Appendix G.2

Global Product Compliance Laboratory
600-700 Mountain Avenue
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LightSquared L-Band GPS Receiver Equipment Impact Evaluation Testing

Client

LightSquared

Product Evaluated

GPS Receivers

Report Number

GPCL-2011-0080-LS R3.0

Date Issued:

June 17, 2011

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Revisions

Date	Revision	Section	Change
6/8/2011	1	Attachment B and Title Page	Corrected title page. Added plots to the Dynamic plots and corrected simulated navigation plots in Attachment B
6/17/2011	2	Attachment B	Reorganized data and added plots. Added summary sheets to each test section detailing tests and plots available.

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1. System Information And Requirements

Device Under Test: (DUT)	Various GPS Devices from different vendors.
Measurement Procedure(s):	ANSI C63.4 (2003)
Test Date(s):	5/16/2011 6/3/2011
Test Performed By:	Alcatel·Lucent Bell Labs Global Product Compliance Laboratory 600-700 Mountain Avenue Murray Hill, New Jersey 07974 (USA) (908) 582-5444, Fax (908) 582-0485 Alcatel·Lucent Bell Labs Global Product Compliance Laboratory 2000 Lucent Lane Naperville, Il 60563 (USA)

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1.1 Introduction

The Device Under Test (DUT) are various GPS receivers that are used in general location and navigation applications , herein referred to as the DUT (Device Under Test). Tests were conducted to determine the DUT's susceptibility to the proposed transmission signals of LightSquared Inc.

1.2 Purpose And Scope

The purpose of this document is to provide the test measurements and results, which will be performed on the DUTs in accordance with the Technical Working Sub-Group for General Location and Navigation Devices, Test Plan version 2.1, dated 19 May 2011.

This document contains the following information:

- Description of the Equipment under Test (or apparatus) to which it refers.
- References to the test specification(s).
- Description of the test facilities and test environment.
- Applied test methodology per the attached test plan.
- Test configuration and performance criteria.

1.3 Reference Documents, Test Specifications & Procedures

General Location and Navigation Test Plan, version 2.1, 19 May 2011

1.4 Applicable Standards

A list of the applicable documents is provided herein:

- ANSI C63.4 (2003) entitled: "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz", American National Standards Institute, Institute of Electrical and Electronic Engineers, Inc., New York, NY 10017-2394, USA.

1.5 Tests Conducted

The EUT's were tested per the attached test descriptions. The results reported in this report are for the Static and Dynamic tests..

1.6 Product Descriptions

The devices tested were GPS devices that are used in a variety of ways, these uses include consumer, marine and emergency functions. The devices are not identified in this report by manufacturer.

1.7 Test Procedures

This is a general over view of the tests performed. Complete and specific details can be found in the General Location and Navigation Test Plan.

1.7.1 Static Tests

1.7.1.1 Interference Susceptibility Test

- ***Test Setup*:** The device under test (DUT) shall be exposed to modified test signals per Section II.D.2.f. Use a communications monitor (provided by manufacturer) to record the baseline C/N_0 reported by the GPS receiver.
- ***Measurement Parameters*:** Measure and record interfering simulated LightSquared transmitter power levels that result in 1dB, 3dB, 6dB, 10dB, and 20dB degradations in average reported C/N_0, as well as a complete loss of fix.
- ***Key Performance Indicator (KPI)****:* Average C/N_0 Degradation from Baseline (dB-Hz)

1.7.1.2 Interference Susceptibility Test (Acquisition Sensitivity)

- ***Test Setup*:** The device under test (DUT) shall be exposed to test signals per Section II.D.2. Use a communications monitor (provided by manufacturer) to delete ephemeris (including predicted ephemeris) and restart the acquisition engine to simulate a ***Warm Start*** condition. Then iterate the GPS signal level to find the baseline Acquisition sensitivity (minimum level at which the receiver can acquire a 3D fix within 3 minutes) reported by the GPS receiver. (Note, ephemeris must be deleted and the acquisition engine restarted prior to each iteration/trial).
- ***Measurement Parameters*:** Measure and record the acquisition sensitivities that result from the LightSquared transmitter power levels measured in Section IV.A.2, above. Also, record the average C/N_0 reported by the DUT after it has acquired a fix. *(Any TTFF test that runs more than 3 minutes shall be aborted and the test operator shall note that the device failed to acquire a fix.)*
- ***Key Performance Indicator (KPI):*** Acquisition Sensitivity (dBm)

1.7.1.3 TTFF (Time to First Fix) - Cold Start

- ***Test Setup*:** The device under test (DUT) shall be exposed to test signals per Section II.D.2. Use a communications monitor (provided by manufacturer) to delete ephemeris (including predicted ephemeris), time, position, and almanac. Then restart the acquisition engine to simulate a ***Cold Start*** condition. The command to ***Cold Start*** the device shall be issued in the 10th second of the GPS minute (as reported by the Spirent GSS 6700). Measure the TTFF with no interference present and record this as the baseline *(record 3 samples)*.
- ***Measurement Parameters*:** Measure and Record the TTFF's that result from the LightSquared transmitter power levels measured in Section IV.A.2 *(record 3 samples at each level)*. Also, record the average C/N_0 reported by the DUT after it has acquired a 3D fix. *(Any TTFF test that runs more than 3 minutes shall be aborted and the test operator shall note that the device failed to acquire a fix.)*
- ***Key Performance Indicator (KPI)***: TTFF (s)

1.7.1.4 TTFF - Warm Start

- ***Test Setup*:** The device under test (DUT) shall be exposed to test signals per Section II.D.2. Use a communications monitor (provided by manufacturer) to delete ephemeris (including predicted ephemeris) and restart the acquisition engine to simulate a ***Warm Start*** condition. The command to ***Warm Start*** the device shall be issued in the 10th second of the GPS minute (as reported by the Spirent GSS 6700). Measure the TTFF with no interference present and record this as the baseline *(record 3 samples)*.
- ***Measurement Parameters*:** Measure and Record the TTFF's that result from the LightSquared transmitter power levels measured in Section IV.A.2 *(record 3 samples at each level)*. Also, record the average C/N_0 reported by the DUT after it has acquired a 3D fix. *(Any TTFF test that runs more than 3 minutes shall be aborted and the test operator shall note that the device failed to acquire a fix.)*
- ***Key Performance Indicator (KPI):*** TTFF (s)

1.7.1.5 WAAS Demodulation Test

- ***Test Setup*:** The device under test (DUT) shall be exposed to test signals per Section II.D.2 with the addition of a WAAS PRN and Signal in Space. Use a communications monitor (provided by manufacturer) to delete ephemeris (including predicted ephemeris), time, position, and almanac. Then restart the acquisition engine to simulate a ***Cold Start*** condition. The command to ***Cold Start*** the device shall be issued in the 10th second of the GPS minute (as reported by the Spirent GSS 6700). Measure the TTFF – 3D Differential with no interference present and record this as the baseline *(record 3 samples).*
- ***Measurement Parameters*:** Measure and Record the TTFF's that result from the LightSquared transmitter power levels measured in Section IV.A.2 *(record 3 samples at each level).* Also, record the average C/N_0 reported by the DUT after it has acquired a fix. *(Any TTFF test that runs more than 5 minutes shall be aborted and the test operator shall note that the device failed to acquire a fix.)*
    - *a. TTFF – Differential (Time to First Differential Fix)*
    - *b. WAAS Satellite Bit Error Rate Degradation (some receivers may not support this test)*
    - *c. Loss of Frame Synchronization - increase in age of differential correction (some receivers may not support this test)*
    - *d. Average C/N_0 reported by the DUT*
    - *e. LightSquared Transmit Power Level*
- ***Key Performance Indicator (KPI):*** TTFF - Differential (s)

1.7.2 Dynamic Tests

1.7.2.1 Simulated Position and Velocity Tests

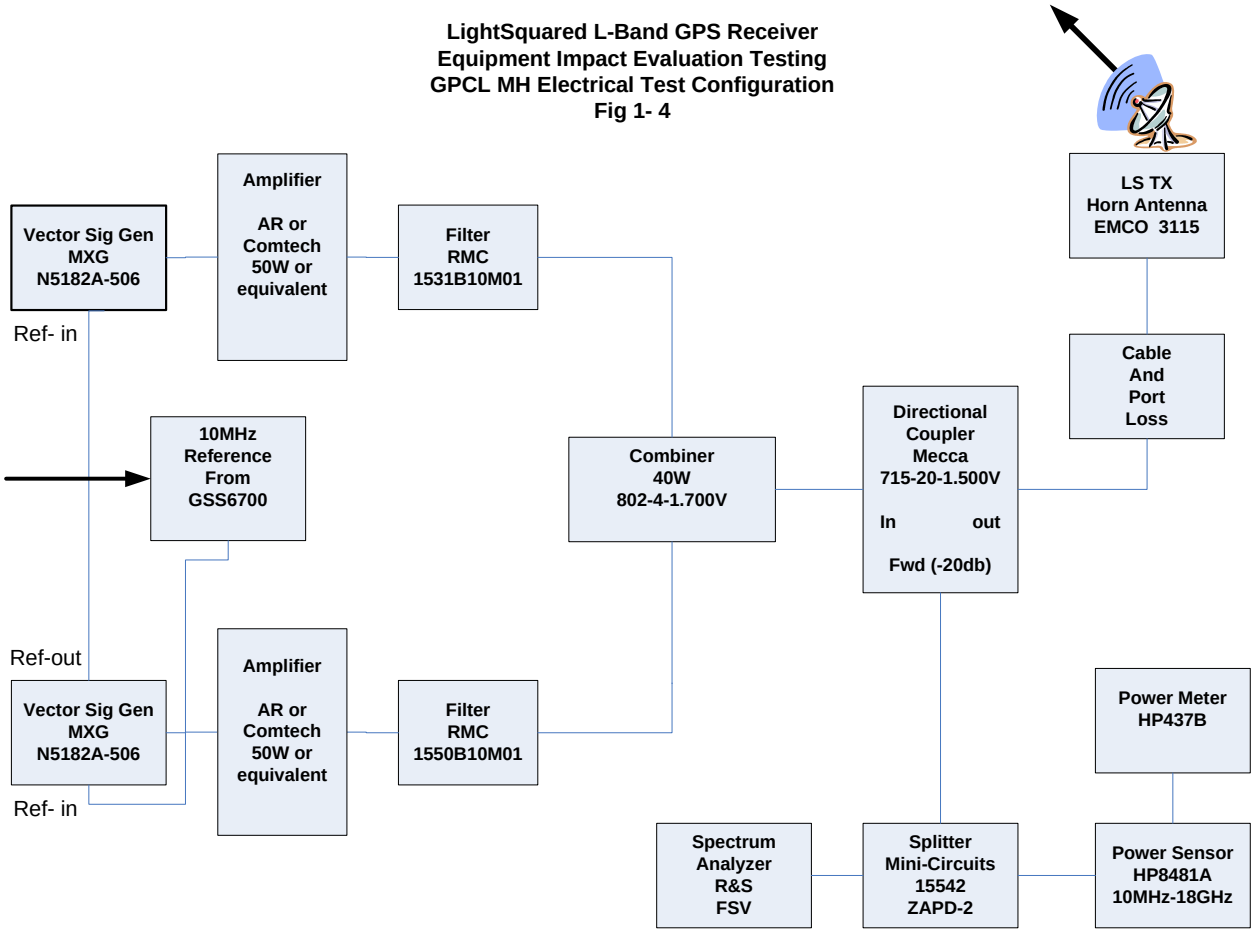
- ***Test Setup*: The device under test (DUT) shall be exposed to simulated GPS signals per Section II.D.3.** Use a communications monitor (provided by manufacturer) to measure and record the parameters detailed in the Measurement Parameters Section at 1 Hz intervals. Record baseline measurements without interference from the LightSquared transmitter. When collecting data with the LightSquared transmitter interference, allow the DUT to acquire a 3D fix during the first 90s of the scenario. Enable the LightSquared transmitter (at the appropriate level) as soon as the device acquires a 3D fix.
- ***Measurement Parameters*:** Collect the following data (at 1Hz intervals) for each DUT in the presence of the LightSquared transmitter at the power levels measured in Section IV.A.
    - a. *Reported position including latitude, longitude, and altitude*
    - b. *Reported velocity*
    - *c. Reported Time*
    - d. *Reported C/N_0 for each satellite*
- ***Key Performance Indicators** (KPIs):* Position with respect to the truth as reported by the GPS satellite simulator, and C/N_0 degradation. (A *.csv file with the aforementioned data shall be provided as part of the final test report.)

1.7.2.2 Navigation Position and Velocity Tests

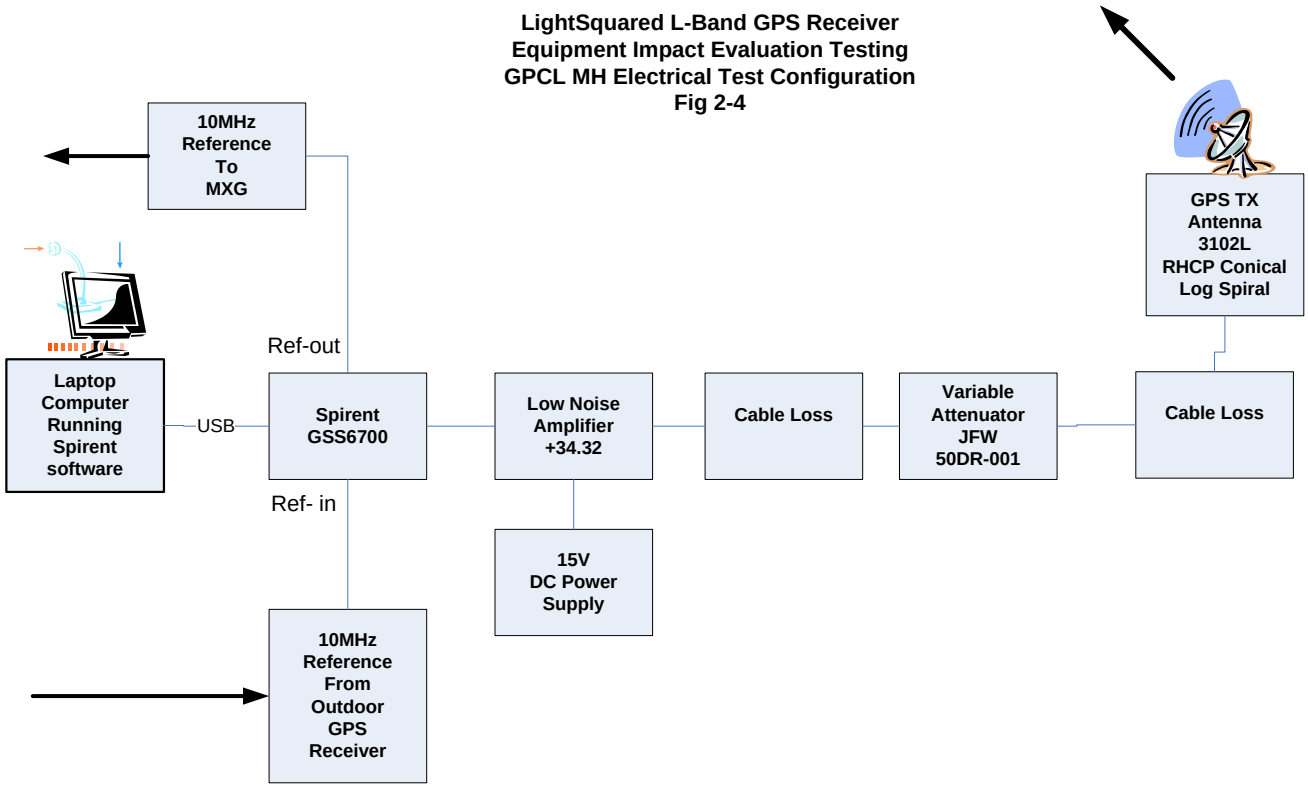
- ***Test Setup*:** The device under test (DUT) shall be exposed to pre-recorded test signals per Section II.D.4. *The recorded scenario shall be played back per the appropriate test case, as indicated in Appendix A.* Use a communications monitor (provided by manufacturer) to measure and record the parameters detailed in the Measurement Parameters Section at 1 Hz intervals. Record baseline measurements without interference from the LightSquared transmitter. When collecting data with the LightSquared transmitter interference, allow the DUT to acquire a 3D fix during the first 5 minutes of the pre-recorded scenario. Enable the LightSquared transmitter (at the appropriate level) 5 minutes into the pre-recorded scenario (as reported by the GSS-6400).
- ***Measurement Parameters*:** Collect the following data (at 1Hz intervals) for each DUT in the presence of the LightSquared transmitter at the power levels measured in Section IV.A.
    a. *Reported position including latitude, longitude, and altitude*
    b. *Reported velocity*
    c. *Reported Time*
    d. *Reported C/N_0 for each satellite*
- ***Key Performance Indicators (KPIs)*:** Position with respect to the baseline, and C/N_0 degradation. (A *.csv file with the aforementioned data shall be provided as part of the final test report.)

1.8 Basic Test Configuration

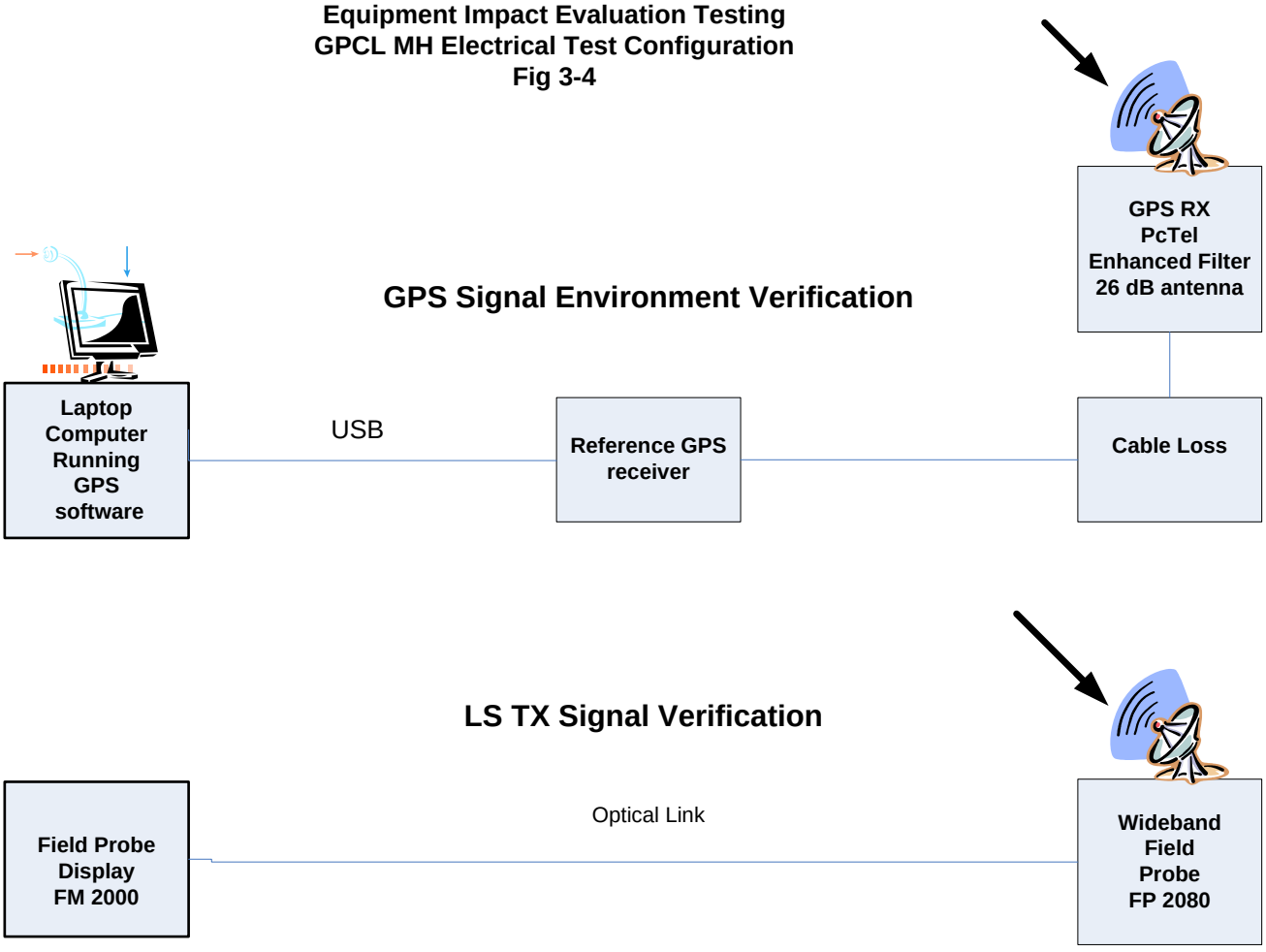
1.8.1 Basic Electrical Configuration



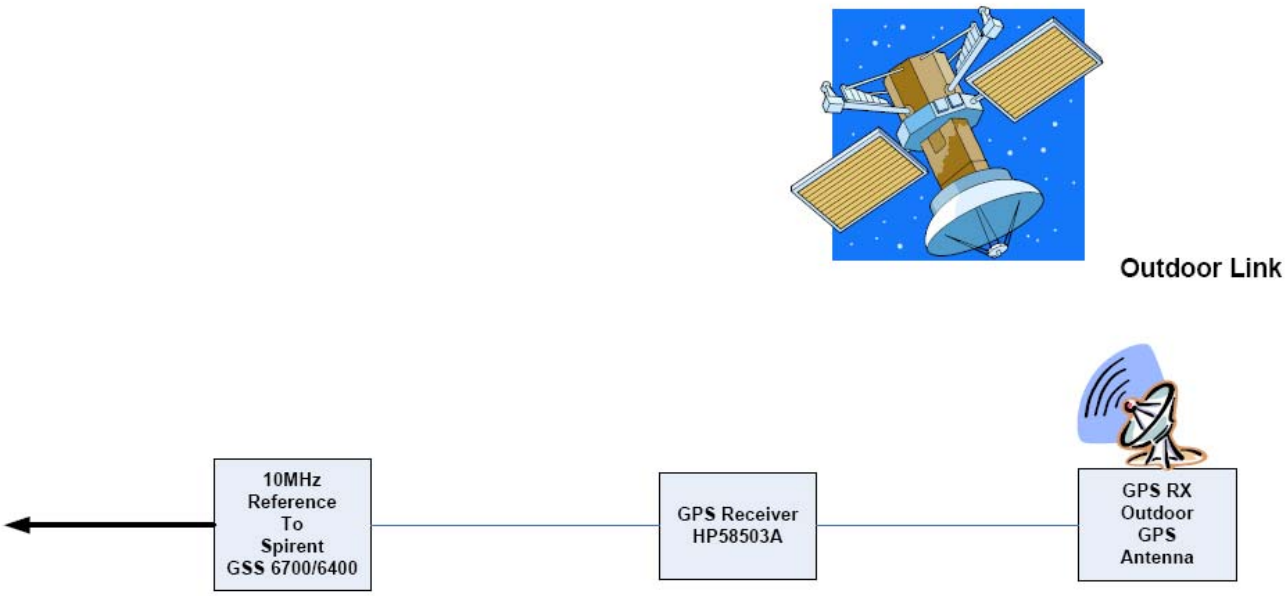
LightSquared L-Band GPS Receiver
Equipment Impact Evaluation Testing
GPCL MH Electrical Test Configuration
Fig 2-4



LightSquared L-Band GPS Receiver
Equipment Impact Evaluation Testing
GPCL MH Electrical Test Configuration
Fig 3-4

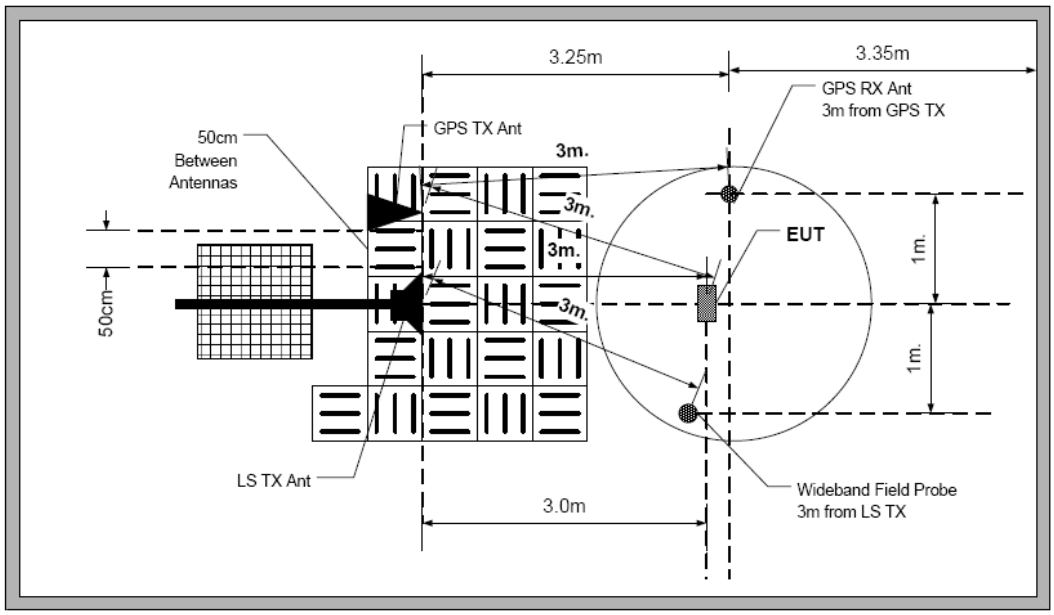


LightSquared L-Band GPS Receiver
Equipment Impact Evaluation Testing
GPCL MH Electrical Test Configuration
Fig 4-4

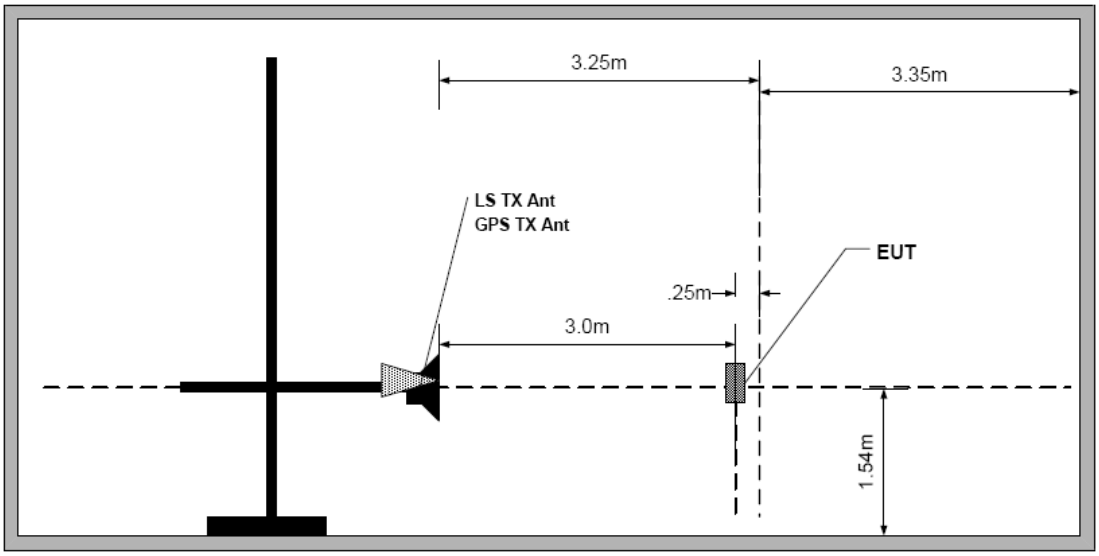


1.8.2 Basic Physical Configuration

Physical Test Configuration in AR4 (Top View)



Physical Test Configuration in AR4 (Side View)



1.9 Test Facilities

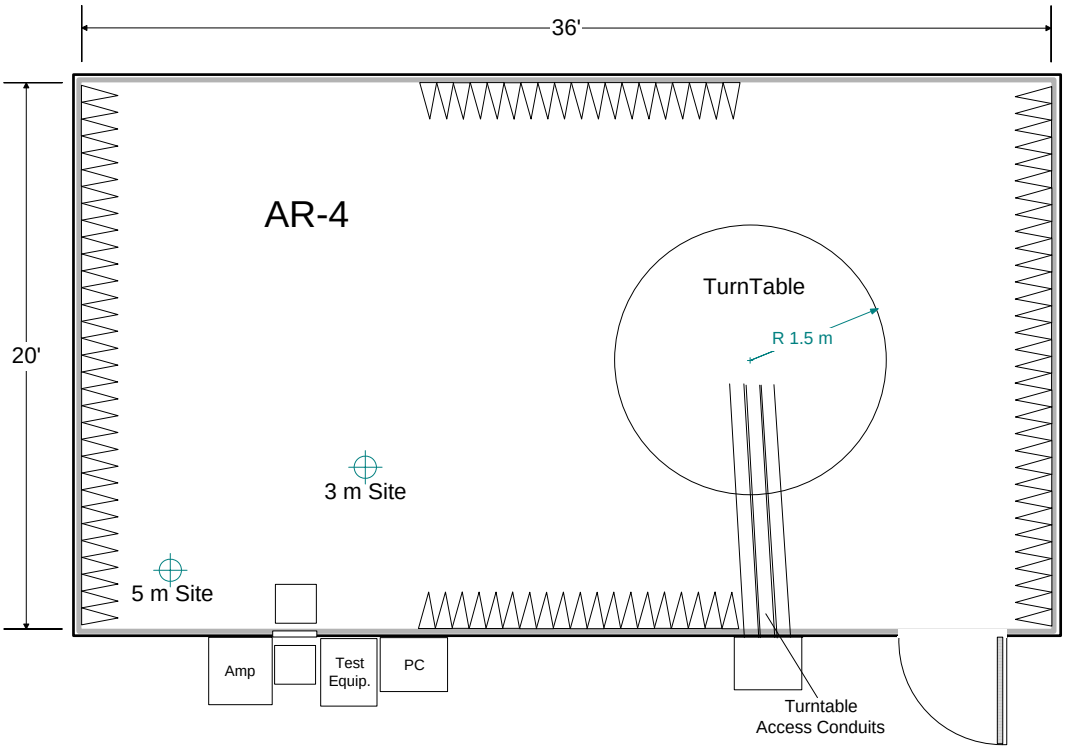
Murray Hill AR-4

The AR-4 chamber is a Panashield 3/5 meter compliance chamber. This chamber is a self supporting modular RF shielding design with nominal dimensions of 6.3m W x 11.1m L x 5.4m H. The walls and ceiling are treated with FFG-1000 & FFG-2000 TOYO grid ferrite treatment. In the specular regions HY-35 hybrid absorber is mounted on ferrite. A removable FFG-1000 ferrite tile grid 3.6m W x 3.3m D is placed between the EUT and antenna during radiated immunity testing. In addition, TDK ICM-006 absorber are installed for 1 to 18 GHz mid range performance. The operational frequency range of the chamber is 30 MHz to 18 GHz. The chamber is single point grounded to a ground rod/ground array.

Access to the chamber is provided with a 1.2m W x 2.4m H RCM auto-latch door. The chamber is provided with a 3 meter variable speed 8800 LB capacity turntable, and a 4 meter antenna mast. Measurement distances of 3 and 5 meters can be achieved with an antenna search height of 4 meters. RF Line Filters are installed on the on the power input lines to remove RF ambient signals. These filters are encased in shielded electrical enclosures. Access from outside the chamber to the center hub of the turntable is provided via 3 6” metallic conduits. The turntable is positioned so that an EUT will have a minimum setback distance of 1 meter from the side walls and ceiling during testing.

The chamber is outfitted with three recessed access boxes. From these boxes RF cables are run under the raised flooring to a bulkhead feed-thru panel and out to a breakout panel adjacent to the test instrumentation. The raised flooring inside the chamber is constructed with modular shielding panels interconnected in the same fashion as the chamber walls. 1/8” galvanized steel plates are used between the batten strips to flush out the flooring. The chamber lighting and wall treatments are specifically designed to provide an office like work environment inside the chamber. A closed circuit color CCTV system shielded to 200 V/m is installed to allow monitoring of the EUT. A dedicated HVAC system with humidity control provides a constant temperature and humidity inside the chamber.

All power entering the chamber is filtered. The filters provide 100 dB insertion loss from 10 kHz to 10 GHz IAW with MIL-STD-220A. Dedicated power is provided in the center hub of the turntable for the EUT’s.

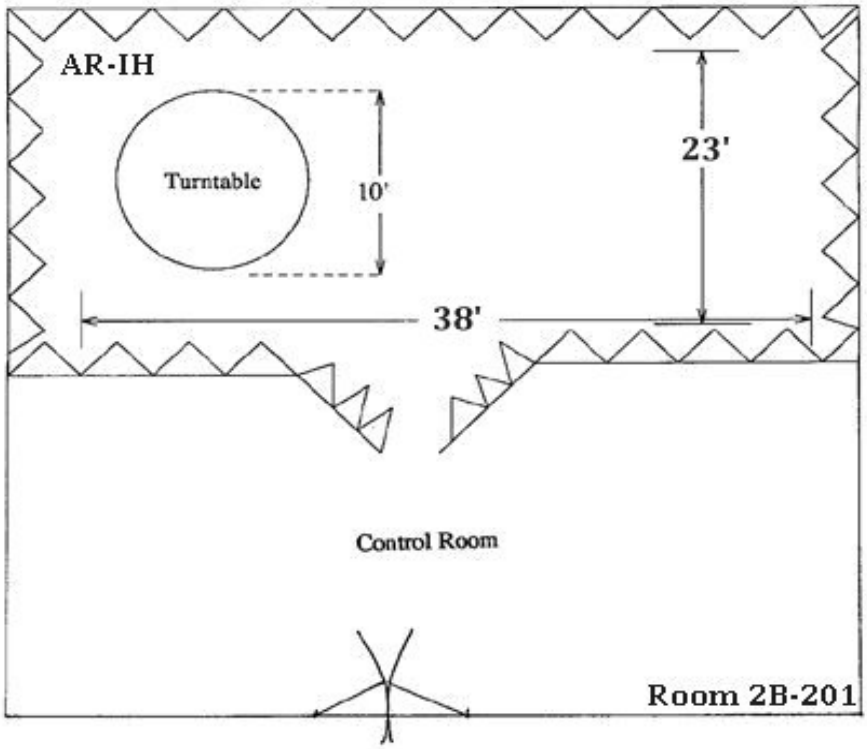


Indian Hill EMC Chamber

AR-IH is a 31' x 18' x 8.5' (9.45m x 5.49m x 2.59m) semi-anechoic chamber. It is built as a six-sided screen room with TDK IP-045C RF Absorber material on five sides. It is located in Rm 2B-201 as shown in the floor layout in Figure 1. The floor subsurface is a bronze screen that bonds intimately with the room's metal skin, forming a ground plane. The subsurface is covered with a layer of anti-static tiles to provide a smooth working surface. A closed circuit CCTV system shielded to 200 V/m is installed to allow monitoring of the EUT. A 10' remote-controlled flush mounted turntable provides 360-degree rotation of the equipment for radiated emission and immunity testing. The receiving antenna is set 3 meters from the test equipment, and a remote-controlled antenna mast can change polarities and perform height scans from 80 to 180 cm. Lab 1 is used for pre-scanning measurements of larger equipment.

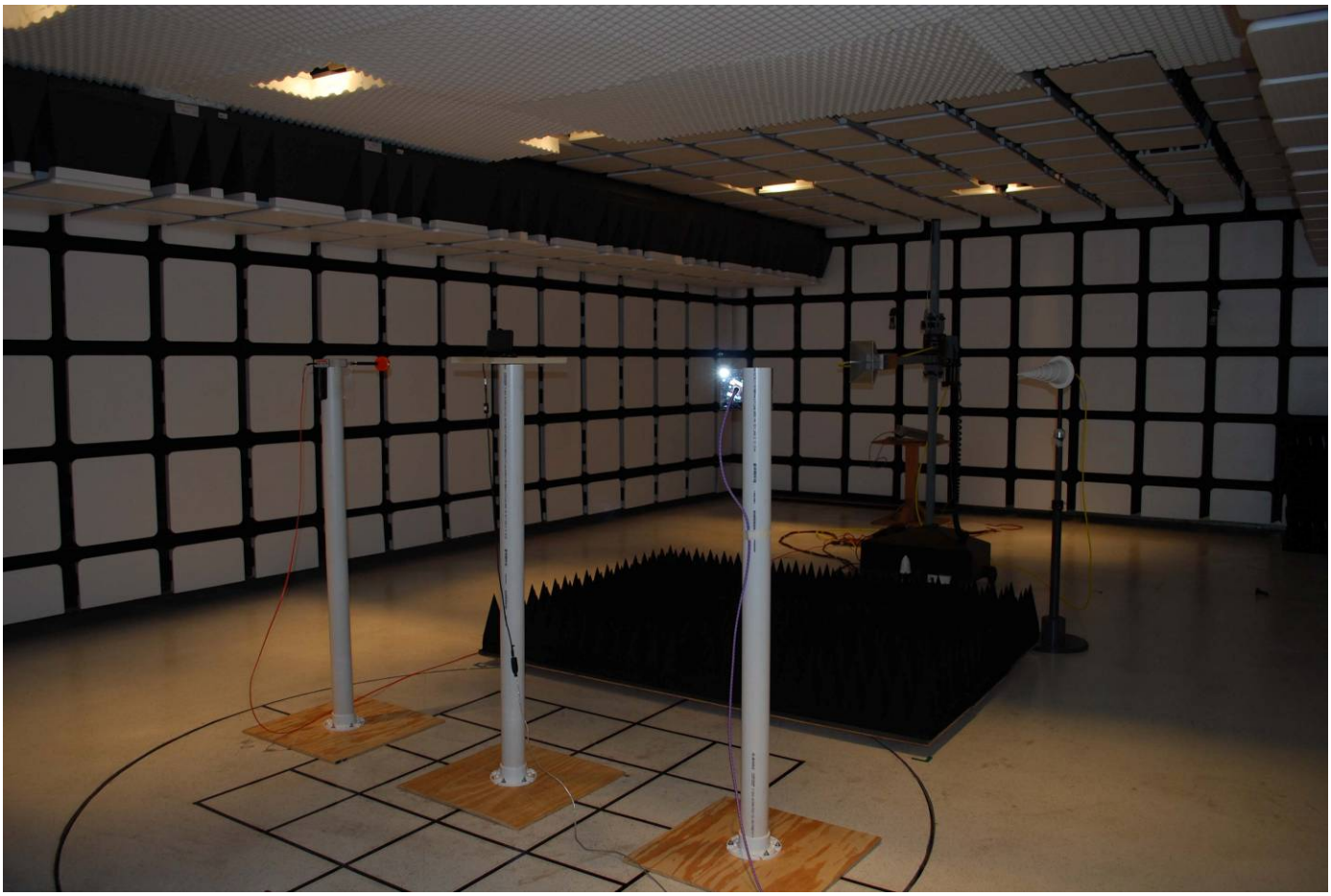
Power available in AR-IH:

- 0-60 VDC, 100A
- 120 VAC, 100 A
- 208 VAC, 3-phase, 100 A
- 0-440 VAC, 1 or 3 phase, 50-500 Hz, 6 kVA
- 100 dB passive filters are available via a jack panel to feed power into AR-IH.



1.9.1 Pictures of Test Facilities

Alcatel-Lucent Murray Hill NJ
AR-4



Alcatel-Lucent Indian Hill

1.10 Equipment Lists

Murray Hill Equipment List

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Multiclass satellite simulator	01201138	Spirent	CSS6700 (GSUA-0120)	NA	NA
Spectrum Analyzer 20HZ-40GHZ -150-+30dBm	830846-008	Rohde & Schwarz	FSEK30	5/27/2010	5/27/2011
MXG Vector Signal Generator	MY50140040	Agilent	N5182A	4/20/2010	4/29/2012
MXG Vector Signal Generator	MY50140010	Agilent	N5182A	4/21/2010	4/29/2012
Power Meter	3737U26396	Hewlett-Packard	437B	8/26/2010	8/26/2011
FSV Signal Analyzer	9002K03-101868	Rohde & Schwarz	FSV3	10/12/2010	4/27/2012
RF Amplifier 0.8 - 4.2 GHz 50 Watts	304598	Amplifier Research	50S1G4A	6/3/2010	NA
50 Watt Amplifier	N1C5A00-1039	Comtech-PST	ARD 8829-50	NA	NA
Band Pass Filter	11030001	LightSquared	1531B10M01	NA	NA
Band Pass Filter	11030002	LightSquared	1550B10M01	NA	NA
Power Sensor 10 MHz-18 GHz	MY41096522	Agilent	8481A	7/13/2010	7/13/2011
Isotropic Field Monitor	23282	Amplifier Research	FM 2000	6/3/2010	NA
Isotropic Field Probe 80 MHz-40 GHz	28124	Amplifier Research	FP 2080	4/7/2011	4/7/2012
Band Pass Filter	2	K&L	4CP120-1632.5	NA	NA
Satellite Simulator/recorder	0043	Spirent	GS6400RPS	NA	NA
Multiclass satellite simulator	01201331	Spirent	CSS6700 (GSUA-0120)	NA	NA
Amplifier	NA	Alcatel-Lucent	1-2GHz Amp	NA	NA
Spiral Antenna	00128329	ETS-Lindgren	3102L	11/19/2010	5/19/2012
GPS Antenna	None	PCTEL	GPS-TMG-HR-26N	NA	NA
Double Ridged Horn Antenna 1-18GHz	9006-3460	EMCO	3115	1/12/2011	1/12/2012

Indian Hill Equipment

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Power Meter	3513003984	HP	438A	4/13/11	4/13/12
Power Meter	3513004126	HP	438A	8/24/10	8/24/11
Power Sensor	2702A81114	HP	8481A	3/29/11	3/29/12
Power Sensor	US37290578	HP	8481A	2/24/11	2/24/12
Spectrum Analyzer	MY46181273	Agilent	E4445A	11/9/10	11/9/11
Spectrum Analyzer	101993	R&S	FSV3	4/6/11	4/27/12
Antenna Horn	9010-3559	EMCO	3115	12/23/10	12/23/11
MXG Sig. Gen.	MY5014004228		N5182A	4/18/10	4/29/2012
MXG Sig. Gen.	MY5014004242		N5182A	4/20/10	4/29/2012
Combiner		Meca	H2N-1.500V		
Splitter		Mini Circuits	15542 25dB		
Coupler		Meca	715-20-1.500V		
Power Amp.		Comtech	AR Series 20W		
Power Amp.		Comtech	AR Series 50W		
Filter (DL)		Lightsquared	RMC 1550B, 10M01/11030003		
Filter (DL)		Lightsquared	RMC 1531B, 10M01/11030002		
Filter (UL)		Lightsquared	4CP120-1632		
Antenna Horn	9107-3707	EMCO	3115		
Power Meter	3513003984	HP	438A	4/13/11	4/13/12
Power Meter	3513004126	HP	438A	8/24/10	8/24/11
Multiclass satellite simulator	01201326	Spirent	CSS6700 (GSUA-0120)	NA	NA
Satellite Simulator/recorder	0049	Spirent	GS6400RPS	NA	NA

1.11 Test Bed Calibration and Measurement Calculations

1.11.1 DownLink

	Bell Labs LightSquared GPS Test Bed Calibration							CM/NPA	13-May-11		
		Maximum LightSquared TX Power:			62	dBm EIRP		(downlink)			
		Test Antenna Separation:			3	Meter					
		Antenna Front-Back Isolation:			30	dB					
		Radiating Antenna Gain:			8.8	dBi					
		Free space loss frequency:			1550.2	MHz					
		Test Bed Power Meter Offset:			20	dB					
							Equivalent	Equivalent	Equivalent		
	Raw	LTE TX	LTE TX	Propgation	Power	Power	Boresight	Boresight	off-lobe		
	Pwr Mtr	Power	EIRP	Loss	at device	diff	Distance	Distance	Distance	LTE Tx	Field Probe
Notes	dBm	dBm	dBi	dB	dBm	dB	Meters	Feet	Meters	W	V/m
1	-25.0	-5	3.8	45.8	-42.0	104.0	2438	8000	77.1	3.16E-04	0.09
	-24.0	-4	4.8	45.8	-41.0	103.0	2173	7130	68.7	3.98E-04	0.10
	-23.0	-3	5.8	45.8	-40.0	102.0	1937	6355	61.3	5.01E-04	0.11
	-22.0	-2	6.8	45.8	-39.0	101.0	1726	5664	54.6	6.31E-04	0.13
	-21.0	-1	7.8	45.8	-38.0	100.0	1539	5048	48.7	7.94E-04	0.14
	-20.0	0	8.8	45.8	-37.0	99.0	1371	4499	43.4	1.00E-03	0.16
	-19.0	1	9.8	45.8	-36.0	98.0	1222	4010	38.6	1.26E-03	0.18
	-18.0	2	10.8	45.8	-35.0	97.0	1089	3574	34.4	1.58E-03	0.20
	-17.0	3	11.8	45.8	-34.0	96.0	971	3185	30.7	2.00E-03	0.22
	-16.0	4	12.8	45.8	-33.0	95.0	865	2839	27.4	2.51E-03	0.25
	-15.0	5	13.8	45.8	-32.0	94.0	771	2530	24.4	3.16E-03	0.28
	-14.0	6	14.8	45.8	-31.0	93.0	687	2255	21.7	3.98E-03	0.32
	-13.0	7	15.8	45.8	-30.0	92.0	613	2010	19.4	5.01E-03	0.36
	-12.0	8	16.8	45.8	-29.0	91.0	546	1791	17.3	6.31E-03	0.40
	-11.0	9	17.8	45.8	-28.0	90.0	487	1596	15.4	7.94E-03	0.45
	-10.0	10	18.8	45.8	-27.0	89.0	434	1423	13.7	1.00E-02	0.50
	-9.0	11	19.8	45.8	-26.0	88.0	386	1268	12.2	1.26E-02	0.56
	-8.0	12	20.8	45.8	-25.0	87.0	344	1130	10.9	1.58E-02	0.63
	-7.0	13	21.8	45.8	-24.0	86.0	307	1007	9.7	2.00E-02	0.71
	-6.0	14	22.8	45.8	-23.0	85.0	274	898	8.7	2.51E-02	0.80
	-5.0	15	23.8	45.8	-22.0	84.0	244	800	7.7	3.16E-02	0.89
	-4.0	16	24.8	45.8	-21.0	83.0	217	713	6.9	3.98E-02	1.00
	-3.0	17	25.8	45.8	-20.0	82.0	194	635	6.1	5.01E-02	1.13
	-2.0	18	26.8	45.8	-19.0	81.0	173	566	5.5	6.31E-02	1.26
	-1.0	19	27.8	45.8	-18.0	80.0	154	505	4.9	7.94E-02	1.42
	0.0	20	28.8	45.8	-17.0	79.0	137	450	4.3	1.00E-01	1.59
	1.0	21	29.8	45.8	-16.0	78.0	122	401	3.9	1.26E-01	1.78
	2.0	22	30.8	45.8	-15.0	77.0	109	357	3.4	1.58E-01	2.00
	3.0	23	31.8	45.8	-14.0	76.0	97	318	3.1	2.00E-01	2.25
	4.0	24	32.8	45.8	-13.0	75.0	87	284	2.7	2.51E-01	2.52
	5.0	25	33.8	45.8	-12.0	74.0	77	253	2.4	3.16E-01	2.83
	6.0	26	34.8	45.8	-11.0	73.0	69	225	2.2	3.98E-01	3.17
	7.0	27	35.8	45.8	-10.0	72.0	61	201	1.9	5.01E-01	3.56
	8.0	28	36.8	45.8	-9.0	71.0	55	179	1.7	6.31E-01	3.99
	9.0	29	37.8	45.8	-8.0	70.0	49	160	1.5	7.94E-01	4.48
	10.0	30	38.8	45.8	-7.0	69.0	43	142	1.4	1.00E+00	5.03
	11.0	31	39.8	45.8	-6.0	68.0	39	127	1.2	1.26E+00	5.64
	12.0	32	40.8	45.8	-5.0	67.0	34	113	1.1	1.58E+00	6.33
	13.0	33	41.8	45.8	-4.0	66.0	31	101	1.0	2.00E+00	7.10
	14.0	34	42.8	45.8	-3.0	65.0	27	90	0.9	2.51E+00	7.97
	15.0	35	43.8	45.8	-2.0	64.0	24	80	0.8	3.16E+00	8.94
	16.0	36	44.8	45.8	-1.0	63.0	22	71	0.7	3.98E+00	10.03
	17.0	37	45.8	45.8	0.0	62.0	19	64	0.6	5.01E+00	11.26
	18.0	38	46.8	45.8	1.0	61.0	17	57	0.5	6.31E+00	12.63
	19.0	39	47.8	45.8	2.0	60.0	15	50	0.5	7.94E+00	14.17
2	20.0	40	48.8	45.8	3.0	59.0	14	45	0.4	1.00E+01	15.90
	Notes:	1	Estimated Minimum RF Test Bed Power, equiv. to > 2.4 km to antenna boresight								
		2	Estimated Maximum RF Test Bed Power, equiv. to < 15 m to antenna boresight								

1.11.2 UpLink

Bell Labs LightSquared GPS Test Bed Calibration							CM/NPA	13-May-11	
	Maximum LightSquared TX Power:			23	dBm EIRP		(uplink)		
	Test Antenna Separation:			3	Meter				
	Antenna Front-Back Isolation:			n/a	dB				
	Radiating Antenna Gain:			8.8	dBi				
	Free space loss frequency:			1632.5	MHz				
	Test Bed Power Meter Offset:			20	dB				
Raw Pwr Mtr dBm	LTE TX Power dBm	LTE TX EIRP dBi	Propgation Loss dB	Power at device dBm	Power diff dB	Equivalent Distance Meters	Equivalent Distance Feet	LTE Tx W	Field Probe V/m
-25	-5	3.8	46.2	-42.4	65.4	27	90	3.16E-04	0.09
-24	-4	4.8	46.2	-41.4	64.4	24	80	3.98E-04	0.10
-23	-3	5.8	46.2	-40.4	63.4	22	71	5.01E-04	0.11
-22	-2	6.8	46.2	-39.4	62.4	19	64	6.31E-04	0.13
-21	-1	7.8	46.2	-38.4	61.4	17	57	7.94E-04	0.14
-20	0	8.8	46.2	-37.4	60.4	15	50	1.00E-03	0.16
-19	1	9.8	46.2	-36.4	59.4	14	45	1.26E-03	0.18
-18	2	10.8	46.2	-35.4	58.4	12	40	1.58E-03	0.20
-17	3	11.8	46.2	-34.4	57.4	11	36	2.00E-03	0.22
-16	4	12.8	46.2	-33.4	56.4	10	32	2.51E-03	0.25
-15	5	13.8	46.2	-32.4	55.4	9	28	3.16E-03	0.28
-14	6	14.8	46.2	-31.4	54.4	8	25	3.98E-03	0.32
-13	7	15.8	46.2	-30.4	53.4	7	23	5.01E-03	0.36
-12	8	16.8	46.2	-29.4	52.4	6	20	6.31E-03	0.40
-11	9	17.8	46.2	-28.4	51.4	5.5	18	7.94E-03	0.45
-10	10	18.8	46.2	-27.4	50.4	4.9	16	1.00E-02	0.50
-9	11	19.8	46.2	-26.4	49.4	4.3	14	1.26E-02	0.56
-8	12	20.8	46.2	-25.4	48.4	3.9	13	1.58E-02	0.63
-7	13	21.8	46.2	-24.4	47.4	3.4	11	2.00E-02	0.71
-6	14	22.8	46.2	-23.4	46.4	3.1	10	2.51E-02	0.80
-5	15	23.8	46.2	-22.4	45.4	2.7	9.0	3.16E-02	0.89
-4	16	24.8	46.2	-21.4	44.4	2.4	8.0	3.98E-02	1.00
-3	17	25.8	46.2	-20.4	43.4	2.2	7.1	5.01E-02	1.13
-2	18	26.8	46.2	-19.4	42.4	1.9	6.4	6.31E-02	1.26
-1	19	27.8	46.2	-18.4	41.4	1.7	5.7	7.94E-02	1.42
0	20	28.8	46.2	-17.4	40.4	1.5	5.0	1.00E-01	1.59
1	21	29.8	46.2	-16.4	39.4	1.4	4.5	1.26E-01	1.78
2	22	30.8	46.2	-15.4	38.4	1.2	4.0	1.58E-01	2.00
3	23	31.8	46.2	-14.4	37.4	1.1	3.6	2.00E-01	2.25
4	24	32.8	46.2	-13.4	36.4	1.0	3.2	2.51E-01	2.52
5	25	33.8	46.2	-12.4	35.4	0.9	2.8	3.16E-01	2.83
6	26	34.8	46.2	-11.4	34.4	0.8	2.5	3.98E-01	3.17
7	27	35.8	46.2	-10.4	33.4	0.7	2.3	5.01E-01	3.56
8	28	36.8	46.2	-9.4	32.4	0.6	2.0	6.31E-01	3.99
9	29	37.8	46.2	-8.4	31.4	0.55	1.8	7.94E-01	4.48
10	30	38.8	46.2	-7.4	30.4	0.49	1.6	1.00E+00	5.03
11	31	39.8	46.2	-6.4	29.4	0.43	1.4	1.26E+00	5.64
12	32	40.8	46.2	-5.4	28.4	0.39	1.3	1.58E+00	6.33
13	33	41.8	46.2	-4.4	27.4	0.34	1.1	2.00E+00	7.10
14	34	42.8	46.2	-3.4	26.4	0.31	1.0	2.51E+00	7.97
15	35	43.8	46.2	-2.4	25.4	0.27	0.9	3.16E+00	8.94
16	36	44.8	46.2	-1.4	24.4	0.24	0.8	3.98E+00	10.03
17	37	45.8	46.2	-0.4	23.4	0.22	0.7	5.01E+00	11.26
18	38	46.8	46.2	0.6	22.4	0.19	0.6	6.31E+00	12.63
19	39	47.8	46.2	1.6	21.4	0.17	0.6	7.94E+00	14.17
20	40	48.8	46.2	2.6	20.4	0.15	0.50	1.00E+01	15.90
Notes:	1	Estimated Minimum RF Test Bed Power, equiv. to 90 ft to LTE mobile							
	2	Estimated Maximum RF Test Bed Power, equiv. to 6 inches to LTE mobile							

2. TEST DATA

Attachment A – Static Test Results

Attachment B – Dynamic Test Plots

NOTE: Summary sheets are provided at the beginning of each Dynamic test section that details the DUTs and the plots available for each device.

ATTACHMENT A

STATIC TESTS

STATIC TEST
KEY PERFORMANCE INDICATORS

	Phase 0a							
	TEST:	**Static InterferenceSuceptibility, downlink 1552.7 (5 MHz BW)**						
	Power at Device (dBm) vs C/N degradation							
	Device	**1 dB**	**3 dB**	**6 dB**	**10 dB**	**20 dB**	**LOF**	
1	G11207	*-76.5*	*-66.6*	*-61.6*		lof	*-56.0*	
2	G14298	*-66.0*	*-61.0*	*-54.0*	*-48.0*	-37.0	-33.0	
3	G17783	*-57.6*	*-52.6*	*-47.6*	*-45.4*	-40.7	-33.7	
4	G12586	*-56.2*	*-52.3*	*-48.9*	*-47.2*	-38.3	-28.8	
5	G17641	*-54.9*	*-50.6*	*-47.8*	*-42.7*	-35.7	-34.9	
6	G18161	*-50.4*	*-47.8*	*-44.3*	-39.2	-29.5	-24.5	
7	G15343	*-51.5*	*-47.6*	*-43.5*	-40.0	-31.0	-25.0	
8	G13445	*-53.9*	*-46.9*	-40.7	-36.2	lof	-30.9	
9	G12867	*-49.3*	*-44.3*	-39.9	-34.6	-23.6	-19.9	
10	P14949	*-50.9*	*-44.2*	-41.0	-37.0	-26.0	-21.0	
11	G17169	*-42.0*	-41.3	-35.7	-32.0	-26.3	-22.7	
12	P14730	-41.4	-38.2	-35.1	-31.6	-21.3	-11.2	
13	P15427	*-42.0*	-38.0	-32.0	-28.0	lof	-24.0	
14	G14188	-37.5	-34.8	-31.1	-26.7	-18.7	-14.7	
15	G15028	-37.6	-34.1	-31.6	-29.2	lof	-15.8	
16	P18892	-36.0	-30.0	-25.0	-22.0	-9.0	***MPNE***	
17	G16382	-36.0	-29.0	-22.0	-18.0	lof	-15.0	
18	G18062	-34.4	-27.4	-21.7	-16.3	-9.0	-2.7	
19	G18696	-33.4	-26.2	-20.2	-15.8	-9.2	-5.5	
20	G14666	-29.7	-25.6	-22.9	-20.3	-13.3	-6.2	
21	G16449	-32.0	-25.2	-19.7	-15.9	-9.2	-8.4	
22	G10195	-28.0	-23.7	-18.3	-14.8	lof	-7.6	
23	P13275	-26.0	-20.0	-14.0		lof	-7.0	
24	G10968	-24.8	-19.5	-16.6	-14.6	lof	-10.1	
25	G16534	-24.0	-19.0	-17.0	-15.0	-9.0	-7.0	
26	G10607	-22.7	-17.7	-14.2	-10.9	-2.9	0.8	
27	G15448	-17.4	-12.9	-8.4	-4.7	1.6	***MPNE***	
28	G12559	-14.0	-11.0	-8.7	-6.8	-4.8	***MPNE***	
29	P17655	-19.7	-10.2	-5.6	-2.0	***MPNE***		
		italics	below power meter range; estimated from amplifier gain					
		lof	loss of fix					
		MPNE	Maximum Power reached with No Effect (> 0 dBm)					

	Phase 0b							
	TEST:	**Static InterferenceSuceptibility, downlink 1531.0 (10 MHz BW)**						
	Power at Device (dBm) vs C/N degradation							
	Device	**1 dB**	**3 dB**	**6 dB**	**10 dB**	**20 dB**	**LOF**	
1	P14949	-33.0	-26.0	-21.0	-15.0	-8.0	-3.0	
2	G15343	-32.0	-27.7	-24.3	-20.1	-9.4	-2.0	
3	G14298	-29.5	-22.5	-17.5	-14.6	-8.6	-6.6	
4	G18161	-23.6	-20.6	-18.2	-15.9	-9.3	-5.5	
5	G15028	-23.5	-19.7	-14.5	-10.5	lof	-5.2	
6	G16382	-22.0	-13.0	-9.0	-8.0	lof	-5.0	
7	G12586	-19.7	-15.6	-12.7	-8.8	-3.5	***MPNE***	
8	G17641	-13.7	-9.7	-8.7	-4.6	***MPNE***		
9	G12867	-13.3	-9.4	-6.5	-3.0	***MPNE***		
10	G10195	-9.6	-6.4	4.0	***MPNE***			
11	G12559	-9.5	-3.8	***MPNE***				
12	P15427	-8.0	-5.0	-3.0	***MPNE***			
13	G10968	-7.5	***MPNE***					
14	G18062	-7.3	***MPNE***					
15	G15448	-5.2	***MPNE***					
16	G13445	-5.1	***MPNE***					
17	G16534	-4.0	***MPNE***					
18	G17169	-3.5	***MPNE***					
19	G11207	-3.4	***MPNE***					
20	P17655	-2.0	***MPNE***					
21	G10607	***MPNE***						
22	G14188	***MPNE***						
23	G14666	***MPNE***						
24	G16449	***MPNE***						
25	G17783	***MPNE***						
26	G18696	***MPNE***						
27	P13275	***MPNE***						
28	P14730	***MPNE***						
29	P18892	***MPNE***						
		MPNE	Maximum Power reached with No Effect (> 0 dBm)					

	Phase 1							
	TEST:	**Static InterferenceSuceptibility, downlink 1528.8 & 1552.7 (5 MHz BW)**						
	Power at Device (dBm) vs C/N degradation							
	Device	**1 dB**	**3 dB**	**6 dB**	**10 dB**	**20 dB**	**LOF**	
1	G11207	*-72.1*	*-61.1*	*-56.1*	lof	lof	*-54.2*	
2	G14298	*-57.8*	*-51.8*	*-44.8*	-41.4	-35.8	-33.8	
3	G17783	*-55.0*	*-50.0*	*45.0*	*-42.7*	lof	-35.7	
4	G12586	*-54.2*	*-51.2*	*-48.2*	*-44.2*	-36.1	-32.2	
5	G17641	*-51.9*	*-48.1*	*-44.7*	-40.2	lof	-33.3	
6	G12867	*-49.8*	*-41.8*	-37.0	-31.9	-23.1	-20.2	
7	G13445	*-49.0*	*-44.0*	-36.1	-33.0	lof	-23.0	
8	G15343	*-48.5*	*-44.7*	-41.9	-38.1	-29.6	-24.4	
9	G18161	-48.1	-45.7	-42.9	-40.0	-32.0	-28.0	
10	P14949	*-47.9*	*-42.9*	-39.0	-36.0	-28.0	-24.0	
11	P14730	*-44.8*	-38.8	-35.5	-33.3	-21.8	-11.8	
12	G17169	*-43.6*	-37.4	-33.3	-29.9	-23.8	-18.8	
13	G16382	-40.0	-35.0	-33.0	-31.0	lof	-28.0	
14	P15427	-40.0	-35.0	-30.0	-36.0	lof	-21.0	
15	G14188	-34.7	-32.5	-28.7	-24.4	-16.7	-10.7	
16	G15028	-33.9	-30.9	-28.9	-26.9	lof	-17.0	
17	G18062	-31.1	-24.1	-18.7	-14.4	-8.2	-4.0	
18	P18892	-31.0	-26.0	-22.0	-18.0	-5.0	***MPNE***	
19	G10968	-30.7	-29.3	-27.3	-25.8	lof	-22.8	
20	G18696	-29.8	-22.8	-17.3	-13.4	-7.8	-4.8	
21	G10195	-29.3	-27.3	-24.5	-21.7	-16.1	***MPNE***	
22	G16449	-28.1	-21.1	-16.2	-12.7	-7.6	-4.9	
23	G16534	-28.0	-26.0	-24.0	-22.0	-18.0	-15.0	
24	G10607	-25.0	-22.0	-18.9	-15.9	-9.0	-4.1	
25	P17655	-24.8	-21.8	-19.5	-16.5	lof	-11.4	
26	G14666	-24.4	-21.4	-20.1	-17.1	-9.4	***MPNE***	
27	G12559	-23.8	-20.9	-17.9	-15.8	-11.0	***MPNE***	
28	P13275	-18.0	-13.0	-9.0	lof	lof	-3.0	
29	G15448	-17.7	-15.0	-13.0	-10.6	-6.6	0.8	
		italics	below power meter range; estimated from amplifier gain					
		lof	loss of fix					
		MPNE	Maximum Power reached with No Effect (>0 dBm)					

	Phase 2							
	TEST:	**Static InterferenceSuceptibility, downlink 1531.0 & 1550.2 (10 MHz BW)**						
	Power at Device (dBm) vs C/N degradation							
	Device	**1 dB**	**3 dB**	**6 dB**	**10 dB**	**20 dB**	**LOF**	
1	G11207	*-58.9*	*-55.6*	*-52.0*	lof	lof	*-49.7*	
2	G14298	*-57.5*	*-49.5*	*-43.5*	-40.5	lof	-33.9	
3	G12586	*-53.9*	*-50.9*	*-47.9*	*-43.9*	-34.8	-29.9	
4	G17641	*-51.0*	*-47.6*	*-43.9*	-34.7	lof	-32.3	
5	G15343	*-50.5*	*-47.7*	*-45.1*	-41.6	-30.7	-16.7	
6	G17783	*-49.9*	*-45.9*	*-41.9*	-39.1	-30.9	-20.9	
7	G13445	*-47.7*	*-42.7*	-36.5	-32.6	lof	-26.7	
8	P14949	*-47.6*	*-44.0*	-42.0	-39.0	-32.0	-28.0	
9	G12867	*-47.0*	-39.6	-34.1	-28.5	-20.1	-16.8	
10	G18161	-46.9	-43.9	-42.0	-38.0	-30.0	-27.0	
11	G17169	-41.8	-35.8	-32.4	-29.0	-21.7	-14.7	
12	P14730	-39.3	-34.2	-30.9	-27.9	-20.6	-12.0	
13	G16382	-37.0	-34.0	-31.0	-29.0	lof	-25.0	
14	P15427	-36.0	-32.0	-26.0	-22.0	lof	-16.0	
15	G14188	-33.8	-31.2	-28.1	-24.0	-17.9	-15.8	
16	G15028	-32.9	-30.0	-28.0	-25.1	lof	-16.1	
17	G10195	-29.6	-26.3	-24.0	-20.6	lof	-13.6	
18	G18062	-29.6	-23.3	-18.4	-14.4	-7.1	-2.0	
19	G18696	-29.5	-23.0	-17.4	-13.9	-7.7	-5.4	
20	G10968	-28.7	-26.8	-24.9	-23.0	lof	-20.0	
21	P18892	-28.0	-23.0	-21.0	-18.0	***MPNE***		
22	G16449	-27.1	-20.6	-16.1	-13.4	-5.7	-2.7	
23	G14666	-27.0	-25.7	-21.6	-18.3	-9.3	-2.7	
24	G16534	-27.0	-24.0	-22.0	-20.0	-16.0	-14.0	
25	P17655	-23.3	-20.3	-17.9	-14.9	lof	-9.6	
26	G10607	-22.6	-19.6	-17.5	-14.5	-8.5	-3.0	
27	G12559	-21.8	-18.8	-15.8	-13.3	-8.4	***MPNE***	
28	G15448	-15.9	-12.9	-10.9	-8.9	-5.0	-4.0	
29	P13275	-12.0	-8.0	-5.0	***MPNE***			
		italics	below power meter range; estimated from amplifier gain					
		lof	loss of fix					
		MPNE	Maximum Power reached with No Effect					

	Phase 3							
	TEST:	**Static InterferenceSuceptibility, uplink 1630.3 (5 MHz BW)**						
	Power at Device (dBm) vs C/N degradation							
	Device	**1 dB**	**3 dB**	**6 dB**	**10 dB**	**20 dB**	**LOF**	
1	P14949	-30.4	-23.4	-18.4	-10.4	***MPNE***		
2	G18161	-29.4	-24.4	-18.4	-13.4	-2.4	***MPNE***	
3	G15028	-20.9	-18.0	-15.6	-14.2	lof	-11.1	
4	G16382	-18.4	-9.4	-3.4	***MPNE***			
5	G10195	-17.8	-14.4	-14.6	-4.2	lof	-0.1	
6	G12867	-15.3	-3.0	***MPNE***				
7	G14298	-14.8	-9.7	-6.7	-2.7	***MPNE***		
8	G15343	-10.9	-7.9	-2.4	***MPNE***			
9	P15427	-8.4	-4.4	-2.4	***MPNE***			
10	G12559	-7.0	***MPNE***					
11	G17783	-5.3	***MPNE***					
12	P14730	-3.3	***MPNE***					
13	G12586	1.0	***MPNE***					
14	G10968	1.3	***MPNE***					
15	G10607	***MPNE***						
16	G11207	***MPNE***						
17	G13445	***MPNE***						
18	G14188	***MPNE***						
19	G14666	***MPNE***						
20	G15448	***MPNE***						
21	G16449	***MPNE***						
22	G16534	***MPNE***						
23	G17169	***MPNE***						
24	G17641	***MPNE***						
25	G18062	***MPNE***						
26	G18696	***MPNE***						
27	P13275	***MPNE***						
28	P17655	***MPNE***						
29	P18892	***MPNE***						
		lof	loss of fix					
		MPNE	Maximum Power reached with No Effect (> 0 dBm)					

	Test IV.B							
	TEST:	**Acquisition Sensitivity, downlink 1528.8 & 1552.7 (5 MHz BW)**						
	Minimum GPS Acquisition Power at device (dBm) vs C/N degradation							
	Device	**Baseline**	**1 dB**	**3 dB**	**6 dB**	**10 dB**	**20 dB**	
1	G17783	-153.5	-151.5	-148.5	-144.5	-141.5	***NF***	
2	P13275	-149.5	-148.5	-137.5	-130.5	***NF***	***NF***	
3	G16534	-147.5	-145.5	-143.5	-140.5	-135.5	***NF***	
4	G18062	-146.5	-145.5	-141.5	-137.5	-132.5	***NF***	
5	G12867	-146.5	-144.5	-139.5	-136.5	-133.5	***NF***	
6	G15343	-145.5	-143.5	-140.5	-137.5	-133.5	***NF***	
7	G12586	-144.6	-143.6	-140.6	-137.6	-133.6	***NF***	
8	G18161	-144.5	-142.5	-141.5	-134.5	-131.5	***NF***	
9	G15448	-143.6	-142.6	-138.6	-133.6	-127.6	***NF***	
10	G14666	-143.5	-139.5	-136.5	-132.5	***NF***	***NF***	
11	P14730	-143.5	-143.5	-138.5	-135.5	-131.5	***NF***	
12	P18892	-143.5	-139.5	-137.5	-130.5	***NF***	***NF***	
13	G10968	-140.6	-140.6	-136.6	-132.6	-129.6	***NF***	
14	G13445	-139.6	-139.6	-138.6	-132.6	-130.6	***NF***	
15	G14298	-139.6	-137.6	-135.6	-129.6	***NF***	***NF***	
16	G16449	-139.5	-138.5	-135.5	-132.5	-129.5	***NF***	
17	G18696	-139.5	-139.5	-137.5	-133.5	-129.5	***NF***	
18	P14949	-139.5	-137.5	-135.5	-132.5	-128.5	***NF***	
19	G17641	-138.6	-136.6	-134.6	-131.6	-127.6	***NF***	
20	G16382	-138.5	-137.5	-132.5	-131.5	***NF***	***NF***	
21	P17655	-138.5	-137.5	-134.5	-132.5	-128.5	***NF***	
22	G15028	-137.6	-136.6	-134.6	-131.6	-128.6	***NF***	
23	G11207	-132.6	-132.6	-128.6	***NF***	***NF***	***NF***	
24	P15427	-132.5	-130.5	-129.5	***NF***	***NF***	***NF***	
		NF	No Fix obtainable after 3 minutes					

Test IV.C

TEST: TTFF, Cold Start, downlink 1528.8 & 1552.7 (5 MHz BW)
Time to Fix (minutes) vs C/N degradation

	Device	Baseline	Baseline	Baseline	1 dB	1 dB	1 dB	3 dB	3 dB	3 dB	6 dB	6 dB	6 dB	10 dB	10 dB	10 dB	20 dB	20 dB	20 dB
1	G15028	1:03	1:08	1:08	0:57	1:11	1:04	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
2	P13275	1:11	1:30	1:11	1:27	1:12	1:27	NF	2:49	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
3	G11207	0:44	2:27	1:30	1:03	1:25	2:15	2:30	2:18	2:01	NF	NF	NF	NF	NF	NF	NF	NF	NF
4	G17641	1:09	1:27	0:50	1:33	1:34	1:31	1:35	1:40	1:39	NF	NF	NF	NF	NF	NF	NF	NF	NF
5	G16449	1:39	1:39	2:03	2:09	1:39	2:07	2:08	2:20	2:26	NF	1:57	2:27	NF	NF	NF	NF	NF	NF
6	P17655	0:40	0:56	0:59	0:40	0:39	1:05	1:27	0:43	0:44	2:37	NF	1:27	NF	NF	NF	NF	NF	NF
7	G12586	0:39	0:39	0:39	0:39	0:37	0:39	1:27	1:39	0:38	1:48	1:39	1:57	NF	NF	NF	NF	NF	NF
8	G10195	0:39	1:08	0:37	0:36	0:37	0:38	0:58	0:57	0:39	1:57	0:27	1:01	NF	NF	NF	NF	NF	NF
9	G18696	0:43	1:45	1:23	1:34	1:10	1:39	1:38	1:54	1:39	2:07	2:03	2:01	NF	NF	NF	NF	NF	NF
10	G10607	0:36	0:38	0:39	0:35	0:38	0:38	0:38	0:37	0:38	1:08	1:30	1:39	NF	NF	NF	NF	NF	NF
11	G16382	0:31	0:31	0:31	0:31	0:31	0:31	0:31	0:33	0:33	0:41	0:41	0:42	NF	NF	NF	NF	NF	NF
12	G14298	0:42	0:40	0:40	0:43	0:40	0:40	0:40	0:39	0:40	2:11	2:10	2:09	NF	NF	NF	NF	NF	NF
13	G14666	0:37	0:37	0:38	0:36	0:37	0:38	0:35	0:36	0:38	0:38	0:38	0:38	2:25	NF	1:03	NF	NF	NF
14	G15343	1:10	0:37	0:37	0:37	0:37	0:37	0:36	0:36	0:36	0:36	1:15	1:05	2:08	NF	2:08	NF	NF	NF
15	G18161	0:38	0:35	0:42	0:35	0:36	0:35	0:37	0:37	0:37	0:38	0:41	0:41	1:11	NF	2:05	NF	NF	NF
16	G10968	0:39	0:40	0:39	0:39	0:37	0:39	0:39	0:39	0:39	0:39	0:39	0:38	2:15	2:12	1:15	NF	NF	NF
17	G13445	1:10	1:08	1:09	1:10	1:04	1:06	1:05	1:10	1:10	1:10	1:10	1:07	2:14	2:03	2:48	NF	NF	NF
18	G18062	0:36	0:38	0:38	0:39	0:39	0:39	0:39	0:38	0:36	0:39	1:40	1:25	1:55	1:43	1:39	NF	NF	NF
19	G15448	0:50	0:40	0:47	0:49	0:40	0:39	0:40	0:40	0:41	0:41	0:39	0:40	1:55	1:32	1:10	NF	NF	NF
20	G12867	0:41	0:41	0:41	0:41	0:41	0:41	0:41	0:41	0:41	0:41	0:41	0:41	1:54	2:34	1:25	NF	NF	NF
21	G17783	0:40	0:41	0:41	0:41	0:40	0:40	0:38	1:03	0:42	1:04	1:35	1:36	1:42	1:41	1:58	NF	NF	NF
22	G14188	0:34	0:33	0:30	0:31	0:32	0:32	0:31	0:32	0:30	0:59	0:33	0:33	0:59	0:34	0:31	NF	NF	NF
23	P14730	0:39	0:38	0:37	0:38	0:39	0:51	0:38	0:39	0:39	0:38	0:38	0:38	0:39	0:39	1:08	NF	NF	NF
24	G17169	0:37	0:36	0:36	0:37	0:37	0:36	0:36	0:35	0:37	0:36	0:37	0:36	0:36	0:37	0:36	NF	NF	NF
25	G16534	0:39	0:40	0:39	0:39	0:38	0:39	0:39	0:39	0:39	0:38	0:39	0:40	0:43	0:39	0:39	NF	NF	NF

NF No Fix obtainable after 3 minutes

Test IV.D

TEST: TTFF, Warm Start, downlink 1528.8 & 1552.7 (5 MHz BW)
Time to Fix (minutes) vs C/N degradation

	Device	Baseline	Baseline	Baseline	1 dB	1 dB	1 dB	3 dB	3 dB	3 dB	6 dB	6 dB	6 dB	10 dB	10 dB	10 dB	20 dB	20 dB	20 dB
1	G11207	1:14	1:35	1:16	1:09	1:17	1:10	2:49	2:04	2:16	NF	NF	NF	NF	NF	NF	NF	NF	NF
2	P13275	0:18	0:23	0:17	0:17	0:23	0:30	0:24	0:32	0:22	NF	NF	NF	NF	NF	NF	NF	NF	NF
3	G15028	0:40	0:38	0:38	0:34	0:38	0:39	0:39	0:38	0:39	1:15	1:27	1:18	NF	NF	NF	NF	NF	NF
4	G14298	0:40	0:41	0:41	0:39	0:39	0:40	0:40	1:40	0:59	1:00	1:04	1:00	NF	NF	NF	NF	NF	NF
5	G17641	0:41	0:40	0:38	0:39	0:39	0:39	0:38	0:39	0:37	0:40	0:39	0:56	NF	NF	NF	NF	NF	NF
6	G12586	0:38	0:38	0:38	0:38	0:38	0:38	0:38	0:38	0:38	0:38	0:38	0:38	NF	NF	NF	NF	NF	NF
7	P17655	0:41	0:39	0:39	0:40	0:40	0:40	0:39	0:39	0:39	0:40	0:40	0:40	NF	NF	NF	NF	NF	NF
8	G16382	0:17	0:16	0:16	0:17	0:16	0:16	0:16	0:18	0:15	0:22	0:24	0:22	NF	NF	NF	NF	NF	NF
9	G15448	0:39	0:38	0:37	0:40	0:37	0:38	0:36	0:39	0:39	0:40	0:38	0:29	1:07	NF	NF	NF	NF	NF
10	G14666	0:37	0:36	0:37	0:37	0:37	0:37	0:37	0:37	0:37	0:37	0:37	0:37	NF	2:01	2:07	NF	NF	NF
11	G10968	0:37	0:30	0:33	0:34	0:49	0:40	0:32	0:44	0:33	0:56	0:33	1:08	NF	1:53	2:05	NF	NF	NF
12	G16449	0:35	0:37	0:55	1:08	0:38	0:38	1:01	1:02	0:38	0:56	1:01	1:07	2:01	1:38	1:30	NF	NF	NF
13	P14730	0:48	0:49	0:41	0:37	0:37	0:37	0:36	0:39	0:34	0:38	0:38	0:37	1:40	0:56	0:56	NF	NF	NF
14	G18696	0:39	0:38	0:38	1:02	1:08	0:38	0:38	0:56	1:07	0:38	0:38	0:57	1:39	1:12	1:08	NF	NF	NF
15	G13445	0:39	0:38	0:38	0:38	0:37	0:37	0:38	0:38	0:39	0:39	0:38	0:39	1:26	1:25	1:26	NF	NF	NF
16	G15343	0:31	0:34	0:37	0:37	0:33	0:33	0:33	0:35	0:38	0:55	1:15	0:36	1:07	0:40	0:37	NF	NF	NF
17	G18161	0:35	0:34	0:35	0:35	0:35	0:35	0:34	0:36	0:34	0:35	0:40	0:38	0:41	0:41	0:41	NF	NF	NF
18	G17783	0:40	0:39	0:40	0:40	0:40	0:40	0:40	0:37	0:40	0:40	0:40	0:41	0:41	0:40	0:41	NF	NF	NF
19	G18062	0:36	0:37	0:37	0:36	0:37	0:36	0:38	0:38	0:38	0:37	0:38	0:37	0:38	0:38	0:38	NF	NF	NF
20	G12867	0:23	0:27	0:36	0:35	0:35	0:35	0:35	0:35	0:35	0:35	0:35	0:35	0:35	0:35	0:35	NF	NF	NF
21	G16534	0:38	0:40	0:39	0:38	0:38	0:37	0:39	0:39	0:39	0:39	0:39	0:38	0:42	0:41	0:41	2:11	1:12	NF

NF No Fix obtainable after 3 minutes

Test IV.E

TEST: WAAS Demod., Cold Start, downlink 1528.8 & 1552.7 (5 MHz BW)
Time to Fix (minutes) vs C/N degradation

	Device	Baseline	Baseline	Baseline	1 dB	1 dB	1 dB	3 dB	3 dB	3 dB	6 dB	6 dB	6 dB	10 dB	10 dB	10 dB
1	G14666	1:45	2:55	2:56	2:54	2:56	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
2	G18062	2:50	3:04	3:01	2:55	3:02	3:02	3:03	3:04	5:00	NF	NF	NF	NF	NF	NF
3	G11207	1:02	2:57	3:19	3:26	3:41	2:23	2:39	3:20	3:23	NF	NF	NF	NF	NF	NF
4	G18161	0:59	1:59	1:00	0:58	1:00	0:59	0:59	1:00	0:59	NF	NF	NF	NF	NF	NF
5	G10607	1:00	0:58	0:56	0:54	0:49	1:03	1:12	0:40	0:55	1:32	NF	NF	NF	NF	NF

NF No WAAS Lock obtainable after 5 minutes

ATTACHMENT B

DYNAMIC TESTS

NAVIGATION POSITION AND VELOCITY

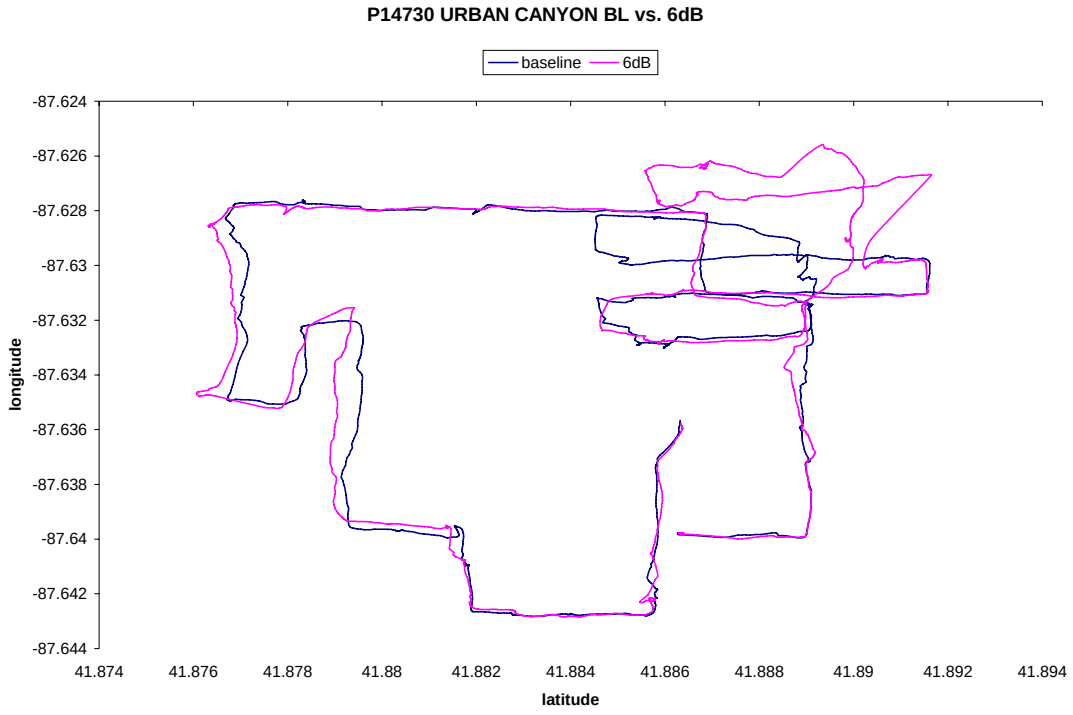
NAVIGATION POSITION AND VELOCITY

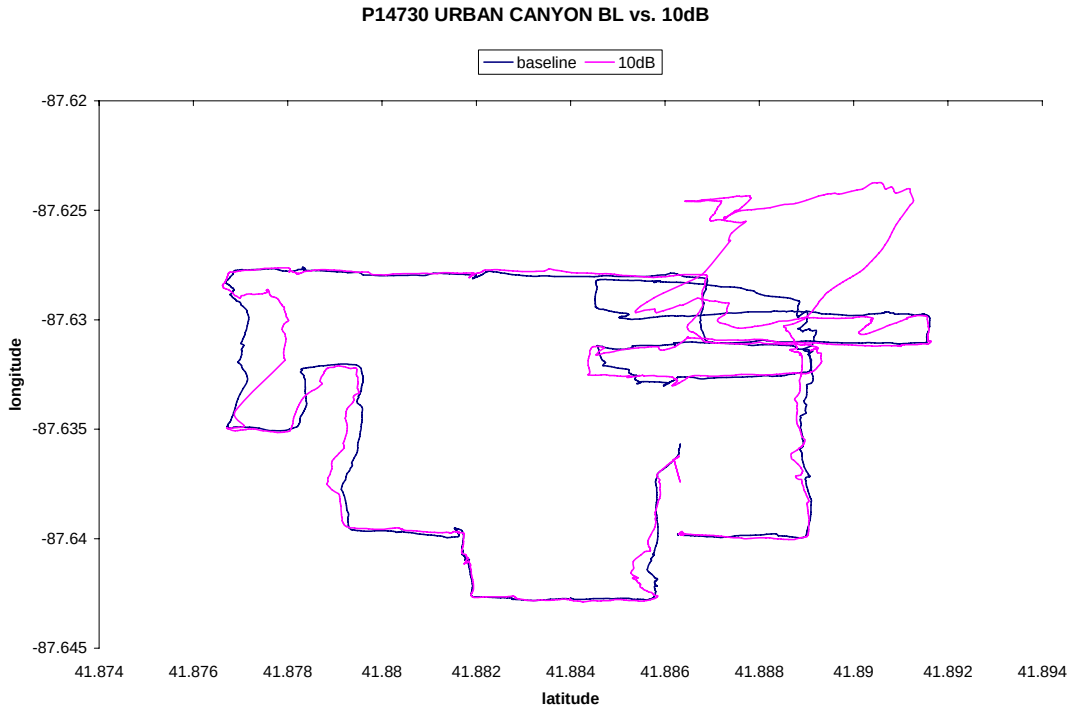
URBAN CANYON

Navigation Position and Velocity Summary
Urban Canyon

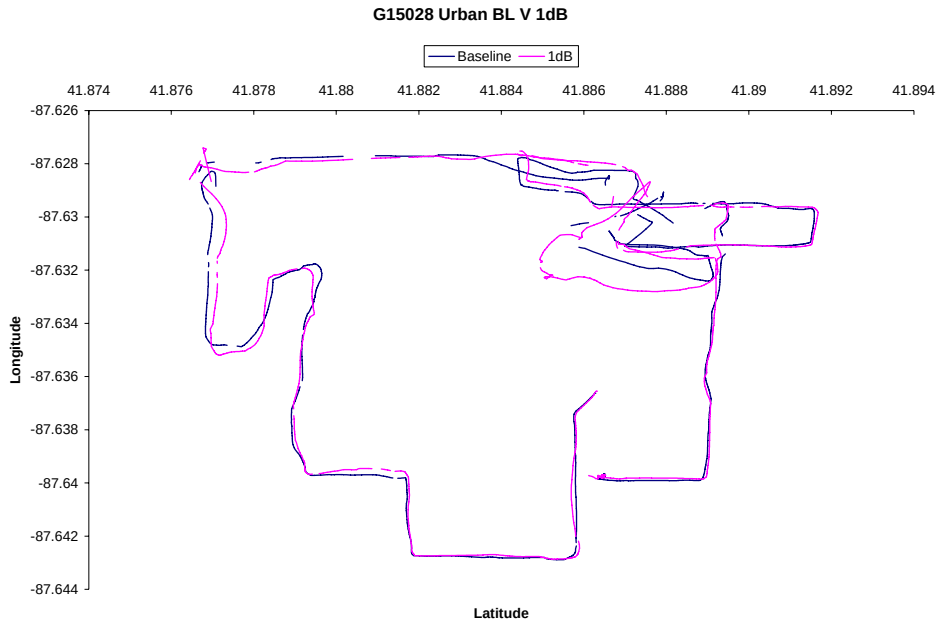
DUT	1db	3db	6db	10db	20db	Notes
G12586	X	✓	✓	✓	✓	x = no data, test waived by vendor
G17641	X	✓	✓	✓	LOF	LOF = Loss of Fix x = no data, test waived by vendor
G10195	X	✓	✓	✓	✓	x = no data, test waived by vendor
G15448	X	X	✓	✓	✓	x = no data, test waived by vendor
G10968	X	✓	✓	✓	X	x = no data, test waived by vendor
P14730	X	X	✓	✓	X	x = no data, test waived by vendor
G15028	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G12867	X	✓	✓	✓	X	x = no data, test waived by vendor
G17783	X	✓	✓	✓	LOF	LOF = Loss of Fix x = no data, test waived by vendor
P17655	X	✓	✓	✓	LOF	LOF = Loss of Fix x = no data, test waived by vendor
G16534	X	✓	✓	✓	✓	x = no data, test waived by vendor
G18161	X	✓	✓	✓	X	x = no data, test waived by vendor
P15427	X	✓	✓	✓	X	x = no data, test waived by vendor

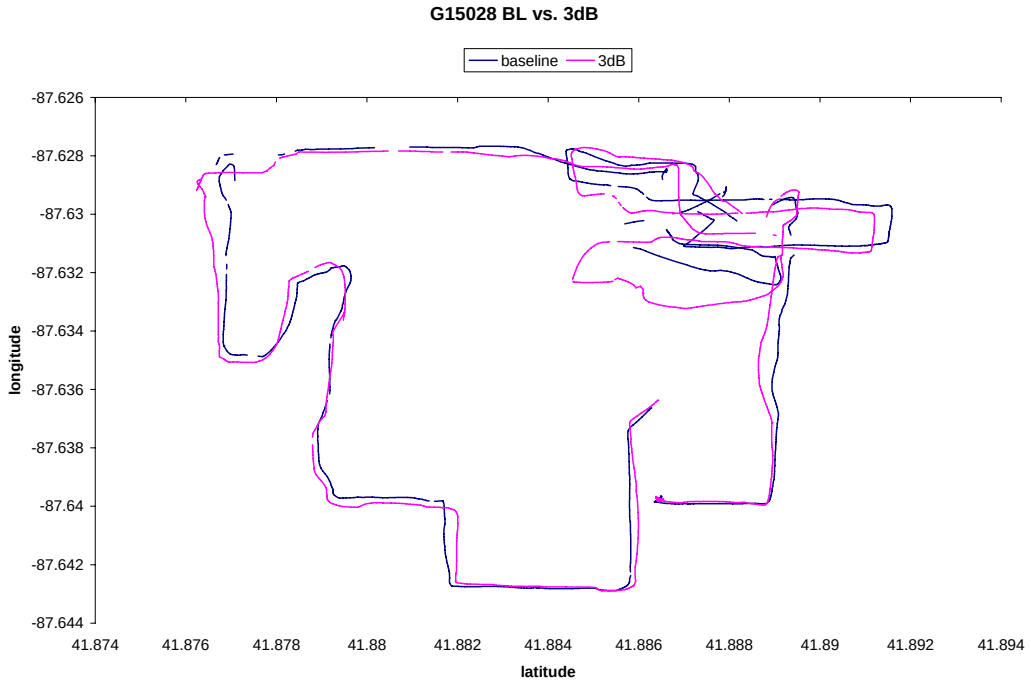
P14730 URBAN

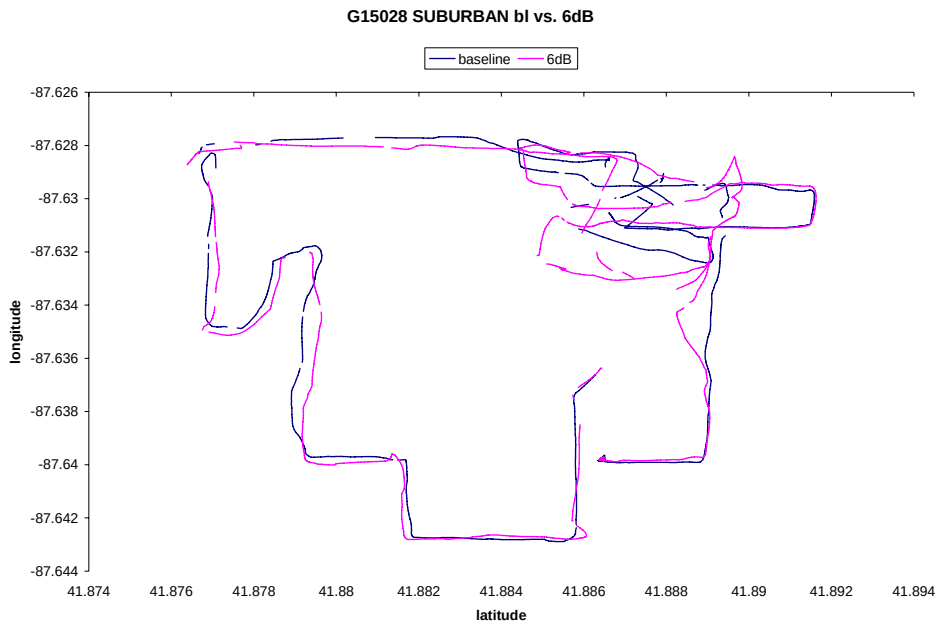


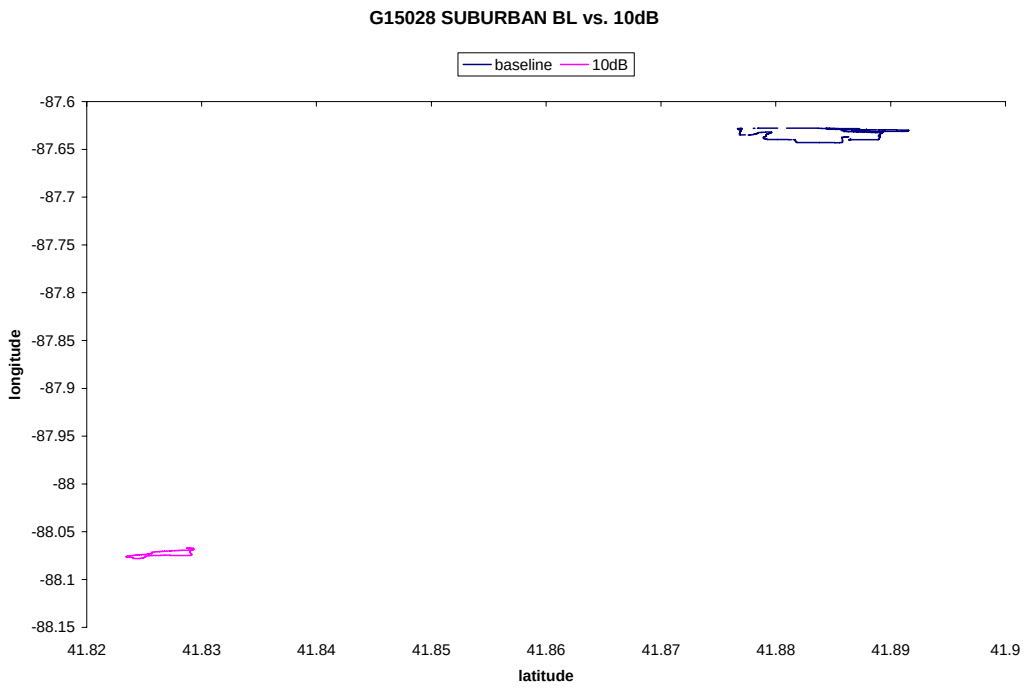


G15028 URBAN

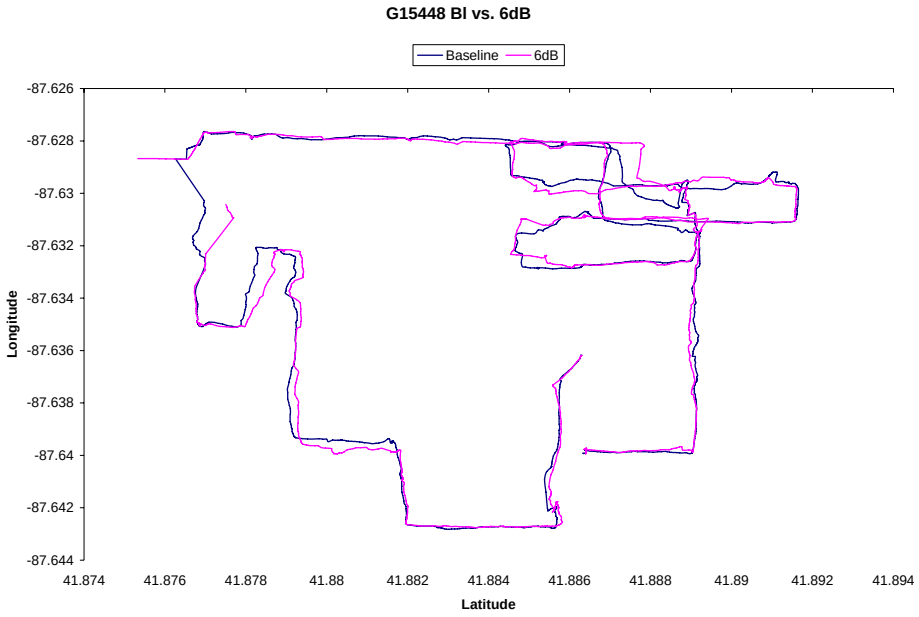


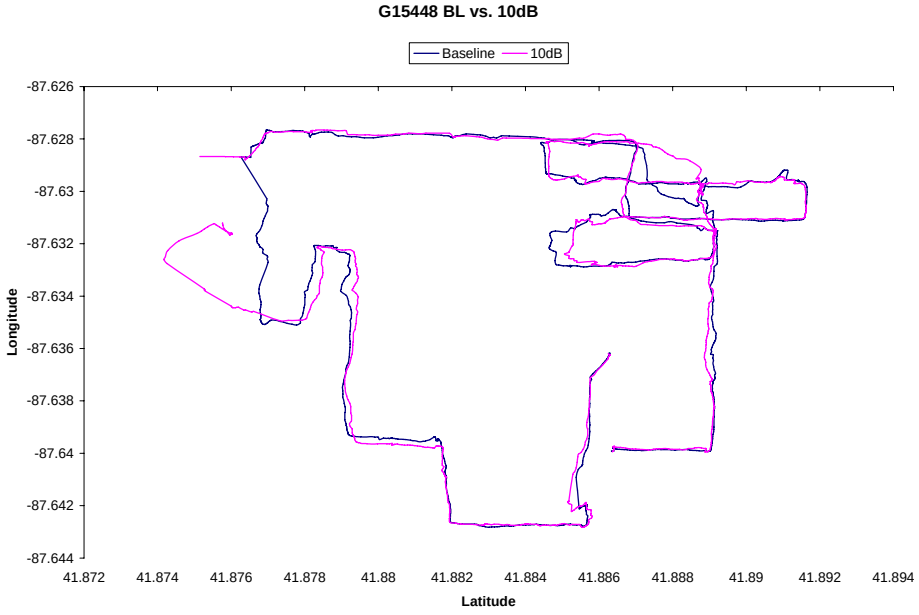


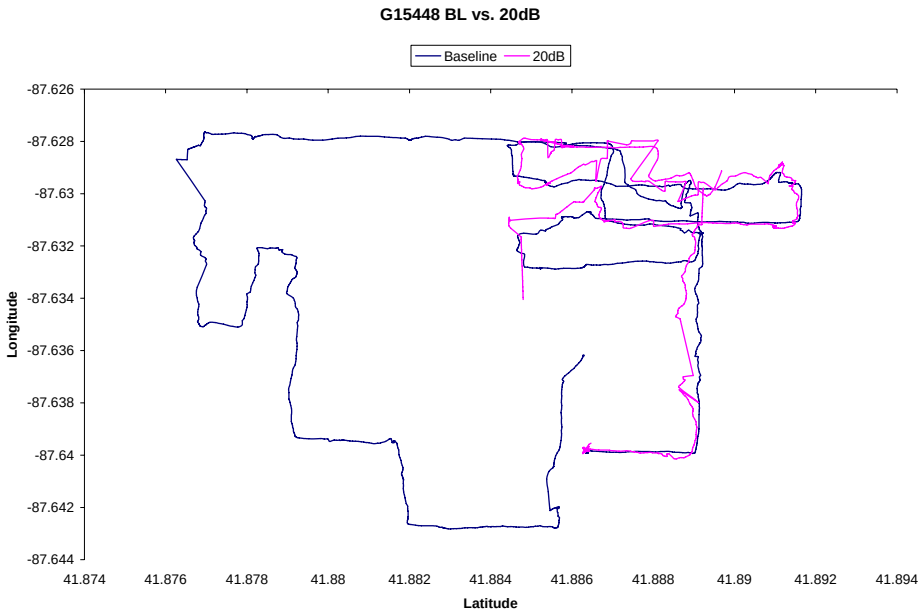

G15028 SUBURBAN bl vs. 6dB
baseline
6dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
latitude


G15028 SUBURBAN BL vs. 10dB
baseline
10dB
-87.6
-87.65
-87.7
-87.75
-87.8
-87.85
-87.9
-87.95
-88
-88.05
-88.1
-88.15
longitude
41.82
41.83
41.84
41.85
41.86
41.87
41.88
41.89
41.9
latitude

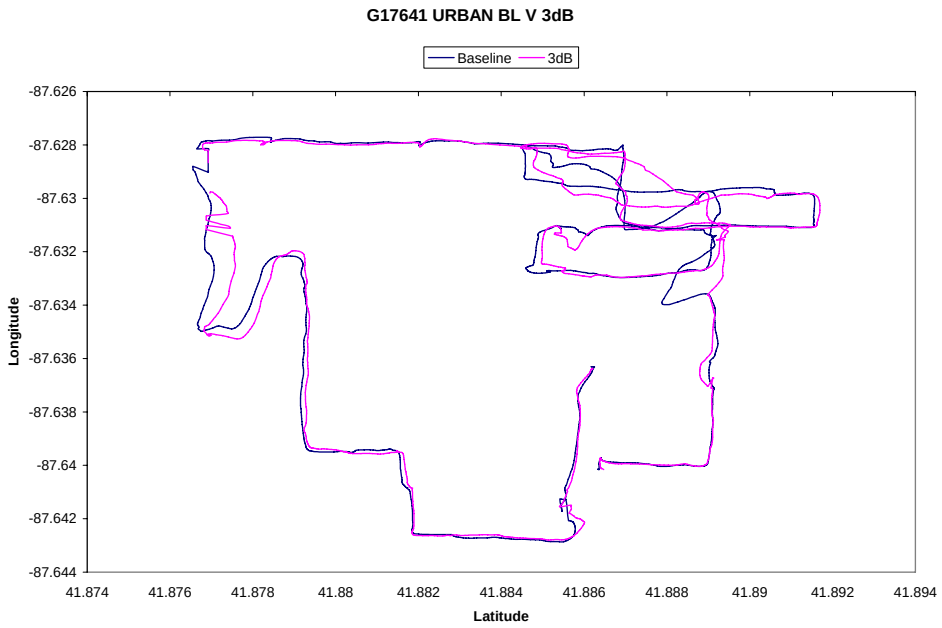
G15448 URBAN

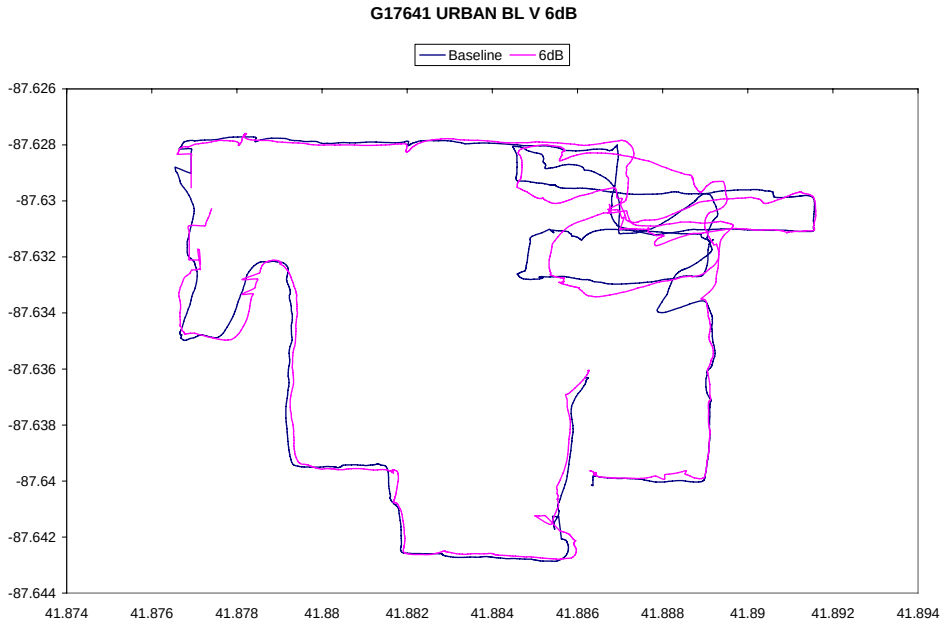


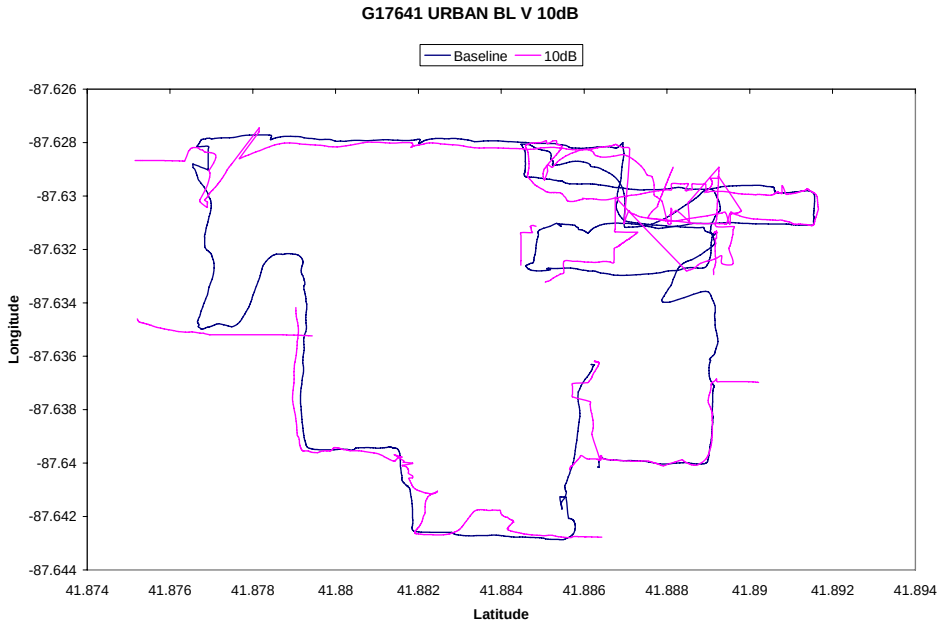



G15448 BL vs. 20dB
Baseline
20dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
Latitude

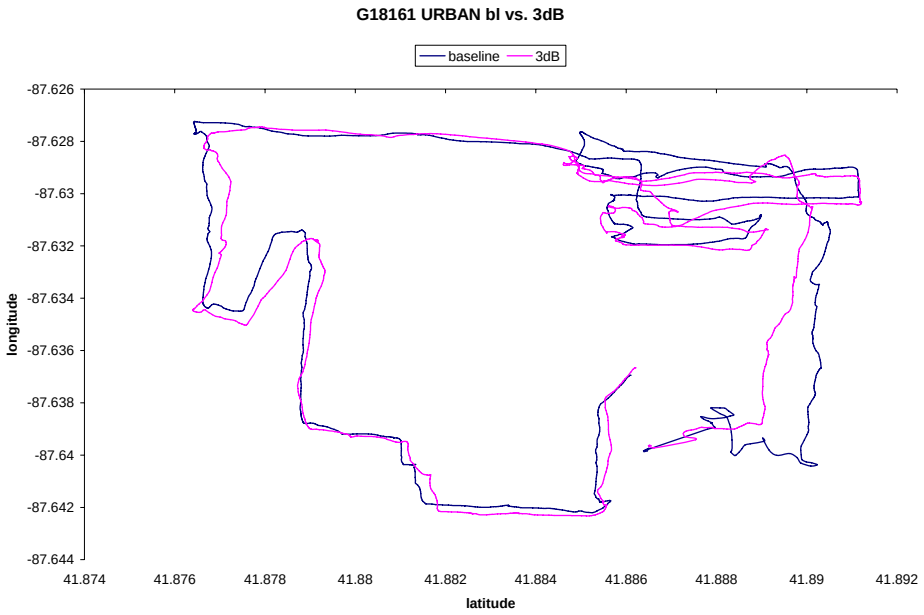
G17641 URBAN CANYON

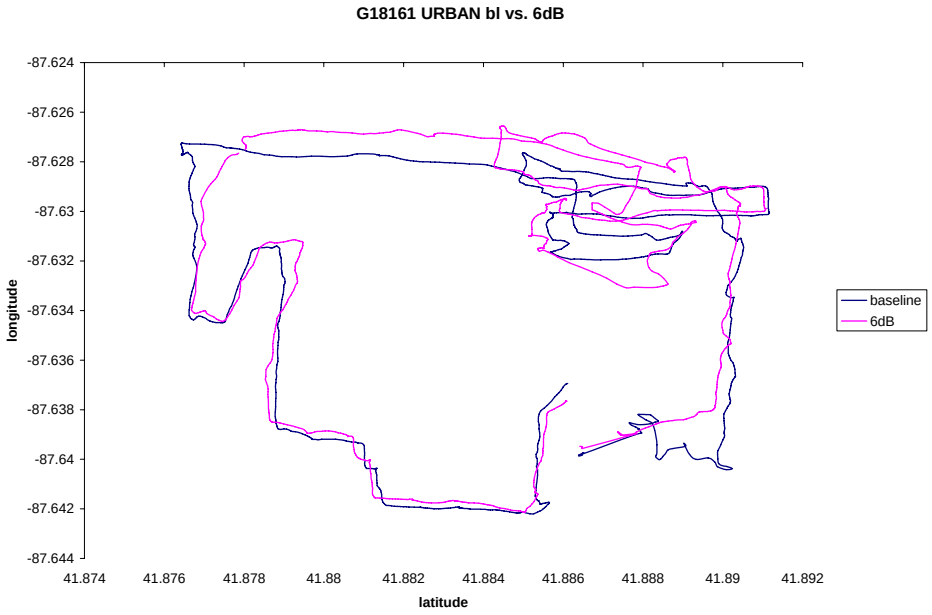


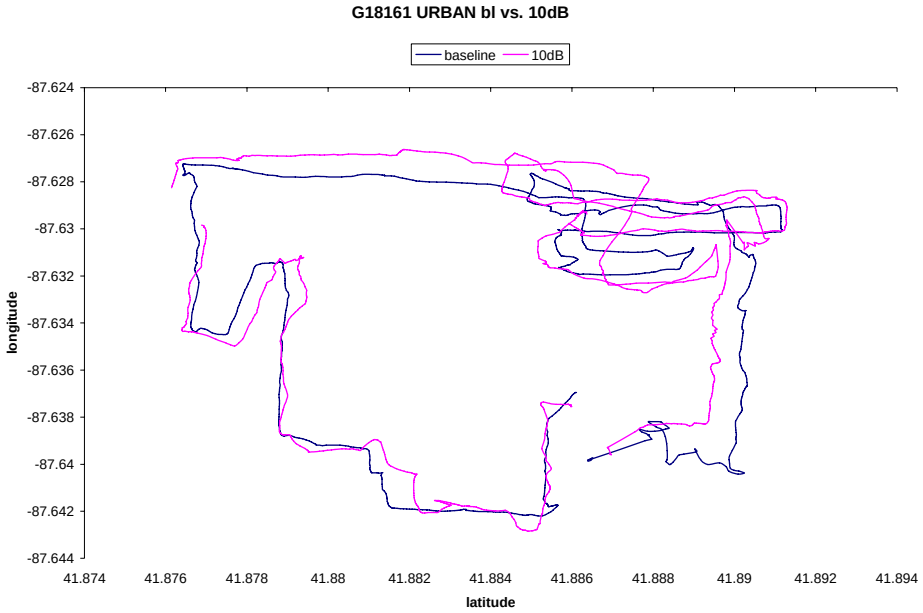



G17641 URBAN BL V 10dB
Baseline
10dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
Latitude

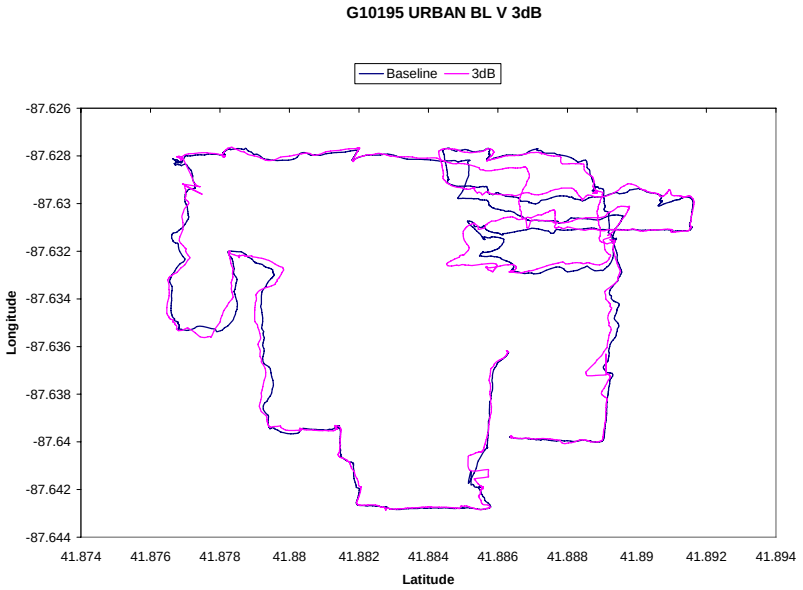
G18161 URBAN

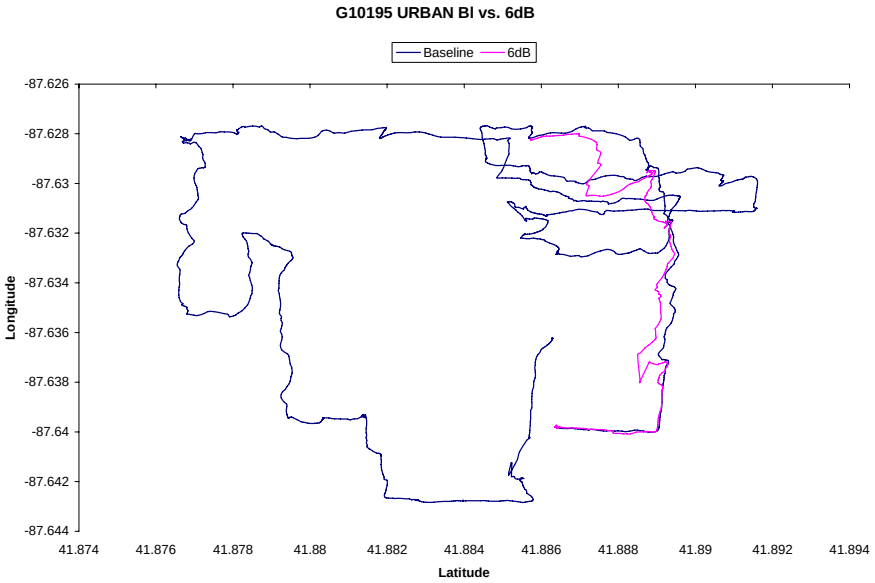


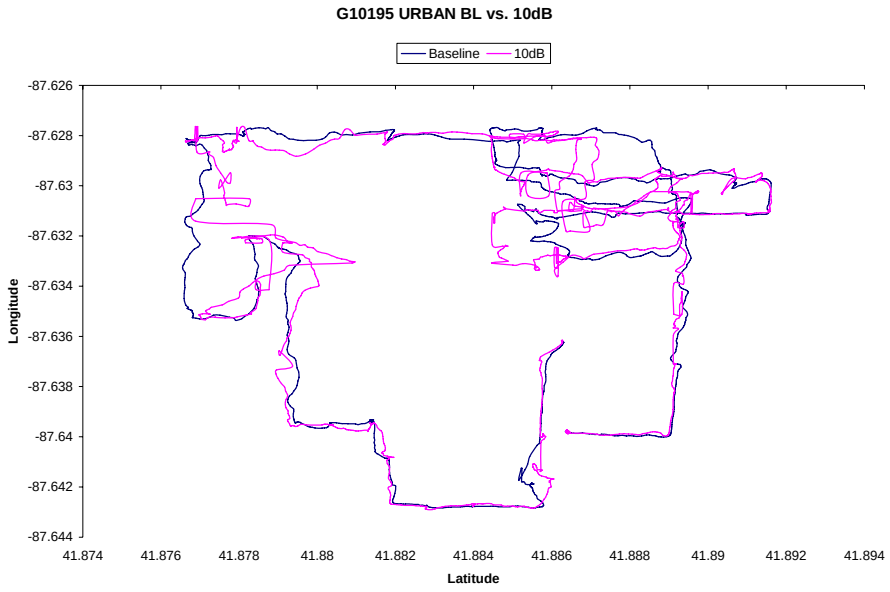


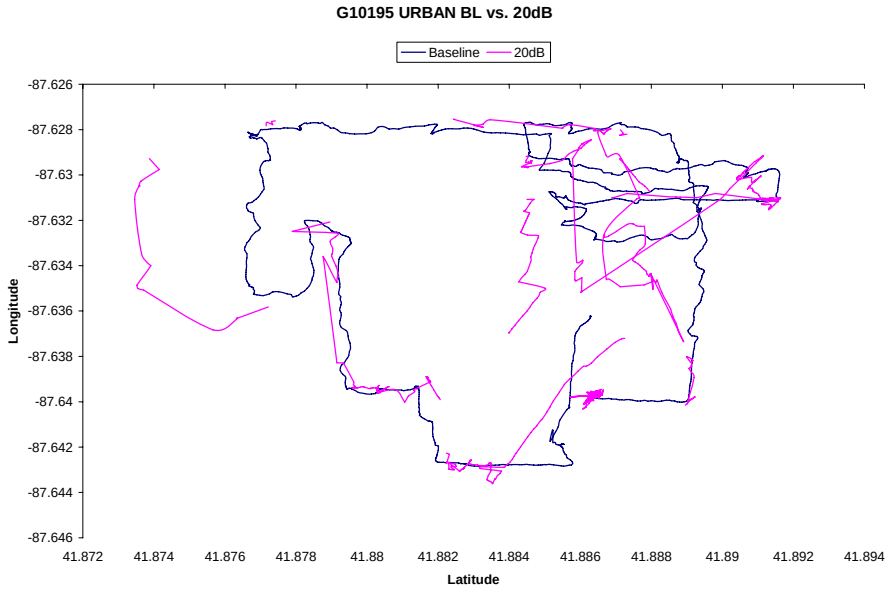

G18161 URBAN bl vs. 10dB
baseline
10dB
-87.624
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
latitude

G10195 URBAN

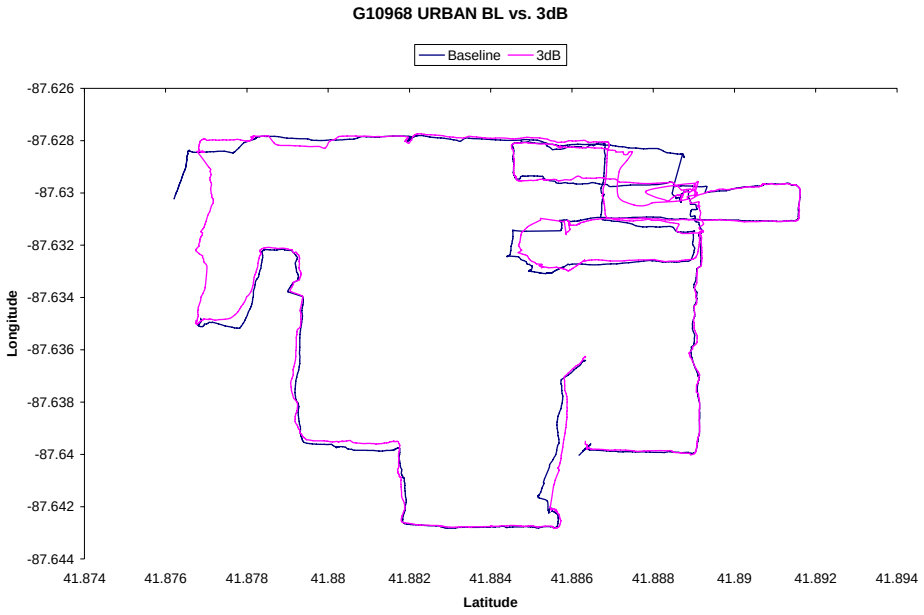


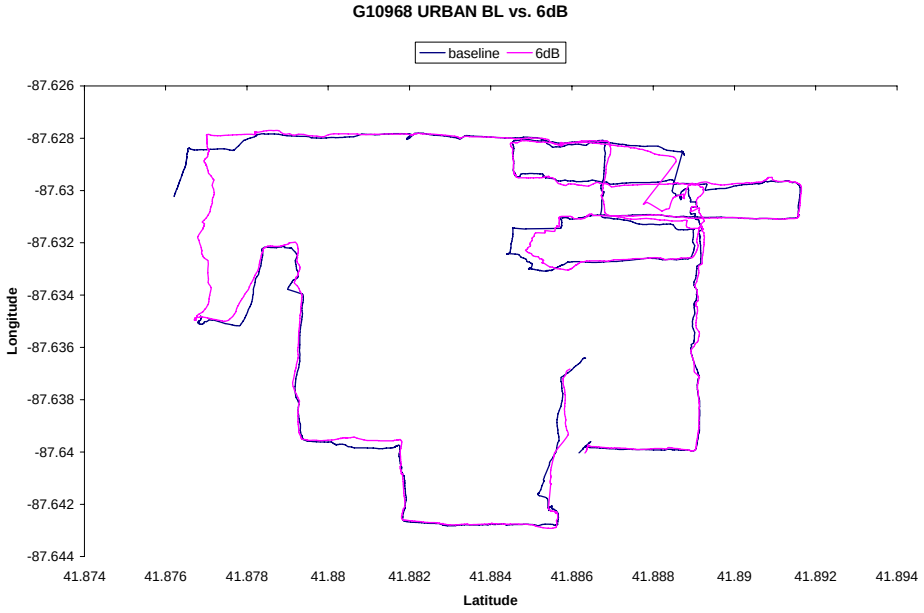


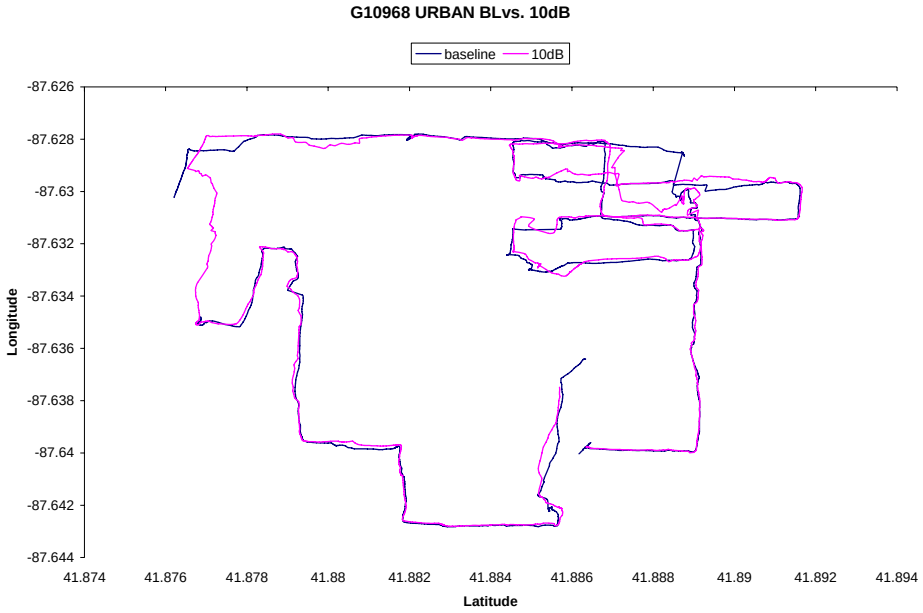

G10195 URBAN BL vs. 10dB
Baseline
10dB
Longitude
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
Latitude


G10195 URBAN BL vs. 20dB
Baseline
20dB
Longitude
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
-87.646
41.872
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
Latitude

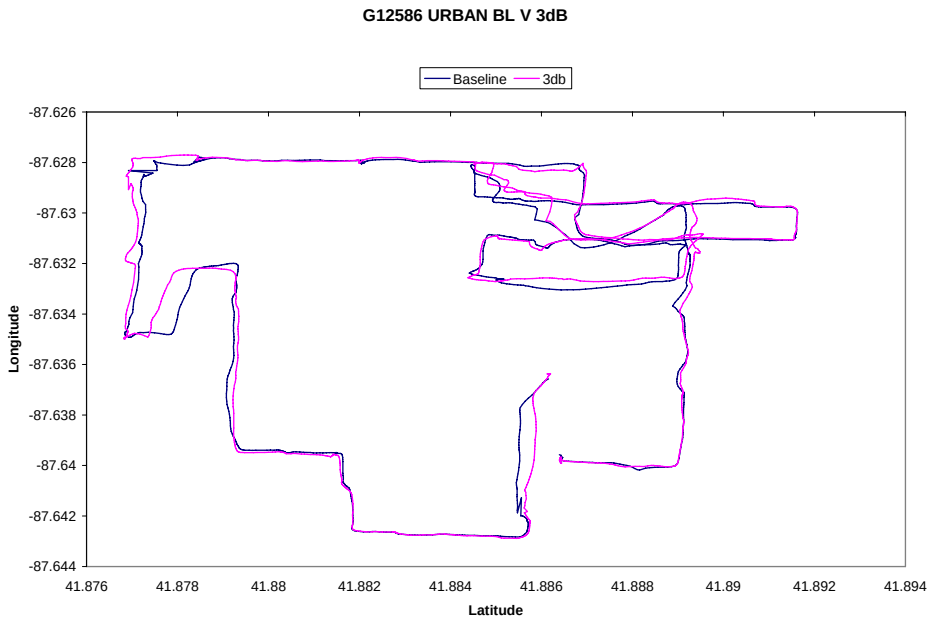
G10968 URBAN

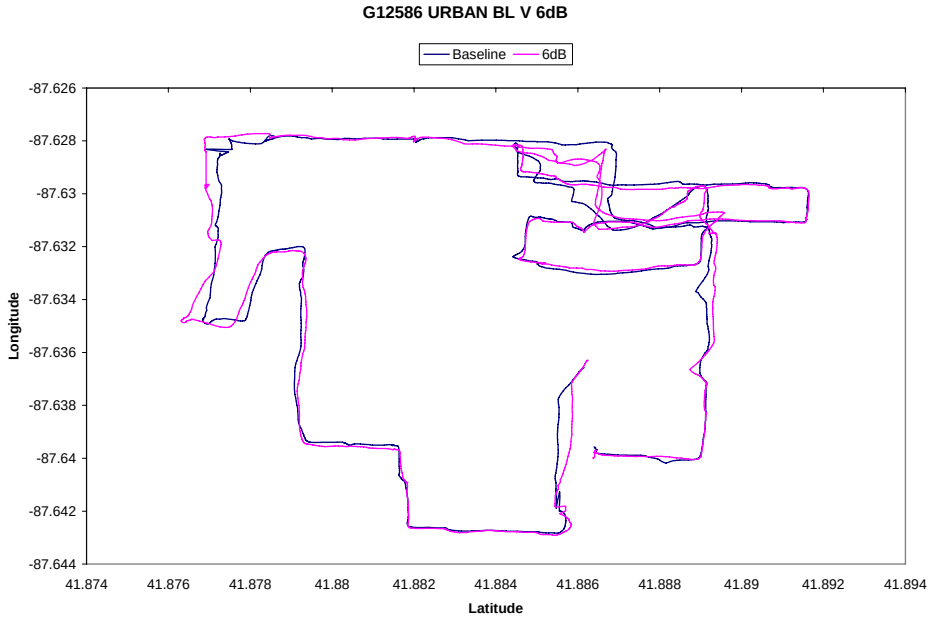


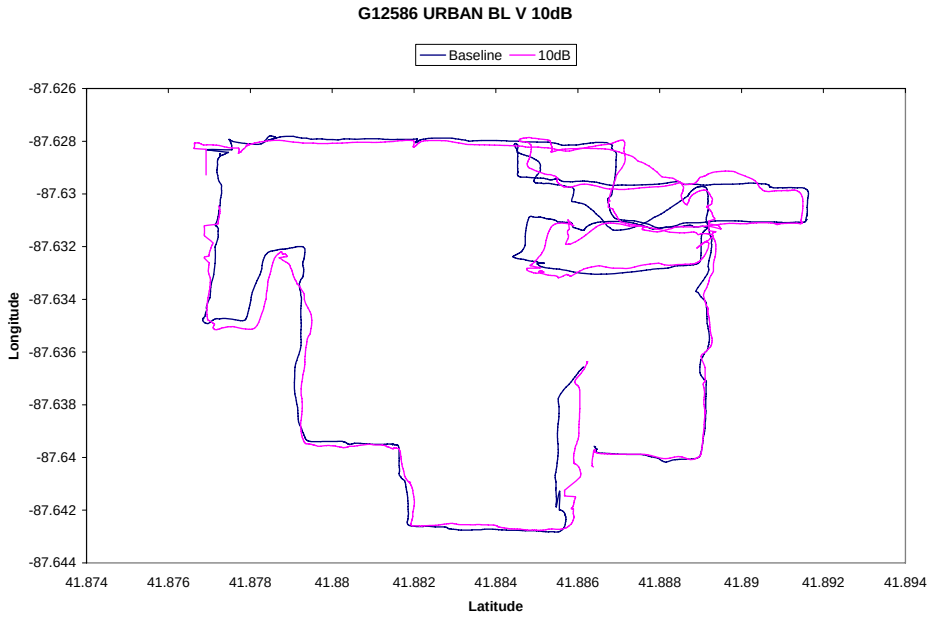


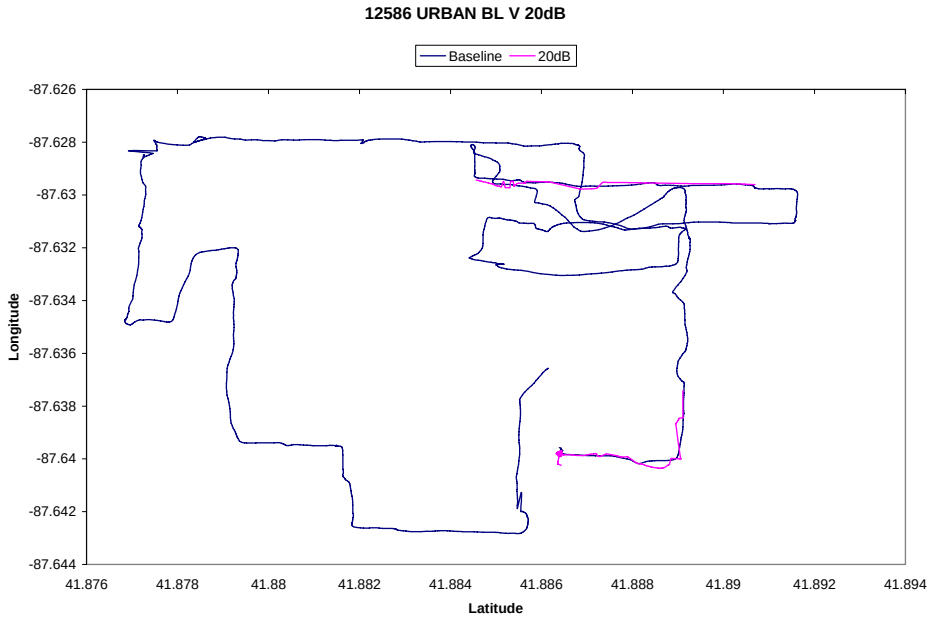

G10968 URBAN BLvs. 10dB
baseline
10dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
Latitude

G12586 URBAN

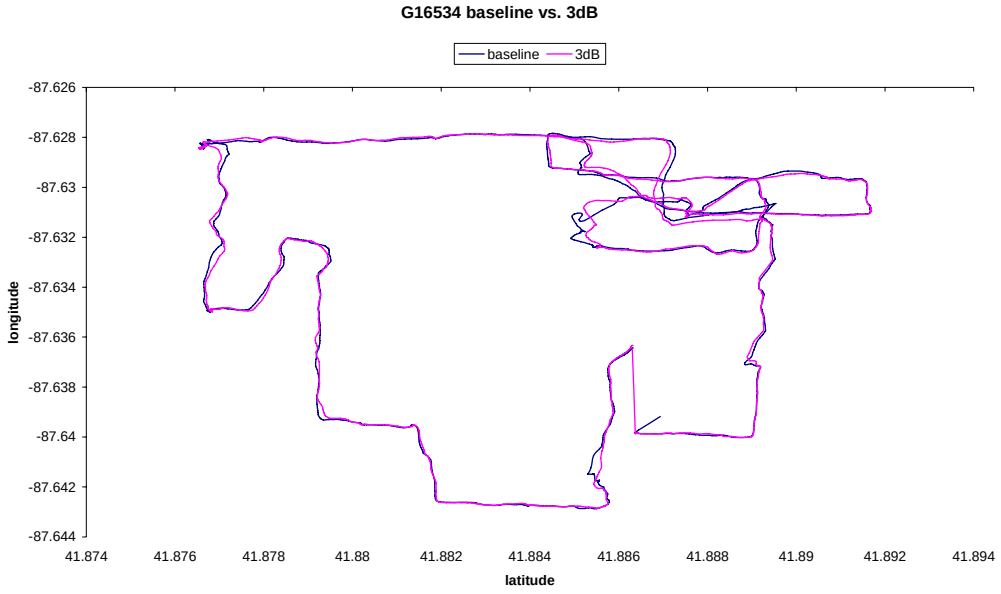


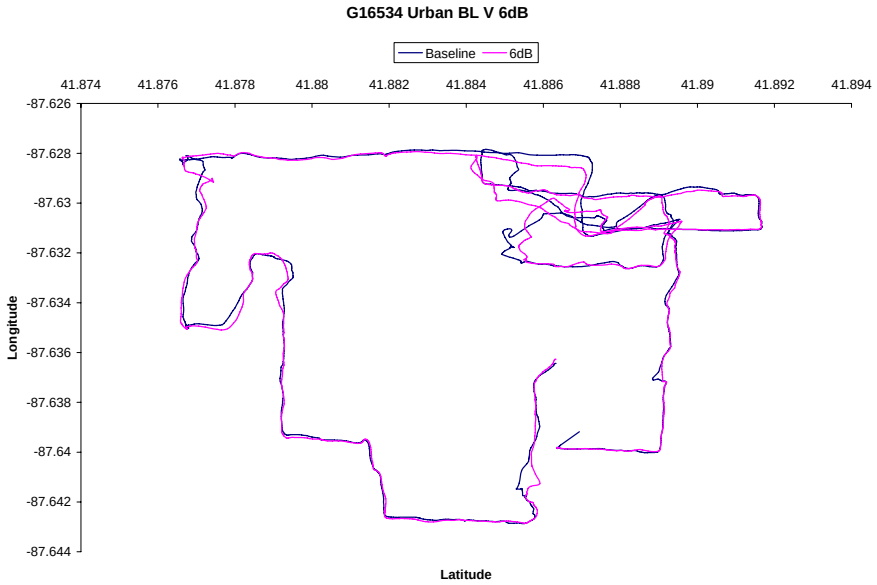


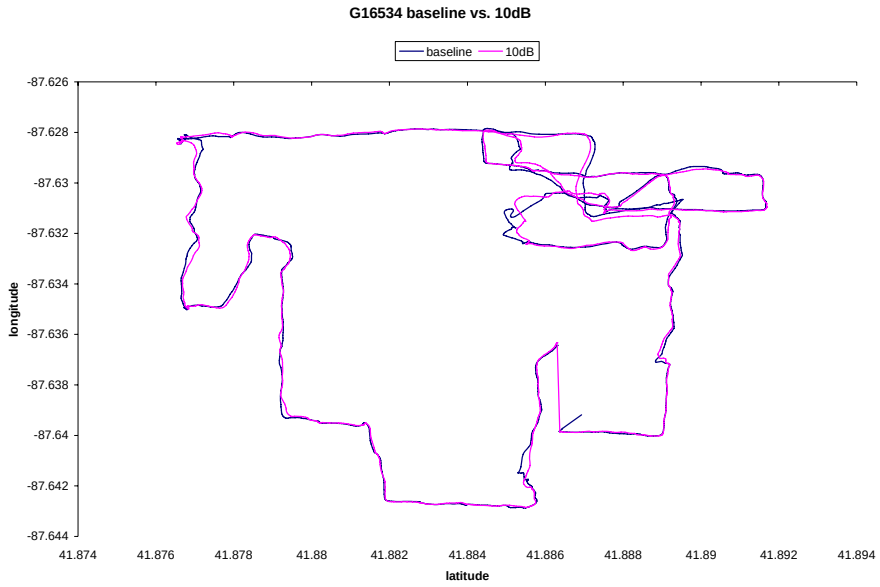

G12586 URBAN BL V 10dB
Baseline
10dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
Latitude

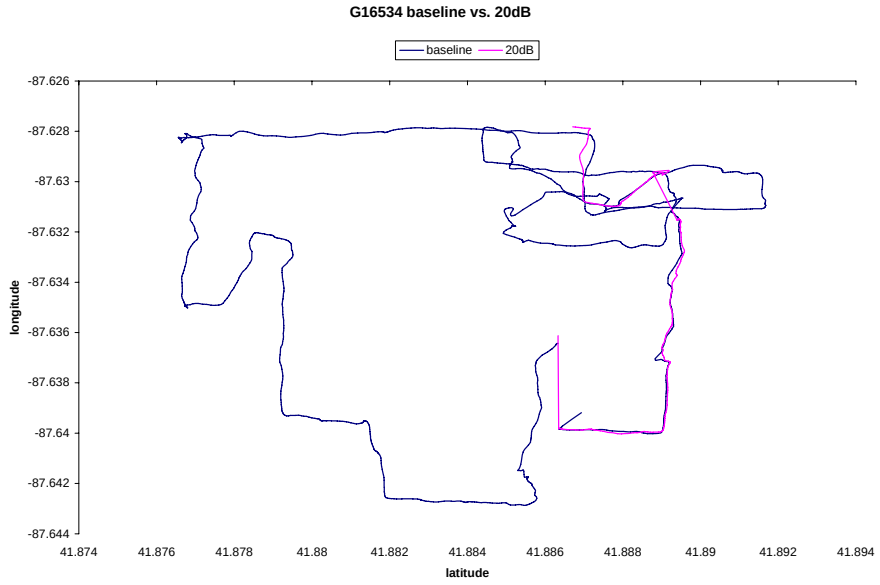

12586 URBAN BL V 20dB
Baseline
20dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
Latitude

G16534 URBAN

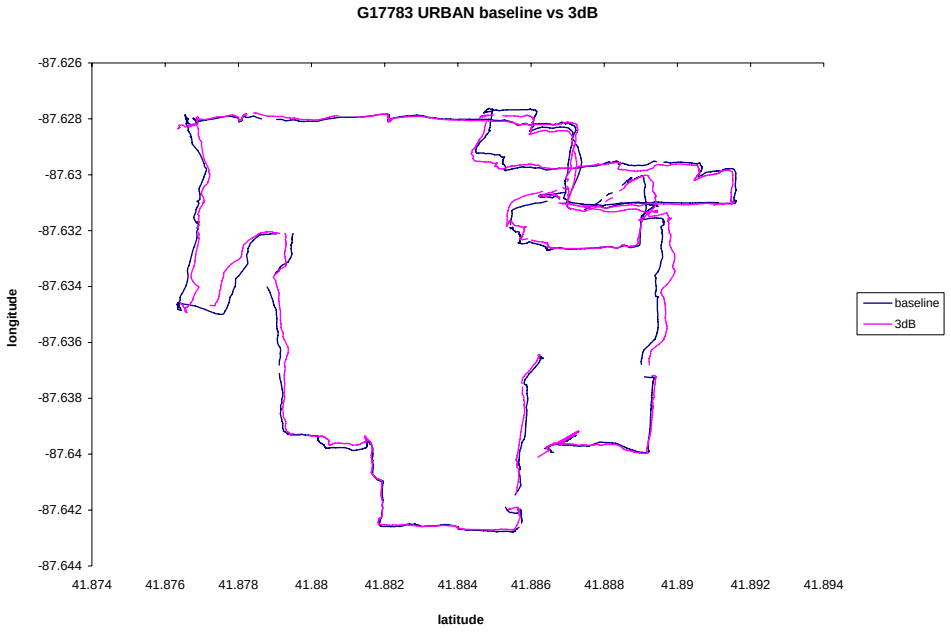


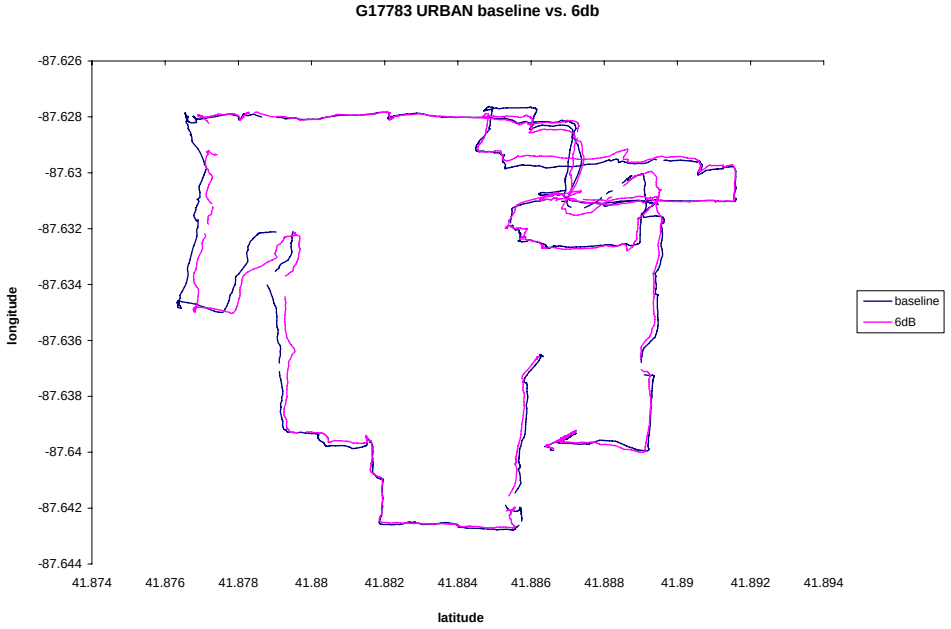


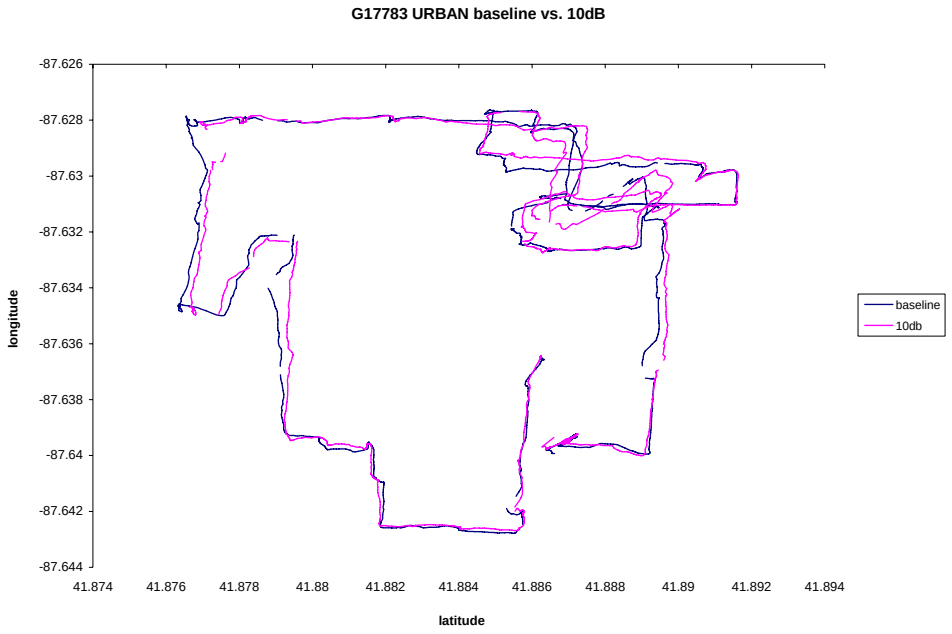

G16534 baseline vs. 10dB
baseline
10dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
latitude


G16534 baseline vs. 20dB
baseline
20dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
latitude

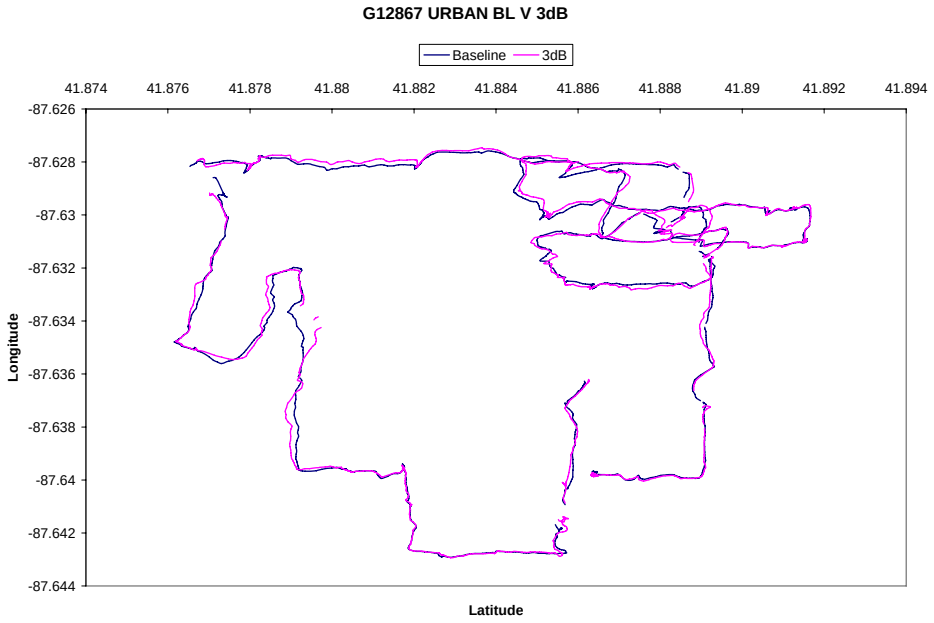
G17783 URBAN

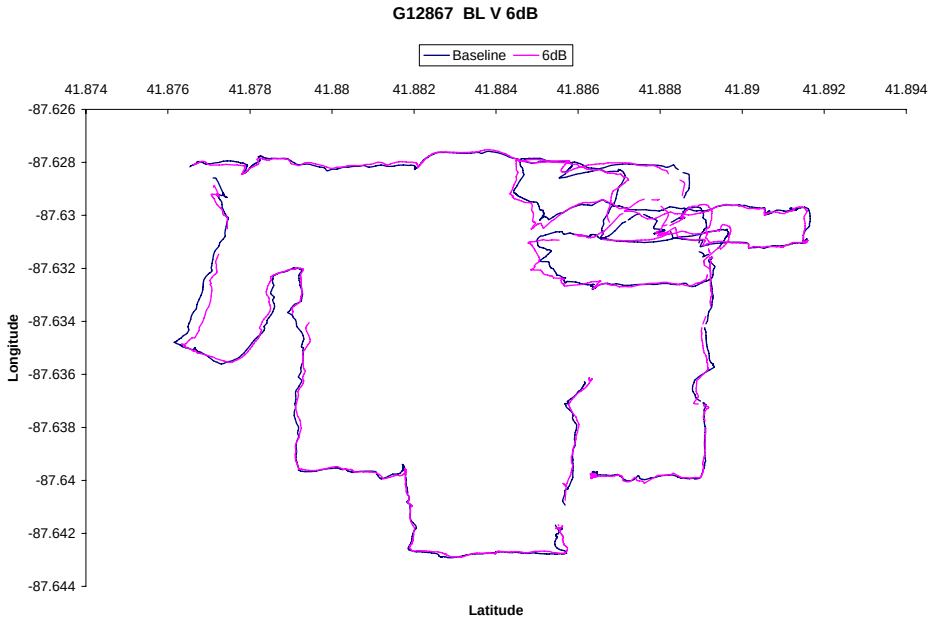


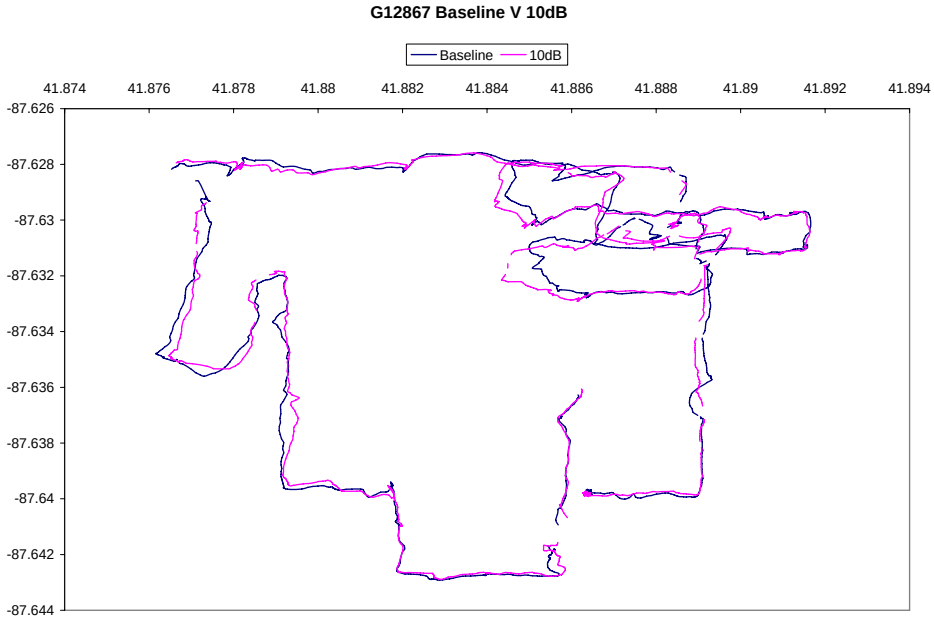



G17783 URBAN baseline vs. 10dB
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
longitude
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
latitude
baseline
10db

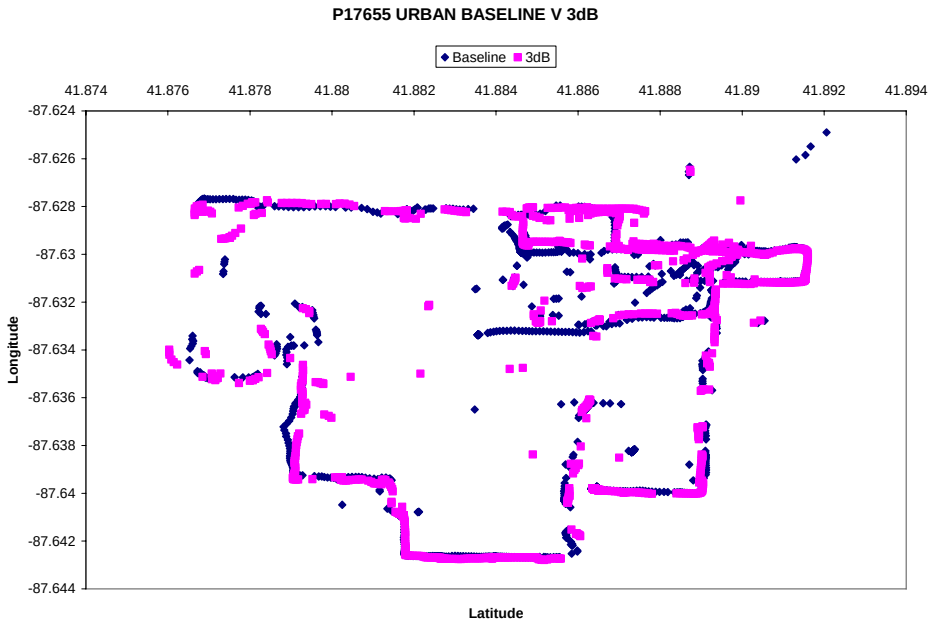
G12867

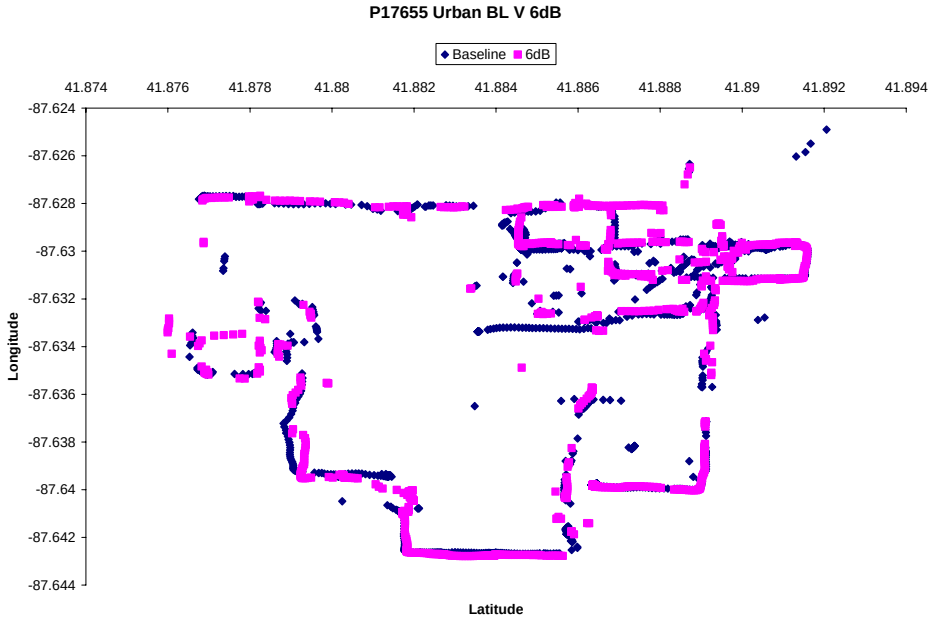

G12867 URBAN BL V 3dB
Baseline
3dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
Latitude

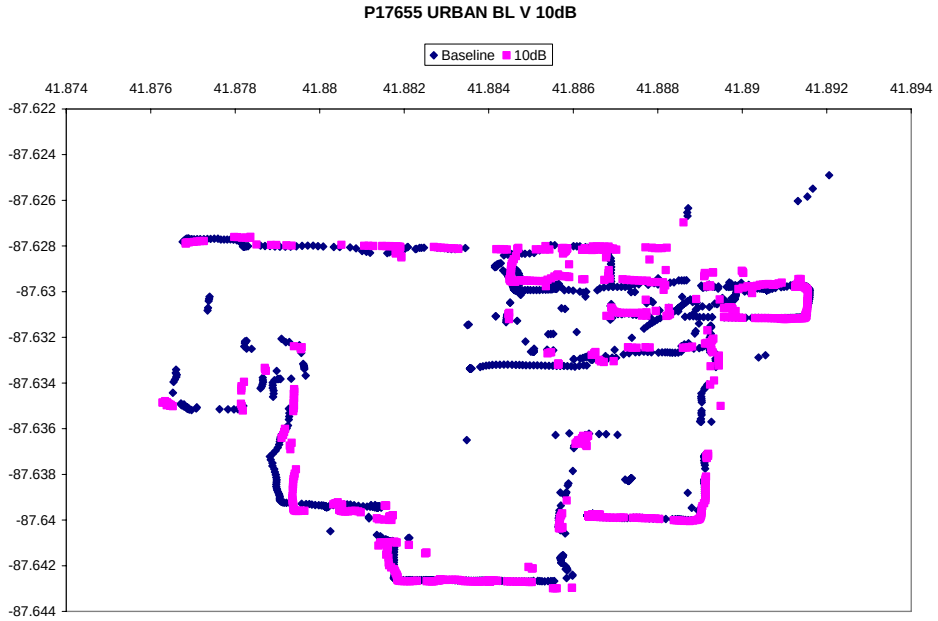

G12867 BL V 6dB
Baseline
6dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
Latitude


G12867 Baseline V 10dB
Baseline
10dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644

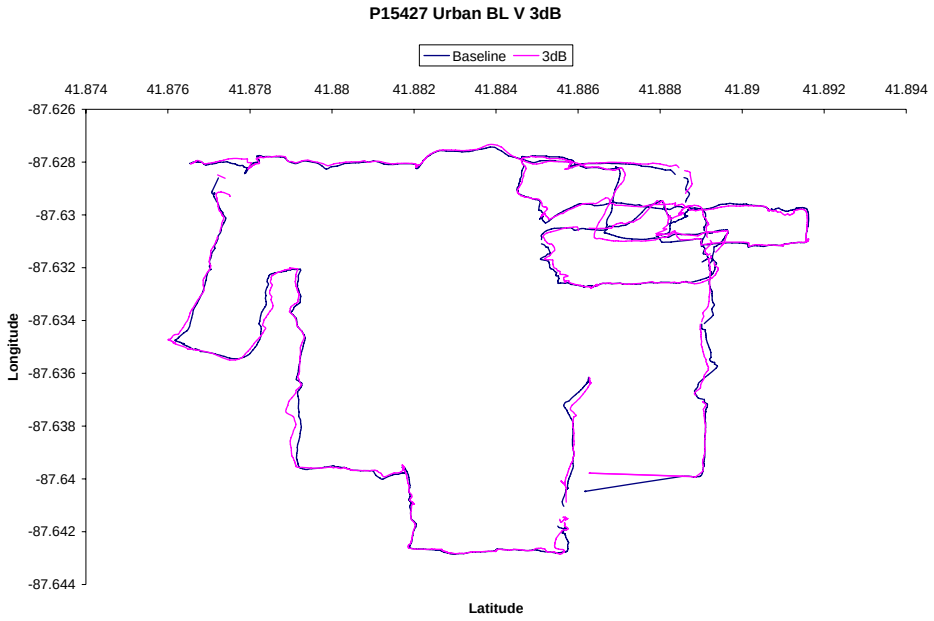
P17655

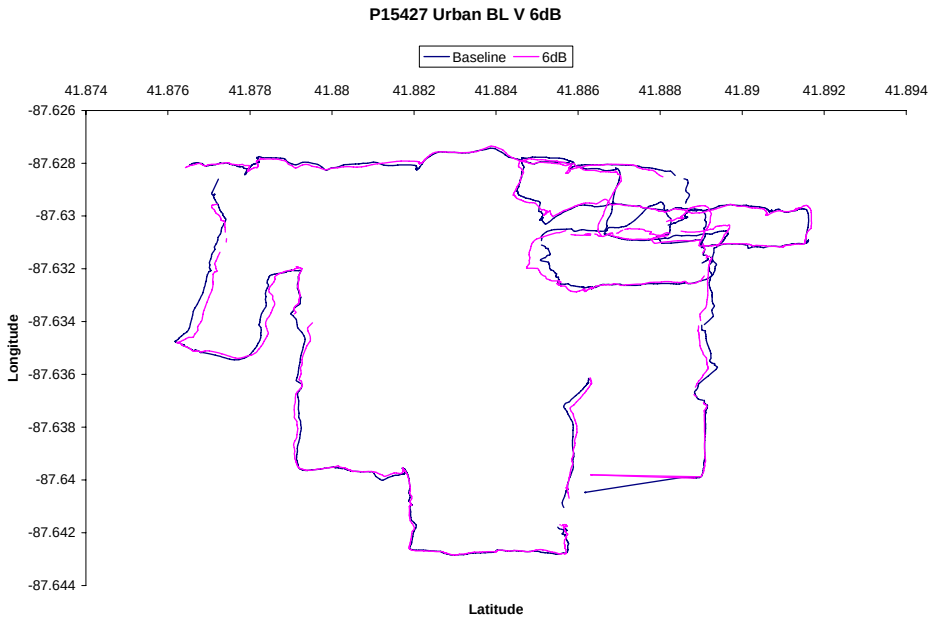

P17655 URBAN BASELINE V 3dB
Baseline
3dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.624
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
Latitude

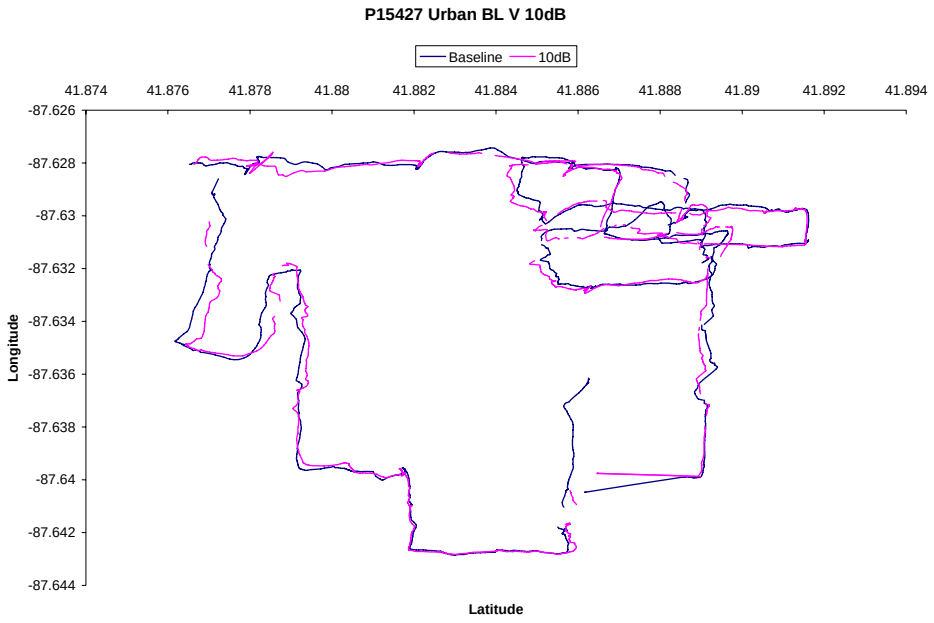

P17655 Urban BL V 6dB
Baseline
6dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.624
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
Latitude


P17655 URBAN BL V 10dB
Baseline
10dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.622
-87.624
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644

P15427


P15427 Urban BL V 3dB
Baseline
3dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
Latitude


P15427 Urban BL V 6dB
Baseline
6dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
Latitude


P15427 Urban BL V 10dB
Baseline
10dB
41.874
41.876
41.878
41.88
41.882
41.884
41.886
41.888
41.89
41.892
41.894
-87.626
-87.628
-87.63
-87.632
-87.634
-87.636
-87.638
-87.64
-87.642
-87.644
Longitude
Latitude

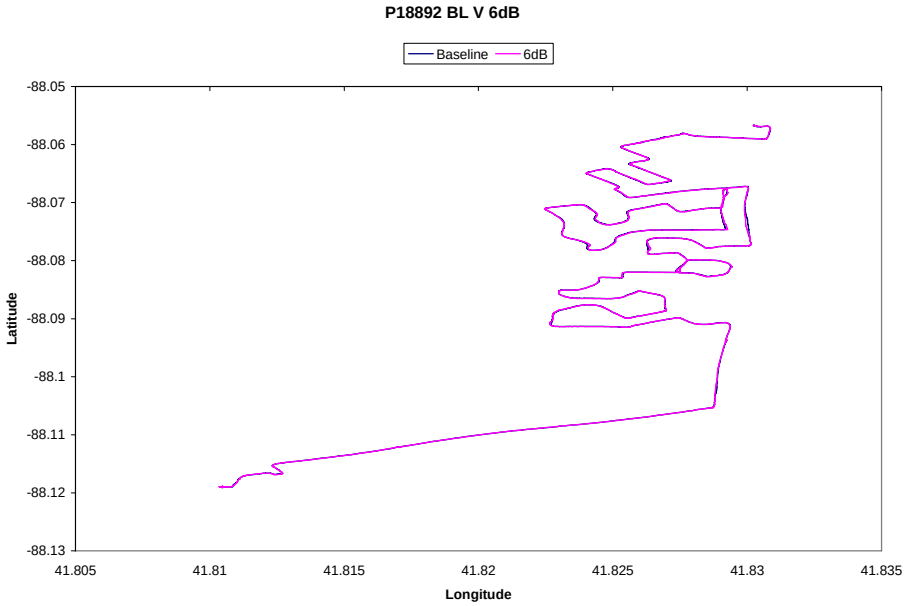
NAVIGATION POSITION AND VELOCITY

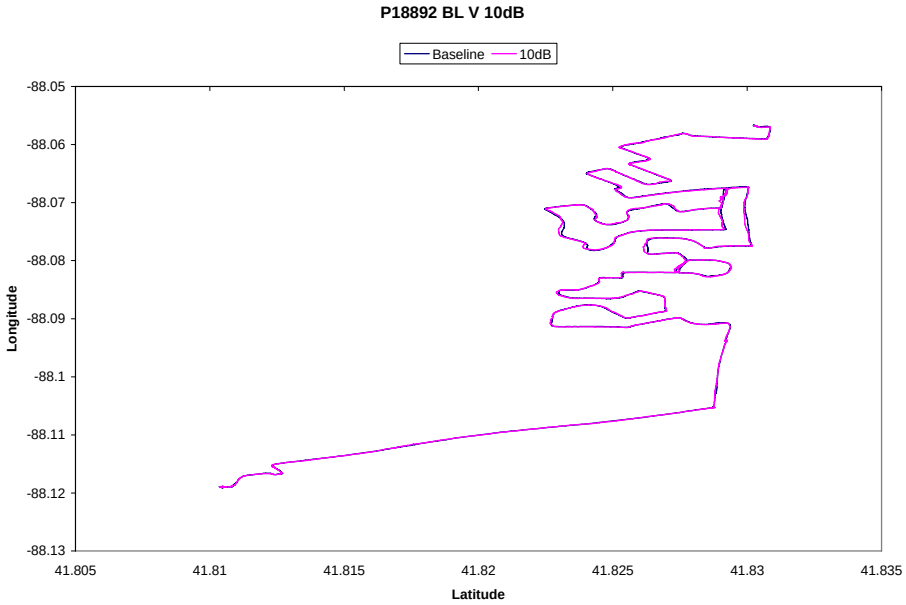
SUBURBAN

Navigation Position and Velocity Summary
Suburban

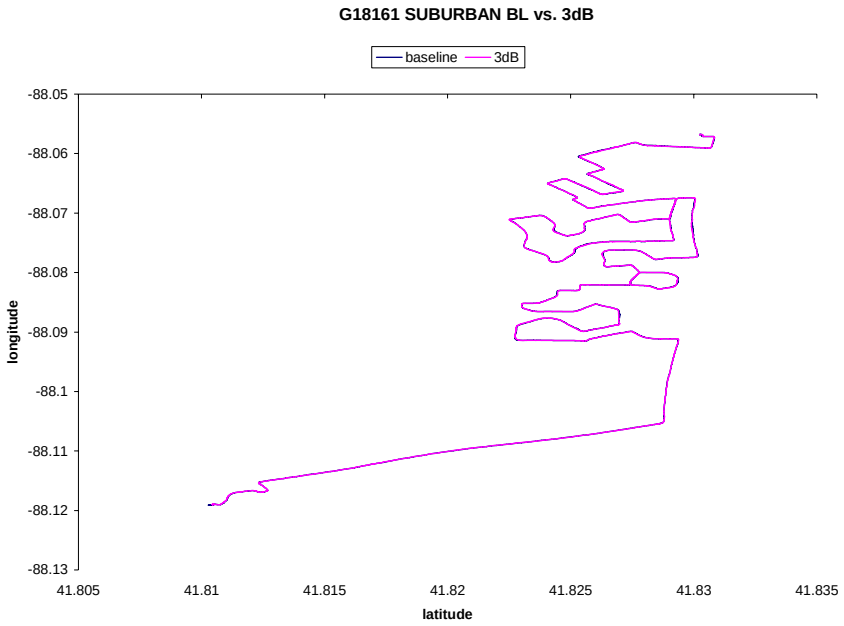
DUT	1db	3db	6db	10db	20db	Notes
G12586	✓	✓	✓	✓	✓	
G17641	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G10195	X	X	X	X	X	x = no data, test waived by vendor
G15448	✓	✓	✓	✓	✓	
G10968	✓	✓	✓	✓	X	x = no data, test waived by vendor
P14730	X	✓	✓	✓	X	x = no data, test waived by vendor
G14298	✓	✓	✓	✓	✓	
G13445	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G12867	X	✓	✓	✓	X	x = no data, test waived by vendor
G17783	X	✓	✓	✓	LOF	LOF = Loss of Fix x = no data, test waived by vendor
P13275	X	X	X	X	X	X = test performed but data not valid
G18161	X	✓	✓	✓	X	x = no data, test waived by vendor
P14949	X	✓	✓	✓	X	x = no data, test waived by vendor
P18892	X	X	✓	✓	X	x = no data, test waived by vendor

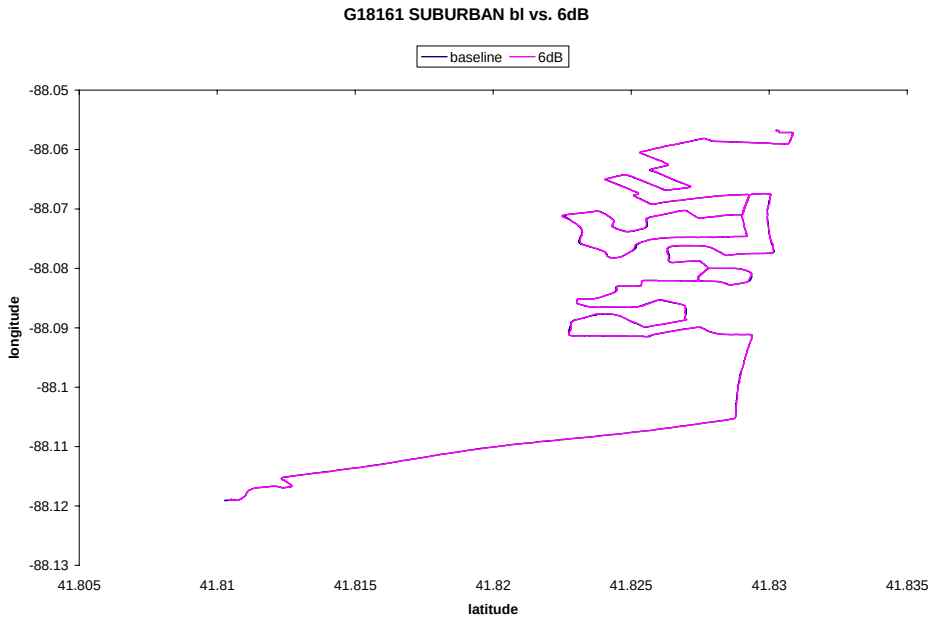
P18892 SUBURBAN

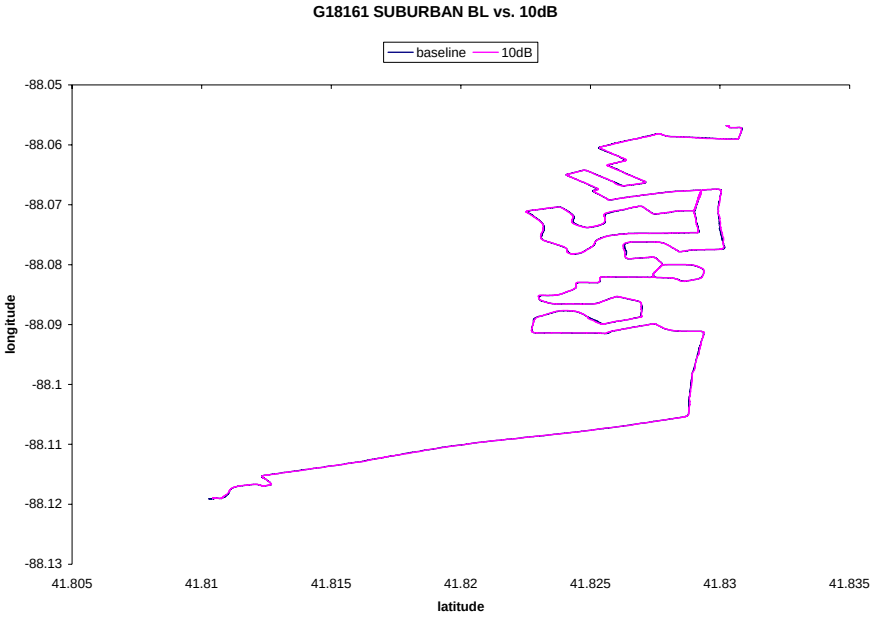




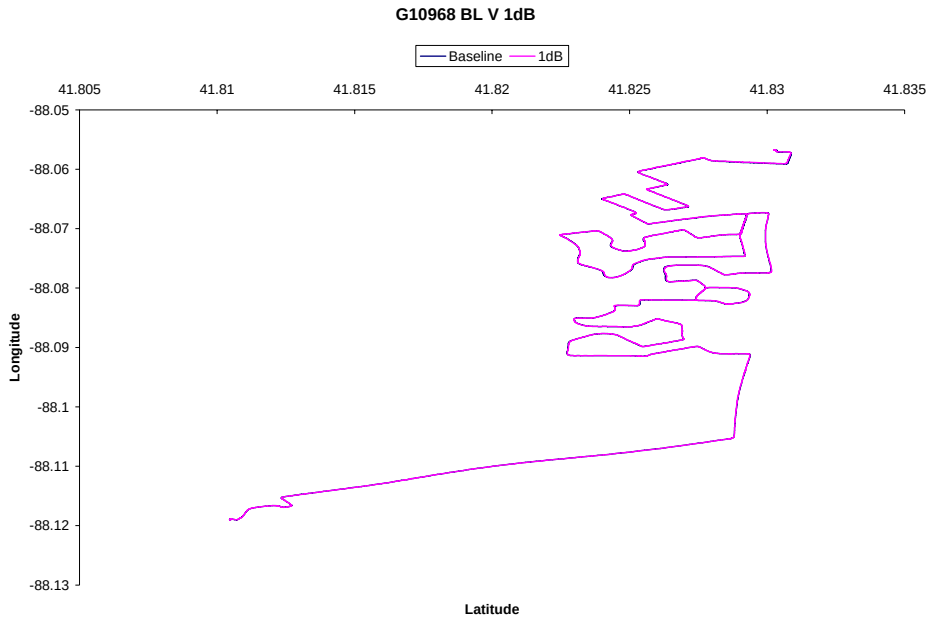
G18161 SUBURBAN

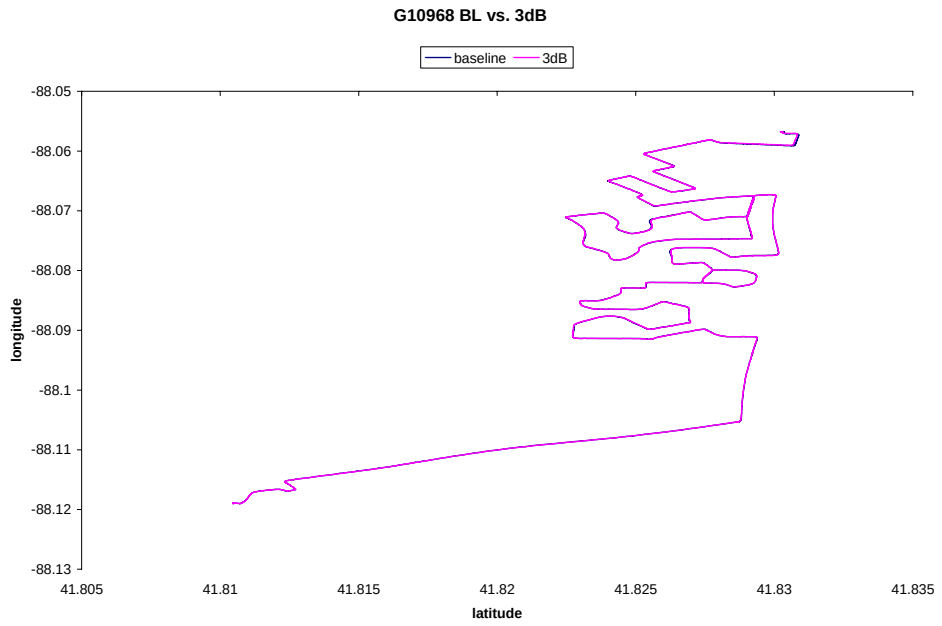


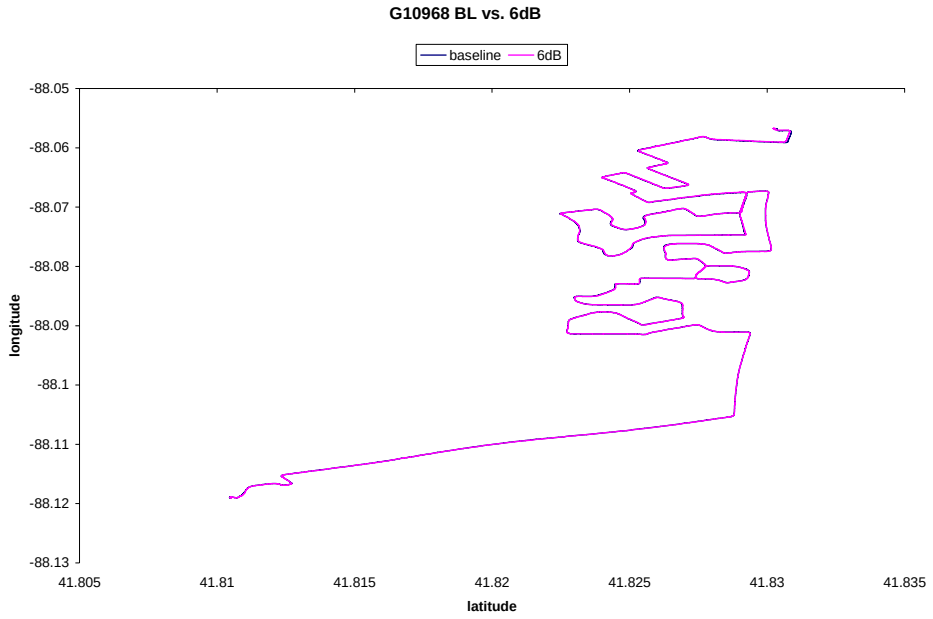


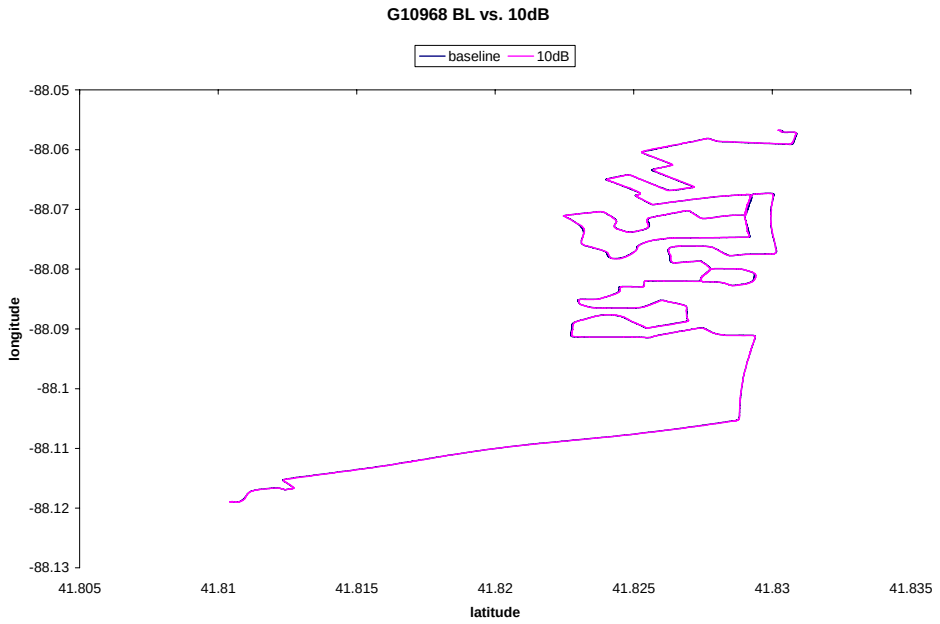

G18161 SUBURBAN BL vs. 10dB
baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

G10968 SUBURBAN

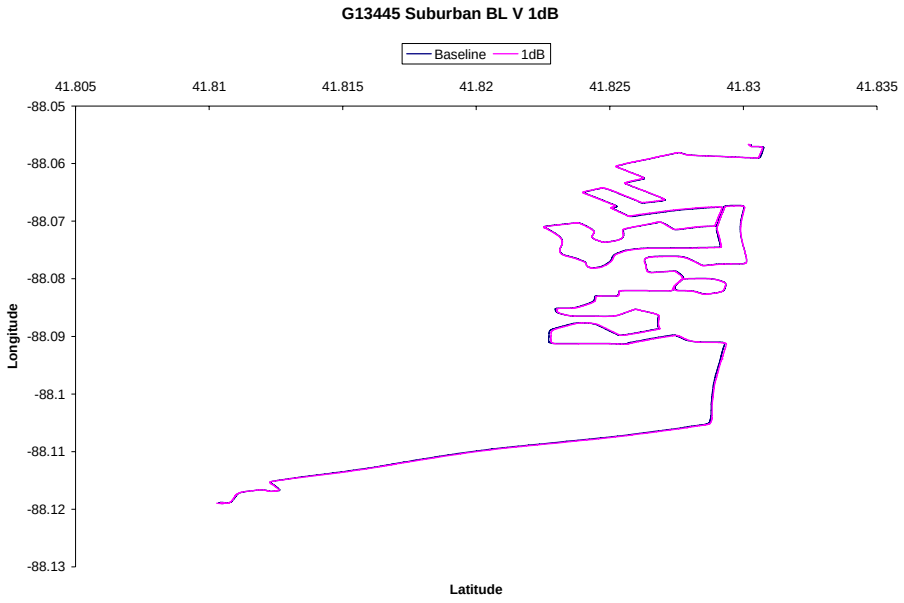


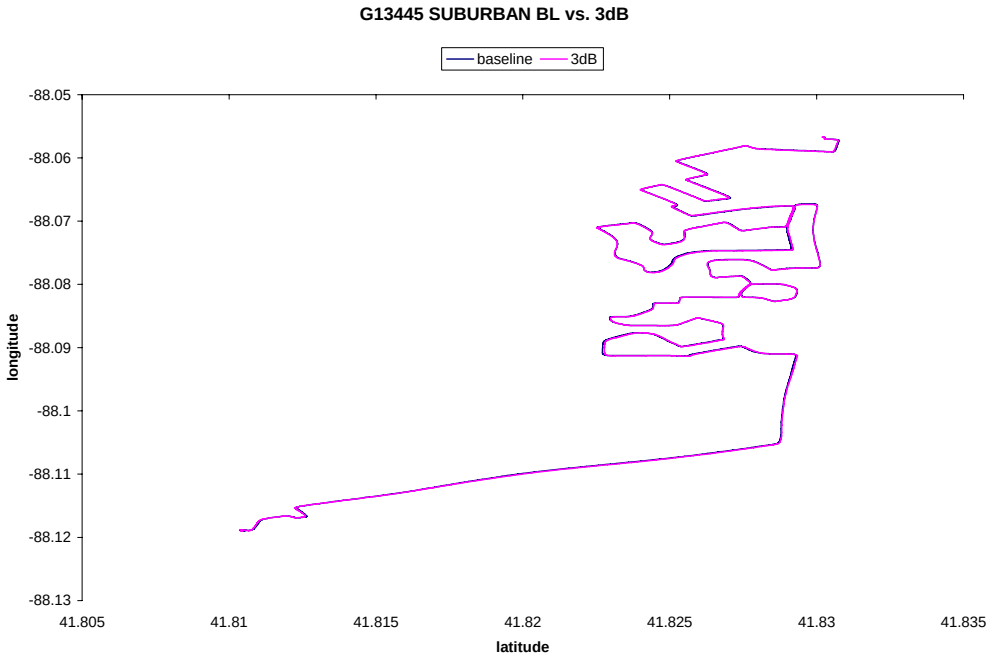


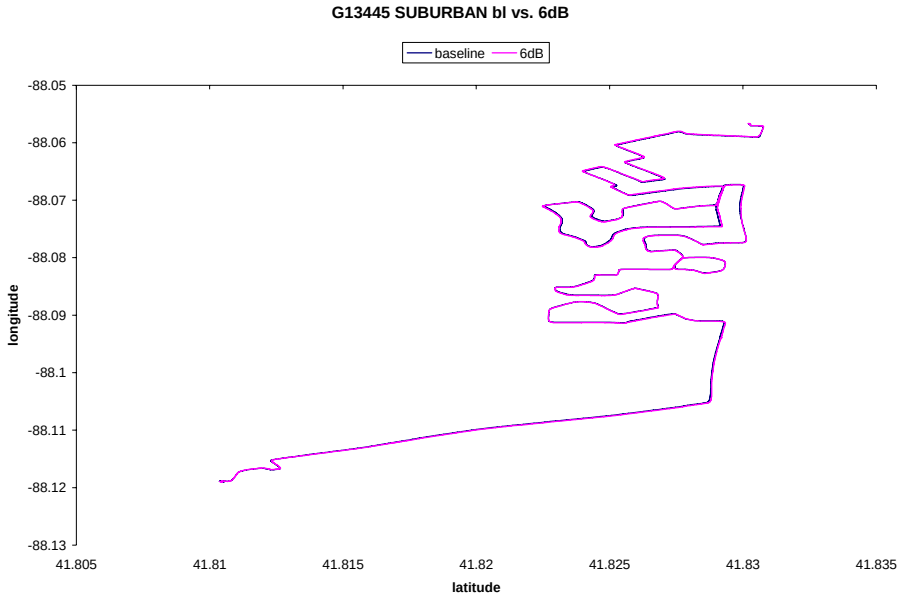

G10968 BL vs. 6dB
baseline
6dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

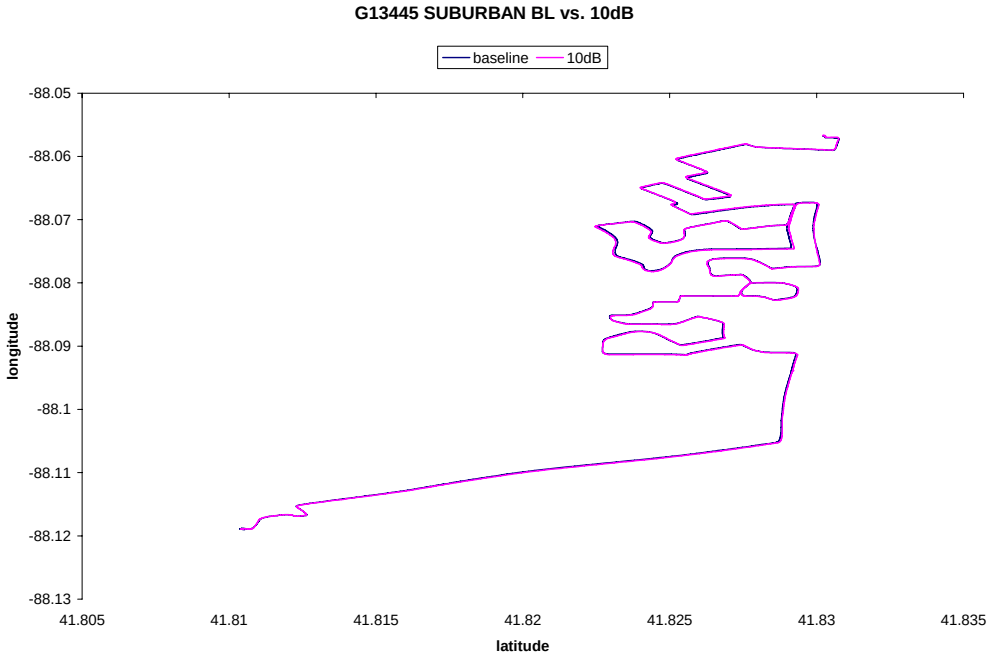

G10968 BL vs. 10dB
baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

G13445 SUBURBAN

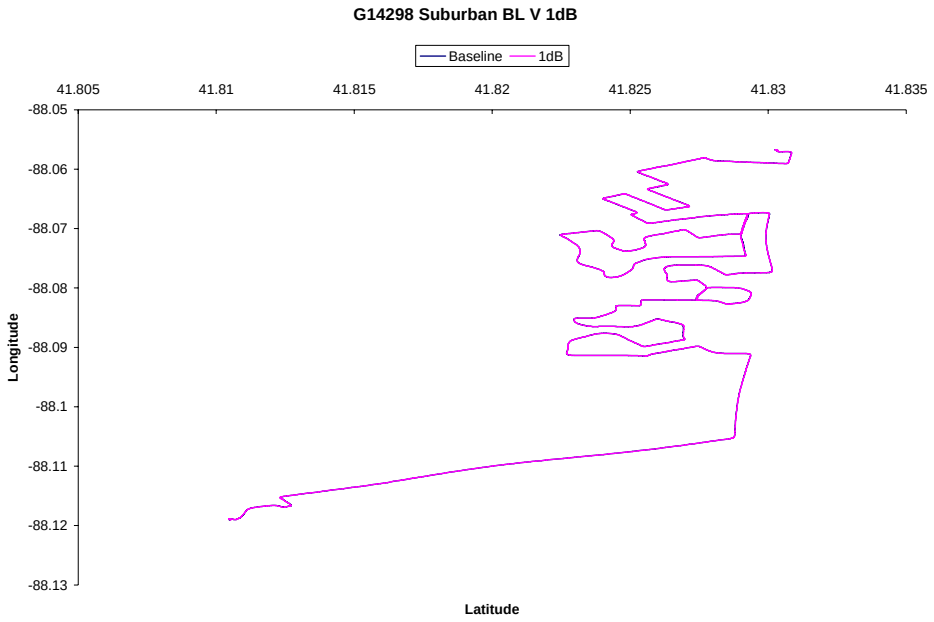


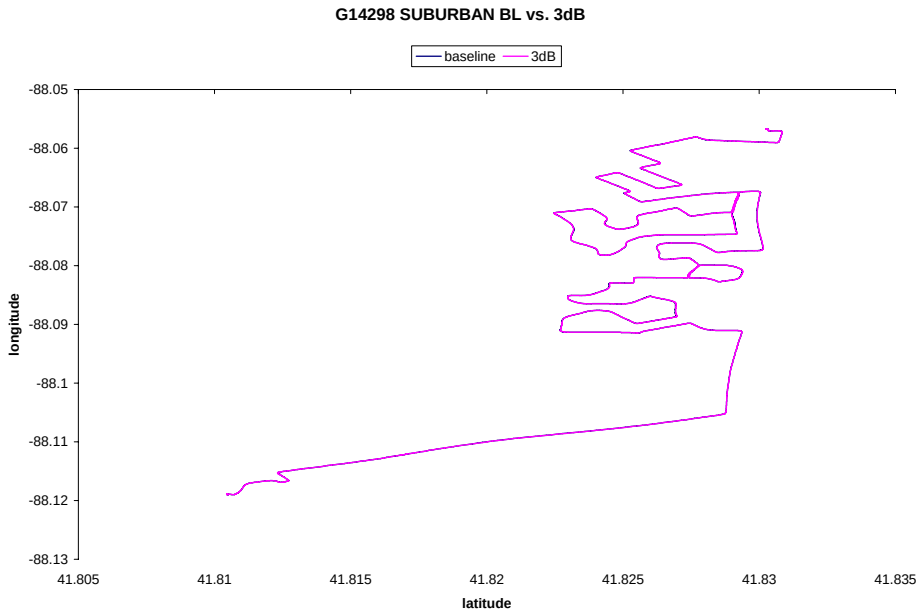


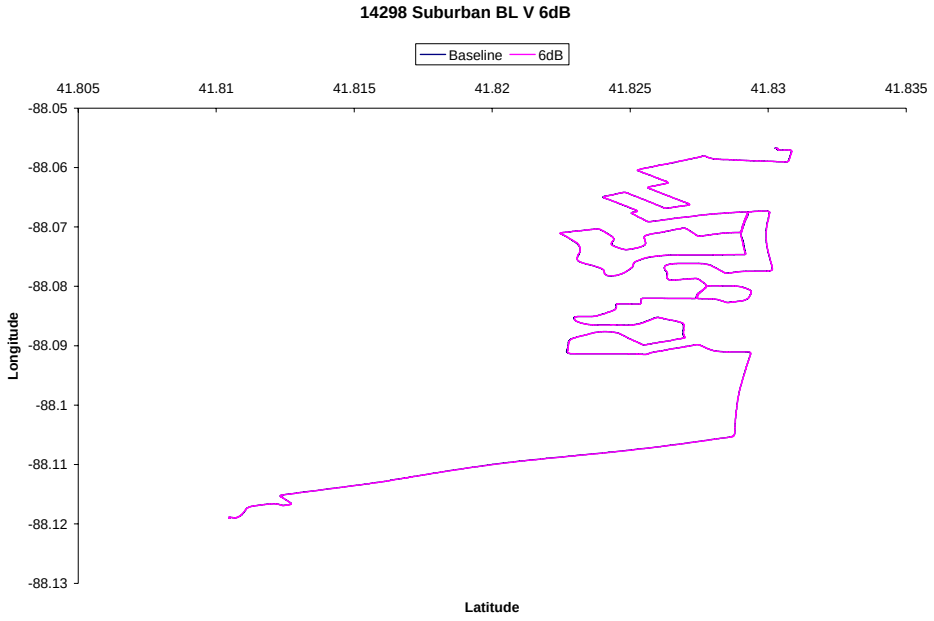

G13445 SUBURBAN bl vs. 6dB
baseline
6dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

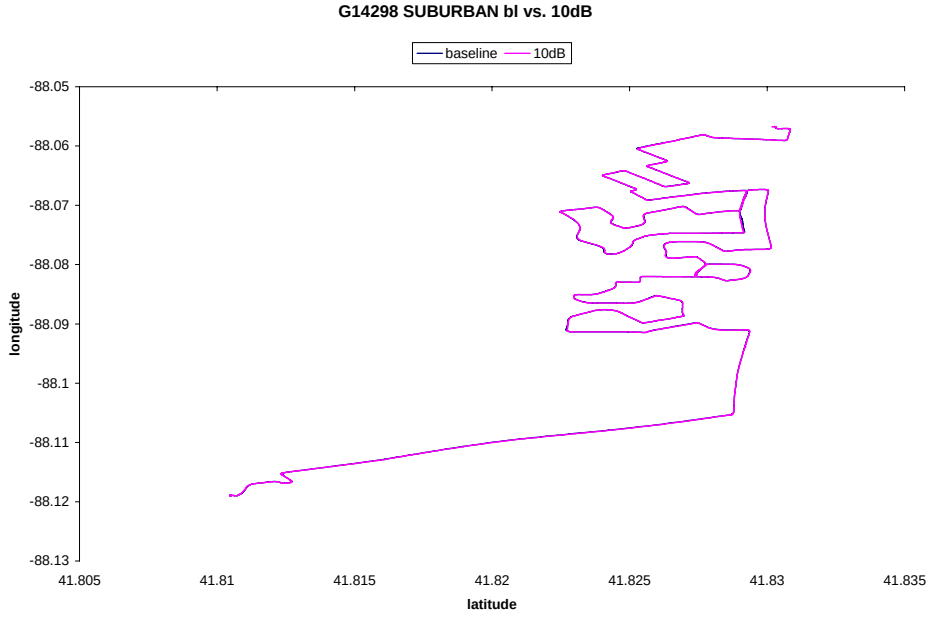

G13445 SUBURBAN BL vs. 10dB
baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

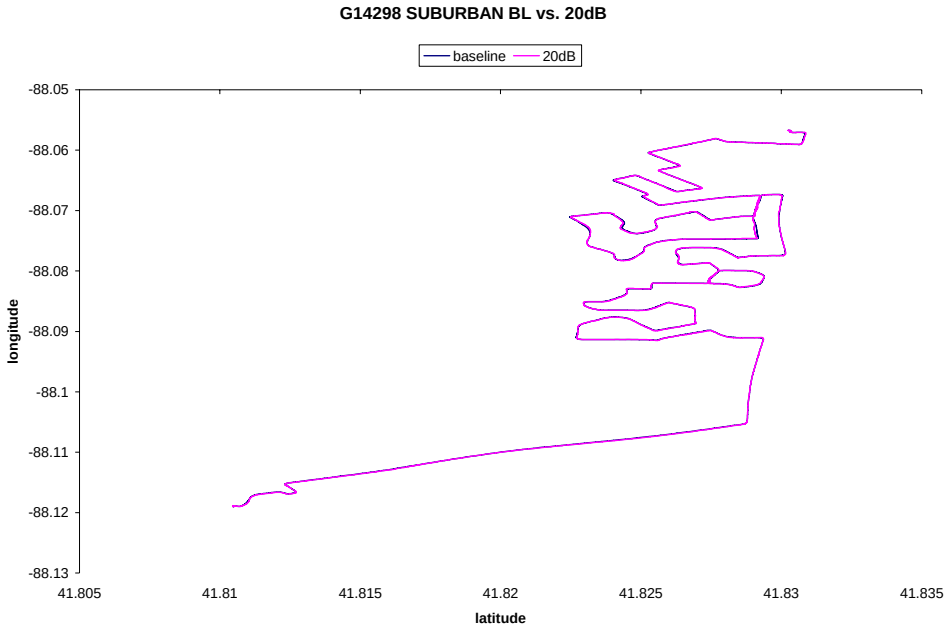
G14298 SUBURBAN



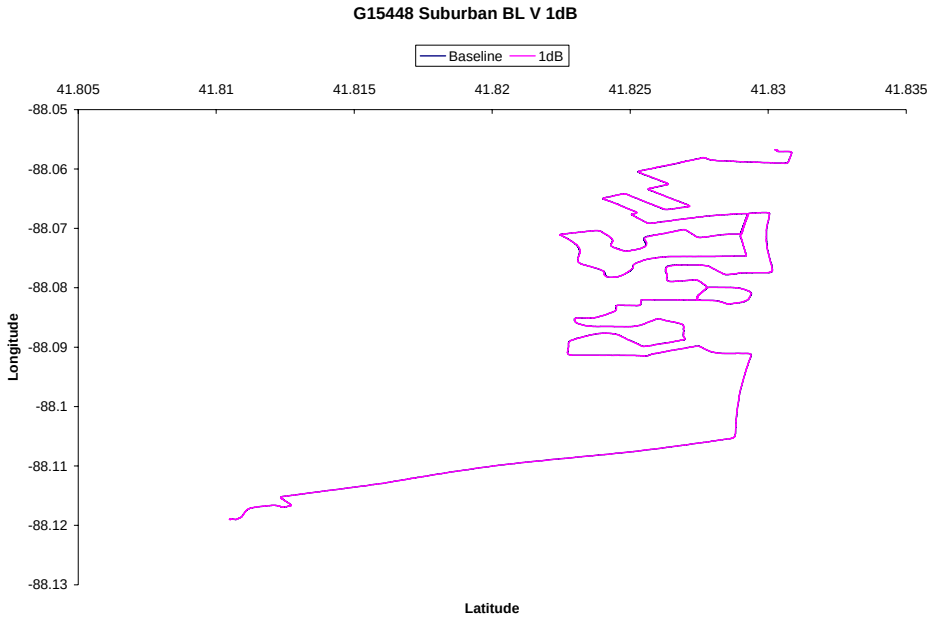


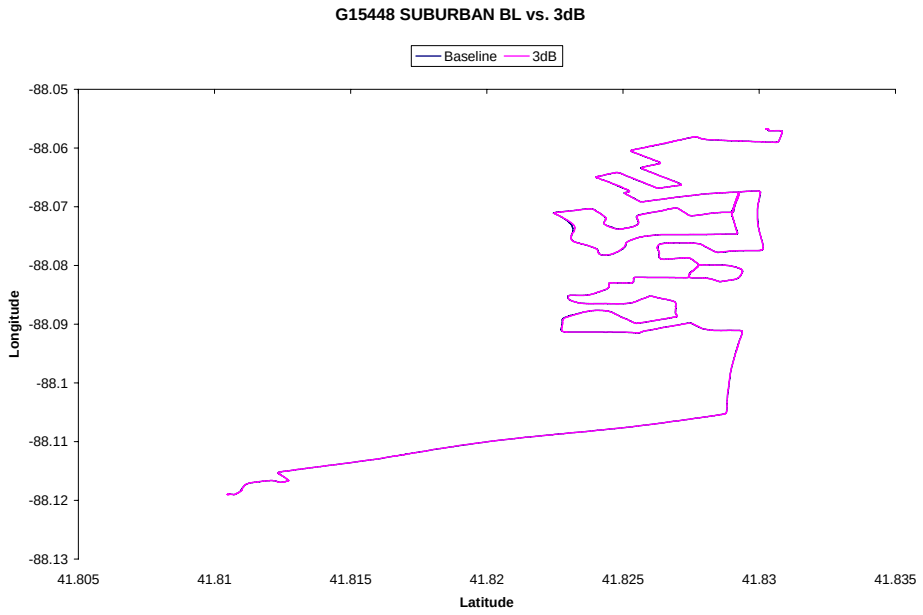

14298 Suburban BL V 6dB
Baseline
6dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude

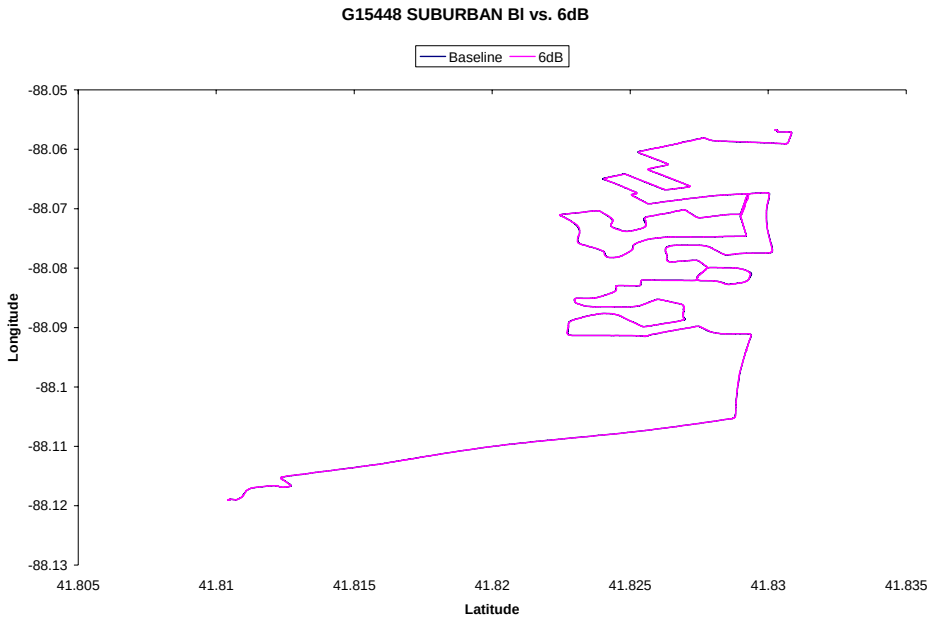

G14298 SUBURBAN bl vs. 10dB
baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

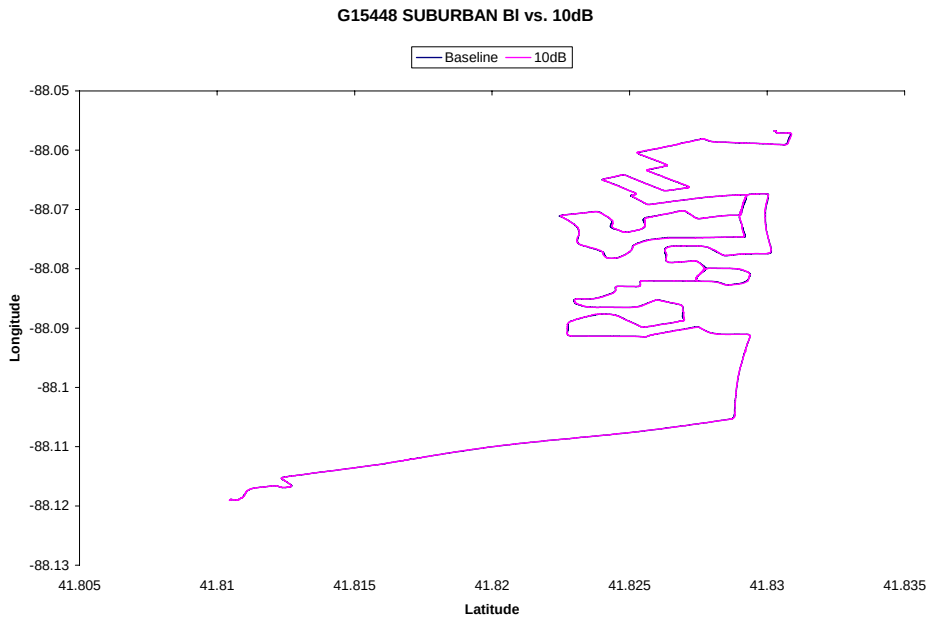

G14298 SUBURBAN BL vs. 20dB
baseline
20dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

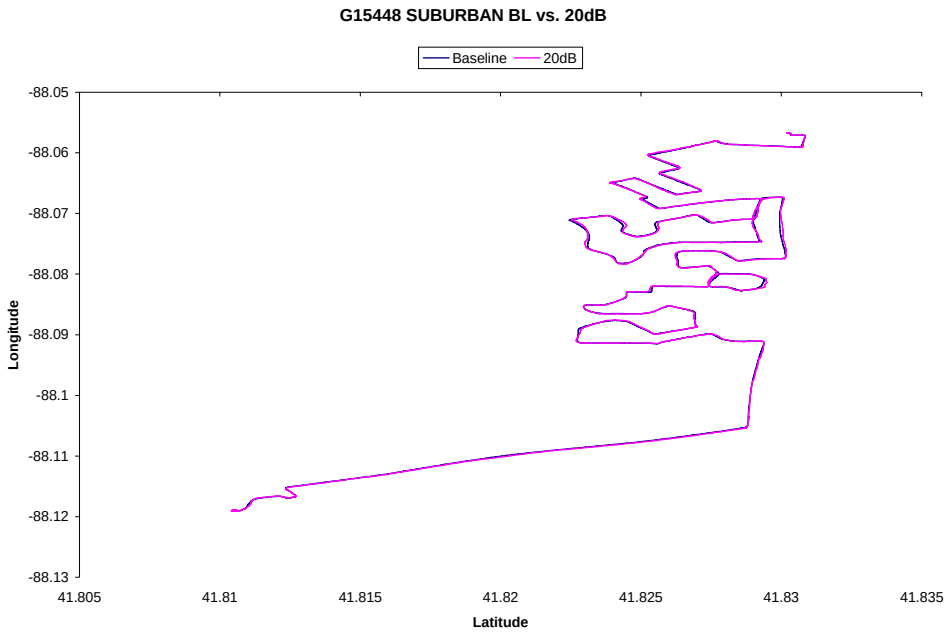
G15448 SUBURBAN



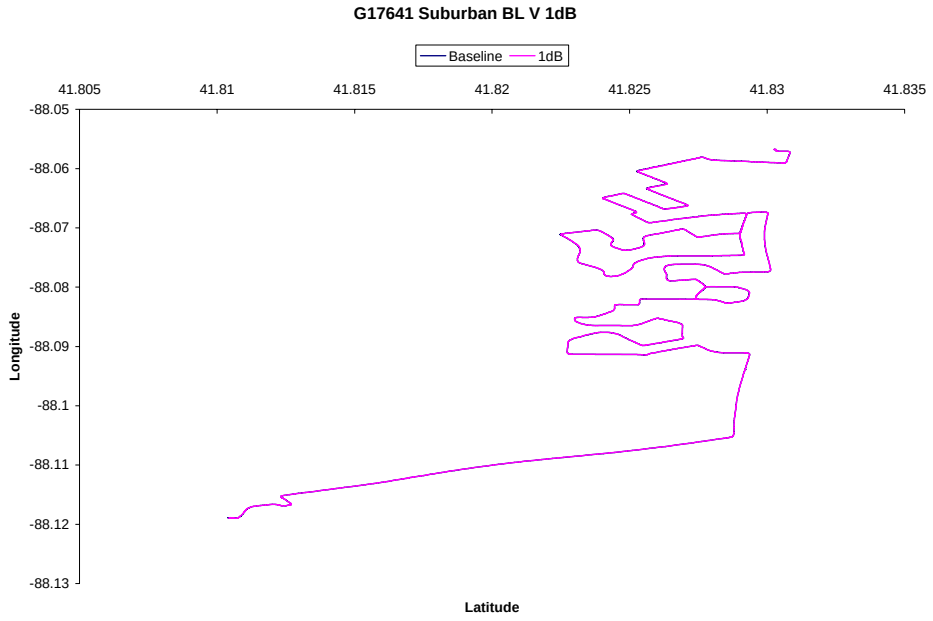


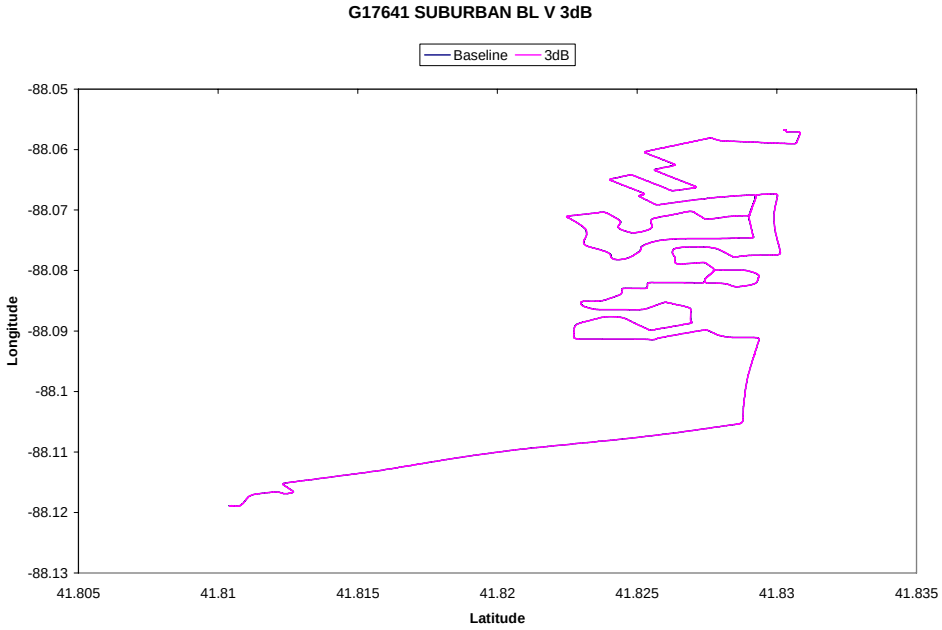

G15448 SUBURBAN Bl vs. 6dB
Baseline
6dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
Latitude

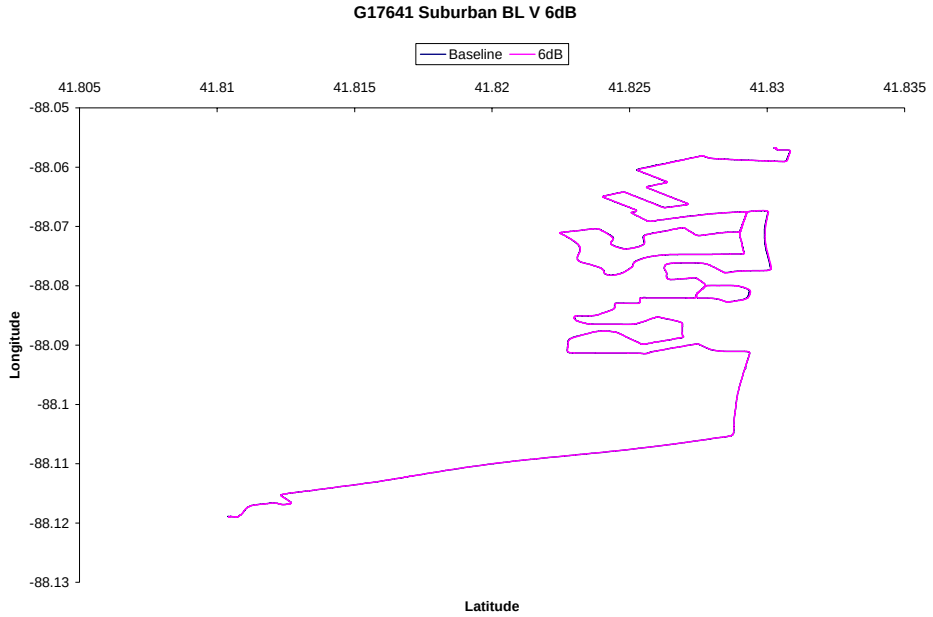

G15448 SUBURBAN Bl vs. 10dB
Baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
Latitude

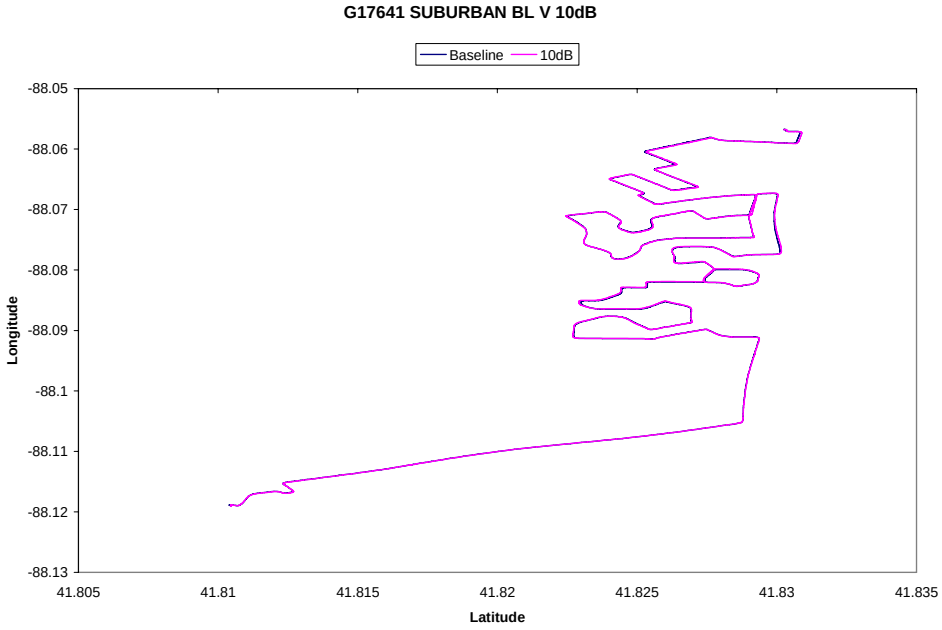

G15448 SUBURBAN BL vs. 20dB
Baseline
20dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
Latitude

G17641 SUBURBAN

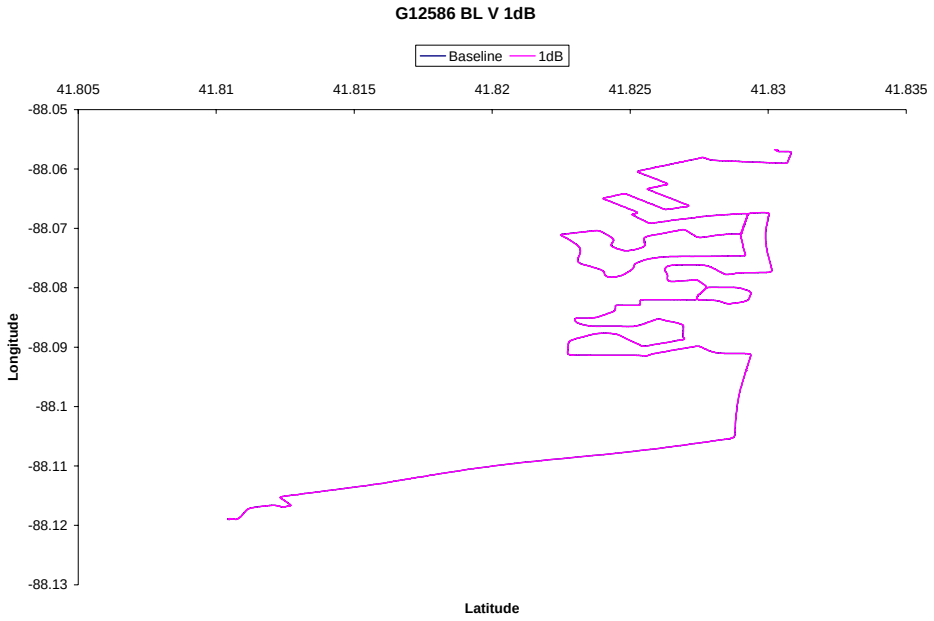


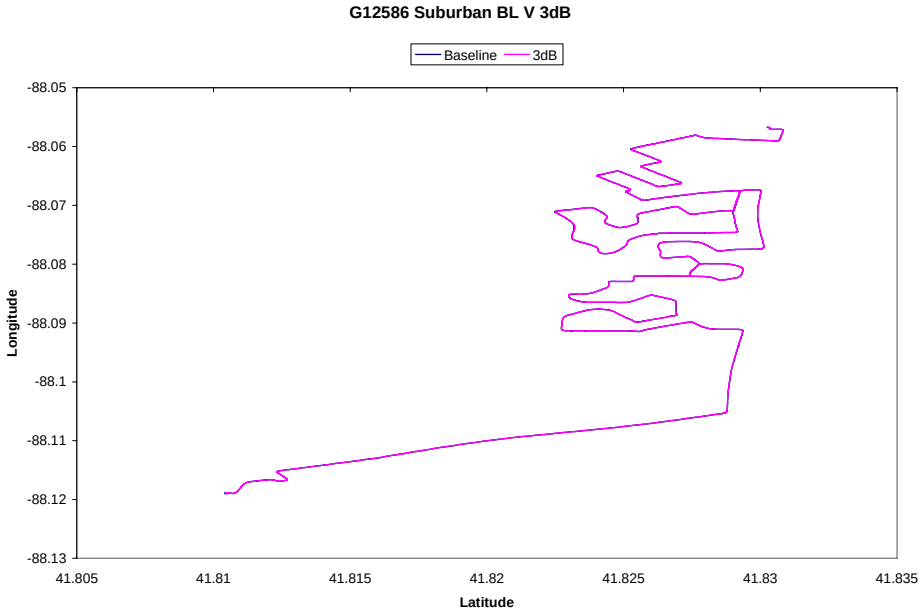


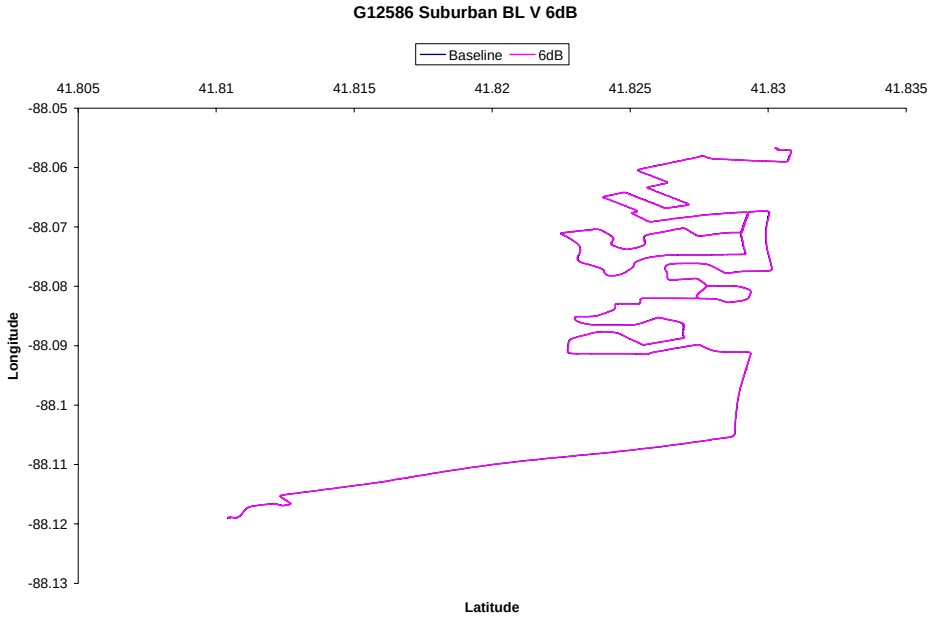

G17641 Suburban BL V 6dB
Baseline
6dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude

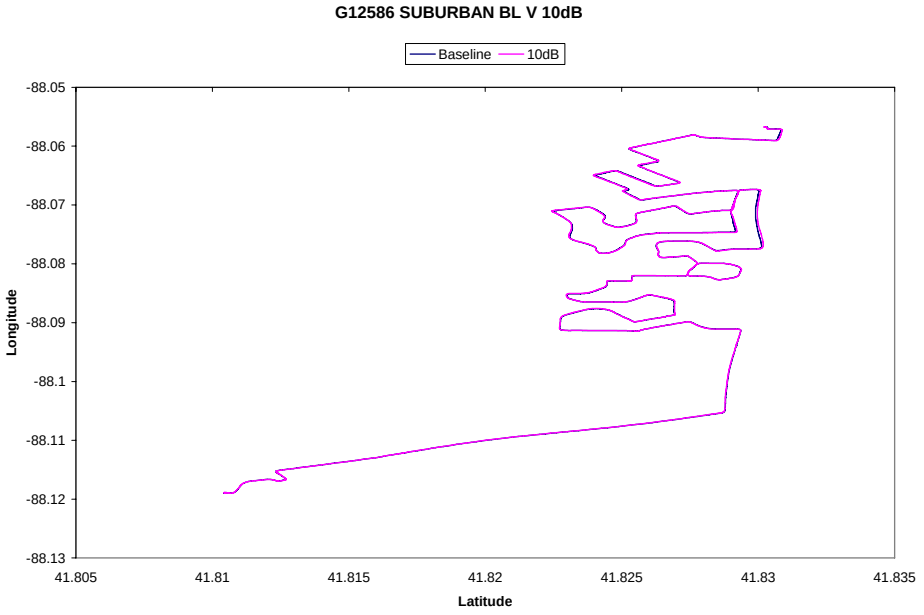

G17641 SUBURBAN BL V 10dB
Baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
Latitude

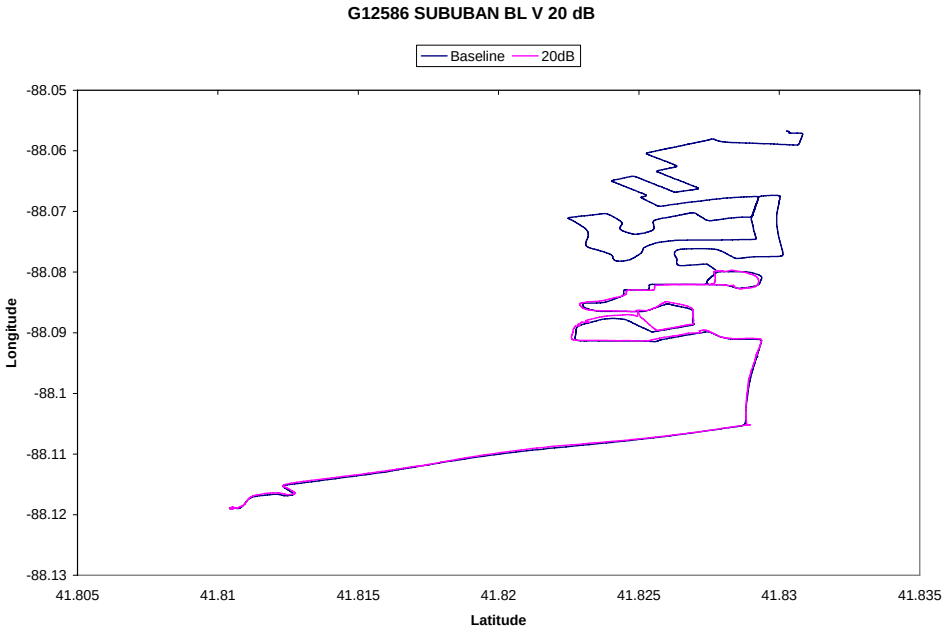
G12586 SUBURBAN



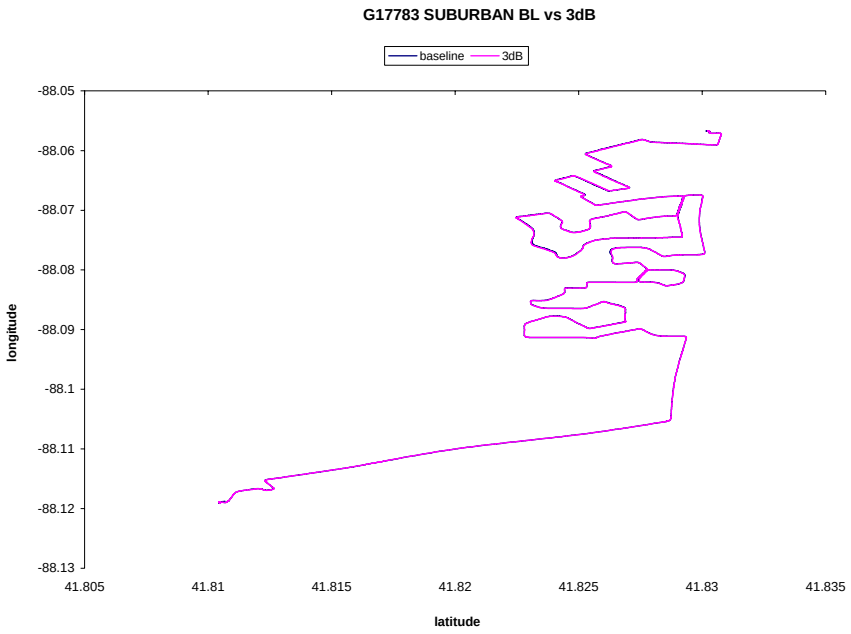


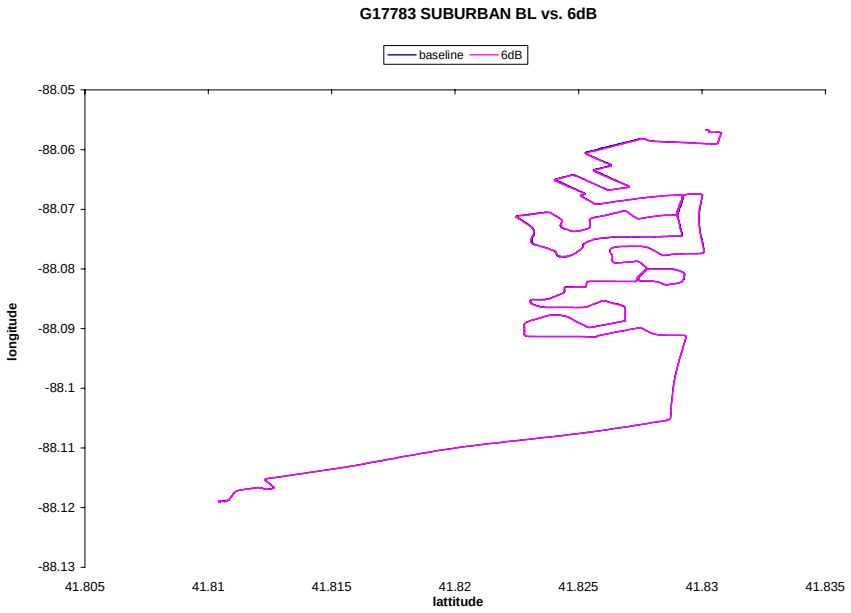

G12586 Suburban BL V 6dB
Baseline
6dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude

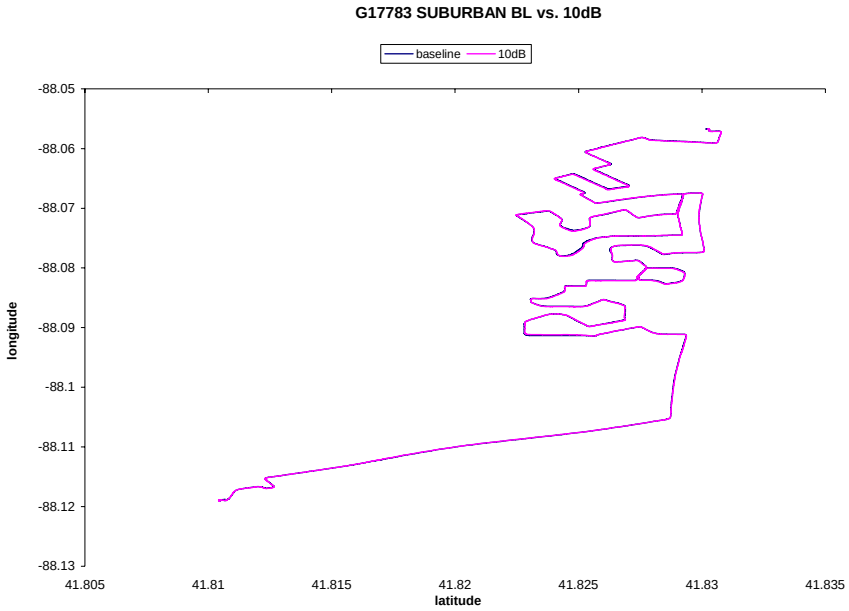

G12586 SUBURBAN BL V 10dB
Baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
Latitude


G12586 SUBUBAN BL V 20 dB
Baseline
20dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
Latitude

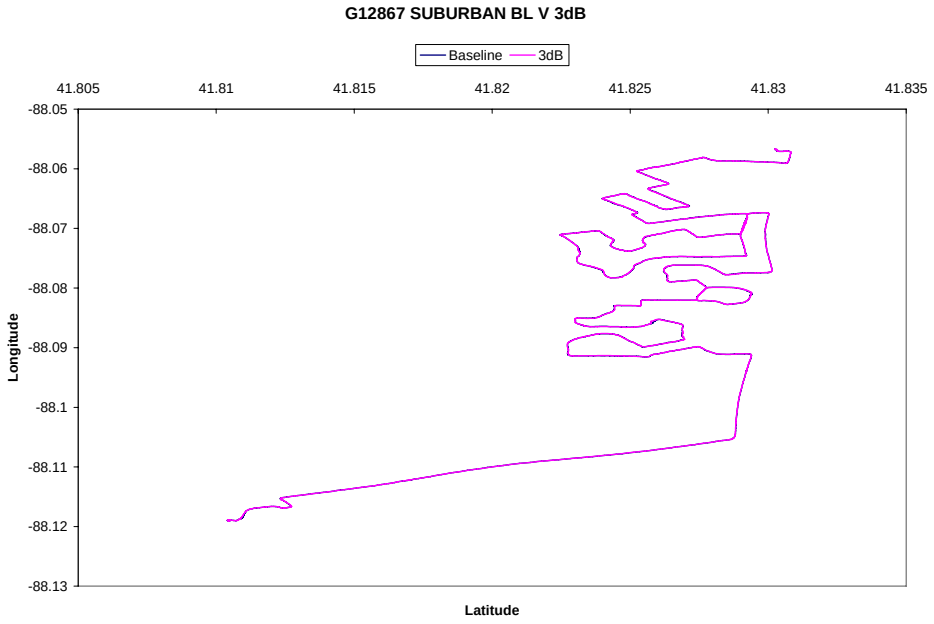
G17783 Suburban

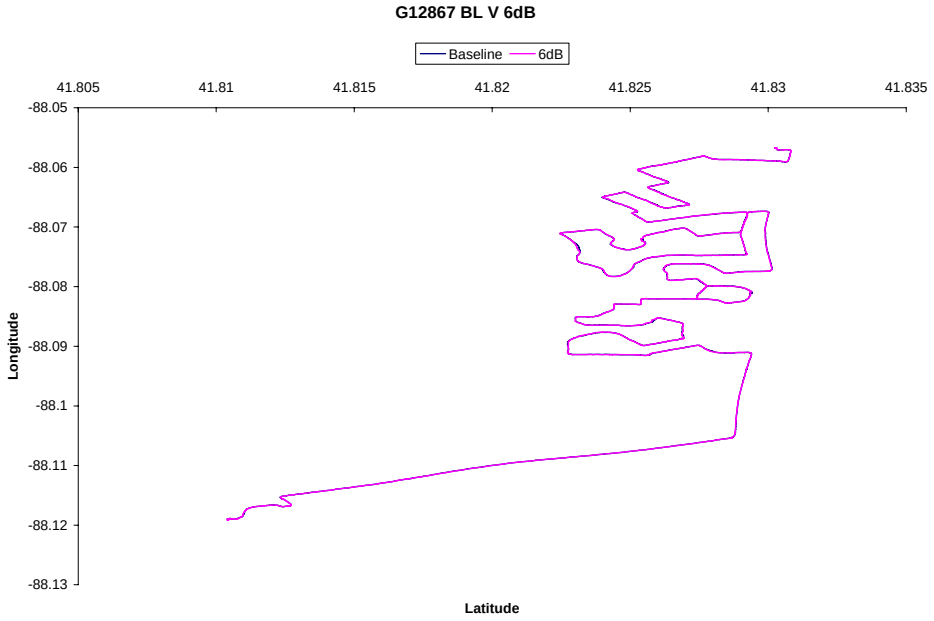


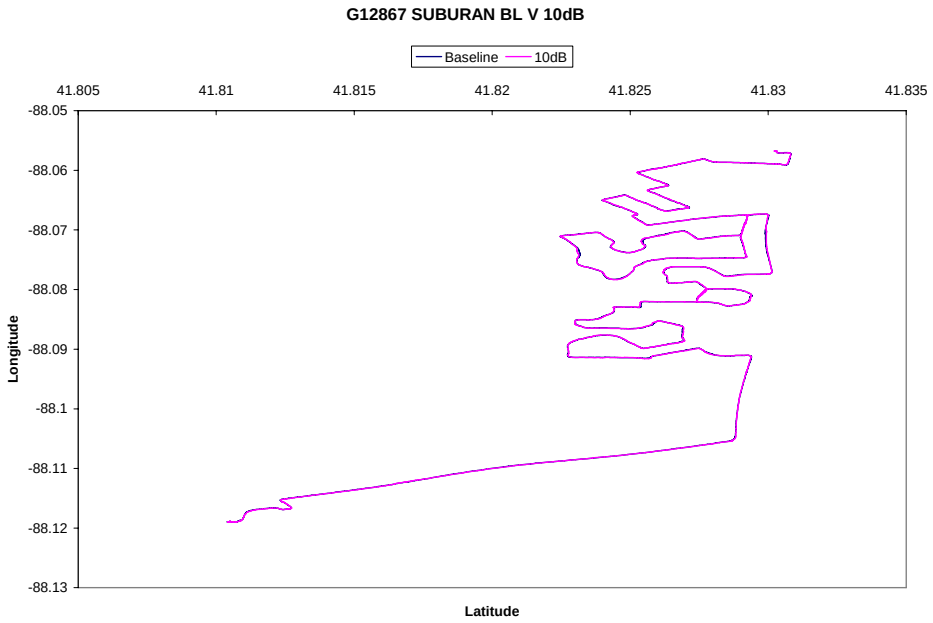



G17783 SUBURBAN BL vs. 10dB
baseline
10dB
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
longitude
41.805
41.81
41.815
41.82
41.825
41.83
41.835
latitude

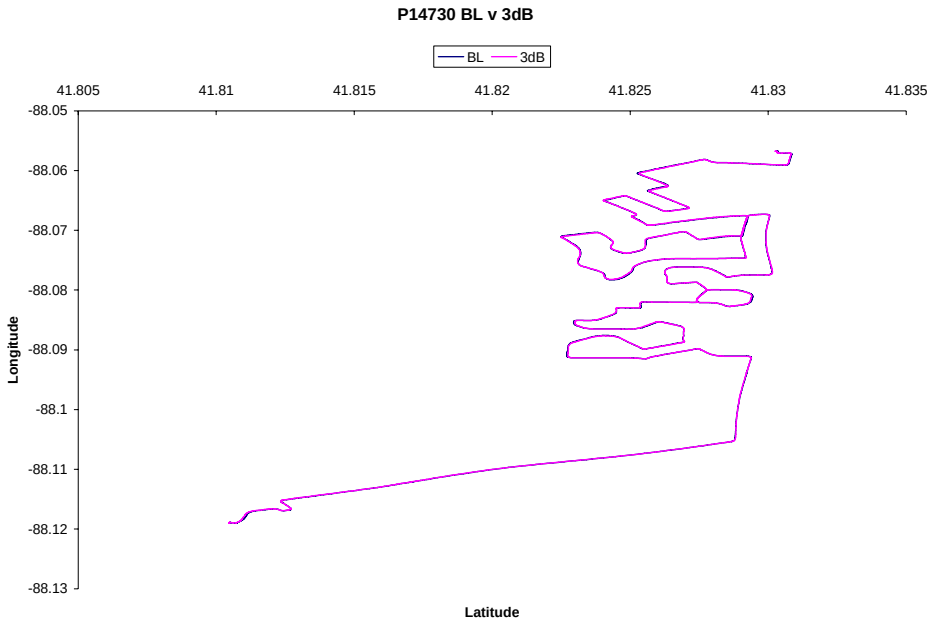
G12867 Suburban

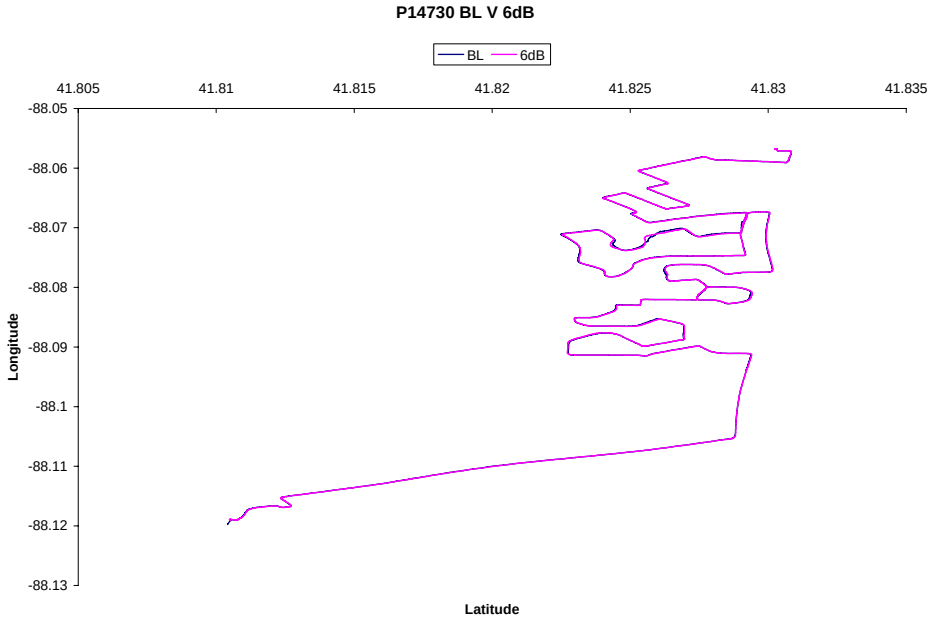


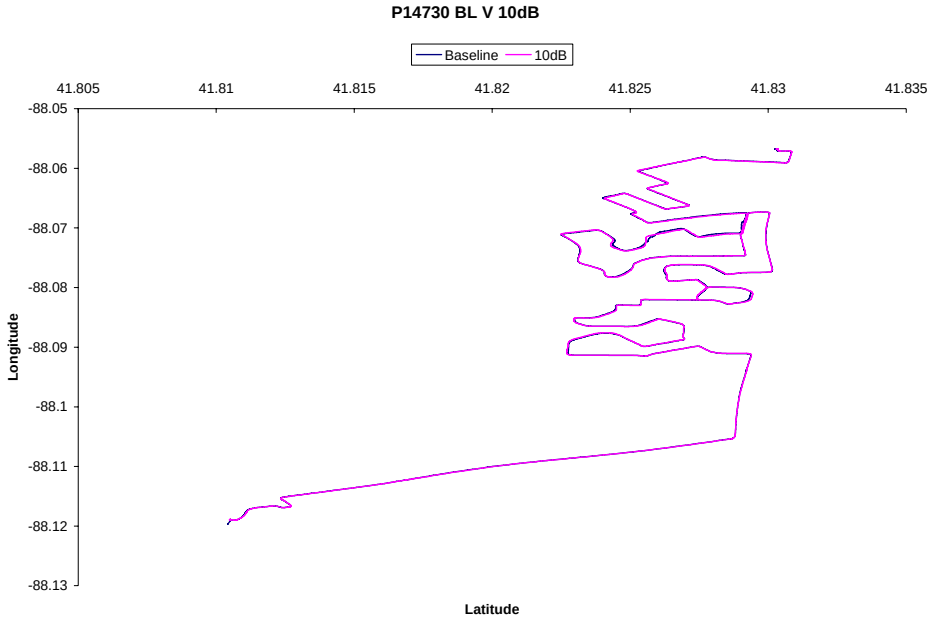



G12867 SUBURAN BL V 10dB
Baseline
10dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude

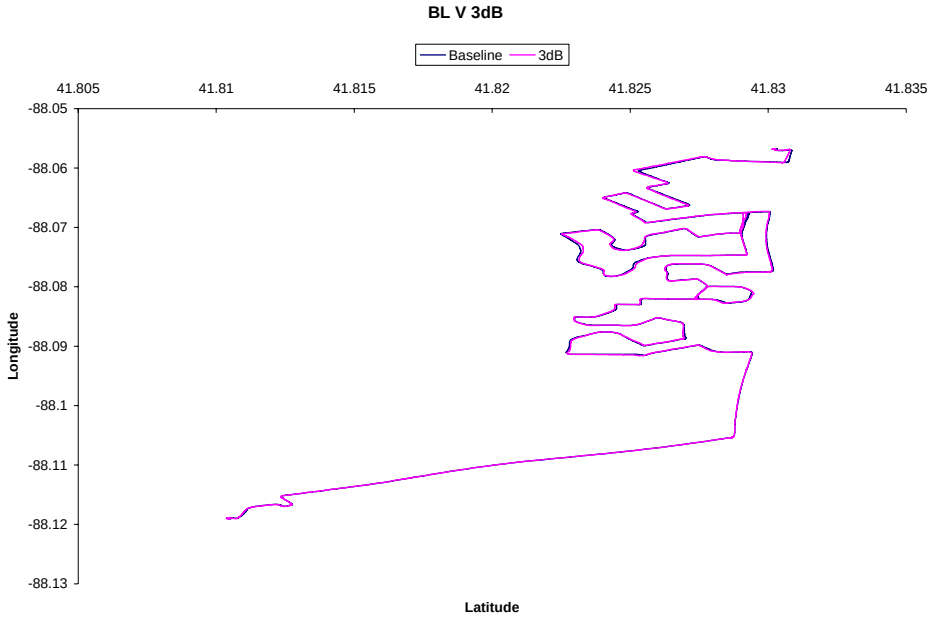
P14730 Suburban

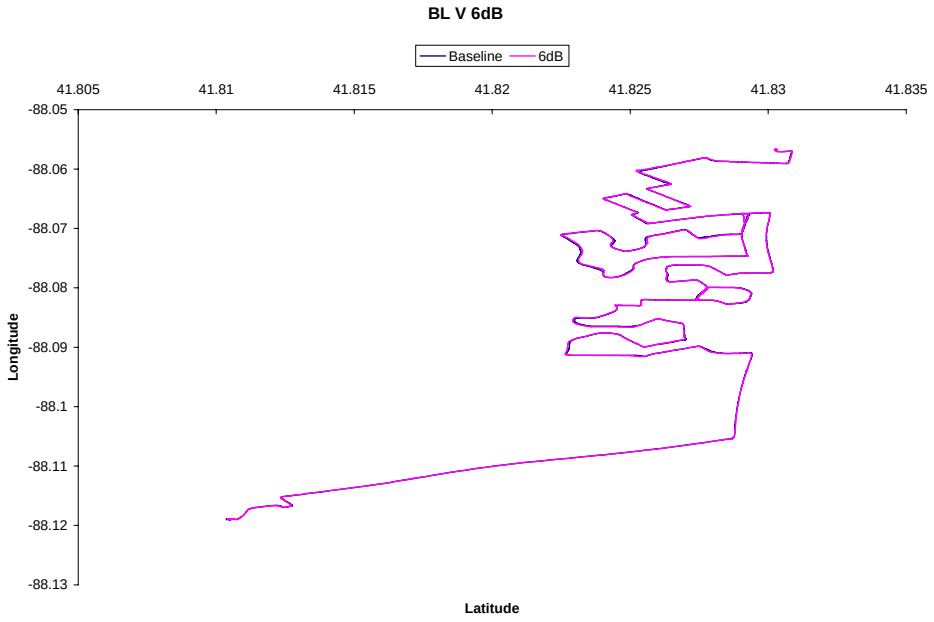


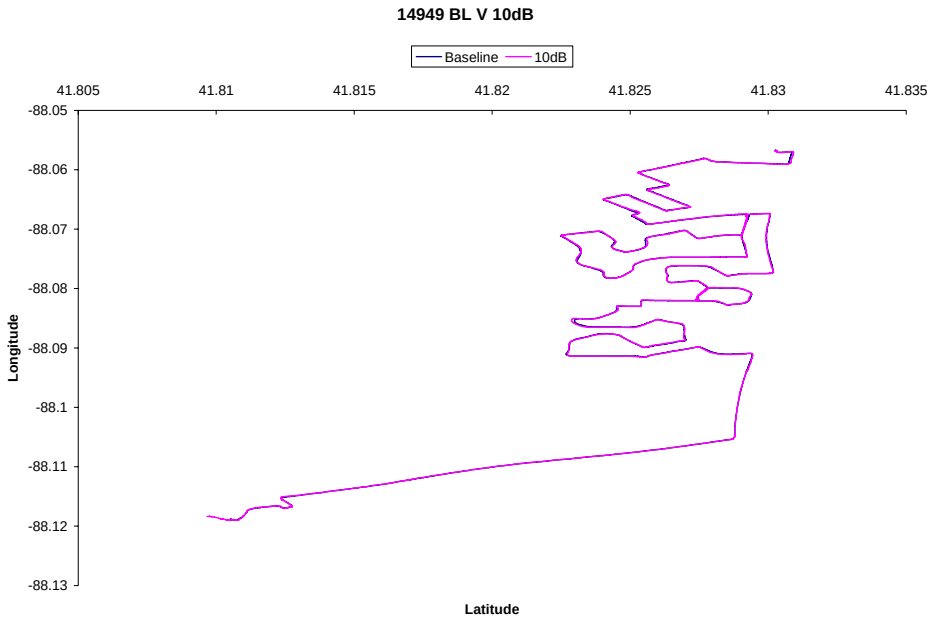



P14730 BL V 10dB
Baseline
10dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude

P14949


BL V 3dB
Baseline
3dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude


BL V 6dB
Baseline
6dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude


14949 BL V 10dB
Baseline
10dB
41.805
41.81
41.815
41.82
41.825
41.83
41.835
-88.05
-88.06
-88.07
-88.08
-88.09
-88.1
-88.11
-88.12
-88.13
Longitude
Latitude

NAVIGATION POSITION AND VELOCITY

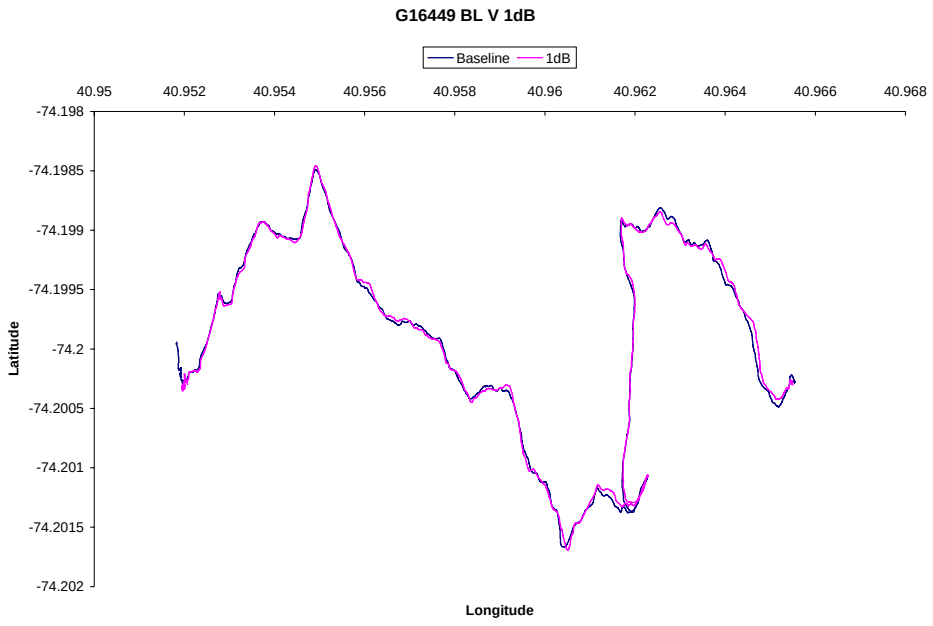
DEEPWOODS

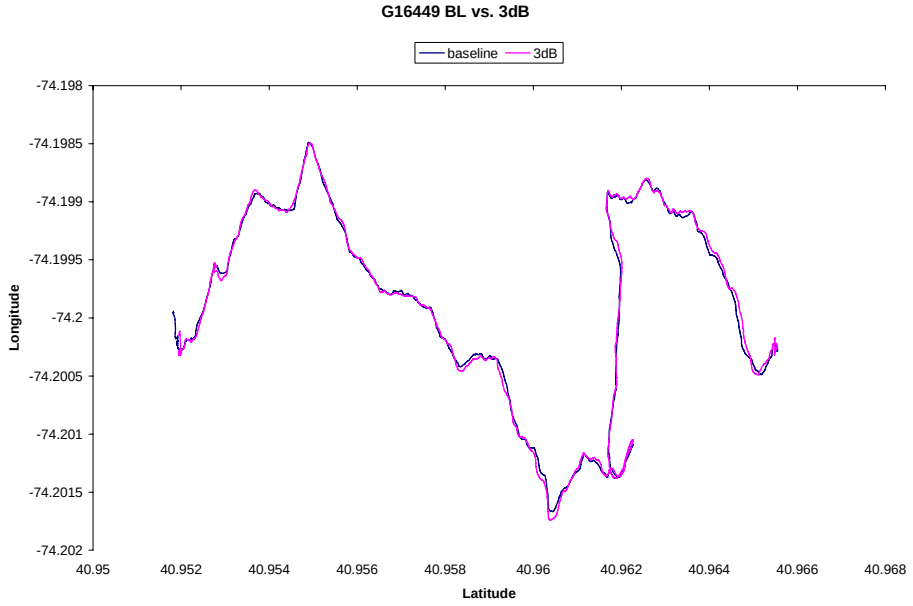
Navigation Position and Velocity Summary

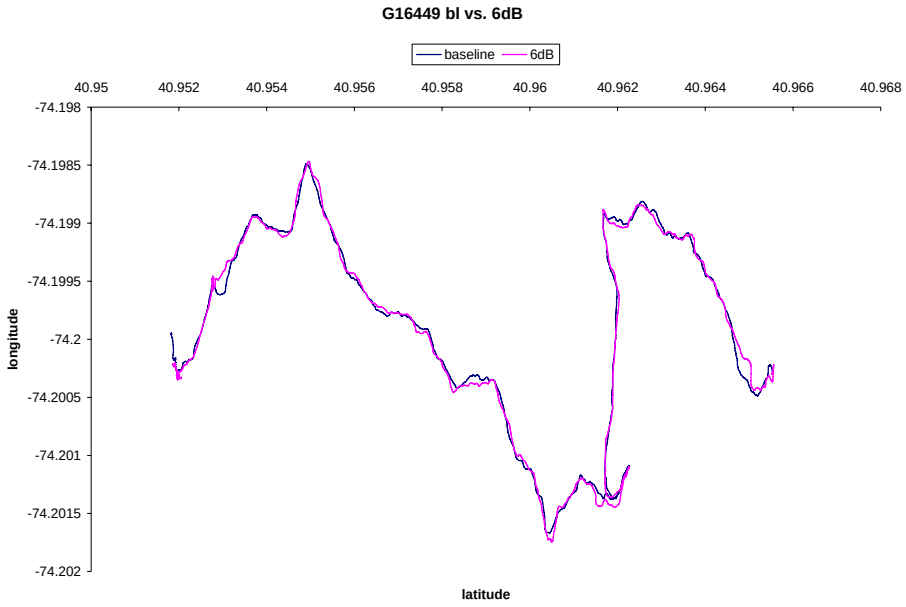
Deep Woods

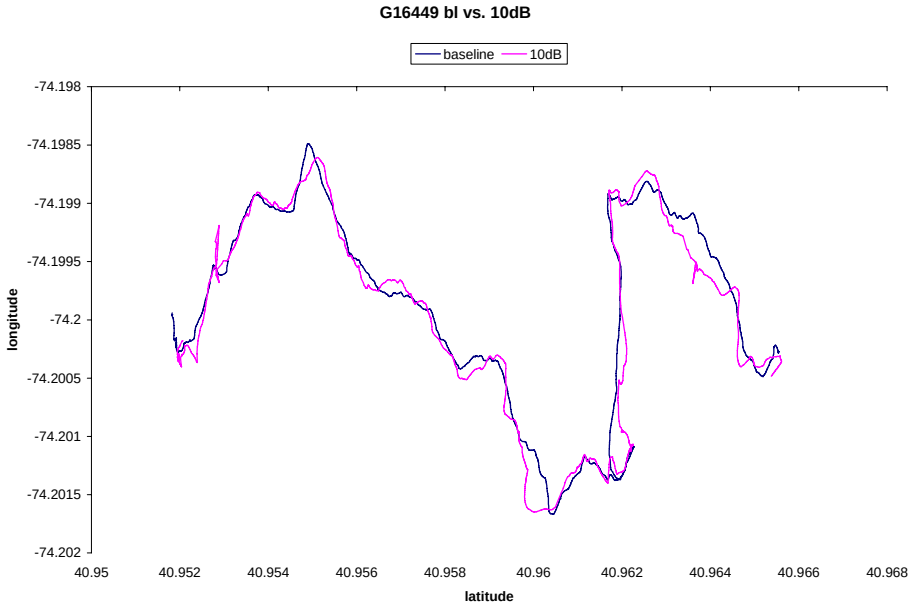
DUT	1db	3db	6db	10db	20db	Notes
G16449	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G15343	X	✓	✓	✓	X	x = no data, test waived by vendor
G18696	✓	✓	✓	X	LOF	LOF = Loss of Fix x = no data, test waived by vendor

G16449 DEEPWOODS

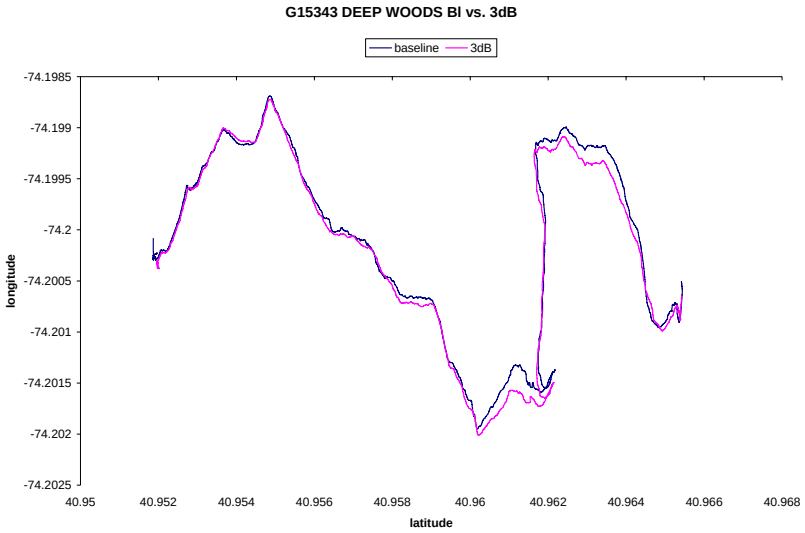


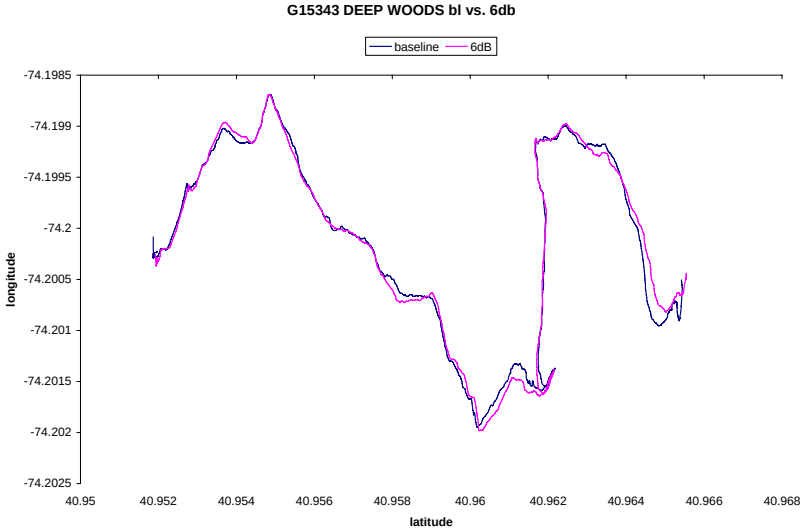


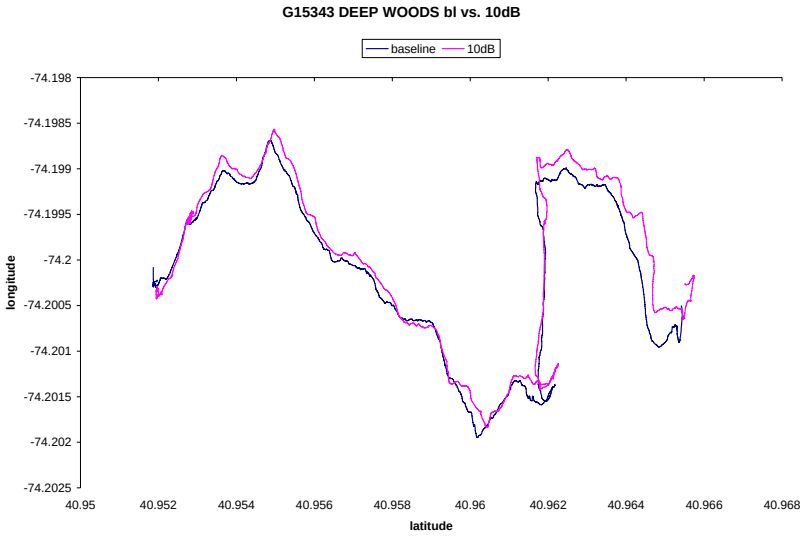

G16449 bl vs. 6dB
baseline
6dB
40.95
40.952
40.954
40.956
40.958
40.96
40.962
40.964
40.966
40.968
-74.198
-74.1985
-74.199
-74.1995
-74.2
-74.2005
-74.201
-74.2015
-74.202
longitude
latitude


G16449 bl vs. 10dB
baseline
10dB
-74.198
-74.1985
-74.199
-74.1995
-74.2
-74.2005
-74.201
-74.2015
-74.202
longitude
40.95
40.952
40.954
40.956
40.958
40.96
40.962
40.964
40.966
40.968
latitude

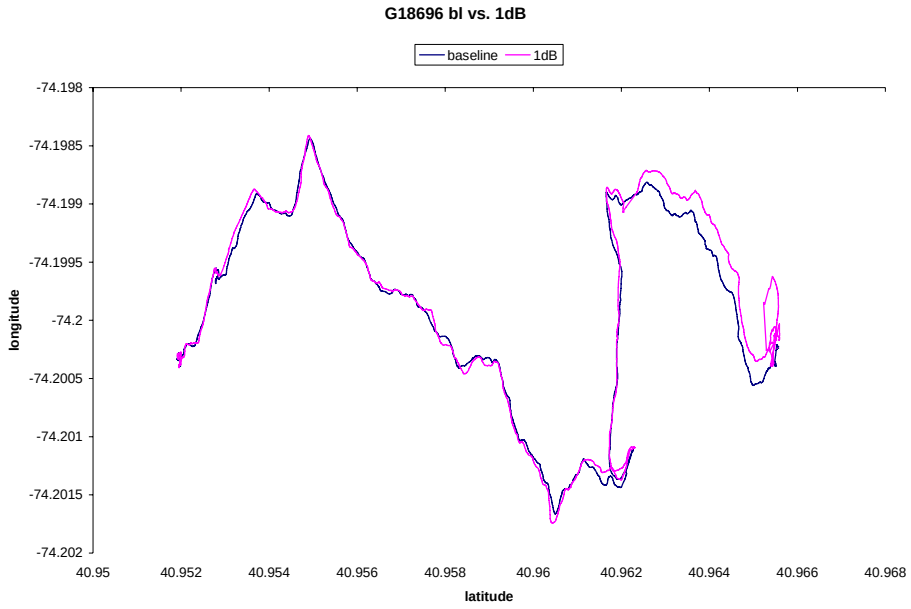
G15343 DEEP WOODS

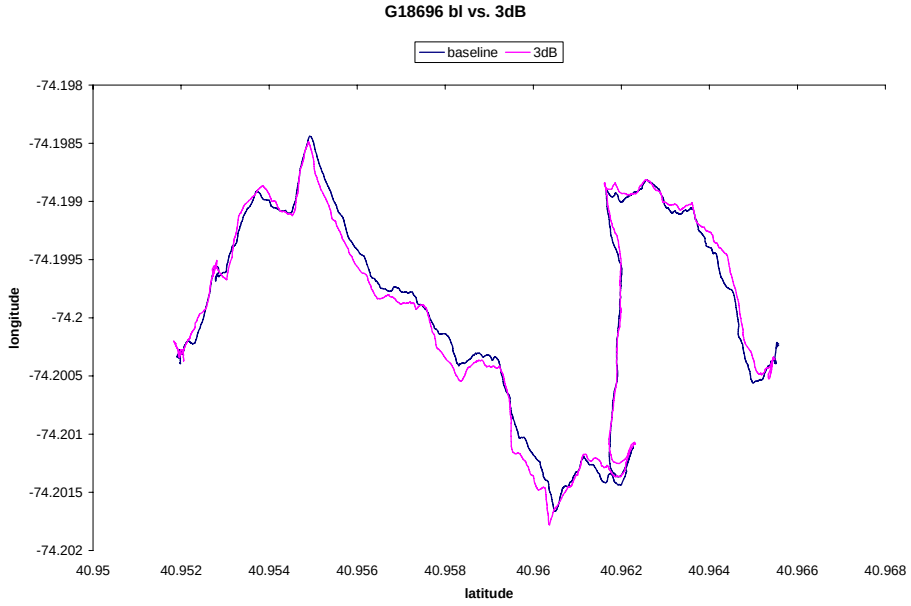


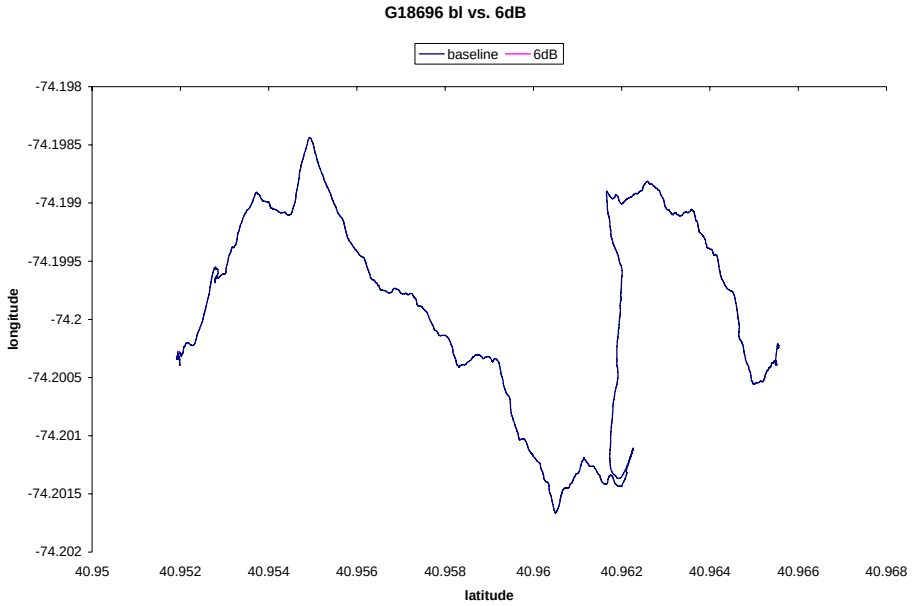



G15343 DEEP WOODS bl vs. 10dB
baseline
10dB
-74.198
-74.1985
-74.199
-74.1995
-74.2
-74.2005
-74.201
-74.2015
-74.202
-74.2025
longitude
40.95
40.952
40.954
40.956
40.958
40.96
40.962
40.964
40.966
40.968
latitude

G18696 DEEPWOODS NVP






G18696 bl vs. 6dB
baseline
6dB
-74.198
-74.1985
-74.199
-74.1995
-74.2
-74.2005
-74.201
-74.2015
-74.202
longitude
40.95
40.952
40.954
40.956
40.958
40.96
40.962
40.964
40.966
40.968
latitude

NAVIGATION POSITION AND VELOCITY

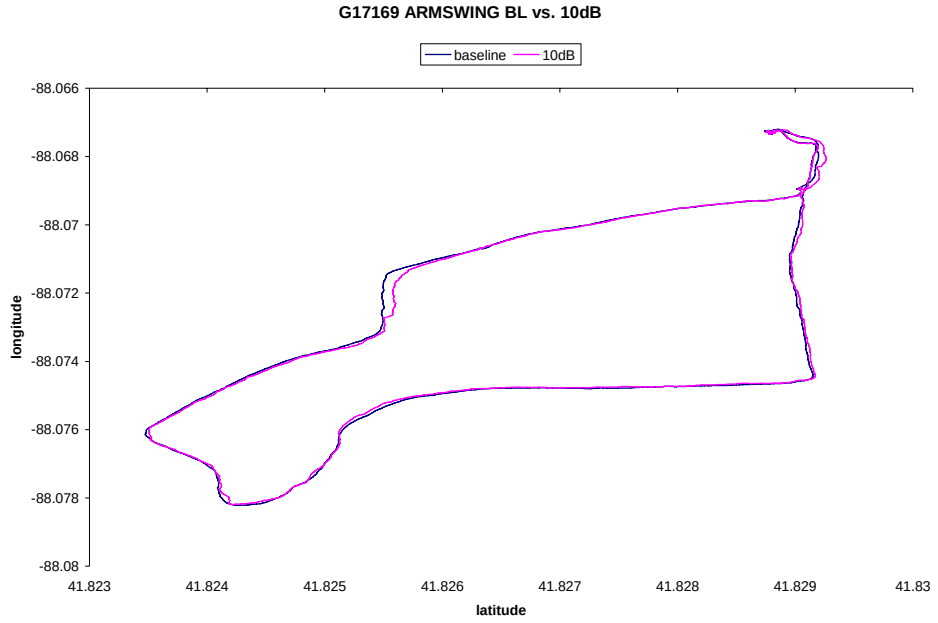
ARMSWING

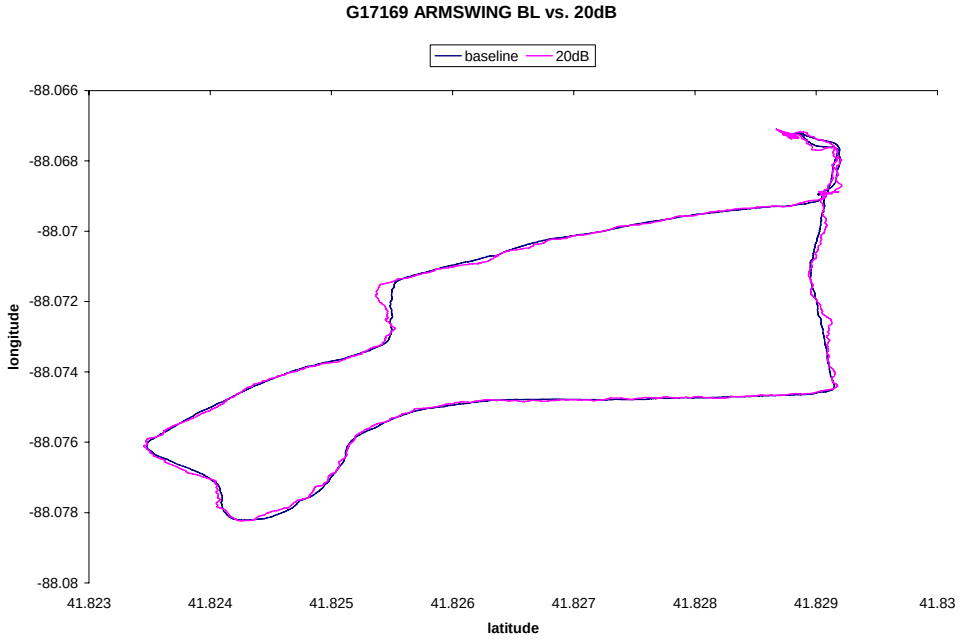
Navigation Position and Velocity Summary

ARMSWING

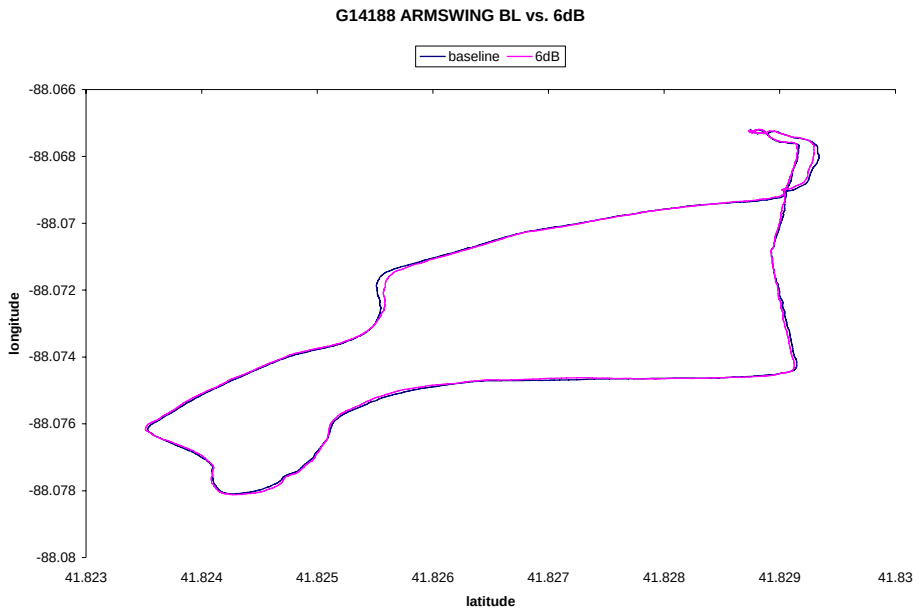
DUT	1db	3db	6db	10db	20db	Notes
G17169	X	X	X	✓	✓	x = no data, test waived by vendor
G14188	X	X	✓	✓	✓	x = no data, test waived by vendor

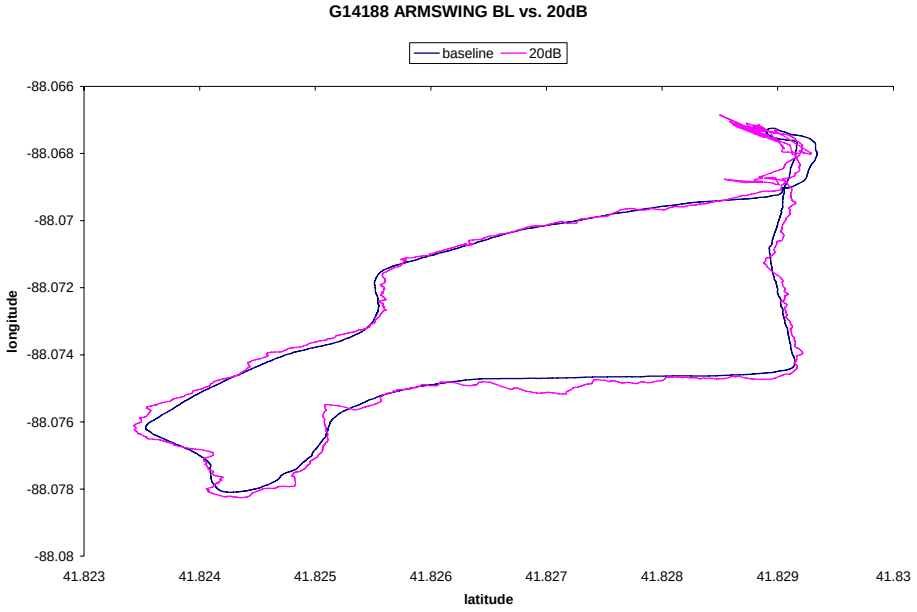
G17169 ARMSWING





G14188 ARMSWING



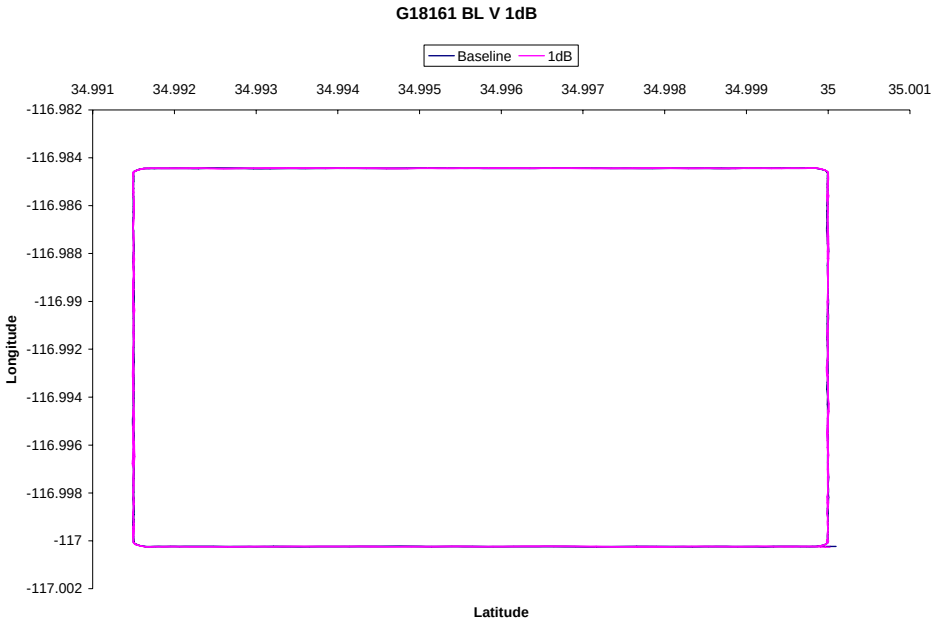

G14188 ARMSWING BL vs. 20dB
baseline
20dB
-88.066
-88.068
-88.07
-88.072
-88.074
-88.076
-88.078
-88.08
longitude
41.823
41.824
41.825
41.826
41.827
41.828
41.829
41.83
latitude

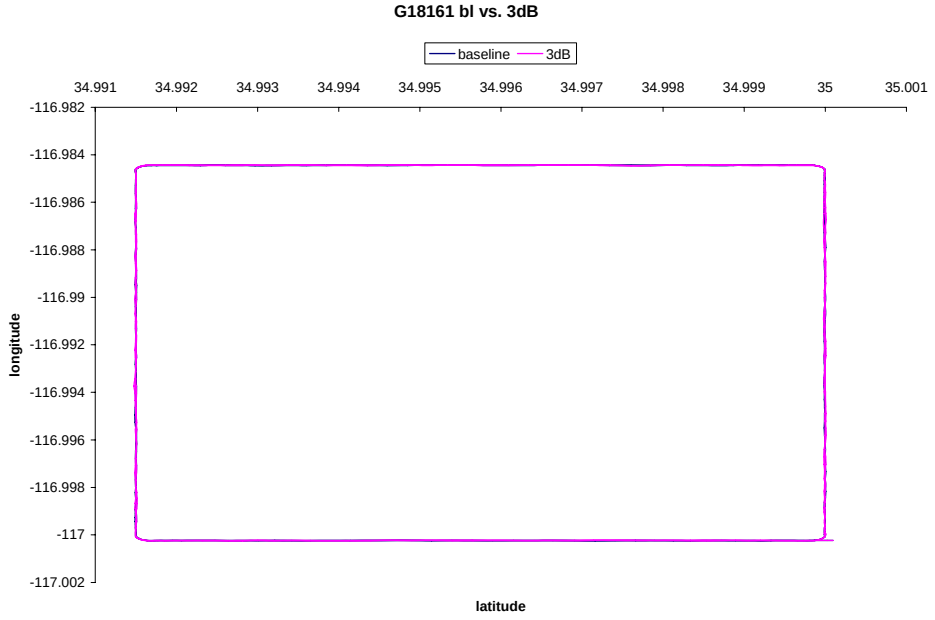
SIMULATED POSITION AND VELOCITY

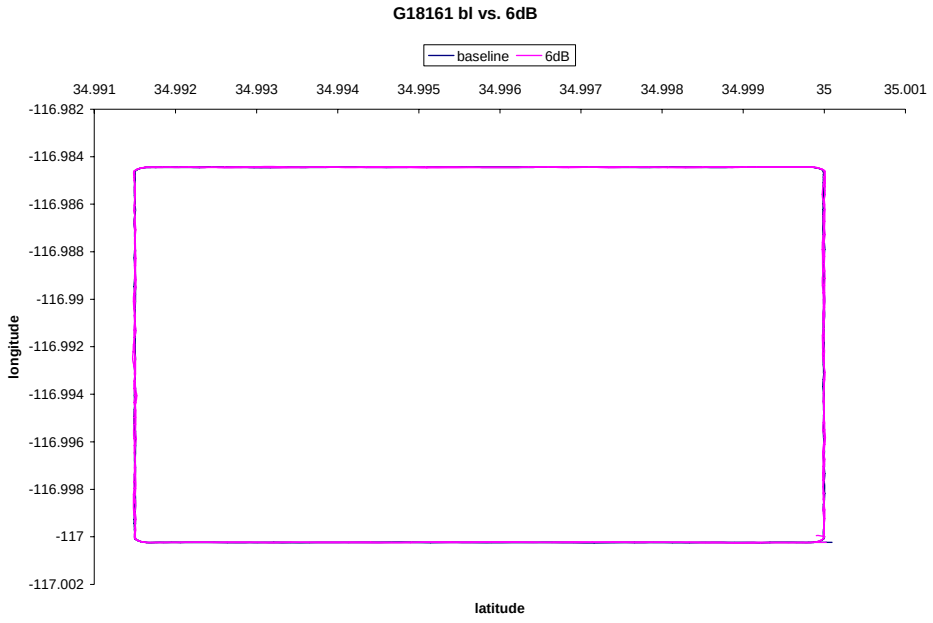
Simulated Position and Velocity Summary

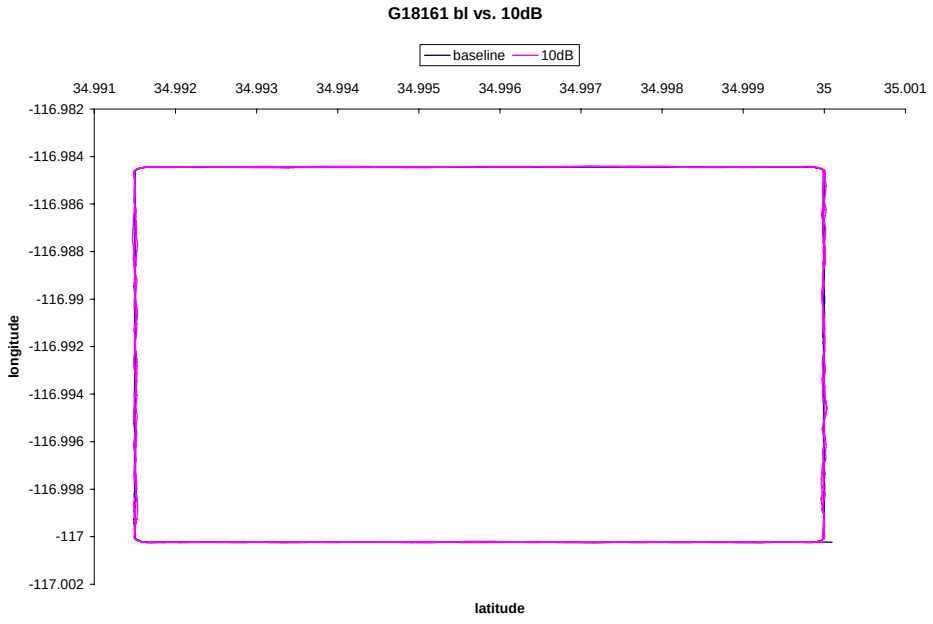
DUT	1db	3db	6db	10db	20db	Notes
G12586	✓	✓	✓	✓	✓	
G17641	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G10195	✓	✓	✓	✓	✓	
G15448	✓	✓	✓	✓	✓	
G10968	✓	✓	✓	✓	✓	
G16449	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G18696	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G15343	✓	✓	✓	✓	✓	
G14188	✓	✓	✓	✓	✓	
G17169	✓	✓	✓	✓	✓	
G12559	✓	✓	✓	✓	✓	
G14666	✓	✓	✓	✓	✓	
P14730	✓	✓	✓	✓	X	x = no data, test waived by vendor
G10607	✓	✓	✓	LOF	LOF	LOF = Loss of Fix
G15028	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G14298	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G13445	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G11207	X	X	LOF	LOF	LOF	X = test performed but data not valid
G12867	✓	✓	✓	✓	✓	
G17783	✓	✓	✓	✓	LOF	LOF = Loss of Fix
P17655	✓	✓	✓	✓	LOF	LOF = Loss of Fix
P13275	X	X	✓	✓	X	X = test performed but data not valid
G16534	✓	✓	✓	✓	X	x = no data, test waived by vendor
G18161	✓	✓	✓	✓	X	x = no data, test waived by vendor
P14949	X	X	X	X	X	X = test performed but data not valid
P18892	✓	✓	✓	✓	X	x = no data, test waived by vendor
P15427	✓	✓	✓	✓	LOF	LOF = Loss of Fix
G18062	X	X	X	X	X	X = missing cable, test not performed
G16382	✓	✓	X	X	LOF	LOF = Loss of Fix x = no data, test waived by vendor

G18161

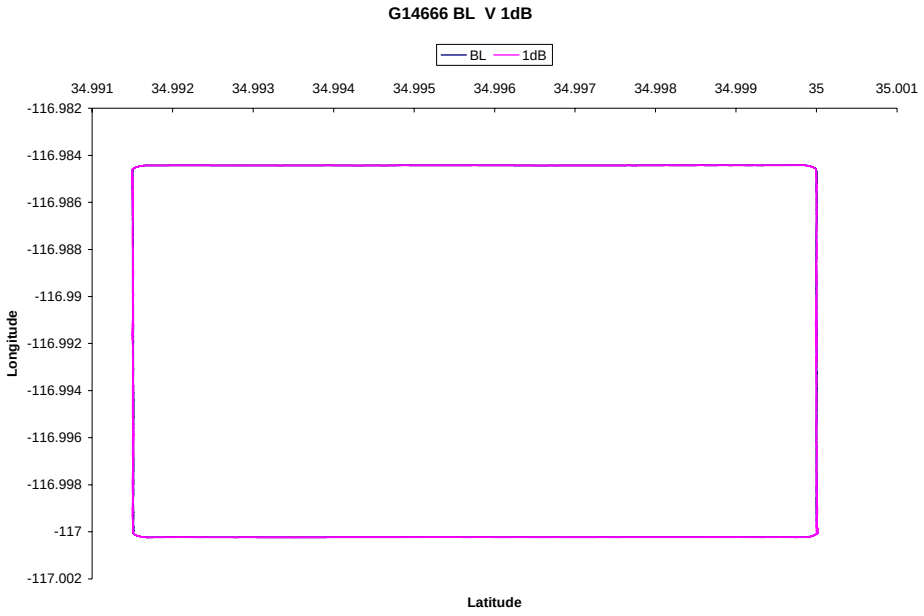

G18161 BL V 1dB
Baseline
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

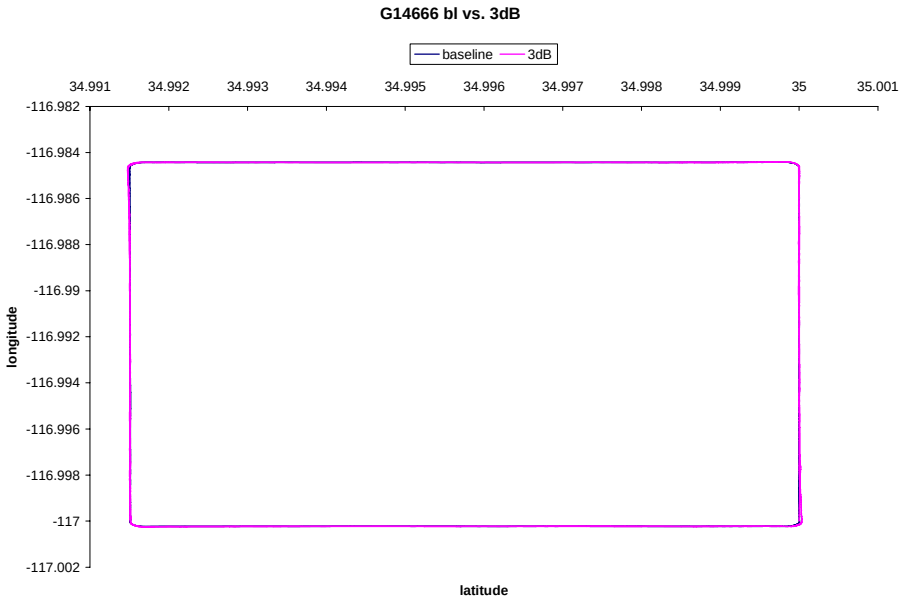

G18161 bl vs. 3dB
baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G18161 bl vs. 6dB
baseline
6dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

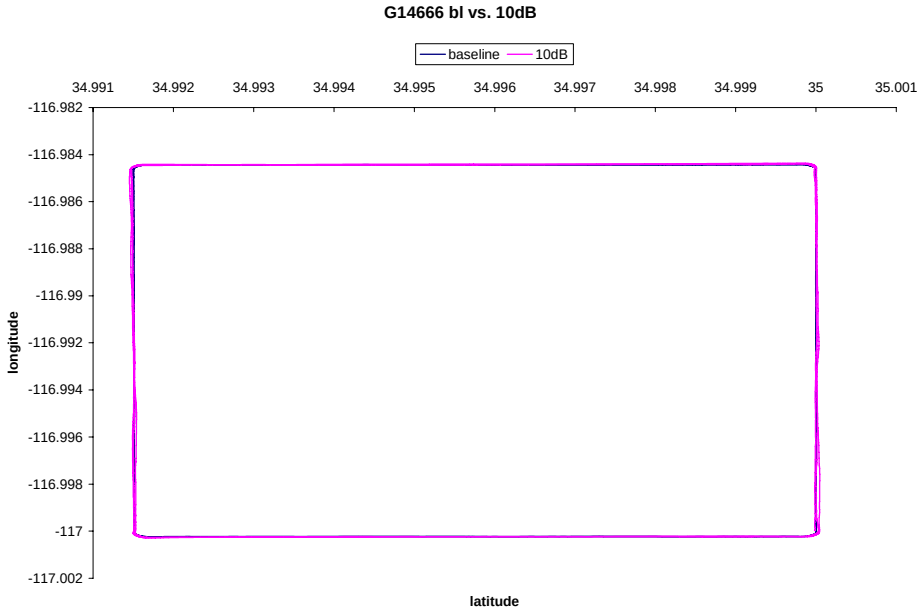

G18161 bl vs. 10dB
baseline
10dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

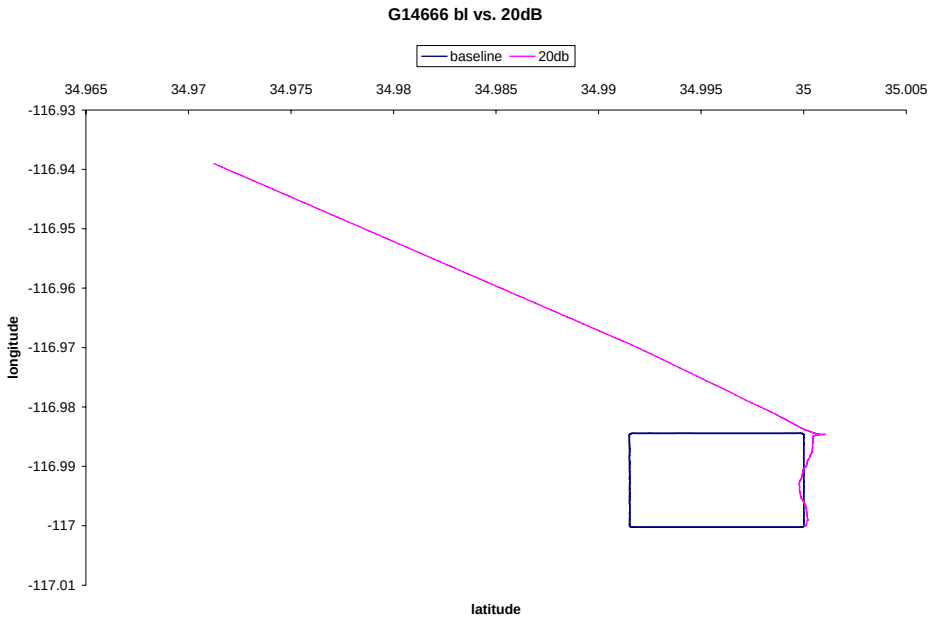
G14666


G14666 BL V 1dB
BL
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

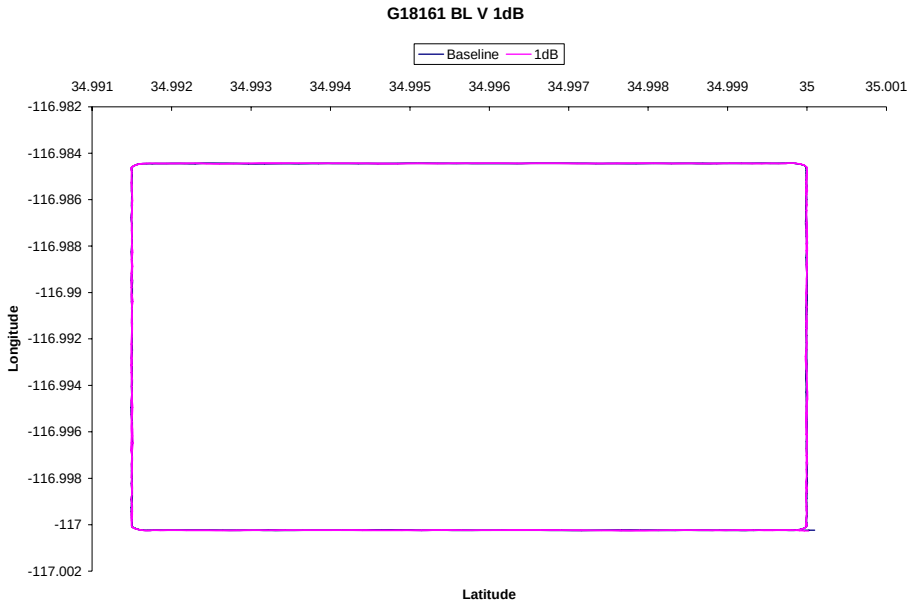

G14666 bl vs. 3dB
baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

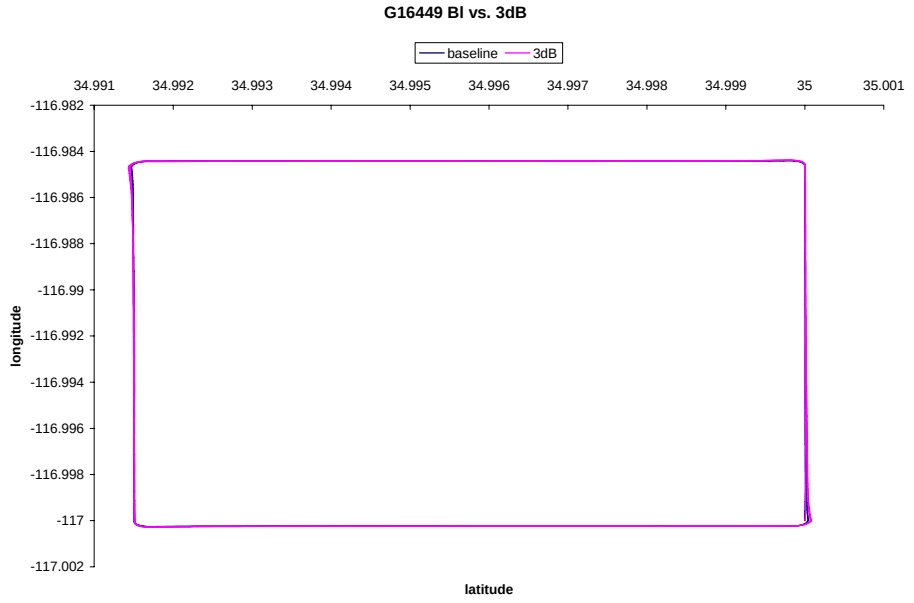
G14666 BL V 6 Db
Baseline
6dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

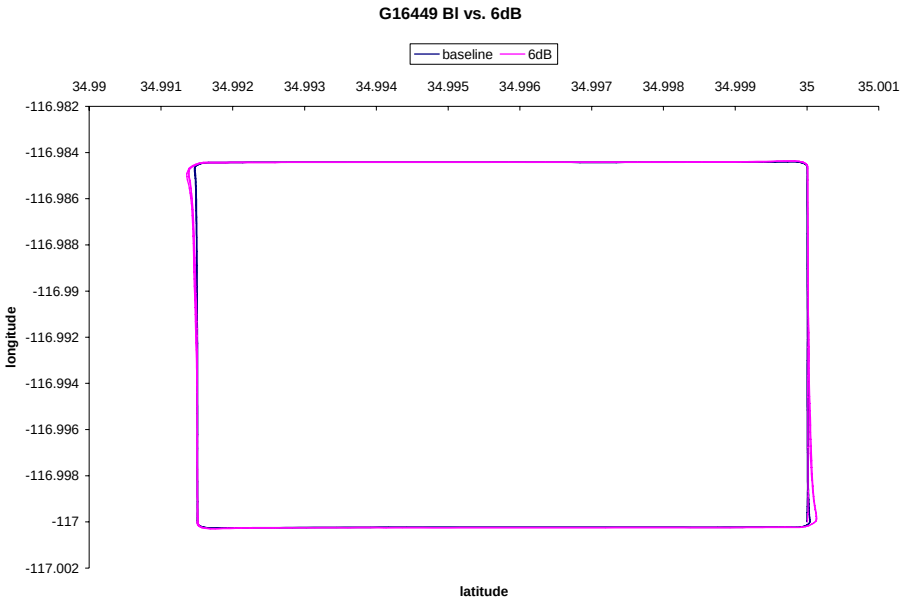

G14666 bl vs. 10dB
baseline
10dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

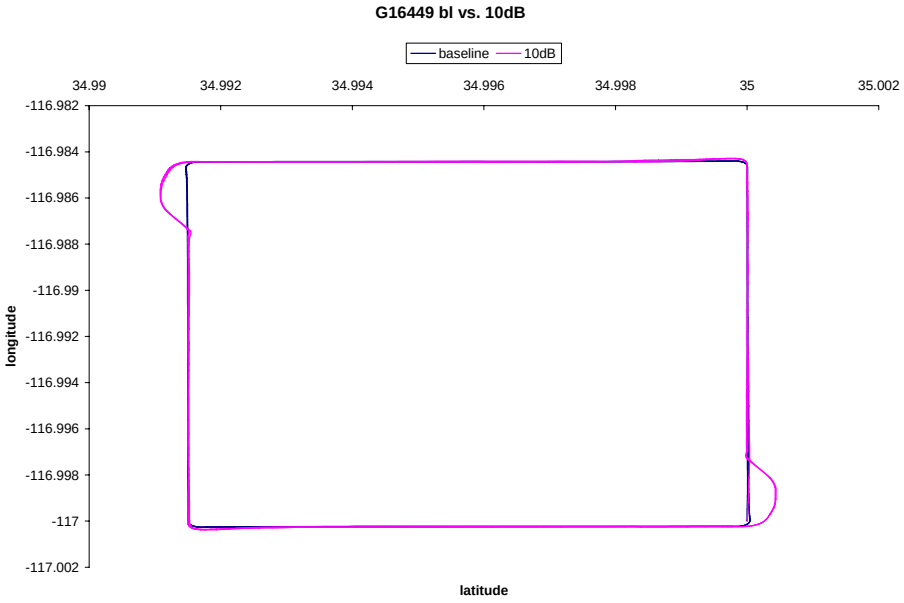

G14666 bl vs. 20dB
baseline
20db
34.965
34.97
34.975
34.98
34.985
34.99
34.995
35
35.005
-116.93
-116.94
-116.95
-116.96
-116.97
-116.98
-116.99
-117
-117.01
longitude
latitude

G16449

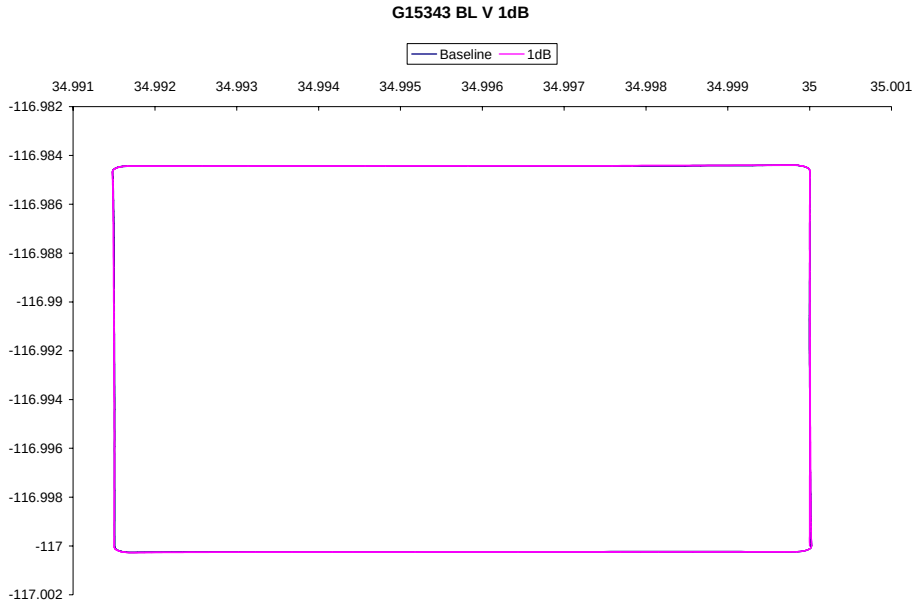

G18161 BL V 1dB
Baseline
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

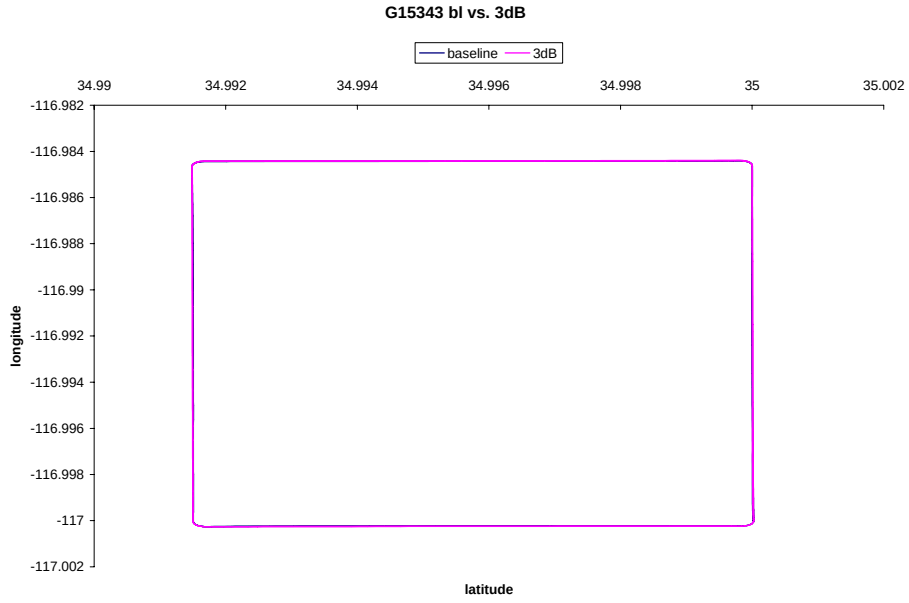

G16449 Bl vs. 3dB
baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

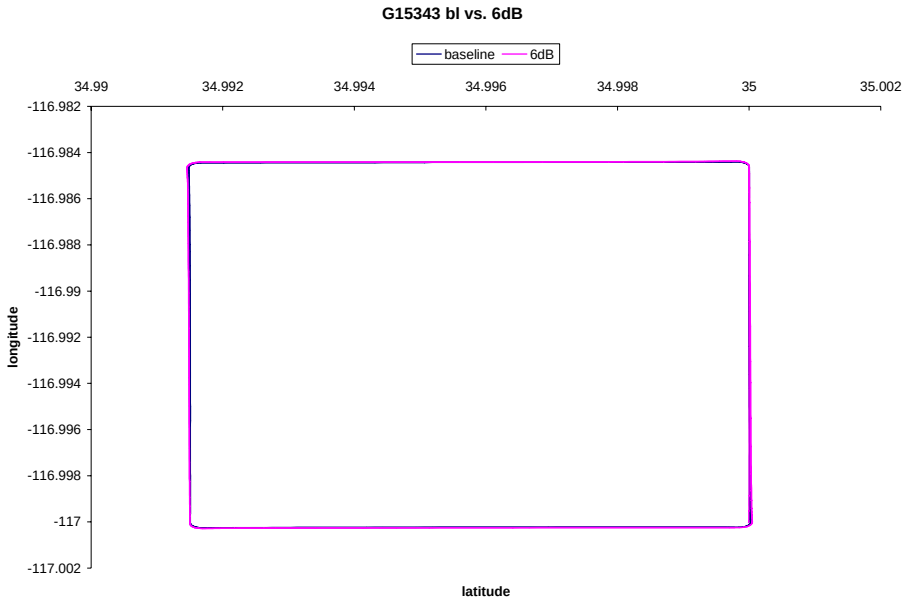

G16449 Bl vs. 6dB
baseline
6dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

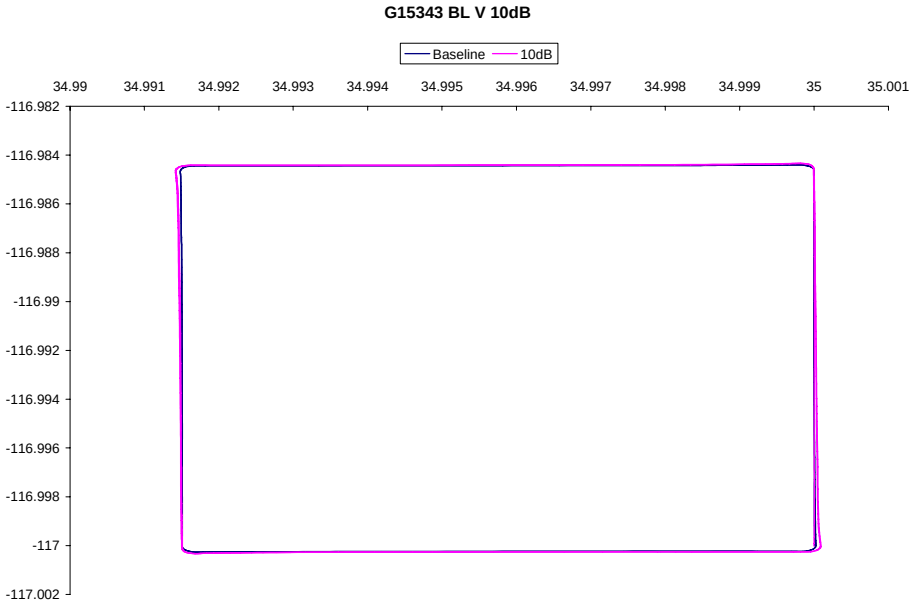

G16449 bl vs. 10dB
baseline
10dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

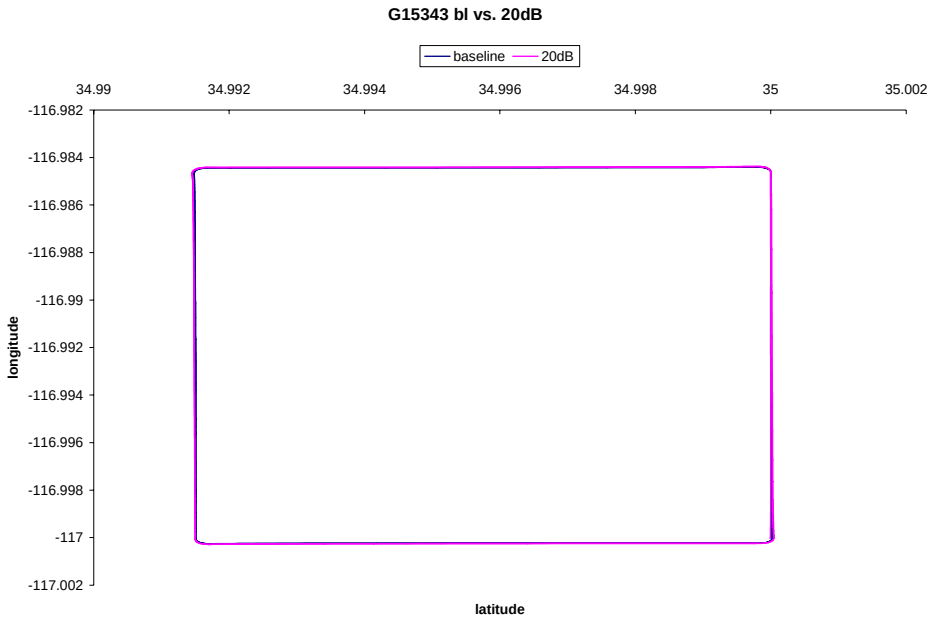
G15343


G15343 BL V 1dB
Baseline
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002

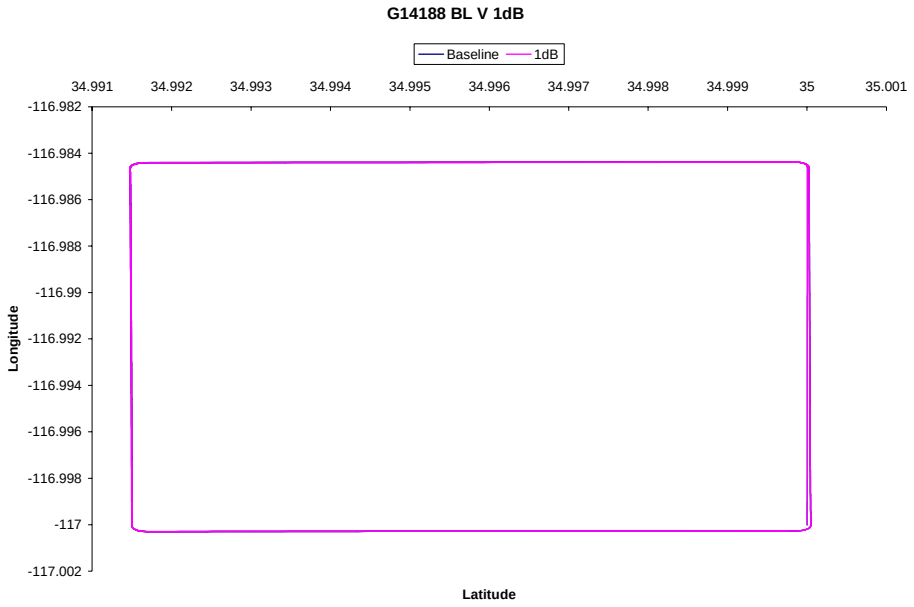

G15343 bl vs. 3dB
baseline
3dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

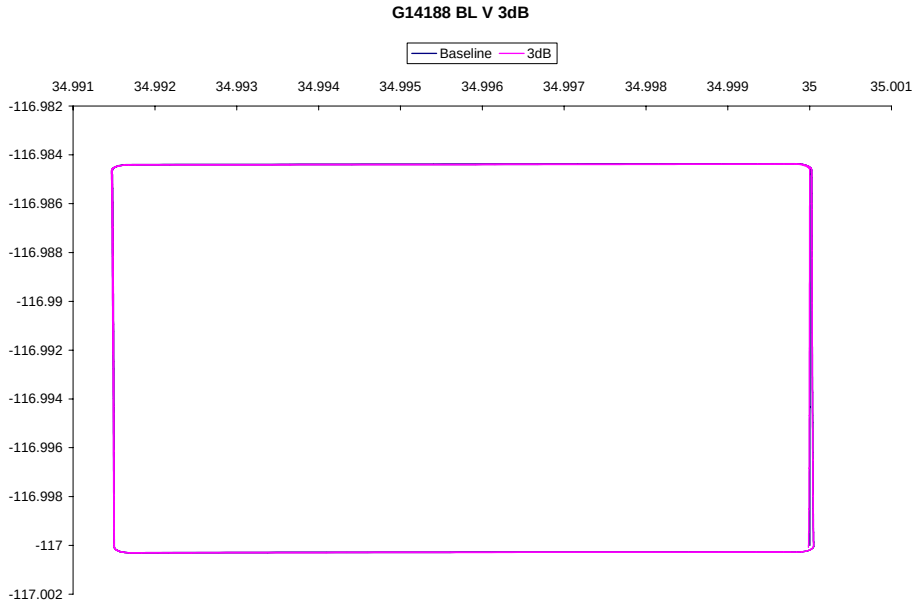

G15343 bl vs. 6dB
baseline
6dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

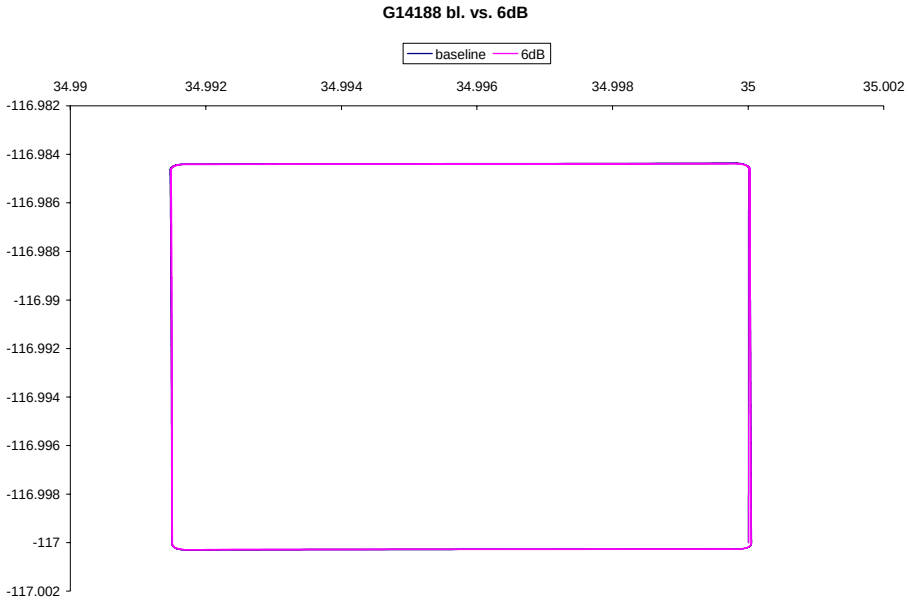

G15343 BL V 10dB
Baseline
10dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002


G15343 bl vs. 20dB
baseline
20dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

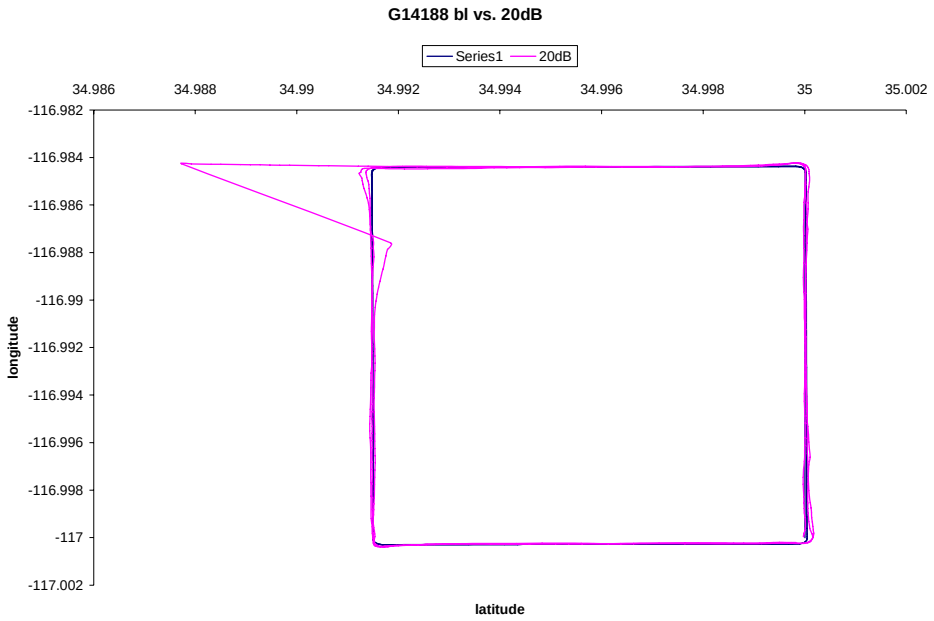
G14188


G14188 BL V 1dB
Baseline
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

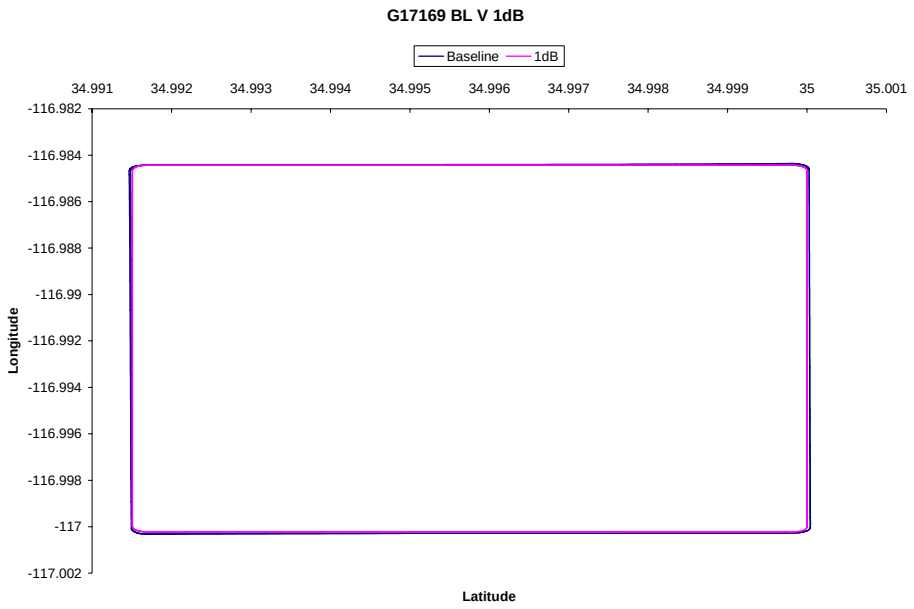

G14188 BL V 3dB
Baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002

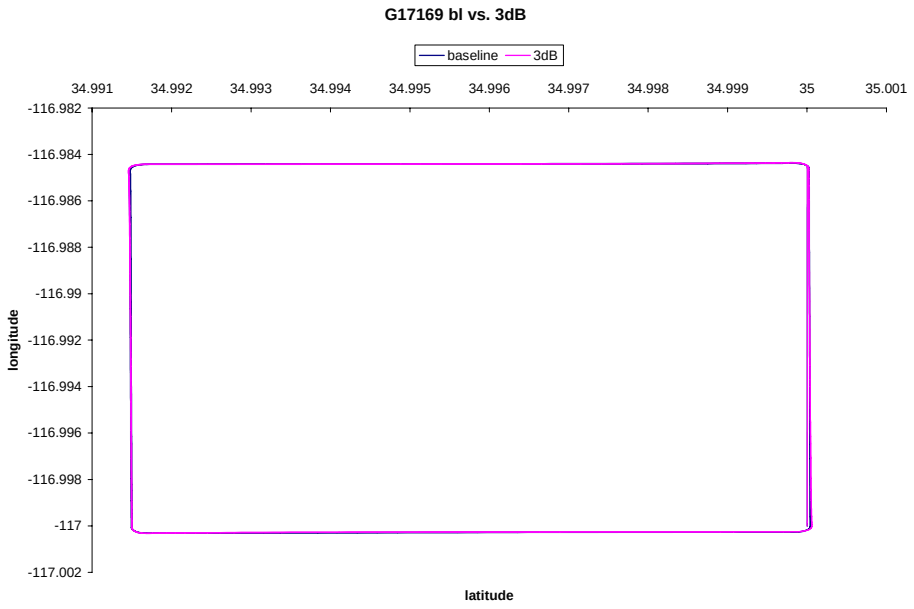

G14188 bl. vs. 6dB
baseline
6dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002

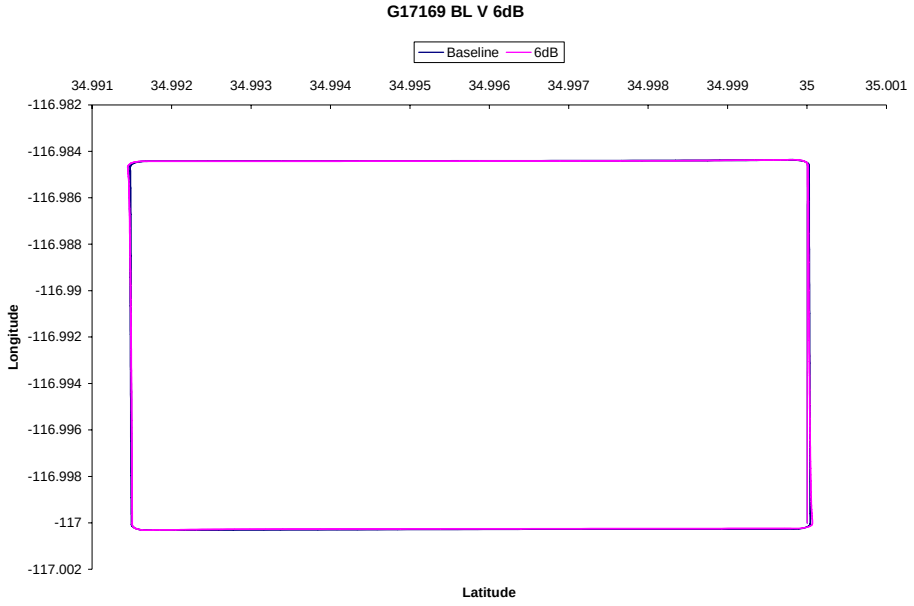
G14188 bl vs. 10dB
baseline
10dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

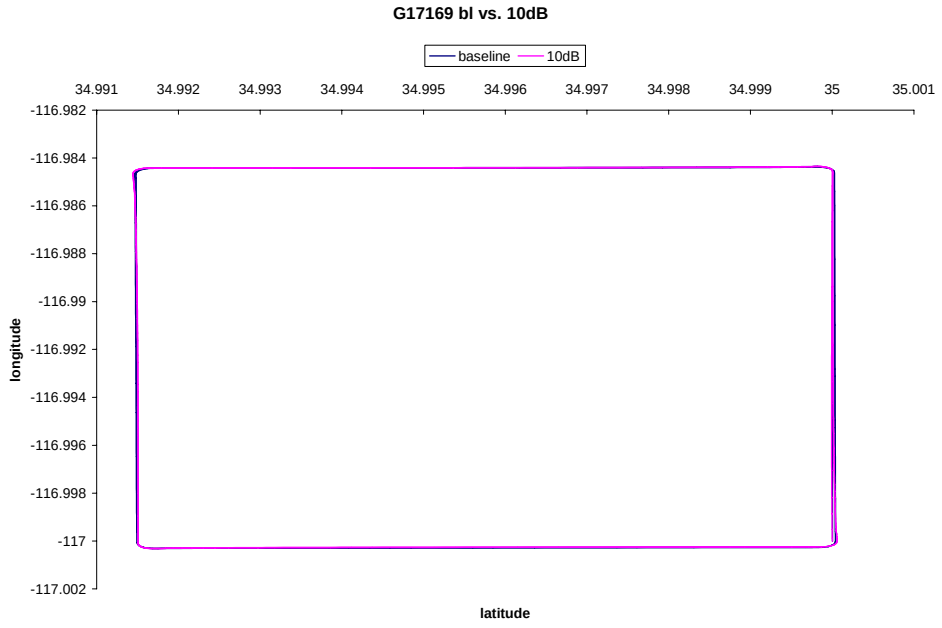

G14188 bl vs. 20dB
Series1
20dB
34.986
34.988
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

G17169


G17169 BL V 1dB
Baseline
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

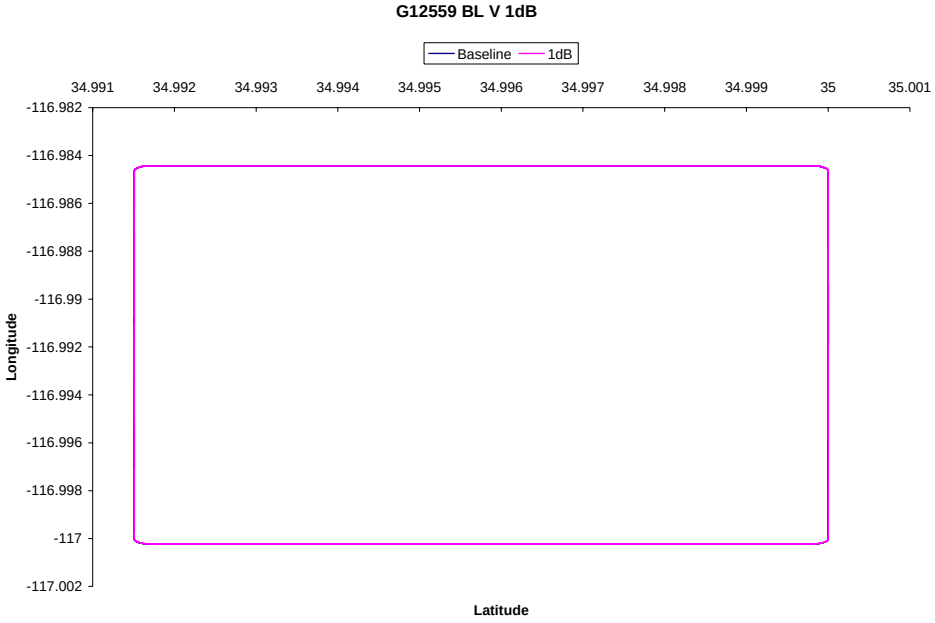

G17169 bl vs. 3dB
baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G17169 BL V 6dB
Baseline
6dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G17169 bl vs. 10dB
baseline
10dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

G17169 bl vs. 20dB
baseline
20dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

G12559


G12559 BL V 1dB
Baseline
1dB
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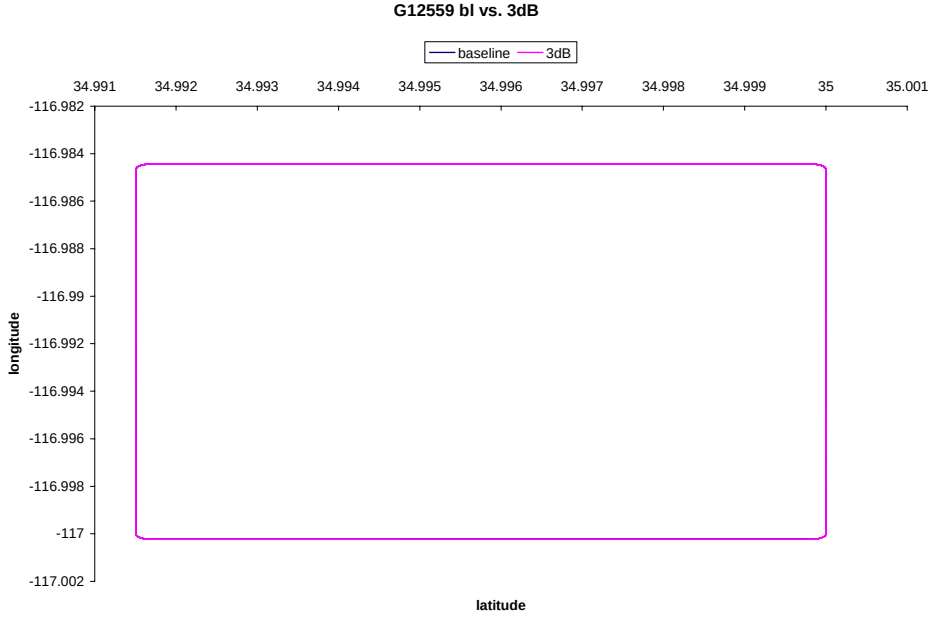
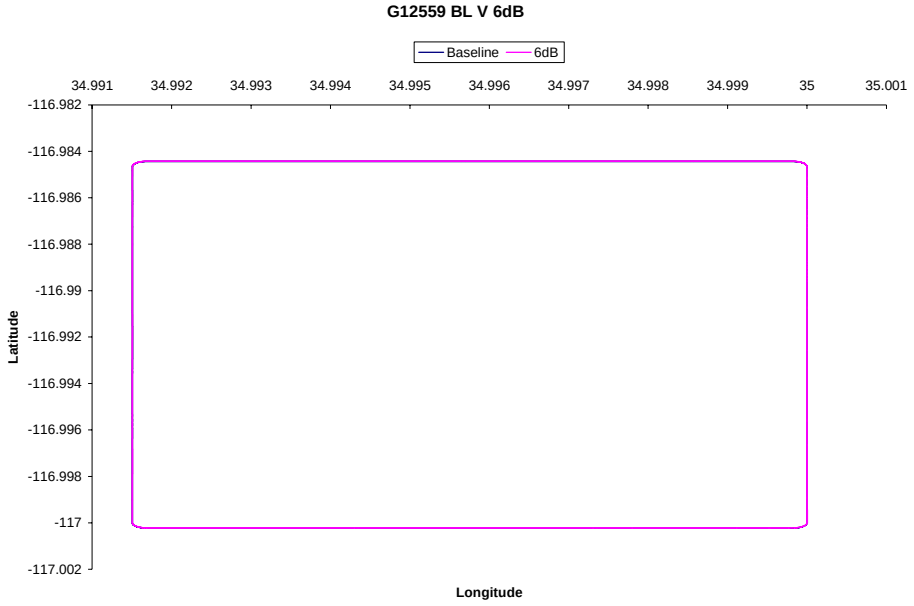
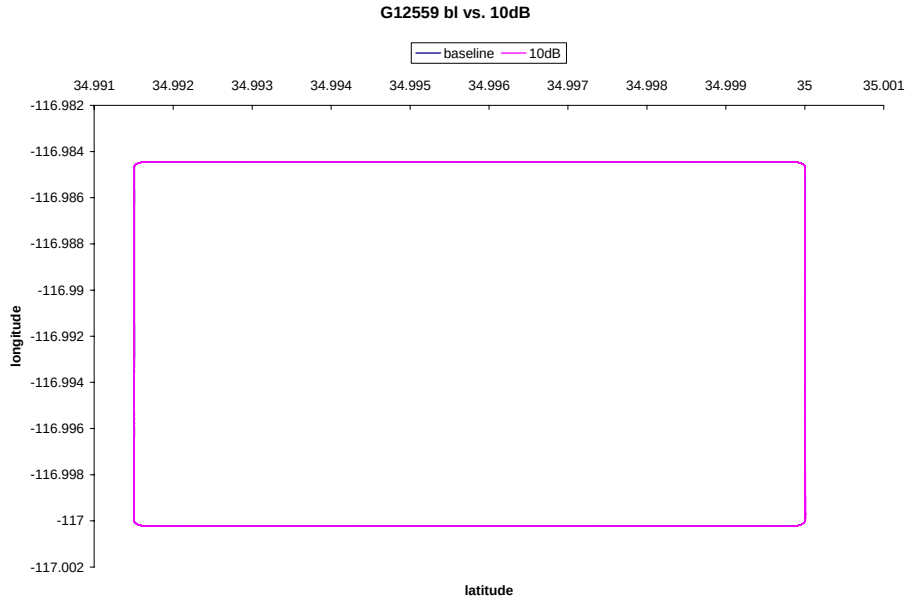
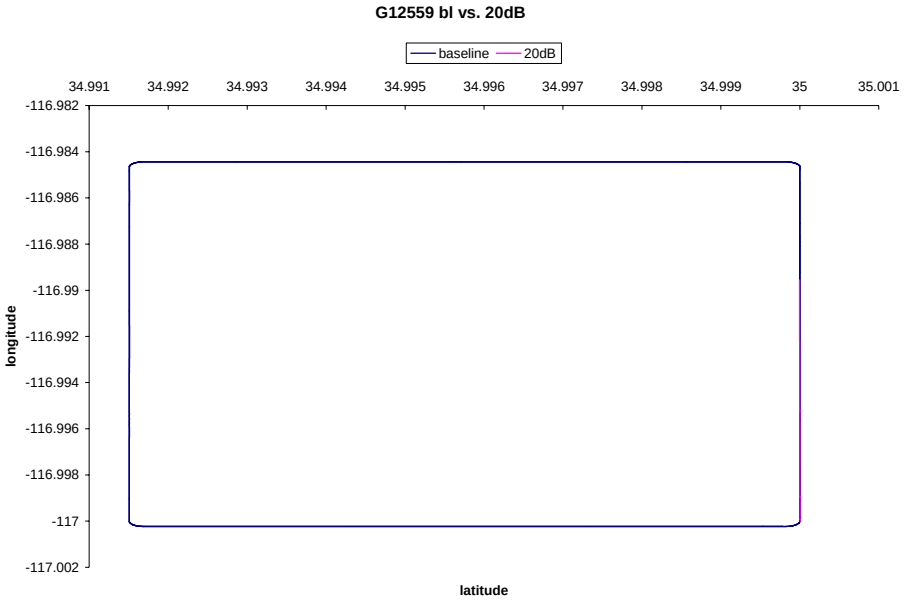
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G12559 bl vs. 3dB
baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G12559 BL V 6dB
Baseline
6dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Latitude
Longitude


G12559 bl vs. 10dB
baseline
10dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G12559 bl vs. 20dB
baseline
20dB
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34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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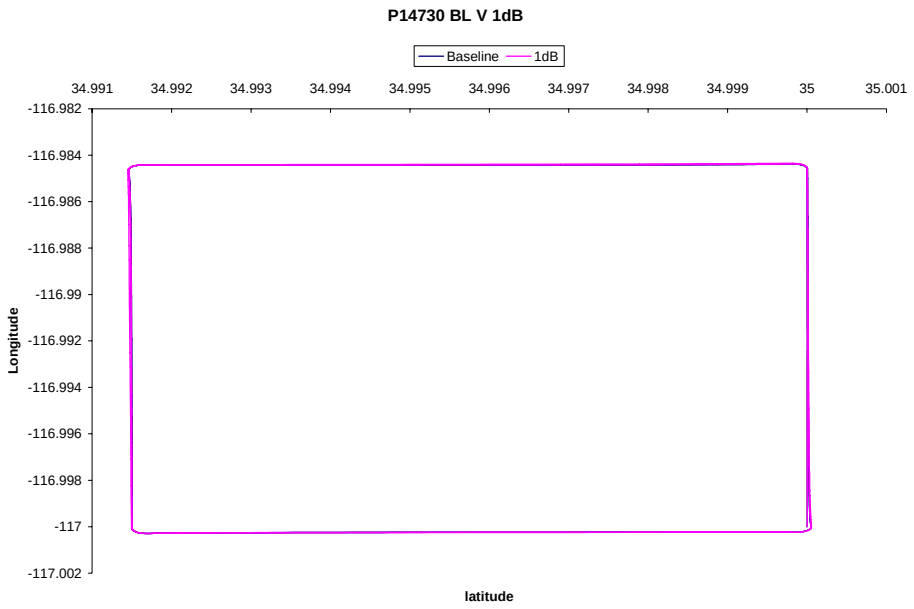
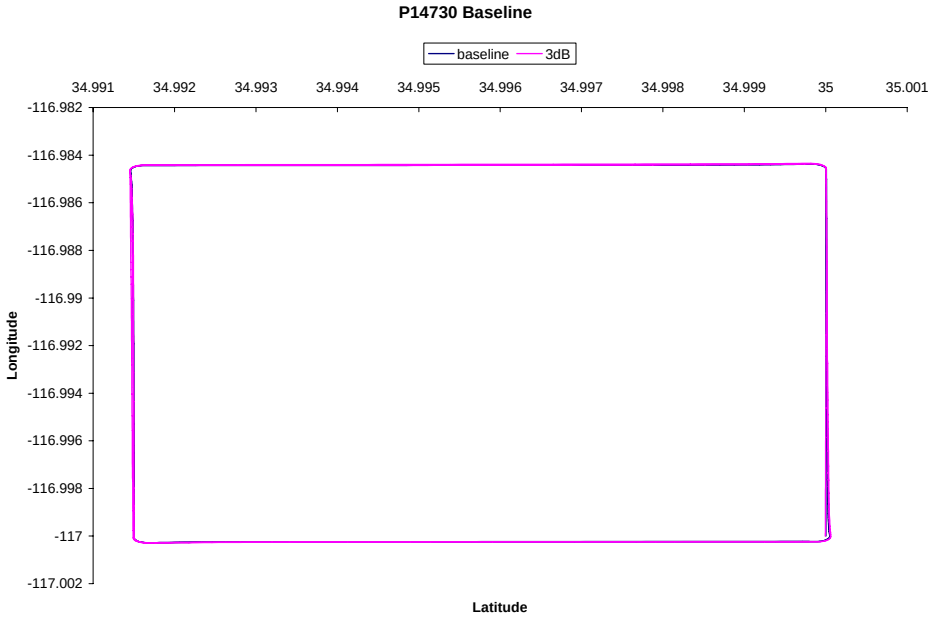
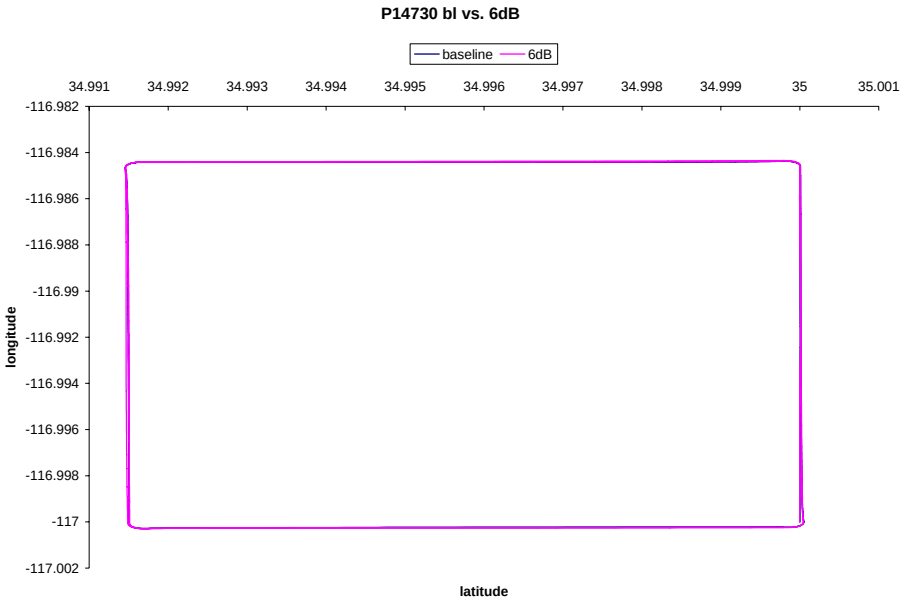
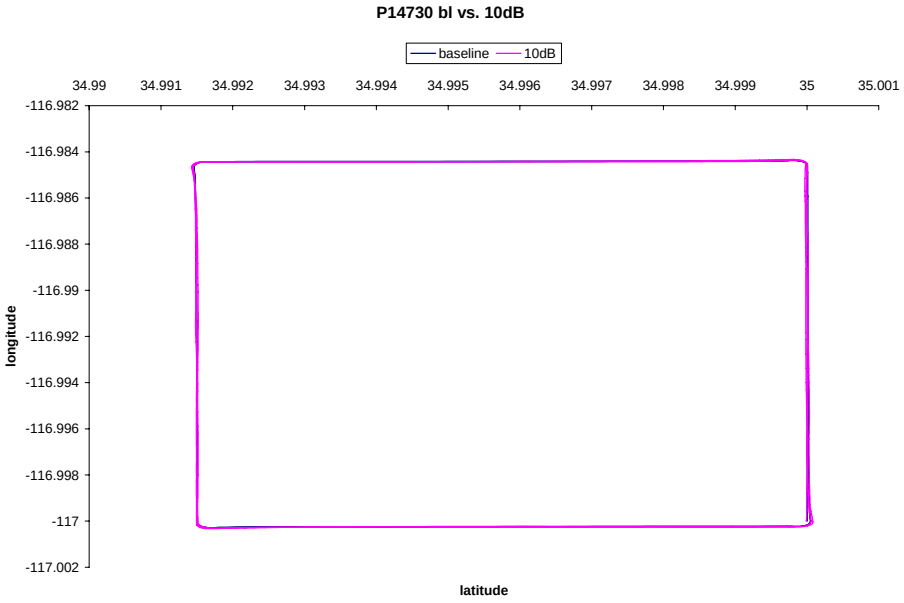
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

P14730

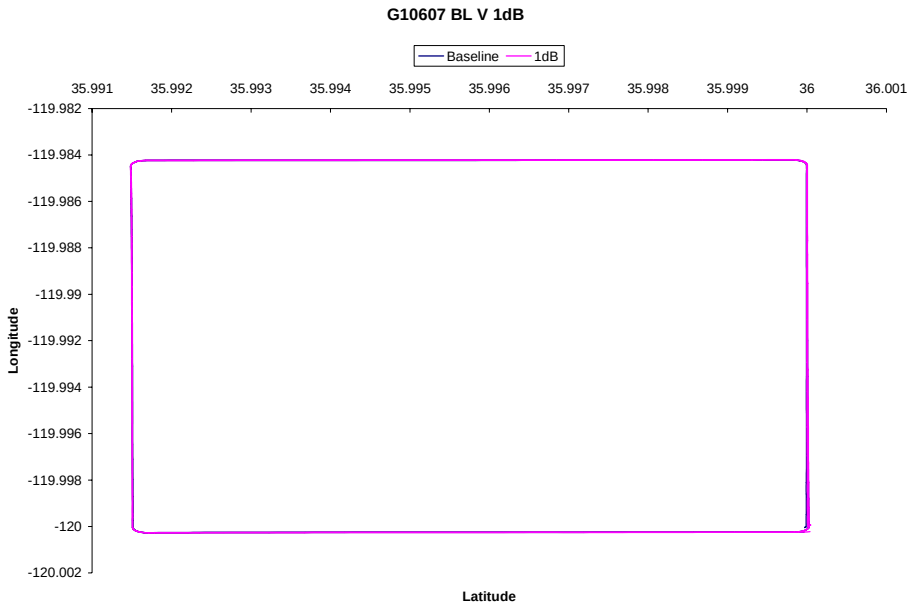

P14730 BL V 1dB
Baseline
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
latitude

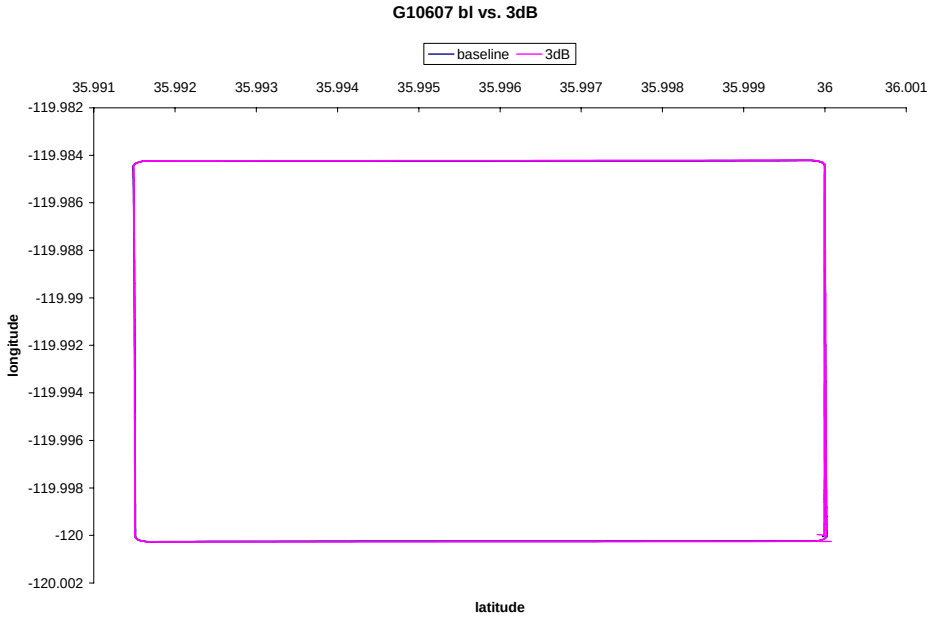

P14730 Baseline
baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

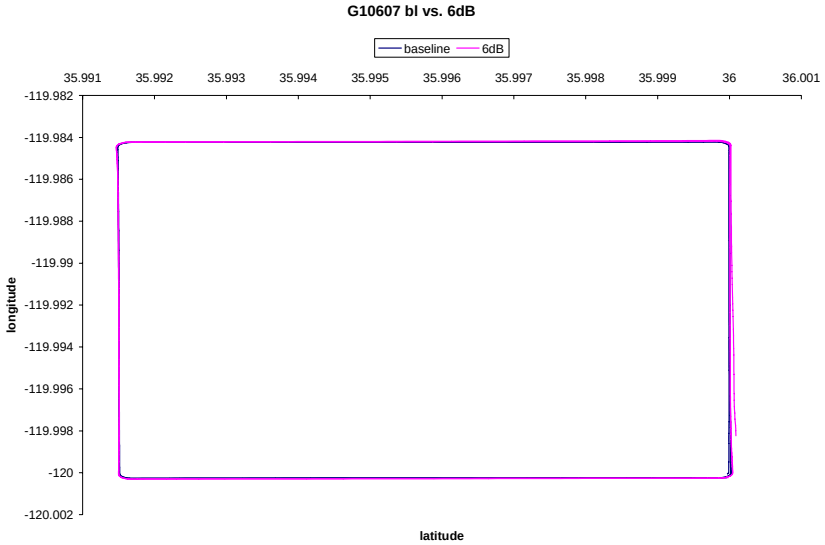

P14730 bl vs. 6dB
baseline
6dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


P14730 bl vs. 10dB
baseline
10dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

G10607


G10607 BL V 1dB
Baseline
1dB
35.991
35.992
35.993
35.994
35.995
35.996
35.997
35.998
35.999
36
36.001
-119.982
-119.984
-119.986
-119.988
-119.99
-119.992
-119.994
-119.996
-119.998
-120
-120.002
Longitude
Latitude


G10607 bl vs. 3dB
baseline
3dB
35.991
35.992
35.993
35.994
35.995
35.996
35.997
35.998
35.999
36
36.001
-119.982
-119.984
-119.986
-119.988
-119.99
-119.992
-119.994
-119.996
-119.998
-120
-120.002
longitude
latitude


G10607 bl vs. 6dB
baseline
6dB
35.991
35.992
35.993
35.994
35.995
35.996
35.997
35.998
35.999
36
36.001
-119.982
-119.984
-119.986
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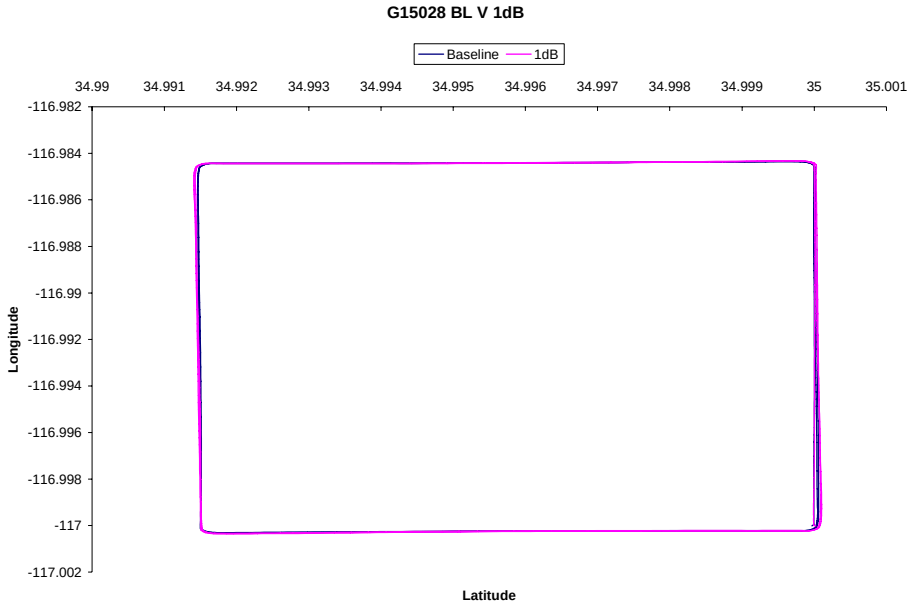
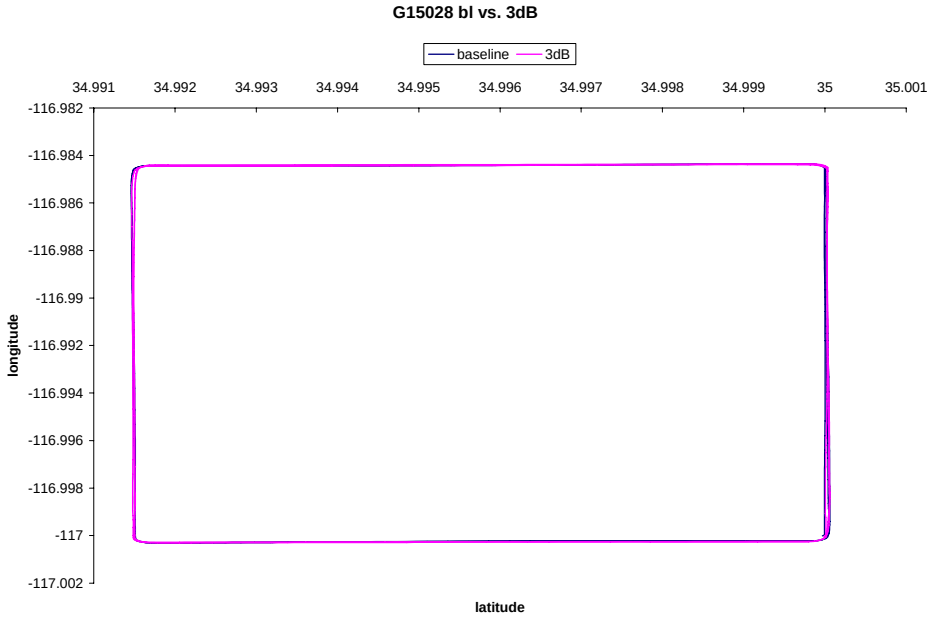
-119.992
-119.994
-119.996
-119.998
-120
-120.002
longitude
latitude

G15028


G15028 BL V 1dB
Baseline
1dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G15028 bl vs. 3dB
baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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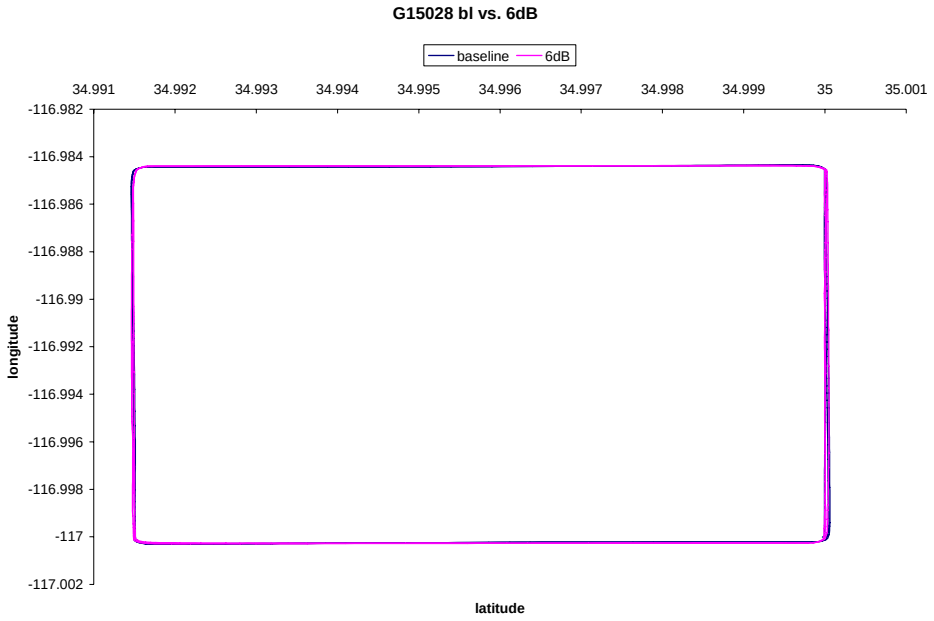
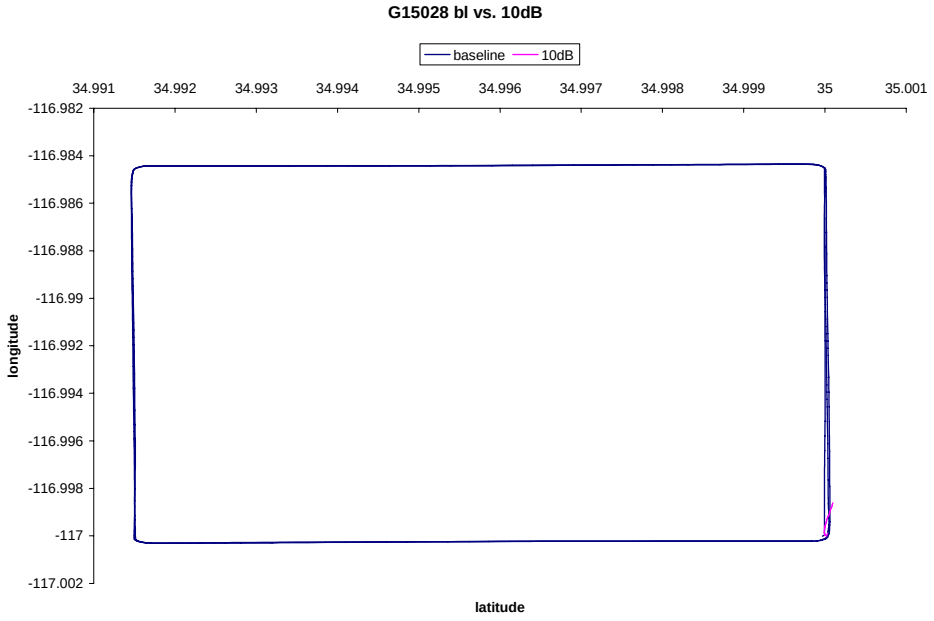
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G15028 bl vs. 6dB
baseline
6dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G15028 bl vs. 10dB
baseline
10dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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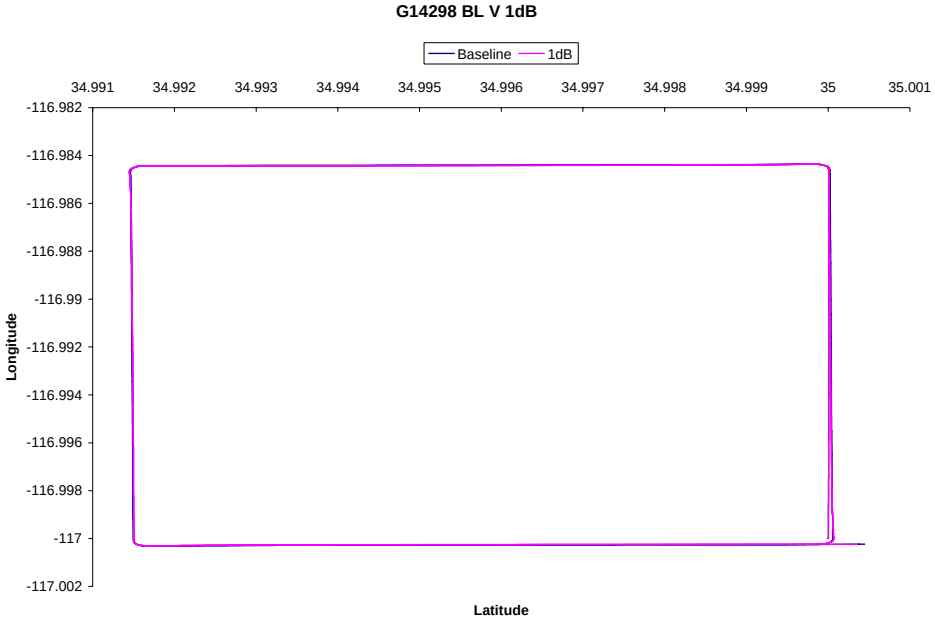
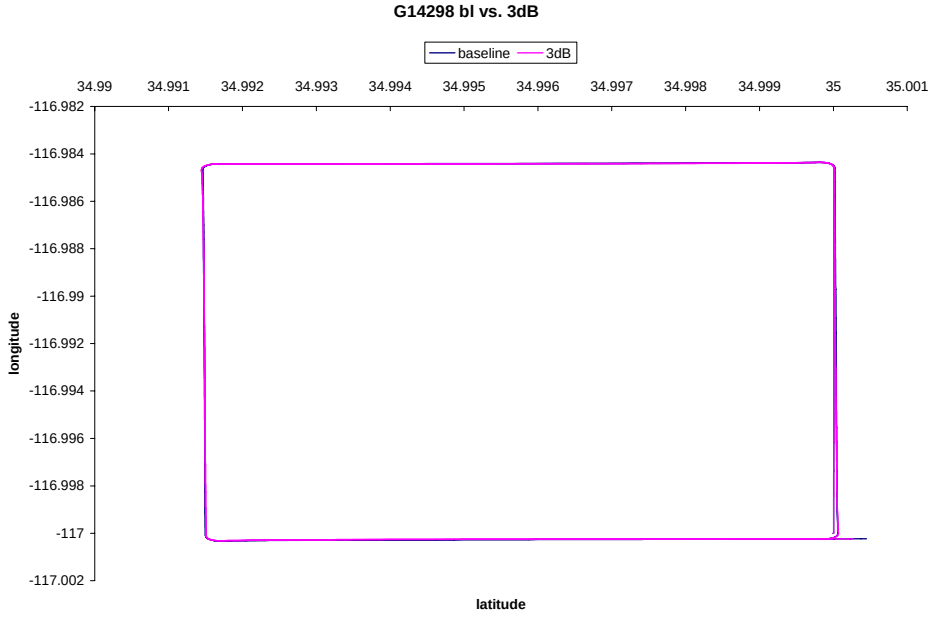
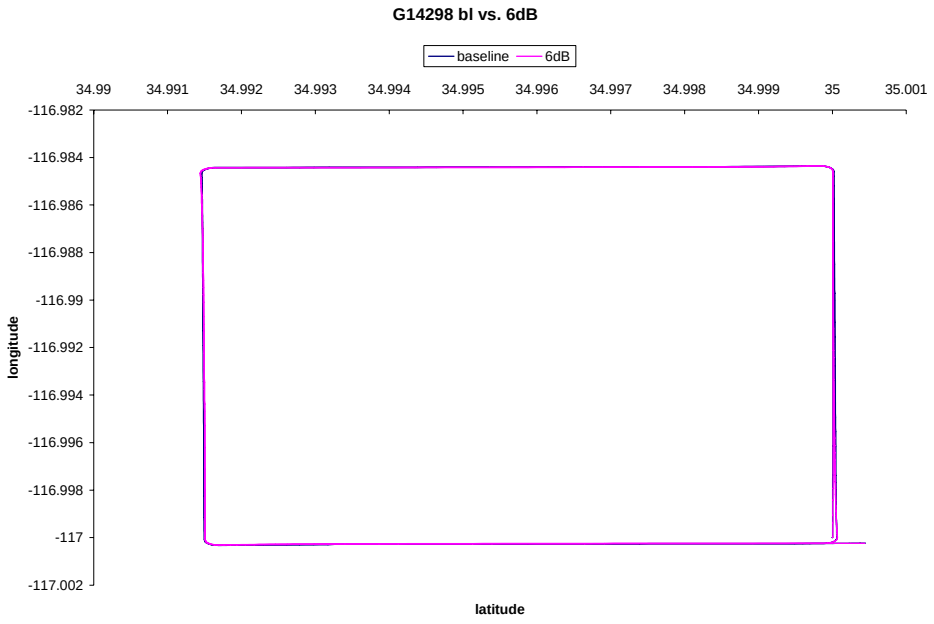
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

G14298


G14298 BL V 1dB
Baseline
1dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G14298 bl vs. 3dB
baseline
3dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G14298 bl vs. 6dB
baseline
6dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
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-116.984
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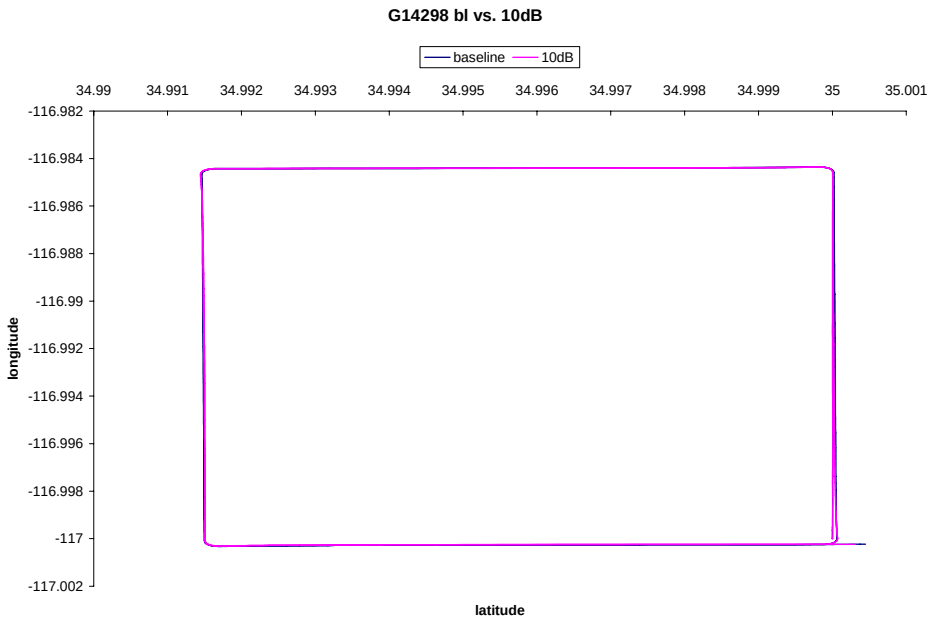
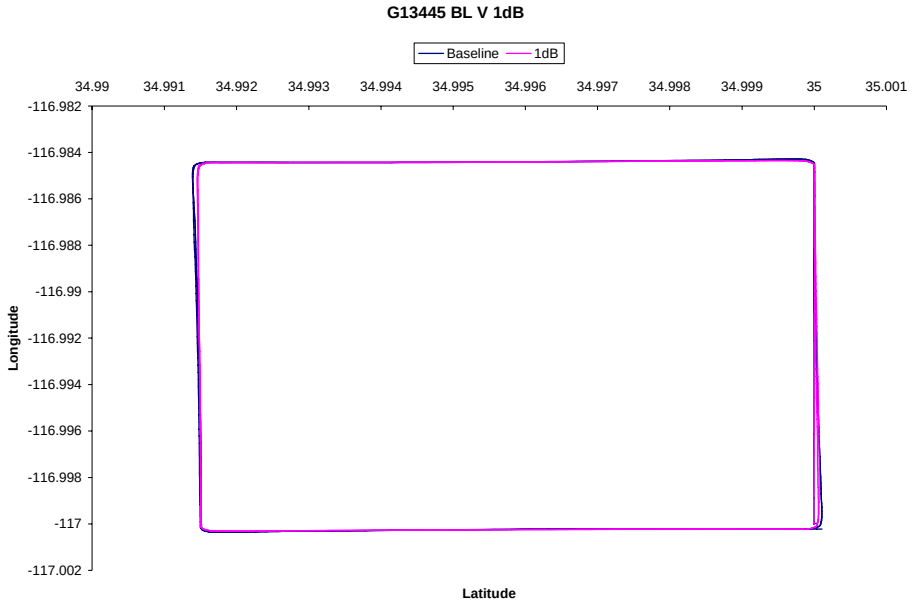
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G14298 bl vs. 10dB
baseline
10dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

G13445


G13445 BL V 1dB
Baseline
1dB
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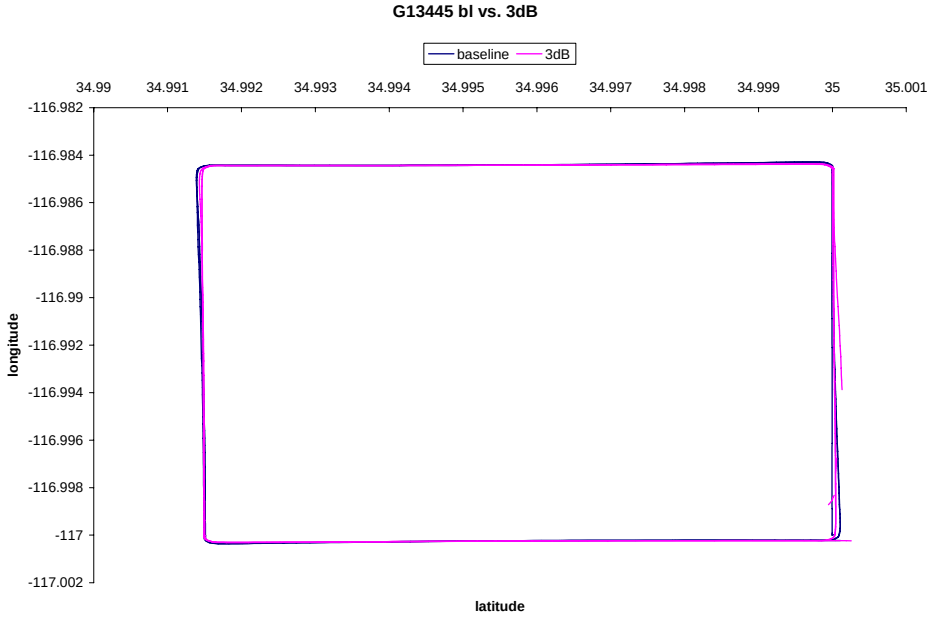
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G13445 bl vs. 3dB
baseline
3dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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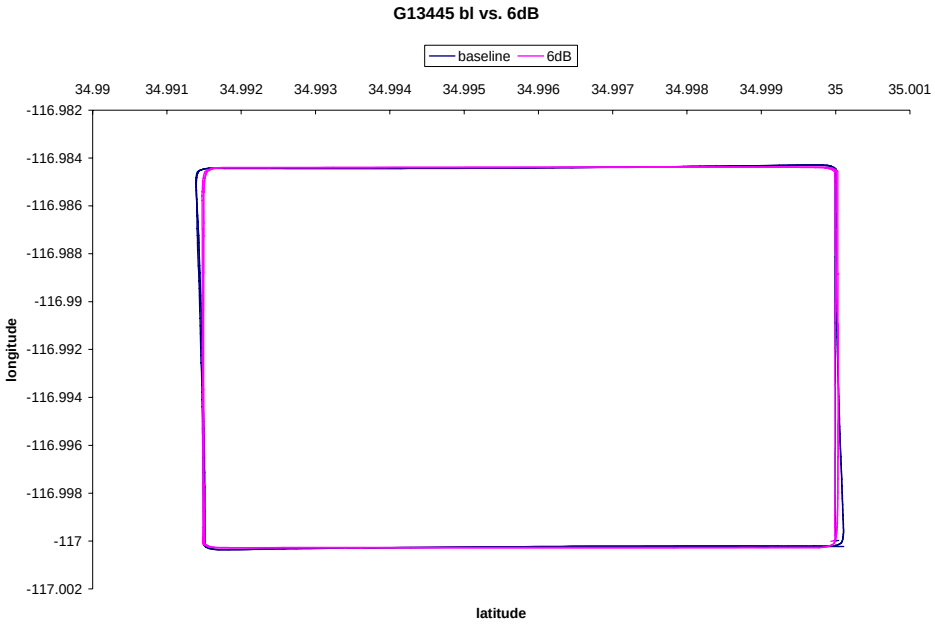
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G13445 bl vs. 6dB
baseline
6dB
34.99
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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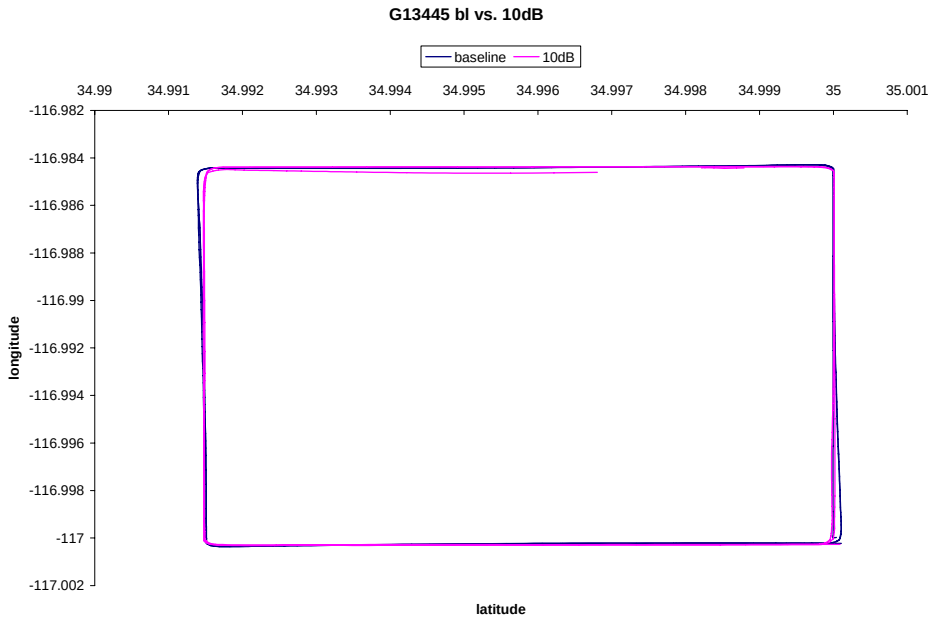
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G13445 bl vs. 10dB
baseline
10dB
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34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
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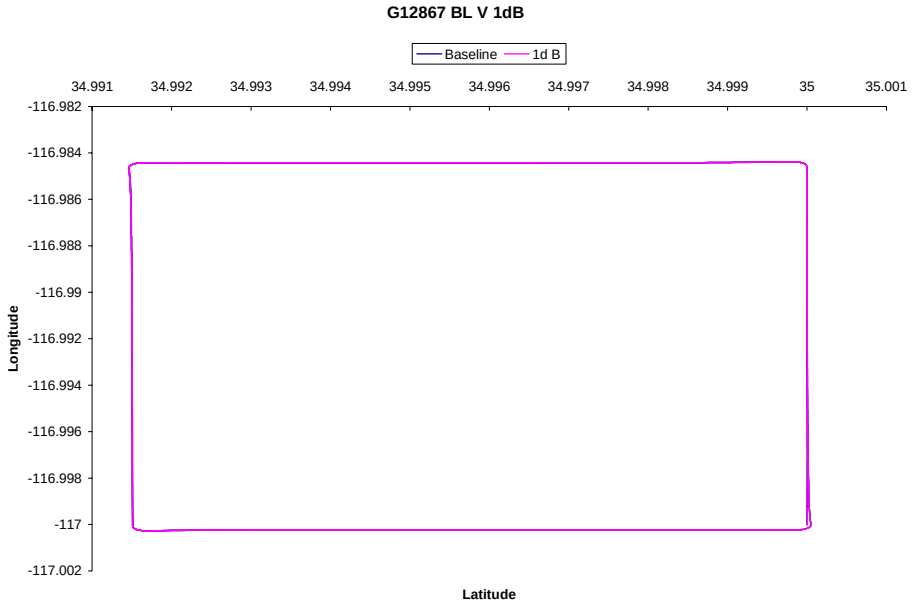
-116.998
-117
-117.002
longitude
latitude

G12867


G12867 BL V 1dB
Baseline
1d B
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
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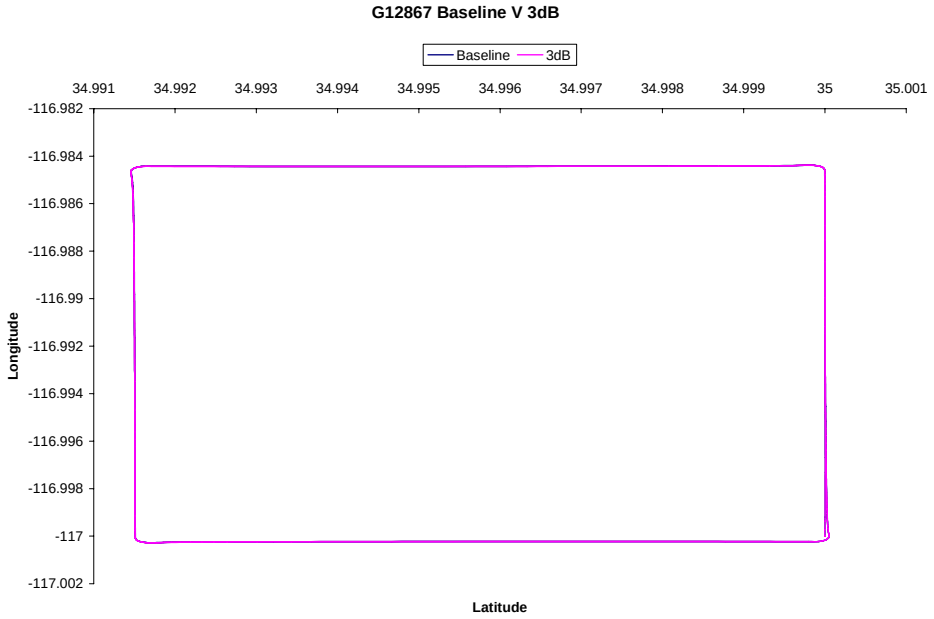
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G12867 Baseline V 3dB
Baseline
3dB
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
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-116.99
-116.992
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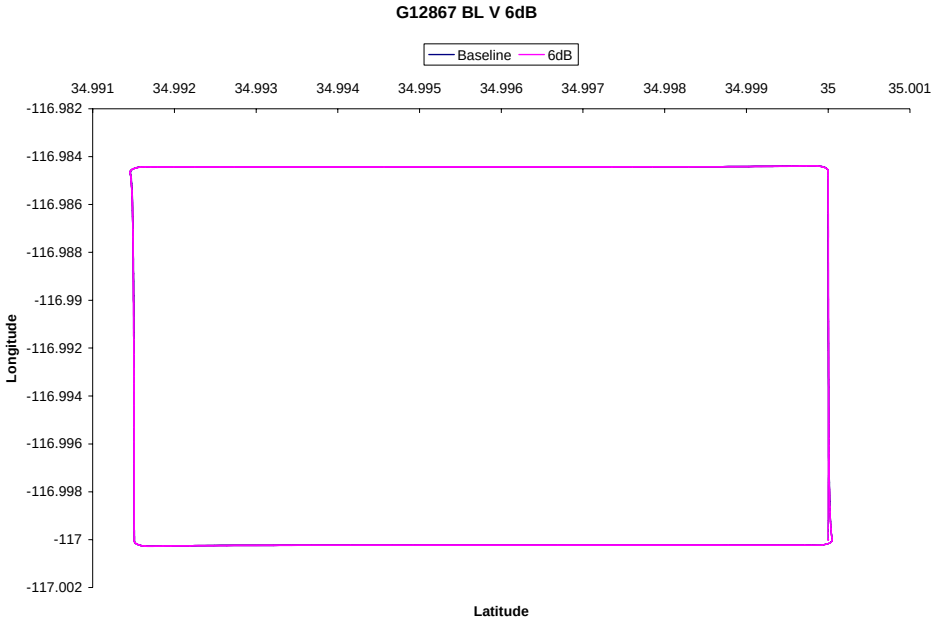
-116.998
-117
-117.002
Longitude
Latitude


G12867 BL V 6dB
Baseline
6dB
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34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
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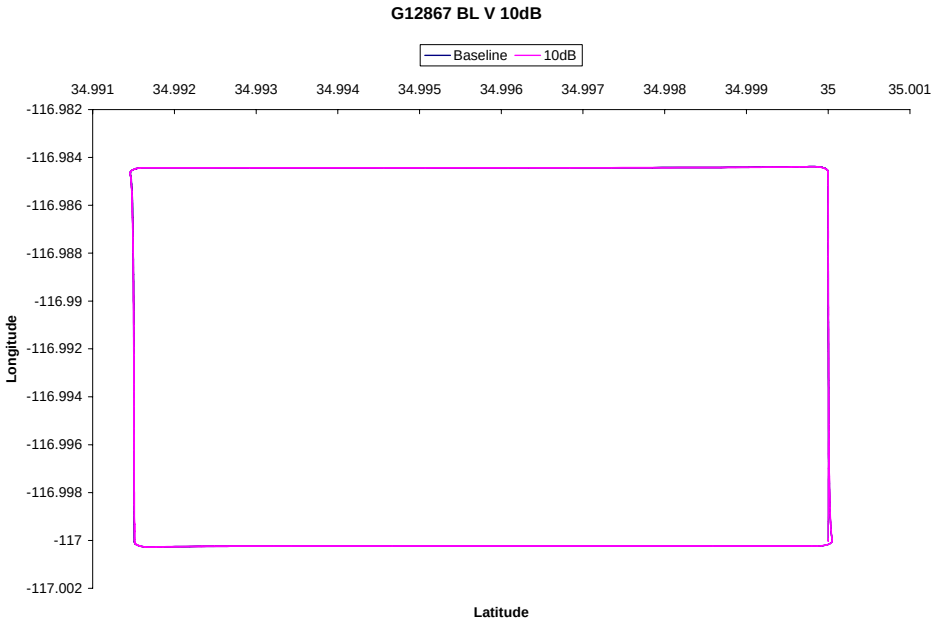
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G12867 BL V 10dB
Baseline
10dB
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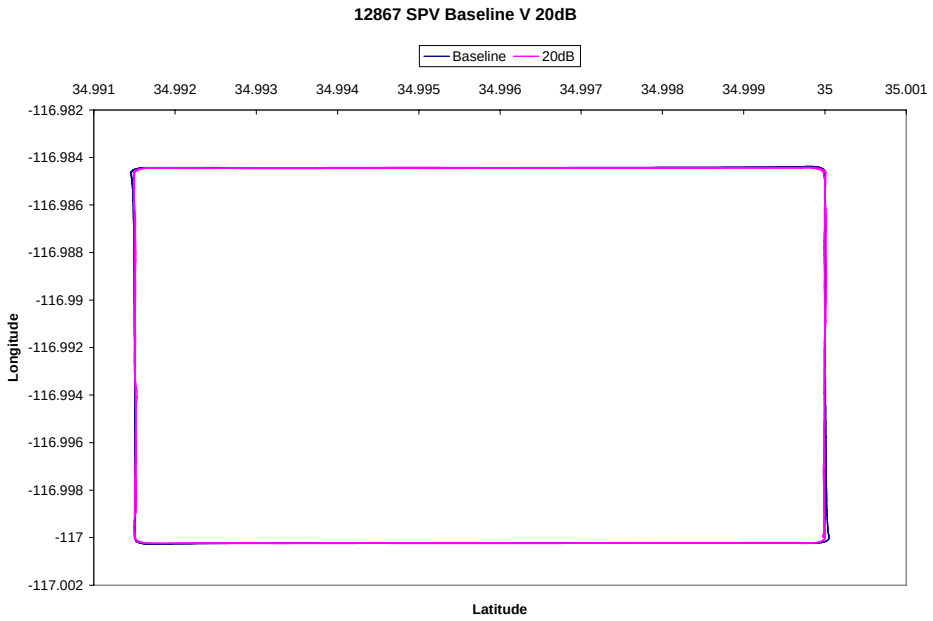
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


12867 SPV Baseline V 20dB
Baseline
20dB
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34.992
34.993
34.994
34.995
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34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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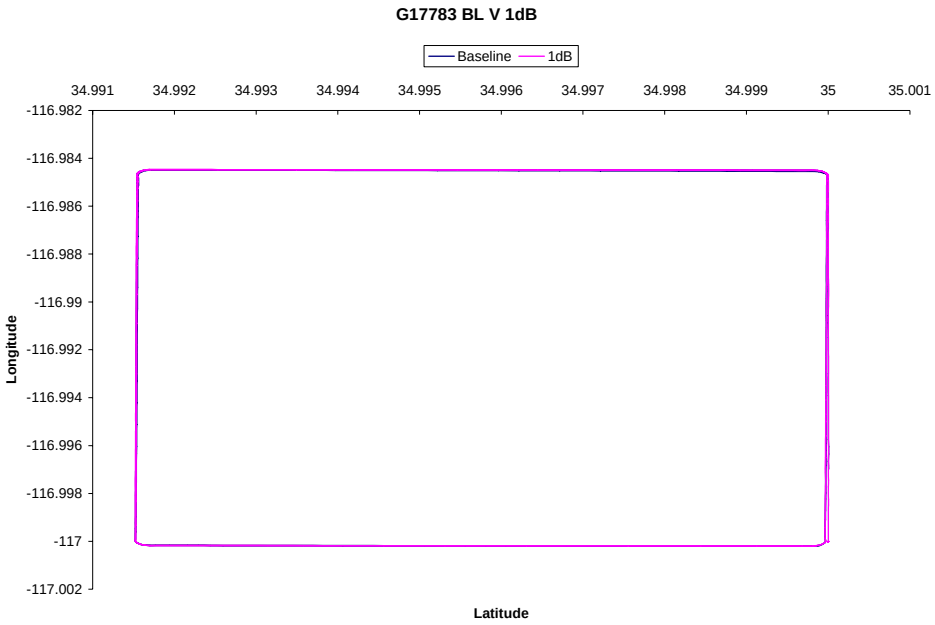
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

G17783


G17783 BL V 1dB
Baseline
1dB
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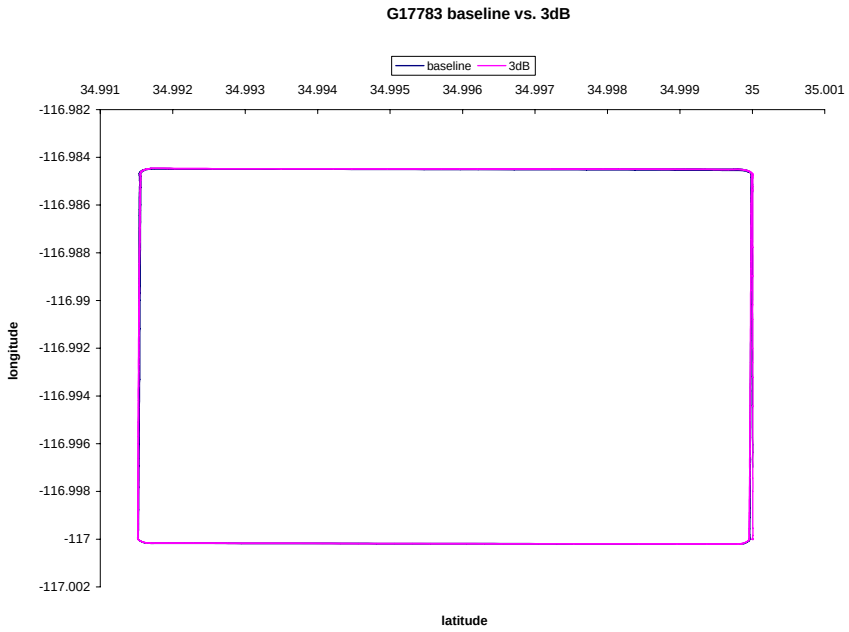
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G17783 baseline vs. 3dB
baseline
3dB
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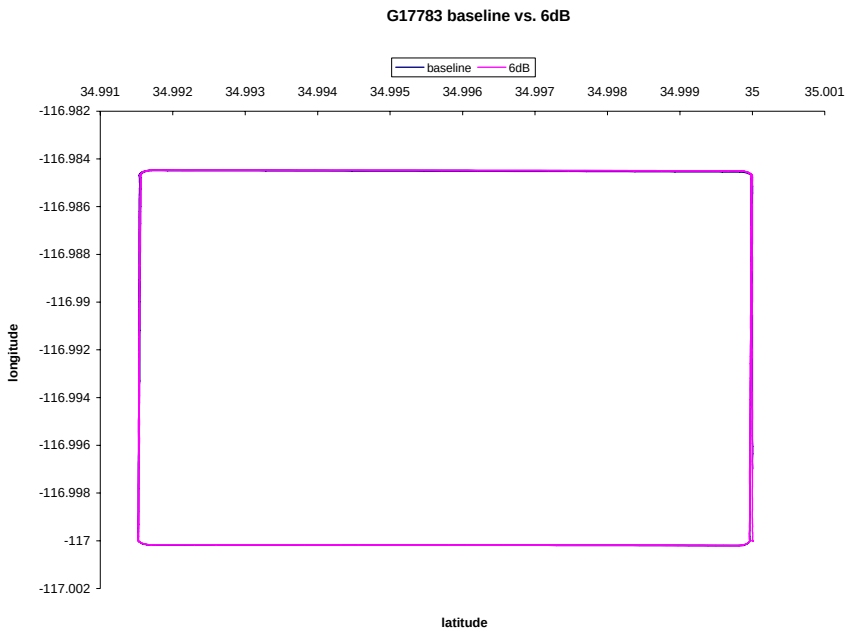
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G17783 baseline vs. 6dB
baseline
6dB
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34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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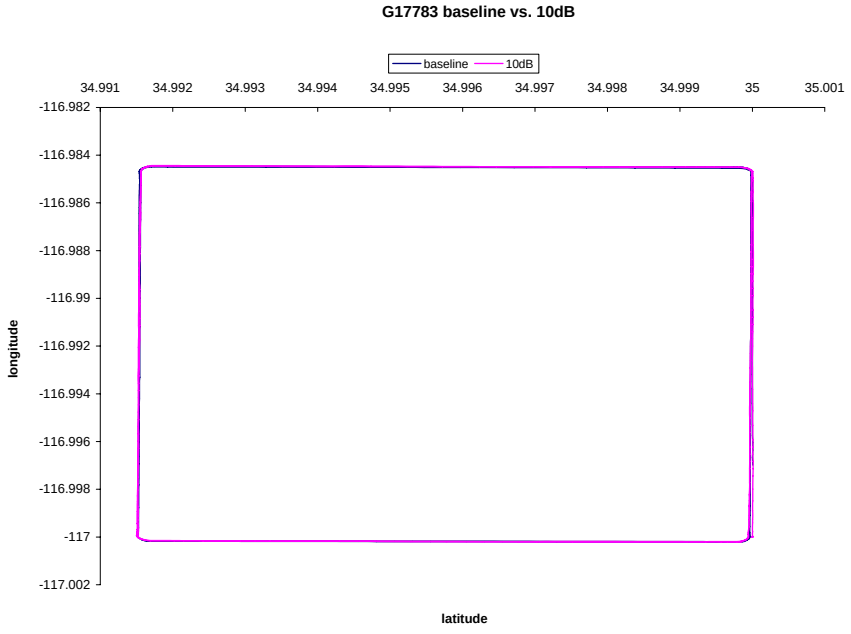
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G17783 baseline vs. 10dB
baseline
10dB
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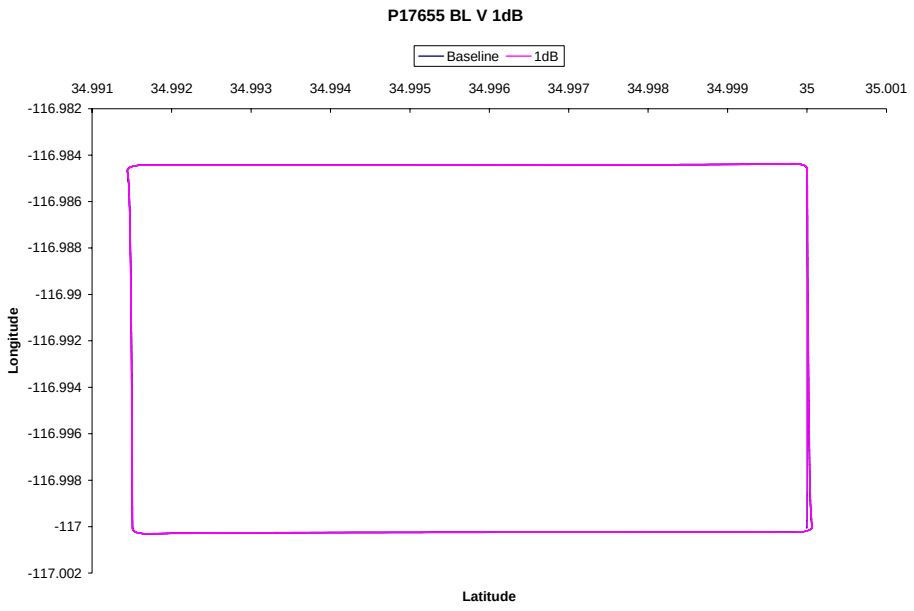
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

P17655


P17655 BL V 1dB
Baseline
1dB
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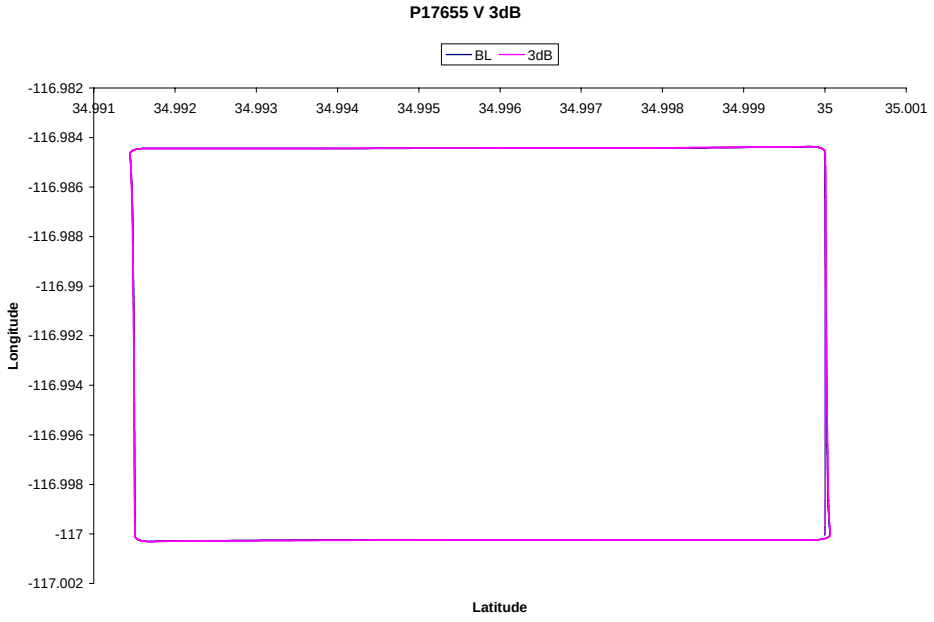
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


P17655 V 3dB
BL
3dB
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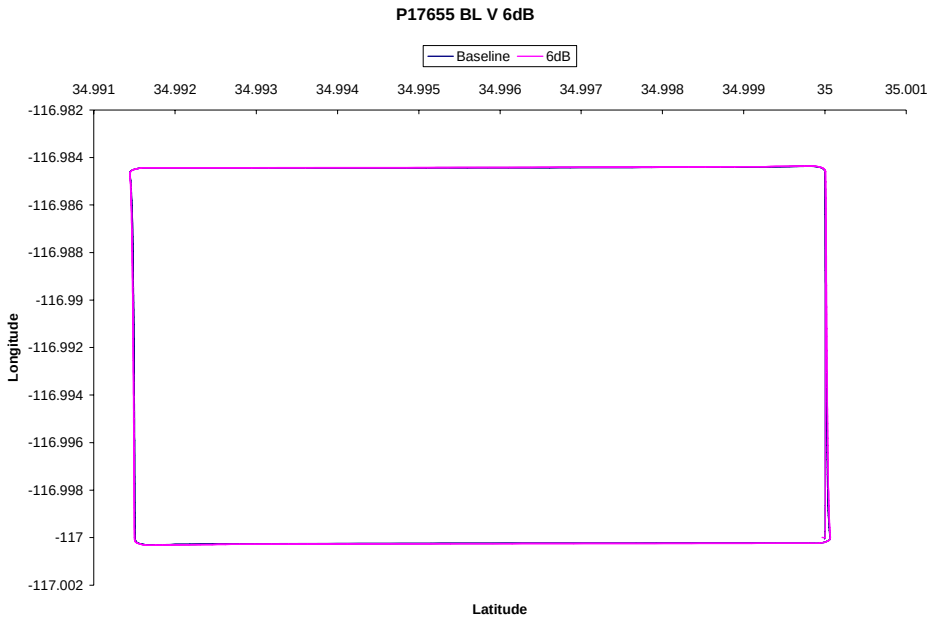
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


P17655 BL V 6dB
Baseline
6dB
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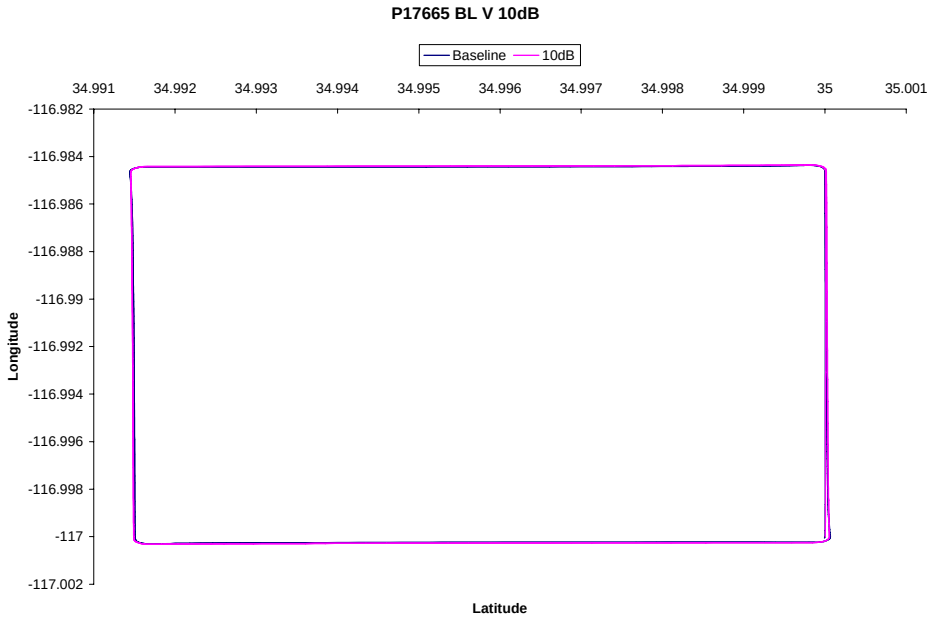
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


P17665 BL V 10dB
Baseline
10dB
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35.001
-116.982
-116.984
-116.986
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-116.996
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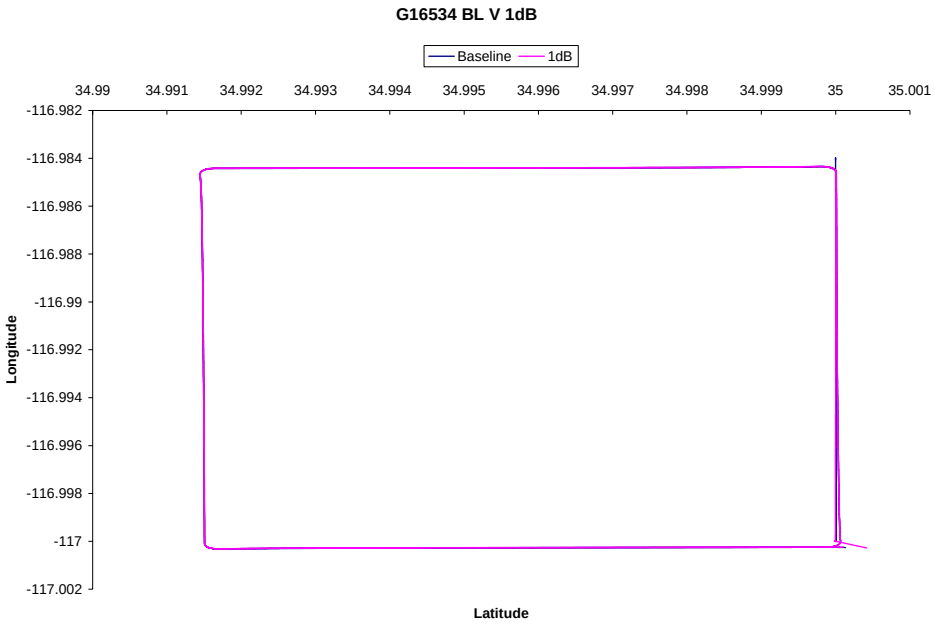
-117
-117.002
Longitude
Latitude

G16534


G16534 BL V 1dB
Baseline
1dB
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34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
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-116.992
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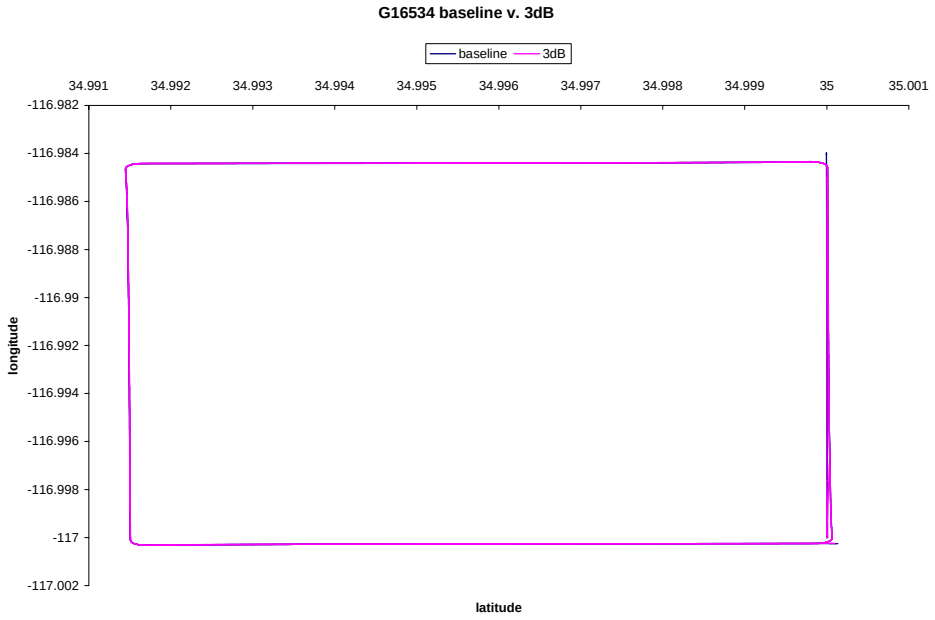
-117.002
Longitude
Latitude


G16534 baseline v. 3dB
baseline
3dB
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34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
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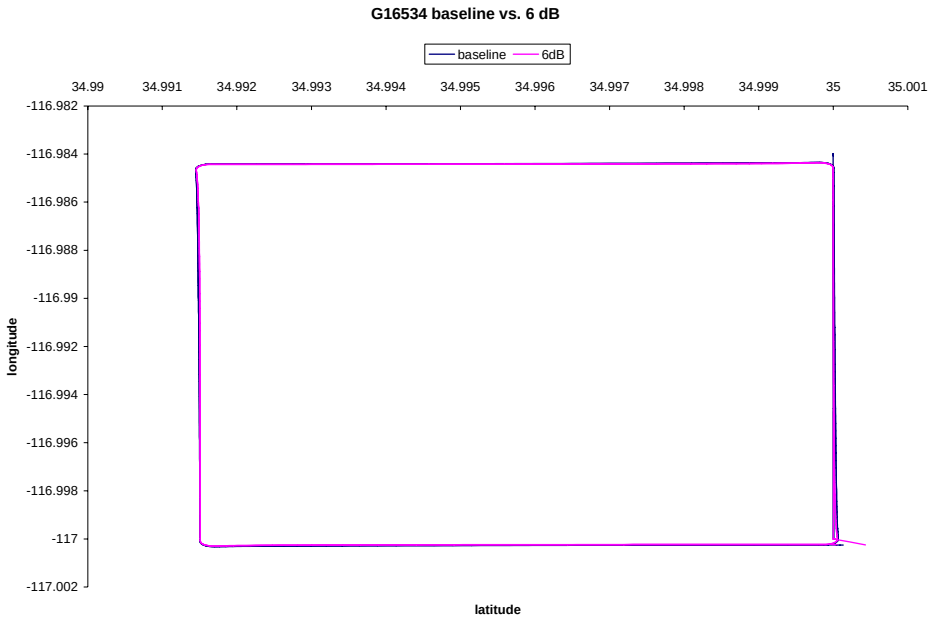
-116.996
-116.998
-117
-117.002
longitude
latitude


G16534 baseline vs. 6 dB
baseline
6dB
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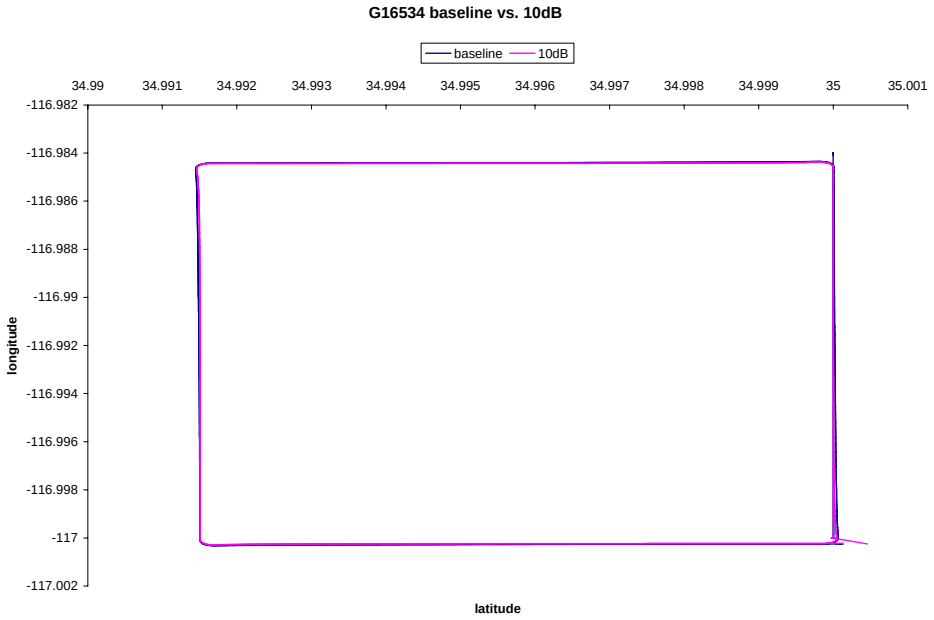
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G16534 baseline vs. 10dB
baseline
10dB
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34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
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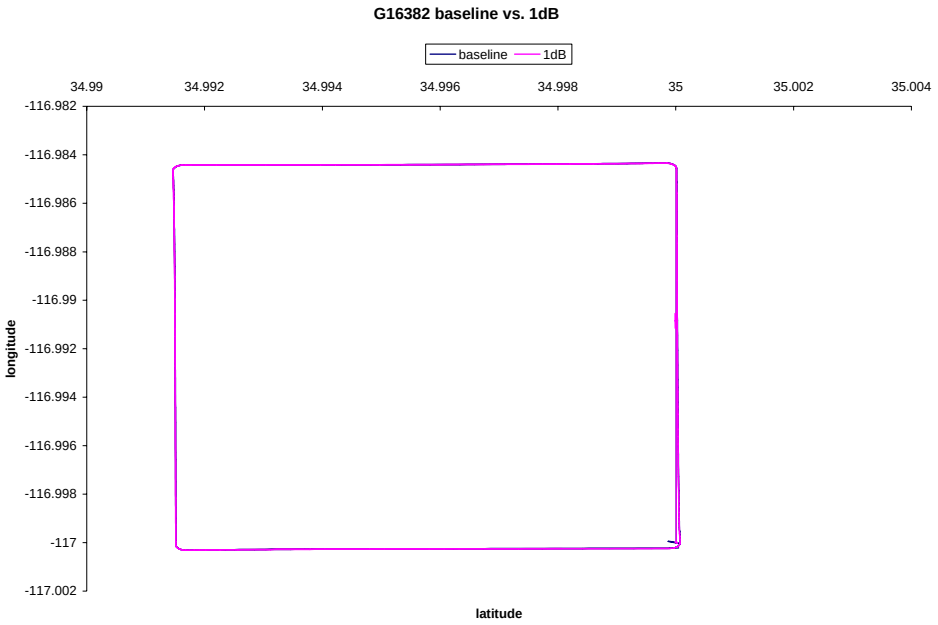
-116.996
-116.998
-117
-117.002
longitude
latitude

G16382


G16382 baseline vs. 1dB
baseline
1dB
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34.994
34.996
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35.004
-116.982
-116.984
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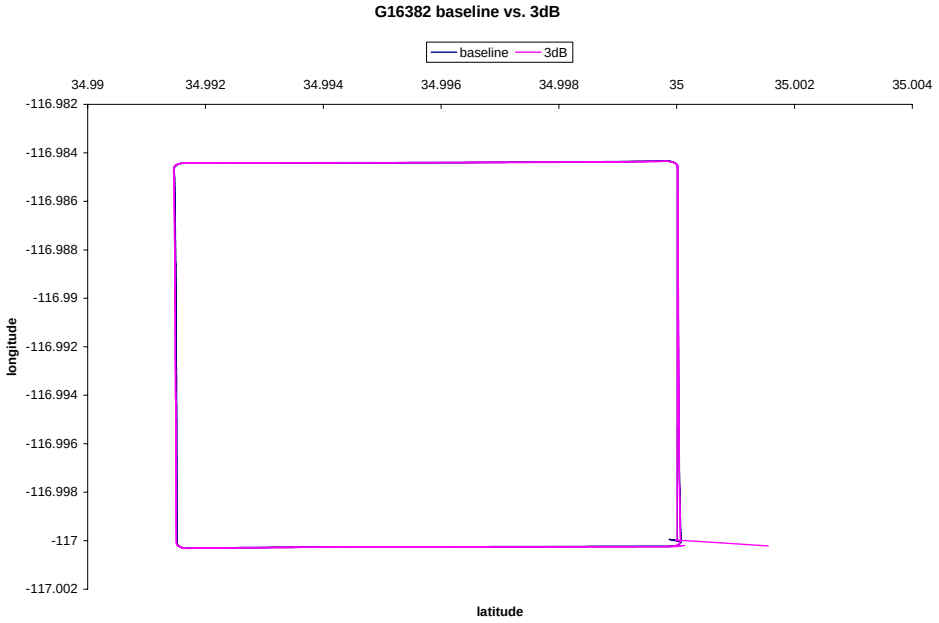
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G16382 baseline vs. 3dB
baseline
3dB
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34.992
34.994
34.996
34.998
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35.002
35.004
-116.982
-116.984
-116.986
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-116.992
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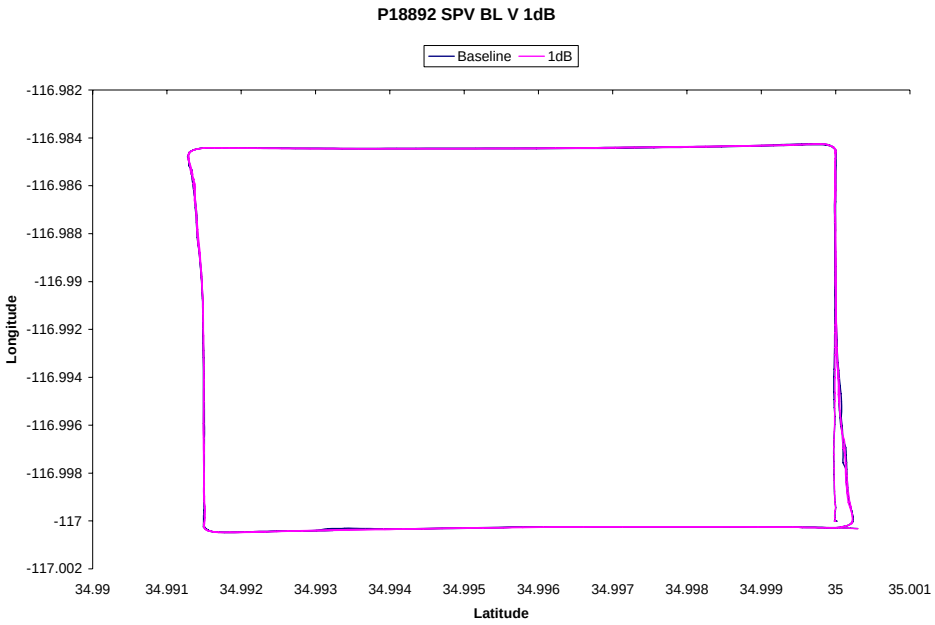
-116.996
-116.998
-117
-117.002
longitude
latitude

P18892


P18892 SPV BL V 1dB
Baseline
1dB
-116.982
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-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
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34.993
34.994
34.995
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34.998
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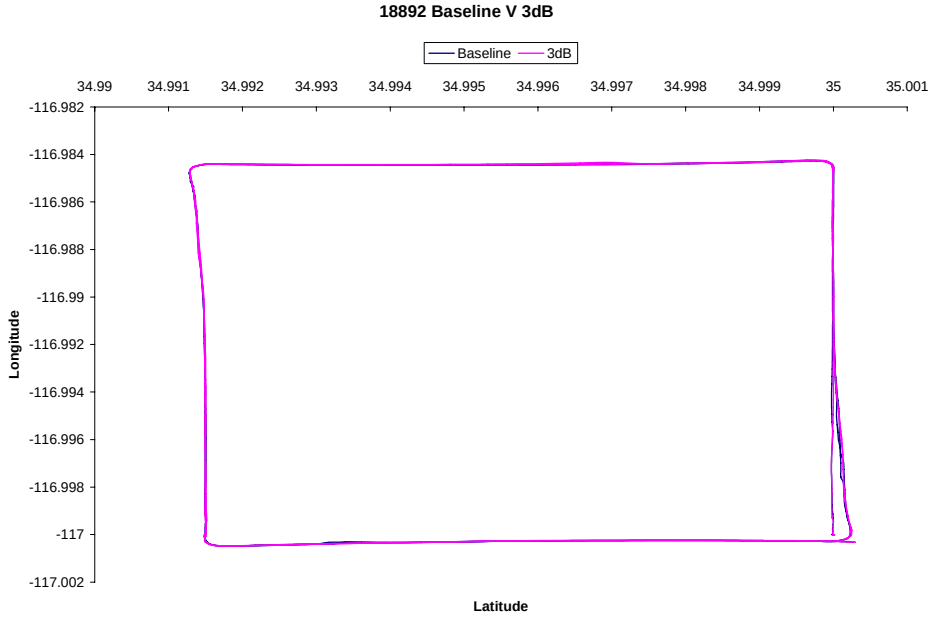
35.001
Latitude


18892 Baseline V 3dB
Baseline
3dB
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34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
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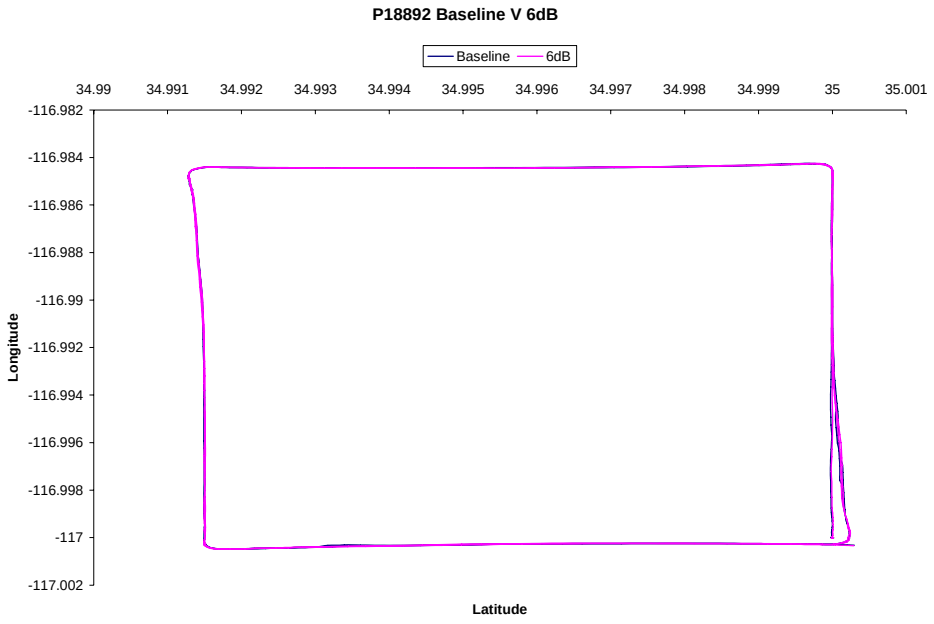
Longitude
Latitude


P18892 Baseline V 6dB
Baseline
6dB
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34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
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-116.99
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-116.998
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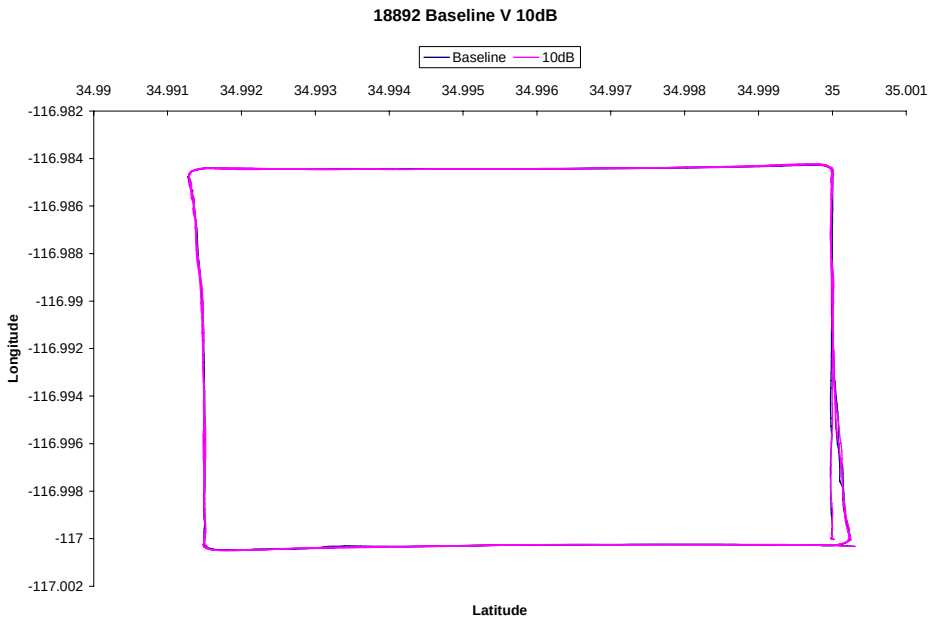
-117.002
Longitude
Latitude


18892 Baseline V 10dB
Baseline
10dB
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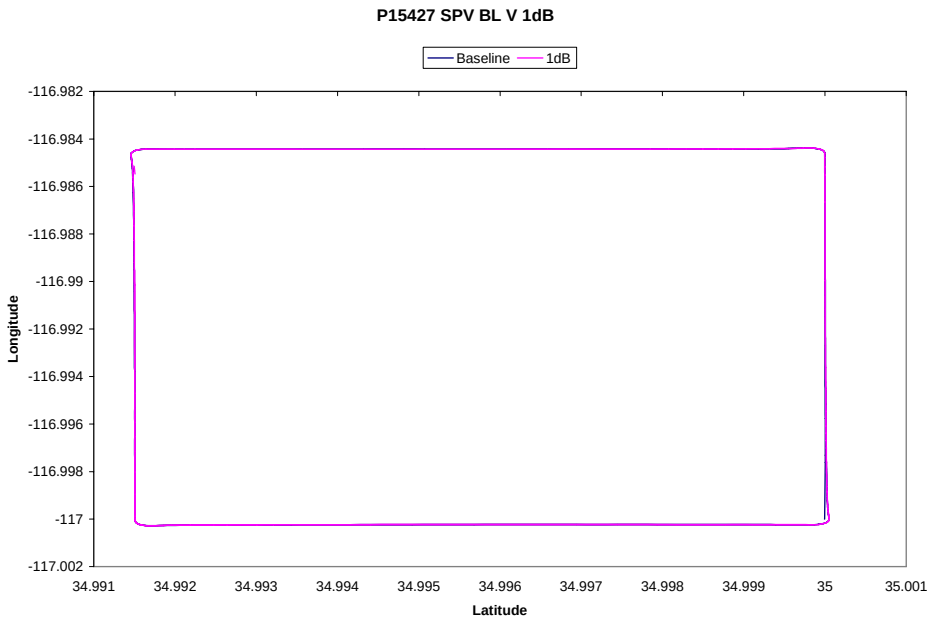
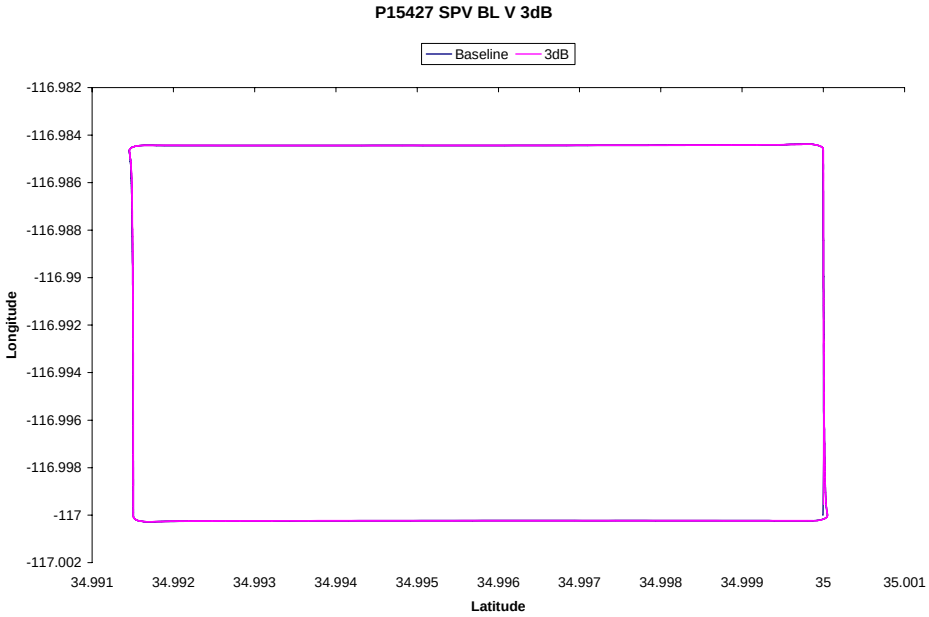
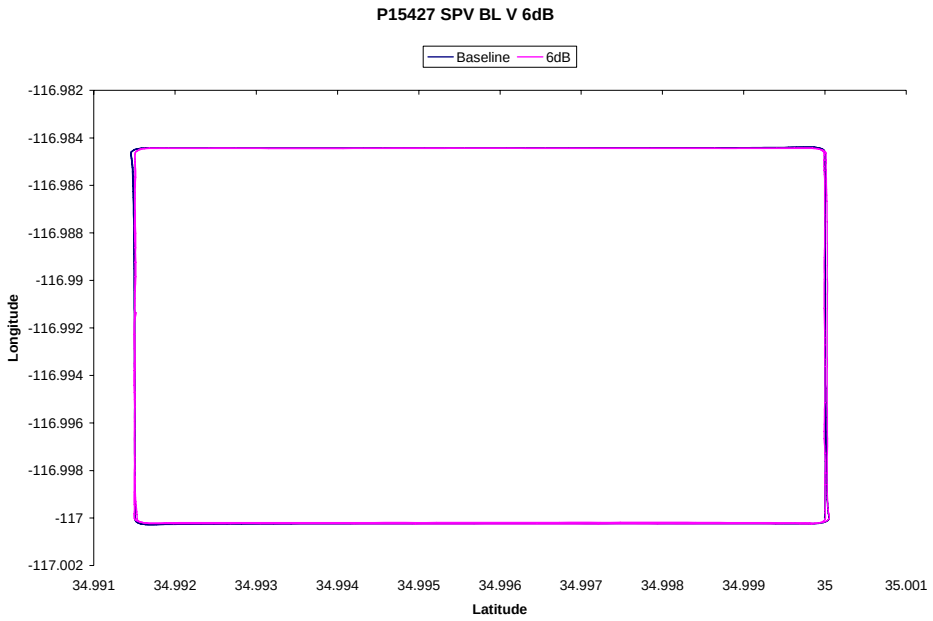
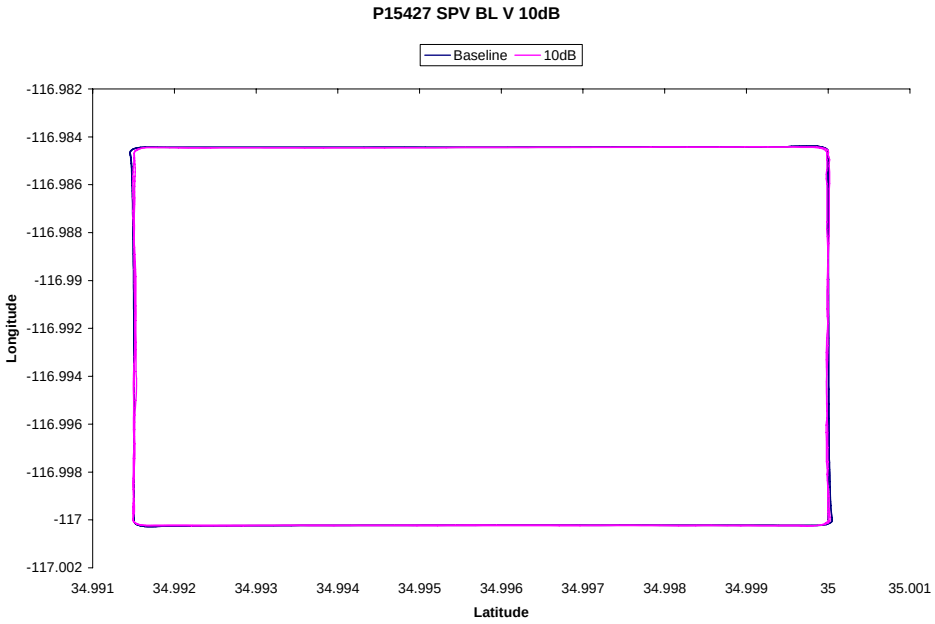
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

P15427

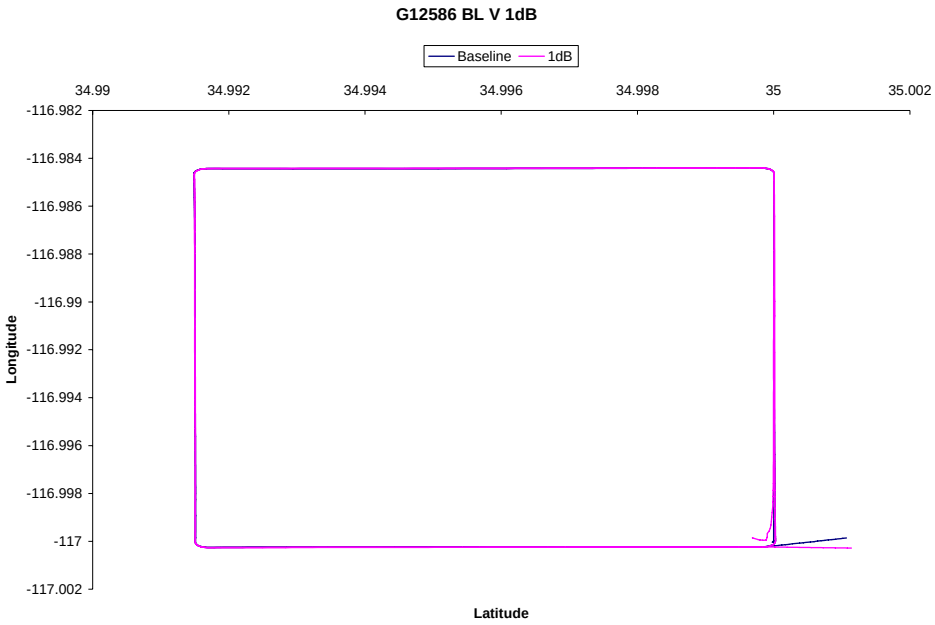

P15427 SPV BL V 1dB
Baseline
1dB
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
Latitude


P15427 SPV BL V 3dB
Baseline
3dB
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
Latitude


P15427 SPV BL V 6dB
Baseline
6dB
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
Latitude


P15427 SPV BL V 10dB
Baseline
10dB
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
Latitude

G12586


G12586 BL V 1dB
Baseline
1dB
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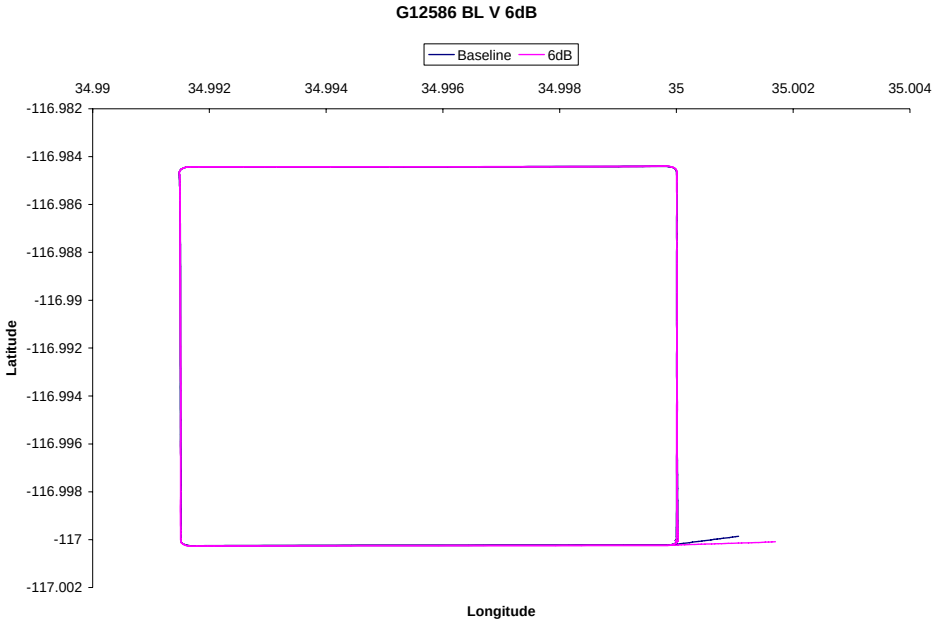
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

G12586 BASELINE V 3DB
Baseline
3dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G12586 BL V 6dB
Baseline
6dB
34.99
34.992
34.994
34.996
34.998
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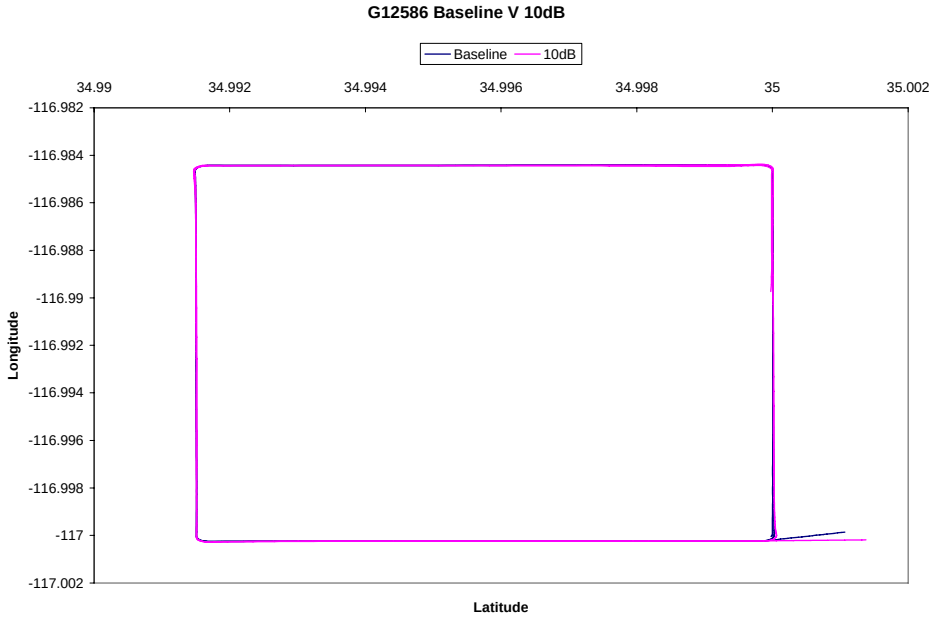
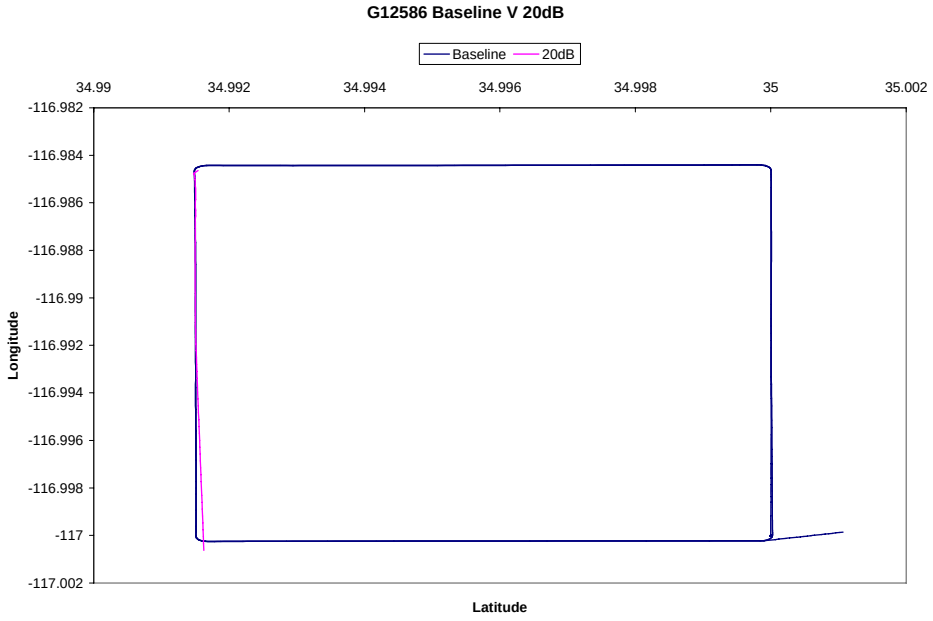
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Latitude
Longitude


G12586 Baseline V 10dB
Baseline
10dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G12586 Baseline V 20dB
Baseline
20dB
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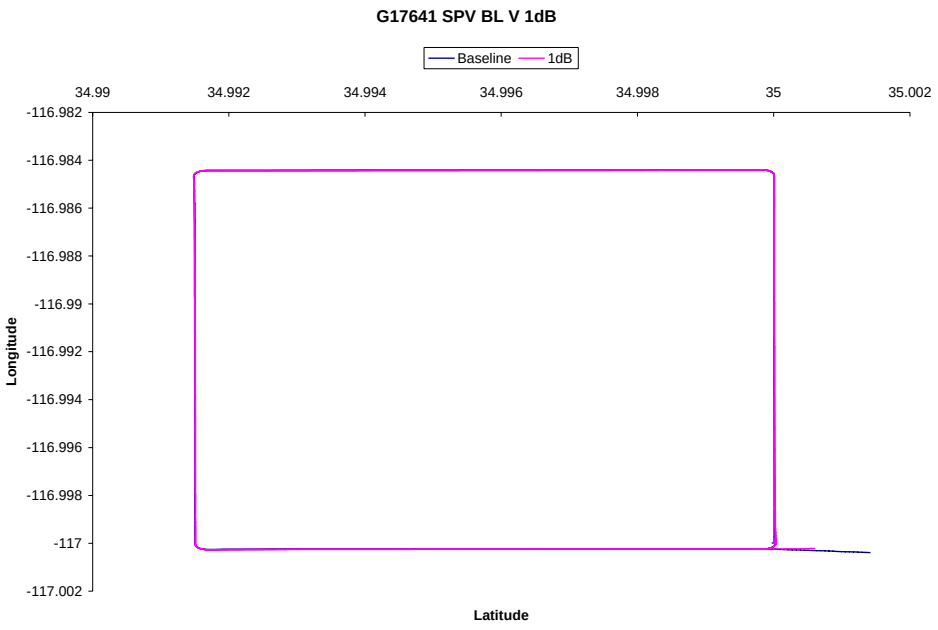
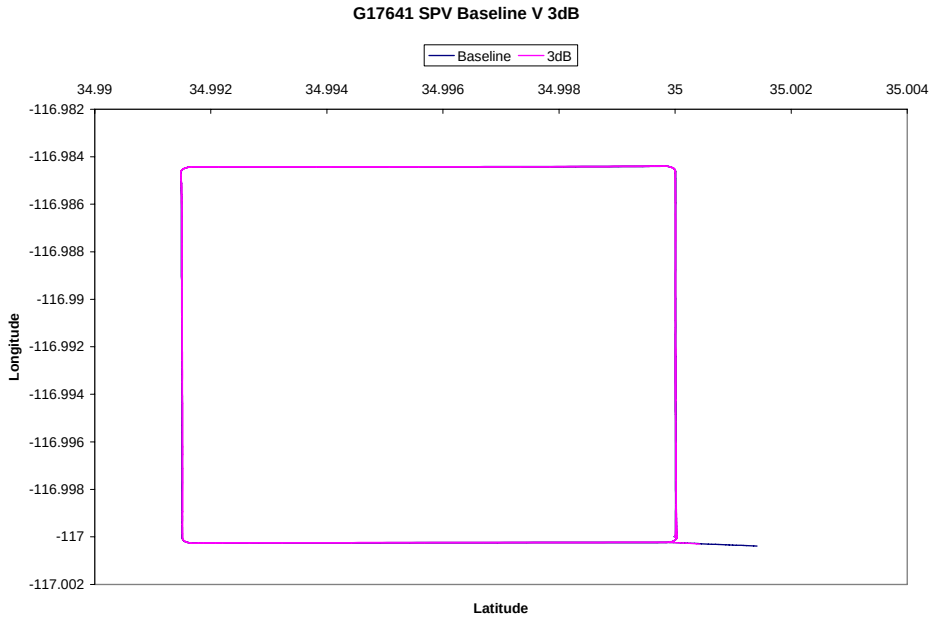
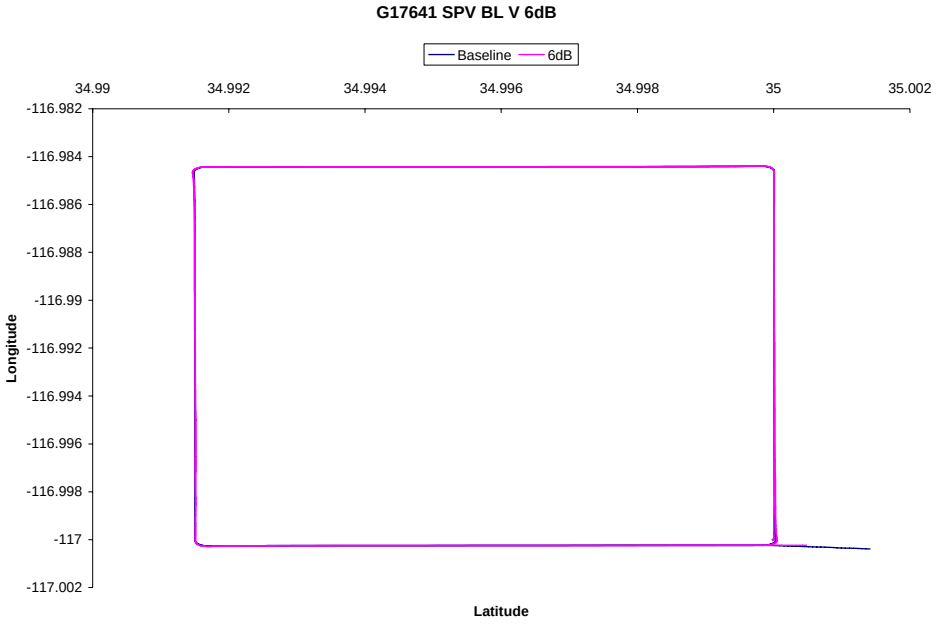
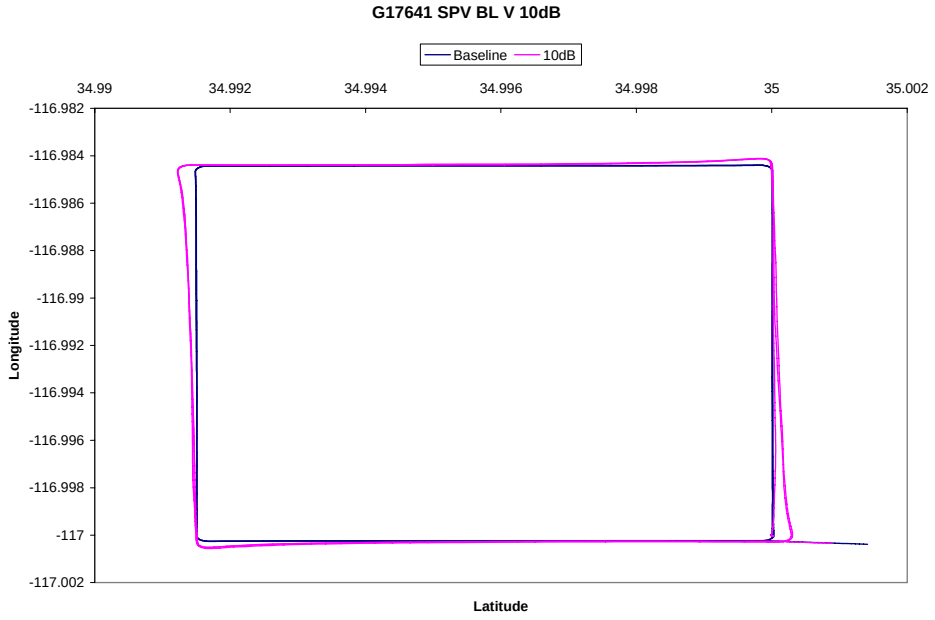
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

G17641

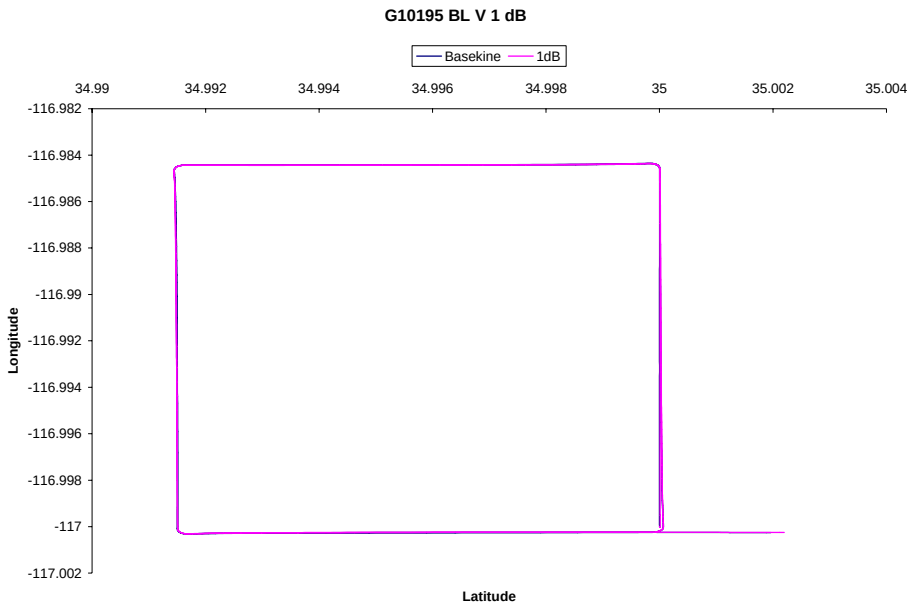

G17641 SPV BL V 1dB
Baseline
1dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

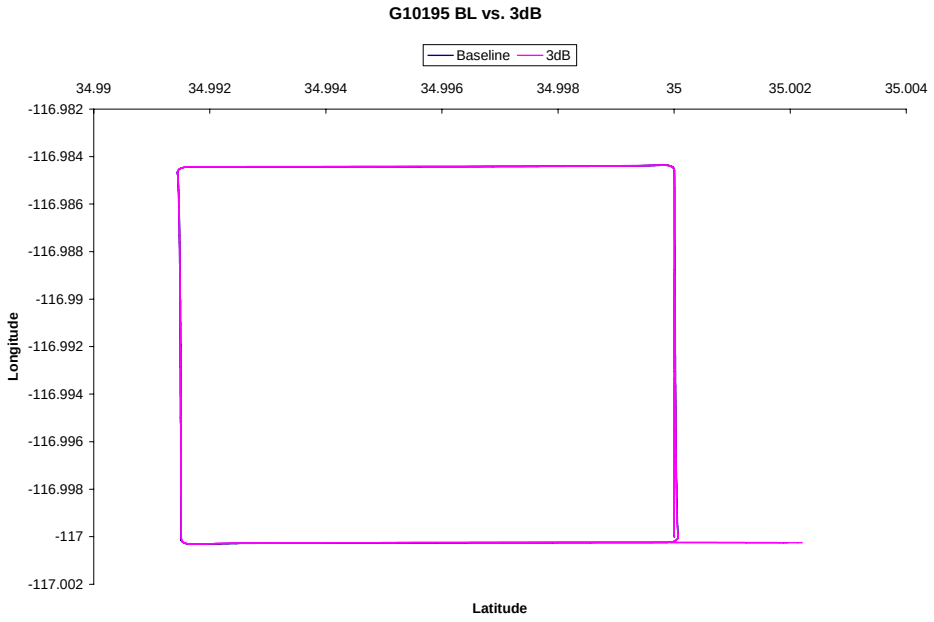

G17641 SPV Baseline V 3dB
Baseline
3dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G17641 SPV BL V 6dB
Baseline
6dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G17641 SPV BL V 10dB
Baseline
10dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

G10195


G10195 BL V 1 dB
Basekine
1dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G10195 BL vs. 3dB
Baseline
3dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
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-116.994
-116.996
-116.998
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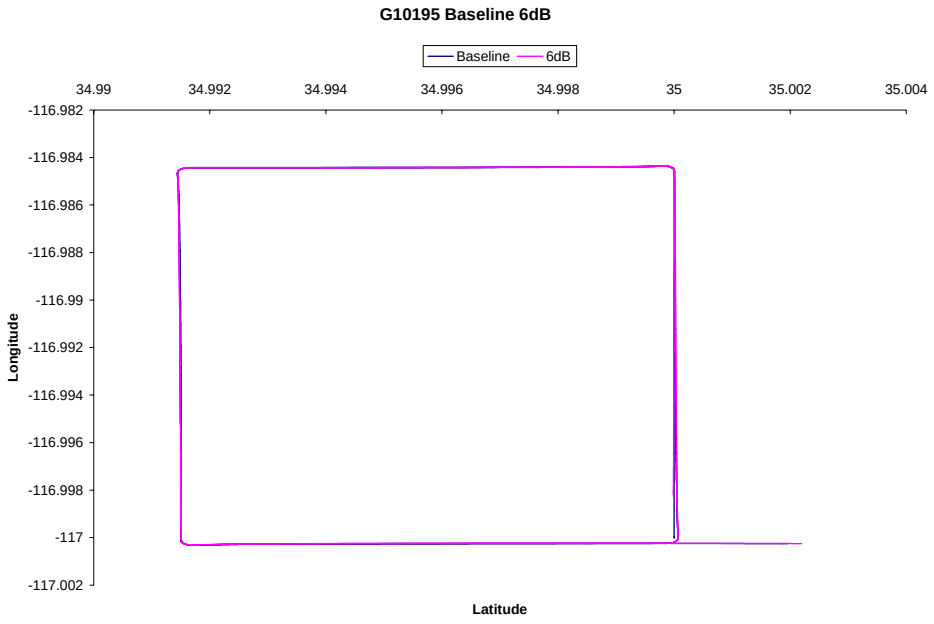
-117.002
Longitude
Latitude


G10195 Baseline 6dB
Baseline
6dB
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34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
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-116.994
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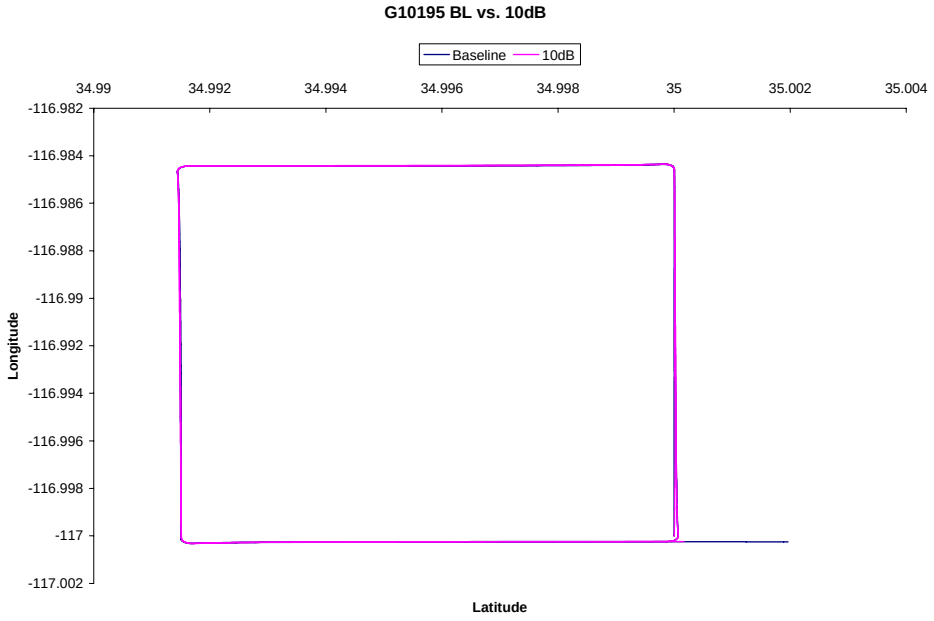
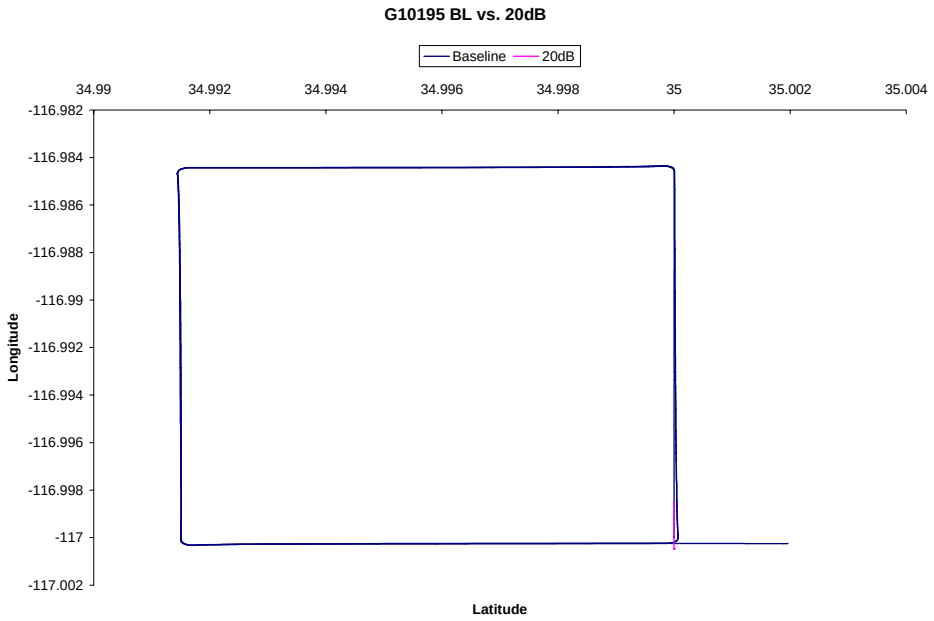
-116.998
-117
-117.002
Longitude
Latitude


G10195 BL vs. 10dB
Baseline
10dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G10195 BL vs. 20dB
Baseline
20dB
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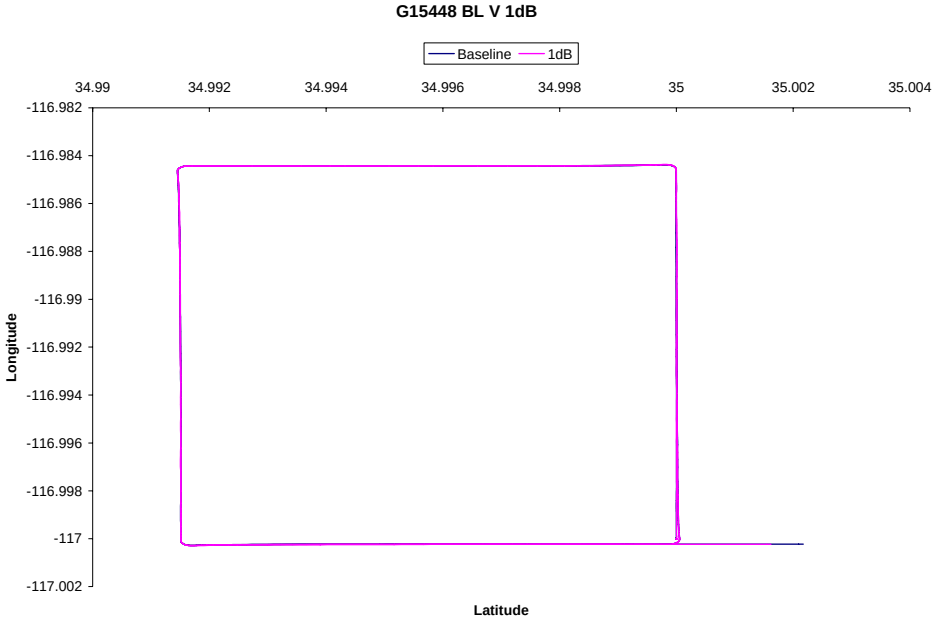
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

G15448


G15448 BL V 1dB
Baseline
1dB
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34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
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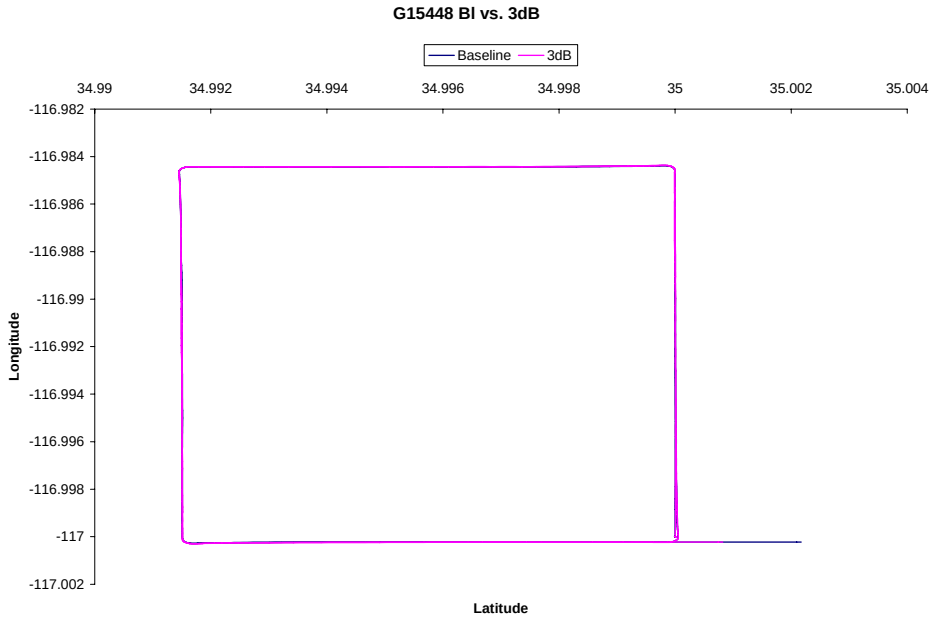
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G15448 Bl vs. 3dB
Baseline
3dB
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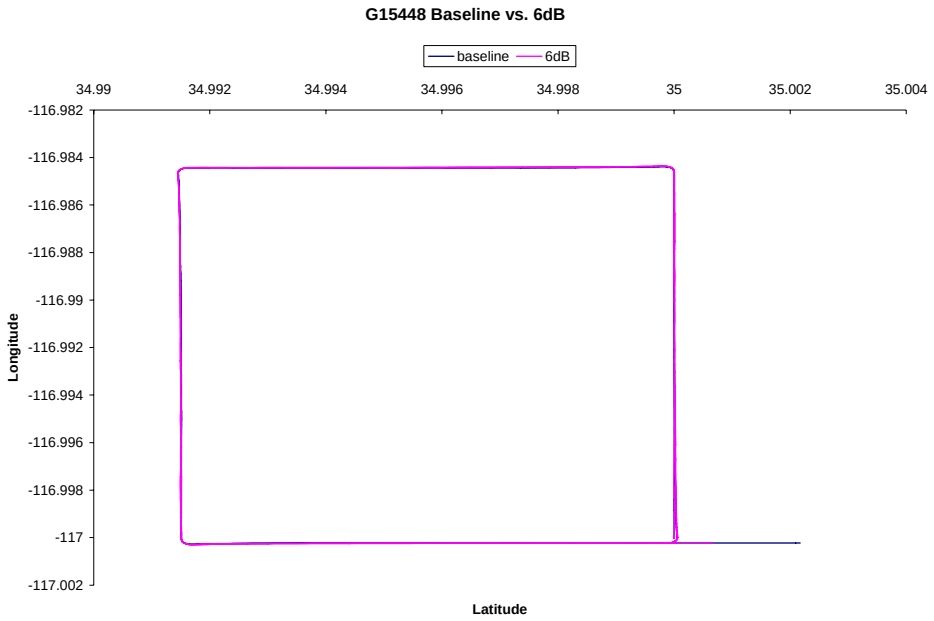
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G15448 Baseline vs. 6dB
baseline
6dB
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34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
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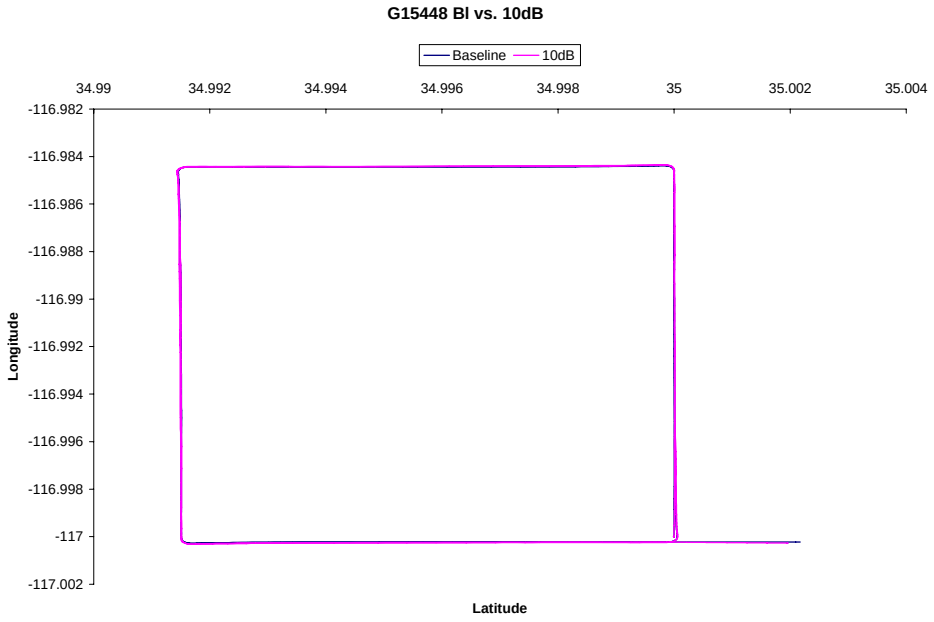
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G15448 Bl vs. 10dB
Baseline
10dB
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34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
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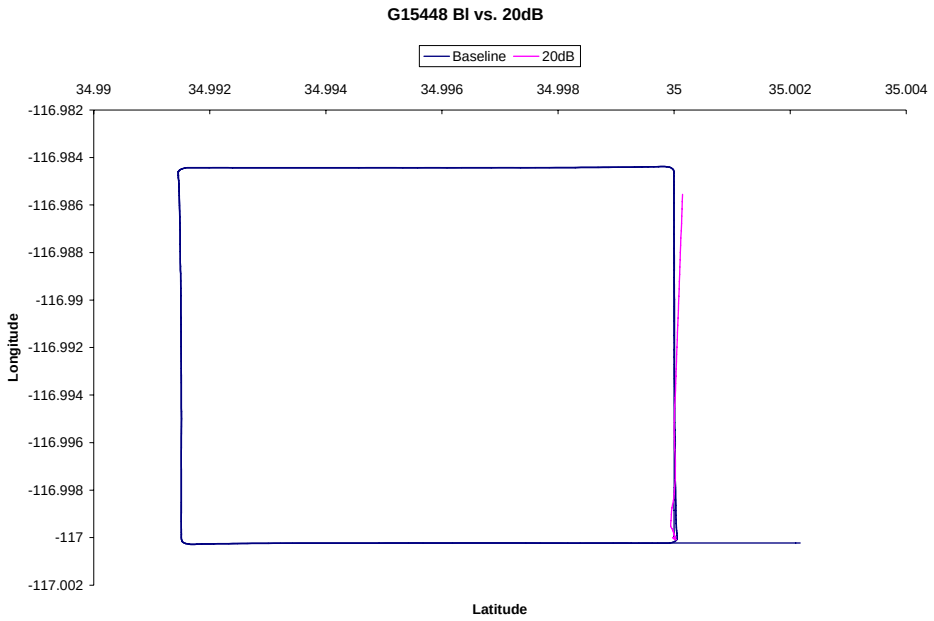
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G15448 Bl vs. 20dB
Baseline
20dB
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34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
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-116.992
-116.994
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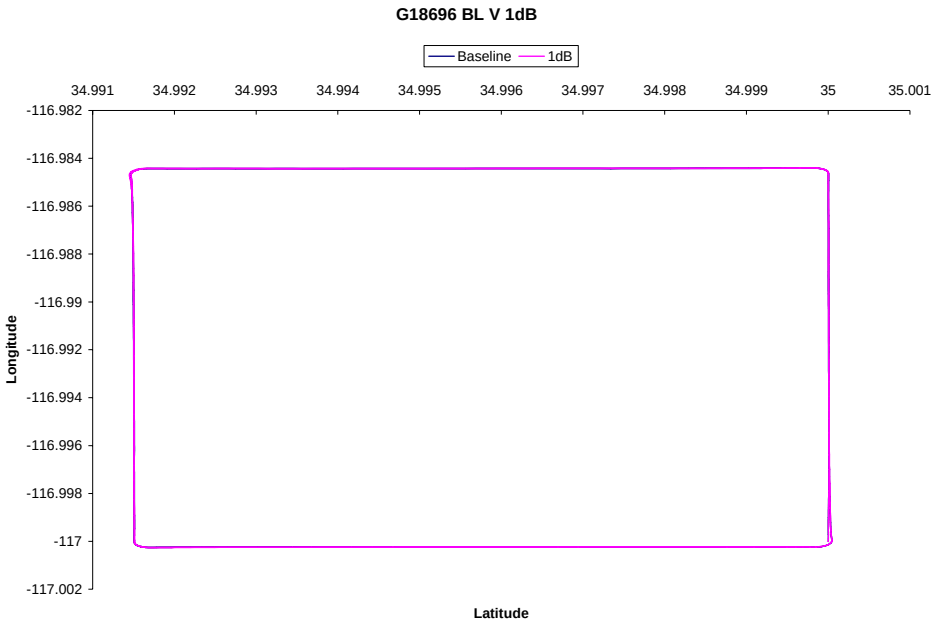
-116.998
-117
-117.002
Longitude
Latitude

G18696


G18696 BL V 1dB
Baseline
1dB
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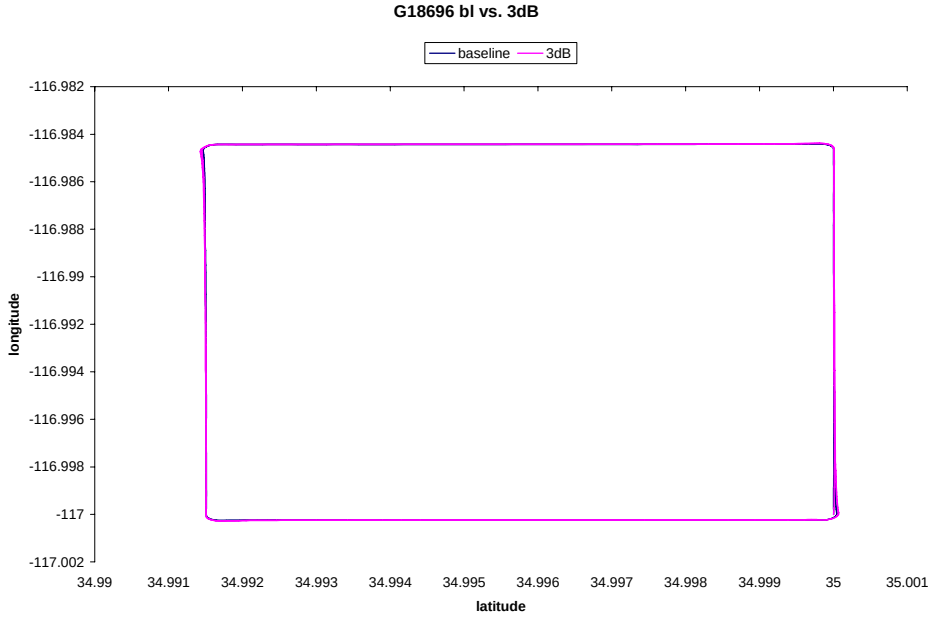
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G18696 bl vs. 3dB
baseline
3dB
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-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
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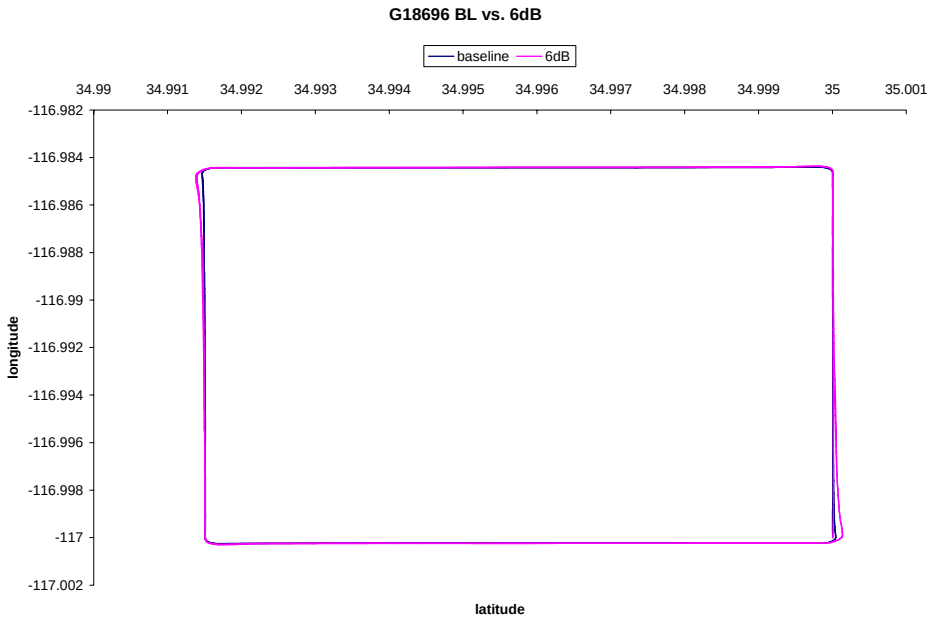
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
latitude


G18696 BL vs. 6dB
baseline
6dB
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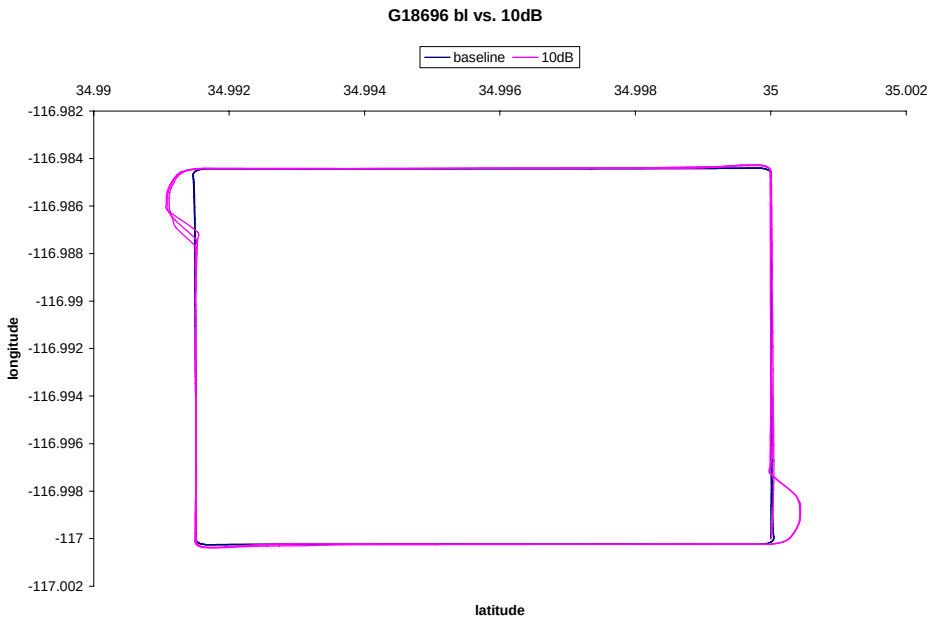
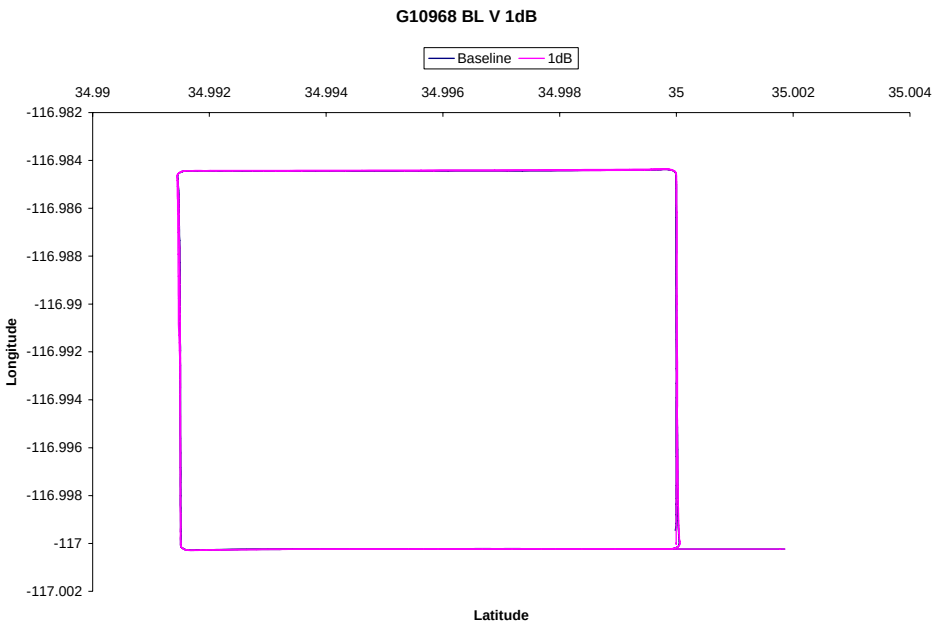
34.991
34.992
34.993
34.994
34.995
34.996
34.997
34.998
34.999
35
35.001
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G18696 bl vs. 10dB
baseline
10dB
34.99
34.992
34.994
34.996
34.998
35
35.002
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude

G10968


G10968 BL V 1dB
Baseline
1dB
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34.994
34.996
34.998
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35.002
35.004
-116.982
-116.984
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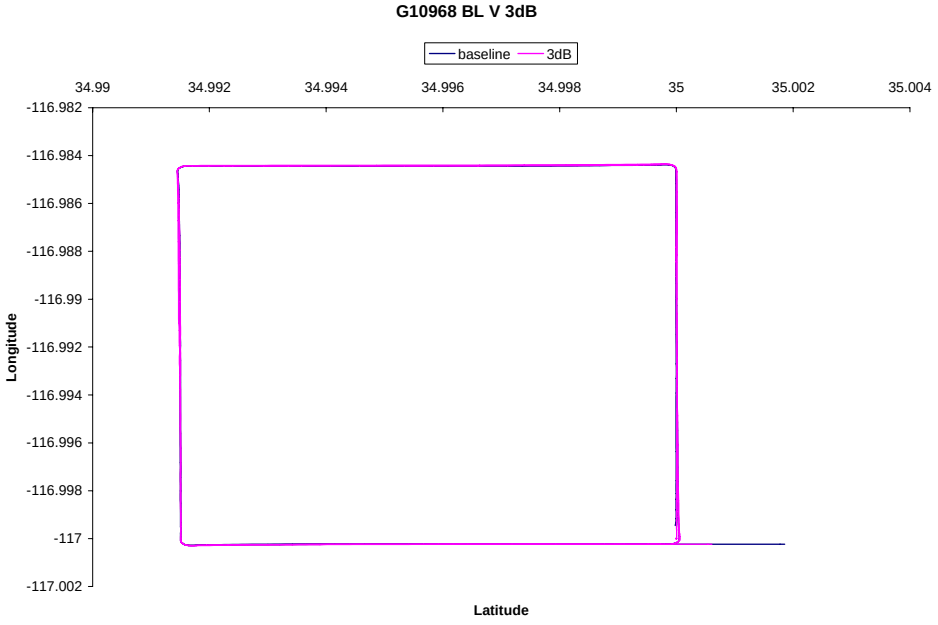
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G10968 BL V 3dB
baseline
3dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
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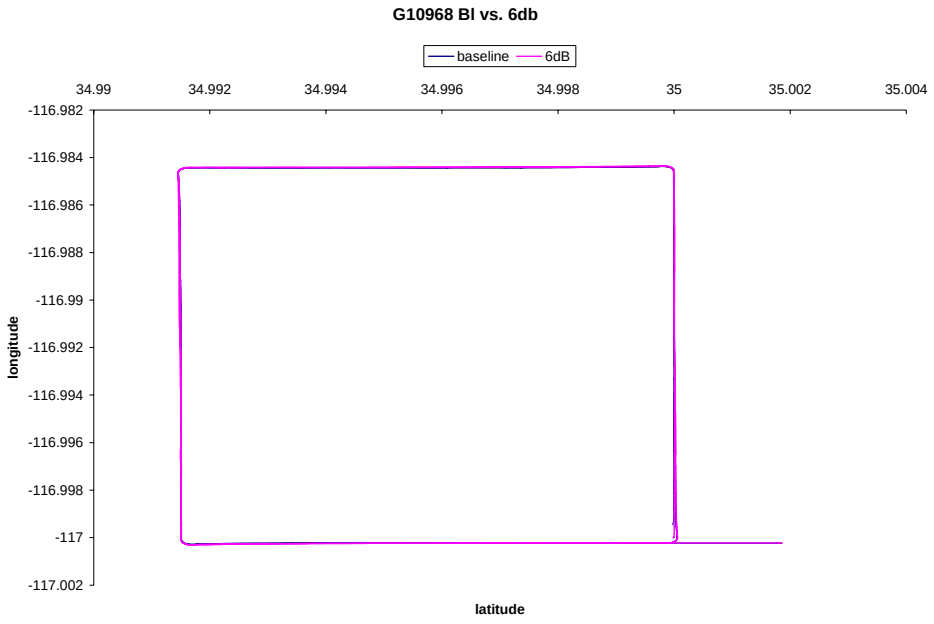
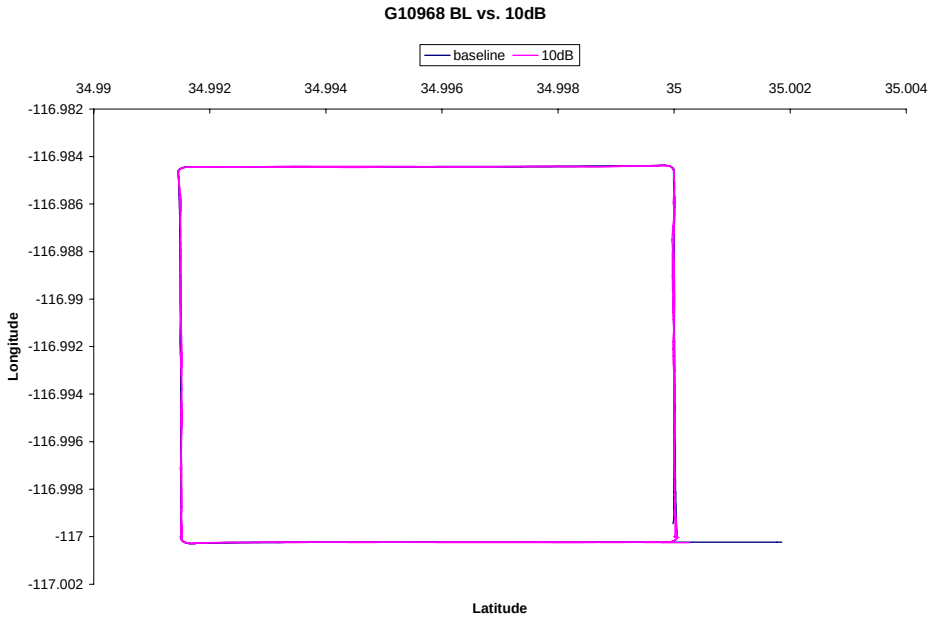
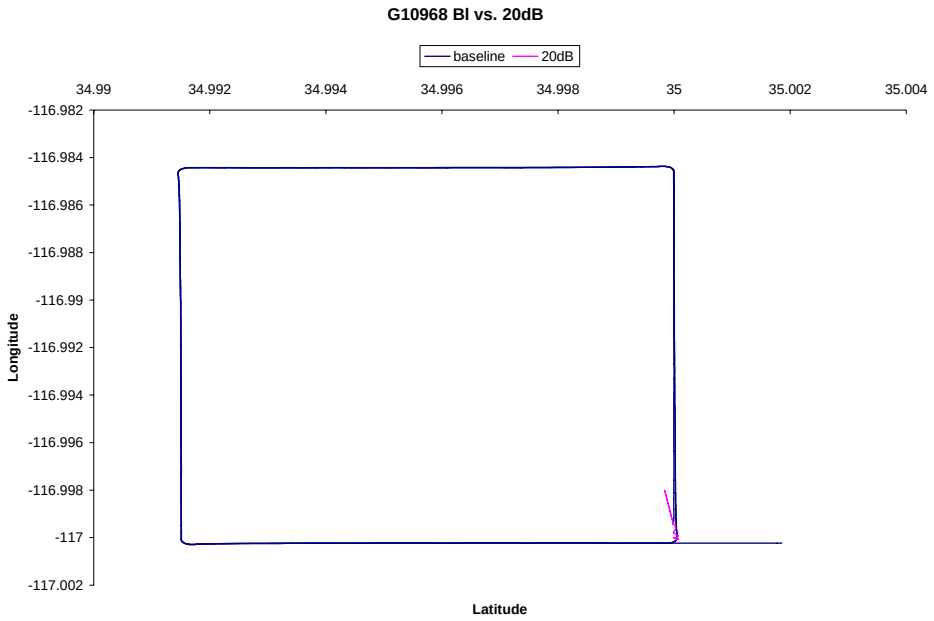
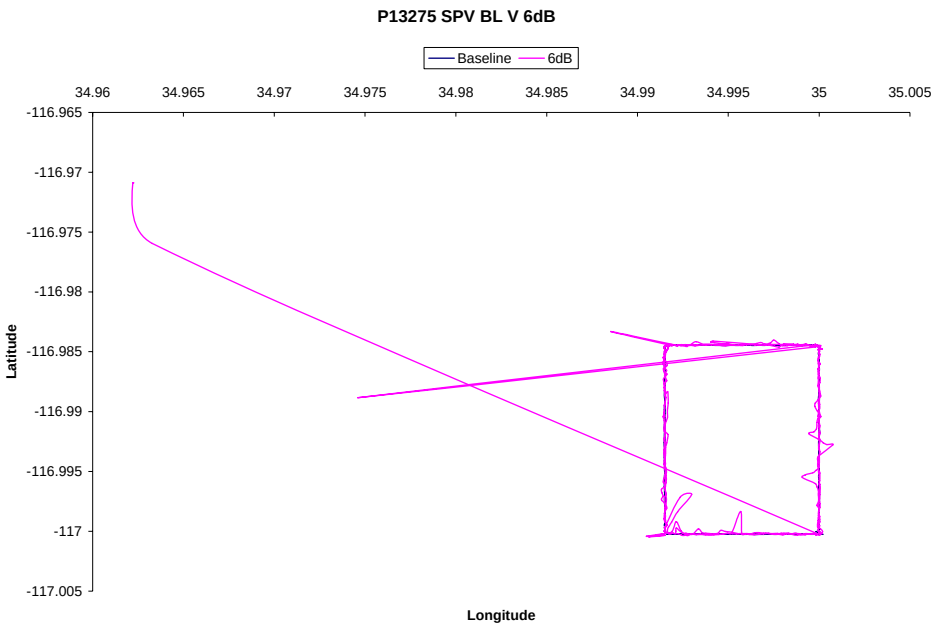
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

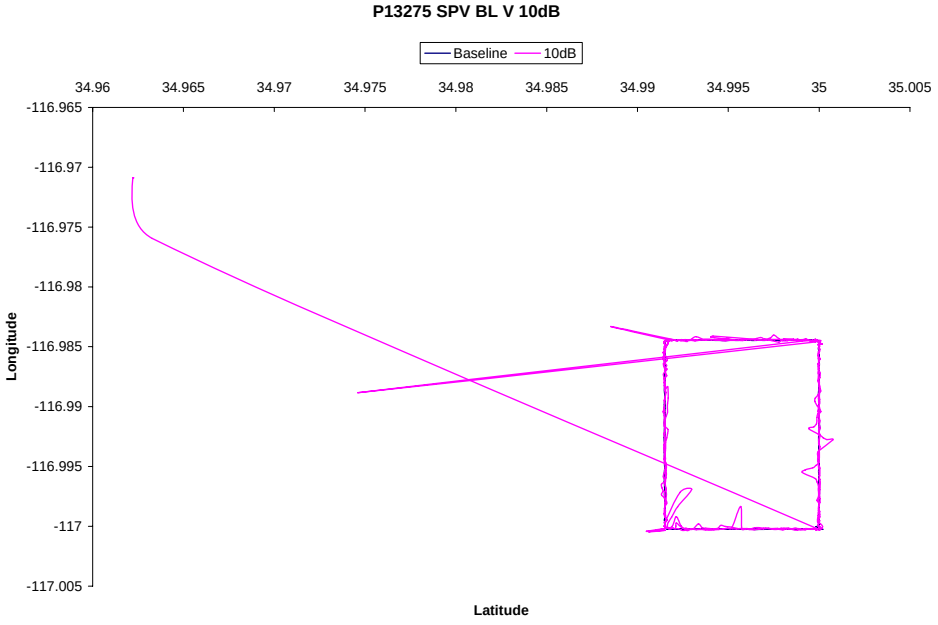

G10968 Bl vs. 6db
baseline
6dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
longitude
latitude


G10968 BL vs. 10dB
baseline
10dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude


G10968 Bl vs. 20dB
baseline
20dB
34.99
34.992
34.994
34.996
34.998
35
35.002
35.004
-116.982
-116.984
-116.986
-116.988
-116.99
-116.992
-116.994
-116.996
-116.998
-117
-117.002
Longitude
Latitude

P13275


P13275 SPV BL V 6dB
Baseline
6dB
34.96
34.965
34.97
34.975
34.98
34.985
34.99
34.995
35
35.005
-116.965
-116.97
-116.975
-116.98
-116.985
-116.99
-116.995
-117
-117.005
Latitude
Longitude


P13275 SPV BL V 10dB
Baseline
10dB
34.96
34.965
34.97
34.975
34.98
34.985
34.99
34.995
35
35.005
-116.965
-116.97
-116.975
-116.98
-116.985
-116.99
-116.995
-117
-117.005
Longitude
Latitude

Appendix G.3

GPS Industry Perspective

This appendix contains data and analysis pertaining to the lower 10 MHz LightSquared downlink channel, which was proposed as a potential mitigation. LightSquared proposed this mitigation after testing was already underway, so the General Location / Navigation sub-team modified the test plan to accommodate this configuration. The results below show that severe jamming occurred as a result of the lower 10 MHz channel configuration.

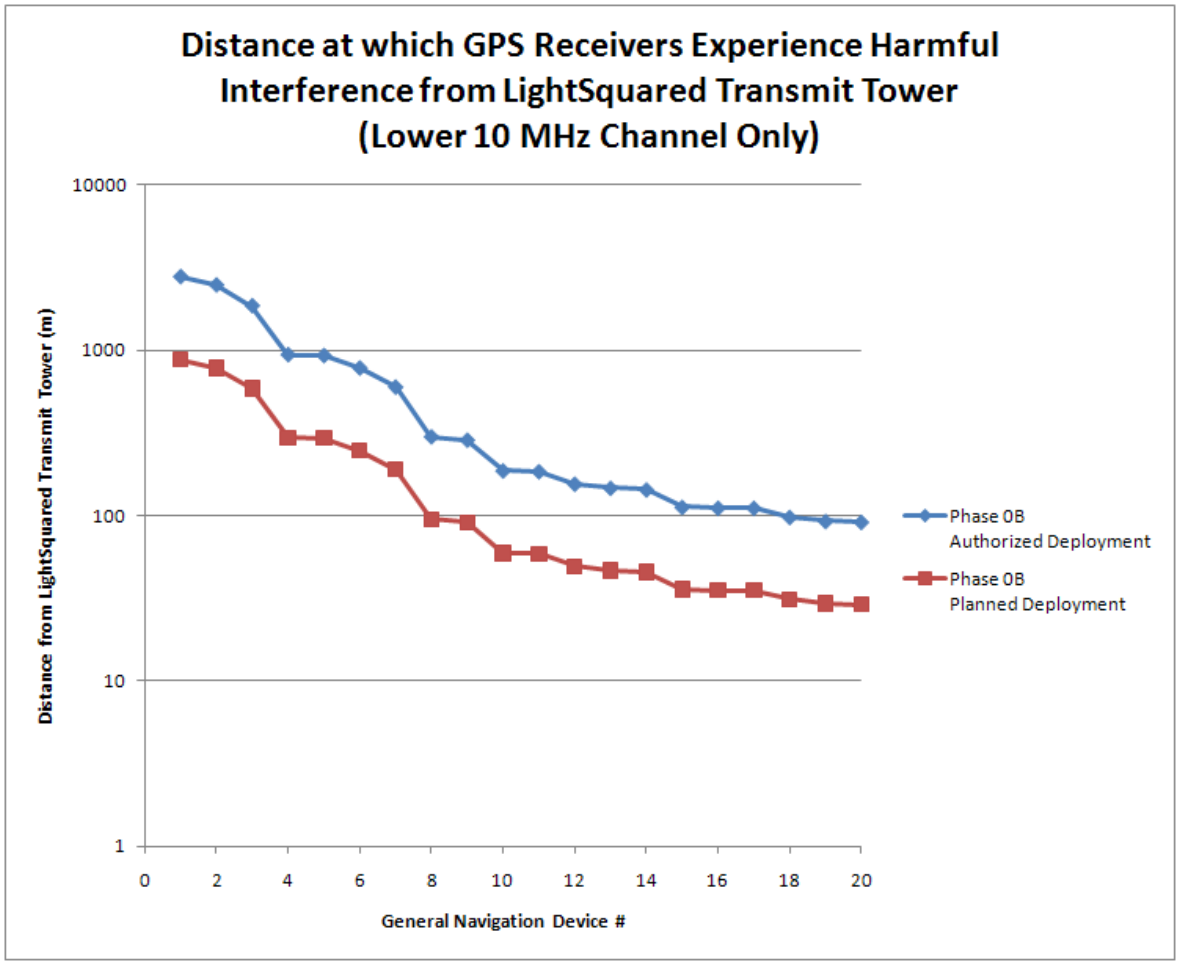


Figure 1

Due to test time constraints, only the Interference Susceptibility test was run for the lower 10 MHz channel configuration. The plot in Figure 1 shows the distance (in meters) from the LightSquared transmit tower at which a General Location / Navigation Device suffers harmful interference. As this plot demonstrates, some devices are jammed around 1 km from the transmit tower, while others can get a bit closer to the tower before suffering harmful interference.

Some have wondered about how far a user can be from a transmit tower before this harmful interference is really a problem. The Live Sky testing in Las Vegas clearly demonstrated just how close a General Location / Navigation device can come to a LightSquared transmit tower, and thus shows the grave threat posed by these interfering signals. For example, vehicles driving on S. Jones Blvd. can come within 30 meters of a LightSquared tower, just while driving down the road. Those same cars could drive within just a few meters of the tower while in an adjacent parking lot. Similarly, the tower next to Clark County Fire Station #16 is about 50 meters from the fire station itself, and fire trucks and rescue vehicles drive within just a few meters of the tower in their parking lot. This poses serious concerns for these rescue workers who depend on their GPS systems to take them to the scene of an emergency. They cannot afford to drive several kilometers from their station each time they receive a call in order for their navigation devices to function as this would risk the safety and lives of the citizens they serve.

LightSquared Perspective

LightSquared believes that the test results it has presented in the main body of the report clearly demonstrate that deployment on the Lower 10 MHz is an excellent means of mitigation. It shows that the devices tested are highly resilient to the Lower 10 MHz channel and the signal strengths that have been presented above, and elsewhere in the report by the GPS industry are wildly overstated.

Appendix G.4

New GPS Filter

TAIYO YUDEN Mobile Technology Co., Ltd.

10 Feb. 2011

GPS Filter

Simulation result

Confidential

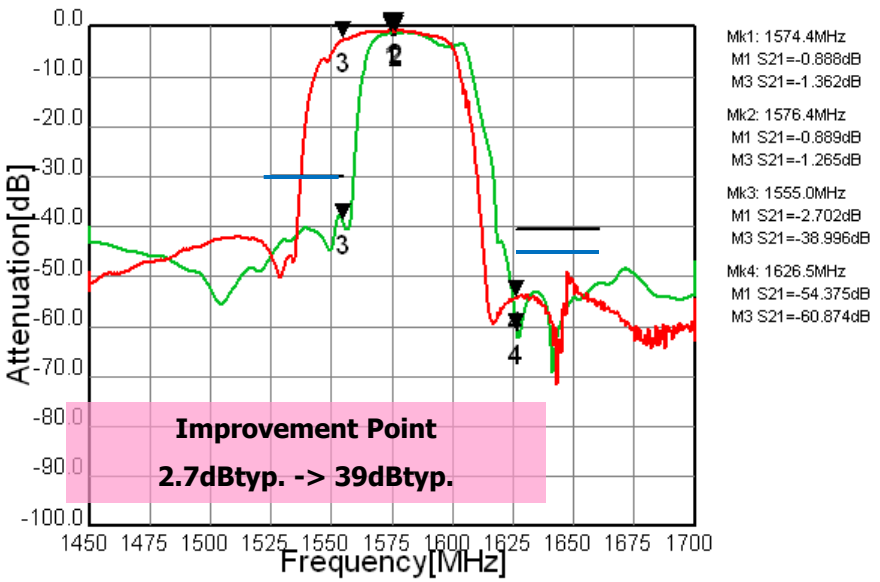


Fig.1 Pass-band Characteristics

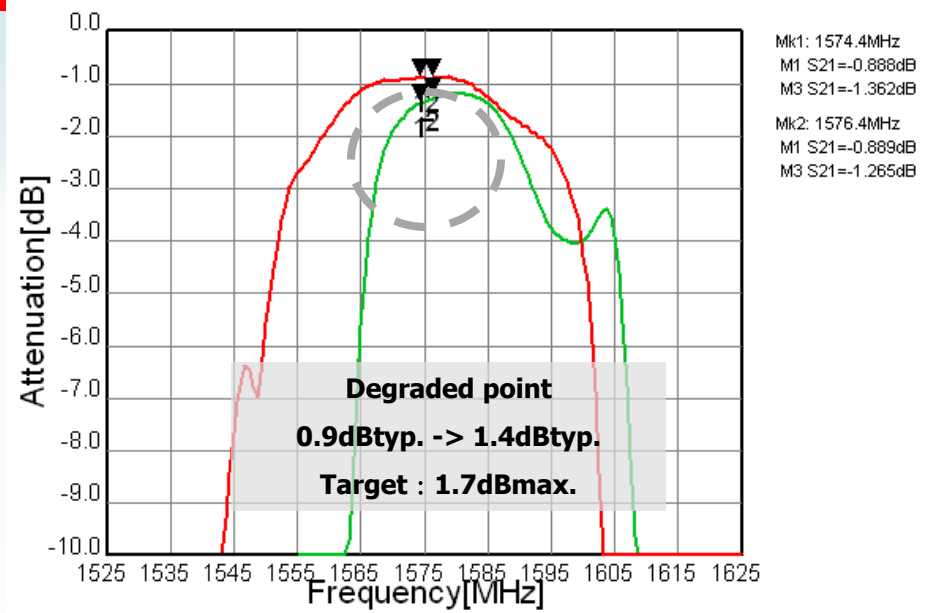


Fig.2 In-band Characteristics

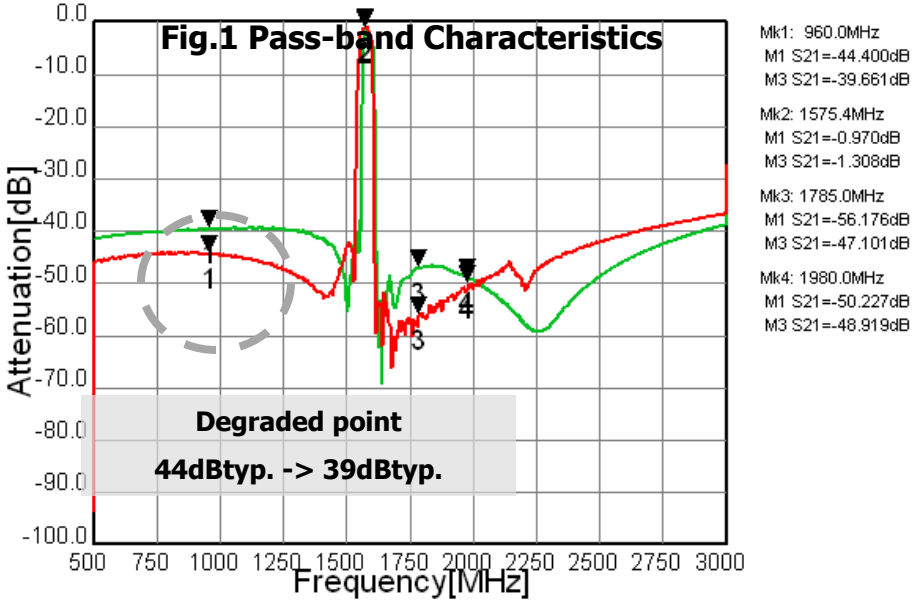


Fig.3 Wide-band Characteristics

- Taiyo Yuden Existing Solution (L4AJ)
- New Simulation result
- Taiyo Yuden Spec Proposal Based on simulation result

GPS Filter

Expected target spec (-30 to +85C)

- IL (1574-1576MHz) 1.4dBtyp. 1.7dB max
- Att 1525-1555MHz 39dB typ. 30dB min
- Att 1626.5-1660.5MHz 52dB typ. 45dB min

Sample development lead time : 2months

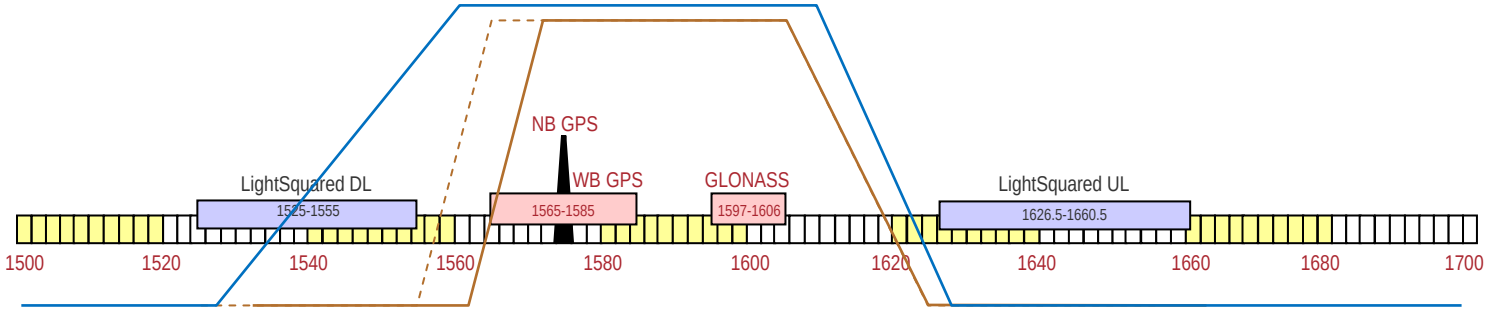
Appendix G.5

Pre-LNA Filter Capability for LightSquared Coexistence with GPS

Design study / Comparison:

A. **Wideband** GPS+GNNS filter with **Lowest Insertion Loss**
B. **Wideband** GPS+GNSS filter with **High-Rejection** including LightSquared requirements
C. **Narrowband** GPS+GNSS filter with **High-Rejection** including LightSquared requirements

Required Performance for LightSquared Coexistence



Filter pass band:
Narrowband GPS + GLONASS: 1574-1606 MHz (tan)
Wideband GPS + GLONASS: 1565-1606 MHz (dashed tan)

Target IL 1.5 dB max at 1575 MHz for LightSquared filters
Target IL 1.0 dB max at 1575 for low loss filter (blue)

Filter reject bands:
LightSquared Downlink: 1525-1555 MHz
LightSquared Uplink: 1626.5 – 1660.5 MHz

Target 40 dB min attenuation in reject bands (tan, dashed tan)
Not applicable to low loss filter (blue)
Note that present filtering already supports this level of rejection in the uplink band

Comments on Simulations

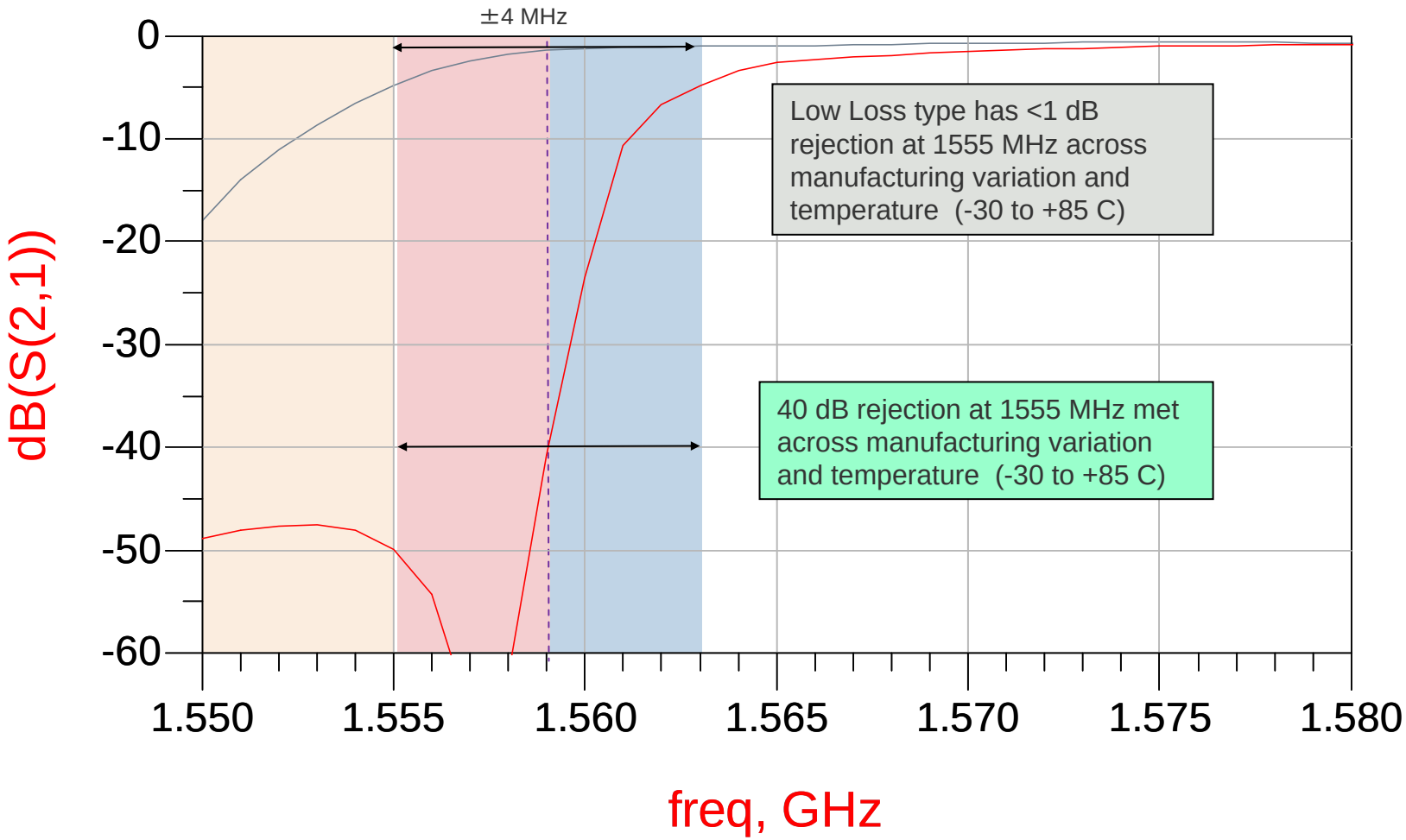
The plots shown on the following pages are linear simulations useful in predicting the capabilities of Avago Technologies' present Film Bulk Acoustic Resonator (FBAR) filter manufacturing process. FBAR is a Bulk Acoustic Wave filtering technology that utilizes high Q resonators to solve difficult filtering challenges. FBAR filters have been used by the mobile handset industry for over 10 years. In the course of this time more than 2 billion FBAR filters have been shipped. The process today supports many high volume applications, including a significant portion of the GPS pre-LNA filters used in mobile handsets.

Linear simulations of the kind included here typically give a good indication of the bandwidth and roll off (rejection) that can be achieved in physical filters. Insertion loss numbers are realistic, though sometimes slightly (tenths of a dB) optimistic. While these simulations do not allow negotiation of a final specification in full detail, they provide enough information to indicate process capability, and can be used to make tradeoffs when considering design options.

The plots represent the performance of typical filters at room temperature (25C). Variations in performance across manufacturing variation and over temperature also need to be accounted for when guaranteeing filter performance. This can be done by adding a frequency "guard band" to the nominal performance. For the technology used at a frequency of 1575 MHz and a temperature range of -30 to +85 C, the required frequency margin is ± 4 MHz.

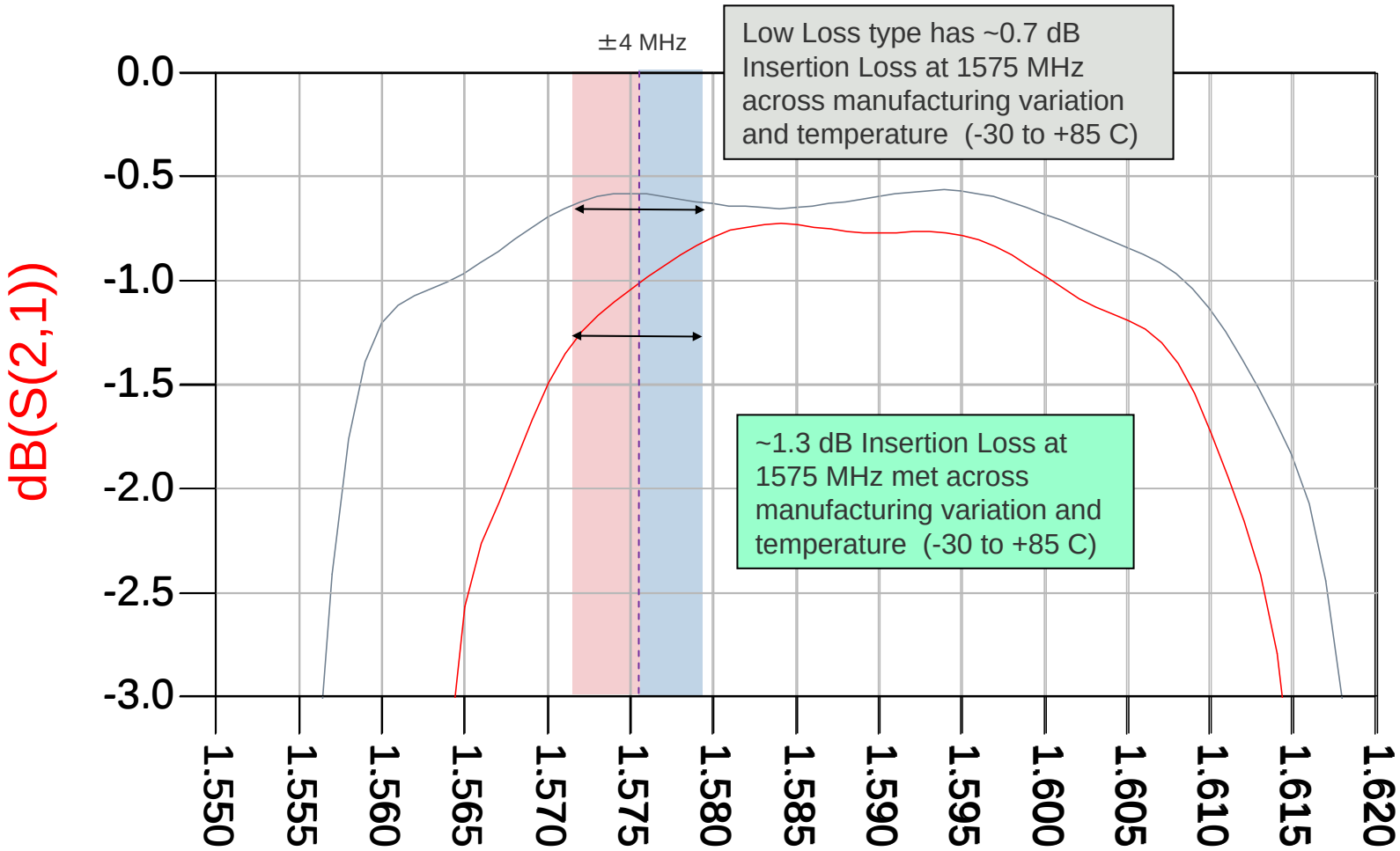
In the following plots, this guard band is represented by red and blue rectangles with a dashed line placed at the nominal (room temperature of a typical device) performance. By reading the value of the typical plot appropriately shifted in frequency, expected performance over temperature and over manufacturing variation can be determined from the typical plots.

Narrowband High Rejection Type: Nominal Transition Band



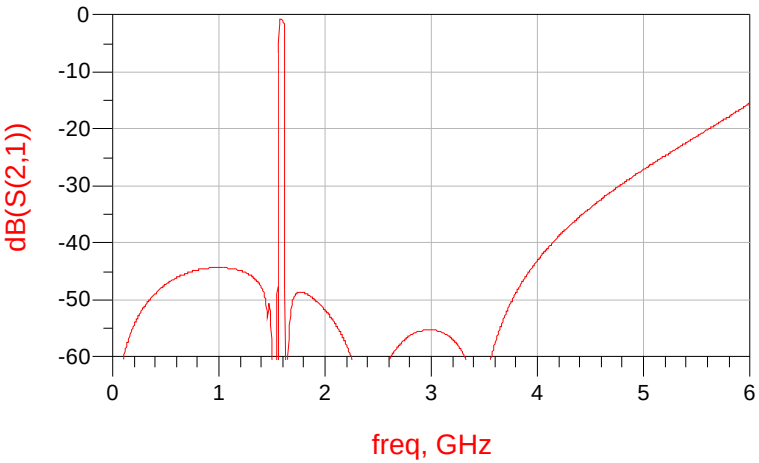
Grey – Wideband „Low IL type“
Red – Narrowband „High Rejection type“

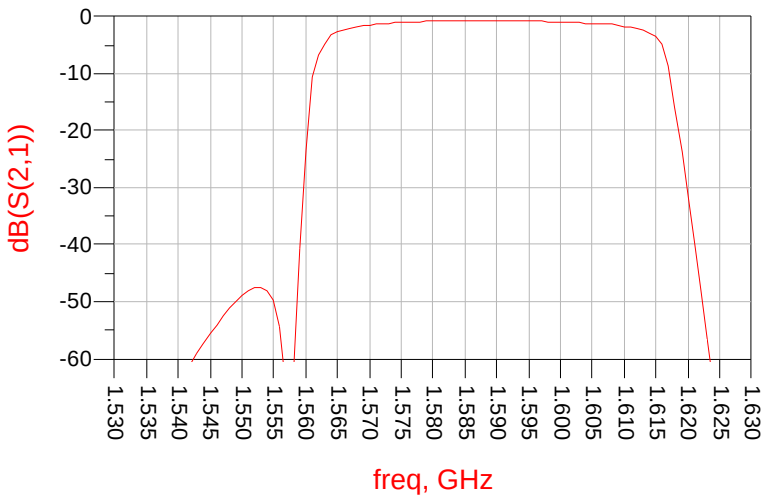
Narrowband High Rejection Type: Nominal Insertion Loss

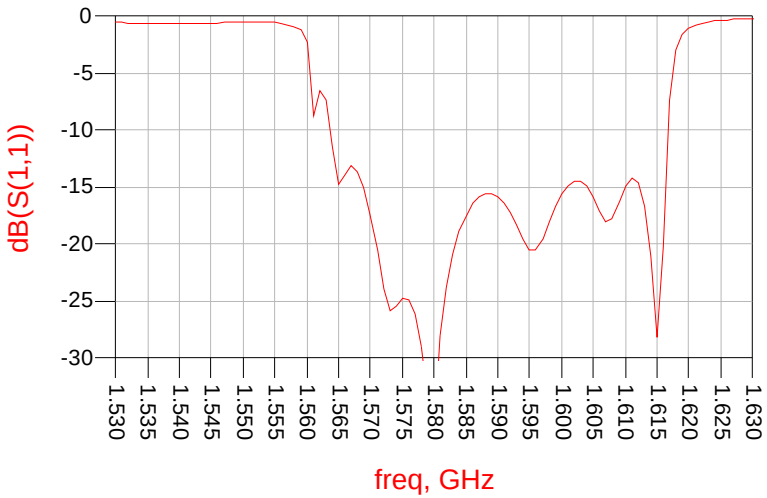


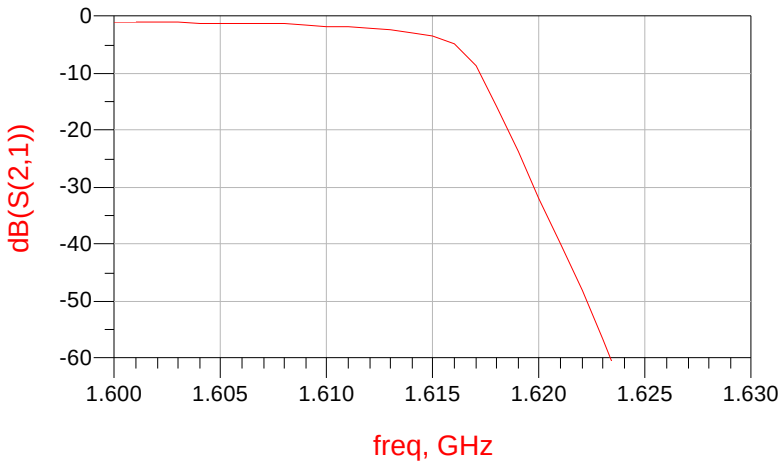
Grey – Wideband „Low IL type“
Red – Narrowband „High Rejection type“

Narrowband High Rejection Type: Nominal Performance

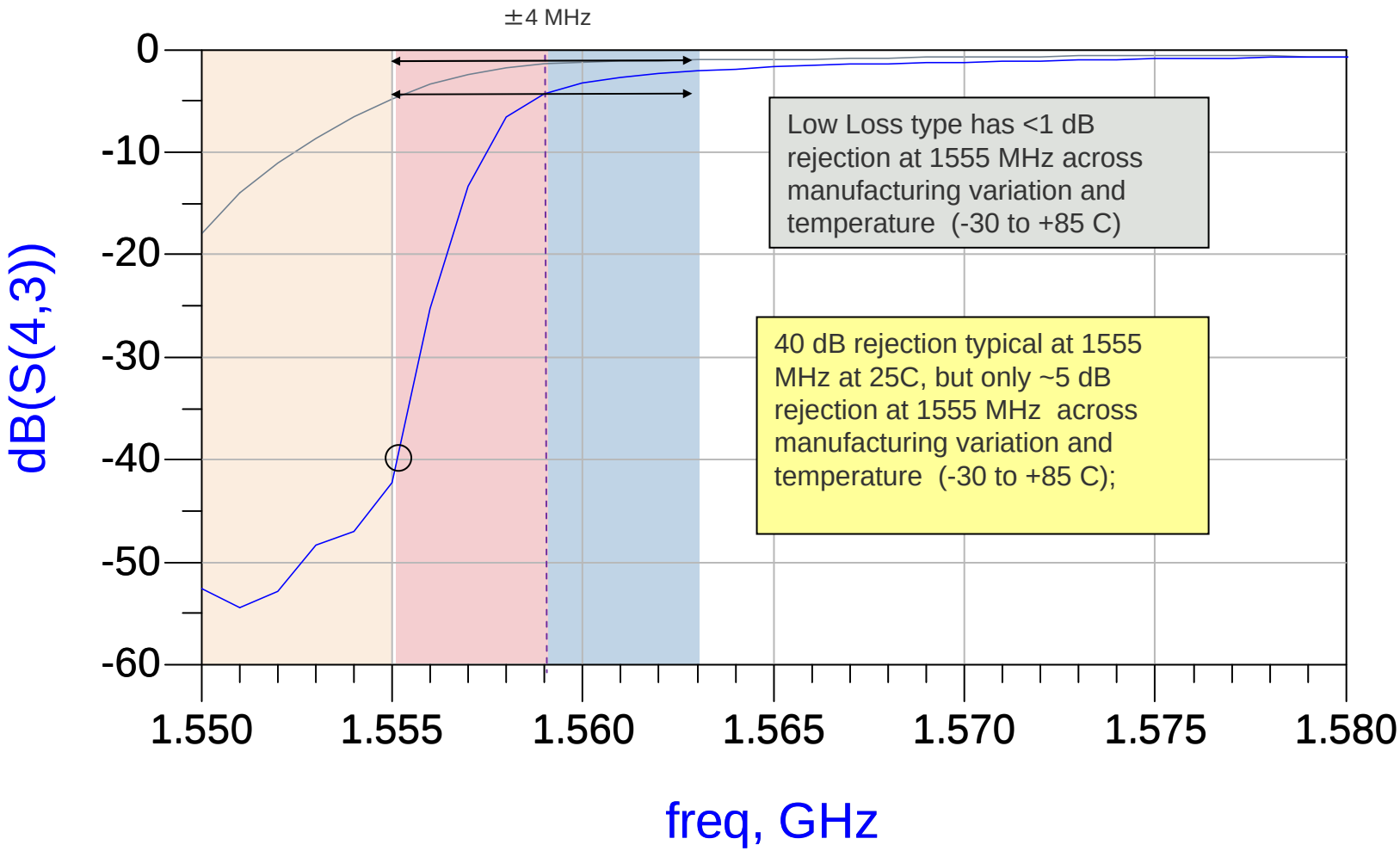






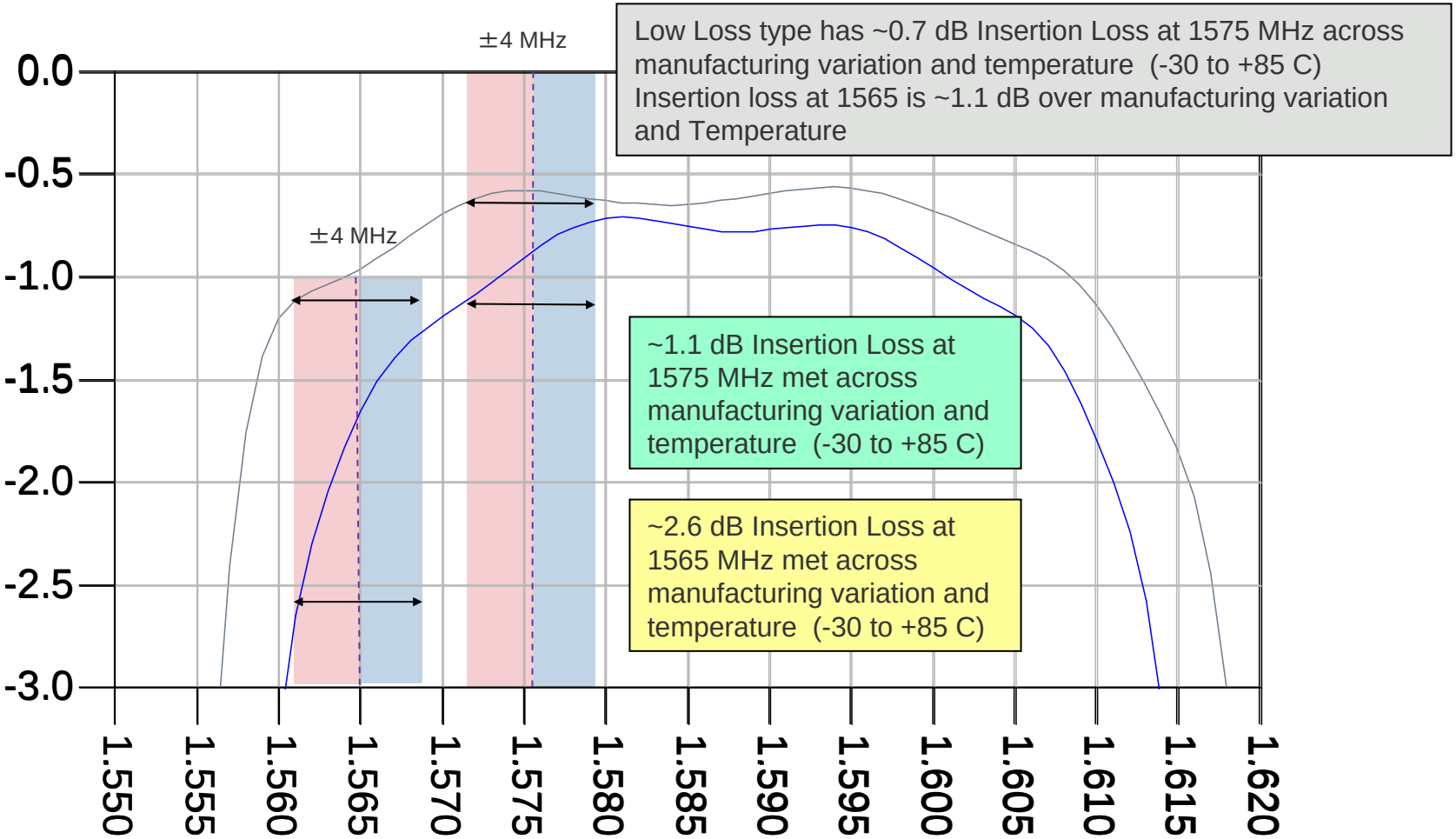


Wideband High Rejection Type: Nominal Transition Band



Grey – Wideband „Low IL type“
Blue– Wideband „High Rejection type“

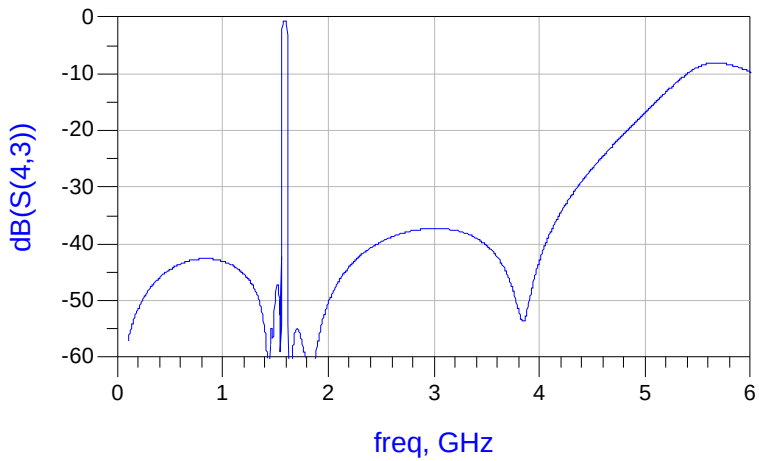
Wideband High Rejection Type: Nominal Insertion Loss

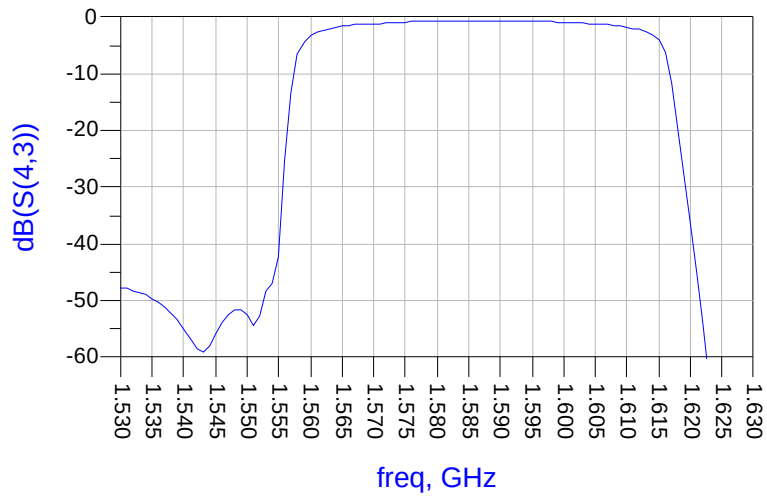


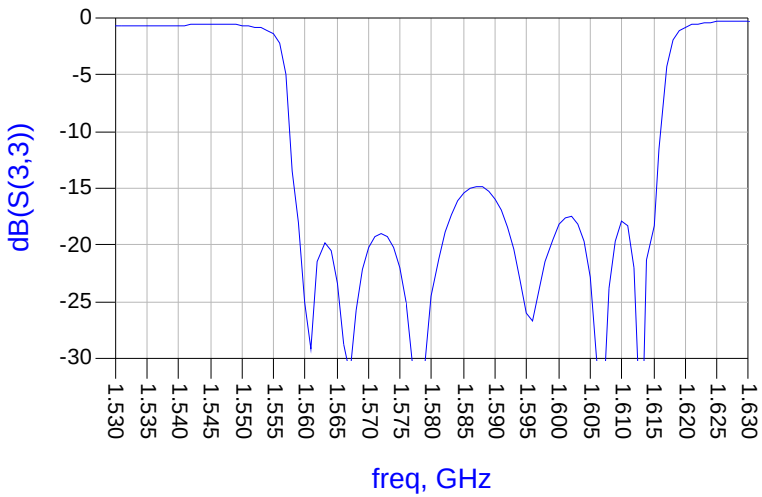
Grey – Wideband „Low IL type“
Blue– Wideband „High Rejection type“

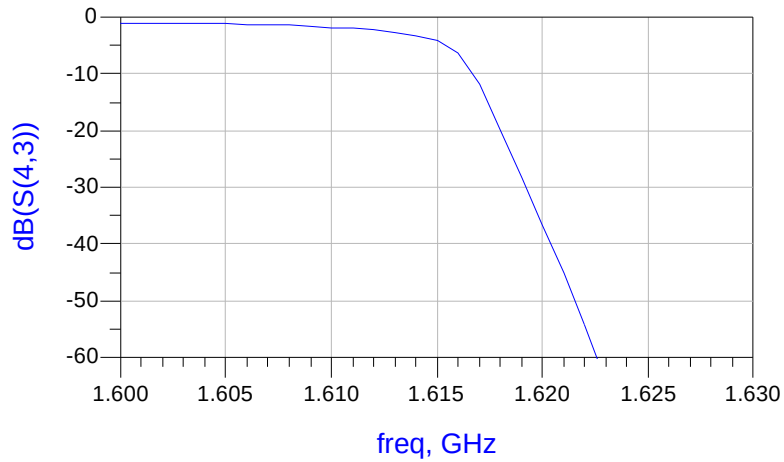
freq, GHz

Wideband High Rejection Type: Nominal Performance

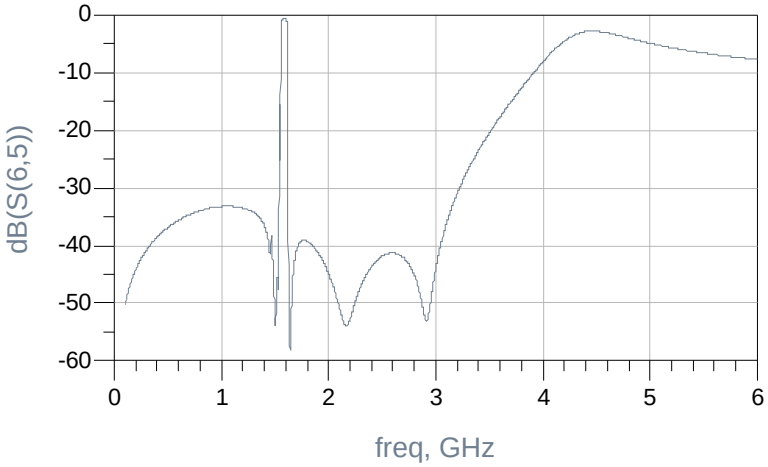


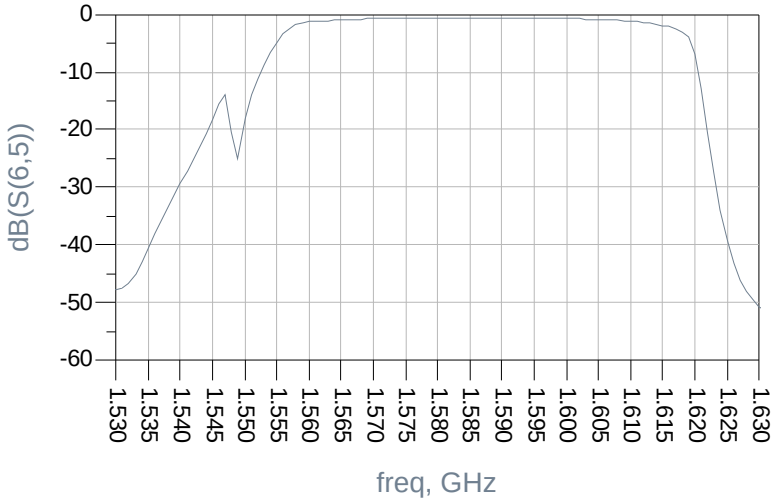


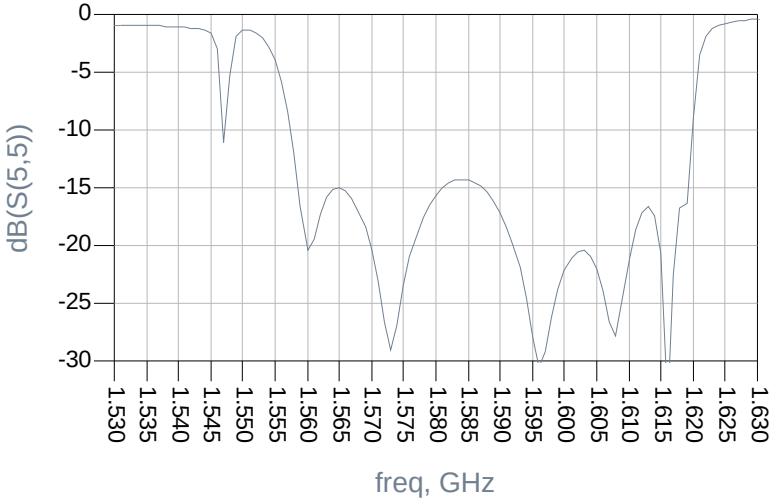


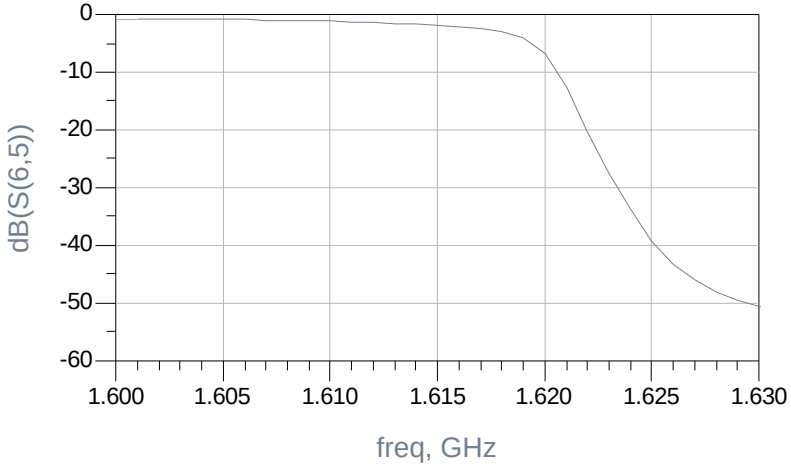


Wideband Low IL Type: Nominal Performance

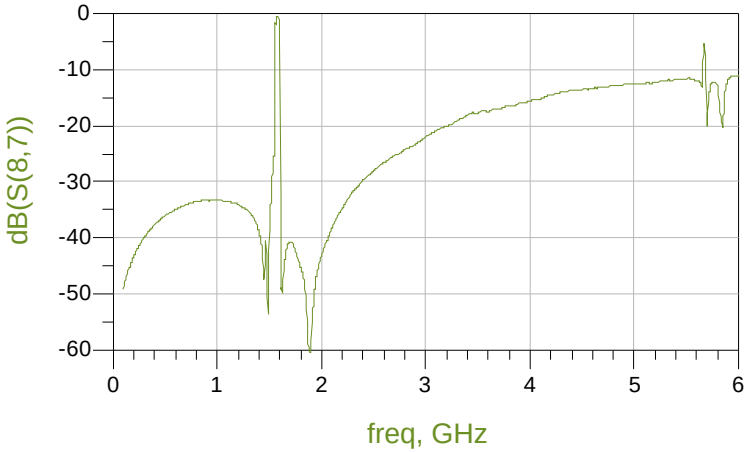


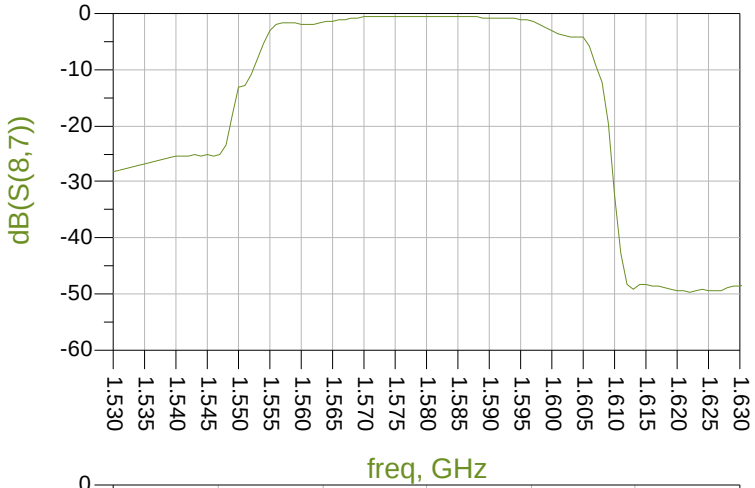


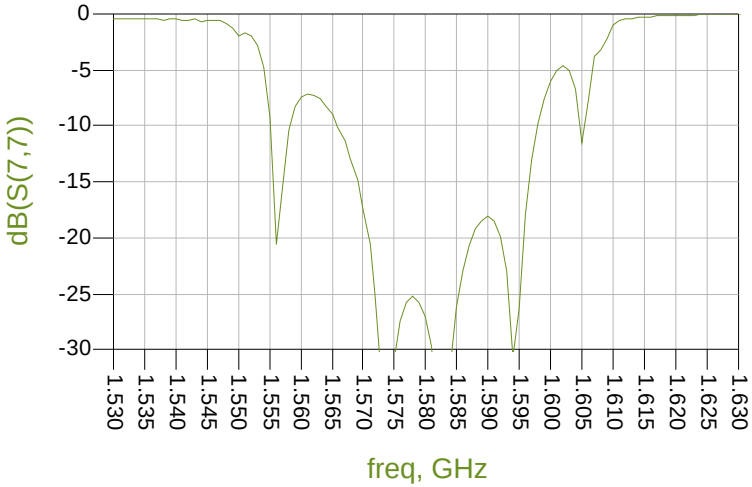


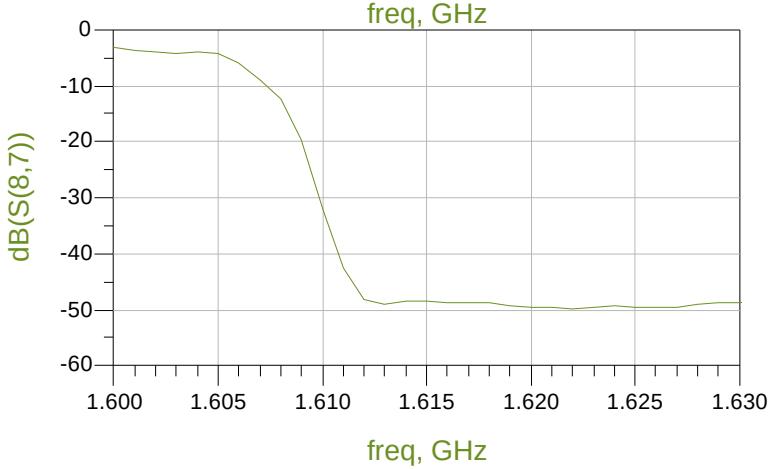


Reference Wide GPS Only Type: Nominal Performance



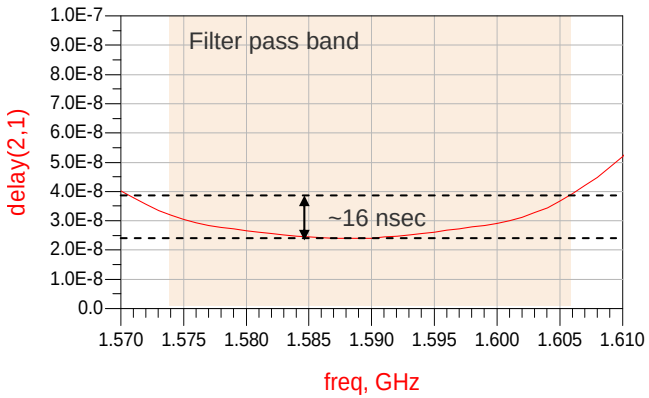




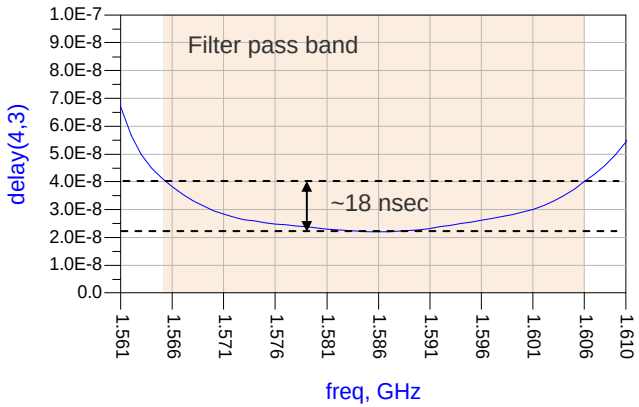


Group Delay Performance of Wideband and Narrowband Filters

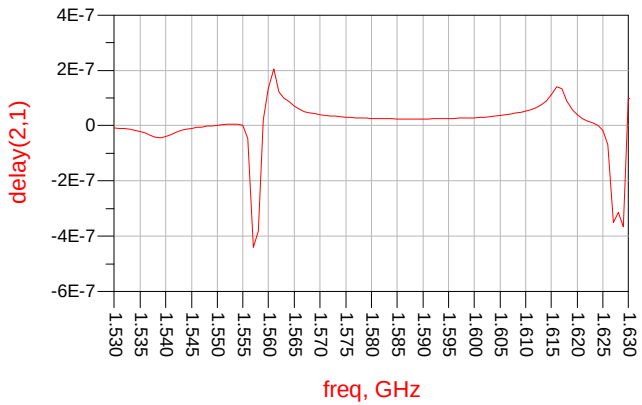
Narrow Band Filter, detail of pass band



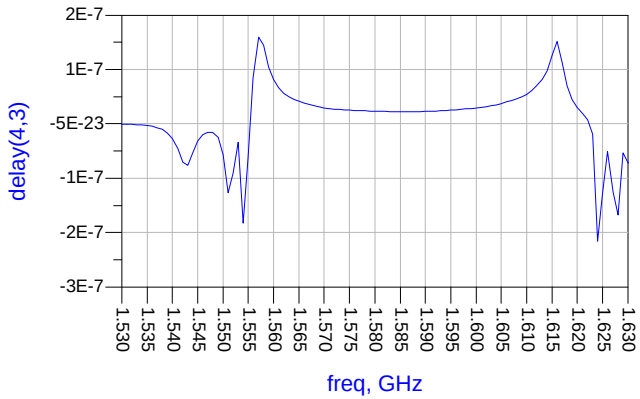
Wide Band Filter, detail of pass band



Narrow Band Filter, broadband

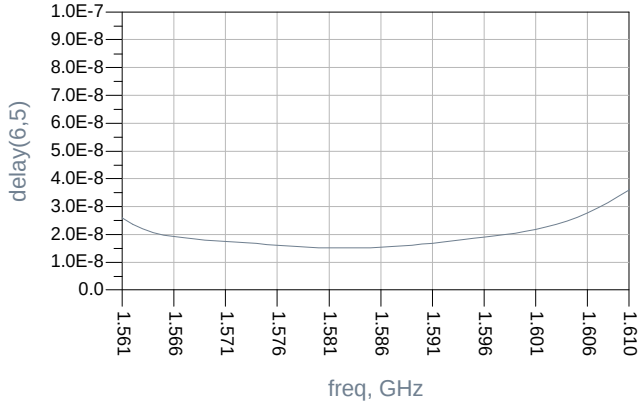


Wide Band Filter, broadband

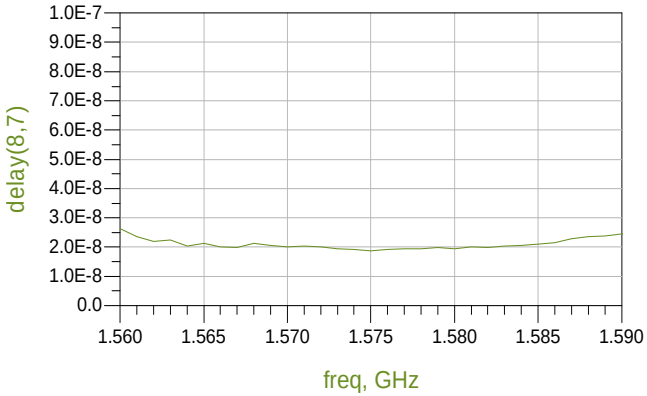


Group Delay Performance of Wideband and Narrowband Filters

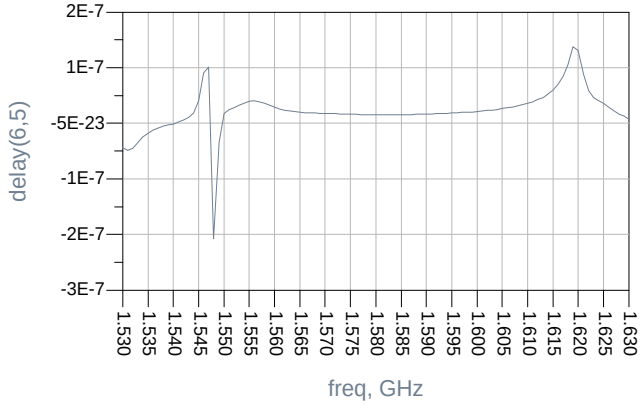
Low Loss Filter, detail of pass band



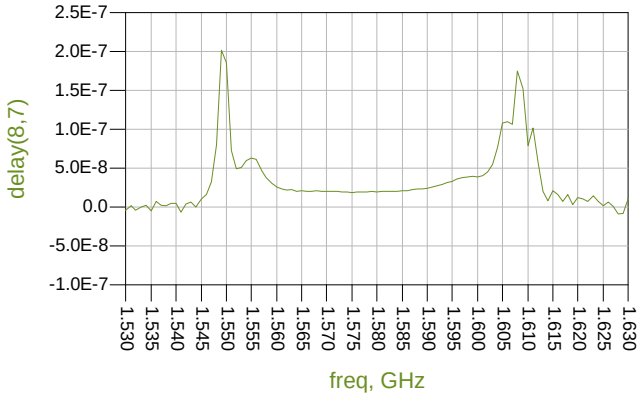
Wide GPS Only Filter, detail of pass band



Low Loss Filter, broadband

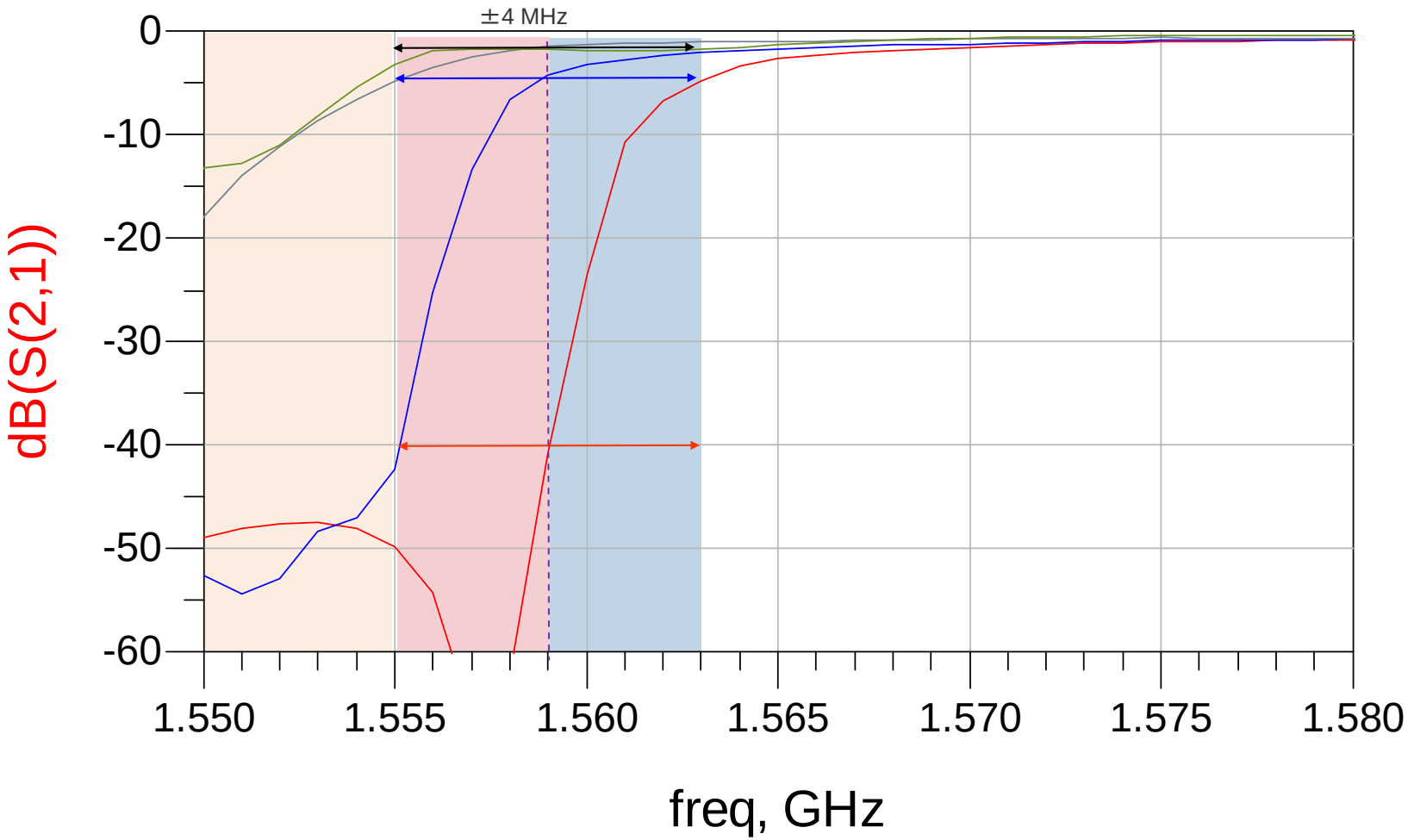


Wide GPS Only Filter, broadband



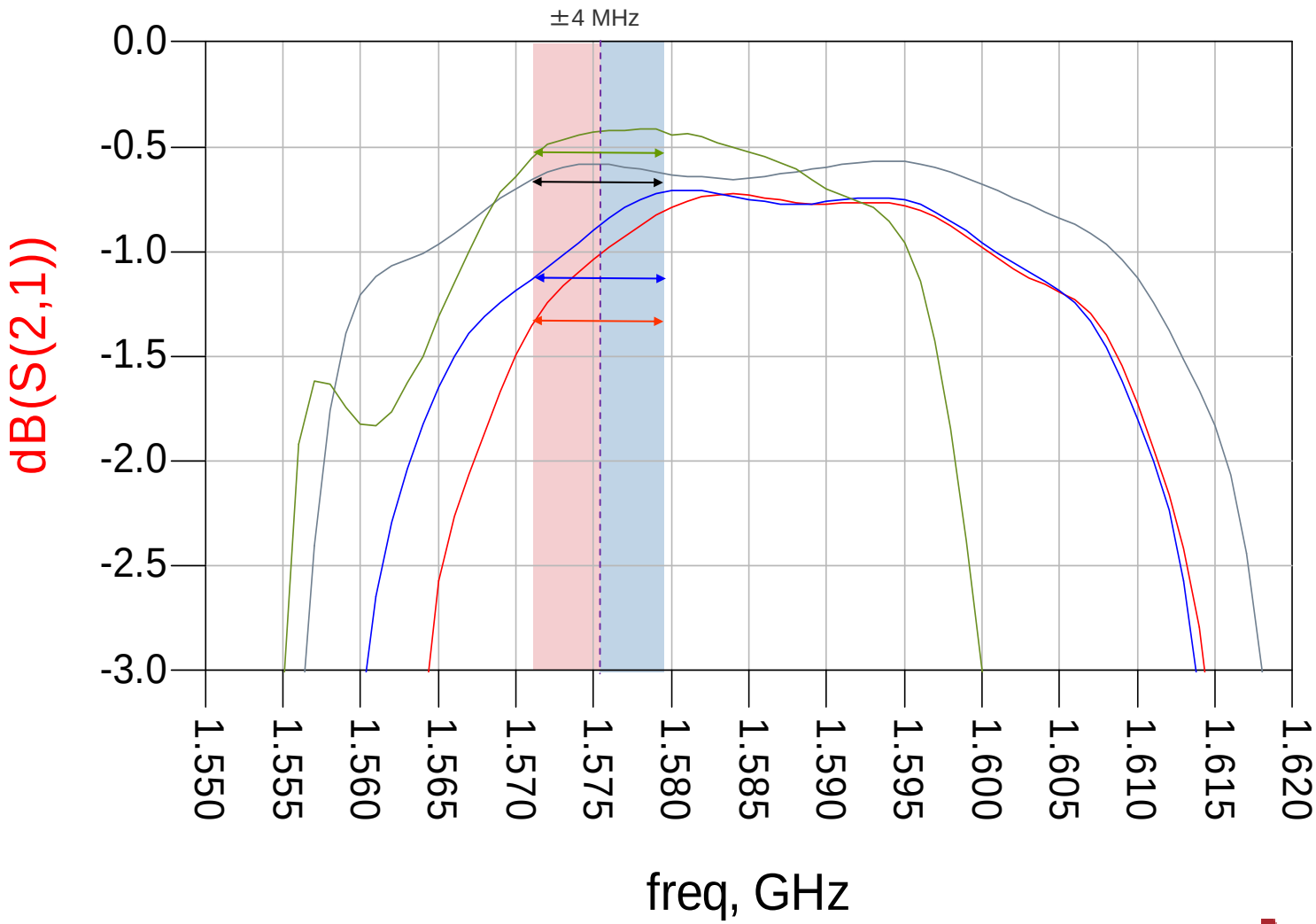
Comparison of Rejection at LightSquared Downlink

Grey – Wideband „Low IL type“
Red – Narrowband „High Rejection type“
Blue– Wideband „High Rejection type“
Olive- Reference measured wide GPS only (no GLONASS)



Comparison of Insertion Loss

Grey – Wideband „Low IL type“
Red – Narrowband „High Rejection type“
Blue– Wideband „High Rejection type“
Olive- Reference measured wide GPS only (no GLONASS)



Conclusions from the Performance Plots

Present Avago FBAR manufacturing technology can support a filter with <1.5 dB insertion loss across narrow GPS + GLONASS (1574-1606 MHZ) that provides 40 dB of rejection in the LightSquared bands. This performance can be maintained across manufacturing variation and a temperature range of -30 to +85 C.

Present Avago FBAR manufacturing technology only marginally supports a filter with <1.5 dB insertion loss across wide GPS + GLONASS (1565-1606 MHZ) that provides more than 40 dB of rejection in the LightSquared bands. While acceptable performance can nominally be obtained at room temperature, at this time relaxations would be needed for guaranteed performance across manufacturing variation and temperature. It is the belief of Avago Technologies that improvements in technology that will become available in volume manufacturing over the next few years will allow the support of wide GPS + GLONASS filters as well.

It is appropriate to note that at this time this work is a feasibility study only. Avago Technologies does not presently manufacture filters that support LightSquared coexistence with GPS.