



Compte-rendu de mission. Acquisition de données Lidar par drone. Mission du 22/02/2019 – Labarre, Foix (09)

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HAL Id: hal-04269824

<https://hal.science/hal-04269824>

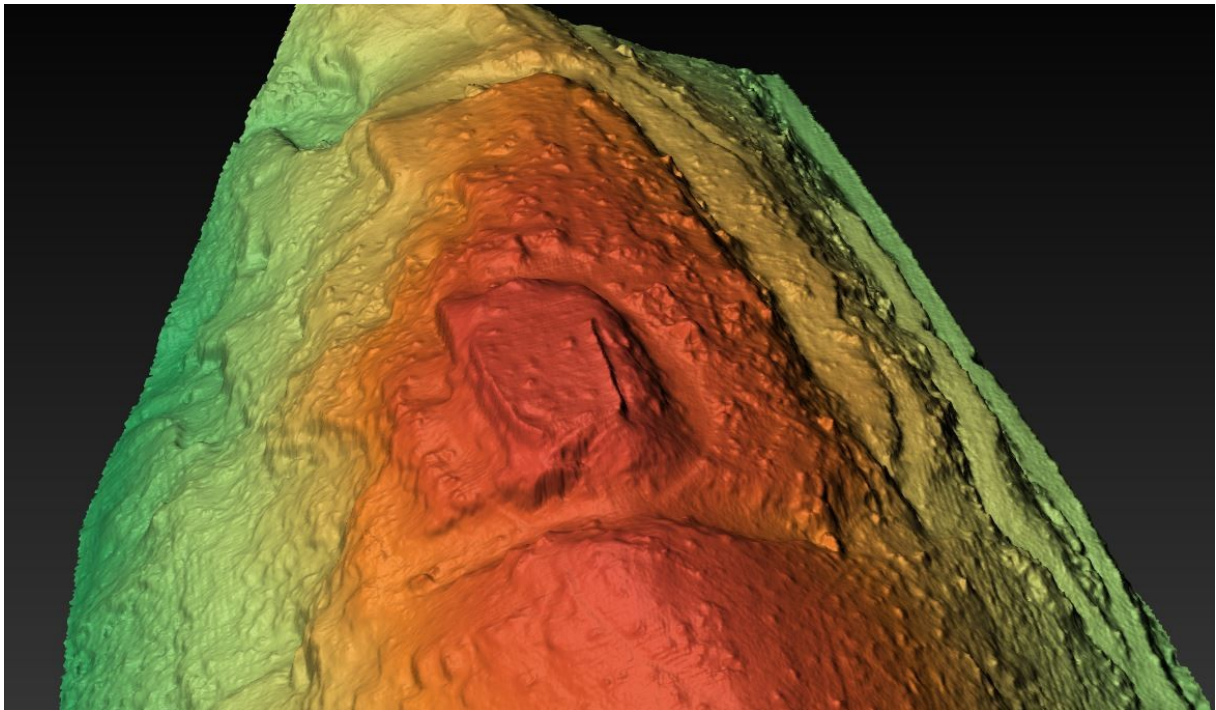
Submitted on 3 Nov 2023

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Commune de Foix (09), site de Labarre Acquisition de données Lidar par drone

Mission du 22/02/2019



TRAVAUX
ET RECHERCHES
ARCHÉOLOGIQUES
SUR
LES ESPACES,
LES CULTURES
ET LES SOCIÉTÉS

Compte-rendu de mission Acquisition de données Lidar par drone

Mission du 22/02/2019 – Labarre, Foix (09)

N. Poirier, C. Calastrenc

1. Objectif et contexte

La mission d'acquisition de données Lidar par drone du 22/02/2019 a été réalisée sur la commune de Foix (09), au lieu-dit Labarre, sur l'emprise d'une forêt.

L'objectif était de réaliser le relevé tridimensionnel de la plateforme fossoyée abritant les vestiges du Castella de Labarre.

Le contexte topographique et végétal est celui d'une petite forêt située sur une colline escarpée au bord de l'Ariège.

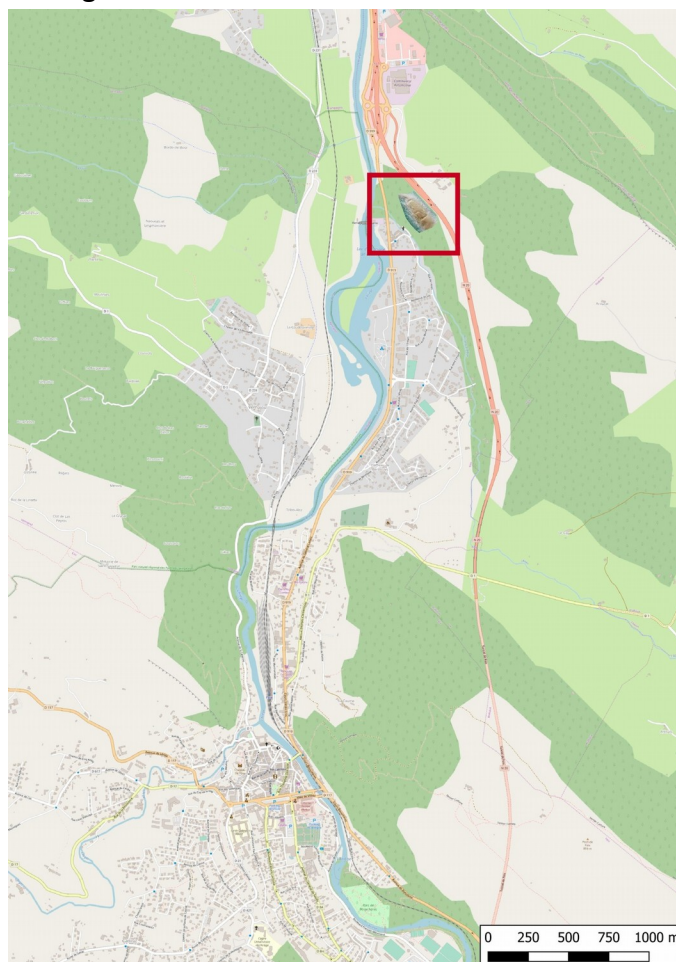


Figure 1-Labarre, Foix (09)- Mission du 22/02/2019 - Localisation de la zone couverte par les 2 vols Lidar par drone

2. Conditions de vol

La réalisation de 2 vols de 10 à 12 minutes chacun a permis de couvrir une surface d'environ 3 ha à une hauteur constante de 50m par rapport au point le plus haut de la colline et à une vitesse moyenne de 4m/s.

Les 2 vols ont couvert la même surface dans des directions perpendiculaires.

3. Traitement des nuages de points

3.1. Correction GPS et assemblage

Les données issues de ces vols ont été corrigées des imprécisions GPS selon la procédure intégrée aux données des bornes GPS de l'IGN (disponibles gratuitement sur le site www.rgp.ign.fr) et au logiciel PosPac¹. (Cf les 2 rapports de correction différentielle extraits du logiciel PosPac). Après cette correction, la précision du positionnement atteint moins de 1 cm en X et Y et moins de 2 cm en Z, ce qui est tout à fait satisfaisant.

Les points issus des deux vols ont été combinés dans un seul fichier comprenant 4 747 931 points, soit une moyenne de 148 pts/m² avant filtrage des points sols.

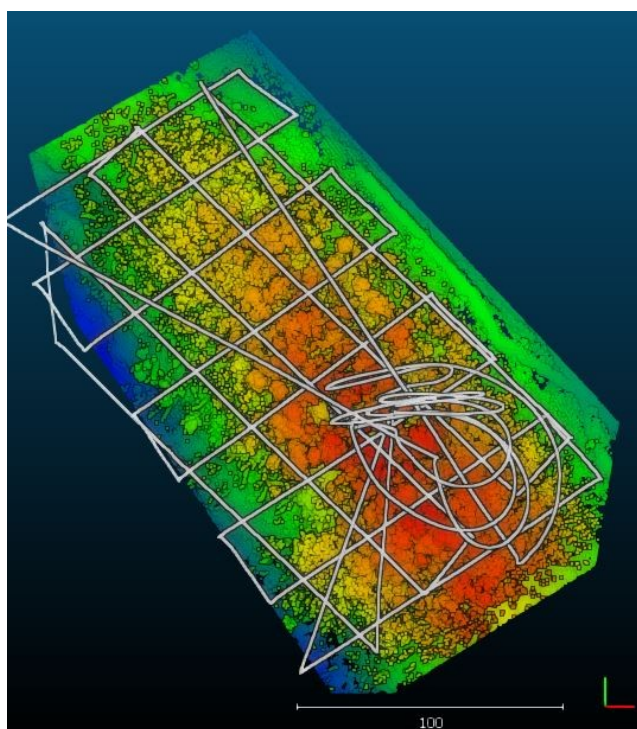
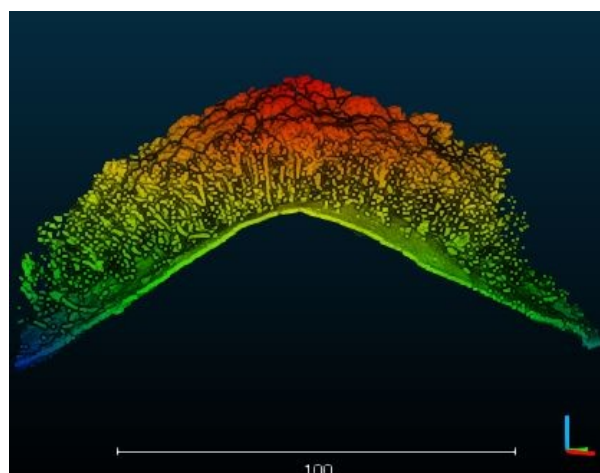
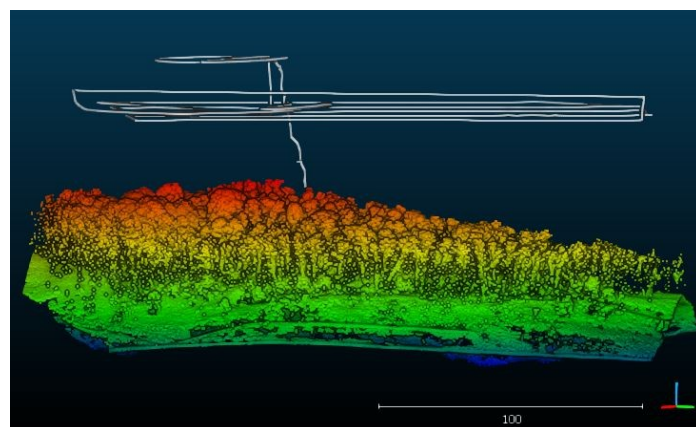


Figure 2- Labarre, Foix (09)- Mission du 22/02/2019 - Nuage de points total



1 <https://www.applanix.com/products/pospac-mms.htm>

3.2. Extraction des points sols

Les points sols ont été extraits en utilisant le plugin CSF² implémenté dans CloudCompare³ avec les paramètres suivants :

- Cloth resolution : 0.5
- Max iterations : 1000
- Classification threshold : 0.3

Les points sols obtenus sont au nombre de 2 632 038, soit environ 82 pts/m² en moyenne.

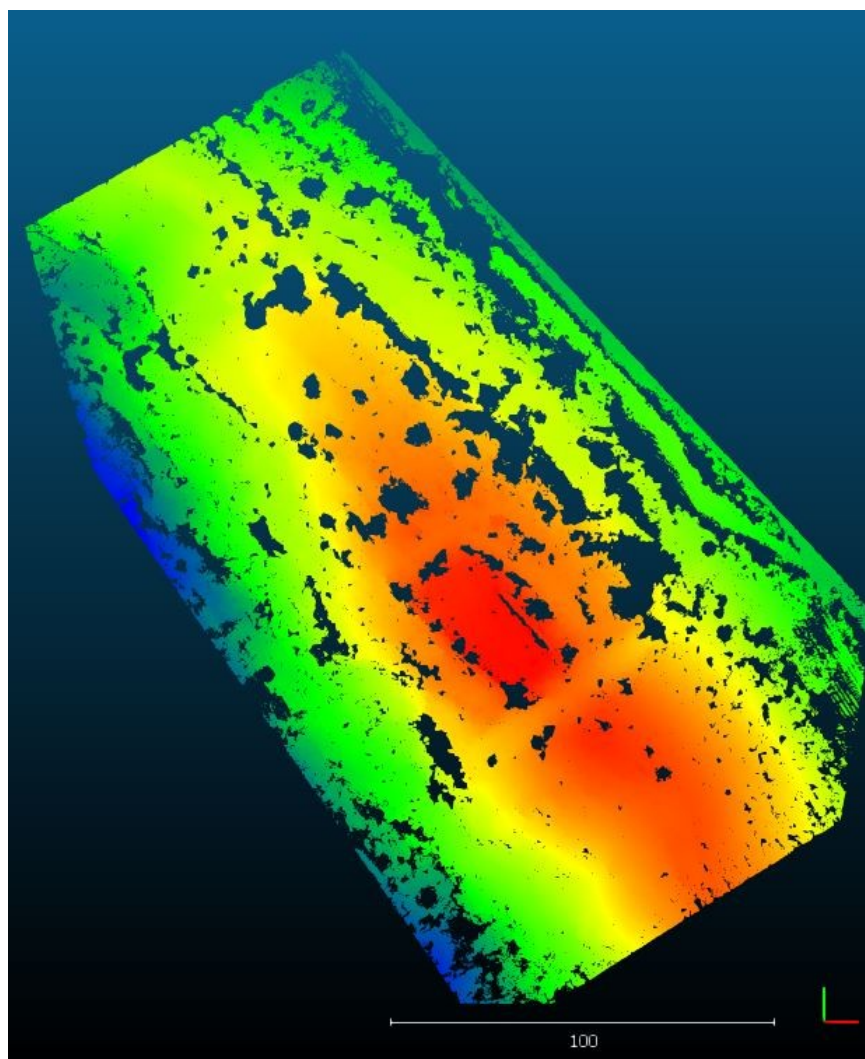


Figure 3- Labarre, Foix (09)- Mission du 22/02/2019 - Nuage de points sol

On constate la présence de « trous » dans la répartition des points-sols, qui sont liés à la présence de tas de bois, aux aplombs rocheux ayant créé des masques dans la couverture malgré la réalisation de vols croisés, et à certaines essences persistantes (buis). Il faudra bien garder à l'esprit l'existence de ces « trous » au moment d'interpréter les résultats.

² Zhang W, Qi J, Wan P, Wang H, Xie D, Wang X, Yan G. An Easy-to-Use Airborne LiDAR Data Filtering Method Based on Cloth Simulation. *Remote Sensing*. 2016; 8(6):501.

³ <https://www.danielgm.net/cc/>

4. Génération des MNT ombrés

Toujours dans CloudCompare, avec l'outil Raster, un Modèle Numérique de Terrain (MNT) d'une résolution de 25 cm a été généré en ne prenant en compte que les points sols.

Ce modèle a été optimisé en suivant la procédure décrite par Volker Wichmann⁴ pour un lissage avec le logiciel SagaSig⁵, dont voici les caractéristiques :

1. Grid-Filter => DTM Filter (slope based)
 - 1.1. Search Radius : 10
 - 1.2. Terrain Slope : 30
2. Grid - Spline Interpolation => Multilevel B-Spline Interpolation (from Grid)
3. Grid - Filter => Multi Direction Lee Filter
4. Close gap
5. Terrain Analysis - Lighting, Visibility => Analytical Hillshading
 - 5.1. Azimuth : 315
 - 5.2. Declination : 45
 - 5.3. Exaggeration : 4

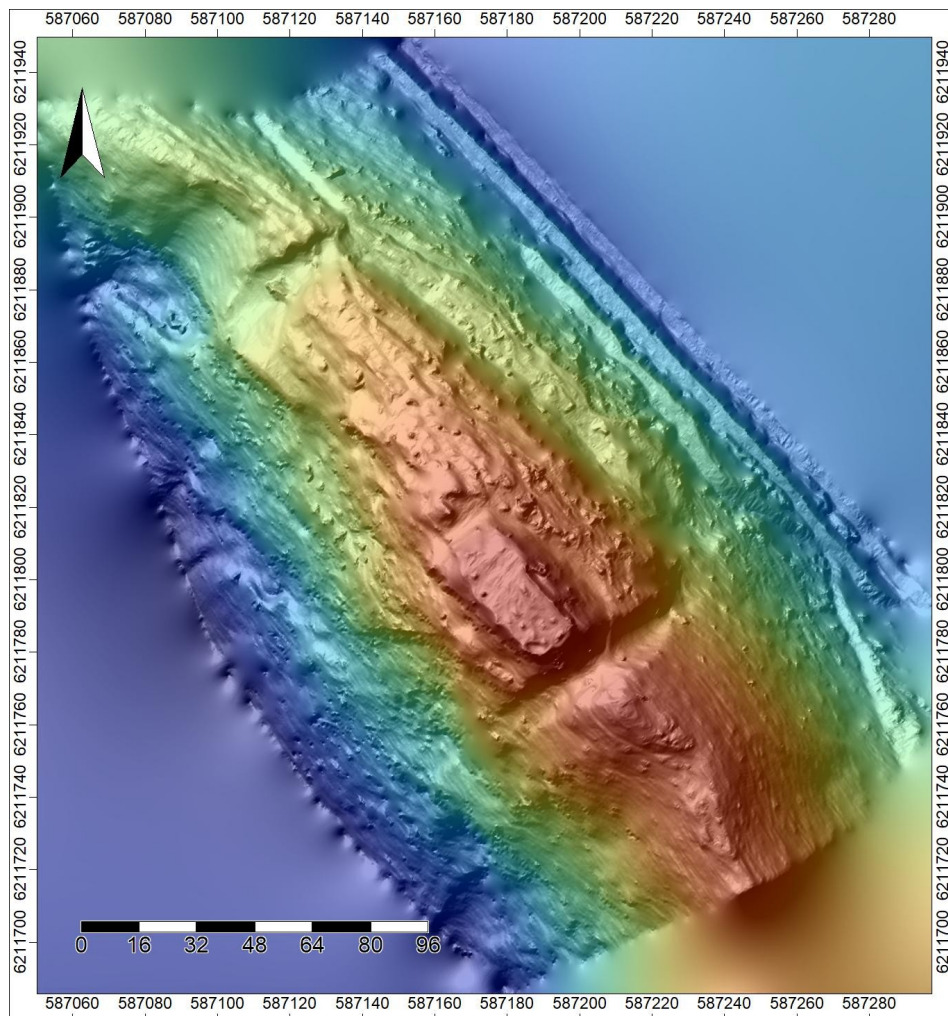


Figure 4 - Labarre, Foix (09)- Mission du 22/02/2019 - MNT ombré dans Saga GIS

4 Wichmann, V.; Conrad, O.; Jochem, A.: LiDAR Point Cloud Processing with SAGA GIS, In: *Hamburger Beiträge zur Physischen Geographie und Landschaftsökologie* 20, S. 81-90, <https://slidex.tips/download/lidar-point-cloud-processing-with>

5 <http://www.saga-gis.org/en/index.html>

Avec le logiciel RVT (Relief Visualization Toolbox⁶) développé par l'Institute of Anthropological and Spatial Studies du ZRC-SAZU (Slovénie), il est possible d'appliquer plusieurs traitements au MNT ainsi produit :

- Ombrage : simulation d'un éclairage et des ombrages correspondants selon une direction et un azimuth défini par l'opérateur
- Ombrages cumulés depuis des directions différentes
- Analyse en Composantes Principales (ACP) de l'ombrage
- Gradient de pente
- Modèle de relief local (SLRM) : suppression des grandes tendances de la topographie du terrain au profit de l'accentuation des micro-reliefs (locaux)
- Sky-view factor : mesure du pourcentage de ciel visible depuis chaque pixel du modèle
- Degrés d'Ouverture positive et négative : met en évidence les zones convexes et les zones concaves (creux et bosses)

Ces différents traitements permettent de multiplier les visions du même espace et de mieux identifier les indicateurs archéologiques. Nous livrons ci-après les visualisations les plus efficaces.

⁶ <https://iaps.zrc-sazu.si/en/rvt#v>



Figure 5 - Labarre, Foix (09)- Mission du 22/02/2019 - Multihilshade - 16 directions - 35 degrés



Figure 6 - Labarre, Foix (09)- Mission du 22/02/2019 - Openness Negative - Rayon 10 - 16 directions



Figure 7 - Labarre, Foix (09)- Mission du 22/02/2019 - Openness Positive _ Rayon 10- 16 directions



Figure 8 - Labarre, Foix (09)- Mission du 22/02/2019 - Slope



Figure 9 - Labarre, Foix (09)- Mission du 22/02/2019 - Simple Local Relief Modelling - Rayon 20

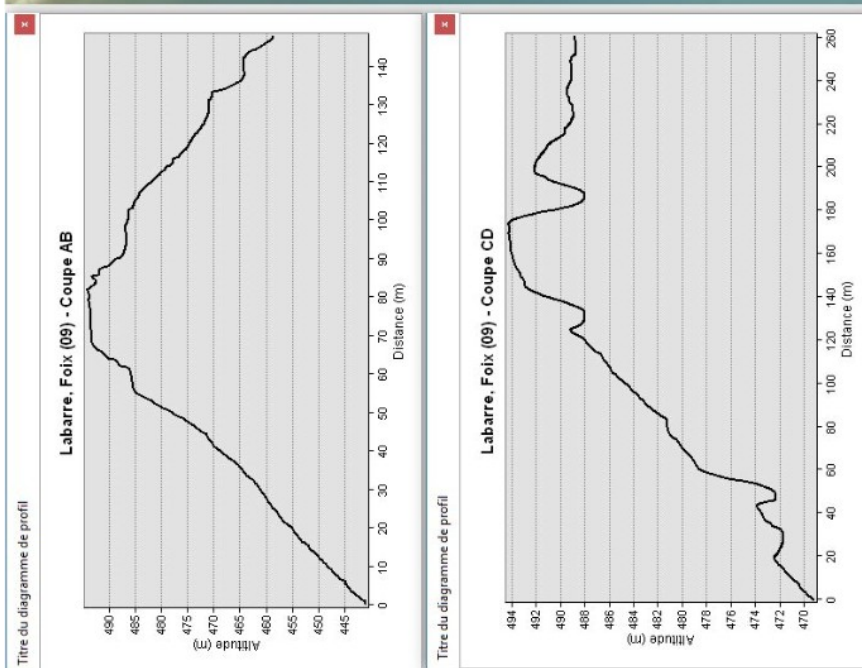


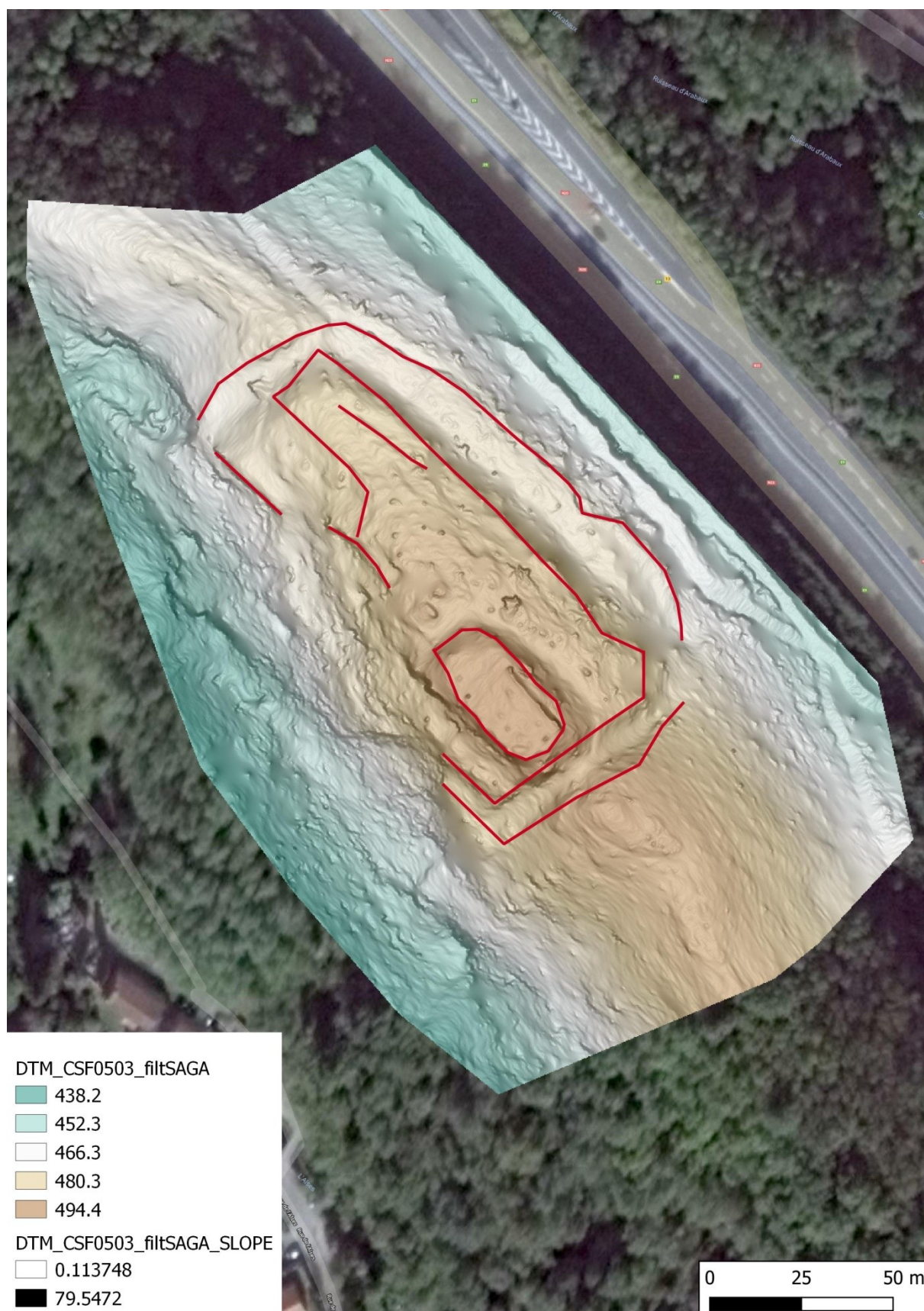
Figure 10 - Labarre, Foix (09)- Mission du 22/02/2019 - SVF - Rayon 10 16 directions

5. Interprétation

Nous laissons le soin aux chercheurs investis scientifiquement sur ce site de proposer des interprétations fines des images produites. Signalons d'emblée que l'analyse détaillée de ces images ne nous semble pas révéler de micro-reliefs susceptibles de témoigner de la présence d'éventuels vestiges enfouis, ni d'aménagements anthropiques autres que ceux déjà connus antérieurement.

Nous nous contenterons ici de produire des coupes topographiques utiles à ces interprétations et à souligner quelques ruptures topographiques qui semblent avoir été accentuées par l'action humaine : plateforme sommitale (donjon ?), basse-cour et fossés barrant l'éperon au Nord-Ouest et Sud-Ouest.





General Information

Mission Information

Project name	Labarre_vol1_MSGTstation
Processing date	2019-02-26 14:55:06
Mission date	2019-02-22 09:27:01
Mission duration	00:12:00.985
Processing mode	IN-Fusion Single Base
GPS Station	MSGT

Rover Hardware Information

Product	APX 15 AVX 210 VER0 174
Serial number	S/N001
IMU type	59
Receiver type	APX-15v3
Antenna type	AV14

Project File List

Rover Data Files

File name	File type
YS-20190222-092637.T04	T04 Rover Data

Input Files

File Name	File type
Ephm0530.19g	GLONASS Broadcast Ephemeris
Ephm0530.19n	GPS Broadcast Ephemeris
msgt053z.19o	GNSS SingleBase

Output Files

Filename	File type
sbet_Mission 1.out	SBET Trajectory File
export_Mission 1.txt	ASCII Export Output

Rover Data Summary

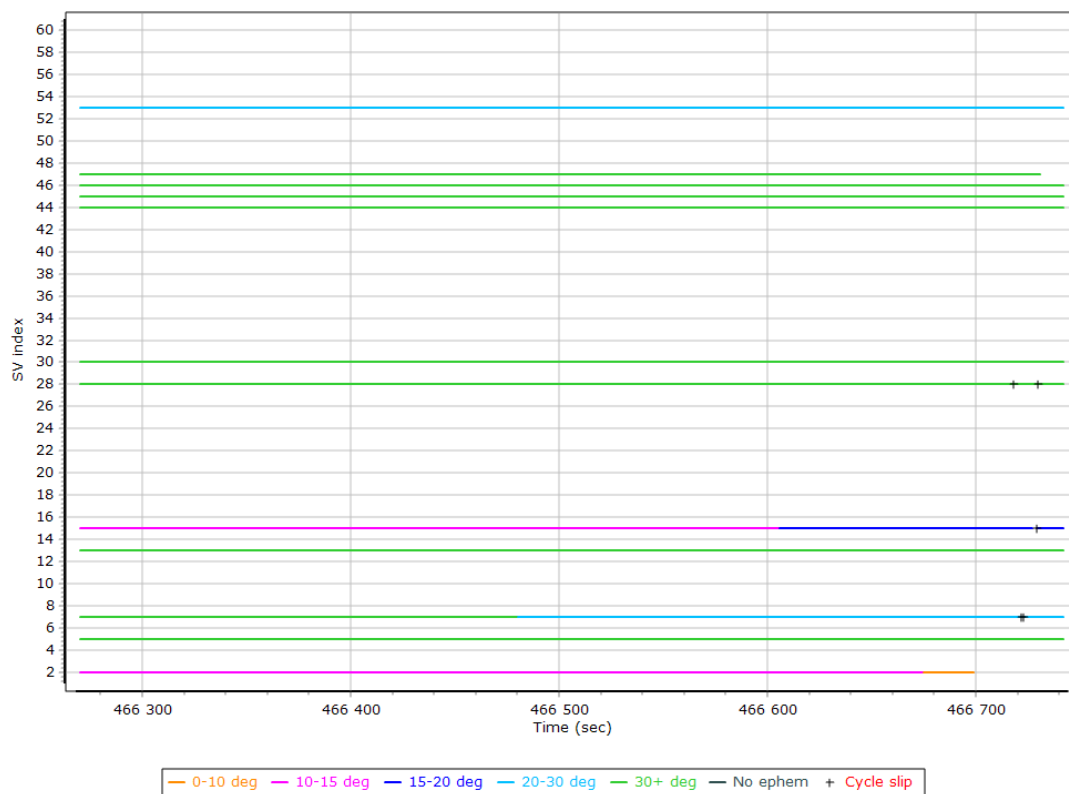
First raw data file	YS-20190222-092637.T04		
Last raw data file	YS-20190222-092637.T04		
Start GPS week	2041		
Start time	466021.000 (2/22/2019 9:27:01 AM)		
End time	466742.000 (2/22/2019 9:39:02 AM)		
Start of fine alignment	466209.800 (2/22/2019 9:30:09 AM)		
Available subsystems	Primary GNSS, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Reference to IMU lever arm [m]	-0.013	0.108	-0.007
Reference to IMU mounting angles [deg]	0.000	0.000	0.000
Reference to Primary GNSS lever arm [m]	0.006	0.218	-0.435
Reference to Primary GNSS lever arm std dev [m]	0.020		
Aircraft to Reference mounting angles [deg]	0.000	0.000	0.000

Raw Data QC

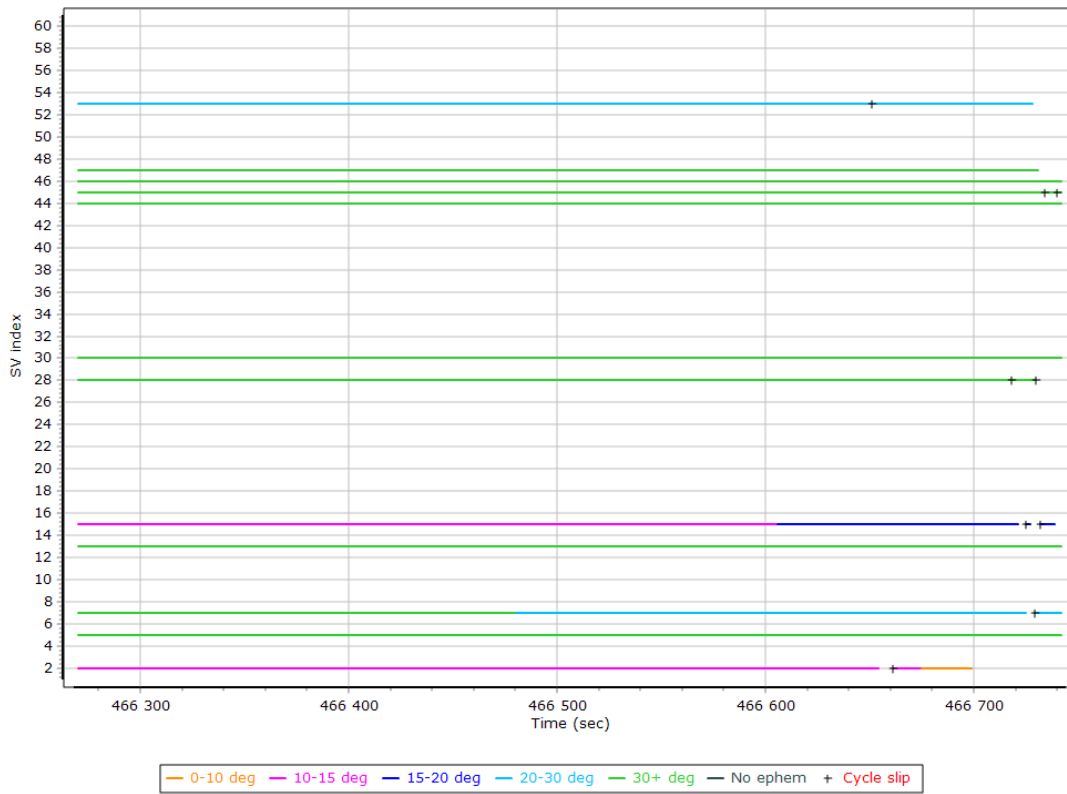
Raw IMU Import QC Summary

IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_Mission 1.log
IMU Records Processed	144225
Termination Status	Normal
IMU Anomalies	0

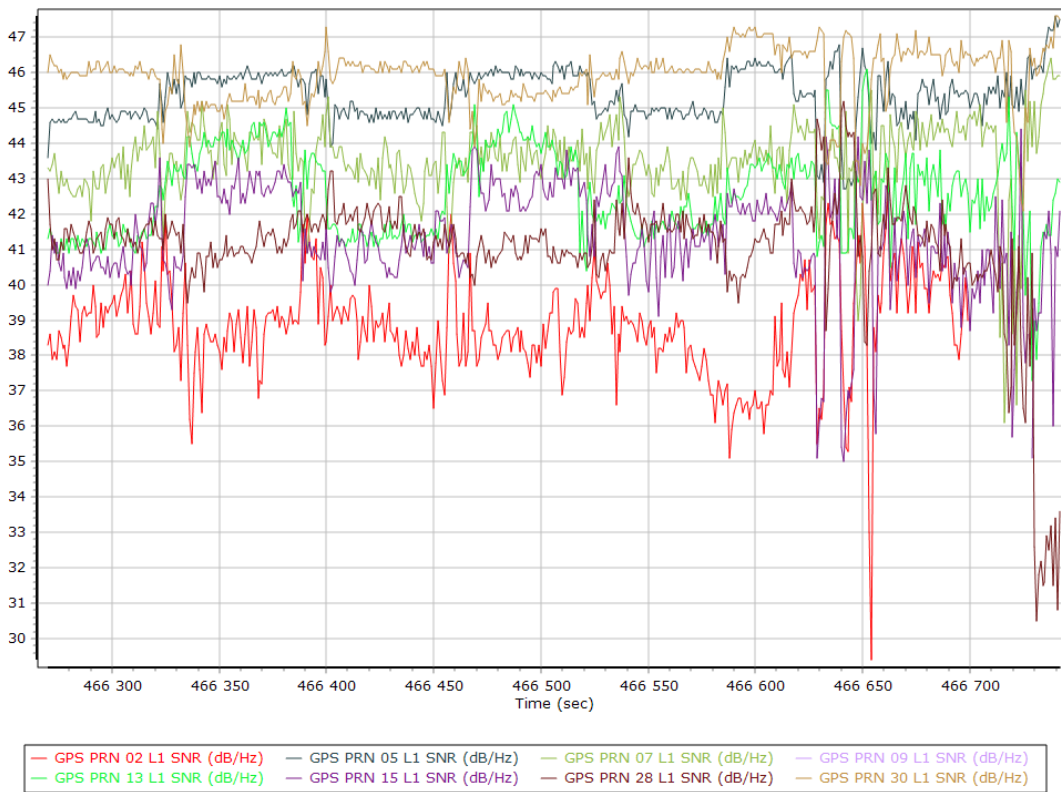
L1 Satellite Lock/Elevation



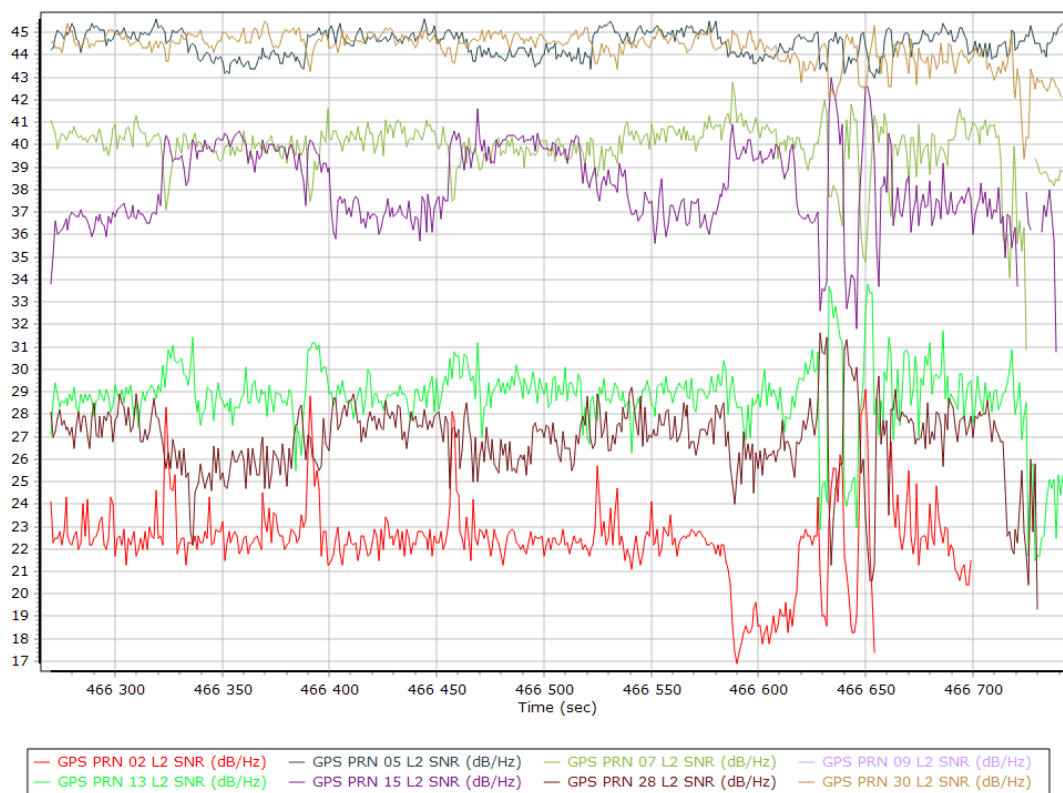
L2 Satellite Lock/Elevation



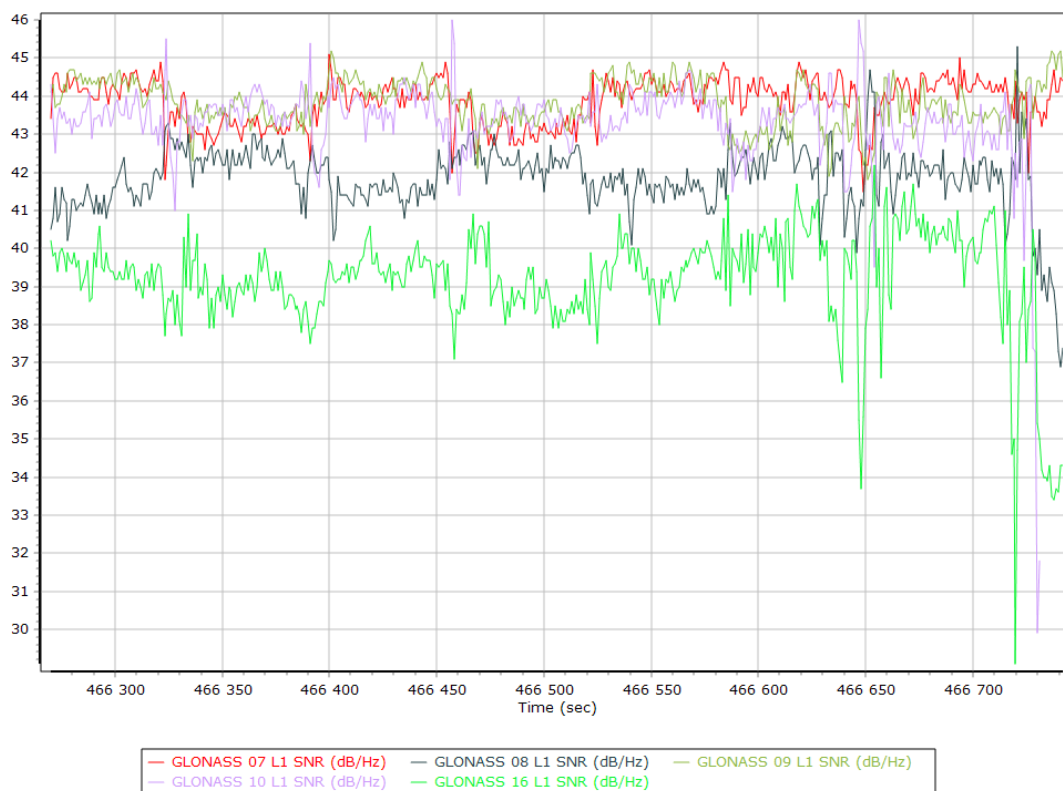
GPS L1 SNR



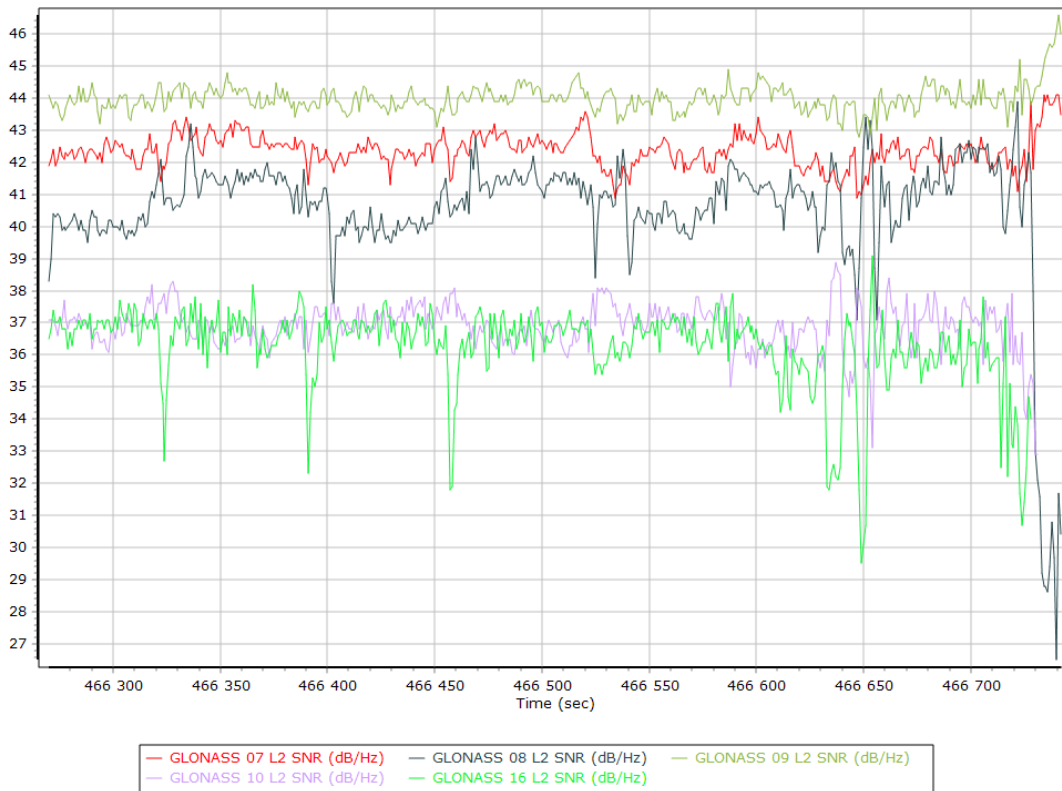
GPS L2 SNR



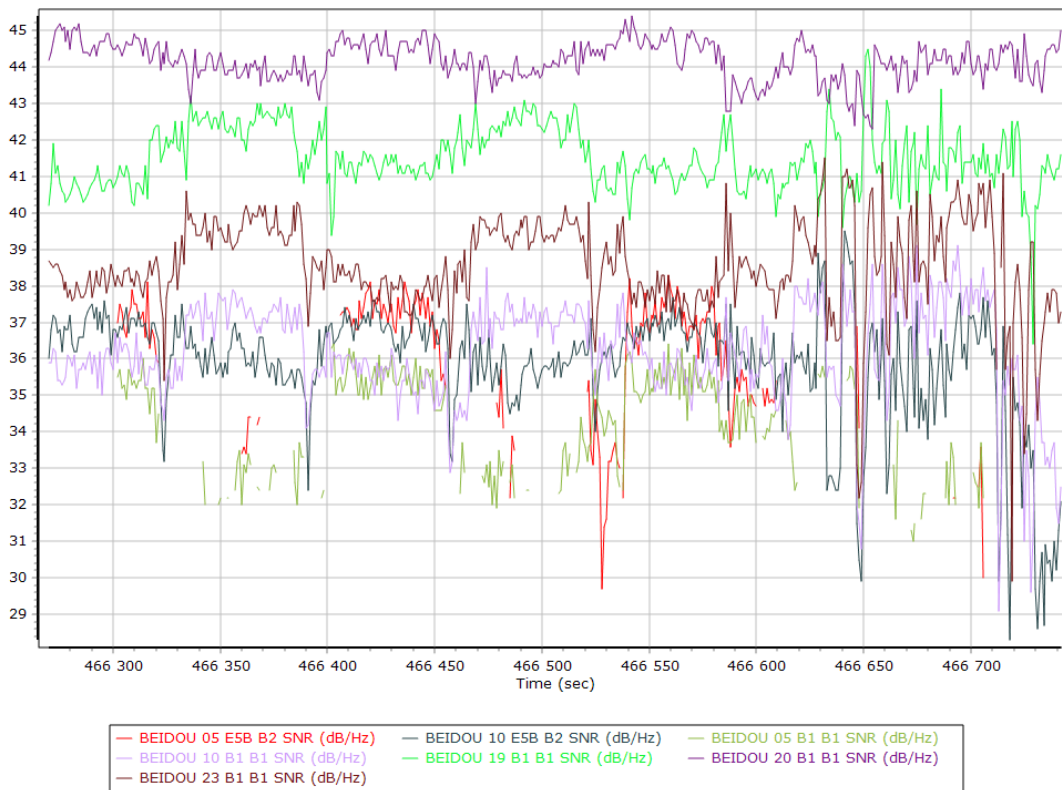
GLONASS L1 SNR



GLONASS L2 SNR

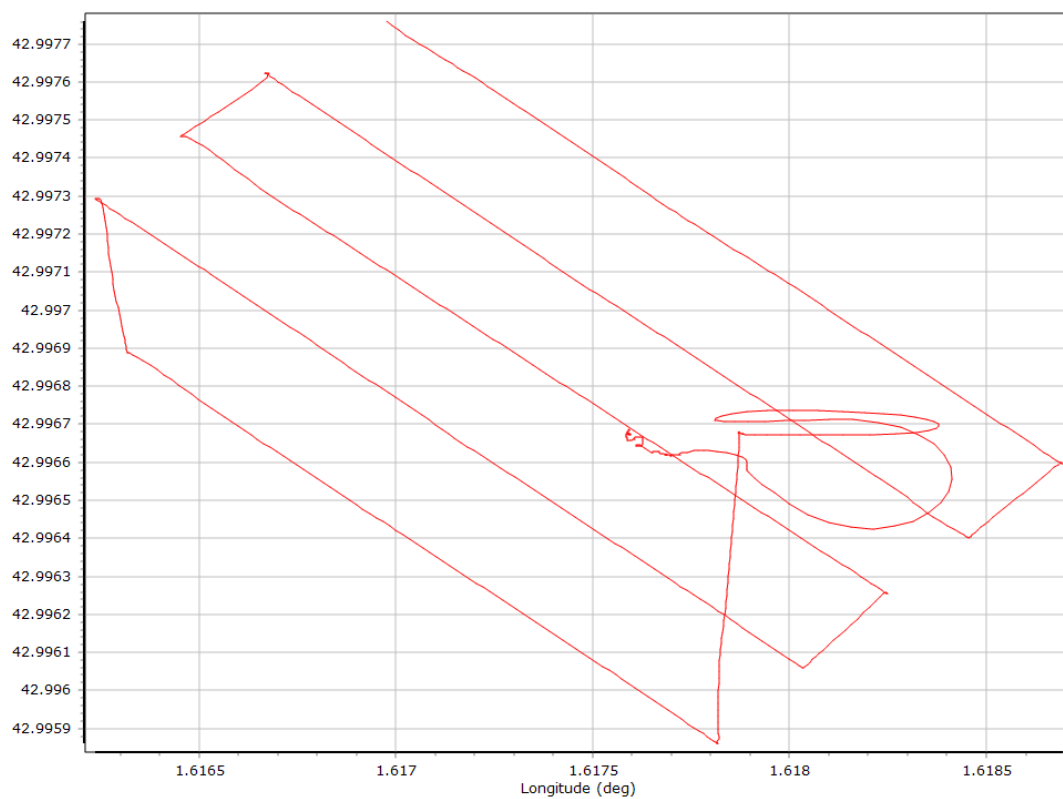


BEIDOU SNR

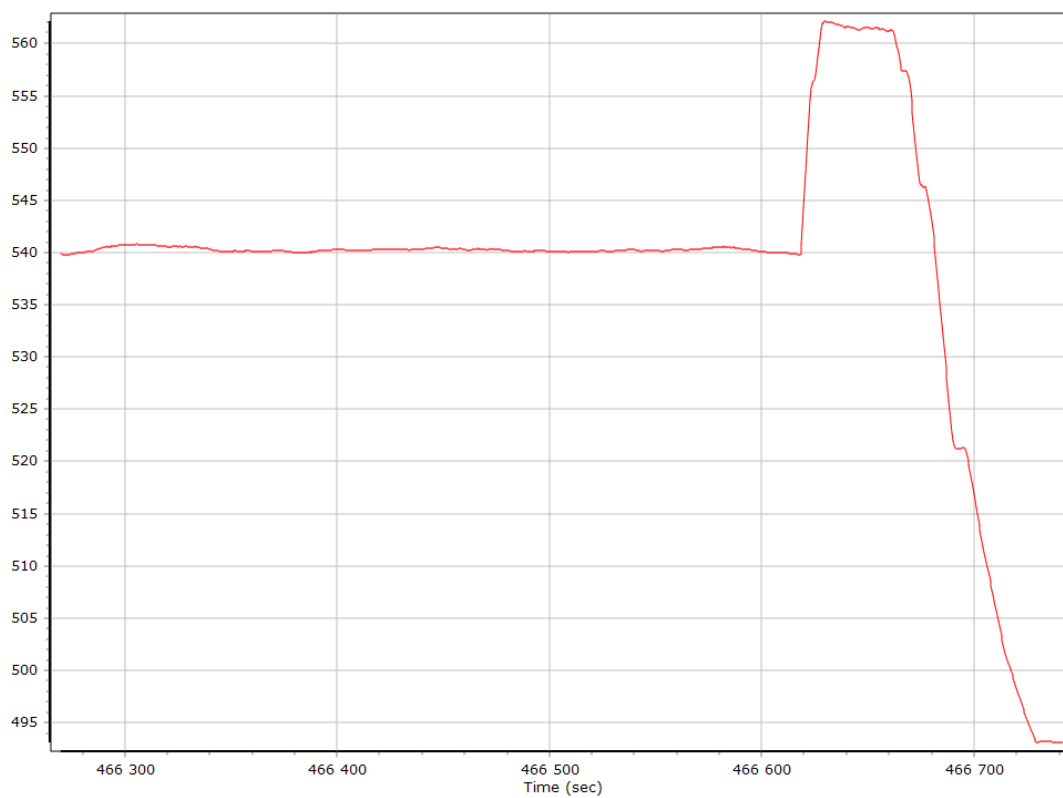


Trajectory Information

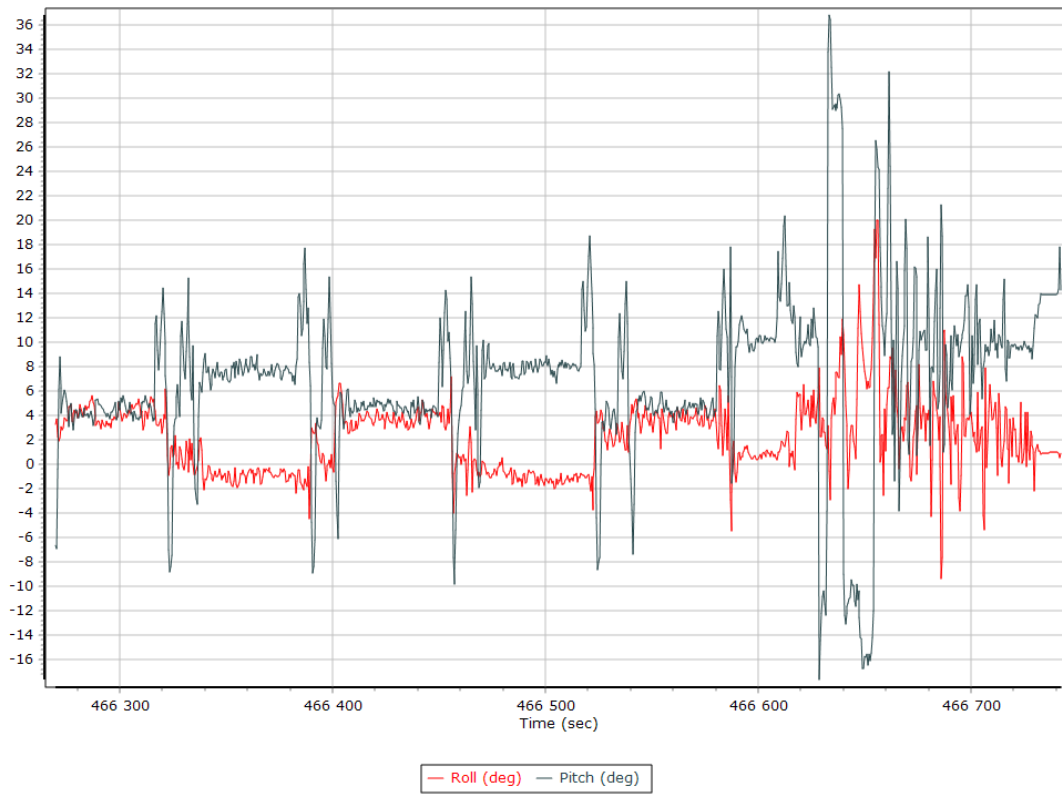
Top View



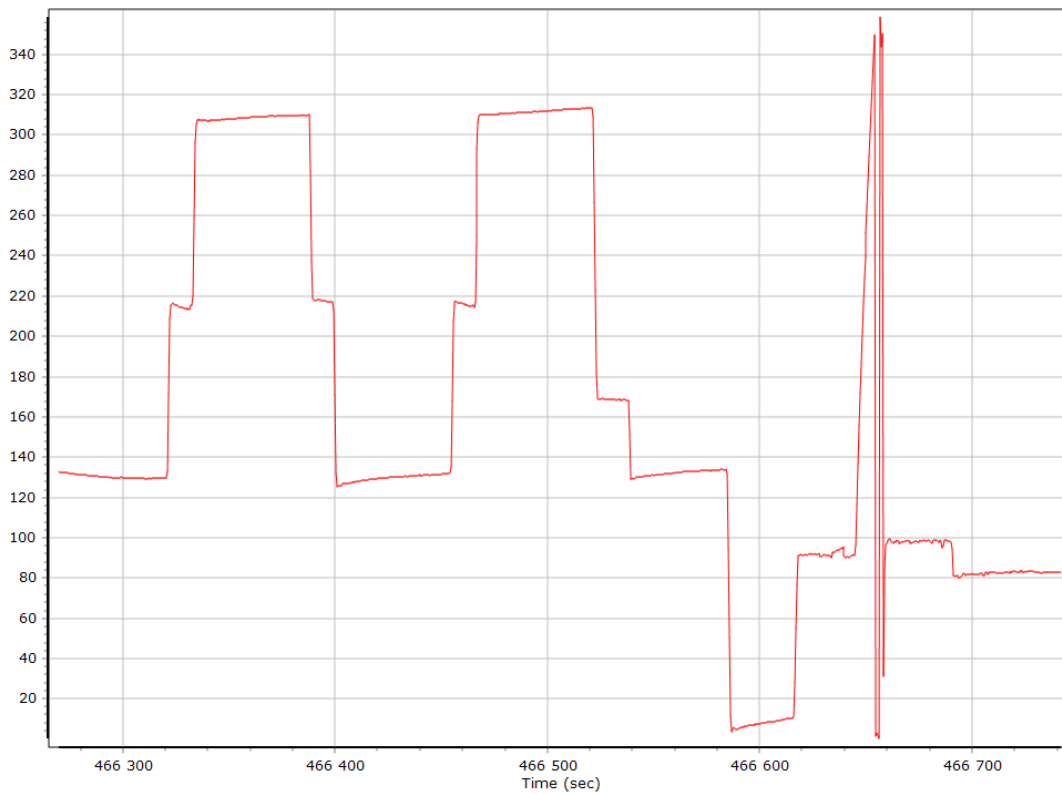
Altitude



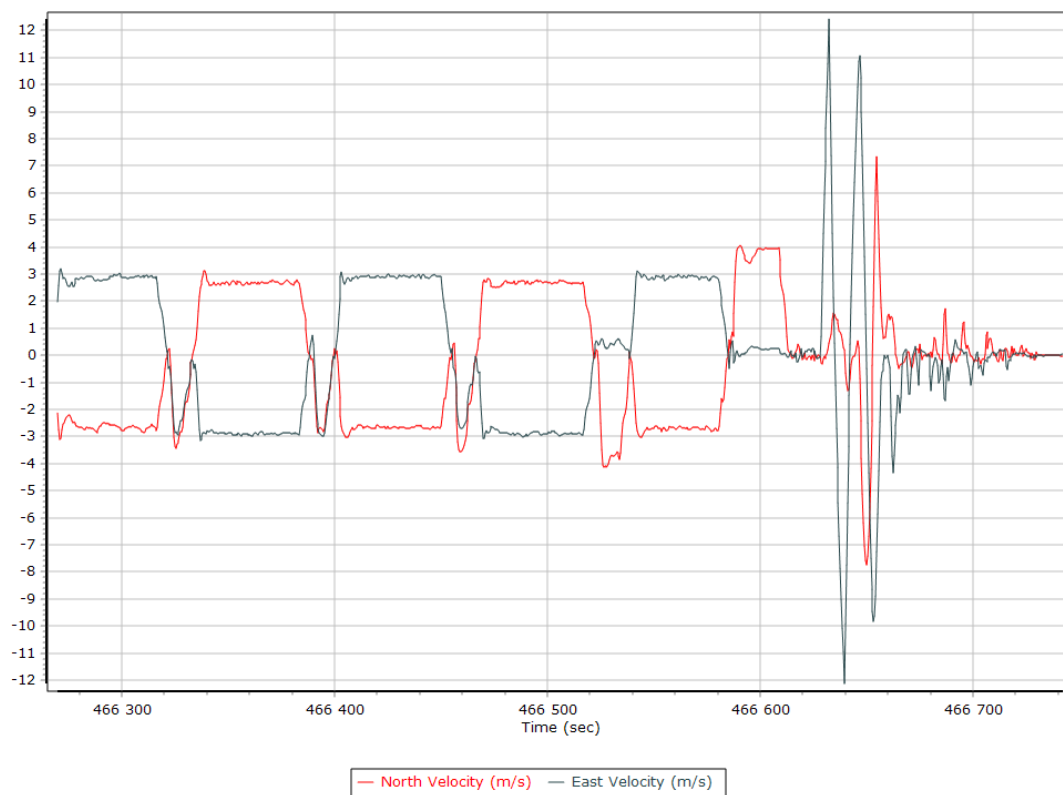
Roll/Pitch



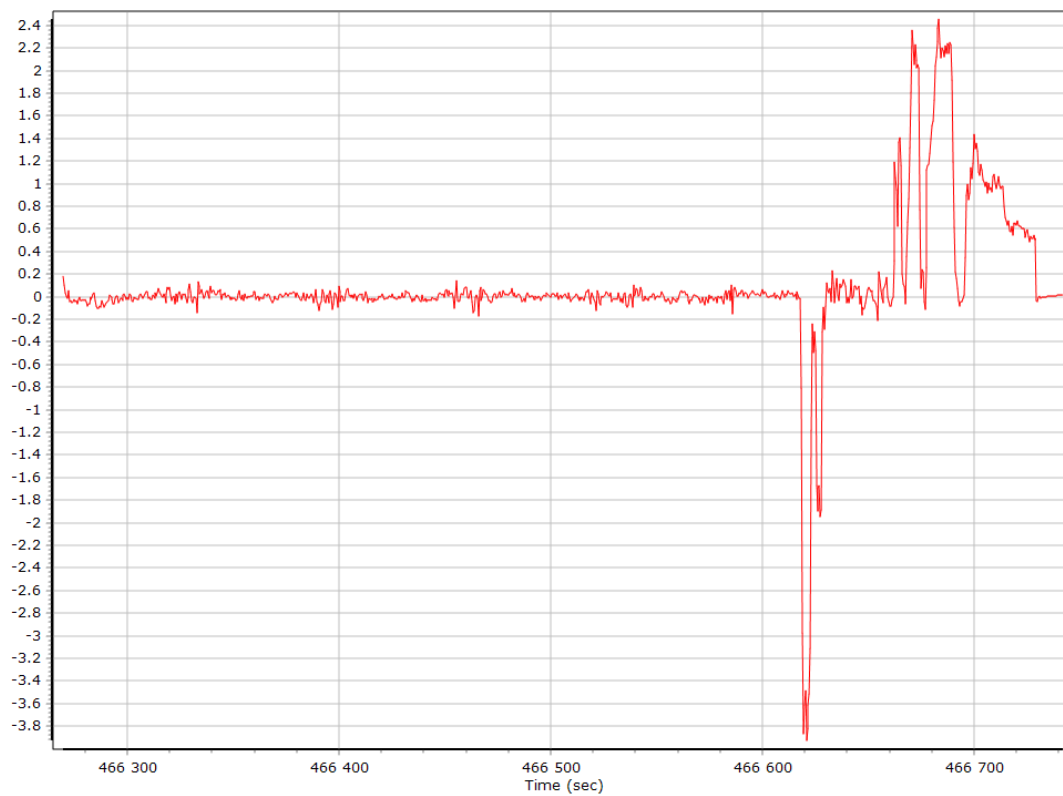
Heading



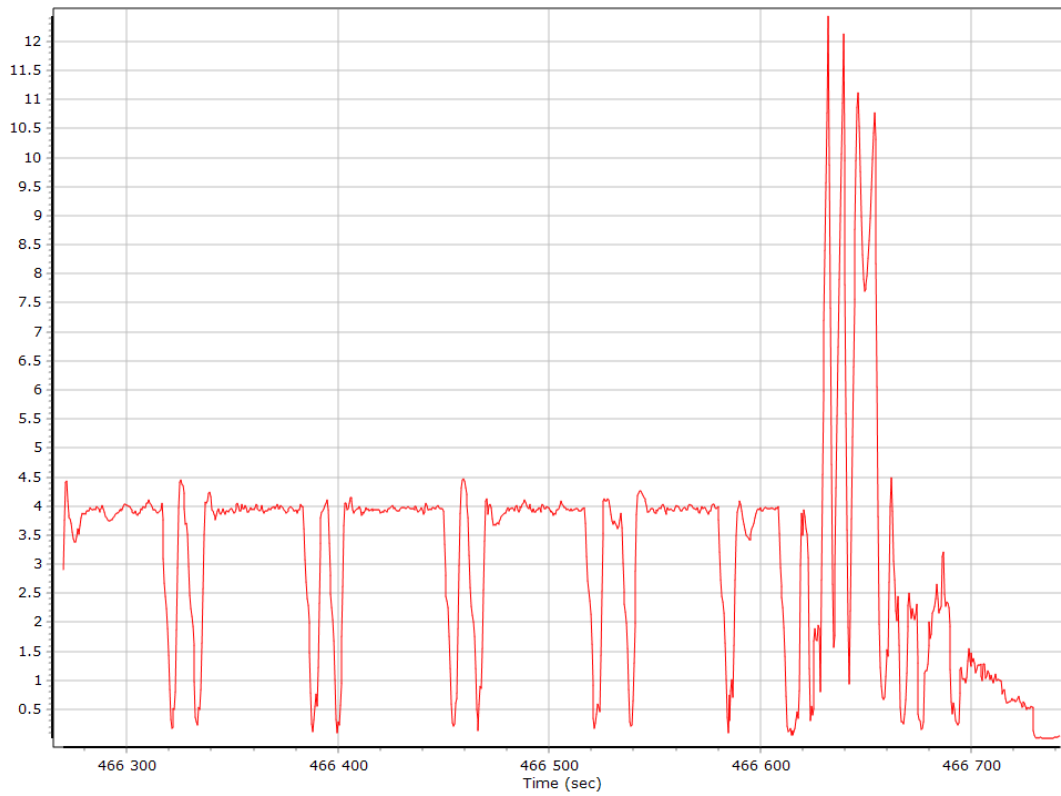
North/East Velocity



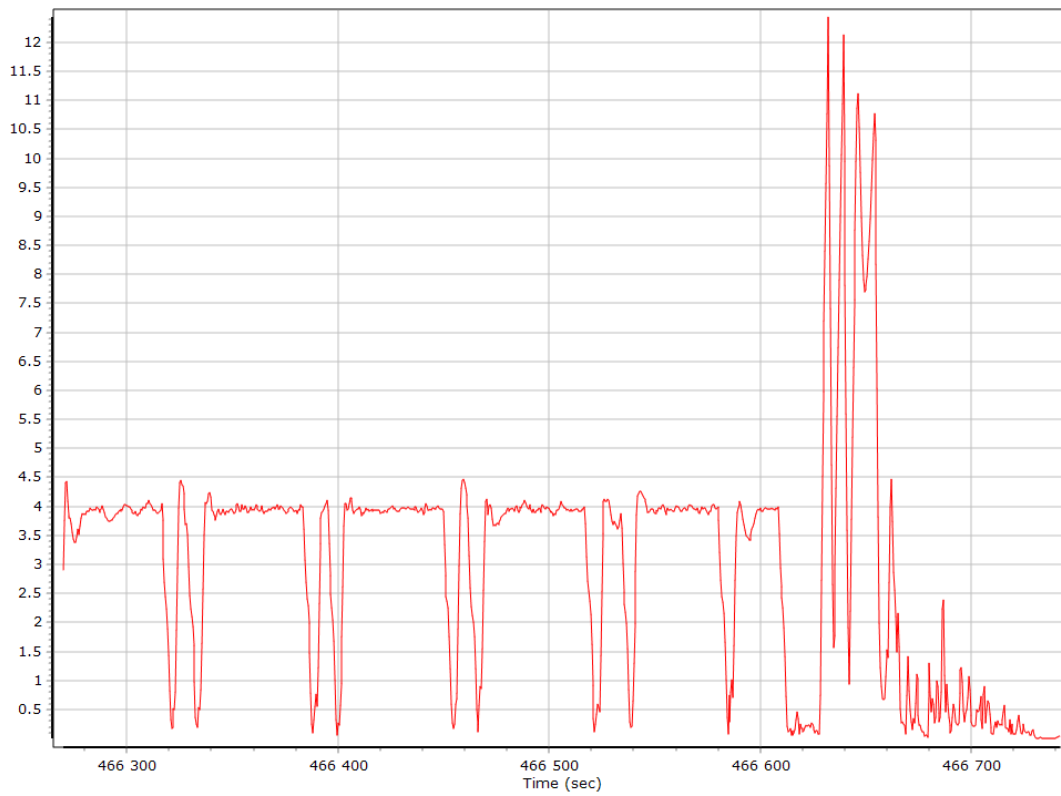
Down Velocity



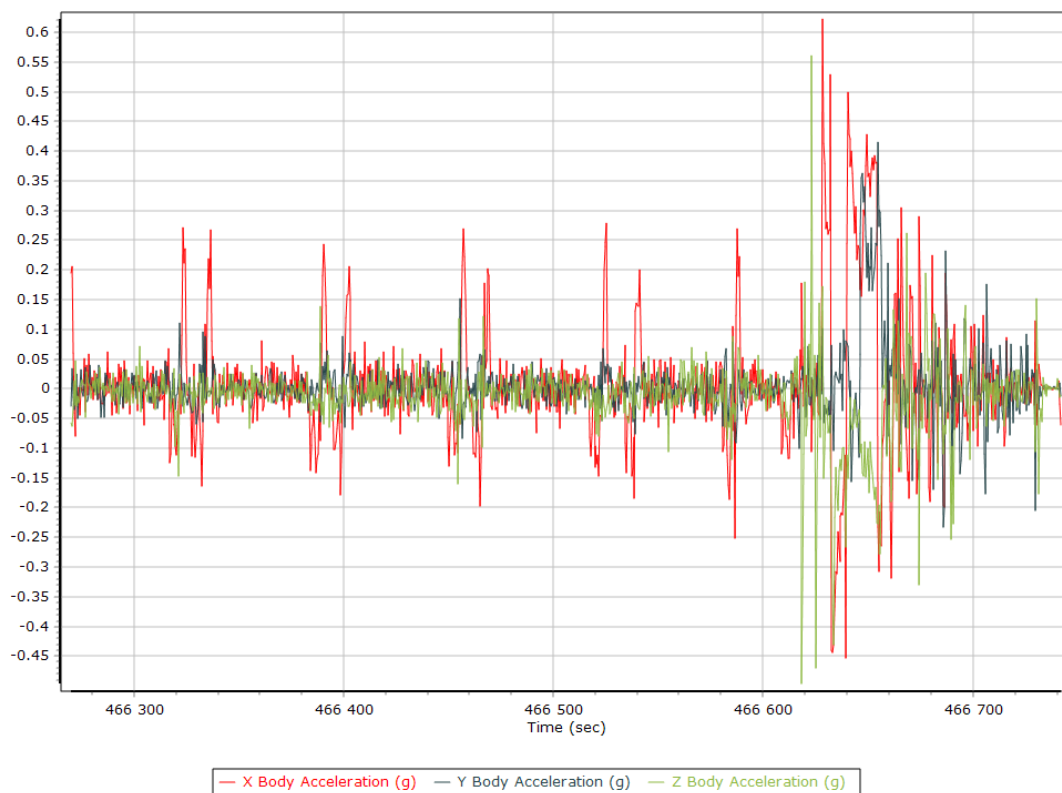
Total Speed



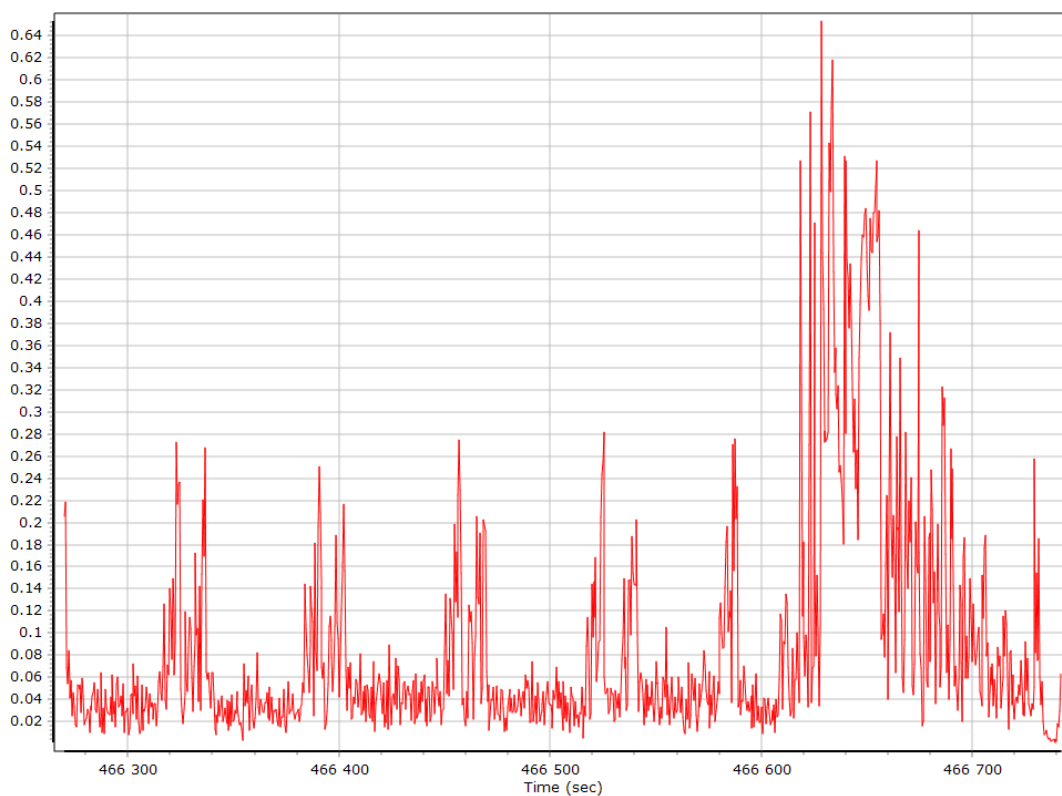
Ground Speed



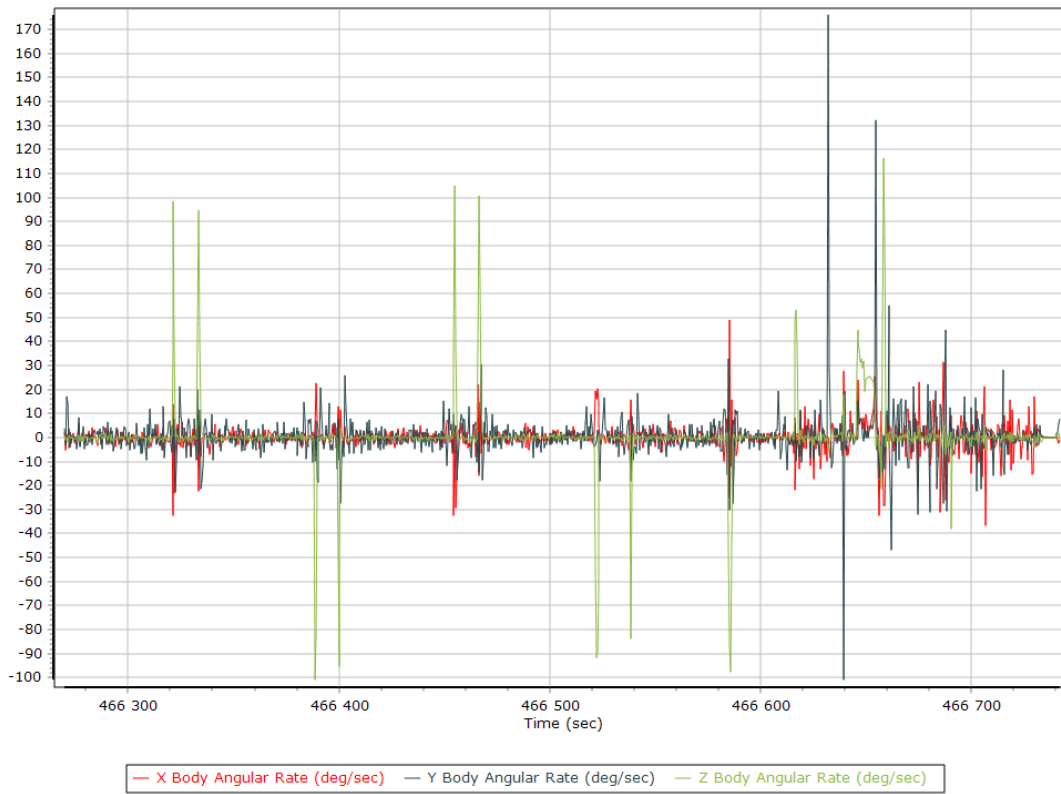
Body Acceleration



Total Body Acceleration



Body Angular Rate



Base Station Information

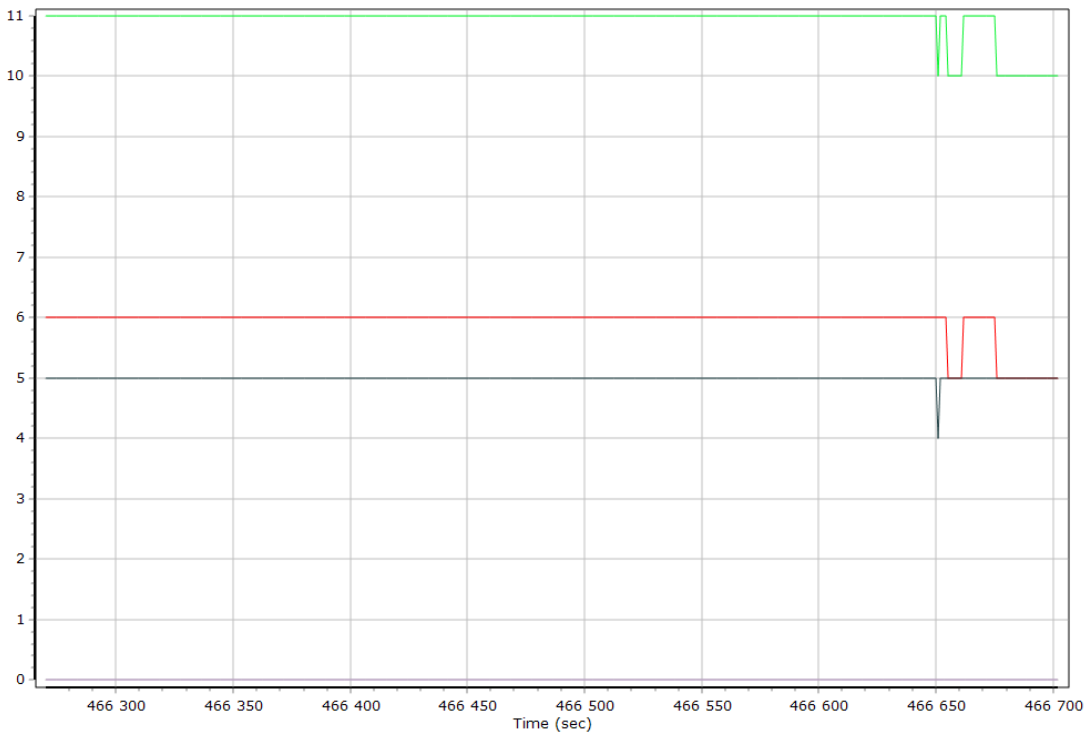
Station ID	MSGT		
Filename	msgt053z.19o		
Start date	2/22/2019 7:00:00 AM		
End date	2/22/2019 11:59:59 AM		
Duration	04:59:59.000		
Data type	GNSS		
Receiver manufacturer, model, serial no.	TPS	NET-G5	1294-11729
Antenna manufacturer, model	Leica		AR25 w/LEIT Dome
Antenna height [m]	0.000		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC [m]	0.15508		
Latitude	N42°52'46.58258"		
Longitude	E1°37'45.94975"		
Ellipsoidal height [m]	548.63250		
Frame	ITRF00		
Epoch	1997		
Ellipsoid	WGS84		
Velocity North [mm/y]	0		
Velocity East [mm/y]	0		
Velocity Up [mm/y]	0		

GNSS QC

GNSS QC Statistics

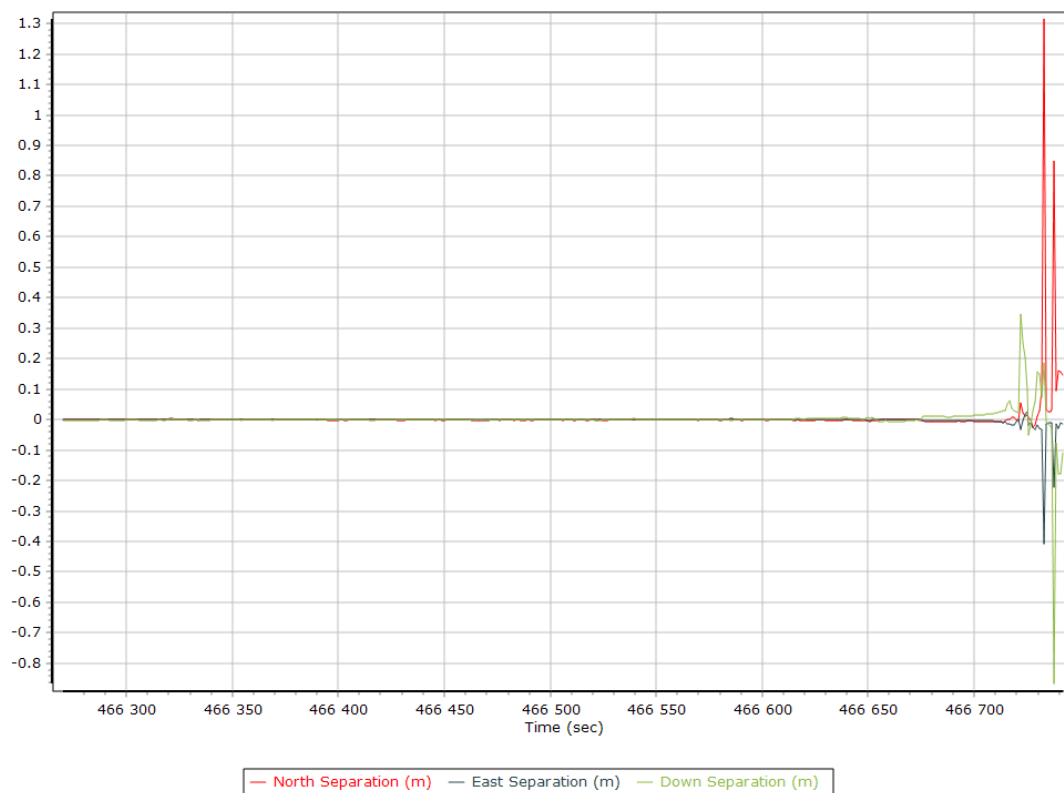
Statistics	Min	Max	Mean
Baseline length [km]	12.95	13.17	
Number of GPS SV	5	6	6
Number of GLONASS SV	4	5	5
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Total number of SV	9	11	11
PDOP	1.55	2.36	1.61
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (s)	681.00	0.00	0.00
Percentage	100.00	0.00	0.00

Num SVs in solution

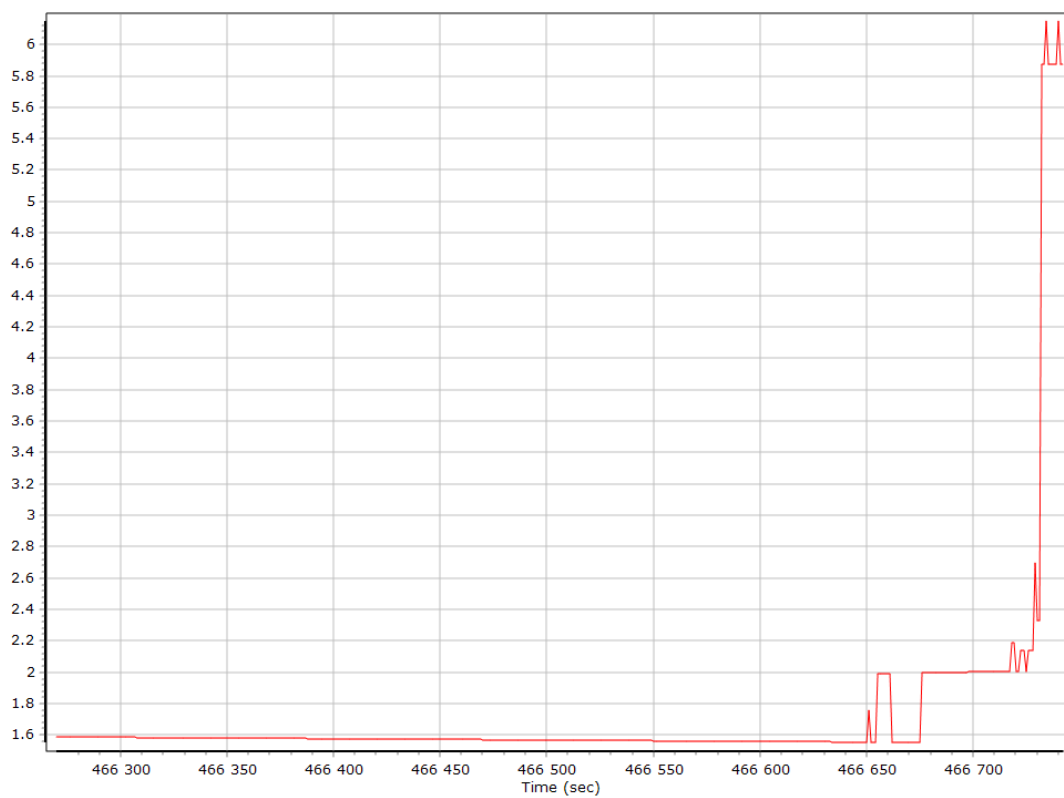


— Number of GPS — Number of GLONASS — Number of QZSS — Number of BEIDOU — Total Number

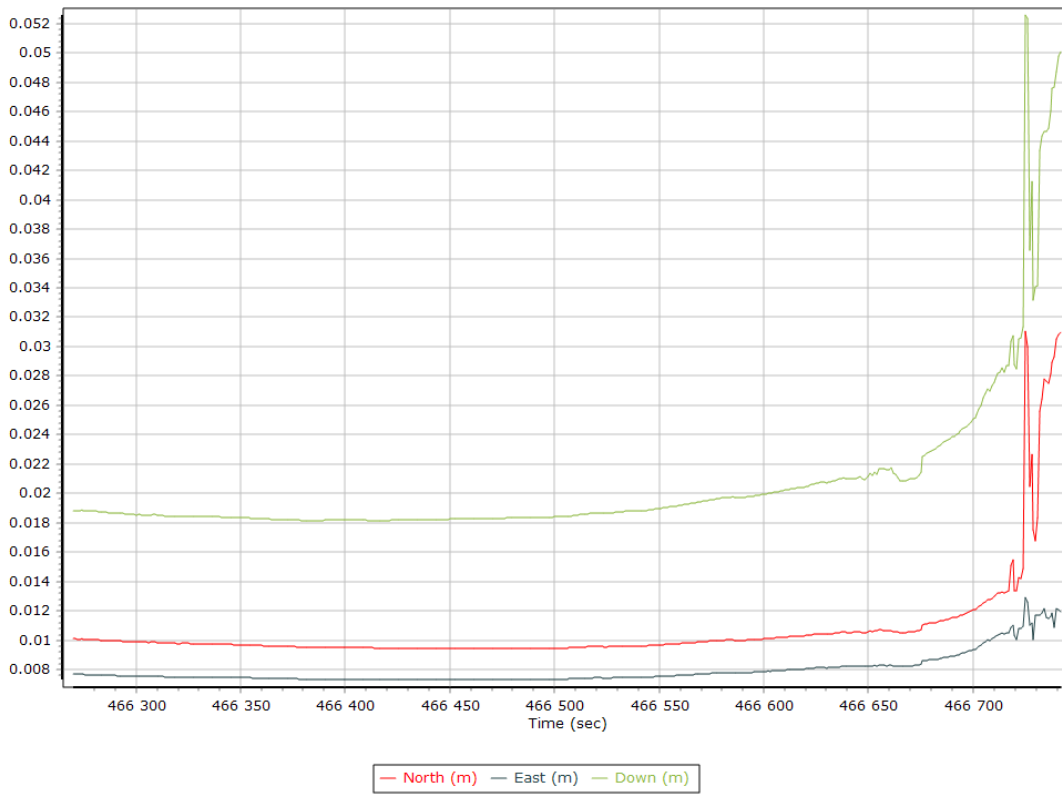
Forward/Reverse Separation



PDOP



Estimated Position Accuracy



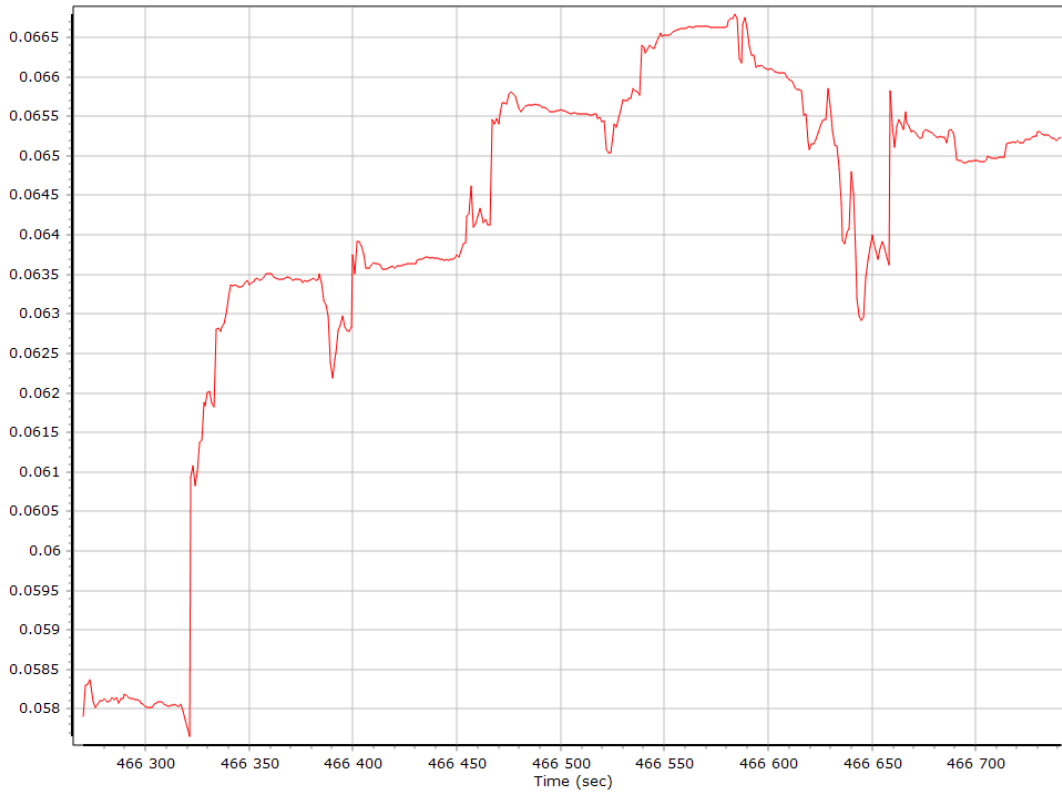
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion Single Base		
Stabilized mount	False		
Base station	MSGT		
Processing start time	466021.015 (2/22/2019 9:27:01 AM)		
Processing end time	466742.000 (2/22/2019 9:39:02 AM)		
Initial attitude source	Primary GNSS Track		
IMU Sensor Context	Processing with Onboard IMU		
Reference to IMU lever arm [m]	-0.013	0.108	-0.007
Reference to IMU mounting angles [deg]	0.000	0.000	0.000
Reference to Primary GNSS lever arm [m]	0.006	0.218	-0.435
Reference to Primary GNSS lever arm std dev [m]	0.100	0.100	0.100
Aircraft to Reference mounting angles [deg]	0.000	0.000	0.000

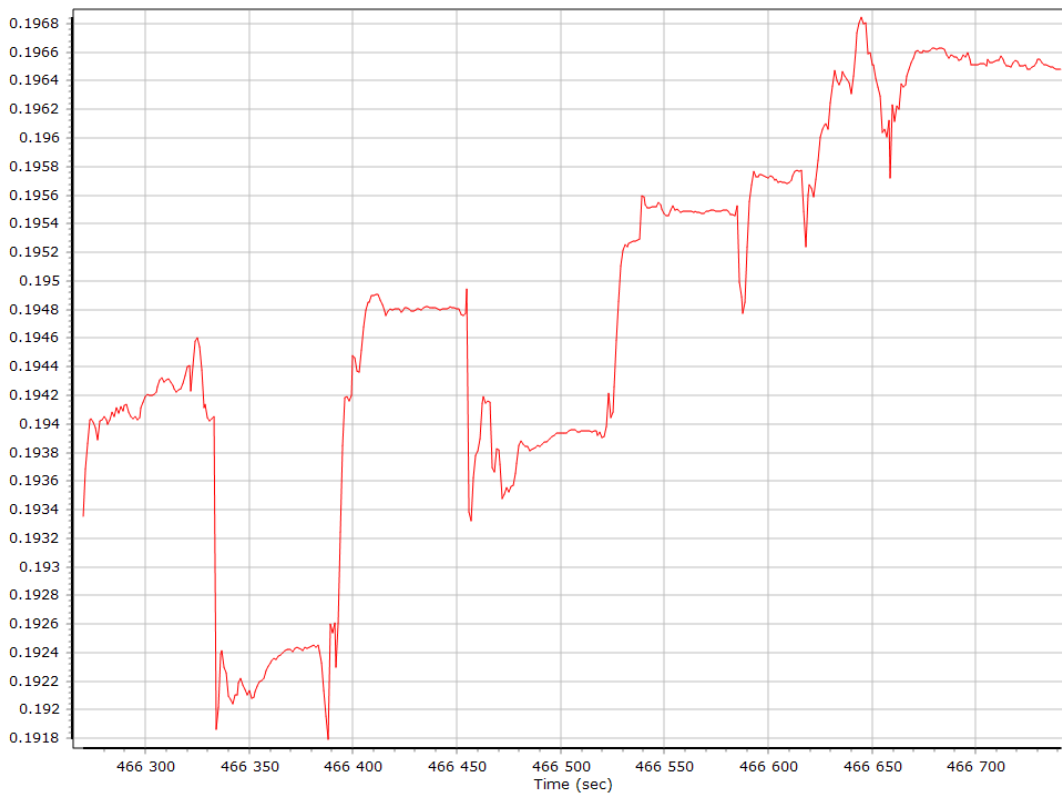
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm

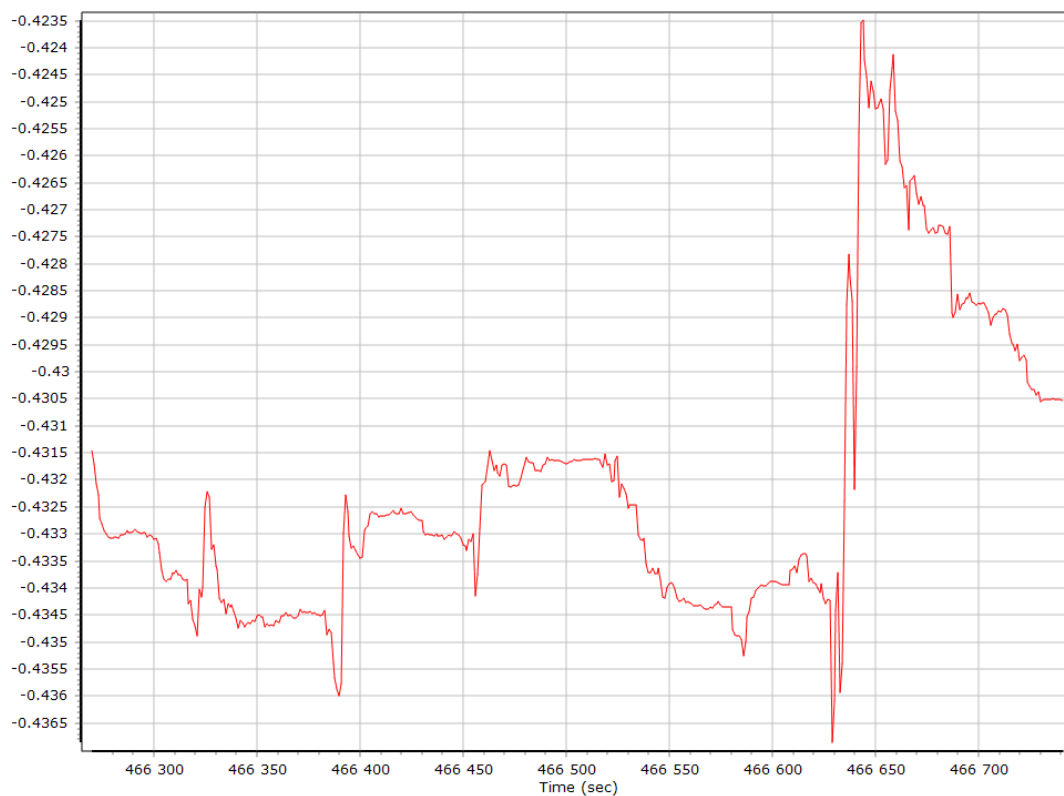
X Reference-Primary GNSS Lever Arm (m)



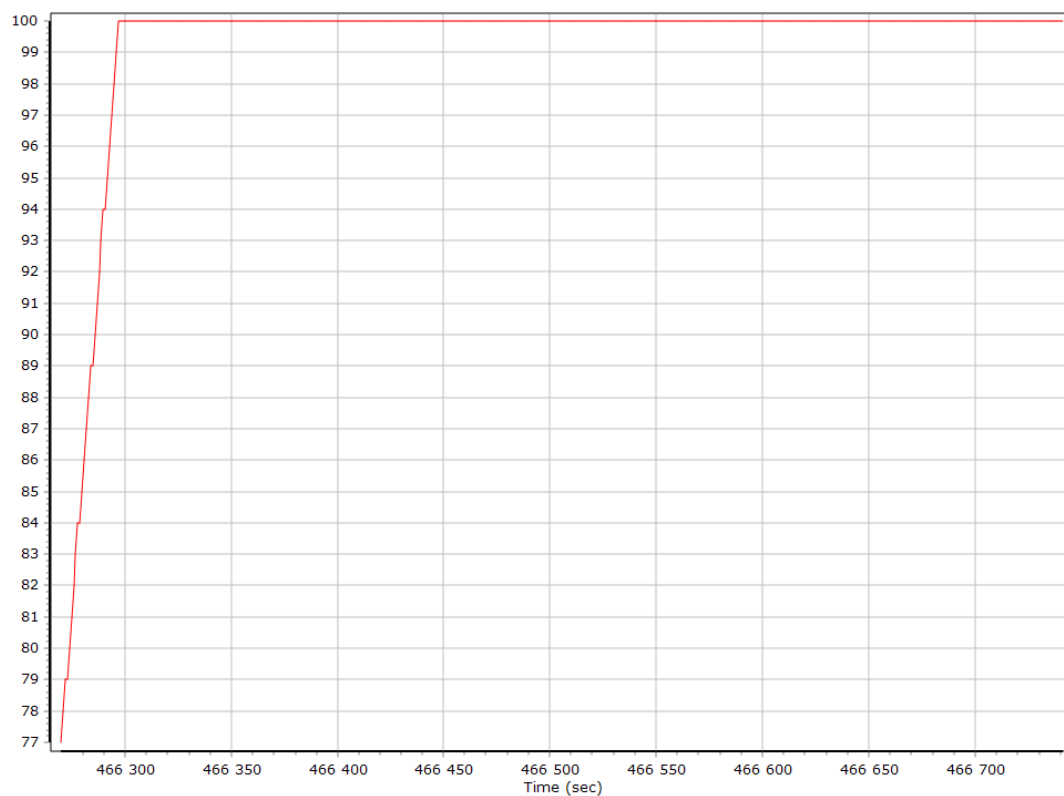
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



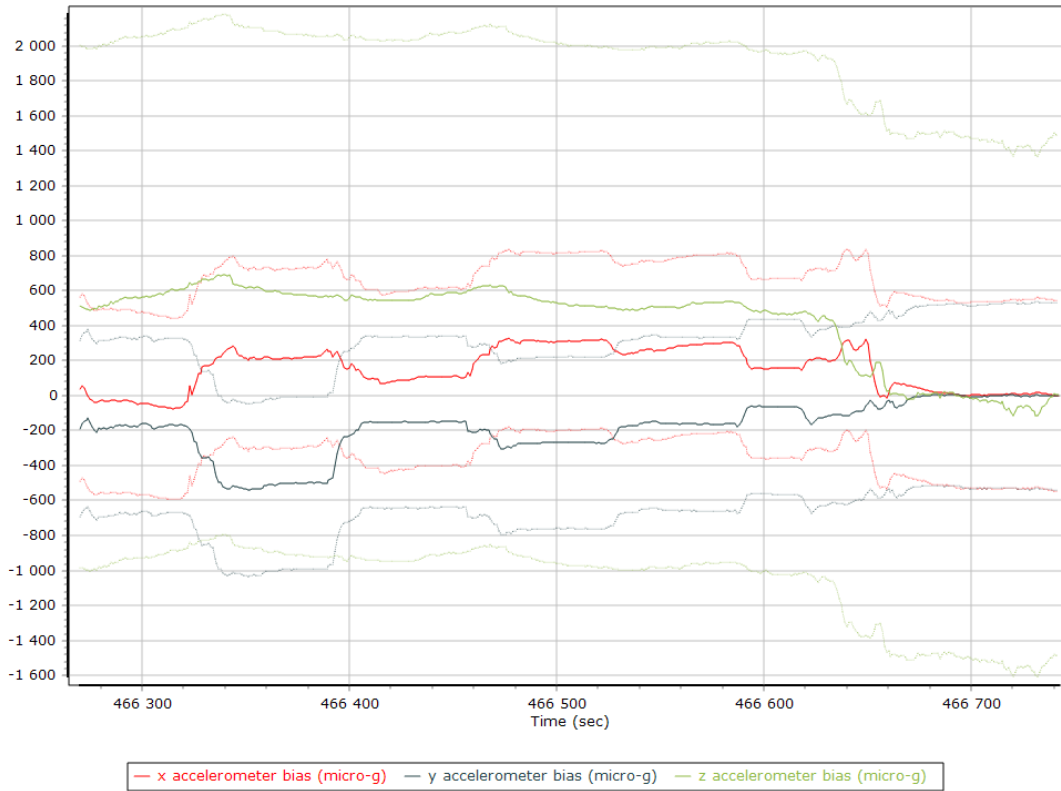
Reference-Primary GNSS Lever Arm Figure of Merit



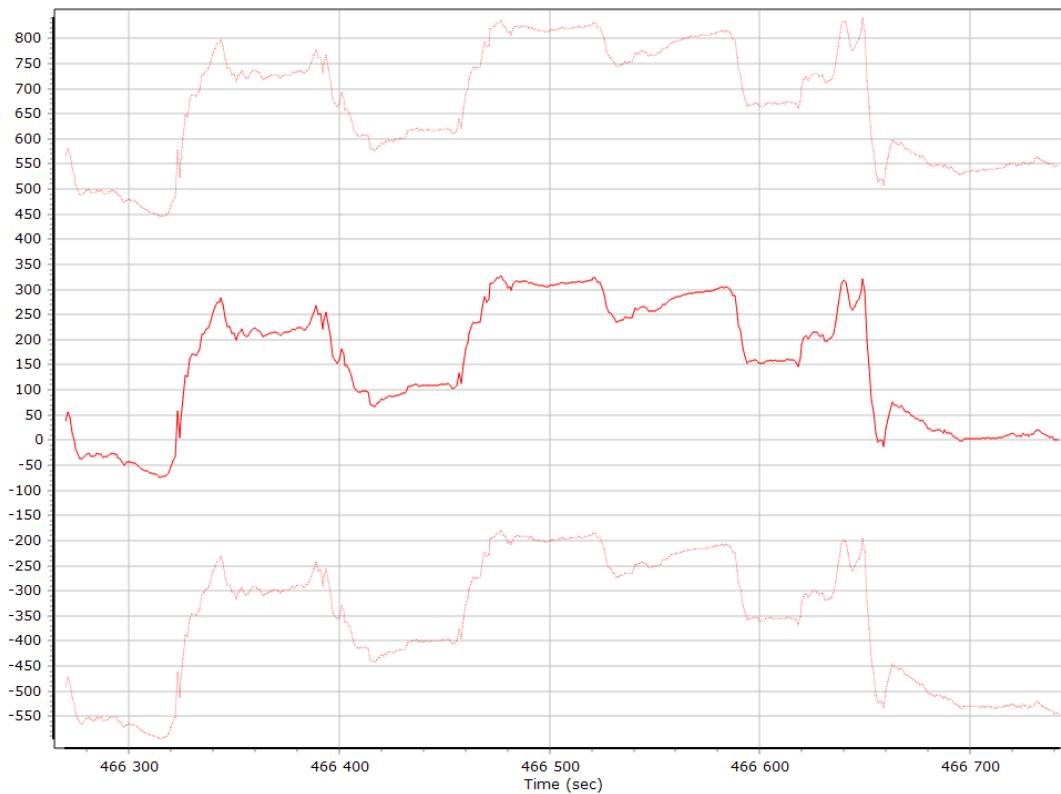
Smoothed IN-Fusion QC

Smoothed Estimated Errors, Reference Frame

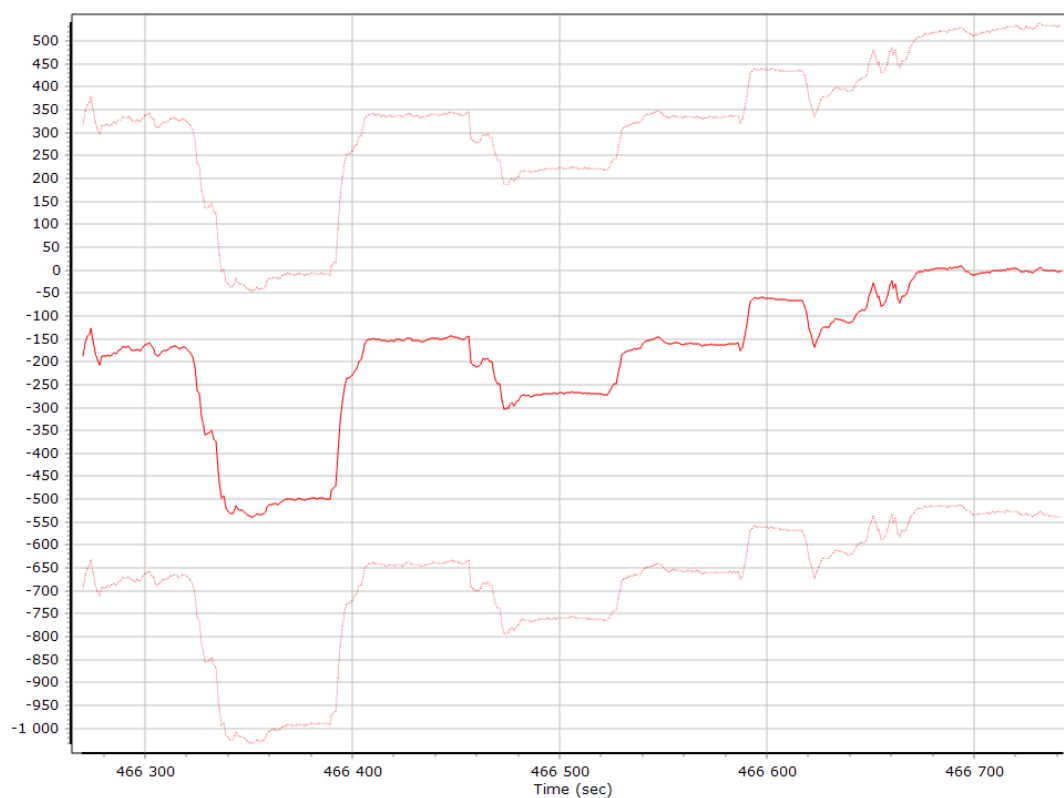
Accelerometer Bias (micro-g)



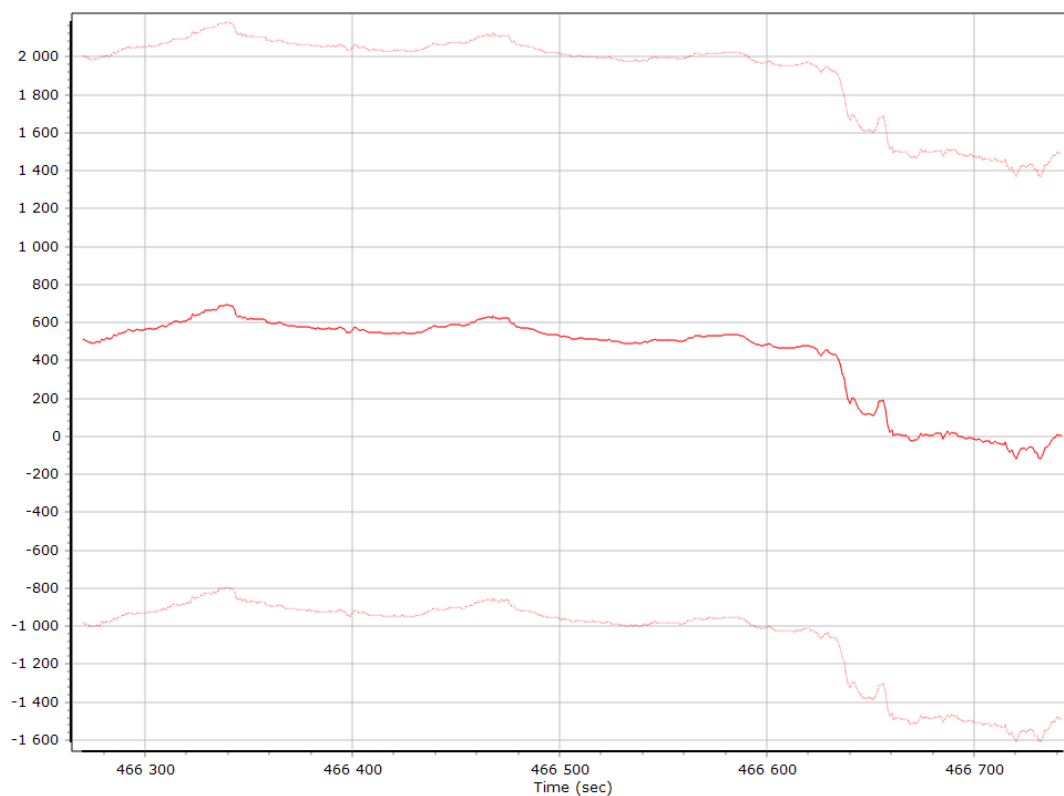
X Accelerometer Bias (micro-g)



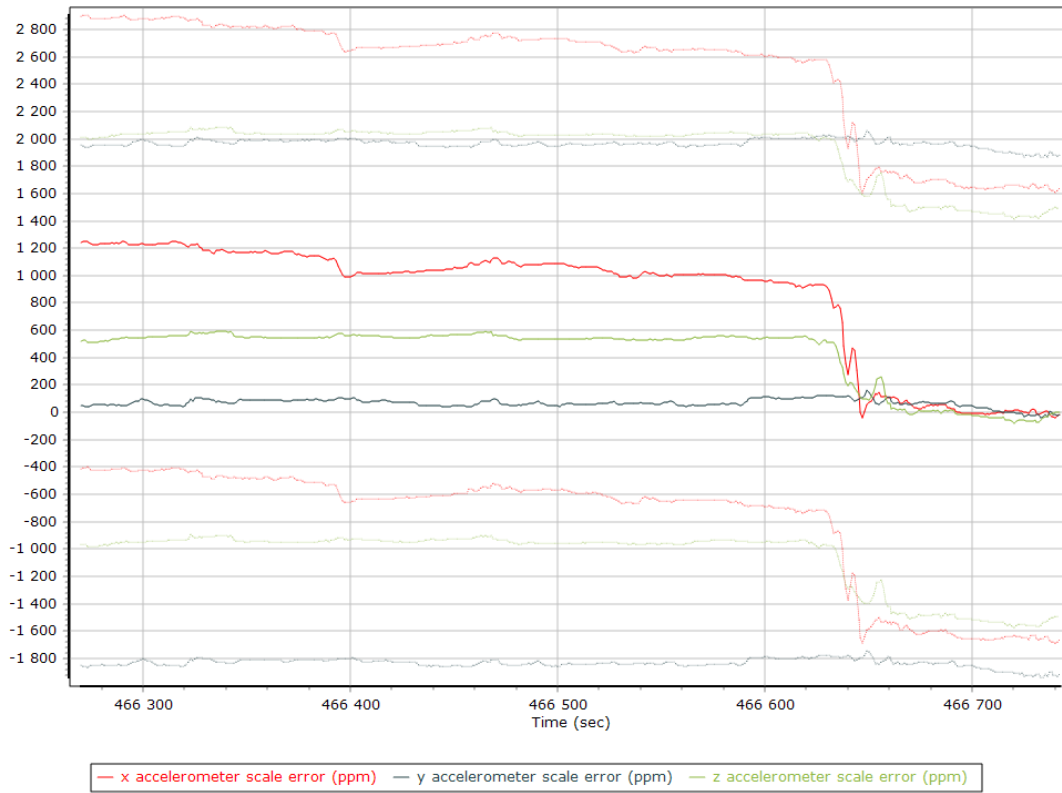
Y Accelerometer Bias (micro-g)



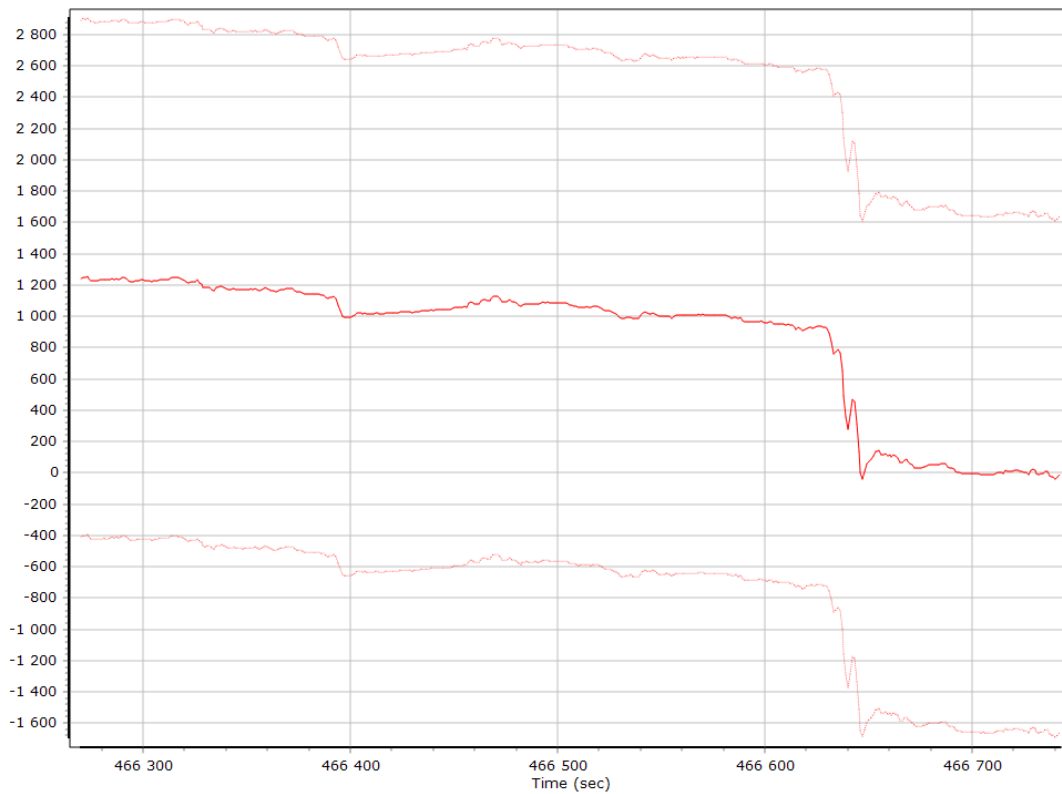
Z Accelerometer Bias (micro-g)



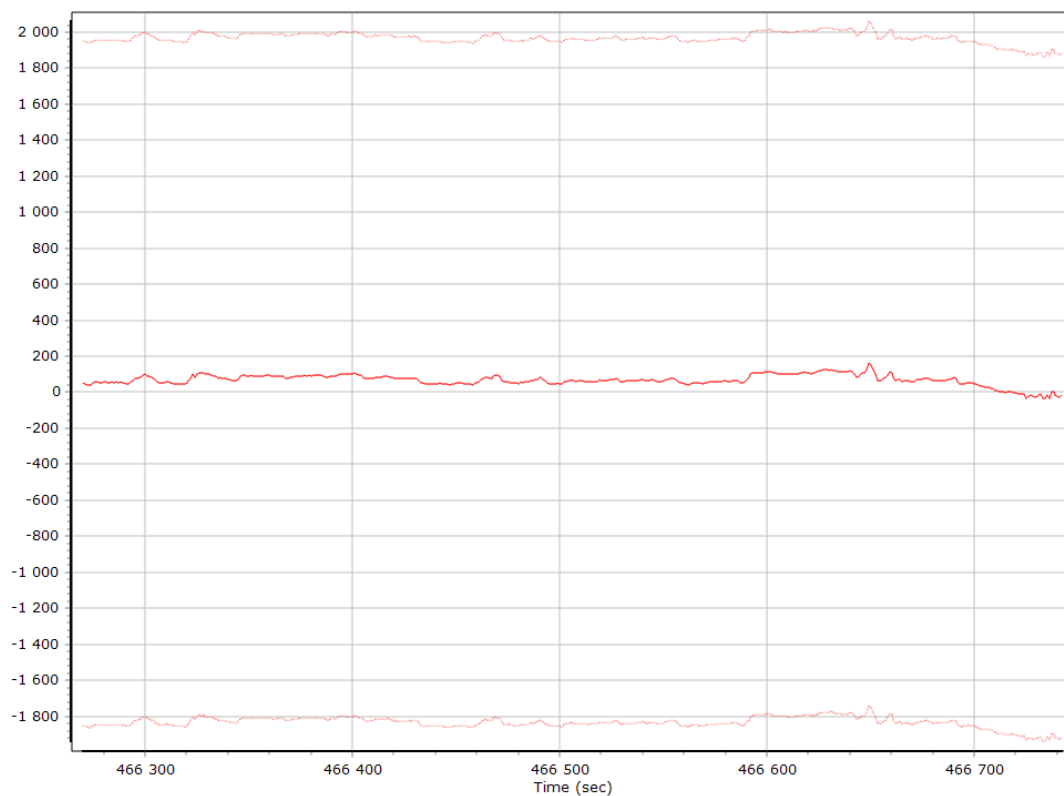
Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



Y Accelerometer Scale Error (ppm)



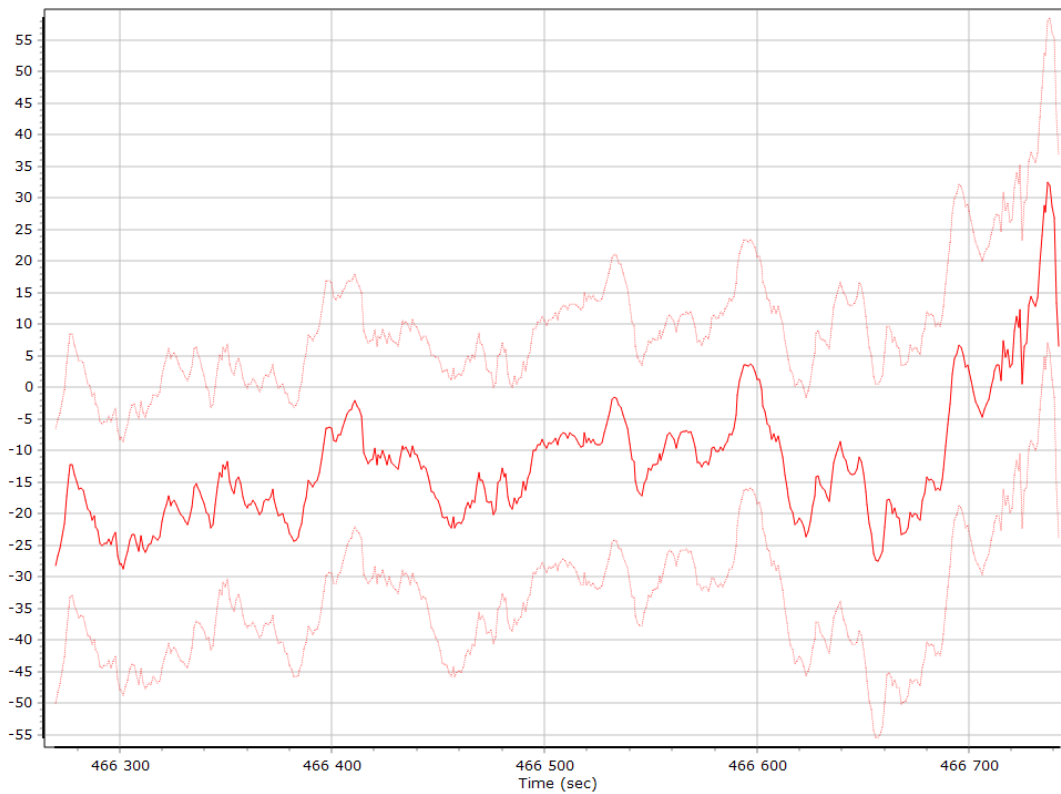
Z Accelerometer Scale Error (ppm)



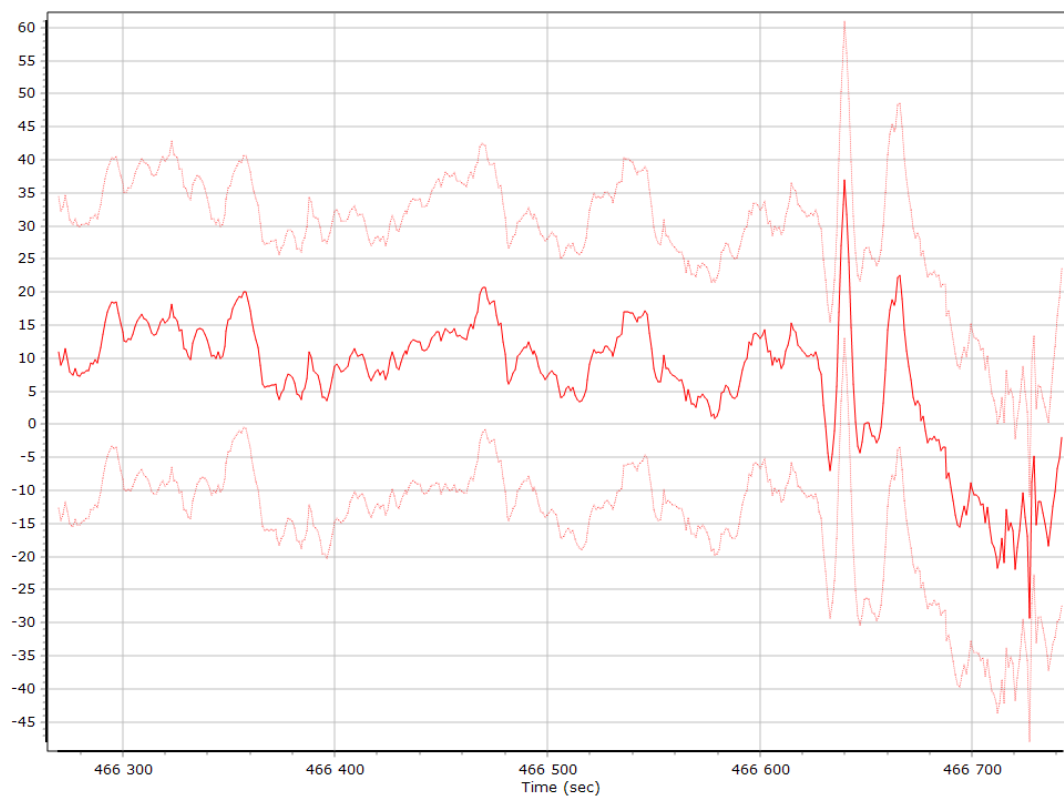
Gyro Bias (deg/h)



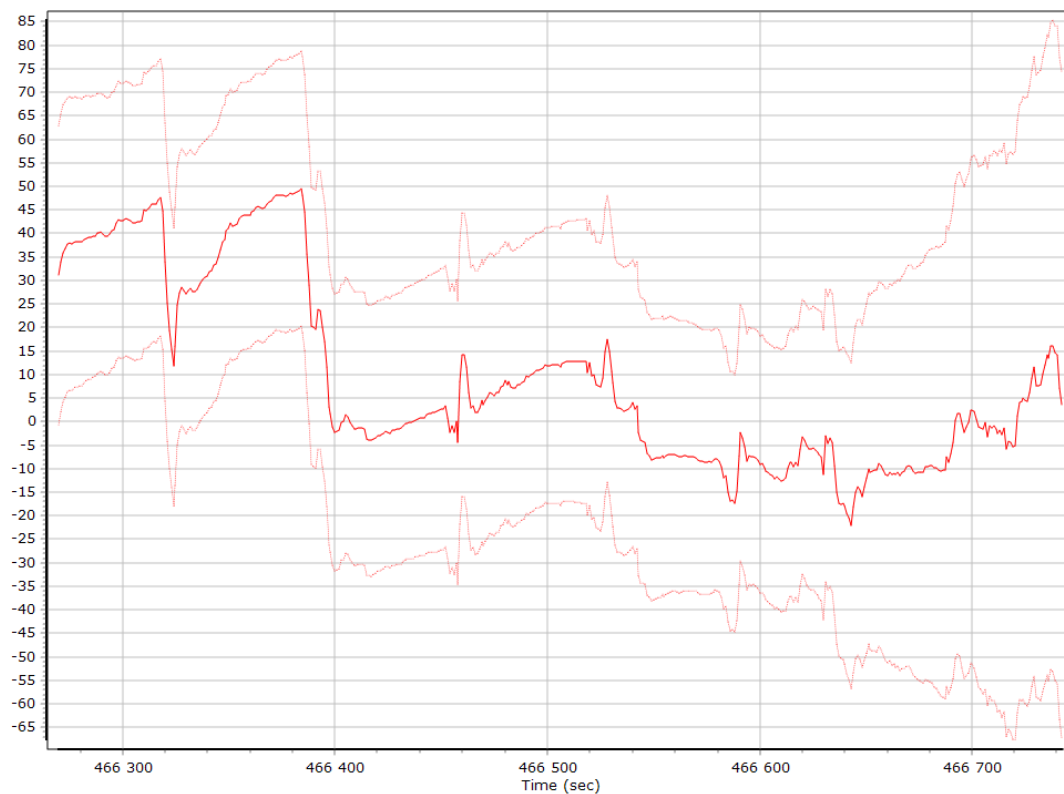
X Gyro Bias (deg/h)



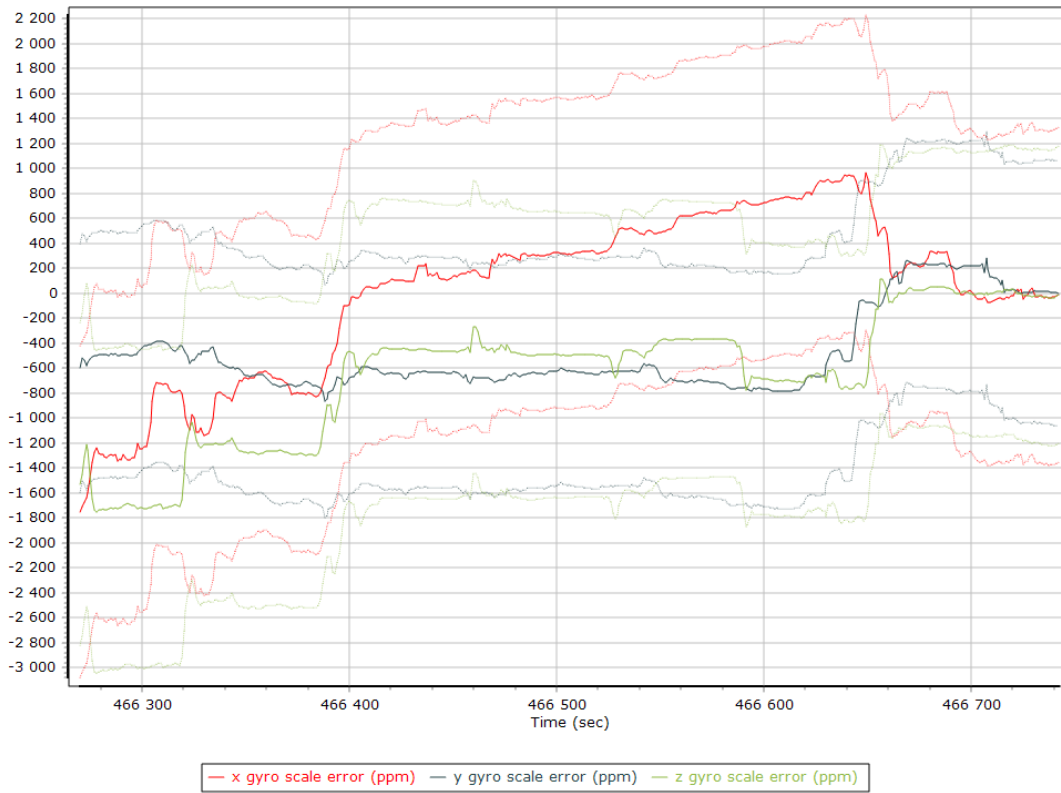
Y Gyro Bias (deg/h)



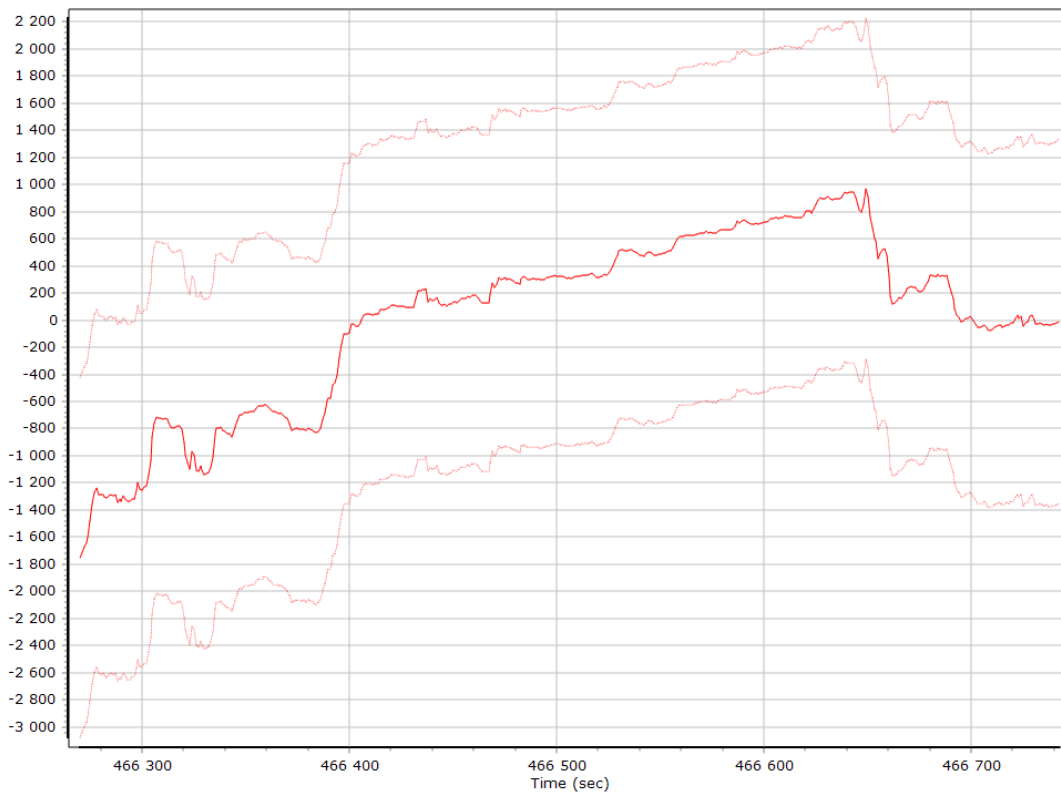
Z Gyro Bias (deg/h)



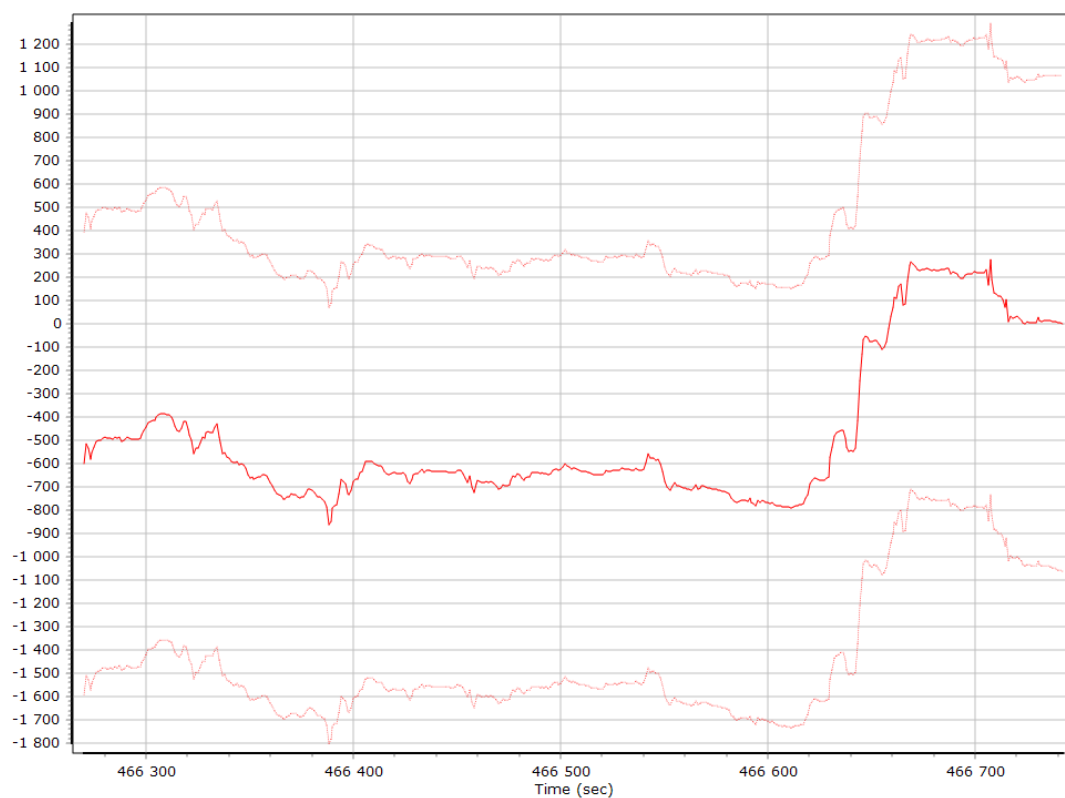
Gyro Scale Error (ppm)



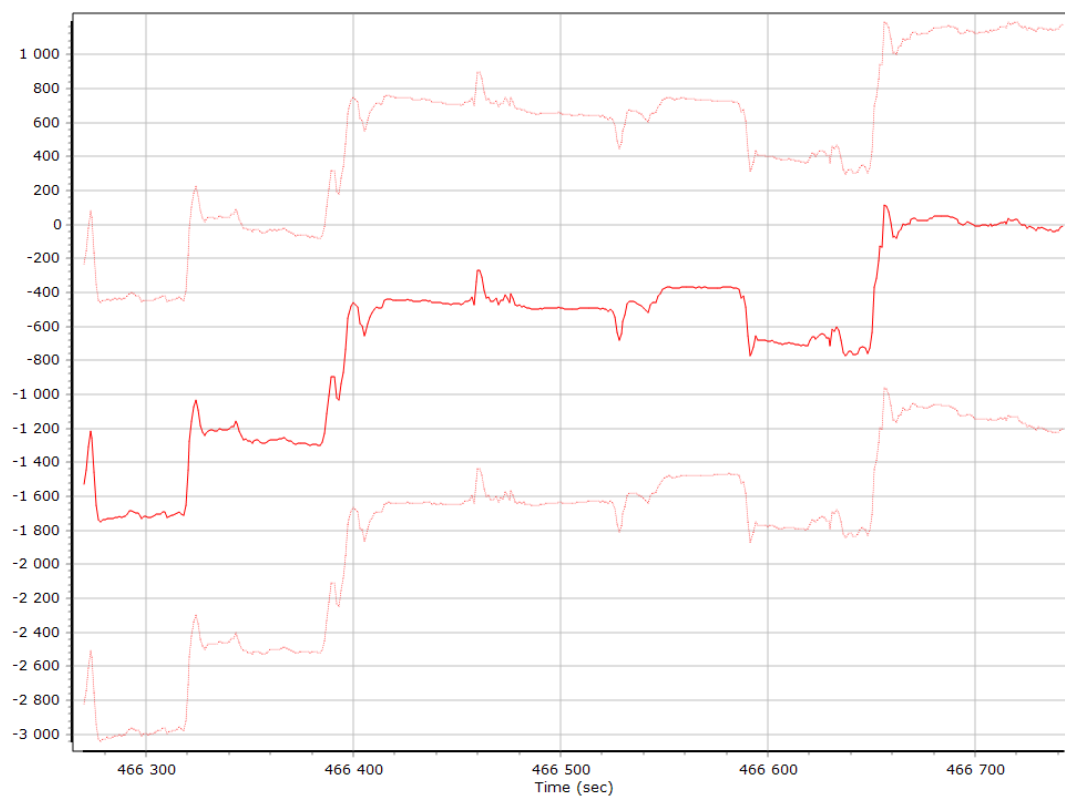
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

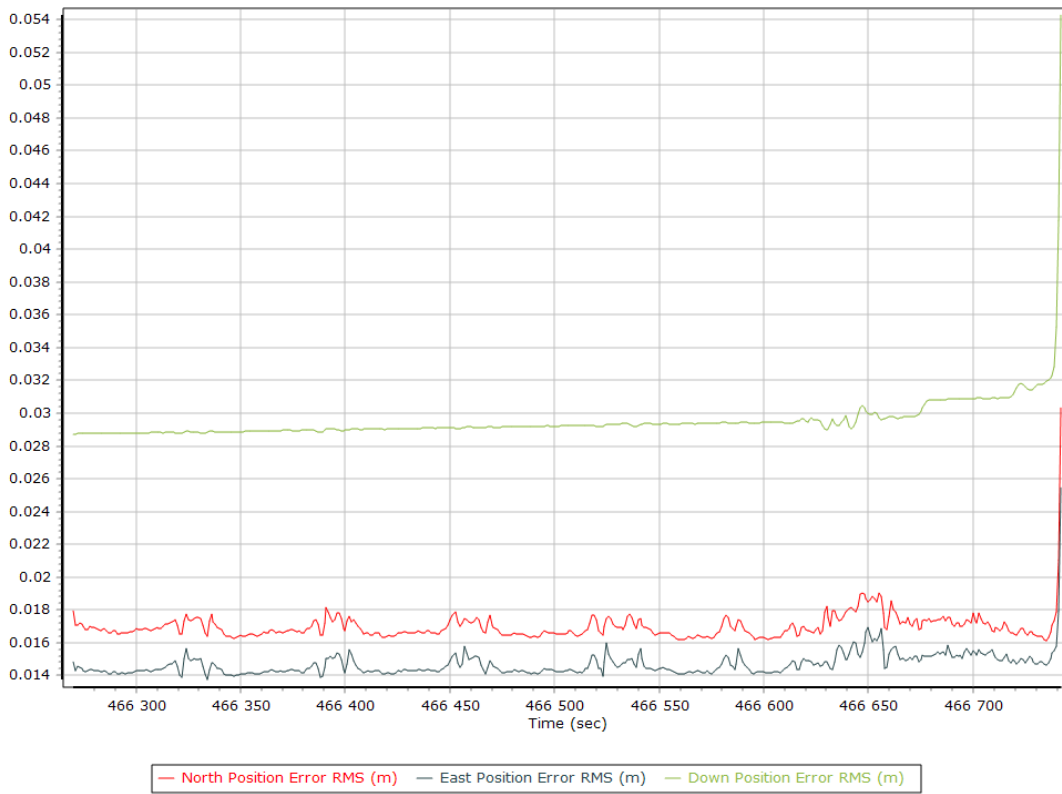


Z Gyro Scale Error (ppm)

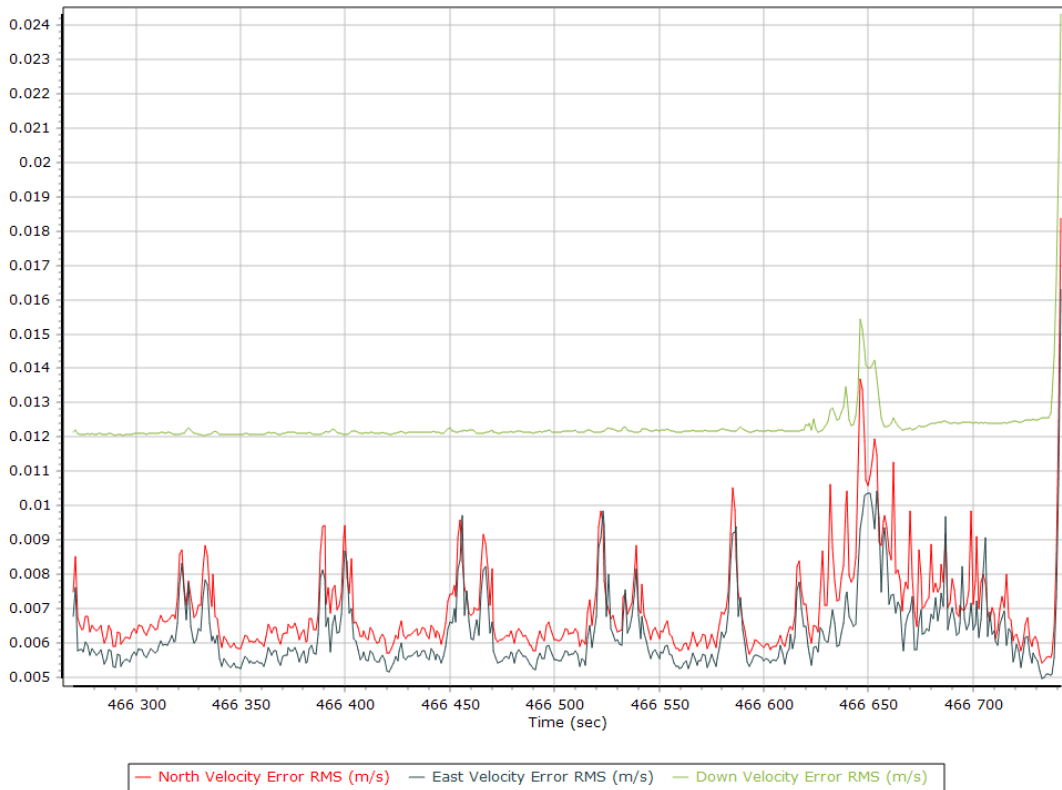


Smoothed Performance Metrics

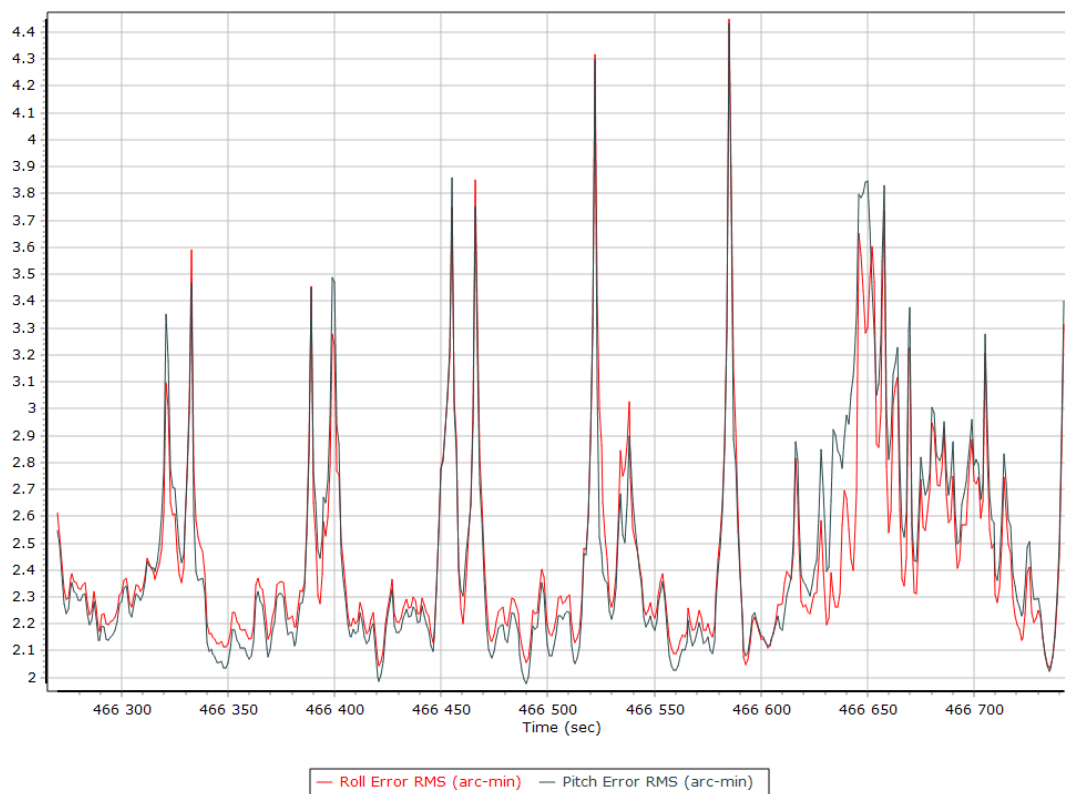
Position Error RMS (m)



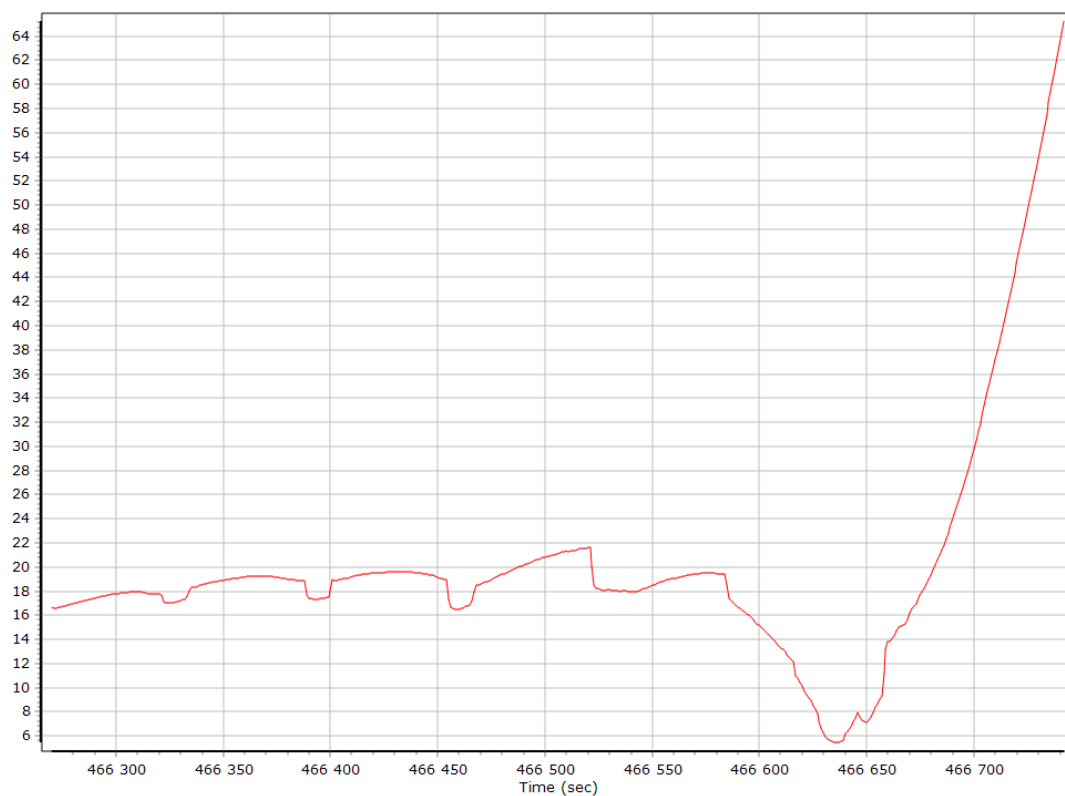
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

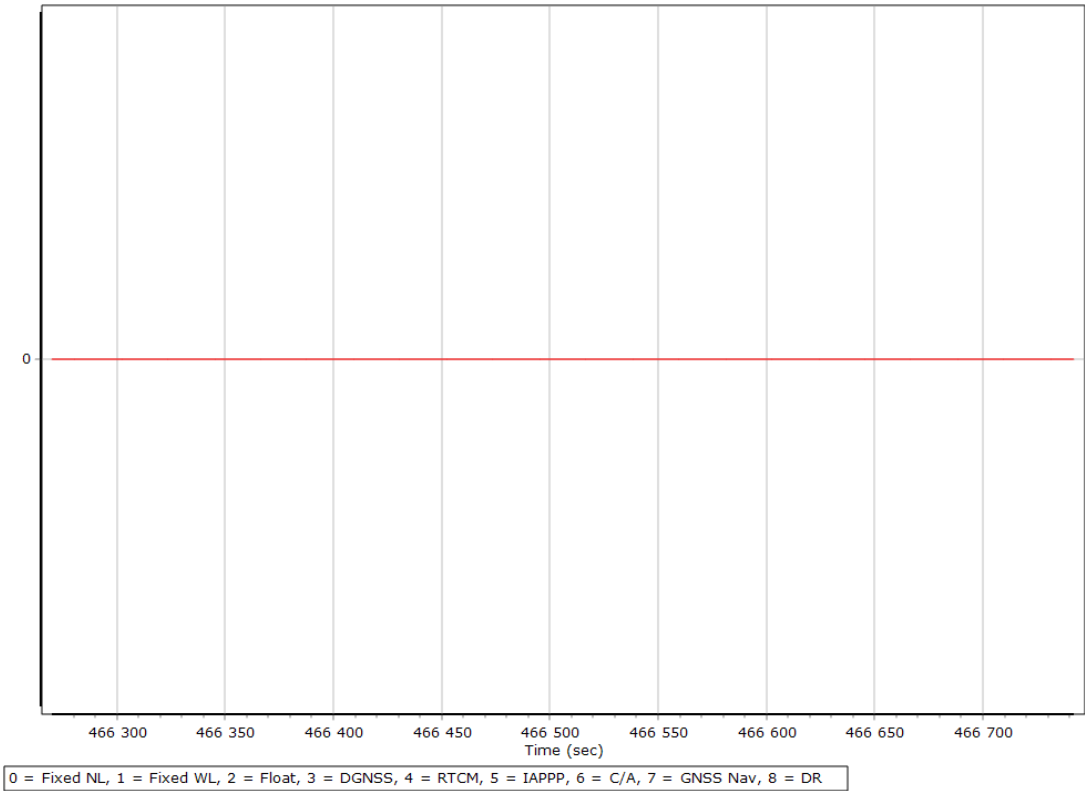


Heading Error RMS (arc-min)

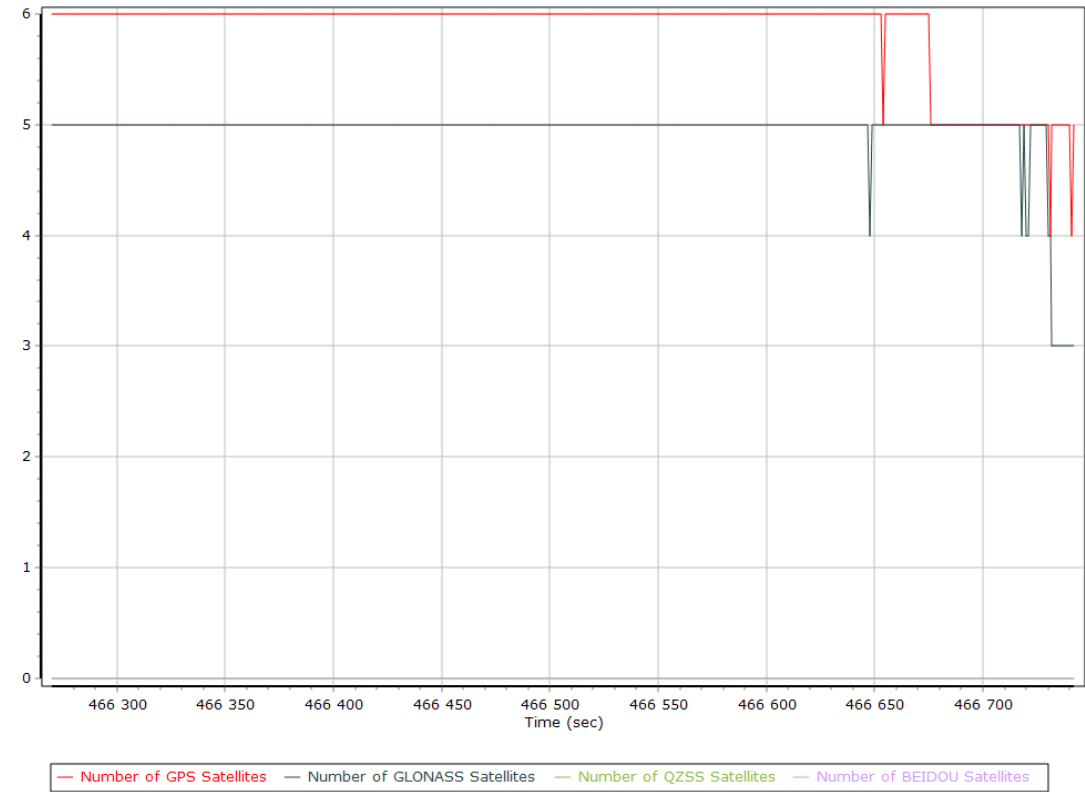


Smoothed Solution Status

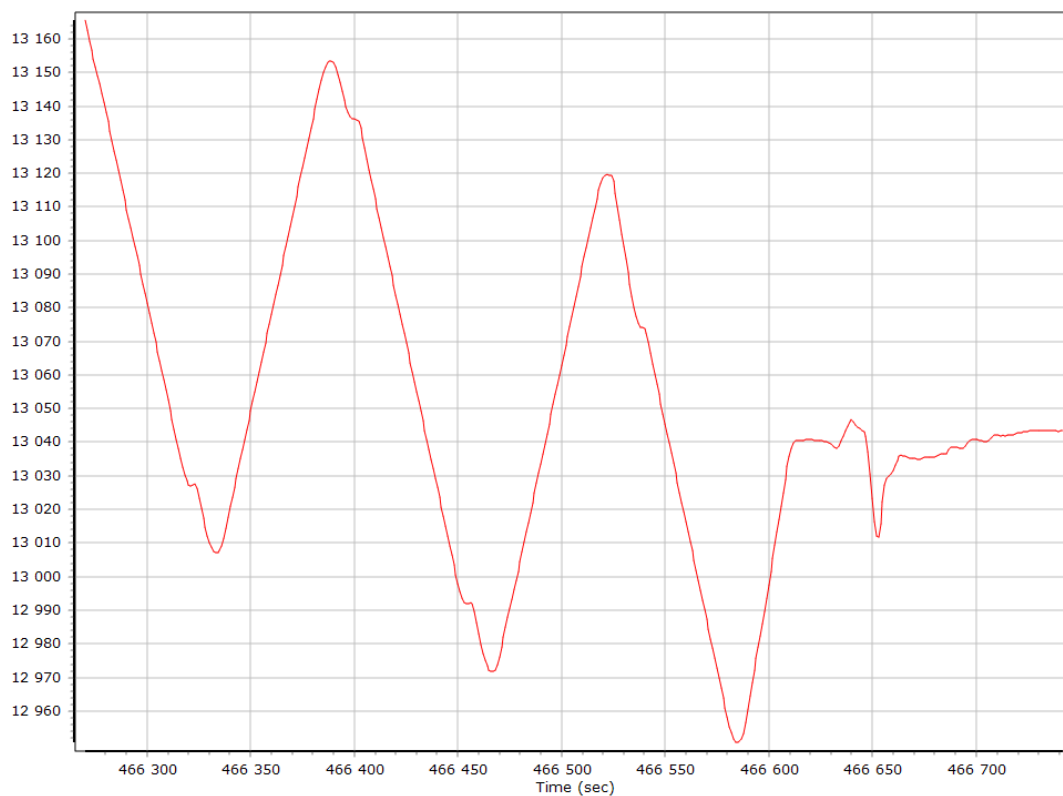
Processing Mode



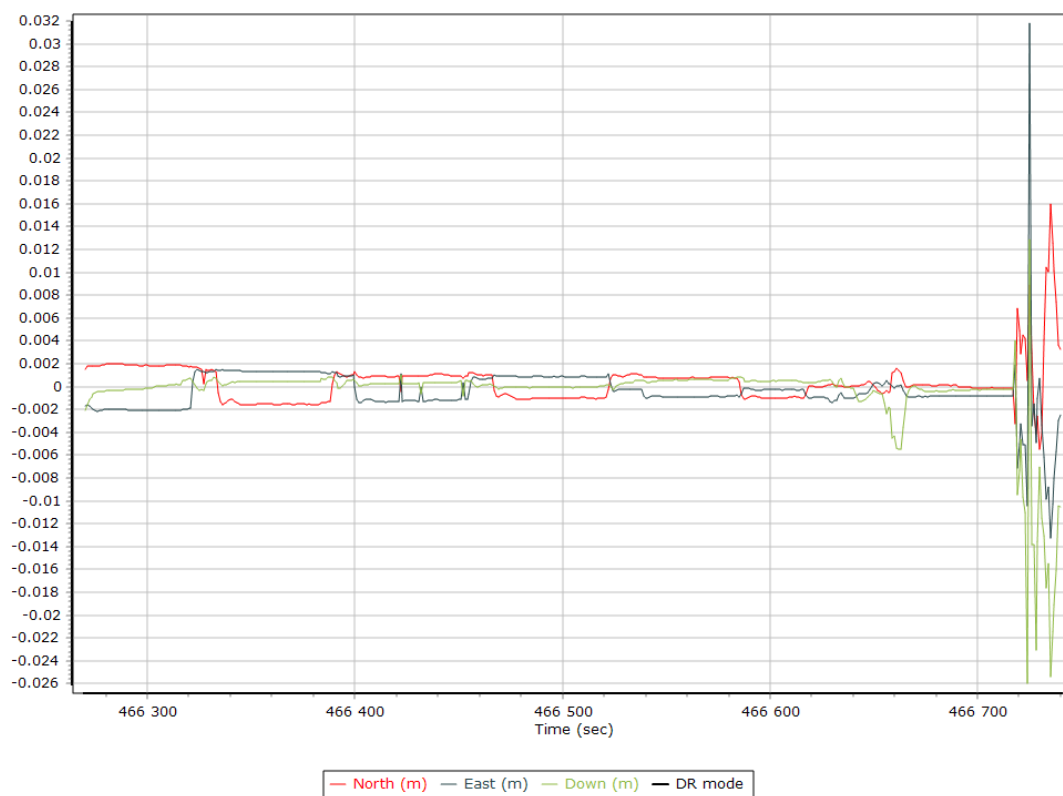
Number of Satellites



Baseline Length



SBET IAKAR Separation



Export Summary

Export file	export_Mission 1.txt		
Export format	ASCII		
Solution in use	Post-processed		
Output rate	All Records		
Reference to Output lever arm [m]	0.000	0.000	0.000
Reference mounting angles [deg]	0.000	0.000	0.000
Output units (Coordinate / Lat & Lon)	Meter		Deg Decimal
Export start time	466198.001 (2/22/2019 9:29:58 AM)		
Export end time	466742.001 (2/22/2019 9:39:02 AM)		
Height option	Ellipsoid Height		
WGS84 height flag	False		
Grid	Universal Transverse Mercator		
Zone	UTM North 31 (0E to 6E)		
Datum	WGS84		
Ellipsoid	WGS84		
Local Transformation	NONE		
Target Epoch	2019.142466		

EO Summary

EO file			
EO format			
Lever arm [m]	0.000	0.000	0.000
Boresight angles [arcmin]	0.000	0.000	0.000
Output rate	All Records		
Rotation sequence	x omega	y phi	z kappa
Local shift [m]	0.000	0.000	0.000
Output units (coordinate / angle / lat & lon)	Meter	Degree	Deg Decimal
Height option	Ellipsoid Height		
WGS84 height flag	False		
Scale height option	False		
Kappa cardinal rotation [deg]	0		
Solution in use	Post-processed		
EO start time	466198.001 (2/22/2019 9:29:58 AM)		
EO end time	466742.001 (2/22/2019 9:39:02 AM)		
Grid	Universal Transverse Mercator		
Zone	UTM North 31 (0E to 6E)		
Datum	WGS84		
Ellipsoid	WGS84		
Local Transformation	NONE		
Target Epoch	2019.142466		

General Information

Mission Information

Project name	Labarre_vol2_MSGTstation
Processing date	2019-02-26 15:01:29
Mission date	2019-02-22 10:08:04
Mission duration	00:11:32.989
Processing mode	IN-Fusion Single Base
GPS Station	MSGT

Rover Hardware Information

Product	APX 15 AVX 210 VER0 174
Serial number	S/N001
IMU type	59
Receiver type	APX-15v3
Antenna type	AV14

Project File List

Rover Data Files

File name	File type
YS-20190222-100740.T04	T04 Rover Data

Input Files

File Name	File type
Ephm0530.19g	GLONASS Broadcast Ephemeris
Ephm0530.19n	GPS Broadcast Ephemeris
msgt053z.19o	GNSS SingleBase

Output Files

Filename	File type
sbet_Mission 1.out	SBET Trajectory File
export_Mission 1.txt	ASCII Export Output

Rover Data Summary

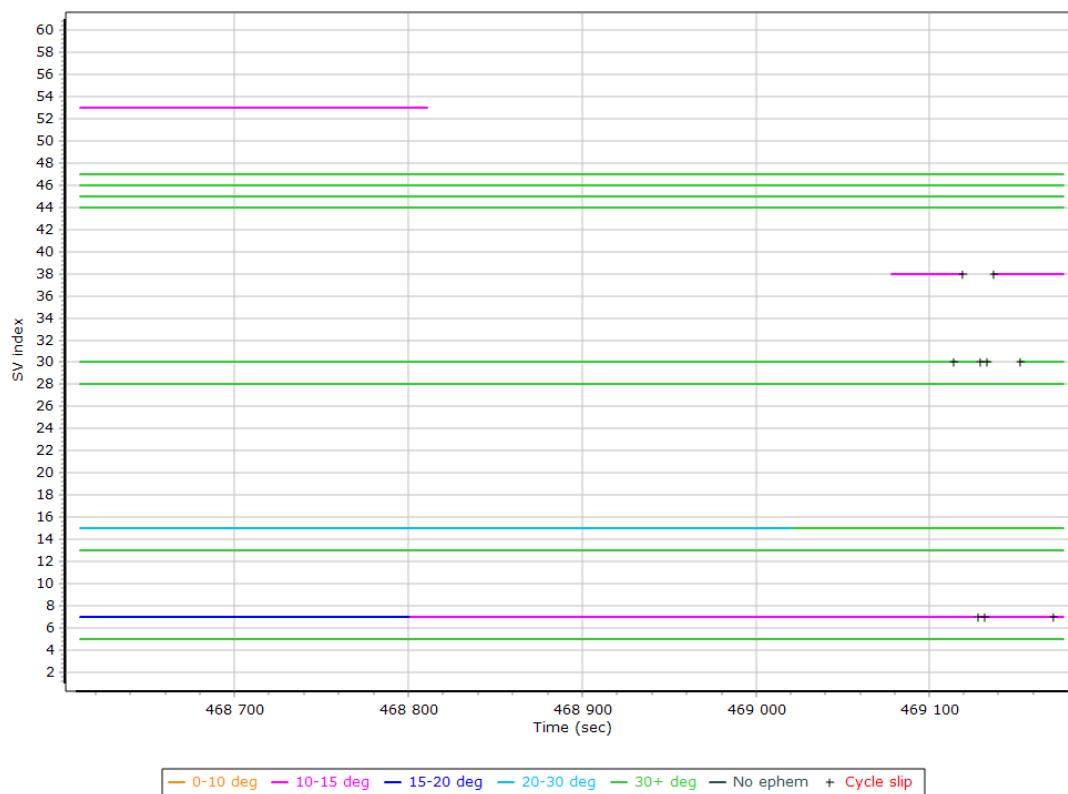
First raw data file	YS-20190222-100740.T04		
Last raw data file	YS-20190222-100740.T04		
Start GPS week	2041		
Start time	468484.000 (2/22/2019 10:08:04 AM)		
End time	469177.000 (2/22/2019 10:19:37 AM)		
Start of fine alignment	468550.600 (2/22/2019 10:09:10 AM)		
Available subsystems	Primary GNSS, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Reference to IMU lever arm [m]	-0.013	0.108	-0.007
Reference to IMU mounting angles [deg]	0.000	0.000	0.000
Reference to Primary GNSS lever arm [m]	0.006	0.218	-0.435
Reference to Primary GNSS lever arm std dev [m]	0.020		
Aircraft to Reference mounting angles [deg]	0.000	0.000	0.000

Raw Data QC

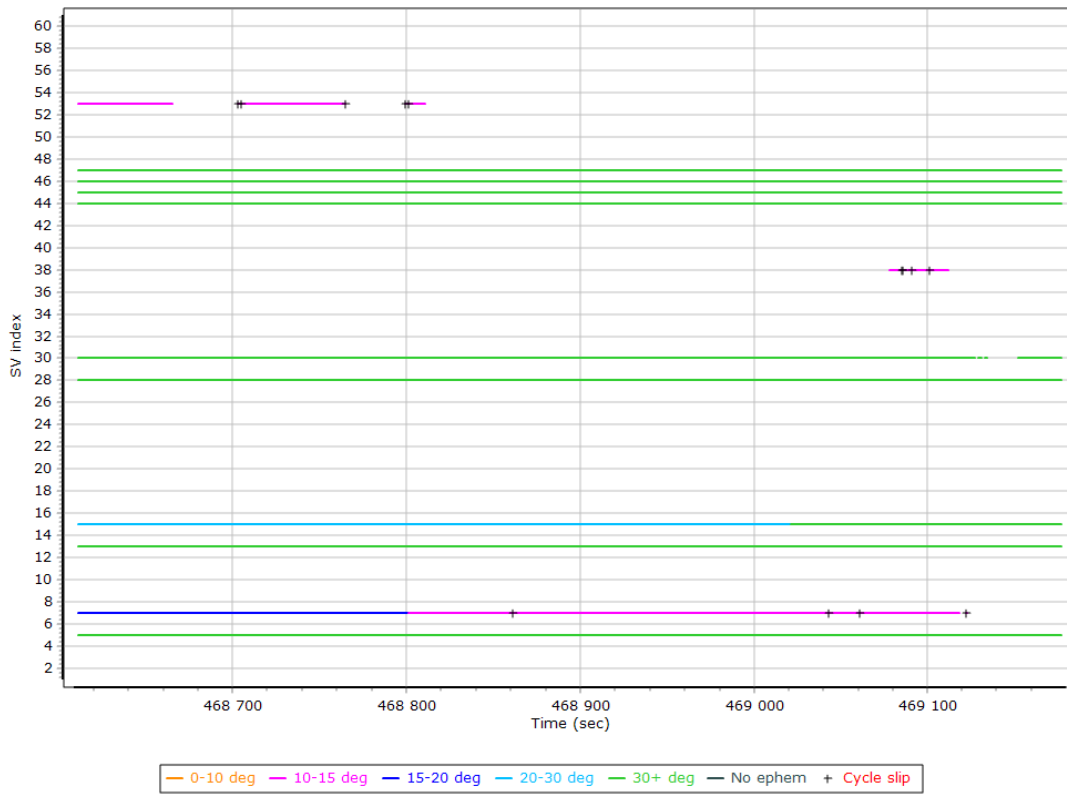
Raw IMU Import QC Summary

IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_Mission 1.log
IMU Records Processed	138590
Termination Status	Normal
IMU Anomalies	0

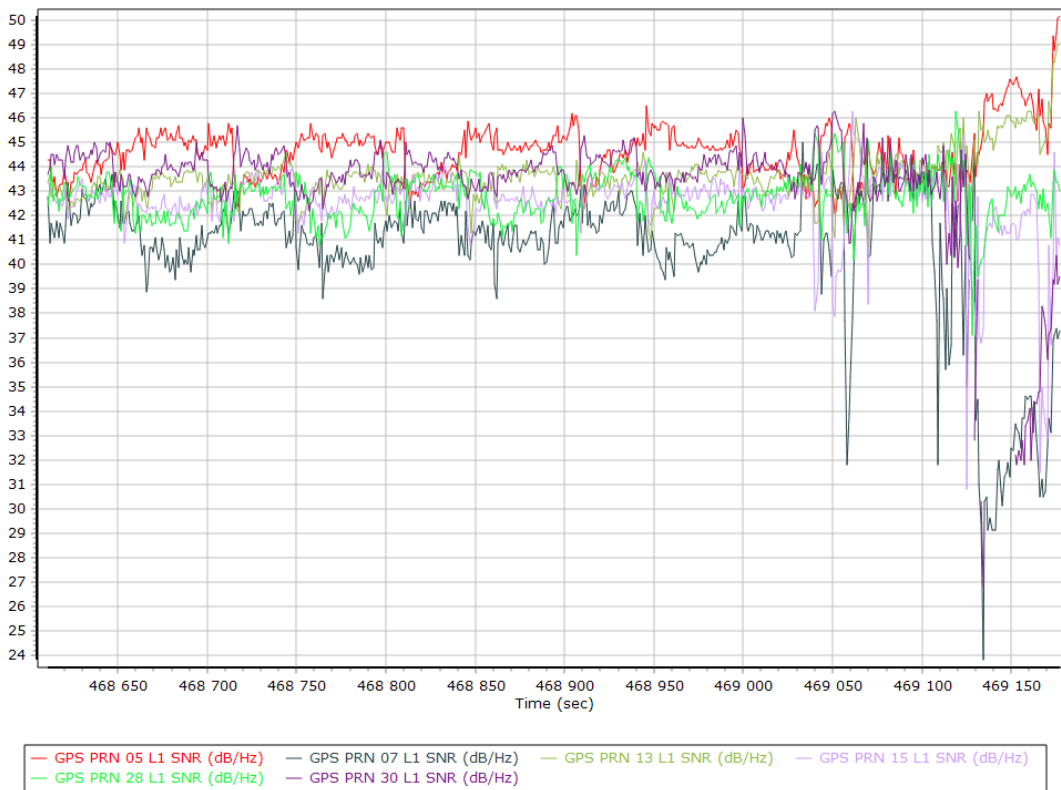
L1 Satellite Lock/Elevation



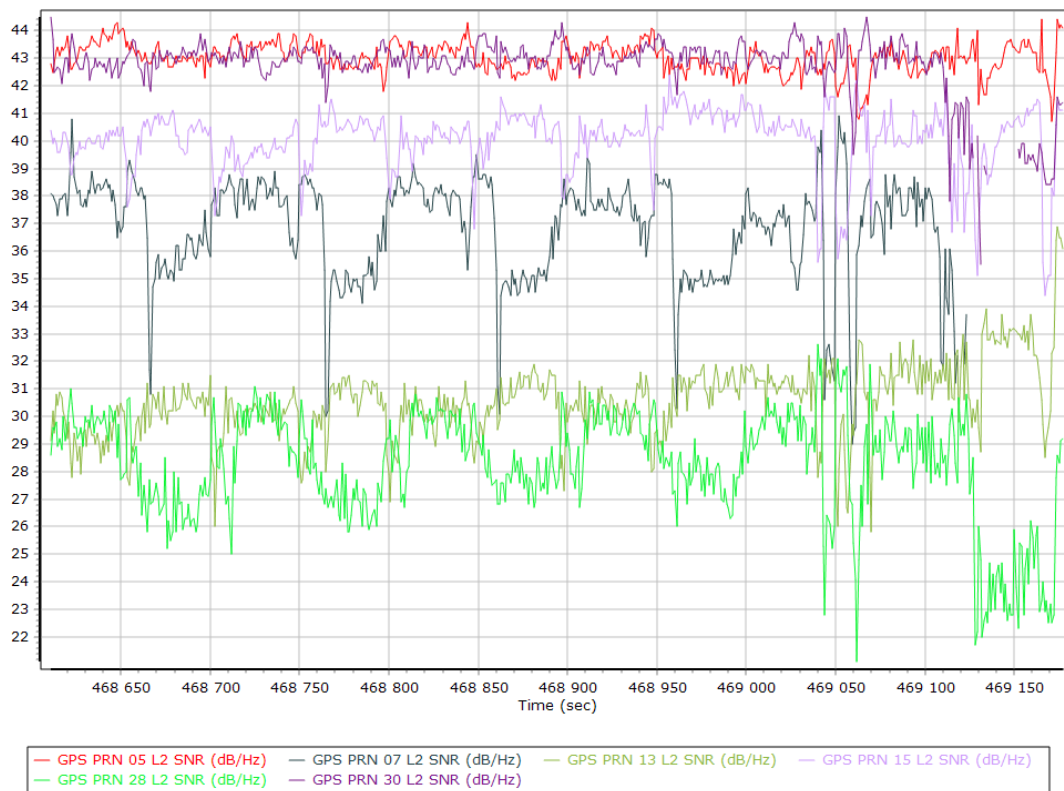
L2 Satellite Lock/Elevation



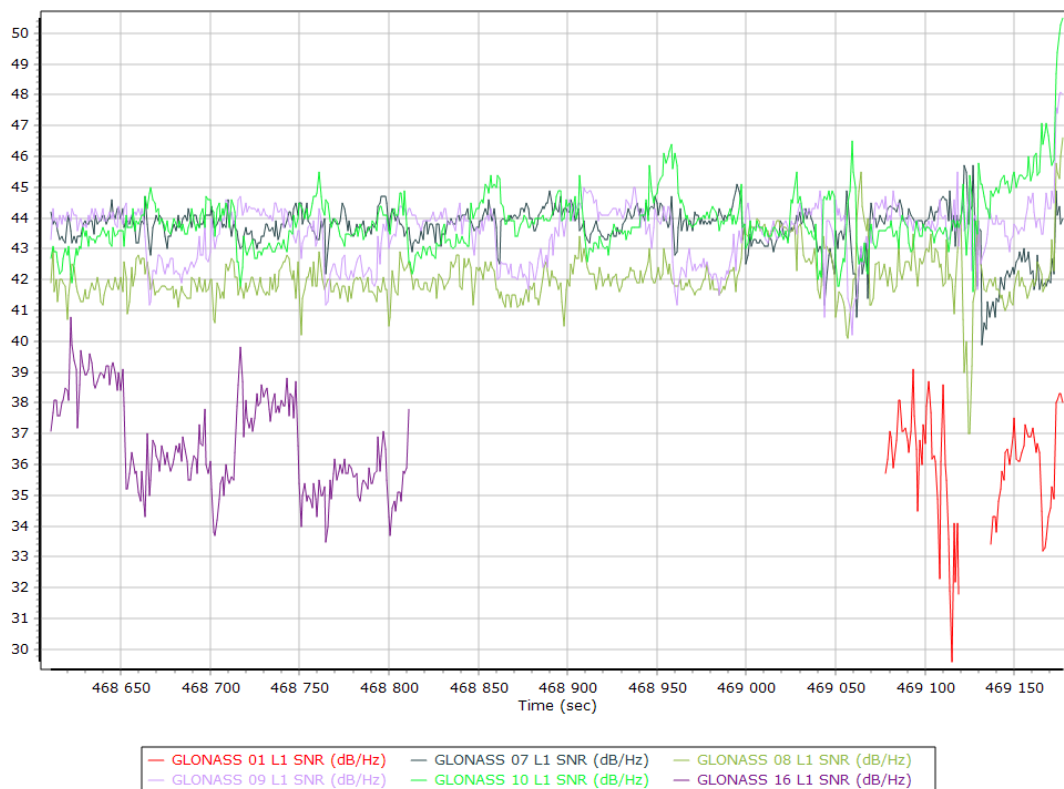
GPS L1 SNR



GPS L2 SNR

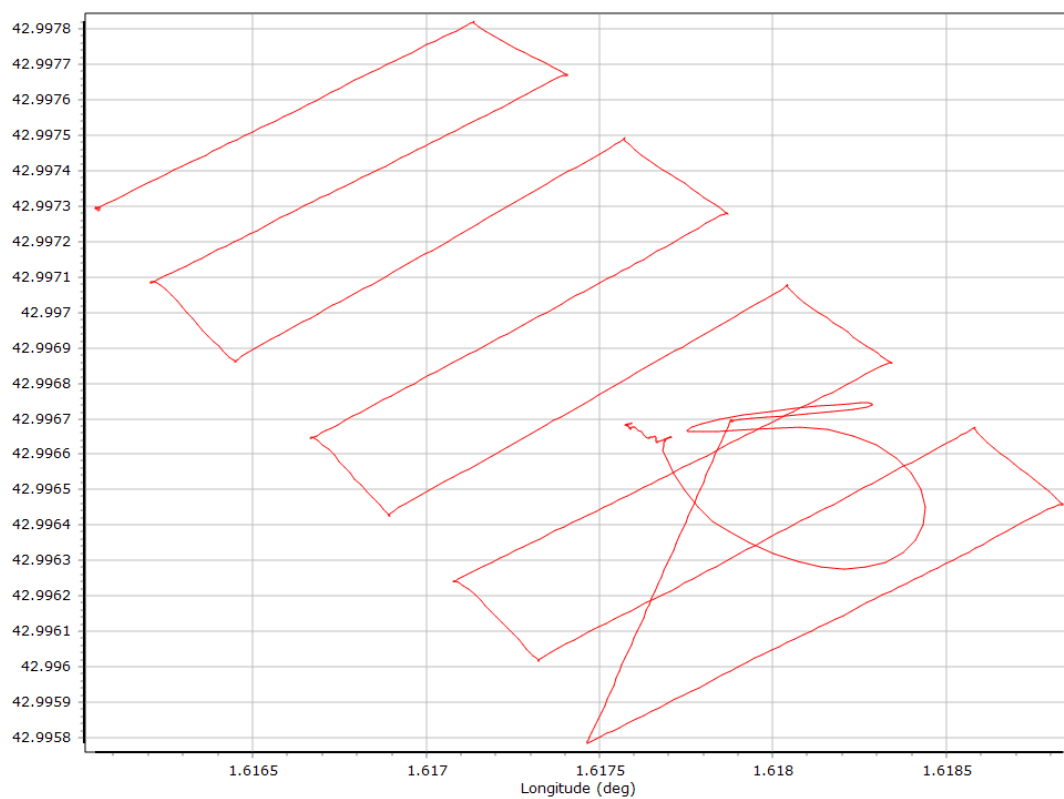


GLONASS L1 SNR

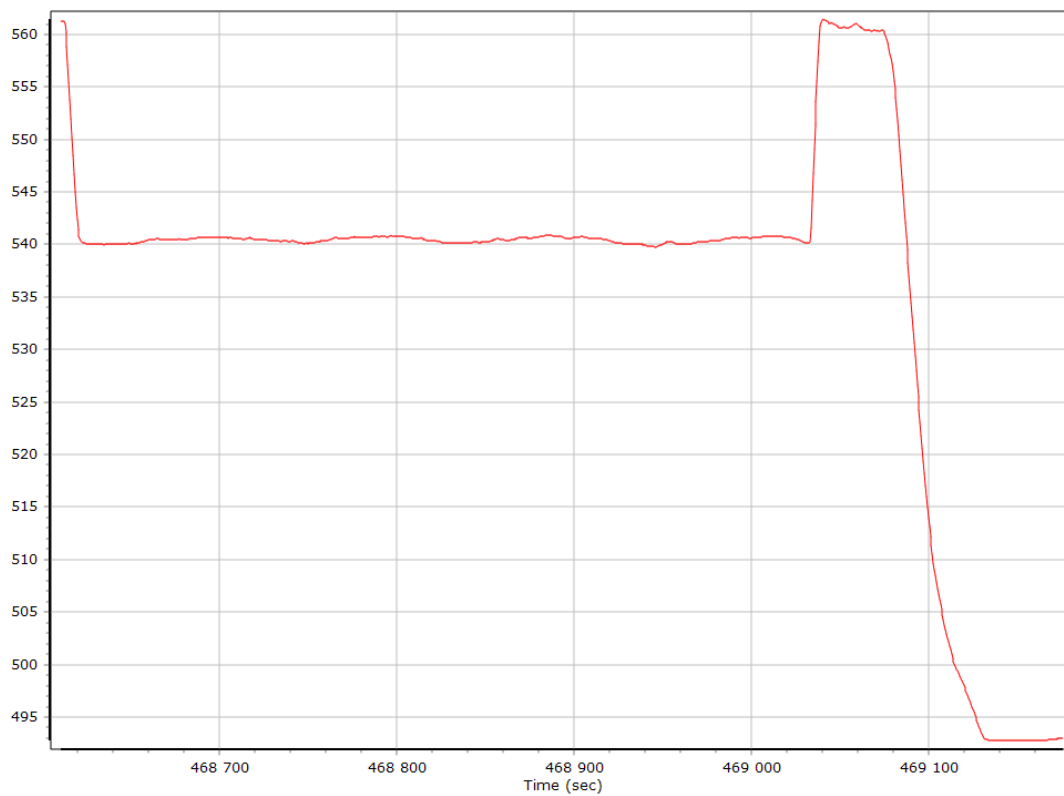


Trajectory Information

Top View



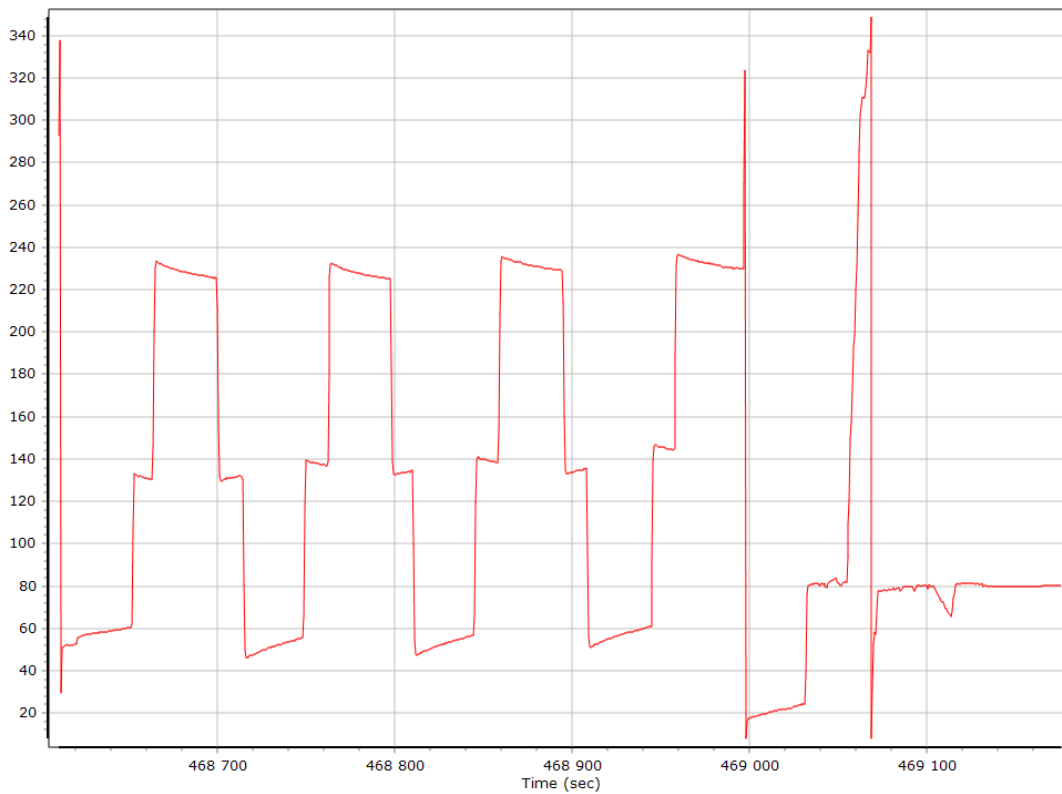
Altitude



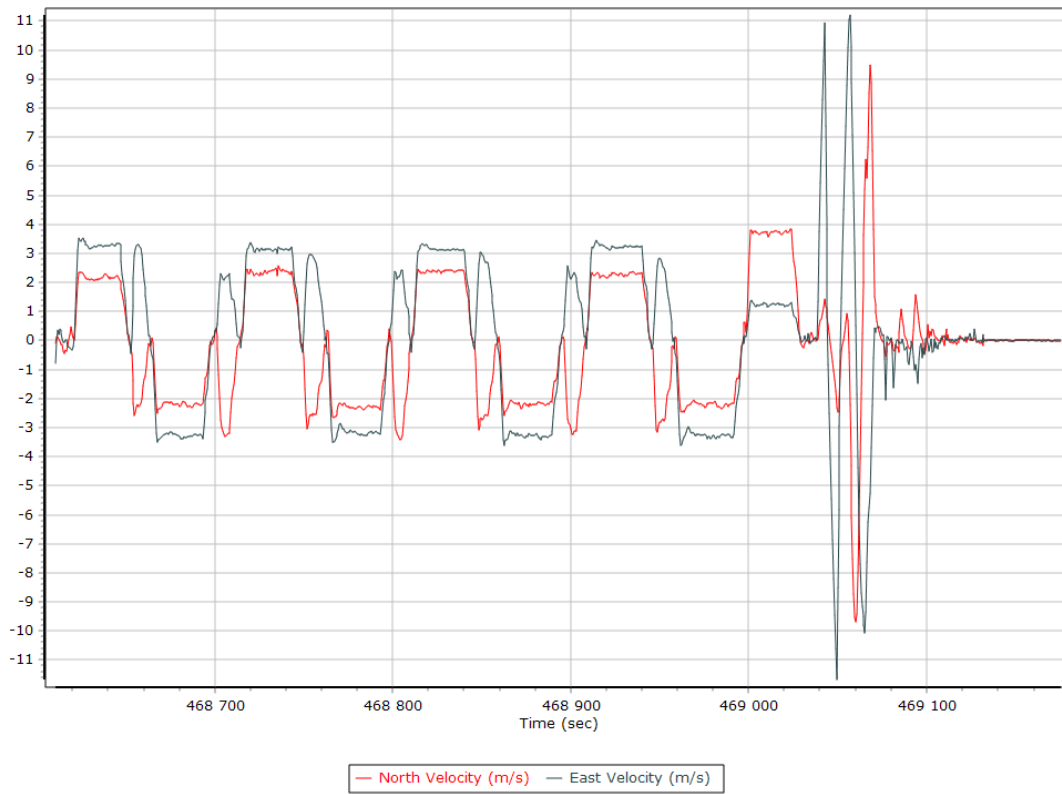
Roll/Pitch



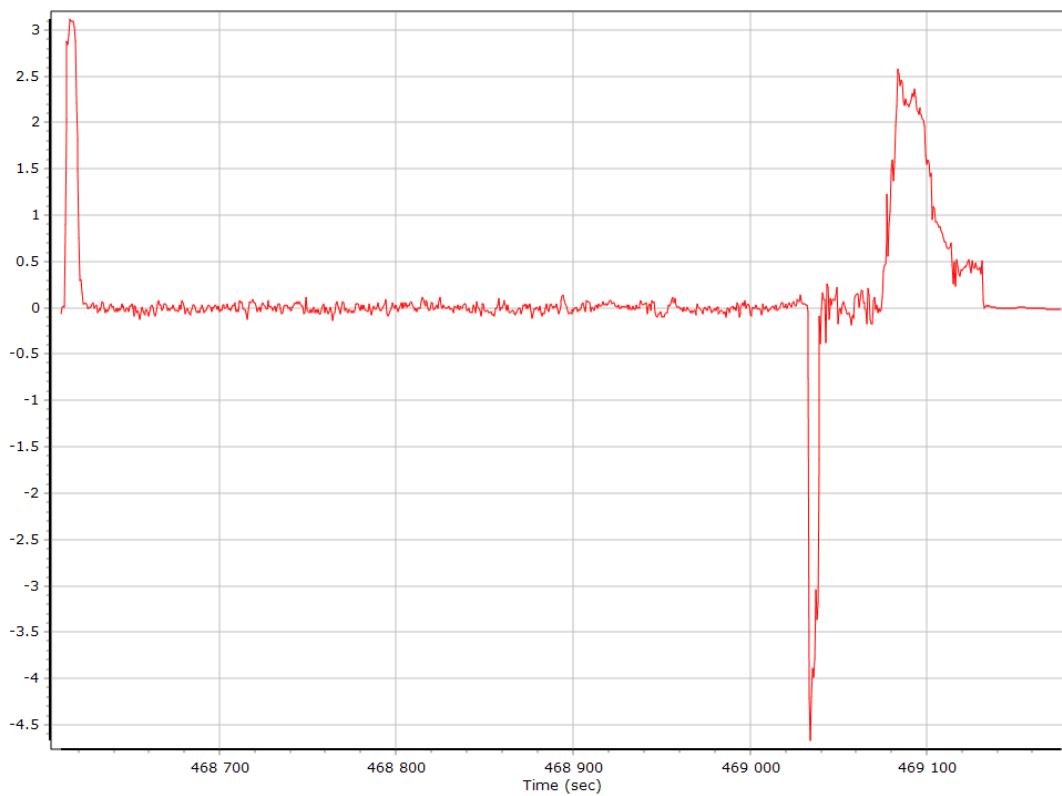
Heading



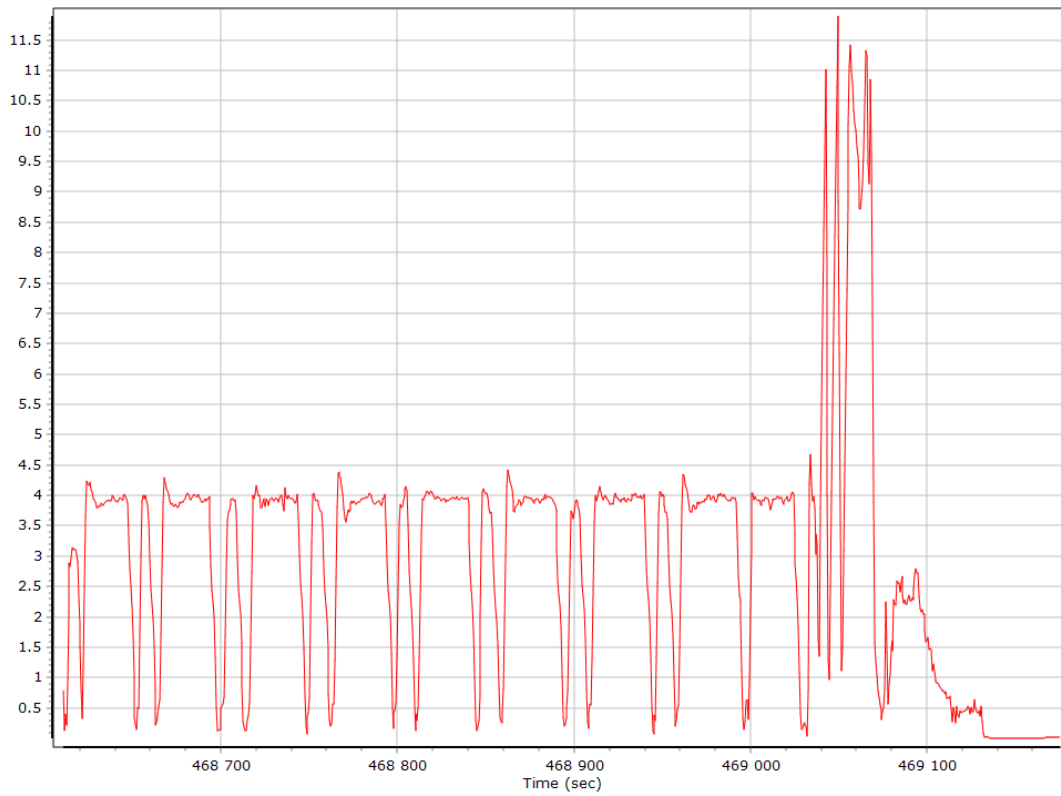
North/East Velocity



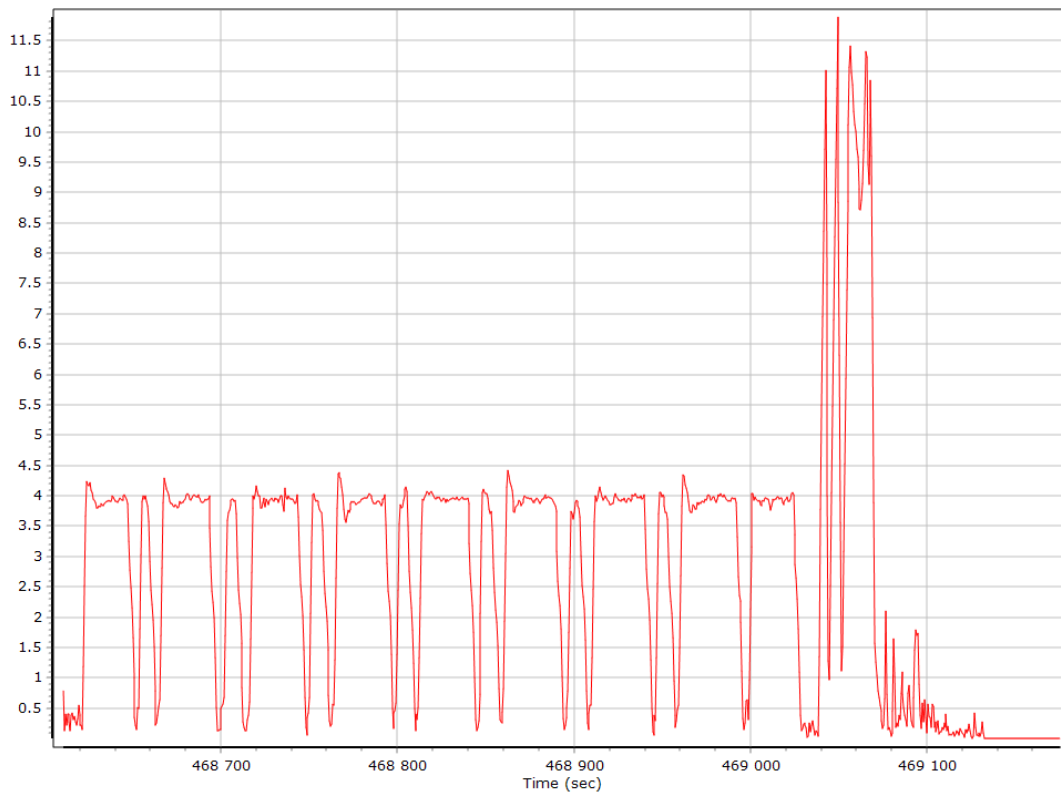
Down Velocity



Total Speed



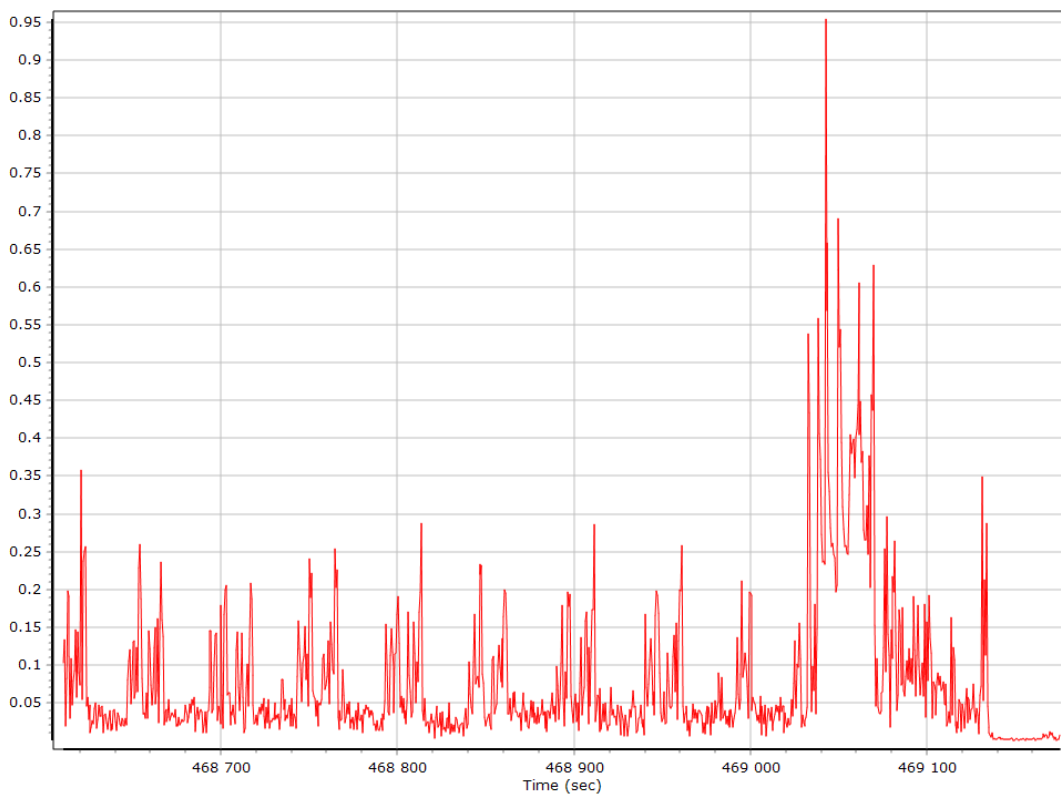
Ground Speed



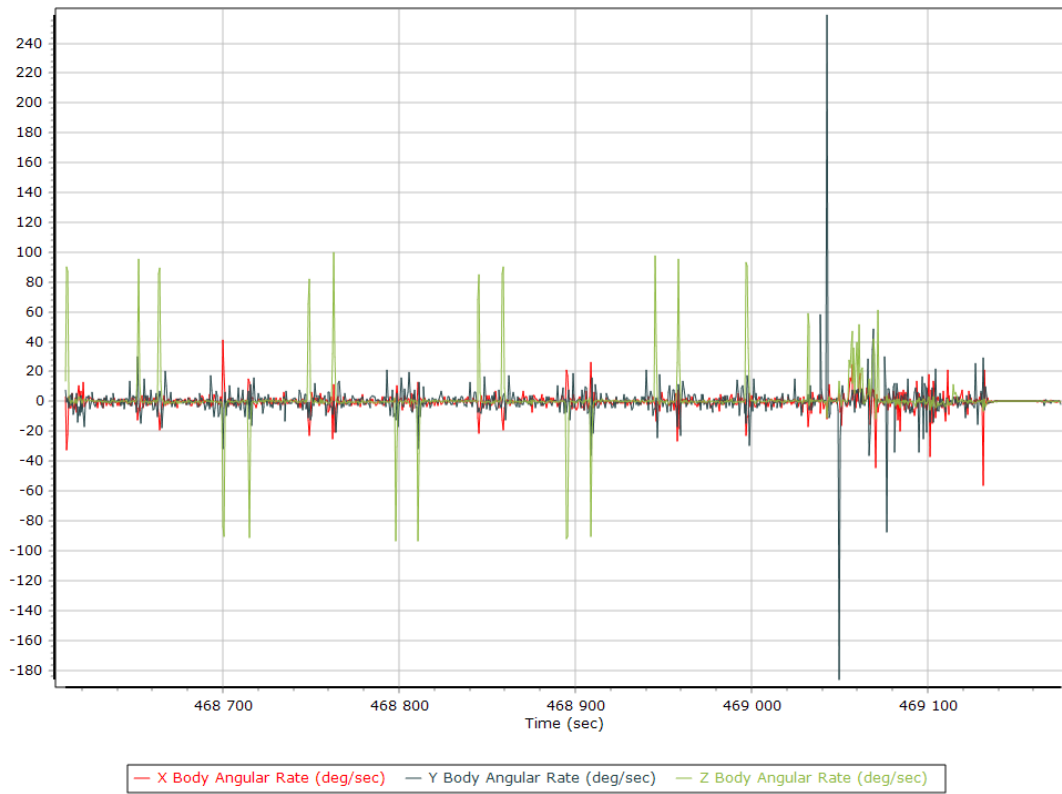
Body Acceleration



Total Body Acceleration



Body Angular Rate



Base Station Information

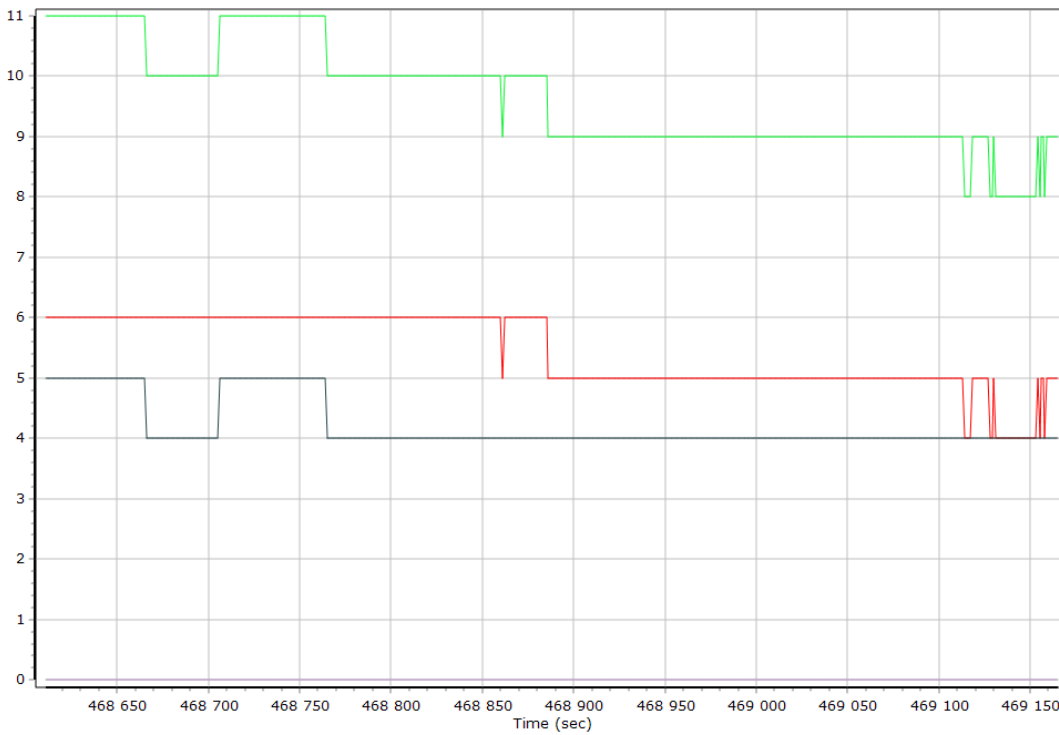
Station ID	MSGT		
Filename	msgt053z.19o		
Start date	2/22/2019 7:00:00 AM		
End date	2/22/2019 11:59:59 AM		
Duration	04:59:59.000		
Data type	GNSS		
Receiver manufacturer, model, serial no.	TPS	NET-G5	1294-11729
Antenna manufacturer, model	Leica		AR25 w/LEIT Dome
Antenna height [m]	0.000		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC [m]	0.15508		
Latitude	N42°52'46.58258"		
Longitude	E1°37'45.94975"		
Ellipsoidal height [m]	548.63250		
Frame	ITRF00		
Epoch	1997		
Ellipsoid	WGS84		
Velocity North [mm/y]	0		
Velocity East [mm/y]	0		
Velocity Up [mm/y]	0		

GNSS QC

GNSS QC Statistics

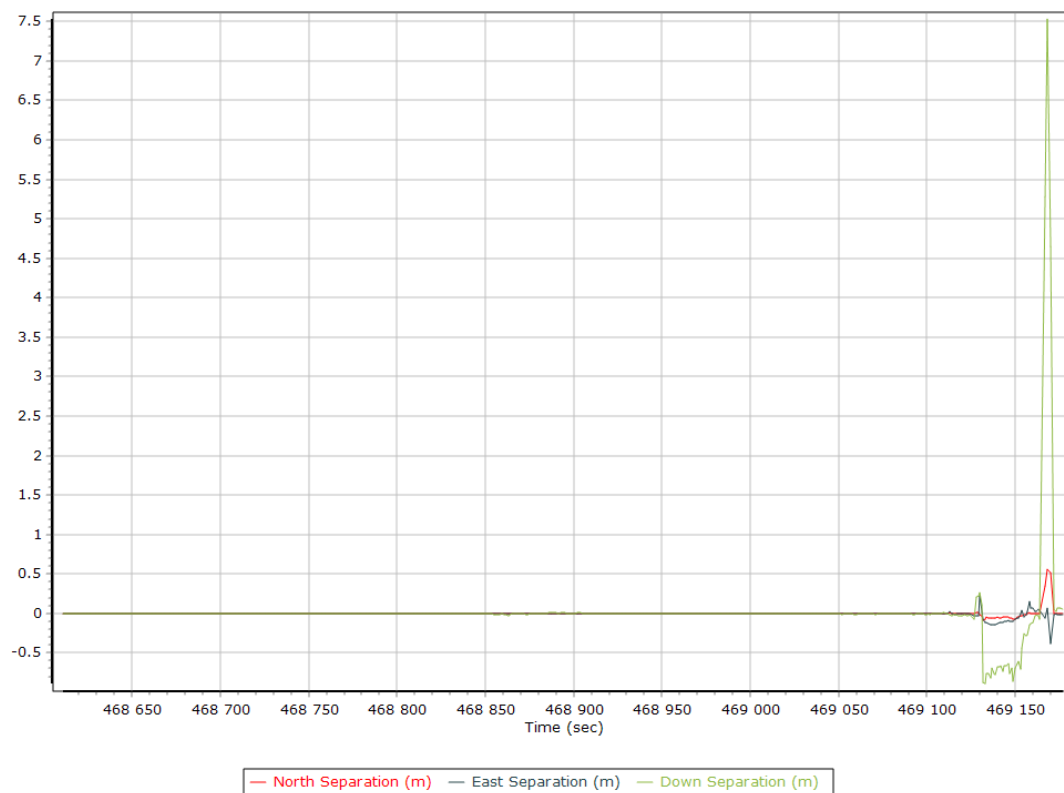
Statistics	Min	Max	Mean
Baseline length [km]	12.94	13.17	
Number of GPS SV	4	6	5
Number of GLONASS SV	3	5	4
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Total number of SV	8	11	10
PDOP	2.02	4.12	2.96
QC Solution Gaps	0.00	0.00	
Solution Type	Fixed	Float	No solution
Epoch (s)	679.00	2.00	0.00
Percentage	99.71	0.29	0.00

Num SVs in solution

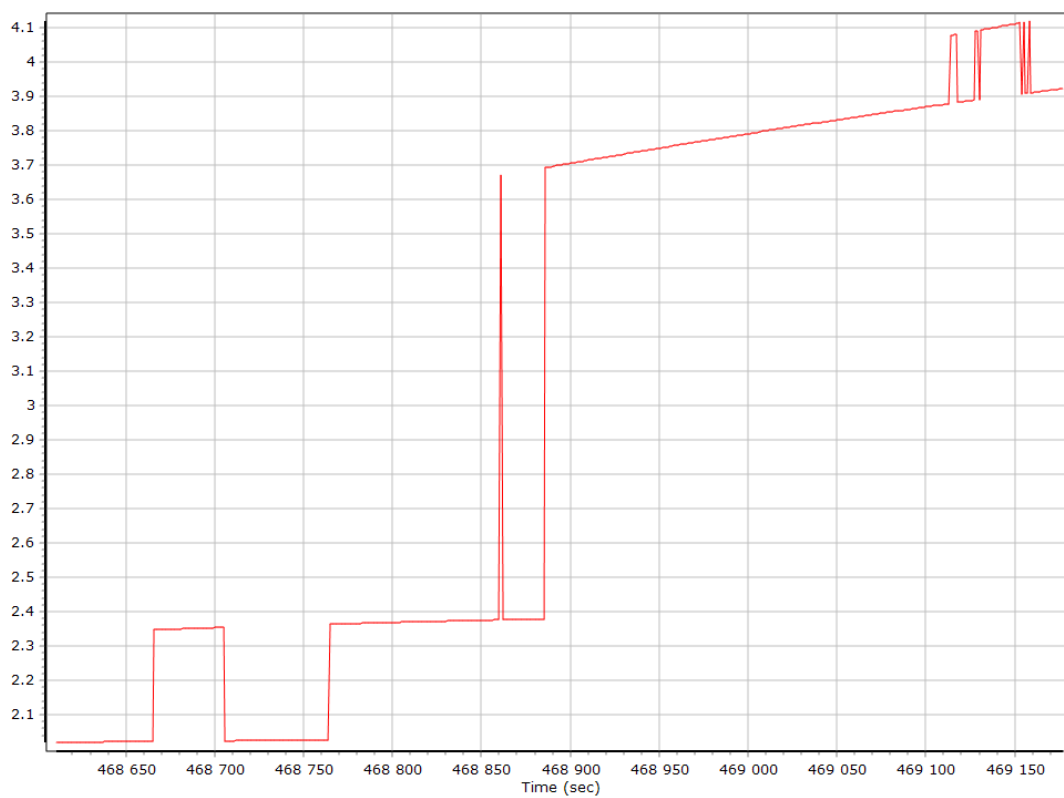


— Number of GPS — Number of GLONASS — Number of QZSS — Number of BEIDOU — Total Number

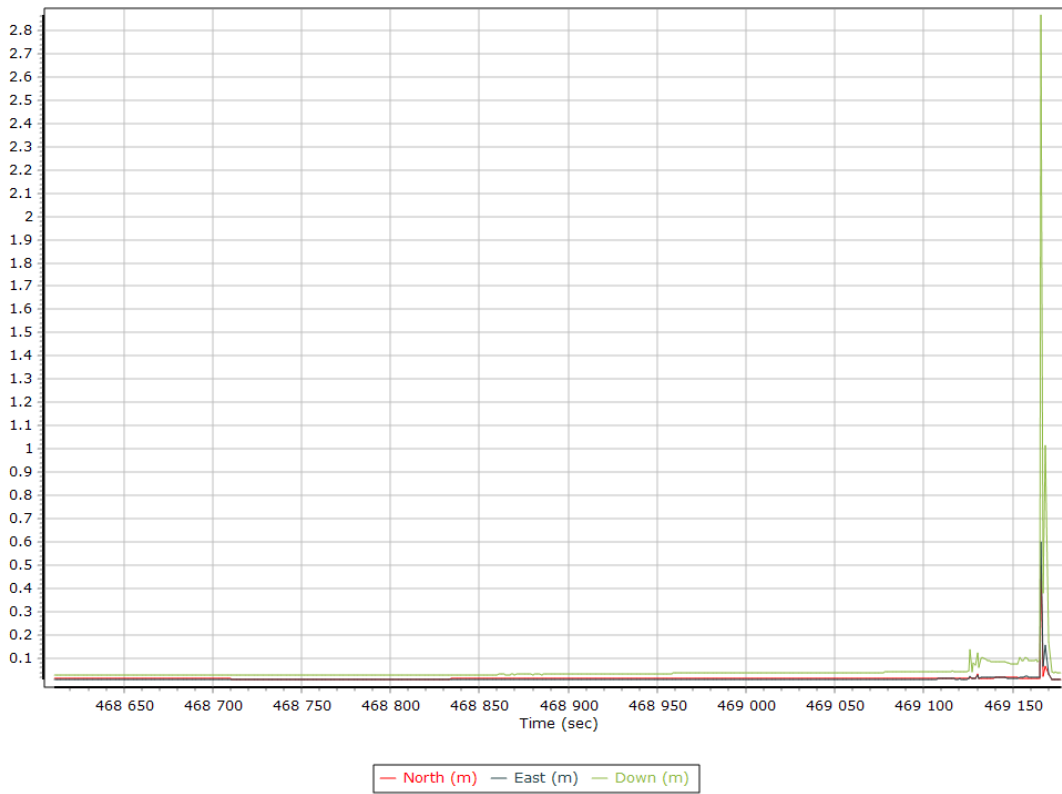
Forward/Reverse Separation



PDOP



Estimated Position Accuracy



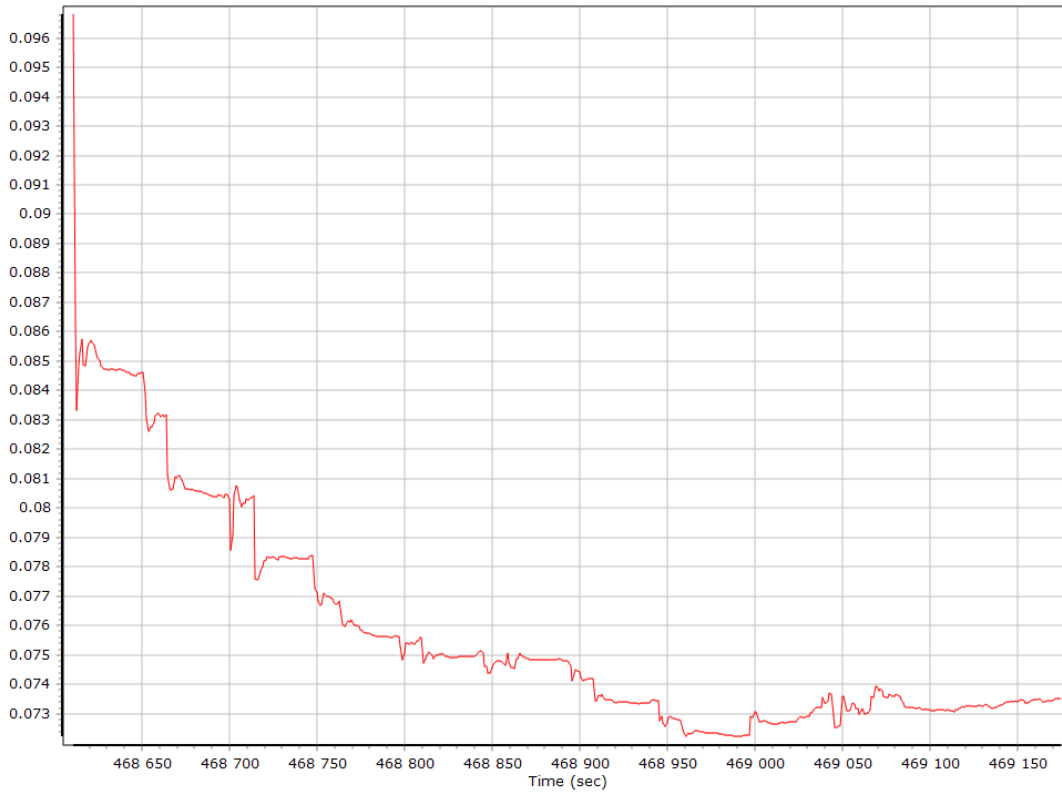
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion Single Base		
Stabilized mount	False		
Base station	MSGT		
Processing start time	468484.005 (2/22/2019 10:08:04 AM)		
Processing end time	469176.994 (2/22/2019 10:19:36 AM)		
Initial attitude source	Primary GNSS Track		
IMU Sensor Context	Processing with Onboard IMU		
Reference to IMU lever arm [m]	-0.013	0.108	-0.007
Reference to IMU mounting angles [deg]	0.000	0.000	0.000
Reference to Primary GNSS lever arm [m]	0.006	0.218	-0.435
Reference to Primary GNSS lever arm std dev [m]	0.100	0.100	0.100
Aircraft to Reference mounting angles [deg]	0.000	0.000	0.000

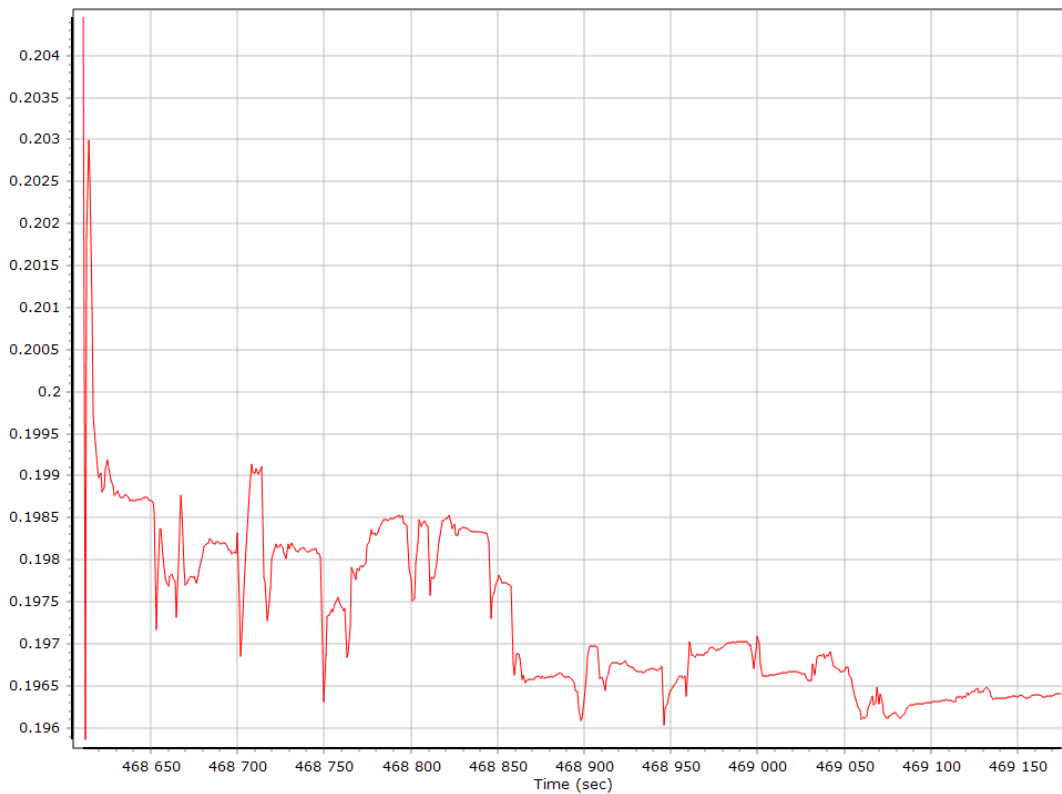
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm

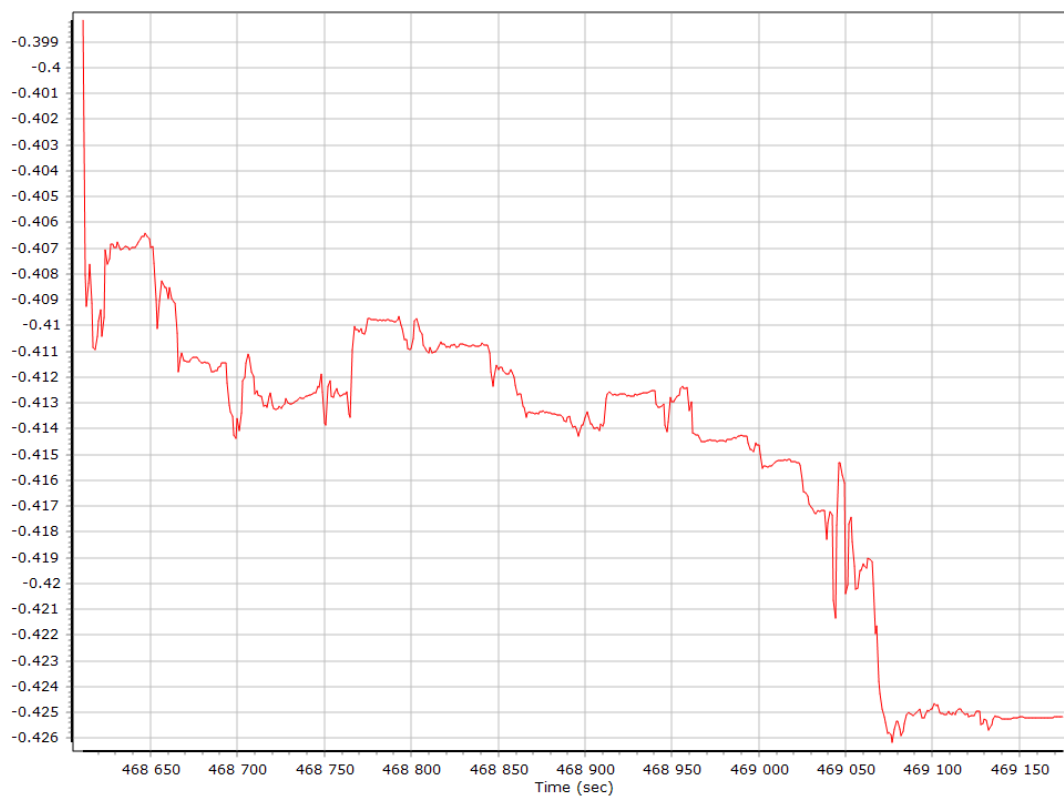
X Reference-Primary GNSS Lever Arm (m)



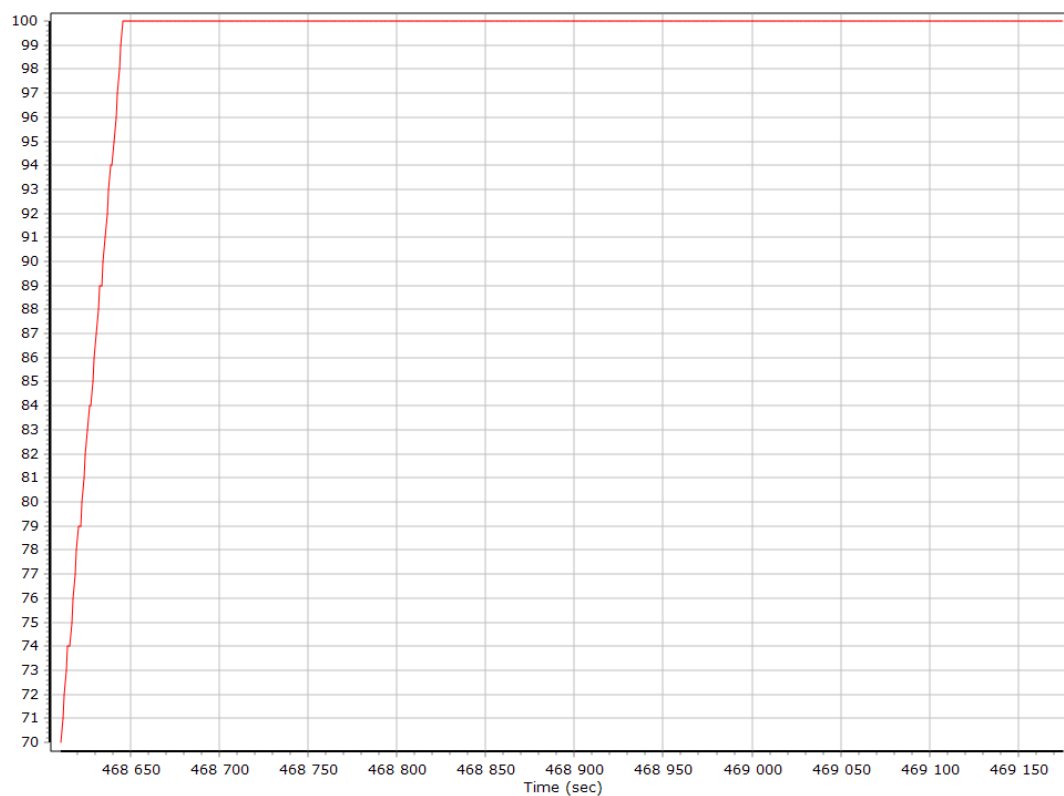
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



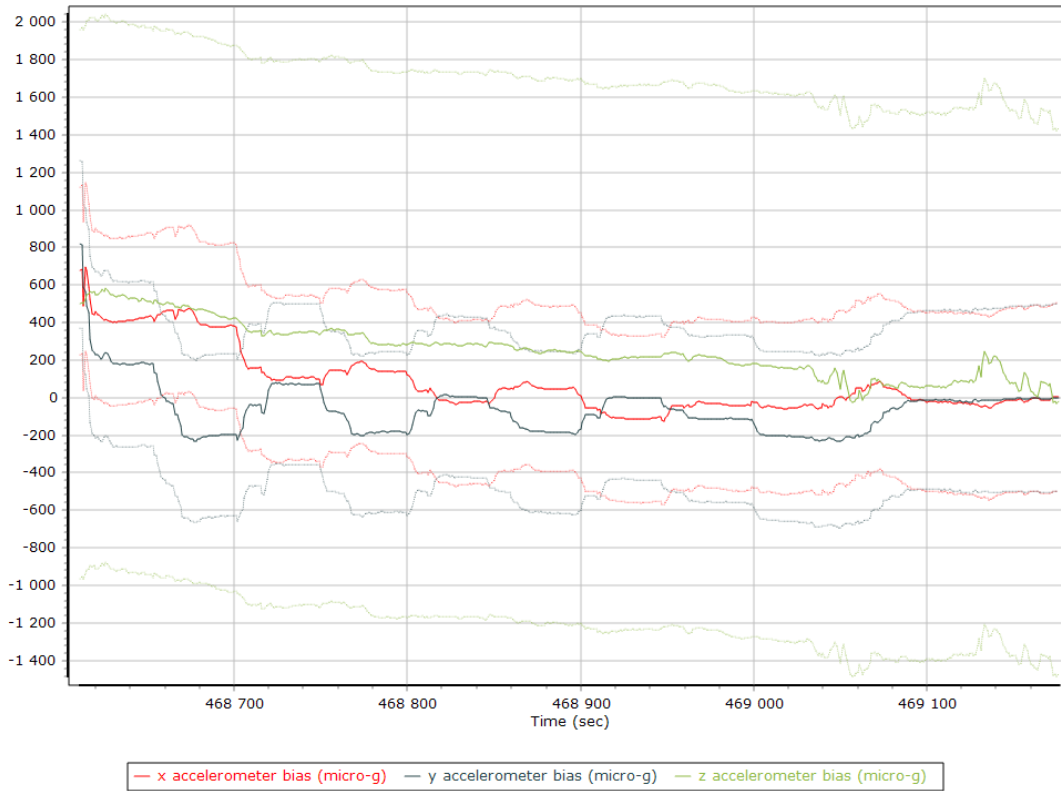
Reference-Primary GNSS Lever Arm Figure of Merit



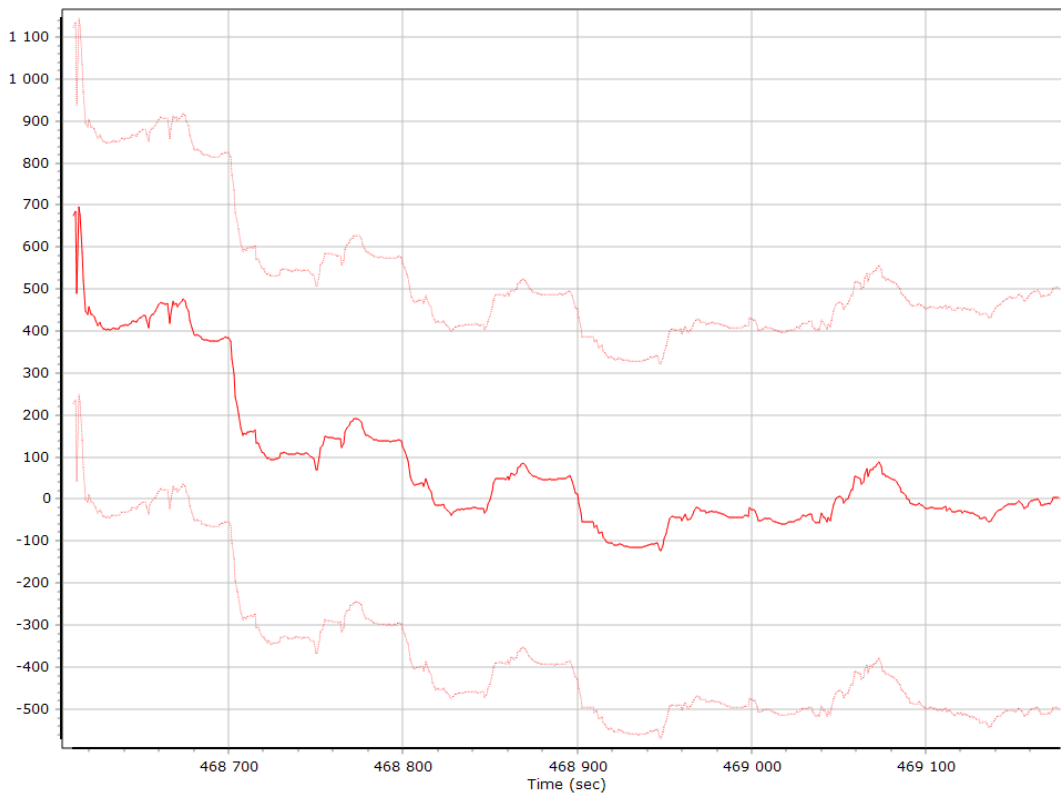
Smoothed IN-Fusion QC

Smoothed Estimated Errors, Reference Frame

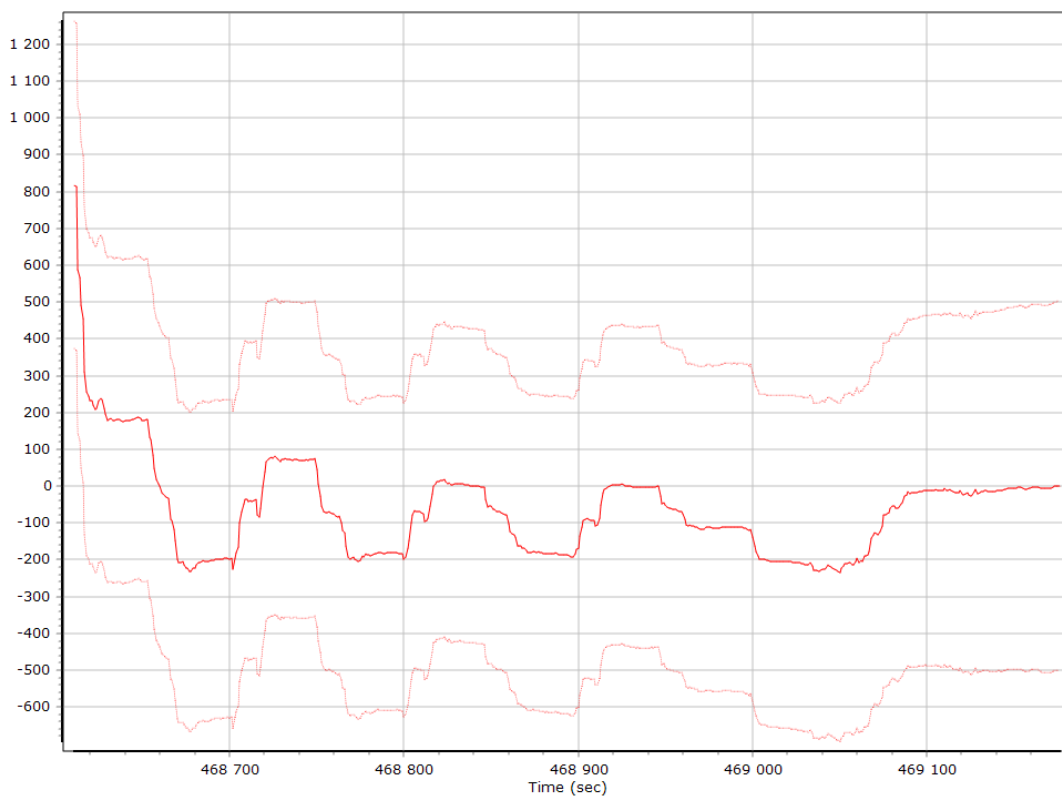
Accelerometer Bias (micro-g)



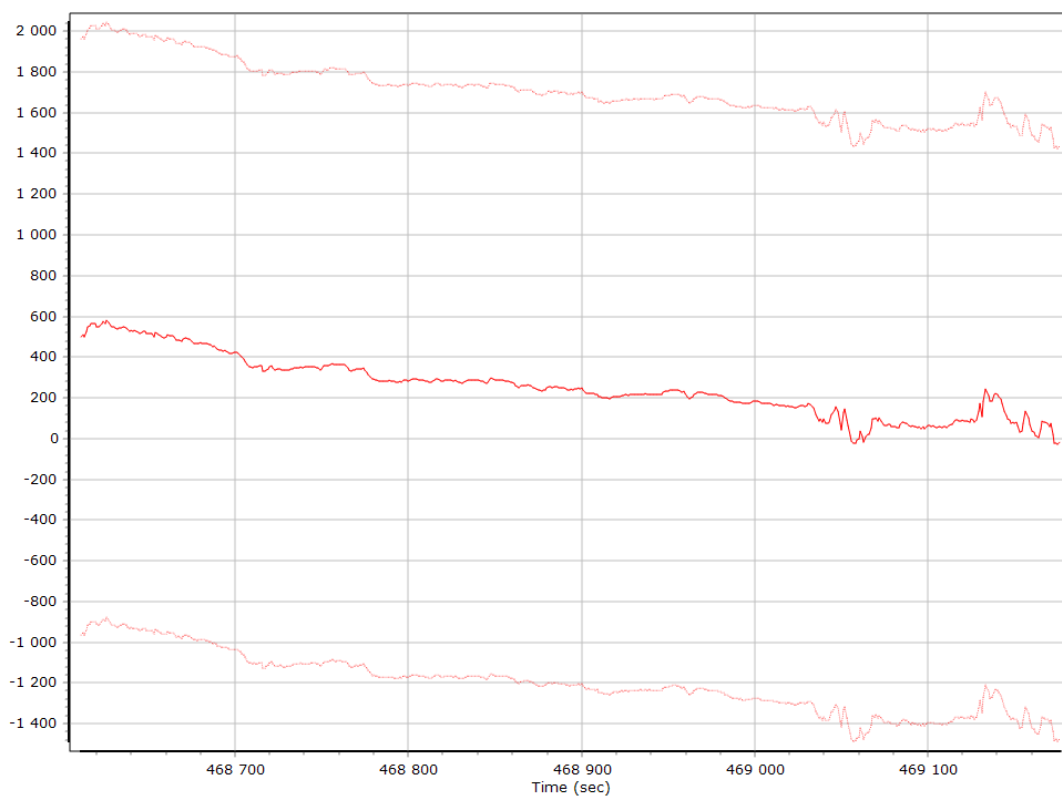
X Accelerometer Bias (micro-g)



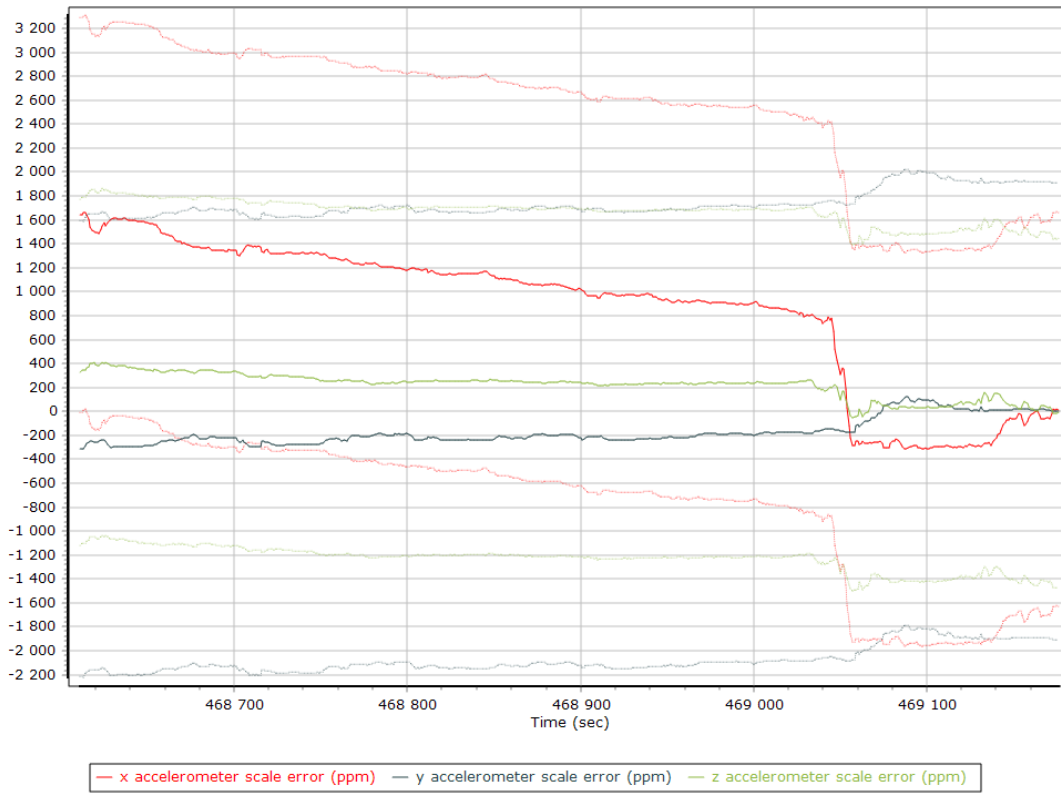
Y Accelerometer Bias (micro-g)



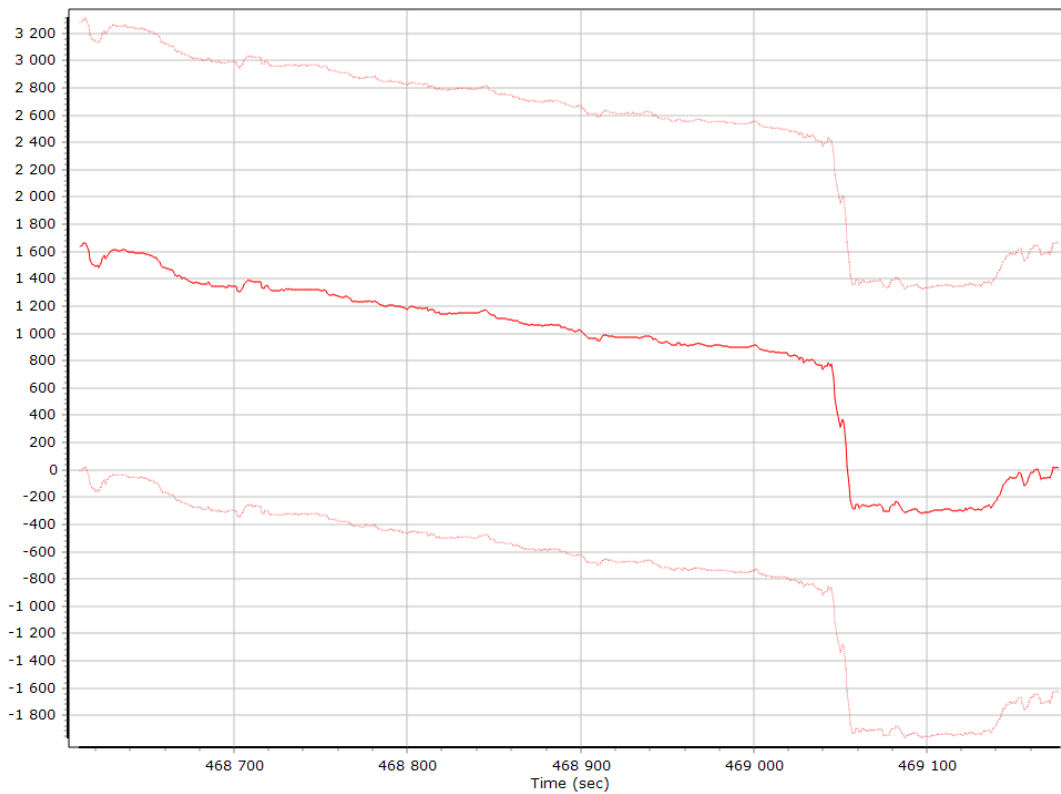
Z Accelerometer Bias (micro-g)



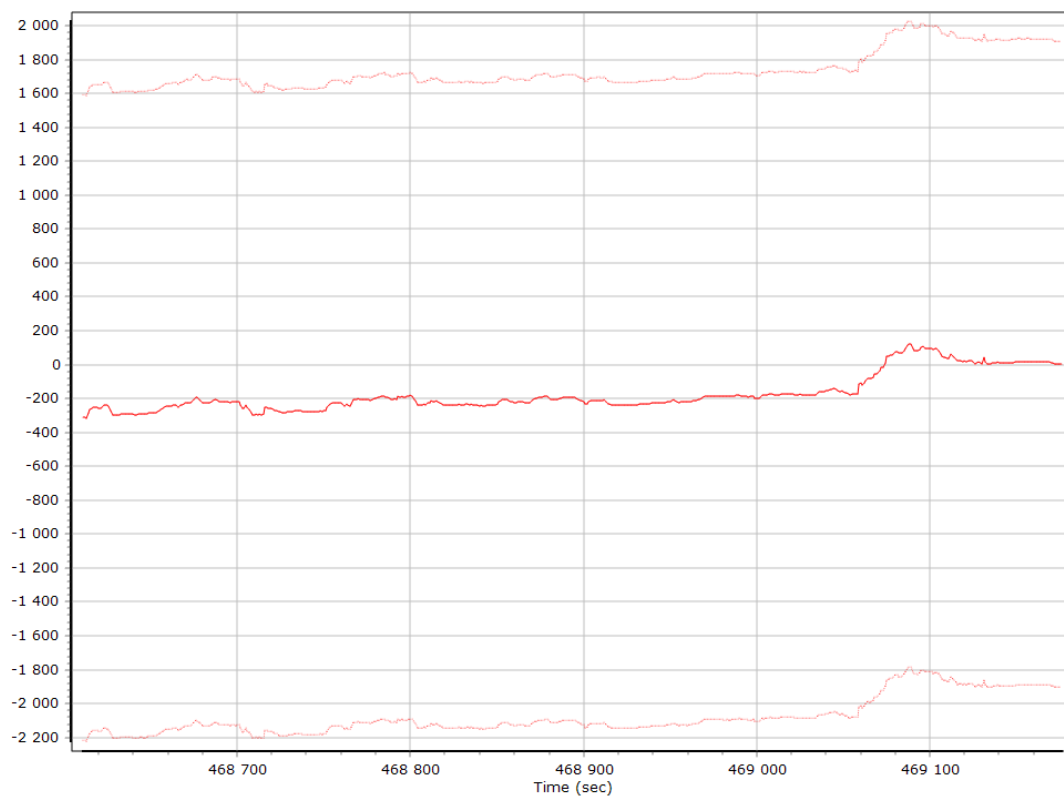
Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



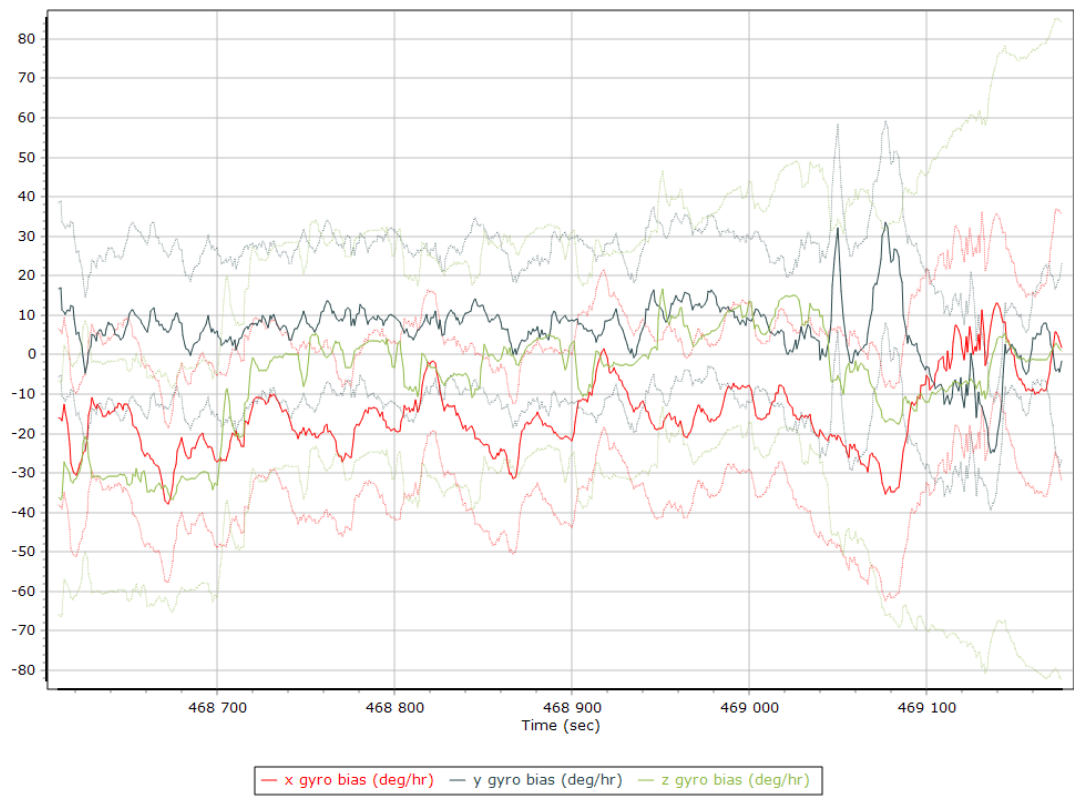
Y Accelerometer Scale Error (ppm)



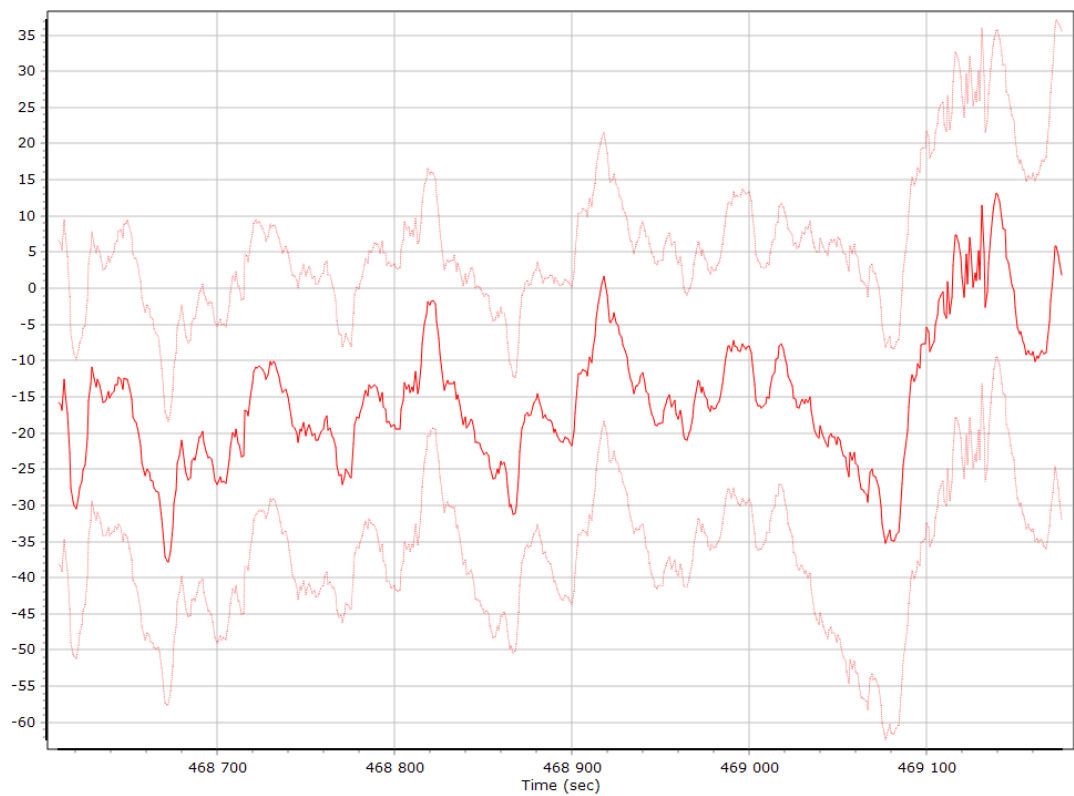
Z Accelerometer Scale Error (ppm)



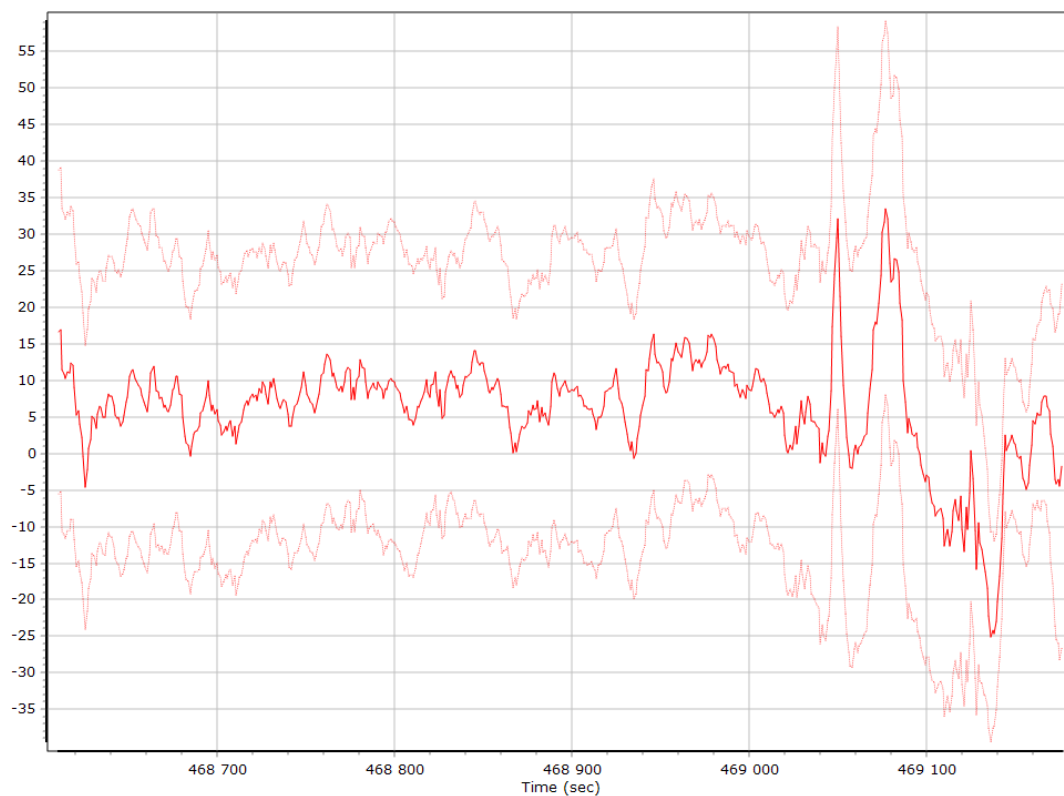
Gyro Bias (deg/h)



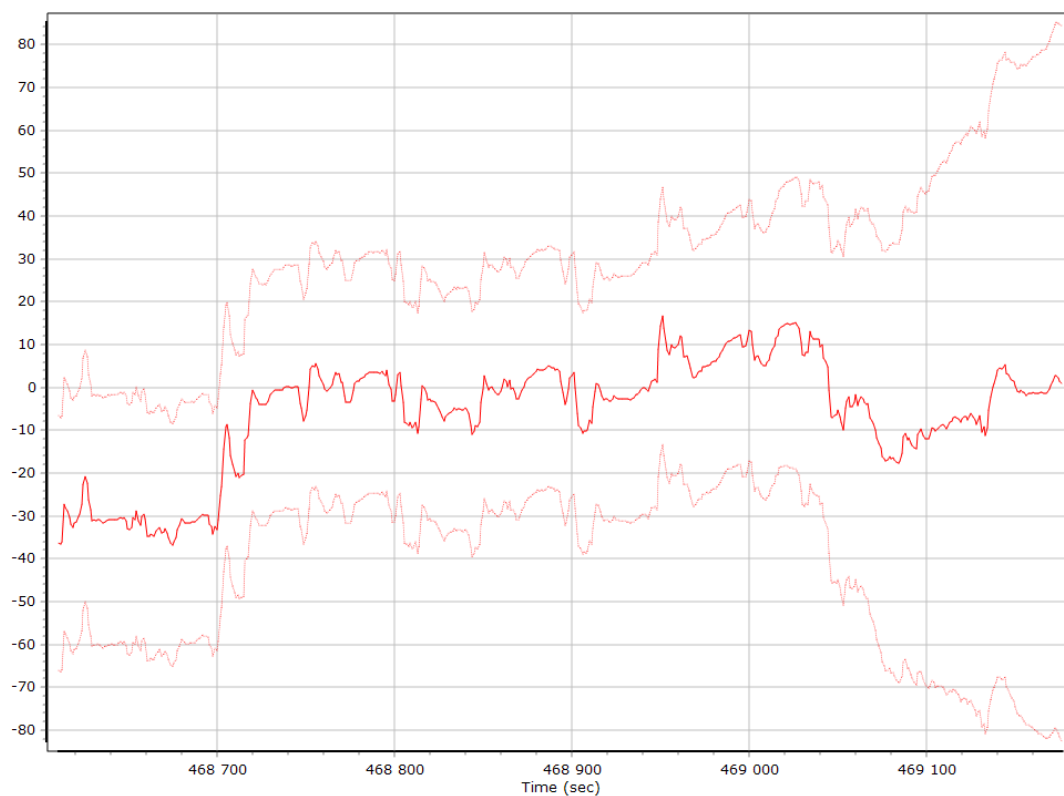
X Gyro Bias (deg/h)



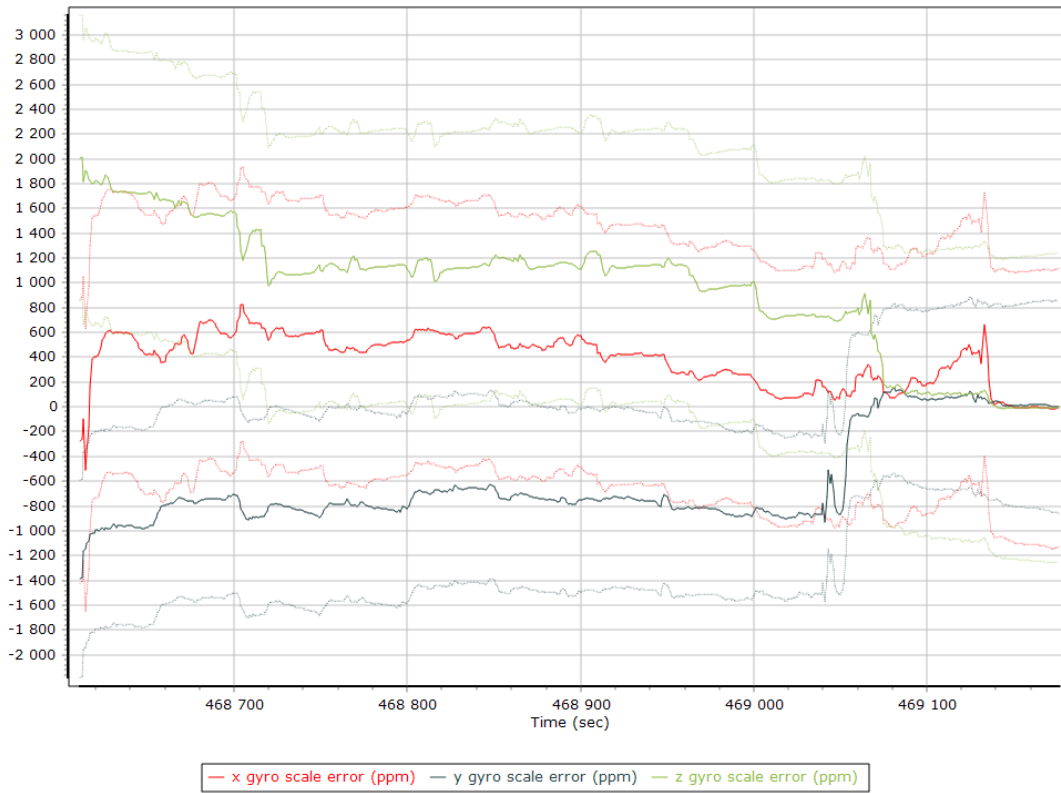
Y Gyro Bias (deg/h)



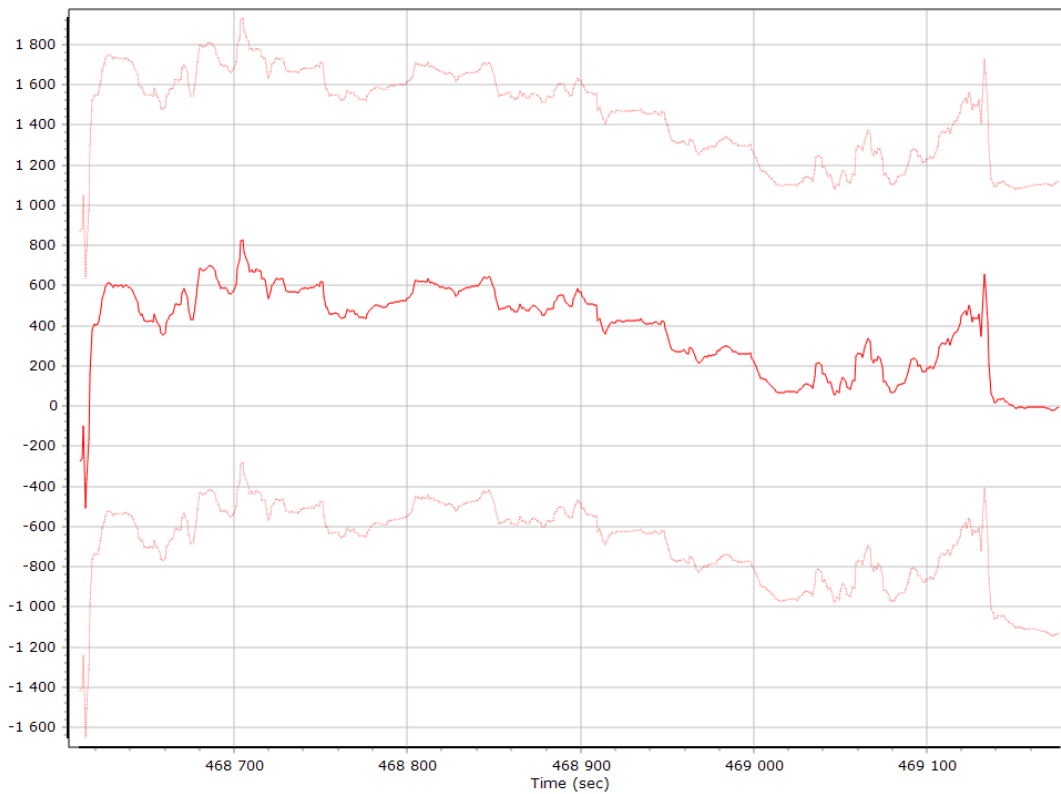
Z Gyro Bias (deg/h)



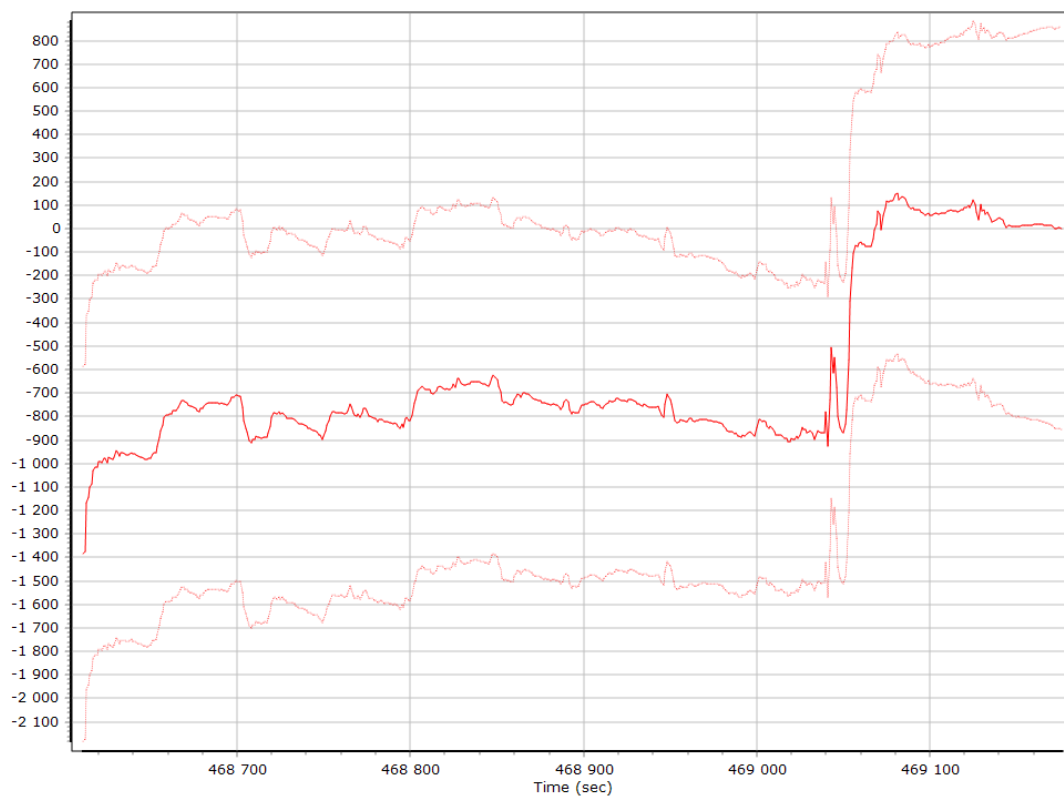
Gyro Scale Error (ppm)



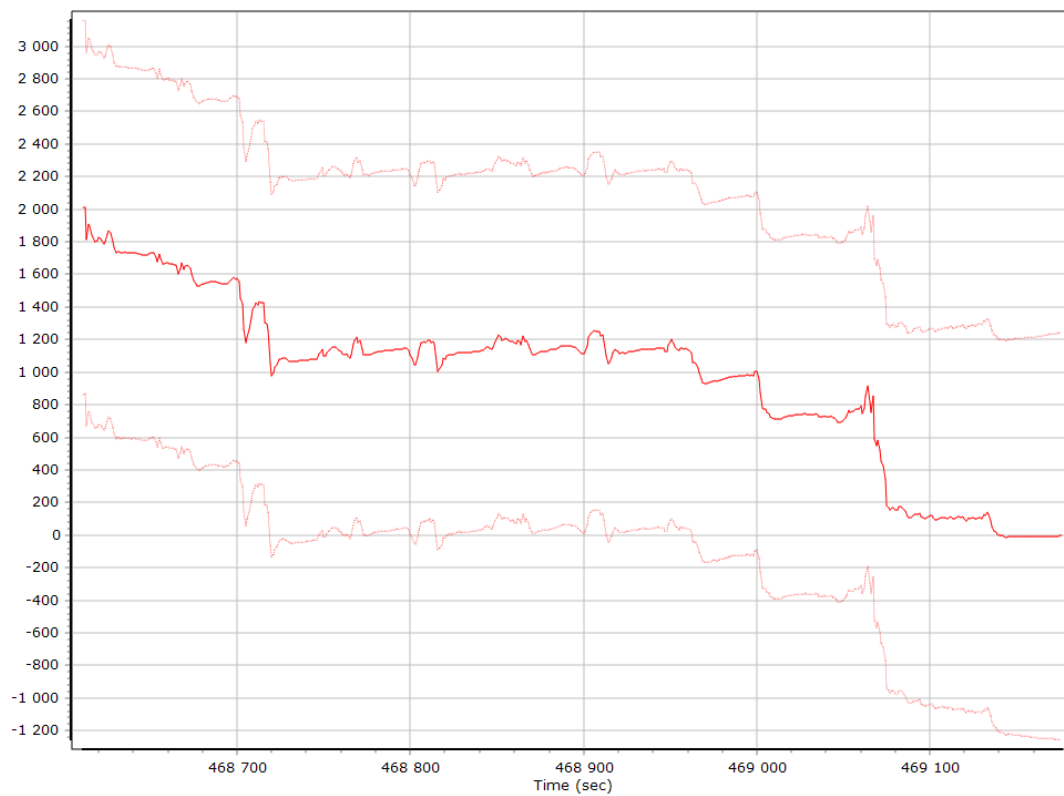
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

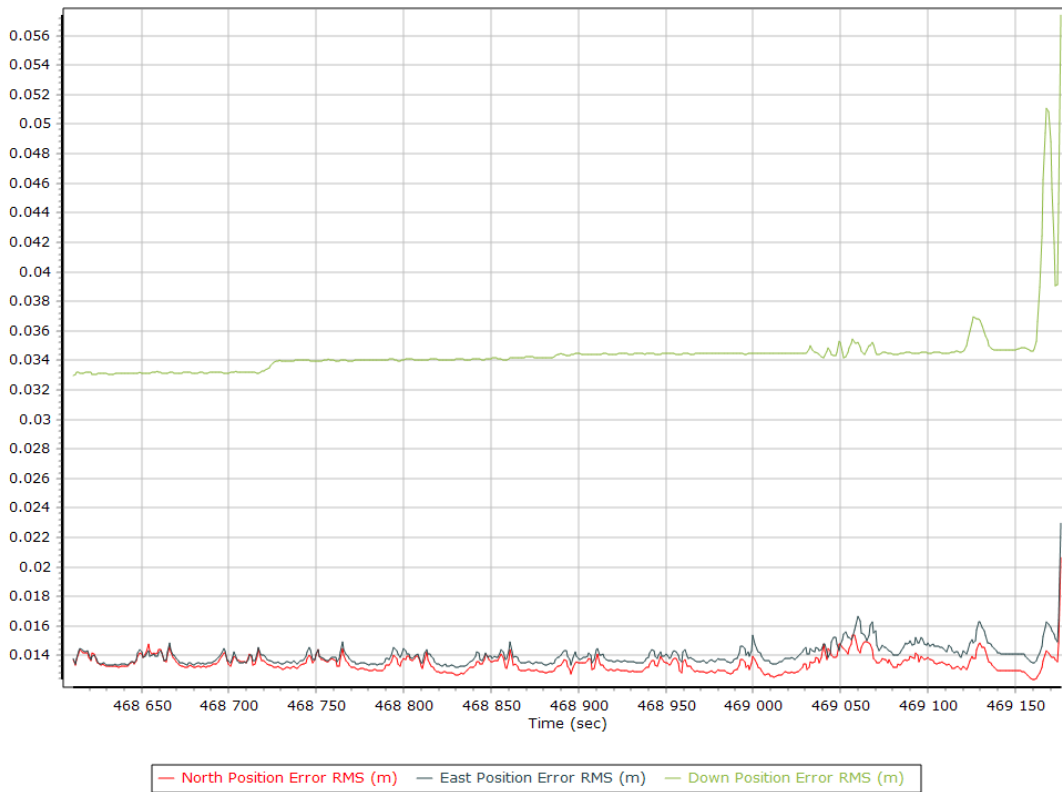


Z Gyro Scale Error (ppm)

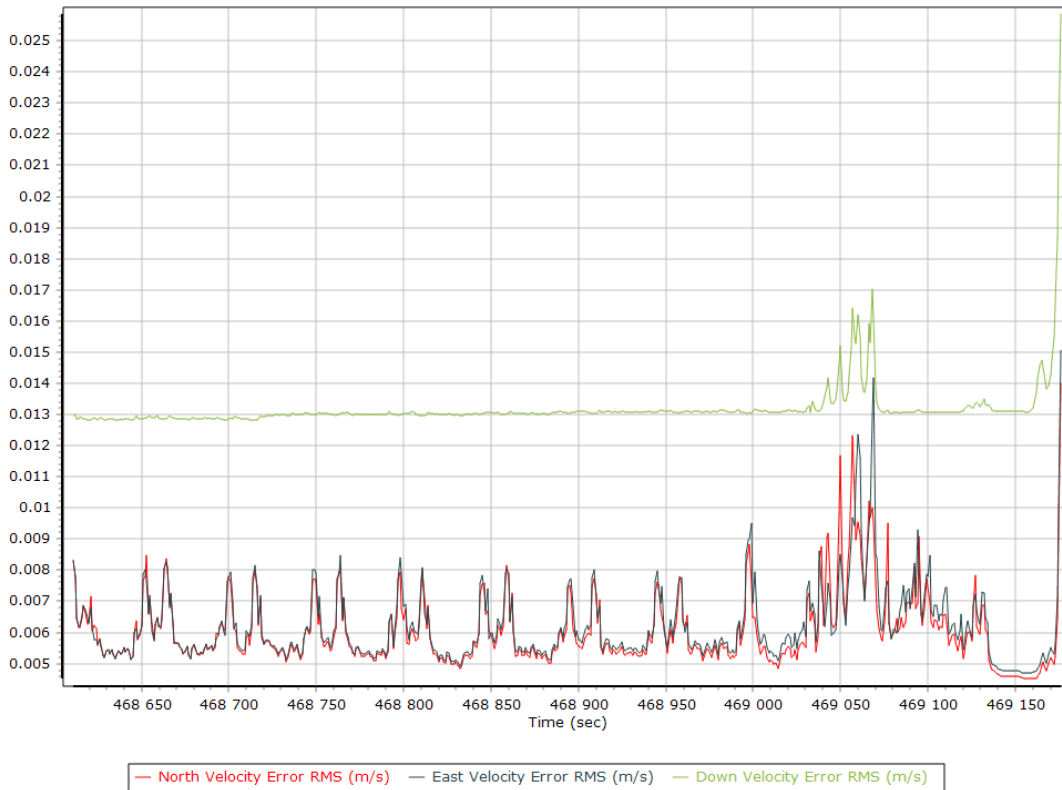


Smoothed Performance Metrics

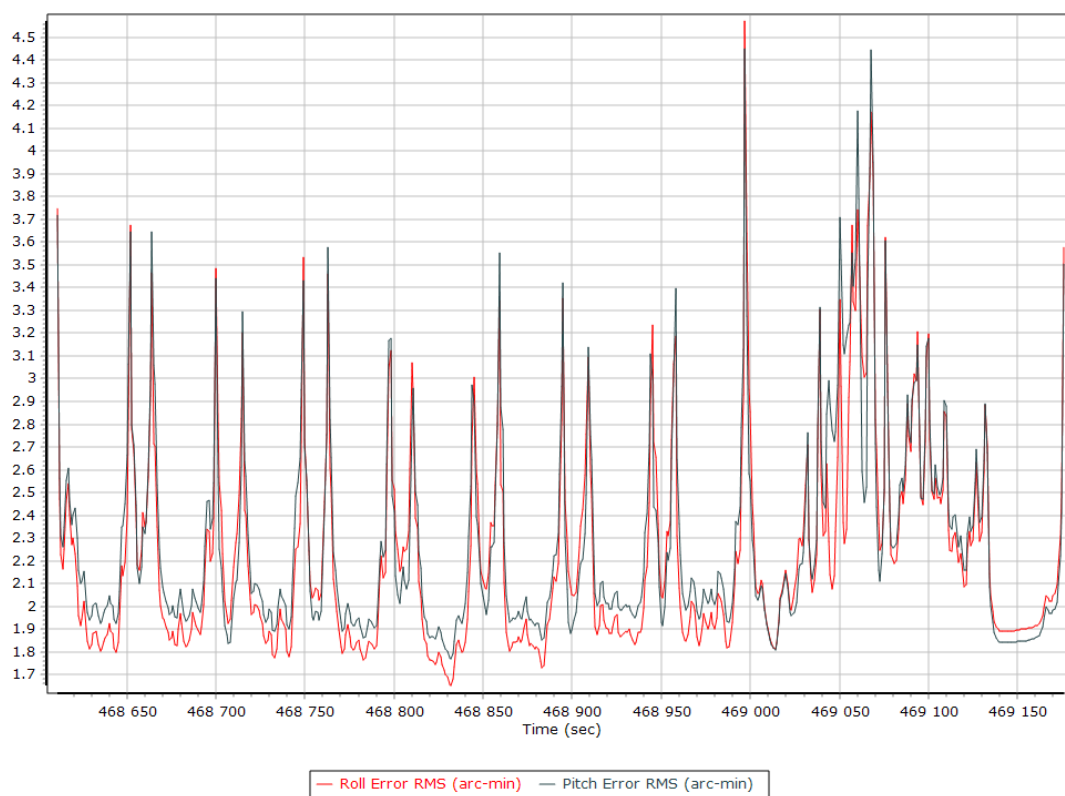
Position Error RMS (m)



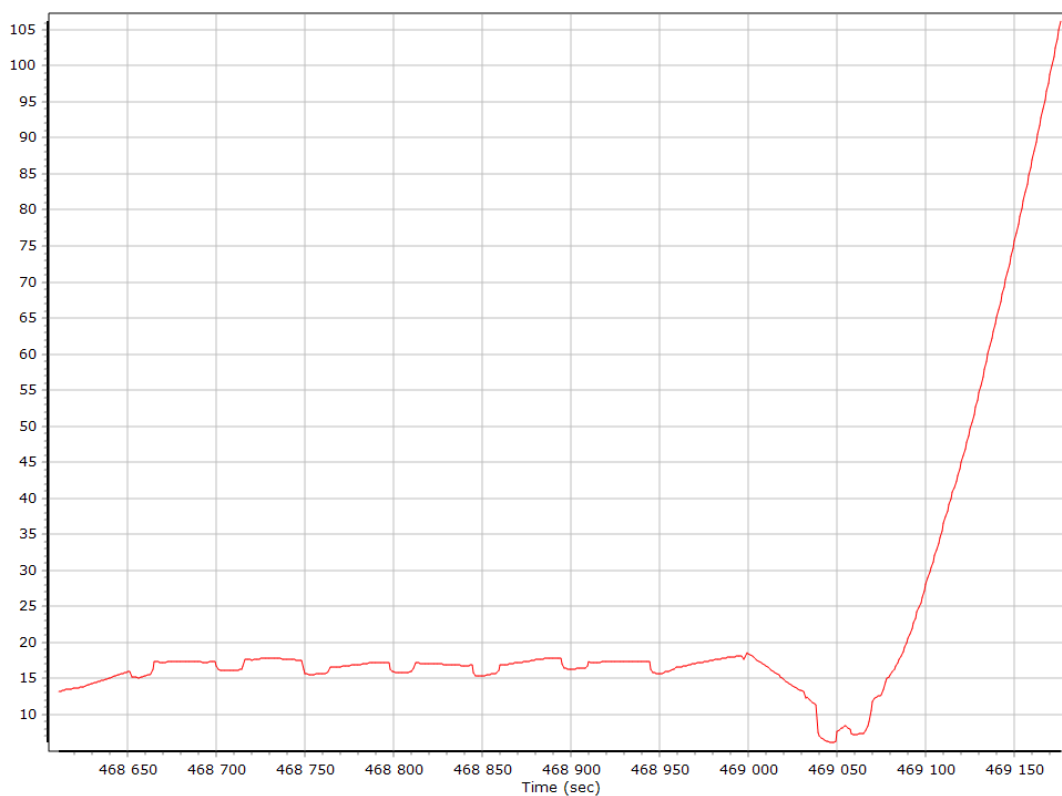
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

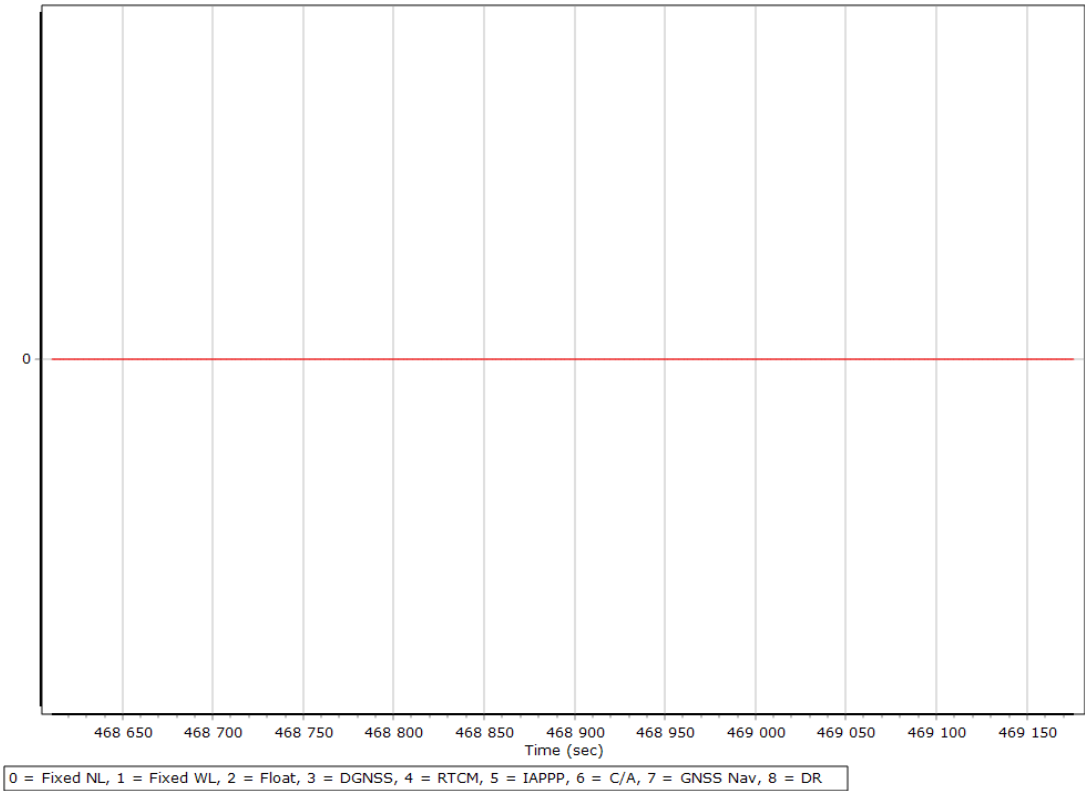


Heading Error RMS (arc-min)

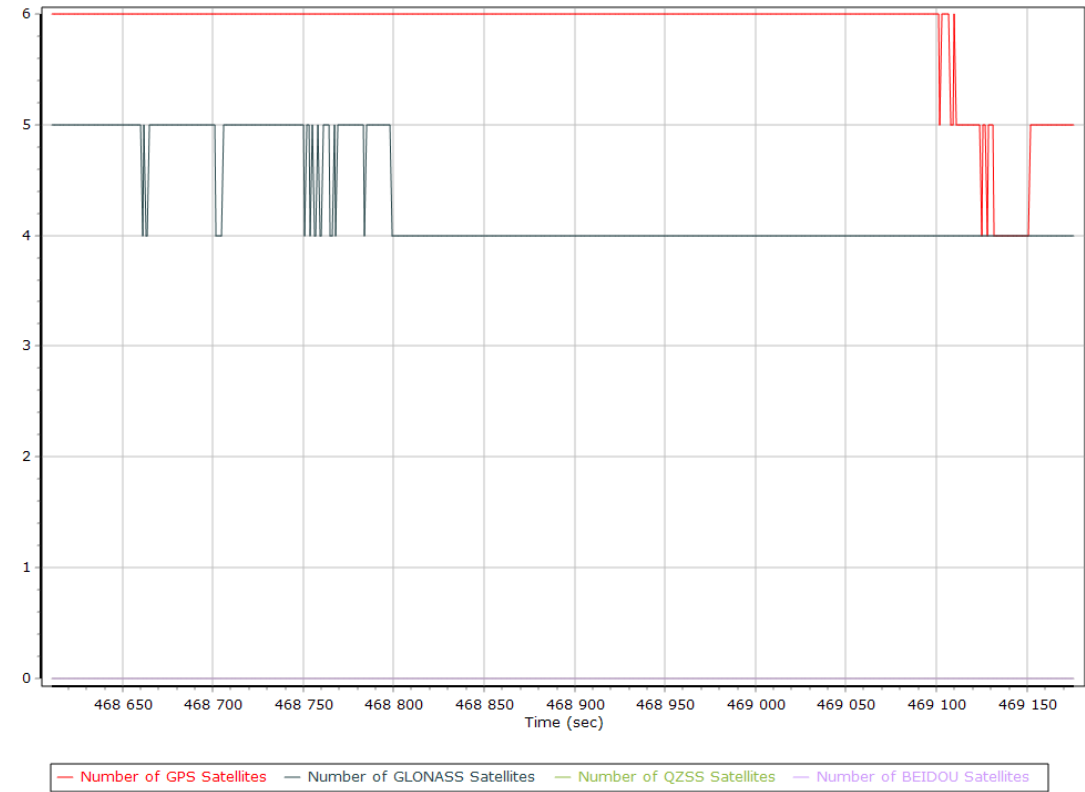


Smoothed Solution Status

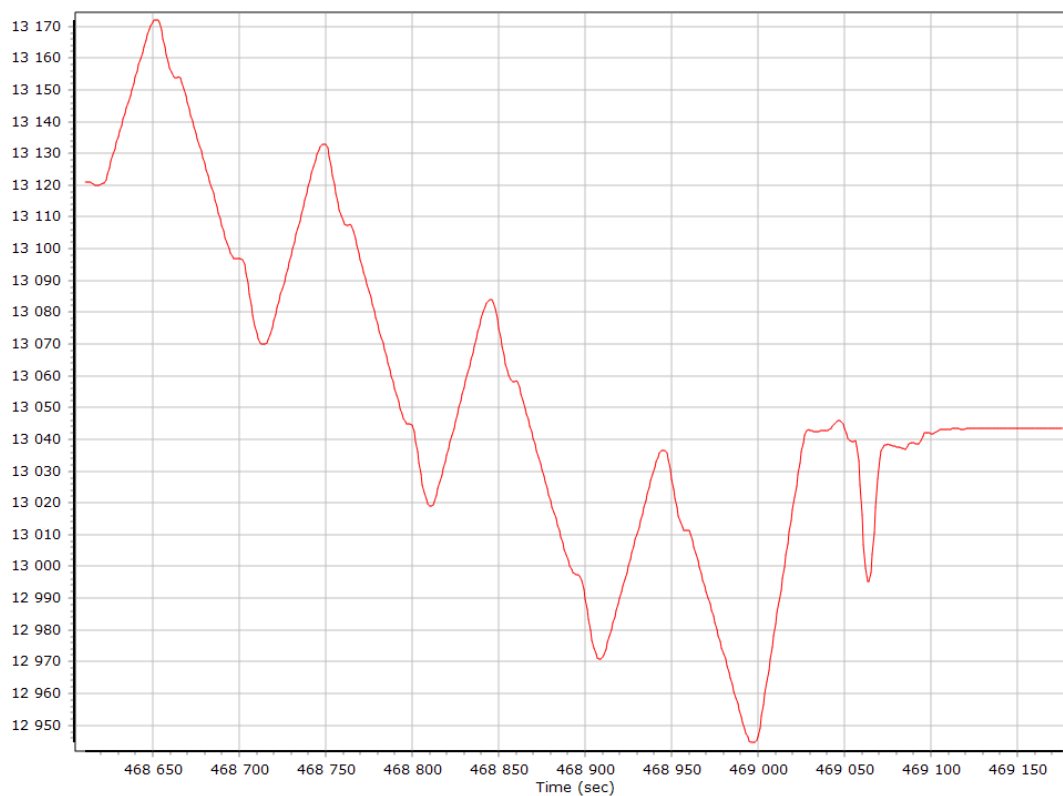
Processing Mode



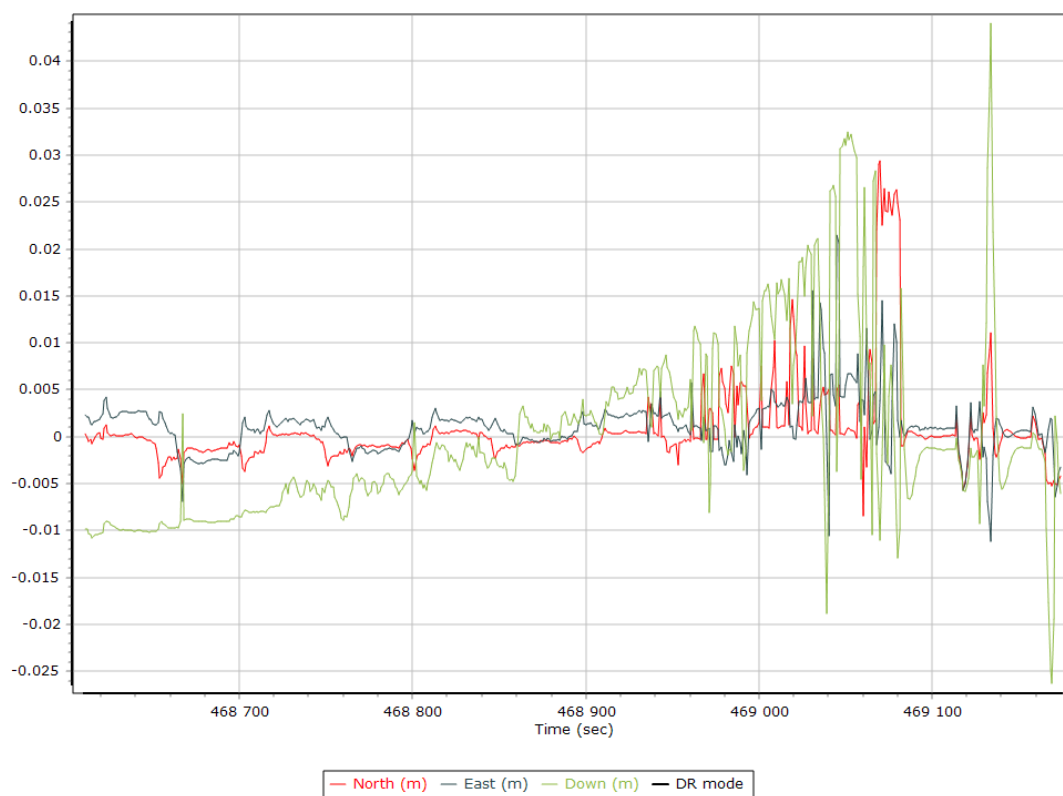
Number of Satellites



Baseline Length



SBET IAKAR Separation



Export Summary

Export file	export_Mission 1.txt		
Export format	ASCII		
Solution in use	Post-processed		
Output rate	All Records		
Reference to Output lever arm [m]	0.000	0.000	0.000
Reference mounting angles [deg]	0.000	0.000	0.000
Output units (Coordinate / Lat & Lon)	Meter		Deg Decimal
Export start time	468547.005 (2/22/2019 10:09:07 AM)		
Export end time	469176.004 (2/22/2019 10:19:36 AM)		
Height option	Ellipsoid Height		
WGS84 height flag	False		
Grid	Universal Transverse Mercator		
Zone	UTM North 31 (0E to 6E)		
Datum	WGS84		
Ellipsoid	WGS84		
Local Transformation	NONE		
Target Epoch	2019.142466		

EO Summary

EO file			
EO format			
Lever arm [m]	0.000	0.000	0.000
Boresight angles [arcmin]	0.000	0.000	0.000
Output rate	All Records		
Rotation sequence	x omega	y phi	z kappa
Local shift [m]	0.000	0.000	0.000
Output units (coordinate / angle / lat & lon)	Meter	Degree	Deg Decimal
Height option	Ellipsoid Height		
WGS84 height flag	False		
Scale height option	False		
Kappa cardinal rotation [deg]	0		
Solution in use	Post-processed		
EO start time	468547.005 (2/22/2019 10:09:07 AM)		
EO end time	469176.004 (2/22/2019 10:19:36 AM)		
Grid	Universal Transverse Mercator		
Zone	UTM North 31 (0E to 6E)		
Datum	WGS84		
Ellipsoid	WGS84		
Local Transformation	NONE		
Target Epoch	2019.142466		