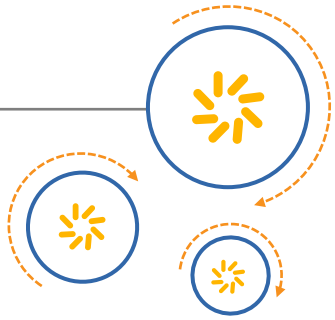
Qualcomm Technologies, Inc.



QCAT GNSS

Analysis Guide

80-NV295-1 C

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Revision history

Revision	Date	Description
A	January 2015	Initial release
B	August 2015	Updated Figure 2-1; added Chapter 3
C	February 2018	Added Chapters 4, 5, 6, and 7

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1 Introduction

1.1 Purpose

This guide describes the GNSS analyzers in QCAT application. The expected outputs, configuration parameters, and default values are listed and described.

Version

QCAT – 06.30.52.00

1.2 Conventions

Function declarations, function names, type declarations, attributes, and code samples appear in a different font, for example, `#include`.

Code variables appear in angle brackets, for example, `<number>`.

Button and key names appear in bold font, for example, click **Save** or press **Enter**.

Shading indicates content that has been added or changed in this revision of the document.

1.3 Technical assistance

For assistance or clarification on information in this document, submit a case to Qualcomm Technologies, Inc. (QTI) at https://support.cdmatech.com/.

If you do not have access to the CDMATech Support website, register for access or send email to support.cdmatech@qti.qualcomm.com.

2 GNSS power statistics analzyer

2.1 Parameters and inputs

GNSS power statistics are computed per the configuration parameters set in the GNSS power statistics analyzer. The parameters are located in the GNSS/GNSS Power Statistics folder in the default QCAT workspace (QCATDefault.aws), as shown in Figure 2-1.

Figure 2-2 shows the packets/events from which the power statistics analyzer receives information.

NOTE: Enable all the packets/events for accurate power consumption estimation.

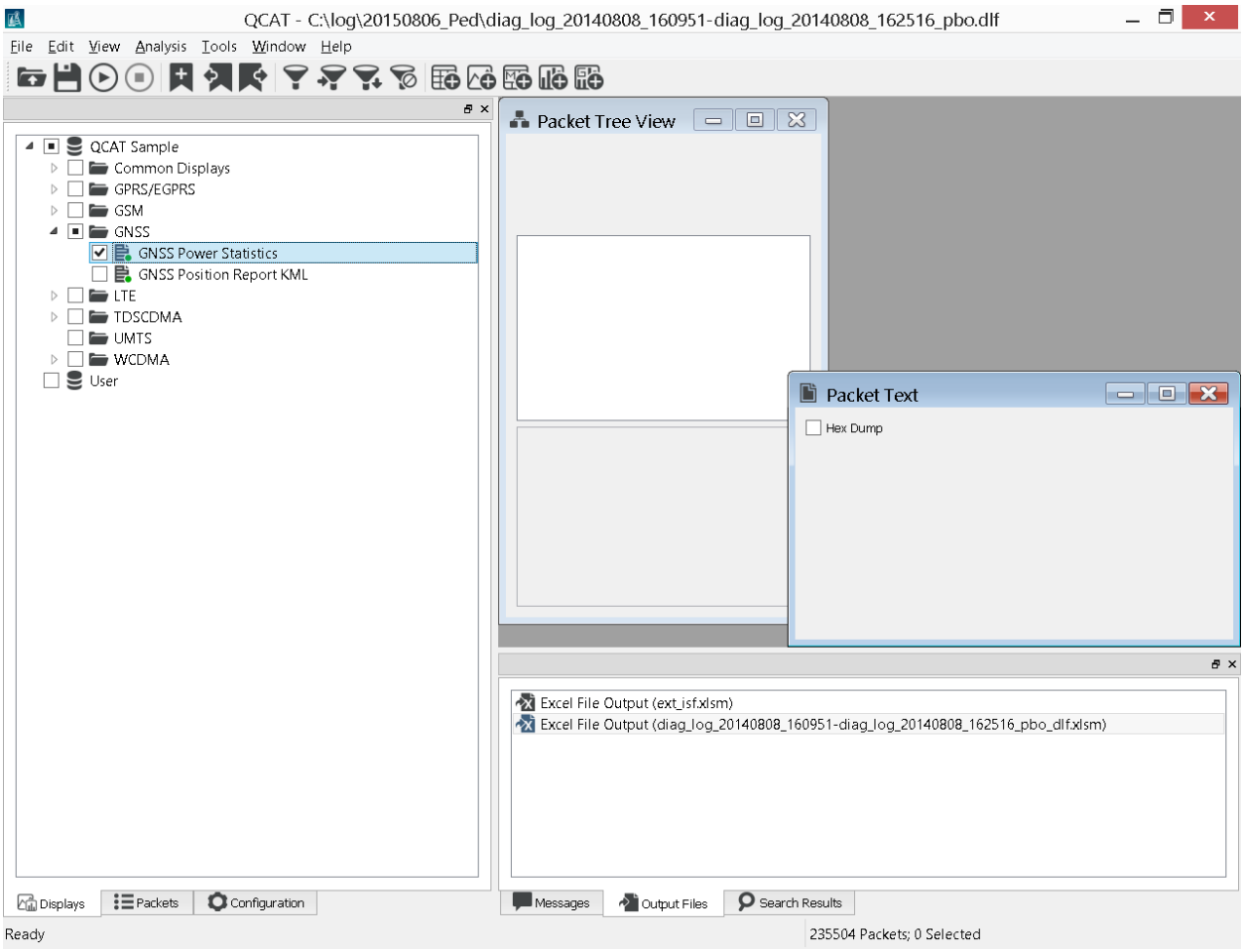


Figure 2-1 Power statistics analyzer location

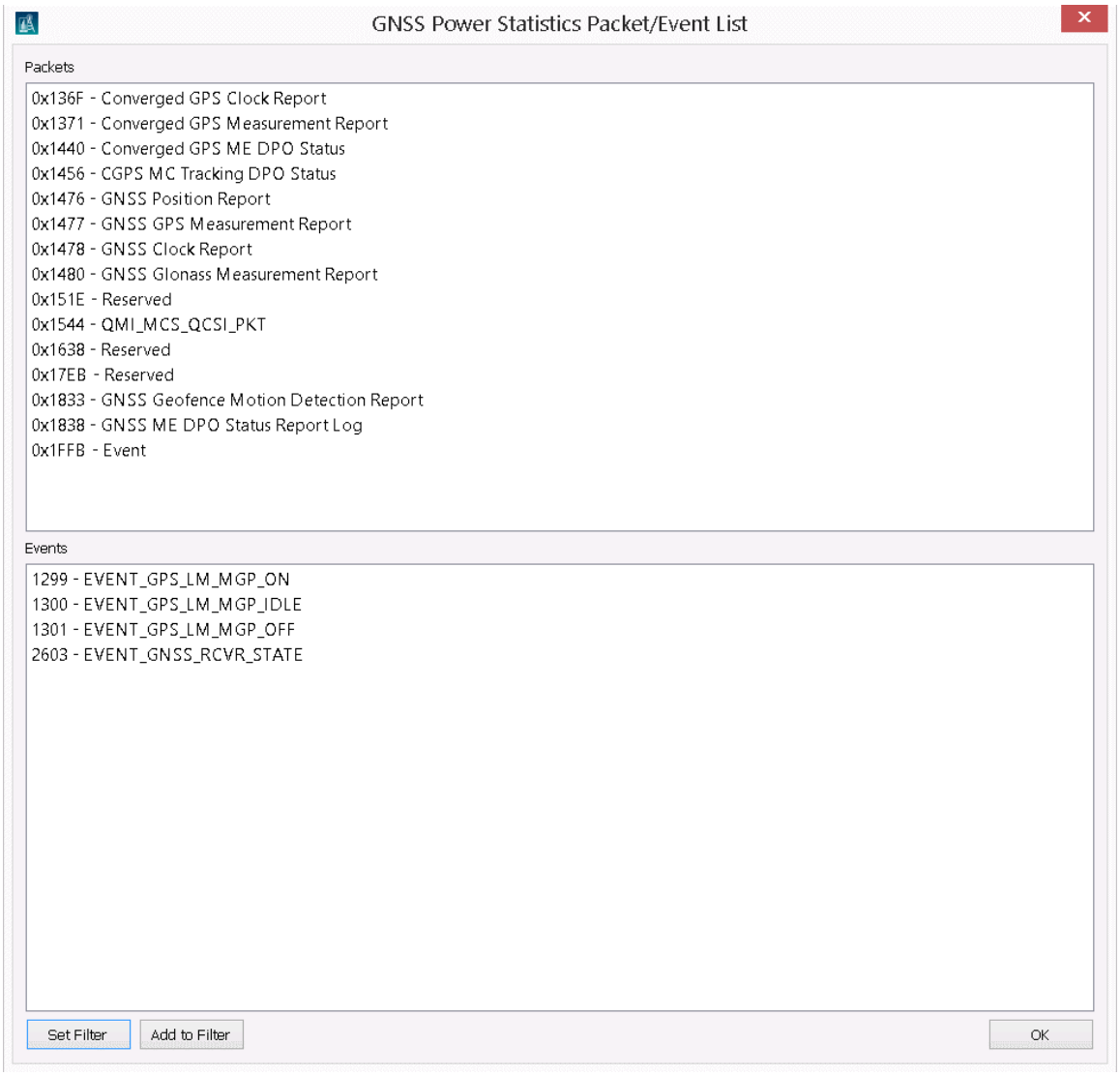


Figure 2-2 Power statistics analyzer – Packets/events list

2.2 Configuration parameter details

The configuration parameters are at **GNSS Extension > GNSS Power Statistics** as shown in Figure 2-3.

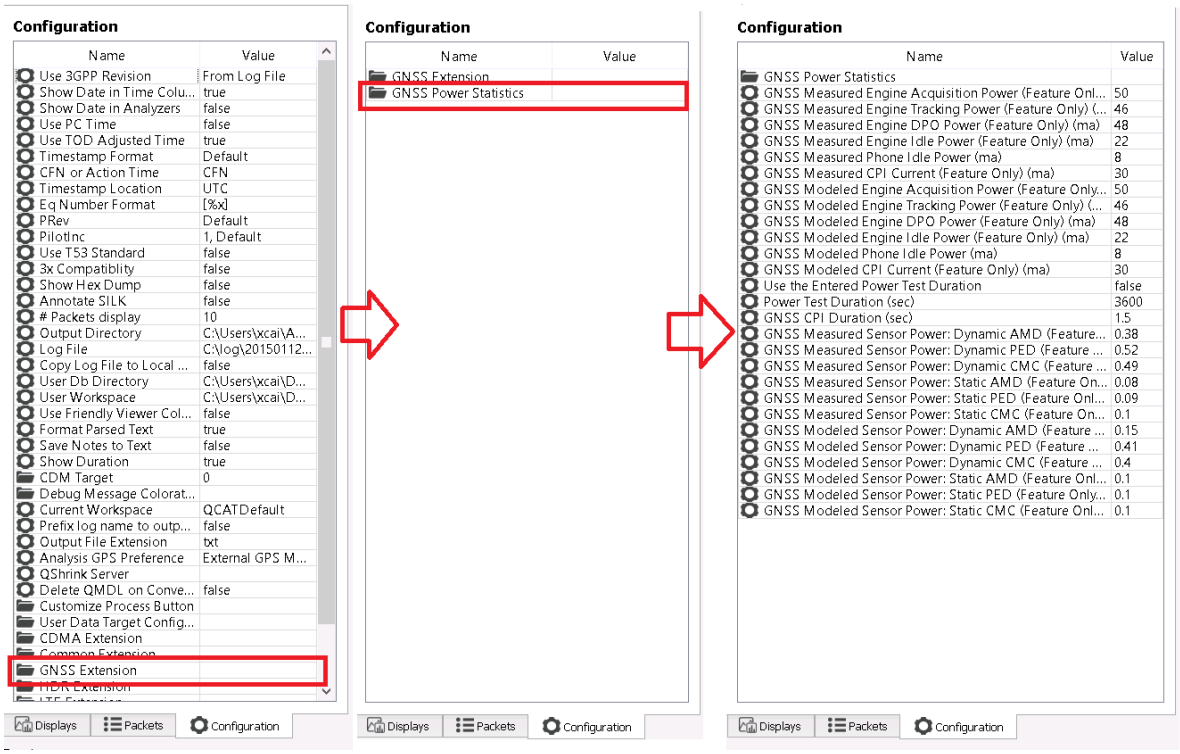


Figure 2-3 Configuration parameter location

Table 2-1 lists the GNSS power statistics configuration parameters.

Table 2-1 Configuration parameters

Parameter name	Description	Default value (mA or sec)
GNSS Measured Engine Acquisition Power (Feature only)	Measured GNSS engine acquisition current[1]	50
GNSS Measured Engine Tracking Power (Feature only)	Measured GNSS engine tracking current[1]	46
GNSS Measured Engine DPO Power (Feature only)	Measured GNSS engine DPO (dynamic power optimization) current[1]	48
GNSS Measured Engine Idle Power (Feature only)	Measured GNSS engine idle current[1]	22
GNSS Measured Phone Idle Power	Measured phone idle current	8
GNSS Measured Sensor Power: Dynamic AMD (Feature only)	Measured sensor current for dynamic AMD (absolute motion detector) state[1]	0.38
GNSS Measured Sensor Power: Dynamic PED (Feature only)	Measured sensor current for dynamic PED (pedometer) state[1]	0.52

Parameter name	Description	Default value (mA or sec)
GNSS Measured Sensor Power: Dynamic CMC (Feature only)	Measured sensor current for dynamic CMC (coarse motion classifier) state[1]	0.49
GNSS Measured Sensor Power: Static AMD (Feature only)	Measured sensor current for static AMD state[1]	0.08
GNSS Measured Sensor Power: Static PED (Feature only)	Measured sensor current for static PED state[1]	0.09
GNSS Measured Sensor Power: Static CMC (Feature only)	Measured sensor current for static CMC state[1]	0.1
GNSS Measured CPI Current (Feature only)	Measured CPI current[1]	30
GNSS Modeled Engine Acquisition Power (Feature only)	Modeled GNSS engine acquisition current[1]	50
GNSS Modeled Engine Tracking Power (Feature only)	Modeled GNSS engine tracking current[1]	46
GNSS Modeled Engine DPO Power (Feature only)	Modeled GNSS engine DPO (dynamic power optimization) current[1]	48
GNSS Modeled Engine Idle Power (Feature only)	Modeled GNSS engine idle current[1]	22
GNSS Modeled Phone Idle Power	Modeled phone idle current.	8
GNSS Modeled Sensor Power: Dynamic AMD (Feature only)	Modeled sensor current for dynamic AMD state[1]	0.15
GNSS Modeled Sensor Power: Dynamic PED (Feature only)	Modeled sensor current for dynamic PED state[1]	0.41
GNSS Modeled Sensor Power: Dynamic CMC (Feature only)	Modeled sensor current for dynamic CMC state[1]	0.40
GNSS Modeled Sensor Power: Static AMD (Feature only)	Modeled sensor current for static AMD state[1]	0.10
GNSS Modeled Sensor Power: Static PED (Feature only)	Modeled Sensor Current for static PED state. [1]	0.10
GNSS Modeled Sensor Power: Static CMC (Feature only)	Modeled sensor current for static CMC state[1]	0.10
GNSS Modeled CPI Current (Feature only)	Modeled CPI (coarse position injection) current[1]	30
GNSS CPI Duration	Approximate CPI injection duration	1.5 sec
Power Test Duration	User input test duration	3600 sec
Use the Entered Power Test Duration	Set to true if the entered test duration in the Power Test Duration (sec) parameter is used as the test duration. This parameter is useful if the analyzer cannot detect the test duration from the log file.	False

1. Does not include the phone idle current.

2.3 Output

Figure 2-4 shows a typical power statistics report. The report shows the duration in each state, the battery current used in each state, the estimated charge consumed, and the average battery current consumption for the log.

The following sets of power values are computed:

- Measured current (mA)
- Modeled current (mA)

The measured and modeled current and other parameters ensure that the power estimation is accurate.

GNSS Power Statistics

diag_log_20150109_131636-diag_log_20150109_134153_filtered.isf

Detected Test Duration (sec): 3959.396

Technology State	Time in State Using Measured Current Values (sec	Time in State Using Modeled Current Values (sec	Est State Battery Current (Measured mA)	Est State
GNSS Acquisition	1291.84231	1291.84231	50	
GF GNSS Acquisition	1291.84231	1291.84231	50	
GNSS Track	0	0	46	
GF GNSS Track	0	0	46	
GNSS DPO	0	0	48	
GF GNSS DPO	0	0	48	
GNSS Idle	10.49015	10.49015	22	
GF GNSS Idle	10.49015	10.49015	22	
Sensors AMD Static	0	1786.55136	0.38	
Sensors PED Static	548.49207	0	0.52	
Sensors CMC Static	1238.05929	0	0.49	
Sensors AMD Dynamic	0	0	0.08	
Sensors PED Dynamic	0	0	0.09	
Sensors CMC Dynamic	0	0	0.1	
Phone Idle	3959.39677	3959.39677	8	
WiFi Positioning Active	12.000 (8 CPI with 1.500 Sec for Each)	12.000 (8 CPI with 1.500 Sec for Each)	30	
Total (GF Feature Only)				

Figure 2-4 Power statistics report

Table 2-2 lists the power statistics field details.

Table 2-2 Power statistics report column details

Field	Description
Technology State	State of technology whose power numbers are to be computed.
Time in State Using Measured Current Values (sec)	Detected duration in the given state using measured current values.
Time in State Using Modeled Current Values (sec)	Detected duration in the given state using modeled current values.
Est State Battery Current (measured, mA)	Estimated battery current consumption in this state using measured values. This value is taken directly from parameter input of the corresponding technology state.
Est State Battery Current (modeled, mA)	Estimated battery current consumption in this state using modeled values. This value is taken directly from parameter input of the corresponding technology state.
Est Charge Consumed (measured, mAh)	Estimated charge consumed for this state using measured current values. Computed by Time in State Using Measured Current Values (sec) × Estimated State Battery Current (measured, mA) / 3600 sec.
Est Charge Consumed (modeled, mAh)	Estimated charge consumed for this state using modeled current values. Computed by Time in State Using Modeled Current Values (sec) × Estimated State Battery Current (modeled, mA) / 3600 sec.

Field	Description
Est Average Battery Current (measured, mA)	Estimated average battery current consumption using measured current values. Computed by Estimated Charge Consumed (measured, mAh) / Test Duration (sec) × 3600 sec
Est Avg Battery Current (modeled, mA)	Estimated average battery current consumption using modeled current values. Computed by Estimated Charge Consumed (modeled, mAh) / Test Duration (sec) × 3600 sec

Test duration detection

The analyzer automatically detects test duration from the log file with QMI_LOC ADD_CIRCULAR_GEOFENCE (0x0063)for the start of the test and DELETE_GEOFENCE (0x0064) for the end of the test. If the delete message is not found, the analyzer uses the latest 0x1476 GNSS position report message from the log as the end of the test.

If the analyzer cannot detect the test duration from the log file, the following message is displayed.

Cannot detect test duration. User Input Test Duration config parameter is used. Please manually enter test duration in configuration.

Use the default power test duration (in sec) for power computation in this case. The resulting test duration is real. Enter the correct test duration in the configuration parameters and set ‘Use the Entered Power Test Duration’ = TRUE to run the analyzer again.

3 GNSS position report KML analyzer

3.1 Parameters and inputs

The GNSS position report KML analyzer receives information from the packets/events in the GNSS position report and generates keyhole markup language (KML).

The configuration parameters are set in the GNSS analyzer located in the GNSS/GNSS Position Report KML folder in the default QCAT workspace (QCATDefault.aws), as shown in Figure 3-1.

Figure 3-2 shows the packets/events from which the GNSS position report KML receives information.

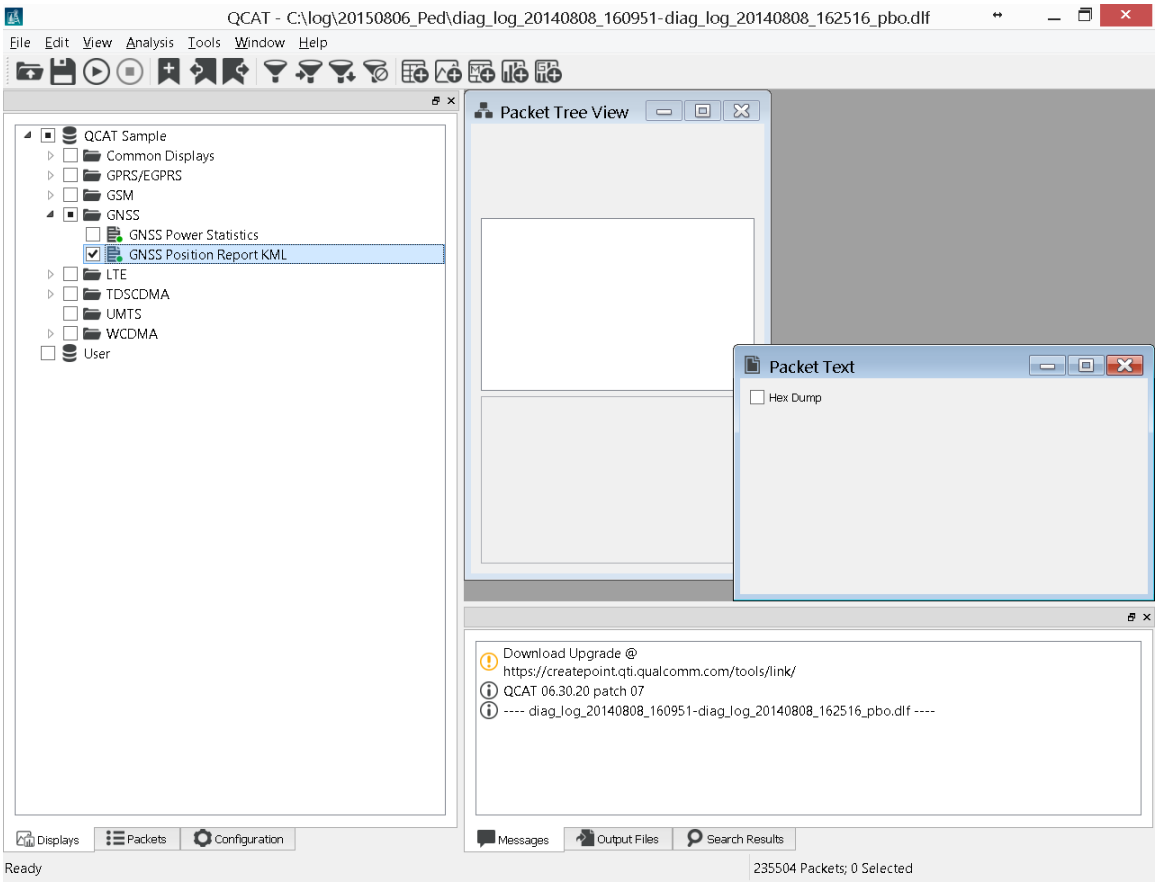


Figure 3-1 Position report KML analyzer location

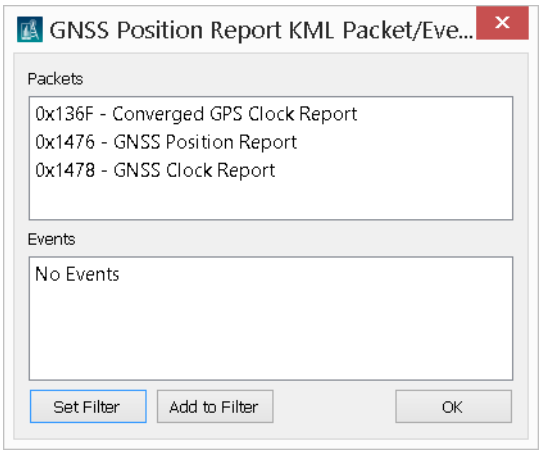


Figure 3-2 Position report KML analyzer – Packets/events list

3.2 Output

Figure 3-3 shows a typical GNSS position report KML output. The Excel output shows which type of fixes are included in the KML output and where the KML output file is saved.

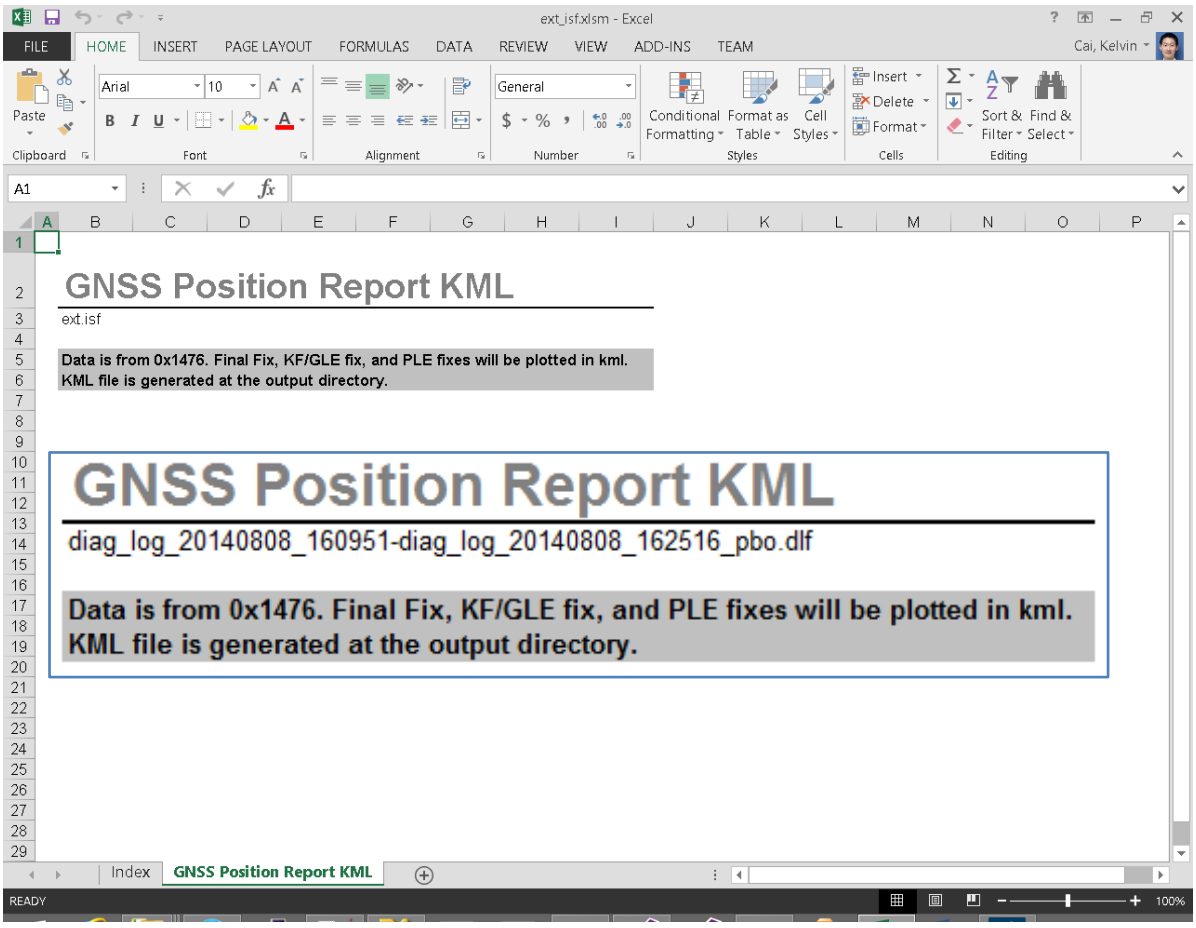


Figure 3-3 Position report KML analyzer – Excel output

The KML file can be opened in Google Earth as shown in Figure 3-4.

The file has three position report folders:

- Final Fixes – Shows all final reports from the 0x1476 DM log
- KF/GLE – Has reports for KF/GLE source type
- PLE Fixes – Shows position reports for PLE source type

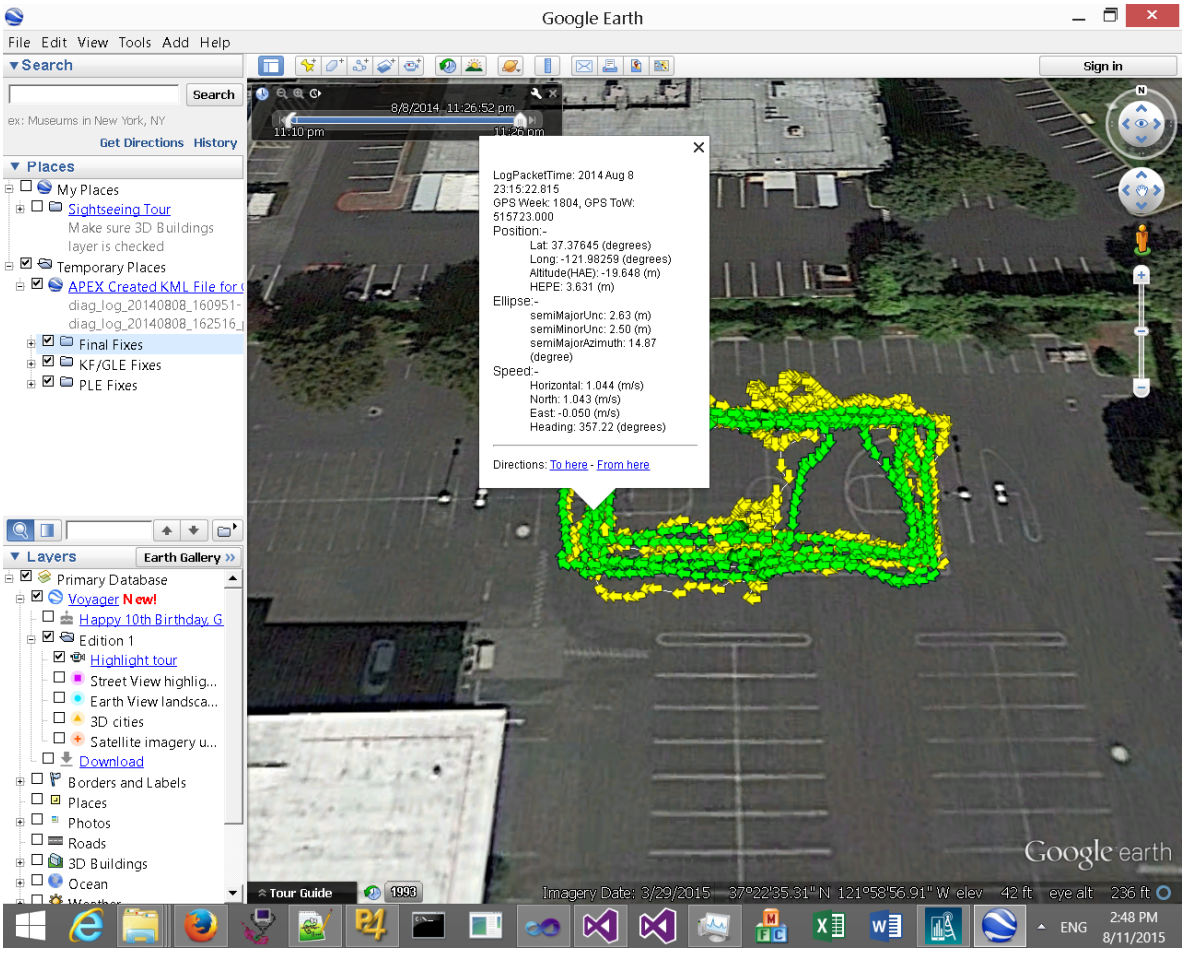


Figure 3-4 Position Report KML Analyzer, output in Google Earth

Clicking a position fix arrow shows detailed information for the position report. All of the information is carried in the 0x1476 DM log.

4 GNSS position report data analyzer

NOTE: This chapter was added to this document revision.

4.1 Parameters and inputs

The GNSS position report data is generated as per the configuration parameters set in the GNSS analyzer located in the GNSS/GNSS Position Report Data folder in the default QCAT workspace (QCATDefault.aws) as shown in Figure 4-1.

Figure 4-2 shows the packets/events from which the GNSS analyzer receives information.

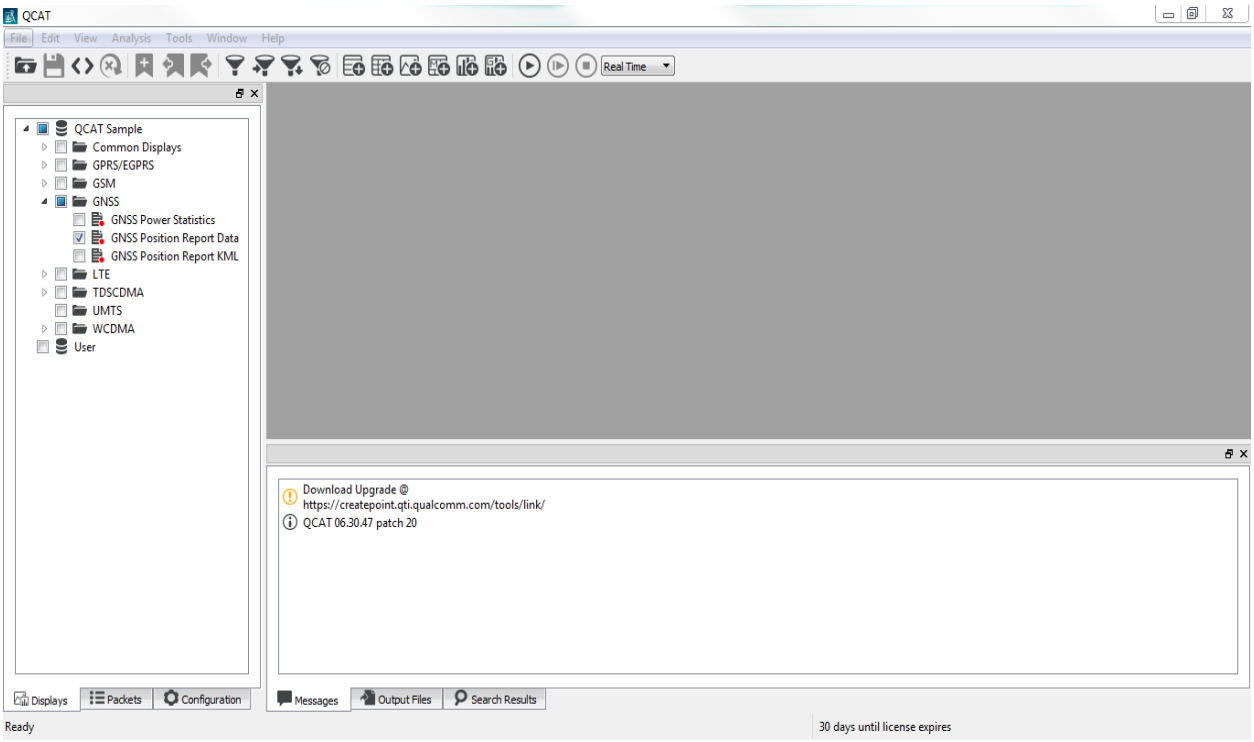


Figure 4-1 GNSS position report data location

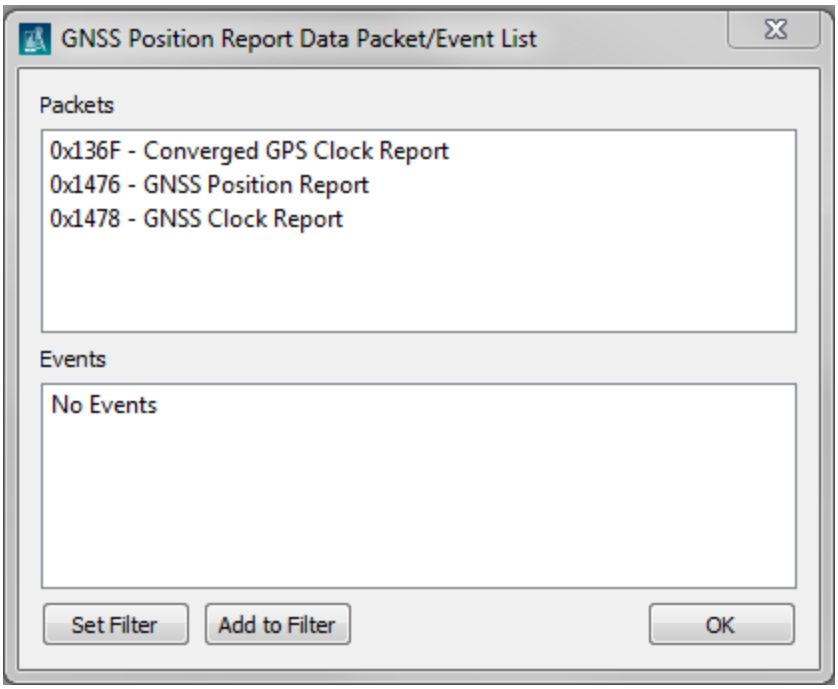
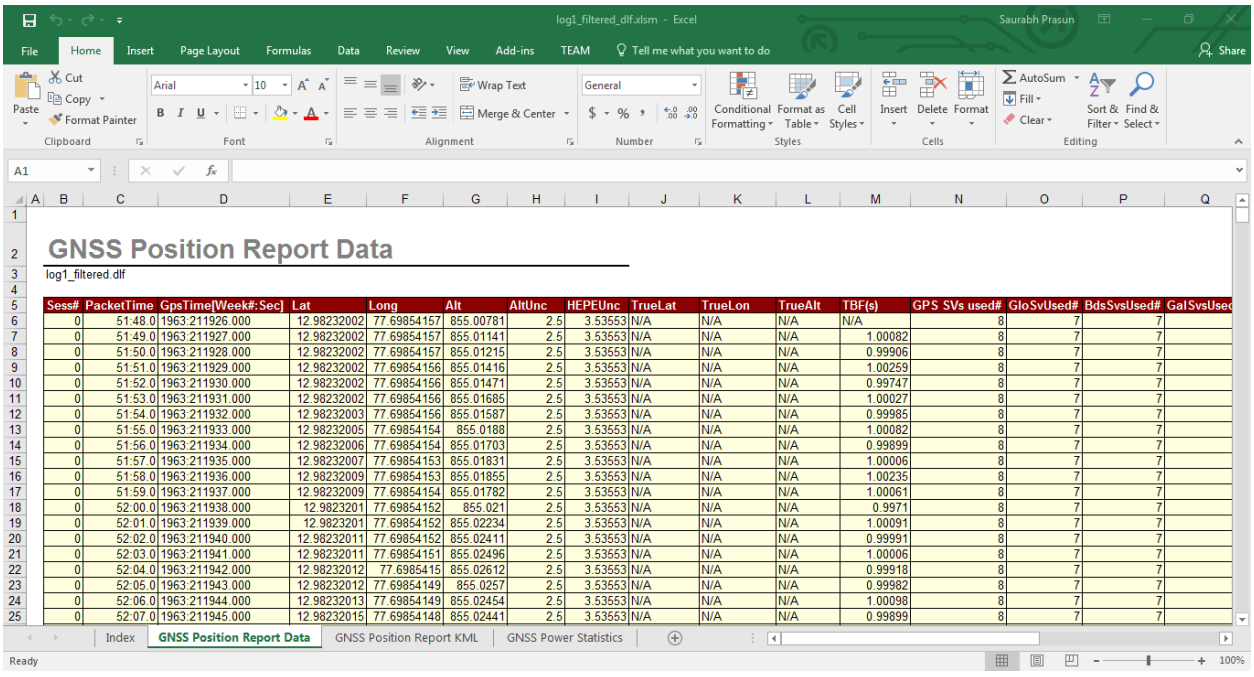


Figure 4-2 GNSS position report data packet/event list

Figure 4-3 shows a typical GNSS position report data output. The Excel output shows information from message 0x1476 and statistics generated using them.



GNSS Position Report Data

log1_filtered.dlf

Sess#	PacketTime	GpsTime[Week#:Sec]	Lat	Long	Alt	AltUnc	HEPEUnc	TrueLat	TrueLon	TrueAlt	TBF(s)	GPS SVs used#	GloSvUsed#	BdsSvsUsed#	GalSvsUsed
0	51:48.0	1963:211926.000	12.98232002	77.69854157	855.00781	2.5	3.53553	N/A	N/A	N/A	N/A	8	7	7	
0	51:49.0	1963:211927.000	12.98232002	77.69854157	855.01141	2.5	3.53553	N/A	N/A	N/A	1.00082	8	7	7	
0	51:50.0	1963:211928.000	12.98232002	77.69854157	855.01215	2.5	3.53553	N/A	N/A	N/A	0.99906	8	7	7	
0	51:51.0	1963:211929.000	12.98232002	77.69854156	855.01416	2.5	3.53553	N/A	N/A	N/A	1.00259	8	7	7	
0	51:52.0	1963:211930.000	12.98232002	77.69854156	855.01471	2.5	3.53553	N/A	N/A	N/A	0.99747	8	7	7	
0	51:53.0	1963:211931.000	12.98232002	77.69854156	855.01685	2.5	3.53553	N/A	N/A	N/A	1.00027	8	7	7	
0	51:54.0	1963:211932.000	12.98232003	77.69854156	855.01587	2.5	3.53553	N/A	N/A	N/A	0.99985	8	7	7	
0	51:55.0	1963:211933.000	12.98232005	77.69854154	855.0188	2.5	3.53553	N/A	N/A	N/A	1.00082	8	7	7	
0	51:56.0	1963:211934.000	12.98232006	77.69854154	855.01703	2.5	3.53553	N/A	N/A	N/A	0.99899	8	7	7	
0	51:57.0	1963:211935.000	12.98232007	77.69854153	855.01831	2.5	3.53553	N/A	N/A	N/A	1.00006	8	7	7	
0	51:58.0	1963:211936.000	12.98232009	77.69854153	855.01855	2.5	3.53553	N/A	N/A	N/A	1.00235	8	7	7	
0	51:59.0	1963:211937.000	12.98232009	77.69854154	855.01782	2.5	3.53553	N/A	N/A	N/A	1.00061	8	7	7	
0	52:00.0	1963:211938.000	12.9823201	77.69854152	855.021	2.5	3.53553	N/A	N/A	N/A	0.9971	8	7	7	
0	52:01.0	1963:211939.000	12.9823201	77.69854152	855.02234	2.5	3.53553	N/A	N/A	N/A	1.00091	8	7	7	
0	52:02.0	1963:211940.000	12.98232011	77.69854152	855.02411	2.5	3.53553	N/A	N/A	N/A	0.99991	8	7	7	
0	52:03.0	1963:211941.000	12.98232011	77.69854151	855.02496	2.5	3.53553	N/A	N/A	N/A	1.00006	8	7	7	
0	52:04.0	1963:211942.000	12.98232012	77.6985415	855.02612	2.5	3.53553	N/A	N/A	N/A	0.99918	8	7	7	
0	52:05.0	1963:211943.000	12.98232012	77.69854149	855.0257	2.5	3.53553	N/A	N/A	N/A	0.99982	8	7	7	
0	52:06.0	1963:211944.000	12.98232013	77.69854149	855.02454	2.5	3.53553	N/A	N/A	N/A	1.00098	8	7	7	
0	52:07.0	1963:211945.000	12.98232015	77.69854148	855.02441	2.5	3.53553	N/A	N/A	N/A	0.99899	8	7	7	

Figure 4-3 GNSS position report data – Excel output

Table 5-1 lists the description of each parameter in the excel output.

Table 5-1 Excel output parameter descriptions

Sl. No.	Parameter name	Description
1	Sess#	Current session number
2	PacketTime	Timestamp for this packet
3	GpsTime[Week#: Sec]	GPS week number of position (received from message): GPS fix time of week of in milliseconds (received from message) / 1000
4	Lat	Latitude (radians) (received from message) * RadiansToDegree
5	Long	Longitude (radians) (received from message) * RadiansToDegree
6	Alt	Altitude (meters) (received from message)
7	AltUnc	Gaussian 1-sigma uncertainty value for final position height-above-ellipsoid altitude (meters) (received from message)
8	HEPEUnc	EllipseSemiMajorAxis = Uncertainty of final horizontal position in an axis along the angle specified with respect to true North (meters) (received from message) EllipseSemiMinorAxis = Uncertainty of final horizontal position in an axis perpendicular to the angle specified with respect to true North (meters) (received from message) HEPEUnc = SquareRoot ((EllipseSemiMajorAxis * EllipseSemiMajorAxis) + (EllipseSemiMinorAxis * EllipseSemiMinorAxis))
9	TrueLat	Latitude from truth file (degrees)
10	TrueLon	Longitude from truth file (degrees)
11	TrueAlt	Altitude from truth file (meters)
12	TBF(s)	TimeStamp of current packet – TimeStamp of last packet
13	GPS SVs used#	The number of GPS SVs used in the fix (received from message)
14	GloSvUsed#	The number of Glonass SVs used in the fix (received from message)
15	BdsSvsUsed#	The number of BDS SVs used in the fix (received from message)
16	GalSvsUsed#	The number of GAL SVs used in the fix (received from message)
17	QzssSvsUsed#	The number of QZSS SVs used in the fix (received from message)
18	HorizErr	NorthPosErr = (DataLatitude – TruthLatitude) * DegreeToRadians * EarthRadius EastPosErr = (DataLongitude – TruthLongitude) * DegreeToRadians * cos(TruthLatitude * DegreeToRadians) * EarthRadius HorzPossErr = SquareRoot ((NorthPosErr * NorthPosErr) + (EastPosErr * EastPosErr)) (meters)
19	AltErrAbs	AbsoluteValue (DataAltitude – TruthAltitude) (meters)
20	HSpeed	EastVel = User velocity in East coordinate frame (meters per second) (received from message) NorthVel = User velocity in North coordinate frame (meters per second) (received from message) HSpeed = SquareRoot ((EastVel * EastVel) + (NorthVel * NorthVel)) (meters per second)
21	Heading	User heading (radians) (received from message) * RadiansToDegree

Sl. No.	Parameter name	Description
22	HSpeedErr	DataHorizontalSpeed (from 20) – TruthHorizontalSpeed (meters per second)
23	VertVelErr	DataVertVel = User velocity in Up coordinate frame (meters per second) (received from message) AbsoluteValue (DataVertVel – TruthVertVel)

24	HeadingErr	HeadingErr = DataHeading (from 21) – TruthHeading
		if (HeadingErr > 180.0) HeadingErr -= 360.0;
		else if (HeadingErr < -180.0) HeadingErr += 360.0;

25	TrueSpeed	TruthHorizontalSpeed

5 QDR position report KML analyzer

NOTE: This chapter was added to this document revision.

5.1 Parameters and inputs

The QDR position report KML is generated as per the configuration parameters set in the GNSS analyzer located in the GNSS/QDR Position Report KML folder in the default QCAT workspace (QCATDefault.aws) as shown in Figure 5-1.

Figure 5-2 shows the packets/events from which the GNSS analyzer receives information.

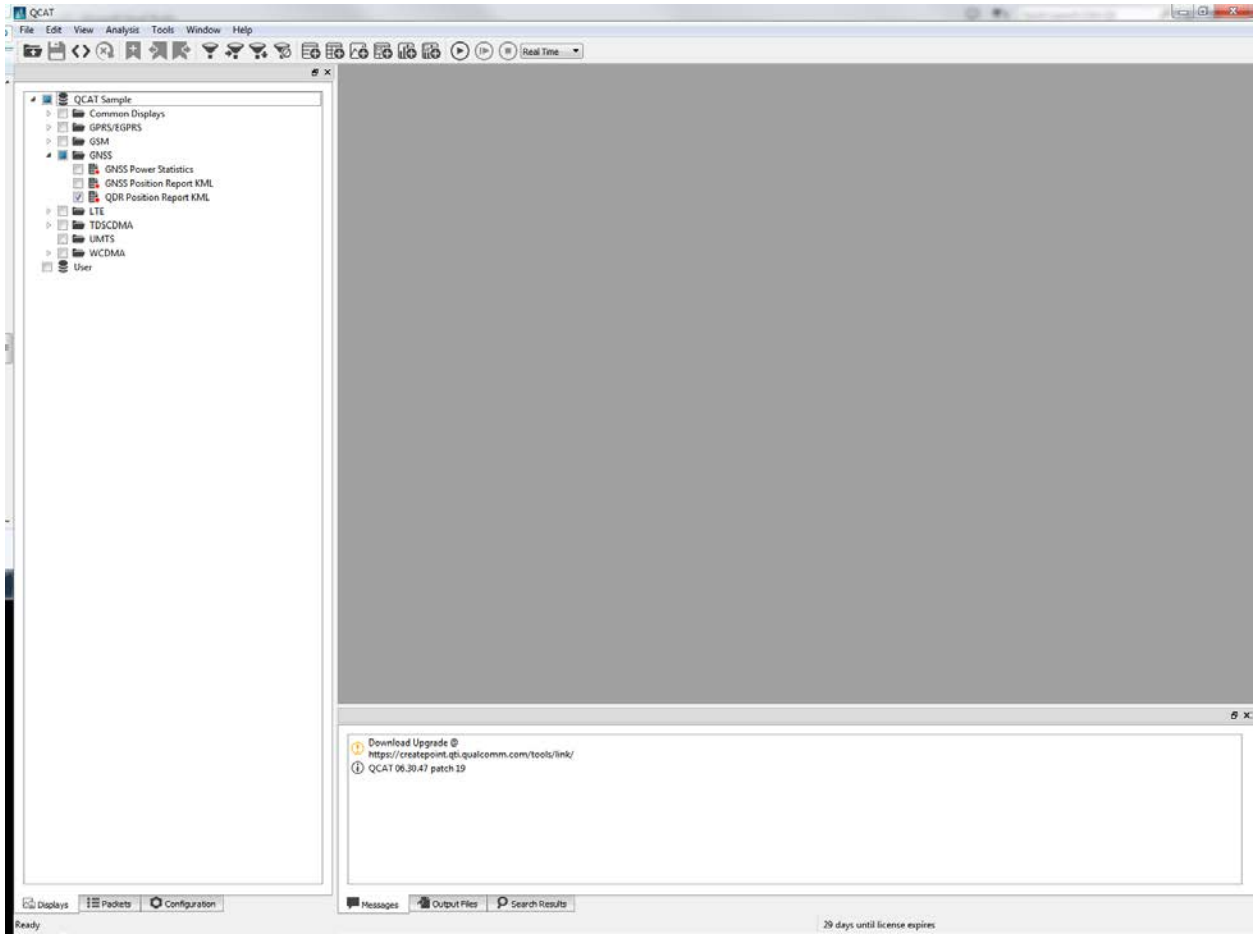


Figure 5-1 QDR position report KML location

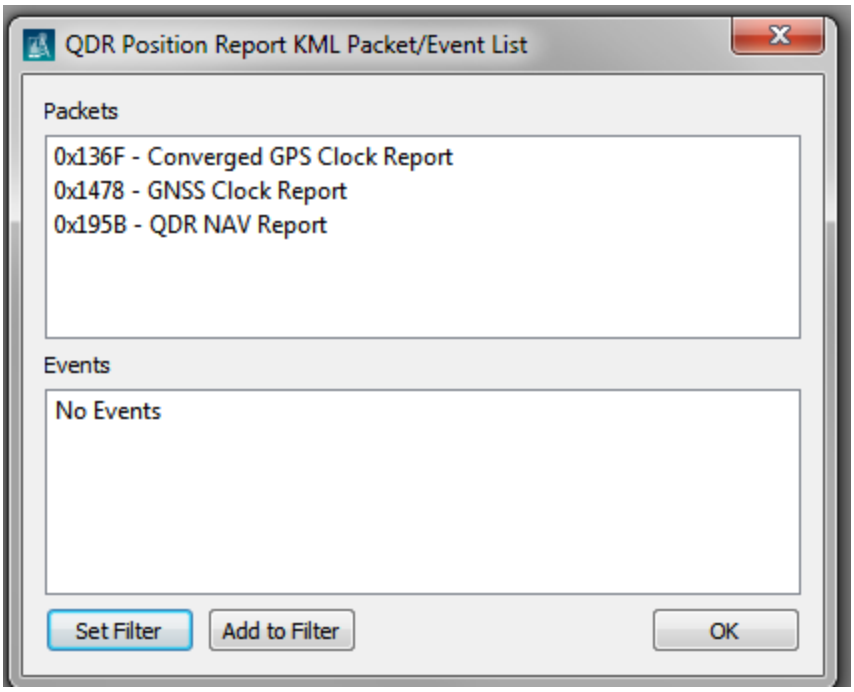


Figure 5-2 QDR position report KML – Packet/event list

5.2 Output

Figure 5-3 shows a typical QDR position report KML output. The Excel output shows which type of fixes are included in the KML output and where the KML file is saved.

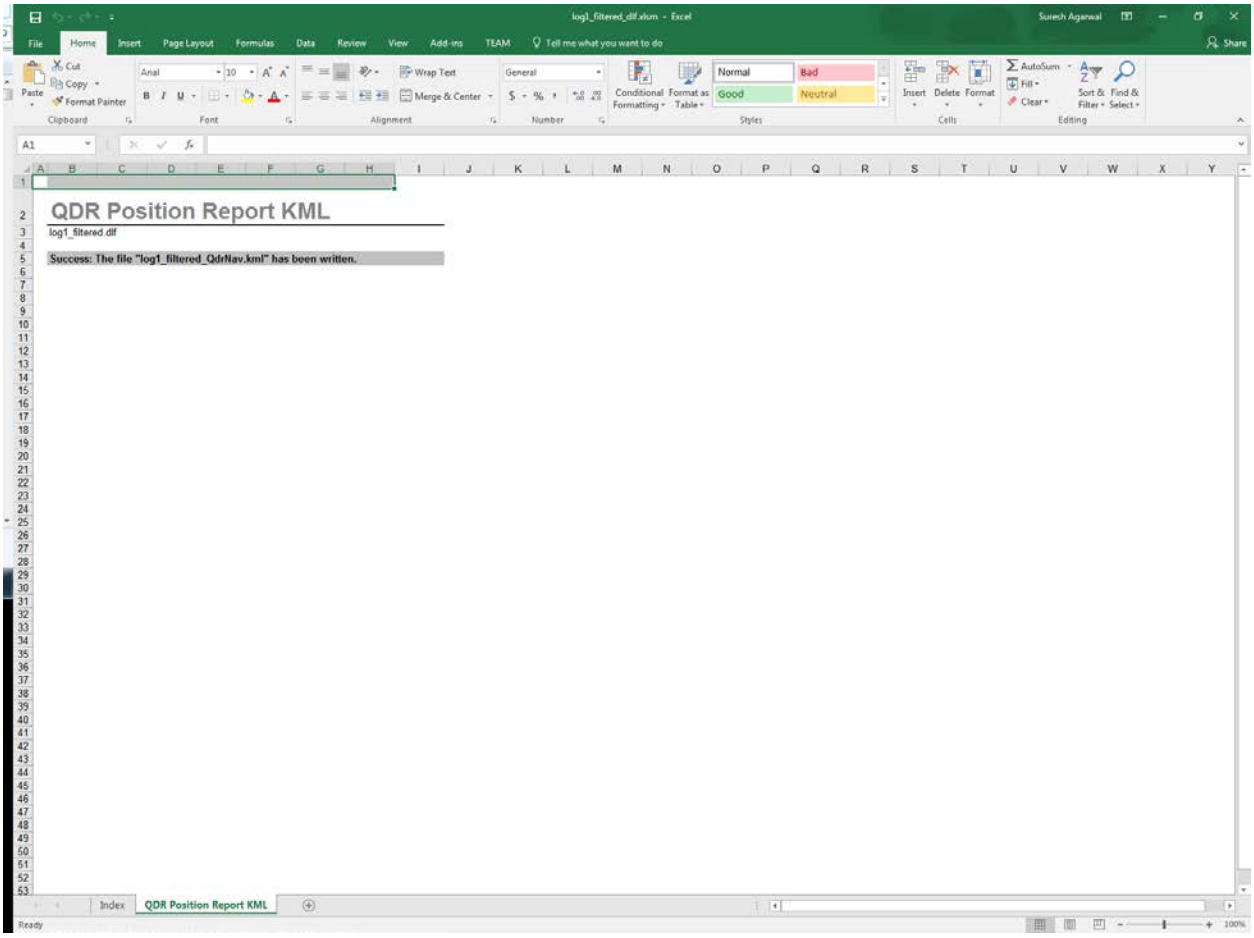


Figure 5-3 QDR position report KML – Excel output

The KML file can be opened by Google Earth, as shown in Figure 5-4. It has one folder of position reports. The fixes folder shows all of the final reports from the 0x195B DM log packet.

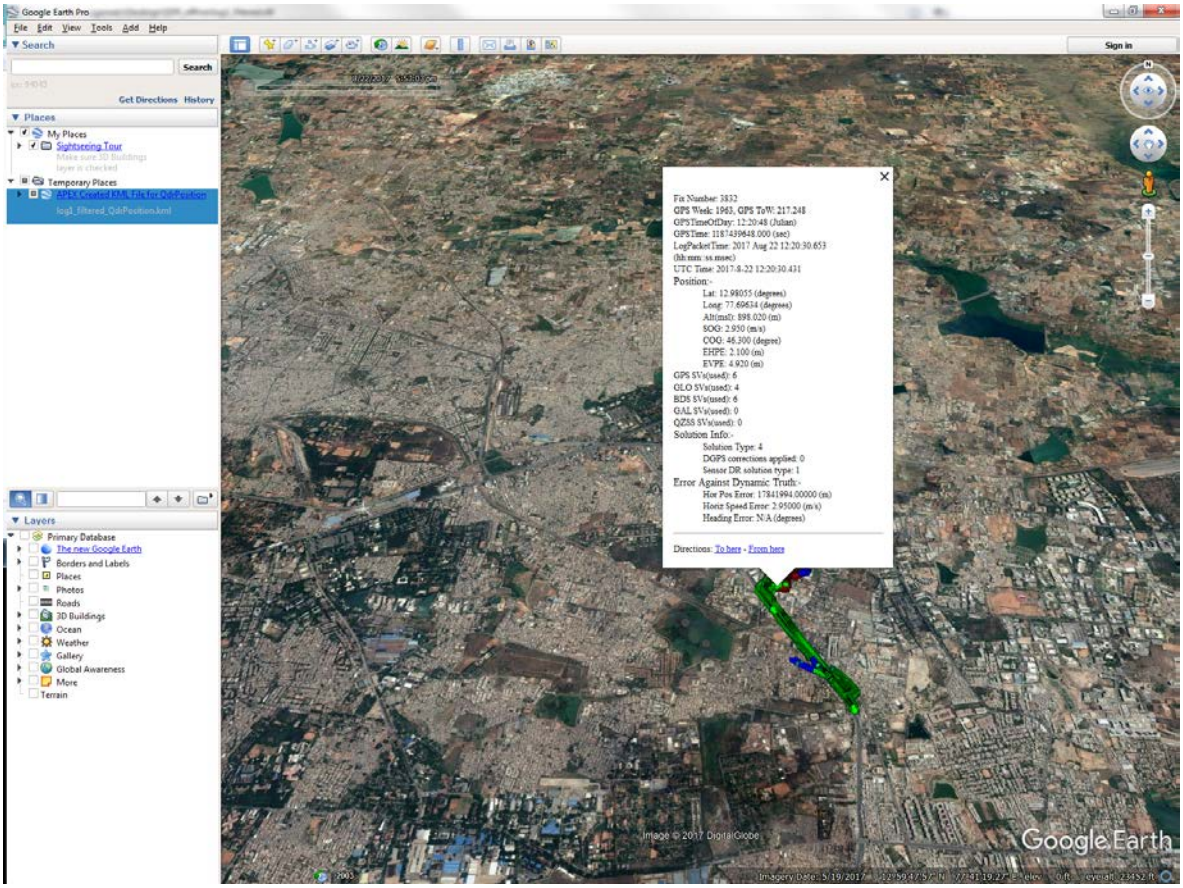


Figure 5-4 QDR position report KML – KML output

Clicking on a position fix arrow shows detailed information of the position report. All the information is carried in the 0x195B log packet.

Table 5-1 lists the QDR position report parameters.

Table 5-1 QDR position report KML parameters

Sl. No.	Parameter name	Description
1	Fix number	Fix number of this point from start of the log
2	GpsWeek	Best estimate GPS extended week number. Week 0 starts on 6th January 1980
3	GPS ToW	GPS Time of Week of measurement. Range 0 to 604,799.999 seconds, scaled by 1000
4	GpsTimeOfDay	GPS time of day
5	GpsTime	GPS week number of position (received from message): GPS fix time of week of in milliseconds (received from message) / 1000
6	LogPacketTime	Timestamp for this packet
7	UTC Time	UTC time of the point

Sl. No.	Parameter name	Description
Position		
8	Lat	Position Latitude. Positive value indicates North. Reported in degrees, scaled by 107.
9	Lon	Position Longitude. Positive value indicates East. Reported in degrees, scaled by 107.
10	Alt(Ellipsoid)	Altitude relative to the WGS-84 ellipsoid, reported in meters, scaled by 102
11	SOG	Speed Over Ground – horizontal component of velocity, reported in meters per second, scaled by 102
12	COG	Course over ground, clockwise from true north, reported in degrees, scaled by 102
13	EHPE	Estimated Horizontal Position Error, reported in meters per second, scaled by 102
14	EVPE	Estimated Vertical Position Error, reported in meters per second, scaled by 102
15	GPS SVs(used)	Number of GPS satellites used in solution.
16	GLO SVs(used)	Number of GLONASS satellites used in solution.
17	BDS SVs(used)	Number of BDS MEO/IGSO satellites used in solution.
18	GAL SVs(used)	Number of GAL satellites used in solution.
19	QZSS SVs(used)	Number of SBAS satellites used in solution.
Solution information		
20	SolutionType	Bits [2:0] – Solution type: ▪ 000 – No navigation fix ▪ 001 – not used ▪ 010 – not used ▪ 011 – 3-SV KF solution ▪ 100 – 4 or more SV KF solution ▪ 101 – 2-D least-squares solution ▪ 110 – 3-D least-squares solution ▪ 111 – DR solution (see bits 8, 14-15)
21	DGpsCorr	Bits [7:1] – DGPS corrections applied
22	SensorDRsolutionType	Bit 8 – Sensor DR solution type ▪ 1 – Sensor DR ▪ 0 – Solution is not DR
Error against dynamic truth		
23	Hor Pos Error	NorthPosErr = (DataLatitude – TruthLatitude) * DegreeToRadians * EarthRadius EastPosErr = (DataLongitude – TruthLongitude) * DegreeToRadians * cos(TruthLatitude * DegreeToRadians) * EarthRadius HorzPossErr = SquareRoot ((NorthPosErr * NorthPosErr) + (EastPosErr * EastPosErr)) (meters)
24	Horiz Speed Error	DataHorizontalSpeed (from 11) – TruthHorizontalSpeed (meters per second)

25	Heading Error	HeadingErr = DataHeading (from 12) – TruthHeading
		if (HeadingErr > 180.0) HeadingErr -= 360.0;
		else if (HeadingErr < -180.0) HeadingErr += 360.0;

6 QDR position report information analyzer

NOTE: This chapter was added to this document revision.

6.1 Parameters and input

The QDR position report info is generated as per the configuration parameters set in the GNSS analyzer located in the GNSS/QDR Position Report Info folder in the default QCAT workspace (QCATDefault.aws) as shown in Figure 6-1.

Figure 6-2 shows the packets/events from which the GNSS analyzer receives information.

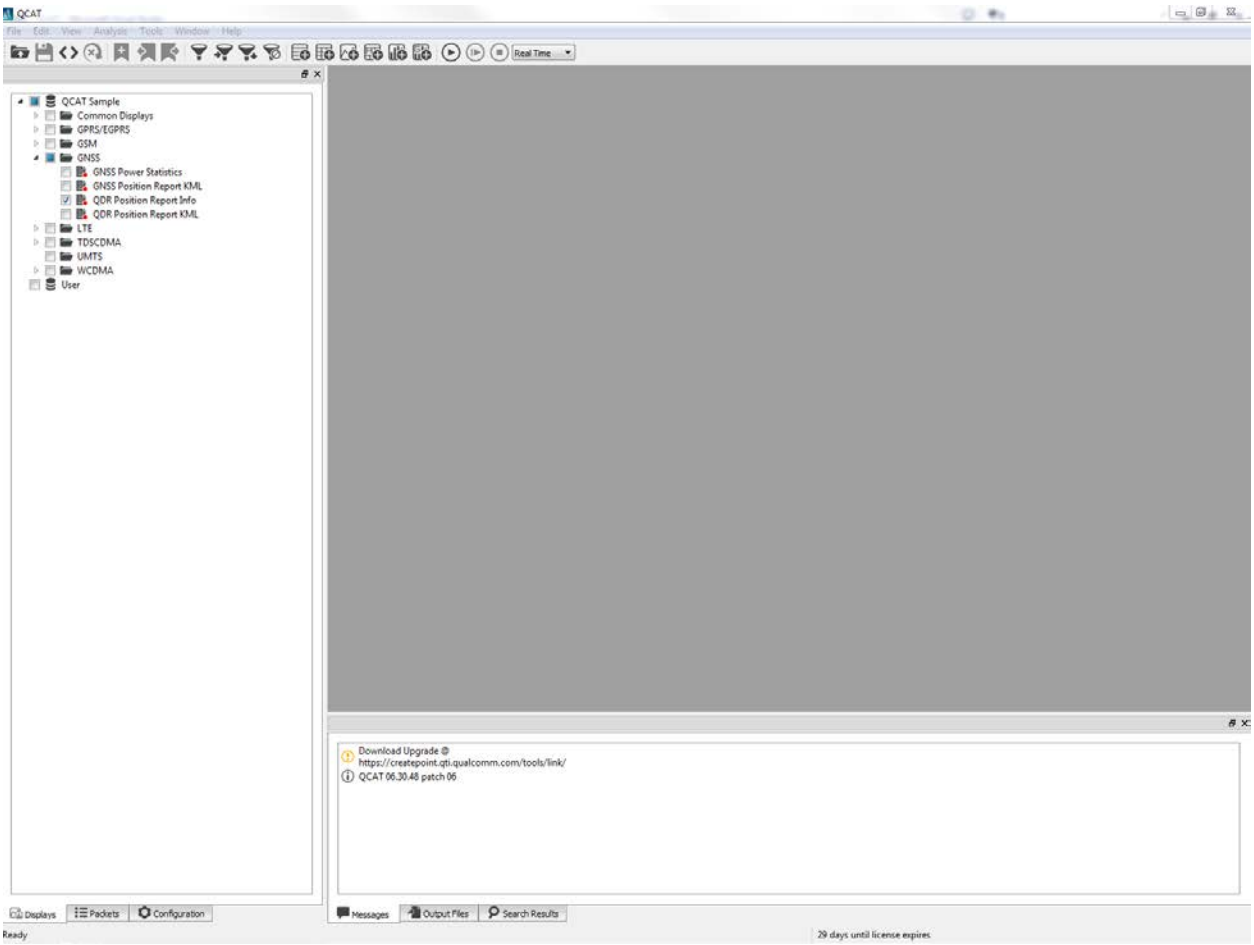


Figure 6-1 QDR position report info location

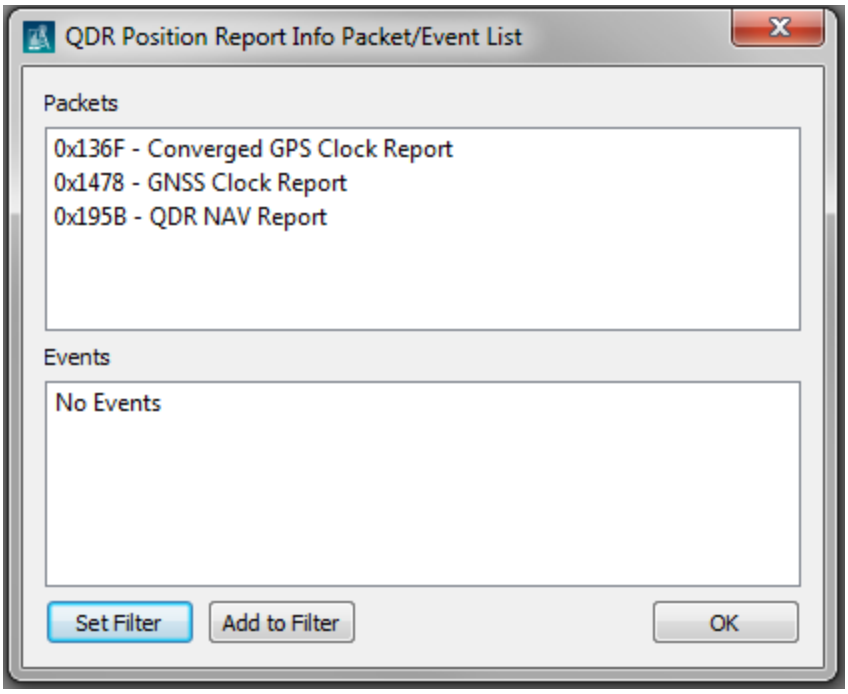


Figure 6-2 QDR position report info – Packet/event list

6.2 Output

Figure 6-3 shows a typical QDR position report info output. The Excel output shows information from the 0x195B log packet and statistics generated using the information.

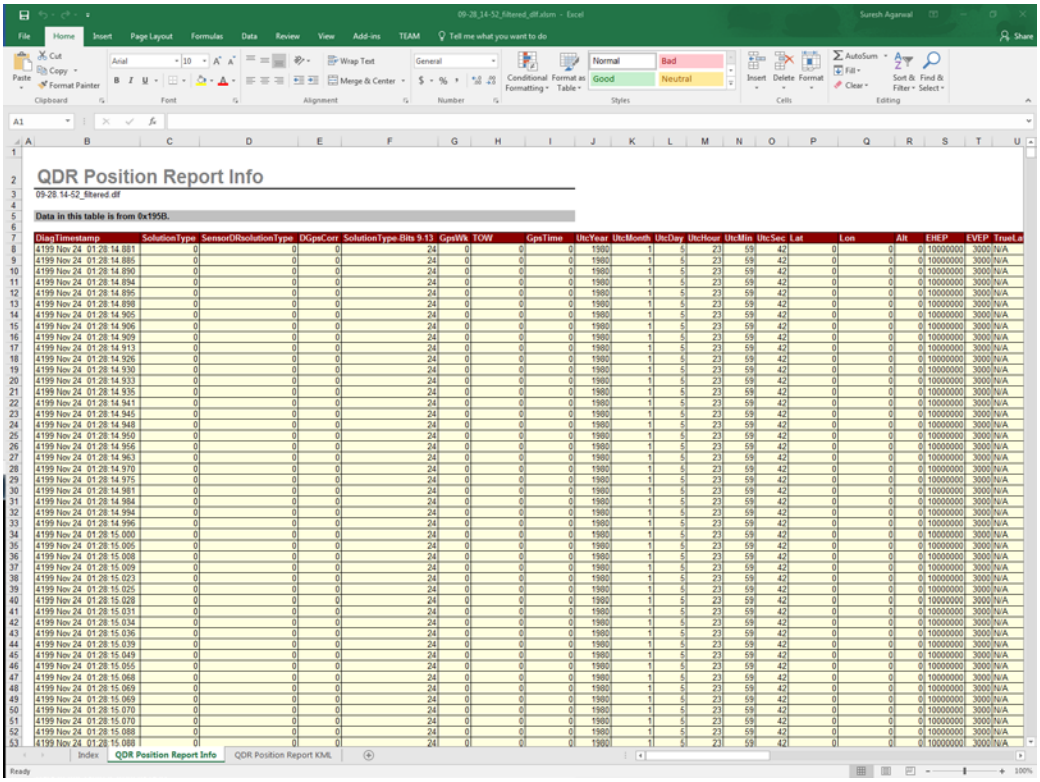


Figure 6-3 QDR position report Info – Excel output

Table 6-1 lists the QDR position report info output parameters.

Table 6-1 QDR position report info output parameters

Sl. No.	Parameter name	Description
1	DiagTimestamp	Timestamp for this packet
2	SolutionType	Bits [2:0] – Solution type: ▪ 000 – No navigation fix ▪ 001 – Not used ▪ 010 – Not used ▪ 011 – 3-SV KF solution ▪ 100 – 4 or more SV KF solution ▪ 101 – 2-D least-squares solution ▪ 110 – 3-D least-squares solution ▪ 111 – DR solution (see bits 8, 14-15)
3	SensorDRsolutionType	Bit 8 – Sensor DR solution type ▪ 1 – Sensor DR ▪ 0 – Solution is not DR
4	DGpsCorr	Bits [7:1] – DGPS corrections applied

Sl. No.	Parameter name	Description
5	GpsWk	Best estimate GPS extended week number. Week 0 starts on 6th January 1980
6	TOW	GPS Time Of Week of measurement. Range 0 to 604,799.999 seconds, scaled by 1000
7	GpsTime	GPS week number of position (received from message): GPS fix time of week of in milliseconds (received from message) / 1000
8	UtcYear	UTC Year
9	UtcMonth	UTC Month, 1 to12
10	UtcDay	UTC day of month, 1 to 31
11	UtcHour	UTC hour 0 to 23
12	UtcMin	UTC minute 0 to 59
13	UtcSec	UTC second 0 to 59.999in s, scaled by 103
14	Lat	Position Latitude. Positive value indicates North. Reported in degrees, scaled by 107.
15	Lon	Position Longitude. Positive value indicates East. Reported in degrees, scaled by 107.
16	Alt(Ellipsoid)	Altitude relative to the WGS-84 ellipsoid, reported in meters, scaled by 102
17	EHPE	Estimated Horizontal Position Error, reported in meters per second, scaled by 102
18	EVPE	Estimated Vertical Position Error, reported in meters per second, scaled by 102
19	TrueLat	Truth Latitude
20	TrueLon	Truth Longitude
21	TrueAlt	Truth Altitude
22	SOG	Speed Over Ground – horizontal component of velocity, reported in meters per second, scaled by 102
23	COG	Course over ground, clockwise from true north, reported in degrees, scaled by 102
24	SolutionValidity	Solution Validity 0x0000 = Valid solution Else Invalid solution
25	NumSv	Number of satellites used in solution
26	NumGpsSVsUsed	Number of GPS satellites used in solution
27	GpsSVsList	List of GPS satellites used in solution. Bits 0 to 31 correspond to PRNs 1 to 32.
28	NumSbasSVsUsed	Number of SBAS satellites used in solution
29	SbasSVsList	List of SBAS satellites used in solution. Bits 0 to 18 correspond to PRNs 120 to 138.
30	NumGloSVsUsed	Number of GLO satellites used in solution
31	GloSVsList	List of GLONASS satellites used in solution. Bits 0 to 23 correspond to Slot Numbers 1 to 24.
32	NumQzssSVsUsed	Number of QZSS satellites used in solution
33	QzssSVsList	List of QZSS and BDS GEO satellites used in solution. Bits 0 to 4 correspond to Slot Numbers 193 to 197 Bits 5 to 9 are reserved for future QZSS satellites 198 to 202 Bits 10 to 14 correspond to BDS GEO PRN 150 to 154

Sl. No.	Parameter name	Description
34	NumBdsSVsUsed	Number of BDS satellites used in solution
35	BdsSVsList	List of BDS MEO/IGSO satellites used in solution. Bits 0 to 4 correspond to BDS IGSO PRN 155 to 159 Bits 5 to 31 correspond to BDS MEO PRN 38 to 64
36	NErr	NorthPosErr = (DataLatitude – TruthLatitude) * DegreeToRadians * EarthRadius
37	EErr	EastPosErr = (DataLongitude – TruthLongitude) * DegreeToRadians * cos(TruthLatitude * DegreeToRadians) * EarthRadius
38	HorizErr	NorthPosErr = (DataLatitude – TruthLatitude) * DegreeToRadians * EarthRadius EastPosErr = (DataLongitude – TruthLongitude) * DegreeToRadians * cos(TruthLatitude * DegreeToRadians) * EarthRadius HorzPossErr = SquareRoot ((NorthPosErr * NorthPosErr) + (EastPosErr * EastPosErr)) (meters)
39	AltErr	(DataAltitude – TruthAltitude) (meters)
40	AltErrAbs	AbsoluteValue (DataAltitude – TruthAltitude) (meters)
41	HSpeedErr	DataHorizontalSpeed (from 25) – TruthHorizontalSpeed (meters per second)

42	HeadingErr	HeadingErr = DataHeading (from 26) – TruthHeading
		if (HeadingErr > 180.0) HeadingErr -= 360.0;
		else if (HeadingErr < -180.0) HeadingErr += 360.0;

43	TrueSpeed	Truth Horizontal Speed
44	TrueHeading	Truth Heading

7 GNSS Location Stats

NOTE: This chapter was added to this document revision.

7.1 Parameters and input

The GNSS location stats are computed as per the configuration parameters set in the GNSS analyzer located in the GNSS/GNSS Location Stats folder in the default QCAT workspace (QCATDefault.aws) shown in Figure 7-1. The GNSS location stats analyzer receives information from the 0x1476 and 0x195B packets.

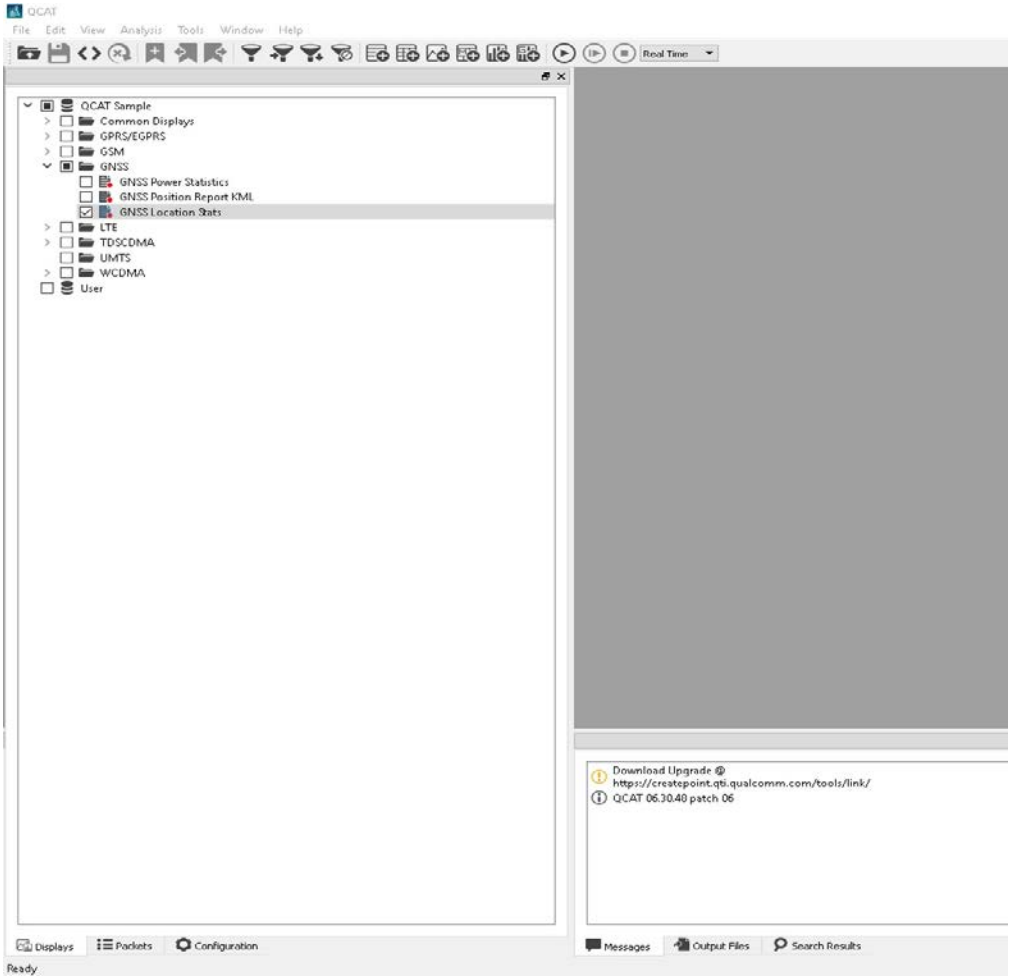


Figure 7-1 GNSS location stats location

Figure 7-2 shows the location of the GNSS location stats configuration parameters at **GNSS Extension** > **Truth.**

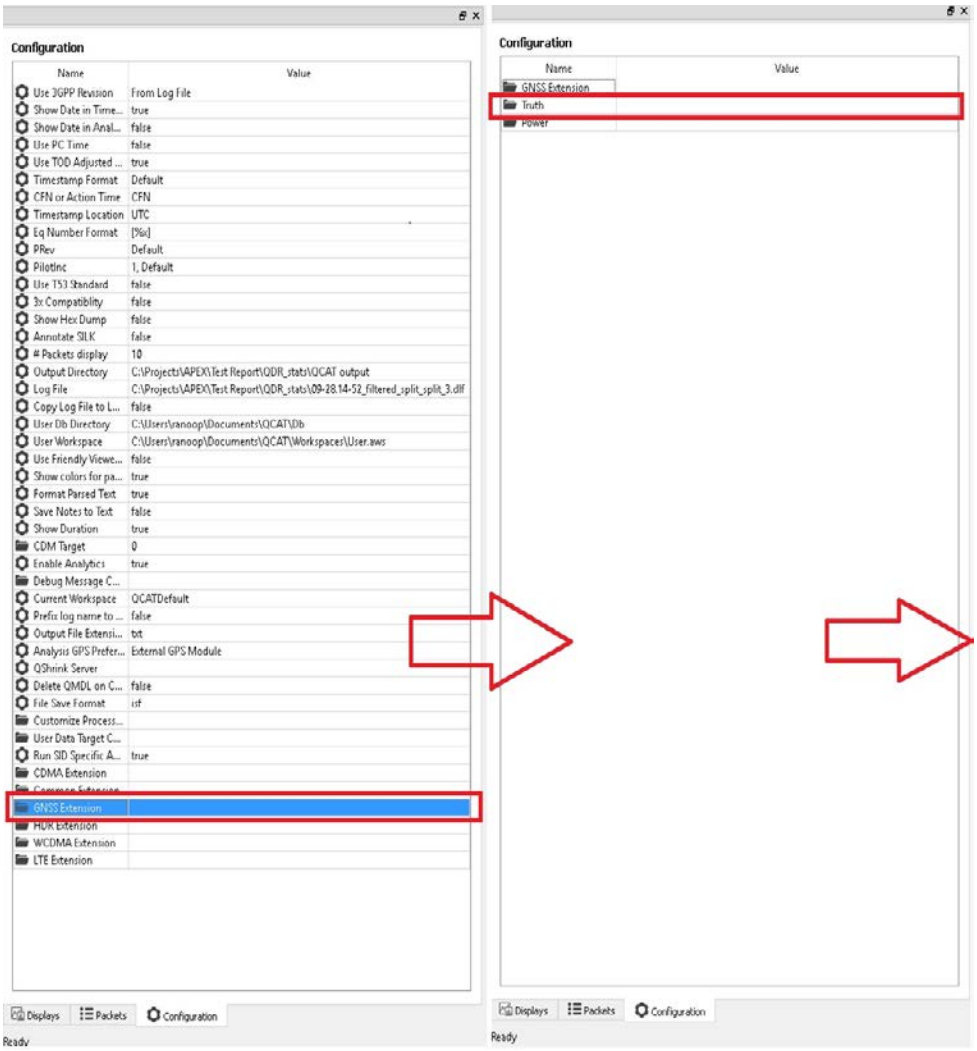


Figure 7-2 GNSS location stats parameters

Figure 7-3 shows a detailed view of the truth parameter configuration.

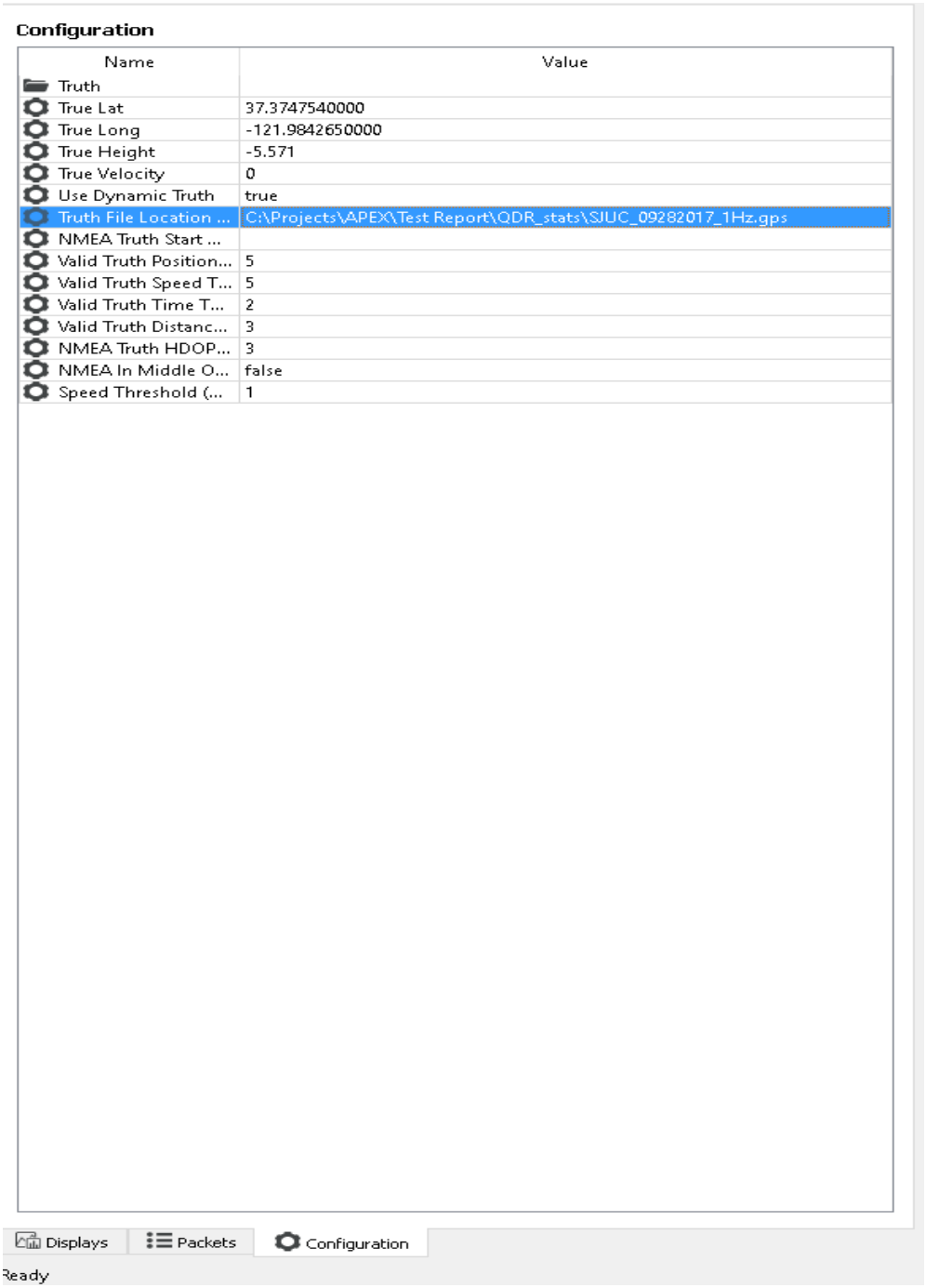


Figure 7-3 Truth parameter configuration

Only the parameters listed in the table below should be changed. Other parameters should remain as their default value.

Table 7-1 Configuration parameter descriptions

Parameter name	Description	Default value
Use Dynamic Truth	To use a truth file like IMU.	True
Truth File Location	Path for the truth file.	<filepath>

7.2 Output

Figure 7-4 shows a typical GNSS location statistics output. Table 7-2 lists the GNSS location stats analyzer output parameters.

GNSS Location Compact Stats

09-28.14-52_filtered_split_split_3.dlf

All Fixes

Description	Mean	StdDev	Min	Max	50%	68%	95%
Horizontal Error (m)	10.47	14.394	0.334	99.4	6.81	8	45.887
HEPEUnc (m)	7.479	7.851	3.536	93.7	4.739	5.59	20.456
Vertical Error (Abs) (m)	9.91	12.545	0.003	57.71	5.716	9.5	44.391
Vertical Unc (m)	6.3	4.178	2.5	32.34	5.051	5.69	16.328
Horizontal Speed Error (m/s)	-0.6371	1.641	-7.42	6.088	0	0.01	0.617
Heading Error (Signed) (deg)	10.76	48.926	-164.2	177.1	0.781	4.52	119.4
Time Between Fixes (s)	1.18	5.304	0.998	157	1	1	1.001
Num SVs in Fix	16.26	3.885	0	21	17	18	20
Num GPS SVs in Fix	7.643	1.935	0	10	8	9	10
Num GLO SVs in Fix	5.204	1.336	0	6	6	6	6
Num BDS SVs in Fix	0.9515	0.507	0	2	1	1	2
Num GAL SVs in Fix	2.464	0.886	0	3	3	3	3
Num QZSS SVs in Fix	0	0	0	0	0	0	0

All Fixes of type QDR

Description	Mean	StdDev	Min	Max	50%	68%	95%
Horizontal Error (m)	4.312	2.973	0.077	17.19	3.801	5.61	9.737
HEPEUnc (m)	4.783	4.552	1.23	19.69	2.23	4.74	13.87
Vertical Error (Abs) (m)	3.98	2.768	0	10.97	3.77	5.74	8.85
Vertical Unc (m)	6.101	1.703	2.89	9.94	5.58	6.76	9.14
Horizontal Speed Error (m/s)	-0.02224	0.385	-2.25	2.17	0	0.03	0.63
Heading Error (Signed) (deg)	-0.4166	8.41	-36.04	39.05	0.51	1.32	11.558
Time Between Fixes (s)	0.1	0.002	0.089	0.111	0.1	0.1	0.109
Num SVs in Fix	10.07	5.648	0	19	12	13	18
Num GPS SVs in Fix	4.988	2.972	0	11	6	7	9
Num GLO SVs in Fix	3.566	2.076	0	6	4	5	6
Num BDS SVs in Fix	0	0	0	0	0	0	0
Num GAL SVs in Fix	1.515	1.038	0	3	2	2	3
Num QZSS SVs in Fix	0	0	0	0	0	0	0

Figure 7-4 GNSS location stats output

For the statistics listed in the following table, the mean, standard deviation, minimum, maximum, 50% percentile, 68% percentile and 95% percentile statistics are computed.

Table 7-2 GNSS location stats output parameters

Sl. No.	Parameter name	Description
1	HorizErr	NorthPosErr = (DataLatitude – TruthLatitude) * DegreeToRadians * EarthRadius EastPosErr = (DataLongitude – TruthLongitude) * DegreeToRadians * cos(TruthLatitude * DegreeToRadians) * EarthRadius HorzPossErr = SquareRoot ((NorthPosErr * NorthPosErr) + (EastPosErr * EastPosErr)) (meters)
2	HEPEUnc (m)	EllipseSemiMajorAxis = uncertainty of final horizontal position in an axis along the angle specified with respect to true North (meters) (received from message) EllipseSemiMinorAxis = uncertainty of final horizontal position in an axis perpendicular to the angle specified with respect to true North (meters) (received from message) HEPEUnc = SquareRoot ((EllipseSemiMajorAxis * EllipseSemiMajorAxis) + (EllipseSemiMinorAxis * EllipseSemiMinorAxis))
3	Vertical Err	Absolute value of (DataAltitude – TruthAltitude) (meters)
4	Vertical Unc (m)	Estimated verticalpPosition error, reported in meters per second, scaled by 102
5	Horizontal Speed Error (m/s)	DataHorizontalSpeed – TruthHorizontalSpeed (meters per second)

6	Heading Error (Signed) (deg)	HeadingErr = DataHeading – TruthHeading
		if (HeadingErr > 180.0) HeadingErr -= 360.0;
		else if (HeadingErr < -180.0) HeadingErr += 360.0;

7	Time Between Fixes (s)	Time taken between subsequent fixes
8	Num SVs in Fix	Number of satellites used in solution
9	Num GPS SVs in Fix	Number of GPS satellites used in solution
10	Num GLO SVs in Fix	Number of GLONASS satellites used in solution
11	Num BDS SVs in Fix	Number of BDS MEO/IGSO satellites used in solution
12	Num GAL SVs in Fix	Number of GAL satellites used in solution
13	Num QZSS SVs in Fix	Number of QZSS satellites used in solution

8 Errors and workarounds

8.1 Missing packets

The error message, as shown in Figure 8-1, is displayed when none of the packets/events listed in Figure 2-2 are observed in the log file.

Figure 8-1 Error message – No analysis data to display

Workaround

1. Ensure that the required log packets are enabled in the log collecting tools.
2. Re-collect the log file.
3. Run the analyzer again.

8.2 High test duration

1. Enter the test duration in the `Power Test Duration (sec)` parameter.
2. Set `Use the Entered Power Test Duration = True`.
3. Run the analyzer again.

8.3 High state (or sensor state) duration

When the state duration is higher than the test duration ensure that the test duration is accurate and the events/packets are correctly logged (no log dropping).

If the issue persists, contact the GNSS team through https://createpoint.qti.qualcomm.com/.

8.4 High sensor power consumption

In normal cases, the sensor power consumption is less than 1 mA. If the value is larger than 1 mA at the output, ensure that the test duration is correctly detected or set.

If the issue persists, contact the GNSS team through https://createpoint.qti.qualcomm.com/.

A References

A.1 Related documents

Title	Number
Qualcomm Technologies, Inc.	
ASIA User Guide	80-V1932-1
QCAT User Guide	80-V1233-5
Serial Interface Control Document for QXDM Events	80-V6196-1
gpsAnalyze Algorithms and Requirements	80-V6294-1
IS-801 Call Flows for gpsOne® PDM	80-V6151-1
gpsOne® Position Determination Messaging and Parameters	80-V0726-1