 - 80 779 0.322 8.988 #|||||
70 - 75 1229 0.258 8.992 #|||||
65 - 70 1478 0.234 8.994 #|||||
60 - 65 1372 0.243 8.993 #|||||
55 - 60 1327 0.247 8.993 #|||||
50 - 55 1325 0.396 8.885 ##|||||
45 - 50 1617 0.542 8.521 ##|||||
40 - 45 1726 0.385 8.121 ##|||||
35 - 40 1601 0.222 8.004 #|||||
30 - 35 1752 0.672 7.761 ###|||||
25 - 30 1660 0.843 7.271 ###|||||
20 - 25 1473 0.508 6.910 ##|||||
15 - 20 1602 0.537 6.459 ##|||||
10 - 15 1713 0.558 5.893 ##|||||
5 - 10 35 1.145 5.429 #####|
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```



S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 132  | 0.873 | 8.697 | ###  |     |     |
| 80 - 85    | 258  | 0.698 | 8.709 | ###  |     |     |
| 75 - 80    | 779  | 0.585 | 8.534 | ##   |     |     |
| 70 - 75    | 1229 | 0.550 | 8.424 | ##   |     |     |
| 65 - 70    | 1478 | 0.497 | 8.272 | ##   |     |     |
| 60 - 65    | 1372 | 0.395 | 8.117 | ##   |     |     |
| 55 - 60    | 1327 | 0.234 | 7.987 | #    |     |     |
| 50 - 55    | 1325 | 0.442 | 7.811 | ##   |     |     |
| 45 - 50    | 1617 | 0.520 | 7.382 | ##   |     |     |
| 40 - 45    | 1726 | 0.533 | 7.104 | ##   |     |     |
| 35 - 40    | 1601 | 0.613 | 6.629 | ##   |     |     |
| 30 - 35    | 1752 | 0.941 | 5.901 | #### |     |     |
| 25 - 30    | 1653 | 0.924 | 5.203 | #### |     |     |
| 20 - 25    | 1466 | 0.730 | 4.837 | ###  |     |     |
| 15 - 20    | 1602 | 0.674 | 4.376 | ###  |     |     |
| 10 - 15    | 1712 | 0.775 | 3.853 | ###  |     |     |
| 5 - 10     | 35   | 1.117 | 3.400 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : lemn1270.09o

input RnxNAV file(s) : lemn1270.09n

\*\*\*\*\*

4-character ID : LEMN

Receiver type : LEICA GRX1200GGPRO (# = 351610) (fw = 5.00/3.013)

Antenna type : LEIAT504GG

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4434464.7882 2084894.1346 4069315.1568 (m)

antenna WGS 84 (geo) : N 39 deg 53' 50.00" E 25 deg 10' 51.19"

antenna WGS 84 (geo) : 39.897221 deg 25.180886 deg

WGS 84 height : 121.9107 m

[qc - header] position : 32.9162 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 34

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

GLONASS SVs w/o OBS : 1 2 4 5 6 7 8 9 10 12 13 14

15 16 17 18 21 22 23 24

GLONASS SVs w/o NAV : 3 11 19 20

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)  
 Possible obs > 0.0 deg: 30449  
 Possible obs > 10.0 deg: 23812  
 Complete obs > 10.0 deg: 23776  
 Deleted obs > 10.0 deg: 2  
 Masked obs < 10.0 deg: 1732  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.206785 m  
 Moving average MP2 : 0.300694 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.19 (sd=0.86 n=23778) 6.17 (sd=1.31 n=23776)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 2) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 1  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 1  
 \* or unknown elevation

| first epoch | last epoch   | hrs   | dt    | #expt | #have | %     | mp1 | mp2  | o/slps     |
|-------------|--------------|-------|-------|-------|-------|-------|-----|------|------------|
| SUM 09 5 7  | 00:00 09 5 7 | 23:59 | 24.00 | 30    | 23812 | 23776 | 100 | 0.21 | 0.30 23776 |

Processing parameters are:

Receiver tracking capability : 26 SVs

Maximum ionospheric rate (L1) : 400.00 cm/min

Report data gap greater than : 10.00 min

Expected rms of MP1 multipath : 50.00 cm

Expected rms of MP2 multipath : 65.00 cm

Multipath slip sigma threshold : 4.00 cm

% increase in MP rms for C/A | A/S : 100.00 %

Points in MP moving averages : 50

Minimum signal to noise for L1 : 0

Minimum signal to noise for L2 : 0

Elevation mask (cutoff) : 10.00 degrees

Elevation comparison threshold : 25.00 degrees

Orbit path spline fit sample time : 10 min

SVs w/ code data for position try : 5

Width of ASCII summary plot : 72

Data indicators on summary plot : yes

Do ionospheric observable : yes

Do ionospheric derivative : yes

Do high-pass ionosphere observable : no

Do multipath observables : yes

Do 1-ms receiver clock slips : yes

Tolerance for 1-ms clock slips : 1.00e-02 ms

Do receiver LLI slips : yes

Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1173 | 22.73 | 923 | 27.54 | 921 | 921 | 921 | 921 | 0 | 921 | 921 | 0 |
| G03 | 1020 | 30.75 | 673 | 44.52 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G04 | 1174 | 22.59 | 924 | 27.35 | 923 | 923 | 923 | 923 | 0 | 923 | 923 | 0 |
| G06 | 928  | 37.06 | 722 | 46.78 | 721 | 721 | 721 | 721 | 0 | 721 | 721 | 0 |
| G07 | 853  | 41.63 | 736 | 47.47 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G08 | 903  | 40.74 | 790 | 45.85 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G09 | 891  | 38.21 | 708 | 47.24 | 707 | 707 | 707 | 707 | 0 | 707 | 707 | 0 |
| G10 | 1159 | 24.00 | 908 | 29.26 | 906 | 906 | 906 | 906 | 0 | 906 | 906 | 0 |
| G11 | 933  | 34.54 | 698 | 45.18 | 697 | 697 | 697 | 697 | 0 | 697 | 697 | 0 |
| G12 | 940  | 40.25 | 831 | 44.87 | 831 | 831 | 831 | 831 | 0 | 831 | 831 | 0 |
| G13 | 925  | 39.57 | 815 | 44.24 | 815 | 815 | 815 | 815 | 0 | 815 | 815 | 0 |
| G14 | 1156 | 24.44 | 914 | 29.59 | 912 | 912 | 912 | 912 | 0 | 912 | 912 | 0 |
| G15 | 1083 | 28.24 | 722 | 39.59 | 714 | 714 | 714 | 714 | 0 | 714 | 714 | 0 |
| G16 | 1145 | 25.22 | 885 | 31.15 | 883 | 883 | 883 | 883 | 0 | 883 | 883 | 0 |
| G17 | 1162 | 23.67 | 913 | 28.77 | 910 | 910 | 910 | 910 | 0 | 910 | 910 | 0 |
| G18 | 1116 | 26.85 | 792 | 35.65 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G19 | 1077 | 28.88 | 658 | 43.52 | 657 | 657 | 657 | 657 | 0 | 657 | 657 | 0 |
| G20 | 921  | 40.83 | 810 | 45.75 | 810 | 808 | 810 | 808 | 0 | 808 | 810 | 0 |
| G21 | 893  | 42.63 | 779 | 48.14 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G22 | 1012 | 32.46 | 696 | 45.62 | 696 | 696 | 696 | 696 | 0 | 696 | 696 | 0 |
| G23 | 904  | 40.97 | 791 | 46.11 | 791 | 791 | 791 | 791 | 0 | 791 | 791 | 0 |
| G24 | 1059 | 30.43 | 680 | 44.79 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |

|      |      |       |     |       |     |     |     |     |   |     |     |   |
|------|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G25  | 986  | 35.28 | 722 | 47.07 | 722 | 722 | 722 | 722 | 0 | 722 | 722 | 0 |
| G26  | 1102 | 26.87 | 841 | 33.64 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G27  | 910  | 41.85 | 797 | 47.07 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G28  | 1060 | 31.11 | 691 | 45.29 | 691 | 691 | 691 | 691 | 0 | 691 | 691 | 0 |
| G29  | 940  | 40.89 | 831 | 45.59 | 831 | 831 | 831 | 831 | 0 | 831 | 831 | 0 |
| G30  | 892  | 41.09 | 776 | 46.49 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G31  | 1187 | 23.14 | 948 | 27.72 | 946 | 946 | 946 | 946 | 0 | 946 | 946 | 0 |
| G32  | 945  | 40.85 | 838 | 45.44 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| R03* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| R11* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| R19* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| R20* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G01  | 1143 | 25.59 | 893 | 31.35 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G05  | 918  | 40.53 | 805 | 45.51 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

\* = SV with no NAV info

Obs below mask ( 10.00 deg) : 153

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 2

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 2

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23931

Obs deleted (any reason) : 155

Obs complete : 23776

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 139       | 0            | 0.000000 |     |      |     |
| 80 - 85    | 317       | 0            | 0.000000 |     |      |     |
| 75 - 80    | 731       | 0            | 0.000000 |     |      |     |
| 70 - 75    | 1214      | 0            | 0.000000 |     |      |     |
| 65 - 70    | 1469      | 0            | 0.000000 |     |      |     |
| 60 - 65    | 1290      | 0            | 0.000000 |     |      |     |
| 55 - 60    | 1299      | 0            | 0.000000 |     |      |     |
| 50 - 55    | 1517      | 0            | 0.000000 |     |      |     |
| 45 - 50    | 1496      | 0            | 0.000000 |     |      |     |
| 40 - 45    | 1735      | 0            | 0.000000 |     |      |     |
| 35 - 40    | 1597      | 0            | 0.000000 |     |      |     |
| 30 - 35    | 1780      | 0            | 0.000000 |     |      |     |
| 25 - 30    | 2073      | 0            | 0.000000 |     |      |     |
| 20 - 25    | 2265      | 0            | 0.000000 |     |      |     |
| 15 - 20    | 2391      | 0            | 0.000000 |     |      |     |
| 10 - 15    | 2436      | 1            | 0.000000 |     |      |     |
| 5 - 10     | 30        | 0            | 0.000000 |     |      |     |
| 0 - 5      | 0         | 0            | 0.000000 |     |      |     |
| < 0        | 0         | 0            | 0.000000 |     |      |     |

MP1 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP1 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 921 | 0 | 27.67 | 0.433897 | 0 | 2 | 2 | 0 | 0 | 0 |
| G03 | 672 | 0 | 44.69 | 0.151203 | 0 | 1 | 1 | 0 | 0 | 0 |
| G04 | 923 | 0 | 27.45 | 0.178517 | 0 | 1 | 1 | 0 | 0 | 0 |
| G06 | 721 | 0 | 46.94 | 0.150435 | 0 | 1 | 1 | 0 | 0 | 0 |
| G07 | 736 | 0 | 47.58 | 0.127532 | 0 | 1 | 1 | 0 | 0 | 0 |
| G08 | 790 | 0 | 45.85 | 0.147651 | 0 | 0 | 0 | 0 | 0 | 0 |
| G09 | 707 | 0 | 47.41 | 0.164071 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 906 | 0 | 29.38 | 0.272018 | 0 | 2 | 2 | 0 | 0 | 0 |
| G11 | 697 | 0 | 45.35 | 0.151446 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 831 | 0 | 44.97 | 0.219125 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 815 | 0 | 44.33 | 0.145582 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 912 | 0 | 29.72 | 0.264594 | 0 | 2 | 2 | 0 | 0 | 0 |
| G15 | 714 | 0 | 40.03 | 0.168101 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 883 | 0 | 31.28 | 0.159811 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 910 | 0 | 28.92 | 0.290232 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 789 | 0 | 35.75 | 0.206839 | 0 | 2 | 2 | 0 | 0 | 0 |
| G19 | 657 | 0 | 43.69 | 0.149885 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 810 | 2 | 45.93 | 0.167036 | 1 | 1 | 2 | 0 | 0 | 0 |
| G21 | 779 | 0 | 48.17 | 0.178033 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 696 | 0 | 45.73 | 0.141618 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 791 | 0 | 46.21 | 0.141475 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 680 | 0 | 44.82 | 0.396160 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 722 | 0 | 47.07 | 0.128405 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 838 | 0 | 33.82 | 0.428682 | 0 | 2 | 2 | 0 | 0 | 0 |
| G27 | 797 | 0 | 47.17 | 0.155333 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 691 | 0 | 45.41 | 0.156060 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 831 | 0 | 45.62 | 0.148590 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 775 | 0 | 46.60 | 0.349727 | 0 | 1 | 1 | 0 | 0 | 0 |



|      |     |    |       |          |   |   |   |   |   |   |
|------|-----|----|-------|----------|---|---|---|---|---|---|
| G31  | 946 | 0  | 27.82 | 0.198234 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32  | 838 | 0  | 45.53 | 0.137796 | 0 | 1 | 1 | 0 | 0 | 0 |
| R03* | 30  | 5  | 0.00  | 0.000000 | 0 | 0 | 1 | 0 | 0 | 0 |
| R11* | 30  | 11 | 0.00  | 0.000000 | 0 | 0 | 2 | 0 | 0 | 0 |
| R19* | 30  | 6  | 0.00  | 0.000000 | 0 | 0 | 2 | 0 | 0 | 0 |
| R20* | 30  | 9  | 0.00  | 0.000000 | 0 | 0 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP1 rms : 0.206016 m

total mean elevation : 40.42 degrees

# MP1 obs > 10 : 23865

# qc MP1 slips < 25 : 1

# Rvr L1 slips < 25 : 34

# Rvr L2 slips < 25 : 41

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m

85 - 90 139 0 0.069160 |

80 - 85 317 0 0.074264 |

75 - 80 731 0 0.070480 |

70 - 75 1214 0 0.072460 |

65 - 70 1469 0 0.081324 ||

60 - 65 1290 0 0.086993 ||

55 - 60 1299 0 0.094396 ||

50 - 55 1517 0 0.116118 ||

45 - 50 1496 0 0.111229 ||

40 - 45 1735 0 0.129210 |||  
 35 - 40 1597 0 0.156975 |||  
 30 - 35 1780 0 0.166238 |||  
 25 - 30 2073 0 0.224124 ||||  
 20 - 25 2265 0 0.219116 ||||  
 15 - 20 2391 0 0.268864 |||||  
 10 - 15 2436 1 0.511774 |||||||||  
 5 - 10 30 0 0.502009 |||||||||  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 921    | 0     | 27.67  | 0.629944 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G03 | 672    | 0     | 44.69  | 0.211869 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G04 | 923    | 0     | 27.45  | 0.261966 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G06 | 721    | 0     | 46.94  | 0.213851 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 736    | 0     | 47.58  | 0.147795 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 790    | 0     | 45.85  | 0.194768 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G09 | 707    | 0     | 47.41  | 0.207358 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G10 | 906    | 0     | 29.38  | 0.668921 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G11 | 697    | 0     | 45.35  | 0.235944 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G12 | 831    | 0     | 44.97  | 0.359208 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G13 | 815    | 0     | 44.33  | 0.190724 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G14 | 912    | 0     | 29.72  | 0.329999 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G15 | 714    | 0     | 40.03  | 0.287384 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G16 | 883    | 0     | 31.28  | 0.549982 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |

|      |     |    |       |          |   |   |   |   |   |   |
|------|-----|----|-------|----------|---|---|---|---|---|---|
| G17  | 910 | 0  | 28.92 | 0.614380 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18  | 789 | 0  | 35.75 | 0.229791 | 0 | 2 | 2 | 0 | 0 | 0 |
| G19  | 657 | 0  | 43.69 | 0.192451 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20  | 810 | 2  | 45.93 | 0.248181 | 1 | 1 | 2 | 0 | 0 | 0 |
| G21  | 779 | 0  | 48.17 | 0.231530 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22  | 696 | 0  | 45.73 | 0.163435 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23  | 791 | 0  | 46.21 | 0.179487 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24  | 680 | 0  | 44.82 | 0.436687 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25  | 722 | 0  | 47.07 | 0.181663 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26  | 838 | 0  | 33.82 | 0.397421 | 0 | 2 | 2 | 0 | 0 | 0 |
| G27  | 797 | 0  | 47.17 | 0.205493 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28  | 691 | 0  | 45.41 | 0.174639 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29  | 831 | 0  | 45.62 | 0.179843 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30  | 775 | 0  | 46.60 | 0.380949 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31  | 946 | 0  | 27.82 | 0.266812 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32  | 838 | 0  | 45.53 | 0.189979 | 0 | 1 | 1 | 0 | 0 | 0 |
| R03* | 30  | 5  | 0.00  | 0.000000 | 0 | 0 | 1 | 0 | 0 | 0 |
| R11* | 30  | 11 | 0.00  | 0.000000 | 0 | 0 | 2 | 0 | 0 | 0 |
| R19* | 30  | 6  | 0.00  | 0.000000 | 0 | 0 | 2 | 0 | 0 | 0 |
| R20* | 30  | 9  | 0.00  | 0.000000 | 0 | 0 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP2 rms : 0.299574 m

total mean elevation : 40.42 degrees

# MP2 obs > 10 : 23865

# qc MP2 slips < 25 : 1

# Rvr L1 slips < 25 : 34

# Rvr L2 slips < 25 : 41

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP2 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 139      | 0    | 0.094240 |     |     |      |     |
| 80 - 85    | 317      | 0    | 0.093036 |     |     |      |     |
| 75 - 80    | 731      | 0    | 0.098394 |     |     |      |     |
| 70 - 75    | 1214     | 0    | 0.104132 |     |     |      |     |
| 65 - 70    | 1469     | 0    | 0.099658 |     |     |      |     |
| 60 - 65    | 1290     | 0    | 0.103622 |     |     |      |     |
| 55 - 60    | 1299     | 0    | 0.115266 |     |     |      |     |
| 50 - 55    | 1517     | 0    | 0.116909 |     |     |      |     |
| 45 - 50    | 1496     | 0    | 0.137404 |     |     |      |     |
| 40 - 45    | 1735     | 0    | 0.161442 |     |     |      |     |
| 35 - 40    | 1597     | 0    | 0.174123 |     |     |      |     |
| 30 - 35    | 1780     | 0    | 0.203850 |     |     |      |     |
| 25 - 30    | 2073     | 0    | 0.285650 |     |     |      |     |
| 20 - 25    | 2265     | 0    | 0.293389 |     |     |      |     |
| 15 - 20    | 2391     | 0    | 0.379807 |     |     |      |     |
| 10 - 15    | 2436     | 1    | 0.846449 |     |     |      |     |
| 5 - 10     | 30       | 0    | 0.724060 |     |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |     |     |      |     |
| < 0        | 0        | 0    | 0.000000 |     |     |      |     |

S/N L1 summary (per elevation bin):

| elev (deg) | tot SN1 | sig   | mean  | 0 5 | 1 0 |
|------------|---------|-------|-------|-----|-----|
| 85 - 90    | 139     | 0.763 | 8.935 | ### |     |

|         |      |       |       |       |  |
|---------|------|-------|-------|-------|--|
| 80 - 85 | 317  | 0.505 | 8.972 | ##    |  |
| 75 - 80 | 731  | 0.333 | 8.988 | #     |  |
| 70 - 75 | 1214 | 0.261 | 8.991 | #     |  |
| 65 - 70 | 1471 | 0.235 | 8.994 | #     |  |
| 60 - 65 | 1291 | 0.250 | 8.993 | #     |  |
| 55 - 60 | 1299 | 0.250 | 8.993 | #     |  |
| 50 - 55 | 1517 | 0.261 | 8.979 | #     |  |
| 45 - 50 | 1496 | 0.362 | 8.909 | #     |  |
| 40 - 45 | 1736 | 0.521 | 8.641 | ##    |  |
| 35 - 40 | 1598 | 0.368 | 8.101 | #     |  |
| 30 - 35 | 1780 | 0.232 | 8.013 | #     |  |
| 25 - 30 | 2073 | 0.292 | 7.939 | #     |  |
| 20 - 25 | 2266 | 0.518 | 7.599 | ##    |  |
| 15 - 20 | 2392 | 0.451 | 7.115 | ##    |  |
| 10 - 15 | 2458 | 0.525 | 6.742 | ##    |  |
| 5 - 10  | 33   | 1.197 | 6.061 | ##### |  |
| 0 - 5   | 0    | 0.000 | 0.000 |       |  |
| < 0     | 0    | 0.000 | 0.000 |       |  |

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 139  | 0.690 | 7.957 | ###  |     |     |
| 80 - 85    | 317  | 0.449 | 7.975 | ##   |     |     |
| 75 - 80    | 731  | 0.311 | 7.979 | #    |     |     |
| 70 - 75    | 1214 | 0.378 | 7.895 | ##   |     |     |
| 65 - 70    | 1471 | 0.506 | 7.680 | ##   |     |     |
| 60 - 65    | 1291 | 0.541 | 7.473 | ##   |     |     |
| 55 - 60    | 1299 | 0.506 | 7.308 | ##   |     |     |

|         |      |       |       |     |  |
|---------|------|-------|-------|-----|--|
| 50 - 55 | 1517 | 0.382 | 7.105 | ##  |  |
| 45 - 50 | 1496 | 0.489 | 6.834 | ##  |  |
| 40 - 45 | 1736 | 0.518 | 6.415 | ##  |  |
| 35 - 40 | 1598 | 0.527 | 6.218 | ##  |  |
| 30 - 35 | 1780 | 0.614 | 5.880 | ##  |  |
| 25 - 30 | 2073 | 0.583 | 5.409 | ##  |  |
| 20 - 25 | 2266 | 0.643 | 5.111 | ### |  |
| 15 - 20 | 2392 | 0.630 | 4.660 | ### |  |
| 10 - 15 | 2456 | 0.585 | 4.347 | ##  |  |
| 5 - 10  | 33   | 0.917 | 4.182 | ### |  |
| 0 - 5   | 0    | 0.000 | 0.000 |     |  |
| < 0     | 0    | 0.000 | 0.000 |     |  |

\*\*\*\*\*

QC of RINEX file(s) : noa11270.09o

input RnxNAV file(s) : noa11270.09n

\*\*\*\*\*

4-character ID : NOA1 (# = 12620M001)

Receiver type : LEICA GRX1200PRO (# = 462590) (fw = 3.00/2.121)

Antenna type : LEIAT504 LEIS (# = 103326)

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4599648.2437 2034858.4659 3909908.0344 (m)

antenna WGS 84 (geo) : N 38 deg 02' 49.51" E 23 deg 51' 51.58"

antenna WGS 84 (geo) : 38.047085 deg 23.864328 deg

WGS 84 height : 563.0152 m

[qc - header] position : 38.1410 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30256

Possible obs > 10.0 deg: 23853

Complete obs > 10.0 deg: 23833  
 Deleted obs > 10.0 deg: 2  
 Masked obs < 10.0 deg: 1728  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.244256 m  
 Moving average MP2 : 0.303417 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.97 (sd=1.08 n=23835) 6.60 (sd=1.67 n=23833)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 217) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 70  
 IOD slips > 10.0 deg : 27  
 IOD or MP slips < 10.0\*: 88  
 IOD or MP slips > 10.0 : 33  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 09 5 7 00:00 09 5 7 23:59 24.00 30 23853 23833 100 0.24 0.30 722

Processing parameters are:



Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1180 | 22.39 | 927 | 27.16 | 927 | 927 | 927 | 927 | 0 | 927 | 927 | 0 |
| G03 | 989  | 32.17 | 684 | 45.05 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G04 | 1178 | 22.46 | 923 | 27.29 | 923 | 923 | 923 | 923 | 0 | 923 | 923 | 0 |
| G06 | 861  | 40.80 | 733 | 47.10 | 733 | 733 | 733 | 733 | 0 | 733 | 733 | 0 |
| G07 | 855  | 41.44 | 736 | 47.33 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G08 | 912  | 40.27 | 797 | 45.36 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G09 | 840  | 40.92 | 720 | 46.92 | 720 | 720 | 720 | 720 | 0 | 720 | 720 | 0 |
| G10 | 1158 | 24.01 | 898 | 29.51 | 896 | 896 | 896 | 896 | 0 | 896 | 896 | 0 |
| G11 | 830  | 39.81 | 710 | 45.71 | 710 | 710 | 710 | 710 | 0 | 710 | 710 | 0 |
| G12 | 956  | 39.56 | 846 | 44.05 | 846 | 846 | 846 | 846 | 0 | 846 | 846 | 0 |
| G13 | 938  | 38.92 | 826 | 43.53 | 826 | 826 | 826 | 826 | 0 | 826 | 826 | 0 |
| G14 | 1161 | 24.01 | 914 | 29.15 | 908 | 908 | 908 | 908 | 0 | 908 | 908 | 0 |
| G15 | 1066 | 28.91 | 657 | 43.52 | 657 | 657 | 657 | 657 | 0 | 657 | 657 | 0 |
| G16 | 1140 | 25.36 | 866 | 31.77 | 866 | 866 | 866 | 866 | 0 | 866 | 866 | 0 |
| G17 | 1170 | 23.24 | 915 | 28.33 | 915 | 915 | 915 | 915 | 0 | 915 | 915 | 0 |
| G18 | 1119 | 26.46 | 791 | 35.24 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G19 | 1056 | 29.70 | 667 | 44.11 | 665 | 665 | 665 | 665 | 0 | 665 | 665 | 0 |
| G20 | 936  | 40.20 | 824 | 44.99 | 824 | 824 | 824 | 824 | 0 | 824 | 824 | 0 |
| G21 | 899  | 42.36 | 782 | 47.95 | 781 | 781 | 781 | 781 | 0 | 781 | 781 | 0 |
| G22 | 1001 | 32.52 | 695 | 45.39 | 695 | 695 | 695 | 695 | 0 | 695 | 695 | 0 |
| G23 | 913  | 40.51 | 798 | 45.63 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G24 | 1054 | 30.22 | 677 | 44.53 | 675 | 674 | 675 | 674 | 0 | 674 | 675 | 0 |
| G25 | 961  | 35.90 | 721 | 46.87 | 721 | 721 | 721 | 721 | 0 | 721 | 721 | 0 |
| G26 | 1094 | 27.14 | 818 | 34.57 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |
| G27 | 927  | 41.26 | 812 | 46.39 | 812 | 812 | 812 | 812 | 0 | 812 | 812 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1054 | 30.92 | 689 | 45.00 | 687 | 686 | 687 | 686 | 0 | 686 | 687 | 0 |
| G29 | 953  | 40.25 | 842 | 44.89 | 842 | 842 | 842 | 842 | 0 | 842 | 842 | 0 |
| G30 | 908  | 40.52 | 790 | 45.83 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G31 | 1190 | 22.93 | 946 | 27.57 | 945 | 945 | 945 | 945 | 0 | 945 | 945 | 0 |
| G32 | 957  | 40.27 | 849 | 44.75 | 849 | 849 | 849 | 849 | 0 | 849 | 849 | 0 |
| G01 | 1145 | 25.17 | 893 | 30.86 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G05 | 935  | 39.84 | 821 | 44.68 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 2625

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 2

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 2

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 26460

Obs deleted (any reason) : 2627

Obs complete : 23833

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 146      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 233      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 756      | 0            | 0.000000 |     |      |     |

```

70 - 75 1055 0 0.000000
65 - 70 1562 0 0.000000
60 - 65 1411 0 0.000000
55 - 60 1302 0 0.000000
50 - 55 1480 0 0.000000
45 - 50 1531 0 0.000000
40 - 45 1798 0 0.000000
35 - 40 1624 0 0.000000
30 - 35 1711 0 0.000000
25 - 30 2169 0 0.000000
20 - 25 2231 0 0.000000
15 - 20 2331 3 0.000000
10 - 15 2484 24 0.000000 =
5 - 10 2564 67 0.000000 =====
0 - 5 31 3 0.000000 =====
< 0 0 0 0.000000

```

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 927    | 0     | 27.16  | 0.240461 | 2       | 4     | 4    | 0     | 0    | 0     |      |       |      |
| G03 | 684    | 0     | 45.05  | 0.159106 | 1       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G04 | 923    | 0     | 27.29  | 0.236830 | 1       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G06 | 733    | 0     | 47.10  | 0.200916 | 2       | 3     | 3    | 0     | 0    | 0     |      |       |      |
| G07 | 736    | 0     | 47.33  | 0.153666 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 797    | 0     | 45.36  | 0.199809 | 1       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 720    | 0     | 46.92  | 0.148636 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G10 | 896    | 0     | 29.63  | 0.293766 | 1       | 1     | 1    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |    |    |   |   |   |
|-----|-----|---|-------|----------|---|----|----|---|---|---|
| G11 | 710 | 0 | 45.71 | 0.162071 | 0 | 0  | 0  | 0 | 0 | 0 |
| G12 | 846 | 0 | 44.14 | 0.155810 | 0 | 0  | 0  | 0 | 0 | 0 |
| G13 | 826 | 0 | 43.53 | 0.154116 | 0 | 0  | 0  | 0 | 0 | 0 |
| G14 | 908 | 0 | 29.27 | 0.735797 | 5 | 10 | 10 | 0 | 0 | 0 |
| G15 | 657 | 0 | 43.52 | 0.434708 | 0 | 1  | 1  | 0 | 0 | 0 |
| G16 | 866 | 0 | 31.86 | 0.252635 | 3 | 3  | 3  | 0 | 0 | 0 |
| G17 | 915 | 0 | 28.33 | 0.243892 | 2 | 2  | 2  | 0 | 0 | 0 |
| G18 | 790 | 0 | 35.37 | 0.389688 | 3 | 5  | 5  | 0 | 0 | 0 |
| G19 | 665 | 0 | 44.21 | 0.266406 | 1 | 2  | 2  | 0 | 0 | 0 |
| G20 | 824 | 0 | 44.99 | 0.153741 | 0 | 0  | 0  | 0 | 0 | 0 |
| G21 | 781 | 0 | 48.03 | 0.200220 | 1 | 1  | 1  | 0 | 0 | 0 |
| G22 | 695 | 0 | 45.39 | 0.211439 | 0 | 0  | 0  | 0 | 0 | 0 |
| G23 | 798 | 0 | 45.63 | 0.165946 | 0 | 0  | 0  | 0 | 0 | 0 |
| G24 | 675 | 1 | 44.73 | 0.218256 | 0 | 1  | 0  | 0 | 0 | 0 |
| G25 | 721 | 0 | 46.87 | 0.193809 | 0 | 0  | 0  | 0 | 0 | 0 |
| G26 | 817 | 0 | 34.60 | 0.265225 | 3 | 3  | 3  | 0 | 0 | 0 |
| G27 | 812 | 0 | 46.39 | 0.157986 | 0 | 0  | 0  | 0 | 0 | 0 |
| G28 | 687 | 1 | 45.16 | 0.377454 | 2 | 1  | 2  | 0 | 0 | 0 |
| G29 | 842 | 0 | 44.93 | 0.319164 | 0 | 0  | 0  | 0 | 0 | 0 |
| G30 | 790 | 0 | 45.89 | 0.187233 | 0 | 1  | 1  | 0 | 0 | 0 |
| G31 | 945 | 0 | 27.64 | 0.235436 | 1 | 1  | 1  | 0 | 0 | 0 |
| G32 | 849 | 0 | 44.75 | 0.157896 | 1 | 1  | 1  | 0 | 0 | 0 |

mean MP1 rms : 0.244258 m

total mean elevation : 40.30 degrees

# MP1 obs > 10 : 23833

# qc MP1 slips < 25 : 30

# Rvr L1 slips < 25 : 43

# Rvr L2 slips < 25 : 43

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=%   | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-------|-----|------|-----|
| 85 - 90    | 146       | 0    | 0.108360 |       |     |      |     |
| 80 - 85    | 233       | 0    | 0.090927 |       |     |      |     |
| 75 - 80    | 756       | 0    | 0.101370 |       |     |      |     |
| 70 - 75    | 1055      | 0    | 0.109881 |       |     |      |     |
| 65 - 70    | 1562      | 0    | 0.115943 |       |     |      |     |
| 60 - 65    | 1411      | 0    | 0.113401 |       |     |      |     |
| 55 - 60    | 1302      | 0    | 0.114845 |       |     |      |     |
| 50 - 55    | 1480      | 0    | 0.129564 |       |     |      |     |
| 45 - 50    | 1531      | 0    | 0.132706 |       |     |      |     |
| 40 - 45    | 1798      | 0    | 0.134255 |       |     |      |     |
| 35 - 40    | 1624      | 0    | 0.131172 |       |     |      |     |
| 30 - 35    | 1711      | 0    | 0.169422 |       |     |      |     |
| 25 - 30    | 2169      | 0    | 0.206820 |       |     |      |     |
| 20 - 25    | 2231      | 0    | 0.296970 |       |     |      |     |
| 15 - 20    | 2331      | 3    | 0.337173 |       |     |      |     |
| 10 - 15    | 2484      | 27   | 0.637402 | ##### |     |      |     |
| 5 - 10     | 2564      | 77   | 0.860705 | ##### |     |      |     |
| 0 - 5      | 31        | 3    | 0.878423 | ##### |     |      |     |
| < 0        | 0         | 0    | 0.000000 |       |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 927    | 0     | 27.16  | 0.296573 | 2       | 4    | 4    | 0    | 0    | 0    |      |
| G03 | 684    | 0     | 45.05  | 0.230192 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G04 | 923    | 0     | 27.29  | 0.254562 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G06 | 733    | 0     | 47.10  | 0.245431 | 2       | 3    | 3    | 0    | 0    | 0    |      |
| G07 | 736    | 0     | 47.33  | 0.174068 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G08 | 797    | 0     | 45.36  | 0.195928 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 720    | 0     | 46.92  | 0.162210 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G10 | 896    | 0     | 29.63  | 0.269459 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G11 | 710    | 0     | 45.71  | 0.163980 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G12 | 846    | 0     | 44.14  | 0.188088 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G13 | 826    | 0     | 43.53  | 0.189963 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G14 | 908    | 0     | 29.27  | 0.892017 | 5       | 10   | 10   | 0    | 0    | 0    |      |
| G15 | 657    | 0     | 43.52  | 0.744059 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G16 | 866    | 0     | 31.86  | 0.581262 | 3       | 3    | 3    | 0    | 0    | 0    |      |
| G17 | 915    | 0     | 28.33  | 0.238035 | 2       | 2    | 2    | 0    | 0    | 0    |      |
| G18 | 790    | 0     | 35.37  | 0.833869 | 2       | 5    | 5    | 0    | 0    | 0    |      |
| G19 | 665    | 0     | 44.21  | 0.373904 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G20 | 824    | 0     | 44.99  | 0.181366 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G21 | 781    | 0     | 48.03  | 0.174722 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G22 | 695    | 0     | 45.39  | 0.211212 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G23 | 798    | 0     | 45.63  | 0.202880 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G24 | 675    | 1     | 44.73  | 0.182774 | 0       | 1    | 0    | 0    | 0    | 0    |      |
| G25 | 721    | 0     | 46.87  | 0.234834 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G26 | 817    | 0     | 34.60  | 0.249634 | 3       | 3    | 3    | 0    | 0    | 0    |      |
| G27 | 812    | 0     | 46.39  | 0.192030 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G28 | 687    | 1     | 45.16  | 0.574700 | 2       | 1    | 2    | 0    | 0    | 0    |      |
| G29 | 842    | 0     | 44.93  | 0.225317 | 0       | 0    | 0    | 0    | 0    | 0    |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G30 | 790 | 0 | 45.89 | 0.202063 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 945 | 0 | 27.64 | 0.257454 | 1 | 1 | 1 | 0 | 0 | 0 |
| G32 | 849 | 0 | 44.75 | 0.174431 | 1 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.303425 m

total mean elevation : 40.30 degrees

# MP2 obs > 10 : 23833

# qc MP2 slips < 25 : 29

# Rvr L1 slips < 25 : 43

# Rvr L2 slips < 25 : 43

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 146 | 0 | 0.127211 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 233 | 0 | 0.114923 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 756 | 0 | 0.111967 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1055 | 0 | 0.114327 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1562 | 0 | 0.114131 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1411 | 0 | 0.117560 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1302 | 0 | 0.123183 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1480 | 0 | 0.129748 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1531 | 0 | 0.133158 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1798 | 0 | 0.148203 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1624 | 0 | 0.147323 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1711 | 0 | 0.192481 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 25 - 30 | 2169 | 0 | 0.218516 |  |  |  |
|---------|------|---|----------|--|--|--|



```

20 - 25 2231 0 0.432287 |||||
15 - 20 2331 3 0.425631 |||||
10 - 15 2484 26 0.893852 ##|||
5 - 10 2564 75 1.402080 #####|
0 - 5 31 3 1.101191 #####|
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 146 0.764 8.904 ###|
80 - 85 233 0.590 8.961 ##|
75 - 80 756 0.327 8.988 #|
70 - 75 1055 0.277 8.991 #|
65 - 70 1563 0.228 8.994 #|
60 - 65 1413 0.239 8.994 #|
55 - 60 1302 0.249 8.993 #|
50 - 55 1480 0.246 8.988 #|
45 - 50 1531 0.406 8.864 ##|
40 - 45 1799 0.519 8.354 ##|
35 - 40 1625 0.213 8.001 #|
30 - 35 1711 0.202 7.992 #|
25 - 30 2169 0.474 7.726 ##|
20 - 25 2232 0.407 7.068 ##|
15 - 20 2332 0.505 6.639 ##|
10 - 15 2488 0.520 6.033 ##|
5 - 10 2592 0.606 5.493 ##|
0 - 5 33 1.011 5.091 ###|
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 146  | 0.775 | 8.884 | ###  |     |     |
| 80 - 85    | 233  | 0.653 | 8.867 | ###  |     |     |
| 75 - 80    | 756  | 0.478 | 8.843 | ##   |     |     |
| 70 - 75    | 1055 | 0.509 | 8.743 | ##   |     |     |
| 65 - 70    | 1563 | 0.533 | 8.390 | ##   |     |     |
| 60 - 65    | 1413 | 0.456 | 8.195 | ##   |     |     |
| 55 - 60    | 1302 | 0.288 | 8.028 | #    |     |     |
| 50 - 55    | 1480 | 0.256 | 7.972 | #    |     |     |
| 45 - 50    | 1531 | 0.524 | 7.610 | ##   |     |     |
| 40 - 45    | 1799 | 0.492 | 7.280 | ##   |     |     |
| 35 - 40    | 1625 | 0.539 | 6.710 | ##   |     |     |
| 30 - 35    | 1711 | 0.550 | 6.271 | ##   |     |     |
| 25 - 30    | 2169 | 0.600 | 5.659 | ##   |     |     |
| 20 - 25    | 2232 | 0.622 | 5.160 | ##   |     |     |
| 15 - 20    | 2332 | 0.625 | 4.574 | ##   |     |     |
| 10 - 15    | 2486 | 0.747 | 4.035 | ###  |     |     |
| 5 - 10     | 2583 | 0.921 | 3.581 | #### |     |     |
| 0 - 5      | 33   | 1.088 | 3.061 | #### |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : nvrk1270.09o

input RnxNAV file(s) : nvrk1270.09n

\*\*\*\*\*

4-character ID : NVRK

Receiver type : LEICA GRX1200GGPRO (# = 351602) (fw = 5.62/3.014)

Antenna type : LEIAX1202GG

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4386260.7399 1940980.5911 4190915.6449 (m)

antenna WGS 84 (geo) : N 41 deg 20' 8.66" E 23 deg 52' 12.17"

antenna WGS 84 (geo) : 41.335739 deg 23.870048 deg

WGS 84 height : 642.0280 m

[qc - header] position : 33.0218 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 35

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

GLONASS SVs w/o OBS : 1 2 4 5 6 7 8 10 12 13 14 15

16 17 18 21 22 23 24

GLONASS SVs w/o NAV : 3 9 11 19 20

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)  
 Possible obs > 0.0 deg: 30594  
 Possible obs > 10.0 deg: 23703  
 Complete obs > 10.0 deg: 23611  
 Deleted obs > 10.0 deg: 5  
 Masked obs < 10.0 deg: 886  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.256059 m  
 Moving average MP2 : 0.320222 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.16 (sd=0.93 n=23616) 6.19 (sd=1.40 n=23611)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 24) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 9  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 11  
 \* or unknown elevation

|     | first epoch | last epoch | hrs   | dt    | #expt | #have | %     | mp1 | mp2  | o/slps    |
|-----|-------------|------------|-------|-------|-------|-------|-------|-----|------|-----------|
| SUM | 09 5 7      | 09 5 7     | 23:59 | 24.00 | 30    | 23703 | 23611 | 100 | 0.26 | 0.32 2146 |

Processing parameters are:

Receiver tracking capability : 26 SVs

Maximum ionospheric rate (L1) : 400.00 cm/min

Report data gap greater than : 10.00 min

Expected rms of MP1 multipath : 50.00 cm

Expected rms of MP2 multipath : 65.00 cm

Multipath slip sigma threshold : 4.00 cm

% increase in MP rms for C/A | A/S : 100.00 %

Points in MP moving averages : 50

Minimum signal to noise for L1 : 0

Minimum signal to noise for L2 : 0

Elevation mask (cutoff) : 10.00 degrees

Elevation comparison threshold : 25.00 degrees

Orbit path spline fit sample time : 10 min

SVs w/ code data for position try : 5

Width of ASCII summary plot : 72

Data indicators on summary plot : yes

Do ionospheric observable : yes

Do ionospheric derivative : yes

Do high-pass ionosphere observable : no

Do multipath observables : yes

Do 1-ms receiver clock slips : yes

Tolerance for 1-ms clock slips : 1.00e-02 ms

Do receiver LLI slips : yes

Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #rept #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1170 | 22.82 | 926 | 27.52 | 921 | 920 | 921 | 920 | 0 | 920 | 921 | 0 |
| G03 | 1022 | 30.92 | 674 | 44.77 | 673 | 673 | 673 | 673 | 0 | 673 | 673 | 0 |
| G04 | 1168 | 22.87 | 923 | 27.63 | 922 | 921 | 922 | 921 | 0 | 921 | 922 | 0 |
| G06 | 950  | 36.41 | 722 | 47.00 | 722 | 722 | 722 | 722 | 0 | 722 | 722 | 0 |
| G07 | 951  | 36.94 | 725 | 47.54 | 725 | 725 | 725 | 725 | 0 | 725 | 725 | 0 |
| G08 | 890  | 41.23 | 778 | 46.45 | 778 | 778 | 778 | 778 | 0 | 778 | 778 | 0 |
| G09 | 919  | 37.16 | 708 | 47.34 | 707 | 707 | 707 | 707 | 0 | 707 | 707 | 0 |
| G10 | 1154 | 24.34 | 904 | 29.69 | 903 | 903 | 903 | 903 | 0 | 903 | 903 | 0 |
| G11 | 940  | 34.45 | 698 | 45.39 | 698 | 698 | 698 | 698 | 0 | 698 | 698 | 0 |
| G12 | 930  | 40.69 | 820 | 45.46 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G13 | 912  | 40.14 | 803 | 44.91 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G14 | 1158 | 24.46 | 920 | 29.49 | 914 | 914 | 914 | 914 | 0 | 914 | 914 | 0 |
| G15 | 1083 | 28.55 | 726 | 39.86 | 706 | 706 | 706 | 706 | 0 | 706 | 706 | 0 |
| G16 | 1143 | 25.57 | 882 | 31.64 | 880 | 880 | 880 | 880 | 0 | 880 | 880 | 0 |
| G17 | 1163 | 23.68 | 919 | 28.64 | 913 | 913 | 913 | 913 | 0 | 913 | 913 | 0 |
| G18 | 1127 | 26.40 | 820 | 34.30 | 818 | 818 | 818 | 818 | 0 | 818 | 818 | 0 |
| G19 | 1077 | 29.18 | 660 | 43.87 | 659 | 659 | 659 | 659 | 0 | 659 | 659 | 0 |
| G20 | 912  | 41.23 | 801 | 46.25 | 801 | 799 | 801 | 799 | 0 | 799 | 801 | 0 |
| G21 | 881  | 42.72 | 767 | 48.33 | 767 | 767 | 767 | 767 | 0 | 767 | 767 | 0 |
| G22 | 1038 | 31.26 | 686 | 45.18 | 675 | 675 | 675 | 675 | 0 | 675 | 675 | 0 |
| G23 | 891  | 41.44 | 779 | 46.68 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G24 | 1077 | 29.65 | 670 | 44.34 | 663 | 663 | 663 | 663 | 0 | 663 | 663 | 0 |

|      |      |       |     |       |     |     |     |     |   |     |     |   |
|------|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G25  | 1023 | 33.65 | 712 | 46.84 | 706 | 705 | 706 | 705 | 0 | 705 | 706 | 0 |
| G26  | 1098 | 27.25 | 840 | 34.05 | 837 | 837 | 837 | 837 | 0 | 837 | 837 | 0 |
| G27  | 906  | 42.12 | 794 | 47.36 | 794 | 794 | 794 | 794 | 0 | 794 | 794 | 0 |
| G28  | 1080 | 30.27 | 681 | 44.87 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G29  | 929  | 41.33 | 820 | 46.17 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G30  | 886  | 41.37 | 772 | 46.74 | 772 | 772 | 772 | 772 | 0 | 772 | 772 | 0 |
| G31  | 1184 | 23.41 | 947 | 28.02 | 945 | 945 | 945 | 945 | 0 | 945 | 945 | 0 |
| G32  | 932  | 41.39 | 826 | 46.06 | 823 | 823 | 823 | 823 | 0 | 823 | 823 | 0 |
| R03* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| R09* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| R11* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| R19* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| R20* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G05  | 911  | 40.83 | 799 | 45.86 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

\* = SV with no NAV info

Obs below mask ( 10.00 deg) : 180

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 5

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 5

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23796

Obs deleted (any reason) : 185

Obs complete : 23611

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 118       | 0            | 0.000000 |     |      |     |
| 80 - 85    | 343       | 0            | 0.000000 |     |      |     |
| 75 - 80    | 752       | 0            | 0.000000 |     |      |     |
| 70 - 75    | 1411      | 0            | 0.000000 |     |      |     |
| 65 - 70    | 1289      | 0            | 0.000000 |     |      |     |
| 60 - 65    | 1320      | 0            | 0.000000 |     |      |     |
| 55 - 60    | 1240      | 0            | 0.000000 |     |      |     |
| 50 - 55    | 1445      | 0            | 0.000000 |     |      |     |
| 45 - 50    | 1491      | 0            | 0.000000 |     |      |     |
| 40 - 45    | 1764      | 0            | 0.000000 |     |      |     |
| 35 - 40    | 1578      | 0            | 0.000000 |     |      |     |
| 30 - 35    | 1746      | 0            | 0.000000 |     |      |     |
| 25 - 30    | 2184      | 0            | 0.000000 |     |      |     |
| 20 - 25    | 2169      | 0            | 0.000000 |     |      |     |
| 15 - 20    | 2348      | 0            | 0.000000 |     |      |     |
| 10 - 15    | 2385      | 9            | 0.000000 |     |      |     |
| 5 - 10     | 26        | 0            | 0.000000 |     |      |     |
| 0 - 5      | 0         | 0            | 0.000000 |     |      |     |
| < 0        | 0         | 0            | 0.000000 |     |      |     |

MP1 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP1 rms [m] < 25 < 25 < 25 > 25 > 25 > 25



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 921 | 1 | 27.72 | 0.284231 | 1 | 3 | 3 | 0 | 0 | 0 |
| G03 | 673 | 0 | 44.94 | 0.258223 | 0 | 1 | 1 | 0 | 0 | 0 |
| G04 | 922 | 1 | 27.75 | 0.291722 | 1 | 2 | 3 | 0 | 0 | 0 |
| G06 | 722 | 0 | 47.11 | 0.245575 | 0 | 1 | 1 | 0 | 0 | 0 |
| G07 | 725 | 0 | 47.65 | 0.191416 | 0 | 1 | 1 | 0 | 0 | 0 |
| G08 | 778 | 0 | 46.56 | 0.204302 | 1 | 2 | 2 | 0 | 0 | 0 |
| G09 | 707 | 0 | 47.51 | 0.234456 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 903 | 0 | 29.79 | 0.298265 | 0 | 2 | 2 | 0 | 0 | 0 |
| G11 | 698 | 0 | 45.50 | 0.317210 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 820 | 0 | 45.55 | 0.163335 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 803 | 0 | 45.01 | 0.178926 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 914 | 0 | 29.70 | 0.302549 | 1 | 4 | 4 | 0 | 0 | 0 |
| G15 | 706 | 0 | 40.82 | 0.255458 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 880 | 0 | 31.77 | 0.359389 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 913 | 0 | 28.85 | 0.285099 | 0 | 2 | 2 | 0 | 0 | 0 |
| G18 | 818 | 0 | 34.36 | 0.326702 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 659 | 0 | 44.05 | 0.221133 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 801 | 2 | 46.34 | 0.214225 | 1 | 0 | 1 | 0 | 0 | 0 |
| G21 | 767 | 0 | 48.37 | 0.204817 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 675 | 0 | 45.85 | 0.191074 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 779 | 0 | 46.78 | 0.170622 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 663 | 0 | 44.73 | 0.204458 | 2 | 0 | 2 | 0 | 0 | 0 |
| G25 | 706 | 1 | 47.31 | 0.245031 | 1 | 1 | 2 | 0 | 0 | 0 |
| G26 | 837 | 0 | 34.23 | 0.331359 | 2 | 2 | 4 | 0 | 0 | 0 |
| G27 | 794 | 0 | 47.46 | 0.194391 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 672 | 0 | 45.44 | 0.196962 | 1 | 0 | 2 | 0 | 0 | 0 |
| G29 | 820 | 0 | 46.20 | 0.207737 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 772 | 0 | 46.80 | 0.487673 | 0 | 1 | 1 | 0 | 0 | 0 |

|      |     |    |       |          |   |   |   |   |   |   |
|------|-----|----|-------|----------|---|---|---|---|---|---|
| G31  | 945 | 0  | 28.12 | 0.274160 | 1 | 1 | 2 | 0 | 0 | 0 |
| G32  | 823 | 0  | 46.28 | 0.264610 | 0 | 2 | 3 | 0 | 0 | 0 |
| R03* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R09* | 30  | 30 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R11* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R19* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R20* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP1 rms : 0.254760 m

total mean elevation : 40.63 degrees

# MP1 obs > 10 : 23731

# qc MP1 slips < 25 : 12

# Rvr L1 slips < 25 : 40

# Rvr L2 slips < 25 : 51

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 118 | 0 | 0.083851 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 343 | 0 | 0.072660 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 752 | 0 | 0.080446 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1411 | 0 | 0.083673 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1289 | 0 | 0.100548 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1320 | 0 | 0.097365 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1240 | 0 | 0.104756 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1445 | 0 | 0.106569 |  |  |  |
|---------|------|---|----------|--|--|--|

45 - 50 1491 0 0.128025 |||  
 40 - 45 1764 0 0.142763 |||  
 35 - 40 1578 0 0.163612 |||  
 30 - 35 1746 0 0.197947 ||||  
 25 - 30 2184 0 0.250175 |||||  
 20 - 25 2169 0 0.372397 |||||||  
 15 - 20 2348 0 0.395178 |||||||  
 10 - 15 2385 12 0.506139 #|||||||  
 5 - 10 26 0 0.452801 |||||||  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 921    | 1     | 27.72  | 0.370250 | 1       | 3     | 3    | 0     | 0    | 0     |      |       |      |
| G03 | 673    | 0     | 44.94  | 0.234229 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G04 | 922    | 1     | 27.75  | 0.460608 | 1       | 2     | 3    | 0     | 0    | 0     |      |       |      |
| G06 | 722    | 0     | 47.11  | 0.255901 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 725    | 0     | 47.65  | 0.179410 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 778    | 0     | 46.56  | 0.209593 | 1       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G09 | 707    | 0     | 47.51  | 0.247213 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G10 | 903    | 0     | 29.79  | 0.558398 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G11 | 698    | 0     | 45.50  | 0.285813 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G12 | 820    | 0     | 45.55  | 0.208194 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G13 | 803    | 0     | 45.01  | 0.209859 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G14 | 914    | 0     | 29.70  | 0.365014 | 1       | 4     | 4    | 0     | 0    | 0     |      |       |      |
| G15 | 706    | 0     | 40.82  | 0.283483 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |

|      |     |    |       |          |   |   |   |   |   |   |
|------|-----|----|-------|----------|---|---|---|---|---|---|
| G16  | 880 | 0  | 31.77 | 0.741092 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17  | 913 | 0  | 28.85 | 0.362191 | 0 | 2 | 2 | 0 | 0 | 0 |
| G18  | 818 | 0  | 34.36 | 0.392147 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19  | 659 | 0  | 44.05 | 0.259106 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20  | 801 | 2  | 46.34 | 0.189383 | 1 | 0 | 1 | 0 | 0 | 0 |
| G21  | 767 | 0  | 48.37 | 0.240324 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22  | 675 | 0  | 45.85 | 0.223054 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23  | 779 | 0  | 46.78 | 0.242028 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24  | 663 | 0  | 44.73 | 0.183167 | 2 | 0 | 2 | 0 | 0 | 0 |
| G25  | 706 | 1  | 47.31 | 0.217977 | 1 | 1 | 2 | 0 | 0 | 0 |
| G26  | 837 | 0  | 34.23 | 0.546633 | 2 | 2 | 4 | 0 | 0 | 0 |
| G27  | 794 | 0  | 47.46 | 0.242049 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28  | 672 | 0  | 45.44 | 0.177225 | 1 | 0 | 2 | 0 | 0 | 0 |
| G29  | 820 | 0  | 46.20 | 0.221815 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30  | 772 | 0  | 46.80 | 0.427130 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31  | 945 | 0  | 28.12 | 0.395363 | 1 | 1 | 2 | 0 | 0 | 0 |
| G32  | 823 | 0  | 46.28 | 0.401416 | 0 | 2 | 3 | 0 | 0 | 0 |
| R03* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R09* | 30  | 30 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R11* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R19* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R20* | 30  | 0  | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP2 rms : 0.318594 m

total mean elevation : 40.63 degrees

# MP2 obs > 10 : 23731

# qc MP2 slips < 25 : 12

```

# Rvr L1 slips < 25 : 40
# Rvr L2 slips < 25 : 51
# qc MP2 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

```

elev (deg) tot slps <MP2 rms, m> 5=% 1|m 15=% 2|m
85 - 90 118 0 0.084172 ||
80 - 85 343 0 0.082018 ||
75 - 80 752 0 0.082516 ||
70 - 75 1411 0 0.093712 ||
65 - 70 1289 0 0.112818 ||
60 - 65 1320 0 0.113347 ||
55 - 60 1240 0 0.122693 ||
50 - 55 1445 0 0.134701 |||
45 - 50 1491 0 0.150251 |||
40 - 45 1764 0 0.162154 |||
35 - 40 1578 0 0.185352 ||||
30 - 35 1746 0 0.216856 ||||
25 - 30 2184 0 0.274899 |||||
20 - 25 2169 0 0.333313 |||||
15 - 20 2348 0 0.457285 |||||
10 - 15 2385 12 0.833069 #|||||||
5 - 10 26 0 0.773682 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 118  | 0.833 | 8.915 | ###   |     |     |
| 80 - 85    | 343  | 0.486 | 8.974 | ##    |     |     |
| 75 - 80    | 752  | 0.328 | 8.988 | #     |     |     |
| 70 - 75    | 1411 | 0.240 | 8.994 | #     |     |     |
| 65 - 70    | 1290 | 0.251 | 8.993 | #     |     |     |
| 60 - 65    | 1322 | 0.248 | 8.993 | #     |     |     |
| 55 - 60    | 1240 | 0.257 | 8.992 | #     |     |     |
| 50 - 55    | 1445 | 0.266 | 8.979 | #     |     |     |
| 45 - 50    | 1491 | 0.361 | 8.910 | #     |     |     |
| 40 - 45    | 1765 | 0.518 | 8.649 | ##    |     |     |
| 35 - 40    | 1579 | 0.366 | 8.098 | #     |     |     |
| 30 - 35    | 1746 | 0.211 | 7.995 | #     |     |     |
| 25 - 30    | 2184 | 0.353 | 7.890 | #     |     |     |
| 20 - 25    | 2171 | 0.588 | 7.513 | ##    |     |     |
| 15 - 20    | 2348 | 0.607 | 7.069 | ##    |     |     |
| 10 - 15    | 2411 | 0.711 | 6.568 | ###   |     |     |
| 5 - 10     | 30   | 1.388 | 6.267 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |
| < 0        | 0    | 0.000 | 0.000 |       |     |     |

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 118  | 0.743 | 7.941 | ###  |     |     |
| 80 - 85    | 343  | 0.432 | 7.977 | ##   |     |     |
| 75 - 80    | 752  | 0.305 | 7.981 | #    |     |     |
| 70 - 75    | 1411 | 0.345 | 7.913 | #    |     |     |
| 65 - 70    | 1290 | 0.425 | 7.836 | ##   |     |     |

|         |      |       |       |     |  |
|---------|------|-------|-------|-----|--|
| 60 - 65 | 1322 | 0.532 | 7.598 | ##  |  |
| 55 - 60 | 1240 | 0.526 | 7.365 | ##  |  |
| 50 - 55 | 1445 | 0.403 | 7.136 | ##  |  |
| 45 - 50 | 1491 | 0.426 | 6.911 | ##  |  |
| 40 - 45 | 1765 | 0.527 | 6.544 | ##  |  |
| 35 - 40 | 1579 | 0.530 | 6.235 | ##  |  |
| 30 - 35 | 1746 | 0.584 | 5.842 | ##  |  |
| 25 - 30 | 2184 | 0.641 | 5.454 | ### |  |
| 20 - 25 | 2171 | 0.714 | 4.993 | ### |  |
| 15 - 20 | 2348 | 0.728 | 4.589 | ### |  |
| 10 - 15 | 2406 | 0.928 | 4.200 | ### |  |
| 5 - 10  | 28   | 0.994 | 3.893 | ### |  |
| 0 - 5   | 0    | 0.000 | 0.000 |     |  |
| < 0     | 0    | 0.000 | 0.000 |     |  |

\*\*\*\*\*

QC of RINEX file(s) : pont1270.09o

input RnxNAV file(s) : pont1270.09n

\*\*\*\*\*

4-character ID : PONT

Receiver type : LEICA GRX1200PRO (# = 465460) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4671267.1796 1754462.2055 3959398.4156 (m)

antenna WGS 84 (geo) : N 38 deg 37' 8.55" E 20 deg 35' 7.70"

antenna WGS 84 (geo) : 38.619042 deg 20.585472 deg

WGS 84 height : 57.3789 m

[qc - header] position : 27.3321 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30347

Possible obs > 10.0 deg: 23775



Complete obs > 10.0 deg: 20843  
 Deleted obs > 10.0 deg: 3  
 Masked obs < 10.0 deg: 4661  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.236885 m  
 Moving average MP2 : 0.322586 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.34 (sd=0.80 n=20846) 6.47 (sd=1.32 n=20843)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 0) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 0  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 0  
 \* or unknown elevation

|     | first epoch | last epoch   | hrs   | dt    | #expt | #have | %     | mp1 | mp2  | o/slps     |
|-----|-------------|--------------|-------|-------|-------|-------|-------|-----|------|------------|
| SUM | 09 5 7      | 00:00 09 5 7 | 23:59 | 24.00 | 30    | 23775 | 20843 | 88  | 0.24 | 0.32 20843 |

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1182 | 22.25 | 931 | 26.91 | 673 | 670 | 673 | 670 | 0 | 670 | 673 | 0 |
| G03 | 950  | 34.40 | 696 | 45.89 | 577 | 577 | 577 | 577 | 0 | 577 | 577 | 0 |
| G04 | 1170 | 22.87 | 914 | 27.89 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G06 | 874  | 41.23 | 746 | 47.48 | 616 | 616 | 616 | 616 | 0 | 616 | 616 | 0 |
| G07 | 925  | 37.40 | 720 | 47.18 | 720 | 720 | 720 | 720 | 0 | 720 | 720 | 0 |
| G08 | 898  | 40.72 | 782 | 46.03 | 782 | 782 | 782 | 782 | 0 | 782 | 782 | 0 |
| G09 | 851  | 40.79 | 732 | 46.62 | 604 | 604 | 604 | 604 | 0 | 604 | 604 | 0 |
| G10 | 1145 | 24.69 | 881 | 30.57 | 776 | 776 | 776 | 776 | 0 | 776 | 776 | 0 |
| G11 | 841  | 40.55 | 722 | 46.42 | 602 | 602 | 602 | 602 | 0 | 602 | 602 | 0 |
| G12 | 954  | 39.66 | 842 | 44.26 | 773 | 773 | 773 | 773 | 0 | 773 | 773 | 0 |
| G13 | 928  | 39.31 | 816 | 44.02 | 816 | 816 | 816 | 816 | 0 | 816 | 816 | 0 |
| G14 | 1167 | 23.72 | 925 | 28.62 | 536 | 536 | 536 | 536 | 0 | 536 | 536 | 0 |
| G15 | 1046 | 30.22 | 670 | 44.56 | 555 | 555 | 555 | 555 | 0 | 555 | 555 | 0 |
| G16 | 1127 | 26.21 | 843 | 33.32 | 726 | 726 | 726 | 726 | 0 | 726 | 726 | 0 |
| G17 | 1175 | 22.96 | 925 | 27.82 | 533 | 533 | 533 | 533 | 0 | 533 | 533 | 0 |
| G18 | 1137 | 25.48 | 840 | 32.67 | 631 | 631 | 631 | 631 | 0 | 631 | 631 | 0 |
| G19 | 1037 | 31.03 | 680 | 45.10 | 563 | 563 | 563 | 563 | 0 | 563 | 563 | 0 |
| G20 | 937  | 40.23 | 825 | 45.02 | 735 | 735 | 735 | 735 | 0 | 735 | 735 | 0 |
| G21 | 883  | 42.33 | 766 | 48.05 | 766 | 766 | 766 | 766 | 0 | 766 | 766 | 0 |
| G22 | 1040 | 30.44 | 679 | 44.39 | 678 | 678 | 678 | 678 | 0 | 678 | 678 | 0 |
| G23 | 899  | 40.92 | 783 | 46.25 | 783 | 783 | 783 | 783 | 0 | 783 | 783 | 0 |
| G24 | 1081 | 28.74 | 662 | 43.37 | 662 | 662 | 662 | 662 | 0 | 662 | 662 | 0 |
| G25 | 1012 | 33.23 | 704 | 46.28 | 704 | 704 | 704 | 704 | 0 | 704 | 704 | 0 |
| G26 | 1081 | 28.03 | 788 | 36.52 | 686 | 686 | 686 | 686 | 0 | 686 | 686 | 0 |
| G27 | 934  | 41.24 | 821 | 46.22 | 696 | 696 | 696 | 696 | 0 | 696 | 696 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1081 | 29.39 | 672 | 43.98 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G29 | 943  | 40.58 | 832 | 45.32 | 832 | 832 | 832 | 832 | 0 | 832 | 832 | 0 |
| G30 | 915  | 40.36 | 798 | 45.56 | 682 | 682 | 682 | 682 | 0 | 682 | 682 | 0 |
| G31 | 1185 | 23.25 | 940 | 28.02 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G32 | 949  | 40.53 | 840 | 45.14 | 837 | 837 | 837 | 837 | 0 | 837 | 837 | 0 |
| G01 | 1155 | 24.67 | 909 | 30.00 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G05 | 936  | 39.86 | 823 | 44.65 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 26

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 3

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 3

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 20872

Obs deleted (any reason) : 29

Obs complete : 20843

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 115      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 307      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 754      | 0            | 0.000000 |     |      |     |

|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1179 | 0 | 0.000000 |
| 65 - 70 | 1476 | 0 | 0.000000 |
| 60 - 65 | 1391 | 0 | 0.000000 |
| 55 - 60 | 1368 | 0 | 0.000000 |
| 50 - 55 | 1282 | 0 | 0.000000 |
| 45 - 50 | 1695 | 0 | 0.000000 |
| 40 - 45 | 1676 | 0 | 0.000000 |
| 35 - 40 | 1623 | 0 | 0.000000 |
| 30 - 35 | 1662 | 0 | 0.000000 |
| 25 - 30 | 1524 | 0 | 0.000000 |
| 20 - 25 | 1393 | 0 | 0.000000 |
| 15 - 20 | 1610 | 0 | 0.000000 |
| 10 - 15 | 1761 | 0 | 0.000000 |
| 5 - 10  | 23   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 673    | 3     | 29.70  | 0.222722 | 0       | 1     | 0    | 0     | 1    | 1     |      |       |      |
| G03 | 577    | 0     | 51.23  | 0.192647 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G04 | 802    | 0     | 28.99  | 0.284412 | 0       | 1     | 1    | 0     | 1    | 1     |      |       |      |
| G06 | 616    | 0     | 53.32  | 0.160434 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G07 | 720    | 0     | 47.29  | 0.178600 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 782    | 0     | 46.13  | 0.184748 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 604    | 0     | 52.34  | 0.123529 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G10 | 776    | 0     | 32.08  | 0.442603 | 0       | 1     | 1    | 0     | 1    | 1     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 602 | 0 | 51.76 | 0.174558 | 0 | 0 | 0 | 0 | 1 | 1 |
| G12 | 773 | 0 | 46.87 | 0.328623 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 816 | 0 | 44.12 | 0.167980 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 536 | 0 | 33.45 | 0.210912 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 555 | 0 | 49.71 | 0.237856 | 0 | 0 | 0 | 0 | 1 | 1 |
| G16 | 726 | 0 | 35.54 | 0.601553 | 0 | 1 | 1 | 0 | 1 | 1 |
| G17 | 533 | 0 | 32.32 | 0.212075 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 631 | 0 | 39.22 | 0.308924 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 563 | 0 | 50.36 | 0.227451 | 0 | 0 | 0 | 0 | 1 | 1 |
| G20 | 735 | 0 | 48.46 | 0.175055 | 0 | 0 | 0 | 0 | 1 | 1 |
| G21 | 766 | 0 | 48.07 | 0.180078 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 678 | 0 | 44.44 | 0.177407 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 783 | 0 | 46.35 | 0.170230 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 662 | 0 | 43.41 | 0.333723 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 704 | 0 | 46.28 | 0.186065 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 686 | 0 | 39.13 | 0.494481 | 0 | 1 | 1 | 0 | 1 | 1 |
| G27 | 696 | 0 | 51.15 | 0.141771 | 0 | 0 | 0 | 0 | 1 | 1 |
| G28 | 672 | 0 | 43.98 | 0.177198 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 832 | 0 | 45.36 | 0.151954 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 682 | 0 | 50.14 | 0.216374 | 0 | 0 | 0 | 0 | 1 | 1 |
| G31 | 828 | 0 | 29.09 | 0.257664 | 0 | 1 | 1 | 0 | 1 | 1 |
| G32 | 837 | 0 | 45.36 | 0.153777 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.236892 m

total mean elevation : 43.34 degrees

# MP1 obs > 10 : 20843

# qc MP1 slips < 25 : 0

# Rvr L1 slips < 25 : 17

# Rvr L2 slips < 25 : 16

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 15

# Rvr L2 slips > 25 : 15

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 115       | 0    | 0.110493 |     |     |      |     |
| 80 - 85    | 307       | 0    | 0.126775 |     |     |      |     |
| 75 - 80    | 754       | 0    | 0.136593 |     |     |      |     |
| 70 - 75    | 1179      | 0    | 0.130677 |     |     |      |     |
| 65 - 70    | 1476      | 0    | 0.132355 |     |     |      |     |
| 60 - 65    | 1391      | 0    | 0.134060 |     |     |      |     |
| 55 - 60    | 1368      | 0    | 0.159939 |     |     |      |     |
| 50 - 55    | 1282      | 0    | 0.165133 |     |     |      |     |
| 45 - 50    | 1695      | 0    | 0.164140 |     |     |      |     |
| 40 - 45    | 1676      | 0    | 0.165821 |     |     |      |     |
| 35 - 40    | 1623      | 0    | 0.200872 |     |     |      |     |
| 30 - 35    | 1662      | 0    | 0.253945 |     |     |      |     |
| 25 - 30    | 1524      | 0    | 0.246198 |     |     |      |     |
| 20 - 25    | 1393      | 0    | 0.282652 |     |     |      |     |
| 15 - 20    | 1610      | 0    | 0.414797 |     |     |      |     |
| 10 - 15    | 1761      | 0    | 0.545849 |     |     |      |     |
| 5 - 10     | 23        | 0    | 0.196934 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 673    | 3     | 29.70  | 0.387727 | 0       | 1    | 0    | 0    | 1    | 1    |      |
| G03 | 577    | 0     | 51.23  | 0.250155 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G04 | 802    | 0     | 28.99  | 0.423955 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G06 | 616    | 0     | 53.32  | 0.245156 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G07 | 720    | 0     | 47.29  | 0.253010 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 782    | 0     | 46.13  | 0.253317 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 604    | 0     | 52.34  | 0.227597 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G10 | 776    | 0     | 32.08  | 0.385765 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G11 | 602    | 0     | 51.76  | 0.238664 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G12 | 773    | 0     | 46.87  | 0.350766 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 816    | 0     | 44.12  | 0.239153 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G14 | 536    | 0     | 33.45  | 0.246816 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G15 | 555    | 0     | 49.71  | 0.270396 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G16 | 726    | 0     | 35.54  | 0.668372 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G17 | 533    | 0     | 32.32  | 0.264517 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G18 | 631    | 0     | 39.22  | 0.391095 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G19 | 563    | 0     | 50.36  | 0.276266 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G20 | 735    | 0     | 48.46  | 0.209445 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G21 | 766    | 0     | 48.07  | 0.295443 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G22 | 678    | 0     | 44.44  | 0.251410 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G23 | 783    | 0     | 46.35  | 0.256799 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G24 | 662    | 0     | 43.41  | 0.615411 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G25 | 704    | 0     | 46.28  | 0.248612 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G26 | 686    | 0     | 39.13  | 0.542819 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G27 | 696    | 0     | 51.15  | 0.219407 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G28 | 672    | 0     | 43.98  | 0.236641 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G29 | 832    | 0     | 45.36  | 0.200393 | 0       | 1    | 1    | 0    | 0    | 0    |      |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G30 | 682 | 0 | 50.14 | 0.429676 | 0 | 0 | 0 | 0 | 1 | 1 |
| G31 | 828 | 0 | 29.09 | 0.521808 | 0 | 1 | 1 | 0 | 1 | 1 |
| G32 | 837 | 0 | 45.36 | 0.215766 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.322594 m

total mean elevation : 43.34 degrees

# MP2 obs > 10 : 20843

# qc MP2 slips < 25 : 0

# Rvr L1 slips < 25 : 17

# Rvr L2 slips < 25 : 16

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 15

# Rvr L2 slips > 25 : 15

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 115 | 0 | 0.272615 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 307 | 0 | 0.200173 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 754 | 0 | 0.225971 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1179 | 0 | 0.218928 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1476 | 0 | 0.210029 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1391 | 0 | 0.220807 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1368 | 0 | 0.227286 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1282 | 0 | 0.216019 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1695 | 0 | 0.232547 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1676 | 0 | 0.220639 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1623 | 0 | 0.224552 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1662 | 0 | 0.305717 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 25 - 30 | 1524 | 0 | 0.333916 |  |  |  |
|---------|------|---|----------|--|--|--|

```

20 - 25 1393 0 0.317232 |||||
15 - 20 1610 0 0.415792 |||||||
10 - 15 1761 0 0.807160 |||||||||||
5 - 10 23 0 0.363320 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 115 0.839 8.922 ###|||
80 - 85 307 0.514 8.971 ##|
75 - 80 754 0.328 8.988 #|
70 - 75 1179 0.262 8.992 #|
65 - 70 1477 0.234 8.994 #|
60 - 65 1392 0.241 8.994 #|
55 - 60 1369 0.245 8.993 #|
50 - 55 1282 0.266 8.985 #|
45 - 50 1695 0.304 8.947 #|
40 - 45 1678 0.509 8.683 ##|
35 - 40 1623 0.437 8.178 ##|
30 - 35 1671 0.417 7.940 ##|
25 - 30 1526 0.347 7.955 #|
20 - 25 1396 0.521 7.752 ##|
15 - 20 1611 0.521 7.235 ##|
10 - 15 1771 0.545 6.844 ##|
5 - 10 26 1.408 6.308 #####|
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 115  | 0.832 | 8.026 | ###  |     |     |
| 80 - 85    | 307  | 0.457 | 7.974 | ##   |     |     |
| 75 - 80    | 754  | 0.307 | 7.996 | #    |     |     |
| 70 - 75    | 1179 | 0.298 | 7.963 | #    |     |     |
| 65 - 70    | 1477 | 0.342 | 7.915 | #    |     |     |
| 60 - 65    | 1392 | 0.482 | 7.741 | ##   |     |     |
| 55 - 60    | 1369 | 0.526 | 7.381 | ##   |     |     |
| 50 - 55    | 1282 | 0.451 | 7.187 | ##   |     |     |
| 45 - 50    | 1695 | 0.414 | 7.031 | ##   |     |     |
| 40 - 45    | 1678 | 0.528 | 6.665 | ##   |     |     |
| 35 - 40    | 1623 | 0.522 | 6.315 | ##   |     |     |
| 30 - 35    | 1671 | 0.757 | 5.925 | ###  |     |     |
| 25 - 30    | 1526 | 0.665 | 5.552 | ###  |     |     |
| 20 - 25    | 1393 | 0.618 | 5.171 | ##   |     |     |
| 15 - 20    | 1611 | 0.640 | 4.690 | ###  |     |     |
| 10 - 15    | 1771 | 0.668 | 4.293 | ###  |     |     |
| 5 - 10     | 26   | 1.033 | 4.115 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : prkv1270.09o

input RnxNAV file(s) : prkv1270.09n

\*\*\*\*\*

4-character ID : PRKV

Receiver type : LEICA GRX1200PRO (# = 465459) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4435579.1143 2188859.4637 4013594.6953 (m)

antenna WGS 84 (geo) : N 39 deg 14' 44.53" E 26 deg 15' 55.13"

antenna WGS 84 (geo) : 39.245702 deg 26.265313 deg

WGS 84 height : 183.5650 m

[qc - header] position : 32.3104 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30440

Possible obs > 10.0 deg: 23856

Complete obs > 10.0 deg: 23828  
 Deleted obs > 10.0 deg: 1  
 Masked obs < 10.0 deg: 1630  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.268164 m  
 Moving average MP2 : 0.304817 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.19 (sd=0.86 n=23829) 6.41 (sd=1.32 n=23828)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 1) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 0  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 0  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 09 5 7 00:00 09 5 7 23:59 24.00 30 23856 23828 100 0.27 0.30 23828

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1172 | 22.77 | 919 | 27.67 | 918 | 918 | 918 | 918 | 0 | 918 | 918 | 0 |
| G03 | 1025 | 30.36 | 670 | 44.26 | 669 | 669 | 669 | 669 | 0 | 669 | 669 | 0 |
| G04 | 1178 | 22.41 | 928 | 27.12 | 926 | 926 | 926 | 926 | 0 | 926 | 926 | 0 |
| G06 | 925  | 36.91 | 719 | 46.62 | 718 | 718 | 718 | 718 | 0 | 718 | 718 | 0 |
| G07 | 860  | 41.59 | 743 | 47.36 | 743 | 743 | 743 | 743 | 0 | 743 | 743 | 0 |
| G08 | 911  | 40.43 | 798 | 45.44 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G09 | 889  | 38.16 | 706 | 47.20 | 706 | 706 | 706 | 706 | 0 | 706 | 706 | 0 |
| G10 | 1163 | 23.77 | 911 | 28.97 | 910 | 910 | 910 | 910 | 0 | 910 | 910 | 0 |
| G11 | 940  | 34.02 | 696 | 44.93 | 696 | 696 | 696 | 696 | 0 | 696 | 696 | 0 |
| G12 | 944  | 40.06 | 835 | 44.64 | 835 | 835 | 835 | 835 | 0 | 835 | 835 | 0 |
| G13 | 931  | 39.30 | 820 | 43.94 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G14 | 1154 | 24.51 | 908 | 29.79 | 907 | 907 | 907 | 907 | 0 | 907 | 907 | 0 |
| G15 | 1086 | 27.92 | 735 | 38.64 | 729 | 729 | 729 | 729 | 0 | 729 | 729 | 0 |
| G16 | 1149 | 24.93 | 887 | 30.80 | 886 | 886 | 886 | 886 | 0 | 886 | 886 | 0 |
| G17 | 1160 | 23.75 | 908 | 28.96 | 905 | 905 | 905 | 905 | 0 | 905 | 905 | 0 |
| G18 | 1108 | 27.24 | 763 | 37.10 | 759 | 759 | 759 | 759 | 0 | 759 | 759 | 0 |
| G19 | 1079 | 28.58 | 654 | 43.22 | 654 | 653 | 654 | 653 | 0 | 653 | 654 | 0 |
| G20 | 924  | 40.67 | 811 | 45.64 | 811 | 811 | 811 | 811 | 0 | 811 | 811 | 0 |
| G21 | 901  | 42.51 | 786 | 48.00 | 786 | 786 | 786 | 786 | 0 | 786 | 786 | 0 |
| G22 | 991  | 33.48 | 702 | 45.96 | 702 | 702 | 702 | 702 | 0 | 702 | 702 | 0 |
| G23 | 912  | 40.67 | 799 | 45.72 | 799 | 799 | 799 | 799 | 0 | 799 | 799 | 0 |
| G24 | 1045 | 31.09 | 686 | 45.16 | 686 | 686 | 686 | 686 | 0 | 686 | 686 | 0 |
| G25 | 954  | 36.77 | 729 | 47.20 | 729 | 729 | 729 | 729 | 0 | 729 | 729 | 0 |
| G26 | 1105 | 26.59 | 844 | 33.25 | 842 | 842 | 842 | 842 | 0 | 842 | 842 | 0 |
| G27 | 910  | 41.74 | 796 | 47.00 | 795 | 795 | 795 | 795 | 0 | 795 | 795 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1047 | 31.75 | 697 | 45.65 | 697 | 697 | 697 | 697 | 0 | 697 | 697 | 0 |
| G29 | 946  | 40.64 | 838 | 45.24 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G30 | 893  | 40.99 | 776 | 46.44 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G31 | 1189 | 23.00 | 949 | 27.56 | 947 | 947 | 947 | 947 | 0 | 947 | 947 | 0 |
| G32 | 949  | 40.69 | 843 | 45.17 | 843 | 843 | 843 | 843 | 0 | 843 | 843 | 0 |
| G01 | 910  | 40.97 | 795 | 46.18 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G05 | 922  | 40.31 | 808 | 45.30 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 33

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 1

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 1

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23862

Obs deleted (any reason) : 34

Obs complete : 23828

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 133      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 347      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 640      | 0            | 0.000000 |     |      |     |



|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1103 | 0 | 0.000000 |
| 65 - 70 | 1561 | 0 | 0.000000 |
| 60 - 65 | 1340 | 0 | 0.000000 |
| 55 - 60 | 1311 | 0 | 0.000000 |
| 50 - 55 | 1551 | 0 | 0.000000 |
| 45 - 50 | 1521 | 0 | 0.000000 |
| 40 - 45 | 1689 | 0 | 0.000000 |
| 35 - 40 | 1657 | 0 | 0.000000 |
| 30 - 35 | 1804 | 0 | 0.000000 |
| 25 - 30 | 1899 | 0 | 0.000000 |
| 20 - 25 | 2404 | 0 | 0.000000 |
| 15 - 20 | 2411 | 0 | 0.000000 |
| 10 - 15 | 2431 | 0 | 0.000000 |
| 5 - 10  | 28   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 918    | 0     | 27.77  | 0.404094 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G03 | 669    | 0     | 44.43  | 0.175488 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G04 | 926    | 0     | 27.25  | 0.309424 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G06 | 718    | 0     | 46.78  | 0.171700 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 743    | 0     | 47.46  | 0.217717 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 798    | 0     | 45.54  | 0.268679 | 0       | 0     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 706    | 0     | 47.32  | 0.169312 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G10 | 910    | 0     | 29.06  | 0.301713 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 696 | 0 | 45.04 | 0.181255 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 835 | 0 | 44.74 | 0.214053 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 820 | 0 | 43.94 | 0.221780 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 907 | 0 | 29.82 | 0.241518 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 729 | 0 | 38.99 | 0.200442 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 886 | 0 | 30.91 | 0.311191 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 905 | 0 | 29.11 | 0.258069 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 759 | 0 | 37.35 | 0.300694 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 654 | 1 | 43.39 | 0.174952 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 811 | 0 | 45.64 | 0.189632 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 786 | 0 | 48.03 | 0.260107 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 702 | 0 | 46.08 | 0.235009 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 799 | 0 | 45.82 | 0.256522 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 686 | 0 | 45.19 | 0.395317 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 729 | 0 | 47.31 | 0.209994 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 842 | 0 | 33.40 | 0.570520 | 0 | 2 | 2 | 0 | 0 | 0 |
| G27 | 795 | 0 | 47.15 | 0.184095 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 697 | 0 | 45.65 | 0.266140 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 838 | 0 | 45.27 | 0.544066 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 775 | 0 | 46.54 | 0.183311 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 947 | 0 | 27.66 | 0.286715 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32 | 843 | 0 | 45.27 | 0.217748 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.268166 m

total mean elevation : 40.33 degrees

# MP1 obs > 10 : 23828

# qc MP1 slips < 25 : 0

# Rvr L1 slips < 25 : 29

# Rvr L2 slips < 25 : 30

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 | rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|---------|-----|-----|------|-----|
|------------|-----------|------|---------|-----|-----|------|-----|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 85 - 90 | 133  | 0 | 0.090087 |  |  |  |  |
| 80 - 85 | 347  | 0 | 0.082695 |  |  |  |  |
| 75 - 80 | 640  | 0 | 0.100477 |  |  |  |  |
| 70 - 75 | 1103 | 0 | 0.099123 |  |  |  |  |
| 65 - 70 | 1561 | 0 | 0.111188 |  |  |  |  |
| 60 - 65 | 1340 | 0 | 0.106526 |  |  |  |  |
| 55 - 60 | 1311 | 0 | 0.115622 |  |  |  |  |
| 50 - 55 | 1551 | 0 | 0.126409 |  |  |  |  |
| 45 - 50 | 1521 | 0 | 0.158394 |  |  |  |  |
| 40 - 45 | 1689 | 0 | 0.156490 |  |  |  |  |
| 35 - 40 | 1657 | 0 | 0.175575 |  |  |  |  |
| 30 - 35 | 1804 | 0 | 0.222077 |  |  |  |  |
| 25 - 30 | 1899 | 0 | 0.248611 |  |  |  |  |
| 20 - 25 | 2404 | 0 | 0.313425 |  |  |  |  |
| 15 - 20 | 2411 | 0 | 0.381556 |  |  |  |  |
| 10 - 15 | 2431 | 0 | 0.625476 |  |  |  |  |
| 5 - 10  | 28   | 0 | 1.110709 |  |  |  |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |  |  |  |
| < 0     | 0    | 0 | 0.000000 |  |  |  |  |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 918    | 0     | 27.77  | 0.456200 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G03 | 669    | 0     | 44.43  | 0.190267 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G04 | 926    | 0     | 27.25  | 0.317459 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G06 | 718    | 0     | 46.78  | 0.193116 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G07 | 743    | 0     | 47.46  | 0.209779 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 798    | 0     | 45.54  | 0.258821 | 0       | 0    | 1    | 0    | 0    | 0    |      |
| G09 | 706    | 0     | 47.32  | 0.210555 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G10 | 910    | 0     | 29.06  | 0.373016 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G11 | 696    | 0     | 45.04  | 0.217124 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G12 | 835    | 0     | 44.74  | 0.356176 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 820    | 0     | 43.94  | 0.247129 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G14 | 907    | 0     | 29.82  | 0.273789 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G15 | 729    | 0     | 38.99  | 0.245090 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G16 | 886    | 0     | 30.91  | 0.338347 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G17 | 905    | 0     | 29.11  | 0.521061 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G18 | 759    | 0     | 37.35  | 0.467435 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G19 | 654    | 1     | 43.39  | 0.192431 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G20 | 811    | 0     | 45.64  | 0.240479 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G21 | 786    | 0     | 48.03  | 0.249594 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G22 | 702    | 0     | 46.08  | 0.241066 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G23 | 799    | 0     | 45.82  | 0.197392 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G24 | 686    | 0     | 45.19  | 0.514494 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G25 | 729    | 0     | 47.31  | 0.225796 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G26 | 842    | 0     | 33.40  | 0.295140 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G27 | 795    | 0     | 47.15  | 0.202929 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G28 | 697    | 0     | 45.65  | 0.325759 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G29 | 838    | 0     | 45.27  | 0.519495 | 0       | 1    | 1    | 0    | 0    | 0    |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G30 | 775 | 0 | 46.54 | 0.238268 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 947 | 0 | 27.66 | 0.425343 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32 | 843 | 0 | 45.27 | 0.247477 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.304816 m

total mean elevation : 40.33 degrees

# MP2 obs > 10 : 23828

# qc MP2 slips < 25 : 1

# Rvr L1 slips < 25 : 29

# Rvr L2 slips < 25 : 30

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 133 | 0 | 0.097608 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 347 | 0 | 0.119480 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 640 | 0 | 0.117730 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1103 | 0 | 0.111760 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1561 | 0 | 0.116678 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1340 | 0 | 0.132522 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1311 | 0 | 0.134964 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1551 | 0 | 0.152283 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1521 | 0 | 0.169125 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1689 | 0 | 0.186920 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1657 | 0 | 0.223497 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1804 | 0 | 0.222708 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 25 - 30 | 1899 | 0 | 0.252509 |  |  |  |
|---------|------|---|----------|--|--|--|

```

20 - 25 2404 0 0.299589 |||||
15 - 20 2411 0 0.415093 |||||
10 - 15 2431 1 0.745389 |||||
5 - 10 28 0 1.044696 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 133 0.780 8.932 ###|||
80 - 85 347 0.483 8.974 ##|||
75 - 80 640 0.356 8.986 #|||
70 - 75 1103 0.271 8.992 #|||
65 - 70 1563 0.228 8.994 #|||
60 - 65 1341 0.246 8.993 #|||
55 - 60 1311 0.249 8.993 #|||
50 - 55 1551 0.229 8.994 #|||
45 - 50 1521 0.293 8.960 #|||
40 - 45 1690 0.522 8.643 ##|||
35 - 40 1657 0.372 8.106 #|||
30 - 35 1805 0.197 7.999 #|||
25 - 30 1899 0.226 7.978 #|||
20 - 25 2405 0.514 7.610 ##|||
15 - 20 2412 0.448 7.118 ##|||
10 - 15 2451 0.511 6.752 ##|||
5 - 10 33 1.251 6.424 #####|||
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 133  | 0.844 | 8.211 | ###  |     |     |
| 80 - 85    | 347  | 0.486 | 8.029 | ##   |     |     |
| 75 - 80    | 640  | 0.316 | 7.987 | #    |     |     |
| 70 - 75    | 1103 | 0.241 | 7.993 | #    |     |     |
| 65 - 70    | 1563 | 0.245 | 7.975 | #    |     |     |
| 60 - 65    | 1341 | 0.366 | 7.897 | #    |     |     |
| 55 - 60    | 1311 | 0.528 | 7.620 | ##   |     |     |
| 50 - 55    | 1551 | 0.488 | 7.282 | ##   |     |     |
| 45 - 50    | 1521 | 0.432 | 7.160 | ##   |     |     |
| 40 - 45    | 1690 | 0.476 | 6.814 | ##   |     |     |
| 35 - 40    | 1657 | 0.531 | 6.445 | ##   |     |     |
| 30 - 35    | 1805 | 0.566 | 6.177 | ##   |     |     |
| 25 - 30    | 1899 | 0.579 | 5.660 | ##   |     |     |
| 20 - 25    | 2405 | 0.620 | 5.268 | ##   |     |     |
| 15 - 20    | 2412 | 0.669 | 4.897 | ###  |     |     |
| 10 - 15    | 2450 | 0.717 | 4.518 | ###  |     |     |
| 5 - 10     | 32   | 1.120 | 4.188 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : rls01270.09o

input RnxNAV file(s) : rls01270.09n

\*\*\*\*\*

4-character ID : RLSO

Receiver type : LEICA GRX1200 (# = 452163) (fw = 1.35/2.120)

Antenna type : LEIAX1202

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4679939.3959 1840180.3381 3910415.5126 (m)

antenna WGS 84 (geo) : N 38 deg 03' 20.98" E 21 deg 27' 54.18"

antenna WGS 84 (geo) : 38.055828 deg 21.465051 deg

WGS 84 height : 146.4310 m

[qc - header] position : 32.1917 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30276

Possible obs > 10.0 deg: 23830



Complete obs > 10.0 deg: 23009  
 Deleted obs > 10.0 deg: 35  
 Masked obs < 10.0 deg: 1612  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.369641 m  
 Moving average MP2 : 0.440780 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.34 (sd=1.05 n=23044) 5.98 (sd=1.32 n=23009)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 43) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 20  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 24  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 09 5 7 00:00 09 5 7 23:59 24.00 30 23830 23009 97 0.37 0.44 959

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1185 | 22.19 | 930 | 26.92 | 928 | 928 | 928 | 928 | 0 | 928 | 928 | 0 |
| G03 | 954  | 34.05 | 694 | 45.71 | 634 | 629 | 634 | 629 | 0 | 629 | 634 | 0 |
| G04 | 1174 | 22.69 | 917 | 27.67 | 913 | 912 | 913 | 912 | 0 | 912 | 913 | 0 |
| G06 | 872  | 41.14 | 744 | 47.39 | 653 | 653 | 653 | 653 | 0 | 653 | 653 | 0 |
| G07 | 845  | 41.26 | 725 | 47.28 | 725 | 725 | 725 | 725 | 0 | 725 | 725 | 0 |
| G08 | 904  | 40.51 | 788 | 45.74 | 788 | 788 | 788 | 788 | 0 | 788 | 788 | 0 |
| G09 | 851  | 40.72 | 731 | 46.60 | 646 | 643 | 646 | 643 | 0 | 643 | 646 | 0 |
| G10 | 1149 | 24.46 | 885 | 30.26 | 862 | 862 | 862 | 862 | 0 | 862 | 862 | 0 |
| G11 | 839  | 40.43 | 719 | 46.34 | 648 | 644 | 648 | 644 | 0 | 644 | 648 | 0 |
| G12 | 957  | 39.52 | 848 | 43.95 | 848 | 848 | 848 | 848 | 0 | 848 | 848 | 0 |
| G13 | 933  | 39.09 | 821 | 43.74 | 821 | 821 | 821 | 821 | 0 | 821 | 821 | 0 |
| G14 | 1166 | 23.73 | 922 | 28.69 | 914 | 914 | 914 | 914 | 0 | 914 | 914 | 0 |
| G15 | 1049 | 29.92 | 668 | 44.29 | 618 | 618 | 618 | 618 | 0 | 618 | 618 | 0 |
| G16 | 1130 | 25.96 | 847 | 32.93 | 816 | 814 | 816 | 814 | 0 | 814 | 816 | 0 |
| G17 | 1173 | 23.00 | 923 | 27.89 | 919 | 919 | 919 | 919 | 0 | 919 | 919 | 0 |
| G18 | 1131 | 25.74 | 827 | 33.30 | 654 | 644 | 654 | 644 | 0 | 644 | 654 | 0 |
| G19 | 1039 | 30.76 | 678 | 44.85 | 629 | 629 | 629 | 629 | 0 | 629 | 629 | 0 |
| G20 | 940  | 40.08 | 828 | 44.83 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G21 | 889  | 42.36 | 771 | 48.08 | 771 | 771 | 771 | 771 | 0 | 771 | 771 | 0 |
| G22 | 1027 | 31.06 | 684 | 44.71 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G23 | 906  | 40.68 | 789 | 45.97 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G24 | 1071 | 29.18 | 667 | 43.70 | 666 | 666 | 666 | 666 | 0 | 666 | 666 | 0 |
| G25 | 995  | 34.03 | 710 | 46.44 | 708 | 708 | 708 | 708 | 0 | 708 | 708 | 0 |
| G26 | 1084 | 27.78 | 793 | 36.08 | 760 | 756 | 760 | 756 | 0 | 756 | 760 | 0 |
| G27 | 935  | 41.12 | 821 | 46.13 | 770 | 767 | 770 | 767 | 0 | 767 | 770 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1071 | 29.85 | 678 | 44.26 | 678 | 678 | 678 | 678 | 0 | 678 | 678 | 0 |
| G29 | 949  | 40.34 | 837 | 45.06 | 837 | 837 | 837 | 837 | 0 | 837 | 837 | 0 |
| G30 | 916  | 40.29 | 798 | 45.51 | 752 | 749 | 752 | 749 | 0 | 749 | 752 | 0 |
| G31 | 1188 | 23.09 | 941 | 27.85 | 939 | 939 | 939 | 939 | 0 | 939 | 939 | 0 |
| G32 | 954  | 40.33 | 846 | 44.84 | 846 | 846 | 846 | 846 | 0 | 846 | 846 | 0 |
| G05 | 939  | 39.72 | 826 | 44.47 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 33

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 35

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 35

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23077

Obs deleted (any reason) : 68

Obs complete : 23009

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 118 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 291 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 732 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1099 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |    |            |
|---------|------|----|------------|
| 65 - 70 | 1537 | 0  | 0.000000   |
| 60 - 65 | 1425 | 0  | 0.000000   |
| 55 - 60 | 1371 | 0  | 0.000000   |
| 50 - 55 | 1297 | 0  | 0.000000   |
| 45 - 50 | 1682 | 0  | 0.000000   |
| 40 - 45 | 1723 | 0  | 0.000000   |
| 35 - 40 | 1621 | 0  | 0.000000   |
| 30 - 35 | 1746 | 0  | 0.000000   |
| 25 - 30 | 2210 | 0  | 0.000000   |
| 20 - 25 | 2024 | 6  | 0.000000   |
| 15 - 20 | 2047 | 3  | 0.000000   |
| 10 - 15 | 2058 | 11 | 0.000000 = |
| 5 - 10  | 31   | 0  | 0.000000   |
| 0 - 5   | 0    | 0  | 0.000000   |
| < 0     | 0    | 0  | 0.000000   |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 928    | 0     | 27.04  | 0.486130 | 0       | 17    | 17   | 0     | 0    | 0     |      |       |      |
| G03 | 634    | 5     | 48.94  | 0.399284 | 0       | 2     | 3    | 0     | 0    | 0     |      |       |      |
| G04 | 913    | 1     | 27.85  | 0.459495 | 0       | 4     | 4    | 0     | 0    | 0     |      |       |      |
| G06 | 653    | 0     | 51.72  | 0.210700 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 725    | 0     | 47.39  | 0.293363 | 0       | 13    | 13   | 0     | 0    | 0     |      |       |      |
| G08 | 788    | 0     | 45.84  | 0.267428 | 1       | 14    | 14   | 0     | 0    | 0     |      |       |      |
| G09 | 646    | 3     | 50.79  | 0.238358 | 0       | 1     | 2    | 0     | 0    | 0     |      |       |      |
| G10 | 862    | 0     | 30.82  | 0.462380 | 2       | 4     | 5    | 0     | 0    | 0     |      |       |      |
| G11 | 648    | 4     | 49.95  | 0.244862 | 2       | 3     | 3    | 0     | 0    | 0     |      |       |      |

|     |     |    |       |          |   |    |    |   |   |   |
|-----|-----|----|-------|----------|---|----|----|---|---|---|
| G12 | 848 | 0  | 44.05 | 0.447519 | 0 | 15 | 15 | 0 | 0 | 0 |
| G13 | 821 | 0  | 43.74 | 0.280850 | 0 | 13 | 13 | 0 | 0 | 0 |
| G14 | 914 | 0  | 28.93 | 0.597989 | 2 | 8  | 26 | 0 | 0 | 0 |
| G15 | 618 | 0  | 46.83 | 0.531859 | 0 | 5  | 5  | 0 | 0 | 0 |
| G16 | 816 | 2  | 33.83 | 0.504255 | 0 | 3  | 2  | 0 | 0 | 0 |
| G17 | 919 | 0  | 28.05 | 0.431443 | 2 | 4  | 4  | 0 | 0 | 0 |
| G18 | 654 | 10 | 39.27 | 0.392019 | 2 | 7  | 4  | 0 | 0 | 0 |
| G19 | 629 | 0  | 47.35 | 0.252617 | 1 | 1  | 2  | 0 | 0 | 0 |
| G20 | 828 | 0  | 44.93 | 0.251165 | 0 | 15 | 15 | 0 | 0 | 0 |
| G21 | 771 | 0  | 48.10 | 0.275659 | 0 | 0  | 0  | 0 | 0 | 0 |
| G22 | 684 | 0  | 44.71 | 0.330962 | 0 | 0  | 0  | 0 | 0 | 0 |
| G23 | 789 | 0  | 46.08 | 0.256413 | 0 | 1  | 1  | 0 | 0 | 0 |
| G24 | 666 | 0  | 43.79 | 0.538498 | 1 | 1  | 1  | 0 | 0 | 0 |
| G25 | 708 | 0  | 46.66 | 0.339534 | 0 | 2  | 2  | 0 | 0 | 0 |
| G26 | 760 | 4  | 37.31 | 0.447133 | 4 | 28 | 26 | 0 | 0 | 0 |
| G27 | 770 | 3  | 48.48 | 0.398492 | 3 | 3  | 6  | 0 | 0 | 0 |
| G28 | 678 | 0  | 44.37 | 0.326552 | 0 | 1  | 1  | 0 | 0 | 0 |
| G29 | 837 | 0  | 45.10 | 0.376093 | 0 | 1  | 1  | 0 | 0 | 0 |
| G30 | 752 | 3  | 47.65 | 0.320713 | 1 | 4  | 2  | 0 | 0 | 0 |
| G31 | 939 | 0  | 27.94 | 0.352391 | 0 | 21 | 21 | 0 | 0 | 0 |
| G32 | 846 | 0  | 44.94 | 0.248650 | 0 | 1  | 1  | 0 | 0 | 0 |

mean MP1 rms : 0.369641 m

total mean elevation : 41.31 degrees

# MP1 obs > 10 : 23009

# qc MP1 slips < 25 : 21

# Rvr L1 slips < 25 : 193

# Rvr L2 slips < 25 : 210

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 118      | 0    | 0.140942 |     |     |      |     |
| 80 - 85    | 291      | 0    | 0.139082 |     |     |      |     |
| 75 - 80    | 732      | 0    | 0.145339 |     |     |      |     |
| 70 - 75    | 1099     | 0    | 0.166546 |     |     |      |     |
| 65 - 70    | 1537     | 0    | 0.172800 |     |     |      |     |
| 60 - 65    | 1425     | 0    | 0.176796 |     |     |      |     |
| 55 - 60    | 1371     | 0    | 0.192128 |     |     |      |     |
| 50 - 55    | 1297     | 0    | 0.204883 |     |     |      |     |
| 45 - 50    | 1682     | 0    | 0.217594 |     |     |      |     |
| 40 - 45    | 1723     | 0    | 0.239795 |     |     |      |     |
| 35 - 40    | 1621     | 0    | 0.242887 |     |     |      |     |
| 30 - 35    | 1746     | 0    | 0.289671 |     |     |      |     |
| 25 - 30    | 2210     | 0    | 0.348418 |     |     |      |     |
| 20 - 25    | 2024     | 4    | 0.563690 |     |     |      |     |
| 15 - 20    | 2047     | 3    | 0.534961 |     |     |      |     |
| 10 - 15    | 2058     | 14   | 0.774360 | #   |     |      |     |
| 5 - 10     | 31       | 0    | 1.097402 |     |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |     |     |      |     |
| < 0        | 0        | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |    |       |          |   |    |    |   |   |   |
|-----|-----|----|-------|----------|---|----|----|---|---|---|
| G02 | 928 | 0  | 27.04 | 0.423025 | 0 | 17 | 17 | 0 | 0 | 0 |
| G03 | 634 | 5  | 48.94 | 0.265222 | 1 | 2  | 3  | 0 | 0 | 0 |
| G04 | 913 | 1  | 27.85 | 0.432972 | 1 | 4  | 4  | 0 | 0 | 0 |
| G06 | 653 | 0  | 51.72 | 0.261802 | 0 | 1  | 1  | 0 | 0 | 0 |
| G07 | 725 | 0  | 47.39 | 0.342093 | 0 | 13 | 13 | 0 | 0 | 0 |
| G08 | 788 | 0  | 45.84 | 0.320508 | 1 | 14 | 14 | 0 | 0 | 0 |
| G09 | 646 | 3  | 50.79 | 0.277608 | 0 | 1  | 2  | 0 | 0 | 0 |
| G10 | 862 | 0  | 30.82 | 0.432488 | 2 | 4  | 5  | 0 | 0 | 0 |
| G11 | 648 | 4  | 49.95 | 0.288257 | 2 | 3  | 3  | 0 | 0 | 0 |
| G12 | 848 | 0  | 44.05 | 0.402987 | 0 | 15 | 15 | 0 | 0 | 0 |
| G13 | 821 | 0  | 43.74 | 0.339287 | 0 | 13 | 13 | 0 | 0 | 0 |
| G14 | 914 | 0  | 28.93 | 1.225085 | 1 | 8  | 26 | 0 | 0 | 0 |
| G15 | 618 | 0  | 46.83 | 0.806877 | 0 | 5  | 5  | 0 | 0 | 0 |
| G16 | 816 | 2  | 33.83 | 0.486354 | 0 | 3  | 2  | 0 | 0 | 0 |
| G17 | 919 | 0  | 28.05 | 0.361162 | 2 | 4  | 4  | 0 | 0 | 0 |
| G18 | 654 | 10 | 39.27 | 0.487446 | 2 | 7  | 4  | 0 | 0 | 0 |
| G19 | 629 | 0  | 47.35 | 0.362145 | 1 | 1  | 2  | 0 | 0 | 0 |
| G20 | 828 | 0  | 44.93 | 0.302298 | 0 | 15 | 15 | 0 | 0 | 0 |
| G21 | 771 | 0  | 48.10 | 0.343442 | 0 | 0  | 0  | 0 | 0 | 0 |
| G22 | 684 | 0  | 44.71 | 0.371888 | 0 | 0  | 0  | 0 | 0 | 0 |
| G23 | 789 | 0  | 46.08 | 0.332193 | 0 | 1  | 1  | 0 | 0 | 0 |
| G24 | 666 | 0  | 43.79 | 0.753532 | 1 | 1  | 1  | 0 | 0 | 0 |
| G25 | 708 | 0  | 46.66 | 0.365071 | 1 | 2  | 2  | 0 | 0 | 0 |
| G26 | 760 | 4  | 37.31 | 0.630736 | 2 | 28 | 26 | 0 | 0 | 0 |
| G27 | 770 | 3  | 48.48 | 0.691320 | 4 | 3  | 6  | 0 | 0 | 0 |
| G28 | 678 | 0  | 44.37 | 0.333126 | 0 | 1  | 1  | 0 | 0 | 0 |
| G29 | 837 | 0  | 45.10 | 0.435278 | 0 | 1  | 1  | 0 | 0 | 0 |
| G30 | 752 | 3  | 47.65 | 0.317274 | 1 | 4  | 2  | 0 | 0 | 0 |



G31 939 0 27.94 0.401189 0 21 21 0 0 0  
 G32 846 0 44.94 0.316238 0 1 1 0 0 0

mean MP2 rms : 0.440782 m

total mean elevation : 41.31 degrees

# MP2 obs > 10 : 23009

# qc MP2 slips < 25 : 22

# Rvr L1 slips < 25 : 193

# Rvr L2 slips < 25 : 210

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 118 0 0.182890 ||||  
 80 - 85 291 0 0.189607 ||||  
 75 - 80 732 0 0.215022 ||||  
 70 - 75 1099 0 0.234574 |||||  
 65 - 70 1537 0 0.221736 ||||  
 60 - 65 1425 0 0.248227 |||||  
 55 - 60 1371 0 0.230877 |||||  
 50 - 55 1297 0 0.224796 ||||  
 45 - 50 1682 0 0.224433 ||||  
 40 - 45 1723 0 0.267455 |||||  
 35 - 40 1621 0 0.306646 |||||  
 30 - 35 1746 0 0.321197 |||||  
 25 - 30 2210 0 0.401418 |||||  
 20 - 25 2024 6 0.699518 |||||

|         |      |    |          |   |
|---------|------|----|----------|---|
| 15 - 20 | 2047 | 2  | 0.619919 |   |
| 10 - 15 | 2058 | 14 | 1.078949 | # |
| 5 - 10  | 31   | 0  | 1.343978 |   |
| 0 - 5   | 0    | 0  | 0.000000 |   |
| < 0     | 0    | 0  | 0.000000 |   |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 118  | 0.896 | 8.246 | #### |     |     |
| 80 - 85    | 291  | 0.673 | 8.285 | ###  |     |     |
| 75 - 80    | 732  | 0.584 | 8.413 | ##   |     |     |
| 70 - 75    | 1099 | 0.523 | 8.294 | ##   |     |     |
| 65 - 70    | 1538 | 0.405 | 8.135 | ##   |     |     |
| 60 - 65    | 1426 | 0.351 | 8.079 | #    |     |     |
| 55 - 60    | 1372 | 0.327 | 8.058 | #    |     |     |
| 50 - 55    | 1297 | 0.259 | 8.012 | #    |     |     |
| 45 - 50    | 1682 | 0.200 | 7.997 | #    |     |     |
| 40 - 45    | 1724 | 0.224 | 7.982 | #    |     |     |
| 35 - 40    | 1622 | 0.442 | 7.799 | ##   |     |     |
| 30 - 35    | 1746 | 0.526 | 7.425 | ##   |     |     |
| 25 - 30    | 2210 | 0.697 | 6.789 | ###  |     |     |
| 20 - 25    | 2043 | 0.803 | 6.363 | ###  |     |     |
| 15 - 20    | 2059 | 0.682 | 6.020 | ###  |     |     |
| 10 - 15    | 2085 | 0.652 | 5.600 | ###  |     |     |
| 5 - 10     | 33   | 1.113 | 5.364 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 118  | 0.848 | 7.610 | ###  |     |     |
| 80 - 85    | 291  | 0.603 | 7.784 | ##   |     |     |
| 75 - 80    | 732  | 0.566 | 7.583 | ##   |     |     |
| 70 - 75    | 1099 | 0.543 | 7.581 | ##   |     |     |
| 65 - 70    | 1538 | 0.509 | 7.331 | ##   |     |     |
| 60 - 65    | 1426 | 0.463 | 7.223 | ##   |     |     |
| 55 - 60    | 1372 | 0.386 | 7.099 | ##   |     |     |
| 50 - 55    | 1297 | 0.424 | 6.888 | ##   |     |     |
| 45 - 50    | 1682 | 0.529 | 6.534 | ##   |     |     |
| 40 - 45    | 1724 | 0.506 | 6.305 | ##   |     |     |
| 35 - 40    | 1622 | 0.555 | 6.049 | ##   |     |     |
| 30 - 35    | 1746 | 0.571 | 5.710 | ##   |     |     |
| 25 - 30    | 2210 | 0.763 | 5.083 | ###  |     |     |
| 20 - 25    | 2029 | 0.874 | 4.798 | ###  |     |     |
| 15 - 20    | 2051 | 0.814 | 4.464 | ###  |     |     |
| 10 - 15    | 2072 | 0.824 | 4.116 | ###  |     |     |
| 5 - 10     | 33   | 1.031 | 4.000 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

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QC of RINEX file(s) : span1270.09o

input RnxNAV file(s) : span1270.09n

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4-character ID : SPAN

Receiver type : LEICA GRX1200PRO (# = 462661) (fw = 3.00/2.121)

Antenna type : LEIAX1202GG (# = 06500017)

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4658312.7097 1757809.0464 3973710.1366 (m)

antenna WGS 84 (geo) : N 38 deg 46' 52.66" E 20 deg 40' 26.19"

antenna WGS 84 (geo) : 38.781294 deg 20.673942 deg

WGS 84 height : 464.2232 m

[qc - header] position : 31.0891 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 29

NAVSTAR GPS SVs w/o OBS : 1 5 32

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 29397

Possible obs > 10.0 deg: 22927

Complete obs > 10.0 deg: 22712  
 Deleted obs > 10.0 deg: 2  
 Masked obs < 10.0 deg: 1943  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.319959 m  
 Moving average MP2 : 0.401689 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.85 (sd=1.01 n=22714) 6.12 (sd=1.35 n=22712)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 40) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 15  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 20  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 09 5 7 00:00 09 5 7 23:59 24.00 30 22927 22712 99 0.32 0.40 1136

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

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|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1182 | 22.26 | 931 | 26.93 | 929 | 929 | 929 | 929 | 0 | 929 | 929 | 0 |
| G03 | 956  | 34.14 | 695 | 45.86 | 686 | 685 | 686 | 685 | 0 | 685 | 686 | 0 |
| G04 | 1169 | 22.89 | 914 | 27.89 | 908 | 908 | 908 | 908 | 0 | 908 | 908 | 0 |
| G06 | 872  | 41.27 | 745 | 47.48 | 705 | 705 | 705 | 705 | 0 | 705 | 705 | 0 |
| G07 | 929  | 37.25 | 720 | 47.19 | 720 | 720 | 720 | 720 | 0 | 720 | 720 | 0 |
| G08 | 897  | 40.77 | 781 | 46.09 | 778 | 778 | 778 | 778 | 0 | 778 | 778 | 0 |
| G09 | 850  | 40.82 | 731 | 46.66 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |
| G10 | 1145 | 24.69 | 882 | 30.54 | 874 | 874 | 874 | 874 | 0 | 874 | 874 | 0 |
| G11 | 839  | 40.56 | 720 | 46.44 | 709 | 709 | 709 | 709 | 0 | 709 | 709 | 0 |
| G12 | 952  | 39.74 | 840 | 44.36 | 840 | 840 | 840 | 840 | 0 | 840 | 840 | 0 |
| G13 | 927  | 39.36 | 815 | 44.08 | 815 | 815 | 815 | 815 | 0 | 815 | 815 | 0 |
| G14 | 1168 | 23.72 | 925 | 28.65 | 921 | 921 | 921 | 921 | 0 | 921 | 921 | 0 |
| G15 | 1049 | 30.11 | 670 | 44.49 | 662 | 662 | 662 | 662 | 0 | 662 | 662 | 0 |
| G16 | 1128 | 26.19 | 844 | 33.28 | 836 | 836 | 836 | 836 | 0 | 836 | 836 | 0 |
| G17 | 1174 | 23.00 | 925 | 27.85 | 922 | 922 | 922 | 922 | 0 | 922 | 922 | 0 |
| G18 | 1137 | 25.50 | 839 | 32.73 | 788 | 788 | 788 | 788 | 0 | 788 | 788 | 0 |
| G19 | 1039 | 30.95 | 680 | 45.03 | 678 | 678 | 678 | 678 | 0 | 678 | 678 | 0 |
| G20 | 935  | 40.32 | 824 | 45.08 | 823 | 823 | 823 | 823 | 0 | 823 | 823 | 0 |
| G21 | 882  | 42.38 | 766 | 48.04 | 766 | 766 | 766 | 766 | 0 | 766 | 766 | 0 |
| G22 | 1040 | 30.46 | 678 | 44.46 | 678 | 678 | 678 | 678 | 0 | 678 | 678 | 0 |
| G23 | 898  | 40.97 | 782 | 46.31 | 781 | 781 | 781 | 781 | 0 | 781 | 781 | 0 |
| G24 | 1081 | 28.76 | 662 | 43.39 | 662 | 662 | 662 | 662 | 0 | 662 | 662 | 0 |
| G25 | 1014 | 33.19 | 705 | 46.25 | 704 | 704 | 704 | 704 | 0 | 704 | 704 | 0 |
| G26 | 1081 | 28.03 | 791 | 36.40 | 783 | 782 | 783 | 782 | 0 | 782 | 783 | 0 |
| G27 | 932  | 41.32 | 820 | 46.28 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1081 | 29.42 | 673 | 43.96 | 673 | 673 | 673 | 673 | 0 | 673 | 673 | 0 |
| G29 | 943  | 40.58 | 831 | 45.38 | 831 | 831 | 831 | 831 | 0 | 831 | 831 | 0 |
| G30 | 913  | 40.45 | 797 | 45.61 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G31 | 1184 | 23.28 | 938 | 28.02 | 938 | 938 | 938 | 938 | 0 | 938 | 938 | 0 |
| G01 | 1156 | 24.50 | 908 | 29.83 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G05 | 934  | 39.94 | 822 | 44.70 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 30

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 2

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 2

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 22744

Obs deleted (any reason) : 32

Obs complete : 22712

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 115 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 298 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 766 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1131 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|



65 - 70 1357 0 0.000000  
 60 - 65 1309 0 0.000000  
 55 - 60 1296 0 0.000000  
 50 - 55 1219 0 0.000000  
 45 - 50 1628 0 0.000000  
 40 - 45 1622 0 0.000000  
 35 - 40 1559 0 0.000000  
 30 - 35 1676 0 0.000000  
 25 - 30 2177 0 0.000000  
 20 - 25 1996 0 0.000000  
 15 - 20 2187 0 0.000000  
 10 - 15 2350 15 0.000000 =  
 5 - 10 26 0 0.000000  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 929    | 0     | 27.05  | 0.368900 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G03 | 686    | 1     | 46.49  | 0.284235 | 2       | 3     | 3    | 0     | 0    | 0     |      |       |      |
| G04 | 908    | 0     | 28.09  | 0.348102 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G06 | 705    | 0     | 49.53  | 0.254299 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 720    | 0     | 47.30  | 0.238049 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 778    | 0     | 46.33  | 0.248520 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 687    | 0     | 48.90  | 0.289818 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G10 | 874    | 0     | 30.81  | 0.340086 | 2       | 4     | 4    | 0     | 0    | 0     |      |       |      |
| G11 | 709    | 0     | 47.11  | 0.286550 | 0       | 1     | 2    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G12 | 840 | 0 | 44.45 | 0.295825 | 1 | 2 | 2 | 0 | 0 | 0 |
| G13 | 815 | 0 | 44.18 | 0.252893 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 921 | 0 | 28.72 | 0.530899 | 1 | 3 | 3 | 0 | 0 | 0 |
| G15 | 662 | 0 | 45.01 | 0.246610 | 2 | 3 | 3 | 0 | 0 | 0 |
| G16 | 836 | 0 | 33.58 | 0.474670 | 3 | 6 | 6 | 0 | 0 | 0 |
| G17 | 922 | 0 | 28.00 | 0.394907 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 788 | 0 | 34.08 | 0.301773 | 6 | 7 | 8 | 0 | 0 | 0 |
| G19 | 678 | 0 | 45.24 | 0.229822 | 1 | 2 | 2 | 0 | 0 | 0 |
| G20 | 823 | 0 | 45.22 | 0.270395 | 1 | 2 | 2 | 0 | 0 | 0 |
| G21 | 766 | 0 | 48.07 | 0.340338 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 678 | 0 | 44.46 | 0.303524 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 781 | 0 | 46.46 | 0.287768 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 662 | 0 | 43.43 | 0.282389 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 704 | 0 | 46.41 | 0.288833 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 783 | 1 | 36.80 | 0.344505 | 1 | 4 | 3 | 0 | 0 | 0 |
| G27 | 820 | 0 | 46.37 | 0.316272 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 673 | 0 | 44.08 | 0.285818 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 831 | 0 | 45.42 | 0.288714 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 797 | 0 | 45.67 | 0.414776 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 938 | 0 | 28.13 | 0.333241 | 0 | 2 | 2 | 0 | 0 | 0 |

mean MP1 rms : 0.319946 m

total mean elevation : 40.57 degrees

# MP1 obs > 10 : 22712

# qc MP1 slips < 25 : 20

# Rvr L1 slips < 25 : 56

# Rvr L2 slips < 25 : 57

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 115       | 0            | 0.174752 |     |      |     |
| 80 - 85    | 298       | 0            | 0.221574 |     |      |     |
| 75 - 80    | 766       | 0            | 0.190403 |     |      |     |
| 70 - 75    | 1131      | 0            | 0.180506 |     |      |     |
| 65 - 70    | 1357      | 0            | 0.193224 |     |      |     |
| 60 - 65    | 1309      | 0            | 0.212422 |     |      |     |
| 55 - 60    | 1296      | 0            | 0.208723 |     |      |     |
| 50 - 55    | 1219      | 0            | 0.199694 |     |      |     |
| 45 - 50    | 1628      | 0            | 0.221869 |     |      |     |
| 40 - 45    | 1622      | 0            | 0.249252 |     |      |     |
| 35 - 40    | 1559      | 0            | 0.278857 |     |      |     |
| 30 - 35    | 1676      | 0            | 0.301988 |     |      |     |
| 25 - 30    | 2177      | 0            | 0.363041 |     |      |     |
| 20 - 25    | 1996      | 0            | 0.361590 |     |      |     |
| 15 - 20    | 2187      | 2            | 0.428840 |     |      |     |
| 10 - 15    | 2350      | 18           | 0.562655 | #   |      |     |
| 5 - 10     | 26        | 0            | 0.544495 |     |      |     |
| 0 - 5      | 0         | 0            | 0.000000 |     |      |     |
| < 0        | 0         | 0            | 0.000000 |     |      |     |

MP2 RMS summary (per SV):

|           | slips | L1 rx  | L2 rx       | slips    | L1 rx | L2 rx |      |      |      |   |
|-----------|-------|--------|-------------|----------|-------|-------|------|------|------|---|
| SV obs>10 | # del | <elev> | MP2 rms [m] | < 25     | < 25  | < 25  | > 25 | > 25 | > 25 |   |
| G02       | 929   | 0      | 27.05       | 0.402843 | 0     | 2     | 2    | 0    | 0    | 0 |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G03 | 686 | 1 | 46.49 | 0.308686 | 2 | 3 | 3 | 0 | 0 | 0 |
| G04 | 908 | 0 | 28.09 | 0.381951 | 0 | 2 | 2 | 0 | 0 | 0 |
| G06 | 705 | 0 | 49.53 | 0.265877 | 0 | 1 | 1 | 0 | 0 | 0 |
| G07 | 720 | 0 | 47.30 | 0.312087 | 0 | 1 | 1 | 0 | 0 | 0 |
| G08 | 778 | 0 | 46.33 | 0.292741 | 0 | 1 | 1 | 0 | 0 | 0 |
| G09 | 687 | 0 | 48.90 | 0.358939 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 874 | 0 | 30.81 | 0.933528 | 1 | 4 | 4 | 0 | 0 | 0 |
| G11 | 709 | 0 | 47.11 | 0.310625 | 0 | 1 | 2 | 0 | 0 | 0 |
| G12 | 840 | 0 | 44.45 | 0.362202 | 1 | 2 | 2 | 0 | 0 | 0 |
| G13 | 815 | 0 | 44.18 | 0.328756 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 921 | 0 | 28.72 | 0.522623 | 2 | 3 | 3 | 0 | 0 | 0 |
| G15 | 662 | 0 | 45.01 | 0.314946 | 2 | 3 | 3 | 0 | 0 | 0 |
| G16 | 836 | 0 | 33.58 | 0.403990 | 3 | 6 | 6 | 0 | 0 | 0 |
| G17 | 922 | 0 | 28.00 | 0.586500 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 788 | 0 | 34.08 | 0.457657 | 6 | 7 | 8 | 0 | 0 | 0 |
| G19 | 678 | 0 | 45.24 | 0.346530 | 1 | 2 | 2 | 0 | 0 | 0 |
| G20 | 823 | 0 | 45.22 | 0.325022 | 1 | 2 | 2 | 0 | 0 | 0 |
| G21 | 766 | 0 | 48.07 | 0.361858 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 678 | 0 | 44.46 | 0.299440 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 781 | 0 | 46.46 | 0.298716 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 662 | 0 | 43.43 | 0.321321 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 704 | 0 | 46.41 | 0.271878 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 783 | 1 | 36.80 | 0.416359 | 1 | 4 | 3 | 0 | 0 | 0 |
| G27 | 820 | 0 | 46.37 | 0.370160 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 673 | 0 | 44.08 | 0.320536 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 831 | 0 | 45.42 | 0.461537 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 797 | 0 | 45.67 | 0.651835 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 938 | 0 | 28.13 | 0.424979 | 0 | 2 | 2 | 0 | 0 | 0 |

mean MP2 rms : 0.401675 m

total mean elevation : 40.57 degrees

# MP2 obs > 10 : 22712

# qc MP2 slips < 25 : 20

# Rvr L1 slips < 25 : 56

# Rvr L2 slips < 25 : 57

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |    |          |   |  |  |  |  |
|---------|------|----|----------|---|--|--|--|--|
| 85 - 90 | 115  | 0  | 0.218254 |   |  |  |  |  |
| 80 - 85 | 298  | 0  | 0.267834 |   |  |  |  |  |
| 75 - 80 | 766  | 0  | 0.223822 |   |  |  |  |  |
| 70 - 75 | 1131 | 0  | 0.255485 |   |  |  |  |  |
| 65 - 70 | 1357 | 0  | 0.248219 |   |  |  |  |  |
| 60 - 65 | 1309 | 0  | 0.237261 |   |  |  |  |  |
| 55 - 60 | 1296 | 0  | 0.233834 |   |  |  |  |  |
| 50 - 55 | 1219 | 0  | 0.248311 |   |  |  |  |  |
| 45 - 50 | 1628 | 0  | 0.258861 |   |  |  |  |  |
| 40 - 45 | 1622 | 0  | 0.293752 |   |  |  |  |  |
| 35 - 40 | 1559 | 0  | 0.306128 |   |  |  |  |  |
| 30 - 35 | 1676 | 0  | 0.333305 |   |  |  |  |  |
| 25 - 30 | 2177 | 0  | 0.388502 |   |  |  |  |  |
| 20 - 25 | 1996 | 0  | 0.465151 |   |  |  |  |  |
| 15 - 20 | 2187 | 1  | 0.621070 |   |  |  |  |  |
| 10 - 15 | 2350 | 19 | 0.816251 | # |  |  |  |  |

```

5 - 10  26  0  0.781158 |||||||||||
0 - 5   0  0  0.000000
< 0    0  0  0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig  mean          0|5      1|0
85 - 90  115  0.938  8.565 #####|||
80 - 85  298  0.664  8.728 ###|||
75 - 80  766  0.412  8.918 ##|||
70 - 75 1131  0.315  8.963 #|||
65 - 70 1358  0.301  8.961 #|||
60 - 65 1310  0.421  8.857 ##|||
55 - 60 1297  0.443  8.830 ##|||
50 - 55 1219  0.547  8.600 ##|||
45 - 50 1628  0.447  8.193 ##|||
40 - 45 1623  0.246  8.017 #|||
35 - 40 1560  0.203  7.995 #|||
30 - 35 1676  0.299  7.940 #|||
25 - 30 2177  0.538  7.522 ##|||
20 - 25 1997  0.510  7.108 ##|||
15 - 20 2190  0.551  6.669 ##|||
10 - 15 2369  0.665  6.135 ###|||
5 - 10   30  1.223  5.767 #####|||
0 - 5    0  0.000  0.000
< 0     0  0.000  0.000

```

S/N L2 summary (per elevation bin):

```

elev (deg) tot SN2 sig  mean          0|5      1|0

```

|         |      |       |       |     |
|---------|------|-------|-------|-----|
| 85 - 90 | 115  | 0.823 | 7.757 | ### |
| 80 - 85 | 298  | 0.552 | 7.866 | ##  |
| 75 - 80 | 766  | 0.410 | 7.894 | ##  |
| 70 - 75 | 1131 | 0.395 | 7.879 | ##  |
| 65 - 70 | 1358 | 0.504 | 7.694 | ##  |
| 60 - 65 | 1310 | 0.530 | 7.390 | ##  |
| 55 - 60 | 1297 | 0.450 | 7.199 | ##  |
| 50 - 55 | 1219 | 0.401 | 7.066 | ##  |
| 45 - 50 | 1628 | 0.518 | 6.779 | ##  |
| 40 - 45 | 1623 | 0.534 | 6.428 | ##  |
| 35 - 40 | 1560 | 0.534 | 6.213 | ##  |
| 30 - 35 | 1676 | 0.577 | 5.836 | ##  |
| 25 - 30 | 2177 | 0.641 | 5.456 | ### |
| 20 - 25 | 1997 | 0.675 | 5.021 | ### |
| 15 - 20 | 2190 | 0.683 | 4.613 | ### |
| 10 - 15 | 2367 | 0.801 | 4.104 | ### |
| 5 - 10  | 29   | 1.026 | 3.862 | ### |
| 0 - 5   | 0    | 0.000 | 0.000 |     |
| < 0     | 0    | 0.000 | 0.000 |     |

\*\*\*\*\*

QC of RINEX file(s) : vlsm1270.09o

input RnxNAV file(s) : vlsm1270.09n

\*\*\*\*\*

4-character ID : VLSM

Receiver type : LEICA GRX1200PRO (# = 462019) (fw = 2.14/2.121)

Antenna type : LEIAX1202 (# = 05470019)

Time of start of window : 2009 May 7 00:00:00.000

Time of end of window : 2009 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4699998.8974 1765586.1196 3921173.7903 (m)

antenna WGS 84 (geo) : N 38 deg 10' 36.47" E 20 deg 35' 20.49"

antenna WGS 84 (geo) : 38.176796 deg 20.589026 deg

WGS 84 height : 460.3524 m

[qc - header] position : 42.5803 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 5

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30334

Possible obs > 10.0 deg: 23808



Complete obs > 10.0 deg: 22529  
 Deleted obs > 10.0 deg: 2  
 Masked obs < 10.0 deg: 2100  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.294028 m  
 Moving average MP2 : 0.361596 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.72 (sd=0.96 n=22531) 6.16 (sd=1.25 n=22529)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 10714 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 50) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 14  
 IOD slips > 10.0 deg : 6  
 IOD or MP slips < 10.0\*: 19  
 IOD or MP slips > 10.0 : 8  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 09 5 7 00:00 09 5 7 23:59 24.00 30 23808 22529 95 0.29 0.36 2816

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2009 May 7 00:00:00.000

Observations end : 2009 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1183 | 22.20 | 933 | 26.83 | 884 | 884 | 884 | 884 | 0 | 884 | 884 | 0 |
| G03 | 941  | 34.78 | 697 | 45.93 | 697 | 697 | 697 | 697 | 0 | 697 | 697 | 0 |
| G04 | 1171 | 22.82 | 913 | 27.86 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G06 | 876  | 41.21 | 748 | 47.44 | 748 | 748 | 748 | 748 | 0 | 748 | 748 | 0 |
| G07 | 906  | 38.22 | 721 | 47.19 | 678 | 678 | 678 | 678 | 0 | 678 | 678 | 0 |
| G08 | 901  | 40.59 | 784 | 45.91 | 745 | 745 | 745 | 745 | 0 | 745 | 745 | 0 |
| G09 | 854  | 40.67 | 734 | 46.52 | 734 | 734 | 734 | 734 | 0 | 734 | 734 | 0 |
| G10 | 1146 | 24.63 | 879 | 30.59 | 738 | 737 | 738 | 737 | 0 | 737 | 738 | 0 |
| G11 | 843  | 40.57 | 723 | 46.49 | 723 | 723 | 723 | 723 | 0 | 723 | 723 | 0 |
| G12 | 957  | 39.52 | 846 | 44.04 | 830 | 830 | 830 | 830 | 0 | 830 | 830 | 0 |
| G13 | 931  | 39.16 | 819 | 43.83 | 798 | 797 | 798 | 797 | 0 | 797 | 798 | 0 |
| G14 | 1168 | 23.64 | 926 | 28.53 | 884 | 884 | 884 | 884 | 0 | 884 | 884 | 0 |
| G15 | 1043 | 30.30 | 671 | 44.59 | 671 | 671 | 671 | 671 | 0 | 671 | 671 | 0 |
| G16 | 1126 | 26.20 | 840 | 33.38 | 628 | 628 | 628 | 628 | 0 | 628 | 628 | 0 |
| G17 | 1176 | 22.90 | 926 | 27.75 | 884 | 884 | 884 | 884 | 0 | 884 | 884 | 0 |
| G18 | 1136 | 25.48 | 839 | 32.69 | 795 | 795 | 795 | 795 | 0 | 795 | 795 | 0 |
| G19 | 1033 | 31.15 | 682 | 45.07 | 682 | 682 | 682 | 682 | 0 | 682 | 682 | 0 |
| G20 | 939  | 40.14 | 828 | 44.84 | 821 | 821 | 821 | 821 | 0 | 821 | 821 | 0 |
| G21 | 885  | 42.32 | 768 | 48.01 | 724 | 724 | 724 | 724 | 0 | 724 | 724 | 0 |
| G22 | 1036 | 30.56 | 679 | 44.47 | 633 | 633 | 633 | 633 | 0 | 633 | 633 | 0 |
| G23 | 902  | 40.79 | 785 | 46.13 | 748 | 748 | 748 | 748 | 0 | 748 | 748 | 0 |
| G24 | 1077 | 28.82 | 663 | 43.38 | 621 | 621 | 621 | 621 | 0 | 621 | 621 | 0 |
| G25 | 1007 | 33.40 | 706 | 46.24 | 657 | 657 | 657 | 657 | 0 | 657 | 657 | 0 |
| G26 | 1080 | 28.04 | 784 | 36.66 | 626 | 626 | 626 | 626 | 0 | 626 | 626 | 0 |
| G27 | 937  | 41.10 | 823 | 46.10 | 823 | 823 | 823 | 823 | 0 | 823 | 823 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1078 | 29.46 | 674 | 43.95 | 631 | 631 | 631 | 631 | 0 | 631 | 631 | 0 |
| G29 | 946  | 40.44 | 835 | 45.15 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G30 | 918  | 40.24 | 800 | 45.44 | 800 | 800 | 800 | 800 | 0 | 800 | 800 | 0 |
| G31 | 1185 | 23.21 | 939 | 27.98 | 863 | 863 | 863 | 863 | 0 | 863 | 863 | 0 |
| G32 | 953  | 40.35 | 843 | 44.97 | 822 | 822 | 822 | 822 | 0 | 822 | 822 | 0 |
| G05 | 939  | 39.73 | 826 | 44.48 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 1732

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 2

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 2

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24263

Obs deleted (any reason) : 1734

Obs complete : 22529

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 117 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 313 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 738 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1124 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

65 - 70 1507 0 0.000000  
 60 - 65 1408 0 0.000000  
 55 - 60 1381 0 0.000000  
 50 - 55 1291 0 0.000000  
 45 - 50 1691 0 0.000000  
 40 - 45 1692 0 0.000000  
 35 - 40 1623 0 0.000000  
 30 - 35 1705 0 0.000000  
 25 - 30 2252 0 0.000000  
 20 - 25 2074 0 0.000000  
 15 - 20 1950 4 0.000000  
 10 - 15 1655 2 0.000000  
 5 - 10 1686 14 0.000000 =  
 0 - 5 12 0 0.000000  
 < 0 0 0 0.000000

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 884    | 0     | 27.56  | 0.330066 | 0       | 15    | 15   | 0     | 0    | 0     |      |       |      |
| G03 | 697    | 0     | 45.93  | 0.256761 | 0       | 14    | 14   | 0     | 0    | 0     |      |       |      |
| G04 | 829    | 0     | 29.34  | 0.553081 | 1       | 13    | 14   | 0     | 0    | 0     |      |       |      |
| G06 | 748    | 0     | 47.44  | 0.229606 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G07 | 678    | 0     | 49.34  | 0.217267 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 745    | 0     | 47.64  | 0.236460 | 1       | 13    | 14   | 0     | 0    | 0     |      |       |      |
| G09 | 734    | 0     | 46.52  | 0.255728 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G10 | 738    | 1     | 33.92  | 0.388405 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G11 | 723    | 0     | 46.49  | 0.233819 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |    |    |   |   |   |
|-----|-----|---|-------|----------|---|----|----|---|---|---|
| G12 | 830 | 0 | 44.68 | 0.232349 | 0 | 0  | 0  | 0 | 0 | 0 |
| G13 | 798 | 1 | 44.72 | 0.241092 | 0 | 0  | 0  | 0 | 0 | 0 |
| G14 | 884 | 0 | 29.23 | 0.356625 | 3 | 14 | 19 | 0 | 0 | 0 |
| G15 | 671 | 0 | 44.59 | 0.244766 | 0 | 0  | 0  | 0 | 0 | 0 |
| G16 | 628 | 0 | 40.21 | 0.270516 | 0 | 0  | 14 | 0 | 0 | 0 |
| G17 | 884 | 0 | 28.41 | 0.364850 | 0 | 0  | 15 | 0 | 0 | 0 |
| G18 | 795 | 0 | 33.83 | 0.518043 | 2 | 17 | 17 | 0 | 0 | 0 |
| G19 | 682 | 0 | 45.07 | 0.269757 | 0 | 15 | 15 | 0 | 0 | 0 |
| G20 | 821 | 0 | 45.14 | 0.212530 | 0 | 0  | 0  | 0 | 0 | 0 |
| G21 | 724 | 0 | 50.14 | 0.243747 | 0 | 0  | 0  | 0 | 0 | 0 |
| G22 | 633 | 0 | 46.70 | 0.211333 | 0 | 0  | 0  | 0 | 0 | 0 |
| G23 | 748 | 0 | 47.78 | 0.236325 | 0 | 0  | 0  | 0 | 0 | 0 |
| G24 | 621 | 0 | 45.45 | 0.352387 | 0 | 0  | 0  | 0 | 0 | 0 |
| G25 | 657 | 0 | 48.67 | 0.225828 | 1 | 12 | 13 | 0 | 0 | 0 |
| G26 | 626 | 0 | 42.85 | 0.258636 | 0 | 0  | 0  | 0 | 0 | 0 |
| G27 | 823 | 0 | 46.10 | 0.242790 | 0 | 0  | 0  | 0 | 0 | 0 |
| G28 | 631 | 0 | 46.02 | 0.262769 | 0 | 13 | 13 | 0 | 0 | 0 |
| G29 | 814 | 0 | 46.05 | 0.223355 | 0 | 0  | 0  | 0 | 0 | 0 |
| G30 | 800 | 0 | 45.50 | 0.242314 | 0 | 0  | 0  | 0 | 0 | 0 |
| G31 | 863 | 0 | 29.33 | 0.539312 | 0 | 2  | 2  | 0 | 0 | 0 |
| G32 | 822 | 0 | 45.81 | 0.251892 | 0 | 0  | 0  | 0 | 0 | 0 |

mean MP1 rms : 0.294046 m

total mean elevation : 41.90 degrees

# MP1 obs > 10 : 22529

# qc MP1 slips < 25 : 8

# Rvr L1 slips < 25 : 130

# Rvr L2 slips < 25 : 167

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 117      | 0    | 0.152101 |     |     |      |     |
| 80 - 85    | 313      | 0    | 0.119722 |     |     |      |     |
| 75 - 80    | 738      | 0    | 0.143637 |     |     |      |     |
| 70 - 75    | 1124     | 0    | 0.135407 |     |     |      |     |
| 65 - 70    | 1507     | 0    | 0.162313 |     |     |      |     |
| 60 - 65    | 1408     | 0    | 0.158284 |     |     |      |     |
| 55 - 60    | 1381     | 0    | 0.174028 |     |     |      |     |
| 50 - 55    | 1291     | 0    | 0.207581 |     |     |      |     |
| 45 - 50    | 1691     | 0    | 0.241585 |     |     |      |     |
| 40 - 45    | 1692     | 0    | 0.222991 |     |     |      |     |
| 35 - 40    | 1623     | 0    | 0.232452 |     |     |      |     |
| 30 - 35    | 1705     | 0    | 0.256230 |     |     |      |     |
| 25 - 30    | 2252     | 0    | 0.299350 |     |     |      |     |
| 20 - 25    | 2074     | 0    | 0.314111 |     |     |      |     |
| 15 - 20    | 1950     | 5    | 0.498524 |     |     |      |     |
| 10 - 15    | 1655     | 3    | 0.641505 |     |     |      |     |
| 5 - 10     | 1686     | 19   | 0.659216 | ##  |     |      |     |
| 0 - 5      | 12       | 0    | 0.347495 |     |     |      |     |
| < 0        | 0        | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |    |    |   |   |   |
|-----|-----|---|-------|----------|---|----|----|---|---|---|
| G02 | 884 | 0 | 27.56 | 0.341135 | 0 | 15 | 15 | 0 | 0 | 0 |
| G03 | 697 | 0 | 45.93 | 0.303404 | 0 | 14 | 14 | 0 | 0 | 0 |
| G04 | 829 | 0 | 29.34 | 0.523521 | 1 | 13 | 14 | 0 | 0 | 0 |
| G06 | 748 | 0 | 47.44 | 0.265114 | 0 | 0  | 0  | 0 | 0 | 0 |
| G07 | 678 | 0 | 49.34 | 0.277486 | 0 | 0  | 0  | 0 | 0 | 0 |
| G08 | 745 | 0 | 47.64 | 0.283953 | 1 | 13 | 14 | 0 | 0 | 0 |
| G09 | 734 | 0 | 46.52 | 0.292668 | 0 | 0  | 0  | 0 | 0 | 0 |
| G10 | 738 | 1 | 33.92 | 0.907552 | 0 | 2  | 2  | 0 | 0 | 0 |
| G11 | 723 | 0 | 46.49 | 0.311977 | 0 | 0  | 0  | 0 | 0 | 0 |
| G12 | 830 | 0 | 44.68 | 0.271755 | 0 | 0  | 0  | 0 | 0 | 0 |
| G13 | 798 | 1 | 44.72 | 0.300938 | 0 | 0  | 0  | 0 | 0 | 0 |
| G14 | 884 | 0 | 29.23 | 0.455726 | 3 | 14 | 19 | 0 | 0 | 0 |
| G15 | 671 | 0 | 44.59 | 0.277928 | 0 | 0  | 0  | 0 | 0 | 0 |
| G16 | 628 | 0 | 40.21 | 0.464613 | 0 | 0  | 14 | 0 | 0 | 0 |
| G17 | 884 | 0 | 28.41 | 0.357261 | 0 | 0  | 15 | 0 | 0 | 0 |
| G18 | 795 | 0 | 33.83 | 0.900928 | 2 | 17 | 17 | 0 | 0 | 0 |
| G19 | 682 | 0 | 45.07 | 0.287994 | 0 | 15 | 15 | 0 | 0 | 0 |
| G20 | 821 | 0 | 45.14 | 0.311977 | 0 | 0  | 0  | 0 | 0 | 0 |
| G21 | 724 | 0 | 50.14 | 0.271235 | 0 | 0  | 0  | 0 | 0 | 0 |
| G22 | 633 | 0 | 46.70 | 0.285757 | 0 | 0  | 0  | 0 | 0 | 0 |
| G23 | 748 | 0 | 47.78 | 0.254621 | 0 | 0  | 0  | 0 | 0 | 0 |
| G24 | 621 | 0 | 45.45 | 0.281372 | 0 | 0  | 0  | 0 | 0 | 0 |
| G25 | 657 | 0 | 48.67 | 0.277329 | 1 | 12 | 13 | 0 | 0 | 0 |
| G26 | 626 | 0 | 42.85 | 0.311056 | 0 | 0  | 0  | 0 | 0 | 0 |
| G27 | 823 | 0 | 46.10 | 0.264803 | 0 | 0  | 0  | 0 | 0 | 0 |
| G28 | 631 | 0 | 46.02 | 0.321889 | 0 | 13 | 13 | 0 | 0 | 0 |
| G29 | 814 | 0 | 46.05 | 0.298820 | 0 | 0  | 0  | 0 | 0 | 0 |
| G30 | 800 | 0 | 45.50 | 0.274883 | 0 | 0  | 0  | 0 | 0 | 0 |



G31 863 0 29.33 0.514742 0 2 2 0 0 0  
 G32 822 0 45.81 0.260637 0 0 0 0 0 0

mean MP2 rms : 0.361642 m

total mean elevation : 41.90 degrees

# MP2 obs > 10 : 22529

# qc MP2 slips < 25 : 8

# Rvr L1 slips < 25 : 130

# Rvr L2 slips < 25 : 167

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
| 85 - 90    | 117       | 0 0.198905   |     |     |      |     |
| 80 - 85    | 313       | 0 0.196595   |     |     |      |     |
| 75 - 80    | 738       | 0 0.214708   |     |     |      |     |
| 70 - 75    | 1124      | 0 0.216982   |     |     |      |     |
| 65 - 70    | 1507      | 0 0.215168   |     |     |      |     |
| 60 - 65    | 1408      | 0 0.221445   |     |     |      |     |
| 55 - 60    | 1381      | 0 0.231095   |     |     |      |     |
| 50 - 55    | 1291      | 0 0.255730   |     |     |      |     |
| 45 - 50    | 1691      | 0 0.301022   |     |     |      |     |
| 40 - 45    | 1692      | 0 0.297706   |     |     |      |     |
| 35 - 40    | 1623      | 0 0.279119   |     |     |      |     |
| 30 - 35    | 1705      | 0 0.303006   |     |     |      |     |
| 25 - 30    | 2252      | 0 0.327315   |     |     |      |     |
| 20 - 25    | 2074      | 0 0.356971   |     |     |      |     |

```

15 - 20 1950 5 0.642453 |||||
10 - 15 1655 3 0.850707 |||||
5 - 10 1686 15 1.247037 #|||
0 - 5 12 0 0.820944 |||||
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 117 0.931 8.573 #####|||
80 - 85 313 0.675 8.661 ###|||
75 - 80 738 0.494 8.822 ##|||
70 - 75 1124 0.479 8.791 ##|||
65 - 70 1508 0.489 8.743 ##|||
60 - 65 1409 0.545 8.566 ##|||
55 - 60 1382 0.534 8.368 ##|||
50 - 55 1291 0.445 8.172 ##|||
45 - 50 1691 0.238 8.014 #|||
40 - 45 1694 0.196 7.996 #|||
35 - 40 1623 0.248 7.972 #|||
30 - 35 1705 0.462 7.763 ##|||
25 - 30 2252 0.504 7.250 ##|||
20 - 25 2075 0.394 6.912 ##|||
15 - 20 1952 0.617 6.416 ##|||
10 - 15 1657 0.590 5.978 ##|||
5 - 10 1717 0.663 5.432 ###|||
0 - 5 15 1.568 5.200 #####|||
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 117  | 0.814 | 7.769 | ###  |     |     |
| 80 - 85    | 313  | 0.544 | 7.866 | ##   |     |     |
| 75 - 80    | 738  | 0.466 | 7.831 | ##   |     |     |
| 70 - 75    | 1124 | 0.508 | 7.706 | ##   |     |     |
| 65 - 70    | 1508 | 0.533 | 7.443 | ##   |     |     |
| 60 - 65    | 1409 | 0.516 | 7.346 | ##   |     |     |
| 55 - 60    | 1382 | 0.430 | 7.166 | ##   |     |     |
| 50 - 55    | 1291 | 0.407 | 6.989 | ##   |     |     |
| 45 - 50    | 1691 | 0.521 | 6.637 | ##   |     |     |
| 40 - 45    | 1694 | 0.517 | 6.384 | ##   |     |     |
| 35 - 40    | 1623 | 0.526 | 6.112 | ##   |     |     |
| 30 - 35    | 1705 | 0.578 | 5.748 | ##   |     |     |
| 25 - 30    | 2252 | 0.587 | 5.429 | ##   |     |     |
| 20 - 25    | 2075 | 0.655 | 5.008 | ###  |     |     |
| 15 - 20    | 1951 | 0.731 | 4.658 | ###  |     |     |
| 10 - 15    | 1656 | 0.745 | 4.185 | ###  |     |     |
| 5 - 10     | 1705 | 0.908 | 3.803 | #### |     |     |
| 0 - 5      | 15   | 1.121 | 3.400 | #### |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

## **Έτος 2010 ημέρα 127**

\*\*\*\*\*

QC of RINEX file(s) : atal1270.10o

input RnxNAV file(s) : atal1270.10n

\*\*\*\*\*

4-character ID : ATAL

Receiver type : ASHTECH UZ-12 (# = PRODUCTION05) (fw = CN00)

Antenna type : NOV533 (# = 32871)

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4591115.3427 1948779.0969 3962408.9841 (m)

antenna WGS 84 (geo) : N 38 deg 39' 11.07" E 22 deg 59' 58.72"

antenna WGS 84 (geo) : 38.653075 deg 22.999643 deg

WGS 84 height : 152.5188 m

|qc - header| position : 28.8903 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 25

NAVSTAR GPS SVs w/o NAV : 1

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2877

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30314  
 Possible obs > 10.0 deg: 24021  
 Complete obs > 10.0 deg: 22045  
 Deleted obs > 10.0 deg: 0  
 Masked obs < 10.0 deg: 1951  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.158805 m  
 Moving average MP2 : 0.248117 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 0.00 (sd=0.00 n=0) 0.00 (sd=0.00 n=0)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 1 (: 325) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 10  
 IOD slips > 10.0 deg : 130  
 IOD or MP slips < 10.0\*: 13  
 IOD or MP slips > 10.0 : 146  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 23.98 30 24021 22045 92 0.16 0.25 151

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G12 | 943  | 39.88 | 833 | 44.48 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G29 | 945  | 40.34 | 834 | 45.04 | 780 | 780 | 780 | 780 | 0 | 780 | 780 | 0 |
| G09 | 853  | 40.81 | 734 | 46.63 | 648 | 648 | 648 | 648 | 0 | 648 | 648 | 0 |
| G04 | 1173 | 22.60 | 919 | 27.47 | 848 | 848 | 848 | 848 | 0 | 848 | 848 | 0 |
| G26 | 1108 | 26.30 | 849 | 32.78 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G14 | 1163 | 23.93 | 919 | 28.97 | 856 | 856 | 856 | 856 | 0 | 856 | 856 | 0 |
| G30 | 906  | 40.25 | 789 | 45.48 | 756 | 756 | 756 | 756 | 0 | 756 | 756 | 0 |
| G02 | 1178 | 22.58 | 923 | 27.45 | 873 | 873 | 873 | 873 | 0 | 873 | 873 | 0 |
| G27 | 908  | 41.70 | 793 | 47.03 | 722 | 722 | 722 | 722 | 0 | 722 | 722 | 0 |
| G31 | 1186 | 23.07 | 945 | 27.69 | 896 | 896 | 896 | 896 | 0 | 896 | 896 | 0 |
| G10 | 1092 | 27.20 | 773 | 36.25 | 703 | 703 | 703 | 703 | 0 | 703 | 703 | 0 |
| G05 | 1162 | 23.81 | 895 | 29.40 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G21 | 903  | 42.63 | 787 | 48.19 | 724 | 724 | 724 | 724 | 0 | 724 | 724 | 0 |
| G24 | 913  | 41.25 | 797 | 46.53 | 737 | 737 | 737 | 737 | 0 | 737 | 737 | 0 |
| G16 | 1130 | 26.32 | 849 | 33.35 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G18 | 1137 | 25.63 | 839 | 32.91 | 698 | 698 | 698 | 698 | 0 | 698 | 698 | 0 |
| G06 | 861  | 41.12 | 743 | 46.86 | 642 | 642 | 642 | 642 | 0 | 642 | 642 | 0 |
| G22 | 1032 | 31.14 | 695 | 44.42 | 622 | 622 | 622 | 622 | 0 | 622 | 622 | 0 |
| G03 | 986  | 32.57 | 685 | 45.45 | 600 | 600 | 600 | 600 | 0 | 600 | 600 | 0 |
| G15 | 1069 | 28.79 | 656 | 43.39 | 573 | 573 | 573 | 573 | 0 | 573 | 573 | 0 |

|      |      |       |     |       |     |     |     |     |   |     |     |   |
|------|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G19  | 1048 | 30.37 | 674 | 44.66 | 598 | 598 | 598 | 598 | 0 | 598 | 598 | 0 |
| G32  | 951  | 40.47 | 842 | 45.07 | 795 | 795 | 795 | 795 | 0 | 795 | 795 | 0 |
| G11  | 893  | 36.19 | 700 | 45.29 | 602 | 602 | 602 | 602 | 0 | 602 | 602 | 0 |
| G20  | 932  | 40.46 | 820 | 45.31 | 785 | 785 | 785 | 785 | 0 | 785 | 785 | 0 |
| G28  | 1077 | 29.81 | 677 | 44.34 | 616 | 616 | 616 | 616 | 0 | 616 | 616 | 0 |
| G23  | 911  | 40.74 | 796 | 45.91 | 740 | 740 | 740 | 740 | 0 | 740 | 740 | 0 |
| G17  | 1169 | 23.35 | 916 | 28.43 | 869 | 869 | 869 | 869 | 0 | 869 | 869 | 0 |
| G13  | 926  | 39.41 | 814 | 44.14 | 761 | 761 | 761 | 761 | 0 | 761 | 761 | 0 |
| G07  | 854  | 41.49 | 735 | 47.41 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G08  | 905  | 40.54 | 790 | 45.72 | 730 | 730 | 730 | 730 | 0 | 730 | 730 | 0 |
| G01* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

\* = SV with no NAV info

Obs below mask ( 10.00 deg) : 1828

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 0

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 0

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23873

Obs deleted (any reason) : 1828

Obs complete : 22045

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms



Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%      | 1 m  | 15=% | 2 m |
|------------|-----------|--------------|----------|------|------|-----|
| 85 - 90    | 106       | 0            | 0.000000 |      |      |     |
| 80 - 85    | 262       | 0            | 0.000000 |      |      |     |
| 75 - 80    | 754       | 1            | 0.000000 |      |      |     |
| 70 - 75    | 1072      | 1            | 0.000000 |      |      |     |
| 65 - 70    | 1469      | 0            | 0.000000 |      |      |     |
| 60 - 65    | 1452      | 0            | 0.000000 |      |      |     |
| 55 - 60    | 1287      | 1            | 0.000000 |      |      |     |
| 50 - 55    | 1468      | 2            | 0.000000 |      |      |     |
| 45 - 50    | 1649      | 9            | 0.000000 | =    |      |     |
| 40 - 45    | 1753      | 17           | 0.000000 | =    |      |     |
| 35 - 40    | 1597      | 33           | 0.000000 | ==== |      |     |
| 30 - 35    | 1686      | 29           | 0.000000 | ===  |      |     |
| 25 - 30    | 2155      | 20           | 0.000000 | =    |      |     |
| 20 - 25    | 2058      | 9            | 0.000000 |      |      |     |
| 15 - 20    | 1776      | 4            | 0.000000 |      |      |     |
| 10 - 15    | 1477      | 4            | 0.000000 |      |      |     |
| 5 - 10     | 1274      | 7            | 0.000000 | =    |      |     |
| 0 - 5      | 4         | 0            | 0.000000 |      |      |     |
| < 0        | 0         | 0            | 0.000000 |      |      |     |

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|-------------|------|------|------|------|------|------|
| G12 | 803    | 0     | 45.70  | 0.118365    | 0    | 1    | 1    | 4    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 780 | 0 | 47.18 | 0.105068 | 1 | 3 | 3 | 4 | 0 | 0 |
| G09 | 648 | 0 | 51.02 | 0.118412 | 0 | 0 | 1 | 4 | 0 | 0 |
| G04 | 848 | 0 | 28.69 | 0.194888 | 0 | 2 | 3 | 6 | 0 | 1 |
| G26 | 779 | 0 | 34.33 | 0.220961 | 1 | 0 | 2 | 4 | 0 | 0 |
| G14 | 856 | 0 | 30.30 | 0.196719 | 0 | 1 | 2 | 6 | 0 | 0 |
| G30 | 756 | 0 | 46.96 | 0.155579 | 2 | 2 | 2 | 5 | 0 | 0 |
| G02 | 873 | 0 | 28.32 | 0.187192 | 3 | 0 | 1 | 5 | 0 | 0 |
| G27 | 722 | 0 | 50.38 | 0.148968 | 0 | 0 | 1 | 4 | 0 | 0 |
| G31 | 896 | 0 | 28.51 | 0.188136 | 4 | 0 | 1 | 4 | 0 | 0 |
| G10 | 703 | 0 | 38.43 | 0.135339 | 0 | 1 | 2 | 4 | 0 | 0 |
| G05 | 838 | 0 | 30.36 | 0.212989 | 4 | 0 | 1 | 2 | 0 | 0 |
| G21 | 724 | 0 | 50.82 | 0.130567 | 0 | 1 | 1 | 4 | 0 | 0 |
| G24 | 737 | 0 | 48.87 | 0.121519 | 0 | 1 | 1 | 4 | 0 | 0 |
| G16 | 779 | 0 | 34.91 | 0.257038 | 2 | 0 | 3 | 4 | 0 | 0 |
| G18 | 698 | 0 | 36.81 | 0.240234 | 0 | 0 | 5 | 4 | 0 | 0 |
| G06 | 642 | 0 | 51.99 | 0.136100 | 0 | 0 | 2 | 4 | 0 | 0 |
| G22 | 622 | 0 | 47.80 | 0.112569 | 0 | 0 | 1 | 4 | 0 | 0 |
| G03 | 600 | 0 | 49.90 | 0.137164 | 0 | 0 | 1 | 4 | 0 | 0 |
| G15 | 573 | 0 | 47.47 | 0.221474 | 0 | 0 | 1 | 4 | 0 | 0 |
| G19 | 598 | 0 | 48.58 | 0.136200 | 0 | 0 | 1 | 4 | 0 | 0 |
| G32 | 795 | 0 | 46.96 | 0.121479 | 0 | 0 | 1 | 4 | 0 | 0 |
| G11 | 602 | 0 | 50.35 | 0.151017 | 0 | 1 | 2 | 4 | 0 | 0 |
| G20 | 785 | 0 | 46.90 | 0.133754 | 0 | 1 | 1 | 4 | 0 | 0 |
| G28 | 616 | 0 | 47.11 | 0.245114 | 0 | 0 | 1 | 4 | 0 | 0 |
| G23 | 740 | 0 | 48.28 | 0.089160 | 0 | 0 | 1 | 4 | 0 | 0 |
| G17 | 869 | 0 | 29.32 | 0.186068 | 4 | 0 | 1 | 4 | 0 | 0 |
| G13 | 761 | 0 | 46.23 | 0.118627 | 1 | 1 | 2 | 4 | 0 | 0 |

|      |     |   |       |          |   |   |   |   |   |   |
|------|-----|---|-------|----------|---|---|---|---|---|---|
| G07  | 672 | 0 | 50.38 | 0.110425 | 0 | 1 | 1 | 4 | 0 | 0 |
| G08  | 730 | 0 | 48.23 | 0.112339 | 0 | 1 | 1 | 4 | 0 | 0 |
| G01* | 544 | 0 | 0.00  | 0.145064 | 4 | 1 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP1 rms : 0.158790 m

total mean elevation : 42.28 degrees

# MP1 obs > 10 : 22589

# qc MP1 slips < 25 : 26

# Rvr L1 slips < 25 : 18

# Rvr L2 slips < 25 : 48

# qc MP1 slips > 25 : 124

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 1

| elev (deg) | tot slips | <MP1 | rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|---------|-----|-----|------|-----|
|------------|-----------|------|---------|-----|-----|------|-----|

|         |      |    |          |      |  |  |  |
|---------|------|----|----------|------|--|--|--|
| 85 - 90 | 106  | 0  | 0.061928 |      |  |  |  |
| 80 - 85 | 262  | 0  | 0.050155 |      |  |  |  |
| 75 - 80 | 754  | 1  | 0.052317 |      |  |  |  |
| 70 - 75 | 1072 | 1  | 0.062910 |      |  |  |  |
| 65 - 70 | 1469 | 0  | 0.074354 |      |  |  |  |
| 60 - 65 | 1452 | 0  | 0.077154 |      |  |  |  |
| 55 - 60 | 1287 | 1  | 0.082727 |      |  |  |  |
| 50 - 55 | 1468 | 2  | 0.085371 |      |  |  |  |
| 45 - 50 | 1649 | 9  | 0.088751 | #    |  |  |  |
| 40 - 45 | 1753 | 18 | 0.119033 | ##   |  |  |  |
| 35 - 40 | 1597 | 37 | 0.142323 | ###= |  |  |  |

```

30 - 35 1686 30 0.143612 ###
25 - 30 2155 25 0.182507 ##||
20 - 25 2058 13 0.203269 #|||
15 - 20 1776 4 0.238705 |||||
10 - 15 1477 5 0.375302 |||||
5 - 10 1274 9 0.521380 #|||
0 - 5 4 0 0.895114 |||
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G12 | 803    | 0     | 45.70  | 0.226646 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G29 | 780    | 0     | 47.18  | 0.252110 | 1       | 3     | 3    | 4     | 0    | 0     |      |       |      |
| G09 | 648    | 0     | 51.02  | 0.192960 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G04 | 848    | 0     | 28.69  | 0.244328 | 0       | 2     | 3    | 6     | 0    | 1     |      |       |      |
| G26 | 779    | 0     | 34.33  | 0.240918 | 1       | 0     | 2    | 4     | 0    | 0     |      |       |      |
| G14 | 856    | 0     | 30.30  | 0.300121 | 0       | 1     | 2    | 6     | 0    | 0     |      |       |      |
| G30 | 756    | 0     | 46.96  | 0.331502 | 2       | 2     | 2    | 5     | 0    | 0     |      |       |      |
| G02 | 873    | 0     | 28.32  | 0.274372 | 3       | 0     | 1    | 5     | 0    | 0     |      |       |      |
| G27 | 722    | 0     | 50.38  | 0.242979 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G31 | 896    | 0     | 28.51  | 0.290420 | 4       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G10 | 703    | 0     | 38.43  | 0.217606 | 0       | 1     | 2    | 4     | 0    | 0     |      |       |      |
| G05 | 838    | 0     | 30.36  | 0.300204 | 4       | 0     | 1    | 2     | 0    | 0     |      |       |      |
| G21 | 724    | 0     | 50.82  | 0.199493 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G24 | 737    | 0     | 48.87  | 0.185938 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G16 | 779    | 0     | 34.91  | 0.456574 | 2       | 0     | 3    | 4     | 0    | 0     |      |       |      |

|      |     |   |       |          |   |   |   |   |   |   |
|------|-----|---|-------|----------|---|---|---|---|---|---|
| G18  | 698 | 0 | 36.81 | 0.346656 | 0 | 0 | 5 | 4 | 0 | 0 |
| G06  | 642 | 0 | 51.99 | 0.362364 | 0 | 0 | 2 | 4 | 0 | 0 |
| G22  | 622 | 0 | 47.80 | 0.161945 | 0 | 0 | 1 | 4 | 0 | 0 |
| G03  | 600 | 0 | 49.90 | 0.192449 | 0 | 0 | 1 | 4 | 0 | 0 |
| G15  | 573 | 0 | 47.47 | 0.213142 | 1 | 0 | 1 | 4 | 0 | 0 |
| G19  | 598 | 0 | 48.58 | 0.200294 | 0 | 0 | 1 | 4 | 0 | 0 |
| G32  | 795 | 0 | 46.96 | 0.245562 | 0 | 0 | 1 | 4 | 0 | 0 |
| G11  | 602 | 0 | 50.35 | 0.203274 | 0 | 1 | 2 | 4 | 0 | 0 |
| G20  | 785 | 0 | 46.90 | 0.214738 | 0 | 1 | 1 | 4 | 0 | 0 |
| G28  | 616 | 0 | 47.11 | 0.211461 | 1 | 0 | 1 | 4 | 0 | 0 |
| G23  | 740 | 0 | 48.28 | 0.209011 | 0 | 0 | 1 | 4 | 0 | 0 |
| G17  | 869 | 0 | 29.32 | 0.237030 | 5 | 0 | 1 | 4 | 0 | 0 |
| G13  | 761 | 0 | 46.23 | 0.224350 | 1 | 1 | 2 | 4 | 0 | 0 |
| G07  | 672 | 0 | 50.38 | 0.209058 | 0 | 1 | 1 | 4 | 0 | 0 |
| G08  | 730 | 0 | 48.23 | 0.208373 | 0 | 1 | 1 | 4 | 0 | 0 |
| G01* | 544 | 0 | 0.00  | 0.199713 | 4 | 1 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP2 rms : 0.248116 m

total mean elevation : 42.28 degrees

# MP2 obs > 10 : 22589

# qc MP2 slips < 25 : 29

# Rvr L1 slips < 25 : 18

# Rvr L2 slips < 25 : 48

# qc MP2 slips > 25 : 124

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 1

| elev (deg) | tot slps | <MP2 rms, m> | 5=%      | 1 m  | 15=% | 2 m |
|------------|----------|--------------|----------|------|------|-----|
| 85 - 90    | 106      | 0            | 0.131240 |      |      |     |
| 80 - 85    | 262      | 0            | 0.141128 |      |      |     |
| 75 - 80    | 754      | 1            | 0.125057 |      |      |     |
| 70 - 75    | 1072     | 1            | 0.171299 |      |      |     |
| 65 - 70    | 1469     | 0            | 0.173464 |      |      |     |
| 60 - 65    | 1452     | 0            | 0.167570 |      |      |     |
| 55 - 60    | 1287     | 1            | 0.163201 |      |      |     |
| 50 - 55    | 1468     | 2            | 0.191005 |      |      |     |
| 45 - 50    | 1649     | 9            | 0.218605 | #    |      |     |
| 40 - 45    | 1753     | 18           | 0.221177 | ##   |      |     |
| 35 - 40    | 1597     | 37           | 0.224611 | #### |      |     |
| 30 - 35    | 1686     | 30           | 0.226905 | ###  |      |     |
| 25 - 30    | 2155     | 25           | 0.229058 | ##   |      |     |
| 20 - 25    | 2058     | 14           | 0.263589 | #    |      |     |
| 15 - 20    | 1776     | 5            | 0.394422 |      |      |     |
| 10 - 15    | 1477     | 6            | 0.506810 |      |      |     |
| 5 - 10     | 1274     | 13           | 0.543096 | ##   |      |     |
| 0 - 5      | 4        | 0            | 0.597504 |      |      |     |
| < 0        | 0        | 0            | 0.000000 |      |      |     |

S/N L1 summary (per elevation bin):

| elev (deg) | tot SN1 | sig   | mean  | 0 5 | 1 0 |
|------------|---------|-------|-------|-----|-----|
| 85 - 90    | 0       | 0.000 | 0.000 |     |     |
| 80 - 85    | 0       | 0.000 | 0.000 |     |     |
| 75 - 80    | 0       | 0.000 | 0.000 |     |     |

|         |   |       |       |
|---------|---|-------|-------|
| 70 - 75 | 0 | 0.000 | 0.000 |
| 65 - 70 | 0 | 0.000 | 0.000 |
| 60 - 65 | 0 | 0.000 | 0.000 |
| 55 - 60 | 0 | 0.000 | 0.000 |
| 50 - 55 | 0 | 0.000 | 0.000 |
| 45 - 50 | 0 | 0.000 | 0.000 |
| 40 - 45 | 0 | 0.000 | 0.000 |
| 35 - 40 | 0 | 0.000 | 0.000 |
| 30 - 35 | 0 | 0.000 | 0.000 |
| 25 - 30 | 0 | 0.000 | 0.000 |
| 20 - 25 | 0 | 0.000 | 0.000 |
| 15 - 20 | 0 | 0.000 | 0.000 |
| 10 - 15 | 0 | 0.000 | 0.000 |
| 5 - 10  | 0 | 0.000 | 0.000 |
| 0 - 5   | 0 | 0.000 | 0.000 |
| < 0     | 0 | 0.000 | 0.000 |

S/N L2 summary (per elevation bin):

| elev (deg) | tot | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|-----|-------|-------|------|-----|-----|
| 85 - 90    | 0   | 0.000 | 0.000 |      |     |     |
| 80 - 85    | 0   | 0.000 | 0.000 |      |     |     |
| 75 - 80    | 0   | 0.000 | 0.000 |      |     |     |
| 70 - 75    | 0   | 0.000 | 0.000 |      |     |     |
| 65 - 70    | 0   | 0.000 | 0.000 |      |     |     |
| 60 - 65    | 0   | 0.000 | 0.000 |      |     |     |
| 55 - 60    | 0   | 0.000 | 0.000 |      |     |     |
| 50 - 55    | 0   | 0.000 | 0.000 |      |     |     |

|         |   |       |       |
|---------|---|-------|-------|
| 45 - 50 | 0 | 0.000 | 0.000 |
| 40 - 45 | 0 | 0.000 | 0.000 |
| 35 - 40 | 0 | 0.000 | 0.000 |
| 30 - 35 | 0 | 0.000 | 0.000 |
| 25 - 30 | 0 | 0.000 | 0.000 |
| 20 - 25 | 0 | 0.000 | 0.000 |
| 15 - 20 | 0 | 0.000 | 0.000 |
| 10 - 15 | 0 | 0.000 | 0.000 |
| 5 - 10  | 0 | 0.000 | 0.000 |
| 0 - 5   | 0 | 0.000 | 0.000 |
| < 0     | 0 | 0.000 | 0.000 |



\*\*\*\*\*

QC of RINEX file(s) : kasi1270.10o

input RnxNAV file(s) : kasi1270.10n

\*\*\*\*\*

4-character ID : KASI

Receiver type : LEICA GRX1200PRO (# = 465462) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG (# = 06500008)

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4616581.2393 1674439.9545 4056458.6589 (m)

antenna WGS 84 (geo) : N 39 deg 44' 46.97" E 19 deg 56' 8.78"

antenna WGS 84 (geo) : 39.746381 deg 19.935773 deg

WGS 84 height : 132.6310 m

|qc - header| position : 32.2747 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30217

Possible obs > 10.0 deg: 23955  
 Complete obs > 10.0 deg: 22916  
 Deleted obs > 10.0 deg: 4  
 Masked obs < 10.0 deg: 1738  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.226431 m  
 Moving average MP2 : 0.250392 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.25 (sd=0.84 n=22920) 6.52 (sd=1.32 n=22916)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 55) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 20  
 IOD slips > 10.0 deg : 6  
 IOD or MP slips < 10.0\*: 22  
 IOD or MP slips > 10.0 : 7  
 \* or unknown elevation

|     | first epoch | last epoch | hrs   | dt    | #expt | #have | %     | mp1 | mp2  | o/slps    |
|-----|-------------|------------|-------|-------|-------|-------|-------|-----|------|-----------|
| SUM | 10 5 7      | 10 5 7     | 23:59 | 24.00 | 30    | 23955 | 22916 | 96  | 0.23 | 0.25 3274 |

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1180 | 22.44 | 929 | 27.17 | 874 | 874 | 874 | 874 | 0 | 874 | 874 | 0 |
| G03 | 961  | 34.20 | 694 | 46.14 | 669 | 669 | 669 | 669 | 0 | 669 | 669 | 0 |
| G04 | 1164 | 23.06 | 911 | 28.09 | 866 | 866 | 866 | 866 | 0 | 866 | 866 | 0 |
| G05 | 1151 | 24.45 | 882 | 30.36 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G06 | 869  | 41.59 | 752 | 47.29 | 725 | 725 | 725 | 725 | 0 | 725 | 725 | 0 |
| G07 | 959  | 36.17 | 718 | 47.31 | 718 | 718 | 718 | 718 | 0 | 718 | 718 | 0 |
| G08 | 887  | 41.15 | 772 | 46.53 | 772 | 772 | 772 | 772 | 0 | 772 | 772 | 0 |
| G09 | 859  | 40.81 | 741 | 46.51 | 494 | 494 | 494 | 494 | 0 | 494 | 494 | 0 |
| G10 | 1079 | 28.15 | 727 | 39.12 | 692 | 691 | 692 | 691 | 0 | 691 | 692 | 0 |
| G11 | 827  | 40.11 | 710 | 45.91 | 686 | 686 | 686 | 686 | 0 | 686 | 686 | 0 |
| G12 | 936  | 40.21 | 828 | 44.81 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G13 | 911  | 39.99 | 799 | 44.90 | 799 | 799 | 799 | 799 | 0 | 799 | 799 | 0 |
| G14 | 1168 | 23.75 | 929 | 28.59 | 871 | 871 | 871 | 871 | 0 | 871 | 871 | 0 |
| G15 | 1056 | 29.85 | 667 | 44.32 | 636 | 636 | 636 | 636 | 0 | 636 | 636 | 0 |
| G16 | 1118 | 27.21 | 829 | 34.90 | 785 | 785 | 785 | 785 | 0 | 785 | 785 | 0 |
| G17 | 1172 | 23.17 | 926 | 28.00 | 867 | 867 | 867 | 867 | 0 | 867 | 867 | 0 |
| G18 | 1151 | 24.89 | 874 | 31.16 | 745 | 744 | 745 | 744 | 0 | 744 | 745 | 0 |
| G19 | 1034 | 31.51 | 685 | 45.46 | 656 | 656 | 656 | 656 | 0 | 656 | 656 | 0 |
| G20 | 927  | 40.74 | 817 | 45.56 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |
| G21 | 885  | 42.71 | 769 | 48.41 | 769 | 769 | 769 | 769 | 0 | 769 | 769 | 0 |
| G22 | 1067 | 29.34 | 679 | 43.35 | 679 | 679 | 679 | 679 | 0 | 679 | 679 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G23 | 894  | 41.28 | 779 | 46.64 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G24 | 896  | 41.66 | 779 | 47.18 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G26 | 1098 | 27.04 | 833 | 34.02 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G27 | 912  | 41.85 | 800 | 47.01 | 792 | 792 | 792 | 792 | 0 | 792 | 792 | 0 |
| G28 | 1100 | 28.58 | 746 | 39.52 | 661 | 661 | 661 | 661 | 0 | 661 | 661 | 0 |
| G29 | 931  | 40.82 | 820 | 45.67 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G30 | 907  | 40.32 | 792 | 45.46 | 788 | 788 | 788 | 788 | 0 | 788 | 788 | 0 |
| G31 | 1180 | 23.47 | 939 | 28.22 | 896 | 894 | 896 | 894 | 0 | 894 | 896 | 0 |
| G32 | 938  | 40.95 | 829 | 45.67 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G25 | 1023 | 33.03 | 704 | 46.39 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 2104

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 4

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 4

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 25024

Obs deleted (any reason) : 2108

Obs complete : 22916

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%            | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------------|-----|------|-----|
| 85 - 90    | 122       | 0            | 0.000000       |     |      |     |
| 80 - 85    | 322       | 0            | 0.000000       |     |      |     |
| 75 - 80    | 769       | 0            | 0.000000       |     |      |     |
| 70 - 75    | 1286      | 0            | 0.000000       |     |      |     |
| 65 - 70    | 1440      | 0            | 0.000000       |     |      |     |
| 60 - 65    | 1251      | 0            | 0.000000       |     |      |     |
| 55 - 60    | 1344      | 0            | 0.000000       |     |      |     |
| 50 - 55    | 1265      | 0            | 0.000000       |     |      |     |
| 45 - 50    | 1703      | 0            | 0.000000       |     |      |     |
| 40 - 45    | 1673      | 0            | 0.000000       |     |      |     |
| 35 - 40    | 1573      | 0            | 0.000000       |     |      |     |
| 30 - 35    | 1635      | 0            | 0.000000       |     |      |     |
| 25 - 30    | 2242      | 0            | 0.000000       |     |      |     |
| 20 - 25    | 2107      | 0            | 0.000000       |     |      |     |
| 15 - 20    | 2137      | 3            | 0.000000       |     |      |     |
| 10 - 15    | 2029      | 3            | 0.000000       |     |      |     |
| 5 - 10     | 2063      | 19           | 0.000000 =     |     |      |     |
| 0 - 5      | 28        | 1            | 0.000000 ===== |     |      |     |
| < 0        | 0         | 0            | 0.000000       |     |      |     |

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | slips < 25 | L1 rx < 25 | L2 rx < 25 | slips > 25 | L1 rx > 25 | L2 rx > 25 |
|-----|--------|-------|--------|-------------|------------|------------|------------|------------|------------|------------|
| G02 | 874    | 0     | 28.06  | 0.291765    | 0          | 2          | 2          | 0          | 0          | 0          |
| G03 | 669    | 0     | 47.52  | 0.164989    | 0          | 1          | 1          | 0          | 0          | 0          |
| G04 | 866    | 0     | 28.88  | 0.272388    | 0          | 1          | 1          | 0          | 0          | 0          |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G05 | 838 | 0 | 31.21 | 0.253857 | 0 | 1 | 1 | 0 | 0 | 0 |
| G06 | 725 | 0 | 48.70 | 0.182378 | 0 | 1 | 1 | 0 | 0 | 0 |
| G07 | 718 | 0 | 47.31 | 0.205451 | 0 | 0 | 0 | 0 | 0 | 0 |
| G08 | 772 | 0 | 46.53 | 0.198577 | 0 | 0 | 0 | 0 | 0 | 0 |
| G09 | 494 | 0 | 54.16 | 0.168879 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 692 | 1 | 40.56 | 0.409475 | 1 | 1 | 4 | 0 | 0 | 0 |
| G11 | 686 | 0 | 47.21 | 0.142579 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 828 | 0 | 44.81 | 0.189487 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 799 | 0 | 44.90 | 0.198214 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 871 | 0 | 29.51 | 0.404519 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 636 | 0 | 45.87 | 0.190831 | 0 | 1 | 1 | 0 | 0 | 0 |
| G16 | 785 | 0 | 36.11 | 0.253142 | 0 | 1 | 1 | 0 | 0 | 0 |
| G17 | 867 | 0 | 29.00 | 0.217922 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 745 | 1 | 34.38 | 0.280575 | 4 | 1 | 6 | 0 | 0 | 0 |
| G19 | 656 | 0 | 47.03 | 0.196197 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 817 | 0 | 45.56 | 0.173453 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 769 | 0 | 48.41 | 0.244283 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 679 | 0 | 43.46 | 0.190386 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 779 | 0 | 46.64 | 0.188690 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 779 | 0 | 47.20 | 0.194571 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 790 | 0 | 35.09 | 0.222411 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 792 | 0 | 47.48 | 0.175042 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 661 | 0 | 43.25 | 0.261865 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 820 | 0 | 45.73 | 0.214012 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 788 | 0 | 45.73 | 0.230195 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 896 | 2 | 28.99 | 0.242281 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32 | 829 | 0 | 45.67 | 0.175241 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.226431 m

total mean elevation : 41.28 degrees

# MP1 obs > 10 : 22916

# qc MP1 slips < 25 : 5

# Rvr L1 slips < 25 : 19

# Rvr L2 slips < 25 : 27

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP1 rms, m> 5=% 1|m 15=% 2|m

85 - 90 122 0 0.103142 ||

80 - 85 322 0 0.110793 ||

75 - 80 769 0 0.127294 |||

70 - 75 1286 0 0.125026 |||

65 - 70 1440 0 0.128651 |||

60 - 65 1251 0 0.143571 |||

55 - 60 1344 0 0.167522 |||

50 - 55 1265 0 0.173943 |||

45 - 50 1703 0 0.176554 ||||

40 - 45 1673 0 0.183039 ||||

35 - 40 1573 0 0.191619 ||||

30 - 35 1635 0 0.241071 |||||

25 - 30 2242 0 0.249019 |||||

20 - 25 2107 0 0.311398 |||||

15 - 20 2137 2 0.369042 |||||



10 - 15 2029 3 0.323458 |||||  
 5 - 10 2063 21 0.662536 ##|||||||  
 0 - 5 28 1 0.276971 #####=  
 < 0 0 0 0.000000

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 874    | 0     | 28.06  | 0.202629 | 1       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G03 | 669    | 0     | 47.52  | 0.184179 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G04 | 866    | 0     | 28.88  | 0.219599 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G05 | 838    | 0     | 31.21  | 0.220352 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G06 | 725    | 0     | 48.70  | 0.295091 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 718    | 0     | 47.31  | 0.175078 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 772    | 0     | 46.53  | 0.186125 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G09 | 494    | 0     | 54.16  | 0.180445 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G10 | 692    | 1     | 40.56  | 0.279349 | 2       | 1     | 4    | 0     | 0    | 0     |      |       |      |
| G11 | 686    | 0     | 47.21  | 0.211577 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G12 | 828    | 0     | 44.81  | 0.214749 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G13 | 799    | 0     | 44.90  | 0.220498 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G14 | 871    | 0     | 29.51  | 0.377468 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G15 | 636    | 0     | 45.87  | 0.377491 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G16 | 785    | 0     | 36.11  | 0.559374 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G17 | 867    | 0     | 29.00  | 0.191508 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G18 | 745    | 1     | 34.38  | 0.248419 | 4       | 1     | 6    | 0     | 0    | 0     |      |       |      |
| G19 | 656    | 0     | 47.03  | 0.204732 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G20 | 817    | 0     | 45.56  | 0.216970 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G21 | 769 | 0 | 48.41 | 0.255282 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 679 | 0 | 43.46 | 0.278938 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 779 | 0 | 46.64 | 0.188974 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 779 | 0 | 47.20 | 0.205644 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 790 | 0 | 35.09 | 0.221646 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 792 | 0 | 47.48 | 0.203849 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 661 | 0 | 43.25 | 0.187349 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 820 | 0 | 45.73 | 0.208628 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 788 | 0 | 45.73 | 0.228861 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 896 | 2 | 28.99 | 0.513499 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32 | 829 | 0 | 45.67 | 0.197800 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.250399 m

total mean elevation : 41.28 degrees

# MP2 obs > 10 : 22916

# qc MP2 slips < 25 : 7

# Rvr L1 slips < 25 : 19

# Rvr L2 slips < 25 : 27

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 122 | 0 | 0.122483 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 322 | 0 | 0.146481 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 769 | 0 | 0.150401 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1286 | 0 | 0.160672 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |    |          |       |
|---------|------|----|----------|-------|
| 65 - 70 | 1440 | 0  | 0.159389 |       |
| 60 - 65 | 1251 | 0  | 0.174408 |       |
| 55 - 60 | 1344 | 0  | 0.182336 |       |
| 50 - 55 | 1265 | 0  | 0.201536 |       |
| 45 - 50 | 1703 | 0  | 0.214582 |       |
| 40 - 45 | 1673 | 0  | 0.205441 |       |
| 35 - 40 | 1573 | 0  | 0.207759 |       |
| 30 - 35 | 1635 | 0  | 0.206597 |       |
| 25 - 30 | 2242 | 0  | 0.228144 |       |
| 20 - 25 | 2107 | 0  | 0.449728 |       |
| 15 - 20 | 2137 | 4  | 0.443504 |       |
| 10 - 15 | 2029 | 3  | 0.314239 |       |
| 5 - 10  | 2063 | 20 | 0.710124 | #     |
| 0 - 5   | 28   | 1  | 1.122245 | ##### |
| < 0     | 0    | 0  | 0.000000 |       |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 123  | 0.812 | 8.927 | ###  |     |     |
| 80 - 85    | 322  | 0.502 | 8.972 | ##   |     |     |
| 75 - 80    | 769  | 0.325 | 8.988 | #    |     |     |
| 70 - 75    | 1286 | 0.251 | 8.993 | #    |     |     |
| 65 - 70    | 1441 | 0.237 | 8.994 | #    |     |     |
| 60 - 65    | 1251 | 0.254 | 8.993 | #    |     |     |
| 55 - 60    | 1344 | 0.245 | 8.993 | #    |     |     |
| 50 - 55    | 1266 | 0.253 | 8.993 | #    |     |     |
| 45 - 50    | 1703 | 0.291 | 8.956 | #    |     |     |

|         |      |       |       |       |  |
|---------|------|-------|-------|-------|--|
| 40 - 45 | 1673 | 0.521 | 8.647 | ##    |  |
| 35 - 40 | 1574 | 0.410 | 8.143 | ##    |  |
| 30 - 35 | 1636 | 0.205 | 7.998 | #     |  |
| 25 - 30 | 2242 | 0.207 | 7.982 | #     |  |
| 20 - 25 | 2109 | 0.461 | 7.753 | ##    |  |
| 15 - 20 | 2144 | 0.514 | 7.084 | ##    |  |
| 10 - 15 | 2037 | 0.535 | 6.698 | ##    |  |
| 5 - 10  | 2073 | 0.723 | 6.242 | ###   |  |
| 0 - 5   | 31   | 1.423 | 5.903 | ##### |  |
| < 0     | 0    | 0.000 | 0.000 |       |  |

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 123  | 0.871 | 8.211 | ###  |     |     |
| 80 - 85    | 322  | 0.558 | 8.096 | ##   |     |     |
| 75 - 80    | 769  | 0.403 | 8.074 | ##   |     |     |
| 70 - 75    | 1286 | 0.335 | 8.060 | #    |     |     |
| 65 - 70    | 1441 | 0.217 | 7.993 | #    |     |     |
| 60 - 65    | 1251 | 0.308 | 7.947 | #    |     |     |
| 55 - 60    | 1344 | 0.501 | 7.703 | ##   |     |     |
| 50 - 55    | 1266 | 0.516 | 7.332 | ##   |     |     |
| 45 - 50    | 1703 | 0.471 | 7.201 | ##   |     |     |
| 40 - 45    | 1673 | 0.484 | 6.886 | ##   |     |     |
| 35 - 40    | 1574 | 0.535 | 6.464 | ##   |     |     |
| 30 - 35    | 1636 | 0.557 | 6.154 | ##   |     |     |
| 25 - 30    | 2242 | 0.613 | 5.744 | ##   |     |     |
| 20 - 25    | 2109 | 0.568 | 5.388 | ##   |     |     |

|         |      |       |       |     |
|---------|------|-------|-------|-----|
| 15 - 20 | 2141 | 0.763 | 4.890 | ### |
| 10 - 15 | 2036 | 0.729 | 4.502 | ### |
| 5 - 10  | 2072 | 0.871 | 4.187 | ### |
| 0 - 5   | 31   | 1.023 | 3.774 | ### |
| < 0     | 0    | 0.000 | 0.000 |     |

\*\*\*\*\*

QC of RINEX file(s) : klok1270.10o

input RnxNAV file(s) : klok1270.10n

\*\*\*\*\*

4-character ID : KLOK

Receiver type : LEICA GRX1200PRO (# = 463363) (fw = 4.03/2.122)

Antenna type : LEIAT504 (# = 103396)

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4564747.7734 1845641.2101 4040947.8479 (m)

antenna WGS 84 (geo) : N 39 deg 33' 53.12" E 22 deg 00' 52.96"

antenna WGS 84 (geo) : 39.564755 deg 22.014710 deg

WGS 84 height : 155.9929 m

[qc - header] position : 34.6071 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30305

Possible obs > 10.0 deg: 23951

Complete obs > 10.0 deg: 20827  
 Deleted obs > 10.0 deg: 14  
 Masked obs < 10.0 deg: 3824  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.254133 m  
 Moving average MP2 : 0.291077 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.97 (sd=1.09 n=20841) 6.64 (sd=1.64 n=20827)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 53) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 1  
 IOD slips > 10.0 deg : 24  
 IOD or MP slips < 10.0\*: 1  
 IOD or MP slips > 10.0 : 27  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 24.00 30 23951 20827 87 0.25 0.29 771

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)



SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1176 | 22.62 | 926 | 27.39 | 537 | 531 | 537 | 531 | 0 | 531 | 537 | 0 |
| G03 | 986  | 32.77 | 687 | 45.60 | 584 | 584 | 584 | 584 | 0 | 584 | 584 | 0 |
| G04 | 1170 | 22.78 | 917 | 27.70 | 831 | 830 | 831 | 830 | 0 | 830 | 831 | 0 |
| G05 | 1157 | 24.09 | 893 | 29.70 | 808 | 808 | 808 | 808 | 0 | 808 | 808 | 0 |
| G06 | 861  | 41.30 | 743 | 47.06 | 618 | 617 | 618 | 617 | 0 | 617 | 618 | 0 |
| G07 | 912  | 38.54 | 728 | 47.45 | 728 | 728 | 728 | 728 | 0 | 728 | 728 | 0 |
| G08 | 896  | 40.88 | 781 | 46.17 | 781 | 781 | 781 | 781 | 0 | 781 | 781 | 0 |
| G09 | 853  | 40.88 | 734 | 46.71 | 473 | 473 | 473 | 473 | 0 | 473 | 473 | 0 |
| G10 | 1090 | 27.47 | 768 | 36.76 | 671 | 671 | 671 | 671 | 0 | 671 | 671 | 0 |
| G11 | 896  | 36.25 | 702 | 45.41 | 597 | 596 | 597 | 596 | 0 | 596 | 597 | 0 |
| G12 | 937  | 40.16 | 828 | 44.79 | 764 | 764 | 764 | 764 | 0 | 764 | 764 | 0 |
| G13 | 917  | 39.80 | 806 | 44.59 | 805 | 805 | 805 | 805 | 0 | 805 | 805 | 0 |
| G14 | 1164 | 23.95 | 925 | 28.86 | 540 | 540 | 540 | 540 | 0 | 540 | 540 | 0 |
| G15 | 1068 | 29.05 | 658 | 43.68 | 565 | 565 | 565 | 565 | 0 | 565 | 565 | 0 |
| G16 | 1126 | 26.65 | 848 | 33.71 | 759 | 759 | 759 | 759 | 0 | 759 | 759 | 0 |
| G17 | 1168 | 23.37 | 921 | 28.31 | 546 | 546 | 546 | 546 | 0 | 546 | 546 | 0 |
| G18 | 1144 | 25.36 | 855 | 32.20 | 625 | 625 | 625 | 625 | 0 | 625 | 625 | 0 |
| G19 | 1048 | 30.61 | 676 | 44.90 | 578 | 578 | 578 | 578 | 0 | 578 | 578 | 0 |
| G20 | 926  | 40.75 | 815 | 45.62 | 728 | 727 | 728 | 727 | 0 | 727 | 728 | 0 |
| G21 | 893  | 42.82 | 778 | 48.42 | 778 | 778 | 778 | 778 | 0 | 778 | 778 | 0 |
| G22 | 1049 | 30.35 | 688 | 44.06 | 688 | 688 | 688 | 688 | 0 | 688 | 688 | 0 |
| G23 | 902  | 41.07 | 787 | 46.34 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G24 | 904  | 41.53 | 787 | 46.96 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G26 | 1104 | 26.59 | 847 | 33.11 | 767 | 767 | 767 | 767 | 0 | 767 | 767 | 0 |
| G27 | 907  | 41.85 | 792 | 47.20 | 660 | 659 | 660 | 659 | 0 | 659 | 660 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1088 | 29.34 | 671 | 43.96 | 671 | 671 | 671 | 671 | 0 | 671 | 671 | 0 |
| G29 | 936  | 40.69 | 826 | 45.45 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G30 | 902  | 40.45 | 787 | 45.63 | 657 | 656 | 657 | 656 | 0 | 656 | 657 | 0 |
| G31 | 1183 | 23.28 | 943 | 27.93 | 858 | 858 | 858 | 858 | 0 | 858 | 858 | 0 |
| G32 | 942  | 40.85 | 834 | 45.48 | 825 | 823 | 825 | 823 | 0 | 823 | 825 | 0 |
| G25 | 1000 | 34.32 | 714 | 46.79 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 31

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 14

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 14

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 20872

Obs deleted (any reason) : 45

Obs complete : 20827

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 116 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 302 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 744 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1248 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

```

65 - 70 1346 0 0.000000
60 - 65 1404 0 0.000000
55 - 60 1303 0 0.000000
50 - 55 1372 0 0.000000
45 - 50 1724 0 0.000000
40 - 45 1698 0 0.000000
35 - 40 1573 0 0.000000
30 - 35 1631 0 0.000000
25 - 30 1545 2 0.000000
20 - 25 1443 2 0.000000
15 - 20 1638 4 0.000000
10 - 15 1714 16 0.000000 =
5 - 10 27 1 0.000000 =====
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | slips L1 rx L2 rx slips L1 rx L2 rx |      |      |      |      |      |
|-----|--------|-------|--------|-------------|-------------------------------------|------|------|------|------|------|
|     |        |       |        |             | < 25                                | < 25 | < 25 | > 25 | > 25 | > 25 |
| G02 | 537    | 6     | 31.53  | 0.301638    | 0                                   | 2    | 2    | 1    | 5    | 2    |
| G03 | 584    | 0     | 50.37  | 0.118108    | 0                                   | 0    | 0    | 0    | 1    | 1    |
| G04 | 831    | 1     | 28.76  | 0.501729    | 0                                   | 4    | 4    | 1    | 1    | 2    |
| G05 | 808    | 0     | 31.01  | 0.370488    | 0                                   | 1    | 1    | 0    | 1    | 1    |
| G06 | 618    | 1     | 52.78  | 0.139173    | 0                                   | 0    | 0    | 0    | 1    | 1    |
| G07 | 728    | 0     | 47.45  | 0.173426    | 0                                   | 0    | 0    | 0    | 0    | 0    |
| G08 | 781    | 0     | 46.17  | 0.198558    | 0                                   | 1    | 1    | 0    | 0    | 0    |
| G09 | 473    | 0     | 60.13  | 0.091349    | 0                                   | 0    | 0    | 0    | 1    | 1    |
| G10 | 671    | 0     | 39.56  | 0.420775    | 4                                   | 6    | 6    | 0    | 1    | 1    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 597 | 1 | 50.16 | 0.140907 | 0 | 0 | 0 | 0 | 1 | 1 |
| G12 | 764 | 0 | 47.31 | 0.150867 | 1 | 2 | 2 | 0 | 0 | 0 |
| G13 | 805 | 0 | 44.73 | 0.174039 | 1 | 2 | 2 | 0 | 0 | 0 |
| G14 | 540 | 0 | 34.28 | 0.536630 | 5 | 9 | 9 | 0 | 0 | 0 |
| G15 | 565 | 0 | 47.96 | 0.121855 | 0 | 0 | 0 | 0 | 1 | 1 |
| G16 | 759 | 0 | 35.63 | 0.626019 | 1 | 3 | 3 | 0 | 1 | 1 |
| G17 | 546 | 0 | 33.63 | 0.215519 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 625 | 0 | 39.05 | 0.220444 | 3 | 3 | 3 | 0 | 0 | 0 |
| G19 | 578 | 0 | 49.46 | 0.112156 | 0 | 0 | 0 | 0 | 1 | 1 |
| G20 | 728 | 1 | 49.15 | 0.207621 | 5 | 6 | 7 | 0 | 0 | 1 |
| G21 | 778 | 0 | 48.42 | 0.198869 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 688 | 0 | 44.17 | 0.211254 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 787 | 0 | 46.34 | 0.150782 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 787 | 0 | 46.99 | 0.337307 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 767 | 0 | 34.83 | 0.291054 | 0 | 2 | 2 | 0 | 1 | 1 |
| G27 | 660 | 1 | 52.79 | 0.148823 | 0 | 0 | 0 | 0 | 1 | 1 |
| G28 | 671 | 0 | 43.96 | 0.187613 | 1 | 1 | 1 | 0 | 0 | 0 |
| G29 | 825 | 0 | 45.55 | 0.150975 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 657 | 1 | 50.81 | 0.178248 | 0 | 0 | 0 | 0 | 1 | 1 |
| G31 | 858 | 0 | 29.00 | 0.589922 | 0 | 1 | 1 | 0 | 1 | 1 |
| G32 | 825 | 2 | 46.04 | 0.160254 | 1 | 2 | 2 | 0 | 0 | 0 |

mean MP1 rms : 0.254138 m

total mean elevation : 43.27 degrees

# MP1 obs > 10 : 20827

# qc MP1 slips < 25 : 22

# Rvr L1 slips < 25 : 50

# Rvr L2 slips < 25 : 51

# qc MP1 slips > 25 : 2

# Rvr L1 slips > 25 : 19

# Rvr L2 slips > 25 : 18

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=%   | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-------|-----|------|-----|
| 85 - 90    | 116      | 0    | 0.081976 |       |     |      |     |
| 80 - 85    | 302      | 0    | 0.076587 |       |     |      |     |
| 75 - 80    | 744      | 0    | 0.084145 |       |     |      |     |
| 70 - 75    | 1248     | 0    | 0.091931 |       |     |      |     |
| 65 - 70    | 1346     | 0    | 0.095775 |       |     |      |     |
| 60 - 65    | 1404     | 0    | 0.092451 |       |     |      |     |
| 55 - 60    | 1303     | 0    | 0.099478 |       |     |      |     |
| 50 - 55    | 1372     | 0    | 0.100740 |       |     |      |     |
| 45 - 50    | 1724     | 0    | 0.114084 |       |     |      |     |
| 40 - 45    | 1698     | 0    | 0.130157 |       |     |      |     |
| 35 - 40    | 1573     | 0    | 0.144409 |       |     |      |     |
| 30 - 35    | 1631     | 0    | 0.226501 |       |     |      |     |
| 25 - 30    | 1545     | 2    | 0.431536 |       |     |      |     |
| 20 - 25    | 1443     | 2    | 0.238811 |       |     |      |     |
| 15 - 20    | 1638     | 2    | 0.370344 |       |     |      |     |
| 10 - 15    | 1714     | 18   | 0.760759 | ##### |     |      |     |
| 5 - 10     | 27       | 1    | 0.719545 | ##### |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |       |     |      |     |
| < 0        | 0        | 0    | 0.000000 |       |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 537 | 6 | 31.53 | 0.323757 | 0 | 2 | 2 | 1 | 5 | 2 |
| G03 | 584 | 0 | 50.37 | 0.119745 | 0 | 0 | 0 | 0 | 1 | 1 |
| G04 | 831 | 1 | 28.76 | 0.677121 | 1 | 4 | 4 | 1 | 1 | 2 |
| G05 | 808 | 0 | 31.01 | 0.417428 | 0 | 1 | 1 | 0 | 1 | 1 |
| G06 | 618 | 1 | 52.78 | 0.130542 | 0 | 0 | 0 | 0 | 1 | 1 |
| G07 | 728 | 0 | 47.45 | 0.190348 | 0 | 0 | 0 | 0 | 0 | 0 |
| G08 | 781 | 0 | 46.17 | 0.209960 | 0 | 1 | 1 | 0 | 0 | 0 |
| G09 | 473 | 0 | 60.13 | 0.134787 | 0 | 0 | 0 | 0 | 1 | 1 |
| G10 | 671 | 0 | 39.56 | 0.706320 | 3 | 6 | 6 | 0 | 1 | 1 |
| G11 | 597 | 1 | 50.16 | 0.162957 | 0 | 0 | 0 | 0 | 1 | 1 |
| G12 | 764 | 0 | 47.31 | 0.142352 | 1 | 2 | 2 | 0 | 0 | 0 |
| G13 | 805 | 0 | 44.73 | 0.170084 | 1 | 2 | 2 | 0 | 0 | 0 |
| G14 | 540 | 0 | 34.28 | 0.782506 | 7 | 9 | 9 | 0 | 0 | 0 |
| G15 | 565 | 0 | 47.96 | 0.160027 | 0 | 0 | 0 | 0 | 1 | 1 |
| G16 | 759 | 0 | 35.63 | 0.446941 | 2 | 3 | 3 | 0 | 1 | 1 |
| G17 | 546 | 0 | 33.63 | 0.249468 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 625 | 0 | 39.05 | 0.212602 | 3 | 3 | 3 | 0 | 0 | 0 |
| G19 | 578 | 0 | 49.46 | 0.136611 | 0 | 0 | 0 | 0 | 1 | 1 |
| G20 | 728 | 1 | 49.15 | 0.266948 | 5 | 6 | 7 | 0 | 0 | 1 |
| G21 | 778 | 0 | 48.42 | 0.512719 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 688 | 0 | 44.17 | 0.208723 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 787 | 0 | 46.34 | 0.151207 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 787 | 0 | 46.99 | 0.545734 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 767 | 0 | 34.83 | 0.272214 | 0 | 2 | 2 | 0 | 1 | 1 |
| G27 | 660 | 1 | 52.79 | 0.158988 | 0 | 0 | 0 | 0 | 1 | 1 |
| G28 | 671 | 0 | 43.96 | 0.261119 | 1 | 1 | 1 | 0 | 0 | 0 |
| G29 | 825 | 0 | 45.55 | 0.217702 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 657 | 1 | 50.81 | 0.227042 | 0 | 0 | 0 | 0 | 1 | 1 |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G31 | 858 | 0 | 29.00 | 0.260911 | 0 | 1 | 1 | 0 | 1 | 1 |
| G32 | 825 | 2 | 46.04 | 0.159530 | 1 | 2 | 2 | 0 | 0 | 0 |

mean MP2 rms : 0.291089 m

total mean elevation : 43.27 degrees

# MP2 obs > 10 : 20827

# qc MP2 slips < 25 : 25

# Rvr L1 slips < 25 : 50

# Rvr L2 slips < 25 : 51

# qc MP2 slips > 25 : 2

# Rvr L1 slips > 25 : 19

# Rvr L2 slips > 25 : 18

| elev (deg) | tot slps | <MP2 rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 116      | 0            | 0.089609 |     |      |     |
| 80 - 85    | 302      | 0            | 0.093102 |     |      |     |
| 75 - 80    | 744      | 0            | 0.096675 |     |      |     |
| 70 - 75    | 1248     | 0            | 0.090309 |     |      |     |
| 65 - 70    | 1346     | 0            | 0.092759 |     |      |     |
| 60 - 65    | 1404     | 0            | 0.097311 |     |      |     |
| 55 - 60    | 1303     | 0            | 0.100310 |     |      |     |
| 50 - 55    | 1372     | 0            | 0.112767 |     |      |     |
| 45 - 50    | 1724     | 0            | 0.108719 |     |      |     |
| 40 - 45    | 1698     | 0            | 0.120406 |     |      |     |
| 35 - 40    | 1573     | 0            | 0.141353 |     |      |     |
| 30 - 35    | 1631     | 0            | 0.198999 |     |      |     |
| 25 - 30    | 1545     | 2            | 0.259856 |     |      |     |
| 20 - 25    | 1443     | 2            | 0.243838 |     |      |     |

```

15 - 20 1638 3 0.470109 |||||
10 - 15 1714 20 1.003809 ##|||
5 - 10 27 1 0.540619 #####|
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 117  | 0.934 | 8.530 | ##### |     |     |
| 80 - 85    | 302  | 0.583 | 8.887 | ##    |     |     |
| 75 - 80    | 744  | 0.356 | 8.969 | #     |     |     |
| 70 - 75    | 1248 | 0.293 | 8.971 | #     |     |     |
| 65 - 70    | 1347 | 0.248 | 8.992 | #     |     |     |
| 60 - 65    | 1404 | 0.240 | 8.994 | #     |     |     |
| 55 - 60    | 1303 | 0.251 | 8.992 | #     |     |     |
| 50 - 55    | 1372 | 0.403 | 8.874 | ##    |     |     |
| 45 - 50    | 1725 | 0.530 | 8.394 | ##    |     |     |
| 40 - 45    | 1699 | 0.354 | 8.091 | #     |     |     |
| 35 - 40    | 1574 | 0.221 | 8.003 | #     |     |     |
| 30 - 35    | 1633 | 0.424 | 7.892 | ##    |     |     |
| 25 - 30    | 1566 | 0.777 | 7.299 | ###   |     |     |
| 20 - 25    | 1445 | 0.422 | 6.940 | ##    |     |     |
| 15 - 20    | 1640 | 0.544 | 6.436 | ##    |     |     |
| 10 - 15    | 1722 | 0.568 | 5.870 | ##    |     |     |
| 5 - 10     | 31   | 1.177 | 5.419 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |
| < 0        | 0    | 0.000 | 0.000 |       |     |     |



S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 117  | 0.921 | 8.658 | ####  |     |     |
| 80 - 85    | 302  | 0.698 | 8.444 | ###   |     |     |
| 75 - 80    | 744  | 0.569 | 8.345 | ##    |     |     |
| 70 - 75    | 1248 | 0.549 | 8.416 | ##    |     |     |
| 65 - 70    | 1347 | 0.509 | 8.286 | ##    |     |     |
| 60 - 65    | 1404 | 0.377 | 8.099 | ##    |     |     |
| 55 - 60    | 1303 | 0.227 | 7.992 | #     |     |     |
| 50 - 55    | 1372 | 0.451 | 7.795 | ##    |     |     |
| 45 - 50    | 1725 | 0.523 | 7.391 | ##    |     |     |
| 40 - 45    | 1699 | 0.527 | 7.099 | ##    |     |     |
| 35 - 40    | 1574 | 0.625 | 6.639 | ###   |     |     |
| 30 - 35    | 1632 | 0.755 | 6.029 | ###   |     |     |
| 25 - 30    | 1555 | 0.875 | 5.276 | ####  |     |     |
| 20 - 25    | 1445 | 0.725 | 4.938 | ###   |     |     |
| 15 - 20    | 1640 | 0.680 | 4.418 | ###   |     |     |
| 10 - 15    | 1720 | 0.821 | 3.878 | ###   |     |     |
| 5 - 10     | 31   | 1.174 | 3.613 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |
| < 0        | 0    | 0.000 | 0.000 |       |     |     |

\*\*\*\*\*

QC of RINEX file(s) : lemn1270.10o

input RnxNAV file(s) : lemn1270.10n

\*\*\*\*\*

4-character ID : LEMN

Receiver type : LEICA GRX1200GGPRO (# = 351610) (fw = 5.00/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4434465.2247 2084894.9752 4069319.3303 (m)

antenna WGS 84 (geo) : N 39 deg 53' 50.08" E 25 deg 10' 51.22"

antenna WGS 84 (geo) : 39.897246 deg 25.180893 deg

WGS 84 height : 125.1651 m

[qc - header] position : 33.6841 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 29

NAVSTAR GPS SVs w/o OBS : 1 9 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 29609

Possible obs > 10.0 deg: 23349

Complete obs > 10.0 deg: 23316  
 Deleted obs > 10.0 deg: 0  
 Masked obs < 10.0 deg: 2270  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.218528 m  
 Moving average MP2 : 0.272661 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.17 (sd=0.87 n=23316) 6.09 (sd=1.35 n=23316)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 2) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 1  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 1  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 24.00 30 23349 23316 100 0.22 0.27 23316

Processing parameters are:

Receiver tracking capability : 26 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

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|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1169 | 22.99 | 916 | 27.96 | 915 | 915 | 915 | 915 | 0 | 915 | 915 | 0 |
| G03 | 1023 | 30.75 | 673 | 44.69 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G04 | 1173 | 22.56 | 924 | 27.30 | 922 | 922 | 922 | 922 | 0 | 922 | 922 | 0 |
| G05 | 1165 | 23.66 | 907 | 28.92 | 905 | 905 | 905 | 905 | 0 | 905 | 905 | 0 |
| G06 | 936  | 36.85 | 729 | 46.46 | 728 | 728 | 728 | 728 | 0 | 728 | 728 | 0 |
| G07 | 858  | 41.63 | 740 | 47.48 | 740 | 740 | 740 | 740 | 0 | 740 | 740 | 0 |
| G08 | 904  | 40.69 | 791 | 45.80 | 791 | 791 | 791 | 791 | 0 | 791 | 791 | 0 |
| G10 | 1106 | 26.53 | 815 | 34.16 | 811 | 811 | 811 | 811 | 0 | 811 | 811 | 0 |
| G11 | 971  | 32.39 | 687 | 44.51 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |
| G12 | 932  | 40.36 | 823 | 45.04 | 823 | 823 | 823 | 823 | 0 | 823 | 823 | 0 |
| G13 | 921  | 39.71 | 810 | 44.47 | 810 | 810 | 810 | 810 | 0 | 810 | 810 | 0 |
| G14 | 1157 | 24.38 | 914 | 29.54 | 913 | 913 | 913 | 913 | 0 | 913 | 913 | 0 |
| G15 | 1087 | 27.91 | 746 | 38.19 | 739 | 739 | 739 | 739 | 0 | 739 | 739 | 0 |
| G16 | 1139 | 25.88 | 873 | 32.23 | 870 | 870 | 870 | 870 | 0 | 870 | 870 | 0 |
| G17 | 1161 | 23.81 | 909 | 29.03 | 907 | 907 | 907 | 907 | 0 | 907 | 907 | 0 |
| G18 | 1130 | 26.23 | 824 | 34.05 | 822 | 822 | 822 | 822 | 0 | 822 | 822 | 0 |
| G19 | 1070 | 29.28 | 661 | 43.92 | 660 | 660 | 660 | 660 | 0 | 660 | 660 | 0 |
| G20 | 919  | 40.96 | 807 | 45.95 | 807 | 807 | 807 | 807 | 0 | 807 | 807 | 0 |
| G21 | 903  | 42.84 | 789 | 48.31 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G22 | 1024 | 31.91 | 701 | 44.95 | 701 | 701 | 701 | 701 | 0 | 701 | 701 | 0 |
| G23 | 909  | 40.93 | 796 | 46.04 | 796 | 796 | 796 | 796 | 0 | 796 | 796 | 0 |
| G24 | 912  | 41.43 | 797 | 46.69 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G26 | 1116 | 25.92 | 867 | 31.92 | 865 | 865 | 865 | 865 | 0 | 865 | 865 | 0 |
| G27 | 892  | 42.07 | 777 | 47.55 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G28 | 1074 | 30.46 | 685 | 44.92 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G29 | 939  | 40.69 | 829 | 45.42 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G30 | 890  | 40.78 | 774 | 46.14 | 774 | 774 | 774 | 774 | 0 | 774 | 774 | 0 |
| G31 | 1186 | 23.12 | 949 | 27.66 | 946 | 946 | 946 | 946 | 0 | 946 | 946 | 0 |
| G32 | 943  | 40.89 | 836 | 45.49 | 836 | 836 | 836 | 836 | 0 | 836 | 836 | 0 |
| G01 | 906  | 40.86 | 790 | 46.13 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G09 | 838  | 41.14 | 719 | 47.14 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G25 | 969  | 36.22 | 728 | 47.23 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 35

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 0

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 0

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23351

Obs deleted (any reason) : 35

Obs complete : 23316

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 86       | 0            | 0.000000 |     |      |     |
| 80 - 85    | 236      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 641      | 0            | 0.000000 |     |      |     |

|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1160 | 0 | 0.000000 |
| 65 - 70 | 1320 | 0 | 0.000000 |
| 60 - 65 | 1387 | 0 | 0.000000 |
| 55 - 60 | 1252 | 0 | 0.000000 |
| 50 - 55 | 1491 | 0 | 0.000000 |
| 45 - 50 | 1523 | 0 | 0.000000 |
| 40 - 45 | 1687 | 0 | 0.000000 |
| 35 - 40 | 1550 | 0 | 0.000000 |
| 30 - 35 | 1728 | 0 | 0.000000 |
| 25 - 30 | 1904 | 0 | 0.000000 |
| 20 - 25 | 2364 | 0 | 0.000000 |
| 15 - 20 | 2339 | 0 | 0.000000 |
| 10 - 15 | 2622 | 1 | 0.000000 |
| 5 - 10  | 32   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     | slips  |       | L1 rx  |          | L2 rx   |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25 | < 25  | < 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 915    | 0     | 28.07  | 0.518643 | 1       | 3    | 3     | 0    | 0     | 0    |       |      |
| G03 | 672    | 0     | 44.86  | 0.152542 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G04 | 922    | 0     | 27.42  | 0.169249 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G05 | 905    | 0     | 29.05  | 0.162962 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |
| G06 | 728    | 0     | 46.61  | 0.348589 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G07 | 740    | 0     | 47.59  | 0.125559 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G08 | 791    | 0     | 45.90  | 0.123865 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G10 | 811    | 0     | 34.38  | 0.182741 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 687 | 0 | 44.63 | 0.156305 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 823 | 0 | 45.14 | 0.187174 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 810 | 0 | 44.57 | 0.151689 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 913 | 0 | 29.56 | 0.290033 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 739 | 0 | 38.56 | 0.174936 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 870 | 0 | 32.35 | 0.193695 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 907 | 0 | 29.16 | 0.291360 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 822 | 0 | 34.18 | 0.239957 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 660 | 0 | 44.09 | 0.146350 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 807 | 0 | 46.05 | 0.193052 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 789 | 0 | 48.32 | 0.130015 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 701 | 0 | 45.06 | 0.458266 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 796 | 0 | 46.04 | 0.136900 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 797 | 0 | 46.72 | 0.137023 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 865 | 0 | 32.06 | 0.167203 | 0 | 2 | 2 | 0 | 0 | 0 |
| G27 | 777 | 0 | 47.66 | 0.211925 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 684 | 0 | 44.97 | 0.163562 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 829 | 0 | 45.48 | 0.157524 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 774 | 0 | 46.23 | 0.299937 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 946 | 0 | 27.80 | 0.428817 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 836 | 0 | 45.58 | 0.154736 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.218527 m

total mean elevation : 39.72 degrees

# MP1 obs > 10 : 23316

# qc MP1 slips < 25 : 1

# Rvr L1 slips < 25 : 34

# Rvr L2 slips < 25 : 34



# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 86        | 0    | 0.061190 |     |     |      |     |
| 80 - 85    | 236       | 0    | 0.067910 |     |     |      |     |
| 75 - 80    | 641       | 0    | 0.067050 |     |     |      |     |
| 70 - 75    | 1160      | 0    | 0.068682 |     |     |      |     |
| 65 - 70    | 1320      | 0    | 0.080526 |     |     |      |     |
| 60 - 65    | 1387      | 0    | 0.085400 |     |     |      |     |
| 55 - 60    | 1252      | 0    | 0.098414 |     |     |      |     |
| 50 - 55    | 1491      | 0    | 0.118455 |     |     |      |     |
| 45 - 50    | 1523      | 0    | 0.120876 |     |     |      |     |
| 40 - 45    | 1687      | 0    | 0.131837 |     |     |      |     |
| 35 - 40    | 1550      | 0    | 0.154129 |     |     |      |     |
| 30 - 35    | 1728      | 0    | 0.173033 |     |     |      |     |
| 25 - 30    | 1904      | 0    | 0.205692 |     |     |      |     |
| 20 - 25    | 2364      | 0    | 0.254318 |     |     |      |     |
| 15 - 20    | 2339      | 0    | 0.275255 |     |     |      |     |
| 10 - 15    | 2622      | 1    | 0.542455 |     |     |      |     |
| 5 - 10     | 32        | 0    | 0.482776 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 915 | 0 | 28.07 | 0.555984 | 1 | 3 | 3 | 0 | 0 | 0 |
| G03 | 672 | 0 | 44.86 | 0.214750 | 0 | 1 | 1 | 0 | 0 | 0 |
| G04 | 922 | 0 | 27.42 | 0.446127 | 0 | 1 | 1 | 0 | 0 | 0 |
| G05 | 905 | 0 | 29.05 | 0.188720 | 0 | 2 | 2 | 0 | 0 | 0 |
| G06 | 728 | 0 | 46.61 | 0.470906 | 0 | 1 | 1 | 0 | 0 | 0 |
| G07 | 740 | 0 | 47.59 | 0.162553 | 0 | 1 | 1 | 0 | 0 | 0 |
| G08 | 791 | 0 | 45.90 | 0.149237 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 811 | 0 | 34.38 | 0.240608 | 0 | 2 | 2 | 0 | 0 | 0 |
| G11 | 687 | 0 | 44.63 | 0.217534 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 823 | 0 | 45.14 | 0.221604 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 810 | 0 | 44.57 | 0.197512 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 913 | 0 | 29.56 | 0.315779 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 739 | 0 | 38.56 | 0.250957 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 870 | 0 | 32.35 | 0.228901 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 907 | 0 | 29.16 | 0.314562 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 822 | 0 | 34.18 | 0.354328 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 660 | 0 | 44.09 | 0.219177 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 807 | 0 | 46.05 | 0.239972 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 789 | 0 | 48.32 | 0.193568 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 701 | 0 | 45.06 | 0.548624 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 796 | 0 | 46.04 | 0.143706 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 797 | 0 | 46.72 | 0.154044 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 865 | 0 | 32.06 | 0.384328 | 0 | 2 | 2 | 0 | 0 | 0 |
| G27 | 777 | 0 | 47.66 | 0.247086 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 684 | 0 | 44.97 | 0.216936 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 829 | 0 | 45.48 | 0.172329 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 774 | 0 | 46.23 | 0.239530 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 946 | 0 | 27.80 | 0.346191 | 0 | 2 | 2 | 0 | 0 | 0 |

G32 836 0 45.58 0.195396 0 1 1 0 0 0

mean MP2 rms : 0.272664 m

total mean elevation : 39.72 degrees

# MP2 obs > 10 : 23316

# qc MP2 slips < 25 : 1

# Rvr L1 slips < 25 : 34

# Rvr L2 slips < 25 : 34

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 86 0 0.096668 ||

80 - 85 236 0 0.084588 ||

75 - 80 641 0 0.088209 ||

70 - 75 1160 0 0.097934 ||

65 - 70 1320 0 0.102210 ||

60 - 65 1387 0 0.102514 ||

55 - 60 1252 0 0.106676 ||

50 - 55 1491 0 0.122977 ||

45 - 50 1523 0 0.134972 |||

40 - 45 1687 0 0.155300 |||

35 - 40 1550 0 0.184210 ||||

30 - 35 1728 0 0.201899 ||||

25 - 30 1904 0 0.277658 |||||

20 - 25 2364 0 0.313363 |||||

15 - 20 2339 0 0.344515 |||||

```

10 - 15 2622 1 0.658311 |||||
5 - 10 32 0 0.332596 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 87 0.965 8.897 #####|||
80 - 85 236 0.586 8.962 ##|||
75 - 80 641 0.355 8.986 #|||
70 - 75 1160 0.266 8.991 #|||
65 - 70 1321 0.248 8.993 #|||
60 - 65 1387 0.242 8.994 #|||
55 - 60 1252 0.254 8.993 #|||
50 - 55 1491 0.233 8.994 #|||
45 - 50 1524 0.337 8.928 #|||
40 - 45 1688 0.525 8.633 ##|||
35 - 40 1551 0.359 8.090 #|||
30 - 35 1728 0.213 7.998 #|||
25 - 30 1904 0.320 7.922 #|||
20 - 25 2364 0.508 7.654 ##|||
15 - 20 2342 0.475 7.156 ##|||
10 - 15 2640 0.504 6.742 ##|||
5 - 10 35 1.215 6.371 #####|||
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 87   | 0.866 | 7.920 | ###  |     |     |
| 80 - 85    | 236  | 0.602 | 7.856 | ##   |     |     |
| 75 - 80    | 641  | 0.398 | 7.924 | ##   |     |     |
| 70 - 75    | 1160 | 0.435 | 7.834 | ##   |     |     |
| 65 - 70    | 1321 | 0.504 | 7.696 | ##   |     |     |
| 60 - 65    | 1387 | 0.531 | 7.406 | ##   |     |     |
| 55 - 60    | 1252 | 0.476 | 7.238 | ##   |     |     |
| 50 - 55    | 1491 | 0.431 | 7.161 | ##   |     |     |
| 45 - 50    | 1524 | 0.480 | 6.826 | ##   |     |     |
| 40 - 45    | 1688 | 0.520 | 6.434 | ##   |     |     |
| 35 - 40    | 1551 | 0.565 | 6.204 | ##   |     |     |
| 30 - 35    | 1728 | 0.651 | 5.791 | ###  |     |     |
| 25 - 30    | 1904 | 0.609 | 5.346 | ##   |     |     |
| 20 - 25    | 2364 | 0.703 | 5.122 | ###  |     |     |
| 15 - 20    | 2342 | 0.669 | 4.611 | ###  |     |     |
| 10 - 15    | 2640 | 0.684 | 4.188 | ###  |     |     |
| 5 - 10     | 35   | 0.950 | 3.743 | ###  |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : noa11270.10o

input RnxNAV file(s) : noa11270.10n

\*\*\*\*\*

4-character ID : NOA1 (# = 12620M001)

Receiver type : LEICA GRX1200PRO (# = 462590) (fw = 7.53/2.125)

Antenna type : LEIAT504 LEIS (# = 103326)

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4599644.1821 2034859.4312 3909899.4122 (m)

antenna WGS 84 (geo) : N 38 deg 02' 49.35" E 23 deg 51' 51.69"

antenna WGS 84 (geo) : 38.047043 deg 23.864357 deg

WGS 84 height : 555.0837 m

[qc - header] position : 34.8947 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30372

Possible obs > 10.0 deg: 24065

Complete obs > 10.0 deg: 24019  
 Deleted obs > 10.0 deg: 10  
 Masked obs < 10.0 deg: 758  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.183534 m  
 Moving average MP2 : 0.223326 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.97 (sd=1.07 n=24029) 6.41 (sd=1.66 n=24019)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 196) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 59  
 IOD slips > 10.0 deg : 22  
 IOD or MP slips < 10.0\*: 77  
 IOD or MP slips > 10.0 : 28  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 24.00 30 24065 24019 100 0.18 0.22 858

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)



SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1177 | 22.61 | 920 | 27.54 | 920 | 920 | 920 | 920 | 0 | 920 | 920 | 0 |
| G03 | 989  | 32.28 | 684 | 45.21 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G04 | 1176 | 22.45 | 922 | 27.27 | 922 | 922 | 922 | 922 | 0 | 922 | 922 | 0 |
| G05 | 1165 | 23.61 | 898 | 29.13 | 896 | 896 | 896 | 896 | 0 | 896 | 896 | 0 |
| G06 | 860  | 40.95 | 740 | 46.79 | 740 | 740 | 740 | 740 | 0 | 740 | 740 | 0 |
| G07 | 861  | 41.39 | 741 | 47.30 | 741 | 741 | 741 | 741 | 0 | 741 | 741 | 0 |
| G08 | 911  | 40.31 | 796 | 45.41 | 796 | 796 | 796 | 796 | 0 | 796 | 796 | 0 |
| G09 | 852  | 40.78 | 732 | 46.65 | 708 | 708 | 708 | 708 | 0 | 708 | 708 | 0 |
| G10 | 1096 | 26.92 | 778 | 35.78 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G11 | 902  | 35.62 | 699 | 45.07 | 699 | 699 | 699 | 699 | 0 | 699 | 699 | 0 |
| G12 | 947  | 39.68 | 837 | 44.24 | 837 | 837 | 837 | 837 | 0 | 837 | 837 | 0 |
| G13 | 933  | 39.10 | 820 | 43.81 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G14 | 1162 | 23.96 | 916 | 29.06 | 914 | 914 | 914 | 914 | 0 | 914 | 914 | 0 |
| G15 | 1072 | 28.51 | 654 | 43.10 | 654 | 654 | 654 | 654 | 0 | 654 | 654 | 0 |
| G16 | 1131 | 26.11 | 853 | 32.96 | 853 | 853 | 853 | 853 | 0 | 853 | 853 | 0 |
| G17 | 1167 | 23.41 | 911 | 28.58 | 911 | 911 | 911 | 911 | 0 | 911 | 911 | 0 |
| G18 | 1132 | 25.87 | 823 | 33.64 | 819 | 818 | 819 | 818 | 0 | 818 | 819 | 0 |
| G19 | 1050 | 30.10 | 672 | 44.40 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G20 | 935  | 40.31 | 823 | 45.12 | 823 | 823 | 823 | 823 | 0 | 823 | 823 | 0 |
| G21 | 910  | 42.49 | 792 | 48.08 | 792 | 792 | 792 | 792 | 0 | 792 | 792 | 0 |
| G22 | 1016 | 31.89 | 700 | 44.74 | 700 | 700 | 700 | 700 | 0 | 700 | 700 | 0 |
| G23 | 918  | 40.48 | 803 | 45.56 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G24 | 920  | 41.02 | 803 | 46.27 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G26 | 1111 | 26.07 | 853 | 32.43 | 852 | 844 | 852 | 844 | 0 | 844 | 852 | 0 |
| G27 | 908  | 41.61 | 791 | 47.02 | 791 | 791 | 791 | 791 | 0 | 791 | 791 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1067 | 30.27 | 682 | 44.64 | 680 | 679 | 680 | 679 | 0 | 679 | 680 | 0 |
| G29 | 951  | 40.10 | 839 | 44.78 | 839 | 839 | 839 | 839 | 0 | 839 | 839 | 0 |
| G30 | 908  | 40.12 | 790 | 45.38 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G31 | 1189 | 22.91 | 945 | 27.55 | 945 | 945 | 945 | 945 | 0 | 945 | 945 | 0 |
| G32 | 956  | 40.27 | 848 | 44.76 | 848 | 848 | 848 | 848 | 0 | 848 | 848 | 0 |
| G25 | 938  | 37.15 | 727 | 47.05 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 2618

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 10

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 10

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 26647

Obs deleted (any reason) : 2628

Obs complete : 24019

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |    |   |          |  |  |  |
|---------|----|---|----------|--|--|--|
| 85 - 90 | 79 | 0 | 0.000000 |  |  |  |
|---------|----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 287 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 705 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1049 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 699 | 0 | 45.07 | 0.117829 | 1 | 0 | 0 | 0 | 0 | 0 |
| G12 | 837 | 0 | 44.24 | 0.110913 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 820 | 0 | 43.81 | 0.127430 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 914 | 0 | 29.10 | 0.225338 | 6 | 0 | 0 | 0 | 0 | 0 |
| G15 | 654 | 0 | 43.10 | 0.141871 | 1 | 0 | 0 | 0 | 0 | 0 |
| G16 | 853 | 0 | 33.01 | 0.352189 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 911 | 0 | 28.58 | 0.145936 | 1 | 0 | 0 | 0 | 0 | 0 |
| G18 | 819 | 1 | 33.84 | 0.253273 | 7 | 0 | 0 | 0 | 0 | 0 |
| G19 | 672 | 0 | 44.40 | 0.259127 | 1 | 0 | 0 | 0 | 0 | 0 |
| G20 | 823 | 0 | 45.12 | 0.115443 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 792 | 0 | 48.09 | 0.129661 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 700 | 0 | 44.84 | 0.187881 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 803 | 0 | 45.56 | 0.113351 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 803 | 0 | 46.30 | 0.124998 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 852 | 8 | 32.66 | 0.165901 | 2 | 0 | 0 | 0 | 0 | 0 |
| G27 | 791 | 0 | 47.02 | 0.174625 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 680 | 1 | 44.80 | 0.151038 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 839 | 0 | 44.84 | 0.113589 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 790 | 0 | 45.47 | 0.107900 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 945 | 0 | 27.62 | 0.154819 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 848 | 0 | 44.76 | 0.105469 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.183531 m

total mean elevation : 39.92 degrees

# MP1 obs > 10 : 24019

# qc MP1 slips < 25 : 25

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP1 slips > 25 : 1

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=%   | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-------|-----|------|-----|
| 85 - 90    | 79       | 0    | 0.065988 |       |     |      |     |
| 80 - 85    | 287      | 0    | 0.074928 |       |     |      |     |
| 75 - 80    | 705      | 0    | 0.059567 |       |     |      |     |
| 70 - 75    | 1049     | 0    | 0.068755 |       |     |      |     |
| 65 - 70    | 1469     | 0    | 0.078349 |       |     |      |     |
| 60 - 65    | 1485     | 0    | 0.071848 |       |     |      |     |
| 55 - 60    | 1313     | 0    | 0.070606 |       |     |      |     |
| 50 - 55    | 1513     | 0    | 0.088440 |       |     |      |     |
| 45 - 50    | 1630     | 0    | 0.085585 |       |     |      |     |
| 40 - 45    | 1752     | 0    | 0.091615 |       |     |      |     |
| 35 - 40    | 1618     | 0    | 0.090754 |       |     |      |     |
| 30 - 35    | 1700     | 1    | 0.111797 |       |     |      |     |
| 25 - 30    | 2023     | 0    | 0.144592 |       |     |      |     |
| 20 - 25    | 2342     | 0    | 0.174605 |       |     |      |     |
| 15 - 20    | 2422     | 2    | 0.299898 |       |     |      |     |
| 10 - 15    | 2623     | 23   | 0.507034 | #     |     |      |     |
| 5 - 10     | 2553     | 72   | 0.550183 | ##### |     |      |     |
| 0 - 5      | 30       | 2    | 0.250631 | ##### |     |      |     |
| < 0        | 0        | 0    | 0.000000 |       |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 920 | 0 | 27.54 | 0.354812 | 0 | 0 | 0 | 0 | 0 | 0 |
| G03 | 684 | 0 | 45.21 | 0.638917 | 0 | 0 | 0 | 0 | 0 | 0 |
| G04 | 922 | 0 | 27.27 | 0.251722 | 2 | 0 | 0 | 0 | 0 | 0 |
| G05 | 896 | 0 | 29.17 | 0.246078 | 3 | 0 | 0 | 0 | 0 | 0 |
| G06 | 740 | 0 | 46.88 | 0.230622 | 1 | 0 | 0 | 0 | 0 | 0 |
| G07 | 741 | 0 | 47.30 | 0.139814 | 0 | 0 | 0 | 0 | 0 | 0 |
| G08 | 796 | 0 | 45.41 | 0.102091 | 0 | 0 | 0 | 0 | 0 | 0 |
| G09 | 708 | 0 | 47.23 | 0.145819 | 0 | 0 | 0 | 1 | 0 | 0 |
| G10 | 777 | 0 | 35.81 | 0.668123 | 0 | 0 | 0 | 0 | 0 | 0 |
| G11 | 699 | 0 | 45.07 | 0.232688 | 1 | 0 | 0 | 0 | 0 | 0 |
| G12 | 837 | 0 | 44.24 | 0.122403 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 820 | 0 | 43.81 | 0.186004 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 914 | 0 | 29.10 | 0.254951 | 6 | 0 | 0 | 0 | 0 | 0 |
| G15 | 654 | 0 | 43.10 | 0.145580 | 1 | 0 | 0 | 0 | 0 | 0 |
| G16 | 853 | 0 | 33.01 | 0.264211 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 911 | 0 | 28.58 | 0.185752 | 1 | 0 | 0 | 0 | 0 | 0 |
| G18 | 819 | 1 | 33.84 | 0.456672 | 7 | 0 | 0 | 0 | 0 | 0 |
| G19 | 672 | 0 | 44.40 | 0.121721 | 1 | 0 | 0 | 0 | 0 | 0 |
| G20 | 823 | 0 | 45.12 | 0.132309 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 792 | 0 | 48.09 | 0.157634 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 700 | 0 | 44.84 | 0.278492 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 803 | 0 | 45.56 | 0.100777 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 803 | 0 | 46.30 | 0.141513 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 852 | 8 | 32.66 | 0.203460 | 2 | 0 | 0 | 0 | 0 | 0 |
| G27 | 791 | 0 | 47.02 | 0.156415 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 680 | 1 | 44.80 | 0.227630 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 839 | 0 | 44.84 | 0.145422 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 790 | 0 | 45.47 | 0.135686 | 0 | 0 | 0 | 0 | 0 | 0 |

G31 945 0 27.62 0.182112 0 0 0 0 0 0  
 G32 848 0 44.76 0.117680 0 0 0 0 0 0

mean MP2 rms : 0.223326 m

total mean elevation : 39.92 degrees

# MP2 obs > 10 : 24019

# qc MP2 slips < 25 : 25

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 1

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 79 0 0.077410 ||  
 80 - 85 287 0 0.081647 ||  
 75 - 80 705 0 0.069012 |  
 70 - 75 1049 0 0.066182 |  
 65 - 70 1469 0 0.071169 |  
 60 - 65 1485 0 0.069234 |  
 55 - 60 1313 0 0.079523 ||  
 50 - 55 1513 0 0.078195 ||  
 45 - 50 1630 0 0.087780 ||  
 40 - 45 1752 0 0.093538 ||  
 35 - 40 1618 0 0.104793 ||  
 30 - 35 1700 1 0.120373 ||  
 25 - 30 2023 0 0.143718 |||  
 20 - 25 2342 0 0.205507 ||||

```

15 - 20 2422 2 0.396646 |||||
10 - 15 2623 23 0.635078 #|||||
5 - 10 2553 68 1.030132 #####|
0 - 5 30 2 0.456477 #####===
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 80 1.049 8.750 #####|
80 - 85 287 0.555 8.941 ##|
75 - 80 705 0.339 8.987 #|
70 - 75 1049 0.278 8.991 #|
65 - 70 1470 0.235 8.994 #|
60 - 65 1485 0.234 8.994 #|
55 - 60 1313 0.248 8.993 #|
50 - 55 1513 0.238 8.991 #|
45 - 50 1631 0.387 8.880 ##|
40 - 45 1753 0.523 8.365 ##|
35 - 40 1619 0.222 8.005 #|
30 - 35 1700 0.206 7.991 #|
25 - 30 2023 0.456 7.765 ##|
20 - 25 2342 0.423 7.114 ##|
15 - 20 2426 0.487 6.689 ##|
10 - 15 2633 0.499 6.075 ##|
5 - 10 2587 0.576 5.556 ##|
0 - 5 31 1.016 5.032 #####|
< 0 0 0.000 0.000

```



S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 80   | 1.079 | 8.500 | #### |     |     |
| 80 - 85    | 287  | 0.706 | 8.432 | ###  |     |     |
| 75 - 80    | 705  | 0.578 | 8.363 | ##   |     |     |
| 70 - 75    | 1049 | 0.558 | 8.416 | ##   |     |     |
| 65 - 70    | 1470 | 0.509 | 8.299 | ##   |     |     |
| 60 - 65    | 1485 | 0.361 | 8.090 | #    |     |     |
| 55 - 60    | 1313 | 0.226 | 7.995 | #    |     |     |
| 50 - 55    | 1513 | 0.399 | 7.858 | ##   |     |     |
| 45 - 50    | 1631 | 0.531 | 7.445 | ##   |     |     |
| 40 - 45    | 1753 | 0.484 | 7.095 | ##   |     |     |
| 35 - 40    | 1619 | 0.532 | 6.494 | ##   |     |     |
| 30 - 35    | 1700 | 0.625 | 6.121 | ###  |     |     |
| 25 - 30    | 2023 | 0.605 | 5.425 | ##   |     |     |
| 20 - 25    | 2342 | 0.674 | 5.076 | ###  |     |     |
| 15 - 20    | 2426 | 0.642 | 4.418 | ###  |     |     |
| 10 - 15    | 2623 | 0.747 | 3.924 | ###  |     |     |
| 5 - 10     | 2574 | 0.976 | 3.435 | #### |     |     |
| 0 - 5      | 30   | 1.074 | 3.133 | #### |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : nvrk1270.10o

input RnxNAV file(s) : nvrk1270.10n

\*\*\*\*\*

4-character ID : NVRK

Receiver type : LEICA GRX1200GGPRO (# = 351602) (fw = 5.62/3.014)

Antenna type : LEIAX1202GG

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4386259.3287 1940978.3234 4190914.4086 (m)

antenna WGS 84 (geo) : N 41 deg 20' 8.68" E 23 deg 52' 12.11"

antenna WGS 84 (geo) : 41.335743 deg 23.870030 deg

WGS 84 height : 639.5534 m

[qc - header] position : 30.4602 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30527

Possible obs > 10.0 deg: 23980

Complete obs > 10.0 deg: 23835  
 Deleted obs > 10.0 deg: 3  
 Masked obs < 10.0 deg: 858  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.265824 m  
 Moving average MP2 : 0.321478 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.16 (sd=0.92 n=23838) 6.21 (sd=1.33 n=23835)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 27) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 1  
 IOD slips > 10.0 deg : 10  
 IOD or MP slips < 10.0\*: 1  
 IOD or MP slips > 10.0 : 12  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 24.00 30 23980 23835 99 0.27 0.32 1986

Processing parameters are:

Receiver tracking capability : 26 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1168 | 23.02 | 922 | 27.84 | 916 | 916 | 916 | 916 | 0 | 916 | 916 | 0 |
| G03 | 1025 | 30.93 | 674 | 44.93 | 673 | 673 | 673 | 673 | 0 | 673 | 673 | 0 |
| G04 | 1168 | 22.82 | 922 | 27.59 | 920 | 920 | 920 | 920 | 0 | 920 | 920 | 0 |
| G05 | 1161 | 23.98 | 909 | 29.23 | 906 | 906 | 906 | 906 | 0 | 906 | 906 | 0 |
| G06 | 957  | 36.26 | 730 | 46.64 | 729 | 729 | 729 | 729 | 0 | 729 | 729 | 0 |
| G07 | 945  | 37.44 | 729 | 47.66 | 728 | 728 | 728 | 728 | 0 | 728 | 728 | 0 |
| G08 | 890  | 41.23 | 778 | 46.45 | 778 | 778 | 778 | 778 | 0 | 778 | 778 | 0 |
| G09 | 892  | 38.73 | 720 | 47.18 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G10 | 1102 | 26.91 | 813 | 34.63 | 810 | 809 | 810 | 809 | 0 | 809 | 810 | 0 |
| G11 | 973  | 32.51 | 688 | 44.70 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |
| G12 | 922  | 40.82 | 814 | 45.57 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G13 | 907  | 40.31 | 798 | 45.13 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G14 | 1159 | 24.40 | 922 | 29.39 | 916 | 916 | 916 | 916 | 0 | 916 | 916 | 0 |
| G15 | 1088 | 28.19 | 748 | 38.55 | 723 | 721 | 723 | 721 | 0 | 721 | 723 | 0 |
| G16 | 1135 | 26.29 | 872 | 32.69 | 870 | 870 | 870 | 870 | 0 | 870 | 870 | 0 |
| G17 | 1162 | 23.81 | 917 | 28.84 | 911 | 911 | 911 | 911 | 0 | 911 | 911 | 0 |
| G18 | 1138 | 25.88 | 850 | 32.91 | 848 | 848 | 848 | 848 | 0 | 848 | 848 | 0 |
| G19 | 1071 | 29.56 | 664 | 44.20 | 663 | 663 | 663 | 663 | 0 | 663 | 663 | 0 |
| G20 | 911  | 41.32 | 800 | 46.37 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G21 | 890  | 43.06 | 776 | 48.66 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G22 | 1050 | 30.73 | 691 | 44.47 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |
| G23 | 895  | 41.45 | 783 | 46.67 | 783 | 783 | 783 | 783 | 0 | 783 | 783 | 0 |
| G24 | 898  | 41.88 | 784 | 47.24 | 784 | 784 | 784 | 784 | 0 | 784 | 784 | 0 |
| G26 | 1113 | 26.25 | 866 | 32.32 | 859 | 859 | 859 | 859 | 0 | 859 | 859 | 0 |
| G27 | 889  | 42.32 | 776 | 47.75 | 776 | 776 | 776 | 776 | 0 | 776 | 776 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1091 | 29.74 | 675 | 44.49 | 667 | 667 | 667 | 667 | 0 | 667 | 667 | 0 |
| G29 | 927  | 41.15 | 817 | 46.03 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |
| G30 | 885  | 41.02 | 771 | 46.35 | 771 | 771 | 771 | 771 | 0 | 771 | 771 | 0 |
| G31 | 1184 | 23.37 | 947 | 27.98 | 943 | 943 | 943 | 943 | 0 | 943 | 943 | 0 |
| G32 | 931  | 41.38 | 824 | 46.10 | 824 | 824 | 824 | 824 | 0 | 824 | 824 | 0 |
| G25 | 1012 | 34.32 | 717 | 47.09 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 31

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 3

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 3

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23869

Obs deleted (any reason) : 34

Obs complete : 23835

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 133 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 336 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 704 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1376 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |    |                |
|---------|------|----|----------------|
| 65 - 70 | 1217 | 0  | 0.000000       |
| 60 - 65 | 1371 | 0  | 0.000000       |
| 55 - 60 | 1258 | 0  | 0.000000       |
| 50 - 55 | 1478 | 0  | 0.000000       |
| 45 - 50 | 1596 | 0  | 0.000000       |
| 40 - 45 | 1713 | 0  | 0.000000       |
| 35 - 40 | 1567 | 0  | 0.000000       |
| 30 - 35 | 1689 | 0  | 0.000000       |
| 25 - 30 | 2169 | 0  | 0.000000       |
| 20 - 25 | 2267 | 0  | 0.000000       |
| 15 - 20 | 2393 | 0  | 0.000000       |
| 10 - 15 | 2541 | 10 | 0.000000       |
| 5 - 10  | 27   | 1  | 0.000000 ===== |
| 0 - 5   | 0    | 0  | 0.000000       |
| < 0     | 0    | 0  | 0.000000       |

MP1 RMS summary (per SV):

|     | slips  |       | L1 rx  |          | L2 rx   |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25 | < 25  | < 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 916    | 0     | 28.04  | 0.274288 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |
| G03 | 673    | 0     | 45.10  | 0.206994 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G04 | 920    | 0     | 27.72  | 0.517994 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |
| G05 | 906    | 0     | 29.38  | 0.264996 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |
| G06 | 729    | 0     | 46.79  | 0.253284 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G07 | 728    | 0     | 47.82  | 0.309247 | 0       | 1    | 2     | 0    | 0     | 0    |       |      |
| G08 | 778    | 0     | 46.45  | 0.184323 | 0       | 0    | 1     | 0    | 0     | 0    |       |      |
| G09 | 672    | 0     | 49.61  | 0.232065 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G10 | 810    | 1     | 34.85  | 0.299667 | 1       | 2    | 5     | 0    | 0     | 0    |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 687 | 0 | 44.86 | 0.242612 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 814 | 0 | 45.67 | 0.155487 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 797 | 0 | 45.28 | 0.185378 | 1 | 2 | 2 | 0 | 0 | 0 |
| G14 | 916 | 0 | 29.60 | 0.350212 | 0 | 2 | 2 | 0 | 0 | 0 |
| G15 | 723 | 2 | 39.71 | 0.268037 | 0 | 2 | 3 | 0 | 0 | 0 |
| G16 | 870 | 0 | 32.79 | 0.382983 | 1 | 2 | 3 | 0 | 0 | 0 |
| G17 | 911 | 0 | 29.05 | 0.278924 | 0 | 2 | 2 | 0 | 0 | 0 |
| G18 | 848 | 0 | 33.03 | 0.422917 | 1 | 2 | 3 | 0 | 0 | 0 |
| G19 | 663 | 0 | 44.37 | 0.200134 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 798 | 0 | 46.56 | 0.170533 | 2 | 1 | 3 | 0 | 0 | 0 |
| G21 | 775 | 0 | 48.71 | 0.313347 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 680 | 0 | 45.13 | 0.245881 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 783 | 0 | 46.67 | 0.276584 | 0 | 0 | 1 | 0 | 0 | 0 |
| G24 | 784 | 0 | 47.27 | 0.215253 | 2 | 1 | 2 | 0 | 0 | 0 |
| G26 | 859 | 0 | 32.59 | 0.311806 | 1 | 3 | 3 | 0 | 0 | 0 |
| G27 | 776 | 0 | 47.86 | 0.210188 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 667 | 0 | 44.90 | 0.199067 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 817 | 0 | 46.09 | 0.163493 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 771 | 0 | 46.45 | 0.196902 | 1 | 1 | 2 | 0 | 0 | 0 |
| G31 | 943 | 0 | 28.13 | 0.326614 | 1 | 3 | 3 | 0 | 0 | 0 |
| G32 | 824 | 0 | 46.20 | 0.188071 | 1 | 1 | 2 | 0 | 0 | 0 |

mean MP1 rms : 0.265825 m

total mean elevation : 40.25 degrees

# MP1 obs > 10 : 23835

# qc MP1 slips < 25 : 12

# Rvr L1 slips < 25 : 39

# Rvr L2 slips < 25 : 53



# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=%   | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-------|-----|------|-----|
| 85 - 90    | 133      | 0    | 0.045641 |       |     |      |     |
| 80 - 85    | 336      | 0    | 0.051207 |       |     |      |     |
| 75 - 80    | 704      | 0    | 0.059400 |       |     |      |     |
| 70 - 75    | 1376     | 0    | 0.068963 |       |     |      |     |
| 65 - 70    | 1217     | 0    | 0.078310 |       |     |      |     |
| 60 - 65    | 1371     | 0    | 0.081207 |       |     |      |     |
| 55 - 60    | 1258     | 0    | 0.080869 |       |     |      |     |
| 50 - 55    | 1478     | 0    | 0.096680 |       |     |      |     |
| 45 - 50    | 1596     | 0    | 0.110092 |       |     |      |     |
| 40 - 45    | 1713     | 0    | 0.120908 |       |     |      |     |
| 35 - 40    | 1567     | 0    | 0.143910 |       |     |      |     |
| 30 - 35    | 1689     | 0    | 0.163968 |       |     |      |     |
| 25 - 30    | 2169     | 0    | 0.223712 |       |     |      |     |
| 20 - 25    | 2267     | 0    | 0.328703 |       |     |      |     |
| 15 - 20    | 2393     | 0    | 0.401886 |       |     |      |     |
| 10 - 15    | 2541     | 12   | 0.619383 |       |     |      |     |
| 5 - 10     | 27       | 1    | 0.553911 | ##### |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |       |     |      |     |
| < 0        | 0        | 0    | 0.000000 |       |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 916 | 0 | 28.04 | 0.288577 | 0 | 2 | 2 | 0 | 0 | 0 |
| G03 | 673 | 0 | 45.10 | 0.219056 | 0 | 1 | 1 | 0 | 0 | 0 |
| G04 | 920 | 0 | 27.72 | 0.305555 | 0 | 2 | 2 | 0 | 0 | 0 |
| G05 | 906 | 0 | 29.38 | 0.402515 | 0 | 2 | 2 | 0 | 0 | 0 |
| G06 | 729 | 0 | 46.79 | 0.820390 | 0 | 1 | 1 | 0 | 0 | 0 |
| G07 | 728 | 0 | 47.82 | 0.175165 | 1 | 1 | 2 | 0 | 0 | 0 |
| G08 | 778 | 0 | 46.45 | 0.245563 | 0 | 0 | 1 | 0 | 0 | 0 |
| G09 | 672 | 0 | 49.61 | 0.220707 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 810 | 1 | 34.85 | 0.420730 | 1 | 2 | 5 | 0 | 0 | 0 |
| G11 | 687 | 0 | 44.86 | 0.277635 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 814 | 0 | 45.67 | 0.195315 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 797 | 0 | 45.28 | 0.249461 | 1 | 2 | 2 | 0 | 0 | 0 |
| G14 | 916 | 0 | 29.60 | 0.300527 | 0 | 2 | 2 | 0 | 0 | 0 |
| G15 | 723 | 2 | 39.71 | 0.338737 | 0 | 2 | 3 | 0 | 0 | 0 |
| G16 | 870 | 0 | 32.79 | 0.377171 | 1 | 2 | 3 | 0 | 0 | 0 |
| G17 | 911 | 0 | 29.05 | 0.383750 | 0 | 2 | 2 | 0 | 0 | 0 |
| G18 | 848 | 0 | 33.03 | 0.643631 | 1 | 2 | 3 | 0 | 0 | 0 |
| G19 | 663 | 0 | 44.37 | 0.200572 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 798 | 0 | 46.56 | 0.185275 | 2 | 1 | 3 | 0 | 0 | 0 |
| G21 | 775 | 0 | 48.71 | 0.284580 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 680 | 0 | 45.13 | 0.187402 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 783 | 0 | 46.67 | 0.317748 | 0 | 0 | 1 | 0 | 0 | 0 |
| G24 | 784 | 0 | 47.27 | 0.363348 | 2 | 1 | 2 | 0 | 0 | 0 |
| G26 | 859 | 0 | 32.59 | 0.323869 | 1 | 3 | 3 | 0 | 0 | 0 |
| G27 | 776 | 0 | 47.86 | 0.226166 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 667 | 0 | 44.90 | 0.199960 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 817 | 0 | 46.09 | 0.294495 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 771 | 0 | 46.45 | 0.186394 | 1 | 1 | 2 | 0 | 0 | 0 |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G31 | 943 | 0 | 28.13 | 0.590979 | 1 | 3 | 3 | 0 | 0 | 0 |
| G32 | 824 | 0 | 46.20 | 0.263181 | 1 | 1 | 2 | 0 | 0 | 0 |

mean MP2 rms : 0.321480 m

total mean elevation : 40.25 degrees

# MP2 obs > 10 : 23835

# qc MP2 slips < 25 : 13

# Rvr L1 slips < 25 : 39

# Rvr L2 slips < 25 : 53

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 | rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|---------|-----|-----|------|-----|
|------------|-----------|------|---------|-----|-----|------|-----|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 85 - 90 | 133  | 0 | 0.059134 |  |  |  |  |
| 80 - 85 | 336  | 0 | 0.081582 |  |  |  |  |
| 75 - 80 | 704  | 0 | 0.081498 |  |  |  |  |
| 70 - 75 | 1376 | 0 | 0.083673 |  |  |  |  |
| 65 - 70 | 1217 | 0 | 0.094910 |  |  |  |  |
| 60 - 65 | 1371 | 0 | 0.110417 |  |  |  |  |
| 55 - 60 | 1258 | 0 | 0.113533 |  |  |  |  |
| 50 - 55 | 1478 | 0 | 0.132377 |  |  |  |  |
| 45 - 50 | 1596 | 0 | 0.142244 |  |  |  |  |
| 40 - 45 | 1713 | 0 | 0.153511 |  |  |  |  |
| 35 - 40 | 1567 | 0 | 0.172458 |  |  |  |  |
| 30 - 35 | 1689 | 0 | 0.203928 |  |  |  |  |
| 25 - 30 | 2169 | 0 | 0.261751 |  |  |  |  |
| 20 - 25 | 2267 | 0 | 0.326333 |  |  |  |  |

```

15 - 20 2393 0 0.449289 |||||
10 - 15 2541 13 0.858502 #|||||
5 - 10 27 1 0.475299 #####||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 134 0.777 8.933 ###|||||
80 - 85 336 0.491 8.973 ##|||||
75 - 80 704 0.339 8.987 #|||||
70 - 75 1376 0.243 8.993 #|||||
65 - 70 1218 0.258 8.993 #|||||
60 - 65 1371 0.243 8.993 #|||||
55 - 60 1258 0.254 8.993 #|||||
50 - 55 1478 0.237 8.993 #|||||
45 - 50 1597 0.317 8.941 #|||||
40 - 45 1714 0.527 8.621 ##|||||
35 - 40 1568 0.358 8.090 #|||||
30 - 35 1689 0.205 7.998 #|||||
25 - 30 2169 0.328 7.910 #|||||
20 - 25 2267 0.557 7.566 ##|||||
15 - 20 2395 0.575 7.101 ##|||||
10 - 15 2564 0.714 6.592 ###|||||
5 - 10 31 1.308 6.387 #####||
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 134  | 0.691 | 7.940 | ###  |     |     |
| 80 - 85    | 336  | 0.436 | 7.976 | ##   |     |     |
| 75 - 80    | 704  | 0.313 | 7.982 | #    |     |     |
| 70 - 75    | 1376 | 0.315 | 7.938 | #    |     |     |
| 65 - 70    | 1218 | 0.484 | 7.748 | ##   |     |     |
| 60 - 65    | 1371 | 0.538 | 7.535 | ##   |     |     |
| 55 - 60    | 1258 | 0.522 | 7.352 | ##   |     |     |
| 50 - 55    | 1478 | 0.444 | 7.199 | ##   |     |     |
| 45 - 50    | 1597 | 0.423 | 6.908 | ##   |     |     |
| 40 - 45    | 1714 | 0.528 | 6.540 | ##   |     |     |
| 35 - 40    | 1568 | 0.535 | 6.261 | ##   |     |     |
| 30 - 35    | 1689 | 0.588 | 5.820 | ##   |     |     |
| 25 - 30    | 2169 | 0.629 | 5.462 | ###  |     |     |
| 20 - 25    | 2267 | 0.665 | 5.140 | ###  |     |     |
| 15 - 20    | 2395 | 0.698 | 4.697 | ###  |     |     |
| 10 - 15    | 2561 | 0.696 | 4.418 | ###  |     |     |
| 5 - 10     | 30   | 0.961 | 4.200 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : pont1270.10o

input RnxNAV file(s) : pont1270.10n

\*\*\*\*\*

4-character ID : PONT

Receiver type : LEICA GRX1200PRO (# = 465460) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4671274.3106 1754468.5285 3959401.3479 (m)

antenna WGS 84 (geo) : N 38 deg 37' 8.44" E 20 deg 35' 7.84"

antenna WGS 84 (geo) : 38.619012 deg 20.585511 deg

WGS 84 height : 66.1619 m

[qc - header] position : 33.7832 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2865

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30237

Possible obs > 10.0 deg: 23944

Complete obs > 10.0 deg: 20186  
 Deleted obs > 10.0 deg: 8  
 Masked obs < 10.0 deg: 5265  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.271071 m  
 Moving average MP2 : 0.345094 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.34 (sd=0.81 n=20194) 6.47 (sd=1.32 n=20186)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 19) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 5  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 11  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 23.88 30 23944 20186 84 0.27 0.35 1835

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)



SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1182 | 22.36 | 929 | 27.10 | 593 | 585 | 593 | 585 | 0 | 585 | 593 | 0 |
| G03 | 950  | 34.53 | 696 | 46.02 | 578 | 578 | 578 | 578 | 0 | 578 | 578 | 0 |
| G04 | 1169 | 22.84 | 912 | 27.88 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G05 | 1154 | 24.22 | 883 | 30.11 | 776 | 776 | 776 | 776 | 0 | 776 | 776 | 0 |
| G06 | 872  | 41.45 | 754 | 47.16 | 616 | 616 | 616 | 616 | 0 | 616 | 616 | 0 |
| G07 | 907  | 38.48 | 725 | 47.31 | 725 | 725 | 725 | 725 | 0 | 725 | 725 | 0 |
| G08 | 897  | 40.76 | 781 | 46.07 | 781 | 781 | 781 | 781 | 0 | 781 | 781 | 0 |
| G09 | 863  | 40.60 | 744 | 46.30 | 90  | 90  | 90  | 90  | 0 | 90  | 90  | 0 |
| G10 | 1079 | 28.00 | 714 | 39.46 | 600 | 600 | 600 | 600 | 0 | 600 | 600 | 0 |
| G11 | 830  | 40.01 | 710 | 45.93 | 592 | 592 | 592 | 592 | 0 | 592 | 592 | 0 |
| G12 | 945  | 39.80 | 836 | 44.34 | 767 | 767 | 767 | 767 | 0 | 767 | 767 | 0 |
| G13 | 921  | 39.55 | 808 | 44.38 | 808 | 808 | 808 | 808 | 0 | 808 | 808 | 0 |
| G14 | 1168 | 23.66 | 927 | 28.52 | 536 | 536 | 536 | 536 | 0 | 536 | 536 | 0 |
| G15 | 1053 | 29.77 | 667 | 44.18 | 538 | 538 | 538 | 538 | 0 | 538 | 538 | 0 |
| G16 | 1117 | 27.03 | 824 | 34.80 | 717 | 717 | 717 | 717 | 0 | 717 | 717 | 0 |
| G17 | 1173 | 23.09 | 923 | 27.99 | 524 | 524 | 524 | 524 | 0 | 524 | 524 | 0 |
| G18 | 1149 | 24.97 | 862 | 31.59 | 622 | 622 | 622 | 622 | 0 | 622 | 622 | 0 |
| G19 | 1029 | 31.52 | 685 | 45.34 | 567 | 567 | 567 | 567 | 0 | 567 | 567 | 0 |
| G20 | 935  | 40.38 | 823 | 45.20 | 733 | 733 | 733 | 733 | 0 | 733 | 733 | 0 |
| G21 | 893  | 42.65 | 777 | 48.28 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G22 | 1053 | 29.90 | 684 | 43.69 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G23 | 903  | 40.95 | 788 | 46.20 | 788 | 788 | 788 | 788 | 0 | 788 | 788 | 0 |
| G24 | 905  | 41.38 | 787 | 46.84 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G26 | 1099 | 26.85 | 831 | 33.87 | 716 | 716 | 716 | 716 | 0 | 716 | 716 | 0 |
| G27 | 917  | 41.58 | 803 | 46.77 | 653 | 653 | 653 | 653 | 0 | 653 | 653 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1090 | 28.91 | 666 | 43.53 | 651 | 651 | 651 | 651 | 0 | 651 | 651 | 0 |
| G29 | 940  | 40.45 | 829 | 45.19 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G30 | 913  | 40.05 | 797 | 45.16 | 681 | 681 | 681 | 681 | 0 | 681 | 681 | 0 |
| G31 | 1184 | 23.23 | 941 | 27.96 | 830 | 830 | 830 | 830 | 0 | 830 | 830 | 0 |
| G32 | 947  | 40.57 | 838 | 45.19 | 833 | 833 | 833 | 833 | 0 | 833 | 833 | 0 |
| G01 | 1163 | 24.24 | 924 | 29.22 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G25 | 999  | 34.01 | 711 | 46.51 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 26

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 8

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 8

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 20220

Obs deleted (any reason) : 34

Obs complete : 20186

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 126      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 245      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 690      | 0            | 0.000000 |     |      |     |

|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1132 | 0 | 0.000000 |
| 65 - 70 | 1444 | 0 | 0.000000 |
| 60 - 65 | 1249 | 0 | 0.000000 |
| 55 - 60 | 1337 | 0 | 0.000000 |
| 50 - 55 | 1237 | 0 | 0.000000 |
| 45 - 50 | 1696 | 0 | 0.000000 |
| 40 - 45 | 1691 | 0 | 0.000000 |
| 35 - 40 | 1586 | 0 | 0.000000 |
| 30 - 35 | 1518 | 1 | 0.000000 |
| 25 - 30 | 1476 | 3 | 0.000000 |
| 20 - 25 | 1419 | 1 | 0.000000 |
| 15 - 20 | 1557 | 0 | 0.000000 |
| 10 - 15 | 1756 | 0 | 0.000000 |
| 5 - 10  | 23   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     | slips  |       | L1 rx  |          | L2 rx   |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25 | < 25  | < 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 593    | 8     | 30.62  | 0.543913 | 1       | 3    | 2     | 2    | 4     | 6    |       |      |
| G03 | 578    | 0     | 51.35  | 0.196754 | 0       | 0    | 0     | 0    | 1     | 1    |       |      |
| G04 | 802    | 0     | 28.97  | 0.344885 | 0       | 1    | 1     | 1    | 1     | 2    |       |      |
| G05 | 776    | 0     | 31.56  | 0.400820 | 0       | 1    | 1     | 0    | 1     | 1    |       |      |
| G06 | 616    | 0     | 53.30  | 0.172529 | 0       | 0    | 0     | 0    | 1     | 1    |       |      |
| G07 | 725    | 0     | 47.42  | 0.185219 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G08 | 781    | 0     | 46.18  | 0.175000 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G09 | 90     | 0     | 40.46  | 0.140451 | 0       | 0    | 0     | 1    | 2     | 2    |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G10 | 600 | 0 | 43.31 | 0.569810 | 1 | 2 | 2 | 0 | 1 | 1 |
| G11 | 592 | 0 | 51.14 | 0.194406 | 0 | 0 | 0 | 0 | 1 | 1 |
| G12 | 767 | 0 | 46.97 | 0.165125 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 808 | 0 | 44.48 | 0.176253 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 536 | 0 | 33.41 | 0.234782 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 538 | 0 | 48.59 | 0.254191 | 0 | 0 | 0 | 1 | 2 | 2 |
| G16 | 717 | 0 | 37.09 | 0.643858 | 1 | 1 | 1 | 1 | 1 | 2 |
| G17 | 524 | 0 | 32.31 | 0.232039 | 0 | 0 | 0 | 0 | 1 | 1 |
| G18 | 622 | 0 | 38.36 | 0.215365 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 567 | 0 | 50.67 | 0.208429 | 0 | 0 | 0 | 0 | 1 | 1 |
| G20 | 733 | 0 | 48.66 | 0.185378 | 0 | 0 | 0 | 0 | 1 | 1 |
| G21 | 777 | 0 | 48.28 | 0.429769 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 684 | 0 | 43.80 | 0.305174 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 788 | 0 | 46.20 | 0.168758 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 787 | 0 | 46.87 | 0.181134 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 716 | 0 | 35.53 | 0.491932 | 0 | 1 | 1 | 0 | 2 | 2 |
| G27 | 653 | 0 | 52.29 | 0.156337 | 0 | 0 | 0 | 1 | 2 | 2 |
| G28 | 651 | 0 | 43.96 | 0.395920 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 829 | 0 | 45.26 | 0.174139 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 681 | 0 | 49.71 | 0.159141 | 0 | 0 | 0 | 0 | 1 | 1 |
| G31 | 830 | 0 | 29.07 | 0.221739 | 0 | 1 | 1 | 0 | 1 | 1 |
| G32 | 833 | 0 | 45.49 | 0.162620 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.271070 m

total mean elevation : 43.03 degrees

# MP1 obs > 10 : 20186

# qc MP1 slips < 25 : 3

# Rvr L1 slips < 25 : 21

# Rvr L2 slips < 25 : 20

# qc MP1 slips > 25 : 7

# Rvr L1 slips > 25 : 24

# Rvr L2 slips > 25 : 28

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 126       | 0    | 0.115285 |     |     |      |     |
| 80 - 85    | 245       | 0    | 0.127738 |     |     |      |     |
| 75 - 80    | 690       | 0    | 0.133369 |     |     |      |     |
| 70 - 75    | 1132      | 1    | 0.133359 |     |     |      |     |
| 65 - 70    | 1444      | 0    | 0.148459 |     |     |      |     |
| 60 - 65    | 1249      | 0    | 0.149268 |     |     |      |     |
| 55 - 60    | 1337      | 0    | 0.156201 |     |     |      |     |
| 50 - 55    | 1237      | 1    | 0.154926 |     |     |      |     |
| 45 - 50    | 1696      | 0    | 0.196968 |     |     |      |     |
| 40 - 45    | 1691      | 1    | 0.190281 |     |     |      |     |
| 35 - 40    | 1586      | 0    | 0.208415 |     |     |      |     |
| 30 - 35    | 1518      | 2    | 0.243933 |     |     |      |     |
| 25 - 30    | 1476      | 2    | 0.390846 |     |     |      |     |
| 20 - 25    | 1419      | 1    | 0.330020 |     |     |      |     |
| 15 - 20    | 1557      | 0    | 0.387186 |     |     |      |     |
| 10 - 15    | 1756      | 2    | 0.692608 |     |     |      |     |
| 5 - 10     | 23        | 0    | 0.365402 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 593    | 8     | 30.62  | 0.666035 | 1       | 3    | 2    | 2    | 4    | 6    |      |
| G03 | 578    | 0     | 51.35  | 0.266722 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G04 | 802    | 0     | 28.97  | 0.453966 | 0       | 1    | 1    | 1    | 1    | 2    |      |
| G05 | 776    | 0     | 31.56  | 0.580928 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G06 | 616    | 0     | 53.30  | 0.250179 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G07 | 725    | 0     | 47.42  | 0.248795 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 781    | 0     | 46.18  | 0.256523 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 90     | 0     | 40.46  | 0.232828 | 0       | 0    | 0    | 1    | 2    | 2    |      |
| G10 | 600    | 0     | 43.31  | 0.488354 | 1       | 2    | 2    | 0    | 1    | 1    |      |
| G11 | 592    | 0     | 51.14  | 0.254505 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G12 | 767    | 0     | 46.97  | 0.219341 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 808    | 0     | 44.48  | 0.221119 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G14 | 536    | 0     | 33.41  | 0.272198 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G15 | 538    | 0     | 48.59  | 0.324716 | 0       | 0    | 0    | 1    | 2    | 2    |      |
| G16 | 717    | 0     | 37.09  | 0.630065 | 0       | 1    | 1    | 1    | 1    | 2    |      |
| G17 | 524    | 0     | 32.31  | 0.753323 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G18 | 622    | 0     | 38.36  | 0.269953 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G19 | 567    | 0     | 50.67  | 0.282122 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G20 | 733    | 0     | 48.66  | 0.223463 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G21 | 777    | 0     | 48.28  | 0.507362 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G22 | 684    | 0     | 43.80  | 0.368547 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G23 | 788    | 0     | 46.20  | 0.239341 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G24 | 787    | 0     | 46.87  | 0.241186 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G26 | 716    | 0     | 35.53  | 0.431192 | 0       | 1    | 1    | 0    | 2    | 2    |      |
| G27 | 653    | 0     | 52.29  | 0.207601 | 0       | 0    | 0    | 1    | 2    | 2    |      |
| G28 | 651    | 0     | 43.96  | 0.314677 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G29 | 829    | 0     | 45.26  | 0.216836 | 0       | 1    | 1    | 0    | 0    | 0    |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G30 | 681 | 0 | 49.71 | 0.308126 | 0 | 0 | 0 | 0 | 1 | 1 |
| G31 | 830 | 0 | 29.07 | 0.432246 | 0 | 1 | 1 | 0 | 1 | 1 |
| G32 | 833 | 0 | 45.49 | 0.215840 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.345082 m

total mean elevation : 43.03 degrees

# MP2 obs > 10 : 20186

# qc MP2 slips < 25 : 2

# Rvr L1 slips < 25 : 21

# Rvr L2 slips < 25 : 20

# qc MP2 slips > 25 : 7

# Rvr L1 slips > 25 : 24

# Rvr L2 slips > 25 : 28

| elev (deg) | tot slips | <MP2 | rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|---------|-----|-----|------|-----|
|------------|-----------|------|---------|-----|-----|------|-----|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 85 - 90 | 126 | 0 | 0.197548 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 80 - 85 | 245 | 0 | 0.189230 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 75 - 80 | 690 | 0 | 0.223719 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 70 - 75 | 1132 | 1 | 0.232804 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 65 - 70 | 1444 | 0 | 0.234735 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 60 - 65 | 1249 | 0 | 0.222862 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 55 - 60 | 1337 | 0 | 0.246503 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 50 - 55 | 1237 | 1 | 0.241680 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 45 - 50 | 1696 | 0 | 0.472875 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 40 - 45 | 1691 | 1 | 0.225186 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 35 - 40 | 1586 | 0 | 0.255834 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 30 - 35 | 1518 | 2 | 0.345499 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 25 - 30 | 1476 | 2 | 0.484433 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |
|---------|------|---|----------|--|
| 20 - 25 | 1419 | 1 | 0.304789 |  |
| 15 - 20 | 1557 | 0 | 0.375944 |  |
| 10 - 15 | 1756 | 1 | 0.768475 |  |
| 5 - 10  | 23   | 0 | 0.398908 |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |
| < 0     | 0    | 0 | 0.000000 |  |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 127  | 0.799 | 8.929 | ###   |     |     |
| 80 - 85    | 245  | 0.575 | 8.963 | ##    |     |     |
| 75 - 80    | 690  | 0.343 | 8.987 | #     |     |     |
| 70 - 75    | 1132 | 0.269 | 8.991 | #     |     |     |
| 65 - 70    | 1445 | 0.237 | 8.994 | #     |     |     |
| 60 - 65    | 1249 | 0.255 | 8.993 | #     |     |     |
| 55 - 60    | 1337 | 0.248 | 8.993 | #     |     |     |
| 50 - 55    | 1237 | 0.277 | 8.981 | #     |     |     |
| 45 - 50    | 1697 | 0.320 | 8.936 | #     |     |     |
| 40 - 45    | 1691 | 0.511 | 8.677 | ##    |     |     |
| 35 - 40    | 1588 | 0.440 | 8.181 | ##    |     |     |
| 30 - 35    | 1528 | 0.486 | 7.926 | ##    |     |     |
| 25 - 30    | 1485 | 0.530 | 7.908 | ##    |     |     |
| 20 - 25    | 1422 | 0.505 | 7.767 | ##    |     |     |
| 15 - 20    | 1558 | 0.521 | 7.281 | ##    |     |     |
| 10 - 15    | 1763 | 0.538 | 6.855 | ##    |     |     |
| 5 - 10     | 26   | 1.357 | 6.192 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |
| < 0        | 0    | 0.000 | 0.000 |       |     |     |



S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 127  | 0.751 | 7.992 | ###  |     |     |
| 80 - 85    | 245  | 0.515 | 7.971 | ##   |     |     |
| 75 - 80    | 690  | 0.318 | 7.983 | #    |     |     |
| 70 - 75    | 1132 | 0.315 | 7.958 | #    |     |     |
| 65 - 70    | 1445 | 0.355 | 7.904 | #    |     |     |
| 60 - 65    | 1249 | 0.466 | 7.778 | ##   |     |     |
| 55 - 60    | 1337 | 0.533 | 7.408 | ##   |     |     |
| 50 - 55    | 1237 | 0.484 | 7.243 | ##   |     |     |
| 45 - 50    | 1697 | 0.443 | 7.068 | ##   |     |     |
| 40 - 45    | 1691 | 0.523 | 6.690 | ##   |     |     |
| 35 - 40    | 1588 | 0.535 | 6.338 | ##   |     |     |
| 30 - 35    | 1528 | 0.806 | 5.924 | ###  |     |     |
| 25 - 30    | 1478 | 0.763 | 5.512 | ###  |     |     |
| 20 - 25    | 1421 | 0.632 | 5.218 | ###  |     |     |
| 15 - 20    | 1558 | 0.685 | 4.785 | ###  |     |     |
| 10 - 15    | 1763 | 0.678 | 4.347 | ###  |     |     |
| 5 - 10     | 26   | 1.116 | 4.269 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

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QC of RINEX file(s) : prkv1270.10o

input RnxNAV file(s) : prkv1270.10n

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4-character ID : PRKV

Receiver type : LEICA GRX1200PRO (# = 465459) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4435580.0265 2188861.2427 4013599.6110 (m)

antenna WGS 84 (geo) : N 39 deg 14' 44.62" E 26 deg 15' 55.17"

antenna WGS 84 (geo) : 39.245727 deg 26.265326 deg

WGS 84 height : 187.9182 m

[qc - header] position : 35.8693 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2868

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30511

Possible obs > 10.0 deg: 24118

Complete obs > 10.0 deg: 23471  
 Deleted obs > 10.0 deg: 1  
 Masked obs < 10.0 deg: 2070  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.272844 m  
 Moving average MP2 : 0.319380 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.16 (sd=0.87 n=23472) 6.39 (sd=1.31 n=23471)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 12) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 0  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 6  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 23.90 30 24118 23471 97 0.27 0.32 3912

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

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|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1168 | 23.05 | 912 | 28.12 | 911 | 911 | 911 | 911 | 0 | 911 | 911 | 0 |
| G03 | 1028 | 30.36 | 671 | 44.38 | 658 | 658 | 658 | 658 | 0 | 658 | 658 | 0 |
| G04 | 1177 | 22.39 | 926 | 27.11 | 924 | 924 | 924 | 924 | 0 | 924 | 924 | 0 |
| G05 | 1169 | 23.43 | 910 | 28.64 | 908 | 908 | 908 | 908 | 0 | 908 | 908 | 0 |
| G06 | 942  | 36.35 | 726 | 46.28 | 714 | 714 | 714 | 714 | 0 | 714 | 714 | 0 |
| G07 | 865  | 41.54 | 748 | 47.27 | 748 | 748 | 748 | 748 | 0 | 748 | 748 | 0 |
| G08 | 911  | 40.42 | 798 | 45.44 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G09 | 836  | 41.12 | 717 | 47.12 | 197 | 197 | 197 | 197 | 0 | 197 | 197 | 0 |
| G10 | 1110 | 26.22 | 821 | 33.65 | 818 | 818 | 818 | 818 | 0 | 818 | 818 | 0 |
| G11 | 978  | 31.92 | 685 | 44.23 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G12 | 935  | 40.20 | 826 | 44.84 | 826 | 826 | 826 | 826 | 0 | 826 | 826 | 0 |
| G13 | 927  | 39.45 | 816 | 44.14 | 816 | 816 | 816 | 816 | 0 | 816 | 816 | 0 |
| G14 | 1156 | 24.43 | 908 | 29.74 | 894 | 894 | 894 | 894 | 0 | 894 | 894 | 0 |
| G15 | 1097 | 27.42 | 756 | 37.41 | 751 | 751 | 751 | 751 | 0 | 751 | 751 | 0 |
| G16 | 1142 | 25.60 | 877 | 31.81 | 874 | 874 | 874 | 874 | 0 | 874 | 874 | 0 |
| G17 | 1158 | 23.92 | 903 | 29.26 | 902 | 902 | 902 | 902 | 0 | 902 | 902 | 0 |
| G18 | 1122 | 26.60 | 802 | 35.11 | 800 | 800 | 800 | 800 | 0 | 800 | 800 | 0 |
| G19 | 1073 | 28.95 | 659 | 43.53 | 646 | 646 | 646 | 646 | 0 | 646 | 646 | 0 |
| G20 | 922  | 40.80 | 810 | 45.76 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G21 | 910  | 42.71 | 796 | 48.12 | 796 | 796 | 796 | 796 | 0 | 796 | 796 | 0 |
| G22 | 1005 | 32.84 | 708 | 45.27 | 695 | 695 | 695 | 695 | 0 | 695 | 695 | 0 |
| G23 | 916  | 40.67 | 803 | 45.70 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G24 | 919  | 41.21 | 804 | 46.39 | 804 | 804 | 804 | 804 | 0 | 804 | 804 | 0 |
| G26 | 1120 | 25.65 | 871 | 31.55 | 869 | 869 | 869 | 869 | 0 | 869 | 869 | 0 |
| G27 | 891  | 41.97 | 775 | 47.50 | 774 | 774 | 774 | 774 | 0 | 774 | 774 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1061 | 31.07 | 691 | 45.29 | 691 | 691 | 691 | 691 | 0 | 691 | 691 | 0 |
| G29 | 945  | 40.45 | 835 | 45.12 | 835 | 835 | 835 | 835 | 0 | 835 | 835 | 0 |
| G30 | 891  | 40.69 | 774 | 46.08 | 774 | 774 | 774 | 774 | 0 | 774 | 774 | 0 |
| G31 | 1188 | 22.98 | 949 | 27.52 | 947 | 946 | 947 | 946 | 0 | 946 | 947 | 0 |
| G32 | 949  | 40.65 | 841 | 45.23 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G01 | 902  | 40.90 | 786 | 46.21 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G25 | 926  | 38.24 | 735 | 47.34 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 36

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 1

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 1

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23508

Obs deleted (any reason) : 37

Obs complete : 23471

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 55       | 0            | 0.000000 |     |      |     |
| 80 - 85    | 265      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 522      | 0            | 0.000000 |     |      |     |

|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1082 | 0 | 0.000000 |
| 65 - 70 | 1406 | 0 | 0.000000 |
| 60 - 65 | 1395 | 0 | 0.000000 |
| 55 - 60 | 1305 | 0 | 0.000000 |
| 50 - 55 | 1506 | 0 | 0.000000 |
| 45 - 50 | 1584 | 0 | 0.000000 |
| 40 - 45 | 1654 | 0 | 0.000000 |
| 35 - 40 | 1635 | 0 | 0.000000 |
| 30 - 35 | 1720 | 0 | 0.000000 |
| 25 - 30 | 1853 | 0 | 0.000000 |
| 20 - 25 | 2426 | 0 | 0.000000 |
| 15 - 20 | 2392 | 0 | 0.000000 |
| 10 - 15 | 2643 | 0 | 0.000000 |
| 5 - 10  | 33   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 911    | 0     | 28.23  | 0.273060 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G03 | 658    | 0     | 44.65  | 0.223064 | 0       | 1     | 1    | 0     | 1    | 1     |      |       |      |
| G04 | 924    | 0     | 27.24  | 0.284569 | 0       | 1     | 2    | 0     | 0    | 0     |      |       |      |
| G05 | 908    | 0     | 28.77  | 0.379813 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G06 | 714    | 0     | 46.61  | 0.239979 | 0       | 1     | 1    | 1     | 1    | 1     |      |       |      |
| G07 | 748    | 0     | 47.38  | 0.217142 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 798    | 0     | 45.54  | 0.273307 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 197    | 0     | 28.87  | 0.242209 | 0       | 1     | 1    | 1     | 1    | 1     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G10 | 818 | 0 | 33.84 | 0.266509 | 0 | 2 | 2 | 0 | 0 | 0 |
| G11 | 672 | 0 | 44.60 | 0.176757 | 0 | 1 | 1 | 1 | 1 | 1 |
| G12 | 826 | 0 | 44.94 | 0.213662 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 816 | 0 | 44.14 | 0.188148 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 894 | 0 | 29.46 | 0.270739 | 0 | 1 | 1 | 1 | 1 | 1 |
| G15 | 751 | 0 | 37.70 | 0.243406 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 874 | 0 | 31.94 | 0.282848 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 902 | 0 | 29.37 | 0.318624 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 800 | 0 | 35.24 | 0.477181 | 0 | 2 | 2 | 0 | 0 | 0 |
| G19 | 646 | 0 | 43.27 | 0.358626 | 0 | 1 | 1 | 0 | 1 | 1 |
| G20 | 798 | 0 | 46.37 | 0.187296 | 0 | 2 | 2 | 0 | 0 | 0 |
| G21 | 796 | 0 | 48.12 | 0.372257 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 695 | 0 | 45.73 | 0.248452 | 0 | 1 | 1 | 1 | 1 | 1 |
| G23 | 803 | 0 | 45.80 | 0.280108 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 804 | 0 | 46.43 | 0.262773 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 869 | 0 | 31.69 | 0.268872 | 0 | 2 | 2 | 0 | 0 | 0 |
| G27 | 774 | 0 | 47.65 | 0.203748 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 691 | 0 | 45.40 | 0.324429 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 835 | 0 | 45.18 | 0.198812 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 774 | 0 | 46.17 | 0.183034 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 947 | 1 | 27.65 | 0.371109 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 829 | 0 | 45.39 | 0.280374 | 0 | 1 | 1 | 1 | 1 | 1 |

mean MP1 rms : 0.272845 m

total mean elevation : 39.51 degrees

# MP1 obs > 10 : 23471

# qc MP1 slips < 25 : 0

# Rvr L1 slips < 25 : 34



# Rvr L2 slips < 25 : 35

# qc MP1 slips > 25 : 6

# Rvr L1 slips > 25 : 8

# Rvr L2 slips > 25 : 8

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 55        | 0    | 0.091121 |     |     |      |     |
| 80 - 85    | 265       | 0    | 0.102984 |     |     |      |     |
| 75 - 80    | 522       | 0    | 0.094961 |     |     |      |     |
| 70 - 75    | 1082      | 0    | 0.103782 |     |     |      |     |
| 65 - 70    | 1406      | 0    | 0.156288 |     |     |      |     |
| 60 - 65    | 1395      | 0    | 0.212848 |     |     |      |     |
| 55 - 60    | 1305      | 0    | 0.130485 |     |     |      |     |
| 50 - 55    | 1506      | 1    | 0.137180 |     |     |      |     |
| 45 - 50    | 1584      | 0    | 0.144305 |     |     |      |     |
| 40 - 45    | 1654      | 1    | 0.161957 |     |     |      |     |
| 35 - 40    | 1635      | 1    | 0.197616 |     |     |      |     |
| 30 - 35    | 1720      | 2    | 0.215480 |     |     |      |     |
| 25 - 30    | 1853      | 1    | 0.249762 |     |     |      |     |
| 20 - 25    | 2426      | 0    | 0.307645 |     |     |      |     |
| 15 - 20    | 2392      | 0    | 0.365149 |     |     |      |     |
| 10 - 15    | 2643      | 0    | 0.555880 |     |     |      |     |
| 5 - 10     | 33        | 0    | 0.543715 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 911    | 0     | 28.23  | 0.310262 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G03 | 658    | 0     | 44.65  | 0.198110 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G04 | 924    | 0     | 27.24  | 0.336371 | 0       | 1    | 2    | 0    | 0    | 0    |      |
| G05 | 908    | 0     | 28.77  | 0.343957 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G06 | 714    | 0     | 46.61  | 0.764152 | 0       | 1    | 1    | 1    | 1    | 1    |      |
| G07 | 748    | 0     | 47.38  | 0.206921 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 798    | 0     | 45.54  | 0.269454 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 197    | 0     | 28.87  | 0.290881 | 0       | 1    | 1    | 1    | 1    | 1    |      |
| G10 | 818    | 0     | 33.84  | 0.325882 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G11 | 672    | 0     | 44.60  | 0.200314 | 0       | 1    | 1    | 1    | 1    | 1    |      |
| G12 | 826    | 0     | 44.94  | 0.234653 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 816    | 0     | 44.14  | 0.228316 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G14 | 894    | 0     | 29.46  | 0.341181 | 0       | 1    | 1    | 1    | 1    | 1    |      |
| G15 | 751    | 0     | 37.70  | 0.218951 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G16 | 874    | 0     | 31.94  | 0.323372 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G17 | 902    | 0     | 29.37  | 0.316542 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G18 | 800    | 0     | 35.24  | 0.439370 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G19 | 646    | 0     | 43.27  | 0.386749 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G20 | 798    | 0     | 46.37  | 0.248559 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G21 | 796    | 0     | 48.12  | 0.371495 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G22 | 695    | 0     | 45.73  | 0.311443 | 0       | 1    | 1    | 1    | 1    | 1    |      |
| G23 | 803    | 0     | 45.80  | 0.229617 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G24 | 804    | 0     | 46.43  | 0.390039 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G26 | 869    | 0     | 31.69  | 0.387525 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G27 | 774    | 0     | 47.65  | 0.218660 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G28 | 691    | 0     | 45.40  | 0.336650 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G29 | 835    | 0     | 45.18  | 0.232869 | 0       | 1    | 1    | 0    | 0    | 0    |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G30 | 774 | 0 | 46.17 | 0.239697 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 947 | 1 | 27.65 | 0.557097 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 829 | 0 | 45.39 | 0.256926 | 0 | 1 | 1 | 1 | 1 | 1 |

mean MP2 rms : 0.319380 m

total mean elevation : 39.51 degrees

# MP2 obs > 10 : 23471

# qc MP2 slips < 25 : 0

# Rvr L1 slips < 25 : 34

# Rvr L2 slips < 25 : 35

# qc MP2 slips > 25 : 6

# Rvr L1 slips > 25 : 8

# Rvr L2 slips > 25 : 8

| elev (deg) | tot slps | <MP2 | rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|------|---------|-----|-----|------|-----|
|------------|----------|------|---------|-----|-----|------|-----|

|         |    |   |          |  |  |  |  |
|---------|----|---|----------|--|--|--|--|
| 85 - 90 | 55 | 0 | 0.076127 |  |  |  |  |
|---------|----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 80 - 85 | 265 | 0 | 0.100934 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 75 - 80 | 522 | 0 | 0.126545 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 70 - 75 | 1082 | 0 | 0.111407 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 65 - 70 | 1406 | 0 | 0.158373 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 60 - 65 | 1395 | 0 | 0.241720 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 55 - 60 | 1305 | 0 | 0.161167 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 50 - 55 | 1506 | 1 | 0.146513 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 45 - 50 | 1584 | 0 | 0.171072 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 40 - 45 | 1654 | 1 | 0.202169 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 35 - 40 | 1635 | 1 | 0.220317 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 30 - 35 | 1720 | 2 | 0.229445 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 25 - 30 | 1853 | 1 | 0.293469 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

```

20 - 25 2426 0 0.336988 |||||
15 - 20 2392 0 0.392819 |||||
10 - 15 2643 0 0.739706 |||||
5 - 10 33 0 0.548351 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90  55 1.214 8.836 #####|||
80 - 85 266 0.552 8.966 ##|||
75 - 80 522 0.394 8.983 ##|||
70 - 75 1082 0.274 8.992 #|||
65 - 70 1406 0.240 8.994 #|||
60 - 65 1396 0.241 8.994 #|||
55 - 60 1305 0.249 8.993 #|||
50 - 55 1506 0.235 8.993 #|||
45 - 50 1585 0.316 8.942 #|||
40 - 45 1655 0.538 8.569 ##|||
35 - 40 1636 0.343 8.080 #|||
30 - 35 1720 0.207 8.000 #|||
25 - 30 1853 0.230 7.977 #|||
20 - 25 2426 0.509 7.634 ##|||
15 - 20 2395 0.473 7.141 ##|||
10 - 15 2664 0.536 6.728 ##|||
5 - 10 36 1.228 6.417 #####|||
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 55   | 1.250 | 8.345 | ##### |     |     |
| 80 - 85    | 266  | 0.570 | 8.056 | ##    |     |     |
| 75 - 80    | 522  | 0.353 | 7.987 | #     |     |     |
| 70 - 75    | 1082 | 0.243 | 7.993 | #     |     |     |
| 65 - 70    | 1406 | 0.239 | 7.982 | #     |     |     |
| 60 - 65    | 1396 | 0.407 | 7.852 | ##    |     |     |
| 55 - 60    | 1305 | 0.541 | 7.528 | ##    |     |     |
| 50 - 55    | 1506 | 0.501 | 7.308 | ##    |     |     |
| 45 - 50    | 1585 | 0.447 | 7.156 | ##    |     |     |
| 40 - 45    | 1655 | 0.490 | 6.821 | ##    |     |     |
| 35 - 40    | 1636 | 0.528 | 6.461 | ##    |     |     |
| 30 - 35    | 1720 | 0.582 | 6.228 | ##    |     |     |
| 25 - 30    | 1853 | 0.606 | 5.702 | ##    |     |     |
| 20 - 25    | 2426 | 0.637 | 5.336 | ###   |     |     |
| 15 - 20    | 2395 | 0.693 | 4.936 | ###   |     |     |
| 10 - 15    | 2663 | 0.756 | 4.540 | ###   |     |     |
| 5 - 10     | 35   | 1.094 | 4.457 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |
| < 0        | 0    | 0.000 | 0.000 |       |     |     |

\*\*\*\*\*

QC of RINEX file(s) : rls01270.10o

input RnxNAV file(s) : rls01270.10n

\*\*\*\*\*

4-character ID : RLSO

Receiver type : LEICA GRX1200 (# = 452163) (fw = 1.35/2.120)

Antenna type : LEIAX1202

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4679938.1133 1840179.3666 3910416.5435 (m)

antenna WGS 84 (geo) : N 38 deg 03' 21.04" E 21 deg 27' 54.17"

antenna WGS 84 (geo) : 38.055844 deg 21.465046 deg

WGS 84 height : 145.8468 m

[qc - header] position : 31.4930 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 29

NAVSTAR GPS SVs w/o OBS : 1 9 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 29374

Possible obs > 10.0 deg: 23259

Complete obs > 10.0 deg: 22462  
 Deleted obs > 10.0 deg: 40  
 Masked obs < 10.0 deg: 2216  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.361860 m  
 Moving average MP2 : 0.440450 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.71 (sd=1.05 n=22502) 6.04 (sd=1.35 n=22462)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 84) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 34  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 41  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 24.00 30 23259 22462 97 0.36 0.44 548

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)



SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

---

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1182 | 22.37 | 927 | 27.16 | 925 | 925 | 925 | 925 | 0 | 925 | 925 | 0 |
| G03 | 954  | 34.18 | 694 | 45.84 | 630 | 630 | 630 | 630 | 0 | 630 | 630 | 0 |
| G04 | 1173 | 22.67 | 916 | 27.64 | 908 | 908 | 908 | 908 | 0 | 908 | 908 | 0 |
| G05 | 1157 | 24.02 | 887 | 29.80 | 872 | 872 | 872 | 872 | 0 | 872 | 872 | 0 |
| G06 | 871  | 41.30 | 751 | 47.11 | 652 | 652 | 652 | 652 | 0 | 652 | 652 | 0 |
| G07 | 849  | 41.42 | 730 | 47.36 | 730 | 730 | 730 | 730 | 0 | 730 | 730 | 0 |
| G08 | 903  | 40.54 | 787 | 45.78 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G10 | 1082 | 27.73 | 727 | 38.59 | 684 | 678 | 684 | 678 | 0 | 678 | 684 | 0 |
| G11 | 829  | 39.82 | 709 | 45.73 | 644 | 642 | 644 | 642 | 0 | 642 | 644 | 0 |
| G12 | 949  | 39.61 | 839 | 44.15 | 839 | 839 | 839 | 839 | 0 | 839 | 839 | 0 |
| G13 | 928  | 39.26 | 814 | 44.06 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G14 | 1167 | 23.67 | 923 | 28.62 | 918 | 918 | 918 | 918 | 0 | 918 | 918 | 0 |
| G15 | 1055 | 29.50 | 664 | 43.95 | 615 | 615 | 615 | 615 | 0 | 615 | 615 | 0 |
| G16 | 1120 | 26.77 | 829 | 34.35 | 799 | 795 | 799 | 795 | 0 | 795 | 799 | 0 |
| G17 | 1173 | 23.10 | 920 | 28.08 | 916 | 916 | 916 | 916 | 0 | 916 | 916 | 0 |
| G18 | 1145 | 25.17 | 850 | 32.13 | 662 | 648 | 662 | 648 | 0 | 648 | 662 | 0 |
| G19 | 1031 | 31.24 | 682 | 45.15 | 634 | 633 | 634 | 633 | 0 | 633 | 634 | 0 |
| G20 | 939  | 40.19 | 826 | 45.01 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G21 | 900  | 42.56 | 782 | 48.23 | 782 | 782 | 782 | 782 | 0 | 782 | 782 | 0 |
| G22 | 1040 | 30.51 | 689 | 44.03 | 689 | 689 | 689 | 689 | 0 | 689 | 689 | 0 |
| G23 | 911  | 40.66 | 794 | 45.92 | 794 | 794 | 794 | 794 | 0 | 794 | 794 | 0 |
| G24 | 911  | 41.22 | 793 | 46.60 | 793 | 793 | 793 | 793 | 0 | 793 | 793 | 0 |
| G26 | 1102 | 26.61 | 835 | 33.50 | 816 | 812 | 816 | 812 | 0 | 812 | 816 | 0 |
| G27 | 918  | 41.45 | 802 | 46.72 | 736 | 727 | 736 | 727 | 0 | 727 | 736 | 0 |
| G28 | 1083 | 29.27 | 672 | 43.81 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G29 | 947  | 40.18 | 834 | 44.94 | 834 | 834 | 834 | 834 | 0 | 834 | 834 | 0 |
| G30 | 914  | 39.98 | 798 | 45.06 | 748 | 748 | 748 | 748 | 0 | 748 | 748 | 0 |
| G31 | 1187 | 23.07 | 941 | 27.80 | 940 | 940 | 940 | 940 | 0 | 940 | 940 | 0 |
| G32 | 954  | 40.29 | 844 | 44.89 | 844 | 844 | 844 | 844 | 0 | 844 | 844 | 0 |
| G09 | 863  | 40.53 | 743 | 46.28 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G25 | 979  | 34.94 | 716 | 46.68 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 35

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 40

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 40

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 22537

Obs deleted (any reason) : 75

Obs complete : 22462

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 121 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 218 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 682 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1028 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |    |            |
|---------|------|----|------------|
| 65 - 70 | 1496 | 0  | 0.000000   |
| 60 - 65 | 1341 | 0  | 0.000000   |
| 55 - 60 | 1318 | 0  | 0.000000   |
| 50 - 55 | 1280 | 0  | 0.000000   |
| 45 - 50 | 1687 | 0  | 0.000000   |
| 40 - 45 | 1710 | 0  | 0.000000   |
| 35 - 40 | 1569 | 0  | 0.000000   |
| 30 - 35 | 1592 | 0  | 0.000000   |
| 25 - 30 | 2184 | 1  | 0.000000   |
| 20 - 25 | 2092 | 8  | 0.000000   |
| 15 - 20 | 2017 | 7  | 0.000000   |
| 10 - 15 | 2103 | 18 | 0.000000 = |
| 5 - 10  | 30   | 0  | 0.000000   |
| 0 - 5   | 0    | 0  | 0.000000   |
| < 0     | 0    | 0  | 0.000000   |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 925    | 0     | 27.27  | 0.421753 | 1       | 3     | 3    | 0     | 0    | 0     |      |       |      |
| G03 | 630    | 0     | 49.05  | 0.236838 | 2       | 2     | 3    | 0     | 0    | 0     |      |       |      |
| G04 | 908    | 0     | 27.88  | 0.390965 | 0       | 21    | 34   | 0     | 0    | 0     |      |       |      |
| G05 | 872    | 0     | 30.20  | 0.408629 | 7       | 10    | 10   | 0     | 0    | 0     |      |       |      |
| G06 | 652    | 0     | 51.73  | 0.205603 | 0       | 2     | 2    | 1     | 1    | 1     |      |       |      |
| G07 | 730    | 0     | 47.47  | 0.265287 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 787    | 0     | 45.78  | 0.277436 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G10 | 684    | 6     | 40.54  | 0.513129 | 7       | 17    | 11   | 0     | 0    | 0     |      |       |      |
| G11 | 644    | 2     | 48.98  | 0.239873 | 2       | 3     | 5    | 0     | 0    | 0     |      |       |      |

|     |     |    |       |          |   |    |    |   |   |   |
|-----|-----|----|-------|----------|---|----|----|---|---|---|
| G12 | 839 | 0  | 44.15 | 0.212403 | 0 | 0  | 0  | 0 | 0 | 0 |
| G13 | 814 | 0  | 44.06 | 0.250337 | 0 | 12 | 12 | 0 | 0 | 0 |
| G14 | 918 | 0  | 28.80 | 1.222659 | 1 | 21 | 39 | 0 | 0 | 0 |
| G15 | 615 | 0  | 46.43 | 0.232861 | 0 | 1  | 1  | 0 | 0 | 0 |
| G16 | 799 | 4  | 35.32 | 0.411383 | 2 | 6  | 6  | 0 | 0 | 0 |
| G17 | 916 | 0  | 28.25 | 0.434138 | 2 | 24 | 24 | 0 | 0 | 0 |
| G18 | 662 | 14 | 37.90 | 0.492863 | 3 | 16 | 8  | 0 | 0 | 0 |
| G19 | 634 | 1  | 47.66 | 0.221851 | 1 | 1  | 2  | 0 | 0 | 0 |
| G20 | 825 | 0  | 45.05 | 0.327594 | 2 | 3  | 7  | 0 | 0 | 0 |
| G21 | 782 | 0  | 48.23 | 0.299699 | 0 | 0  | 0  | 0 | 0 | 0 |
| G22 | 689 | 0  | 44.14 | 0.340039 | 0 | 1  | 1  | 0 | 0 | 0 |
| G23 | 794 | 0  | 45.92 | 0.276028 | 0 | 0  | 0  | 0 | 0 | 0 |
| G24 | 793 | 0  | 46.63 | 0.322198 | 0 | 1  | 1  | 0 | 0 | 0 |
| G26 | 816 | 4  | 34.21 | 0.361794 | 4 | 6  | 6  | 0 | 0 | 0 |
| G27 | 736 | 9  | 50.05 | 0.270970 | 3 | 5  | 5  | 0 | 0 | 0 |
| G28 | 672 | 0  | 43.93 | 0.324441 | 2 | 17 | 17 | 0 | 0 | 0 |
| G29 | 834 | 0  | 45.00 | 0.248186 | 0 | 0  | 0  | 0 | 0 | 0 |
| G30 | 748 | 0  | 47.26 | 0.276122 | 2 | 2  | 3  | 0 | 0 | 0 |
| G31 | 940 | 0  | 27.90 | 0.472894 | 0 | 17 | 17 | 0 | 0 | 0 |
| G32 | 844 | 0  | 44.98 | 0.257274 | 0 | 1  | 1  | 0 | 0 | 0 |

mean MP1 rms : 0.361869 m

total mean elevation : 40.83 degrees

# MP1 obs > 10 : 22462

# qc MP1 slips < 25 : 41

# Rvr L1 slips < 25 : 193

# Rvr L2 slips < 25 : 219

# qc MP1 slips > 25 : 1

# Rvr L1 slips > 25 : 1

# Rvr L2 slips > 25 : 1

| elev (deg) | tot slips | <MP1 rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 121       | 0            | 0.156698 |     |      |     |
| 80 - 85    | 218       | 0            | 0.132601 |     |      |     |
| 75 - 80    | 682       | 0            | 0.140401 |     |      |     |
| 70 - 75    | 1028      | 0            | 0.162971 |     |      |     |
| 65 - 70    | 1496      | 0            | 0.168152 |     |      |     |
| 60 - 65    | 1341      | 0            | 0.167886 |     |      |     |
| 55 - 60    | 1318      | 0            | 0.175897 |     |      |     |
| 50 - 55    | 1280      | 0            | 0.204187 |     |      |     |
| 45 - 50    | 1687      | 0            | 0.223674 |     |      |     |
| 40 - 45    | 1710      | 0            | 0.232306 |     |      |     |
| 35 - 40    | 1569      | 0            | 0.261431 |     |      |     |
| 30 - 35    | 1592      | 0            | 0.269875 |     |      |     |
| 25 - 30    | 2184      | 1            | 0.334970 |     |      |     |
| 20 - 25    | 2092      | 10           | 0.397953 |     |      |     |
| 15 - 20    | 2017      | 7            | 0.633916 |     |      |     |
| 10 - 15    | 2103      | 24           | 0.920481 | ##  |      |     |
| 5 - 10     | 30        | 0            | 0.655925 |     |      |     |
| 0 - 5      | 0         | 0            | 0.000000 |     |      |     |
| < 0        | 0         | 0            | 0.000000 |     |      |     |

MP2 RMS summary (per SV):

|           | slips | L1 rx  | L2 rx       | slips    | L1 rx | L2 rx |      |      |      |   |
|-----------|-------|--------|-------------|----------|-------|-------|------|------|------|---|
| SV obs>10 | # del | <elev> | MP2 rms [m] | < 25     | < 25  | < 25  | > 25 | > 25 | > 25 |   |
| G02       | 925   | 0      | 27.27       | 0.731137 | 1     | 3     | 3    | 0    | 0    | 0 |

|     |     |    |       |          |   |    |    |   |   |   |
|-----|-----|----|-------|----------|---|----|----|---|---|---|
| G03 | 630 | 0  | 49.05 | 0.269015 | 2 | 2  | 3  | 0 | 0 | 0 |
| G04 | 908 | 0  | 27.88 | 0.441881 | 0 | 21 | 34 | 0 | 0 | 0 |
| G05 | 872 | 0  | 30.20 | 0.393256 | 7 | 10 | 10 | 0 | 0 | 0 |
| G06 | 652 | 0  | 51.73 | 0.313839 | 0 | 2  | 2  | 1 | 1 | 1 |
| G07 | 730 | 0  | 47.47 | 0.317612 | 0 | 1  | 1  | 0 | 0 | 0 |
| G08 | 787 | 0  | 45.78 | 0.316915 | 0 | 0  | 0  | 0 | 0 | 0 |
| G10 | 684 | 6  | 40.54 | 0.431377 | 7 | 17 | 11 | 0 | 0 | 0 |
| G11 | 644 | 2  | 48.98 | 0.381428 | 2 | 3  | 5  | 0 | 0 | 0 |
| G12 | 839 | 0  | 44.15 | 0.307659 | 0 | 0  | 0  | 0 | 0 | 0 |
| G13 | 814 | 0  | 44.06 | 0.325150 | 0 | 12 | 12 | 0 | 0 | 0 |
| G14 | 918 | 0  | 28.80 | 0.634543 | 2 | 21 | 39 | 0 | 0 | 0 |
| G15 | 615 | 0  | 46.43 | 0.253638 | 0 | 1  | 1  | 0 | 0 | 0 |
| G16 | 799 | 4  | 35.32 | 0.806002 | 2 | 6  | 6  | 0 | 0 | 0 |
| G17 | 916 | 0  | 28.25 | 0.363966 | 2 | 24 | 24 | 0 | 0 | 0 |
| G18 | 662 | 14 | 37.90 | 0.721782 | 3 | 16 | 8  | 0 | 0 | 0 |
| G19 | 634 | 1  | 47.66 | 0.276938 | 1 | 1  | 2  | 0 | 0 | 0 |
| G20 | 825 | 0  | 45.05 | 0.458043 | 2 | 3  | 7  | 0 | 0 | 0 |
| G21 | 782 | 0  | 48.23 | 0.352818 | 0 | 0  | 0  | 0 | 0 | 0 |
| G22 | 689 | 0  | 44.14 | 0.387260 | 0 | 1  | 1  | 0 | 0 | 0 |
| G23 | 794 | 0  | 45.92 | 0.328495 | 0 | 0  | 0  | 0 | 0 | 0 |
| G24 | 793 | 0  | 46.63 | 0.367841 | 0 | 1  | 1  | 0 | 0 | 0 |
| G26 | 816 | 4  | 34.21 | 0.556835 | 4 | 6  | 6  | 0 | 0 | 0 |
| G27 | 736 | 9  | 50.05 | 0.359782 | 3 | 5  | 5  | 0 | 0 | 0 |
| G28 | 672 | 0  | 43.93 | 0.390517 | 2 | 17 | 17 | 0 | 0 | 0 |
| G29 | 834 | 0  | 45.00 | 0.389961 | 0 | 0  | 0  | 0 | 0 | 0 |
| G30 | 748 | 0  | 47.26 | 0.824592 | 1 | 2  | 3  | 0 | 0 | 0 |
| G31 | 940 | 0  | 27.90 | 0.559580 | 0 | 17 | 17 | 0 | 0 | 0 |
| G32 | 844 | 0  | 44.98 | 0.337353 | 0 | 1  | 1  | 0 | 0 | 0 |

mean MP2 rms : 0.440463 m

total mean elevation : 40.83 degrees

# MP2 obs > 10 : 22462

# qc MP2 slips < 25 : 41

# Rvr L1 slips < 25 : 193

# Rvr L2 slips < 25 : 219

# qc MP2 slips > 25 : 1

# Rvr L1 slips > 25 : 1

# Rvr L2 slips > 25 : 1

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |    |          |    |  |  |  |  |
|---------|------|----|----------|----|--|--|--|--|
| 85 - 90 | 121  | 0  | 0.175487 |    |  |  |  |  |
| 80 - 85 | 218  | 0  | 0.243867 |    |  |  |  |  |
| 75 - 80 | 682  | 0  | 0.225337 |    |  |  |  |  |
| 70 - 75 | 1028 | 0  | 0.226679 |    |  |  |  |  |
| 65 - 70 | 1496 | 0  | 0.227225 |    |  |  |  |  |
| 60 - 65 | 1341 | 0  | 0.234105 |    |  |  |  |  |
| 55 - 60 | 1318 | 0  | 0.231730 |    |  |  |  |  |
| 50 - 55 | 1280 | 0  | 0.226381 |    |  |  |  |  |
| 45 - 50 | 1687 | 0  | 0.228774 |    |  |  |  |  |
| 40 - 45 | 1710 | 0  | 0.266315 |    |  |  |  |  |
| 35 - 40 | 1569 | 0  | 0.314322 |    |  |  |  |  |
| 30 - 35 | 1592 | 0  | 0.327250 |    |  |  |  |  |
| 25 - 30 | 2184 | 1  | 0.483021 |    |  |  |  |  |
| 20 - 25 | 2092 | 9  | 0.644190 |    |  |  |  |  |
| 15 - 20 | 2017 | 7  | 0.711090 |    |  |  |  |  |
| 10 - 15 | 2103 | 25 | 0.886144 | ## |  |  |  |  |

```

5 - 10  30  0  0.600434 |||||||||
0 - 5   0  0  0.000000
< 0    0  0  0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig  mean          0|5      1|0
85 - 90  122  0.919  8.549 #####|||
80 - 85  218  0.722  8.748 ###|||
75 - 80  682  0.522  8.789 ##|||
70 - 75 1028  0.456  8.836 #|||
65 - 70 1497  0.403  8.868 #|||
60 - 65 1341  0.472  8.784 #|||
55 - 60 1318  0.543  8.599 ##|||
50 - 55 1280  0.513  8.292 ##|||
45 - 50 1688  0.300  8.050 #|||
40 - 45 1711  0.193  7.995 #|||
35 - 40 1570  0.217  7.989 #|||
30 - 35 1592  0.357  7.898 #|||
25 - 30 2184  0.740  7.193 ###|||
20 - 25 2103  0.710  6.748 ###|||
15 - 20 2039  0.688  6.498 ###|||
10 - 15 2129  0.660  6.043 ###|||
5 - 10  35  1.106  5.800 #####|||
0 - 5   0  0.000  0.000
< 0    0  0.000  0.000

```

S/N L2 summary (per elevation bin):

```

elev (deg) tot SN2 sig  mean          0|5      1|0

```



|         |      |       |       |     |
|---------|------|-------|-------|-----|
| 85 - 90 | 122  | 0.828 | 7.672 | ### |
| 80 - 85 | 218  | 0.698 | 7.647 | ### |
| 75 - 80 | 682  | 0.532 | 7.723 | ##  |
| 70 - 75 | 1028 | 0.494 | 7.746 | ##  |
| 65 - 70 | 1497 | 0.535 | 7.460 | ##  |
| 60 - 65 | 1341 | 0.519 | 7.350 | ##  |
| 55 - 60 | 1318 | 0.443 | 7.180 | ##  |
| 50 - 55 | 1280 | 0.455 | 7.036 | ##  |
| 45 - 50 | 1688 | 0.518 | 6.681 | ##  |
| 40 - 45 | 1711 | 0.527 | 6.400 | ##  |
| 35 - 40 | 1570 | 0.546 | 6.151 | ##  |
| 30 - 35 | 1592 | 0.580 | 5.783 | ##  |
| 25 - 30 | 2184 | 0.739 | 5.102 | ### |
| 20 - 25 | 2097 | 0.882 | 4.839 | ### |
| 15 - 20 | 2021 | 0.791 | 4.547 | ### |
| 10 - 15 | 2113 | 0.817 | 4.137 | ### |
| 5 - 10  | 35   | 0.919 | 4.086 | ### |
| 0 - 5   | 0    | 0.000 | 0.000 |     |
| < 0     | 0    | 0.000 | 0.000 |     |

\*\*\*\*\*

QC of RINEX file(s) : span1270.10o

input RnxNAV file(s) : span1270.10n

\*\*\*\*\*

4-character ID : SPAN

Receiver type : LEICA GRX1200PRO (# = 462661) (fw = 3.00/2.121)

Antenna type : LEIAX1202GG (# = 06500017)

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4658316.4633 1757811.5270 3973717.5446 (m)

antenna WGS 84 (geo) : N 38 deg 46' 52.76" E 20 deg 40' 26.23"

antenna WGS 84 (geo) : 38.781321 deg 20.673954 deg

WGS 84 height : 472.2836 m

[qc - header] position : 36.7161 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 29

NAVSTAR GPS SVs w/o OBS : 1 25 32

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 29295

Possible obs > 10.0 deg: 23104

Complete obs > 10.0 deg: 22310  
 Deleted obs > 10.0 deg: 6  
 Masked obs < 10.0 deg: 2421  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.311222 m  
 Moving average MP2 : 0.372326 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.82 (sd=1.01 n=22316) 6.09 (sd=1.35 n=22310)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 30) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 1  
 IOD slips > 10.0 deg : 6  
 IOD or MP slips < 10.0\*: 1  
 IOD or MP slips > 10.0 : 13  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 24.00 30 23104 22310 97 0.31 0.37 1716

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1181 | 22.39 | 929 | 27.13 | 926 | 926 | 926 | 926 | 0 | 926 | 926 | 0 |
| G03 | 955  | 34.30 | 695 | 45.99 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |
| G04 | 1169 | 22.84 | 913 | 27.86 | 908 | 908 | 908 | 908 | 0 | 908 | 908 | 0 |
| G05 | 1154 | 24.22 | 884 | 30.08 | 881 | 881 | 881 | 881 | 0 | 881 | 881 | 0 |
| G06 | 871  | 41.44 | 752 | 47.21 | 713 | 713 | 713 | 713 | 0 | 713 | 713 | 0 |
| G07 | 912  | 38.28 | 724 | 47.37 | 724 | 724 | 724 | 724 | 0 | 724 | 724 | 0 |
| G08 | 896  | 40.81 | 780 | 46.13 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G09 | 862  | 40.63 | 743 | 46.35 | 162 | 162 | 162 | 162 | 0 | 162 | 162 | 0 |
| G10 | 1080 | 27.96 | 723 | 39.04 | 708 | 708 | 708 | 708 | 0 | 708 | 708 | 0 |
| G11 | 829  | 39.97 | 709 | 45.90 | 699 | 698 | 699 | 698 | 0 | 698 | 699 | 0 |
| G12 | 944  | 39.85 | 835 | 44.40 | 835 | 835 | 835 | 835 | 0 | 835 | 835 | 0 |
| G13 | 920  | 39.60 | 807 | 44.44 | 807 | 807 | 807 | 807 | 0 | 807 | 807 | 0 |
| G14 | 1168 | 23.68 | 926 | 28.58 | 917 | 917 | 917 | 917 | 0 | 917 | 917 | 0 |
| G15 | 1054 | 29.72 | 666 | 44.15 | 663 | 663 | 663 | 663 | 0 | 663 | 663 | 0 |
| G16 | 1119 | 26.98 | 826 | 34.72 | 817 | 816 | 817 | 816 | 0 | 816 | 817 | 0 |
| G17 | 1172 | 23.13 | 924 | 28.00 | 920 | 920 | 920 | 920 | 0 | 920 | 920 | 0 |
| G18 | 1149 | 24.99 | 862 | 31.62 | 788 | 785 | 788 | 785 | 0 | 785 | 788 | 0 |
| G19 | 1031 | 31.43 | 684 | 45.32 | 677 | 677 | 677 | 677 | 0 | 677 | 677 | 0 |
| G20 | 934  | 40.42 | 823 | 45.21 | 822 | 822 | 822 | 822 | 0 | 822 | 822 | 0 |
| G21 | 893  | 42.64 | 776 | 48.33 | 776 | 776 | 776 | 776 | 0 | 776 | 776 | 0 |
| G22 | 1054 | 29.89 | 684 | 43.70 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G23 | 903  | 40.95 | 787 | 46.26 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G24 | 904  | 41.43 | 787 | 46.85 | 786 | 786 | 786 | 786 | 0 | 786 | 786 | 0 |
| G26 | 1099 | 26.84 | 833 | 33.79 | 828 | 827 | 828 | 827 | 0 | 827 | 828 | 0 |
| G27 | 916  | 41.61 | 802 | 46.82 | 801 | 801 | 801 | 801 | 0 | 801 | 801 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1092 | 28.89 | 666 | 43.56 | 666 | 666 | 666 | 666 | 0 | 666 | 666 | 0 |
| G29 | 940  | 40.45 | 828 | 45.26 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G30 | 911  | 40.13 | 796 | 45.21 | 796 | 796 | 796 | 796 | 0 | 796 | 796 | 0 |
| G31 | 1183 | 23.26 | 940 | 27.99 | 938 | 938 | 938 | 938 | 0 | 938 | 938 | 0 |
| G01 | 1166 | 23.85 | 922 | 28.84 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G25 | 1002 | 33.93 | 711 | 46.52 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 31

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 6

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 6

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 22347

Obs deleted (any reason) : 37

Obs complete : 22310

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 125 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 243 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 697 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1092 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |                |
|---------|------|---|----------------|
| 65 - 70 | 1326 | 0 | 0.000000       |
| 60 - 65 | 1165 | 0 | 0.000000       |
| 55 - 60 | 1275 | 0 | 0.000000       |
| 50 - 55 | 1194 | 0 | 0.000000       |
| 45 - 50 | 1630 | 0 | 0.000000       |
| 40 - 45 | 1615 | 0 | 0.000000       |
| 35 - 40 | 1514 | 0 | 0.000000       |
| 30 - 35 | 1531 | 0 | 0.000000       |
| 25 - 30 | 2228 | 0 | 0.000000       |
| 20 - 25 | 2089 | 0 | 0.000000       |
| 15 - 20 | 2270 | 0 | 0.000000       |
| 10 - 15 | 2290 | 6 | 0.000000       |
| 5 - 10  | 28   | 1 | 0.000000 ===== |
| 0 - 5   | 0    | 0 | 0.000000       |
| < 0     | 0    | 0 | 0.000000       |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 926    | 0     | 27.27  | 0.327837 | 1       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G03 | 680    | 0     | 46.86  | 0.235985 | 3       | 4     | 4    | 0     | 0    | 0     |      |       |      |
| G04 | 908    | 0     | 28.05  | 0.298529 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G05 | 881    | 0     | 30.24  | 0.302810 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G06 | 713    | 0     | 49.18  | 0.241328 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 724    | 0     | 47.37  | 0.257570 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 779    | 0     | 46.28  | 0.260411 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 162    | 0     | 26.02  | 0.376510 | 0       | 2     | 2    | 1     | 2    | 2     |      |       |      |
| G10 | 708    | 0     | 39.76  | 0.225094 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 699 | 1 | 46.56 | 0.240518 | 0 | 2 | 2 | 0 | 0 | 0 |
| G12 | 835 | 0 | 44.50 | 0.243797 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 807 | 0 | 44.54 | 0.242578 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 917 | 0 | 28.84 | 0.443401 | 2 | 5 | 5 | 0 | 0 | 0 |
| G15 | 663 | 0 | 44.43 | 0.228995 | 0 | 1 | 1 | 0 | 0 | 0 |
| G16 | 817 | 1 | 35.06 | 0.321278 | 2 | 5 | 5 | 0 | 0 | 0 |
| G17 | 920 | 0 | 28.16 | 0.386954 | 0 | 3 | 3 | 0 | 0 | 0 |
| G18 | 788 | 3 | 33.52 | 0.570385 | 1 | 4 | 2 | 0 | 0 | 0 |
| G19 | 677 | 0 | 45.80 | 0.245877 | 1 | 2 | 2 | 0 | 0 | 0 |
| G20 | 822 | 0 | 45.35 | 0.278182 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 776 | 0 | 48.33 | 0.280199 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 684 | 0 | 43.81 | 0.269816 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 787 | 0 | 46.26 | 0.216543 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 786 | 0 | 46.92 | 0.279059 | 2 | 2 | 4 | 0 | 0 | 0 |
| G26 | 828 | 1 | 34.06 | 0.279590 | 1 | 3 | 3 | 0 | 0 | 0 |
| G27 | 801 | 0 | 46.96 | 0.221578 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 666 | 0 | 43.56 | 0.298343 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 828 | 0 | 45.32 | 0.582056 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 796 | 0 | 45.30 | 0.239697 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 938 | 0 | 28.10 | 0.534343 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.311225 m

total mean elevation : 40.03 degrees

# MP1 obs > 10 : 22310

# qc MP1 slips < 25 : 13

# Rvr L1 slips < 25 : 52

# Rvr L2 slips < 25 : 52

# qc MP1 slips > 25 : 1



# Rvr L1 slips > 25 : 2

# Rvr L2 slips > 25 : 2

| elev (deg) | tot slips | <MP1 rms, m> | 5=%      | 1 m   | 15=% | 2 m |
|------------|-----------|--------------|----------|-------|------|-----|
| 85 - 90    | 125       | 0            | 0.147945 |       |      |     |
| 80 - 85    | 243       | 0            | 0.196202 |       |      |     |
| 75 - 80    | 697       | 0            | 0.182572 |       |      |     |
| 70 - 75    | 1092      | 0            | 0.182711 |       |      |     |
| 65 - 70    | 1326      | 0            | 0.174682 |       |      |     |
| 60 - 65    | 1165      | 0            | 0.178823 |       |      |     |
| 55 - 60    | 1275      | 0            | 0.185035 |       |      |     |
| 50 - 55    | 1194      | 0            | 0.176337 |       |      |     |
| 45 - 50    | 1630      | 0            | 0.205624 |       |      |     |
| 40 - 45    | 1615      | 0            | 0.227323 |       |      |     |
| 35 - 40    | 1514      | 0            | 0.227613 |       |      |     |
| 30 - 35    | 1531      | 0            | 0.287097 |       |      |     |
| 25 - 30    | 2228      | 1            | 0.305218 |       |      |     |
| 20 - 25    | 2089      | 0            | 0.325309 |       |      |     |
| 15 - 20    | 2270      | 0            | 0.411140 |       |      |     |
| 10 - 15    | 2290      | 13           | 0.672126 | #     |      |     |
| 5 - 10     | 28        | 1            | 0.687332 | ##### |      |     |
| 0 - 5      | 0         | 0            | 0.000000 |       |      |     |
| < 0        | 0         | 0            | 0.000000 |       |      |     |

MP2 RMS summary (per SV):

|           | slips | L1 rx  | L2 rx       | slips    | L1 rx | L2 rx |      |      |      |   |
|-----------|-------|--------|-------------|----------|-------|-------|------|------|------|---|
| SV obs>10 | # del | <elev> | MP2 rms [m] | < 25     | < 25  | < 25  | > 25 | > 25 | > 25 |   |
| G02       | 926   | 0      | 27.27       | 0.354505 | 1     | 2     | 2    | 0    | 0    | 0 |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G03 | 680 | 0 | 46.86 | 0.315580 | 3 | 4 | 4 | 0 | 0 | 0 |
| G04 | 908 | 0 | 28.05 | 0.318600 | 0 | 2 | 2 | 0 | 0 | 0 |
| G05 | 881 | 0 | 30.24 | 0.313795 | 0 | 2 | 2 | 0 | 0 | 0 |
| G06 | 713 | 0 | 49.18 | 0.254623 | 0 | 1 | 1 | 0 | 0 | 0 |
| G07 | 724 | 0 | 47.37 | 0.275732 | 0 | 0 | 0 | 0 | 0 | 0 |
| G08 | 779 | 0 | 46.28 | 0.310100 | 0 | 1 | 1 | 0 | 0 | 0 |
| G09 | 162 | 0 | 26.02 | 0.580536 | 0 | 2 | 2 | 1 | 2 | 2 |
| G10 | 708 | 0 | 39.76 | 0.364150 | 0 | 2 | 2 | 0 | 0 | 0 |
| G11 | 699 | 1 | 46.56 | 0.329637 | 0 | 2 | 2 | 0 | 0 | 0 |
| G12 | 835 | 0 | 44.50 | 0.306396 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 807 | 0 | 44.54 | 0.296992 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 917 | 0 | 28.84 | 0.529925 | 2 | 5 | 5 | 0 | 0 | 0 |
| G15 | 663 | 0 | 44.43 | 0.295451 | 0 | 1 | 1 | 0 | 0 | 0 |
| G16 | 817 | 1 | 35.06 | 0.333444 | 3 | 5 | 5 | 0 | 0 | 0 |
| G17 | 920 | 0 | 28.16 | 0.399389 | 0 | 3 | 3 | 0 | 0 | 0 |
| G18 | 788 | 3 | 33.52 | 0.788166 | 0 | 4 | 2 | 0 | 0 | 0 |
| G19 | 677 | 0 | 45.80 | 0.311486 | 1 | 2 | 2 | 0 | 0 | 0 |
| G20 | 822 | 0 | 45.35 | 0.298332 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 776 | 0 | 48.33 | 0.345712 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 684 | 0 | 43.81 | 0.332984 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 787 | 0 | 46.26 | 0.294153 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 786 | 0 | 46.92 | 0.313508 | 2 | 2 | 4 | 0 | 0 | 0 |
| G26 | 828 | 1 | 34.06 | 0.322092 | 1 | 3 | 3 | 0 | 0 | 0 |
| G27 | 801 | 0 | 46.96 | 0.278365 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 666 | 0 | 43.56 | 0.317321 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 828 | 0 | 45.32 | 0.550226 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 796 | 0 | 45.30 | 0.332977 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 938 | 0 | 28.10 | 0.753294 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.372337 m

total mean elevation : 40.03 degrees

# MP2 obs > 10 : 22310

# qc MP2 slips < 25 : 13

# Rvr L1 slips < 25 : 52

# Rvr L2 slips < 25 : 52

# qc MP2 slips > 25 : 1

# Rvr L1 slips > 25 : 2

# Rvr L2 slips > 25 : 2

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |    |          |   |  |  |  |  |
|---------|------|----|----------|---|--|--|--|--|
| 85 - 90 | 125  | 0  | 0.192426 |   |  |  |  |  |
| 80 - 85 | 243  | 0  | 0.174751 |   |  |  |  |  |
| 75 - 80 | 697  | 0  | 0.210006 |   |  |  |  |  |
| 70 - 75 | 1092 | 0  | 0.258878 |   |  |  |  |  |
| 65 - 70 | 1326 | 0  | 0.208258 |   |  |  |  |  |
| 60 - 65 | 1165 | 0  | 0.253914 |   |  |  |  |  |
| 55 - 60 | 1275 | 0  | 0.227155 |   |  |  |  |  |
| 50 - 55 | 1194 | 0  | 0.216847 |   |  |  |  |  |
| 45 - 50 | 1630 | 0  | 0.259332 |   |  |  |  |  |
| 40 - 45 | 1615 | 0  | 0.256570 |   |  |  |  |  |
| 35 - 40 | 1514 | 0  | 0.307515 |   |  |  |  |  |
| 30 - 35 | 1531 | 0  | 0.308020 |   |  |  |  |  |
| 25 - 30 | 2228 | 1  | 0.323138 |   |  |  |  |  |
| 20 - 25 | 2089 | 0  | 0.348831 |   |  |  |  |  |
| 15 - 20 | 2270 | 0  | 0.467293 |   |  |  |  |  |
| 10 - 15 | 2290 | 13 | 0.860197 | # |  |  |  |  |

```

5 - 10  28  1  0.794014 #####|
0 - 5   0  0  0.000000
< 0    0  0  0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig  mean          0|5      1|0
85 - 90  126  0.909  8.540 #####|
80 - 85  243  0.678  8.798 ###|
75 - 80  697  0.496  8.828 ##|
70 - 75 1092  0.392  8.903 ##|
65 - 70 1327  0.357  8.921 #|
60 - 65 1165  0.400  8.890 ##|
55 - 60 1275  0.453  8.818 ##|
50 - 55 1194  0.556  8.541 ##|
45 - 50 1631  0.432  8.172 ##|
40 - 45 1615  0.271  8.030 #|
35 - 40 1516  0.209  7.993 #|
30 - 35 1531  0.302  7.942 #|
25 - 30 2228  0.522  7.576 ##|
20 - 25 2091  0.512  7.105 ##|
15 - 20 2272  0.629  6.632 ###|
10 - 15 2313  0.720  6.167 ###|
5 - 10  31  1.166  5.677 #####|
0 - 5   0  0.000  0.000
< 0    0  0.000  0.000

```

S/N L2 summary (per elevation bin):

```

elev (deg) tot SN2 sig  mean          0|5      1|0

```

|         |      |       |       |      |
|---------|------|-------|-------|------|
| 85 - 90 | 126  | 0.777 | 7.810 | ###  |
| 80 - 85 | 243  | 0.621 | 7.811 | ##   |
| 75 - 80 | 697  | 0.452 | 7.855 | ##   |
| 70 - 75 | 1092 | 0.460 | 7.800 | ##   |
| 65 - 70 | 1327 | 0.526 | 7.625 | ##   |
| 60 - 65 | 1165 | 0.544 | 7.448 | ##   |
| 55 - 60 | 1275 | 0.464 | 7.214 | ##   |
| 50 - 55 | 1194 | 0.443 | 7.085 | ##   |
| 45 - 50 | 1631 | 0.502 | 6.752 | ##   |
| 40 - 45 | 1615 | 0.531 | 6.472 | ##   |
| 35 - 40 | 1516 | 0.556 | 6.178 | ##   |
| 30 - 35 | 1531 | 0.624 | 5.810 | ##   |
| 25 - 30 | 2228 | 0.609 | 5.472 | ##   |
| 20 - 25 | 2091 | 0.675 | 5.036 | ###  |
| 15 - 20 | 2272 | 0.825 | 4.588 | ###  |
| 10 - 15 | 2307 | 0.812 | 4.173 | ###  |
| 5 - 10  | 31   | 0.946 | 3.806 | #### |
| 0 - 5   | 0    | 0.000 | 0.000 |      |
| < 0     | 0    | 0.000 | 0.000 |      |

\*\*\*\*\*

QC of RINEX file(s) : vlsm1270.10o

input RnxNAV file(s) : vlsm1270.10n

\*\*\*\*\*

4-character ID : VLSM

Receiver type : LEICA GRX1200PRO (# = 462019) (fw = 7.53/2.125)

Antenna type : LEIAX1202 (# = 05470019)

Time of start of window : 2010 May 7 00:00:00.000

Time of end of window : 2010 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4699987.1557 1765577.4758 3921173.5095 (m)

antenna WGS 84 (geo) : N 38 deg 10' 36.74" E 20 deg 35' 20.33"

antenna WGS 84 (geo) : 38.176872 deg 20.588981 deg

WGS 84 height : 449.1486 m

[qc - header] position : 33.3217 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 25

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30222

Possible obs > 10.0 deg: 23957

Complete obs > 10.0 deg: 22670  
 Deleted obs > 10.0 deg: 3  
 Masked obs < 10.0 deg: 1995  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.225668 m  
 Moving average MP2 : 0.279057 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.72 (sd=0.94 n=22673) 6.11 (sd=1.23 n=22670)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11079 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 10) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 2  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 5  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 10 5 7 00:00 10 5 7 23:59 24.00 30 23957 22670 95 0.23 0.28 4534

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2010 May 7 00:00:00.000

Observations end : 2010 May 7 23:59:30.000

Observation interval : 30.0000 second(s)



SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1183 | 22.31 | 928 | 27.07 | 887 | 886 | 887 | 886 | 0 | 886 | 887 | 0 |
| G03 | 938  | 35.02 | 697 | 46.06 | 696 | 696 | 696 | 696 | 0 | 696 | 696 | 0 |
| G04 | 1170 | 22.80 | 913 | 27.82 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G05 | 1153 | 24.21 | 881 | 30.12 | 760 | 759 | 760 | 759 | 0 | 759 | 760 | 0 |
| G06 | 874  | 41.43 | 755 | 47.18 | 754 | 754 | 754 | 754 | 0 | 754 | 754 | 0 |
| G07 | 875  | 39.93 | 726 | 47.31 | 682 | 682 | 682 | 682 | 0 | 682 | 682 | 0 |
| G08 | 900  | 40.62 | 783 | 45.95 | 743 | 743 | 743 | 743 | 0 | 743 | 743 | 0 |
| G09 | 866  | 40.47 | 746 | 46.19 | 745 | 745 | 745 | 745 | 0 | 745 | 745 | 0 |
| G10 | 1077 | 28.03 | 699 | 40.14 | 644 | 644 | 644 | 644 | 0 | 644 | 644 | 0 |
| G11 | 832  | 40.03 | 712 | 45.95 | 712 | 712 | 712 | 712 | 0 | 712 | 712 | 0 |
| G12 | 948  | 39.66 | 839 | 44.16 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G13 | 925  | 39.37 | 811 | 44.20 | 796 | 796 | 796 | 796 | 0 | 796 | 796 | 0 |
| G14 | 1168 | 23.61 | 925 | 28.50 | 877 | 877 | 877 | 877 | 0 | 877 | 877 | 0 |
| G15 | 1049 | 29.88 | 668 | 44.20 | 667 | 667 | 667 | 667 | 0 | 667 | 667 | 0 |
| G16 | 1117 | 27.00 | 821 | 34.87 | 634 | 634 | 634 | 634 | 0 | 634 | 634 | 0 |
| G17 | 1174 | 23.03 | 924 | 27.92 | 882 | 882 | 882 | 882 | 0 | 882 | 882 | 0 |
| G18 | 1149 | 24.95 | 860 | 31.62 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G19 | 1025 | 31.64 | 685 | 45.42 | 685 | 685 | 685 | 685 | 0 | 685 | 685 | 0 |
| G20 | 938  | 40.25 | 827 | 44.98 | 819 | 819 | 819 | 819 | 0 | 819 | 819 | 0 |
| G21 | 895  | 42.60 | 778 | 48.26 | 738 | 738 | 738 | 738 | 0 | 738 | 738 | 0 |
| G22 | 1050 | 30.00 | 685 | 43.73 | 640 | 640 | 640 | 640 | 0 | 640 | 640 | 0 |
| G23 | 907  | 40.78 | 790 | 46.08 | 759 | 758 | 759 | 758 | 0 | 758 | 759 | 0 |
| G24 | 907  | 41.31 | 789 | 46.73 | 750 | 750 | 750 | 750 | 0 | 750 | 750 | 0 |
| G26 | 1098 | 26.84 | 829 | 33.90 | 605 | 605 | 605 | 605 | 0 | 605 | 605 | 0 |
| G27 | 920  | 41.45 | 805 | 46.66 | 805 | 805 | 805 | 805 | 0 | 805 | 805 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G28 | 1089 | 28.92 | 668 | 43.49 | 625 | 625 | 625 | 625 | 0 | 625 | 625 | 0 |
| G29 | 944  | 40.27 | 832 | 45.02 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G30 | 916  | 39.93 | 800 | 44.99 | 800 | 800 | 800 | 800 | 0 | 800 | 800 | 0 |
| G31 | 1184 | 23.19 | 939 | 27.94 | 862 | 862 | 862 | 862 | 0 | 862 | 862 | 0 |
| G32 | 951  | 40.39 | 842 | 44.97 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G25 | 992  | 34.25 | 711 | 46.55 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 24

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 3

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 3

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 22697

Obs deleted (any reason) : 27

Obs complete : 22670

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 126 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 292 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 722 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1163 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 712 | 0 | 46.06 | 0.193391 | 0 | 0 | 0 | 0 | 0 | 0 |
| G12 | 829 | 0 | 44.66 | 0.170594 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 796 | 0 | 44.92 | 0.188514 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 877 | 0 | 29.30 | 0.303794 | 1 | 0 | 0 | 0 | 0 | 0 |
| G15 | 667 | 0 | 44.37 | 0.188280 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 634 | 0 | 41.48 | 0.174238 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 882 | 0 | 28.68 | 0.313959 | 0 | 0 | 0 | 0 | 0 | 0 |
| G18 | 814 | 0 | 32.69 | 0.309885 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 685 | 0 | 45.54 | 0.178038 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 819 | 0 | 45.41 | 0.162159 | 1 | 0 | 0 | 0 | 0 | 0 |
| G21 | 738 | 0 | 50.17 | 0.244420 | 1 | 0 | 0 | 0 | 0 | 0 |
| G22 | 640 | 0 | 45.95 | 0.181693 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 759 | 1 | 47.50 | 0.196777 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 750 | 0 | 48.52 | 0.187820 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 605 | 0 | 41.33 | 0.187308 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 805 | 0 | 46.75 | 0.205001 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 625 | 0 | 45.67 | 0.216840 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 814 | 0 | 45.83 | 0.216134 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 800 | 0 | 45.09 | 0.223713 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 862 | 0 | 29.33 | 0.273129 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 820 | 0 | 45.96 | 0.175629 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.225662 m

total mean elevation : 41.78 degrees

# MP1 obs > 10 : 22670

# qc MP1 slips < 25 : 5

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 126      | 0    | 0.095343 |     |     |      |     |
| 80 - 85    | 292      | 0    | 0.077891 |     |     |      |     |
| 75 - 80    | 722      | 0    | 0.095513 |     |     |      |     |
| 70 - 75    | 1163     | 0    | 0.107187 |     |     |      |     |
| 65 - 70    | 1514     | 0    | 0.122501 |     |     |      |     |
| 60 - 65    | 1309     | 0    | 0.133536 |     |     |      |     |
| 55 - 60    | 1393     | 0    | 0.135731 |     |     |      |     |
| 50 - 55    | 1315     | 0    | 0.147204 |     |     |      |     |
| 45 - 50    | 1742     | 0    | 0.188689 |     |     |      |     |
| 40 - 45    | 1726     | 0    | 0.174497 |     |     |      |     |
| 35 - 40    | 1615     | 0    | 0.185989 |     |     |      |     |
| 30 - 35    | 1589     | 0    | 0.207573 |     |     |      |     |
| 25 - 30    | 2310     | 0    | 0.257618 |     |     |      |     |
| 20 - 25    | 2165     | 0    | 0.262461 |     |     |      |     |
| 15 - 20    | 2077     | 3    | 0.466047 |     |     |      |     |
| 10 - 15    | 1584     | 2    | 0.369633 |     |     |      |     |
| 5 - 10     | 22       | 0    | 0.700722 |     |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |     |     |      |     |
| < 0        | 0        | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G02 | 887 | 1 | 27.80 | 0.272476 | 1 | 0 | 0 | 0 | 0 | 0 |
| G03 | 696 | 0 | 46.23 | 0.206011 | 0 | 0 | 0 | 0 | 0 | 0 |
| G04 | 829 | 0 | 29.39 | 0.314543 | 1 | 0 | 0 | 0 | 0 | 0 |
| G05 | 760 | 1 | 32.88 | 0.651196 | 0 | 0 | 0 | 0 | 0 | 0 |
| G06 | 754 | 0 | 47.32 | 0.230459 | 0 | 0 | 0 | 0 | 0 | 0 |
| G07 | 682 | 0 | 49.62 | 0.216495 | 0 | 0 | 0 | 0 | 0 | 0 |
| G08 | 743 | 0 | 47.83 | 0.218346 | 0 | 0 | 0 | 0 | 0 | 0 |
| G09 | 745 | 0 | 46.34 | 0.238917 | 0 | 0 | 0 | 0 | 0 | 0 |
| G10 | 644 | 0 | 42.82 | 0.263307 | 0 | 0 | 0 | 0 | 0 | 0 |
| G11 | 712 | 0 | 46.06 | 0.262982 | 0 | 0 | 0 | 0 | 0 | 0 |
| G12 | 829 | 0 | 44.66 | 0.227892 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 796 | 0 | 44.92 | 0.222155 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 877 | 0 | 29.30 | 0.441931 | 1 | 0 | 0 | 0 | 0 | 0 |
| G15 | 667 | 0 | 44.37 | 0.256676 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 634 | 0 | 41.48 | 0.268630 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 882 | 0 | 28.68 | 0.392329 | 0 | 0 | 0 | 0 | 0 | 0 |
| G18 | 814 | 0 | 32.69 | 0.290468 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 685 | 0 | 45.54 | 0.213672 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 819 | 0 | 45.41 | 0.230408 | 1 | 0 | 0 | 0 | 0 | 0 |
| G21 | 738 | 0 | 50.17 | 0.216481 | 1 | 0 | 0 | 0 | 0 | 0 |
| G22 | 640 | 0 | 45.95 | 0.218288 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 759 | 1 | 47.50 | 0.218426 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 750 | 0 | 48.52 | 0.242891 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 605 | 0 | 41.33 | 0.313042 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 805 | 0 | 46.75 | 0.241779 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 625 | 0 | 45.67 | 0.270561 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 814 | 0 | 45.83 | 0.257244 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 800 | 0 | 45.09 | 0.356093 | 0 | 0 | 0 | 0 | 0 | 0 |

G31 862 0 29.33 0.335874 0 0 0 0 0 0  
 G32 820 0 45.96 0.208861 0 0 0 0 0 0

mean MP2 rms : 0.279049 m

total mean elevation : 41.78 degrees

# MP2 obs > 10 : 22670

# qc MP2 slips < 25 : 5

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 126 0 0.116532 ||  
 80 - 85 292 0 0.137844 |||  
 75 - 80 722 0 0.164355 |||  
 70 - 75 1163 0 0.164393 |||  
 65 - 70 1514 0 0.193526 ||||  
 60 - 65 1309 0 0.189485 ||||  
 55 - 60 1393 0 0.168155 |||  
 50 - 55 1315 0 0.193211 ||||  
 45 - 50 1742 0 0.198088 ||||  
 40 - 45 1726 0 0.225564 |||||  
 35 - 40 1615 0 0.238862 |||||  
 30 - 35 1589 0 0.294739 |||||  
 25 - 30 2310 0 0.288122 |||||  
 20 - 25 2165 0 0.300727 |||||

|         |      |   |          |  |
|---------|------|---|----------|--|
| 15 - 20 | 2077 | 3 | 0.482791 |  |
| 10 - 15 | 1584 | 2 | 0.526957 |  |
| 5 - 10  | 22   | 0 | 0.228786 |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |
| < 0     | 0    | 0 | 0.000000 |  |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 127  | 0.906 | 8.551 | #### |     |     |
| 80 - 85    | 292  | 0.681 | 8.685 | ###  |     |     |
| 75 - 80    | 722  | 0.536 | 8.751 | ##   |     |     |
| 70 - 75    | 1164 | 0.501 | 8.747 | ##   |     |     |
| 65 - 70    | 1514 | 0.504 | 8.708 | ##   |     |     |
| 60 - 65    | 1309 | 0.539 | 8.623 | ##   |     |     |
| 55 - 60    | 1393 | 0.533 | 8.368 | ##   |     |     |
| 50 - 55    | 1315 | 0.438 | 8.164 | ##   |     |     |
| 45 - 50    | 1743 | 0.233 | 8.013 | #    |     |     |
| 40 - 45    | 1726 | 0.197 | 7.995 | #    |     |     |
| 35 - 40    | 1617 | 0.240 | 7.976 | #    |     |     |
| 30 - 35    | 1589 | 0.457 | 7.776 | ##   |     |     |
| 25 - 30    | 2310 | 0.508 | 7.326 | ##   |     |     |
| 20 - 25    | 2167 | 0.418 | 6.920 | ##   |     |     |
| 15 - 20    | 2080 | 0.602 | 6.476 | ##   |     |     |
| 10 - 15    | 1605 | 0.592 | 5.975 | ##   |     |     |
| 5 - 10     | 24   | 1.308 | 5.667 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |



S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 127  | 0.820 | 7.654 | ###  |     |     |
| 80 - 85    | 292  | 0.663 | 7.562 | ###  |     |     |
| 75 - 80    | 722  | 0.555 | 7.640 | ##   |     |     |
| 70 - 75    | 1164 | 0.540 | 7.582 | ##   |     |     |
| 65 - 70    | 1514 | 0.523 | 7.383 | ##   |     |     |
| 60 - 65    | 1309 | 0.497 | 7.286 | ##   |     |     |
| 55 - 60    | 1393 | 0.433 | 7.164 | ##   |     |     |
| 50 - 55    | 1315 | 0.426 | 6.979 | ##   |     |     |
| 45 - 50    | 1743 | 0.519 | 6.598 | ##   |     |     |
| 40 - 45    | 1726 | 0.522 | 6.383 | ##   |     |     |
| 35 - 40    | 1617 | 0.569 | 6.091 | ##   |     |     |
| 30 - 35    | 1589 | 0.573 | 5.696 | ##   |     |     |
| 25 - 30    | 2310 | 0.609 | 5.403 | ##   |     |     |
| 20 - 25    | 2167 | 0.669 | 5.003 | ###  |     |     |
| 15 - 20    | 2078 | 0.738 | 4.622 | ###  |     |     |
| 10 - 15    | 1604 | 0.785 | 4.186 | ###  |     |     |
| 5 - 10     | 24   | 1.116 | 3.875 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

## **Έτος 2011 ημέρα 127**

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QC of RINEX file(s) : atal1270.11o

input RnxNAV file(s) : atal1270.11n

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4-character ID : ATAL

Receiver type : ASHTECH UZ-12 (# = PRODUCTION05) (fw = CN00)

Antenna type : NOV533 (# = 32871)

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4591116.3683 1948781.8086 3962411.9578 (m)

antenna WGS 84 (geo) : N 38 deg 39' 11.11" E 22 deg 59' 58.80"

antenna WGS 84 (geo) : 38.653085 deg 22.999667 deg

WGS 84 height : 155.9409 m

|qc - header| position : 32.7392 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2878

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31062  
 Possible obs > 10.0 deg: 24668  
 Complete obs > 10.0 deg: 22515  
 Deleted obs > 10.0 deg: 34  
 Masked obs < 10.0 deg: 2102  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.139774 m  
 Moving average MP2 : 0.246164 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 0.00 (sd=0.00 n=0) 0.00 (sd=0.00 n=0)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 1 (: 289) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 130  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 144  
 \* or unknown elevation

| first epoch | last epoch | hrs | dt        | #expt | #have | %     | mp1   | mp2 | o/slps        |
|-------------|------------|-----|-----------|-------|-------|-------|-------|-----|---------------|
| SUM 11      | 5 7 00:00  | 11  | 5 7 23:59 | 23.98 | 30    | 24668 | 22515 | 91  | 0.14 0.25 156 |

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

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|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G29 | 940  | 40.22 | 828 | 44.98 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G02 | 1183 | 22.42 | 927 | 27.24 | 878 | 877 | 878 | 877 | 0 | 877 | 878 | 0 |
| G31 | 1186 | 22.98 | 937 | 27.81 | 887 | 887 | 887 | 887 | 0 | 887 | 887 | 0 |
| G14 | 1167 | 23.72 | 922 | 28.70 | 867 | 866 | 867 | 866 | 0 | 866 | 867 | 0 |
| G25 | 908  | 40.76 | 792 | 46.00 | 760 | 760 | 760 | 760 | 0 | 760 | 760 | 0 |
| G12 | 943  | 39.71 | 834 | 44.25 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G27 | 913  | 41.65 | 798 | 46.93 | 745 | 745 | 745 | 745 | 0 | 745 | 745 | 0 |
| G05 | 1150 | 24.08 | 888 | 29.72 | 829 | 828 | 829 | 828 | 0 | 828 | 829 | 0 |
| G18 | 1119 | 26.84 | 781 | 36.15 | 627 | 625 | 627 | 625 | 0 | 625 | 627 | 0 |
| G21 | 901  | 42.47 | 785 | 48.02 | 722 | 720 | 722 | 720 | 0 | 720 | 722 | 0 |
| G16 | 1143 | 25.56 | 881 | 31.65 | 771 | 768 | 771 | 768 | 0 | 768 | 771 | 0 |
| G30 | 1099 | 27.03 | 804 | 35.04 | 737 | 735 | 737 | 735 | 0 | 735 | 737 | 0 |
| G06 | 869  | 41.62 | 750 | 47.44 | 653 | 651 | 653 | 651 | 0 | 651 | 653 | 0 |
| G22 | 992  | 33.46 | 710 | 45.53 | 647 | 645 | 647 | 645 | 0 | 645 | 647 | 0 |
| G03 | 966  | 33.79 | 698 | 45.62 | 611 | 609 | 611 | 609 | 0 | 609 | 611 | 0 |
| G15 | 1108 | 26.76 | 781 | 35.73 | 709 | 707 | 709 | 707 | 0 | 707 | 709 | 0 |
| G19 | 1050 | 30.55 | 677 | 44.97 | 596 | 594 | 596 | 594 | 0 | 594 | 596 | 0 |
| G11 | 840  | 40.58 | 720 | 46.53 | 618 | 618 | 618 | 618 | 0 | 618 | 618 | 0 |
| G32 | 950  | 40.44 | 841 | 45.04 | 794 | 793 | 794 | 793 | 0 | 793 | 794 | 0 |
| G24 | 869  | 41.75 | 751 | 47.54 | 670 | 670 | 670 | 670 | 0 | 670 | 670 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G20 | 931  | 40.55 | 818 | 45.46 | 781 | 780 | 781 | 780 | 0 | 780 | 781 | 0 |
| G28 | 1076 | 30.10 | 681 | 44.61 | 620 | 619 | 620 | 619 | 0 | 619 | 620 | 0 |
| G23 | 903  | 41.06 | 786 | 46.43 | 727 | 726 | 727 | 726 | 0 | 726 | 727 | 0 |
| G17 | 1169 | 23.38 | 916 | 28.46 | 867 | 867 | 867 | 867 | 0 | 867 | 867 | 0 |
| G13 | 928  | 39.41 | 817 | 44.09 | 767 | 766 | 767 | 766 | 0 | 766 | 767 | 0 |
| G04 | 1174 | 22.50 | 921 | 27.32 | 848 | 847 | 848 | 847 | 0 | 847 | 848 | 0 |
| G07 | 861  | 41.49 | 742 | 47.35 | 681 | 679 | 681 | 679 | 0 | 679 | 681 | 0 |
| G10 | 1026 | 31.03 | 675 | 45.03 | 592 | 590 | 592 | 590 | 0 | 590 | 592 | 0 |
| G08 | 900  | 40.71 | 784 | 45.99 | 724 | 723 | 724 | 723 | 0 | 723 | 724 | 0 |
| G26 | 955  | 35.40 | 700 | 47.23 | 602 | 601 | 602 | 601 | 0 | 601 | 602 | 0 |
| G09 | 843  | 40.92 | 723 | 46.88 | 640 | 640 | 640 | 640 | 0 | 640 | 640 | 0 |

Obs below mask ( 10.00 deg) : 1

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 34

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 34

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 22550

Obs deleted (any reason) : 35

Obs complete : 22515

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 206       | 0            | 0.000000 |     |      |     |
| 80 - 85    | 376       | 0            | 0.000000 |     |      |     |
| 75 - 80    | 912       | 0            | 0.000000 |     |      |     |
| 70 - 75    | 1024      | 0            | 0.000000 |     |      |     |
| 65 - 70    | 1506      | 0            | 0.000000 |     |      |     |
| 60 - 65    | 1367      | 0            | 0.000000 |     |      |     |
| 55 - 60    | 1407      | 1            | 0.000000 |     |      |     |
| 50 - 55    | 1419      | 4            | 0.000000 |     |      |     |
| 45 - 50    | 1631      | 9            | 0.000000 | =   |      |     |
| 40 - 45    | 1841      | 18           | 0.000000 | =   |      |     |
| 35 - 40    | 1650      | 27           | 0.000000 | === |      |     |
| 30 - 35    | 1745      | 31           | 0.000000 | === |      |     |
| 25 - 30    | 2253      | 18           | 0.000000 | =   |      |     |
| 20 - 25    | 2058      | 16           | 0.000000 | =   |      |     |
| 15 - 20    | 1720      | 5            | 0.000000 |     |      |     |
| 10 - 15    | 1369      | 1            | 0.000000 |     |      |     |
| 5 - 10     | 1         | 0            | 0.000000 |     |      |     |
| 0 - 5      | 0         | 0            | 0.000000 |     |      |     |
| < 0        | 0         | 0            | 0.000000 |     |      |     |

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | < 25  | < 25  | < 25  | > 25  | > 25  | > 25  |
|-----|--------|-------|--------|-------------|-------|-------|-------|-------|-------|-------|
|     |        |       |        |             | slips | L1 rx | L2 rx | slips | L1 rx | L2 rx |
| G29 | 777    | 0     | 47.03  | 0.109329    | 0     | 1     | 1     | 4     | 0     | 0     |
| G02 | 878    | 1     | 28.22  | 0.139383    | 3     | 1     | 2     | 5     | 0     | 0     |

|     |     |   |       |          |   |   |    |   |   |   |
|-----|-----|---|-------|----------|---|---|----|---|---|---|
| G31 | 887 | 0 | 28.68 | 0.150066 | 5 | 2 | 2  | 3 | 0 | 0 |
| G14 | 867 | 1 | 29.84 | 0.203032 | 2 | 1 | 3  | 4 | 0 | 0 |
| G25 | 760 | 0 | 47.50 | 0.129144 | 0 | 1 | 2  | 4 | 0 | 0 |
| G12 | 802 | 0 | 45.59 | 0.115662 | 0 | 0 | 1  | 4 | 0 | 0 |
| G27 | 745 | 0 | 49.43 | 0.125938 | 0 | 0 | 1  | 4 | 0 | 0 |
| G05 | 829 | 1 | 30.82 | 0.204249 | 4 | 6 | 6  | 0 | 0 | 0 |
| G18 | 627 | 2 | 41.88 | 0.253439 | 1 | 1 | 11 | 4 | 0 | 0 |
| G21 | 722 | 2 | 50.81 | 0.115958 | 0 | 1 | 1  | 4 | 0 | 0 |
| G16 | 771 | 3 | 34.11 | 0.226626 | 2 | 1 | 2  | 2 | 0 | 0 |
| G30 | 737 | 2 | 36.80 | 0.150208 | 1 | 3 | 3  | 3 | 0 | 0 |
| G06 | 653 | 2 | 52.30 | 0.142604 | 0 | 0 | 2  | 4 | 0 | 0 |
| G22 | 647 | 2 | 48.39 | 0.106137 | 0 | 0 | 1  | 4 | 0 | 0 |
| G03 | 611 | 2 | 50.04 | 0.119646 | 1 | 2 | 3  | 4 | 0 | 0 |
| G15 | 709 | 2 | 37.99 | 0.182312 | 2 | 2 | 3  | 2 | 0 | 0 |
| G19 | 596 | 2 | 49.19 | 0.110058 | 0 | 1 | 1  | 4 | 0 | 0 |
| G11 | 618 | 0 | 51.80 | 0.156702 | 0 | 0 | 2  | 4 | 0 | 0 |
| G32 | 794 | 1 | 46.92 | 0.099430 | 0 | 1 | 1  | 4 | 0 | 0 |
| G24 | 670 | 0 | 51.64 | 0.117722 | 0 | 1 | 1  | 4 | 0 | 0 |
| G20 | 781 | 1 | 47.13 | 0.109778 | 0 | 1 | 1  | 4 | 0 | 0 |
| G28 | 620 | 1 | 47.46 | 0.118532 | 0 | 0 | 1  | 4 | 0 | 0 |
| G23 | 727 | 1 | 48.96 | 0.096443 | 0 | 1 | 1  | 4 | 0 | 0 |
| G17 | 867 | 0 | 29.48 | 0.164965 | 2 | 1 | 2  | 4 | 0 | 0 |
| G13 | 767 | 1 | 46.07 | 0.115554 | 1 | 3 | 3  | 4 | 0 | 0 |
| G04 | 848 | 1 | 28.58 | 0.162390 | 4 | 1 | 2  | 4 | 0 | 0 |
| G07 | 681 | 2 | 50.26 | 0.102988 | 0 | 1 | 1  | 4 | 0 | 0 |
| G10 | 592 | 2 | 49.47 | 0.139152 | 0 | 0 | 1  | 4 | 0 | 0 |
| G08 | 724 | 1 | 48.53 | 0.093102 | 0 | 1 | 1  | 4 | 0 | 0 |



G26 602 1 52.64 0.115157 0 0 2 4 0 0  
 G09 640 0 51.27 0.126611 1 2 2 4 0 0

mean MP1 rms : 0.139773 m

total mean elevation : 43.03 degrees

# MP1 obs > 10 : 22515

# qc MP1 slips < 25 : 29

# Rvr L1 slips < 25 : 36

# Rvr L2 slips < 25 : 66

# qc MP1 slips > 25 : 115

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP1 rms, m> 5=% 1|m 15=% 2|m

85 - 90 206 0 0.047909 |  
 80 - 85 376 0 0.044930 |  
 75 - 80 912 0 0.054215 |  
 70 - 75 1024 0 0.057995 |  
 65 - 70 1506 0 0.070513 |  
 60 - 65 1367 0 0.073625 |  
 55 - 60 1407 1 0.076932 ||  
 50 - 55 1419 4 0.090896 ||  
 45 - 50 1631 9 0.092774 #|  
 40 - 45 1841 19 0.107682 ##  
 35 - 40 1650 29 0.128743 ###  
 30 - 35 1745 34 0.133947 ###  
 25 - 30 2253 19 0.156739 #||

20 - 25 2058 20 0.188760 #|||  
 15 - 20 1720 7 0.231636 |||||  
 10 - 15 1369 2 0.293632 |||||  
 5 - 10 1 0 0.000000  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G29 | 777    | 0     | 47.03  | 0.287689 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G02 | 878    | 1     | 28.22  | 0.369201 | 3       | 1     | 2    | 5     | 0    | 0     |      |       |      |
| G31 | 887    | 0     | 28.68  | 0.277437 | 5       | 2     | 2    | 3     | 0    | 0     |      |       |      |
| G14 | 867    | 1     | 29.84  | 0.246389 | 2       | 1     | 3    | 4     | 0    | 0     |      |       |      |
| G25 | 760    | 0     | 47.50  | 0.234671 | 0       | 1     | 2    | 4     | 0    | 0     |      |       |      |
| G12 | 802    | 0     | 45.59  | 0.230061 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G27 | 745    | 0     | 49.43  | 0.210167 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G05 | 829    | 1     | 30.82  | 0.246884 | 4       | 6     | 6    | 0     | 0    | 0     |      |       |      |
| G18 | 627    | 2     | 41.88  | 0.402731 | 2       | 1     | 11   | 4     | 0    | 0     |      |       |      |
| G21 | 722    | 2     | 50.81  | 0.212257 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |
| G16 | 771    | 3     | 34.11  | 0.284828 | 2       | 1     | 2    | 2     | 0    | 0     |      |       |      |
| G30 | 737    | 2     | 36.80  | 0.281133 | 1       | 3     | 3    | 3     | 0    | 0     |      |       |      |
| G06 | 653    | 2     | 52.30  | 0.208671 | 0       | 0     | 2    | 4     | 0    | 0     |      |       |      |
| G22 | 647    | 2     | 48.39  | 0.394193 | 0       | 0     | 1    | 4     | 0    | 0     |      |       |      |
| G03 | 611    | 2     | 50.04  | 0.199426 | 1       | 2     | 3    | 4     | 0    | 0     |      |       |      |
| G15 | 709    | 2     | 37.99  | 0.204320 | 2       | 2     | 3    | 2     | 0    | 0     |      |       |      |
| G19 | 596    | 2     | 49.19  | 0.190984 | 0       | 1     | 1    | 4     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 618 | 0 | 51.80 | 0.247563 | 0 | 0 | 2 | 4 | 0 | 0 |
| G32 | 794 | 1 | 46.92 | 0.277002 | 0 | 1 | 1 | 4 | 0 | 0 |
| G24 | 670 | 0 | 51.64 | 0.222948 | 0 | 1 | 1 | 4 | 0 | 0 |
| G20 | 781 | 1 | 47.13 | 0.223648 | 0 | 1 | 1 | 4 | 0 | 0 |
| G28 | 620 | 1 | 47.46 | 0.176094 | 0 | 0 | 1 | 4 | 0 | 0 |
| G23 | 727 | 1 | 48.96 | 0.179852 | 0 | 1 | 1 | 4 | 0 | 0 |
| G17 | 867 | 0 | 29.48 | 0.255947 | 2 | 1 | 2 | 4 | 0 | 0 |
| G13 | 767 | 1 | 46.07 | 0.231474 | 1 | 3 | 3 | 4 | 0 | 0 |
| G04 | 848 | 1 | 28.58 | 0.266200 | 4 | 1 | 2 | 4 | 0 | 0 |
| G07 | 681 | 2 | 50.26 | 0.186453 | 0 | 1 | 1 | 4 | 0 | 0 |
| G10 | 592 | 2 | 49.47 | 0.211703 | 0 | 0 | 1 | 4 | 0 | 0 |
| G08 | 724 | 1 | 48.53 | 0.174246 | 0 | 1 | 1 | 4 | 0 | 0 |
| G26 | 602 | 1 | 52.64 | 0.225254 | 0 | 0 | 2 | 4 | 0 | 0 |
| G09 | 640 | 0 | 51.27 | 0.216756 | 1 | 2 | 2 | 4 | 0 | 0 |

mean MP2 rms : 0.246161 m

total mean elevation : 43.03 degrees

# MP2 obs > 10 : 22515

# qc MP2 slips < 25 : 30

# Rvr L1 slips < 25 : 36

# Rvr L2 slips < 25 : 66

# qc MP2 slips > 25 : 115

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 206 0 0.149236 |||

|         |      |    |          |     |
|---------|------|----|----------|-----|
| 80 - 85 | 376  | 0  | 0.125339 |     |
| 75 - 80 | 912  | 0  | 0.116282 |     |
| 70 - 75 | 1024 | 0  | 0.191061 |     |
| 65 - 70 | 1506 | 0  | 0.187381 |     |
| 60 - 65 | 1367 | 0  | 0.171187 |     |
| 55 - 60 | 1407 | 1  | 0.185441 |     |
| 50 - 55 | 1419 | 4  | 0.211670 |     |
| 45 - 50 | 1631 | 9  | 0.229201 | #   |
| 40 - 45 | 1841 | 19 | 0.230730 | ##  |
| 35 - 40 | 1650 | 29 | 0.231834 | ### |
| 30 - 35 | 1745 | 34 | 0.231261 | ### |
| 25 - 30 | 2253 | 19 | 0.277824 | #   |
| 20 - 25 | 2058 | 20 | 0.331324 | #   |
| 15 - 20 | 1720 | 7  | 0.341153 |     |
| 10 - 15 | 1369 | 3  | 0.379106 |     |
| 5 - 10  | 1    | 0  | 0.000000 |     |
| 0 - 5   | 0    | 0  | 0.000000 |     |
| < 0     | 0    | 0  | 0.000000 |     |

S/N L1 summary (per elevation bin):

| elev (deg) | tot | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|-----|-------|-------|------|-----|-----|
| 85 - 90    | 0   | 0.000 | 0.000 |      |     |     |
| 80 - 85    | 0   | 0.000 | 0.000 |      |     |     |
| 75 - 80    | 0   | 0.000 | 0.000 |      |     |     |
| 70 - 75    | 0   | 0.000 | 0.000 |      |     |     |
| 65 - 70    | 0   | 0.000 | 0.000 |      |     |     |
| 60 - 65    | 0   | 0.000 | 0.000 |      |     |     |

|         |   |       |       |
|---------|---|-------|-------|
| 55 - 60 | 0 | 0.000 | 0.000 |
| 50 - 55 | 0 | 0.000 | 0.000 |
| 45 - 50 | 0 | 0.000 | 0.000 |
| 40 - 45 | 0 | 0.000 | 0.000 |
| 35 - 40 | 0 | 0.000 | 0.000 |
| 30 - 35 | 0 | 0.000 | 0.000 |
| 25 - 30 | 0 | 0.000 | 0.000 |
| 20 - 25 | 0 | 0.000 | 0.000 |
| 15 - 20 | 0 | 0.000 | 0.000 |
| 10 - 15 | 0 | 0.000 | 0.000 |
| 5 - 10  | 0 | 0.000 | 0.000 |
| 0 - 5   | 0 | 0.000 | 0.000 |
| < 0     | 0 | 0.000 | 0.000 |

S/N L2 summary (per elevation bin):

| elev (deg) | tot | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|-----|-------|-------|------|-----|-----|
| 85 - 90    | 0   | 0.000 | 0.000 |      |     |     |
| 80 - 85    | 0   | 0.000 | 0.000 |      |     |     |
| 75 - 80    | 0   | 0.000 | 0.000 |      |     |     |
| 70 - 75    | 0   | 0.000 | 0.000 |      |     |     |
| 65 - 70    | 0   | 0.000 | 0.000 |      |     |     |
| 60 - 65    | 0   | 0.000 | 0.000 |      |     |     |
| 55 - 60    | 0   | 0.000 | 0.000 |      |     |     |
| 50 - 55    | 0   | 0.000 | 0.000 |      |     |     |
| 45 - 50    | 0   | 0.000 | 0.000 |      |     |     |
| 40 - 45    | 0   | 0.000 | 0.000 |      |     |     |
| 35 - 40    | 0   | 0.000 | 0.000 |      |     |     |

|         |   |       |       |
|---------|---|-------|-------|
| 30 - 35 | 0 | 0.000 | 0.000 |
| 25 - 30 | 0 | 0.000 | 0.000 |
| 20 - 25 | 0 | 0.000 | 0.000 |
| 15 - 20 | 0 | 0.000 | 0.000 |
| 10 - 15 | 0 | 0.000 | 0.000 |
| 5 - 10  | 0 | 0.000 | 0.000 |
| 0 - 5   | 0 | 0.000 | 0.000 |
| < 0     | 0 | 0.000 | 0.000 |

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QC of RINEX file(s) : kasi1270.11o

input RnxNAV file(s) : kasi1270.11n

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4-character ID : KASI

Receiver type : LEICA GRX1200PRO (# = 465462) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG (# = 06500008)

Time of start of window : 2011 May 7 04:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 19.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4616586.1137 1674446.6399 4056457.7511 (m)

antenna WGS 84 (geo) : N 39 deg 44' 46.81" E 19 deg 56' 8.98"

antenna WGS 84 (geo) : 39.746335 deg 19.935827 deg

WGS 84 height : 137.3265 m

|qc - header| position : 37.6976 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2400

Epochs w/ observations : 2400

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 25594  
 Possible obs > 10.0 deg: 20312  
 Complete obs > 10.0 deg: 19508  
 Deleted obs > 10.0 deg: 15  
 Masked obs < 10.0 deg: 787  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.190041 m  
 Moving average MP2 : 0.221694 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.25 (sd=0.84 n=19523) 6.56 (sd=1.31 n=19508)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 ffff0  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 66) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 12  
 IOD slips > 10.0 deg : 16  
 IOD or MP slips < 10.0\*: 18  
 IOD or MP slips > 10.0 : 17  
 \* or unknown elevation

| first epoch | last epoch | hrs | dt        | #expt | #have | %     | mp1   | mp2 | o/slps         |
|-------------|------------|-----|-----------|-------|-------|-------|-------|-----|----------------|
| SUM 11      | 5 7 04:00  | 11  | 5 7 23:59 | 20.00 | 30    | 20312 | 19508 | 96  | 0.19 0.22 1148 |



Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 04:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1183 | 22.34 | 933 | 27.00 | 880 | 880 | 880 | 880 | 0 | 880 | 880 | 0 |
| G03 | 456  | 11.83 | 227 | 20.81 | 201 | 201 | 201 | 201 | 0 | 201 | 201 | 0 |
| G04 | 1165 | 22.94 | 911 | 27.95 | 866 | 866 | 866 | 866 | 0 | 866 | 866 | 0 |
| G05 | 1138 | 24.78 | 873 | 30.77 | 827 | 827 | 827 | 827 | 0 | 827 | 827 | 0 |
| G06 | 396  | 19.50 | 279 | 25.61 | 250 | 250 | 250 | 250 | 0 | 250 | 250 | 0 |
| G07 | 841  | 41.60 | 725 | 47.46 | 725 | 725 | 725 | 725 | 0 | 725 | 725 | 0 |
| G08 | 882  | 41.28 | 767 | 46.73 | 767 | 767 | 767 | 767 | 0 | 767 | 767 | 0 |
| G09 | 851  | 40.87 | 733 | 46.66 | 705 | 705 | 705 | 705 | 0 | 705 | 705 | 0 |
| G10 | 1009 | 32.27 | 685 | 45.79 | 659 | 659 | 659 | 659 | 0 | 659 | 659 | 0 |
| G11 | 534  | 49.55 | 480 | 54.57 | 480 | 480 | 480 | 480 | 0 | 480 | 480 | 0 |
| G12 | 935  | 40.08 | 826 | 44.70 | 826 | 826 | 826 | 826 | 0 | 826 | 826 | 0 |
| G13 | 915  | 39.92 | 802 | 44.85 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G14 | 805  | 21.01 | 626 | 25.59 | 569 | 568 | 569 | 568 | 0 | 568 | 569 | 0 |
| G15 | 831  | 33.92 | 645 | 42.43 | 607 | 607 | 607 | 607 | 0 | 607 | 607 | 0 |
| G16 | 736  | 20.38 | 525 | 26.52 | 479 | 479 | 479 | 479 | 0 | 479 | 479 | 0 |
| G17 | 1172 | 23.20 | 928 | 27.99 | 869 | 868 | 869 | 868 | 0 | 868 | 869 | 0 |
| G18 | 675  | 17.05 | 434 | 23.62 | 263 | 250 | 263 | 250 | 0 | 250 | 263 | 0 |
| G19 | 556  | 17.21 | 233 | 35.93 | 233 | 233 | 233 | 233 | 0 | 233 | 233 | 0 |
| G20 | 816  | 45.05 | 763 | 47.84 | 763 | 763 | 763 | 763 | 0 | 763 | 763 | 0 |
| G21 | 542  | 51.35 | 491 | 56.18 | 491 | 491 | 491 | 491 | 0 | 491 | 491 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G22 | 559  | 10.26 | 213 | 20.55 | 213 | 213 | 213 | 213 | 0 | 213 | 213 | 0 |
| G23 | 885  | 41.56 | 769 | 47.08 | 769 | 769 | 769 | 769 | 0 | 769 | 769 | 0 |
| G24 | 609  | 51.04 | 558 | 55.25 | 558 | 558 | 558 | 558 | 0 | 558 | 558 | 0 |
| G25 | 910  | 40.85 | 796 | 45.99 | 792 | 792 | 792 | 792 | 0 | 792 | 792 | 0 |
| G26 | 852  | 40.07 | 709 | 47.33 | 683 | 683 | 683 | 683 | 0 | 683 | 683 | 0 |
| G27 | 917  | 41.75 | 805 | 46.87 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G28 | 952  | 32.29 | 708 | 41.54 | 665 | 665 | 665 | 665 | 0 | 665 | 665 | 0 |
| G29 | 822  | 44.78 | 772 | 47.35 | 772 | 772 | 772 | 772 | 0 | 772 | 772 | 0 |
| G30 | 780  | 26.60 | 521 | 37.15 | 481 | 481 | 481 | 481 | 0 | 481 | 481 | 0 |
| G31 | 1169 | 23.59 | 933 | 28.29 | 884 | 884 | 884 | 884 | 0 | 884 | 884 | 0 |
| G32 | 701  | 46.59 | 642 | 50.41 | 642 | 642 | 642 | 642 | 0 | 642 | 642 | 0 |

Obs below mask ( 10.00 deg) : 1613

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 15

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 15

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 21136

Obs deleted (any reason) : 1628

Obs complete : 19508

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%            | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------------|-----|------|-----|
| 85 - 90    | 149       | 0            | 0.000000       |     |      |     |
| 80 - 85    | 403       | 0            | 0.000000       |     |      |     |
| 75 - 80    | 663       | 0            | 0.000000       |     |      |     |
| 70 - 75    | 996       | 0            | 0.000000       |     |      |     |
| 65 - 70    | 1241      | 0            | 0.000000       |     |      |     |
| 60 - 65    | 1024      | 0            | 0.000000       |     |      |     |
| 55 - 60    | 1074      | 0            | 0.000000       |     |      |     |
| 50 - 55    | 1023      | 0            | 0.000000       |     |      |     |
| 45 - 50    | 1346      | 0            | 0.000000       |     |      |     |
| 40 - 45    | 1379      | 0            | 0.000000       |     |      |     |
| 35 - 40    | 1299      | 0            | 0.000000       |     |      |     |
| 30 - 35    | 1524      | 0            | 0.000000       |     |      |     |
| 25 - 30    | 1967      | 0            | 0.000000       |     |      |     |
| 20 - 25    | 1826      | 0            | 0.000000       |     |      |     |
| 15 - 20    | 1897      | 2            | 0.000000       |     |      |     |
| 10 - 15    | 1677      | 14           | 0.000000 =     |     |      |     |
| 5 - 10     | 1568      | 11           | 0.000000 =     |     |      |     |
| 0 - 5      | 29        | 1            | 0.000000 ===== |     |      |     |
| < 0        | 0         | 0            | 0.000000       |     |      |     |

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | slips | L1 rx | L2 rx | slips | L1 rx | L2 rx |
|-----|--------|-------|--------|-------------|-------|-------|-------|-------|-------|-------|
| G02 | 880    | 0     | 27.84  | 0.207460    | 0     | 1     | 1     | 0     | 0     | 0     |
| G03 | 201    | 0     | 22.23  | 0.560240    | 0     | 1     | 1     | 0     | 0     | 0     |

|     |     |    |       |          |    |    |    |   |   |   |
|-----|-----|----|-------|----------|----|----|----|---|---|---|
| G04 | 866 | 0  | 28.74 | 0.225963 | 0  | 1  | 1  | 0 | 0 | 0 |
| G05 | 827 | 0  | 31.77 | 0.223509 | 0  | 1  | 1  | 0 | 0 | 0 |
| G06 | 250 | 0  | 27.43 | 0.168290 | 0  | 1  | 1  | 0 | 0 | 0 |
| G07 | 725 | 0  | 47.46 | 0.175395 | 0  | 0  | 0  | 0 | 0 | 0 |
| G08 | 767 | 0  | 46.73 | 0.190313 | 0  | 0  | 0  | 0 | 0 | 0 |
| G09 | 705 | 0  | 48.14 | 0.155992 | 1  | 1  | 2  | 0 | 0 | 0 |
| G10 | 659 | 0  | 47.22 | 0.180592 | 0  | 1  | 1  | 0 | 0 | 0 |
| G11 | 480 | 0  | 54.64 | 0.146493 | 0  | 0  | 0  | 0 | 0 | 0 |
| G12 | 826 | 0  | 44.70 | 0.173246 | 0  | 0  | 0  | 0 | 0 | 0 |
| G13 | 802 | 0  | 44.85 | 0.174124 | 0  | 0  | 0  | 0 | 0 | 0 |
| G14 | 569 | 1  | 26.77 | 0.166463 | 0  | 1  | 1  | 0 | 0 | 0 |
| G15 | 607 | 0  | 44.37 | 0.170692 | 1  | 1  | 2  | 0 | 0 | 0 |
| G16 | 479 | 0  | 27.68 | 0.228754 | 0  | 1  | 1  | 0 | 0 | 0 |
| G17 | 869 | 1  | 29.00 | 0.186336 | 0  | 1  | 1  | 0 | 0 | 0 |
| G18 | 263 | 13 | 31.82 | 0.285149 | 13 | 12 | 17 | 0 | 0 | 0 |
| G19 | 233 | 0  | 36.04 | 0.169561 | 0  | 0  | 0  | 0 | 0 | 0 |
| G20 | 763 | 0  | 47.93 | 0.163046 | 0  | 0  | 0  | 0 | 0 | 0 |
| G21 | 491 | 0  | 56.18 | 0.150524 | 0  | 0  | 0  | 0 | 0 | 0 |
| G22 | 213 | 0  | 20.85 | 0.205792 | 0  | 0  | 0  | 0 | 0 | 0 |
| G23 | 769 | 0  | 47.08 | 0.189434 | 0  | 0  | 0  | 0 | 0 | 0 |
| G24 | 558 | 0  | 55.33 | 0.132855 | 0  | 0  | 0  | 0 | 0 | 0 |
| G25 | 792 | 0  | 46.27 | 0.185707 | 0  | 1  | 1  | 0 | 0 | 0 |
| G26 | 683 | 0  | 48.79 | 0.157207 | 0  | 1  | 1  | 0 | 0 | 0 |
| G27 | 802 | 0  | 47.11 | 0.169198 | 0  | 1  | 1  | 0 | 0 | 0 |
| G28 | 665 | 0  | 43.55 | 0.229889 | 0  | 0  | 0  | 0 | 0 | 0 |
| G29 | 772 | 0  | 47.35 | 0.188369 | 0  | 0  | 0  | 0 | 0 | 0 |
| G30 | 481 | 0  | 39.09 | 0.269895 | 1  | 1  | 3  | 0 | 0 | 0 |

G31 884 0 29.04 0.202183 0 1 1 0 0 0  
 G32 642 0 50.48 0.148526 0 0 0 0 0 0

mean MP1 rms : 0.190051 m

total mean elevation : 41.22 degrees

# MP1 obs > 10 : 19508

# qc MP1 slips < 25 : 16

# Rvr L1 slips < 25 : 28

# Rvr L2 slips < 25 : 37

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP1 rms, m> 5=% 1|m 15=% 2|m

85 - 90 149 0 0.109419 ||

80 - 85 403 0 0.100111 ||

75 - 80 663 0 0.121939 ||

70 - 75 996 0 0.125571 |||

65 - 70 1241 0 0.113219 ||

60 - 65 1024 0 0.144386 |||

55 - 60 1074 0 0.160249 |||

50 - 55 1023 0 0.179101 ||||

45 - 50 1346 0 0.164203 |||

40 - 45 1379 0 0.163638 |||

35 - 40 1299 0 0.170513 |||

30 - 35 1524 0 0.200421 ||||

25 - 30 1967 0 0.221285 ||||

```

20 - 25 1826 0 0.206421 ||||
15 - 20 1897 2 0.290192 |||||
10 - 15 1677 14 0.270963 #|||
5 - 10 1568 14 0.485141 #|||||||
0 - 5 29 2 0.192449 #####=====
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 880    | 0     | 27.84  | 0.187701 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G03 | 201    | 0     | 22.23  | 0.391436 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G04 | 866    | 0     | 28.74  | 0.226156 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G05 | 827    | 0     | 31.77  | 0.204635 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G06 | 250    | 0     | 27.43  | 0.279420 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 725    | 0     | 47.46  | 0.182163 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 767    | 0     | 46.73  | 0.194952 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G09 | 705    | 0     | 48.14  | 0.184670 | 1       | 1     | 2    | 0     | 0    | 0     |      |       |      |
| G10 | 659    | 0     | 47.22  | 0.167572 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G11 | 480    | 0     | 54.64  | 0.203523 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G12 | 826    | 0     | 44.70  | 0.196315 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G13 | 802    | 0     | 44.85  | 0.212034 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G14 | 569    | 1     | 26.77  | 0.196883 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G15 | 607    | 0     | 44.37  | 0.349185 | 1       | 1     | 2    | 0     | 0    | 0     |      |       |      |
| G16 | 479    | 0     | 27.68  | 0.466852 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G17 | 869    | 1     | 29.00  | 0.174472 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G18 | 263    | 13    | 31.82  | 0.283360 | 14      | 12    | 17   | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G19 | 233 | 0 | 36.04 | 0.197887 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 763 | 0 | 47.93 | 0.208499 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 491 | 0 | 56.18 | 0.211659 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 213 | 0 | 20.85 | 0.243742 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 769 | 0 | 47.08 | 0.184721 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 558 | 0 | 55.33 | 0.189615 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 792 | 0 | 46.27 | 0.184713 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 683 | 0 | 48.79 | 0.201430 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 802 | 0 | 47.11 | 0.210264 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 665 | 0 | 43.55 | 0.212522 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 772 | 0 | 47.35 | 0.203270 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 481 | 0 | 39.09 | 0.514143 | 2 | 1 | 3 | 0 | 0 | 0 |
| G31 | 884 | 0 | 29.04 | 0.220825 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32 | 642 | 0 | 50.48 | 0.190174 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.221696 m

total mean elevation : 41.22 degrees

# MP2 obs > 10 : 19508

# qc MP2 slips < 25 : 18

# Rvr L1 slips < 25 : 28

# Rvr L2 slips < 25 : 37

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 149 0 0.114805 ||



```

80 - 85  403  0  0.143919  |||
75 - 80  663  0  0.141270  |||
70 - 75  996  0  0.169504  |||
65 - 70 1241  0  0.160265  |||
60 - 65 1024  0  0.172434  |||
55 - 60 1074  0  0.206281  ||||
50 - 55 1023  0  0.202901  ||||
45 - 50 1346  0  0.201858  ||||
40 - 45 1379  0  0.192438  ||||
35 - 40 1299  0  0.195717  ||||
30 - 35 1524  0  0.206863  ||||
25 - 30 1967  0  0.214073  ||||
20 - 25 1826  0  0.347339  ||||||
15 - 20 1897  3  0.331171  ||||||
10 - 15 1677 15  0.290429  #||||
 5 - 10 1568 14  0.701068  #|||||||||
 0 -  5  29  2  0.276266  #####=====
 < 0   0  0  0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig  mean          0|5          1|0
85 - 90  149  0.737  8.940  ###|
80 - 85  403  0.448  8.978  ##|
75 - 80  663  0.350  8.986  #|
70 - 75  996  0.285  8.991  #|
65 - 70 1241  0.255  8.993  #|
60 - 65 1025  0.281  8.991  #|

```

|         |      |       |       |       |
|---------|------|-------|-------|-------|
| 55 - 60 | 1075 | 0.274 | 8.992 | #     |
| 50 - 55 | 1023 | 0.281 | 8.991 | #     |
| 45 - 50 | 1348 | 0.284 | 8.972 | #     |
| 40 - 45 | 1380 | 0.517 | 8.688 | ##    |
| 35 - 40 | 1299 | 0.442 | 8.169 | ##    |
| 30 - 35 | 1525 | 0.245 | 8.013 | #     |
| 25 - 30 | 1968 | 0.205 | 7.987 | #     |
| 20 - 25 | 1827 | 0.445 | 7.788 | ##    |
| 15 - 20 | 1905 | 0.499 | 7.117 | ##    |
| 10 - 15 | 1696 | 0.660 | 6.715 | ###   |
| 5 - 10  | 1580 | 0.767 | 6.224 | ###   |
| 0 - 5   | 33   | 1.300 | 5.758 | ##### |
| < 0     | 0    | 0.000 | 0.000 |       |

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 149  | 0.808 | 8.208 | ###  |     |     |
| 80 - 85    | 403  | 0.489 | 8.065 | ##   |     |     |
| 75 - 80    | 663  | 0.432 | 8.084 | ##   |     |     |
| 70 - 75    | 996  | 0.377 | 8.075 | ##   |     |     |
| 65 - 70    | 1241 | 0.229 | 7.993 | #    |     |     |
| 60 - 65    | 1025 | 0.310 | 7.957 | #    |     |     |
| 55 - 60    | 1075 | 0.478 | 7.772 | ##   |     |     |
| 50 - 55    | 1023 | 0.550 | 7.455 | ##   |     |     |
| 45 - 50    | 1348 | 0.517 | 7.278 | ##   |     |     |
| 40 - 45    | 1380 | 0.514 | 6.934 | ##   |     |     |
| 35 - 40    | 1299 | 0.542 | 6.548 | ##   |     |     |

|         |      |       |       |      |  |
|---------|------|-------|-------|------|--|
| 30 - 35 | 1525 | 0.593 | 6.226 | ##   |  |
| 25 - 30 | 1968 | 0.602 | 5.837 | ##   |  |
| 20 - 25 | 1827 | 0.584 | 5.435 | ##   |  |
| 15 - 20 | 1903 | 0.726 | 5.003 | ###  |  |
| 10 - 15 | 1683 | 0.769 | 4.554 | ###  |  |
| 5 - 10  | 1576 | 0.896 | 4.209 | #### |  |
| 0 - 5   | 32   | 1.190 | 4.062 | #### |  |
| < 0     | 0    | 0.000 | 0.000 |      |  |

\*\*\*\*\*

QC of RINEX file(s) : klok1270.11o

input RnxNAV file(s) : klok1270.11n

\*\*\*\*\*

4-character ID : KLOK

Receiver type : LEICA GRX1200PRO (# = 463363) (fw = 4.03/2.122)

Antenna type : LEIAT504 (# = 103396)

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4564751.0740 1845643.0185 4040949.9456 (m)

antenna WGS 84 (geo) : N 39 deg 33' 53.09" E 22 deg 00' 52.97"

antenna WGS 84 (geo) : 39.564748 deg 22.014715 deg

WGS 84 height : 160.2106 m

[qc - header] position : 37.5332 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31010

Possible obs > 10.0 deg: 24621

Complete obs > 10.0 deg: 21484  
 Deleted obs > 10.0 deg: 39  
 Masked obs < 10.0 deg: 3098  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.228572 m  
 Moving average MP2 : 0.254415 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.99 (sd=1.10 n=21523) 6.74 (sd=1.63 n=21484)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 71) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 31  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 36  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 11 5 7 00:00 11 5 7 23:59 24.00 30 24621 21484 87 0.23 0.25 597

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1180 | 22.49 | 930 | 27.19 | 590 | 560 | 590 | 560 | 0 | 560 | 590 | 0 |
| G03 | 967  | 33.95 | 699 | 45.81 | 594 | 594 | 594 | 594 | 0 | 594 | 594 | 0 |
| G04 | 1170 | 22.69 | 918 | 27.57 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G05 | 1145 | 24.37 | 886 | 30.03 | 799 | 799 | 799 | 799 | 0 | 799 | 799 | 0 |
| G06 | 868  | 41.82 | 751 | 47.56 | 631 | 631 | 631 | 631 | 0 | 631 | 631 | 0 |
| G07 | 852  | 41.63 | 735 | 47.47 | 735 | 735 | 735 | 735 | 0 | 735 | 735 | 0 |
| G08 | 891  | 41.04 | 776 | 46.39 | 776 | 776 | 776 | 776 | 0 | 776 | 776 | 0 |
| G09 | 843  | 41.00 | 725 | 46.87 | 605 | 605 | 605 | 605 | 0 | 605 | 605 | 0 |
| G10 | 1025 | 31.28 | 677 | 45.23 | 580 | 579 | 580 | 579 | 0 | 579 | 580 | 0 |
| G11 | 839  | 40.76 | 720 | 46.68 | 610 | 610 | 610 | 610 | 0 | 610 | 610 | 0 |
| G12 | 937  | 39.99 | 828 | 44.60 | 778 | 776 | 778 | 776 | 0 | 776 | 778 | 0 |
| G13 | 920  | 39.76 | 808 | 44.59 | 808 | 808 | 808 | 808 | 0 | 808 | 808 | 0 |
| G14 | 1167 | 23.76 | 926 | 28.64 | 535 | 535 | 535 | 535 | 0 | 535 | 535 | 0 |
| G15 | 1106 | 27.02 | 777 | 36.20 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G16 | 1141 | 25.82 | 880 | 31.98 | 796 | 794 | 796 | 794 | 0 | 794 | 796 | 0 |
| G17 | 1170 | 23.37 | 921 | 28.34 | 545 | 545 | 545 | 545 | 0 | 545 | 545 | 0 |
| G18 | 1128 | 26.47 | 810 | 34.81 | 646 | 646 | 646 | 646 | 0 | 646 | 646 | 0 |
| G19 | 1049 | 30.82 | 679 | 45.20 | 581 | 581 | 581 | 581 | 0 | 581 | 581 | 0 |
| G20 | 925  | 40.83 | 814 | 45.72 | 724 | 722 | 724 | 722 | 0 | 722 | 724 | 0 |
| G21 | 892  | 42.57 | 776 | 48.19 | 776 | 776 | 776 | 776 | 0 | 776 | 776 | 0 |
| G22 | 1017 | 32.30 | 703 | 45.20 | 703 | 703 | 703 | 703 | 0 | 703 | 703 | 0 |
| G23 | 893  | 41.40 | 778 | 46.79 | 778 | 778 | 778 | 778 | 0 | 778 | 778 | 0 |
| G24 | 868  | 41.89 | 752 | 47.60 | 632 | 631 | 632 | 631 | 0 | 631 | 632 | 0 |
| G25 | 905  | 40.95 | 791 | 46.14 | 661 | 661 | 661 | 661 | 0 | 661 | 661 | 0 |
| G26 | 960  | 35.36 | 701 | 47.32 | 595 | 595 | 595 | 595 | 0 | 595 | 595 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 910  | 41.87 | 797 | 47.09 | 666 | 665 | 666 | 665 | 0 | 665 | 666 | 0 |
| G28 | 1088 | 29.60 | 675 | 44.24 | 675 | 675 | 675 | 675 | 0 | 675 | 675 | 0 |
| G29 | 932  | 40.53 | 820 | 45.38 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G30 | 1097 | 27.28 | 799 | 35.50 | 711 | 711 | 711 | 711 | 0 | 711 | 711 | 0 |
| G31 | 1183 | 23.19 | 936 | 28.03 | 851 | 851 | 851 | 851 | 0 | 851 | 851 | 0 |
| G32 | 942  | 40.77 | 833 | 45.46 | 809 | 809 | 809 | 809 | 0 | 809 | 809 | 0 |

Obs below mask ( 10.00 deg) : 29

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 39

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 39

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 21552

Obs deleted (any reason) : 68

Obs complete : 21484

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 212 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 425 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 866 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1202 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|



|         |      |    |             |
|---------|------|----|-------------|
| 65 - 70 | 1398 | 0  | 0.000000    |
| 60 - 65 | 1387 | 0  | 0.000000    |
| 55 - 60 | 1386 | 0  | 0.000000    |
| 50 - 55 | 1327 | 0  | 0.000000    |
| 45 - 50 | 1703 | 0  | 0.000000    |
| 40 - 45 | 1794 | 0  | 0.000000    |
| 35 - 40 | 1644 | 0  | 0.000000    |
| 30 - 35 | 1723 | 0  | 0.000000    |
| 25 - 30 | 1602 | 7  | 0.000000    |
| 20 - 25 | 1417 | 1  | 0.000000    |
| 15 - 20 | 1611 | 4  | 0.000000    |
| 10 - 15 | 1759 | 19 | 0.000000 == |
| 5 - 10  | 26   | 0  | 0.000000    |
| 0 - 5   | 0    | 0  | 0.000000    |
| < 0     | 0    | 0  | 0.000000    |

MP1 RMS summary (per SV):

|     | slips  |       | L1 rx  |          | L2 rx   |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25 | < 25  | < 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 590    | 30    | 30.82  | 0.432326 | 1       | 3    | 3     | 11   | 15    | 17   |       |      |
| G03 | 594    | 0     | 50.61  | 0.525644 | 0       | 0    | 0     | 0    | 1     | 1    |       |      |
| G04 | 829    | 0     | 28.62  | 0.200299 | 2       | 3    | 3     | 0    | 1     | 1    |       |      |
| G05 | 799    | 0     | 31.42  | 0.466702 | 0       | 1    | 1     | 0    | 1     | 1    |       |      |
| G06 | 631    | 0     | 52.96  | 0.149255 | 0       | 0    | 0     | 0    | 1     | 1    |       |      |
| G07 | 735    | 0     | 47.58  | 0.144798 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G08 | 776    | 0     | 46.39  | 0.261512 | 1       | 1    | 1     | 0    | 0     | 0    |       |      |
| G09 | 605    | 0     | 52.41  | 0.117934 | 0       | 0    | 0     | 0    | 1     | 1    |       |      |
| G10 | 580    | 1     | 49.82  | 0.166369 | 1       | 1    | 1     | 0    | 1     | 1    |       |      |

|     |     |   |       |          |   |    |    |   |   |   |
|-----|-----|---|-------|----------|---|----|----|---|---|---|
| G11 | 610 | 0 | 51.70 | 0.123517 | 1 | 1  | 1  | 0 | 1 | 1 |
| G12 | 778 | 2 | 46.70 | 0.133505 | 2 | 3  | 4  | 0 | 0 | 0 |
| G13 | 808 | 0 | 44.69 | 0.163424 | 1 | 2  | 2  | 0 | 0 | 0 |
| G14 | 535 | 0 | 33.55 | 0.267807 | 5 | 6  | 6  | 0 | 0 | 0 |
| G15 | 684 | 0 | 38.80 | 0.420133 | 4 | 6  | 6  | 0 | 1 | 1 |
| G16 | 796 | 2 | 33.57 | 0.259751 | 0 | 1  | 1  | 0 | 1 | 1 |
| G17 | 545 | 0 | 33.51 | 0.213915 | 1 | 1  | 1  | 0 | 0 | 0 |
| G18 | 646 | 0 | 40.66 | 0.216468 | 1 | 2  | 2  | 0 | 0 | 0 |
| G19 | 581 | 0 | 49.78 | 0.129886 | 0 | 0  | 0  | 0 | 1 | 1 |
| G20 | 724 | 2 | 49.37 | 0.160389 | 0 | 0  | 0  | 0 | 2 | 1 |
| G21 | 776 | 0 | 48.23 | 0.165520 | 0 | 0  | 0  | 0 | 0 | 0 |
| G22 | 703 | 0 | 45.28 | 0.165789 | 0 | 1  | 1  | 0 | 0 | 0 |
| G23 | 778 | 0 | 46.89 | 0.161639 | 0 | 1  | 1  | 0 | 0 | 0 |
| G24 | 632 | 1 | 53.07 | 0.162378 | 0 | 0  | 0  | 0 | 1 | 1 |
| G25 | 661 | 0 | 51.35 | 0.169444 | 0 | 0  | 0  | 0 | 1 | 1 |
| G26 | 595 | 0 | 52.46 | 0.120551 | 0 | 0  | 0  | 0 | 1 | 1 |
| G27 | 666 | 1 | 52.56 | 0.148211 | 0 | 0  | 0  | 0 | 2 | 1 |
| G28 | 675 | 0 | 44.36 | 0.164485 | 0 | 1  | 1  | 0 | 0 | 0 |
| G29 | 820 | 0 | 45.47 | 0.274517 | 0 | 1  | 1  | 0 | 0 | 0 |
| G30 | 711 | 0 | 37.71 | 0.275087 | 0 | 1  | 1  | 0 | 1 | 1 |
| G31 | 851 | 0 | 29.16 | 0.396328 | 0 | 2  | 2  | 0 | 1 | 1 |
| G32 | 809 | 0 | 46.53 | 0.279327 | 4 | 10 | 10 | 0 | 0 | 0 |

mean MP1 rms : 0.228567 m

total mean elevation : 43.80 degrees

# MP1 obs > 10 : 21484

# qc MP1 slips < 25 : 24

# Rvr L1 slips < 25 : 49

# Rvr L2 slips < 25 : 50  
 # qc MP1 slips > 25 : 11  
 # Rvr L1 slips > 25 : 34  
 # Rvr L2 slips > 25 : 34

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 212       | 0    | 0.085881 |     |     |      |     |
| 80 - 85    | 425       | 0    | 0.082150 |     |     |      |     |
| 75 - 80    | 866       | 0    | 0.090405 |     |     |      |     |
| 70 - 75    | 1202      | 0    | 0.092629 |     |     |      |     |
| 65 - 70    | 1398      | 0    | 0.092988 |     |     |      |     |
| 60 - 65    | 1387      | 0    | 0.092473 |     |     |      |     |
| 55 - 60    | 1386      | 0    | 0.099341 |     |     |      |     |
| 50 - 55    | 1327      | 0    | 0.112387 |     |     |      |     |
| 45 - 50    | 1703      | 0    | 0.120961 |     |     |      |     |
| 40 - 45    | 1794      | 0    | 0.132239 |     |     |      |     |
| 35 - 40    | 1644      | 0    | 0.142766 |     |     |      |     |
| 30 - 35    | 1723      | 0    | 0.297366 |     |     |      |     |
| 25 - 30    | 1602      | 11   | 0.380129 | #   |     |      |     |
| 20 - 25    | 1417      | 1    | 0.232898 |     |     |      |     |
| 15 - 20    | 1611      | 4    | 0.359250 |     |     |      |     |
| 10 - 15    | 1759      | 19   | 0.565100 | ##  |     |      |     |
| 5 - 10     | 26        | 0    | 0.333884 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 590    | 30    | 30.82  | 0.535839 | 1       | 3    | 3    | 12   | 15   | 17   |      |
| G03 | 594    | 0     | 50.61  | 0.234620 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G04 | 829    | 0     | 28.62  | 0.256962 | 2       | 3    | 3    | 0    | 1    | 1    |      |
| G05 | 799    | 0     | 31.42  | 0.548909 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G06 | 631    | 0     | 52.96  | 0.158045 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G07 | 735    | 0     | 47.58  | 0.152807 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 776    | 0     | 46.39  | 0.220826 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 605    | 0     | 52.41  | 0.128634 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G10 | 580    | 1     | 49.82  | 0.169205 | 1       | 1    | 1    | 0    | 1    | 1    |      |
| G11 | 610    | 0     | 51.70  | 0.155830 | 1       | 1    | 1    | 0    | 1    | 1    |      |
| G12 | 778    | 2     | 46.70  | 0.158709 | 2       | 3    | 4    | 0    | 0    | 0    |      |
| G13 | 808    | 0     | 44.69  | 0.148687 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G14 | 535    | 0     | 33.55  | 0.322535 | 4       | 6    | 6    | 0    | 0    | 0    |      |
| G15 | 684    | 0     | 38.80  | 0.586532 | 4       | 6    | 6    | 0    | 1    | 1    |      |
| G16 | 796    | 2     | 33.57  | 0.271619 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G17 | 545    | 0     | 33.51  | 0.188630 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G18 | 646    | 0     | 40.66  | 0.250789 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G19 | 581    | 0     | 49.78  | 0.151714 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G20 | 724    | 2     | 49.37  | 0.159543 | 0       | 0    | 0    | 0    | 2    | 1    |      |
| G21 | 776    | 0     | 48.23  | 0.180455 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G22 | 703    | 0     | 45.28  | 0.154861 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G23 | 778    | 0     | 46.89  | 0.149942 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G24 | 632    | 1     | 53.07  | 0.160800 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G25 | 661    | 0     | 51.35  | 0.149428 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G26 | 595    | 0     | 52.46  | 0.157936 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G27 | 666    | 1     | 52.56  | 0.131488 | 0       | 0    | 0    | 0    | 2    | 1    |      |
| G28 | 675    | 0     | 44.36  | 0.159091 | 0       | 1    | 1    | 0    | 0    | 0    |      |

|     |     |   |       |          |   |    |    |   |   |   |
|-----|-----|---|-------|----------|---|----|----|---|---|---|
| G29 | 820 | 0 | 45.47 | 0.243956 | 0 | 1  | 1  | 0 | 0 | 0 |
| G30 | 711 | 0 | 37.71 | 0.565363 | 0 | 1  | 1  | 0 | 1 | 1 |
| G31 | 851 | 0 | 29.16 | 0.579215 | 0 | 2  | 2  | 0 | 1 | 1 |
| G32 | 809 | 0 | 46.53 | 0.333884 | 5 | 10 | 10 | 0 | 0 | 0 |

mean MP2 rms : 0.254411 m

total mean elevation : 43.80 degrees

# MP2 obs > 10 : 21484

# qc MP2 slips < 25 : 24

# Rvr L1 slips < 25 : 49

# Rvr L2 slips < 25 : 50

# qc MP2 slips > 25 : 12

# Rvr L1 slips > 25 : 34

# Rvr L2 slips > 25 : 34

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 212 | 0 | 0.098151 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 425 | 0 | 0.091549 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 866 | 0 | 0.093258 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1202 | 0 | 0.091577 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1398 | 0 | 0.097356 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1387 | 0 | 0.101977 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1386 | 0 | 0.099386 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1327 | 0 | 0.111389 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1703 | 0 | 0.121940 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1794 | 0 | 0.123617 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1644 | 0 | 0.139669 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1723 | 0 | 0.277133 |  |  |  |
|---------|------|---|----------|--|--|--|

```

25 - 30 1602 12 0.558807 #|||||||
20 - 25 1417 1 0.213259 |||
15 - 20 1611 5 0.339193 |||||
10 - 15 1759 18 0.692394 ##|||||||
5 - 10 26 0 0.505232 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 212  | 0.710 | 8.797 | ###   |     |     |
| 80 - 85    | 425  | 0.566 | 8.816 | ##    |     |     |
| 75 - 80    | 866  | 0.310 | 8.987 | #     |     |     |
| 70 - 75    | 1202 | 0.290 | 8.975 | #     |     |     |
| 65 - 70    | 1398 | 0.244 | 8.992 | #     |     |     |
| 60 - 65    | 1389 | 0.241 | 8.994 | #     |     |     |
| 55 - 60    | 1388 | 0.242 | 8.994 | #     |     |     |
| 50 - 55    | 1327 | 0.394 | 8.886 | ##    |     |     |
| 45 - 50    | 1703 | 0.540 | 8.473 | ##    |     |     |
| 40 - 45    | 1795 | 0.390 | 8.128 | ##    |     |     |
| 35 - 40    | 1644 | 0.233 | 8.010 | #     |     |     |
| 30 - 35    | 1728 | 0.467 | 7.887 | ##    |     |     |
| 25 - 30    | 1648 | 0.995 | 7.203 | ####  |     |     |
| 20 - 25    | 1417 | 0.437 | 6.940 | ##    |     |     |
| 15 - 20    | 1615 | 0.559 | 6.424 | ##    |     |     |
| 10 - 15    | 1766 | 0.540 | 5.937 | ##    |     |     |
| 5 - 10     | 29   | 1.181 | 5.414 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |

< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 212  | 0.761 | 8.613 | ###  |     |     |
| 80 - 85    | 425  | 0.636 | 8.628 | ###  |     |     |
| 75 - 80    | 866  | 0.569 | 8.599 | ##   |     |     |
| 70 - 75    | 1202 | 0.554 | 8.441 | ##   |     |     |
| 65 - 70    | 1398 | 0.526 | 8.342 | ##   |     |     |
| 60 - 65    | 1389 | 0.414 | 8.138 | ##   |     |     |
| 55 - 60    | 1388 | 0.264 | 8.018 | #    |     |     |
| 50 - 55    | 1327 | 0.383 | 7.882 | ##   |     |     |
| 45 - 50    | 1703 | 0.533 | 7.453 | ##   |     |     |
| 40 - 45    | 1795 | 0.560 | 7.126 | ##   |     |     |
| 35 - 40    | 1644 | 0.614 | 6.719 | ##   |     |     |
| 30 - 35    | 1727 | 0.822 | 6.093 | ###  |     |     |
| 25 - 30    | 1612 | 0.992 | 5.247 | #### |     |     |
| 20 - 25    | 1417 | 0.737 | 4.954 | ###  |     |     |
| 15 - 20    | 1613 | 0.687 | 4.520 | ###  |     |     |
| 10 - 15    | 1766 | 0.748 | 4.116 | ###  |     |     |
| 5 - 10     | 29   | 0.978 | 3.793 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : lemn1270.11o

input RnxNAV file(s) : lemn1270.11n

\*\*\*\*\*

4-character ID : LEMN

Receiver type : LEICA GRX1200GGPRO (# = 351610) (fw = 5.00/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4434464.1344 2084891.8395 4069315.9013 (m)

antenna WGS 84 (geo) : N 39 deg 53' 50.05" E 25 deg 10' 51.12"

antenna WGS 84 (geo) : 39.897235 deg 25.180865 deg

WGS 84 height : 121.1851 m

[qc - header] position : 29.5149 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31132

Possible obs > 10.0 deg: 24594



Complete obs > 10.0 deg: 24559  
 Deleted obs > 10.0 deg: 1  
 Masked obs < 10.0 deg: 821  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.214551 m  
 Moving average MP2 : 0.246700 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.21 (sd=0.85 n=24560) 6.19 (sd=1.35 n=24559)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 4) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 1  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 2  
 \* or unknown elevation

|     | first epoch | last epoch | hrs | dt    | #expt | #have | % | mp1   | mp2   | o/slps |       |       |     |      |      |       |
|-----|-------------|------------|-----|-------|-------|-------|---|-------|-------|--------|-------|-------|-----|------|------|-------|
| SUM | 11          | 5          | 7   | 00:00 | 11    | 5     | 7 | 23:59 | 24.00 | 30     | 24594 | 24559 | 100 | 0.21 | 0.25 | 12280 |

Processing parameters are:

Receiver tracking capability : 26 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1174 | 22.82 | 922 | 27.70 | 921 | 921 | 921 | 921 | 0 | 921 | 921 | 0 |
| G03 | 1008 | 31.71 | 685 | 44.95 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G04 | 1174 | 22.47 | 925 | 27.19 | 924 | 924 | 924 | 924 | 0 | 924 | 924 | 0 |
| G05 | 1155 | 23.85 | 901 | 29.17 | 899 | 899 | 899 | 899 | 0 | 899 | 899 | 0 |
| G06 | 854  | 41.30 | 736 | 47.13 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G07 | 864  | 41.63 | 747 | 47.37 | 747 | 747 | 747 | 747 | 0 | 747 | 747 | 0 |
| G08 | 899  | 40.87 | 786 | 46.03 | 786 | 786 | 786 | 786 | 0 | 786 | 786 | 0 |
| G09 | 912  | 37.43 | 710 | 47.20 | 709 | 709 | 709 | 709 | 0 | 709 | 709 | 0 |
| G10 | 1050 | 29.81 | 663 | 44.26 | 662 | 662 | 662 | 662 | 0 | 662 | 662 | 0 |
| G11 | 825  | 40.04 | 707 | 45.90 | 706 | 706 | 706 | 706 | 0 | 706 | 706 | 0 |
| G12 | 932  | 40.20 | 823 | 44.86 | 823 | 823 | 823 | 823 | 0 | 823 | 823 | 0 |
| G13 | 923  | 39.71 | 812 | 44.46 | 812 | 812 | 812 | 812 | 0 | 812 | 812 | 0 |
| G14 | 1161 | 24.16 | 918 | 29.23 | 916 | 916 | 916 | 916 | 0 | 916 | 916 | 0 |
| G15 | 1122 | 26.12 | 830 | 33.51 | 826 | 826 | 826 | 826 | 0 | 826 | 826 | 0 |
| G16 | 1151 | 25.21 | 898 | 30.89 | 896 | 896 | 896 | 896 | 0 | 896 | 896 | 0 |
| G17 | 1162 | 23.83 | 911 | 29.02 | 909 | 909 | 909 | 909 | 0 | 909 | 909 | 0 |
| G18 | 1111 | 27.52 | 754 | 37.96 | 748 | 748 | 748 | 748 | 0 | 748 | 748 | 0 |
| G19 | 1073 | 29.41 | 665 | 44.19 | 664 | 664 | 664 | 664 | 0 | 664 | 664 | 0 |
| G20 | 918  | 41.04 | 805 | 46.10 | 805 | 805 | 805 | 805 | 0 | 805 | 805 | 0 |
| G21 | 902  | 42.69 | 787 | 48.20 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G22 | 984  | 34.27 | 715 | 46.02 | 715 | 715 | 715 | 715 | 0 | 715 | 715 | 0 |
| G23 | 901  | 41.27 | 787 | 46.53 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G24 | 853  | 41.78 | 737 | 47.58 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G25 | 893  | 41.24 | 777 | 46.65 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G26 | 996  | 33.53 | 687 | 47.04 | 686 | 686 | 686 | 686 | 0 | 686 | 686 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 897  | 42.06 | 783 | 47.46 | 782 | 782 | 782 | 782 | 0 | 782 | 782 | 0 |
| G28 | 1073 | 30.75 | 688 | 45.23 | 688 | 688 | 688 | 688 | 0 | 688 | 688 | 0 |
| G29 | 935  | 40.54 | 825 | 45.28 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G30 | 1112 | 26.41 | 836 | 33.46 | 832 | 832 | 832 | 832 | 0 | 832 | 832 | 0 |
| G31 | 1177 | 23.23 | 940 | 27.83 | 938 | 938 | 938 | 938 | 0 | 938 | 938 | 0 |
| G32 | 941  | 40.90 | 834 | 45.51 | 834 | 833 | 834 | 833 | 0 | 833 | 834 | 0 |
| G01 | 901  | 41.09 | 787 | 46.32 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 36

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 1

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 1

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24596

Obs deleted (any reason) : 37

Obs complete : 24559

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 177      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 406      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 849      | 0            | 0.000000 |     |      |     |

|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1155 | 0 | 0.000000 |
| 65 - 70 | 1397 | 0 | 0.000000 |
| 60 - 65 | 1385 | 0 | 0.000000 |
| 55 - 60 | 1340 | 0 | 0.000000 |
| 50 - 55 | 1565 | 0 | 0.000000 |
| 45 - 50 | 1571 | 0 | 0.000000 |
| 40 - 45 | 1764 | 0 | 0.000000 |
| 35 - 40 | 1645 | 0 | 0.000000 |
| 30 - 35 | 1857 | 1 | 0.000000 |
| 25 - 30 | 2044 | 0 | 0.000000 |
| 20 - 25 | 2456 | 0 | 0.000000 |
| 15 - 20 | 2342 | 0 | 0.000000 |
| 10 - 15 | 2577 | 0 | 0.000000 |
| 5 - 10  | 34   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     |        | slips L1 rx L2 rx slips L1 rx L2 rx |        |             |      |      |      |      |      |      |
|-----|--------|-------------------------------------|--------|-------------|------|------|------|------|------|------|
| SV  | obs>10 | # del                               | <elev> | MP1 rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
| G02 | 921    | 0                                   | 27.81  | 0.247552    | 0    | 2    | 2    | 0    | 0    | 0    |
| G03 | 684    | 0                                   | 45.09  | 0.147375    | 0    | 1    | 1    | 0    | 0    | 0    |
| G04 | 924    | 0                                   | 27.29  | 0.327818    | 0    | 2    | 2    | 0    | 0    | 0    |
| G05 | 899    | 0                                   | 29.30  | 0.147824    | 0    | 2    | 2    | 0    | 0    | 0    |
| G06 | 736    | 0                                   | 47.20  | 0.156684    | 0    | 1    | 1    | 0    | 0    | 0    |
| G07 | 747    | 0                                   | 47.48  | 0.130305    | 0    | 1    | 1    | 0    | 0    | 0    |
| G08 | 786    | 0                                   | 46.03  | 0.125408    | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 709    | 0                                   | 47.37  | 0.156602    | 0    | 1    | 1    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G10 | 662 | 0 | 44.43 | 0.164993 | 0 | 1 | 1 | 0 | 0 | 0 |
| G11 | 706 | 0 | 46.06 | 0.158682 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 823 | 0 | 44.96 | 0.173994 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 812 | 0 | 44.56 | 0.136422 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 916 | 0 | 29.36 | 0.248388 | 0 | 2 | 2 | 0 | 0 | 0 |
| G15 | 826 | 0 | 33.72 | 0.148684 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 896 | 0 | 30.98 | 0.169544 | 1 | 2 | 3 | 0 | 0 | 0 |
| G17 | 909 | 0 | 29.15 | 0.277006 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 748 | 0 | 38.23 | 0.536737 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 664 | 0 | 44.37 | 0.144968 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 805 | 0 | 46.20 | 0.184691 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 787 | 0 | 48.24 | 0.125095 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 715 | 0 | 46.10 | 0.327290 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 787 | 0 | 46.53 | 0.140971 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 736 | 0 | 47.74 | 0.179727 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 777 | 0 | 46.76 | 0.198763 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 686 | 0 | 47.21 | 0.159946 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 782 | 0 | 47.61 | 0.206145 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 688 | 0 | 45.35 | 0.145176 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 825 | 0 | 45.36 | 0.139298 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 832 | 0 | 33.60 | 0.378302 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 938 | 0 | 27.95 | 0.566483 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 834 | 1 | 45.62 | 0.173682 | 0 | 1 | 1 | 1 | 0 | 1 |

mean MP1 rms : 0.214552 m

total mean elevation : 40.59 degrees

# MP1 obs > 10 : 24559

# qc MP1 slips < 25 : 1

```

# Rvr L1 slips < 25 : 35
# Rvr L2 slips < 25 : 36
# qc MP1 slips > 25 : 1
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 1

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 177 0 0.076911 ||
80 - 85 406 0 0.072286 |
75 - 80 849 0 0.074794 |
70 - 75 1155 0 0.075505 ||
65 - 70 1397 0 0.081878 ||
60 - 65 1385 0 0.088913 ||
55 - 60 1340 0 0.091238 ||
50 - 55 1565 0 0.121676 ||
45 - 50 1571 0 0.124393 ||
40 - 45 1764 0 0.136124 |||
35 - 40 1645 0 0.158058 |||
30 - 35 1857 1 0.170856 |||
25 - 30 2044 0 0.199630 ||||
20 - 25 2456 0 0.233513 |||||
15 - 20 2342 0 0.278452 |||||
10 - 15 2577 1 0.572275 |||||
5 - 10 34 0 0.294583 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 921    | 0     | 27.81  | 0.346940 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G03 | 684    | 0     | 45.09  | 0.259266 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G04 | 924    | 0     | 27.29  | 0.239153 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G05 | 899    | 0     | 29.30  | 0.180619 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G06 | 736    | 0     | 47.20  | 0.221294 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G07 | 747    | 0     | 47.48  | 0.153523 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 786    | 0     | 46.03  | 0.159949 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G09 | 709    | 0     | 47.37  | 0.215385 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G10 | 662    | 0     | 44.43  | 0.214368 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G11 | 706    | 0     | 46.06  | 0.223973 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G12 | 823    | 0     | 44.96  | 0.207100 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 812    | 0     | 44.56  | 0.187025 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G14 | 916    | 0     | 29.36  | 0.662370 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G15 | 826    | 0     | 33.72  | 0.208251 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G16 | 896    | 0     | 30.98  | 0.257841 | 1       | 2    | 3    | 0    | 0    | 0    |      |
| G17 | 909    | 0     | 29.15  | 0.396977 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G18 | 748    | 0     | 38.23  | 0.344306 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G19 | 664    | 0     | 44.37  | 0.207883 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G20 | 805    | 0     | 46.20  | 0.265406 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G21 | 787    | 0     | 48.24  | 0.159480 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G22 | 715    | 0     | 46.10  | 0.226481 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G23 | 787    | 0     | 46.53  | 0.167079 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G24 | 736    | 0     | 47.74  | 0.208863 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G25 | 777    | 0     | 46.76  | 0.210355 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G26 | 686    | 0     | 47.21  | 0.221224 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G27 | 782    | 0     | 47.61  | 0.237054 | 0       | 1    | 1    | 0    | 0    | 0    |      |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 688 | 0 | 45.35 | 0.176773 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 825 | 0 | 45.36 | 0.167989 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 832 | 0 | 33.60 | 0.284068 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 938 | 0 | 27.95 | 0.260083 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 834 | 1 | 45.62 | 0.248007 | 0 | 1 | 1 | 1 | 0 | 1 |

mean MP2 rms : 0.246702 m

total mean elevation : 40.59 degrees

# MP2 obs > 10 : 24559

# qc MP2 slips < 25 : 1

# Rvr L1 slips < 25 : 35

# Rvr L2 slips < 25 : 36

# qc MP2 slips > 25 : 1

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 1

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |   |          |  |
|---------|------|---|----------|--|
| 85 - 90 | 177  | 0 | 0.103692 |  |
| 80 - 85 | 406  | 0 | 0.100156 |  |
| 75 - 80 | 849  | 0 | 0.096770 |  |
| 70 - 75 | 1155 | 0 | 0.110070 |  |
| 65 - 70 | 1397 | 0 | 0.109764 |  |
| 60 - 65 | 1385 | 0 | 0.112518 |  |
| 55 - 60 | 1340 | 0 | 0.115785 |  |
| 50 - 55 | 1565 | 0 | 0.130451 |  |
| 45 - 50 | 1571 | 0 | 0.139677 |  |
| 40 - 45 | 1764 | 0 | 0.162920 |  |
| 35 - 40 | 1645 | 0 | 0.181004 |  |

```

30 - 35 1857 1 0.229818 |||||
25 - 30 2044 0 0.272987 |||||
20 - 25 2456 0 0.297527 |||||
15 - 20 2342 0 0.329810 |||||
10 - 15 2577 1 0.554809 |||||
5 - 10 34 0 0.522296 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 177 0.676 8.949 ###|||
80 - 85 406 0.447 8.978 ##|||
75 - 80 849 0.309 8.989 #|||
70 - 75 1155 0.265 8.992 #|||
65 - 70 1397 0.247 8.991 #|||
60 - 65 1387 0.264 8.986 #|||
55 - 60 1342 0.246 8.993 #|||
50 - 55 1565 0.229 8.994 #|||
45 - 50 1571 0.294 8.957 #|||
40 - 45 1765 0.515 8.659 ##|||
35 - 40 1645 0.414 8.135 ##|||
30 - 35 1859 0.221 8.003 #|||
25 - 30 2045 0.316 7.926 #|||
20 - 25 2457 0.501 7.667 ##|||
15 - 20 2342 0.471 7.151 ##|||
10 - 15 2598 0.472 6.793 ##|||
5 - 10 36 1.204 6.417 #####|||

```

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 177  | 0.601 | 7.955 | ##   |     |     |
| 80 - 85    | 406  | 0.400 | 7.978 | ##   |     |     |
| 75 - 80    | 849  | 0.289 | 7.982 | #    |     |     |
| 70 - 75    | 1155 | 0.449 | 7.811 | ##   |     |     |
| 65 - 70    | 1397 | 0.513 | 7.682 | ##   |     |     |
| 60 - 65    | 1387 | 0.567 | 7.572 | ##   |     |     |
| 55 - 60    | 1342 | 0.513 | 7.329 | ##   |     |     |
| 50 - 55    | 1565 | 0.464 | 7.215 | ##   |     |     |
| 45 - 50    | 1571 | 0.469 | 6.880 | ##   |     |     |
| 40 - 45    | 1765 | 0.524 | 6.483 | ##   |     |     |
| 35 - 40    | 1645 | 0.568 | 6.269 | ##   |     |     |
| 30 - 35    | 1858 | 0.635 | 5.904 | ###  |     |     |
| 25 - 30    | 2045 | 0.585 | 5.392 | ##   |     |     |
| 20 - 25    | 2457 | 0.716 | 5.123 | ###  |     |     |
| 15 - 20    | 2342 | 0.668 | 4.666 | ###  |     |     |
| 10 - 15    | 2598 | 0.698 | 4.274 | ###  |     |     |
| 5 - 10     | 36   | 0.894 | 4.000 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : noa11270.11o

input RnxNAV file(s) : noa11270.11n

\*\*\*\*\*

4-character ID : NOA1 (# = 12620M001)

Receiver type : LEICA GRX1200PRO (# = 462590) (fw = 7.53/2.125)

Antenna type : LEIAT504 LEIS (# = 103326)

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4599646.6845 2034857.8081 3909903.1046 (m)

antenna WGS 84 (geo) : N 38 deg 02' 49.41" E 23 deg 51' 51.58"

antenna WGS 84 (geo) : 38.047060 deg 23.864329 deg

WGS 84 height : 558.6444 m

[qc - header] position : 35.0585 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31094

Possible obs > 10.0 deg: 24687

Complete obs > 10.0 deg: 24656  
 Deleted obs > 10.0 deg: 2  
 Masked obs < 10.0 deg: 28  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.181406 m  
 Moving average MP2 : 0.272036 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.02 (sd=1.04 n=24658) 5.76 (sd=1.75 n=24656)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 237) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 96  
 IOD slips > 10.0 deg : 22  
 IOD or MP slips < 10.0\*: 109  
 IOD or MP slips > 10.0 : 22  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 11 5 7 00:00 11 5 7 23:59 24.00 30 24687 24656 100 0.18 0.27 1121

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1183 | 22.43 | 925 | 27.30 | 925 | 925 | 925 | 925 | 0 | 925 | 925 | 0 |
| G03 | 969  | 33.49 | 696 | 45.44 | 696 | 696 | 696 | 696 | 0 | 696 | 696 | 0 |
| G04 | 1178 | 22.34 | 923 | 27.15 | 923 | 923 | 923 | 923 | 0 | 923 | 923 | 0 |
| G05 | 1154 | 23.86 | 891 | 29.43 | 891 | 891 | 891 | 891 | 0 | 891 | 891 | 0 |
| G06 | 868  | 41.48 | 749 | 47.28 | 749 | 749 | 749 | 749 | 0 | 749 | 749 | 0 |
| G07 | 867  | 41.40 | 748 | 47.19 | 748 | 748 | 748 | 748 | 0 | 748 | 748 | 0 |
| G08 | 908  | 40.40 | 791 | 45.64 | 791 | 791 | 791 | 791 | 0 | 791 | 791 | 0 |
| G09 | 842  | 40.88 | 722 | 46.84 | 722 | 722 | 722 | 722 | 0 | 722 | 722 | 0 |
| G10 | 1027 | 30.80 | 673 | 44.80 | 659 | 659 | 659 | 659 | 0 | 659 | 659 | 0 |
| G11 | 839  | 40.44 | 719 | 46.38 | 717 | 717 | 717 | 717 | 0 | 717 | 717 | 0 |
| G12 | 947  | 39.51 | 838 | 44.00 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G13 | 935  | 39.11 | 822 | 43.80 | 822 | 822 | 822 | 822 | 0 | 822 | 822 | 0 |
| G14 | 1166 | 23.74 | 918 | 28.81 | 911 | 911 | 911 | 911 | 0 | 911 | 911 | 0 |
| G15 | 1111 | 26.51 | 786 | 35.26 | 786 | 786 | 786 | 786 | 0 | 786 | 786 | 0 |
| G16 | 1147 | 25.29 | 884 | 31.32 | 884 | 884 | 884 | 884 | 0 | 884 | 884 | 0 |
| G17 | 1168 | 23.42 | 912 | 28.59 | 912 | 912 | 912 | 912 | 0 | 912 | 912 | 0 |
| G18 | 1112 | 27.17 | 747 | 37.77 | 747 | 747 | 747 | 747 | 0 | 747 | 747 | 0 |
| G19 | 1051 | 30.30 | 675 | 44.72 | 675 | 675 | 675 | 675 | 0 | 675 | 675 | 0 |
| G20 | 934  | 40.39 | 821 | 45.27 | 821 | 821 | 821 | 821 | 0 | 821 | 821 | 0 |
| G21 | 908  | 42.37 | 791 | 47.90 | 791 | 791 | 791 | 791 | 0 | 791 | 791 | 0 |
| G22 | 967  | 34.64 | 716 | 45.77 | 716 | 716 | 716 | 716 | 0 | 716 | 716 | 0 |
| G23 | 909  | 40.86 | 793 | 46.11 | 793 | 793 | 793 | 793 | 0 | 793 | 793 | 0 |
| G24 | 868  | 41.68 | 749 | 47.51 | 749 | 749 | 749 | 749 | 0 | 749 | 749 | 0 |
| G25 | 910  | 40.62 | 793 | 45.88 | 793 | 793 | 793 | 793 | 0 | 793 | 793 | 0 |
| G26 | 953  | 35.33 | 697 | 47.21 | 697 | 697 | 697 | 697 | 0 | 697 | 697 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 913  | 41.56 | 797 | 46.88 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G28 | 1066 | 30.56 | 686 | 44.91 | 680 | 678 | 680 | 678 | 0 | 678 | 680 | 0 |
| G29 | 947  | 39.95 | 835 | 44.65 | 835 | 835 | 835 | 835 | 0 | 835 | 835 | 0 |
| G30 | 1103 | 26.76 | 807 | 34.68 | 807 | 807 | 807 | 807 | 0 | 807 | 807 | 0 |
| G31 | 1189 | 22.83 | 937 | 27.67 | 937 | 937 | 937 | 937 | 0 | 937 | 937 | 0 |
| G32 | 955  | 40.24 | 846 | 44.78 | 846 | 846 | 846 | 846 | 0 | 846 | 846 | 0 |

Obs below mask ( 10.00 deg) : 2543

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 2

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 2

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 27201

Obs deleted (any reason) : 2545

Obs complete : 24656

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 195 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 388 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 886 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1012 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|





|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 717 | 0 | 46.47 | 0.178095 | 3 | 0 | 0 | 0 | 0 | 0 |
| G12 | 838 | 0 | 44.00 | 0.105561 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 822 | 0 | 43.80 | 0.119628 | 1 | 0 | 0 | 0 | 0 | 0 |
| G14 | 911 | 0 | 28.94 | 0.268486 | 9 | 0 | 0 | 1 | 0 | 0 |
| G15 | 786 | 0 | 35.26 | 0.349897 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 884 | 0 | 31.36 | 0.166589 | 2 | 0 | 0 | 0 | 0 | 0 |
| G17 | 912 | 0 | 28.59 | 0.127991 | 0 | 0 | 0 | 0 | 0 | 0 |
| G18 | 747 | 0 | 37.81 | 0.183687 | 1 | 0 | 0 | 0 | 0 | 0 |
| G19 | 675 | 0 | 44.72 | 0.107784 | 1 | 0 | 0 | 0 | 0 | 0 |
| G20 | 821 | 0 | 45.27 | 0.094547 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 791 | 0 | 47.94 | 0.107330 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 716 | 0 | 45.84 | 0.165927 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 793 | 0 | 46.11 | 0.109811 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 749 | 0 | 47.51 | 0.120186 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 793 | 0 | 45.88 | 0.112671 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 697 | 0 | 47.21 | 0.457509 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 797 | 0 | 46.88 | 0.111738 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 680 | 2 | 45.31 | 0.113956 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 835 | 0 | 44.73 | 0.103836 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 807 | 0 | 34.71 | 0.456947 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 937 | 0 | 27.67 | 0.424125 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 846 | 0 | 44.78 | 0.098546 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.181400 m

total mean elevation : 40.48 degrees

# MP1 obs > 10 : 24656

# qc MP1 slips < 25 : 18

# Rvr L1 slips < 25 : 0

```

# Rvr L2 slips < 25 : 0
# qc MP1 slips > 25 : 1
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 195 0 0.066546 |
80 - 85 388 0 0.078626 ||
75 - 80 886 0 0.064753 |
70 - 75 1012 0 0.067821 |
65 - 70 1480 0 0.080392 ||
60 - 65 1403 0 0.081302 ||
55 - 60 1383 0 0.074728 |
50 - 55 1536 0 0.086663 ||
45 - 50 1587 0 0.081407 ||
40 - 45 1835 0 0.074357 |
35 - 40 1663 0 0.083551 ||
30 - 35 1771 0 0.097975 ||
25 - 30 2154 1 0.115167 ||
20 - 25 2331 2 0.136581 |||
15 - 20 2380 0 0.284106 |||||
10 - 15 2643 16 0.550417 #|||||||
5 - 10 2453 102 0.680777 #####|||
0 - 5 33 2 0.369575 #####=====
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 925    | 0     | 27.30  | 0.189803 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G03 | 696    | 0     | 45.53  | 0.147184 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G04 | 923    | 0     | 27.15  | 0.470796 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G05 | 891    | 0     | 29.43  | 0.205096 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G06 | 749    | 0     | 47.35  | 0.124467 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G07 | 748    | 0     | 47.19  | 0.129918 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 791    | 0     | 45.64  | 0.204234 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 722    | 0     | 46.84  | 0.238660 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G10 | 659    | 0     | 45.64  | 0.145267 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G11 | 717    | 0     | 46.47  | 0.369560 | 3       | 0    | 0    | 0    | 0    | 0    | 0    |
| G12 | 838    | 0     | 44.00  | 0.135177 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G13 | 822    | 0     | 43.80  | 0.923090 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 911    | 0     | 28.94  | 0.436257 | 9       | 0    | 0    | 1    | 0    | 0    | 0    |
| G15 | 786    | 0     | 35.26  | 0.357678 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G16 | 884    | 0     | 31.36  | 0.302736 | 2       | 0    | 0    | 0    | 0    | 0    | 0    |
| G17 | 912    | 0     | 28.59  | 0.191394 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G18 | 747    | 0     | 37.81  | 0.269282 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G19 | 675    | 0     | 44.72  | 0.130178 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G20 | 821    | 0     | 45.27  | 0.168651 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 791    | 0     | 47.94  | 0.173157 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 716    | 0     | 45.84  | 0.186962 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 793    | 0     | 46.11  | 0.126944 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G24 | 749    | 0     | 47.51  | 0.152441 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 793    | 0     | 45.88  | 0.125607 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G26 | 697    | 0     | 47.21  | 0.645695 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G27 | 797    | 0     | 46.88  | 0.201344 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G28 | 680    | 2     | 45.31  | 0.148934 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 835 | 0 | 44.73 | 0.130931 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 807 | 0 | 34.71 | 0.576211 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 937 | 0 | 27.67 | 0.580537 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 846 | 0 | 44.78 | 0.107931 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.272020 m

total mean elevation : 40.48 degrees

# MP2 obs > 10 : 24656

# qc MP2 slips < 25 : 18

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 1

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 | rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|---------|-----|-----|------|-----|
|------------|-----------|------|---------|-----|-----|------|-----|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 85 - 90 | 195 | 0 | 0.059379 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 80 - 85 | 388 | 0 | 0.064836 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 75 - 80 | 886 | 0 | 0.061172 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 70 - 75 | 1012 | 0 | 0.062203 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 65 - 70 | 1480 | 0 | 0.068064 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 60 - 65 | 1403 | 0 | 0.057828 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 55 - 60 | 1383 | 0 | 0.071699 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 50 - 55 | 1536 | 0 | 0.075024 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 45 - 50 | 1587 | 0 | 0.089881 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 40 - 45 | 1835 | 0 | 0.094537 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 35 - 40 | 1663 | 0 | 0.104076 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 30 - 35 | 1771 | 0 | 0.133953 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

25 - 30 2154 1 0.151753 |||  
 20 - 25 2331 2 0.200737 ||||  
 15 - 20 2380 0 0.398547 |||||||  
 10 - 15 2643 16 0.905970 #||||||||||||||  
 5 - 10 2453 93 1.380318 #####|  
 0 - 5 33 2 0.944445 #####|  
 < 0 0 0 0.000000

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 195  | 0.703 | 8.856 | ###  |     |     |
| 80 - 85    | 388  | 0.457 | 8.977 | ##   |     |     |
| 75 - 80    | 886  | 0.302 | 8.990 | #    |     |     |
| 70 - 75    | 1012 | 0.283 | 8.991 | #    |     |     |
| 65 - 70    | 1480 | 0.234 | 8.994 | #    |     |     |
| 60 - 65    | 1405 | 0.240 | 8.994 | #    |     |     |
| 55 - 60    | 1385 | 0.242 | 8.994 | #    |     |     |
| 50 - 55    | 1536 | 0.235 | 8.992 | #    |     |     |
| 45 - 50    | 1587 | 0.348 | 8.917 | #    |     |     |
| 40 - 45    | 1836 | 0.537 | 8.465 | ##   |     |     |
| 35 - 40    | 1664 | 0.274 | 8.033 | #    |     |     |
| 30 - 35    | 1771 | 0.197 | 7.996 | #    |     |     |
| 25 - 30    | 2155 | 0.432 | 7.799 | ##   |     |     |
| 20 - 25    | 2332 | 0.438 | 7.151 | ##   |     |     |
| 15 - 20    | 2380 | 0.470 | 6.747 | ##   |     |     |
| 10 - 15    | 2646 | 0.485 | 6.173 | ##   |     |     |
| 5 - 10     | 2508 | 0.563 | 5.610 | ##   |     |     |
| 0 - 5      | 35   | 0.993 | 5.114 | ###  |     |     |

< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 195  | 0.681 | 8.103 | ###  |     |     |
| 80 - 85    | 388  | 0.486 | 8.041 | ##   |     |     |
| 75 - 80    | 886  | 0.289 | 7.998 | #    |     |     |
| 70 - 75    | 1012 | 0.287 | 7.978 | #    |     |     |
| 65 - 70    | 1480 | 0.332 | 7.922 | #    |     |     |
| 60 - 65    | 1405 | 0.499 | 7.703 | ##   |     |     |
| 55 - 60    | 1385 | 0.516 | 7.345 | ##   |     |     |
| 50 - 55    | 1536 | 0.480 | 7.146 | ##   |     |     |
| 45 - 50    | 1587 | 0.527 | 6.702 | ##   |     |     |
| 40 - 45    | 1836 | 0.515 | 6.277 | ##   |     |     |
| 35 - 40    | 1664 | 0.560 | 5.710 | ##   |     |     |
| 30 - 35    | 1771 | 0.600 | 5.265 | ##   |     |     |
| 25 - 30    | 2155 | 0.626 | 4.612 | ###  |     |     |
| 20 - 25    | 2332 | 0.609 | 4.252 | ##   |     |     |
| 15 - 20    | 2380 | 0.684 | 3.722 | ###  |     |     |
| 10 - 15    | 2644 | 0.865 | 3.284 | ###  |     |     |
| 5 - 10     | 2474 | 1.060 | 2.785 | #### |     |     |
| 0 - 5      | 34   | 1.108 | 2.500 | #### |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

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QC of RINEX file(s) : nvrk1270.11o

input RnxNAV file(s) : nvrk1270.11n

\*\*\*\*\*

4-character ID : NVRK

Receiver type : LEICA GRX1200GGPRO (# = 351602) (fw = 5.62/3.014)

Antenna type : LEIAX1202GG

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4386262.9552 1940981.5447 4190920.6707 (m)

antenna WGS 84 (geo) : N 41 deg 20' 8.73" E 23 deg 52' 12.17"

antenna WGS 84 (geo) : 41.335758 deg 23.870048 deg

WGS 84 height : 647.1582 m

[qc - header] position : 36.1457 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31226

Possible obs > 10.0 deg: 24527



Complete obs > 10.0 deg: 24452  
 Deleted obs > 10.0 deg: 1  
 Masked obs < 10.0 deg: 74  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.300077 m  
 Moving average MP2 : 0.290732 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.18 (sd=0.91 n=24453) 6.29 (sd=1.33 n=24452)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 20) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 7  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 9  
 \* or unknown elevation

|     | first epoch | last epoch | hrs | dt    | #expt | #have | % | mp1   | mp2   | o/slps |       |       |     |      |      |      |
|-----|-------------|------------|-----|-------|-------|-------|---|-------|-------|--------|-------|-------|-----|------|------|------|
| SUM | 11          | 5          | 7   | 00:00 | 11    | 5     | 7 | 23:59 | 24.00 | 30     | 24527 | 24452 | 100 | 0.30 | 0.29 | 2717 |

Processing parameters are:

Receiver tracking capability : 26 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1174 | 22.84 | 926 | 27.64 | 921 | 921 | 921 | 921 | 0 | 921 | 921 | 0 |
| G03 | 1012 | 31.82 | 686 | 45.18 | 685 | 685 | 685 | 685 | 0 | 685 | 685 | 0 |
| G04 | 1168 | 22.74 | 921 | 27.51 | 920 | 920 | 920 | 920 | 0 | 920 | 920 | 0 |
| G05 | 1150 | 24.20 | 899 | 29.57 | 896 | 896 | 896 | 896 | 0 | 896 | 896 | 0 |
| G06 | 919  | 38.56 | 737 | 47.28 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G07 | 922  | 38.67 | 735 | 47.69 | 735 | 735 | 735 | 735 | 0 | 735 | 735 | 0 |
| G08 | 886  | 41.36 | 773 | 46.67 | 773 | 773 | 773 | 773 | 0 | 773 | 773 | 0 |
| G09 | 936  | 36.61 | 710 | 47.31 | 709 | 709 | 709 | 709 | 0 | 709 | 709 | 0 |
| G10 | 1051 | 30.05 | 665 | 44.53 | 664 | 664 | 664 | 664 | 0 | 664 | 664 | 0 |
| G11 | 822  | 40.29 | 706 | 46.09 | 705 | 705 | 705 | 705 | 0 | 705 | 705 | 0 |
| G12 | 922  | 40.66 | 814 | 45.39 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G13 | 909  | 40.31 | 799 | 45.17 | 799 | 799 | 799 | 799 | 0 | 799 | 799 | 0 |
| G14 | 1163 | 24.18 | 924 | 29.15 | 917 | 917 | 917 | 917 | 0 | 917 | 917 | 0 |
| G15 | 1119 | 26.48 | 823 | 34.11 | 819 | 819 | 819 | 819 | 0 | 819 | 819 | 0 |
| G16 | 1148 | 25.57 | 896 | 31.35 | 893 | 893 | 893 | 893 | 0 | 893 | 893 | 0 |
| G17 | 1164 | 23.81 | 917 | 28.87 | 912 | 912 | 912 | 912 | 0 | 912 | 912 | 0 |
| G18 | 1122 | 27.02 | 806 | 35.56 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G19 | 1075 | 29.66 | 667 | 44.51 | 666 | 666 | 666 | 666 | 0 | 666 | 666 | 0 |
| G20 | 909  | 41.44 | 798 | 46.51 | 796 | 796 | 796 | 796 | 0 | 796 | 796 | 0 |
| G21 | 888  | 42.90 | 776 | 48.37 | 776 | 776 | 776 | 776 | 0 | 776 | 776 | 0 |
| G22 | 1021 | 32.55 | 705 | 45.57 | 695 | 695 | 695 | 695 | 0 | 695 | 695 | 0 |
| G23 | 888  | 41.70 | 775 | 47.06 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G24 | 851  | 41.98 | 737 | 47.71 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G25 | 887  | 41.57 | 775 | 46.86 | 774 | 774 | 774 | 774 | 0 | 774 | 774 | 0 |
| G26 | 1003 | 33.51 | 688 | 47.18 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 893  | 42.34 | 782 | 47.65 | 781 | 781 | 781 | 781 | 0 | 781 | 781 | 0 |
| G28 | 1089 | 30.07 | 679 | 44.77 | 671 | 670 | 671 | 670 | 0 | 670 | 671 | 0 |
| G29 | 922  | 41.03 | 812 | 45.91 | 810 | 810 | 810 | 810 | 0 | 810 | 810 | 0 |
| G30 | 1108 | 26.77 | 834 | 33.89 | 830 | 830 | 830 | 830 | 0 | 830 | 830 | 0 |
| G31 | 1175 | 23.48 | 940 | 28.12 | 935 | 935 | 935 | 935 | 0 | 935 | 935 | 0 |
| G32 | 930  | 41.34 | 822 | 46.12 | 821 | 821 | 821 | 821 | 0 | 821 | 821 | 0 |

Obs below mask ( 10.00 deg) : 35

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 1

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 1

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24488

Obs deleted (any reason) : 36

Obs complete : 24452

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 205 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 424 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 885 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1338 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |
|---------|------|---|----------|
| 65 - 70 | 1230 | 0 | 0.000000 |
| 60 - 65 | 1337 | 0 | 0.000000 |
| 55 - 60 | 1329 | 0 | 0.000000 |
| 50 - 55 | 1501 | 0 | 0.000000 |
| 45 - 50 | 1563 | 0 | 0.000000 |
| 40 - 45 | 1792 | 0 | 0.000000 |
| 35 - 40 | 1613 | 0 | 0.000000 |
| 30 - 35 | 1801 | 0 | 0.000000 |
| 25 - 30 | 2213 | 0 | 0.000000 |
| 20 - 25 | 2323 | 0 | 0.000000 |
| 15 - 20 | 2313 | 0 | 0.000000 |
| 10 - 15 | 2560 | 7 | 0.000000 |
| 5 - 10  | 29   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 921    | 0     | 27.82  | 0.457525 | 0       | 2     | 4    | 0     | 0    | 0     |      |       |      |
| G03 | 685    | 0     | 45.32  | 0.246175 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G04 | 920    | 0     | 27.62  | 0.272786 | 1       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G05 | 896    | 0     | 29.71  | 0.383516 | 1       | 4     | 4    | 0     | 0    | 0     |      |       |      |
| G06 | 736    | 0     | 47.40  | 0.213772 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 735    | 0     | 47.69  | 0.168228 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 773    | 0     | 46.67  | 0.182358 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G09 | 709    | 0     | 47.48  | 0.225261 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G10 | 664    | 0     | 44.70  | 0.189407 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 705 | 0 | 46.26 | 0.240171 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 814 | 0 | 45.49 | 0.206629 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 799 | 0 | 45.17 | 0.201228 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 917 | 0 | 29.38 | 0.265545 | 1 | 2 | 3 | 0 | 0 | 0 |
| G15 | 819 | 0 | 34.33 | 0.752392 | 0 | 6 | 6 | 0 | 0 | 0 |
| G16 | 893 | 0 | 31.45 | 0.618687 | 0 | 4 | 4 | 0 | 0 | 0 |
| G17 | 912 | 0 | 29.06 | 0.272727 | 0 | 2 | 2 | 0 | 0 | 0 |
| G18 | 802 | 0 | 35.73 | 0.526836 | 0 | 3 | 3 | 0 | 0 | 0 |
| G19 | 666 | 0 | 44.68 | 0.188512 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 796 | 0 | 46.60 | 0.174377 | 1 | 0 | 1 | 0 | 0 | 0 |
| G21 | 776 | 0 | 48.41 | 0.526402 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 695 | 0 | 46.15 | 0.198822 | 1 | 0 | 1 | 0 | 0 | 0 |
| G23 | 775 | 0 | 47.16 | 0.190873 | 0 | 1 | 1 | 0 | 0 | 0 |
| G24 | 736 | 0 | 47.87 | 0.222243 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 774 | 0 | 47.01 | 0.168416 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 687 | 0 | 47.35 | 0.276460 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 781 | 0 | 47.80 | 0.200504 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 671 | 1 | 45.22 | 0.180437 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 810 | 0 | 46.07 | 0.384939 | 0 | 2 | 2 | 0 | 0 | 0 |
| G30 | 830 | 0 | 34.04 | 0.514281 | 0 | 3 | 3 | 0 | 0 | 0 |
| G31 | 935 | 0 | 28.20 | 0.277117 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 821 | 0 | 46.26 | 0.177926 | 2 | 2 | 3 | 0 | 0 | 0 |

mean MP1 rms : 0.300094 m

total mean elevation : 40.77 degrees

# MP1 obs > 10 : 24452

# qc MP1 slips < 25 : 7

# Rvr L1 slips < 25 : 47

# Rvr L2 slips < 25 : 53

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 205       | 0    | 0.055202 |     |     |      |     |
| 80 - 85    | 424       | 0    | 0.060760 |     |     |      |     |
| 75 - 80    | 885       | 0    | 0.063459 |     |     |      |     |
| 70 - 75    | 1338      | 0    | 0.072507 |     |     |      |     |
| 65 - 70    | 1230      | 0    | 0.081973 |     |     |      |     |
| 60 - 65    | 1337      | 0    | 0.089796 |     |     |      |     |
| 55 - 60    | 1329      | 0    | 0.090479 |     |     |      |     |
| 50 - 55    | 1501      | 0    | 0.108069 |     |     |      |     |
| 45 - 50    | 1563      | 0    | 0.125370 |     |     |      |     |
| 40 - 45    | 1792      | 0    | 0.132374 |     |     |      |     |
| 35 - 40    | 1613      | 0    | 0.147454 |     |     |      |     |
| 30 - 35    | 1801      | 0    | 0.184249 |     |     |      |     |
| 25 - 30    | 2213      | 0    | 0.225274 |     |     |      |     |
| 20 - 25    | 2323      | 0    | 0.339660 |     |     |      |     |
| 15 - 20    | 2313      | 1    | 0.439656 |     |     |      |     |
| 10 - 15    | 2560      | 6    | 0.824573 |     |     |      |     |
| 5 - 10     | 29        | 0    | 0.465158 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 921    | 0     | 27.82  | 0.387428 | 1       | 2    | 4    | 0    | 0    | 0    |      |
| G03 | 685    | 0     | 45.32  | 0.246116 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G04 | 920    | 0     | 27.62  | 0.483055 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G05 | 896    | 0     | 29.71  | 0.368763 | 1       | 4    | 4    | 0    | 0    | 0    |      |
| G06 | 736    | 0     | 47.40  | 0.251425 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G07 | 735    | 0     | 47.69  | 0.196206 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G08 | 773    | 0     | 46.67  | 0.183586 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G09 | 709    | 0     | 47.48  | 0.254214 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G10 | 664    | 0     | 44.70  | 0.262706 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G11 | 705    | 0     | 46.26  | 0.243250 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G12 | 814    | 0     | 45.49  | 0.174637 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 799    | 0     | 45.17  | 0.221375 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G14 | 917    | 0     | 29.38  | 0.306857 | 1       | 2    | 3    | 0    | 0    | 0    |      |
| G15 | 819    | 0     | 34.33  | 0.456502 | 1       | 6    | 6    | 0    | 0    | 0    |      |
| G16 | 893    | 0     | 31.45  | 0.411659 | 1       | 4    | 4    | 0    | 0    | 0    |      |
| G17 | 912    | 0     | 29.06  | 0.328830 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G18 | 802    | 0     | 35.73  | 0.355654 | 1       | 3    | 3    | 0    | 0    | 0    |      |
| G19 | 666    | 0     | 44.68  | 0.245776 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G20 | 796    | 0     | 46.60  | 0.179847 | 1       | 0    | 1    | 0    | 0    | 0    |      |
| G21 | 776    | 0     | 48.41  | 0.517901 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G22 | 695    | 0     | 46.15  | 0.223545 | 1       | 0    | 1    | 0    | 0    | 0    |      |
| G23 | 775    | 0     | 47.16  | 0.215380 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G24 | 736    | 0     | 47.87  | 0.230516 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G25 | 774    | 0     | 47.01  | 0.196725 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G26 | 687    | 0     | 47.35  | 0.258981 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G27 | 781    | 0     | 47.80  | 0.199704 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G28 | 671    | 1     | 45.22  | 0.215433 | 0       | 0    | 0    | 0    | 0    | 0    |      |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 810 | 0 | 46.07 | 0.306357 | 1 | 2 | 2 | 0 | 0 | 0 |
| G30 | 830 | 0 | 34.04 | 0.341502 | 1 | 3 | 3 | 0 | 0 | 0 |
| G31 | 935 | 0 | 28.20 | 0.308497 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 821 | 0 | 46.26 | 0.284330 | 2 | 2 | 3 | 0 | 0 | 0 |

mean MP2 rms : 0.290743 m

total mean elevation : 40.77 degrees

# MP2 obs > 10 : 24452

# qc MP2 slips < 25 : 13

# Rvr L1 slips < 25 : 47

# Rvr L2 slips < 25 : 53

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 205 | 0 | 0.082436 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 424 | 0 | 0.071588 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 885 | 0 | 0.078583 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1338 | 0 | 0.085324 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1230 | 0 | 0.107030 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1337 | 0 | 0.116371 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1329 | 0 | 0.122510 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1501 | 0 | 0.147267 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1563 | 0 | 0.149170 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1792 | 0 | 0.175669 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1613 | 0 | 0.177114 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1801 | 0 | 0.219356 |  |  |  |
|---------|------|---|----------|--|--|--|

```

25 - 30 2213 0 0.288224 |||||
20 - 25 2323 0 0.353776 |||||
15 - 20 2313 1 0.447096 |||||
10 - 15 2560 12 0.629418 |||||
5 - 10 29 0 0.476474 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 205 0.629 8.956 ###|||
80 - 85 424 0.437 8.979 ##|||
75 - 80 885 0.303 8.990 #|||
70 - 75 1338 0.249 8.992 #|||
65 - 70 1230 0.257 8.993 #|||
60 - 65 1338 0.246 8.993 #|||
55 - 60 1332 0.247 8.993 #|||
50 - 55 1501 0.250 8.985 #|||
45 - 50 1563 0.332 8.931 #|||
40 - 45 1793 0.514 8.664 ##|||
35 - 40 1613 0.400 8.131 ##|||
30 - 35 1803 0.222 8.008 #|||
25 - 30 2213 0.308 7.929 #|||
20 - 25 2323 0.561 7.563 ##|||
15 - 20 2314 0.577 7.093 ##|||
10 - 15 2578 0.697 6.639 ###|||
5 - 10 35 1.235 6.343 #####|||
0 - 5 0 0.000 0.000

```

< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 205  | 0.559 | 7.961 | ##   |     |     |
| 80 - 85    | 424  | 0.389 | 7.981 | ##   |     |     |
| 75 - 80    | 885  | 0.269 | 7.991 | #    |     |     |
| 70 - 75    | 1338 | 0.273 | 7.966 | #    |     |     |
| 65 - 70    | 1230 | 0.456 | 7.796 | ##   |     |     |
| 60 - 65    | 1338 | 0.525 | 7.626 | ##   |     |     |
| 55 - 60    | 1332 | 0.541 | 7.490 | ##   |     |     |
| 50 - 55    | 1501 | 0.477 | 7.250 | ##   |     |     |
| 45 - 50    | 1563 | 0.412 | 6.954 | ##   |     |     |
| 40 - 45    | 1793 | 0.522 | 6.598 | ##   |     |     |
| 35 - 40    | 1613 | 0.549 | 6.322 | ##   |     |     |
| 30 - 35    | 1803 | 0.581 | 5.862 | ##   |     |     |
| 25 - 30    | 2213 | 0.604 | 5.521 | ##   |     |     |
| 20 - 25    | 2323 | 0.681 | 5.146 | ###  |     |     |
| 15 - 20    | 2314 | 0.696 | 4.755 | ###  |     |     |
| 10 - 15    | 2577 | 0.744 | 4.522 | ###  |     |     |
| 5 - 10     | 35   | 0.942 | 4.229 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : pont1270.11o

input RnxNAV file(s) : pont1270.11n

\*\*\*\*\*

4-character ID : PONT

Receiver type : LEICA GRX1200PRO (# = 465460) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4671278.3340 1754469.2699 3959405.2109 (m)

antenna WGS 84 (geo) : N 38 deg 37' 8.46" E 20 deg 35' 7.81"

antenna WGS 84 (geo) : 38.619017 deg 20.585503 deg

WGS 84 height : 71.7194 m

[qc - header] position : 36.3385 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30958

Possible obs > 10.0 deg: 24627

Complete obs > 10.0 deg: 21360  
 Deleted obs > 10.0 deg: 6  
 Masked obs < 10.0 deg: 4196  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.268475 m  
 Moving average MP2 : 0.365027 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.33 (sd=0.86 n=21366) 6.54 (sd=1.30 n=21360)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 30) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 16  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 16  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 11 5 7 00:00 11 5 7 23:59 24.00 30 24627 21360 87 0.27 0.37 1335

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1186 | 22.23 | 933 | 26.92 | 648 | 644 | 648 | 644 | 0 | 644 | 648 | 0 |
| G03 | 919  | 36.28 | 708 | 46.19 | 584 | 584 | 584 | 584 | 0 | 584 | 584 | 0 |
| G04 | 1170 | 22.73 | 914 | 27.72 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G05 | 1140 | 24.58 | 873 | 30.55 | 768 | 768 | 768 | 768 | 0 | 768 | 768 | 0 |
| G06 | 879  | 41.88 | 761 | 47.60 | 631 | 631 | 631 | 631 | 0 | 631 | 631 | 0 |
| G07 | 850  | 41.50 | 731 | 47.44 | 731 | 731 | 731 | 731 | 0 | 731 | 731 | 0 |
| G08 | 891  | 40.95 | 775 | 46.33 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G09 | 854  | 40.70 | 734 | 46.55 | 603 | 603 | 603 | 603 | 0 | 603 | 603 | 0 |
| G10 | 1003 | 32.35 | 686 | 45.66 | 569 | 569 | 569 | 569 | 0 | 569 | 569 | 0 |
| G11 | 849  | 41.09 | 730 | 46.98 | 609 | 609 | 609 | 609 | 0 | 609 | 609 | 0 |
| G12 | 944  | 39.66 | 835 | 44.19 | 774 | 774 | 774 | 774 | 0 | 774 | 774 | 0 |
| G13 | 924  | 39.53 | 810 | 44.38 | 810 | 810 | 810 | 810 | 0 | 810 | 810 | 0 |
| G14 | 1171 | 23.48 | 929 | 28.30 | 582 | 580 | 582 | 580 | 0 | 580 | 582 | 0 |
| G15 | 1095 | 27.53 | 727 | 38.66 | 611 | 611 | 611 | 611 | 0 | 611 | 611 | 0 |
| G16 | 1135 | 26.09 | 865 | 32.65 | 760 | 760 | 760 | 760 | 0 | 760 | 760 | 0 |
| G17 | 1175 | 23.08 | 925 | 27.98 | 539 | 539 | 539 | 539 | 0 | 539 | 539 | 0 |
| G18 | 1133 | 26.05 | 820 | 34.01 | 642 | 642 | 642 | 642 | 0 | 642 | 642 | 0 |
| G19 | 1029 | 31.78 | 688 | 45.62 | 569 | 569 | 569 | 569 | 0 | 569 | 569 | 0 |
| G20 | 935  | 40.43 | 823 | 45.26 | 732 | 732 | 732 | 732 | 0 | 732 | 732 | 0 |
| G21 | 892  | 42.35 | 775 | 48.01 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G22 | 1020 | 31.86 | 699 | 44.89 | 699 | 699 | 699 | 699 | 0 | 699 | 699 | 0 |
| G23 | 894  | 41.27 | 777 | 46.73 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G24 | 879  | 41.73 | 761 | 47.43 | 630 | 630 | 630 | 630 | 0 | 630 | 630 | 0 |
| G25 | 915  | 40.60 | 801 | 45.67 | 683 | 683 | 683 | 683 | 0 | 683 | 683 | 0 |
| G26 | 911  | 37.50 | 709 | 47.30 | 586 | 586 | 586 | 586 | 0 | 586 | 586 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 922  | 41.48 | 808 | 46.64 | 676 | 676 | 676 | 676 | 0 | 676 | 676 | 0 |
| G28 | 1090 | 29.17 | 670 | 43.82 | 669 | 669 | 669 | 669 | 0 | 669 | 669 | 0 |
| G29 | 935  | 40.32 | 822 | 45.17 | 822 | 822 | 822 | 822 | 0 | 822 | 822 | 0 |
| G30 | 1088 | 27.72 | 767 | 37.11 | 659 | 659 | 659 | 659 | 0 | 659 | 659 | 0 |
| G31 | 1183 | 23.16 | 933 | 28.06 | 821 | 821 | 821 | 821 | 0 | 821 | 821 | 0 |
| G32 | 947  | 40.50 | 838 | 45.12 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G01 | 1169 | 23.97 | 935 | 28.73 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 30

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 6

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 6

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 21396

Obs deleted (any reason) : 36

Obs complete : 21360

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 189      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 436      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 872      | 0            | 0.000000 |     |      |     |



|         |      |    |            |
|---------|------|----|------------|
| 70 - 75 | 1145 | 0  | 0.000000   |
| 65 - 70 | 1455 | 0  | 0.000000   |
| 60 - 65 | 1419 | 0  | 0.000000   |
| 55 - 60 | 1419 | 0  | 0.000000   |
| 50 - 55 | 1318 | 0  | 0.000000   |
| 45 - 50 | 1737 | 0  | 0.000000   |
| 40 - 45 | 1754 | 0  | 0.000000   |
| 35 - 40 | 1655 | 0  | 0.000000   |
| 30 - 35 | 1679 | 3  | 0.000000   |
| 25 - 30 | 1541 | 12 | 0.000000 = |
| 20 - 25 | 1352 | 1  | 0.000000   |
| 15 - 20 | 1651 | 0  | 0.000000   |
| 10 - 15 | 1713 | 0  | 0.000000   |
| 5 - 10  | 24   | 0  | 0.000000   |
| 0 - 5   | 0    | 0  | 0.000000   |
| < 0     | 0    | 0  | 0.000000   |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 648    | 4     | 29.99  | 0.465849 | 0       | 0     | 0    | 8     | 2    | 16    |      |       |      |
| G03 | 584    | 0     | 51.67  | 0.278274 | 0       | 0     | 0    | 0     | 2    | 2     |      |       |      |
| G04 | 803    | 0     | 28.79  | 0.357551 | 1       | 0     | 0    | 1     | 1    | 2     |      |       |      |
| G05 | 768    | 0     | 32.05  | 0.462073 | 0       | 1     | 1    | 0     | 1    | 1     |      |       |      |
| G06 | 631    | 0     | 53.31  | 0.163139 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G07 | 731    | 0     | 47.44  | 0.207379 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 775    | 0     | 46.43  | 0.200246 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 603    | 0     | 52.36  | 0.159723 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |    |
|-----|-----|---|-------|----------|---|---|---|---|---|----|
| G10 | 569 | 0 | 50.98 | 0.232384 | 0 | 0 | 0 | 0 | 1 | 1  |
| G11 | 609 | 0 | 52.41 | 0.177970 | 0 | 0 | 0 | 0 | 1 | 1  |
| G12 | 774 | 0 | 46.53 | 0.189133 | 1 | 1 | 2 | 0 | 0 | 0  |
| G13 | 810 | 0 | 44.38 | 0.197135 | 0 | 0 | 0 | 0 | 0 | 0  |
| G14 | 582 | 2 | 32.38 | 0.402749 | 0 | 0 | 0 | 4 | 4 | 10 |
| G15 | 611 | 0 | 42.38 | 0.600548 | 0 | 1 | 1 | 0 | 1 | 1  |
| G16 | 760 | 0 | 34.46 | 0.439616 | 0 | 1 | 1 | 0 | 1 | 1  |
| G17 | 539 | 0 | 32.73 | 0.223079 | 0 | 0 | 0 | 0 | 0 | 0  |
| G18 | 642 | 0 | 40.07 | 0.240459 | 0 | 1 | 1 | 0 | 0 | 0  |
| G19 | 569 | 0 | 51.01 | 0.228435 | 0 | 0 | 0 | 0 | 1 | 1  |
| G20 | 732 | 0 | 48.78 | 0.208059 | 0 | 0 | 0 | 0 | 1 | 1  |
| G21 | 775 | 0 | 48.05 | 0.226378 | 0 | 1 | 1 | 0 | 0 | 0  |
| G22 | 699 | 0 | 44.96 | 0.198427 | 0 | 0 | 0 | 0 | 0 | 0  |
| G23 | 777 | 0 | 46.73 | 0.209161 | 0 | 0 | 0 | 0 | 0 | 0  |
| G24 | 630 | 0 | 53.17 | 0.168486 | 0 | 0 | 0 | 0 | 1 | 1  |
| G25 | 683 | 0 | 50.37 | 0.139713 | 0 | 0 | 0 | 0 | 1 | 1  |
| G26 | 586 | 0 | 53.06 | 0.194032 | 0 | 0 | 0 | 0 | 1 | 2  |
| G27 | 676 | 0 | 51.95 | 0.146675 | 0 | 0 | 0 | 0 | 1 | 1  |
| G28 | 669 | 0 | 43.87 | 0.185846 | 0 | 0 | 0 | 0 | 0 | 0  |
| G29 | 822 | 0 | 45.26 | 0.407112 | 0 | 1 | 1 | 0 | 0 | 0  |
| G30 | 659 | 0 | 39.94 | 0.633163 | 0 | 1 | 1 | 0 | 1 | 1  |
| G31 | 821 | 0 | 29.20 | 0.229796 | 0 | 1 | 1 | 0 | 1 | 1  |
| G32 | 829 | 0 | 45.58 | 0.156913 | 0 | 1 | 1 | 0 | 0 | 0  |

mean MP1 rms : 0.268484 m

total mean elevation : 43.95 degrees

# MP1 obs > 10 : 21360

# qc MP1 slips < 25 : 2

```

# Rvr L1 slips < 25 : 11
# Rvr L2 slips < 25 : 12
# qc MP1 slips > 25 : 13
# Rvr L1 slips > 25 : 24
# Rvr L2 slips > 25 : 46

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 189 0 0.125845 |||
80 - 85 436 0 0.148538 |||
75 - 80 872 0 0.141653 |||
70 - 75 1145 0 0.134218 |||
65 - 70 1455 0 0.152351 |||
60 - 65 1419 0 0.139205 |||
55 - 60 1419 0 0.148020 |||
50 - 55 1318 0 0.164866 |||
45 - 50 1737 0 0.185014 ||||
40 - 45 1754 0 0.189252 ||||
35 - 40 1655 0 0.229602 |||||
30 - 35 1679 2 0.324451 |||||
25 - 30 1541 11 0.368709 #|||
20 - 25 1352 1 0.249282 ||||
15 - 20 1651 0 0.415523 |||||
10 - 15 1713 1 0.671493 |||||
5 - 10 24 0 0.232887 ||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 648    | 4     | 29.99  | 1.243971 | 0       | 0    | 0    | 9    | 2    | 16   |      |
| G03 | 584    | 0     | 51.67  | 0.254782 | 0       | 0    | 0    | 0    | 2    | 2    |      |
| G04 | 803    | 0     | 28.79  | 0.425904 | 0       | 0    | 0    | 1    | 1    | 2    |      |
| G05 | 768    | 0     | 32.05  | 0.401547 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G06 | 631    | 0     | 53.31  | 0.272433 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G07 | 731    | 0     | 47.44  | 0.275400 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G08 | 775    | 0     | 46.43  | 0.285503 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 603    | 0     | 52.36  | 0.212259 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G10 | 569    | 0     | 50.98  | 0.281144 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G11 | 609    | 0     | 52.41  | 0.271623 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G12 | 774    | 0     | 46.53  | 0.246420 | 1       | 1    | 2    | 0    | 0    | 0    |      |
| G13 | 810    | 0     | 44.38  | 0.255675 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G14 | 582    | 2     | 32.38  | 0.557391 | 0       | 0    | 0    | 4    | 4    | 10   |      |
| G15 | 611    | 0     | 42.38  | 0.490623 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G16 | 760    | 0     | 34.46  | 0.572032 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G17 | 539    | 0     | 32.73  | 0.271685 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G18 | 642    | 0     | 40.07  | 0.490182 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G19 | 569    | 0     | 51.01  | 0.305334 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G20 | 732    | 0     | 48.78  | 0.213761 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G21 | 775    | 0     | 48.05  | 0.371703 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G22 | 699    | 0     | 44.96  | 0.344102 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G23 | 777    | 0     | 46.73  | 0.276905 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G24 | 630    | 0     | 53.17  | 0.236027 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G25 | 683    | 0     | 50.37  | 0.217061 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G26 | 586    | 0     | 53.06  | 0.282692 | 0       | 0    | 0    | 0    | 1    | 2    |      |
| G27 | 676    | 0     | 51.95  | 0.208213 | 0       | 0    | 0    | 0    | 1    | 1    |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 669 | 0 | 43.87 | 0.265760 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 822 | 0 | 45.26 | 0.531645 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 659 | 0 | 39.94 | 0.768842 | 0 | 1 | 1 | 0 | 1 | 1 |
| G31 | 821 | 0 | 29.20 | 0.282749 | 0 | 1 | 1 | 0 | 1 | 1 |
| G32 | 829 | 0 | 45.58 | 0.243004 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.365043 m

total mean elevation : 43.95 degrees

# MP2 obs > 10 : 21360

# qc MP2 slips < 25 : 1

# Rvr L1 slips < 25 : 11

# Rvr L2 slips < 25 : 12

# qc MP2 slips > 25 : 14

# Rvr L1 slips > 25 : 24

# Rvr L2 slips > 25 : 46

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 189 0 0.233109 |||||

80 - 85 436 0 0.263692 |||||

75 - 80 872 0 0.233668 |||||

70 - 75 1145 0 0.217422 ||||

65 - 70 1455 0 0.216740 ||||

60 - 65 1419 0 0.224323 ||||

55 - 60 1419 0 0.232231 |||||

50 - 55 1318 0 0.249461 |||||

45 - 50 1737 0 0.233012 |||||

40 - 45 1754 0 0.246177 |||||

35 - 40 1655 0 0.267909 |||||

|         |      |    |          |   |
|---------|------|----|----------|---|
| 30 - 35 | 1679 | 3  | 0.360806 |   |
| 25 - 30 | 1541 | 11 | 0.615786 | # |
| 20 - 25 | 1352 | 1  | 0.299984 |   |
| 15 - 20 | 1651 | 0  | 0.471348 |   |
| 10 - 15 | 1713 | 0  | 1.003029 |   |
| 5 - 10  | 24   | 0  | 0.873501 |   |
| 0 - 5   | 0    | 0  | 0.000000 |   |
| < 0     | 0    | 0  | 0.000000 |   |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 189  | 0.658 | 8.947 | ###  |     |     |
| 80 - 85    | 436  | 0.431 | 8.979 | ##   |     |     |
| 75 - 80    | 872  | 0.305 | 8.990 | #    |     |     |
| 70 - 75    | 1145 | 0.266 | 8.992 | #    |     |     |
| 65 - 70    | 1455 | 0.236 | 8.994 | #    |     |     |
| 60 - 65    | 1420 | 0.239 | 8.994 | #    |     |     |
| 55 - 60    | 1422 | 0.240 | 8.993 | #    |     |     |
| 50 - 55    | 1318 | 0.276 | 8.978 | #    |     |     |
| 45 - 50    | 1737 | 0.337 | 8.922 | #    |     |     |
| 40 - 45    | 1755 | 0.505 | 8.691 | ##   |     |     |
| 35 - 40    | 1656 | 0.458 | 8.211 | ##   |     |     |
| 30 - 35    | 1689 | 0.505 | 7.943 | ##   |     |     |
| 25 - 30    | 1550 | 0.877 | 7.714 | ###  |     |     |
| 20 - 25    | 1353 | 0.596 | 7.587 | ##   |     |     |
| 15 - 20    | 1652 | 0.601 | 7.191 | ##   |     |     |
| 10 - 15    | 1717 | 0.594 | 6.836 | ##   |     |     |
| 5 - 10     | 30   | 1.299 | 6.367 | #### |     |     |

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 189  | 0.592 | 7.968 | ##   |     |     |
| 80 - 85    | 436  | 0.383 | 7.982 | ##   |     |     |
| 75 - 80    | 872  | 0.309 | 7.997 | #    |     |     |
| 70 - 75    | 1145 | 0.280 | 7.969 | #    |     |     |
| 65 - 70    | 1455 | 0.338 | 7.918 | #    |     |     |
| 60 - 65    | 1420 | 0.481 | 7.742 | ##   |     |     |
| 55 - 60    | 1422 | 0.538 | 7.513 | ##   |     |     |
| 50 - 55    | 1318 | 0.497 | 7.280 | ##   |     |     |
| 45 - 50    | 1737 | 0.461 | 7.074 | ##   |     |     |
| 40 - 45    | 1755 | 0.525 | 6.715 | ##   |     |     |
| 35 - 40    | 1656 | 0.553 | 6.358 | ##   |     |     |
| 30 - 35    | 1689 | 0.745 | 5.944 | ###  |     |     |
| 25 - 30    | 1544 | 0.752 | 5.435 | ###  |     |     |
| 20 - 25    | 1353 | 0.672 | 5.177 | ###  |     |     |
| 15 - 20    | 1652 | 0.715 | 4.858 | ###  |     |     |
| 10 - 15    | 1717 | 0.627 | 4.504 | ###  |     |     |
| 5 - 10     | 30   | 1.022 | 4.300 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : prkv1270.11o

input RnxNAV file(s) : prkv1270.11n

\*\*\*\*\*

4-character ID : PRKV

Receiver type : LEICA GRX1200PRO (# = 465459) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4435580.4258 2188860.7024 4013599.5857 (m)

antenna WGS 84 (geo) : N 39 deg 14' 44.61" E 26 deg 15' 55.15"

antenna WGS 84 (geo) : 39.245726 deg 26.265319 deg

WGS 84 height : 187.9943 m

[qc - header] position : 35.3914 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31179

Possible obs > 10.0 deg: 24554



Complete obs > 10.0 deg: 24533  
 Deleted obs > 10.0 deg: 0  
 Masked obs < 10.0 deg: 825  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.289299 m  
 Moving average MP2 : 0.326683 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.21 (sd=0.85 n=24533) 6.50 (sd=1.30 n=24533)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 7) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 6  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 6  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 11 5 7 00:00 11 5 7 23:59 24.00 30 24554 24533 100 0.29 0.33 4089

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1174 | 22.86 | 918 | 27.84 | 917 | 917 | 917 | 917 | 0 | 917 | 917 | 0 |
| G03 | 1013 | 31.32 | 682 | 44.71 | 682 | 682 | 682 | 682 | 0 | 682 | 682 | 0 |
| G04 | 1177 | 22.32 | 927 | 27.01 | 926 | 926 | 926 | 926 | 0 | 926 | 926 | 0 |
| G05 | 1159 | 23.62 | 905 | 28.85 | 903 | 903 | 903 | 903 | 0 | 903 | 903 | 0 |
| G06 | 872  | 40.17 | 734 | 46.93 | 733 | 733 | 733 | 733 | 0 | 733 | 733 | 0 |
| G07 | 872  | 41.46 | 754 | 47.17 | 754 | 754 | 754 | 754 | 0 | 754 | 754 | 0 |
| G08 | 907  | 40.57 | 793 | 45.69 | 793 | 793 | 793 | 793 | 0 | 793 | 793 | 0 |
| G09 | 910  | 37.38 | 708 | 47.16 | 707 | 707 | 707 | 707 | 0 | 707 | 707 | 0 |
| G10 | 1055 | 29.43 | 660 | 43.96 | 659 | 659 | 659 | 659 | 0 | 659 | 659 | 0 |
| G11 | 824  | 39.80 | 704 | 45.75 | 704 | 704 | 704 | 704 | 0 | 704 | 704 | 0 |
| G12 | 936  | 40.00 | 827 | 44.62 | 827 | 827 | 827 | 827 | 0 | 827 | 827 | 0 |
| G13 | 929  | 39.45 | 818 | 44.13 | 818 | 818 | 818 | 818 | 0 | 818 | 818 | 0 |
| G14 | 1159 | 24.22 | 912 | 29.42 | 911 | 911 | 911 | 911 | 0 | 911 | 911 | 0 |
| G15 | 1127 | 25.80 | 836 | 33.01 | 833 | 833 | 833 | 833 | 0 | 833 | 833 | 0 |
| G16 | 1155 | 24.93 | 902 | 30.52 | 900 | 900 | 900 | 900 | 0 | 900 | 900 | 0 |
| G17 | 1160 | 23.91 | 905 | 29.24 | 904 | 904 | 904 | 904 | 0 | 904 | 904 | 0 |
| G18 | 1101 | 27.99 | 667 | 42.28 | 666 | 666 | 666 | 666 | 0 | 666 | 666 | 0 |
| G19 | 1075 | 29.10 | 662 | 43.87 | 661 | 661 | 661 | 661 | 0 | 661 | 661 | 0 |
| G20 | 920  | 40.92 | 808 | 45.90 | 808 | 808 | 808 | 808 | 0 | 808 | 808 | 0 |
| G21 | 910  | 42.56 | 795 | 48.00 | 795 | 795 | 795 | 795 | 0 | 795 | 795 | 0 |
| G22 | 951  | 35.86 | 722 | 46.30 | 722 | 722 | 722 | 722 | 0 | 722 | 722 | 0 |
| G23 | 909  | 40.99 | 794 | 46.21 | 794 | 794 | 794 | 794 | 0 | 794 | 794 | 0 |
| G24 | 852  | 41.61 | 734 | 47.50 | 734 | 734 | 734 | 734 | 0 | 734 | 734 | 0 |
| G25 | 894  | 41.12 | 777 | 46.57 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G26 | 997  | 33.31 | 684 | 46.92 | 683 | 683 | 683 | 683 | 0 | 683 | 683 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 896  | 41.98 | 781 | 47.43 | 781 | 781 | 781 | 781 | 0 | 781 | 781 | 0 |
| G28 | 1060 | 31.37 | 694 | 45.58 | 694 | 694 | 694 | 694 | 0 | 694 | 694 | 0 |
| G29 | 942  | 40.27 | 831 | 44.98 | 831 | 831 | 831 | 831 | 0 | 831 | 831 | 0 |
| G30 | 1116 | 26.13 | 840 | 33.04 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G31 | 1180 | 23.06 | 941 | 27.67 | 939 | 939 | 939 | 939 | 0 | 939 | 939 | 0 |
| G32 | 947  | 40.66 | 839 | 45.25 | 839 | 839 | 839 | 839 | 0 | 839 | 839 | 0 |
| G01 | 1104 | 27.62 | 804 | 35.98 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 38

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 0

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 0

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24571

Obs deleted (any reason) : 38

Obs complete : 24533

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 110      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 488      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 784      | 0            | 0.000000 |     |      |     |

|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1073 | 1 | 0.000000 |
| 65 - 70 | 1475 | 0 | 0.000000 |
| 60 - 65 | 1385 | 0 | 0.000000 |
| 55 - 60 | 1339 | 1 | 0.000000 |
| 50 - 55 | 1617 | 0 | 0.000000 |
| 45 - 50 | 1597 | 2 | 0.000000 |
| 40 - 45 | 1708 | 0 | 0.000000 |
| 35 - 40 | 1740 | 0 | 0.000000 |
| 30 - 35 | 1837 | 1 | 0.000000 |
| 25 - 30 | 1957 | 1 | 0.000000 |
| 20 - 25 | 2521 | 0 | 0.000000 |
| 15 - 20 | 2396 | 0 | 0.000000 |
| 10 - 15 | 2480 | 0 | 0.000000 |
| 5 - 10  | 33   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     | slips  |       | L1 rx  |          | L2 rx   |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25 | < 25  | < 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 917    | 0     | 27.95  | 0.297933 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G03 | 682    | 0     | 44.80  | 0.270237 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G04 | 926    | 0     | 27.12  | 0.306133 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |
| G05 | 903    | 0     | 28.98  | 0.317763 | 0       | 2    | 2     | 1    | 1     | 1    |       |      |
| G06 | 733    | 0     | 47.05  | 0.260177 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G07 | 754    | 0     | 47.17  | 0.586320 | 0       | 0    | 0     | 0    | 1     | 1    |       |      |
| G08 | 793    | 0     | 45.69  | 0.511169 | 0       | 0    | 0     | 0    | 1     | 1    |       |      |
| G09 | 707    | 0     | 47.32  | 0.176864 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G10 | 659 | 0 | 44.13 | 0.215792 | 0 | 1 | 1 | 0 | 1 | 1 |
| G11 | 704 | 0 | 45.86 | 0.193491 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 827 | 0 | 44.72 | 0.192623 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 818 | 0 | 44.23 | 0.267543 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 911 | 0 | 29.45 | 0.425643 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 833 | 0 | 33.19 | 0.310359 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 900 | 0 | 30.60 | 0.339074 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 904 | 0 | 29.35 | 0.309919 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 666 | 0 | 42.38 | 0.406067 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 661 | 0 | 44.05 | 0.182537 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 808 | 0 | 46.00 | 0.212205 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 795 | 0 | 48.04 | 0.342173 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 722 | 0 | 46.38 | 0.302941 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 794 | 0 | 46.21 | 0.335999 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 734 | 0 | 47.61 | 0.175212 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 777 | 0 | 46.67 | 0.199796 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 683 | 0 | 47.10 | 0.193665 | 0 | 1 | 1 | 1 | 1 | 1 |
| G27 | 781 | 0 | 47.53 | 0.192578 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 694 | 0 | 45.58 | 0.280444 | 0 | 0 | 0 | 1 | 1 | 1 |
| G29 | 831 | 0 | 45.07 | 0.181540 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 838 | 0 | 33.13 | 0.290311 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 939 | 0 | 27.79 | 0.347922 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 839 | 0 | 45.34 | 0.256491 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.289267 m

total mean elevation : 40.54 degrees

# MP1 obs > 10 : 24533

# qc MP1 slips < 25 : 0

```

# Rvr L1 slips < 25 : 32
# Rvr L2 slips < 25 : 32
# qc MP1 slips > 25 : 3
# Rvr L1 slips > 25 : 6
# Rvr L2 slips > 25 : 6

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 110 0 0.084463 ||
80 - 85 488 0 0.095923 ||
75 - 80 784 0 0.102885 ||
70 - 75 1073 1 0.107868 ||
65 - 70 1475 0 0.107650 ||
60 - 65 1385 0 0.112727 ||
55 - 60 1339 0 0.300915 |||||
50 - 55 1617 0 0.167473 |||
45 - 50 1597 2 0.161022 |||
40 - 45 1708 0 0.177521 ||||
35 - 40 1740 0 0.189208 ||||
30 - 35 1837 0 0.372087 |||||
25 - 30 1957 0 0.309667 |||||
20 - 25 2521 0 0.317694 |||||
15 - 20 2396 0 0.427400 |||||
10 - 15 2480 0 0.560713 |||||
5 - 10 33 0 0.838438 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 917    | 0     | 27.95  | 0.302125 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G03 | 682    | 0     | 44.80  | 0.478470 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G04 | 926    | 0     | 27.12  | 0.697825 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G05 | 903    | 0     | 28.98  | 0.329719 | 0       | 2    | 2    | 1    | 1    | 1    | 1    |
| G06 | 733    | 0     | 47.05  | 0.460888 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G07 | 754    | 0     | 47.17  | 0.216412 | 0       | 0    | 0    | 1    | 1    | 1    | 1    |
| G08 | 793    | 0     | 45.69  | 0.266113 | 0       | 0    | 0    | 1    | 1    | 1    | 1    |
| G09 | 707    | 0     | 47.32  | 0.204394 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G10 | 659    | 0     | 44.13  | 0.467727 | 0       | 1    | 1    | 0    | 1    | 1    | 1    |
| G11 | 704    | 0     | 45.86  | 0.236287 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G12 | 827    | 0     | 44.72  | 0.247377 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G13 | 818    | 0     | 44.23  | 0.297370 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G14 | 911    | 0     | 29.45  | 0.294792 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G15 | 833    | 0     | 33.19  | 0.325755 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G16 | 900    | 0     | 30.60  | 0.355818 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G17 | 904    | 0     | 29.35  | 0.303557 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G18 | 666    | 0     | 42.38  | 0.399879 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G19 | 661    | 0     | 44.05  | 0.196578 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G20 | 808    | 0     | 46.00  | 0.290577 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G21 | 795    | 0     | 48.04  | 0.310118 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G22 | 722    | 0     | 46.38  | 0.467250 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 794    | 0     | 46.21  | 0.284290 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G24 | 734    | 0     | 47.61  | 0.212768 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G25 | 777    | 0     | 46.67  | 0.231571 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G26 | 683    | 0     | 47.10  | 0.258410 | 0       | 1    | 1    | 0    | 1    | 1    | 1    |
| G27 | 781    | 0     | 47.53  | 0.226052 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 694 | 0 | 45.58 | 0.276430 | 0 | 0 | 0 | 1 | 1 | 1 |
| G29 | 831 | 0 | 45.07 | 0.344713 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 838 | 0 | 33.13 | 0.312056 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 939 | 0 | 27.79 | 0.486723 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 839 | 0 | 45.34 | 0.270898 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.326692 m

total mean elevation : 40.54 degrees

# MP2 obs > 10 : 24533

# qc MP2 slips < 25 : 0

# Rvr L1 slips < 25 : 32

# Rvr L2 slips < 25 : 32

# qc MP2 slips > 25 : 4

# Rvr L1 slips > 25 : 6

# Rvr L2 slips > 25 : 6

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |   |          |  |
|---------|------|---|----------|--|
| 85 - 90 | 110  | 0 | 0.109762 |  |
| 80 - 85 | 488  | 0 | 0.104930 |  |
| 75 - 80 | 784  | 0 | 0.119434 |  |
| 70 - 75 | 1073 | 1 | 0.131883 |  |
| 65 - 70 | 1475 | 0 | 0.133172 |  |
| 60 - 65 | 1385 | 0 | 0.135892 |  |
| 55 - 60 | 1339 | 1 | 0.148877 |  |
| 50 - 55 | 1617 | 0 | 0.177594 |  |
| 45 - 50 | 1597 | 1 | 0.207904 |  |
| 40 - 45 | 1708 | 0 | 0.219369 |  |
| 35 - 40 | 1740 | 0 | 0.215047 |  |

|         |      |   |          |  |
|---------|------|---|----------|--|
| 30 - 35 | 1837 | 1 | 0.259534 |  |
| 25 - 30 | 1957 | 0 | 0.333029 |  |
| 20 - 25 | 2521 | 0 | 0.357008 |  |
| 15 - 20 | 2396 | 0 | 0.461573 |  |
| 10 - 15 | 2480 | 0 | 0.749678 |  |
| 5 - 10  | 33   | 0 | 0.581683 |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |
| < 0     | 0    | 0 | 0.000000 |  |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 110  | 0.858 | 8.918 | ###   |     |     |
| 80 - 85    | 488  | 0.407 | 8.982 | ##    |     |     |
| 75 - 80    | 784  | 0.321 | 8.989 | #     |     |     |
| 70 - 75    | 1073 | 0.275 | 8.992 | #     |     |     |
| 65 - 70    | 1475 | 0.234 | 8.994 | #     |     |     |
| 60 - 65    | 1386 | 0.242 | 8.994 | #     |     |     |
| 55 - 60    | 1341 | 0.246 | 8.993 | #     |     |     |
| 50 - 55    | 1618 | 0.226 | 8.993 | #     |     |     |
| 45 - 50    | 1597 | 0.308 | 8.947 | #     |     |     |
| 40 - 45    | 1709 | 0.517 | 8.659 | ##    |     |     |
| 35 - 40    | 1740 | 0.398 | 8.136 | ##    |     |     |
| 30 - 35    | 1838 | 0.222 | 8.010 | #     |     |     |
| 25 - 30    | 1958 | 0.265 | 7.957 | #     |     |     |
| 20 - 25    | 2522 | 0.507 | 7.642 | ##    |     |     |
| 15 - 20    | 2396 | 0.513 | 7.190 | ##    |     |     |
| 10 - 15    | 2498 | 0.552 | 6.766 | ##    |     |     |
| 5 - 10     | 38   | 1.224 | 6.474 | ##### |     |     |

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 110  | 0.763 | 7.927 | ###  |     |     |
| 80 - 85    | 488  | 0.493 | 8.107 | ##   |     |     |
| 75 - 80    | 784  | 0.309 | 8.004 | #    |     |     |
| 70 - 75    | 1073 | 0.256 | 7.998 | #    |     |     |
| 65 - 70    | 1475 | 0.216 | 7.991 | #    |     |     |
| 60 - 65    | 1386 | 0.351 | 7.909 | #    |     |     |
| 55 - 60    | 1341 | 0.524 | 7.632 | ##   |     |     |
| 50 - 55    | 1618 | 0.525 | 7.403 | ##   |     |     |
| 45 - 50    | 1597 | 0.473 | 7.230 | ##   |     |     |
| 40 - 45    | 1709 | 0.500 | 6.893 | ##   |     |     |
| 35 - 40    | 1740 | 0.528 | 6.553 | ##   |     |     |
| 30 - 35    | 1838 | 0.578 | 6.266 | ##   |     |     |
| 25 - 30    | 1958 | 0.618 | 5.715 | ##   |     |     |
| 20 - 25    | 2522 | 0.634 | 5.392 | ###  |     |     |
| 15 - 20    | 2396 | 0.725 | 5.004 | ###  |     |     |
| 10 - 15    | 2498 | 0.761 | 4.653 | ###  |     |     |
| 5 - 10     | 38   | 0.956 | 4.289 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : rls01270.11o

input RnxNAV file(s) : rls01270.11n

\*\*\*\*\*

4-character ID : RLSO

Receiver type : LEICA GRX1200 (# = 452161) (fw = 7.80/2.125)

Antenna type : LEIAX1202

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4679942.9902 1840182.0268 3910422.6393 (m)

antenna WGS 84 (geo) : N 38 deg 03' 21.09" E 21 deg 27' 54.19"

antenna WGS 84 (geo) : 38.055857 deg 21.465054 deg

WGS 84 height : 153.9446 m

[qc - header] position : 34.5409 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31004

Possible obs > 10.0 deg: 24673

Complete obs > 10.0 deg: 23651  
 Deleted obs > 10.0 deg: 15  
 Masked obs < 10.0 deg: 1807  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.281200 m  
 Moving average MP2 : 0.348554 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.71 (sd=1.05 n=23666) 6.13 (sd=1.35 n=23651)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 33) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 15  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 18  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 11 5 7 00:00 11 5 7 23:59 24.00 30 24673 23651 96 0.28 0.35 1314

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1187 | 22.22 | 932 | 26.95 | 930 | 930 | 930 | 930 | 0 | 930 | 930 | 0 |
| G03 | 923  | 35.91 | 706 | 46.03 | 639 | 639 | 639 | 639 | 0 | 639 | 639 | 0 |
| G04 | 1173 | 22.58 | 916 | 27.52 | 913 | 913 | 913 | 913 | 0 | 913 | 913 | 0 |
| G05 | 1145 | 24.32 | 877 | 30.22 | 860 | 860 | 860 | 860 | 0 | 860 | 860 | 0 |
| G06 | 879  | 41.72 | 759 | 47.54 | 670 | 669 | 670 | 669 | 0 | 669 | 670 | 0 |
| G07 | 857  | 41.42 | 738 | 47.31 | 738 | 738 | 738 | 738 | 0 | 738 | 738 | 0 |
| G08 | 898  | 40.70 | 781 | 46.05 | 781 | 781 | 781 | 781 | 0 | 781 | 781 | 0 |
| G09 | 853  | 40.67 | 733 | 46.52 | 648 | 648 | 648 | 648 | 0 | 648 | 648 | 0 |
| G10 | 1005 | 32.08 | 683 | 45.50 | 629 | 628 | 629 | 628 | 0 | 628 | 629 | 0 |
| G11 | 849  | 40.91 | 728 | 46.89 | 652 | 648 | 652 | 648 | 0 | 648 | 652 | 0 |
| G12 | 948  | 39.47 | 839 | 43.95 | 839 | 839 | 839 | 839 | 0 | 839 | 839 | 0 |
| G13 | 930  | 39.27 | 817 | 44.02 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |
| G14 | 1170 | 23.49 | 926 | 28.37 | 921 | 921 | 921 | 921 | 0 | 921 | 921 | 0 |
| G15 | 1097 | 27.29 | 738 | 37.88 | 697 | 697 | 697 | 697 | 0 | 697 | 697 | 0 |
| G16 | 1139 | 25.81 | 869 | 32.27 | 845 | 844 | 845 | 844 | 0 | 844 | 845 | 0 |
| G17 | 1173 | 23.13 | 922 | 28.07 | 920 | 920 | 920 | 920 | 0 | 920 | 920 | 0 |
| G18 | 1127 | 26.33 | 801 | 34.92 | 647 | 647 | 647 | 647 | 0 | 647 | 647 | 0 |
| G19 | 1032 | 31.47 | 685 | 45.44 | 625 | 625 | 625 | 625 | 0 | 625 | 625 | 0 |
| G20 | 937  | 40.32 | 825 | 45.12 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G21 | 898  | 42.36 | 780 | 48.01 | 780 | 780 | 780 | 780 | 0 | 780 | 780 | 0 |
| G22 | 1003 | 32.68 | 704 | 45.20 | 704 | 704 | 704 | 704 | 0 | 704 | 704 | 0 |
| G23 | 901  | 41.04 | 784 | 46.43 | 784 | 784 | 784 | 784 | 0 | 784 | 784 | 0 |
| G24 | 878  | 41.68 | 759 | 47.43 | 677 | 670 | 677 | 670 | 0 | 670 | 677 | 0 |
| G25 | 917  | 40.46 | 801 | 45.60 | 749 | 749 | 749 | 749 | 0 | 749 | 749 | 0 |
| G26 | 910  | 37.43 | 708 | 47.23 | 635 | 635 | 635 | 635 | 0 | 635 | 635 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 922  | 41.41 | 808 | 46.55 | 729 | 728 | 729 | 728 | 0 | 728 | 729 | 0 |
| G28 | 1081 | 29.58 | 675 | 44.14 | 674 | 674 | 674 | 674 | 0 | 674 | 674 | 0 |
| G29 | 942  | 40.06 | 828 | 44.89 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G30 | 1092 | 27.45 | 775 | 36.53 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G31 | 1186 | 22.99 | 934 | 27.89 | 932 | 932 | 932 | 932 | 0 | 932 | 932 | 0 |
| G32 | 952  | 40.30 | 842 | 44.90 | 842 | 842 | 842 | 842 | 0 | 842 | 842 | 0 |
| G01 | 917  | 40.16 | 801 | 45.26 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 37

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 15

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 15

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23703

Obs deleted (any reason) : 52

Obs complete : 23651

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 193      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 400      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 889      | 0            | 0.000000 |     |      |     |





|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G10 | 629 | 1 | 48.30 | 0.191724 | 1 | 0 | 0 | 0 | 0 | 0 |
| G11 | 652 | 4 | 50.72 | 0.220317 | 1 | 0 | 0 | 0 | 0 | 0 |
| G12 | 839 | 0 | 44.05 | 0.186592 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 817 | 0 | 44.11 | 0.210970 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 921 | 0 | 28.46 | 0.478810 | 4 | 0 | 0 | 0 | 0 | 0 |
| G15 | 697 | 0 | 39.47 | 0.249070 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 845 | 1 | 32.91 | 0.313740 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 920 | 0 | 28.19 | 0.594302 | 1 | 0 | 0 | 2 | 0 | 0 |
| G18 | 647 | 0 | 40.49 | 0.335134 | 1 | 0 | 0 | 0 | 0 | 0 |
| G19 | 625 | 0 | 48.46 | 0.301343 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 825 | 0 | 45.21 | 0.185495 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 780 | 0 | 48.05 | 0.200693 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 704 | 0 | 45.28 | 0.222621 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 784 | 0 | 46.53 | 0.225913 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 677 | 7 | 51.59 | 0.266426 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 749 | 0 | 47.89 | 0.222584 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 635 | 0 | 50.94 | 0.397917 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 729 | 1 | 50.02 | 0.232321 | 1 | 0 | 0 | 0 | 0 | 0 |
| G28 | 674 | 0 | 44.19 | 0.238363 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 828 | 0 | 44.98 | 0.197207 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 736 | 0 | 37.81 | 0.381028 | 1 | 0 | 0 | 0 | 0 | 0 |
| G31 | 932 | 0 | 27.93 | 0.462900 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 842 | 0 | 44.90 | 0.201345 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.281182 m

total mean elevation : 41.77 degrees

# MP1 obs > 10 : 23651

# qc MP1 slips < 25 : 14

```

# Rvr L1 slips < 25 : 2
# Rvr L2 slips < 25 : 2
# qc MP1 slips > 25 : 2
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 193       | 0    | 0.103169 |     |     |      |     |
| 80 - 85    | 400       | 0    | 0.097930 |     |     |      |     |
| 75 - 80    | 889       | 0    | 0.101261 |     |     |      |     |
| 70 - 75    | 1024      | 0    | 0.121714 |     |     |      |     |
| 65 - 70    | 1521      | 0    | 0.114081 |     |     |      |     |
| 60 - 65    | 1443      | 0    | 0.123977 |     |     |      |     |
| 55 - 60    | 1420      | 0    | 0.136859 |     |     |      |     |
| 50 - 55    | 1347      | 0    | 0.138223 |     |     |      |     |
| 45 - 50    | 1718      | 0    | 0.168636 |     |     |      |     |
| 40 - 45    | 1797      | 0    | 0.170876 |     |     |      |     |
| 35 - 40    | 1660      | 0    | 0.213045 |     |     |      |     |
| 30 - 35    | 1724      | 0    | 0.215525 |     |     |      |     |
| 25 - 30    | 2331      | 2    | 0.299297 |     |     |      |     |
| 20 - 25    | 1992      | 6    | 0.400700 |     |     |      |     |
| 15 - 20    | 2108      | 3    | 0.382031 |     |     |      |     |
| 10 - 15    | 2057      | 5    | 0.674338 |     |     |      |     |
| 5 - 10     | 32        | 0    | 0.566310 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 930    | 0     | 27.07  | 0.393546 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G03 | 639    | 0     | 49.31  | 0.249046 | 1       | 1    | 1    | 0    | 0    | 0    | 0    |
| G04 | 913    | 0     | 27.67  | 0.350094 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G05 | 860    | 0     | 30.68  | 0.400970 | 2       | 1    | 1    | 0    | 0    | 0    | 0    |
| G06 | 670    | 1     | 51.72  | 0.499762 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G07 | 738    | 0     | 47.41  | 0.244426 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 781    | 0     | 46.15  | 0.228661 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 648    | 0     | 50.57  | 0.252219 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G10 | 629    | 1     | 48.30  | 0.370798 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G11 | 652    | 4     | 50.72  | 0.351691 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G12 | 839    | 0     | 44.05  | 0.230690 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G13 | 817    | 0     | 44.11  | 0.272486 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 921    | 0     | 28.46  | 0.385175 | 4       | 0    | 0    | 0    | 0    | 0    | 0    |
| G15 | 697    | 0     | 39.47  | 0.391910 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G16 | 845    | 1     | 32.91  | 0.305450 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G17 | 920    | 0     | 28.19  | 0.357281 | 2       | 0    | 0    | 2    | 0    | 0    | 0    |
| G18 | 647    | 0     | 40.49  | 0.389996 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G19 | 625    | 0     | 48.46  | 0.335195 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G20 | 825    | 0     | 45.21  | 0.222344 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 780    | 0     | 48.05  | 0.332378 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 704    | 0     | 45.28  | 0.316006 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 784    | 0     | 46.53  | 0.229848 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G24 | 677    | 7     | 51.59  | 0.483185 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 749    | 0     | 47.89  | 0.256537 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G26 | 635    | 0     | 50.94  | 0.479347 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G27 | 729    | 1     | 50.02  | 0.250599 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 674 | 0 | 44.19 | 0.315808 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 828 | 0 | 44.98 | 0.275298 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 736 | 0 | 37.81 | 0.636775 | 1 | 0 | 0 | 0 | 0 | 0 |
| G31 | 932 | 0 | 27.93 | 0.738924 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 842 | 0 | 44.90 | 0.234729 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.348542 m

total mean elevation : 41.77 degrees

# MP2 obs > 10 : 23651

# qc MP2 slips < 25 : 15

# Rvr L1 slips < 25 : 2

# Rvr L2 slips < 25 : 2

# qc MP2 slips > 25 : 2

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |   |          |  |
|---------|------|---|----------|--|
| 85 - 90 | 193  | 0 | 0.113871 |  |
| 80 - 85 | 400  | 0 | 0.140280 |  |
| 75 - 80 | 889  | 0 | 0.149547 |  |
| 70 - 75 | 1024 | 0 | 0.184890 |  |
| 65 - 70 | 1521 | 0 | 0.163342 |  |
| 60 - 65 | 1443 | 0 | 0.171294 |  |
| 55 - 60 | 1420 | 0 | 0.170104 |  |
| 50 - 55 | 1347 | 0 | 0.180620 |  |
| 45 - 50 | 1718 | 0 | 0.186815 |  |
| 40 - 45 | 1797 | 0 | 0.204197 |  |
| 35 - 40 | 1660 | 0 | 0.237069 |  |

|         |      |   |          |  |
|---------|------|---|----------|--|
| 30 - 35 | 1724 | 0 | 0.263999 |  |
| 25 - 30 | 2331 | 2 | 0.422502 |  |
| 20 - 25 | 1992 | 6 | 0.543581 |  |
| 15 - 20 | 2108 | 3 | 0.552952 |  |
| 10 - 15 | 2057 | 6 | 0.716255 |  |
| 5 - 10  | 32   | 0 | 0.419137 |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |
| < 0     | 0    | 0 | 0.000000 |  |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 193  | 0.758 | 8.725 | ###   |     |     |
| 80 - 85    | 400  | 0.624 | 8.705 | ##    |     |     |
| 75 - 80    | 889  | 0.441 | 8.870 | ##    |     |     |
| 70 - 75    | 1024 | 0.514 | 8.738 | ##    |     |     |
| 65 - 70    | 1521 | 0.423 | 8.845 | ##    |     |     |
| 60 - 65    | 1444 | 0.504 | 8.714 | ##    |     |     |
| 55 - 60    | 1423 | 0.548 | 8.493 | ##    |     |     |
| 50 - 55    | 1347 | 0.477 | 8.225 | ##    |     |     |
| 45 - 50    | 1718 | 0.292 | 8.045 | #     |     |     |
| 40 - 45    | 1798 | 0.224 | 8.010 | #     |     |     |
| 35 - 40    | 1661 | 0.216 | 7.988 | #     |     |     |
| 30 - 35    | 1724 | 0.398 | 7.852 | ##    |     |     |
| 25 - 30    | 2332 | 0.758 | 7.103 | ###   |     |     |
| 20 - 25    | 2011 | 0.798 | 6.696 | ###   |     |     |
| 15 - 20    | 2112 | 0.642 | 6.489 | ###   |     |     |
| 10 - 15    | 2069 | 0.642 | 5.991 | ###   |     |     |
| 5 - 10     | 37   | 1.132 | 5.676 | ##### |     |     |

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 193  | 0.723 | 7.642 | ###  |     |     |
| 80 - 85    | 400  | 0.569 | 7.760 | ##   |     |     |
| 75 - 80    | 889  | 0.514 | 7.721 | ##   |     |     |
| 70 - 75    | 1024 | 0.494 | 7.747 | ##   |     |     |
| 65 - 70    | 1521 | 0.533 | 7.555 | ##   |     |     |
| 60 - 65    | 1444 | 0.522 | 7.370 | ##   |     |     |
| 55 - 60    | 1423 | 0.485 | 7.256 | ##   |     |     |
| 50 - 55    | 1347 | 0.449 | 7.042 | ##   |     |     |
| 45 - 50    | 1718 | 0.513 | 6.728 | ##   |     |     |
| 40 - 45    | 1798 | 0.538 | 6.468 | ##   |     |     |
| 35 - 40    | 1661 | 0.572 | 6.197 | ##   |     |     |
| 30 - 35    | 1724 | 0.571 | 5.816 | ##   |     |     |
| 25 - 30    | 2332 | 0.768 | 5.156 | ###  |     |     |
| 20 - 25    | 1998 | 0.906 | 4.904 | #### |     |     |
| 15 - 20    | 2111 | 0.768 | 4.570 | ###  |     |     |
| 10 - 15    | 2068 | 0.847 | 4.186 | ###  |     |     |
| 5 - 10     | 36   | 0.979 | 4.111 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : span1270.11o

input RnxNAV file(s) : span1270.11n

\*\*\*\*\*

4-character ID : SPAN

Receiver type : LEICA GRX1200PRO (# = 462661) (fw = 3.00/2.121)

Antenna type : LEIAX1202GG (# = 06500017)

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4658311.9842 1757810.9761 3973711.6144 (m)

antenna WGS 84 (geo) : N 38 deg 46' 52.70" E 20 deg 40' 26.28"

antenna WGS 84 (geo) : 38.781305 deg 20.673966 deg

WGS 84 height : 465.1508 m

[qc - header] position : 31.6997 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 1 32

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30014

Possible obs > 10.0 deg: 23789



Complete obs > 10.0 deg: 23467  
 Deleted obs > 10.0 deg: 37  
 Masked obs < 10.0 deg: 1218  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.302833 m  
 Moving average MP2 : 0.406676 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.88 (sd=1.02 n=23504) 5.41 (sd=1.40 n=23467)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 36) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 15  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 18  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 11 5 7 00:00 11 5 7 23:59 24.00 30 23789 23467 99 0.30 0.41 1304

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

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|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1185 | 22.27 | 932 | 26.96 | 929 | 929 | 929 | 929 | 0 | 929 | 929 | 0 |
| G03 | 925  | 35.99 | 707 | 46.17 | 705 | 704 | 705 | 704 | 0 | 704 | 705 | 0 |
| G04 | 1169 | 22.75 | 913 | 27.74 | 910 | 907 | 910 | 907 | 0 | 907 | 910 | 0 |
| G05 | 1141 | 24.56 | 875 | 30.49 | 871 | 870 | 871 | 870 | 0 | 870 | 871 | 0 |
| G06 | 878  | 41.88 | 760 | 47.61 | 723 | 717 | 723 | 717 | 0 | 717 | 723 | 0 |
| G07 | 850  | 41.50 | 732 | 47.40 | 732 | 732 | 732 | 732 | 0 | 732 | 732 | 0 |
| G08 | 891  | 40.95 | 775 | 46.34 | 773 | 773 | 773 | 773 | 0 | 773 | 773 | 0 |
| G09 | 853  | 40.73 | 733 | 46.59 | 689 | 689 | 689 | 689 | 0 | 689 | 689 | 0 |
| G10 | 1005 | 32.25 | 685 | 45.64 | 683 | 679 | 683 | 679 | 0 | 679 | 683 | 0 |
| G11 | 848  | 41.06 | 728 | 47.01 | 691 | 691 | 691 | 691 | 0 | 691 | 691 | 0 |
| G12 | 943  | 39.71 | 834 | 44.25 | 834 | 834 | 834 | 834 | 0 | 834 | 834 | 0 |
| G13 | 922  | 39.62 | 810 | 44.40 | 810 | 810 | 810 | 810 | 0 | 810 | 810 | 0 |
| G14 | 1171 | 23.50 | 928 | 28.35 | 923 | 923 | 923 | 923 | 0 | 923 | 923 | 0 |
| G15 | 1095 | 27.51 | 734 | 38.33 | 720 | 720 | 720 | 720 | 0 | 720 | 720 | 0 |
| G16 | 1135 | 26.08 | 866 | 32.61 | 856 | 853 | 856 | 853 | 0 | 853 | 856 | 0 |
| G17 | 1174 | 23.12 | 925 | 28.01 | 922 | 922 | 922 | 922 | 0 | 922 | 922 | 0 |
| G18 | 1133 | 26.07 | 820 | 34.04 | 774 | 763 | 774 | 763 | 0 | 763 | 774 | 0 |
| G19 | 1031 | 31.69 | 687 | 45.60 | 682 | 679 | 682 | 679 | 0 | 679 | 682 | 0 |
| G20 | 933  | 40.51 | 821 | 45.36 | 821 | 821 | 821 | 821 | 0 | 821 | 821 | 0 |
| G21 | 891  | 42.40 | 775 | 48.01 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G22 | 1021 | 31.85 | 700 | 44.85 | 700 | 700 | 700 | 700 | 0 | 700 | 700 | 0 |
| G23 | 894  | 41.27 | 776 | 46.79 | 773 | 773 | 773 | 773 | 0 | 773 | 773 | 0 |
| G24 | 877  | 41.79 | 760 | 47.46 | 727 | 723 | 727 | 723 | 0 | 723 | 727 | 0 |
| G25 | 915  | 40.59 | 800 | 45.72 | 800 | 800 | 800 | 800 | 0 | 800 | 800 | 0 |
| G26 | 919  | 37.16 | 708 | 47.33 | 698 | 697 | 698 | 697 | 0 | 697 | 698 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 920  | 41.56 | 807 | 46.68 | 806 | 806 | 806 | 806 | 0 | 806 | 806 | 0 |
| G28 | 1090 | 29.20 | 670 | 43.85 | 669 | 669 | 669 | 669 | 0 | 669 | 669 | 0 |
| G29 | 934  | 40.37 | 822 | 45.19 | 822 | 822 | 822 | 822 | 0 | 822 | 822 | 0 |
| G30 | 1088 | 27.71 | 772 | 36.89 | 755 | 755 | 755 | 755 | 0 | 755 | 755 | 0 |
| G31 | 1183 | 23.17 | 934 | 28.06 | 931 | 931 | 931 | 931 | 0 | 931 | 931 | 0 |
| G01 | 1174 | 23.37 | 933 | 28.11 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 31

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 37

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 37

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23535

Obs deleted (any reason) : 68

Obs complete : 23467

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 192 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 436 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 874 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1097 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |    |            |
|---------|------|----|------------|
| 65 - 70 | 1335 | 0  | 0.000000   |
| 60 - 65 | 1337 | 0  | 0.000000   |
| 55 - 60 | 1338 | 0  | 0.000000   |
| 50 - 55 | 1263 | 0  | 0.000000   |
| 45 - 50 | 1667 | 0  | 0.000000   |
| 40 - 45 | 1700 | 0  | 0.000000   |
| 35 - 40 | 1595 | 0  | 0.000000   |
| 30 - 35 | 1715 | 0  | 0.000000   |
| 25 - 30 | 2247 | 0  | 0.000000   |
| 20 - 25 | 2044 | 0  | 0.000000   |
| 15 - 20 | 2294 | 1  | 0.000000   |
| 10 - 15 | 2306 | 14 | 0.000000 = |
| 5 - 10  | 28   | 0  | 0.000000   |
| 0 - 5   | 0    | 0  | 0.000000   |
| < 0     | 0    | 0  | 0.000000   |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G02 | 929    | 0     | 27.10  | 0.314690 | 0       | 1     | 2    | 0     | 0    | 0     |      |       |      |
| G03 | 705    | 1     | 46.41  | 0.290132 | 0       | 1     | 2    | 0     | 0    | 0     |      |       |      |
| G04 | 910    | 3     | 27.94  | 0.353315 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G05 | 871    | 1     | 30.70  | 0.299045 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G06 | 723    | 6     | 49.73  | 0.263072 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G07 | 732    | 0     | 47.51  | 0.272719 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 773    | 0     | 46.54  | 0.259207 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G09 | 689    | 0     | 48.82  | 0.217329 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G10 | 683    | 4     | 46.06  | 0.254979 | 2       | 1     | 5    | 0     | 0    | 0     |      |       |      |

|     |     |    |       |          |    |   |    |   |   |   |
|-----|-----|----|-------|----------|----|---|----|---|---|---|
| G11 | 691 | 0  | 48.93 | 0.225730 | 0  | 1 | 1  | 0 | 0 | 0 |
| G12 | 834 | 0  | 44.35 | 0.241909 | 0  | 1 | 1  | 0 | 0 | 0 |
| G13 | 810 | 0  | 44.50 | 0.268585 | 0  | 1 | 1  | 0 | 0 | 0 |
| G14 | 923 | 0  | 28.45 | 0.343512 | 0  | 1 | 1  | 0 | 0 | 0 |
| G15 | 720 | 0  | 38.99 | 0.263604 | 1  | 3 | 3  | 0 | 0 | 0 |
| G16 | 856 | 3  | 32.98 | 0.457745 | 1  | 2 | 6  | 0 | 0 | 0 |
| G17 | 922 | 0  | 28.15 | 0.299443 | 0  | 2 | 2  | 0 | 0 | 0 |
| G18 | 774 | 11 | 35.79 | 0.474954 | 10 | 8 | 14 | 0 | 0 | 0 |
| G19 | 682 | 3  | 46.12 | 0.308508 | 2  | 4 | 6  | 0 | 0 | 0 |
| G20 | 821 | 0  | 45.46 | 0.273695 | 1  | 2 | 2  | 0 | 0 | 0 |
| G21 | 775 | 0  | 48.05 | 0.260733 | 0  | 1 | 1  | 0 | 0 | 0 |
| G22 | 700 | 0  | 44.92 | 0.351556 | 0  | 1 | 1  | 0 | 0 | 0 |
| G23 | 773 | 0  | 46.93 | 0.257187 | 0  | 0 | 0  | 0 | 0 | 0 |
| G24 | 727 | 4  | 49.33 | 0.235370 | 1  | 1 | 3  | 0 | 0 | 0 |
| G25 | 800 | 0  | 45.82 | 0.230019 | 0  | 1 | 1  | 0 | 0 | 0 |
| G26 | 698 | 1  | 48.01 | 0.238705 | 0  | 1 | 1  | 0 | 0 | 0 |
| G27 | 806 | 0  | 46.83 | 0.226053 | 0  | 1 | 1  | 0 | 0 | 0 |
| G28 | 669 | 0  | 43.90 | 0.270184 | 0  | 0 | 0  | 0 | 0 | 0 |
| G29 | 822 | 0  | 45.28 | 0.281931 | 0  | 1 | 1  | 0 | 0 | 0 |
| G30 | 755 | 0  | 37.51 | 0.286654 | 0  | 2 | 2  | 0 | 0 | 0 |
| G31 | 931 | 0  | 28.20 | 0.637883 | 0  | 4 | 4  | 0 | 0 | 0 |

mean MP1 rms : 0.302829 m

total mean elevation : 41.00 degrees

# MP1 obs > 10 : 23467

# qc MP1 slips < 25 : 18

# Rvr L1 slips < 25 : 48

# Rvr L2 slips < 25 : 68

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 192      | 0    | 0.192301 |     |     |      |     |
| 80 - 85    | 436      | 0    | 0.216819 |     |     |      |     |
| 75 - 80    | 874      | 0    | 0.192480 |     |     |      |     |
| 70 - 75    | 1097     | 0    | 0.185417 |     |     |      |     |
| 65 - 70    | 1335     | 0    | 0.176506 |     |     |      |     |
| 60 - 65    | 1337     | 0    | 0.193320 |     |     |      |     |
| 55 - 60    | 1338     | 0    | 0.181416 |     |     |      |     |
| 50 - 55    | 1263     | 0    | 0.207803 |     |     |      |     |
| 45 - 50    | 1667     | 0    | 0.212049 |     |     |      |     |
| 40 - 45    | 1700     | 0    | 0.222780 |     |     |      |     |
| 35 - 40    | 1595     | 0    | 0.240250 |     |     |      |     |
| 30 - 35    | 1715     | 0    | 0.278443 |     |     |      |     |
| 25 - 30    | 2247     | 0    | 0.324929 |     |     |      |     |
| 20 - 25    | 2044     | 0    | 0.432937 |     |     |      |     |
| 15 - 20    | 2294     | 1    | 0.454683 |     |     |      |     |
| 10 - 15    | 2306     | 17   | 0.497817 | #   |     |      |     |
| 5 - 10     | 28       | 0    | 0.347166 |     |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |     |     |      |     |
| < 0        | 0        | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

SV obs>10 # del <elev> MP2 rms [m] < 25 < 25 < 25 > 25 > 25 > 25

|     |     |    |       |          |    |   |    |   |   |   |
|-----|-----|----|-------|----------|----|---|----|---|---|---|
| G02 | 929 | 0  | 27.10 | 0.361349 | 0  | 1 | 2  | 0 | 0 | 0 |
| G03 | 705 | 1  | 46.41 | 0.284570 | 1  | 1 | 2  | 0 | 0 | 0 |
| G04 | 910 | 3  | 27.94 | 0.342703 | 0  | 1 | 1  | 0 | 0 | 0 |
| G05 | 871 | 1  | 30.70 | 0.341823 | 0  | 2 | 2  | 0 | 0 | 0 |
| G06 | 723 | 6  | 49.73 | 0.297725 | 0  | 1 | 1  | 0 | 0 | 0 |
| G07 | 732 | 0  | 47.51 | 0.292558 | 0  | 1 | 1  | 0 | 0 | 0 |
| G08 | 773 | 0  | 46.54 | 0.312419 | 0  | 1 | 1  | 0 | 0 | 0 |
| G09 | 689 | 0  | 48.82 | 0.302352 | 0  | 1 | 1  | 0 | 0 | 0 |
| G10 | 683 | 4  | 46.06 | 1.121944 | 0  | 1 | 5  | 0 | 0 | 0 |
| G11 | 691 | 0  | 48.93 | 0.322895 | 0  | 1 | 1  | 0 | 0 | 0 |
| G12 | 834 | 0  | 44.35 | 0.305987 | 0  | 1 | 1  | 0 | 0 | 0 |
| G13 | 810 | 0  | 44.50 | 0.306419 | 0  | 1 | 1  | 0 | 0 | 0 |
| G14 | 923 | 0  | 28.45 | 0.733696 | 0  | 1 | 1  | 0 | 0 | 0 |
| G15 | 720 | 0  | 38.99 | 0.443129 | 1  | 3 | 3  | 0 | 0 | 0 |
| G16 | 856 | 3  | 32.98 | 0.392106 | 3  | 2 | 6  | 0 | 0 | 0 |
| G17 | 922 | 0  | 28.15 | 0.305237 | 0  | 2 | 2  | 0 | 0 | 0 |
| G18 | 774 | 11 | 35.79 | 0.663794 | 10 | 8 | 14 | 0 | 0 | 0 |
| G19 | 682 | 3  | 46.12 | 0.703524 | 1  | 4 | 6  | 0 | 0 | 0 |
| G20 | 821 | 0  | 45.46 | 0.368513 | 1  | 2 | 2  | 0 | 0 | 0 |
| G21 | 775 | 0  | 48.05 | 0.313102 | 0  | 1 | 1  | 0 | 0 | 0 |
| G22 | 700 | 0  | 44.92 | 0.355723 | 0  | 1 | 1  | 0 | 0 | 0 |
| G23 | 773 | 0  | 46.93 | 0.289114 | 0  | 0 | 0  | 0 | 0 | 0 |
| G24 | 727 | 4  | 49.33 | 0.350867 | 1  | 1 | 3  | 0 | 0 | 0 |
| G25 | 800 | 0  | 45.82 | 0.307237 | 0  | 1 | 1  | 0 | 0 | 0 |
| G26 | 698 | 1  | 48.01 | 0.293700 | 0  | 1 | 1  | 0 | 0 | 0 |
| G27 | 806 | 0  | 46.83 | 0.265355 | 0  | 1 | 1  | 0 | 0 | 0 |
| G28 | 669 | 0  | 43.90 | 0.338174 | 0  | 0 | 0  | 0 | 0 | 0 |
| G29 | 822 | 0  | 45.28 | 0.348078 | 0  | 1 | 1  | 0 | 0 | 0 |



G30 755 0 37.51 0.332873 0 2 2 0 0 0  
 G31 931 0 28.20 0.792243 0 4 4 0 0 0

mean MP2 rms : 0.406670 m

total mean elevation : 41.00 degrees

# MP2 obs > 10 : 23467

# qc MP2 slips < 25 : 18

# Rvr L1 slips < 25 : 48

# Rvr L2 slips < 25 : 68

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
| 85 - 90    | 192      | 0 0.163256   |     |     |      |     |
| 80 - 85    | 436      | 0 0.197351   |     |     |      |     |
| 75 - 80    | 874      | 0 0.198852   |     |     |      |     |
| 70 - 75    | 1097     | 0 0.277881   |     |     |      |     |
| 65 - 70    | 1335     | 0 0.237428   |     |     |      |     |
| 60 - 65    | 1337     | 0 0.225888   |     |     |      |     |
| 55 - 60    | 1338     | 0 0.242325   |     |     |      |     |
| 50 - 55    | 1263     | 0 0.250421   |     |     |      |     |
| 45 - 50    | 1667     | 0 0.255281   |     |     |      |     |
| 40 - 45    | 1700     | 0 0.263672   |     |     |      |     |
| 35 - 40    | 1595     | 0 0.306832   |     |     |      |     |
| 30 - 35    | 1715     | 0 0.316942   |     |     |      |     |
| 25 - 30    | 2247     | 0 0.382399   |     |     |      |     |
| 20 - 25    | 2044     | 0 0.487498   |     |     |      |     |

```

15 - 20 2294 1 0.616620 |||||
10 - 15 2306 17 0.962809 #|||
5 - 10 28 0 0.632922 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 192 0.759 8.729 ###|||
80 - 85 436 0.604 8.727 ##|||
75 - 80 874 0.402 8.913 ##|||
70 - 75 1097 0.406 8.889 ##|||
65 - 70 1335 0.294 8.966 #|||
60 - 65 1338 0.315 8.952 #|||
55 - 60 1341 0.409 8.870 ##|||
50 - 55 1263 0.538 8.635 ##|||
45 - 50 1668 0.457 8.210 ##|||
40 - 45 1700 0.286 8.041 #|||
35 - 40 1595 0.215 8.001 #|||
30 - 35 1717 0.283 7.950 #|||
25 - 30 2247 0.528 7.570 ##|||
20 - 25 2044 0.508 7.144 ##|||
15 - 20 2308 0.608 6.679 ##|||
10 - 15 2349 0.768 6.138 ###|||
5 - 10 31 1.251 5.968 #####|||
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 192  | 0.668 | 7.172 | ###   |     |     |
| 80 - 85    | 436  | 0.477 | 6.993 | ##    |     |     |
| 75 - 80    | 874  | 0.610 | 7.057 | ##    |     |     |
| 70 - 75    | 1097 | 0.701 | 7.072 | ###   |     |     |
| 65 - 70    | 1335 | 0.730 | 7.041 | ###   |     |     |
| 60 - 65    | 1338 | 0.706 | 6.691 | ###   |     |     |
| 55 - 60    | 1341 | 0.657 | 6.505 | ###   |     |     |
| 50 - 55    | 1263 | 0.721 | 6.274 | ###   |     |     |
| 45 - 50    | 1668 | 0.771 | 5.869 | ###   |     |     |
| 40 - 45    | 1700 | 0.788 | 5.729 | ###   |     |     |
| 35 - 40    | 1595 | 0.780 | 5.367 | ###   |     |     |
| 30 - 35    | 1717 | 0.744 | 5.083 | ###   |     |     |
| 25 - 30    | 2247 | 0.707 | 4.728 | ###   |     |     |
| 20 - 25    | 2044 | 0.733 | 4.276 | ###   |     |     |
| 15 - 20    | 2298 | 0.803 | 3.981 | ###   |     |     |
| 10 - 15    | 2322 | 0.966 | 3.495 | ####  |     |     |
| 5 - 10     | 31   | 1.151 | 3.516 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |
| < 0        | 0    | 0.000 | 0.000 |       |     |     |

\*\*\*\*\*

QC of RINEX file(s) : vlsm1270.11o

input RnxNAV file(s) : vlsm1270.11n

\*\*\*\*\*

4-character ID : VLSM

Receiver type : LEICA GRX1200PRO (# = 462019) (fw = 7.53/2.125)

Antenna type : LEIAX1202 (# = 05470019)

Time of start of window : 2011 May 7 00:00:00.000

Time of end of window : 2011 May 7 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4699990.5883 1765578.4309 3921171.0278 (m)

antenna WGS 84 (geo) : N 38 deg 10' 36.61" E 20 deg 35' 20.32"

antenna WGS 84 (geo) : 38.176835 deg 20.588977 deg

WGS 84 height : 450.4048 m

[qc - header] position : 31.9998 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 1

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30947

Possible obs > 10.0 deg: 24634

Complete obs > 10.0 deg: 23397  
 Deleted obs > 10.0 deg: 0  
 Masked obs < 10.0 deg: 1237  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.259533 m  
 Moving average MP2 : 0.304105 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.74 (sd=0.95 n=23397) 6.21 (sd=1.25 n=23397)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11444 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 21) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 7  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 11  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 11 5 7 00:00 11 5 7 23:59 24.00 30 24634 23397 95 0.26 0.30 2127

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2011 May 7 00:00:00.000

Observations end : 2011 May 7 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G02 | 1188 | 22.16 | 932 | 26.89 | 890 | 890 | 890 | 890 | 0 | 890 | 890 | 0 |
| G03 | 903  | 36.98 | 709 | 46.23 | 709 | 709 | 709 | 709 | 0 | 709 | 709 | 0 |
| G04 | 1171 | 22.69 | 913 | 27.70 | 830 | 830 | 830 | 830 | 0 | 830 | 830 | 0 |
| G05 | 1141 | 24.52 | 873 | 30.51 | 726 | 726 | 726 | 726 | 0 | 726 | 726 | 0 |
| G06 | 882  | 41.79 | 763 | 47.55 | 762 | 762 | 762 | 762 | 0 | 762 | 762 | 0 |
| G07 | 852  | 41.45 | 733 | 47.37 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |
| G08 | 895  | 40.77 | 777 | 46.21 | 733 | 733 | 733 | 733 | 0 | 733 | 733 | 0 |
| G09 | 857  | 40.58 | 736 | 46.44 | 735 | 735 | 735 | 735 | 0 | 735 | 735 | 0 |
| G10 | 997  | 32.56 | 686 | 45.75 | 686 | 686 | 686 | 686 | 0 | 686 | 686 | 0 |
| G11 | 852  | 41.06 | 732 | 46.99 | 731 | 731 | 731 | 731 | 0 | 731 | 731 | 0 |
| G12 | 947  | 39.52 | 839 | 43.97 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G13 | 927  | 39.38 | 813 | 44.20 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G14 | 1171 | 23.43 | 928 | 28.26 | 884 | 884 | 884 | 884 | 0 | 884 | 884 | 0 |
| G15 | 1094 | 27.53 | 713 | 39.26 | 644 | 644 | 644 | 644 | 0 | 644 | 644 | 0 |
| G16 | 1135 | 26.05 | 862 | 32.69 | 639 | 639 | 639 | 639 | 0 | 639 | 639 | 0 |
| G17 | 1176 | 23.02 | 924 | 27.94 | 881 | 881 | 881 | 881 | 0 | 881 | 881 | 0 |
| G18 | 1131 | 26.08 | 815 | 34.16 | 770 | 770 | 770 | 770 | 0 | 770 | 770 | 0 |
| G19 | 1024 | 31.94 | 688 | 45.70 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |
| G20 | 938  | 40.30 | 825 | 45.13 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G21 | 894  | 42.32 | 777 | 47.95 | 734 | 734 | 734 | 734 | 0 | 734 | 734 | 0 |
| G22 | 1015 | 32.04 | 701 | 44.88 | 653 | 653 | 653 | 653 | 0 | 653 | 653 | 0 |
| G23 | 897  | 41.14 | 779 | 46.62 | 739 | 739 | 739 | 739 | 0 | 739 | 739 | 0 |
| G24 | 881  | 41.67 | 763 | 47.34 | 761 | 761 | 761 | 761 | 0 | 761 | 761 | 0 |
| G25 | 919  | 40.42 | 803 | 45.54 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G26 | 887  | 38.53 | 711 | 47.23 | 710 | 710 | 710 | 710 | 0 | 710 | 710 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 925  | 41.35 | 810 | 46.52 | 810 | 810 | 810 | 810 | 0 | 810 | 810 | 0 |
| G28 | 1087 | 29.22 | 670 | 43.88 | 626 | 626 | 626 | 626 | 0 | 626 | 626 | 0 |
| G29 | 939  | 40.15 | 825 | 45.00 | 810 | 810 | 810 | 810 | 0 | 810 | 810 | 0 |
| G30 | 1087 | 27.74 | 761 | 37.34 | 634 | 634 | 634 | 634 | 0 | 634 | 634 | 0 |
| G31 | 1184 | 23.09 | 933 | 28.00 | 857 | 857 | 857 | 857 | 0 | 857 | 857 | 0 |
| G32 | 951  | 40.32 | 840 | 44.98 | 821 | 821 | 821 | 821 | 0 | 821 | 821 | 0 |

Obs below mask ( 10.00 deg) : 30

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 0

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 0

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23427

Obs deleted (any reason) : 30

Obs complete : 23397

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 192 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 430 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 861 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1089 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|





|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G11 | 731 | 0 | 47.15 | 0.161349 | 0 | 0 | 0 | 0 | 0 | 0 |
| G12 | 828 | 0 | 44.50 | 0.158724 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 797 | 0 | 44.86 | 0.200869 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 884 | 0 | 28.98 | 0.277583 | 1 | 0 | 0 | 0 | 0 | 0 |
| G15 | 644 | 0 | 42.48 | 0.184184 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 639 | 0 | 39.07 | 0.333372 | 1 | 0 | 0 | 0 | 0 | 0 |
| G17 | 881 | 0 | 28.73 | 0.293796 | 0 | 0 | 0 | 0 | 0 | 0 |
| G18 | 770 | 0 | 35.41 | 0.446847 | 1 | 0 | 0 | 0 | 0 | 0 |
| G19 | 687 | 0 | 45.87 | 0.176876 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 820 | 0 | 45.44 | 0.158229 | 3 | 0 | 0 | 0 | 0 | 0 |
| G21 | 734 | 0 | 50.03 | 0.226021 | 1 | 0 | 0 | 0 | 0 | 0 |
| G22 | 653 | 0 | 47.24 | 0.192665 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 739 | 0 | 48.44 | 0.153358 | 0 | 0 | 0 | 0 | 0 | 0 |
| G24 | 761 | 0 | 47.55 | 0.159615 | 1 | 0 | 0 | 0 | 0 | 0 |
| G25 | 803 | 0 | 45.64 | 0.159122 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 710 | 0 | 47.39 | 0.372240 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 810 | 0 | 46.61 | 0.201550 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 626 | 0 | 46.00 | 0.197983 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 810 | 0 | 45.72 | 0.201449 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 634 | 0 | 42.61 | 0.595828 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 857 | 0 | 29.40 | 0.388310 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 821 | 0 | 45.75 | 0.165462 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.259547 m

total mean elevation : 42.21 degrees

# MP1 obs > 10 : 23397

# qc MP1 slips < 25 : 10

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 192       | 0    | 0.090788 |     |     |      |     |
| 80 - 85    | 430       | 0    | 0.094927 |     |     |      |     |
| 75 - 80    | 861       | 0    | 0.095406 |     |     |      |     |
| 70 - 75    | 1089      | 0    | 0.105089 |     |     |      |     |
| 65 - 70    | 1496      | 0    | 0.121872 |     |     |      |     |
| 60 - 65    | 1434      | 0    | 0.122592 |     |     |      |     |
| 55 - 60    | 1426      | 0    | 0.130751 |     |     |      |     |
| 50 - 55    | 1331      | 0    | 0.131041 |     |     |      |     |
| 45 - 50    | 1737      | 0    | 0.152115 |     |     |      |     |
| 40 - 45    | 1761      | 0    | 0.167142 |     |     |      |     |
| 35 - 40    | 1660      | 0    | 0.191167 |     |     |      |     |
| 30 - 35    | 1758      | 0    | 0.199501 |     |     |      |     |
| 25 - 30    | 2316      | 0    | 0.238202 |     |     |      |     |
| 20 - 25    | 2118      | 0    | 0.246831 |     |     |      |     |
| 15 - 20    | 2052      | 4    | 0.446223 |     |     |      |     |
| 10 - 15    | 1710      | 6    | 0.741446 |     |     |      |     |
| 5 - 10     | 25        | 0    | 0.239495 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G02 | 890    | 0     | 27.60  | 0.285907 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G03 | 709    | 0     | 46.32  | 0.313422 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G04 | 830    | 0     | 29.23  | 0.344900 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G05 | 726    | 0     | 34.02  | 0.471469 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G06 | 762    | 0     | 47.65  | 0.578595 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G07 | 687    | 0     | 49.75  | 0.201977 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 733    | 0     | 48.30  | 0.190368 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 735    | 0     | 46.60  | 0.240185 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G10 | 686    | 0     | 45.86  | 0.257514 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G11 | 731    | 0     | 47.15  | 0.223321 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G12 | 828    | 0     | 44.50  | 0.226273 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G13 | 797    | 0     | 44.86  | 0.204370 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 884    | 0     | 28.98  | 0.589125 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G15 | 644    | 0     | 42.48  | 0.264045 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G16 | 639    | 0     | 39.07  | 0.309362 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G17 | 881    | 0     | 28.73  | 0.409586 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G18 | 770    | 0     | 35.41  | 0.549113 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G19 | 687    | 0     | 45.87  | 0.215189 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G20 | 820    | 0     | 45.44  | 0.220670 | 3       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 734    | 0     | 50.03  | 0.238533 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 653    | 0     | 47.24  | 0.244273 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 739    | 0     | 48.44  | 0.201606 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G24 | 761    | 0     | 47.55  | 0.228694 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 803    | 0     | 45.64  | 0.181689 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G26 | 710    | 0     | 47.39  | 0.579481 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G27 | 810    | 0     | 46.61  | 0.291735 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G28 | 626    | 0     | 46.00  | 0.250314 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 810 | 0 | 45.72 | 0.327735 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 634 | 0 | 42.61 | 0.241195 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 857 | 0 | 29.40 | 0.278621 | 1 | 0 | 0 | 0 | 0 | 0 |
| G32 | 821 | 0 | 45.75 | 0.192429 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.304105 m

total mean elevation : 42.21 degrees

# MP2 obs > 10 : 23397

# qc MP2 slips < 25 : 11

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 192 | 0 | 0.135010 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 430 | 0 | 0.122087 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 861 | 0 | 0.159329 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1089 | 0 | 0.153703 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1496 | 0 | 0.162355 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1434 | 0 | 0.166166 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1426 | 0 | 0.179120 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1331 | 0 | 0.176728 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1737 | 0 | 0.215650 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1761 | 0 | 0.204311 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1660 | 0 | 0.200005 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1758 | 0 | 0.234805 |  |  |  |
|---------|------|---|----------|--|--|--|

```

25 - 30 2316 0 0.261940 |||||
20 - 25 2118 0 0.320069 |||||
15 - 20 2052 4 0.460379 |||||
10 - 15 1710 7 0.830626 |||||
5 - 10 25 0 0.305360 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 192 0.770 8.688 ###|||
80 - 85 430 0.607 8.723 ##|||
75 - 80 861 0.501 8.787 ##|||
70 - 75 1089 0.519 8.717 ##|||
65 - 70 1496 0.496 8.729 ##|||
60 - 65 1435 0.545 8.560 ##|||
55 - 60 1429 0.541 8.411 ##|||
50 - 55 1331 0.451 8.183 ##|||
45 - 50 1737 0.288 8.043 #|||
40 - 45 1762 0.226 8.007 #|||
35 - 40 1661 0.243 7.974 #|||
30 - 35 1759 0.439 7.799 ##|||
25 - 30 2316 0.500 7.310 ##|||
20 - 25 2118 0.407 6.941 ##|||
15 - 20 2053 0.636 6.488 ###|||
10 - 15 1728 0.602 5.983 ##|||
5 - 10 30 1.165 5.767 #####|||
0 - 5 0 0.000 0.000

```

< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 192  | 0.715 | 7.682 | ###  |     |     |
| 80 - 85    | 430  | 0.558 | 7.763 | ##   |     |     |
| 75 - 80    | 861  | 0.508 | 7.739 | ##   |     |     |
| 70 - 75    | 1089 | 0.522 | 7.669 | ##   |     |     |
| 65 - 70    | 1496 | 0.536 | 7.515 | ##   |     |     |
| 60 - 65    | 1435 | 0.522 | 7.371 | ##   |     |     |
| 55 - 60    | 1429 | 0.490 | 7.269 | ##   |     |     |
| 50 - 55    | 1331 | 0.459 | 7.059 | ##   |     |     |
| 45 - 50    | 1737 | 0.528 | 6.676 | ##   |     |     |
| 40 - 45    | 1762 | 0.529 | 6.461 | ##   |     |     |
| 35 - 40    | 1661 | 0.552 | 6.160 | ##   |     |     |
| 30 - 35    | 1759 | 0.560 | 5.795 | ##   |     |     |
| 25 - 30    | 2316 | 0.582 | 5.451 | ##   |     |     |
| 20 - 25    | 2118 | 0.659 | 5.060 | ###  |     |     |
| 15 - 20    | 2053 | 0.759 | 4.736 | ###  |     |     |
| 10 - 15    | 1728 | 0.768 | 4.219 | ###  |     |     |
| 5 - 10     | 30   | 0.947 | 4.000 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

## **Έτος 2012 ημέρα 127**

\*\*\*\*\*

QC of RINEX file(s) : atal1270.12o

input RnxNAV file(s) : atal1270.12n

\*\*\*\*\*

4-character ID : ATAL

Receiver type : ASHTECH UZ-12 (# = PRODUCTION05) (fw = CN00)

Antenna type : NOV533 (# = 32871)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4591115.9425 1948781.0041 3962409.6410 (m)

antenna WGS 84 (geo) : N 38 deg 39' 11.06" E 22 deg 59' 58.78"

antenna WGS 84 (geo) : 38.653073 deg 22.999661 deg

WGS 84 height : 153.9422 m

[qc - header] position : 32.5987 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 32

NAVSTAR GPS SVs w/o OBS :

NAVSTAR GPS SVs w/o NAV : 24

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2874



Epochs repeated : 0 (0.00%)  
 Possible obs > 0.0 deg: 31062  
 Possible obs > 10.0 deg: 24793  
 Complete obs > 10.0 deg: 22653  
 Deleted obs > 10.0 deg: 45  
 Masked obs < 10.0 deg: 2042  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.163813 m  
 Moving average MP2 : 0.278381 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 0.00 (sd=0.00 n=0) 0.00 (sd=0.00 n=0)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 286) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 3  
 IOD slips > 10.0 deg : 128  
 IOD or MP slips < 10.0\*: 4  
 IOD or MP slips > 10.0 : 139  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 23.95 30 24793 22653 91 0.16 0.28 163

Processing parameters are:

Receiver tracking capability : 12 SVs

Maximum ionospheric rate (L1) : 400.00 cm/min

Report data gap greater than : 10.00 min

Expected rms of MP1 multipath : 50.00 cm

Expected rms of MP2 multipath : 65.00 cm

Multipath slip sigma threshold : 4.00 cm

% increase in MP rms for C/A | A/S : 100.00 %

Points in MP moving averages : 50

Minimum signal to noise for L1 : 0

Minimum signal to noise for L2 : 0

Elevation mask (cutoff) : 10.00 degrees

Elevation comparison threshold : 25.00 degrees

Orbit path spline fit sample time : 10 min

SVs w/ code data for position try : 5

Width of ASCII summary plot : 72

Data indicators on summary plot : yes

Do ionospheric observable : yes

Do ionospheric derivative : yes

Do high-pass ionosphere observable : no

Do multipath observables : yes

Do 1-ms receiver clock slips : yes

Tolerance for 1-ms clock slips : 1.00e-02 ms

Do receiver LLI slips : yes

Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #rept #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G31 | 1176 | 23.23 | 936 | 27.92 | 884 | 882 | 884 | 882 | 0 | 882 | 884 | 0 |
| G02 | 1185 | 22.37 | 931 | 27.12 | 879 | 879 | 879 | 879 | 0 | 879 | 879 | 0 |
| G05 | 1151 | 23.97 | 889 | 29.56 | 827 | 825 | 827 | 825 | 0 | 825 | 827 | 0 |
| G30 | 1112 | 26.20 | 827 | 33.46 | 762 | 760 | 762 | 760 | 0 | 760 | 762 | 0 |
| G12 | 943  | 39.52 | 834 | 44.04 | 797 | 794 | 797 | 794 | 0 | 794 | 797 | 0 |
| G21 | 908  | 42.36 | 792 | 47.84 | 729 | 727 | 729 | 727 | 0 | 727 | 729 | 0 |
| G25 | 910  | 40.60 | 794 | 45.81 | 757 | 754 | 757 | 754 | 0 | 754 | 757 | 0 |
| G29 | 943  | 39.94 | 823 | 45.05 | 772 | 770 | 772 | 770 | 0 | 770 | 772 | 0 |
| G18 | 1134 | 26.01 | 818 | 34.06 | 688 | 686 | 688 | 686 | 0 | 686 | 688 | 0 |
| G06 | 866  | 41.83 | 748 | 47.65 | 648 | 648 | 648 | 648 | 0 | 648 | 648 | 0 |
| G22 | 958  | 35.43 | 719 | 46.23 | 654 | 653 | 654 | 653 | 0 | 653 | 654 | 0 |
| G16 | 1147 | 25.40 | 889 | 31.31 | 793 | 793 | 793 | 793 | 0 | 793 | 793 | 0 |
| G03 | 977  | 33.33 | 692 | 45.77 | 608 | 607 | 608 | 607 | 0 | 607 | 608 | 0 |
| G15 | 1116 | 26.24 | 809 | 34.21 | 744 | 741 | 744 | 741 | 0 | 741 | 744 | 0 |
| G19 | 1068 | 29.51 | 672 | 43.83 | 590 | 589 | 590 | 589 | 0 | 589 | 590 | 0 |
| G14 | 1175 | 23.57 | 920 | 28.75 | 845 | 844 | 845 | 844 | 0 | 844 | 845 | 0 |
| G11 | 839  | 40.69 | 720 | 46.60 | 623 | 622 | 623 | 622 | 0 | 622 | 623 | 0 |
| G32 | 947  | 40.43 | 837 | 45.09 | 790 | 789 | 790 | 789 | 0 | 789 | 790 | 0 |
| G01 | 849  | 41.42 | 730 | 47.36 | 633 | 632 | 633 | 632 | 0 | 632 | 633 | 0 |
| G20 | 930  | 40.62 | 817 | 45.55 | 779 | 778 | 779 | 778 | 0 | 778 | 779 | 0 |
| G28 | 1065 | 31.04 | 691 | 45.36 | 632 | 630 | 632 | 630 | 0 | 630 | 632 | 0 |
| G23 | 914  | 40.95 | 799 | 46.13 | 740 | 740 | 740 | 740 | 0 | 740 | 740 | 0 |

|      |      |       |     |       |     |     |     |     |   |     |     |   |
|------|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G17  | 1173 | 23.23 | 922 | 28.20 | 873 | 870 | 873 | 870 | 0 | 870 | 873 | 0 |
| G13  | 930  | 39.46 | 818 | 44.17 | 765 | 765 | 765 | 765 | 0 | 765 | 765 | 0 |
| G04  | 1176 | 22.37 | 924 | 27.13 | 868 | 867 | 868 | 867 | 0 | 867 | 868 | 0 |
| G07  | 870  | 40.54 | 731 | 47.44 | 663 | 663 | 663 | 663 | 0 | 663 | 663 | 0 |
| G10  | 1004 | 32.18 | 684 | 45.57 | 601 | 601 | 601 | 601 | 0 | 601 | 601 | 0 |
| G08  | 905  | 40.62 | 789 | 45.86 | 727 | 725 | 727 | 725 | 0 | 725 | 727 | 0 |
| G26  | 923  | 36.73 | 703 | 47.29 | 612 | 610 | 612 | 610 | 0 | 610 | 612 | 0 |
| G27  | 919  | 41.56 | 805 | 46.74 | 768 | 765 | 768 | 765 | 0 | 765 | 768 | 0 |
| G09  | 849  | 40.76 | 730 | 46.60 | 647 | 644 | 647 | 644 | 0 | 644 | 647 | 0 |
| G24* | 0    | 0.00  | 0   | 0.00  | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

\* = SV with no NAV info

Obs below mask ( 10.00 deg) : 809

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 45

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 45

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23507

Obs deleted (any reason) : 854

Obs complete : 22653

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slips | <ION rms, m> | 5=%      | 1 m  | 15=% | 2 m |
|------------|-----------|--------------|----------|------|------|-----|
| 85 - 90    | 185       | 0            | 0.000000 |      |      |     |
| 80 - 85    | 361       | 0            | 0.000000 |      |      |     |
| 75 - 80    | 899       | 0            | 0.000000 |      |      |     |
| 70 - 75    | 1073      | 0            | 0.000000 |      |      |     |
| 65 - 70    | 1321      | 0            | 0.000000 |      |      |     |
| 60 - 65    | 1456      | 0            | 0.000000 |      |      |     |
| 55 - 60    | 1390      | 1            | 0.000000 |      |      |     |
| 50 - 55    | 1473      | 3            | 0.000000 |      |      |     |
| 45 - 50    | 1585      | 12           | 0.000000 | =    |      |     |
| 40 - 45    | 1880      | 16           | 0.000000 | =    |      |     |
| 35 - 40    | 1657      | 23           | 0.000000 | ==   |      |     |
| 30 - 35    | 1737      | 35           | 0.000000 | ==== |      |     |
| 25 - 30    | 2300      | 19           | 0.000000 | =    |      |     |
| 20 - 25    | 2094      | 11           | 0.000000 | =    |      |     |
| 15 - 20    | 1731      | 4            | 0.000000 |      |      |     |
| 10 - 15    | 1480      | 4            | 0.000000 |      |      |     |
| 5 - 10     | 2         | 0            | 0.000000 |      |      |     |
| 0 - 5      | 0         | 0            | 0.000000 |      |      |     |
| < 0        | 0         | 0            | 0.000000 |      |      |     |

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | < 25  | < 25  | < 25  | > 25  | > 25  | > 25  |
|-----|--------|-------|--------|-------------|-------|-------|-------|-------|-------|-------|
|     |        |       |        |             | slips | L1 rx | L2 rx | slips | L1 rx | L2 rx |
| G31 | 884    | 2     | 28.77  | 0.176683    | 5     | 2     | 2     | 3     | 0     | 0     |
| G02 | 879    | 0     | 28.11  | 0.177799    | 3     | 2     | 3     | 5     | 0     | 0     |
| G05 | 827    | 2     | 30.73  | 0.165621    | 2     | 3     | 3     | 0     | 0     | 0     |
| G30 | 762    | 2     | 35.09  | 0.207373    | 2     | 8     | 8     | 3     | 0     | 0     |

|      |     |   |       |          |   |   |   |   |   |   |
|------|-----|---|-------|----------|---|---|---|---|---|---|
| G12  | 797 | 3 | 45.62 | 0.128175 | 0 | 1 | 1 | 4 | 0 | 0 |
| G21  | 729 | 2 | 50.60 | 0.165809 | 1 | 2 | 2 | 4 | 0 | 0 |
| G25  | 757 | 3 | 47.55 | 0.123931 | 0 | 0 | 2 | 4 | 0 | 0 |
| G29  | 772 | 2 | 47.10 | 0.099150 | 1 | 0 | 1 | 4 | 0 | 0 |
| G18  | 688 | 2 | 38.01 | 0.201301 | 0 | 2 | 8 | 4 | 0 | 0 |
| G06  | 648 | 0 | 52.44 | 0.189545 | 0 | 1 | 1 | 4 | 0 | 0 |
| G22  | 654 | 1 | 48.99 | 0.360350 | 0 | 1 | 1 | 3 | 0 | 0 |
| G16  | 793 | 0 | 33.33 | 0.281242 | 1 | 3 | 5 | 3 | 0 | 0 |
| G03  | 608 | 1 | 49.85 | 0.213344 | 0 | 1 | 3 | 4 | 0 | 0 |
| G15  | 744 | 3 | 35.89 | 0.161698 | 1 | 1 | 2 | 3 | 0 | 0 |
| G19  | 590 | 1 | 47.83 | 0.217442 | 0 | 0 | 1 | 4 | 0 | 0 |
| G14  | 845 | 1 | 30.28 | 0.223817 | 0 | 0 | 2 | 4 | 0 | 0 |
| G11  | 623 | 1 | 51.61 | 0.155299 | 0 | 0 | 3 | 4 | 0 | 0 |
| G32  | 790 | 1 | 46.92 | 0.134749 | 0 | 1 | 1 | 4 | 0 | 0 |
| G01  | 633 | 1 | 52.41 | 0.108691 | 0 | 0 | 1 | 4 | 0 | 0 |
| G20  | 779 | 1 | 47.21 | 0.127749 | 0 | 0 | 1 | 4 | 0 | 0 |
| G28  | 632 | 2 | 48.17 | 0.124772 | 0 | 0 | 1 | 4 | 0 | 0 |
| G23  | 740 | 0 | 48.52 | 0.102675 | 0 | 0 | 1 | 4 | 0 | 0 |
| G17  | 873 | 3 | 29.16 | 0.172055 | 2 | 1 | 2 | 4 | 0 | 0 |
| G13  | 765 | 0 | 46.21 | 0.121449 | 1 | 2 | 2 | 4 | 0 | 0 |
| G04  | 868 | 1 | 28.04 | 0.189853 | 5 | 2 | 2 | 3 | 0 | 0 |
| G07  | 663 | 0 | 50.53 | 0.111122 | 0 | 1 | 1 | 4 | 0 | 0 |
| G10  | 601 | 0 | 49.80 | 0.144085 | 0 | 1 | 1 | 4 | 0 | 0 |
| G08  | 727 | 2 | 48.49 | 0.113435 | 0 | 1 | 1 | 4 | 0 | 0 |
| G26  | 612 | 2 | 52.19 | 0.128773 | 0 | 0 | 1 | 4 | 0 | 0 |
| G27  | 768 | 3 | 48.41 | 0.155147 | 0 | 1 | 1 | 4 | 0 | 0 |
| G09  | 647 | 3 | 50.98 | 0.136409 | 0 | 2 | 2 | 4 | 0 | 0 |
| G24* | 807 | 2 | 0.00  | 0.122211 | 4 | 1 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP1 rms : 0.163815 m

total mean elevation : 42.68 degrees

# MP1 obs > 10 : 23458

# qc MP1 slips < 25 : 28

# Rvr L1 slips < 25 : 40

# Rvr L2 slips < 25 : 67

# qc MP1 slips > 25 : 115

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m

85 - 90 185 0 0.042751 |

80 - 85 361 0 0.055285 |

75 - 80 899 0 0.053512 |

70 - 75 1073 0 0.071018 |

65 - 70 1321 0 0.083662 ||

60 - 65 1456 0 0.077955 ||

55 - 60 1390 1 0.086456 ||

50 - 55 1473 3 0.099724 ||

45 - 50 1585 12 0.094436 #|

40 - 45 1880 17 0.112930 #|

35 - 40 1657 24 0.145106 ##|

30 - 35 1737 37 0.159141 ###=

25 - 30 2300 21 0.212695 #||

20 - 25 2094 15 0.242522 #|||

15 - 20 1731 5 0.253571 ||||

10 - 15 1480 4 0.349616 |||||

5 - 10 2 0 0.131393 |||

0 - 5 0 0 0.000000

< 0 0 0 0.000000

MP2 RMS summary (per SV):

|     |        | slips L1 rx L2 rx |        |          |         | slips L1 rx L2 rx |      |      |      |      |      |
|-----|--------|-------------------|--------|----------|---------|-------------------|------|------|------|------|------|
| SV  | obs>10 | # del             | <elev> | MP2      | rms [m] | < 25              | < 25 | < 25 | > 25 | > 25 | > 25 |
| G31 | 884    | 2                 | 28.77  | 0.274452 | 5       | 2                 | 2    | 3    | 0    | 0    |      |
| G02 | 879    | 0                 | 28.11  | 0.334308 | 3       | 2                 | 3    | 5    | 0    | 0    |      |
| G05 | 827    | 2                 | 30.73  | 0.289285 | 2       | 3                 | 3    | 0    | 0    | 0    |      |
| G30 | 762    | 2                 | 35.09  | 0.238061 | 2       | 8                 | 8    | 3    | 0    | 0    |      |
| G12 | 797    | 3                 | 45.62  | 0.241236 | 0       | 1                 | 1    | 4    | 0    | 0    |      |
| G21 | 729    | 2                 | 50.60  | 0.217194 | 1       | 2                 | 2    | 4    | 0    | 0    |      |
| G25 | 757    | 3                 | 47.55  | 0.218198 | 0       | 0                 | 2    | 4    | 0    | 0    |      |
| G29 | 772    | 2                 | 47.10  | 0.228792 | 1       | 0                 | 1    | 4    | 0    | 0    |      |
| G18 | 688    | 2                 | 38.01  | 0.488902 | 0       | 2                 | 8    | 4    | 0    | 0    |      |
| G06 | 648    | 0                 | 52.44  | 0.253754 | 0       | 1                 | 1    | 4    | 0    | 0    |      |
| G22 | 654    | 1                 | 48.99  | 0.580770 | 0       | 1                 | 1    | 3    | 0    | 0    |      |
| G16 | 793    | 0                 | 33.33  | 0.938039 | 1       | 3                 | 5    | 3    | 0    | 0    |      |
| G03 | 608    | 1                 | 49.85  | 0.221265 | 0       | 1                 | 3    | 4    | 0    | 0    |      |
| G15 | 744    | 3                 | 35.89  | 0.231814 | 1       | 1                 | 2    | 3    | 0    | 0    |      |
| G19 | 590    | 1                 | 47.83  | 0.209062 | 0       | 0                 | 1    | 4    | 0    | 0    |      |
| G14 | 845    | 1                 | 30.28  | 0.244106 | 0       | 0                 | 2    | 4    | 0    | 0    |      |
| G11 | 623    | 1                 | 51.61  | 0.239481 | 0       | 0                 | 3    | 4    | 0    | 0    |      |
| G32 | 790    | 1                 | 46.92  | 0.258734 | 0       | 1                 | 1    | 4    | 0    | 0    |      |
| G01 | 633    | 1                 | 52.41  | 0.184219 | 0       | 0                 | 1    | 4    | 0    | 0    |      |
| G20 | 779    | 1                 | 47.21  | 0.214782 | 0       | 0                 | 1    | 4    | 0    | 0    |      |



|      |     |   |       |          |   |   |   |   |   |   |
|------|-----|---|-------|----------|---|---|---|---|---|---|
| G28  | 632 | 2 | 48.17 | 0.175943 | 0 | 0 | 1 | 4 | 0 | 0 |
| G23  | 740 | 0 | 48.52 | 0.204897 | 0 | 0 | 1 | 4 | 0 | 0 |
| G17  | 873 | 3 | 29.16 | 0.329114 | 2 | 1 | 2 | 4 | 0 | 0 |
| G13  | 765 | 0 | 46.21 | 0.214195 | 1 | 2 | 2 | 4 | 0 | 0 |
| G04  | 868 | 1 | 28.04 | 0.329313 | 5 | 2 | 2 | 3 | 0 | 0 |
| G07  | 663 | 0 | 50.53 | 0.168709 | 0 | 1 | 1 | 4 | 0 | 0 |
| G10  | 601 | 0 | 49.80 | 0.197925 | 0 | 1 | 1 | 4 | 0 | 0 |
| G08  | 727 | 2 | 48.49 | 0.197926 | 0 | 1 | 1 | 4 | 0 | 0 |
| G26  | 612 | 2 | 52.19 | 0.195492 | 0 | 0 | 1 | 4 | 0 | 0 |
| G27  | 768 | 3 | 48.41 | 0.221599 | 0 | 1 | 1 | 4 | 0 | 0 |
| G09  | 647 | 3 | 50.98 | 0.201435 | 0 | 2 | 2 | 4 | 0 | 0 |
| G24* | 807 | 2 | 0.00  | 0.246918 | 4 | 1 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP2 rms : 0.278377 m

total mean elevation : 42.68 degrees

# MP2 obs > 10 : 23458

# qc MP2 slips < 25 : 28

# Rvr L1 slips < 25 : 40

# Rvr L2 slips < 25 : 67

# qc MP2 slips > 25 : 115

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 185       | 0            | 0.133587 |     |      |     |
| 80 - 85    | 361       | 0            | 0.138700 |     |      |     |
| 75 - 80    | 899       | 0            | 0.132155 |     |      |     |

```

70 - 75 1073 0 0.186943 ||||
65 - 70 1321 0 0.180192 ||||
60 - 65 1456 0 0.173867 |||
55 - 60 1390 1 0.177187 ||||
50 - 55 1473 3 0.197968 ||||
45 - 50 1585 12 0.192322 #|||
40 - 45 1880 17 0.214639 #|||
35 - 40 1657 24 0.221565 ##||
30 - 35 1737 37 0.214557 #####
25 - 30 2300 21 0.324952 #||||
20 - 25 2094 15 0.409321 #|||||
15 - 20 1731 5 0.508466 |||||||
10 - 15 1480 4 0.683213 |||||||||
5 - 10 2 0 0.404570 |||||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

| elev (deg) | tot | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|-----|-------|-------|------|-----|-----|
| 85 - 90    | 0   | 0.000 | 0.000 |      |     |     |
| 80 - 85    | 0   | 0.000 | 0.000 |      |     |     |
| 75 - 80    | 0   | 0.000 | 0.000 |      |     |     |
| 70 - 75    | 0   | 0.000 | 0.000 |      |     |     |
| 65 - 70    | 0   | 0.000 | 0.000 |      |     |     |
| 60 - 65    | 0   | 0.000 | 0.000 |      |     |     |
| 55 - 60    | 0   | 0.000 | 0.000 |      |     |     |
| 50 - 55    | 0   | 0.000 | 0.000 |      |     |     |
| 45 - 50    | 0   | 0.000 | 0.000 |      |     |     |

|         |   |       |       |
|---------|---|-------|-------|
| 40 - 45 | 0 | 0.000 | 0.000 |
| 35 - 40 | 0 | 0.000 | 0.000 |
| 30 - 35 | 0 | 0.000 | 0.000 |
| 25 - 30 | 0 | 0.000 | 0.000 |
| 20 - 25 | 0 | 0.000 | 0.000 |
| 15 - 20 | 0 | 0.000 | 0.000 |
| 10 - 15 | 0 | 0.000 | 0.000 |
| 5 - 10  | 0 | 0.000 | 0.000 |
| 0 - 5   | 0 | 0.000 | 0.000 |
| < 0     | 0 | 0.000 | 0.000 |

S/N L2 summary (per elevation bin):

| elev (deg) | tot | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|-----|-------|-------|------|-----|-----|
| 85 - 90    | 0   | 0.000 | 0.000 |      |     |     |
| 80 - 85    | 0   | 0.000 | 0.000 |      |     |     |
| 75 - 80    | 0   | 0.000 | 0.000 |      |     |     |
| 70 - 75    | 0   | 0.000 | 0.000 |      |     |     |
| 65 - 70    | 0   | 0.000 | 0.000 |      |     |     |
| 60 - 65    | 0   | 0.000 | 0.000 |      |     |     |
| 55 - 60    | 0   | 0.000 | 0.000 |      |     |     |
| 50 - 55    | 0   | 0.000 | 0.000 |      |     |     |
| 45 - 50    | 0   | 0.000 | 0.000 |      |     |     |
| 40 - 45    | 0   | 0.000 | 0.000 |      |     |     |
| 35 - 40    | 0   | 0.000 | 0.000 |      |     |     |
| 30 - 35    | 0   | 0.000 | 0.000 |      |     |     |
| 25 - 30    | 0   | 0.000 | 0.000 |      |     |     |
| 20 - 25    | 0   | 0.000 | 0.000 |      |     |     |
| 15 - 20    | 0   | 0.000 | 0.000 |      |     |     |

10 - 15 0 0.000 0.000

5 - 10 0 0.000 0.000

0 - 5 0 0.000 0.000

< 0 0 0.000 0.000

\*\*\*\*\*

QC of RINEX file(s) : kasi1270.12o

input RnxNAV file(s) : kasi1270.12n

\*\*\*\*\*

4-character ID : KASI

Receiver type : LEICA GRX1200PRO (# = 465462) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG (# = 06500008)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4616588.4641 1674445.5085 4056458.7861 (m)

antenna WGS 84 (geo) : N 39 deg 44' 46.79" E 19 deg 56' 8.90"

antenna WGS 84 (geo) : 39.746332 deg 19.935806 deg

WGS 84 height : 139.3906 m

[qc - header] position : 38.1494 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31060

Possible obs > 10.0 deg: 24689

Complete obs > 10.0 deg: 23888  
 Deleted obs > 10.0 deg: 3  
 Masked obs < 10.0 deg: 1611  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.212535 m  
 Moving average MP2 : 0.245130 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.22 (sd=0.84 n=23891) 6.54 (sd=1.31 n=23888)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 56) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 21  
 IOD slips > 10.0 deg : 1  
 IOD or MP slips < 10.0\*: 27  
 IOD or MP slips > 10.0 : 2  
 \* or unknown elevation

| first epoch | last epoch | hrs    | dt    | #expt | #have | %     | mp1   | mp2 | o/slps          |
|-------------|------------|--------|-------|-------|-------|-------|-------|-----|-----------------|
| SUM 12      | 5 6 00:00  | 12 5 6 | 23:59 | 24.00 | 30    | 24689 | 23888 | 97  | 0.21 0.25 11944 |

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 857  | 41.66 | 740 | 47.47 | 712 | 712 | 712 | 712 | 0 | 712 | 712 | 0 |
| G02 | 1185 | 22.30 | 934 | 26.95 | 880 | 880 | 880 | 880 | 0 | 880 | 880 | 0 |
| G03 | 951  | 35.01 | 701 | 46.44 | 676 | 676 | 676 | 676 | 0 | 676 | 676 | 0 |
| G04 | 1166 | 22.80 | 914 | 27.72 | 867 | 867 | 867 | 867 | 0 | 867 | 867 | 0 |
| G05 | 1139 | 24.66 | 876 | 30.56 | 830 | 830 | 830 | 830 | 0 | 830 | 830 | 0 |
| G06 | 873  | 42.24 | 757 | 47.96 | 730 | 730 | 730 | 730 | 0 | 730 | 730 | 0 |
| G07 | 989  | 34.94 | 714 | 47.24 | 714 | 714 | 714 | 714 | 0 | 714 | 714 | 0 |
| G08 | 886  | 41.26 | 772 | 46.62 | 772 | 772 | 772 | 772 | 0 | 772 | 772 | 0 |
| G09 | 856  | 40.72 | 738 | 46.44 | 708 | 708 | 708 | 708 | 0 | 708 | 708 | 0 |
| G10 | 985  | 33.53 | 694 | 46.23 | 665 | 665 | 665 | 665 | 0 | 665 | 665 | 0 |
| G11 | 845  | 41.23 | 728 | 47.06 | 703 | 703 | 703 | 703 | 0 | 703 | 703 | 0 |
| G12 | 934  | 39.92 | 825 | 44.53 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G13 | 917  | 39.97 | 805 | 44.85 | 805 | 805 | 805 | 805 | 0 | 805 | 805 | 0 |
| G14 | 1174 | 23.49 | 930 | 28.36 | 869 | 869 | 869 | 869 | 0 | 869 | 869 | 0 |
| G15 | 1104 | 27.11 | 776 | 36.32 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G16 | 1137 | 26.14 | 875 | 32.45 | 834 | 834 | 834 | 834 | 0 | 834 | 834 | 0 |
| G17 | 1176 | 23.08 | 931 | 27.85 | 876 | 876 | 876 | 876 | 0 | 876 | 876 | 0 |
| G18 | 1149 | 25.19 | 860 | 31.94 | 717 | 716 | 717 | 716 | 0 | 716 | 717 | 0 |
| G19 | 1055 | 30.60 | 683 | 44.72 | 652 | 651 | 652 | 651 | 0 | 651 | 652 | 0 |
| G20 | 925  | 40.90 | 814 | 45.79 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G21 | 890  | 42.37 | 775 | 47.93 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G22 | 1020 | 32.30 | 702 | 45.36 | 702 | 702 | 702 | 702 | 0 | 702 | 702 | 0 |
| G23 | 897  | 41.48 | 783 | 46.80 | 783 | 783 | 783 | 783 | 0 | 783 | 783 | 0 |
| G25 | 910  | 40.77 | 797 | 45.84 | 794 | 794 | 794 | 794 | 0 | 794 | 794 | 0 |
| G26 | 897  | 38.22 | 712 | 47.31 | 688 | 687 | 688 | 687 | 0 | 687 | 688 | 0 |



|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 922  | 41.66 | 811 | 46.68 | 811 | 811 | 811 | 811 | 0 | 811 | 811 | 0 |
| G28 | 1089 | 29.71 | 675 | 44.38 | 675 | 675 | 675 | 675 | 0 | 675 | 675 | 0 |
| G29 | 928  | 40.45 | 809 | 45.71 | 809 | 809 | 809 | 809 | 0 | 809 | 809 | 0 |
| G30 | 1099 | 27.04 | 803 | 35.10 | 760 | 760 | 760 | 760 | 0 | 760 | 760 | 0 |
| G31 | 1170 | 23.64 | 930 | 28.46 | 884 | 884 | 884 | 884 | 0 | 884 | 884 | 0 |
| G32 | 935  | 40.85 | 825 | 45.63 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G24 | 927  | 41.08 | 816 | 45.99 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 2017

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 3

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 3

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 25908

Obs deleted (any reason) : 2020

Obs complete : 23888

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 196      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 465      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 810      | 0            | 0.000000 |     |      |     |

```

70 - 75 1298 0 0.000000
65 - 70 1360 0 0.000000
60 - 65 1291 0 0.000000
55 - 60 1479 0 0.000000
50 - 55 1325 0 0.000000
45 - 50 1700 0 0.000000
40 - 45 1743 0 0.000000
35 - 40 1661 0 0.000000
30 - 35 1753 0 0.000000
25 - 30 2370 0 0.000000
20 - 25 2070 0 0.000000
15 - 20 2263 0 0.000000
10 - 15 2084 1 0.000000
5 - 10 1972 20 0.000000 ==
0 - 5 30 1 0.000000 =====
< 0 0 0 0.000000

```

MP1 RMS summary (per SV):

```

                slips L1 rx L2 rx slips L1 rx L2 rx
SV obs>10 # del <elev> MP1 rms [m] < 25 < 25 < 25 > 25 > 25 > 25
G01 712 0 48.96 0.154753 0 1 1 0 0 0
G02 880 0 27.80 0.216032 0 1 1 0 0 0
G03 676 0 47.76 0.220144 0 1 1 0 0 0
G04 867 0 28.51 0.222603 0 1 1 0 0 0
G05 830 0 31.54 0.250529 0 1 1 0 0 0
G06 730 0 49.31 0.179943 0 1 1 0 0 0
G07 714 0 47.24 0.185997 0 0 0 0 0 0
G08 772 0 46.62 0.218259 0 0 0 0 0 0

```

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G09 | 708 | 0 | 48.00 | 0.162159 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 665 | 0 | 47.82 | 0.181131 | 0 | 1 | 1 | 0 | 0 | 0 |
| G11 | 703 | 0 | 48.42 | 0.179680 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 825 | 0 | 44.53 | 0.215522 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 805 | 0 | 44.85 | 0.188194 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 869 | 0 | 29.31 | 0.209334 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 736 | 0 | 37.66 | 0.422635 | 0 | 1 | 1 | 0 | 0 | 0 |
| G16 | 834 | 0 | 33.40 | 0.262699 | 0 | 1 | 1 | 0 | 0 | 0 |
| G17 | 876 | 0 | 28.77 | 0.231978 | 0 | 1 | 2 | 0 | 0 | 0 |
| G18 | 717 | 1 | 35.79 | 0.304546 | 1 | 2 | 3 | 0 | 0 | 0 |
| G19 | 652 | 1 | 46.40 | 0.206165 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 814 | 0 | 45.79 | 0.174491 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 775 | 0 | 47.99 | 0.195948 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 702 | 0 | 45.41 | 0.261582 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 783 | 0 | 46.80 | 0.170046 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 794 | 0 | 46.07 | 0.162076 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 688 | 1 | 48.70 | 0.167691 | 1 | 1 | 2 | 0 | 0 | 0 |
| G27 | 811 | 0 | 46.78 | 0.198219 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 675 | 0 | 44.38 | 0.224971 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 809 | 0 | 45.71 | 0.188396 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 760 | 0 | 36.35 | 0.214653 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 884 | 0 | 29.19 | 0.227509 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32 | 825 | 0 | 45.63 | 0.184501 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.212541 m

total mean elevation : 41.52 degrees

# MP1 obs > 10 : 23888

# qc MP1 slips < 25 : 2

```

# Rvr L1 slips < 25 : 21
# Rvr L2 slips < 25 : 24
# qc MP1 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 196 0 0.111532 ||
80 - 85 465 0 0.120987 ||
75 - 80 810 0 0.108714 ||
70 - 75 1298 0 0.125711 |||
65 - 70 1360 0 0.129718 |||
60 - 65 1291 0 0.155969 |||
55 - 60 1479 0 0.168775 |||
50 - 55 1325 0 0.181020 ||||
45 - 50 1700 0 0.174525 |||
40 - 45 1743 0 0.182430 ||||
35 - 40 1661 0 0.182308 ||||
30 - 35 1753 0 0.222877 ||||
25 - 30 2370 0 0.237774 |||||
20 - 25 2070 0 0.251192 |||||
15 - 20 2263 0 0.313175 |||||
10 - 15 2084 2 0.328047 |||||
5 - 10 1972 23 0.794823 ##|||||||
0 - 5 30 1 0.670470 #####|
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 712    | 0     | 48.96  | 0.215051 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G02 | 880    | 0     | 27.80  | 0.185421 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G03 | 676    | 0     | 47.76  | 0.228902 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G04 | 867    | 0     | 28.51  | 0.237365 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G05 | 830    | 0     | 31.54  | 0.232999 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G06 | 730    | 0     | 49.31  | 0.332875 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G07 | 714    | 0     | 47.24  | 0.196166 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 772    | 0     | 46.62  | 0.183520 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 708    | 0     | 48.00  | 0.173662 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G10 | 665    | 0     | 47.82  | 0.191301 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G11 | 703    | 0     | 48.42  | 0.224896 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G12 | 825    | 0     | 44.53  | 0.212047 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G13 | 805    | 0     | 44.85  | 0.214974 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 869    | 0     | 29.31  | 0.499914 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G15 | 736    | 0     | 37.66  | 0.289149 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G16 | 834    | 0     | 33.40  | 0.328566 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G17 | 876    | 0     | 28.77  | 0.199231 | 0       | 1    | 2    | 0    | 0    | 0    | 0    |
| G18 | 717    | 1     | 35.79  | 0.409210 | 1       | 2    | 3    | 0    | 0    | 0    | 0    |
| G19 | 652    | 1     | 46.40  | 0.286524 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G20 | 814    | 0     | 45.79  | 0.224428 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 775    | 0     | 47.99  | 0.315089 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 702    | 0     | 45.41  | 0.212555 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 783    | 0     | 46.80  | 0.197687 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 794    | 0     | 46.07  | 0.191599 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G26 | 688    | 1     | 48.70  | 0.213389 | 1       | 1    | 2    | 0    | 0    | 0    | 0    |
| G27 | 811    | 0     | 46.78  | 0.216079 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 675 | 0 | 44.38 | 0.216052 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 809 | 0 | 45.71 | 0.225216 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 760 | 0 | 36.35 | 0.280793 | 0 | 1 | 1 | 0 | 0 | 0 |
| G31 | 884 | 0 | 29.19 | 0.229534 | 0 | 1 | 1 | 0 | 0 | 0 |
| G32 | 825 | 0 | 45.63 | 0.218182 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.245132 m

total mean elevation : 41.52 degrees

# MP2 obs > 10 : 23888

# qc MP2 slips < 25 : 2

# Rvr L1 slips < 25 : 21

# Rvr L2 slips < 25 : 24

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |   |          |  |
|---------|------|---|----------|--|
| 85 - 90 | 196  | 0 | 0.121069 |  |
| 80 - 85 | 465  | 0 | 0.120343 |  |
| 75 - 80 | 810  | 0 | 0.140581 |  |
| 70 - 75 | 1298 | 0 | 0.159245 |  |
| 65 - 70 | 1360 | 0 | 0.161973 |  |
| 60 - 65 | 1291 | 0 | 0.170414 |  |
| 55 - 60 | 1479 | 0 | 0.189306 |  |
| 50 - 55 | 1325 | 0 | 0.204641 |  |
| 45 - 50 | 1700 | 0 | 0.208056 |  |
| 40 - 45 | 1743 | 0 | 0.208189 |  |
| 35 - 40 | 1661 | 0 | 0.217067 |  |

```

30 - 35 1753 0 0.202167 ||||
25 - 30 2370 0 0.217598 ||||
20 - 25 2070 0 0.380548 |||||||
15 - 20 2263 0 0.394759 |||||||
10 - 15 2084 2 0.350092 |||||||
5 - 10 1972 27 0.785576 ##|||||||||
0 - 5 30 1 0.690484 #####|
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 196 0.752 8.735 ###|||||||||
80 - 85 465 0.505 8.888 ##|||||||||
75 - 80 810 0.385 8.937 ##|||||||||
70 - 75 1299 0.283 8.975 #|||||||||
65 - 70 1360 0.260 8.985 #|||||||||
60 - 65 1291 0.262 8.987 #|||||||||
55 - 60 1483 0.255 8.983 #|||||||||
50 - 55 1325 0.297 8.965 #|||||||||
45 - 50 1700 0.368 8.896 #|||||||||
40 - 45 1743 0.536 8.563 ##|||||||||
35 - 40 1663 0.381 8.115 ##|||||||||
30 - 35 1753 0.234 8.009 #|||||||||
25 - 30 2370 0.245 7.965 #|||||||||
20 - 25 2070 0.491 7.694 ##|||||||||
15 - 20 2270 0.500 7.062 ##|||||||||
10 - 15 2093 0.540 6.682 ##|||||||||
5 - 10 1978 0.766 6.175 ###|||||||||

```

```

0 - 5  39  1.167  5.821 #####|
< 0   0  0.000  0.000

```

S/N L2 summary (per elevation bin):

```

elev (deg) tot SN2 sig  mean          0|5      1|0
85 - 90  196  0.763  8.306 ###|
80 - 85  465  0.491  8.095 ##|
75 - 80  810  0.331  8.021 #|
70 - 75 1299  0.309  8.042 #|
65 - 70 1360  0.239  7.984 #|
60 - 65 1291  0.319  7.938 #|
55 - 60 1483  0.500  7.695 ##|
50 - 55 1325  0.541  7.424 ##|
45 - 50 1700  0.492  7.214 ##|
40 - 45 1743  0.521  6.871 ##|
35 - 40 1663  0.543  6.503 ##|
30 - 35 1753  0.571  6.203 ##|
25 - 30 2370  0.626  5.753 ###|
20 - 25 2070  0.584  5.400 ##|
15 - 20 2269  0.794  4.934 ###|
10 - 15 2091  0.724  4.578 ###|
5 - 10  1974  0.898  4.222 #####|
0 - 5   39  0.961  3.846 #####|
< 0   0  0.000  0.000

```



\*\*\*\*\*

QC of RINEX file(s) : kipo1270.12o

input RnxNAV file(s) : kipo1270.12n

\*\*\*\*\*

4-character ID : KIPO

Receiver type : LEICA GMX902GG (# = 120160) (fw = 3.017)

Antenna type : LEIAX1203+GNSS NONE (# = 09320143)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4705443.0901 1745140.2832 3923290.2289 (m)

antenna WGS 84 (geo) : N 38 deg 12' 11.51" E 20 deg 20' 55.16"

antenna WGS 84 (geo) : 38.203196 deg 20.348655 deg

WGS 84 height : 158.1201 m

[qc - header] position : 40.0610 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 55

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

GLONASS SVs w/o OBS :

GLONASS SVs w/o NAV : 7 8 13 14 22 23 24 1 2 17 3 18

11 12 19 4 20 5 15 16 6 9 10 21

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)  
 Possible obs > 0.0 deg: 31026  
 Possible obs > 10.0 deg: 24779  
 Complete obs > 10.0 deg: 23818  
 Deleted obs > 10.0 deg: 22  
 Masked obs < 10.0 deg: 939  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.216904 m  
 Moving average MP2 : 0.234160 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.34 (sd=0.80 n=23840) 6.59 (sd=1.32 n=23818)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 42) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 17  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 20  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24779 23818 96 0.22 0.23 1191

Processing parameters are:

Receiver tracking capability : 26 SVs

Maximum ionospheric rate (L1) : 400.00 cm/min

Report data gap greater than : 10.00 min

Expected rms of MP1 multipath : 50.00 cm

Expected rms of MP2 multipath : 65.00 cm

Multipath slip sigma threshold : 4.00 cm

% increase in MP rms for C/A | A/S : 100.00 %

Points in MP moving averages : 50

Minimum signal to noise for L1 : 0

Minimum signal to noise for L2 : 0

Elevation mask (cutoff) : 10.00 degrees

Elevation comparison threshold : 25.00 degrees

Orbit path spline fit sample time : 10 min

SVs w/ code data for position try : 5

Width of ASCII summary plot : 72

Data indicators on summary plot : yes

Do ionospheric observable : yes

Do ionospheric derivative : yes

Do high-pass ionosphere observable : no

Do multipath observables : yes

Do 1-ms receiver clock slips : yes

Tolerance for 1-ms clock slips : 1.00e-02 ms

Do receiver LLI slips : yes

Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G31 | 1174 | 23.36 | 930 | 28.20 | 916 | 916 | 916 | 916 | 0 | 916 | 916 | 0 |
| G02 | 1190 | 22.11 | 936 | 26.76 | 914 | 914 | 914 | 914 | 0 | 914 | 914 | 0 |
| G05 | 1142 | 24.44 | 872 | 30.45 | 841 | 841 | 841 | 841 | 0 | 841 | 841 | 0 |
| G30 | 1099 | 26.92 | 793 | 35.31 | 726 | 723 | 726 | 723 | 0 | 723 | 726 | 0 |
| G12 | 946  | 39.36 | 836 | 43.88 | 830 | 830 | 830 | 830 | 0 | 830 | 830 | 0 |
| G21 | 900  | 42.24 | 783 | 47.81 | 756 | 755 | 756 | 755 | 0 | 755 | 756 | 0 |
| G25 | 920  | 40.30 | 805 | 45.34 | 783 | 781 | 783 | 781 | 0 | 781 | 783 | 0 |
| G29 | 941  | 39.91 | 819 | 45.14 | 809 | 809 | 809 | 809 | 0 | 809 | 809 | 0 |
| G18 | 1147 | 25.22 | 845 | 32.40 | 805 | 804 | 805 | 804 | 0 | 804 | 805 | 0 |
| G06 | 880  | 42.02 | 761 | 47.83 | 729 | 728 | 729 | 728 | 0 | 728 | 729 | 0 |
| G22 | 995  | 33.34 | 708 | 45.61 | 655 | 654 | 655 | 654 | 0 | 654 | 655 | 0 |
| G16 | 1138 | 25.93 | 870 | 32.36 | 839 | 839 | 839 | 839 | 0 | 839 | 839 | 0 |
| G03 | 922  | 36.17 | 705 | 46.39 | 668 | 664 | 668 | 664 | 0 | 664 | 668 | 0 |
| G15 | 1101 | 27.05 | 759 | 36.82 | 692 | 689 | 692 | 689 | 0 | 689 | 692 | 0 |
| G19 | 1045 | 30.78 | 685 | 44.67 | 647 | 647 | 647 | 647 | 0 | 647 | 647 | 0 |
| G14 | 1181 | 23.21 | 928 | 28.22 | 904 | 904 | 904 | 904 | 0 | 904 | 904 | 0 |
| G11 | 853  | 41.12 | 732 | 47.11 | 696 | 694 | 696 | 694 | 0 | 694 | 696 | 0 |
| G32 | 947  | 40.33 | 837 | 44.98 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G01 | 863  | 41.45 | 744 | 47.29 | 705 | 705 | 705 | 705 | 0 | 705 | 705 | 0 |
| G20 | 937  | 40.38 | 825 | 45.18 | 810 | 809 | 810 | 809 | 0 | 809 | 810 | 0 |
| G28 | 1077 | 30.04 | 680 | 44.56 | 633 | 633 | 633 | 633 | 0 | 633 | 633 | 0 |
| G23 | 908  | 41.06 | 792 | 46.34 | 776 | 775 | 776 | 775 | 0 | 775 | 776 | 0 |



|      |   |      |   |      |   |   |   |   |   |   |   |   |
|------|---|------|---|------|---|---|---|---|---|---|---|---|
| R16* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R06* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R09* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R10* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R21* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

\* = SV with no NAV info

Obs below mask ( 10.00 deg) : 19235

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 22

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 22

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 43075

Obs deleted (any reason) : 19257

Obs complete : 23818

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 212      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 399      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 818      | 0            | 0.000000 |     |      |     |
| 70 - 75    | 1136     | 0            | 0.000000 |     |      |     |

65 - 70 1449 0 0.000000  
 60 - 65 1378 0 0.000000  
 55 - 60 1482 0 0.000000  
 50 - 55 1351 0 0.000000  
 45 - 50 1716 0 0.000000  
 40 - 45 1768 0 0.000000  
 35 - 40 1683 0 0.000000  
 30 - 35 1729 0 0.000000  
 25 - 30 2386 0 0.000000  
 20 - 25 2103 0 0.000000  
 15 - 20 2268 12 0.000000 =  
 10 - 15 1910 5 0.000000  
 5 - 10 5 0 0.000000  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G31 | 916    | 0     | 28.55  | 0.405826 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G02 | 914    | 0     | 27.22  | 0.248508 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G05 | 841    | 0     | 31.26  | 0.235327 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G30 | 726    | 3     | 37.69  | 0.257141 | 2       | 2     | 5    | 0     | 0    | 0     |      |       |      |
| G12 | 830    | 0     | 44.22  | 0.176043 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G21 | 756    | 1     | 49.23  | 0.213971 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G25 | 783    | 2     | 46.46  | 0.172807 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G29 | 809    | 0     | 45.56  | 0.191408 | 1       | 0     | 2    | 0     | 0    | 0     |      |       |      |
| G18 | 805    | 1     | 33.41  | 0.273532 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |

|      |      |   |       |          |   |   |   |   |   |   |
|------|------|---|-------|----------|---|---|---|---|---|---|
| G06  | 729  | 1 | 49.42 | 0.180326 | 1 | 1 | 4 | 0 | 0 | 0 |
| G22  | 655  | 1 | 48.31 | 0.199759 | 1 | 1 | 3 | 0 | 0 | 0 |
| G16  | 839  | 0 | 33.19 | 0.261092 | 0 | 2 | 2 | 0 | 0 | 0 |
| G03  | 668  | 4 | 48.45 | 0.173935 | 2 | 3 | 3 | 0 | 0 | 0 |
| G15  | 692  | 3 | 39.53 | 0.223239 | 2 | 2 | 4 | 0 | 0 | 0 |
| G19  | 647  | 0 | 46.61 | 0.195043 | 2 | 1 | 3 | 0 | 0 | 0 |
| G14  | 904  | 0 | 28.74 | 0.332438 | 0 | 2 | 2 | 0 | 0 | 0 |
| G11  | 696  | 2 | 49.06 | 0.206148 | 3 | 4 | 4 | 0 | 0 | 0 |
| G32  | 828  | 0 | 45.45 | 0.193112 | 0 | 1 | 1 | 0 | 0 | 0 |
| G01  | 705  | 0 | 49.25 | 0.180780 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20  | 810  | 1 | 45.95 | 0.190722 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28  | 633  | 0 | 46.95 | 0.166834 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23  | 776  | 1 | 47.22 | 0.207092 | 0 | 1 | 1 | 0 | 0 | 0 |
| G17  | 908  | 0 | 28.18 | 0.245494 | 0 | 2 | 2 | 0 | 0 | 0 |
| G13  | 804  | 0 | 44.79 | 0.178473 | 2 | 2 | 3 | 0 | 0 | 0 |
| G04  | 903  | 0 | 27.83 | 0.208959 | 0 | 2 | 2 | 0 | 0 | 0 |
| G07  | 674  | 0 | 49.76 | 0.193076 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10  | 654  | 1 | 48.50 | 0.179194 | 1 | 1 | 2 | 0 | 0 | 0 |
| G08  | 759  | 1 | 47.30 | 0.209401 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26  | 676  | 0 | 49.22 | 0.167883 | 1 | 1 | 2 | 0 | 0 | 0 |
| G27  | 790  | 0 | 47.53 | 0.184371 | 1 | 2 | 3 | 0 | 0 | 0 |
| G09  | 710  | 0 | 47.78 | 0.166381 | 1 | 1 | 2 | 0 | 0 | 0 |
| R07* | 996  | 6 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R08* | 1021 | 0 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R13* | 941  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R14* | 921  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R22* | 930  | 1 | 0.00  | 0.000000 | 0 | 3 | 1 | 0 | 0 | 0 |
| R23* | 958  | 0 | 0.00  | 0.000000 | 0 | 2 | 0 | 0 | 0 | 0 |



|      |     |   |      |          |   |   |   |   |   |   |
|------|-----|---|------|----------|---|---|---|---|---|---|
| R24* | 862 | 6 | 0.00 | 0.000000 | 0 | 4 | 2 | 0 | 0 | 0 |
| R01* | 898 | 5 | 0.00 | 0.000000 | 0 | 3 | 3 | 0 | 0 | 0 |
| R02* | 731 | 2 | 0.00 | 0.000000 | 0 | 1 | 0 | 0 | 0 | 0 |
| R17* | 754 | 1 | 0.00 | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R03* | 755 | 2 | 0.00 | 0.000000 | 0 | 3 | 1 | 0 | 0 | 0 |
| R18* | 824 | 0 | 0.00 | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R11* | 804 | 4 | 0.00 | 0.000000 | 0 | 5 | 2 | 0 | 0 | 0 |
| R12* | 898 | 1 | 0.00 | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R19* | 803 | 1 | 0.00 | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R04* | 672 | 0 | 0.00 | 0.000000 | 0 | 1 | 1 | 0 | 0 | 0 |
| R20* | 683 | 1 | 0.00 | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R05* | 576 | 7 | 0.00 | 0.000000 | 0 | 3 | 1 | 0 | 0 | 0 |
| R15* | 689 | 1 | 0.00 | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R16* | 722 | 0 | 0.00 | 0.000000 | 0 | 1 | 1 | 0 | 0 | 0 |
| R06* | 753 | 0 | 0.00 | 0.000000 | 0 | 2 | 1 | 0 | 0 | 0 |
| R09* | 754 | 1 | 0.00 | 0.000000 | 0 | 2 | 1 | 0 | 0 | 0 |
| R10* | 674 | 0 | 0.00 | 0.000000 | 0 | 1 | 1 | 0 | 0 | 0 |
| R21* | 610 | 6 | 0.00 | 0.000000 | 0 | 2 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP1 rms : 0.120143 m

total mean elevation : 41.64 degrees

# MP1 obs > 10 : 43000

# qc MP1 slips < 25 : 20

# Rvr L1 slips < 25 : 100

# Rvr L2 slips < 25 : 102

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 212      | 0    | 0.082083 |     |     |      |     |
| 80 - 85    | 399      | 0    | 0.079489 |     |     |      |     |
| 75 - 80    | 818      | 0    | 0.080515 |     |     |      |     |
| 70 - 75    | 1136     | 0    | 0.085969 |     |     |      |     |
| 65 - 70    | 1449     | 0    | 0.089687 |     |     |      |     |
| 60 - 65    | 1378     | 0    | 0.102861 |     |     |      |     |
| 55 - 60    | 1482     | 0    | 0.110799 |     |     |      |     |
| 50 - 55    | 1351     | 0    | 0.128922 |     |     |      |     |
| 45 - 50    | 1716     | 0    | 0.143374 |     |     |      |     |
| 40 - 45    | 1768     | 0    | 0.160251 |     |     |      |     |
| 35 - 40    | 1683     | 0    | 0.181673 |     |     |      |     |
| 30 - 35    | 1729     | 0    | 0.196265 |     |     |      |     |
| 25 - 30    | 2386     | 0    | 0.225927 |     |     |      |     |
| 20 - 25    | 2103     | 0    | 0.270579 |     |     |      |     |
| 15 - 20    | 2268     | 12   | 0.340921 | #   |     |      |     |
| 10 - 15    | 1910     | 8    | 0.437373 |     |     |      |     |
| 5 - 10     | 5        | 0    | 0.281038 |     |     |      |     |
| 0 - 5      | 0        | 0    | 0.000000 |     |     |      |     |
| < 0        | 0        | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G31 | 916    | 0     | 28.55  | 0.240072 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G02 | 914    | 0     | 27.22  | 0.247118 | 0       | 2     | 2    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G05 | 841 | 0 | 31.26 | 0.331588 | 0 | 2 | 2 | 0 | 0 | 0 |
| G30 | 726 | 3 | 37.69 | 0.296515 | 3 | 2 | 5 | 0 | 0 | 0 |
| G12 | 830 | 0 | 44.22 | 0.167570 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 756 | 1 | 49.23 | 0.262754 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 783 | 2 | 46.46 | 0.188376 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 809 | 0 | 45.56 | 0.249467 | 1 | 0 | 2 | 0 | 0 | 0 |
| G18 | 805 | 1 | 33.41 | 0.472600 | 0 | 2 | 2 | 0 | 0 | 0 |
| G06 | 729 | 1 | 49.42 | 0.241254 | 2 | 1 | 4 | 0 | 0 | 0 |
| G22 | 655 | 1 | 48.31 | 0.304136 | 1 | 1 | 3 | 0 | 0 | 0 |
| G16 | 839 | 0 | 33.19 | 0.277627 | 0 | 2 | 2 | 0 | 0 | 0 |
| G03 | 668 | 4 | 48.45 | 0.207151 | 2 | 3 | 3 | 0 | 0 | 0 |
| G15 | 692 | 3 | 39.53 | 0.217267 | 2 | 2 | 4 | 0 | 0 | 0 |
| G19 | 647 | 0 | 46.61 | 0.200847 | 2 | 1 | 3 | 0 | 0 | 0 |
| G14 | 904 | 0 | 28.74 | 0.247852 | 0 | 2 | 2 | 0 | 0 | 0 |
| G11 | 696 | 2 | 49.06 | 0.180281 | 3 | 4 | 4 | 0 | 0 | 0 |
| G32 | 828 | 0 | 45.45 | 0.213748 | 0 | 1 | 1 | 0 | 0 | 0 |
| G01 | 705 | 0 | 49.25 | 0.190853 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 810 | 1 | 45.95 | 0.194760 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 633 | 0 | 46.95 | 0.186786 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 776 | 1 | 47.22 | 0.182551 | 0 | 1 | 1 | 0 | 0 | 0 |
| G17 | 908 | 0 | 28.18 | 0.291054 | 0 | 2 | 2 | 0 | 0 | 0 |
| G13 | 804 | 0 | 44.79 | 0.202473 | 2 | 2 | 3 | 0 | 0 | 0 |
| G04 | 903 | 0 | 27.83 | 0.251572 | 0 | 2 | 2 | 0 | 0 | 0 |
| G07 | 674 | 0 | 49.76 | 0.189342 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 654 | 1 | 48.50 | 0.207446 | 1 | 1 | 2 | 0 | 0 | 0 |
| G08 | 759 | 1 | 47.30 | 0.198274 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 676 | 0 | 49.22 | 0.199023 | 1 | 1 | 2 | 0 | 0 | 0 |
| G27 | 790 | 0 | 47.53 | 0.178829 | 1 | 2 | 3 | 0 | 0 | 0 |

|      |      |   |       |          |   |   |   |   |   |   |
|------|------|---|-------|----------|---|---|---|---|---|---|
| G09  | 710  | 0 | 47.78 | 0.177026 | 1 | 1 | 2 | 0 | 0 | 0 |
| R07* | 996  | 6 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R08* | 1021 | 0 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R13* | 941  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R14* | 921  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R22* | 930  | 1 | 0.00  | 0.000000 | 0 | 3 | 1 | 0 | 0 | 0 |
| R23* | 958  | 0 | 0.00  | 0.000000 | 0 | 2 | 0 | 0 | 0 | 0 |
| R24* | 862  | 6 | 0.00  | 0.000000 | 0 | 4 | 2 | 0 | 0 | 0 |
| R01* | 898  | 5 | 0.00  | 0.000000 | 0 | 3 | 3 | 0 | 0 | 0 |
| R02* | 731  | 2 | 0.00  | 0.000000 | 0 | 1 | 0 | 0 | 0 | 0 |
| R17* | 754  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R03* | 755  | 2 | 0.00  | 0.000000 | 0 | 3 | 1 | 0 | 0 | 0 |
| R18* | 824  | 0 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R11* | 804  | 4 | 0.00  | 0.000000 | 0 | 5 | 2 | 0 | 0 | 0 |
| R12* | 898  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R19* | 803  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R04* | 672  | 0 | 0.00  | 0.000000 | 0 | 1 | 1 | 0 | 0 | 0 |
| R20* | 683  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R05* | 576  | 7 | 0.00  | 0.000000 | 0 | 3 | 1 | 0 | 0 | 0 |
| R15* | 689  | 1 | 0.00  | 0.000000 | 0 | 2 | 2 | 0 | 0 | 0 |
| R16* | 722  | 0 | 0.00  | 0.000000 | 0 | 1 | 1 | 0 | 0 | 0 |
| R06* | 753  | 0 | 0.00  | 0.000000 | 0 | 2 | 1 | 0 | 0 | 0 |
| R09* | 754  | 1 | 0.00  | 0.000000 | 0 | 2 | 1 | 0 | 0 | 0 |
| R10* | 674  | 0 | 0.00  | 0.000000 | 0 | 1 | 1 | 0 | 0 | 0 |
| R21* | 610  | 6 | 0.00  | 0.000000 | 0 | 2 | 1 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP2 rms : 0.129701 m

total mean elevation : 41.64 degrees

# MP2 obs > 10 : 43000

# qc MP2 slips < 25 : 22

# Rvr L1 slips < 25 : 100

# Rvr L2 slips < 25 : 102

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 212       | 0    | 0.103242 |     |     |      |     |
| 80 - 85    | 399       | 0    | 0.118399 |     |     |      |     |
| 75 - 80    | 818       | 0    | 0.112037 |     |     |      |     |
| 70 - 75    | 1136      | 0    | 0.104803 |     |     |      |     |
| 65 - 70    | 1449      | 0    | 0.130170 |     |     |      |     |
| 60 - 65    | 1378      | 0    | 0.149737 |     |     |      |     |
| 55 - 60    | 1482      | 0    | 0.129637 |     |     |      |     |
| 50 - 55    | 1351      | 0    | 0.148802 |     |     |      |     |
| 45 - 50    | 1716      | 0    | 0.155031 |     |     |      |     |
| 40 - 45    | 1768      | 0    | 0.174731 |     |     |      |     |
| 35 - 40    | 1683      | 0    | 0.187019 |     |     |      |     |
| 30 - 35    | 1729      | 0    | 0.204360 |     |     |      |     |
| 25 - 30    | 2386      | 0    | 0.226428 |     |     |      |     |
| 20 - 25    | 2103      | 0    | 0.278201 |     |     |      |     |
| 15 - 20    | 2268      | 13   | 0.338724 | #   |     |      |     |
| 10 - 15    | 1910      | 9    | 0.496850 |     |     |      |     |
| 5 - 10     | 5         | 0    | 0.143261 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |

< 0 0 0 0.000000

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1 sig | mean        | 0 5 | 1 0 |
|------------|------|---------|-------------|-----|-----|
| 85 - 90    | 212  | 0.724   | 8.759 ###   |     |     |
| 80 - 85    | 399  | 0.544   | 8.867 ##    |     |     |
| 75 - 80    | 818  | 0.380   | 8.940 ##    |     |     |
| 70 - 75    | 1136 | 0.297   | 8.974 #     |     |     |
| 65 - 70    | 1450 | 0.262   | 8.981 #     |     |     |
| 60 - 65    | 1379 | 0.252   | 8.988 #     |     |     |
| 55 - 60    | 1484 | 0.249   | 8.987 #     |     |     |
| 50 - 55    | 1352 | 0.270   | 8.980 #     |     |     |
| 45 - 50    | 1716 | 0.282   | 8.961 #     |     |     |
| 40 - 45    | 1768 | 0.448   | 8.800 ##    |     |     |
| 35 - 40    | 1685 | 0.523   | 8.361 ##    |     |     |
| 30 - 35    | 1729 | 0.407   | 8.145 ##    |     |     |
| 25 - 30    | 2386 | 0.207   | 7.993 #     |     |     |
| 20 - 25    | 2103 | 0.429   | 7.805 ##    |     |     |
| 15 - 20    | 2280 | 0.808   | 7.336 ###   |     |     |
| 10 - 15    | 1943 | 0.871   | 7.012 ###   |     |     |
| 5 - 10     | 6    | 2.875   | 5.667 ##### |     |     |
| 0 - 5      | 0    | 0.000   | 0.000       |     |     |
| < 0        | 0    | 0.000   | 0.000       |     |     |

S/N L2 summary (per elevation bin):

| elev (deg) | tot | SN2 sig | mean      | 0 5 | 1 0 |
|------------|-----|---------|-----------|-----|-----|
| 85 - 90    | 212 | 0.741   | 8.292 ### |     |     |
| 80 - 85    | 399 | 0.539   | 8.125 ##  |     |     |

|         |      |       |       |       |  |
|---------|------|-------|-------|-------|--|
| 75 - 80 | 818  | 0.422 | 8.100 | ##    |  |
| 70 - 75 | 1136 | 0.327 | 8.046 | #     |  |
| 65 - 70 | 1450 | 0.280 | 7.959 | #     |  |
| 60 - 65 | 1379 | 0.406 | 7.854 | ##    |  |
| 55 - 60 | 1484 | 0.467 | 7.764 | ##    |  |
| 50 - 55 | 1352 | 0.533 | 7.399 | ##    |  |
| 45 - 50 | 1716 | 0.495 | 7.264 | ##    |  |
| 40 - 45 | 1768 | 0.538 | 6.937 | ##    |  |
| 35 - 40 | 1685 | 0.531 | 6.512 | ##    |  |
| 30 - 35 | 1729 | 0.619 | 6.139 | ##    |  |
| 25 - 30 | 2386 | 0.641 | 5.997 | ###   |  |
| 20 - 25 | 2103 | 0.708 | 5.304 | ###   |  |
| 15 - 20 | 2271 | 0.952 | 5.087 | ####  |  |
| 10 - 15 | 1930 | 0.896 | 4.528 | ####  |  |
| 5 - 10  | 6    | 2.098 | 4.000 | ##### |  |
| 0 - 5   | 0    | 0.000 | 0.000 |       |  |
| < 0     | 0    | 0.000 | 0.000 |       |  |

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QC of RINEX file(s) : klok1270.12o

input RnxNAV file(s) : klok1270.12n

\*\*\*\*\*

4-character ID : KLOK

Receiver type : LEICA GRX1200PRO (# = 463363) (fw = 4.03/2.122)

Antenna type : LEIAT504 (# = 103396)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4564754.2487 1845643.1074 4040952.8888 (m)

antenna WGS 84 (geo) : N 39 deg 33' 53.10" E 22 deg 00' 52.93"

antenna WGS 84 (geo) : 39.564751 deg 22.014702 deg

WGS 84 height : 164.3799 m

[qc - header] position : 37.5976 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31114

Possible obs > 10.0 deg: 24734



Complete obs > 10.0 deg: 21576  
 Deleted obs > 10.0 deg: 25  
 Masked obs < 10.0 deg: 3133  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.204603 m  
 Moving average MP2 : 0.240792 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.90 (sd=1.14 n=21601) 6.67 (sd=1.65 n=21576)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 69) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 28  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 35  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24734 21576 87 0.20 0.24 616

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 849  | 41.57 | 732 | 47.42 | 608 | 607 | 608 | 607 | 0 | 607 | 608 | 0 |
| G02 | 1184 | 22.40 | 932 | 27.12 | 599 | 581 | 599 | 581 | 0 | 581 | 599 | 0 |
| G03 | 977  | 33.53 | 693 | 45.97 | 591 | 590 | 591 | 590 | 0 | 590 | 591 | 0 |
| G04 | 1171 | 22.57 | 920 | 27.38 | 832 | 830 | 832 | 830 | 0 | 830 | 832 | 0 |
| G05 | 1147 | 24.23 | 887 | 29.87 | 801 | 801 | 801 | 801 | 0 | 801 | 801 | 0 |
| G06 | 866  | 41.98 | 749 | 47.78 | 631 | 630 | 631 | 630 | 0 | 630 | 631 | 0 |
| G07 | 957  | 36.58 | 724 | 47.43 | 724 | 724 | 724 | 724 | 0 | 724 | 724 | 0 |
| G08 | 895  | 41.01 | 780 | 46.31 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G09 | 848  | 40.88 | 730 | 46.69 | 610 | 610 | 610 | 610 | 0 | 610 | 610 | 0 |
| G10 | 1004 | 32.39 | 685 | 45.79 | 584 | 584 | 584 | 584 | 0 | 584 | 584 | 0 |
| G11 | 839  | 40.81 | 720 | 46.74 | 609 | 609 | 609 | 609 | 0 | 609 | 609 | 0 |
| G12 | 936  | 39.85 | 827 | 44.44 | 792 | 791 | 792 | 791 | 0 | 791 | 792 | 0 |
| G13 | 921  | 39.85 | 810 | 44.62 | 807 | 807 | 807 | 807 | 0 | 807 | 807 | 0 |
| G14 | 1177 | 23.55 | 924 | 28.67 | 543 | 543 | 543 | 543 | 0 | 543 | 543 | 0 |
| G15 | 1113 | 26.52 | 806 | 34.63 | 714 | 714 | 714 | 714 | 0 | 714 | 714 | 0 |
| G16 | 1144 | 25.67 | 886 | 31.68 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G17 | 1173 | 23.25 | 927 | 28.10 | 540 | 540 | 540 | 540 | 0 | 540 | 540 | 0 |
| G18 | 1139 | 25.76 | 839 | 33.13 | 636 | 636 | 636 | 636 | 0 | 636 | 636 | 0 |
| G19 | 1068 | 29.75 | 675 | 44.06 | 572 | 572 | 572 | 572 | 0 | 572 | 572 | 0 |
| G20 | 924  | 40.90 | 813 | 45.80 | 717 | 717 | 717 | 717 | 0 | 717 | 717 | 0 |
| G21 | 899  | 42.48 | 784 | 47.98 | 782 | 782 | 782 | 782 | 0 | 782 | 782 | 0 |
| G22 | 993  | 33.79 | 712 | 45.92 | 712 | 712 | 712 | 712 | 0 | 712 | 712 | 0 |
| G23 | 904  | 41.32 | 791 | 46.51 | 791 | 791 | 791 | 791 | 0 | 791 | 791 | 0 |
| G25 | 906  | 40.83 | 792 | 45.99 | 661 | 661 | 661 | 661 | 0 | 661 | 661 | 0 |
| G26 | 930  | 36.58 | 704 | 47.36 | 596 | 596 | 596 | 596 | 0 | 596 | 596 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 916  | 41.77 | 804 | 46.89 | 669 | 669 | 669 | 669 | 0 | 669 | 669 | 0 |
| G28 | 1078 | 30.47 | 685 | 45.02 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G29 | 934  | 40.29 | 815 | 45.47 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G30 | 1109 | 26.46 | 824 | 33.84 | 738 | 737 | 738 | 737 | 0 | 737 | 738 | 0 |
| G31 | 1174 | 23.43 | 934 | 28.17 | 850 | 850 | 850 | 850 | 0 | 850 | 850 | 0 |
| G32 | 939  | 40.75 | 830 | 45.45 | 813 | 813 | 813 | 813 | 0 | 813 | 813 | 0 |

Obs below mask ( 10.00 deg) : 28

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 25

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 25

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 21629

Obs deleted (any reason) : 53

Obs complete : 21576

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 196 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 339 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 943 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1218 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |    |             |
|---------|------|----|-------------|
| 65 - 70 | 1308 | 0  | 0.000000    |
| 60 - 65 | 1375 | 0  | 0.000000    |
| 55 - 60 | 1424 | 0  | 0.000000    |
| 50 - 55 | 1363 | 0  | 0.000000    |
| 45 - 50 | 1689 | 0  | 0.000000    |
| 40 - 45 | 1809 | 0  | 0.000000    |
| 35 - 40 | 1646 | 0  | 0.000000    |
| 30 - 35 | 1722 | 0  | 0.000000    |
| 25 - 30 | 1637 | 4  | 0.000000    |
| 20 - 25 | 1458 | 0  | 0.000000    |
| 15 - 20 | 1631 | 5  | 0.000000    |
| 10 - 15 | 1789 | 19 | 0.000000 == |
| 5 - 10  | 26   | 0  | 0.000000    |
| 0 - 5   | 0    | 0  | 0.000000    |
| < 0     | 0    | 0  | 0.000000    |

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G01 | 608    | 1     | 53.33  | 0.221840 | 4       | 6     | 6    | 0     | 1    | 1     |      |       |      |
| G02 | 599    | 18    | 30.63  | 0.333907 | 3       | 5     | 5    | 5     | 8    | 7     |      |       |      |
| G03 | 591    | 1     | 50.70  | 0.118463 | 0       | 0     | 0    | 0     | 2    | 1     |      |       |      |
| G04 | 832    | 2     | 28.42  | 0.229319 | 2       | 3     | 3    | 0     | 1    | 1     |      |       |      |
| G05 | 801    | 0     | 31.21  | 0.211936 | 0       | 1     | 1    | 0     | 1    | 1     |      |       |      |
| G06 | 631    | 1     | 53.13  | 0.169173 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G07 | 724    | 0     | 47.43  | 0.148868 | 0       | 0     | 0    | 0     | 0    | 0     |      |       |      |
| G08 | 779    | 0     | 46.46  | 0.151133 | 1       | 2     | 2    | 0     | 0    | 0     |      |       |      |
| G09 | 610    | 0     | 52.16  | 0.154011 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |

|     |     |   |       |          |   |    |    |   |   |   |
|-----|-----|---|-------|----------|---|----|----|---|---|---|
| G10 | 584 | 0 | 50.53 | 0.178393 | 1 | 2  | 2  | 1 | 2 | 2 |
| G11 | 609 | 0 | 51.79 | 0.134635 | 0 | 0  | 0  | 0 | 1 | 1 |
| G12 | 792 | 1 | 45.95 | 0.166179 | 0 | 2  | 2  | 0 | 0 | 0 |
| G13 | 807 | 0 | 44.85 | 0.154877 | 0 | 2  | 2  | 0 | 0 | 0 |
| G14 | 543 | 0 | 33.84 | 0.217465 | 0 | 1  | 1  | 0 | 0 | 0 |
| G15 | 714 | 0 | 36.89 | 0.327773 | 1 | 2  | 2  | 0 | 1 | 1 |
| G16 | 802 | 0 | 33.20 | 0.298281 | 2 | 5  | 5  | 0 | 1 | 1 |
| G17 | 540 | 0 | 32.91 | 0.217955 | 0 | 1  | 1  | 0 | 0 | 0 |
| G18 | 636 | 0 | 39.62 | 0.297324 | 0 | 1  | 1  | 0 | 0 | 0 |
| G19 | 572 | 0 | 48.76 | 0.134606 | 0 | 0  | 0  | 0 | 1 | 1 |
| G20 | 717 | 0 | 49.59 | 0.151050 | 0 | 0  | 0  | 0 | 1 | 1 |
| G21 | 782 | 0 | 48.14 | 0.218958 | 9 | 11 | 11 | 0 | 0 | 0 |
| G22 | 712 | 0 | 45.96 | 0.176666 | 0 | 0  | 0  | 0 | 0 | 0 |
| G23 | 791 | 0 | 46.61 | 0.172292 | 0 | 1  | 1  | 0 | 0 | 0 |
| G25 | 661 | 0 | 51.21 | 0.140054 | 0 | 0  | 0  | 0 | 2 | 2 |
| G26 | 596 | 0 | 52.57 | 0.152250 | 0 | 0  | 0  | 0 | 1 | 1 |
| G27 | 669 | 0 | 52.33 | 0.141995 | 1 | 1  | 1  | 0 | 1 | 1 |
| G28 | 684 | 0 | 45.07 | 0.246466 | 1 | 1  | 1  | 0 | 0 | 0 |
| G29 | 814 | 0 | 45.61 | 0.176093 | 0 | 1  | 1  | 0 | 0 | 0 |
| G30 | 738 | 1 | 35.76 | 0.318081 | 2 | 3  | 3  | 0 | 1 | 1 |
| G31 | 850 | 0 | 29.26 | 0.199948 | 0 | 2  | 2  | 0 | 2 | 2 |
| G32 | 813 | 0 | 46.25 | 0.339302 | 2 | 4  | 4  | 0 | 0 | 0 |

mean MP1 rms : 0.204601 m

total mean elevation : 43.57 degrees

# MP1 obs > 10 : 21576

# qc MP1 slips < 25 : 29

# Rvr L1 slips < 25 : 57

# Rvr L2 slips < 25 : 57

# qc MP1 slips > 25 : 6

# Rvr L1 slips > 25 : 29

# Rvr L2 slips > 25 : 27

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=%   | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-------|-----|------|-----|
| 85 - 90    | 196       | 0    | 0.078665 |       |     |      |     |
| 80 - 85    | 339       | 0    | 0.090521 |       |     |      |     |
| 75 - 80    | 943       | 0    | 0.088348 |       |     |      |     |
| 70 - 75    | 1218      | 0    | 0.091204 |       |     |      |     |
| 65 - 70    | 1308      | 0    | 0.092752 |       |     |      |     |
| 60 - 65    | 1375      | 0    | 0.094042 |       |     |      |     |
| 55 - 60    | 1424      | 0    | 0.099523 |       |     |      |     |
| 50 - 55    | 1363      | 0    | 0.111488 |       |     |      |     |
| 45 - 50    | 1689      | 0    | 0.113107 |       |     |      |     |
| 40 - 45    | 1809      | 0    | 0.133079 |       |     |      |     |
| 35 - 40    | 1646      | 0    | 0.146667 |       |     |      |     |
| 30 - 35    | 1722      | 1    | 0.154488 |       |     |      |     |
| 25 - 30    | 1637      | 5    | 0.232239 |       |     |      |     |
| 20 - 25    | 1458      | 0    | 0.233575 |       |     |      |     |
| 15 - 20    | 1631      | 7    | 0.374183 |       |     |      |     |
| 10 - 15    | 1789      | 22   | 0.473762 | ##### |     |      |     |
| 5 - 10     | 26        | 0    | 0.572854 |       |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |       |     |      |     |
| < 0        | 0         | 0    | 0.000000 |       |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 608    | 1     | 53.33  | 0.255405 | 3       | 6    | 6    | 0    | 1    | 1    |      |
| G02 | 599    | 18    | 30.63  | 0.599543 | 3       | 5    | 5    | 5    | 8    | 7    |      |
| G03 | 591    | 1     | 50.70  | 0.140728 | 0       | 0    | 0    | 0    | 2    | 1    |      |
| G04 | 832    | 2     | 28.42  | 0.344239 | 2       | 3    | 3    | 0    | 1    | 1    |      |
| G05 | 801    | 0     | 31.21  | 0.245559 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G06 | 631    | 1     | 53.13  | 0.157056 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G07 | 724    | 0     | 47.43  | 0.155091 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G08 | 779    | 0     | 46.46  | 0.133765 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G09 | 610    | 0     | 52.16  | 0.183621 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G10 | 584    | 0     | 50.53  | 0.290354 | 1       | 2    | 2    | 0    | 2    | 2    |      |
| G11 | 609    | 0     | 51.79  | 0.137923 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G12 | 792    | 1     | 45.95  | 0.147647 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G13 | 807    | 0     | 44.85  | 0.149866 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G14 | 543    | 0     | 33.84  | 0.197297 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G15 | 714    | 0     | 36.89  | 0.461111 | 1       | 2    | 2    | 0    | 1    | 1    |      |
| G16 | 802    | 0     | 33.20  | 0.397966 | 3       | 5    | 5    | 0    | 1    | 1    |      |
| G17 | 540    | 0     | 32.91  | 0.191971 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G18 | 636    | 0     | 39.62  | 0.408718 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G19 | 572    | 0     | 48.76  | 0.128974 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G20 | 717    | 0     | 49.59  | 0.164581 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G21 | 782    | 0     | 48.14  | 0.239109 | 9       | 11   | 11   | 0    | 0    | 0    |      |
| G22 | 712    | 0     | 45.96  | 0.274999 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G23 | 791    | 0     | 46.61  | 0.129658 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G25 | 661    | 0     | 51.21  | 0.160365 | 0       | 0    | 0    | 0    | 2    | 2    |      |
| G26 | 596    | 0     | 52.57  | 0.151048 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G27 | 669    | 0     | 52.33  | 0.162528 | 1       | 1    | 1    | 0    | 1    | 1    |      |
| G28 | 684    | 0     | 45.07  | 0.168672 | 1       | 1    | 1    | 0    | 0    | 0    |      |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 814 | 0 | 45.61 | 0.145932 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 738 | 1 | 35.76 | 0.601955 | 2 | 3 | 3 | 0 | 1 | 1 |
| G31 | 850 | 0 | 29.26 | 0.178099 | 0 | 2 | 2 | 0 | 2 | 2 |
| G32 | 813 | 0 | 46.25 | 0.341611 | 2 | 4 | 4 | 0 | 0 | 0 |

mean MP2 rms : 0.240799 m

total mean elevation : 43.57 degrees

# MP2 obs > 10 : 21576

# qc MP2 slips < 25 : 29

# Rvr L1 slips < 25 : 57

# Rvr L2 slips < 25 : 57

# qc MP2 slips > 25 : 5

# Rvr L1 slips > 25 : 29

# Rvr L2 slips > 25 : 27

| elev (deg) | tot slps | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 196 | 0 | 0.086261 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 339 | 0 | 0.092662 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 943 | 0 | 0.092186 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1218 | 0 | 0.087491 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1308 | 0 | 0.093833 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1375 | 0 | 0.100767 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1424 | 0 | 0.097098 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1363 | 0 | 0.112413 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1689 | 0 | 0.109594 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1809 | 0 | 0.117122 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1646 | 0 | 0.141763 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1722 | 1 | 0.290395 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |    |          |    |
|---------|------|----|----------|----|
| 25 - 30 | 1637 | 4  | 0.458056 |    |
| 20 - 25 | 1458 | 0  | 0.225350 |    |
| 15 - 20 | 1631 | 7  | 0.372532 |    |
| 10 - 15 | 1789 | 22 | 0.631766 | ## |
| 5 - 10  | 26   | 0  | 0.473696 |    |
| 0 - 5   | 0    | 0  | 0.000000 |    |
| < 0     | 0    | 0  | 0.000000 |    |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 196  | 0.748 | 8.745 | ###  |     |     |
| 80 - 85    | 339  | 0.659 | 8.670 | ###  |     |     |
| 75 - 80    | 943  | 0.414 | 8.894 | ##   |     |     |
| 70 - 75    | 1218 | 0.380 | 8.906 | ##   |     |     |
| 65 - 70    | 1309 | 0.320 | 8.950 | #    |     |     |
| 60 - 65    | 1375 | 0.301 | 8.960 | #    |     |     |
| 55 - 60    | 1427 | 0.313 | 8.950 | #    |     |     |
| 50 - 55    | 1364 | 0.485 | 8.761 | ##   |     |     |
| 45 - 50    | 1689 | 0.498 | 8.288 | ##   |     |     |
| 40 - 45    | 1810 | 0.346 | 8.088 | #    |     |     |
| 35 - 40    | 1647 | 0.213 | 7.999 | #    |     |     |
| 30 - 35    | 1726 | 0.628 | 7.787 | ###  |     |     |
| 25 - 30    | 1669 | 0.917 | 7.182 | #### |     |     |
| 20 - 25    | 1458 | 0.448 | 6.861 | ##   |     |     |
| 15 - 20    | 1633 | 0.563 | 6.269 | ##   |     |     |
| 10 - 15    | 1798 | 0.572 | 5.761 | ##   |     |     |
| 5 - 10     | 28   | 1.188 | 5.321 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |

< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 196  | 0.778 | 8.622 | ###  |     |     |
| 80 - 85    | 339  | 0.652 | 8.696 | ###  |     |     |
| 75 - 80    | 943  | 0.564 | 8.406 | ##   |     |     |
| 70 - 75    | 1218 | 0.553 | 8.444 | ##   |     |     |
| 65 - 70    | 1309 | 0.516 | 8.302 | ##   |     |     |
| 60 - 65    | 1375 | 0.417 | 8.142 | ##   |     |     |
| 55 - 60    | 1427 | 0.243 | 8.003 | #    |     |     |
| 50 - 55    | 1364 | 0.453 | 7.793 | ##   |     |     |
| 45 - 50    | 1689 | 0.533 | 7.422 | ##   |     |     |
| 40 - 45    | 1810 | 0.573 | 7.067 | ##   |     |     |
| 35 - 40    | 1647 | 0.625 | 6.673 | ##   |     |     |
| 30 - 35    | 1724 | 0.863 | 6.007 | ###  |     |     |
| 25 - 30    | 1647 | 0.943 | 5.210 | #### |     |     |
| 20 - 25    | 1458 | 0.702 | 4.848 | ###  |     |     |
| 15 - 20    | 1632 | 0.695 | 4.433 | ###  |     |     |
| 10 - 15    | 1798 | 0.805 | 4.049 | ###  |     |     |
| 5 - 10     | 28   | 0.957 | 3.786 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

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QC of RINEX file(s) : lemn1270.12o

input RnxNAV file(s) : lemn1270.12n

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4-character ID : LEMN

Receiver type : LEICA GRX1200GGPRO (# = 351610) (fw = 5.00/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4434471.0839 2084893.7193 4069322.2055 (m)

antenna WGS 84 (geo) : N 39 deg 53' 50.06" E 25 deg 10' 51.06"

antenna WGS 84 (geo) : 39.897238 deg 25.180851 deg

WGS 84 height : 130.6673 m

[qc - header] position : 34.1548 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31263

Possible obs > 10.0 deg: 24753

Complete obs > 10.0 deg: 24715  
 Deleted obs > 10.0 deg: 0  
 Masked obs < 10.0 deg: 836  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.184289 m  
 Moving average MP2 : 0.267895 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.10 (sd=0.89 n=24715) 6.15 (sd=1.33 n=24715)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 2) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 0  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 1  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24753 24715 100 0.18 0.27 24715

Processing parameters are:

Receiver tracking capability : 26 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 948  | 36.37 | 716 | 47.19 | 716 | 716 | 716 | 716 | 0 | 716 | 716 | 0 |
| G02 | 1179 | 22.72 | 924 | 27.62 | 923 | 923 | 923 | 923 | 0 | 923 | 923 | 0 |
| G03 | 1015 | 31.45 | 680 | 45.05 | 679 | 679 | 679 | 679 | 0 | 679 | 679 | 0 |
| G04 | 1173 | 22.41 | 925 | 27.08 | 923 | 923 | 923 | 923 | 0 | 923 | 923 | 0 |
| G05 | 1157 | 23.72 | 902 | 29.02 | 900 | 900 | 900 | 900 | 0 | 900 | 900 | 0 |
| G06 | 905  | 39.04 | 734 | 47.34 | 733 | 733 | 733 | 733 | 0 | 733 | 733 | 0 |
| G07 | 870  | 40.90 | 736 | 47.56 | 736 | 736 | 736 | 736 | 0 | 736 | 736 | 0 |
| G08 | 903  | 40.83 | 790 | 45.95 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G09 | 877  | 39.07 | 715 | 47.10 | 715 | 715 | 715 | 715 | 0 | 715 | 715 | 0 |
| G10 | 1033 | 30.72 | 672 | 44.84 | 671 | 671 | 671 | 671 | 0 | 671 | 671 | 0 |
| G11 | 824  | 40.16 | 706 | 46.04 | 705 | 705 | 705 | 705 | 0 | 705 | 705 | 0 |
| G12 | 933  | 39.99 | 824 | 44.62 | 824 | 824 | 824 | 824 | 0 | 824 | 824 | 0 |
| G13 | 923  | 39.83 | 813 | 44.53 | 813 | 813 | 813 | 813 | 0 | 813 | 813 | 0 |
| G14 | 1169 | 24.00 | 916 | 29.29 | 914 | 914 | 914 | 914 | 0 | 914 | 914 | 0 |
| G15 | 1129 | 25.65 | 844 | 32.59 | 841 | 841 | 841 | 841 | 0 | 841 | 841 | 0 |
| G16 | 1152 | 25.13 | 903 | 30.66 | 901 | 901 | 901 | 901 | 0 | 901 | 901 | 0 |
| G17 | 1166 | 23.66 | 918 | 28.72 | 916 | 916 | 916 | 916 | 0 | 916 | 916 | 0 |
| G18 | 1123 | 26.74 | 799 | 35.44 | 796 | 796 | 796 | 796 | 0 | 796 | 796 | 0 |
| G19 | 1088 | 28.54 | 714 | 40.52 | 704 | 704 | 704 | 704 | 0 | 704 | 704 | 0 |
| G20 | 917  | 41.11 | 804 | 46.18 | 804 | 804 | 804 | 804 | 0 | 804 | 804 | 0 |
| G21 | 908  | 42.61 | 795 | 47.95 | 795 | 795 | 795 | 795 | 0 | 795 | 795 | 0 |
| G22 | 950  | 36.27 | 724 | 46.67 | 724 | 724 | 724 | 724 | 0 | 724 | 724 | 0 |
| G23 | 911  | 41.18 | 799 | 46.26 | 799 | 799 | 799 | 799 | 0 | 799 | 799 | 0 |
| G25 | 895  | 41.10 | 779 | 46.48 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G26 | 974  | 34.37 | 690 | 47.16 | 689 | 689 | 689 | 689 | 0 | 689 | 689 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 904  | 41.99 | 790 | 47.33 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G28 | 1062 | 31.70 | 699 | 45.87 | 699 | 699 | 699 | 699 | 0 | 699 | 699 | 0 |
| G29 | 937  | 40.28 | 819 | 45.37 | 819 | 819 | 819 | 819 | 0 | 819 | 819 | 0 |
| G30 | 1123 | 25.68 | 853 | 32.20 | 850 | 850 | 850 | 850 | 0 | 850 | 850 | 0 |
| G31 | 1176 | 23.29 | 939 | 27.92 | 937 | 937 | 937 | 937 | 0 | 937 | 937 | 0 |
| G32 | 939  | 40.85 | 831 | 45.51 | 831 | 831 | 831 | 831 | 0 | 831 | 831 | 0 |
| G24 | 914  | 41.31 | 798 | 46.58 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 40

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 0

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 0

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24755

Obs deleted (any reason) : 40

Obs complete : 24715

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 160      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 420      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 891      | 0            | 0.000000 |     |      |     |



|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1088 | 0 | 0.000000 |
| 65 - 70 | 1336 | 0 | 0.000000 |
| 60 - 65 | 1396 | 0 | 0.000000 |
| 55 - 60 | 1343 | 0 | 0.000000 |
| 50 - 55 | 1576 | 0 | 0.000000 |
| 45 - 50 | 1594 | 0 | 0.000000 |
| 40 - 45 | 1768 | 0 | 0.000000 |
| 35 - 40 | 1651 | 0 | 0.000000 |
| 30 - 35 | 1893 | 0 | 0.000000 |
| 25 - 30 | 2075 | 0 | 0.000000 |
| 20 - 25 | 2439 | 0 | 0.000000 |
| 15 - 20 | 2473 | 0 | 0.000000 |
| 10 - 15 | 2584 | 0 | 0.000000 |
| 5 - 10  | 37   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

|     | slips  |       | L1 rx  |          | L2 rx   |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25 | < 25  | < 25 | > 25  | > 25 | > 25  | > 25 |
| G01 | 716    | 0     | 47.31  | 0.172425 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G02 | 923    | 0     | 27.72  | 0.269010 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G03 | 679    | 0     | 45.15  | 0.156950 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G04 | 923    | 0     | 27.20  | 0.193868 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |
| G05 | 900    | 0     | 29.15  | 0.155285 | 0       | 2    | 2     | 0    | 0     | 0    |       |      |
| G06 | 733    | 0     | 47.43  | 0.193232 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |
| G07 | 736    | 0     | 47.56  | 0.123219 | 0       | 0    | 0     | 0    | 0     | 0    |       |      |
| G08 | 790    | 0     | 46.05  | 0.142871 | 0       | 1    | 1     | 0    | 0     | 0    |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G09 | 715 | 0 | 47.21 | 0.170021 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 671 | 0 | 45.01 | 0.157418 | 0 | 1 | 1 | 0 | 0 | 0 |
| G11 | 705 | 0 | 46.20 | 0.189269 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 824 | 0 | 44.72 | 0.143227 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 813 | 0 | 44.53 | 0.141915 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 914 | 0 | 29.42 | 0.286806 | 1 | 4 | 4 | 0 | 0 | 0 |
| G15 | 841 | 0 | 32.76 | 0.184571 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 901 | 0 | 30.75 | 0.160570 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 916 | 0 | 28.84 | 0.273867 | 0 | 2 | 2 | 0 | 0 | 0 |
| G18 | 796 | 0 | 35.57 | 0.212313 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 704 | 0 | 41.06 | 0.178976 | 0 | 2 | 2 | 0 | 0 | 0 |
| G20 | 804 | 0 | 46.18 | 0.164781 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 795 | 0 | 48.01 | 0.154497 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 724 | 0 | 46.71 | 0.162262 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 799 | 0 | 46.36 | 0.159898 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 779 | 0 | 46.59 | 0.183376 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 689 | 0 | 47.33 | 0.158348 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 789 | 0 | 47.48 | 0.175690 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 699 | 0 | 45.98 | 0.162152 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 819 | 0 | 45.47 | 0.141097 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 850 | 0 | 32.35 | 0.168517 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 937 | 0 | 28.04 | 0.329979 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 831 | 0 | 45.61 | 0.166253 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.184291 m

total mean elevation : 40.32 degrees

# MP1 obs > 10 : 24715

# qc MP1 slips < 25 : 1

```

# Rvr L1 slips < 25 : 37
# Rvr L2 slips < 25 : 37
# qc MP1 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 160       | 0    | 0.071691 |     |     |      |     |
| 80 - 85    | 420       | 0    | 0.071505 |     |     |      |     |
| 75 - 80    | 891       | 0    | 0.072389 |     |     |      |     |
| 70 - 75    | 1088      | 0    | 0.074812 |     |     |      |     |
| 65 - 70    | 1336      | 0    | 0.079174 |     |     |      |     |
| 60 - 65    | 1396      | 0    | 0.086855 |     |     |      |     |
| 55 - 60    | 1343      | 0    | 0.096855 |     |     |      |     |
| 50 - 55    | 1576      | 0    | 0.110782 |     |     |      |     |
| 45 - 50    | 1594      | 0    | 0.116136 |     |     |      |     |
| 40 - 45    | 1768      | 0    | 0.133613 |     |     |      |     |
| 35 - 40    | 1651      | 0    | 0.167271 |     |     |      |     |
| 30 - 35    | 1893      | 0    | 0.176608 |     |     |      |     |
| 25 - 30    | 2075      | 0    | 0.222183 |     |     |      |     |
| 20 - 25    | 2439      | 0    | 0.240630 |     |     |      |     |
| 15 - 20    | 2473      | 0    | 0.251305 |     |     |      |     |
| 10 - 15    | 2584      | 1    | 0.329080 |     |     |      |     |
| 5 - 10     | 37        | 0    | 0.271916 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 716    | 0     | 47.31  | 0.212150 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G02 | 923    | 0     | 27.72  | 0.310911 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G03 | 679    | 0     | 45.15  | 0.262872 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G04 | 923    | 0     | 27.20  | 0.261350 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G05 | 900    | 0     | 29.15  | 0.209837 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G06 | 733    | 0     | 47.43  | 0.247282 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G07 | 736    | 0     | 47.56  | 0.155596 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 790    | 0     | 46.05  | 0.155372 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G09 | 715    | 0     | 47.21  | 0.246555 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G10 | 671    | 0     | 45.01  | 0.219183 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G11 | 705    | 0     | 46.20  | 0.209459 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G12 | 824    | 0     | 44.72  | 0.207389 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G13 | 813    | 0     | 44.53  | 0.178542 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 914    | 0     | 29.42  | 0.372348 | 1       | 4    | 4    | 0    | 0    | 0    | 0    |
| G15 | 841    | 0     | 32.76  | 0.382605 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G16 | 901    | 0     | 30.75  | 0.301301 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G17 | 916    | 0     | 28.84  | 0.331285 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G18 | 796    | 0     | 35.57  | 0.500397 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G19 | 704    | 0     | 41.06  | 0.404547 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G20 | 804    | 0     | 46.18  | 0.282069 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 795    | 0     | 48.01  | 0.729982 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 724    | 0     | 46.71  | 0.237212 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 799    | 0     | 46.36  | 0.150755 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G25 | 779    | 0     | 46.59  | 0.215067 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G26 | 689    | 0     | 47.33  | 0.222278 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G27 | 789    | 0     | 47.48  | 0.266891 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 699 | 0 | 45.98 | 0.167218 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 819 | 0 | 45.47 | 0.161770 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 850 | 0 | 32.35 | 0.218514 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 937 | 0 | 28.04 | 0.241215 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 831 | 0 | 45.61 | 0.188061 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.267900 m

total mean elevation : 40.32 degrees

# MP2 obs > 10 : 24715

# qc MP2 slips < 25 : 1

# Rvr L1 slips < 25 : 37

# Rvr L2 slips < 25 : 37

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 160 | 0 | 0.067851 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 420 | 0 | 0.086779 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 891 | 0 | 0.089564 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1088 | 0 | 0.100794 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1336 | 0 | 0.096884 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1396 | 0 | 0.107816 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1343 | 0 | 0.113130 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1576 | 0 | 0.121652 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1594 | 0 | 0.139479 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1768 | 0 | 0.156683 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1651 | 0 | 0.189371 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |
|---------|------|---|----------|--|
| 30 - 35 | 1893 | 0 | 0.213293 |  |
| 25 - 30 | 2075 | 0 | 0.289277 |  |
| 20 - 25 | 2439 | 0 | 0.288559 |  |
| 15 - 20 | 2473 | 0 | 0.357592 |  |
| 10 - 15 | 2584 | 1 | 0.664172 |  |
| 5 - 10  | 37   | 0 | 0.514796 |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |
| < 0     | 0    | 0 | 0.000000 |  |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 160  | 0.793 | 8.775 | ###   |     |     |
| 80 - 85    | 420  | 0.549 | 8.848 | ##    |     |     |
| 75 - 80    | 891  | 0.377 | 8.935 | ##    |     |     |
| 70 - 75    | 1088 | 0.336 | 8.951 | #     |     |     |
| 65 - 70    | 1337 | 0.302 | 8.961 | #     |     |     |
| 60 - 65    | 1397 | 0.295 | 8.963 | #     |     |     |
| 55 - 60    | 1344 | 0.301 | 8.961 | #     |     |     |
| 50 - 55    | 1578 | 0.350 | 8.916 | #     |     |     |
| 45 - 50    | 1594 | 0.470 | 8.774 | ##    |     |     |
| 40 - 45    | 1769 | 0.537 | 8.452 | ##    |     |     |
| 35 - 40    | 1651 | 0.315 | 8.059 | #     |     |     |
| 30 - 35    | 1894 | 0.238 | 7.986 | #     |     |     |
| 25 - 30    | 2075 | 0.413 | 7.830 | ##    |     |     |
| 20 - 25    | 2439 | 0.547 | 7.521 | ##    |     |     |
| 15 - 20    | 2475 | 0.484 | 7.025 | ##    |     |     |
| 10 - 15    | 2603 | 0.544 | 6.642 | ##    |     |     |
| 5 - 10     | 40   | 1.148 | 6.375 | ##### |     |     |

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 160  | 0.645 | 7.931 | ###  |     |     |
| 80 - 85    | 420  | 0.489 | 7.881 | ##   |     |     |
| 75 - 80    | 891  | 0.412 | 7.879 | ##   |     |     |
| 70 - 75    | 1088 | 0.479 | 7.768 | ##   |     |     |
| 65 - 70    | 1337 | 0.517 | 7.658 | ##   |     |     |
| 60 - 65    | 1397 | 0.537 | 7.462 | ##   |     |     |
| 55 - 60    | 1344 | 0.515 | 7.315 | ##   |     |     |
| 50 - 55    | 1578 | 0.423 | 7.110 | ##   |     |     |
| 45 - 50    | 1594 | 0.479 | 6.839 | ##   |     |     |
| 40 - 45    | 1769 | 0.528 | 6.490 | ##   |     |     |
| 35 - 40    | 1651 | 0.589 | 6.234 | ##   |     |     |
| 30 - 35    | 1894 | 0.614 | 5.815 | ##   |     |     |
| 25 - 30    | 2075 | 0.623 | 5.421 | ##   |     |     |
| 20 - 25    | 2439 | 0.690 | 5.107 | ###  |     |     |
| 15 - 20    | 2475 | 0.666 | 4.668 | ###  |     |     |
| 10 - 15    | 2603 | 0.730 | 4.274 | ###  |     |     |
| 5 - 10     | 40   | 1.105 | 3.900 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : noa11270.12o

input RnxNAV file(s) : noa11270.12n

\*\*\*\*\*

4-character ID : NOA1 (# = 12620M001)

Receiver type : LEICA GRX1200PRO (# = 462590) (fw = 7.53/2.125)

Antenna type : LEIAT504 LEIS (# = 103326)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4599646.9474 2034859.1264 3909910.6159 (m)

antenna WGS 84 (geo) : N 38 deg 02' 49.59" E 23 deg 51' 51.63"

antenna WGS 84 (geo) : 38.047109 deg 23.864341 deg

WGS 84 height : 563.8831 m

[qc - header] position : 37.1239 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31056

Possible obs > 10.0 deg: 24824



Complete obs > 10.0 deg: 24755  
 Deleted obs > 10.0 deg: 0  
 Masked obs < 10.0 deg: 69  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.210478 m  
 Moving average MP2 : 0.303081 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.92 (sd=1.08 n=24755) 6.55 (sd=1.66 n=24755)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 185) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 71  
 IOD slips > 10.0 deg : 10  
 IOD or MP slips < 10.0\*: 81  
 IOD or MP slips > 10.0 : 12  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24824 24755 100 0.21 0.30 2063

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 848  | 41.29 | 729 | 47.23 | 729 | 729 | 729 | 729 | 0 | 729 | 729 | 0 |
| G02 | 1186 | 22.36 | 929 | 27.18 | 926 | 926 | 926 | 926 | 0 | 926 | 926 | 0 |
| G03 | 980  | 33.04 | 691 | 45.53 | 691 | 691 | 691 | 691 | 0 | 691 | 691 | 0 |
| G04 | 1180 | 22.22 | 924 | 27.01 | 924 | 924 | 924 | 924 | 0 | 924 | 924 | 0 |
| G05 | 1155 | 23.75 | 893 | 29.26 | 891 | 891 | 891 | 891 | 0 | 891 | 891 | 0 |
| G06 | 865  | 41.68 | 746 | 47.54 | 746 | 746 | 746 | 746 | 0 | 746 | 746 | 0 |
| G07 | 856  | 41.47 | 737 | 47.37 | 737 | 737 | 737 | 737 | 0 | 737 | 737 | 0 |
| G08 | 911  | 40.39 | 795 | 45.56 | 795 | 795 | 795 | 795 | 0 | 795 | 795 | 0 |
| G09 | 848  | 40.72 | 728 | 46.62 | 722 | 722 | 722 | 722 | 0 | 722 | 722 | 0 |
| G10 | 1005 | 31.95 | 682 | 45.37 | 682 | 682 | 682 | 682 | 0 | 682 | 682 | 0 |
| G11 | 839  | 40.51 | 719 | 46.45 | 719 | 719 | 719 | 719 | 0 | 719 | 719 | 0 |
| G12 | 948  | 39.29 | 838 | 43.80 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G13 | 937  | 39.15 | 824 | 43.84 | 824 | 824 | 824 | 824 | 0 | 824 | 824 | 0 |
| G14 | 1174 | 23.60 | 916 | 28.86 | 916 | 916 | 916 | 916 | 0 | 916 | 916 | 0 |
| G15 | 1121 | 25.95 | 815 | 33.75 | 805 | 805 | 805 | 805 | 0 | 805 | 805 | 0 |
| G16 | 1150 | 25.16 | 890 | 31.04 | 890 | 890 | 890 | 890 | 0 | 890 | 890 | 0 |
| G17 | 1172 | 23.26 | 918 | 28.31 | 910 | 910 | 910 | 910 | 0 | 910 | 910 | 0 |
| G18 | 1126 | 26.33 | 796 | 35.05 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G19 | 1071 | 29.22 | 670 | 43.55 | 670 | 670 | 670 | 670 | 0 | 670 | 670 | 0 |
| G20 | 933  | 40.47 | 820 | 45.35 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G21 | 915  | 42.24 | 799 | 47.66 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G22 | 918  | 37.35 | 724 | 46.50 | 724 | 724 | 724 | 724 | 0 | 724 | 724 | 0 |
| G23 | 920  | 40.74 | 806 | 45.79 | 806 | 806 | 806 | 806 | 0 | 806 | 806 | 0 |
| G25 | 911  | 40.50 | 794 | 45.74 | 794 | 794 | 794 | 794 | 0 | 794 | 794 | 0 |
| G26 | 920  | 36.71 | 701 | 47.24 | 692 | 692 | 692 | 692 | 0 | 692 | 692 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 920  | 41.45 | 805 | 46.66 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G28 | 1053 | 31.58 | 696 | 45.63 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |
| G29 | 949  | 39.70 | 829 | 44.74 | 829 | 829 | 829 | 829 | 0 | 829 | 829 | 0 |
| G30 | 1115 | 25.97 | 831 | 33.09 | 831 | 831 | 831 | 831 | 0 | 831 | 831 | 0 |
| G31 | 1178 | 23.09 | 936 | 27.77 | 936 | 936 | 936 | 936 | 0 | 936 | 936 | 0 |
| G32 | 952  | 40.23 | 843 | 44.78 | 843 | 843 | 843 | 843 | 0 | 843 | 843 | 0 |

Obs below mask ( 10.00 deg) : 2521

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 0

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 0

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 27276

Obs deleted (any reason) : 2521

Obs complete : 24755

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 171 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 386 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 857 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1023 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G10 | 682 | 0 | 45.37 | 0.331393 | 0 | 0 | 0 | 0 | 0 | 0 |
| G11 | 719 | 0 | 46.45 | 0.174162 | 1 | 0 | 0 | 0 | 0 | 0 |
| G12 | 838 | 0 | 43.80 | 0.120567 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 824 | 0 | 43.84 | 0.115506 | 1 | 0 | 0 | 0 | 0 | 0 |
| G14 | 916 | 0 | 28.86 | 0.290569 | 0 | 0 | 0 | 0 | 0 | 0 |
| G15 | 805 | 0 | 33.57 | 0.210279 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 890 | 0 | 31.08 | 0.227254 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 910 | 0 | 28.14 | 0.163359 | 0 | 0 | 0 | 0 | 0 | 0 |
| G18 | 790 | 0 | 35.27 | 0.591668 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 670 | 0 | 43.66 | 0.487238 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 820 | 0 | 45.35 | 0.105995 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 798 | 0 | 47.76 | 0.256492 | 2 | 0 | 0 | 0 | 0 | 0 |
| G22 | 724 | 0 | 46.54 | 0.531372 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 806 | 0 | 45.79 | 0.091992 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 794 | 0 | 45.74 | 0.099562 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 692 | 0 | 46.95 | 0.133763 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 797 | 0 | 46.66 | 0.158612 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 680 | 0 | 45.68 | 0.137715 | 3 | 0 | 0 | 0 | 0 | 0 |
| G29 | 829 | 0 | 44.74 | 0.234038 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 831 | 0 | 33.16 | 0.254535 | 2 | 0 | 0 | 0 | 0 | 0 |
| G31 | 936 | 0 | 27.77 | 0.151135 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 843 | 0 | 44.78 | 0.100303 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.210515 m

total mean elevation : 40.19 degrees

# MP1 obs > 10 : 24755

# qc MP1 slips < 25 : 12

# Rvr L1 slips < 25 : 0

```

# Rvr L2 slips < 25 : 0
# qc MP1 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 171 0 0.067245 |
80 - 85 386 0 0.071499 |
75 - 80 857 0 0.058951 |
70 - 75 1023 0 0.064742 |
65 - 70 1334 0 0.076092 ||
60 - 65 1496 0 0.073993 |
55 - 60 1388 0 0.074472 |
50 - 55 1517 0 0.085360 ||
45 - 50 1590 0 0.090482 ||
40 - 45 1860 0 0.081817 ||
35 - 40 1677 0 0.090473 ||
30 - 35 1810 0 0.112015 ||
25 - 30 2183 0 0.134537 |||
20 - 25 2356 1 0.162269 |||
15 - 20 2389 1 0.291850 |||||
10 - 15 2709 10 0.640466 |||||
5 - 10 2460 77 0.724470 #####|||
0 - 5 32 0 1.306363 |||||
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 729    | 0     | 47.23  | 0.583052 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G02 | 926    | 0     | 27.18  | 0.222318 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G03 | 691    | 0     | 45.59  | 0.140155 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G04 | 924    | 0     | 27.01  | 0.219488 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G05 | 891    | 0     | 29.30  | 0.369200 | 2       | 0    | 0    | 0    | 0    | 0    | 0    |
| G06 | 746    | 0     | 47.58  | 0.135920 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G07 | 737    | 0     | 47.37  | 0.087939 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 795    | 0     | 45.56  | 0.126892 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 722    | 0     | 46.78  | 0.330548 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G10 | 682    | 0     | 45.37  | 0.496029 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G11 | 719    | 0     | 46.45  | 0.235583 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G12 | 838    | 0     | 43.80  | 0.176573 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G13 | 824    | 0     | 43.84  | 0.196556 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 916    | 0     | 28.86  | 0.351835 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G15 | 805    | 0     | 33.57  | 0.343164 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G16 | 890    | 0     | 31.08  | 0.520452 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G17 | 910    | 0     | 28.14  | 0.229226 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G18 | 790    | 0     | 35.27  | 1.054285 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G19 | 670    | 0     | 43.66  | 0.171676 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G20 | 820    | 0     | 45.35  | 0.155468 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 798    | 0     | 47.76  | 0.485593 | 2       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 724    | 0     | 46.54  | 0.774009 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 806    | 0     | 45.79  | 0.126917 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 794    | 0     | 45.74  | 0.147647 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G26 | 692    | 0     | 46.95  | 0.235046 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G27 | 797    | 0     | 46.66  | 0.371959 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G28 | 680    | 0     | 45.68  | 0.271826 | 3       | 0    | 0    | 0    | 0    | 0    | 0    |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 829 | 0 | 44.74 | 0.365902 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 831 | 0 | 33.16 | 0.200412 | 2 | 0 | 0 | 0 | 0 | 0 |
| G31 | 936 | 0 | 27.77 | 0.204767 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 843 | 0 | 44.78 | 0.121458 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.303126 m

total mean elevation : 40.19 degrees

# MP2 obs > 10 : 24755

# qc MP2 slips < 25 : 14

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 | rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|---------|-----|-----|------|-----|
|------------|-----------|------|---------|-----|-----|------|-----|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 85 - 90 | 171 | 0 | 0.068886 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 80 - 85 | 386 | 0 | 0.072156 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |     |   |          |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|
| 75 - 80 | 857 | 0 | 0.072140 |  |  |  |  |
|---------|-----|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 70 - 75 | 1023 | 0 | 0.060685 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 65 - 70 | 1334 | 0 | 0.067695 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 60 - 65 | 1496 | 0 | 0.069357 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 55 - 60 | 1388 | 0 | 0.074447 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 50 - 55 | 1517 | 0 | 0.085899 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 45 - 50 | 1590 | 0 | 0.086050 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 40 - 45 | 1860 | 0 | 0.104441 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 35 - 40 | 1677 | 0 | 0.099000 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

|         |      |   |          |  |  |  |  |
|---------|------|---|----------|--|--|--|--|
| 30 - 35 | 1810 | 0 | 0.133504 |  |  |  |  |
|---------|------|---|----------|--|--|--|--|

```

25 - 30 2183 0 0.158396 |||
20 - 25 2356 1 0.213690 ||||
15 - 20 2389 1 0.407871 |||||||
10 - 15 2709 12 0.999406 |||||||||||||||
5 - 10 2460 82 1.021583 #####|||
0 - 5 32 0 0.757376 |||
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 171  | 0.759 | 8.813 | ###  |     |     |
| 80 - 85    | 386  | 0.586 | 8.806 | ##   |     |     |
| 75 - 80    | 857  | 0.382 | 8.933 | ##   |     |     |
| 70 - 75    | 1023 | 0.350 | 8.945 | #    |     |     |
| 65 - 70    | 1335 | 0.307 | 8.958 | #    |     |     |
| 60 - 65    | 1497 | 0.283 | 8.967 | #    |     |     |
| 55 - 60    | 1389 | 0.292 | 8.965 | #    |     |     |
| 50 - 55    | 1519 | 0.309 | 8.949 | #    |     |     |
| 45 - 50    | 1590 | 0.458 | 8.792 | ##   |     |     |
| 40 - 45    | 1861 | 0.482 | 8.263 | ##   |     |     |
| 35 - 40    | 1678 | 0.255 | 8.023 | #    |     |     |
| 30 - 35    | 1810 | 0.233 | 7.976 | #    |     |     |
| 25 - 30    | 2183 | 0.500 | 7.659 | ##   |     |     |
| 20 - 25    | 2356 | 0.411 | 7.061 | ##   |     |     |
| 15 - 20    | 2390 | 0.512 | 6.624 | ##   |     |     |
| 10 - 15    | 2710 | 0.500 | 6.027 | ##   |     |     |
| 5 - 10     | 2486 | 0.585 | 5.507 | ##   |     |     |
| 0 - 5      | 35   | 0.970 | 5.000 | ###  |     |     |

< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 171  | 0.793 | 8.713 | ###  |     |     |
| 80 - 85    | 386  | 0.584 | 8.811 | ##   |     |     |
| 75 - 80    | 857  | 0.575 | 8.565 | ##   |     |     |
| 70 - 75    | 1023 | 0.563 | 8.557 | ##   |     |     |
| 65 - 70    | 1335 | 0.539 | 8.369 | ##   |     |     |
| 60 - 65    | 1497 | 0.470 | 8.217 | ##   |     |     |
| 55 - 60    | 1389 | 0.297 | 8.024 | #    |     |     |
| 50 - 55    | 1519 | 0.316 | 7.934 | #    |     |     |
| 45 - 50    | 1590 | 0.536 | 7.592 | ##   |     |     |
| 40 - 45    | 1861 | 0.548 | 7.247 | ##   |     |     |
| 35 - 40    | 1678 | 0.540 | 6.629 | ##   |     |     |
| 30 - 35    | 1810 | 0.595 | 6.266 | ##   |     |     |
| 25 - 30    | 2183 | 0.621 | 5.584 | ##   |     |     |
| 20 - 25    | 2356 | 0.665 | 5.167 | ###  |     |     |
| 15 - 20    | 2390 | 0.663 | 4.540 | ###  |     |     |
| 10 - 15    | 2710 | 0.770 | 4.092 | ###  |     |     |
| 5 - 10     | 2479 | 0.979 | 3.532 | #### |     |     |
| 0 - 5      | 35   | 1.114 | 3.229 | #### |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : nvrk1270.12o

input RnxNAV file(s) : nvrk1270.12n

\*\*\*\*\*

4-character ID : NVRK

Receiver type : LEICA GRX1200GGPRO (# = 351602) (fw = 5.62/3.014)

Antenna type : LEIAX1202GG

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4386267.6138 1940980.3063 4190923.7134 (m)

antenna WGS 84 (geo) : N 41 deg 20' 8.72" E 23 deg 52' 12.04"

antenna WGS 84 (geo) : 41.335756 deg 23.870011 deg

WGS 84 height : 651.9903 m

[qc - header] position : 129.1834 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 26 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31418

Possible obs > 10.0 deg: 24685

Complete obs > 10.0 deg: 24602  
 Deleted obs > 10.0 deg: 2  
 Masked obs < 10.0 deg: 877  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.281807 m  
 Moving average MP2 : 0.319951 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.10 (sd=0.95 n=24604) 6.25 (sd=1.31 n=24602)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 34) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 13  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 17  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24685 24602 100 0.28 0.32 1447

Processing parameters are:

Receiver tracking capability : 26 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 964  | 35.97 | 717 | 47.34 | 715 | 715 | 715 | 715 | 0 | 715 | 715 | 0 |
| G02 | 1177 | 22.78 | 928 | 27.56 | 923 | 923 | 923 | 923 | 0 | 923 | 923 | 0 |
| G03 | 1018 | 31.59 | 681 | 45.29 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |
| G04 | 1168 | 22.65 | 923 | 27.35 | 921 | 921 | 921 | 921 | 0 | 921 | 921 | 0 |
| G05 | 1152 | 24.06 | 900 | 29.41 | 897 | 897 | 897 | 897 | 0 | 897 | 897 | 0 |
| G06 | 936  | 37.94 | 734 | 47.55 | 733 | 733 | 733 | 733 | 0 | 733 | 733 | 0 |
| G07 | 977  | 36.12 | 726 | 47.62 | 725 | 725 | 725 | 725 | 0 | 725 | 725 | 0 |
| G08 | 890  | 41.32 | 778 | 46.55 | 778 | 778 | 778 | 778 | 0 | 778 | 778 | 0 |
| G09 | 917  | 37.48 | 716 | 47.15 | 715 | 715 | 715 | 715 | 0 | 715 | 715 | 0 |
| G10 | 1036 | 30.88 | 673 | 45.12 | 672 | 672 | 672 | 672 | 0 | 672 | 672 | 0 |
| G11 | 823  | 40.30 | 706 | 46.17 | 706 | 706 | 706 | 706 | 0 | 706 | 706 | 0 |
| G12 | 922  | 40.49 | 814 | 45.20 | 814 | 814 | 814 | 814 | 0 | 814 | 814 | 0 |
| G13 | 911  | 40.35 | 802 | 45.16 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G14 | 1164 | 24.14 | 922 | 29.18 | 915 | 915 | 915 | 915 | 0 | 915 | 915 | 0 |
| G15 | 1126 | 26.00 | 842 | 33.04 | 839 | 839 | 839 | 839 | 0 | 839 | 839 | 0 |
| G16 | 1151 | 25.44 | 902 | 31.08 | 901 | 901 | 901 | 901 | 0 | 901 | 901 | 0 |
| G17 | 1166 | 23.70 | 924 | 28.60 | 919 | 919 | 919 | 919 | 0 | 919 | 919 | 0 |
| G18 | 1134 | 26.30 | 834 | 33.90 | 830 | 830 | 830 | 830 | 0 | 830 | 830 | 0 |
| G19 | 1088 | 28.85 | 721 | 40.67 | 702 | 702 | 702 | 702 | 0 | 702 | 702 | 0 |
| G20 | 909  | 41.46 | 798 | 46.54 | 796 | 795 | 796 | 795 | 0 | 795 | 796 | 0 |
| G21 | 895  | 42.80 | 783 | 48.21 | 783 | 783 | 783 | 783 | 0 | 783 | 783 | 0 |
| G22 | 999  | 33.95 | 714 | 46.24 | 705 | 704 | 705 | 704 | 0 | 704 | 705 | 0 |
| G23 | 898  | 41.64 | 787 | 46.82 | 787 | 787 | 787 | 787 | 0 | 787 | 787 | 0 |
| G25 | 889  | 41.43 | 775 | 46.78 | 775 | 775 | 775 | 775 | 0 | 775 | 775 | 0 |
| G26 | 983  | 34.24 | 691 | 47.27 | 690 | 690 | 690 | 690 | 0 | 690 | 690 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 899  | 42.30 | 788 | 47.55 | 788 | 788 | 788 | 788 | 0 | 788 | 788 | 0 |
| G28 | 1081 | 30.89 | 690 | 45.44 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |
| G29 | 925  | 40.73 | 807 | 46.00 | 807 | 807 | 807 | 807 | 0 | 807 | 807 | 0 |
| G30 | 1119 | 26.02 | 851 | 32.62 | 850 | 850 | 850 | 850 | 0 | 850 | 850 | 0 |
| G31 | 1174 | 23.55 | 939 | 28.22 | 937 | 937 | 937 | 937 | 0 | 937 | 937 | 0 |
| G32 | 927  | 41.33 | 819 | 46.12 | 819 | 819 | 819 | 819 | 0 | 819 | 819 | 0 |
| G24 | 908  | 41.60 | 796 | 46.76 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 28

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 2

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 2

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24632

Obs deleted (any reason) : 30

Obs complete : 24602

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 191      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 384      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 976      | 0            | 0.000000 |     |      |     |



70 - 75 1273 0 0.000000  
 65 - 70 1171 0 0.000000  
 60 - 65 1344 0 0.000000  
 55 - 60 1345 0 0.000000  
 50 - 55 1466 0 0.000000  
 45 - 50 1590 0 0.000000  
 40 - 45 1830 0 0.000000  
 35 - 40 1623 0 0.000000  
 30 - 35 1836 0 0.000000  
 25 - 30 2209 0 0.000000  
 20 - 25 2340 0 0.000000  
 15 - 20 2417 0 0.000000  
 10 - 15 2580 13 0.000000 =  
 5 - 10 24 0 0.000000  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | slips L1 rx L2 rx slips L1 rx L2 rx |      |      |      |      |      |
|-----|--------|-------|--------|-------------|-------------------------------------|------|------|------|------|------|
|     |        |       |        |             | < 25                                | < 25 | < 25 | > 25 | > 25 | > 25 |
| G01 | 715    | 0     | 47.55  | 0.198689    | 1                                   | 2    | 2    | 0    | 0    | 0    |
| G02 | 923    | 0     | 27.74  | 0.289130    | 0                                   | 2    | 2    | 0    | 0    | 0    |
| G03 | 680    | 0     | 45.40  | 0.560205    | 0                                   | 1    | 1    | 0    | 0    | 0    |
| G04 | 921    | 0     | 27.47  | 0.282792    | 1                                   | 2    | 3    | 0    | 0    | 0    |
| G05 | 897    | 0     | 29.56  | 0.294877    | 2                                   | 4    | 4    | 0    | 0    | 0    |
| G06 | 733    | 0     | 47.63  | 0.302900    | 0                                   | 1    | 1    | 0    | 0    | 0    |
| G07 | 725    | 0     | 47.66  | 0.228859    | 1                                   | 1    | 1    | 0    | 0    | 0    |
| G08 | 778    | 0     | 46.55  | 0.160837    | 2                                   | 2    | 3    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G09 | 715 | 0 | 47.31 | 0.221064 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 672 | 0 | 45.29 | 0.187028 | 0 | 1 | 1 | 0 | 0 | 0 |
| G11 | 706 | 0 | 46.28 | 0.217163 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 814 | 0 | 45.20 | 0.200348 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 802 | 0 | 45.26 | 0.204819 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 915 | 0 | 29.41 | 0.316801 | 2 | 4 | 4 | 0 | 0 | 0 |
| G15 | 839 | 0 | 33.21 | 0.490530 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 901 | 0 | 31.14 | 0.574004 | 2 | 2 | 5 | 0 | 0 | 0 |
| G17 | 919 | 0 | 28.79 | 0.273412 | 1 | 2 | 3 | 0 | 0 | 0 |
| G18 | 830 | 0 | 34.05 | 0.382297 | 0 | 2 | 2 | 0 | 0 | 0 |
| G19 | 702 | 0 | 41.60 | 0.515892 | 2 | 7 | 7 | 0 | 0 | 0 |
| G20 | 796 | 1 | 46.77 | 0.162146 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 783 | 0 | 48.27 | 0.197684 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 705 | 1 | 46.79 | 0.208314 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 787 | 0 | 46.92 | 0.180640 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 775 | 0 | 46.89 | 0.163211 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 690 | 0 | 47.44 | 0.227184 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 788 | 0 | 47.65 | 0.198730 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 680 | 0 | 46.07 | 0.317743 | 2 | 2 | 3 | 0 | 0 | 0 |
| G29 | 807 | 0 | 46.10 | 0.180626 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 850 | 0 | 32.71 | 0.500577 | 1 | 3 | 5 | 0 | 0 | 0 |
| G31 | 937 | 0 | 28.34 | 0.274647 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 819 | 0 | 46.12 | 0.164422 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.281820 m

total mean elevation : 40.52 degrees

# MP1 obs > 10 : 24602

# qc MP1 slips < 25 : 17

```

# Rvr L1 slips < 25 : 52
# Rvr L2 slips < 25 : 61
# qc MP1 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 191 0 0.061149 |
80 - 85 384 0 0.058286 |
75 - 80 976 0 0.068473 |
70 - 75 1273 0 0.071311 |
65 - 70 1171 0 0.080936 ||
60 - 65 1344 0 0.086899 ||
55 - 60 1345 0 0.098032 ||
50 - 55 1466 0 0.104851 ||
45 - 50 1590 0 0.123185 ||
40 - 45 1830 0 0.132820 |||
35 - 40 1623 0 0.149575 |||
30 - 35 1836 0 0.173846 |||
25 - 30 2209 0 0.232410 ||||
20 - 25 2340 0 0.327469 |||||
15 - 20 2417 0 0.426040 |||||||
10 - 15 2580 17 0.719992 #|||||||||
5 - 10 24 0 0.374808 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 715    | 0     | 47.55  | 0.237829 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G02 | 923    | 0     | 27.74  | 0.336870 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G03 | 680    | 0     | 45.40  | 0.539900 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G04 | 921    | 0     | 27.47  | 0.454605 | 1       | 2    | 3    | 0    | 0    | 0    |      |
| G05 | 897    | 0     | 29.56  | 0.321057 | 2       | 4    | 4    | 0    | 0    | 0    |      |
| G06 | 733    | 0     | 47.63  | 0.494837 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G07 | 725    | 0     | 47.66  | 0.212844 | 1       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 778    | 0     | 46.55  | 0.305512 | 2       | 2    | 3    | 0    | 0    | 0    |      |
| G09 | 715    | 0     | 47.31  | 0.242302 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G10 | 672    | 0     | 45.29  | 0.256033 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G11 | 706    | 0     | 46.28  | 0.254812 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G12 | 814    | 0     | 45.20  | 0.189970 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G13 | 802    | 0     | 45.26  | 0.217968 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G14 | 915    | 0     | 29.41  | 0.488492 | 2       | 4    | 4    | 0    | 0    | 0    |      |
| G15 | 839    | 0     | 33.21  | 0.580443 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G16 | 901    | 0     | 31.14  | 0.682776 | 1       | 2    | 5    | 0    | 0    | 0    |      |
| G17 | 919    | 0     | 28.79  | 0.325052 | 1       | 2    | 3    | 0    | 0    | 0    |      |
| G18 | 830    | 0     | 34.05  | 0.470513 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G19 | 702    | 0     | 41.60  | 0.429812 | 3       | 7    | 7    | 0    | 0    | 0    |      |
| G20 | 796    | 1     | 46.77  | 0.193508 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G21 | 783    | 0     | 48.27  | 0.238581 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G22 | 705    | 1     | 46.79  | 0.216115 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G23 | 787    | 0     | 46.92  | 0.202349 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G25 | 775    | 0     | 46.89  | 0.187823 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G26 | 690    | 0     | 47.44  | 0.295766 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G27 | 788    | 0     | 47.65  | 0.211431 | 0       | 1    | 1    | 0    | 0    | 0    |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 680 | 0 | 46.07 | 0.192395 | 2 | 2 | 3 | 0 | 0 | 0 |
| G29 | 807 | 0 | 46.10 | 0.188325 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 850 | 0 | 32.71 | 0.308636 | 1 | 3 | 5 | 0 | 0 | 0 |
| G31 | 937 | 0 | 28.34 | 0.293781 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 819 | 0 | 46.12 | 0.218161 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.319960 m

total mean elevation : 40.52 degrees

# MP2 obs > 10 : 24602

# qc MP2 slips < 25 : 17

# Rvr L1 slips < 25 : 52

# Rvr L2 slips < 25 : 61

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|-----------|--------------|----------|-----|------|-----|
| 85 - 90    | 191       | 0            | 0.075783 |     |      |     |
| 80 - 85    | 384       | 0            | 0.067462 |     |      |     |
| 75 - 80    | 976       | 0            | 0.075695 |     |      |     |
| 70 - 75    | 1273      | 0            | 0.088540 |     |      |     |
| 65 - 70    | 1171      | 0            | 0.102969 |     |      |     |
| 60 - 65    | 1344      | 0            | 0.117128 |     |      |     |
| 55 - 60    | 1345      | 0            | 0.117397 |     |      |     |
| 50 - 55    | 1466      | 0            | 0.133420 |     |      |     |
| 45 - 50    | 1590      | 0            | 0.147993 |     |      |     |
| 40 - 45    | 1830      | 0            | 0.176117 |     |      |     |
| 35 - 40    | 1623      | 0            | 0.179323 |     |      |     |

```

30 - 35 1836 0 0.217255 ||||
25 - 30 2209 0 0.271367 |||||
20 - 25 2340 0 0.340534 |||||||
15 - 20 2417 0 0.422002 |||||||
10 - 15 2580 17 0.838201 #|||||||||||||
5 - 10 24 0 0.345349 |||||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 191 0.757 8.738 ###|||||||||||||||||
80 - 85 384 0.558 8.857 ##|||||||||||||||||
75 - 80 976 0.355 8.945 #|||||||||||||||||
70 - 75 1273 0.301 8.965 #|||||||||||||||||
65 - 70 1172 0.283 8.981 #|||||||||||||||||
60 - 65 1345 0.260 8.986 #|||||||||||||||||
55 - 60 1346 0.272 8.979 #|||||||||||||||||
50 - 55 1468 0.329 8.937 #|||||||||||||||||
45 - 50 1590 0.442 8.816 ##|||||||||||||||||
40 - 45 1831 0.537 8.538 ##|||||||||||||||||
35 - 40 1623 0.344 8.080 #|||||||||||||||||
30 - 35 1837 0.231 7.995 #|||||||||||||||||
25 - 30 2209 0.380 7.873 ##|||||||||||||||||
20 - 25 2340 0.582 7.462 ##|||||||||||||||||
15 - 20 2419 0.588 7.026 ##|||||||||||||||||
10 - 15 2600 0.746 6.504 ###|||||||||||||||||
5 - 10 28 1.343 6.393 #####|||||||||||||

```

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 191  | 0.579 | 7.958 | ##   |     |     |
| 80 - 85    | 384  | 0.411 | 7.977 | ##   |     |     |
| 75 - 80    | 976  | 0.271 | 7.984 | #    |     |     |
| 70 - 75    | 1273 | 0.346 | 7.918 | #    |     |     |
| 65 - 70    | 1172 | 0.489 | 7.742 | ##   |     |     |
| 60 - 65    | 1345 | 0.539 | 7.540 | ##   |     |     |
| 55 - 60    | 1346 | 0.532 | 7.409 | ##   |     |     |
| 50 - 55    | 1468 | 0.483 | 7.218 | ##   |     |     |
| 45 - 50    | 1590 | 0.454 | 6.901 | ##   |     |     |
| 40 - 45    | 1831 | 0.527 | 6.560 | ##   |     |     |
| 35 - 40    | 1623 | 0.561 | 6.307 | ##   |     |     |
| 30 - 35    | 1837 | 0.575 | 5.794 | ##   |     |     |
| 25 - 30    | 2209 | 0.601 | 5.510 | ##   |     |     |
| 20 - 25    | 2340 | 0.683 | 5.151 | ###  |     |     |
| 15 - 20    | 2419 | 0.703 | 4.768 | ###  |     |     |
| 10 - 15    | 2598 | 0.767 | 4.519 | ###  |     |     |
| 5 - 10     | 28   | 0.979 | 4.071 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : pont1270.12o

input RnxNAV file(s) : pont1270.12n

\*\*\*\*\*

4-character ID : PONT

Receiver type : LEICA GRX1200PRO (# = 465460) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4671281.3211 1754469.6992 3959406.7318 (m)

antenna WGS 84 (geo) : N 38 deg 37' 8.44" E 20 deg 35' 7.78"

antenna WGS 84 (geo) : 38.619011 deg 20.585495 deg

WGS 84 height : 74.9714 m

[qc - header] position : 37.9601 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31022

Possible obs > 10.0 deg: 24768



Complete obs > 10.0 deg: 21455  
 Deleted obs > 10.0 deg: 1  
 Masked obs < 10.0 deg: 4134  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.306929 m  
 Moving average MP2 : 0.374368 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.27 (sd=0.88 n=21456) 6.50 (sd=1.30 n=21455)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 17) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 9  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 9  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24768 21455 87 0.31 0.37 2384

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 860  | 41.50 | 741 | 47.37 | 611 | 611 | 611 | 611 | 0 | 611 | 611 | 0 |
| G02 | 1188 | 22.18 | 935 | 26.85 | 653 | 652 | 653 | 652 | 0 | 652 | 653 | 0 |
| G03 | 938  | 35.43 | 703 | 46.30 | 584 | 584 | 584 | 584 | 0 | 584 | 584 | 0 |
| G04 | 1171 | 22.60 | 917 | 27.49 | 803 | 803 | 803 | 803 | 0 | 803 | 803 | 0 |
| G05 | 1144 | 24.40 | 876 | 30.33 | 768 | 768 | 768 | 768 | 0 | 768 | 768 | 0 |
| G06 | 876  | 42.10 | 758 | 47.88 | 629 | 629 | 629 | 629 | 0 | 629 | 629 | 0 |
| G07 | 953  | 36.46 | 721 | 47.26 | 721 | 721 | 721 | 721 | 0 | 721 | 721 | 0 |
| G08 | 896  | 40.87 | 780 | 46.21 | 780 | 780 | 780 | 780 | 0 | 780 | 780 | 0 |
| G09 | 859  | 40.55 | 740 | 46.28 | 608 | 608 | 608 | 608 | 0 | 608 | 608 | 0 |
| G10 | 977  | 33.71 | 694 | 46.18 | 575 | 575 | 575 | 575 | 0 | 575 | 575 | 0 |
| G11 | 849  | 41.12 | 729 | 47.08 | 609 | 609 | 609 | 609 | 0 | 609 | 609 | 0 |
| G12 | 944  | 39.47 | 834 | 44.02 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G13 | 926  | 39.57 | 813 | 44.38 | 813 | 813 | 813 | 813 | 0 | 813 | 813 | 0 |
| G14 | 1179 | 23.31 | 927 | 28.33 | 536 | 536 | 536 | 536 | 0 | 536 | 536 | 0 |
| G15 | 1104 | 26.95 | 771 | 36.29 | 657 | 657 | 657 | 657 | 0 | 657 | 657 | 0 |
| G16 | 1139 | 25.91 | 874 | 32.23 | 769 | 769 | 769 | 769 | 0 | 769 | 769 | 0 |
| G17 | 1178 | 22.97 | 929 | 27.80 | 550 | 550 | 550 | 550 | 0 | 550 | 550 | 0 |
| G18 | 1145 | 25.33 | 845 | 32.48 | 631 | 631 | 631 | 631 | 0 | 631 | 631 | 0 |
| G19 | 1051 | 30.55 | 683 | 44.58 | 560 | 560 | 560 | 560 | 0 | 560 | 560 | 0 |
| G20 | 934  | 40.50 | 822 | 45.35 | 732 | 732 | 732 | 732 | 0 | 732 | 732 | 0 |
| G21 | 899  | 42.29 | 783 | 47.82 | 783 | 783 | 783 | 783 | 0 | 783 | 783 | 0 |
| G22 | 996  | 33.35 | 709 | 45.59 | 709 | 709 | 709 | 709 | 0 | 709 | 709 | 0 |
| G23 | 906  | 41.16 | 791 | 46.41 | 791 | 791 | 791 | 791 | 0 | 791 | 791 | 0 |
| G25 | 917  | 40.43 | 803 | 45.47 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G26 | 831  | 41.23 | 713 | 47.23 | 587 | 587 | 587 | 587 | 0 | 587 | 587 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 927  | 41.40 | 815 | 46.40 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |
| G28 | 1079 | 30.06 | 680 | 44.64 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |
| G29 | 938  | 40.05 | 818 | 45.23 | 818 | 818 | 818 | 818 | 0 | 818 | 818 | 0 |
| G30 | 1101 | 26.85 | 800 | 35.00 | 693 | 693 | 693 | 693 | 0 | 693 | 693 | 0 |
| G31 | 1173 | 23.42 | 930 | 28.23 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G32 | 944  | 40.48 | 834 | 45.15 | 826 | 826 | 826 | 826 | 0 | 826 | 826 | 0 |
| G24 | 935  | 40.72 | 822 | 45.64 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 30

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 1

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 1

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 21486

Obs deleted (any reason) : 31

Obs complete : 21455

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 206      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 399      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 854      | 0            | 0.000000 |     |      |     |

70 - 75 1172 0 0.000000  
 65 - 70 1405 0 0.000000  
 60 - 65 1371 0 0.000000  
 55 - 60 1463 0 0.000000  
 50 - 55 1350 0 0.000000  
 45 - 50 1710 0 0.000000  
 40 - 45 1767 0 0.000000  
 35 - 40 1680 0 0.000000  
 30 - 35 1622 0 0.000000  
 25 - 30 1592 9 0.000000 =  
 20 - 25 1358 0 0.000000  
 15 - 20 1679 0 0.000000  
 10 - 15 1798 0 0.000000  
 5 - 10 28 0 0.000000  
 0 - 5 0 0 0.000000  
 < 0 0 0 0.000000

MP1 RMS summary (per SV):

|     |        | slips |        | L1 rx    |         | L2 rx |      | slips |      | L1 rx |      | L2 rx |      |
|-----|--------|-------|--------|----------|---------|-------|------|-------|------|-------|------|-------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25  | < 25 | < 25  | > 25 | > 25  | > 25 | > 25  | > 25 |
| G01 | 611    | 0     | 53.26  | 0.185546 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G02 | 653    | 1     | 29.83  | 0.364257 | 0       | 0     | 0    | 4     | 1    | 5     |      |       |      |
| G03 | 584    | 0     | 51.64  | 0.259211 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G04 | 803    | 0     | 28.53  | 0.307873 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G05 | 768    | 0     | 31.86  | 0.507481 | 0       | 1     | 1    | 0     | 1    | 1     |      |       |      |
| G06 | 629    | 0     | 53.57  | 0.278492 | 0       | 0     | 0    | 0     | 1    | 1     |      |       |      |
| G07 | 721    | 0     | 47.37  | 0.271807 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |
| G08 | 780    | 0     | 46.31  | 0.256266 | 0       | 1     | 1    | 0     | 0    | 0     |      |       |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G09 | 608 | 0 | 52.06 | 0.207557 | 0 | 0 | 0 | 0 | 1 | 1 |
| G10 | 575 | 0 | 51.60 | 0.205031 | 0 | 0 | 0 | 0 | 1 | 1 |
| G11 | 609 | 0 | 52.48 | 0.223413 | 0 | 0 | 0 | 0 | 1 | 1 |
| G12 | 789 | 0 | 45.81 | 0.217481 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 813 | 0 | 44.47 | 0.205668 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 536 | 0 | 32.94 | 0.290520 | 0 | 0 | 0 | 0 | 0 | 0 |
| G15 | 657 | 0 | 39.24 | 0.918380 | 0 | 3 | 3 | 0 | 1 | 1 |
| G16 | 769 | 0 | 33.97 | 0.574921 | 0 | 1 | 1 | 0 | 1 | 1 |
| G17 | 550 | 0 | 32.00 | 0.417981 | 0 | 1 | 1 | 4 | 3 | 7 |
| G18 | 631 | 0 | 39.02 | 0.370186 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 560 | 0 | 50.04 | 0.290593 | 0 | 0 | 0 | 0 | 1 | 1 |
| G20 | 732 | 0 | 48.85 | 0.229587 | 0 | 0 | 0 | 0 | 1 | 1 |
| G21 | 783 | 0 | 47.89 | 0.249957 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 709 | 0 | 45.63 | 0.259276 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 791 | 0 | 46.52 | 0.203409 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 684 | 0 | 50.15 | 0.166110 | 0 | 0 | 0 | 0 | 1 | 1 |
| G26 | 587 | 0 | 53.08 | 0.199754 | 0 | 0 | 0 | 0 | 1 | 1 |
| G27 | 687 | 0 | 51.46 | 0.179849 | 0 | 0 | 0 | 0 | 1 | 1 |
| G28 | 680 | 0 | 44.76 | 0.230272 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 818 | 0 | 45.32 | 0.198640 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 693 | 0 | 37.39 | 0.793321 | 1 | 1 | 1 | 0 | 1 | 1 |
| G31 | 820 | 0 | 29.29 | 0.298688 | 0 | 0 | 0 | 0 | 1 | 1 |
| G32 | 826 | 0 | 45.58 | 0.183906 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.306931 m

total mean elevation : 43.68 degrees

# MP1 obs > 10 : 21455

# qc MP1 slips < 25 : 1

```

# Rvr L1 slips < 25 : 17
# Rvr L2 slips < 25 : 17
# qc MP1 slips > 25 : 8
# Rvr L1 slips > 25 : 21
# Rvr L2 slips > 25 : 29

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 206 0 0.123736 ||
80 - 85 399 0 0.183966 ||||
75 - 80 854 0 0.151064 |||
70 - 75 1172 0 0.150696 |||
65 - 70 1405 0 0.153547 |||
60 - 65 1371 0 0.165081 |||
55 - 60 1463 0 0.176619 ||||
50 - 55 1350 0 0.192124 ||||
45 - 50 1710 0 0.202637 ||||
40 - 45 1767 0 0.233819 |||||
35 - 40 1680 0 0.349761 |||||||
30 - 35 1622 0 0.520239 |||||||||
25 - 30 1592 8 0.280120 #|||||
20 - 25 1358 0 0.314351 |||||||
15 - 20 1679 0 0.478456 |||||||||
10 - 15 1798 1 0.743393 |||||||||||
5 - 10 28 0 0.878345 |||||||||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 611    | 0     | 53.26  | 0.264597 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G02 | 653    | 1     | 29.83  | 0.388815 | 0       | 0    | 0    | 4    | 1    | 5    |      |
| G03 | 584    | 0     | 51.64  | 0.314196 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G04 | 803    | 0     | 28.53  | 0.373459 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G05 | 768    | 0     | 31.86  | 0.589407 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G06 | 629    | 0     | 53.57  | 0.667906 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G07 | 721    | 0     | 47.37  | 0.347940 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 780    | 0     | 46.31  | 0.297323 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 608    | 0     | 52.06  | 0.280303 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G10 | 575    | 0     | 51.60  | 0.318396 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G11 | 609    | 0     | 52.48  | 0.292843 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G12 | 789    | 0     | 45.81  | 0.280910 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 813    | 0     | 44.47  | 0.258662 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G14 | 536    | 0     | 32.94  | 0.329165 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G15 | 657    | 0     | 39.24  | 0.515713 | 1       | 3    | 3    | 0    | 1    | 1    |      |
| G16 | 769    | 0     | 33.97  | 0.485694 | 0       | 1    | 1    | 0    | 1    | 1    |      |
| G17 | 550    | 0     | 32.00  | 0.902389 | 0       | 1    | 1    | 3    | 3    | 7    |      |
| G18 | 631    | 0     | 39.02  | 0.600208 | 0       | 0    | 0    | 0    | 0    | 0    |      |
| G19 | 560    | 0     | 50.04  | 0.332727 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G20 | 732    | 0     | 48.85  | 0.231185 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G21 | 783    | 0     | 47.89  | 0.389482 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G22 | 709    | 0     | 45.63  | 0.322516 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G23 | 791    | 0     | 46.52  | 0.269321 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G25 | 684    | 0     | 50.15  | 0.237379 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G26 | 587    | 0     | 53.08  | 0.306843 | 0       | 0    | 0    | 0    | 1    | 1    |      |
| G27 | 687    | 0     | 51.46  | 0.259909 | 0       | 0    | 0    | 0    | 1    | 1    |      |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 680 | 0 | 44.76 | 0.291550 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 818 | 0 | 45.32 | 0.242209 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 693 | 0 | 37.39 | 0.819408 | 0 | 1 | 1 | 0 | 1 | 1 |
| G31 | 820 | 0 | 29.29 | 0.331643 | 0 | 0 | 0 | 0 | 1 | 1 |
| G32 | 826 | 0 | 45.58 | 0.231480 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.374380 m

total mean elevation : 43.68 degrees

# MP2 obs > 10 : 21455

# qc MP2 slips < 25 : 1

# Rvr L1 slips < 25 : 17

# Rvr L2 slips < 25 : 17

# qc MP2 slips > 25 : 7

# Rvr L1 slips > 25 : 21

# Rvr L2 slips > 25 : 29

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |   |          |  |
|---------|------|---|----------|--|
| 85 - 90 | 206  | 0 | 0.216303 |  |
| 80 - 85 | 399  | 0 | 0.237119 |  |
| 75 - 80 | 854  | 0 | 0.236160 |  |
| 70 - 75 | 1172 | 0 | 0.228881 |  |
| 65 - 70 | 1405 | 0 | 0.240116 |  |
| 60 - 65 | 1371 | 0 | 0.246575 |  |
| 55 - 60 | 1463 | 0 | 0.247937 |  |
| 50 - 55 | 1350 | 0 | 0.239350 |  |
| 45 - 50 | 1710 | 0 | 0.250893 |  |
| 40 - 45 | 1767 | 0 | 0.258094 |  |
| 35 - 40 | 1680 | 0 | 0.308015 |  |

|         |      |   |          |  |
|---------|------|---|----------|--|
| 30 - 35 | 1622 | 0 | 0.540718 |  |
| 25 - 30 | 1592 | 7 | 0.555009 |  |
| 20 - 25 | 1358 | 0 | 0.381318 |  |
| 15 - 20 | 1679 | 0 | 0.470986 |  |
| 10 - 15 | 1798 | 1 | 0.822604 |  |
| 5 - 10  | 28   | 0 | 1.196132 |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |
| < 0     | 0    | 0 | 0.000000 |  |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 206  | 0.734 | 8.752 | ###   |     |     |
| 80 - 85    | 399  | 0.549 | 8.860 | ##    |     |     |
| 75 - 80    | 854  | 0.374 | 8.941 | #     |     |     |
| 70 - 75    | 1172 | 0.299 | 8.971 | #     |     |     |
| 65 - 70    | 1406 | 0.272 | 8.977 | #     |     |     |
| 60 - 65    | 1372 | 0.272 | 8.978 | #     |     |     |
| 55 - 60    | 1465 | 0.258 | 8.982 | #     |     |     |
| 50 - 55    | 1351 | 0.366 | 8.912 | #     |     |     |
| 45 - 50    | 1710 | 0.437 | 8.818 | ##    |     |     |
| 40 - 45    | 1767 | 0.553 | 8.522 | ##    |     |     |
| 35 - 40    | 1682 | 0.473 | 8.164 | ##    |     |     |
| 30 - 35    | 1631 | 0.556 | 7.922 | ##    |     |     |
| 25 - 30    | 1597 | 0.740 | 7.755 | ###   |     |     |
| 20 - 25    | 1358 | 0.616 | 7.550 | ##    |     |     |
| 15 - 20    | 1680 | 0.590 | 7.181 | ##    |     |     |
| 10 - 15    | 1806 | 0.666 | 6.700 | ###   |     |     |
| 5 - 10     | 30   | 1.383 | 6.133 | ##### |     |     |

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 206  | 0.567 | 7.971 | ##   |     |     |
| 80 - 85    | 399  | 0.407 | 7.980 | ##   |     |     |
| 75 - 80    | 854  | 0.327 | 7.974 | #    |     |     |
| 70 - 75    | 1172 | 0.320 | 7.942 | #    |     |     |
| 65 - 70    | 1406 | 0.372 | 7.889 | #    |     |     |
| 60 - 65    | 1372 | 0.472 | 7.764 | ##   |     |     |
| 55 - 60    | 1465 | 0.535 | 7.459 | ##   |     |     |
| 50 - 55    | 1351 | 0.526 | 7.262 | ##   |     |     |
| 45 - 50    | 1710 | 0.538 | 7.009 | ##   |     |     |
| 40 - 45    | 1767 | 0.574 | 6.655 | ##   |     |     |
| 35 - 40    | 1682 | 0.613 | 6.317 | ##   |     |     |
| 30 - 35    | 1631 | 0.773 | 5.869 | ###  |     |     |
| 25 - 30    | 1596 | 0.763 | 5.489 | ###  |     |     |
| 20 - 25    | 1358 | 0.671 | 5.169 | ###  |     |     |
| 15 - 20    | 1680 | 0.699 | 4.820 | ###  |     |     |
| 10 - 15    | 1806 | 0.652 | 4.527 | ###  |     |     |
| 5 - 10     | 30   | 1.073 | 4.433 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : prkv1270.12o

input RnxNAV file(s) : prkv1270.12n

\*\*\*\*\*

4-character ID : PRKV

Receiver type : LEICA GRX1200PRO (# = 465459) (fw = 5.10/3.013)

Antenna type : LEIAX1202GG

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4435583.6351 2188860.2859 4013602.9632 (m)

antenna WGS 84 (geo) : N 39 deg 14' 44.64" E 26 deg 15' 55.07"

antenna WGS 84 (geo) : 39.245734 deg 26.265298 deg

WGS 84 height : 192.2171 m

[qc - header] position : 34.4119 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31243

Possible obs > 10.0 deg: 24789

Complete obs > 10.0 deg: 24754  
 Deleted obs > 10.0 deg: 1  
 Masked obs < 10.0 deg: 828  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.255561 m  
 Moving average MP2 : 0.293356 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.11 (sd=0.89 n=24755) 6.41 (sd=1.31 n=24754)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 0) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 0  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 0  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24789 24754 100 0.26 0.29 24754

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 949  | 36.10 | 714 | 47.01 | 713 | 713 | 713 | 713 | 0 | 713 | 713 | 0 |
| G02 | 1178 | 22.77 | 921 | 27.73 | 919 | 919 | 919 | 919 | 0 | 919 | 919 | 0 |
| G03 | 1019 | 31.09 | 677 | 44.80 | 677 | 677 | 677 | 677 | 0 | 677 | 677 | 0 |
| G04 | 1177 | 22.25 | 927 | 26.92 | 925 | 925 | 925 | 925 | 0 | 925 | 925 | 0 |
| G05 | 1160 | 23.51 | 905 | 28.72 | 903 | 903 | 903 | 903 | 0 | 903 | 903 | 0 |
| G06 | 910  | 38.56 | 731 | 47.19 | 730 | 730 | 730 | 730 | 0 | 730 | 730 | 0 |
| G07 | 861  | 41.61 | 743 | 47.43 | 743 | 743 | 743 | 743 | 0 | 743 | 743 | 0 |
| G08 | 911  | 40.52 | 798 | 45.55 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G09 | 874  | 39.08 | 713 | 47.07 | 712 | 712 | 712 | 712 | 0 | 712 | 712 | 0 |
| G10 | 1037 | 30.36 | 668 | 44.62 | 668 | 667 | 668 | 667 | 0 | 667 | 668 | 0 |
| G11 | 823  | 39.93 | 705 | 45.79 | 704 | 704 | 704 | 704 | 0 | 704 | 704 | 0 |
| G12 | 937  | 39.80 | 828 | 44.38 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0 |
| G13 | 930  | 39.52 | 819 | 44.20 | 819 | 819 | 819 | 819 | 0 | 819 | 819 | 0 |
| G14 | 1167 | 24.08 | 909 | 29.52 | 907 | 907 | 907 | 907 | 0 | 907 | 907 | 0 |
| G15 | 1134 | 25.34 | 850 | 32.11 | 848 | 848 | 848 | 848 | 0 | 848 | 848 | 0 |
| G16 | 1156 | 24.86 | 908 | 30.28 | 906 | 906 | 906 | 906 | 0 | 906 | 906 | 0 |
| G17 | 1164 | 23.74 | 911 | 28.94 | 909 | 909 | 909 | 909 | 0 | 909 | 909 | 0 |
| G18 | 1117 | 27.08 | 767 | 36.98 | 762 | 762 | 762 | 762 | 0 | 762 | 762 | 0 |
| G19 | 1091 | 28.21 | 731 | 39.37 | 724 | 724 | 724 | 724 | 0 | 724 | 724 | 0 |
| G20 | 920  | 40.94 | 807 | 45.98 | 807 | 807 | 807 | 807 | 0 | 807 | 807 | 0 |
| G21 | 916  | 42.46 | 802 | 47.79 | 802 | 802 | 802 | 802 | 0 | 802 | 802 | 0 |
| G22 | 881  | 39.60 | 732 | 46.87 | 732 | 732 | 732 | 732 | 0 | 732 | 732 | 0 |
| G23 | 918  | 40.93 | 805 | 45.97 | 805 | 805 | 805 | 805 | 0 | 805 | 805 | 0 |
| G25 | 894  | 41.08 | 779 | 46.40 | 779 | 779 | 779 | 779 | 0 | 779 | 779 | 0 |
| G26 | 974  | 34.18 | 688 | 47.01 | 687 | 687 | 687 | 687 | 0 | 687 | 687 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 903  | 41.93 | 789 | 47.27 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G28 | 1047 | 32.40 | 705 | 46.18 | 705 | 705 | 705 | 705 | 0 | 705 | 705 | 0 |
| G29 | 944  | 40.01 | 825 | 45.06 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G30 | 1127 | 25.41 | 857 | 31.81 | 855 | 855 | 855 | 855 | 0 | 855 | 855 | 0 |
| G31 | 1179 | 23.13 | 939 | 27.77 | 938 | 938 | 938 | 938 | 0 | 938 | 938 | 0 |
| G32 | 945  | 40.61 | 836 | 45.25 | 836 | 836 | 836 | 836 | 0 | 836 | 836 | 0 |
| G24 | 915  | 41.21 | 794 | 46.70 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 37

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 1

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 1

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 24792

Obs deleted (any reason) : 38

Obs complete : 24754

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 115      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 475      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 784      | 0            | 0.000000 |     |      |     |



|         |      |   |          |
|---------|------|---|----------|
| 70 - 75 | 1061 | 0 | 0.000000 |
| 65 - 70 | 1430 | 0 | 0.000000 |
| 60 - 65 | 1361 | 0 | 0.000000 |
| 55 - 60 | 1352 | 0 | 0.000000 |
| 50 - 55 | 1621 | 0 | 0.000000 |
| 45 - 50 | 1618 | 0 | 0.000000 |
| 40 - 45 | 1726 | 0 | 0.000000 |
| 35 - 40 | 1676 | 0 | 0.000000 |
| 30 - 35 | 1936 | 0 | 0.000000 |
| 25 - 30 | 1897 | 0 | 0.000000 |
| 20 - 25 | 2596 | 0 | 0.000000 |
| 15 - 20 | 2515 | 0 | 0.000000 |
| 10 - 15 | 2565 | 0 | 0.000000 |
| 5 - 10  | 32   | 0 | 0.000000 |
| 0 - 5   | 0    | 0 | 0.000000 |
| < 0     | 0    | 0 | 0.000000 |

MP1 RMS summary (per SV):

| SV  | obs>10 | # del | <elev> | MP1 rms [m] | slips L1 rx L2 rx slips L1 rx L2 rx |      |      |      |      |      |
|-----|--------|-------|--------|-------------|-------------------------------------|------|------|------|------|------|
|     |        |       |        |             | < 25                                | < 25 | < 25 | > 25 | > 25 | > 25 |
| G01 | 713    | 0     | 47.17  | 0.159147    | 0                                   | 1    | 1    | 0    | 0    | 0    |
| G02 | 919    | 0     | 27.86  | 0.277083    | 0                                   | 2    | 2    | 0    | 0    | 0    |
| G03 | 677    | 0     | 44.86  | 0.185747    | 0                                   | 1    | 1    | 0    | 0    | 0    |
| G04 | 925    | 0     | 27.04  | 0.323464    | 0                                   | 1    | 1    | 0    | 0    | 0    |
| G05 | 903    | 0     | 28.85  | 0.331225    | 0                                   | 2    | 2    | 0    | 0    | 0    |
| G06 | 730    | 0     | 47.27  | 0.226532    | 0                                   | 1    | 1    | 0    | 0    | 0    |
| G07 | 743    | 0     | 47.43  | 0.273647    | 0                                   | 0    | 0    | 0    | 0    | 0    |
| G08 | 798    | 0     | 45.65  | 0.293656    | 0                                   | 1    | 1    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G09 | 712 | 0 | 47.24 | 0.195878 | 0 | 1 | 1 | 0 | 0 | 0 |
| G10 | 668 | 1 | 44.80 | 0.188943 | 0 | 1 | 1 | 0 | 0 | 0 |
| G11 | 704 | 0 | 45.96 | 0.175163 | 0 | 1 | 1 | 0 | 0 | 0 |
| G12 | 828 | 0 | 44.48 | 0.215513 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 819 | 0 | 44.30 | 0.204059 | 0 | 1 | 1 | 0 | 0 | 0 |
| G14 | 907 | 0 | 29.56 | 0.292980 | 0 | 1 | 1 | 0 | 0 | 0 |
| G15 | 848 | 0 | 32.25 | 0.305774 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 906 | 0 | 30.37 | 0.410460 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 909 | 0 | 29.07 | 0.295564 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 762 | 0 | 37.19 | 0.341092 | 0 | 1 | 1 | 0 | 0 | 0 |
| G19 | 724 | 0 | 39.76 | 0.293280 | 0 | 2 | 2 | 0 | 0 | 0 |
| G20 | 807 | 0 | 46.08 | 0.195491 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 802 | 0 | 47.85 | 0.304267 | 0 | 1 | 1 | 0 | 0 | 0 |
| G22 | 732 | 0 | 46.91 | 0.231109 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 805 | 0 | 45.97 | 0.250880 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 779 | 0 | 46.50 | 0.182872 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 687 | 0 | 47.18 | 0.179910 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 789 | 0 | 47.37 | 0.182794 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 705 | 0 | 46.18 | 0.264654 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 825 | 0 | 45.06 | 0.198858 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 855 | 0 | 31.93 | 0.286693 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 938 | 0 | 27.87 | 0.316702 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 836 | 0 | 45.35 | 0.218444 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP1 rms : 0.255556 m

total mean elevation : 40.20 degrees

# MP1 obs > 10 : 24754

# qc MP1 slips < 25 : 0

```

# Rvr L1 slips < 25 : 34
# Rvr L2 slips < 25 : 34
# qc MP1 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 115       | 0    | 0.075248 |     |     |      |     |
| 80 - 85    | 475       | 0    | 0.101254 |     |     |      |     |
| 75 - 80    | 784       | 0    | 0.098302 |     |     |      |     |
| 70 - 75    | 1061      | 0    | 0.101992 |     |     |      |     |
| 65 - 70    | 1430      | 0    | 0.097996 |     |     |      |     |
| 60 - 65    | 1361      | 0    | 0.111177 |     |     |      |     |
| 55 - 60    | 1352      | 0    | 0.121592 |     |     |      |     |
| 50 - 55    | 1621      | 0    | 0.130656 |     |     |      |     |
| 45 - 50    | 1618      | 0    | 0.160301 |     |     |      |     |
| 40 - 45    | 1726      | 0    | 0.184118 |     |     |      |     |
| 35 - 40    | 1676      | 0    | 0.179850 |     |     |      |     |
| 30 - 35    | 1936      | 0    | 0.227771 |     |     |      |     |
| 25 - 30    | 1897      | 0    | 0.249764 |     |     |      |     |
| 20 - 25    | 2596      | 0    | 0.298972 |     |     |      |     |
| 15 - 20    | 2515      | 0    | 0.370770 |     |     |      |     |
| 10 - 15    | 2565      | 0    | 0.507199 |     |     |      |     |
| 5 - 10     | 32        | 0    | 0.486209 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 713    | 0     | 47.17  | 0.194489 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G02 | 919    | 0     | 27.86  | 0.320913 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G03 | 677    | 0     | 44.86  | 0.284748 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G04 | 925    | 0     | 27.04  | 0.326552 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G05 | 903    | 0     | 28.85  | 0.413042 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G06 | 730    | 0     | 47.27  | 0.269011 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G07 | 743    | 0     | 47.43  | 0.241010 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 798    | 0     | 45.65  | 0.295281 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G09 | 712    | 0     | 47.24  | 0.229738 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G10 | 668    | 1     | 44.80  | 0.199770 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G11 | 704    | 0     | 45.96  | 0.211275 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G12 | 828    | 0     | 44.48  | 0.288451 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G13 | 819    | 0     | 44.30  | 0.226306 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G14 | 907    | 0     | 29.56  | 0.321702 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G15 | 848    | 0     | 32.25  | 0.379338 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G16 | 906    | 0     | 30.37  | 0.382210 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G17 | 909    | 0     | 29.07  | 0.319136 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G18 | 762    | 0     | 37.19  | 0.344344 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G19 | 724    | 0     | 39.76  | 0.242357 | 0       | 2    | 2    | 0    | 0    | 0    | 0    |
| G20 | 807    | 0     | 46.08  | 0.269594 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G21 | 802    | 0     | 47.85  | 0.540093 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G22 | 732    | 0     | 46.91  | 0.278567 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G23 | 805    | 0     | 45.97  | 0.252197 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 779    | 0     | 46.50  | 0.214254 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G26 | 687    | 0     | 47.18  | 0.227439 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |
| G27 | 789    | 0     | 47.37  | 0.264074 | 0       | 1    | 1    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 705 | 0 | 46.18 | 0.303441 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 825 | 0 | 45.06 | 0.198524 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 855 | 0 | 31.93 | 0.337496 | 0 | 2 | 2 | 0 | 0 | 0 |
| G31 | 938 | 0 | 27.87 | 0.356912 | 0 | 2 | 2 | 0 | 0 | 0 |
| G32 | 836 | 0 | 45.35 | 0.241200 | 0 | 1 | 1 | 0 | 0 | 0 |

mean MP2 rms : 0.293357 m

total mean elevation : 40.20 degrees

# MP2 obs > 10 : 24754

# qc MP2 slips < 25 : 0

# Rvr L1 slips < 25 : 34

# Rvr L2 slips < 25 : 34

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

|         |      |   |          |  |
|---------|------|---|----------|--|
| 85 - 90 | 115  | 0 | 0.094921 |  |
| 80 - 85 | 475  | 0 | 0.121591 |  |
| 75 - 80 | 784  | 0 | 0.123272 |  |
| 70 - 75 | 1061 | 0 | 0.133245 |  |
| 65 - 70 | 1430 | 0 | 0.123358 |  |
| 60 - 65 | 1361 | 0 | 0.129757 |  |
| 55 - 60 | 1352 | 0 | 0.139452 |  |
| 50 - 55 | 1621 | 0 | 0.160473 |  |
| 45 - 50 | 1618 | 0 | 0.192458 |  |
| 40 - 45 | 1726 | 0 | 0.217711 |  |
| 35 - 40 | 1676 | 0 | 0.214579 |  |

```

30 - 35 1936 0 0.249260 |||||
25 - 30 1897 0 0.270637 |||||
20 - 25 2596 0 0.324146 |||||
15 - 20 2515 0 0.416568 |||||
10 - 15 2565 0 0.606583 |||||
5 - 10 32 0 0.429644 |||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 115  | 0.839 | 8.922 | ###   |     |     |
| 80 - 85    | 475  | 0.547 | 8.821 | ##    |     |     |
| 75 - 80    | 784  | 0.403 | 8.923 | ##    |     |     |
| 70 - 75    | 1061 | 0.336 | 8.953 | #     |     |     |
| 65 - 70    | 1431 | 0.262 | 8.981 | #     |     |     |
| 60 - 65    | 1363 | 0.259 | 8.985 | #     |     |     |
| 55 - 60    | 1352 | 0.270 | 8.980 | #     |     |     |
| 50 - 55    | 1623 | 0.344 | 8.919 | #     |     |     |
| 45 - 50    | 1618 | 0.458 | 8.791 | ##    |     |     |
| 40 - 45    | 1727 | 0.537 | 8.441 | ##    |     |     |
| 35 - 40    | 1676 | 0.334 | 8.074 | #     |     |     |
| 30 - 35    | 1937 | 0.218 | 8.006 | #     |     |     |
| 25 - 30    | 1897 | 0.344 | 7.902 | #     |     |     |
| 20 - 25    | 2596 | 0.528 | 7.517 | ##    |     |     |
| 15 - 20    | 2516 | 0.492 | 7.038 | ##    |     |     |
| 10 - 15    | 2584 | 0.560 | 6.649 | ##    |     |     |
| 5 - 10     | 37   | 1.244 | 6.297 | ##### |     |     |

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 115  | 0.821 | 8.043 | ###  |     |     |
| 80 - 85    | 475  | 0.400 | 8.008 | ##   |     |     |
| 75 - 80    | 784  | 0.286 | 7.990 | #    |     |     |
| 70 - 75    | 1061 | 0.247 | 7.992 | #    |     |     |
| 65 - 70    | 1431 | 0.251 | 7.976 | #    |     |     |
| 60 - 65    | 1363 | 0.445 | 7.806 | ##   |     |     |
| 55 - 60    | 1352 | 0.539 | 7.538 | ##   |     |     |
| 50 - 55    | 1623 | 0.518 | 7.360 | ##   |     |     |
| 45 - 50    | 1618 | 0.471 | 7.142 | ##   |     |     |
| 40 - 45    | 1727 | 0.497 | 6.764 | ##   |     |     |
| 35 - 40    | 1676 | 0.533 | 6.476 | ##   |     |     |
| 30 - 35    | 1937 | 0.609 | 6.205 | ##   |     |     |
| 25 - 30    | 1897 | 0.590 | 5.675 | ##   |     |     |
| 20 - 25    | 2596 | 0.647 | 5.349 | ###  |     |     |
| 15 - 20    | 2516 | 0.721 | 4.938 | ###  |     |     |
| 10 - 15    | 2583 | 0.785 | 4.513 | ###  |     |     |
| 5 - 10     | 37   | 0.898 | 4.162 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : pylo1270.12o

input RnxNAV file(s) : pylo1270.12n

\*\*\*\*\*

4-character ID : PYLO

Receiver type : LEICA GR10 (# = 1700407) (fw = 2.00/4.007)

Antenna type : LEIAS10 NONE (# = 11031006)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4744083.8697 1887478.2590 3809822.8000 (m)

antenna WGS 84 (geo) : N 36 deg 54' 51.06" E 21 deg 41' 44.16"

antenna WGS 84 (geo) : 36.914184 deg 21.695600 deg

WGS 84 height : 66.2575 m

[qc - header] position : 37.6994 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 55

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

GLONASS SVs w/o OBS :

GLONASS SVs w/o NAV : 1 7 8 13 14 22 23 24 2 17 3 11

18 12 19 4 20 15 5 16 6 9 10 21

Rx tracking capability : 32 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880



Epochs repeated : 0 (0.00%)  
 Possible obs > 0.0 deg: 30986  
 Possible obs > 10.0 deg: 24874  
 Complete obs > 10.0 deg: 24845  
 Deleted obs > 10.0 deg: 1  
 Masked obs < 10.0 deg: 28  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.159918 m  
 Moving average MP2 : 0.192817 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 8.17 (sd=0.83 n=24845) 6.41 (sd=1.29 n=24845)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 ffffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 0) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 0  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 0  
 \* or unknown elevation

| first epoch | last epoch | hrs    | dt    | #expt | #have | %     | mp1   | mp2 | o/slps          |
|-------------|------------|--------|-------|-------|-------|-------|-------|-----|-----------------|
| SUM 12      | 5 6 00:00  | 12 5 6 | 23:59 | 24.00 | 30    | 24874 | 24845 | 100 | 0.16 0.19 24845 |

Processing parameters are:

Receiver tracking capability : 32 SVs

Maximum ionospheric rate (L1) : 400.00 cm/min

Report data gap greater than : 10.00 min

Expected rms of MP1 multipath : 50.00 cm

Expected rms of MP2 multipath : 65.00 cm

Multipath slip sigma threshold : 4.00 cm

% increase in MP rms for C/A | A/S : 100.00 %

Points in MP moving averages : 50

Minimum signal to noise for L1 : 0

Minimum signal to noise for L2 : 0

Elevation mask (cutoff) : 10.00 degrees

Elevation comparison threshold : 25.00 degrees

Orbit path spline fit sample time : 10 min

SVs w/ code data for position try : 5

Width of ASCII summary plot : 72

Data indicators on summary plot : yes

Do ionospheric observable : yes

Do ionospheric derivative : yes

Do high-pass ionosphere observable : no

Do multipath observables : yes

Do 1-ms receiver clock slips : yes

Tolerance for 1-ms clock slips : 1.00e-02 ms

Do receiver LLI slips : yes

Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #rept #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |     |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|-----|
| G01 | 864  | 41.23 | 742 | 47.20 | 741 | 741 | 741 | 741 | 0 | 741 | 741 | 741 |
| G02 | 1194 | 22.01 | 933 | 26.78 | 931 | 931 | 931 | 931 | 0 | 931 | 931 | 0   |
| G03 | 919  | 36.01 | 702 | 46.21 | 702 | 702 | 702 | 702 | 0 | 702 | 702 | 0   |
| G04 | 1181 | 22.25 | 921 | 27.15 | 919 | 919 | 919 | 919 | 0 | 919 | 919 | 0   |
| G05 | 1148 | 24.06 | 878 | 29.92 | 876 | 876 | 876 | 876 | 0 | 875 | 876 | 876 |
| G06 | 880  | 41.83 | 760 | 47.66 | 760 | 760 | 760 | 760 | 0 | 760 | 760 | 0   |
| G07 | 851  | 41.29 | 730 | 47.31 | 730 | 730 | 730 | 730 | 0 | 730 | 730 | 730 |
| G08 | 911  | 40.26 | 793 | 45.52 | 793 | 793 | 793 | 793 | 0 | 793 | 793 | 0   |
| G09 | 864  | 40.25 | 741 | 46.10 | 741 | 741 | 741 | 741 | 0 | 741 | 741 | 0   |
| G10 | 963  | 34.00 | 694 | 46.01 | 693 | 693 | 693 | 693 | 0 | 693 | 693 | 0   |
| G11 | 854  | 40.92 | 732 | 46.93 | 731 | 731 | 731 | 731 | 0 | 731 | 731 | 0   |
| G12 | 957  | 38.86 | 846 | 43.30 | 846 | 846 | 846 | 846 | 0 | 846 | 846 | 846 |
| G13 | 942  | 38.85 | 828 | 43.52 | 828 | 828 | 828 | 828 | 0 | 828 | 828 | 0   |
| G14 | 1181 | 23.18 | 922 | 28.31 | 921 | 921 | 921 | 921 | 0 | 921 | 921 | 0   |
| G15 | 1106 | 26.63 | 765 | 36.11 | 761 | 761 | 761 | 761 | 0 | 761 | 761 | 761 |
| G16 | 1141 | 25.56 | 874 | 31.83 | 872 | 872 | 872 | 872 | 0 | 872 | 872 | 0   |
| G17 | 1179 | 22.86 | 925 | 27.77 | 924 | 924 | 924 | 924 | 0 | 924 | 924 | 924 |
| G18 | 1138 | 25.59 | 818 | 33.57 | 815 | 815 | 815 | 815 | 0 | 815 | 815 | 0   |
| G19 | 1047 | 30.38 | 682 | 44.32 | 682 | 681 | 681 | 681 | 0 | 681 | 682 | 0   |
| G20 | 945  | 39.99 | 832 | 44.74 | 832 | 832 | 832 | 832 | 0 | 832 | 832 | 0   |
| G21 | 913  | 42.05 | 794 | 47.60 | 794 | 794 | 794 | 794 | 0 | 794 | 794 | 0   |
| G22 | 941  | 35.82 | 718 | 46.03 | 717 | 717 | 717 | 717 | 0 | 717 | 717 | 0   |



|      |   |      |   |      |   |   |   |   |   |   |   |   |
|------|---|------|---|------|---|---|---|---|---|---|---|---|
| R16* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R06* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R09* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R10* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R21* | 0 | 0.00 | 0 | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

\* = SV with no NAV info

Obs below mask ( 10.00 deg) : 19717

Obs above mask w/ no L1 : 1

Obs above mask w/ no L2 : 1

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 1

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 44563

Obs deleted (any reason) : 19718

Obs complete : 24845

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 204      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 407      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 791      | 0            | 0.000000 |     |      |     |
| 70 - 75    | 989      | 0            | 0.000000 |     |      |     |



|      |      |   |       |          |   |   |   |   |   |   |
|------|------|---|-------|----------|---|---|---|---|---|---|
| G10  | 693  | 0 | 46.18 | 0.087954 | 0 | 0 | 0 | 0 | 0 | 0 |
| G11  | 731  | 0 | 47.09 | 0.061701 | 0 | 0 | 0 | 0 | 0 | 0 |
| G12  | 846  | 0 | 43.30 | 0.068241 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13  | 828  | 0 | 43.62 | 0.069491 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14  | 921  | 0 | 28.42 | 0.193366 | 0 | 0 | 0 | 0 | 0 | 0 |
| G15  | 761  | 0 | 36.35 | 0.289771 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16  | 872  | 0 | 31.92 | 0.362514 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17  | 924  | 0 | 27.88 | 0.101213 | 0 | 0 | 0 | 0 | 0 | 0 |
| G18  | 815  | 0 | 33.69 | 0.644652 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19  | 682  | 1 | 44.48 | 0.137705 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20  | 832  | 0 | 44.84 | 0.064089 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21  | 794  | 0 | 47.67 | 0.141392 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22  | 717  | 0 | 46.12 | 0.324849 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23  | 805  | 0 | 45.80 | 0.057476 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25  | 808  | 0 | 45.16 | 0.078385 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26  | 713  | 0 | 47.26 | 0.086450 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27  | 819  | 0 | 46.14 | 0.075329 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28  | 688  | 0 | 45.16 | 0.069826 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29  | 832  | 0 | 44.55 | 0.073634 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30  | 794  | 0 | 34.91 | 0.486351 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31  | 930  | 0 | 27.97 | 0.132054 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32  | 848  | 0 | 44.49 | 0.056830 | 0 | 0 | 0 | 0 | 0 | 0 |
| R01* | 920  | 2 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R07* | 999  | 4 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R08* | 1031 | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R13* | 951  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R14* | 934  | 2 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R22* | 970  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |

|      |     |   |      |          |   |   |   |   |   |   |
|------|-----|---|------|----------|---|---|---|---|---|---|
| R23* | 990 | 1 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R24* | 874 | 1 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R02* | 762 | 2 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R17* | 770 | 1 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R03* | 771 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R11* | 844 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R18* | 829 | 1 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R12* | 914 | 2 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R19* | 809 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R04* | 693 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R20* | 680 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R15* | 706 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R05* | 601 | 4 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R16* | 745 | 1 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R06* | 770 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R09* | 770 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R10* | 696 | 1 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R21* | 649 | 0 | 0.00 | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP1 rms : 0.089288 m

total mean elevation : 40.34 degrees

# MP1 obs > 10 : 44500

# qc MP1 slips < 25 : 0

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0





|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G03 | 702 | 0 | 46.26 | 0.549762 | 0 | 0 | 0 | 0 | 0 | 0 |
| G04 | 919 | 0 | 27.27 | 0.251634 | 0 | 0 | 0 | 0 | 0 | 0 |
| G05 | 876 | 0 | 30.06 | 0.215290 | 0 | 0 | 0 | 0 | 0 | 0 |
| G06 | 760 | 0 | 47.69 | 0.098661 | 0 | 0 | 0 | 0 | 0 | 0 |
| G07 | 730 | 0 | 47.31 | 0.070147 | 0 | 0 | 0 | 0 | 0 | 0 |
| G08 | 793 | 0 | 45.62 | 0.104098 | 0 | 0 | 0 | 0 | 0 | 0 |
| G09 | 741 | 0 | 46.21 | 0.146341 | 0 | 0 | 0 | 0 | 0 | 0 |
| G10 | 693 | 0 | 46.18 | 0.110101 | 0 | 0 | 0 | 0 | 0 | 0 |
| G11 | 731 | 0 | 47.09 | 0.082839 | 0 | 0 | 0 | 0 | 0 | 0 |
| G12 | 846 | 0 | 43.30 | 0.178089 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 828 | 0 | 43.62 | 0.088705 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 921 | 0 | 28.42 | 0.197950 | 0 | 0 | 0 | 0 | 0 | 0 |
| G15 | 761 | 0 | 36.35 | 0.177397 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 872 | 0 | 31.92 | 0.244675 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 924 | 0 | 27.88 | 0.162683 | 0 | 0 | 0 | 0 | 0 | 0 |
| G18 | 815 | 0 | 33.69 | 0.504765 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 682 | 1 | 44.48 | 0.150121 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 832 | 0 | 44.84 | 0.100819 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 794 | 0 | 47.67 | 0.333926 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 717 | 0 | 46.12 | 0.733174 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 805 | 0 | 45.80 | 0.086221 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 808 | 0 | 45.16 | 0.097368 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 713 | 0 | 47.26 | 0.134467 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 819 | 0 | 46.14 | 0.109987 | 0 | 0 | 0 | 0 | 0 | 0 |
| G28 | 688 | 0 | 45.16 | 0.110349 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 832 | 0 | 44.55 | 0.112164 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 794 | 0 | 34.91 | 0.417919 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 930 | 0 | 27.97 | 0.144054 | 0 | 0 | 0 | 0 | 0 | 0 |

|      |      |   |       |          |   |   |   |   |   |   |
|------|------|---|-------|----------|---|---|---|---|---|---|
| G32  | 848  | 0 | 44.49 | 0.096950 | 0 | 0 | 0 | 0 | 0 | 0 |
| R01* | 920  | 2 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R07* | 999  | 4 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R08* | 1031 | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R13* | 951  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R14* | 934  | 2 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R22* | 970  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R23* | 990  | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R24* | 874  | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R02* | 762  | 2 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R17* | 770  | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R03* | 771  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R11* | 844  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R18* | 829  | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R12* | 914  | 2 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R19* | 809  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R04* | 693  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R20* | 680  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R15* | 706  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R05* | 601  | 4 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R16* | 745  | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R06* | 770  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R09* | 770  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R10* | 696  | 1 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |
| R21* | 649  | 0 | 0.00  | 0.000000 | 0 | 0 | 0 | 0 | 0 | 0 |

\* = SV with no NAV info

mean MP2 rms : 0.107657 m

total mean elevation : 40.34 degrees

# MP2 obs > 10 : 44500

# qc MP2 slips < 25 : 0

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 204       | 0    | 0.064879 |     |     |      |     |
| 80 - 85    | 407       | 0    | 0.057224 |     |     |      |     |
| 75 - 80    | 791       | 0    | 0.065638 |     |     |      |     |
| 70 - 75    | 989       | 0    | 0.071602 |     |     |      |     |
| 65 - 70    | 1377      | 0    | 0.097602 |     |     |      |     |
| 60 - 65    | 1543      | 0    | 0.100201 |     |     |      |     |
| 55 - 60    | 1480      | 0    | 0.100048 |     |     |      |     |
| 50 - 55    | 1395      | 0    | 0.086406 |     |     |      |     |
| 45 - 50    | 1711      | 0    | 0.098345 |     |     |      |     |
| 40 - 45    | 1835      | 0    | 0.104060 |     |     |      |     |
| 35 - 40    | 1699      | 0    | 0.087653 |     |     |      |     |
| 30 - 35    | 1693      | 0    | 0.097945 |     |     |      |     |
| 25 - 30    | 2385      | 0    | 0.135419 |     |     |      |     |
| 20 - 25    | 2141      | 0    | 0.170872 |     |     |      |     |
| 15 - 20    | 2456      | 0    | 0.254345 |     |     |      |     |
| 10 - 15    | 2710      | 0    | 0.648153 |     |     |      |     |
| 5 - 10     | 34        | 0    | 0.312218 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |

< 0 0 0 0.000000

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1 sig | mean  | 0 5   | 1 0 |
|------------|------|---------|-------|-------|-----|
| 85 - 90    | 204  | 0.739   | 8.745 | ###   |     |
| 80 - 85    | 407  | 0.577   | 8.808 | ##    |     |
| 75 - 80    | 791  | 0.399   | 8.927 | ##    |     |
| 70 - 75    | 989  | 0.354   | 8.944 | #     |     |
| 65 - 70    | 1378 | 0.300   | 8.961 | #     |     |
| 60 - 65    | 1544 | 0.274   | 8.971 | #     |     |
| 55 - 60    | 1482 | 0.295   | 8.960 | #     |     |
| 50 - 55    | 1396 | 0.332   | 8.938 | #     |     |
| 45 - 50    | 1711 | 0.499   | 8.708 | ##    |     |
| 40 - 45    | 1835 | 0.538   | 8.508 | ##    |     |
| 35 - 40    | 1701 | 0.402   | 8.138 | ##    |     |
| 30 - 35    | 1693 | 0.295   | 8.006 | #     |     |
| 25 - 30    | 2385 | 0.351   | 7.904 | #     |     |
| 20 - 25    | 2141 | 0.502   | 7.675 | ##    |     |
| 15 - 20    | 2457 | 0.528   | 7.247 | ##    |     |
| 10 - 15    | 2731 | 0.531   | 6.805 | ##    |     |
| 5 - 10     | 39   | 1.181   | 6.641 | ##### |     |
| 0 - 5      | 0    | 0.000   | 0.000 |       |     |
| < 0        | 0    | 0.000   | 0.000 |       |     |

S/N L2 summary (per elevation bin):

| elev (deg) | tot | SN2 sig | mean  | 0 5 | 1 0 |
|------------|-----|---------|-------|-----|-----|
| 85 - 90    | 204 | 0.568   | 7.951 | ##  |     |
| 80 - 85    | 407 | 0.435   | 7.978 | ##  |     |

|         |      |       |       |       |
|---------|------|-------|-------|-------|
| 75 - 80 | 791  | 0.330 | 8.013 | #     |
| 70 - 75 | 989  | 0.338 | 7.943 | #     |
| 65 - 70 | 1378 | 0.328 | 7.928 | #     |
| 60 - 65 | 1544 | 0.470 | 7.756 | ##    |
| 55 - 60 | 1482 | 0.537 | 7.537 | ##    |
| 50 - 55 | 1396 | 0.526 | 7.334 | ##    |
| 45 - 50 | 1711 | 0.487 | 7.108 | ##    |
| 40 - 45 | 1835 | 0.540 | 6.798 | ##    |
| 35 - 40 | 1701 | 0.558 | 6.449 | ##    |
| 30 - 35 | 1693 | 0.611 | 6.097 | ##    |
| 25 - 30 | 2385 | 0.662 | 5.732 | ###   |
| 20 - 25 | 2141 | 0.662 | 5.306 | ###   |
| 15 - 20 | 2457 | 0.676 | 4.985 | ###   |
| 10 - 15 | 2731 | 0.672 | 4.580 | ###   |
| 5 - 10  | 36   | 1.128 | 4.611 | ##### |
| 0 - 5   | 0    | 0.000 | 0.000 |       |
| < 0     | 0    | 0.000 | 0.000 |       |

\*\*\*\*\*

QC of RINEX file(s) : rls01270.12o

input RnxNAV file(s) : rls01270.12n

\*\*\*\*\*

4-character ID : RLSO

Receiver type : LEICA GRX1200 (# = 452161) (fw = 7.80/2.125)

Antenna type : LEIAX1202

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4679944.8049 1840181.7059 3910424.0064 (m)

antenna WGS 84 (geo) : N 38 deg 03' 21.09" E 21 deg 27' 54.15"

antenna WGS 84 (geo) : 38.055858 deg 21.465043 deg

WGS 84 height : 156.0247 m

[qc - header] position : 35.1116 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31005

Possible obs > 10.0 deg: 24814

Complete obs > 10.0 deg: 23766  
 Deleted obs > 10.0 deg: 29  
 Masked obs < 10.0 deg: 1842  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.256178 m  
 Moving average MP2 : 0.394132 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.68 (sd=1.05 n=23795) 6.09 (sd=1.34 n=23766)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 26) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 10  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 15  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24814 23766 96 0.26 0.39 1584

Processing parameters are:



Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 859  | 41.41 | 740 | 47.28 | 653 | 653 | 653 | 653 | 0 | 653 | 653 | 0 |
| G02 | 1190 | 22.15 | 933 | 26.89 | 931 | 931 | 931 | 931 | 0 | 931 | 931 | 0 |
| G03 | 943  | 35.04 | 700 | 46.19 | 636 | 636 | 636 | 636 | 0 | 636 | 636 | 0 |
| G04 | 1175 | 22.44 | 920 | 27.29 | 917 | 917 | 917 | 917 | 0 | 917 | 917 | 0 |
| G05 | 1147 | 24.19 | 880 | 30.01 | 860 | 860 | 860 | 860 | 0 | 860 | 860 | 0 |
| G06 | 876  | 41.93 | 757 | 47.75 | 673 | 673 | 673 | 673 | 0 | 673 | 673 | 0 |
| G07 | 902  | 38.77 | 726 | 47.34 | 726 | 726 | 726 | 726 | 0 | 726 | 726 | 0 |
| G08 | 903  | 40.62 | 786 | 45.92 | 786 | 786 | 786 | 786 | 0 | 786 | 786 | 0 |
| G09 | 859  | 40.48 | 738 | 46.31 | 647 | 645 | 647 | 645 | 0 | 645 | 647 | 0 |
| G10 | 978  | 33.47 | 692 | 46.00 | 629 | 627 | 629 | 627 | 0 | 627 | 629 | 0 |
| G11 | 849  | 40.95 | 728 | 46.94 | 650 | 648 | 650 | 648 | 0 | 648 | 650 | 0 |
| G12 | 947  | 39.32 | 838 | 43.79 | 838 | 838 | 838 | 838 | 0 | 838 | 838 | 0 |
| G13 | 932  | 39.32 | 820 | 44.01 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G14 | 1180 | 23.29 | 924 | 28.40 | 922 | 922 | 922 | 922 | 0 | 922 | 922 | 0 |
| G15 | 1107 | 26.69 | 778 | 35.73 | 744 | 740 | 744 | 740 | 0 | 740 | 744 | 0 |
| G16 | 1141 | 25.69 | 876 | 31.93 | 861 | 860 | 861 | 860 | 0 | 860 | 861 | 0 |
| G17 | 1177 | 22.99 | 926 | 27.87 | 925 | 925 | 925 | 925 | 0 | 925 | 925 | 0 |
| G18 | 1141 | 25.54 | 832 | 33.11 | 646 | 637 | 646 | 637 | 0 | 637 | 646 | 0 |
| G19 | 1053 | 30.28 | 681 | 44.31 | 622 | 622 | 622 | 622 | 0 | 622 | 622 | 0 |
| G20 | 936  | 40.40 | 825 | 45.16 | 825 | 825 | 825 | 825 | 0 | 825 | 825 | 0 |
| G21 | 905  | 42.26 | 789 | 47.75 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G22 | 973  | 34.46 | 713 | 45.94 | 713 | 713 | 713 | 713 | 0 | 713 | 713 | 0 |
| G23 | 913  | 40.91 | 797 | 46.14 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G25 | 918  | 40.33 | 803 | 45.40 | 756 | 756 | 756 | 756 | 0 | 756 | 756 | 0 |
| G26 | 830  | 41.17 | 711 | 47.23 | 633 | 632 | 633 | 632 | 0 | 632 | 633 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 928  | 41.29 | 815 | 46.33 | 750 | 742 | 750 | 742 | 0 | 742 | 750 | 0 |
| G28 | 1069 | 30.52 | 685 | 44.93 | 684 | 684 | 684 | 684 | 0 | 684 | 684 | 0 |
| G29 | 945  | 39.78 | 823 | 44.97 | 823 | 823 | 823 | 823 | 0 | 823 | 823 | 0 |
| G30 | 1104 | 26.61 | 805 | 34.57 | 767 | 767 | 767 | 767 | 0 | 767 | 767 | 0 |
| G31 | 1176 | 23.24 | 933 | 28.01 | 932 | 932 | 932 | 932 | 0 | 932 | 932 | 0 |
| G32 | 949  | 40.28 | 840 | 44.86 | 840 | 840 | 840 | 840 | 0 | 840 | 840 | 0 |
| G24 | 936  | 40.64 | 823 | 45.54 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 32

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 29

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 29

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23827

Obs deleted (any reason) : 61

Obs complete : 23766

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 196      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 395      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 862      | 0            | 0.000000 |     |      |     |



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G09 | 647 | 2 | 50.62 | 0.222388 | 1 | 0 | 0 | 0 | 0 | 0 |
| G10 | 629 | 2 | 49.27 | 0.241824 | 0 | 0 | 0 | 0 | 0 | 0 |
| G11 | 650 | 2 | 50.79 | 0.286892 | 0 | 0 | 0 | 0 | 0 | 0 |
| G12 | 838 | 0 | 43.88 | 0.183439 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 820 | 0 | 44.11 | 0.180923 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 922 | 0 | 28.44 | 0.315087 | 2 | 0 | 0 | 0 | 0 | 0 |
| G15 | 744 | 4 | 37.00 | 0.522815 | 1 | 0 | 0 | 0 | 0 | 0 |
| G16 | 861 | 1 | 32.34 | 0.461171 | 3 | 0 | 0 | 0 | 0 | 0 |
| G17 | 925 | 0 | 27.98 | 0.284513 | 1 | 0 | 0 | 0 | 0 | 0 |
| G18 | 646 | 9 | 39.40 | 0.279520 | 0 | 0 | 0 | 0 | 0 | 0 |
| G19 | 622 | 0 | 47.21 | 0.136990 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 825 | 0 | 45.26 | 0.171226 | 1 | 0 | 0 | 0 | 0 | 0 |
| G21 | 789 | 0 | 47.81 | 0.264651 | 0 | 0 | 0 | 0 | 0 | 0 |
| G22 | 713 | 0 | 45.98 | 0.285299 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 797 | 0 | 46.24 | 0.204326 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 756 | 0 | 47.48 | 0.173873 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 633 | 1 | 51.18 | 0.259622 | 1 | 1 | 0 | 0 | 0 | 0 |
| G27 | 750 | 8 | 49.45 | 0.296781 | 2 | 0 | 0 | 0 | 0 | 0 |
| G28 | 684 | 0 | 45.10 | 0.232593 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 823 | 0 | 44.97 | 0.167705 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 767 | 0 | 35.69 | 0.282486 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 932 | 0 | 28.12 | 0.275799 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 840 | 0 | 44.95 | 0.187076 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.256176 m

total mean elevation : 41.53 degrees

# MP1 obs > 10 : 23766

# qc MP1 slips < 25 : 12

```

# Rvr L1 slips < 25 : 1
# Rvr L2 slips < 25 : 0
# qc MP1 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

```

elev (deg) tot slps <MP1 rms, m> 5=% 1|m 15=% 2|m
85 - 90 196 0 0.095902 ||
80 - 85 395 0 0.089628 ||
75 - 80 862 0 0.104051 ||
70 - 75 1047 0 0.114990 ||
65 - 70 1445 0 0.116526 ||
60 - 65 1422 0 0.118256 ||
55 - 60 1457 0 0.120508 ||
50 - 55 1370 0 0.129022 |||
45 - 50 1707 0 0.159351 |||
40 - 45 1815 0 0.159209 |||
35 - 40 1676 0 0.201652 ||||
30 - 35 1722 0 0.200769 ||||
25 - 30 2361 0 0.270863 |||||
20 - 25 2015 3 0.407110 |||||||
15 - 20 2105 6 0.471059 |||||||
10 - 15 2142 3 0.459616 |||||||
5 - 10 30 0 0.532620 |||||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 653    | 0     | 51.48  | 0.191921 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G02 | 931    | 0     | 27.01  | 0.395520 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G03 | 636    | 0     | 49.33  | 0.743834 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G04 | 917    | 0     | 27.43  | 0.395356 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G05 | 860    | 0     | 30.53  | 0.453697 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G06 | 673    | 0     | 51.69  | 0.879629 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G07 | 726    | 0     | 47.45  | 0.257084 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 786    | 0     | 46.02  | 0.236946 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 647    | 2     | 50.62  | 0.624371 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G10 | 629    | 2     | 49.27  | 0.359989 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G11 | 650    | 2     | 50.79  | 0.233766 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G12 | 838    | 0     | 43.88  | 0.219150 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G13 | 820    | 0     | 44.11  | 0.262162 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 922    | 0     | 28.44  | 0.358330 | 2       | 0    | 0    | 0    | 0    | 0    | 0    |
| G15 | 744    | 4     | 37.00  | 0.804810 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G16 | 861    | 1     | 32.34  | 0.680208 | 5       | 0    | 0    | 0    | 0    | 0    | 0    |
| G17 | 925    | 0     | 27.98  | 0.461903 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G18 | 646    | 9     | 39.40  | 0.528056 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G19 | 622    | 0     | 47.21  | 0.249688 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G20 | 825    | 0     | 45.26  | 0.222914 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 789    | 0     | 47.81  | 0.506513 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 713    | 0     | 45.98  | 0.412910 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 797    | 0     | 46.24  | 0.243753 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 756    | 0     | 47.48  | 0.203343 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G26 | 633    | 1     | 51.18  | 0.420128 | 1       | 1    | 0    | 0    | 0    | 0    | 0    |
| G27 | 750    | 8     | 49.45  | 0.455988 | 2       | 0    | 0    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G28 | 684 | 0 | 45.10 | 0.269658 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 823 | 0 | 44.97 | 0.331603 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 767 | 0 | 35.69 | 0.383305 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 932 | 0 | 28.12 | 0.318930 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 840 | 0 | 44.95 | 0.233514 | 0 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.394142 m

total mean elevation : 41.53 degrees

# MP2 obs > 10 : 23766

# qc MP2 slips < 25 : 14

# Rvr L1 slips < 25 : 1

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

elev (deg) tot slips <MP2 rms, m> 5=% 1|m 15=% 2|m

85 - 90 196 0 0.142180 |||

80 - 85 395 0 0.128166 |||

75 - 80 862 0 0.165613 |||

70 - 75 1047 0 0.161756 |||

65 - 70 1445 0 0.160119 |||

60 - 65 1422 0 0.148680 |||

55 - 60 1457 0 0.159703 |||

50 - 55 1370 0 0.156597 |||

45 - 50 1707 0 0.186885 ||||

40 - 45 1815 0 0.212334 ||||

35 - 40 1676 0 0.227115 |||||



|         |      |   |          |  |
|---------|------|---|----------|--|
| 30 - 35 | 1722 | 0 | 0.272424 |  |
| 25 - 30 | 2361 | 0 | 0.564241 |  |
| 20 - 25 | 2015 | 3 | 0.687837 |  |
| 15 - 20 | 2105 | 7 | 0.598738 |  |
| 10 - 15 | 2142 | 4 | 0.858081 |  |
| 5 - 10  | 30   | 0 | 1.001088 |  |
| 0 - 5   | 0    | 0 | 0.000000 |  |
| < 0     | 0    | 0 | 0.000000 |  |

S/N L1 summary (per elevation bin):

| elev (deg) | tot  | SN1   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 196  | 0.747 | 8.750 | ###   |     |     |
| 80 - 85    | 395  | 0.631 | 8.686 | ###   |     |     |
| 75 - 80    | 862  | 0.488 | 8.809 | ##    |     |     |
| 70 - 75    | 1047 | 0.513 | 8.736 | ##    |     |     |
| 65 - 70    | 1446 | 0.452 | 8.810 | ##    |     |     |
| 60 - 65    | 1423 | 0.510 | 8.702 | ##    |     |     |
| 55 - 60    | 1459 | 0.544 | 8.440 | ##    |     |     |
| 50 - 55    | 1371 | 0.465 | 8.206 | ##    |     |     |
| 45 - 50    | 1707 | 0.283 | 8.039 | #     |     |     |
| 40 - 45    | 1815 | 0.236 | 8.014 | #     |     |     |
| 35 - 40    | 1678 | 0.246 | 7.977 | #     |     |     |
| 30 - 35    | 1722 | 0.438 | 7.802 | ##    |     |     |
| 25 - 30    | 2361 | 0.716 | 7.105 | ###   |     |     |
| 20 - 25    | 2029 | 0.746 | 6.710 | ###   |     |     |
| 15 - 20    | 2117 | 0.649 | 6.450 | ###   |     |     |
| 10 - 15    | 2167 | 0.660 | 6.003 | ###   |     |     |
| 5 - 10     | 32   | 1.157 | 5.781 | ##### |     |     |

0 - 5 0 0.000 0.000  
< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 196  | 0.692 | 7.745 | ###  |     |     |
| 80 - 85    | 395  | 0.584 | 7.727 | ##   |     |     |
| 75 - 80    | 862  | 0.523 | 7.705 | ##   |     |     |
| 70 - 75    | 1047 | 0.523 | 7.672 | ##   |     |     |
| 65 - 70    | 1446 | 0.538 | 7.499 | ##   |     |     |
| 60 - 65    | 1423 | 0.529 | 7.399 | ##   |     |     |
| 55 - 60    | 1459 | 0.450 | 7.197 | ##   |     |     |
| 50 - 55    | 1371 | 0.462 | 7.007 | ##   |     |     |
| 45 - 50    | 1707 | 0.525 | 6.675 | ##   |     |     |
| 40 - 45    | 1815 | 0.534 | 6.437 | ##   |     |     |
| 35 - 40    | 1678 | 0.606 | 6.150 | ##   |     |     |
| 30 - 35    | 1722 | 0.577 | 5.770 | ##   |     |     |
| 25 - 30    | 2361 | 0.782 | 5.161 | ###  |     |     |
| 20 - 25    | 2020 | 0.886 | 4.849 | #### |     |     |
| 15 - 20    | 2108 | 0.748 | 4.559 | ###  |     |     |
| 10 - 15    | 2156 | 0.808 | 4.204 | ###  |     |     |
| 5 - 10     | 32   | 1.045 | 4.062 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |

\*\*\*\*\*

QC of RINEX file(s) : span1270.12o

input RnxNAV file(s) : span1270.12n

\*\*\*\*\*

4-character ID : SPAN

Receiver type : LEICA GRX1200PRO (# = 462661) (fw = 3.00/2.121)

Antenna type : LEIAX1202GG (# = 06500017)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4658310.4542 1757811.4766 3973711.9273 (m)

antenna WGS 84 (geo) : N 38 deg 46' 52.73" E 20 deg 40' 26.32"

antenna WGS 84 (geo) : 38.781314 deg 20.673978 deg

WGS 84 height : 464.3686 m

[qc - header] position : 32.2407 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 30

NAVSTAR GPS SVs w/o OBS : 24 32

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 30114

Possible obs > 10.0 deg: 23924

Complete obs > 10.0 deg: 23570  
 Deleted obs > 10.0 deg: 29  
 Masked obs < 10.0 deg: 1982  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.347013 m  
 Moving average MP2 : 0.409668 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.83 (sd=1.01 n=23599) 5.52 (sd=1.37 n=23570)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 37) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 2  
 IOD slips > 10.0 deg : 11  
 IOD or MP slips < 10.0\*: 2  
 IOD or MP slips > 10.0 : 16  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 23924 23570 99 0.35 0.41 1473

Processing parameters are:

Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 859  | 41.51 | 740 | 47.39 | 702 | 701 | 702 | 701 | 0 | 701 | 702 | 0 |
| G02 | 1188 | 22.20 | 935 | 26.87 | 932 | 932 | 932 | 932 | 0 | 932 | 932 | 0 |
| G03 | 943  | 35.20 | 702 | 46.28 | 690 | 686 | 690 | 686 | 0 | 686 | 690 | 0 |
| G04 | 1171 | 22.60 | 917 | 27.49 | 913 | 912 | 913 | 912 | 0 | 912 | 913 | 0 |
| G05 | 1144 | 24.40 | 876 | 30.33 | 860 | 860 | 860 | 860 | 0 | 860 | 860 | 0 |
| G06 | 875  | 42.10 | 757 | 47.88 | 719 | 718 | 719 | 718 | 0 | 718 | 719 | 0 |
| G07 | 957  | 36.32 | 721 | 47.27 | 721 | 721 | 721 | 721 | 0 | 721 | 721 | 0 |
| G08 | 895  | 40.92 | 780 | 46.22 | 777 | 777 | 777 | 777 | 0 | 777 | 777 | 0 |
| G09 | 859  | 40.54 | 738 | 46.37 | 702 | 702 | 702 | 702 | 0 | 702 | 702 | 0 |
| G10 | 980  | 33.57 | 693 | 46.16 | 681 | 681 | 681 | 681 | 0 | 681 | 681 | 0 |
| G11 | 848  | 41.09 | 729 | 47.00 | 697 | 694 | 697 | 694 | 0 | 694 | 697 | 0 |
| G12 | 942  | 39.56 | 832 | 44.12 | 832 | 832 | 832 | 832 | 0 | 832 | 832 | 0 |
| G13 | 926  | 39.58 | 812 | 44.44 | 812 | 812 | 812 | 812 | 0 | 812 | 812 | 0 |
| G14 | 1179 | 23.33 | 928 | 28.34 | 924 | 924 | 924 | 924 | 0 | 924 | 924 | 0 |
| G15 | 1106 | 26.89 | 775 | 36.11 | 764 | 763 | 764 | 763 | 0 | 763 | 764 | 0 |
| G16 | 1139 | 25.91 | 874 | 32.22 | 865 | 863 | 865 | 863 | 0 | 863 | 865 | 0 |
| G17 | 1178 | 22.99 | 929 | 27.82 | 927 | 927 | 927 | 927 | 0 | 927 | 927 | 0 |
| G18 | 1144 | 25.37 | 846 | 32.49 | 786 | 772 | 786 | 772 | 0 | 772 | 786 | 0 |
| G19 | 1054 | 30.45 | 682 | 44.56 | 679 | 677 | 679 | 677 | 0 | 677 | 679 | 0 |
| G20 | 932  | 40.59 | 820 | 45.45 | 820 | 820 | 820 | 820 | 0 | 820 | 820 | 0 |
| G21 | 899  | 42.28 | 782 | 47.87 | 782 | 782 | 782 | 782 | 0 | 782 | 782 | 0 |
| G22 | 998  | 33.29 | 708 | 45.65 | 708 | 708 | 708 | 708 | 0 | 708 | 708 | 0 |
| G23 | 905  | 41.20 | 790 | 46.47 | 790 | 790 | 790 | 790 | 0 | 790 | 790 | 0 |
| G25 | 915  | 40.51 | 801 | 45.57 | 801 | 801 | 801 | 801 | 0 | 801 | 801 | 0 |
| G26 | 862  | 39.72 | 713 | 47.21 | 688 | 688 | 688 | 688 | 0 | 688 | 688 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 926  | 41.44 | 813 | 46.50 | 813 | 813 | 813 | 813 | 0 | 813 | 813 | 0 |
| G28 | 1080 | 30.07 | 680 | 44.67 | 680 | 680 | 680 | 680 | 0 | 680 | 680 | 0 |
| G29 | 937  | 40.10 | 817 | 45.29 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |
| G30 | 1101 | 26.84 | 803 | 34.87 | 789 | 789 | 789 | 789 | 0 | 789 | 789 | 0 |
| G31 | 1172 | 23.45 | 931 | 28.23 | 928 | 928 | 928 | 928 | 0 | 928 | 928 | 0 |
| G24 | 933  | 40.80 | 820 | 45.74 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |
| G32 | 946  | 40.74 | 837 | 45.40 | 0   | 0   | 0   | 0   | 0 | 0   | 0   | 0 |

Obs below mask ( 10.00 deg) : 27

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 29

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 29

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23626

Obs deleted (any reason) : 56

Obs complete : 23570

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=%      | 1 m | 15=% | 2 m |
|------------|----------|--------------|----------|-----|------|-----|
| 85 - 90    | 202      | 0            | 0.000000 |     |      |     |
| 80 - 85    | 401      | 0            | 0.000000 |     |      |     |
| 75 - 80    | 868      | 0            | 0.000000 |     |      |     |

|         |      |   |          |       |
|---------|------|---|----------|-------|
| 70 - 75 | 1105 | 0 | 0.000000 |       |
| 65 - 70 | 1291 | 0 | 0.000000 |       |
| 60 - 65 | 1295 | 0 | 0.000000 |       |
| 55 - 60 | 1390 | 0 | 0.000000 |       |
| 50 - 55 | 1282 | 0 | 0.000000 |       |
| 45 - 50 | 1657 | 0 | 0.000000 |       |
| 40 - 45 | 1703 | 0 | 0.000000 |       |
| 35 - 40 | 1618 | 0 | 0.000000 |       |
| 30 - 35 | 1670 | 0 | 0.000000 |       |
| 25 - 30 | 2322 | 0 | 0.000000 |       |
| 20 - 25 | 2035 | 0 | 0.000000 |       |
| 15 - 20 | 2366 | 4 | 0.000000 |       |
| 10 - 15 | 2337 | 7 | 0.000000 |       |
| 5 - 10  | 25   | 2 | 0.000000 | ===== |
| 0 - 5   | 0    | 0 | 0.000000 |       |
| < 0     | 0    | 0 | 0.000000 |       |

MP1 RMS summary (per SV):

|     |        |       |        |          |         | slips L1 rx L2 rx slips L1 rx L2 rx |      |      |      |      |      |
|-----|--------|-------|--------|----------|---------|-------------------------------------|------|------|------|------|------|
| SV  | obs>10 | # del | <elev> | MP1      | rms [m] | < 25                                | < 25 | < 25 | > 25 | > 25 | > 25 |
| G01 | 702    | 1     | 49.41  | 0.278550 | 0       | 1                                   | 1    | 0    | 0    | 0    |      |
| G02 | 932    | 0     | 27.01  | 0.325528 | 0       | 2                                   | 2    | 0    | 0    | 0    |      |
| G03 | 690    | 4     | 47.15  | 0.325104 | 1       | 1                                   | 3    | 0    | 0    | 0    |      |
| G04 | 913    | 1     | 27.67  | 0.475892 | 0       | 2                                   | 2    | 0    | 0    | 0    |      |
| G05 | 860    | 0     | 30.77  | 0.337206 | 0       | 2                                   | 2    | 0    | 0    | 0    |      |
| G06 | 719    | 1     | 49.81  | 0.302683 | 1       | 2                                   | 2    | 0    | 0    | 0    |      |
| G07 | 721    | 0     | 47.38  | 0.284408 | 0       | 1                                   | 1    | 0    | 0    | 0    |      |
| G08 | 777    | 0     | 46.47  | 0.310304 | 0       | 1                                   | 1    | 0    | 0    | 0    |      |



|     |     |    |       |          |   |   |   |   |   |   |
|-----|-----|----|-------|----------|---|---|---|---|---|---|
| G09 | 702 | 0  | 48.21 | 0.275277 | 2 | 2 | 3 | 0 | 0 | 0 |
| G10 | 681 | 0  | 46.89 | 0.313599 | 3 | 3 | 4 | 0 | 0 | 0 |
| G11 | 697 | 3  | 48.83 | 0.291985 | 0 | 1 | 2 | 0 | 0 | 0 |
| G12 | 832 | 0  | 44.22 | 0.311362 | 0 | 1 | 1 | 0 | 0 | 0 |
| G13 | 812 | 0  | 44.44 | 0.285507 | 1 | 1 | 1 | 0 | 0 | 0 |
| G14 | 924 | 0  | 28.50 | 0.356889 | 0 | 3 | 3 | 0 | 0 | 0 |
| G15 | 764 | 1  | 36.61 | 0.360591 | 0 | 2 | 2 | 0 | 0 | 0 |
| G16 | 865 | 2  | 32.54 | 0.365733 | 0 | 2 | 2 | 0 | 0 | 0 |
| G17 | 927 | 0  | 27.95 | 0.352462 | 0 | 1 | 1 | 0 | 0 | 0 |
| G18 | 786 | 14 | 34.50 | 0.436228 | 6 | 4 | 9 | 0 | 0 | 0 |
| G19 | 679 | 2  | 44.91 | 0.280734 | 0 | 1 | 1 | 0 | 0 | 0 |
| G20 | 820 | 0  | 45.54 | 0.328097 | 0 | 1 | 1 | 0 | 0 | 0 |
| G21 | 782 | 0  | 47.94 | 0.505418 | 0 | 2 | 2 | 0 | 0 | 0 |
| G22 | 708 | 0  | 45.69 | 0.538732 | 0 | 1 | 1 | 0 | 0 | 0 |
| G23 | 790 | 0  | 46.57 | 0.306046 | 0 | 1 | 1 | 0 | 0 | 0 |
| G25 | 801 | 0  | 45.67 | 0.298103 | 0 | 1 | 1 | 0 | 0 | 0 |
| G26 | 688 | 0  | 48.60 | 0.266254 | 0 | 1 | 1 | 0 | 0 | 0 |
| G27 | 813 | 0  | 46.60 | 0.233508 | 0 | 1 | 1 | 0 | 0 | 0 |
| G28 | 680 | 0  | 44.67 | 0.447239 | 0 | 1 | 1 | 0 | 0 | 0 |
| G29 | 817 | 0  | 45.38 | 0.265893 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 789 | 0  | 35.36 | 0.571957 | 2 | 5 | 5 | 0 | 0 | 0 |
| G31 | 928 | 0  | 28.37 | 0.348624 | 0 | 2 | 2 | 0 | 0 | 0 |

mean MP1 rms : 0.347010 m

total mean elevation : 40.78 degrees

# MP1 obs > 10 : 23570

# qc MP1 slips < 25 : 16

# Rvr L1 slips < 25 : 50

# Rvr L2 slips < 25 : 60

# qc MP1 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=%   | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-------|-----|------|-----|
| 85 - 90    | 202       | 0    | 0.197486 |       |     |      |     |
| 80 - 85    | 401       | 0    | 0.207522 |       |     |      |     |
| 75 - 80    | 868       | 0    | 0.198730 |       |     |      |     |
| 70 - 75    | 1105      | 0    | 0.210914 |       |     |      |     |
| 65 - 70    | 1291      | 0    | 0.201009 |       |     |      |     |
| 60 - 65    | 1295      | 0    | 0.203466 |       |     |      |     |
| 55 - 60    | 1390      | 0    | 0.215567 |       |     |      |     |
| 50 - 55    | 1282      | 0    | 0.218019 |       |     |      |     |
| 45 - 50    | 1657      | 0    | 0.225080 |       |     |      |     |
| 40 - 45    | 1703      | 0    | 0.263414 |       |     |      |     |
| 35 - 40    | 1618      | 0    | 0.283619 |       |     |      |     |
| 30 - 35    | 1670      | 0    | 0.327654 |       |     |      |     |
| 25 - 30    | 2322      | 0    | 0.346708 |       |     |      |     |
| 20 - 25    | 2035      | 0    | 0.425487 |       |     |      |     |
| 15 - 20    | 2366      | 4    | 0.522373 |       |     |      |     |
| 10 - 15    | 2337      | 12   | 0.614802 | #     |     |      |     |
| 5 - 10     | 25        | 1    | 0.602139 | ##### |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |       |     |      |     |
| < 0        | 0         | 0    | 0.000000 |       |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 702    | 1     | 49.41  | 0.298937 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G02 | 932    | 0     | 27.01  | 0.372097 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G03 | 690    | 4     | 47.15  | 0.441274 | 1       | 1    | 3    | 0    | 0    | 0    |      |
| G04 | 913    | 1     | 27.67  | 0.429944 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G05 | 860    | 0     | 30.77  | 0.393274 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G06 | 719    | 1     | 49.81  | 0.285807 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G07 | 721    | 0     | 47.38  | 0.314707 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G08 | 777    | 0     | 46.47  | 0.318269 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G09 | 702    | 0     | 48.21  | 0.384429 | 3       | 2    | 3    | 0    | 0    | 0    |      |
| G10 | 681    | 0     | 46.89  | 0.378151 | 3       | 3    | 4    | 0    | 0    | 0    |      |
| G11 | 697    | 3     | 48.83  | 0.373980 | 0       | 1    | 2    | 0    | 0    | 0    |      |
| G12 | 832    | 0     | 44.22  | 0.331367 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G13 | 812    | 0     | 44.44  | 0.420971 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G14 | 924    | 0     | 28.50  | 0.667650 | 0       | 3    | 3    | 0    | 0    | 0    |      |
| G15 | 764    | 1     | 36.61  | 0.480543 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G16 | 865    | 2     | 32.54  | 0.371430 | 0       | 2    | 2    | 0    | 0    | 0    |      |
| G17 | 927    | 0     | 27.95  | 0.510930 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G18 | 786    | 14    | 34.50  | 0.533197 | 7       | 4    | 9    | 0    | 0    | 0    |      |
| G19 | 679    | 2     | 44.91  | 0.350022 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G20 | 820    | 0     | 45.54  | 0.375413 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G21 | 782    | 0     | 47.94  | 0.382662 | 1       | 2    | 2    | 0    | 0    | 0    |      |
| G22 | 708    | 0     | 45.69  | 0.840605 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G23 | 790    | 0     | 46.57  | 0.353051 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G25 | 801    | 0     | 45.67  | 0.313546 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G26 | 688    | 0     | 48.60  | 0.334728 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G27 | 813    | 0     | 46.60  | 0.314377 | 0       | 1    | 1    | 0    | 0    | 0    |      |
| G28 | 680    | 0     | 44.67  | 0.446024 | 0       | 1    | 1    | 0    | 0    | 0    |      |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 817 | 0 | 45.38 | 0.379286 | 0 | 1 | 1 | 0 | 0 | 0 |
| G30 | 789 | 0 | 35.36 | 0.511564 | 2 | 5 | 5 | 0 | 0 | 0 |
| G31 | 928 | 0 | 28.37 | 0.346162 | 0 | 2 | 2 | 0 | 0 | 0 |

mean MP2 rms : 0.409664 m

total mean elevation : 40.78 degrees

# MP2 obs > 10 : 23570

# qc MP2 slips < 25 : 18

# Rvr L1 slips < 25 : 50

# Rvr L2 slips < 25 : 60

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slips | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|--------------|-----|-----|------|-----|
|------------|-----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 202 | 0 | 0.195969 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 401 | 0 | 0.201311 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 868 | 0 | 0.234187 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1105 | 0 | 0.298211 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1291 | 0 | 0.254920 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1295 | 0 | 0.260874 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1390 | 0 | 0.245089 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1282 | 0 | 0.261486 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1657 | 0 | 0.266138 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1703 | 0 | 0.294025 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1618 | 0 | 0.339942 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1670 | 0 | 0.356278 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 25 - 30 | 2322 | 0 | 0.358503 |  |  |  |
|---------|------|---|----------|--|--|--|

```

20 - 25 2035 0 0.441674 |||||
15 - 20 2366 6 0.561022 |||||
10 - 15 2337 12 0.863255 #|||
5 - 10 25 2 0.582502 #####=====
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 202 0.754 8.703 ###|||
80 - 85 401 0.620 8.716 ##|||
75 - 80 868 0.436 8.878 ##|||
70 - 75 1105 0.444 8.844 ##|||
65 - 70 1292 0.369 8.912 #|||
60 - 65 1296 0.378 8.904 ##|||
55 - 60 1392 0.469 8.787 ##|||
50 - 55 1283 0.552 8.535 ##|||
45 - 50 1657 0.425 8.164 ##|||
40 - 45 1703 0.286 8.041 #|||
35 - 40 1620 0.219 7.998 #|||
30 - 35 1670 0.354 7.898 #|||
25 - 30 2322 0.527 7.547 ##|||
20 - 25 2035 0.520 7.096 ##|||
15 - 20 2375 0.628 6.620 ###|||
10 - 15 2378 0.715 6.127 ###|||
5 - 10 27 1.289 5.741 #####|||
0 - 5 0 0.000 0.000
< 0 0 0.000 0.000

```

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean  | 0 5 | 1 0 |
|------------|------|-------|-------|-------|-----|-----|
| 85 - 90    | 202  | 0.845 | 7.248 | ###   |     |     |
| 80 - 85    | 401  | 0.767 | 7.117 | ###   |     |     |
| 75 - 80    | 868  | 0.601 | 7.164 | ##    |     |     |
| 70 - 75    | 1105 | 0.570 | 7.123 | ##    |     |     |
| 65 - 70    | 1292 | 0.561 | 7.094 | ##    |     |     |
| 60 - 65    | 1296 | 0.579 | 6.823 | ##    |     |     |
| 55 - 60    | 1392 | 0.601 | 6.662 | ##    |     |     |
| 50 - 55    | 1283 | 0.560 | 6.436 | ##    |     |     |
| 45 - 50    | 1657 | 0.585 | 6.115 | ##    |     |     |
| 40 - 45    | 1703 | 0.663 | 5.869 | ###   |     |     |
| 35 - 40    | 1620 | 0.648 | 5.454 | ###   |     |     |
| 30 - 35    | 1670 | 0.692 | 5.153 | ###   |     |     |
| 25 - 30    | 2322 | 0.728 | 4.868 | ###   |     |     |
| 20 - 25    | 2035 | 0.692 | 4.409 | ###   |     |     |
| 15 - 20    | 2370 | 0.838 | 4.099 | ###   |     |     |
| 10 - 15    | 2354 | 0.925 | 3.617 | ####  |     |     |
| 5 - 10     | 27   | 1.210 | 3.185 | ##### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |       |     |     |
| < 0        | 0    | 0.000 | 0.000 |       |     |     |

\*\*\*\*\*

QC of RINEX file(s) : vlsm1270.12o

input RnxNAV file(s) : vlsm1270.12n

\*\*\*\*\*

4-character ID : VLSM

Receiver type : LEICA GRX1200PRO (# = 462019) (fw = 7.53/2.125)

Antenna type : LEIAX1202 (# = 05470019)

Time of start of window : 2012 May 6 00:00:00.000

Time of end of window : 2012 May 6 23:59:30.000

Time line window length : 23.99 hour(s), ticked every 3.0 hour(s)

antenna WGS 84 (xyz) : 4699989.4421 1765579.5213 3921172.3992 (m)

antenna WGS 84 (geo) : N 38 deg 10' 36.65" E 20 deg 35' 20.38"

antenna WGS 84 (geo) : 38.176848 deg 20.588993 deg

WGS 84 height : 450.7104 m

[qc - header] position : 33.4659 m

Observation interval : 30.0000 seconds

Total satellites w/ obs : 31

NAVSTAR GPS SVs w/o OBS : 24

NAVSTAR GPS SVs w/o NAV :

Rx tracking capability : 12 SVs

Poss. # of obs epochs : 2880

Epochs w/ observations : 2880

Epochs repeated : 0 (0.00%)

Possible obs > 0.0 deg: 31018

Possible obs > 10.0 deg: 24788

Complete obs > 10.0 deg: 23510  
 Deleted obs > 10.0 deg: 6  
 Masked obs < 10.0 deg: 1272  
 Obs w/ SV duplication : 0 (within non-repeated epochs)  
 Moving average MP1 : 0.244415 m  
 Moving average MP2 : 0.338442 m  
 Points in MP moving avg : 50  
 Mean S1 S2 : 7.48 (sd=1.06 n=23516) 6.15 (sd=1.25 n=23510)  
 No. of Rx clock offsets : 0  
 Total Rx clock drift : 0.000000 ms  
 Rate of Rx clock drift : 0.000 ms/hr  
 Avg time between resets : Inf minute(s)  
 Freq no. and timecode : 2 11809 fffff  
 Report gap > than : 10.00 minute(s)  
 epochs w/ msec clk slip : 0  
 other msec mp events : 0 (: 20) {expect ~= 1:50}  
 IOD signifying a slip : >400.0 cm/minute  
 IOD slips < 10.0 deg\* : 0  
 IOD slips > 10.0 deg : 7  
 IOD or MP slips < 10.0\*: 0  
 IOD or MP slips > 10.0 : 10  
 \* or unknown elevation  
 first epoch last epoch hrs dt #expt #have % mp1 mp2 o/slps  
 SUM 12 5 6 00:00 12 5 6 23:59 24.00 30 24788 23510 95 0.24 0.34 2351

Processing parameters are:



Receiver tracking capability : 12 SVs  
Maximum ionospheric rate (L1) : 400.00 cm/min  
Report data gap greater than : 10.00 min  
Expected rms of MP1 multipath : 50.00 cm  
Expected rms of MP2 multipath : 65.00 cm  
Multipath slip sigma threshold : 4.00 cm  
% increase in MP rms for C/A | A/S : 100.00 %  
Points in MP moving averages : 50  
Minimum signal to noise for L1 : 0  
Minimum signal to noise for L2 : 0  
Elevation mask (cutoff) : 10.00 degrees  
Elevation comparison threshold : 25.00 degrees  
Orbit path spline fit sample time : 10 min  
SVs w/ code data for position try : 5  
Width of ASCII summary plot : 72  
Data indicators on summary plot : yes  
Do ionospheric observable : yes  
Do ionospheric derivative : yes  
Do high-pass ionosphere observable : no  
Do multipath observables : yes  
Do 1-ms receiver clock slips : yes  
Tolerance for 1-ms clock slips : 1.00e-02 ms  
Do receiver LLI slips : yes  
Do plot file(s) : yes

Observations start : 2012 May 6 00:00:00.000

Observations end : 2012 May 6 23:59:30.000

Observation interval : 30.0000 second(s)

SV #+hor <ele> #+mask <ele> #reprt #compl L1 L2 P1 P2 CA L2C

-----

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G01 | 862  | 41.45 | 743 | 47.29 | 741 | 741 | 741 | 741 | 0 | 741 | 741 | 0 |
| G02 | 1190 | 22.11 | 936 | 26.78 | 890 | 890 | 890 | 890 | 0 | 890 | 890 | 0 |
| G03 | 927  | 35.90 | 704 | 46.34 | 703 | 703 | 703 | 703 | 0 | 703 | 703 | 0 |
| G04 | 1173 | 22.54 | 917 | 27.45 | 831 | 831 | 831 | 831 | 0 | 831 | 831 | 0 |
| G05 | 1142 | 24.41 | 874 | 30.35 | 733 | 732 | 733 | 732 | 0 | 732 | 733 | 0 |
| G06 | 878  | 42.06 | 760 | 47.82 | 759 | 759 | 759 | 759 | 0 | 759 | 759 | 0 |
| G07 | 940  | 36.98 | 722 | 47.26 | 678 | 678 | 678 | 678 | 0 | 678 | 678 | 0 |
| G08 | 898  | 40.78 | 782 | 46.09 | 741 | 741 | 741 | 741 | 0 | 741 | 741 | 0 |
| G09 | 862  | 40.42 | 741 | 46.21 | 741 | 741 | 741 | 741 | 0 | 741 | 741 | 0 |
| G10 | 968  | 34.05 | 695 | 46.22 | 694 | 694 | 694 | 694 | 0 | 694 | 694 | 0 |
| G11 | 851  | 41.14 | 731 | 47.08 | 731 | 731 | 731 | 731 | 0 | 731 | 731 | 0 |
| G12 | 946  | 39.36 | 837 | 43.84 | 826 | 826 | 826 | 826 | 0 | 826 | 826 | 0 |
| G13 | 929  | 39.43 | 816 | 44.19 | 797 | 797 | 797 | 797 | 0 | 797 | 797 | 0 |
| G14 | 1180 | 23.24 | 926 | 28.28 | 883 | 883 | 883 | 883 | 0 | 883 | 883 | 0 |
| G15 | 1102 | 26.98 | 763 | 36.58 | 638 | 638 | 638 | 638 | 0 | 638 | 638 | 0 |
| G16 | 1139 | 25.87 | 872 | 32.25 | 698 | 695 | 698 | 695 | 0 | 695 | 698 | 0 |
| G17 | 1178 | 22.93 | 929 | 27.74 | 887 | 887 | 887 | 887 | 0 | 887 | 887 | 0 |
| G18 | 1145 | 25.30 | 844 | 32.50 | 798 | 798 | 798 | 798 | 0 | 798 | 798 | 0 |
| G19 | 1047 | 30.67 | 684 | 44.60 | 683 | 683 | 683 | 683 | 0 | 683 | 683 | 0 |
| G20 | 937  | 40.37 | 825 | 45.18 | 820 | 819 | 820 | 819 | 0 | 819 | 820 | 0 |
| G21 | 901  | 42.25 | 784 | 47.81 | 743 | 743 | 743 | 743 | 0 | 743 | 743 | 0 |
| G22 | 991  | 33.55 | 709 | 45.68 | 664 | 664 | 664 | 664 | 0 | 664 | 664 | 0 |
| G23 | 909  | 41.03 | 793 | 46.30 | 764 | 763 | 764 | 763 | 0 | 763 | 764 | 0 |
| G25 | 920  | 40.29 | 805 | 45.34 | 805 | 805 | 805 | 805 | 0 | 805 | 805 | 0 |
| G26 | 834  | 41.12 | 715 | 47.15 | 715 | 715 | 715 | 715 | 0 | 715 | 715 | 0 |

|     |      |       |     |       |     |     |     |     |   |     |     |   |
|-----|------|-------|-----|-------|-----|-----|-----|-----|---|-----|-----|---|
| G27 | 930  | 41.27 | 817 | 46.28 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |
| G28 | 1076 | 30.12 | 681 | 44.65 | 637 | 637 | 637 | 637 | 0 | 637 | 637 | 0 |
| G29 | 942  | 39.87 | 821 | 45.05 | 804 | 804 | 804 | 804 | 0 | 804 | 804 | 0 |
| G30 | 1099 | 26.88 | 795 | 35.16 | 626 | 626 | 626 | 626 | 0 | 626 | 626 | 0 |
| G31 | 1174 | 23.35 | 930 | 28.17 | 852 | 852 | 852 | 852 | 0 | 852 | 852 | 0 |
| G32 | 948  | 40.30 | 837 | 44.98 | 817 | 817 | 817 | 817 | 0 | 817 | 817 | 0 |

Obs below mask ( 10.00 deg) : 26

Obs above mask w/ no L1 : 0

Obs above mask w/ no L2 : 6

Obs above mask w/ no P1 | CA : 0

Obs above mask w/ no P2 | L2C : 6

Obs above mask w/ low L1 S/N : 0

Obs above mask w/ low L2 S/N : 0

Obs reported w/ code | phase : 23542

Obs deleted (any reason) : 32

Obs complete : 23510

No. of Rx clock offsets : 0

Total Rx clock drift : 0.000000 ms

Rate of Rx clock drift : 0.000000 ms/hr

| elev (deg) | tot slps | <ION rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 210 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 399 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 821 | 0 | 0.000000 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1121 | 0 | 0.000000 |  |  |  |
|---------|------|---|----------|--|--|--|



|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G10 | 694 | 0 | 46.38 | 0.237456 | 0 | 0 | 0 | 0 | 0 | 0 |
| G11 | 731 | 0 | 47.19 | 0.177654 | 0 | 0 | 0 | 0 | 0 | 0 |
| G12 | 826 | 0 | 44.37 | 0.163941 | 0 | 0 | 0 | 0 | 0 | 0 |
| G13 | 797 | 0 | 45.07 | 0.203834 | 0 | 0 | 0 | 0 | 0 | 0 |
| G14 | 883 | 0 | 29.07 | 0.306103 | 2 | 0 | 0 | 0 | 0 | 0 |
| G15 | 638 | 0 | 41.71 | 0.232141 | 0 | 0 | 0 | 0 | 0 | 0 |
| G16 | 698 | 3 | 36.90 | 0.356530 | 0 | 0 | 0 | 0 | 0 | 0 |
| G17 | 887 | 0 | 28.49 | 0.312859 | 1 | 0 | 0 | 0 | 0 | 0 |
| G18 | 798 | 0 | 33.62 | 0.342943 | 2 | 0 | 0 | 0 | 0 | 0 |
| G19 | 683 | 0 | 44.76 | 0.223868 | 0 | 0 | 0 | 0 | 0 | 0 |
| G20 | 820 | 1 | 45.53 | 0.163030 | 0 | 0 | 0 | 0 | 0 | 0 |
| G21 | 743 | 0 | 49.79 | 0.319717 | 1 | 0 | 0 | 0 | 0 | 0 |
| G22 | 664 | 0 | 47.89 | 0.223912 | 0 | 0 | 0 | 0 | 0 | 0 |
| G23 | 764 | 1 | 47.74 | 0.198809 | 0 | 0 | 0 | 0 | 0 | 0 |
| G25 | 805 | 0 | 45.44 | 0.175395 | 0 | 0 | 0 | 0 | 0 | 0 |
| G26 | 715 | 0 | 47.26 | 0.197935 | 0 | 0 | 0 | 0 | 0 | 0 |
| G27 | 817 | 0 | 46.38 | 0.279458 | 1 | 0 | 0 | 0 | 0 | 0 |
| G28 | 637 | 0 | 46.79 | 0.220757 | 0 | 0 | 0 | 0 | 0 | 0 |
| G29 | 804 | 0 | 45.87 | 0.188133 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 626 | 0 | 41.44 | 0.260652 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 852 | 0 | 29.62 | 0.240945 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 817 | 0 | 45.79 | 0.161484 | 1 | 0 | 0 | 0 | 0 | 0 |

mean MP1 rms : 0.244416 m

total mean elevation : 41.98 degrees

# MP1 obs > 10 : 23510

# qc MP1 slips < 25 : 11

# Rvr L1 slips < 25 : 0

```

# Rvr L2 slips < 25 : 0
# qc MP1 slips > 25 : 0
# Rvr L1 slips > 25 : 0
# Rvr L2 slips > 25 : 0

```

| elev (deg) | tot slips | <MP1 | rms, m>  | 5=% | 1 m | 15=% | 2 m |
|------------|-----------|------|----------|-----|-----|------|-----|
| 85 - 90    | 210       | 0    | 0.078689 |     |     |      |     |
| 80 - 85    | 399       | 0    | 0.096983 |     |     |      |     |
| 75 - 80    | 821       | 0    | 0.097934 |     |     |      |     |
| 70 - 75    | 1121      | 0    | 0.106074 |     |     |      |     |
| 65 - 70    | 1451      | 0    | 0.124201 |     |     |      |     |
| 60 - 65    | 1391      | 0    | 0.121391 |     |     |      |     |
| 55 - 60    | 1467      | 0    | 0.129024 |     |     |      |     |
| 50 - 55    | 1361      | 0    | 0.132302 |     |     |      |     |
| 45 - 50    | 1714      | 0    | 0.166852 |     |     |      |     |
| 40 - 45    | 1773      | 0    | 0.161547 |     |     |      |     |
| 35 - 40    | 1684      | 0    | 0.169125 |     |     |      |     |
| 30 - 35    | 1716      | 0    | 0.210783 |     |     |      |     |
| 25 - 30    | 2394      | 0    | 0.239887 |     |     |      |     |
| 20 - 25    | 2100      | 0    | 0.316165 |     |     |      |     |
| 15 - 20    | 2136      | 5    | 0.392439 |     |     |      |     |
| 10 - 15    | 1743      | 6    | 0.567586 |     |     |      |     |
| 5 - 10     | 24        | 0    | 0.406954 |     |     |      |     |
| 0 - 5      | 0         | 0    | 0.000000 |     |     |      |     |
| < 0        | 0         | 0    | 0.000000 |     |     |      |     |

MP2 RMS summary (per SV):

slips L1 rx L2 rx slips L1 rx L2 rx

| SV  | obs>10 | # del | <elev> | MP2      | rms [m] | < 25 | < 25 | < 25 | > 25 | > 25 | > 25 |
|-----|--------|-------|--------|----------|---------|------|------|------|------|------|------|
| G01 | 741    | 0     | 47.50  | 0.224055 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G02 | 890    | 0     | 27.55  | 0.300148 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G03 | 703    | 0     | 46.44  | 0.259625 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G04 | 831    | 0     | 29.01  | 0.466402 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G05 | 733    | 1     | 33.68  | 0.553506 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G06 | 759    | 0     | 47.90  | 0.210298 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G07 | 678    | 0     | 49.58  | 0.209911 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G08 | 741    | 0     | 48.02  | 0.210776 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G09 | 741    | 0     | 46.32  | 0.370901 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G10 | 694    | 0     | 46.38  | 0.416700 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G11 | 731    | 0     | 47.19  | 0.261447 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G12 | 826    | 0     | 44.37  | 0.229658 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G13 | 797    | 0     | 45.07  | 0.254603 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G14 | 883    | 0     | 29.07  | 1.052918 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G15 | 638    | 0     | 41.71  | 0.416189 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G16 | 698    | 3     | 36.90  | 0.289075 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G17 | 887    | 0     | 28.49  | 0.439049 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G18 | 798    | 0     | 33.62  | 0.391927 | 2       | 0    | 0    | 0    | 0    | 0    | 0    |
| G19 | 683    | 0     | 44.76  | 0.235187 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G20 | 820    | 1     | 45.53  | 0.232091 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G21 | 743    | 0     | 49.79  | 0.442052 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G22 | 664    | 0     | 47.89  | 0.317216 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G23 | 764    | 1     | 47.74  | 0.212511 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G25 | 805    | 0     | 45.44  | 0.197909 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G26 | 715    | 0     | 47.26  | 0.390806 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |
| G27 | 817    | 0     | 46.38  | 0.449332 | 1       | 0    | 0    | 0    | 0    | 0    | 0    |
| G28 | 637    | 0     | 46.79  | 0.268004 | 0       | 0    | 0    | 0    | 0    | 0    | 0    |

|     |     |   |       |          |   |   |   |   |   |   |
|-----|-----|---|-------|----------|---|---|---|---|---|---|
| G29 | 804 | 0 | 45.87 | 0.249067 | 0 | 0 | 0 | 0 | 0 | 0 |
| G30 | 626 | 0 | 41.44 | 0.202943 | 0 | 0 | 0 | 0 | 0 | 0 |
| G31 | 852 | 0 | 29.62 | 0.362986 | 0 | 0 | 0 | 0 | 0 | 0 |
| G32 | 817 | 0 | 45.79 | 0.219195 | 1 | 0 | 0 | 0 | 0 | 0 |

mean MP2 rms : 0.338443 m

total mean elevation : 41.98 degrees

# MP2 obs > 10 : 23510

# qc MP2 slips < 25 : 9

# Rvr L1 slips < 25 : 0

# Rvr L2 slips < 25 : 0

# qc MP2 slips > 25 : 0

# Rvr L1 slips > 25 : 0

# Rvr L2 slips > 25 : 0

| elev (deg) | tot slps | <MP2 rms, m> | 5=% | 1 m | 15=% | 2 m |
|------------|----------|--------------|-----|-----|------|-----|
|------------|----------|--------------|-----|-----|------|-----|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 85 - 90 | 210 | 0 | 0.109460 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 80 - 85 | 399 | 0 | 0.152744 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |     |   |          |  |  |  |
|---------|-----|---|----------|--|--|--|
| 75 - 80 | 821 | 0 | 0.140671 |  |  |  |
|---------|-----|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 70 - 75 | 1121 | 0 | 0.159050 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 65 - 70 | 1451 | 0 | 0.170690 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 60 - 65 | 1391 | 0 | 0.176647 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 55 - 60 | 1467 | 0 | 0.159201 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 50 - 55 | 1361 | 0 | 0.189618 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 45 - 50 | 1714 | 0 | 0.193305 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 40 - 45 | 1773 | 0 | 0.201521 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 35 - 40 | 1684 | 0 | 0.233494 |  |  |  |
|---------|------|---|----------|--|--|--|

|         |      |   |          |  |  |  |
|---------|------|---|----------|--|--|--|
| 30 - 35 | 1716 | 0 | 0.265730 |  |  |  |
|---------|------|---|----------|--|--|--|



```

25 - 30 2394 0 0.285163 |||||
20 - 25 2100 0 0.356399 |||||
15 - 20 2136 4 0.686211 |||||||||
10 - 15 1743 5 0.875688 |||||||||
5 - 10 24 0 1.023590 |||||||||
0 - 5 0 0 0.000000
< 0 0 0 0.000000

```

S/N L1 summary (per elevation bin):

```

elev (deg) tot SN1 sig mean          0|5          1|0
85 - 90 210 0.830 8.219 ###|||
80 - 85 399 0.804 8.273 ###|||
75 - 80 821 0.644 8.420 ###|||
70 - 75 1121 0.579 8.450 ##|||
65 - 70 1452 0.557 8.514 ##|||
60 - 65 1392 0.549 8.438 ##|||
55 - 60 1469 0.525 8.255 ##|||
50 - 55 1362 0.472 8.051 ##|||
45 - 50 1714 0.454 7.892 ##|||
40 - 45 1773 0.453 7.824 ##|||
35 - 40 1686 0.547 7.708 ##|||
30 - 35 1716 0.709 7.467 ###|||
25 - 30 2394 0.674 6.955 ###|||
20 - 25 2100 0.716 6.619 ###|||
15 - 20 2141 0.771 6.156 ###|||
10 - 15 1766 0.745 5.730 ###|||
5 - 10 26 1.303 5.462 #####|||
0 - 5 0 0.000 0.000

```

< 0 0 0.000 0.000

S/N L2 summary (per elevation bin):

| elev (deg) | tot  | SN2   | sig   | mean | 0 5 | 1 0 |
|------------|------|-------|-------|------|-----|-----|
| 85 - 90    | 210  | 0.685 | 7.724 | ###  |     |     |
| 80 - 85    | 399  | 0.594 | 7.697 | ##   |     |     |
| 75 - 80    | 821  | 0.542 | 7.658 | ##   |     |     |
| 70 - 75    | 1121 | 0.538 | 7.604 | ##   |     |     |
| 65 - 70    | 1452 | 0.534 | 7.438 | ##   |     |     |
| 60 - 65    | 1392 | 0.520 | 7.358 | ##   |     |     |
| 55 - 60    | 1469 | 0.502 | 7.210 | ##   |     |     |
| 50 - 55    | 1362 | 0.474 | 6.974 | ##   |     |     |
| 45 - 50    | 1714 | 0.529 | 6.614 | ##   |     |     |
| 40 - 45    | 1773 | 0.541 | 6.405 | ##   |     |     |
| 35 - 40    | 1686 | 0.618 | 6.100 | ##   |     |     |
| 30 - 35    | 1716 | 0.595 | 5.728 | ##   |     |     |
| 25 - 30    | 2394 | 0.612 | 5.410 | ##   |     |     |
| 20 - 25    | 2100 | 0.679 | 5.016 | ###  |     |     |
| 15 - 20    | 2137 | 0.749 | 4.688 | ###  |     |     |
| 10 - 15    | 1764 | 0.820 | 4.208 | ###  |     |     |
| 5 - 10     | 26   | 0.992 | 4.231 | #### |     |     |
| 0 - 5      | 0    | 0.000 | 0.000 |      |     |     |
| < 0        | 0    | 0.000 | 0.000 |      |     |     |