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CERTIFICATION TEST REPORT

Manufacturer: Innovative Developments LLC
8437 Mayfield Road, Suite 101-2
Chesterland, Ohio 44026
United States of America

Applicant: Same As Above

Product: 3D Human/Computer Input Device

Model: MYCESTRO-001

FCC ID: 2ABH4INNDEV001

Testing Commenced: Dec. 12, 2013

Testing Ended: Jan. 29, 2014

Summary of Test Results: Page 4

Standards:

- ❖ **FCC Part 15 Subpart C, Section 15.247**
- ❖ **FCC Part 15, Subpart C, Section 15.207**



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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to the 2003 version of ANSI C63.4 and recommended FCC procedure of measurement of DTS operating under Section 15.247 and in KDB558074. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

Radiated Emission

- Combined Uncertainty (+ or -) 2.67 dB
- Expanded Uncertainty (+ or -) 5.35 dB

Conducted Emissions

- Combined Uncertainty (+ or -) 1.88 dB
- Expanded Uncertainty (+ or -) 3.75 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2LQ5797-01E	First Issue	Jan. 31, 2014	W. Fuster

**2 SUMMARY OF TEST RESULTS**

Test Name	Standard(s)	Results
-6dB Occupied Bandwidth	CFR 47 Part 15.247(a)(2) / KDB558074	Complies
Conducted Output Power	CFR 47 Part 15.247(b)(3) / KDB558074	Complies
Conducted Spurious Emissions	CFR 47 Part 15.247(d) / Part 15.209 / KDB558074	Complies
Radiated Spurious Emission with 0dBi Integral Antenna	CFR 47 Part 15.247(d) / Part 15.209 / KDB558074	Complies
Peak Power Spectral Density	CFR 47 Part 15.247(e) / KDB558074	Complies
Conducted Emissions	CFR 47 Part 15.207(a)	Complies

Modifications Made to the Equipment
None

**3 TABLE OF MEASURED RESULTS**

Test	High Channel 2.480GHz	Mid Channel 2.440GHz	Low Channel 2.402GHz
Conducted Output Power	0.01291mW (-18.89dBm)	0.01563mW (-18.06dBm)	0.01489mW (-18.27dBm)
Conducted Output Power Limit	1 Watt, (30dBm)	1 Watt, (30dBm)	1 Watt, (30dBm)
E.I.R.P. with 0dBi Integral antenna	0.01291mW (-18.89dBm)	0.01489mW (-18.27dBm)	0.01563mW (-18.06dBm)
E.I.R.P. Limit	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)
Peak Power Spectral Density	-29.77 dBm	-29.82 dBm	-30.10 dBm
Peak Power Spectral Density Limit	8 dBm	8 dBm	8 dBm
-6dB Occupied bandwidth	.5628 MHz	.5562 MHz	.5514 MHz
-6dB Occupied Bandwidth Limit	≥ 500KHz	≥ 500KHz	≥ 500KHz



4 ENGINEERING STATEMENT

This report has been prepared on behalf of Innovative Developments LLC to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.247 of the FCC Rules using ANSI C63.4 2003 and KDB558074 standards. The test results found in this test report relate only to the items tested.



5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: 3D Human/Computer Input Device

Model: MYCESTRO-001

Serial No.: TBD

FCC ID: 2ABH4INNDEV001

5.2 Trade Name:

Innovative Developments LLC

5.3 Power Supply:

Internal Rechargeable Battery

5.4 Applicable Rules:

CFR 47, Part 15.247, subpart C

5.5 Equipment Category:

Radio Transmitter-DTS

5.6 Antenna:

0dBi Integral

5.7 Accessories:

N/A

5.8 Test Item Condition:

The equipment to be tested was received in good condition.

5.9 Testing Algorithm:

The EUT was configured to permit frequency changes from low-mid-upper transmission channel using digital modulation (required for digital transmission systems). For RF antenna conducted tests, the EUT was equipped with an SMA connector for connection to the measuring equipment. For radiated emissions tests, in a semi-anechoic chamber and on the OATS, the EUT was equipped with integral/internal chip antenna. The highest emissions were recorded in the data tables.

**6 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shield Room	0175	Ray Proof	N/A	11645	Oct. 28, 2014
Temp/Hum. Recorder	CL137	Extech	RH520	CH16992	Apr. 17, 2014
OATS-3m	CL017	Compliance Labs	N/A	001	Dec. 13, 2014
Spectrum Analyzer	CL147	Agilent	E7402A	MY45101241	Oct. 24, 2014
Spectrum Analyzer	CL138	Agilent Technologies	E4407B	US41192779	Oct. 29, 2014
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Oct. 30, 2014
Antenna 1-Chamber	0142	ETS/EMCO	3142B	9811-1330	Verified
Antenna 2-OATS	0105	Sunol Sciences	JB1	A101101	May 7, 2015
Pre-Amplifier	CL153	Agilent	83006-69007	MY39500900	Jan. 9, 2015
Active 18" Loop Antenna	CL082	A.H. Systems, Inc.	SAS-562B	241	Sept. 6, 2014
Antenna, Horn	CL098	Emco	3115	9809-5580	Dec. 3, 2015
Antenna, Horn	CL114	A.H. Systems, Inc.	SAS-572	237	Sept. 6, 2014
Cable: 0.3m Low Loss	CL116	A.H. Systems, Inc.	SAC-26G-0.3	206	Mar. 1, 2014
Cable: 0.3m Low Loss	CL117	A.H. Systems, Inc.	SAC-26G-3	207	Jan. 16, 2015
Coaxial Cable	CL139	Thermax	M17/128-RG400	JB (Brown)	Feb. 21, 2014
Coaxial Cable	CL140	Thermax	M17/128-RG400	JC (Brown)	Feb. 25, 2014
Temp/Hum. Rec.	CL119	Extech	RH520	H005869	Jan. 8, 2015
Transient Limiter	0202	Hewlett Packard	11947A	3107A00729	June 27, 2018
LISN 1	0149	Solar	8028-50-TS-24-BNC	1130	Jan. 8, 2017
LISN 3	0148	Solar	8028-50-TS-24-BNC	1129	Jan. 8, 2017
Software:	Tile Version 1.0		Software Verified: Jan. 10, 2014		
Software:	EMC 32, Version 5.20.2		Software Verified: Jan. 10, 2014		



7 FCC PART 15.247(a)(2) – OCCUPIED BANDWIDTH

7.1 Requirements:

The 6dB bandwidth shall be greater than 500 kHz.

7.2 Procedure:

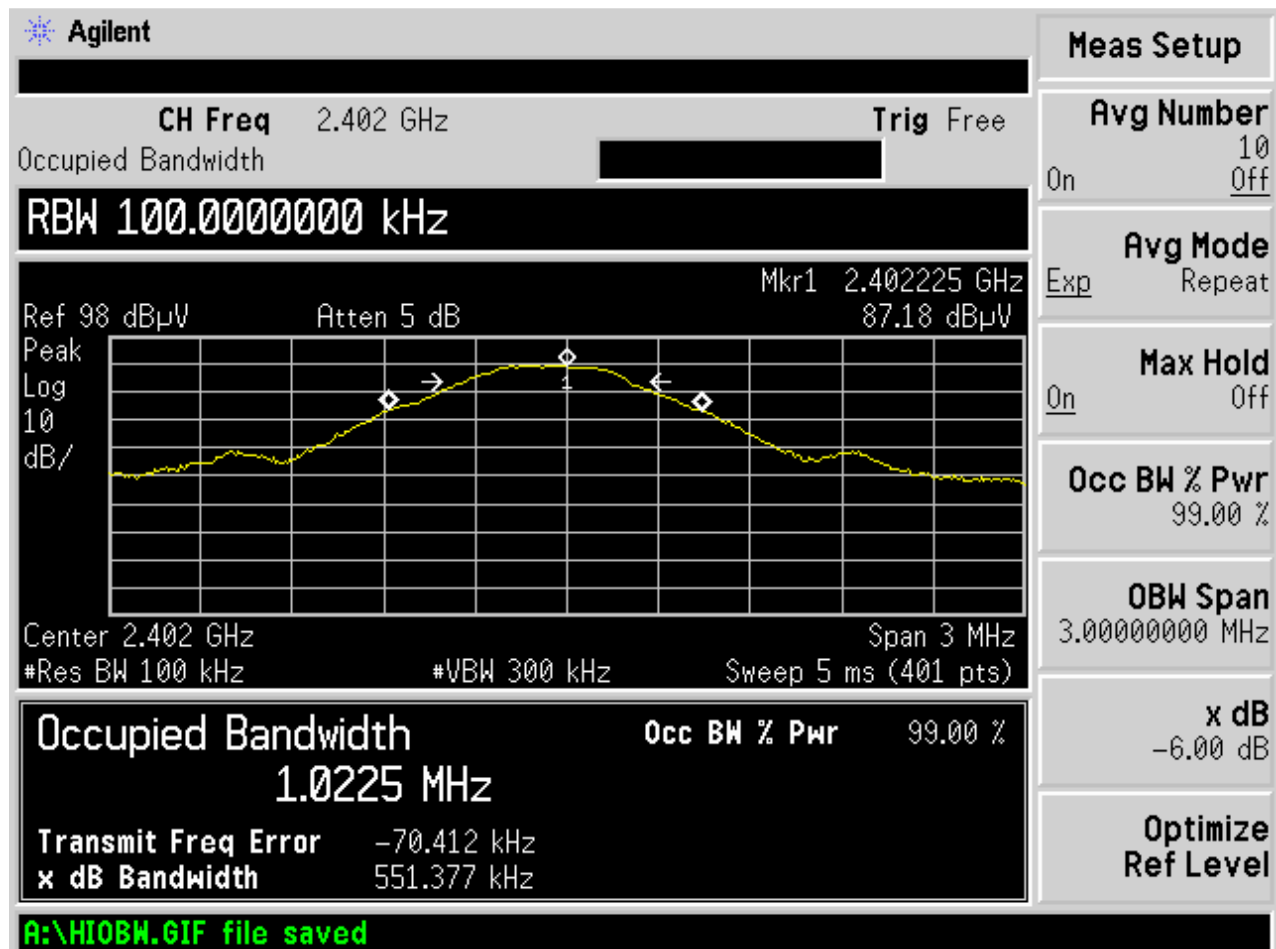
Bandwidth measurements were made at the low (2.402 GHz), mid (2.440 GHz) and upper (2.480 GHz) frequencies with the resolution Bandwidth set at 100 kHz (video bandwidth set at 300 kHz) while the span was set at 3MHz. The bandwidth was measured using the analyzer's marker function.



7.3 Occupied Bandwidth Test Data

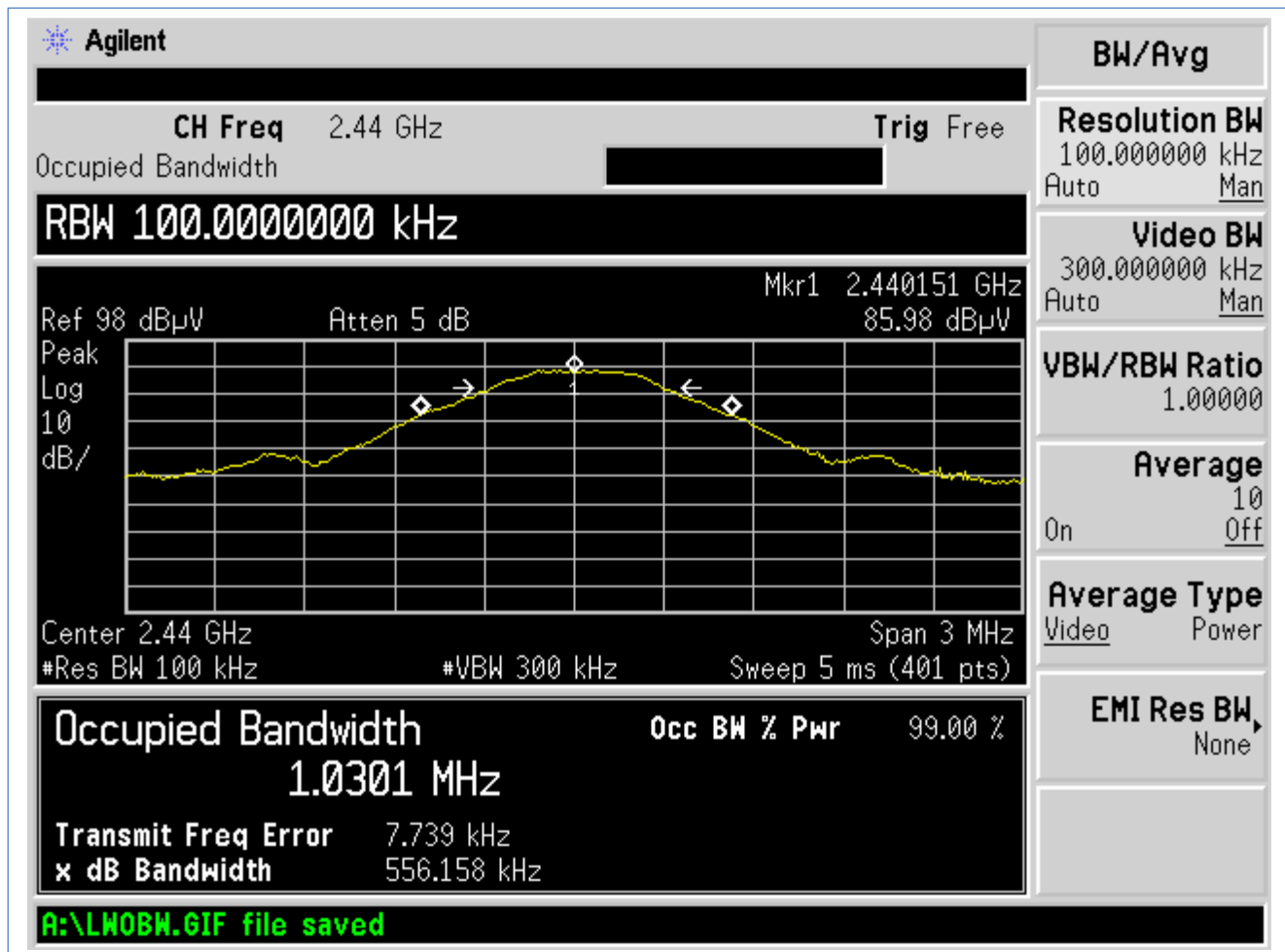
Test Date:	Dec. 12, 2013	Test Engineers:	J. Knepper; K. Littell
Standards:	CFR 47 Part 15.247(a)(2); KDB558074	Air Temperature:	20.1°C
		Relative Humidity:	38%

Low Channel



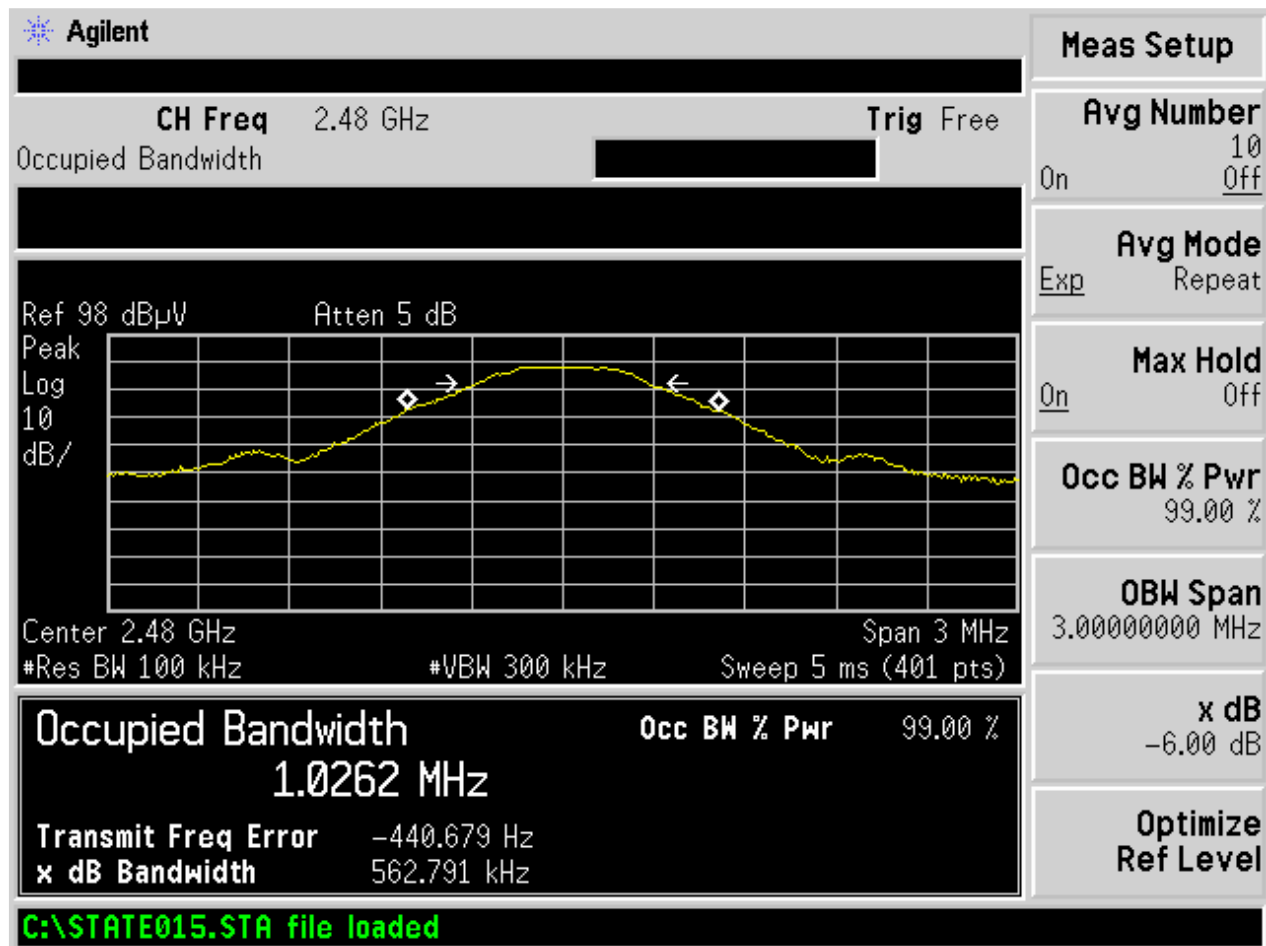


Mid Channel





High Channel





8 FCC PART 15.247(b)(3) – CONDUCTED OUTPUT POWER

8.1 Procedure:

The EUT antenna port was fitted with an SMA connector and directly connected to the input of the receiver. The peak power output was measured.

8.2 Requirements:

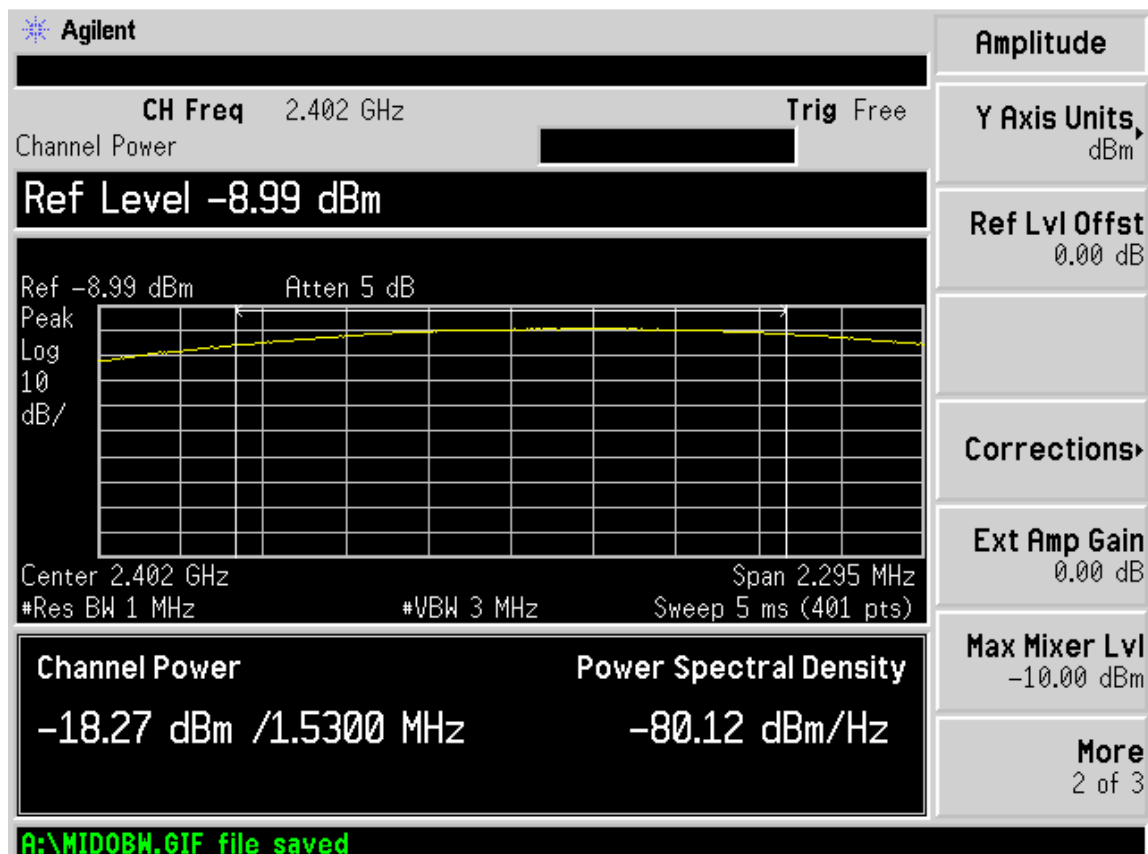
The peak power output shall be 1 watt (30 dBm) or less when using an antenna with a gain of less than 6dBi. For antennas having a gain of more than 6dBi, the limit is reduced by 1dB for every dB the antenna gain is over 6dBi.



8.3 Conducted Output Power Test Data

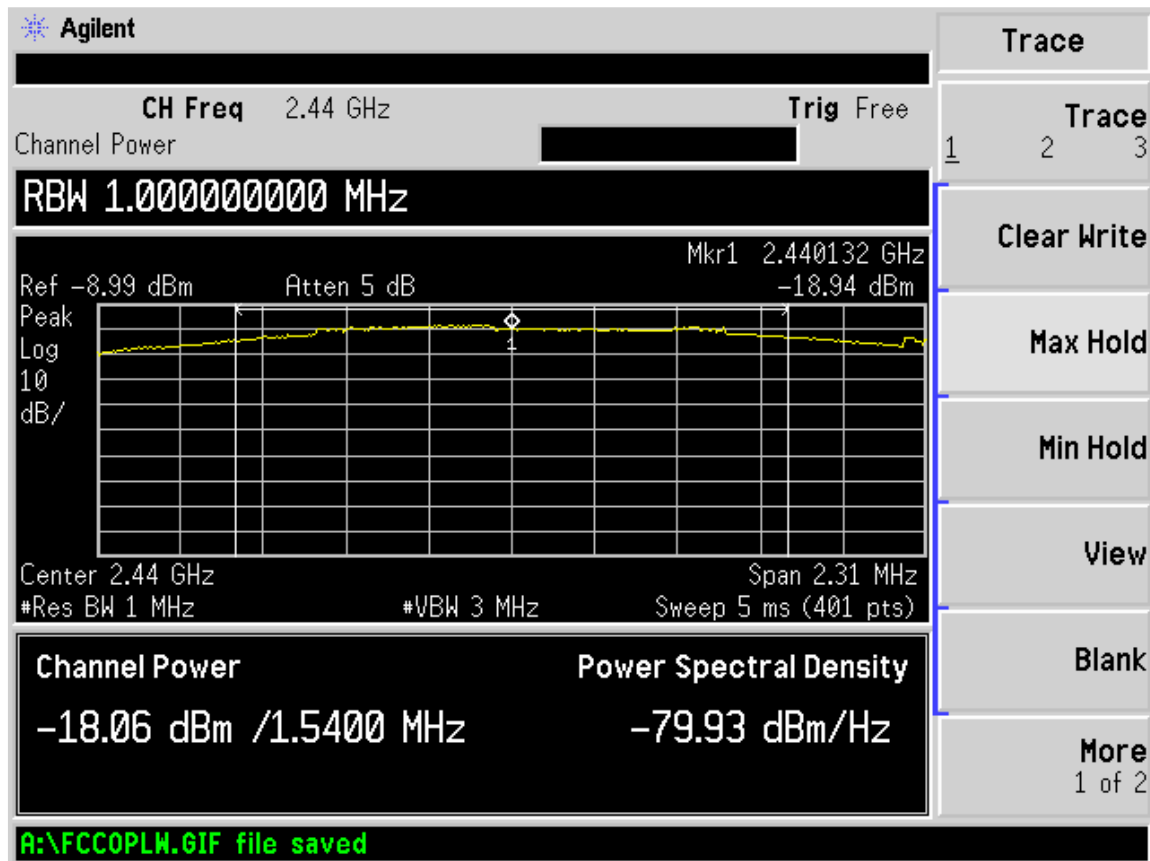
Test Date:	Dec. 31, 2014	Test Engineers:	M. Toth; K. Littell
Standards:	CFR 47 Part 15.247(b)(3); KDB558074	Air Temperature:	20.3°C
		Relative Humidity:	39%

Low Channel



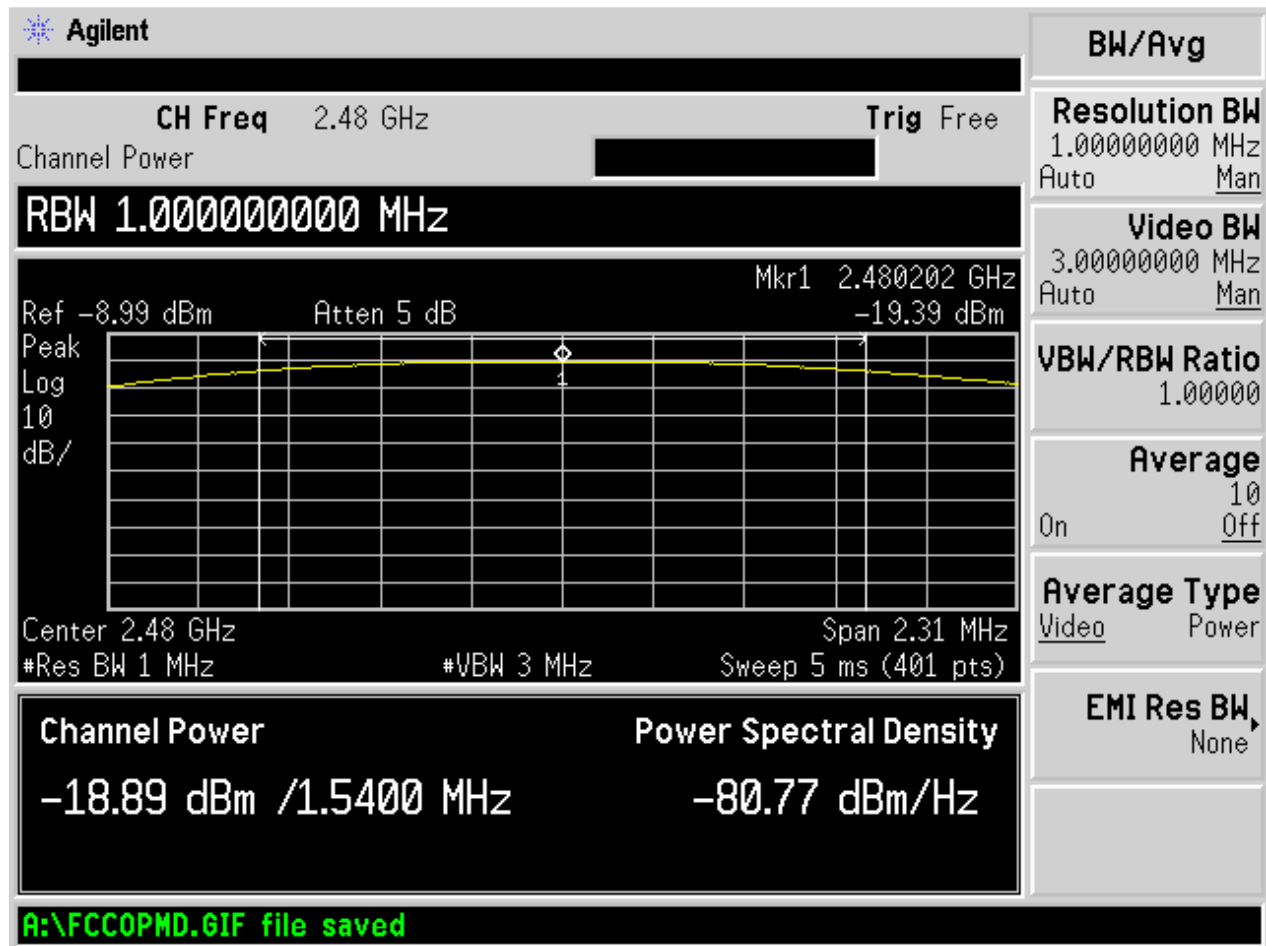


Mid Channel





High Channel





9 FCC Part 15.247(c) – CONDUCTED SPURIOUS EMISSIONS

The following tests were performed to demonstrate compliance.

9.1 Test Procedure:

The EUT antenna port was fitted with an SMA connector and directly connected to the input of the spectrum analyzer.

9.2 Requirements:

All Spurious Emissions must be at least 20dB down from the highest emission level measured within the authorized band up through the tenth harmonic.

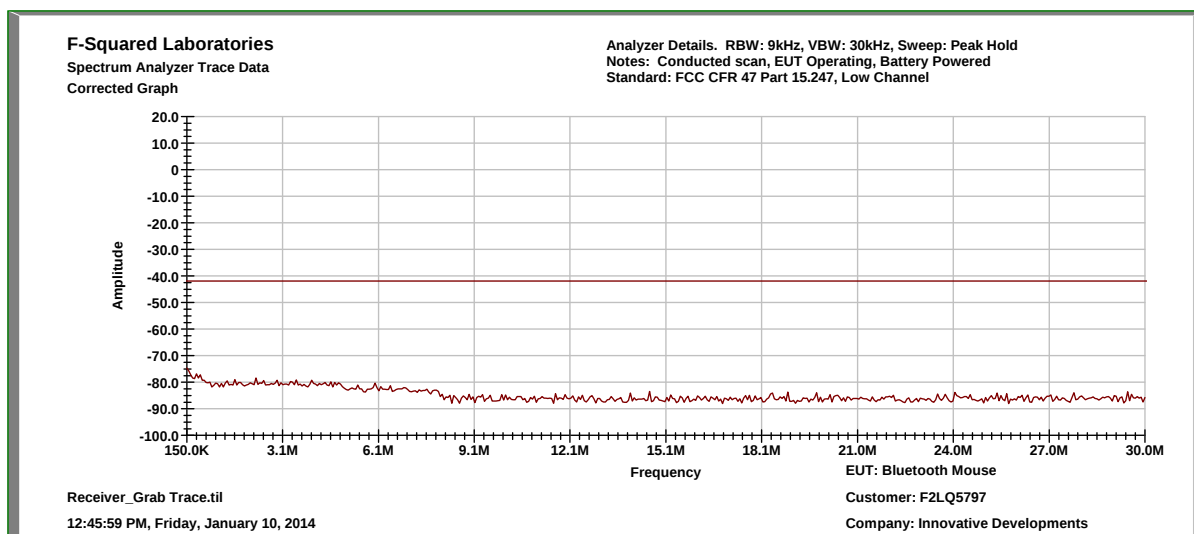
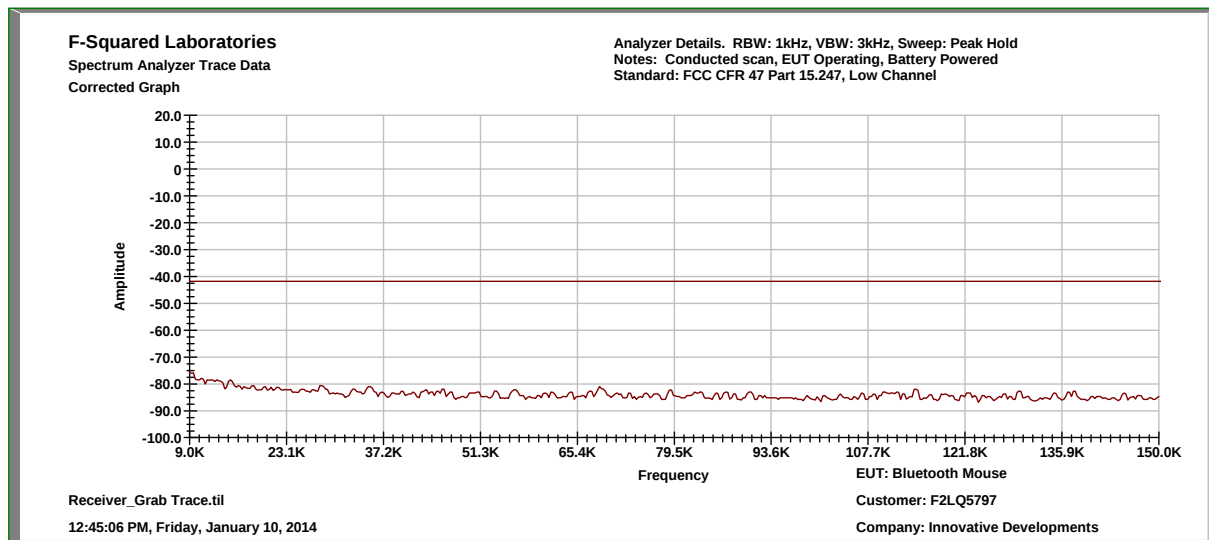
Spurious emissions measurements were made at the low, mid, and upper channels with the appropriate spectrum analyzer impulse bandwidth. Additionally, 20dB down points were measured for the low and high channels to verify band edge compliance.



9.3 Conducted Spurious Emissions Test Data

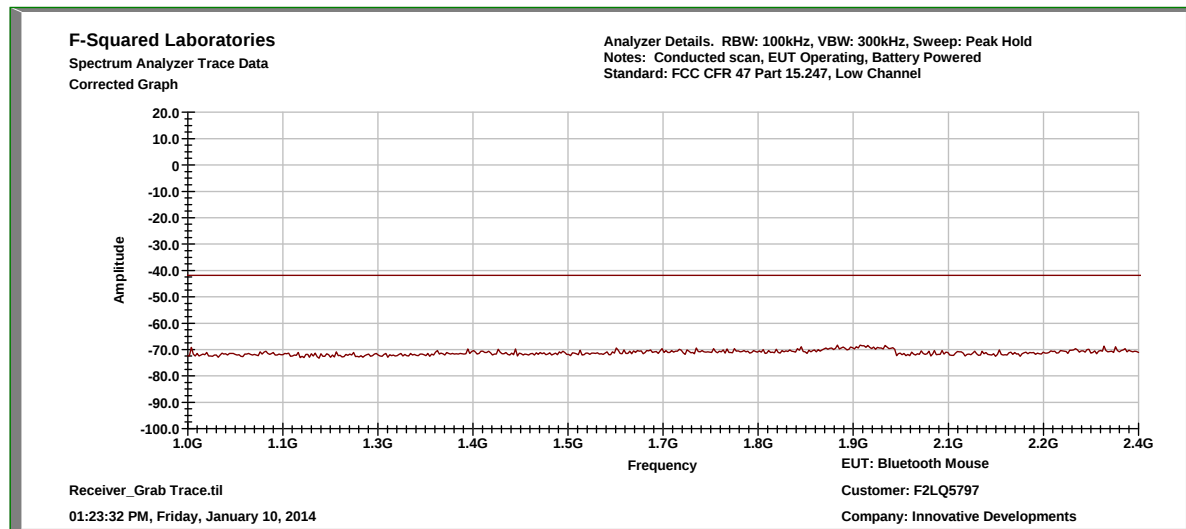
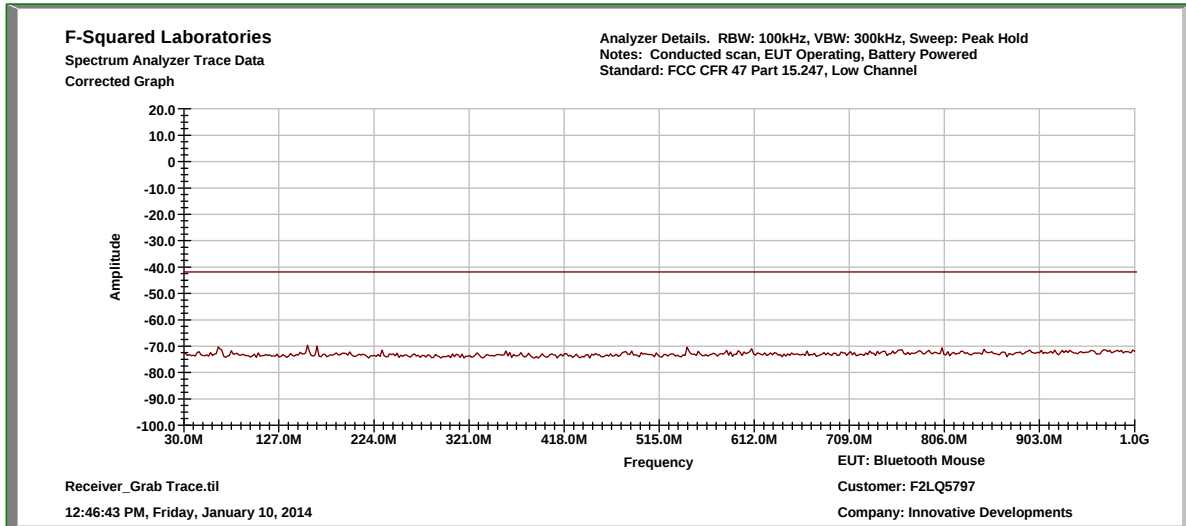
Test Date:	Jan. 10, 2014	Test Engineers:	J. Knepper; K. Littell
Standards:	CFR 47 Part 15.247(d) / Part 15.209; KDB558074	Air Temperature:	21.2°C
		Relative Humidity:	42%

Low Channel



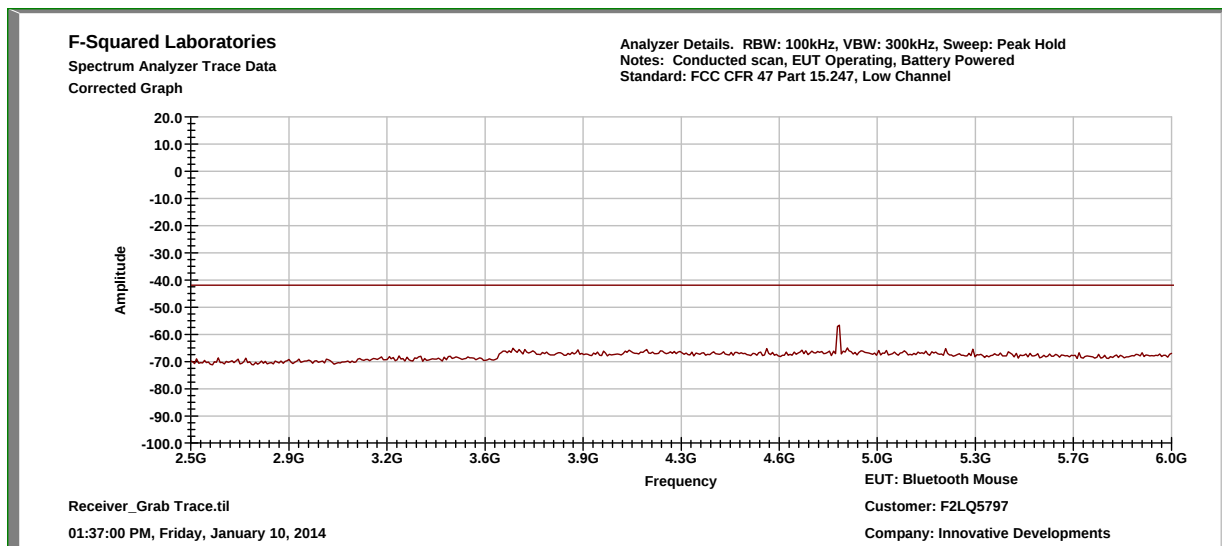
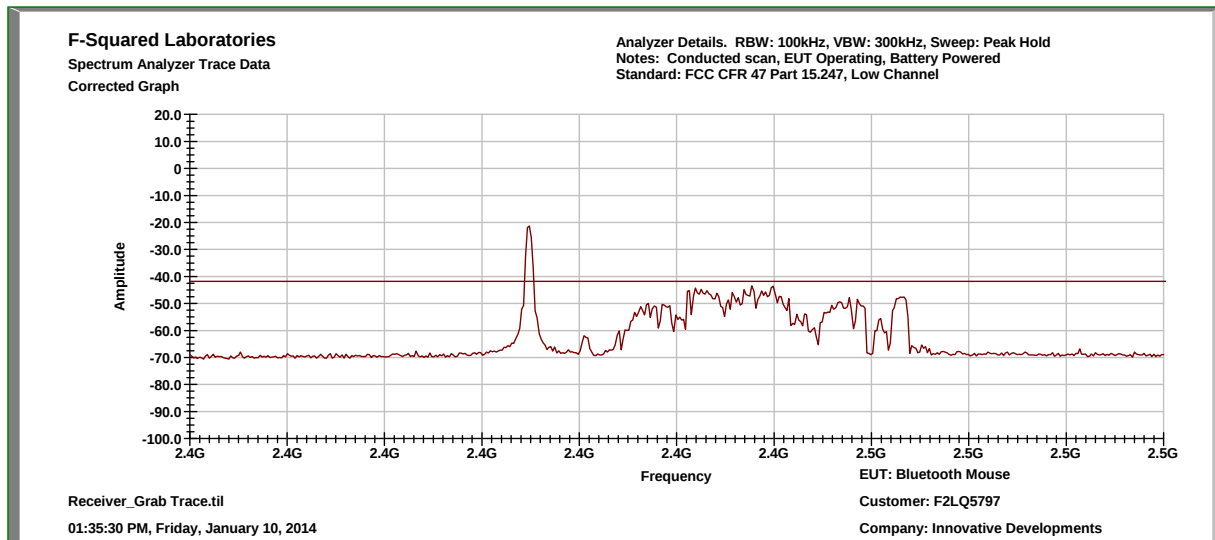


Low Channel, cont'd



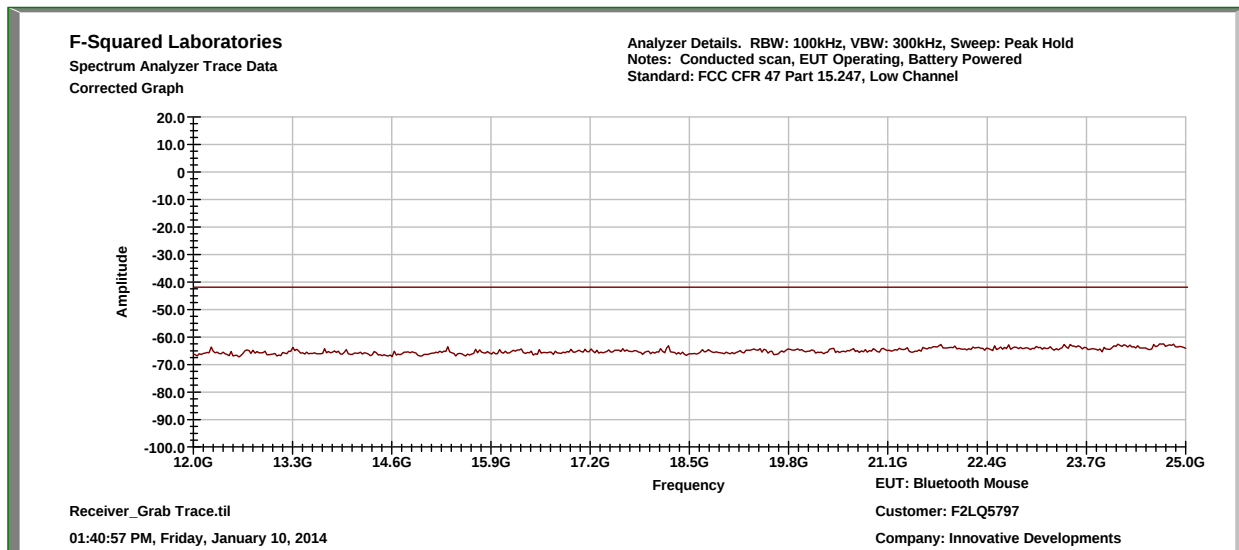
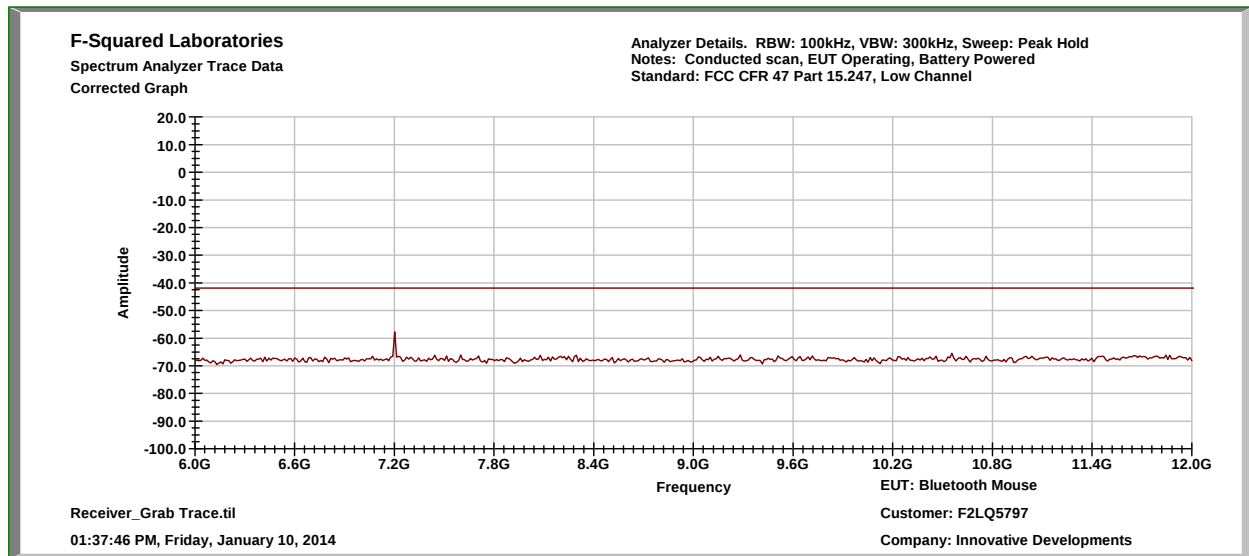


Low Channel, cont'd



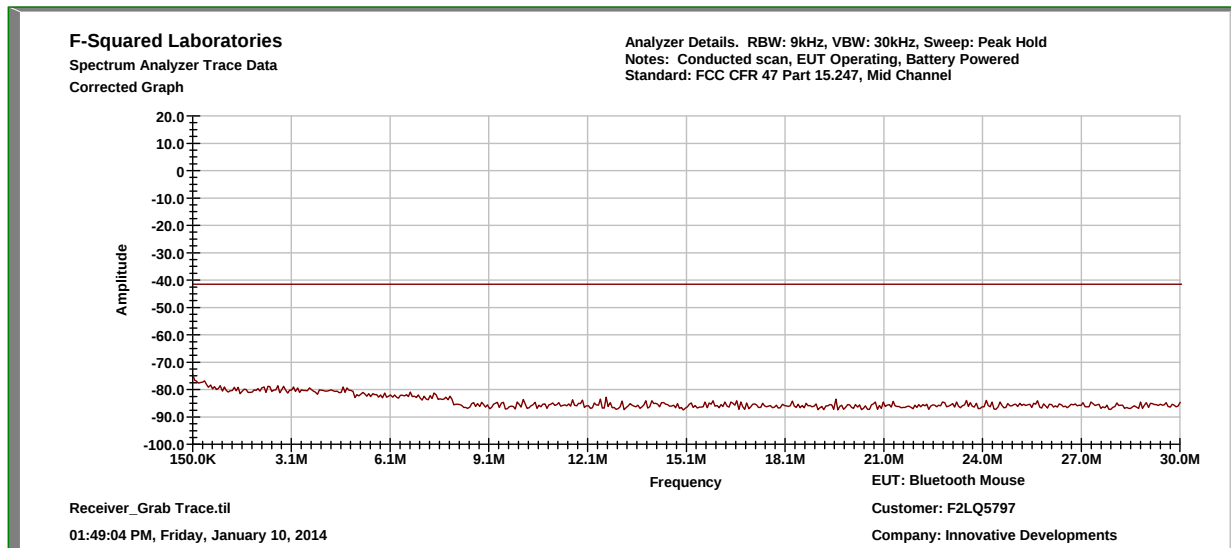
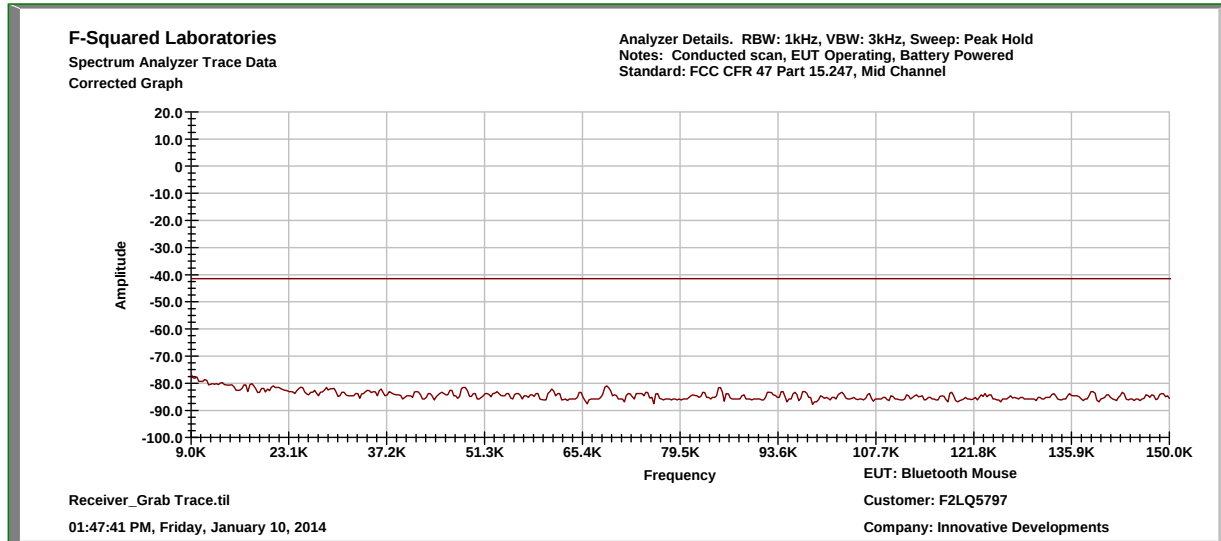


Low Channel, cont'd



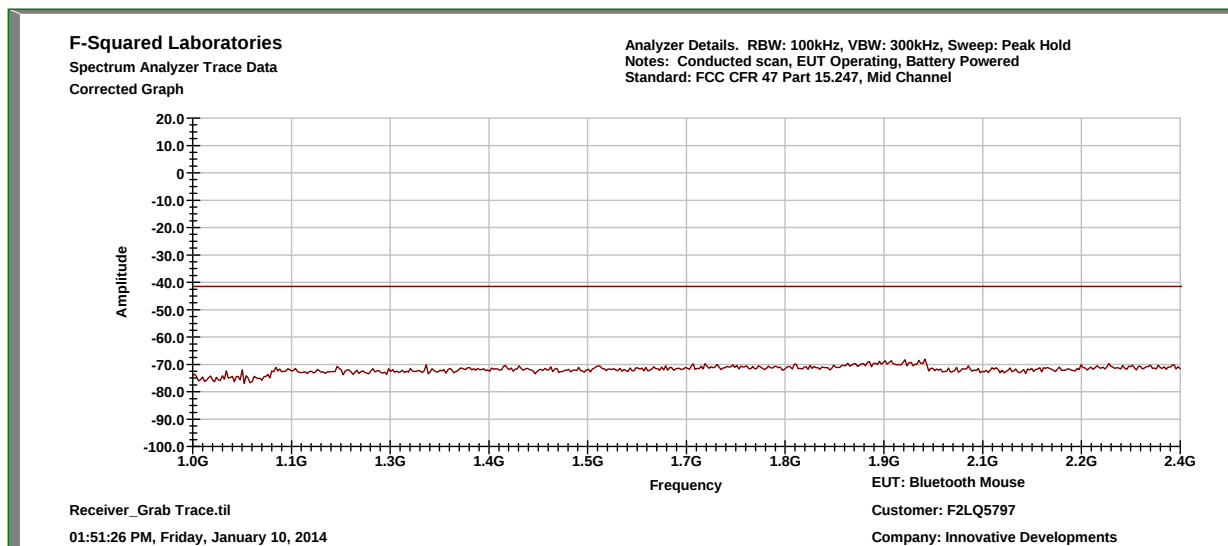
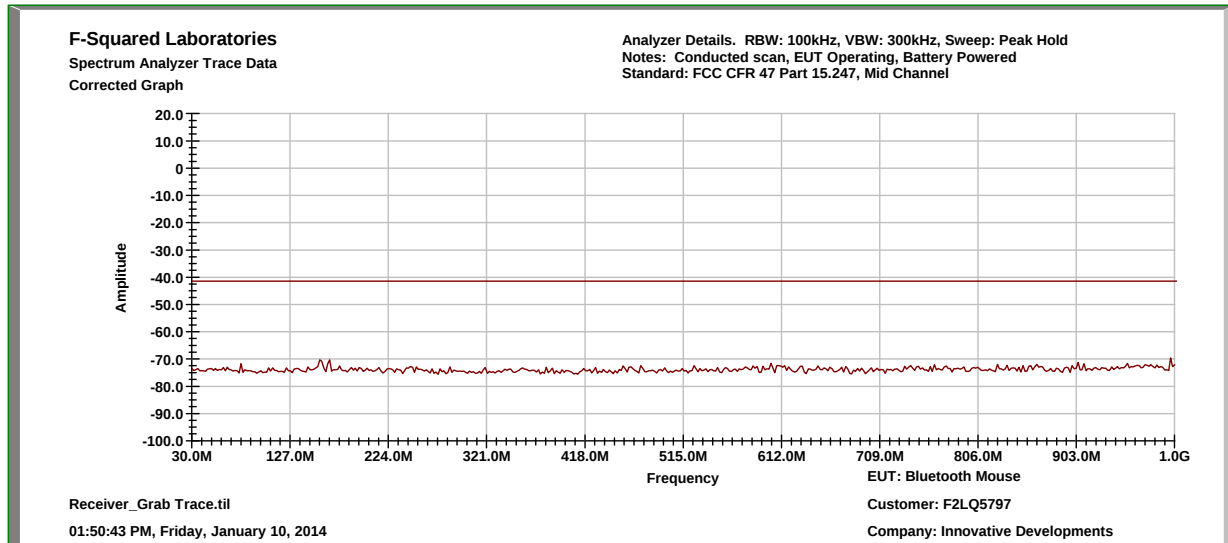


Mid-Channel



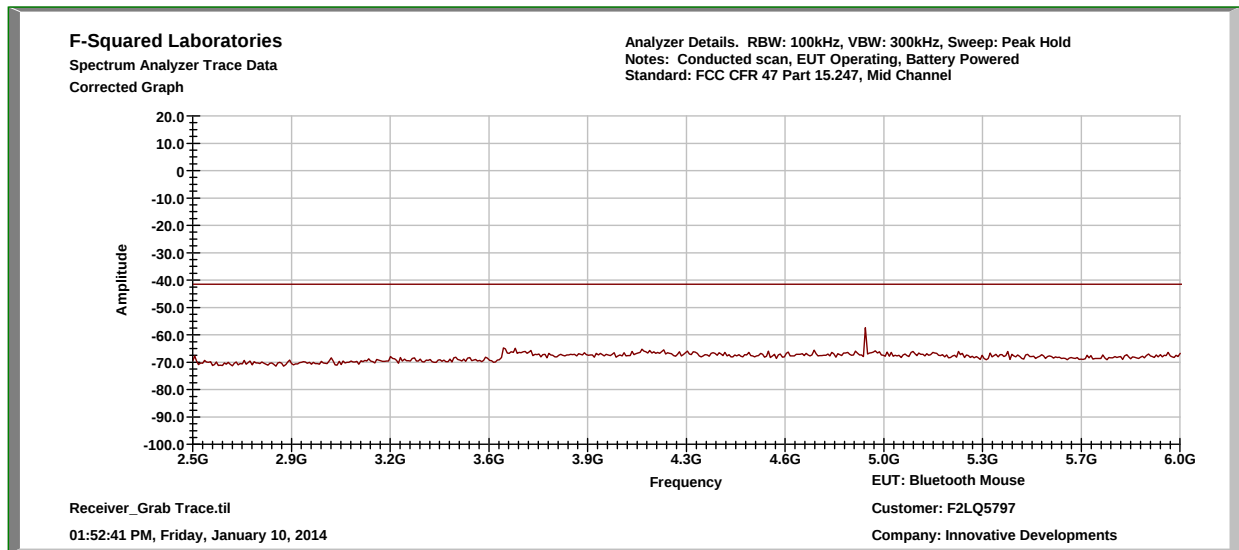
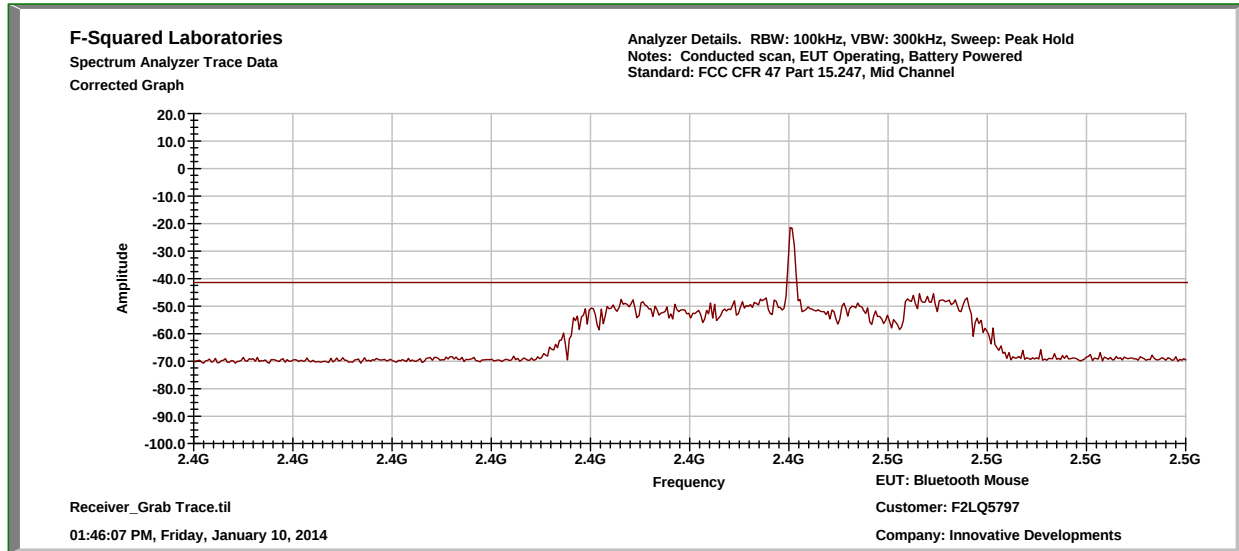


Mid-Channel, cont'd



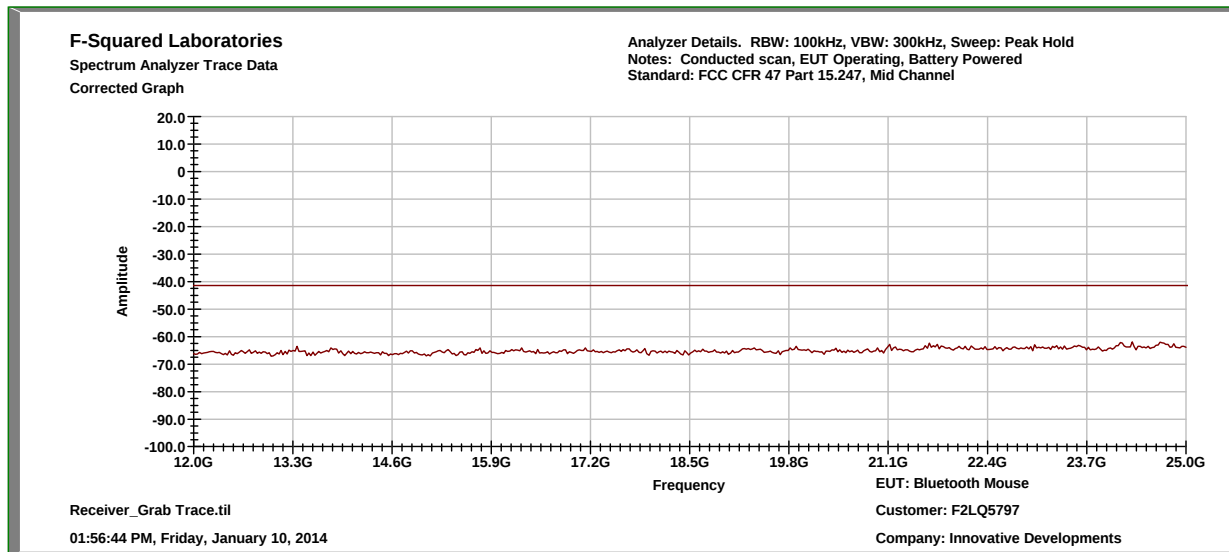
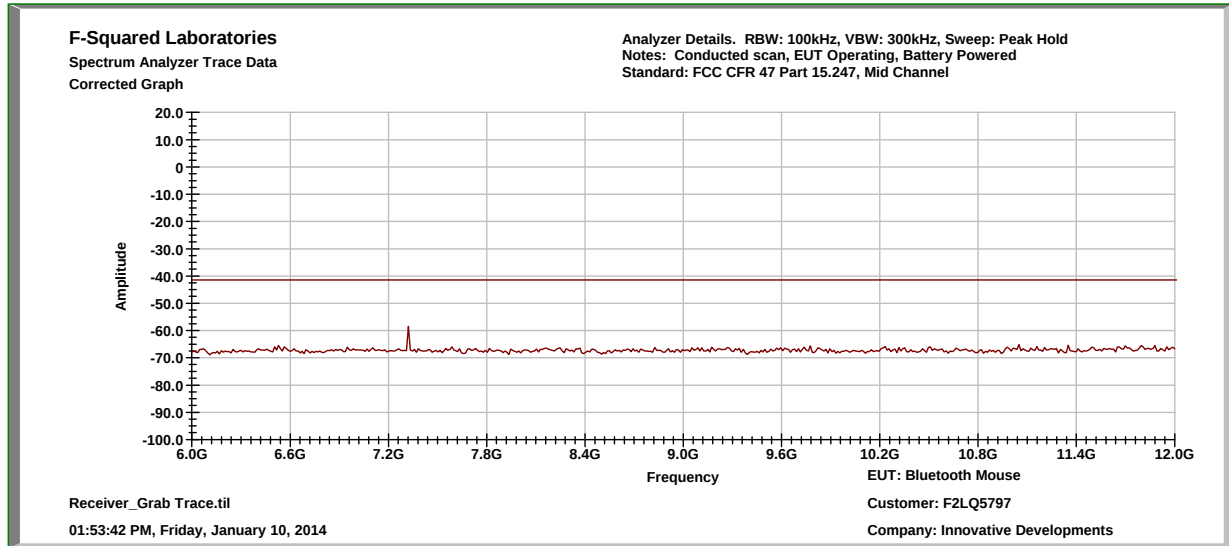


Mid-Channel, cont'd



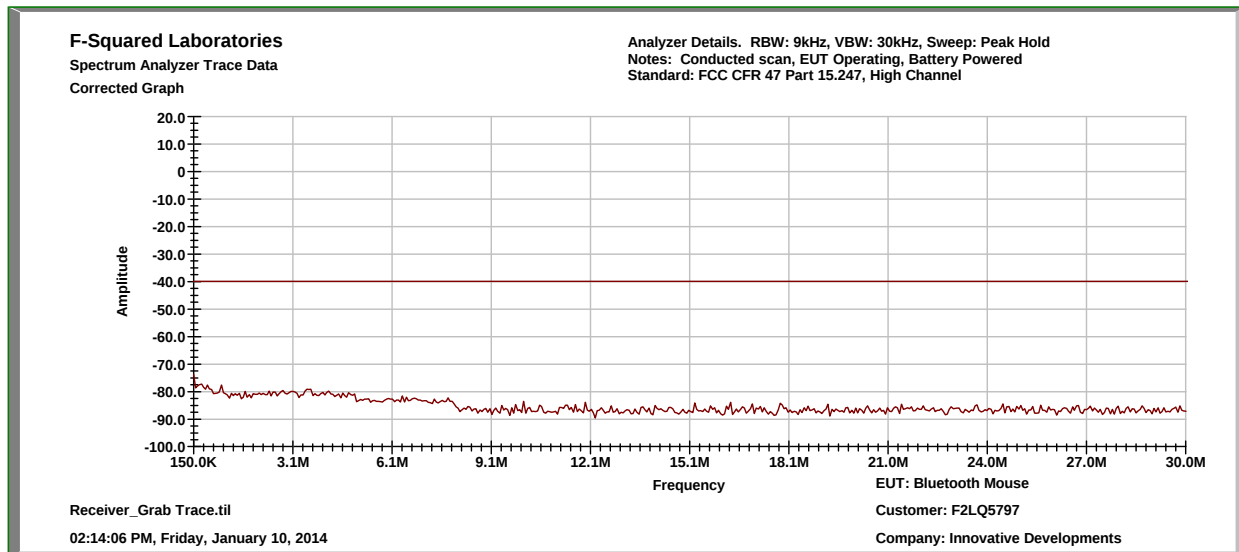
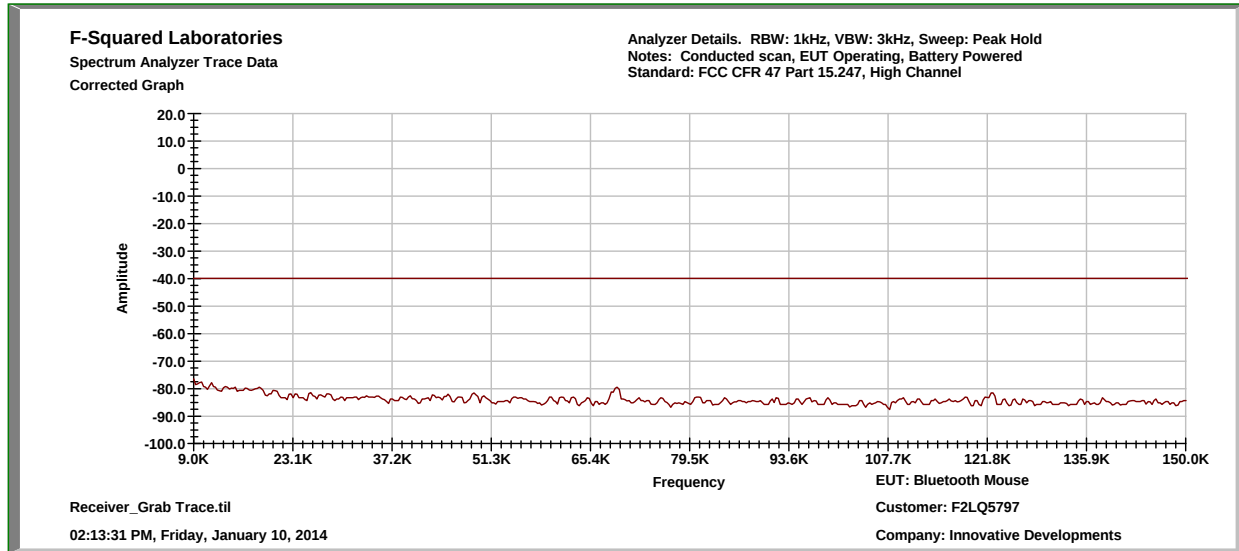


Mid-Channel, cont'd



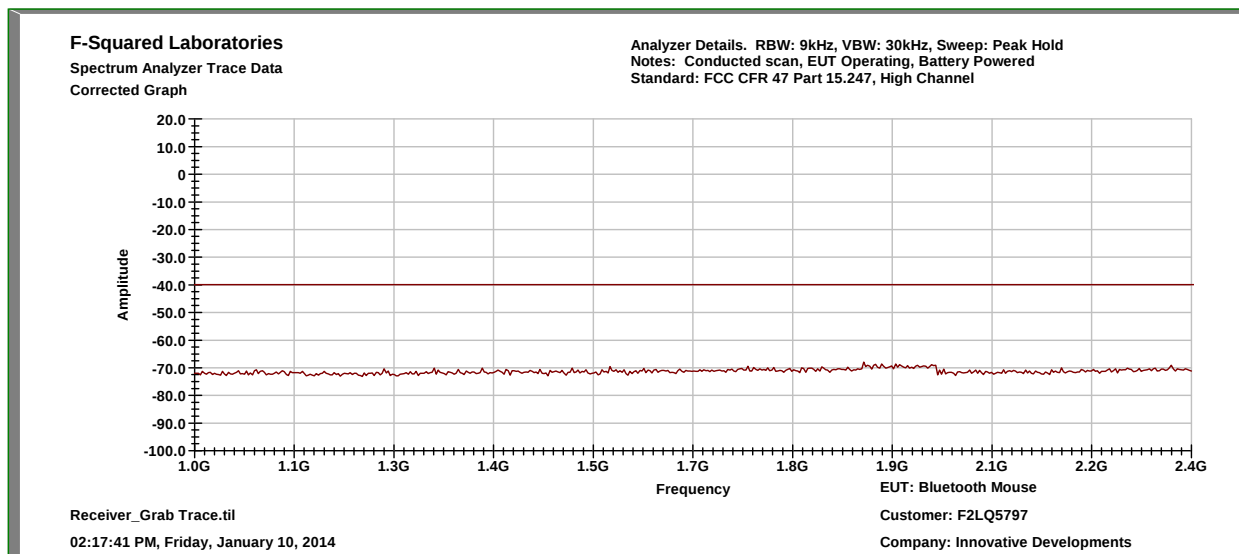
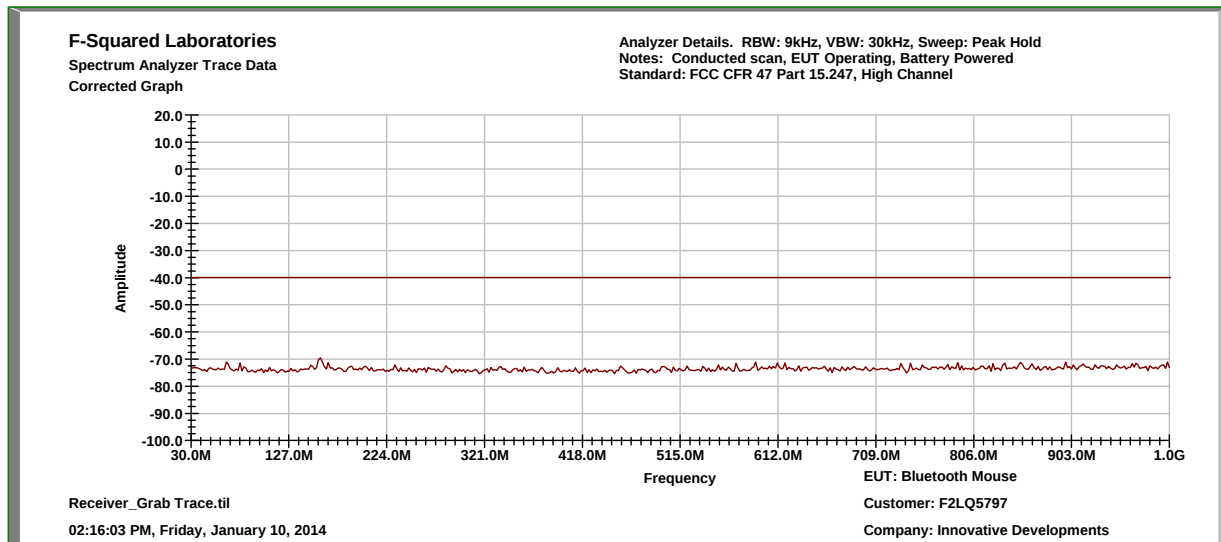


High Channel



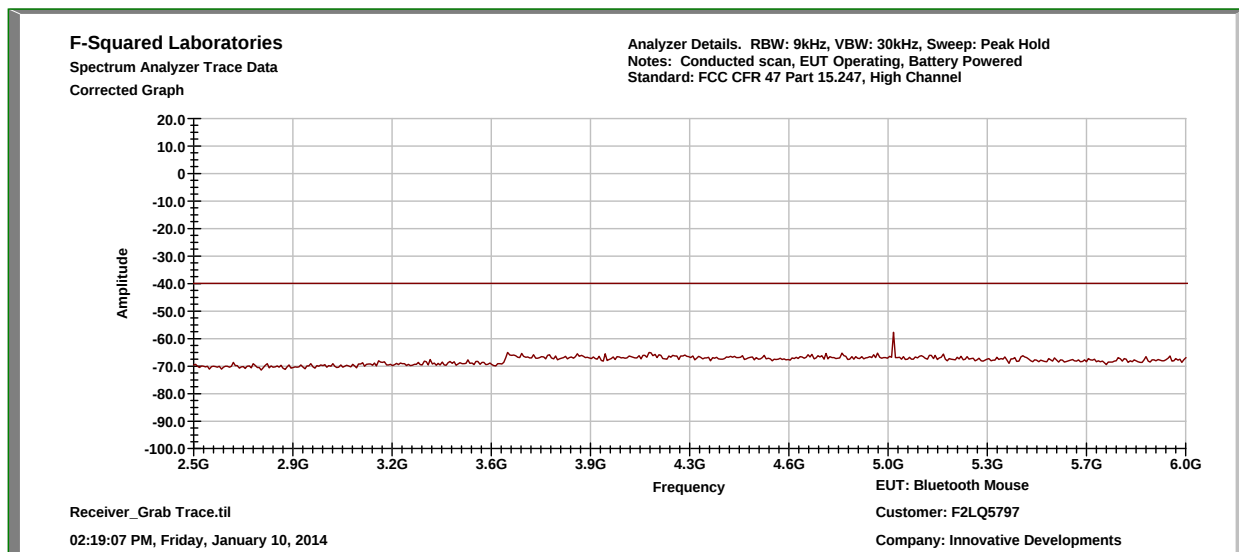
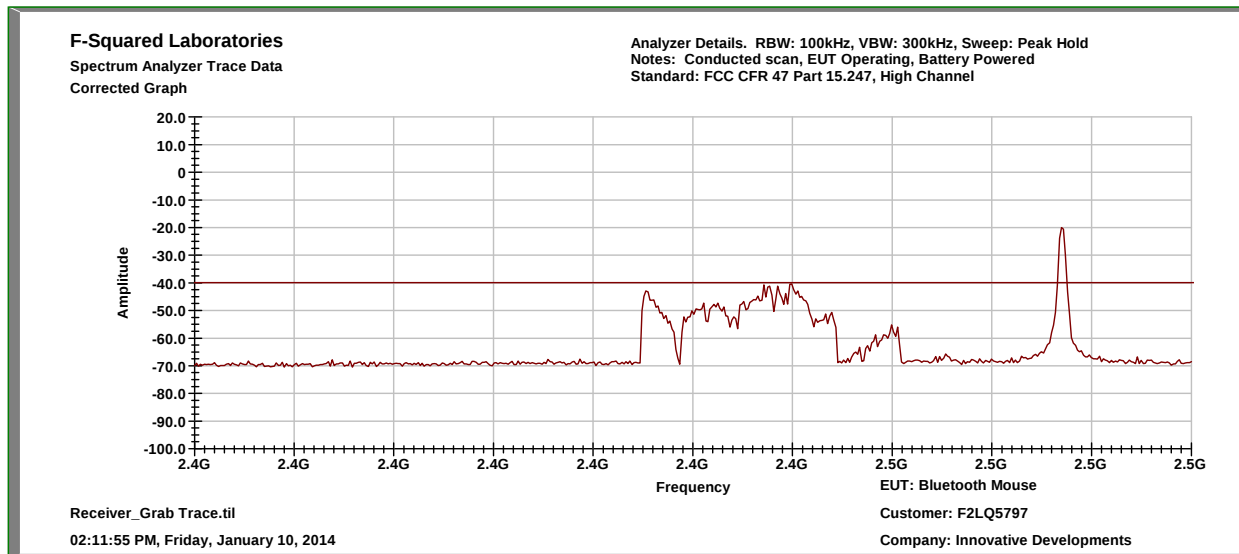


High Channel, cont'd



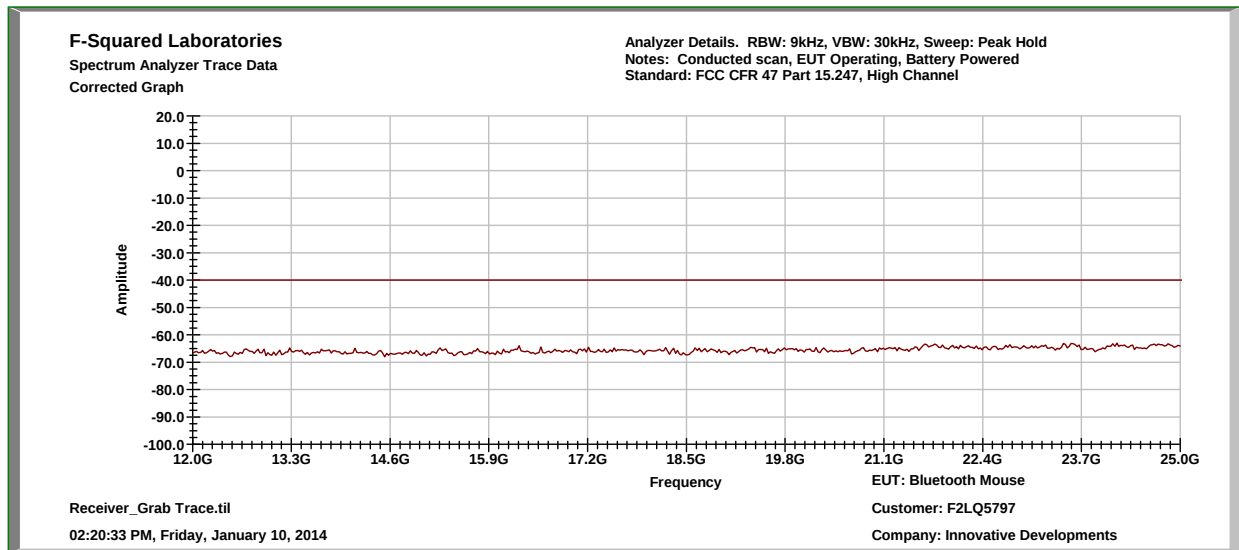
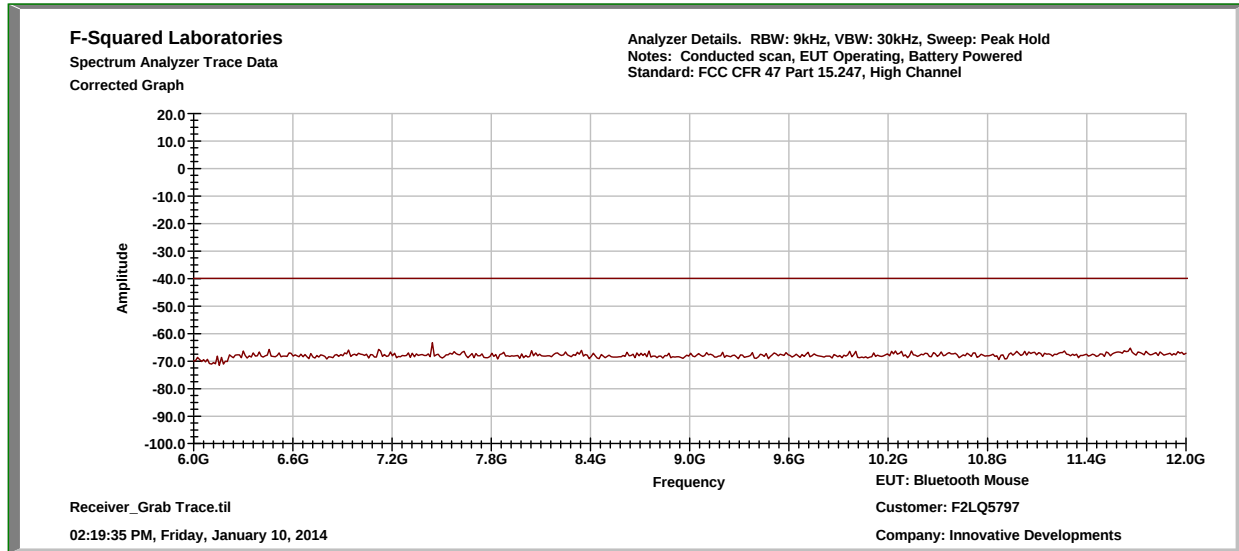


High Channel, cont'd





High Channel, cont'd



**Low Channel Measurements**

Frequency (GHz)	Reading (dBm)	Limit (dBm)	Margin (dB)
2.414900	-51.45	-40.0	-11.45
2.425000	-45.72	-40.0	-5.72
2.432000	-44.21	-40.0	-4.21
2.451000	-50.66	-40.0	-10.66

Mid Channel Measurements

Frequency (GHz)	Reading (dBm)	Limit (dBm)	Margin (dB)
2.423000	-55.14	-40.0	-15.14
2.435000	-51.48	-40.0	-11.48
2.482000	-49.62	-40.0	-9.62
2.456000	-52.41	-40.0	-12.41

High Channel Measurements

Frequency (GHz)	Reading (dBm)	Limit (dBm)	Margin (dB)
2.417800	-50.23	-40.0	-10.23
2.419000	-46.42	-40.0	-6.42
2.435000	-45.87	-40.0	-5.87
2.434000	-50.66	-40.0	-10.66



10 RADIATED SPURIOUS EMISSION

10.1 Procedure:

The EUT antenna port was fitted with its integral/internal chip antenna. Radiated emissions were measured on the Open Area Test Site (OATS). All emissions generated that fall in the restricted bands per FCC Part 15.205 were examined.

10.2 Requirements:

All emissions that fall in the restricted bands defined in FCC Part 15.205 shall not exceed the maximum field strength listed in FCC Part 15.209(a).



10.3 Radiated Spurious Emission Test Data

Test Date(s):	Jan. 24, 2014	Test Engineers:	J. Knepper; K. Littell
Standards:	CFR 47 Part 15.247(d); Part 15.209 / KDB558074	Air Temperature:	13.5°C
		Relative Humidity:	10%

Notes:

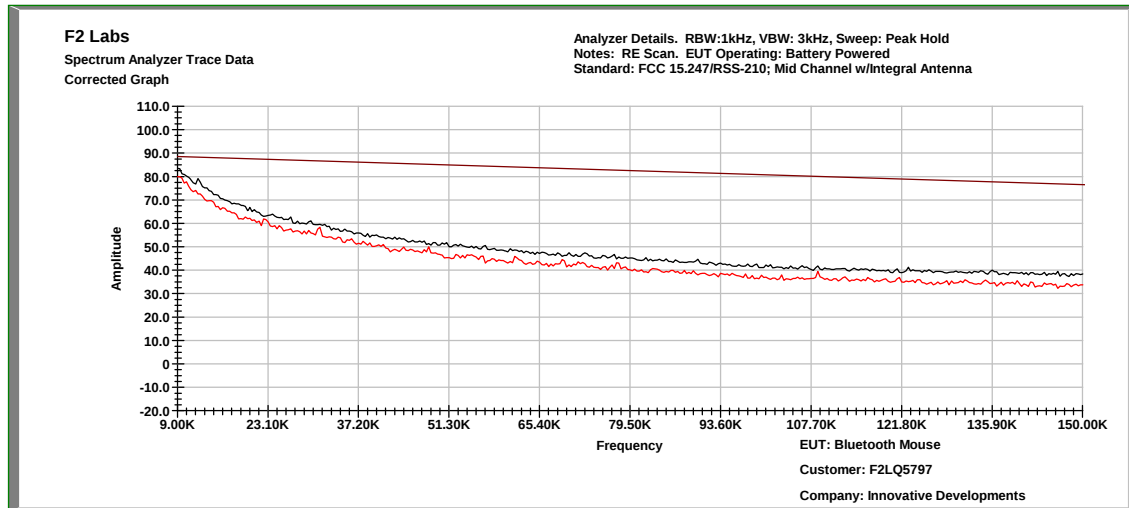
Plots are peak, max hold prescan data included only to determine what frequencies to investigate and measure. No emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off. At least 6 of the highest frequencies were measured per ANSI 63.4 but these were ambient frequencies which did not change with the EUT on. The test distance was shortened to 1 meter and still no emissions from the EUT were visible.

In the plots that follow, black waveform represents ambient with EUT off; red waveform represents emissions readings with EUT on.

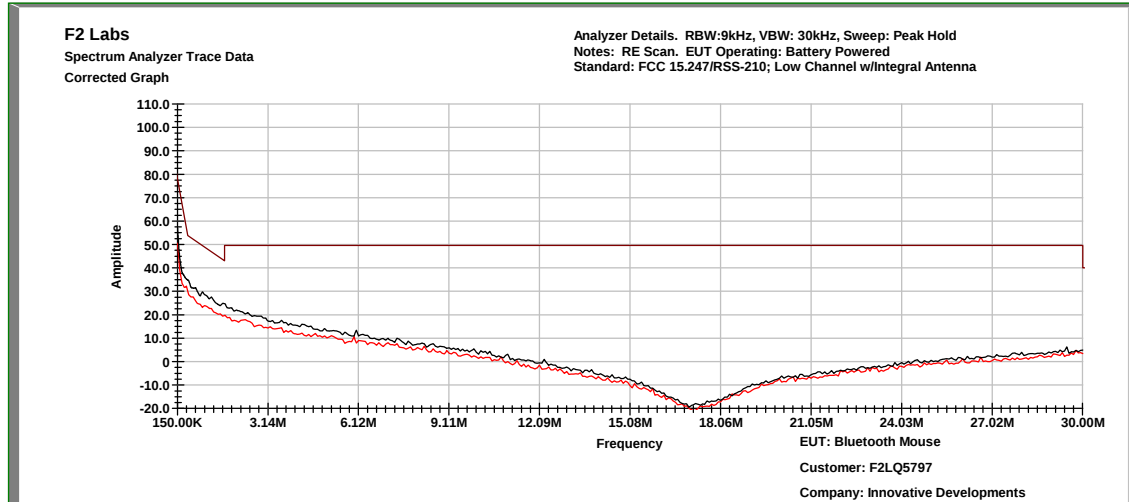


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel

.009 MHz to 0.15 MHz



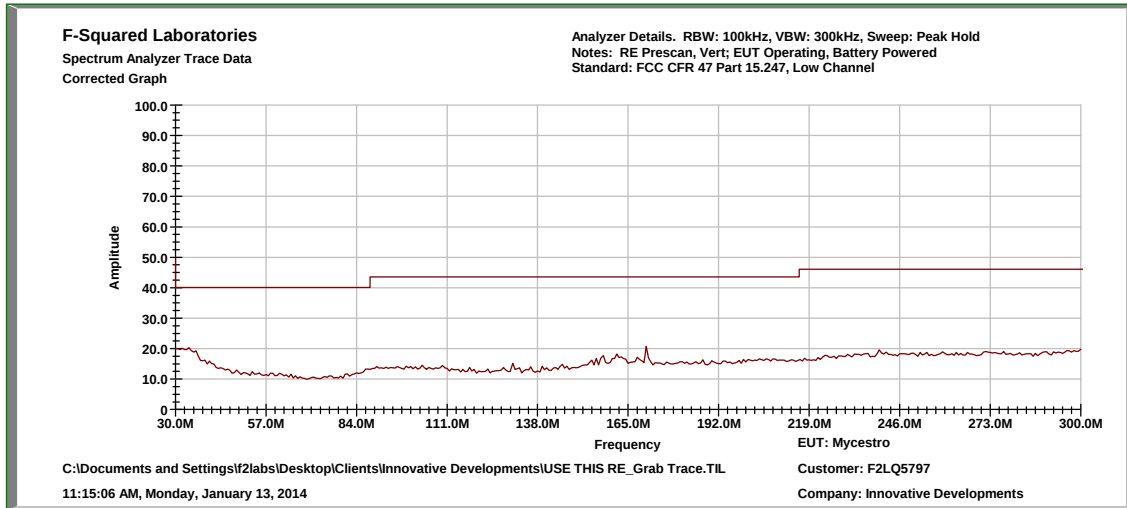
0.15 MHz to 30 MHz



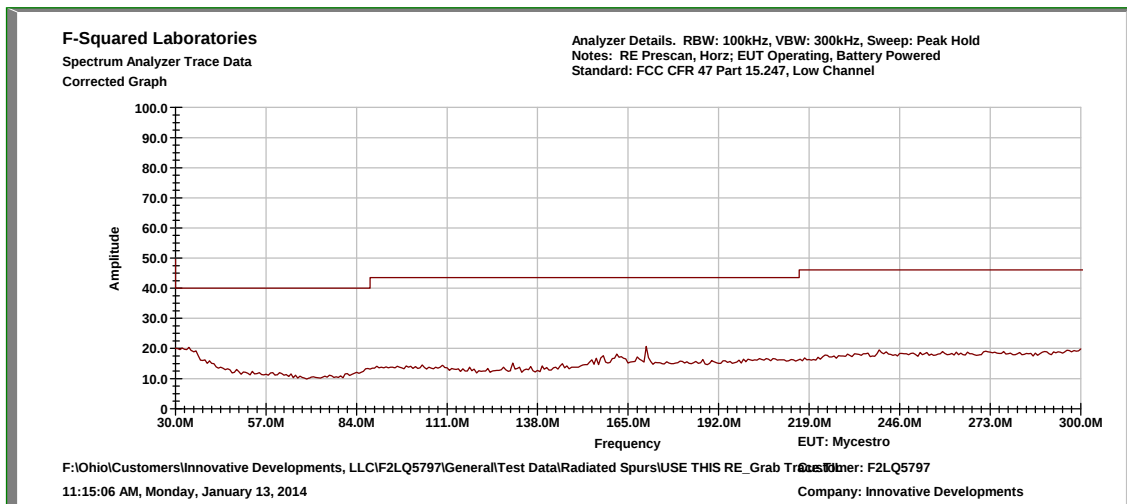


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel, cont'd

30 MHz to 300 MHz, Vertical



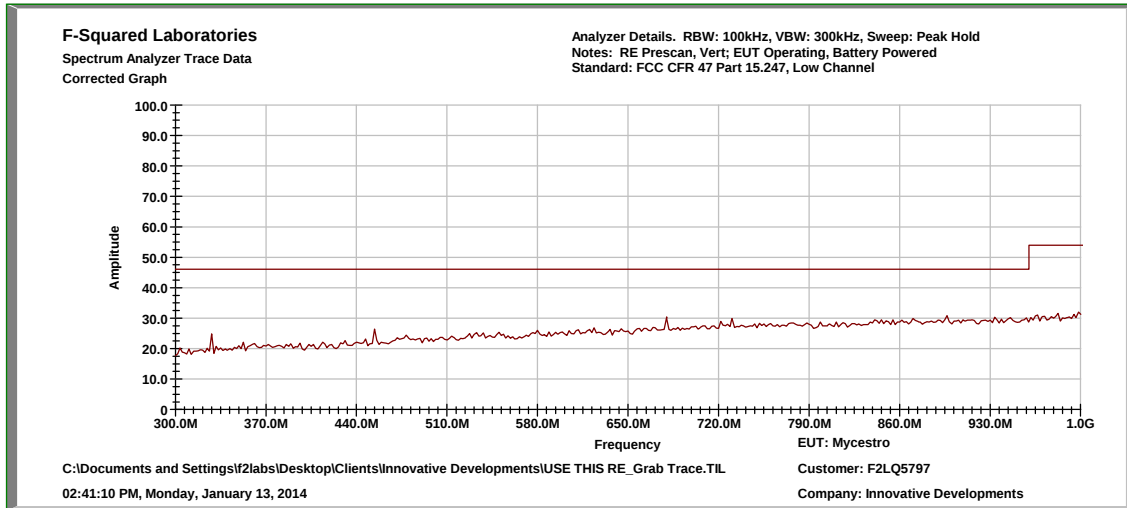
30 MHz to 300 MHz, Horizontal



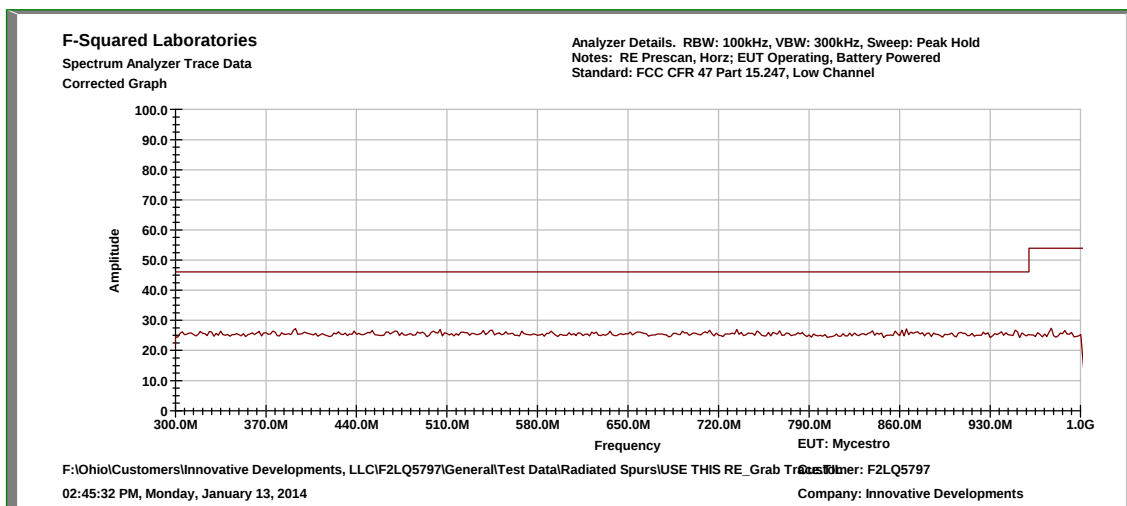


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel, cont'd

300 MHz to 1000 MHz, Vertical



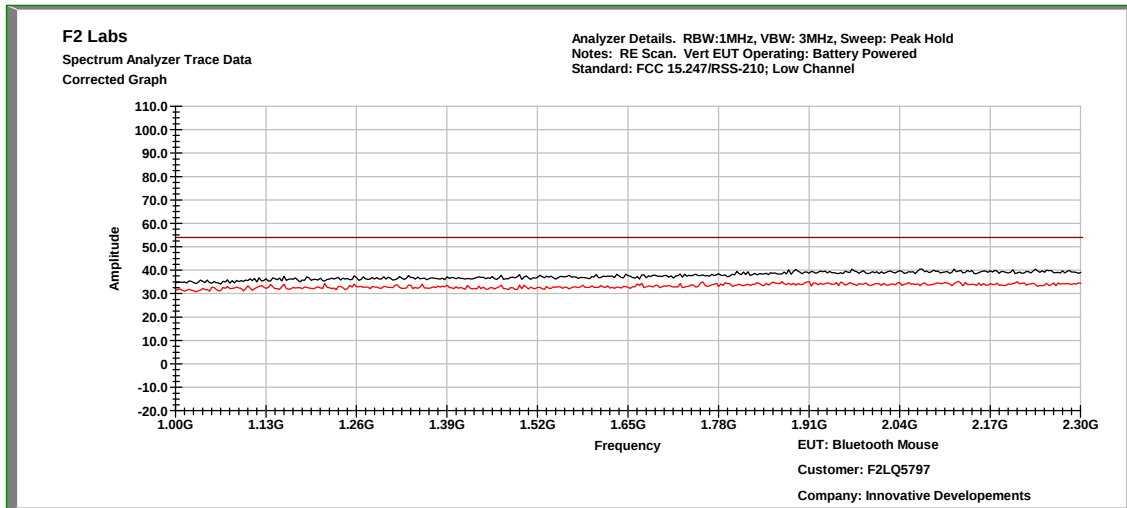
300 MHz to 1000 MHz, Horizontal



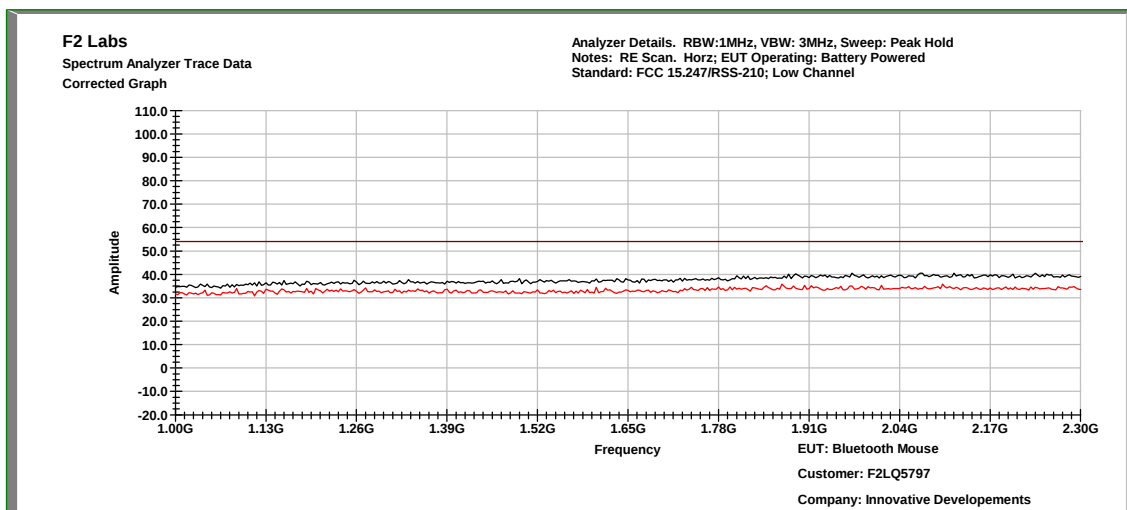


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel, cont'd

1000 MHz to 2300 MHz, Vertical



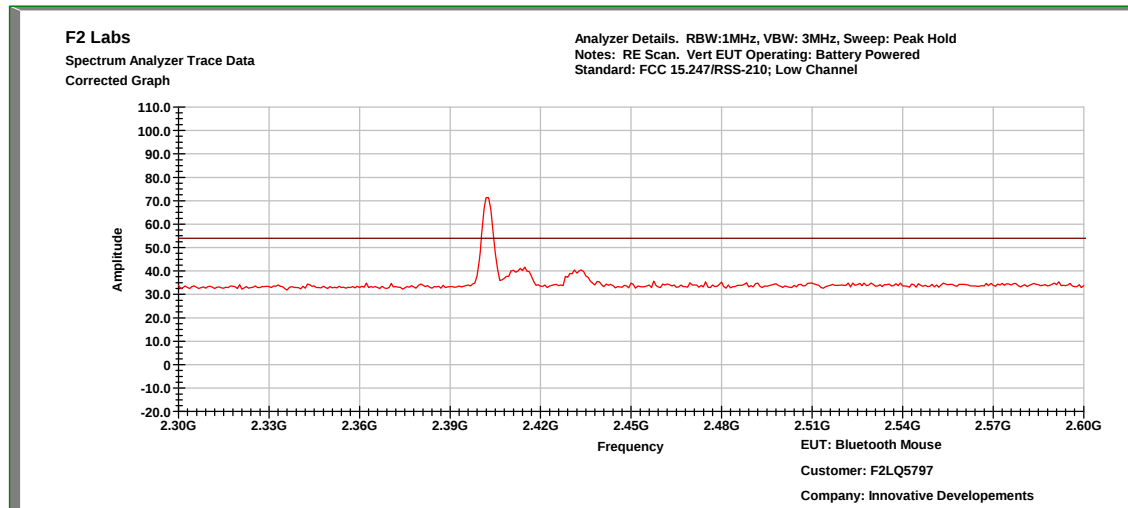
1000 MHz to 2300 MHz, Horizontal



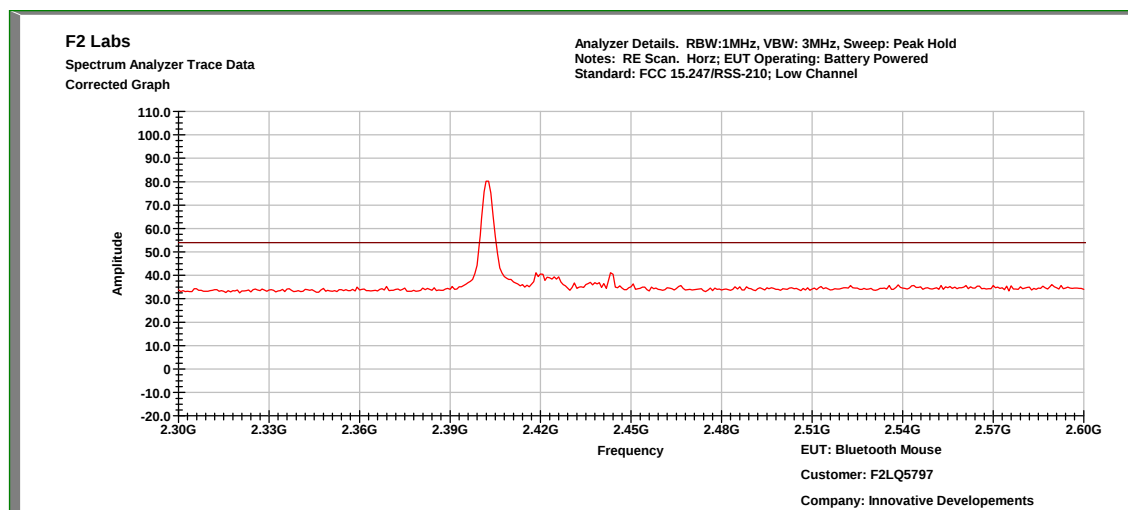


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel, cont'd

2300 MHz to 2600 MHz, Vertical



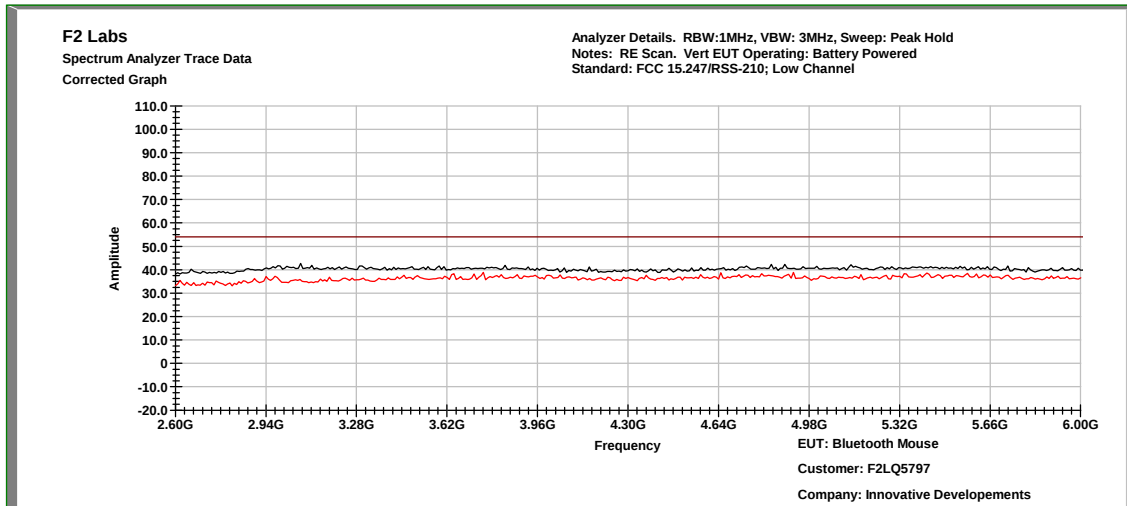
2300 MHz to 2600 MHz, Horizontal



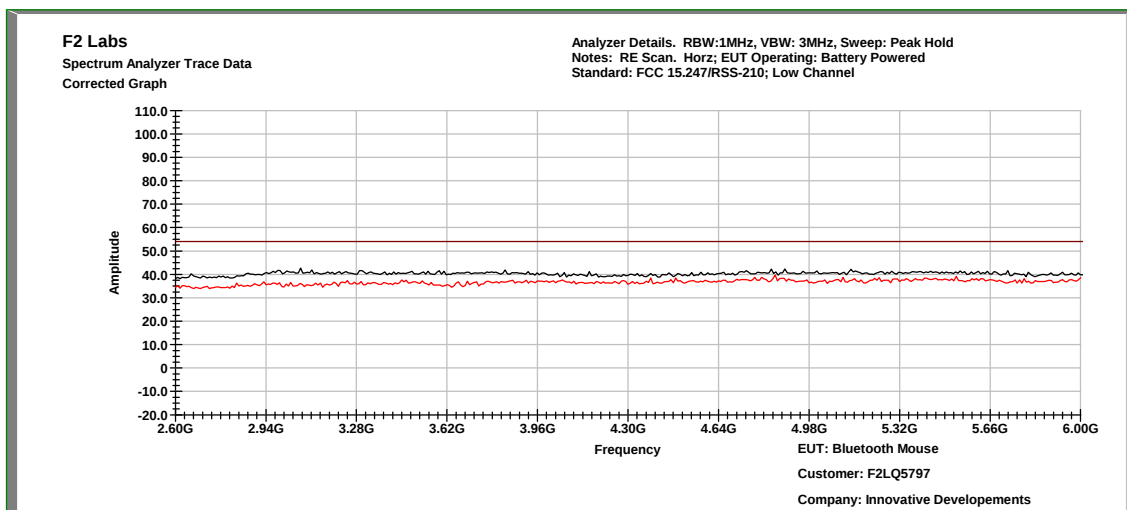


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel, cont'd

2.6 GHz to 6 GHz, Vertical



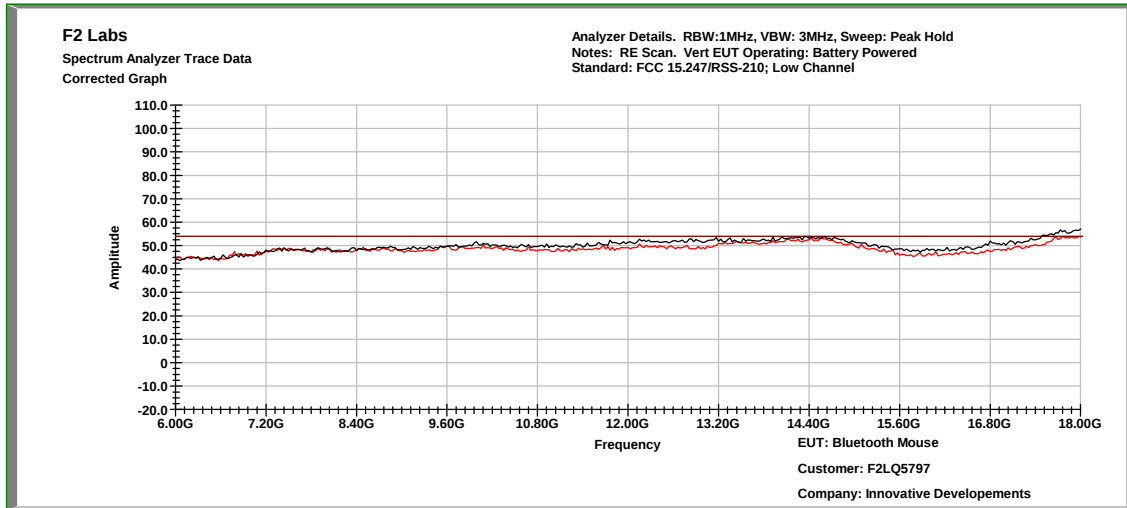
2.6 GHz to 6 GHz, Horizontal



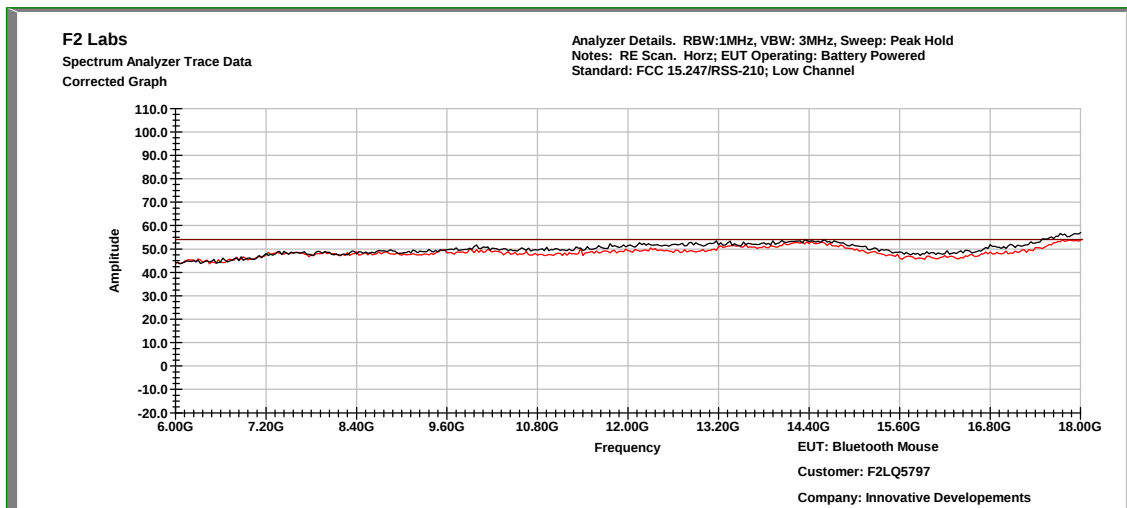


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel, cont'd

6 GHz to 18 GHz, Vertical



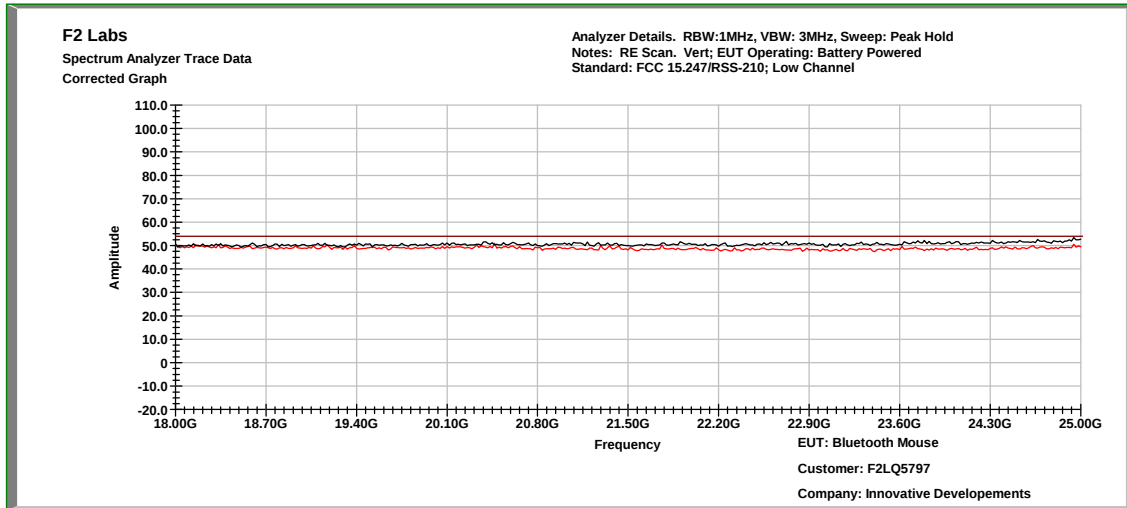
6 GHz to 18 GHz, Horizontal



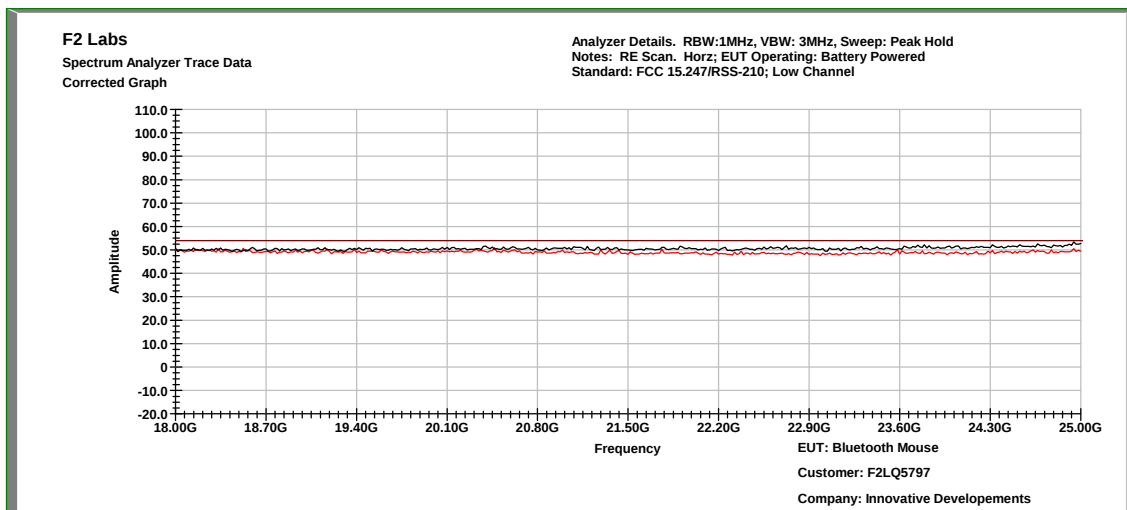


Radiated Spurious Emission with 0dBi Integral Antenna: Low Channel, cont'd

18 GHz to 25 GHz, Vertical



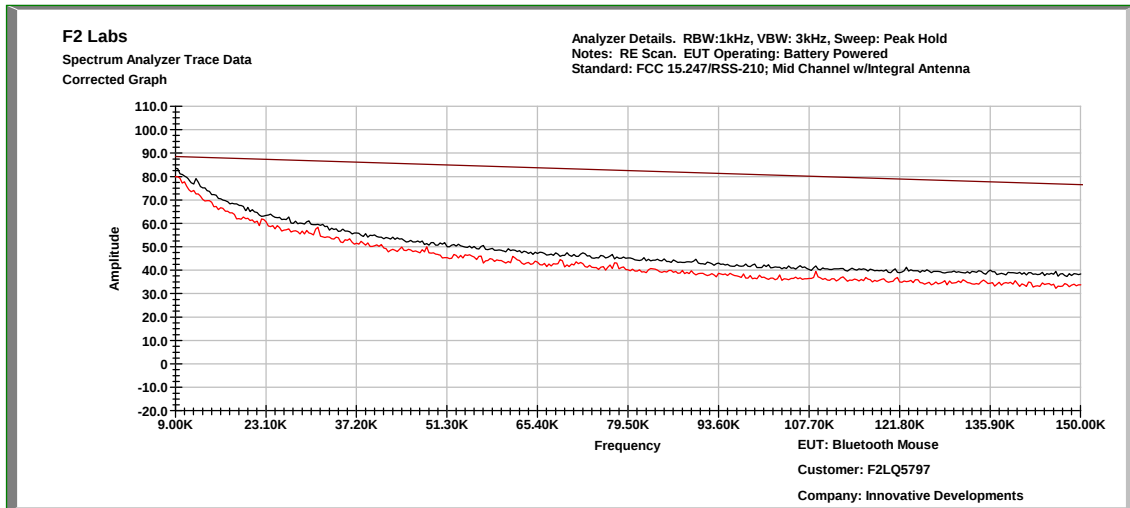
18 GHz to 25 GHz, Horizontal



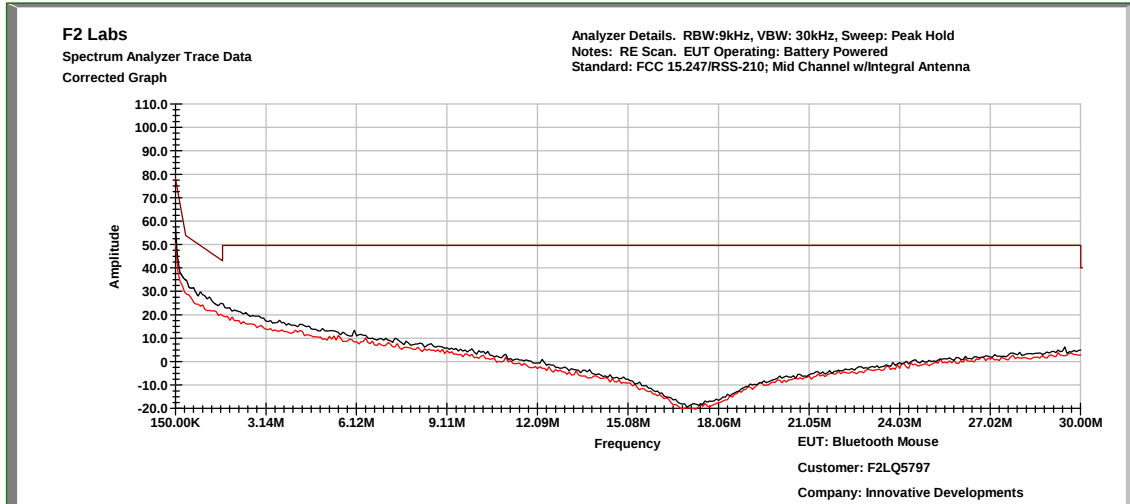


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel

.009 MHz to 0.15 MHz



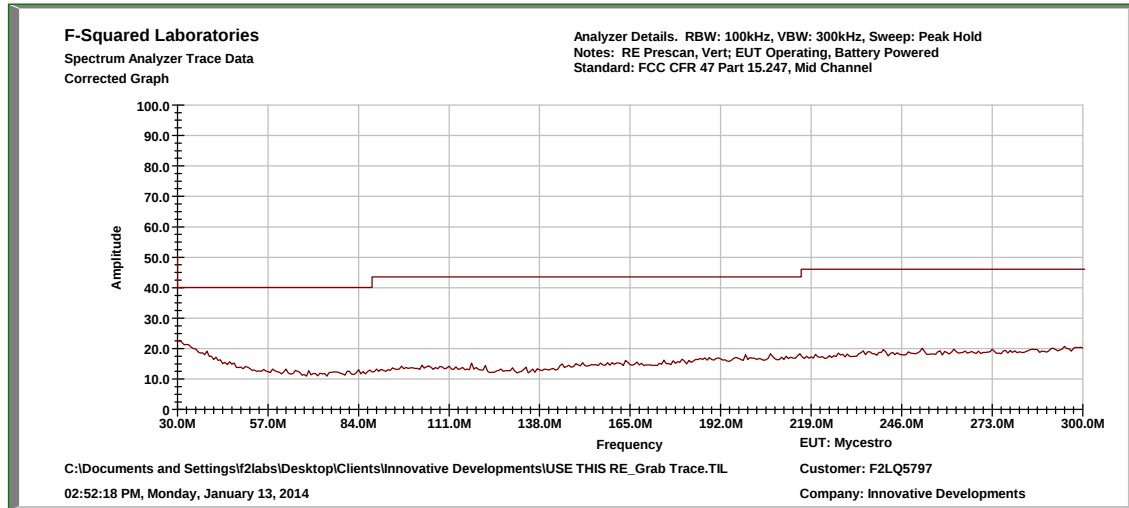
0.15 MHz to 30 MHz



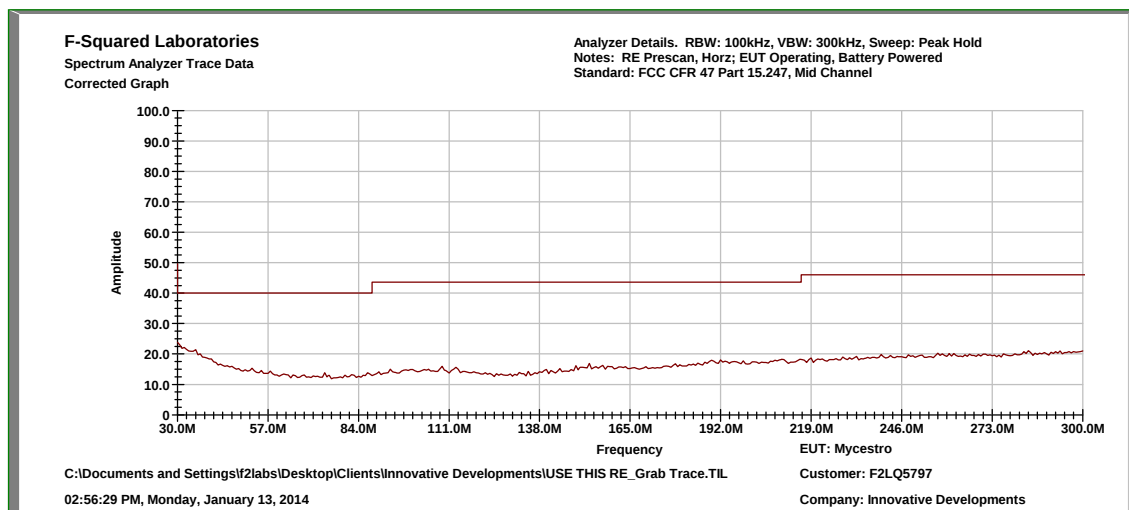


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel, cont'd

30 MHz to 300 MHz, Vertical



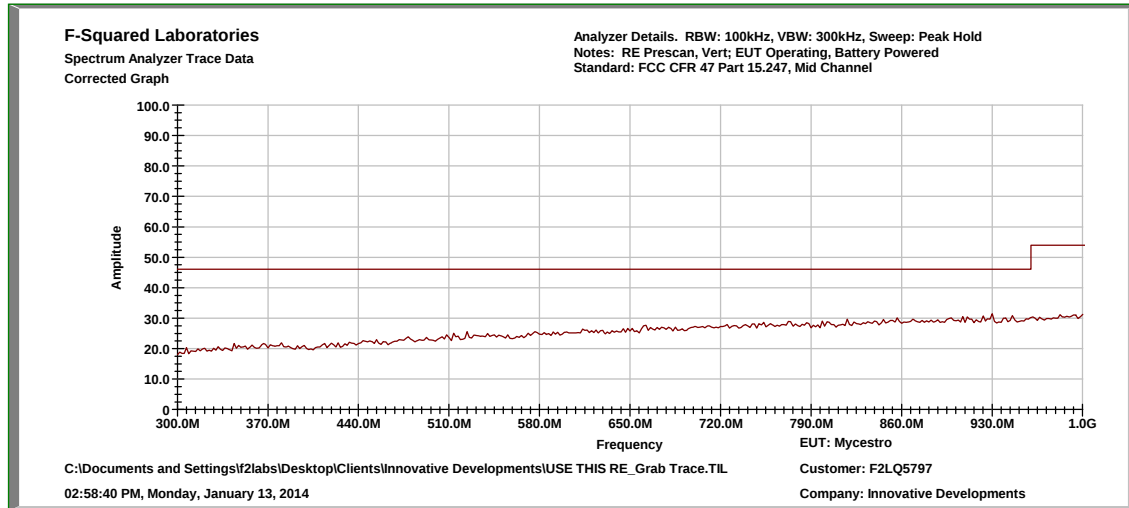
30 MHz to 300 MHz, Horizontal



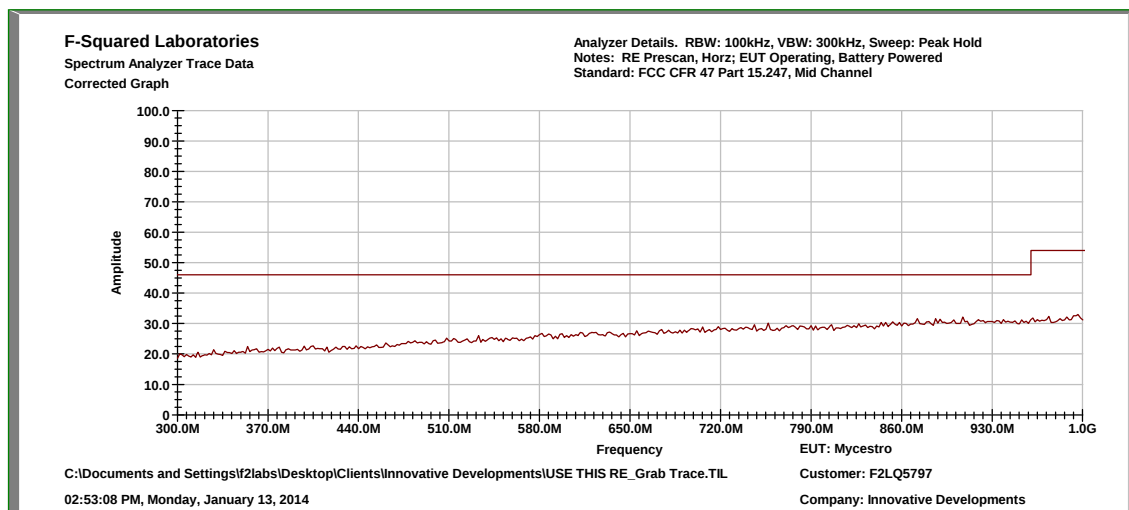


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel, cont'd

300 MHz to 1000 MHz, Vertical



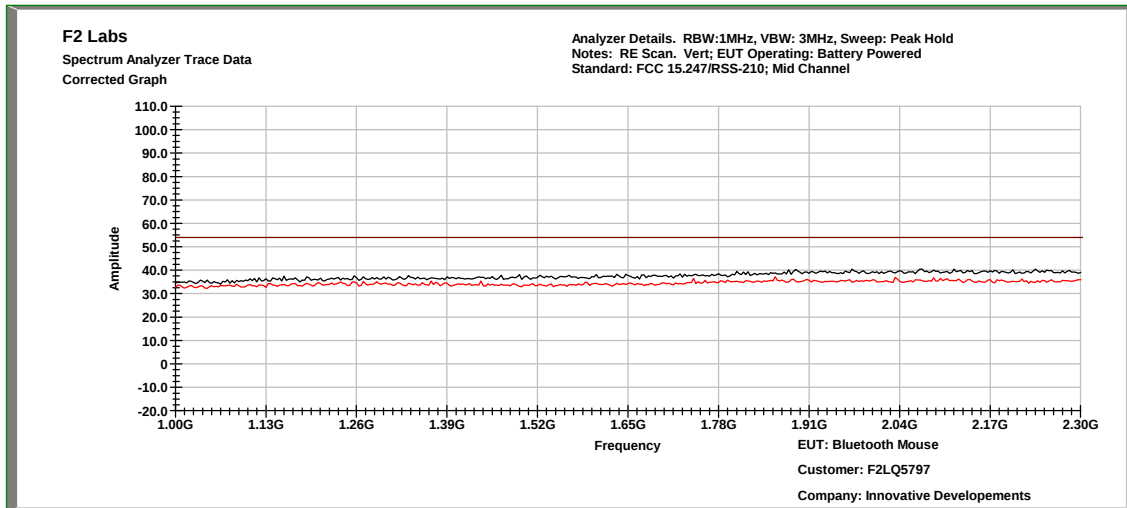
300 MHz to 1000 MHz, Horizontal



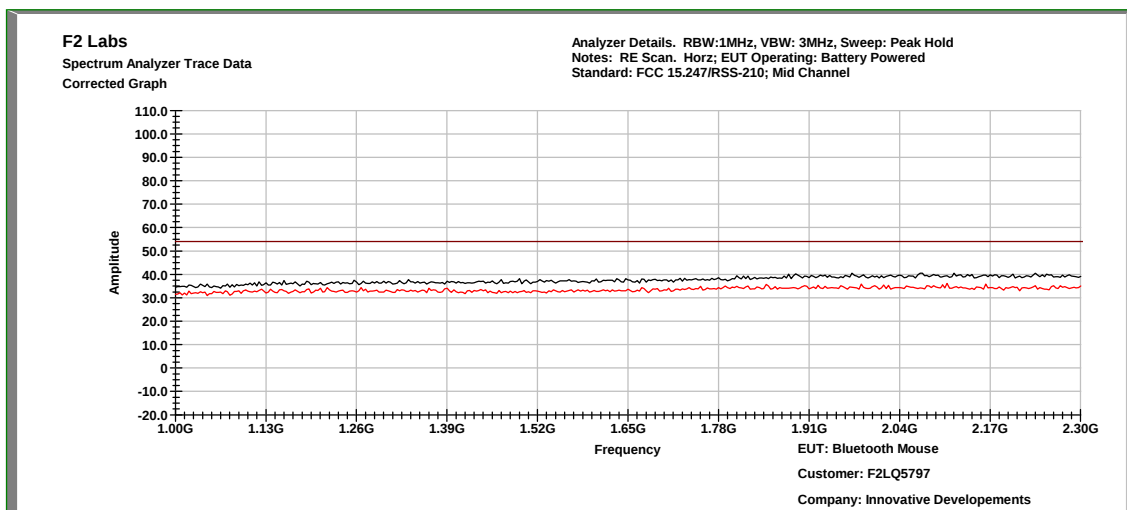


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel, cont'd

1000 MHz to 2300 MHz, Vertical



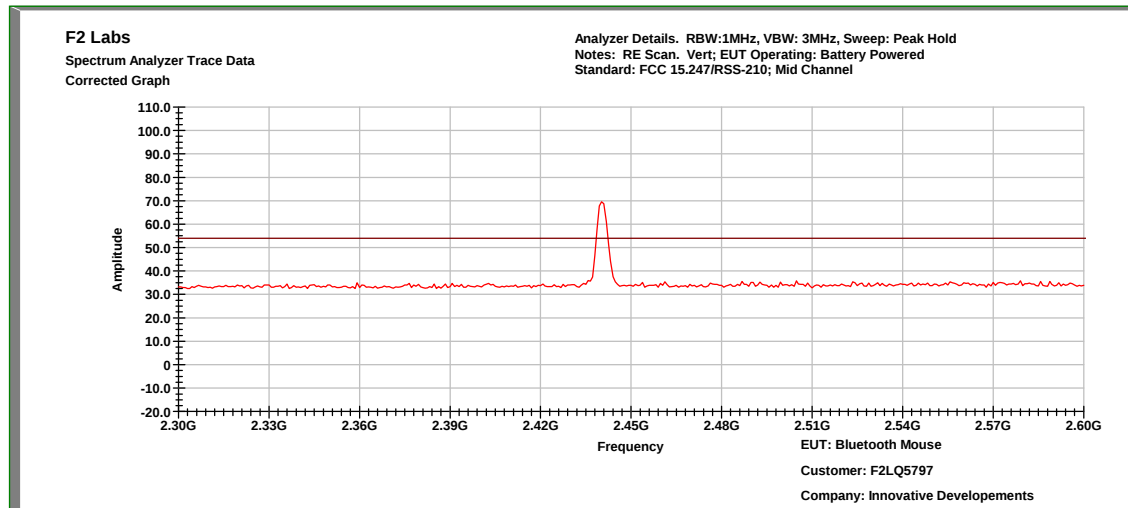
1000 MHz to 2300 MHz, Horizontal



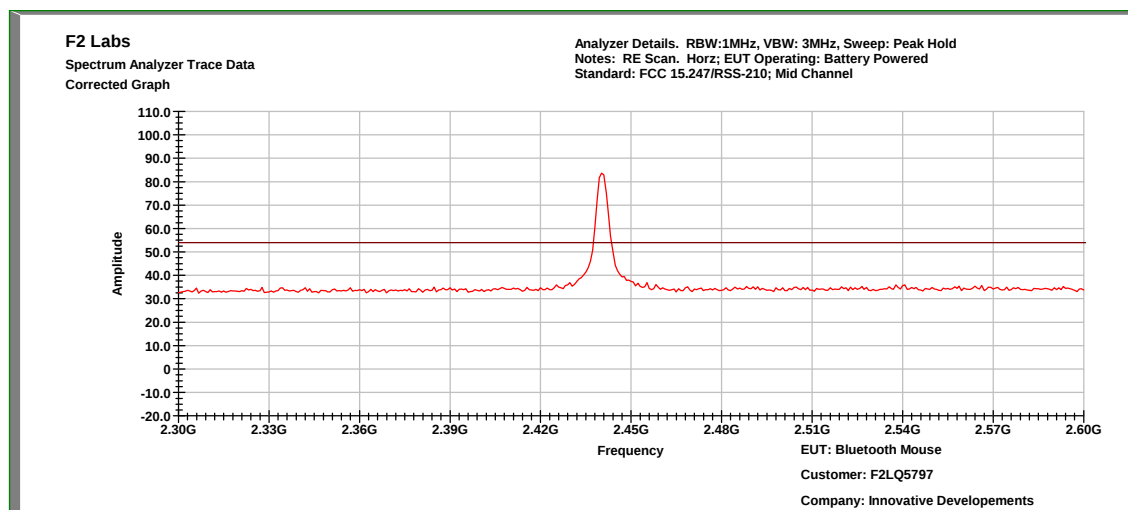


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel, cont'd

2300 MHz to 2600 MHz, Vertical



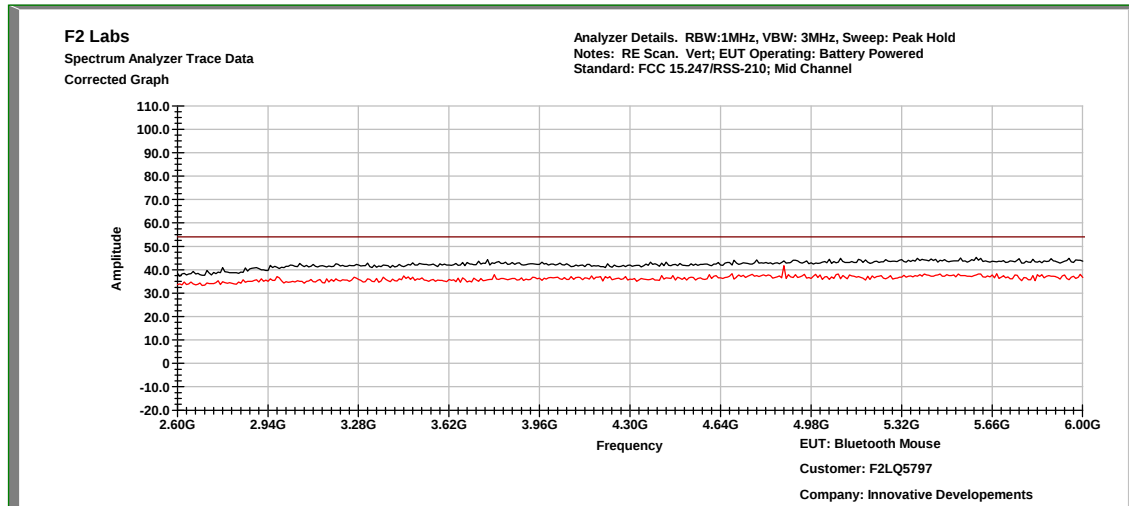
2300 MHz to 2600 MHz, Horizontal



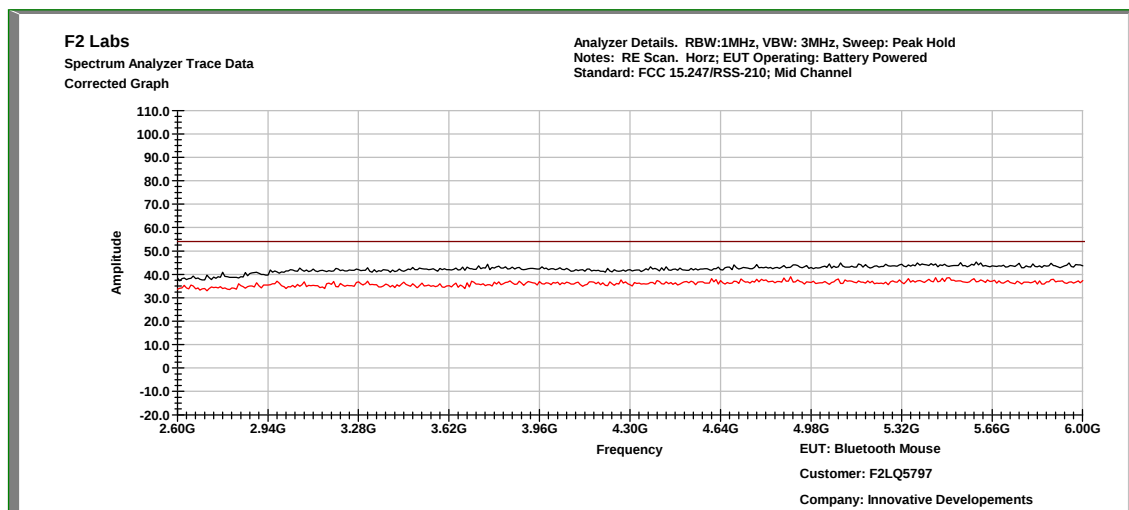


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel, cont'd

2.6 GHz to 6 GHz, Vertical



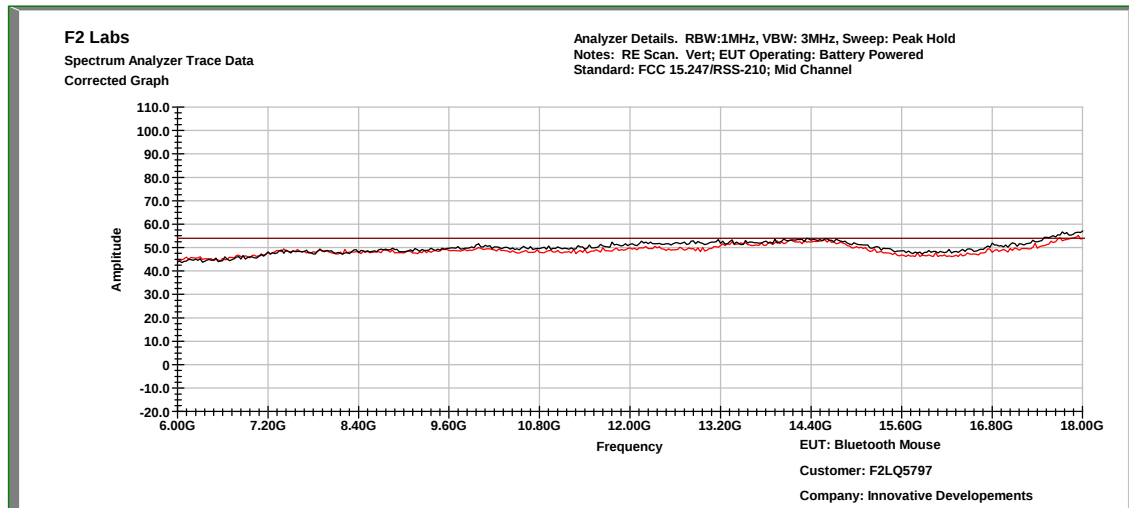
2.6 GHz to 6 GHz, Horizontal



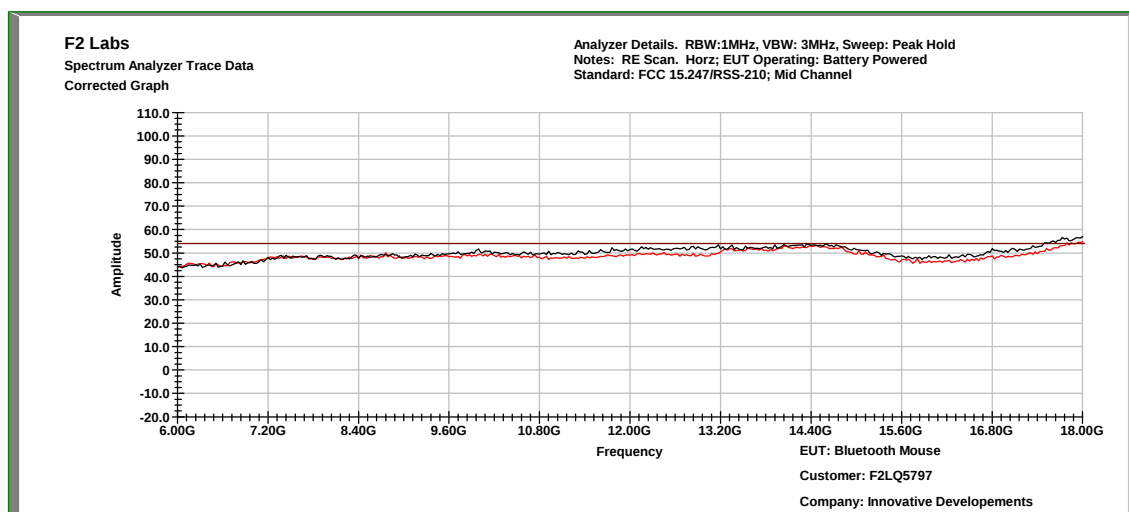


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel, cont'd

6 GHz to 18 GHz, Vertical



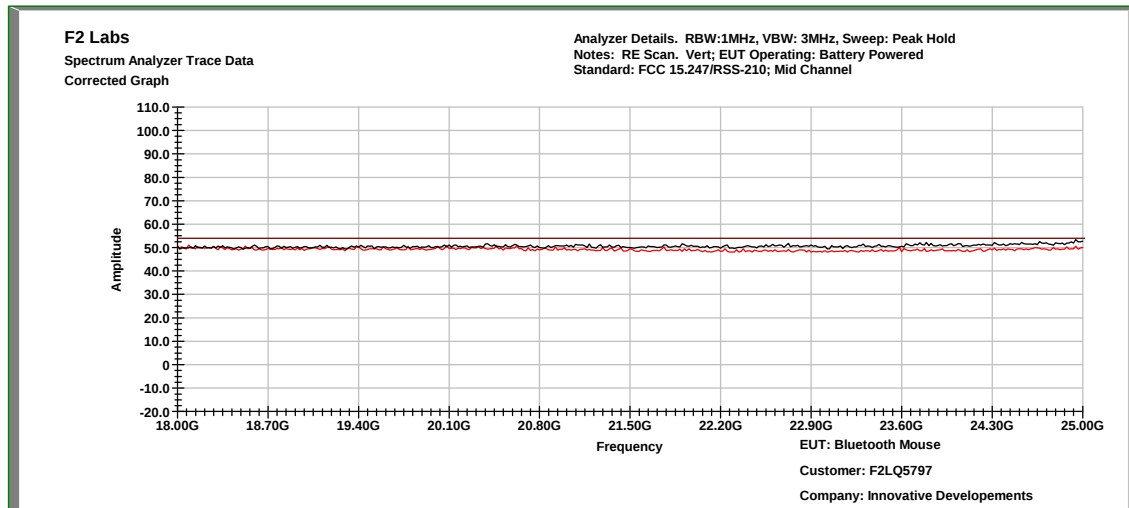
6 GHz to 18 GHz, Horizontal



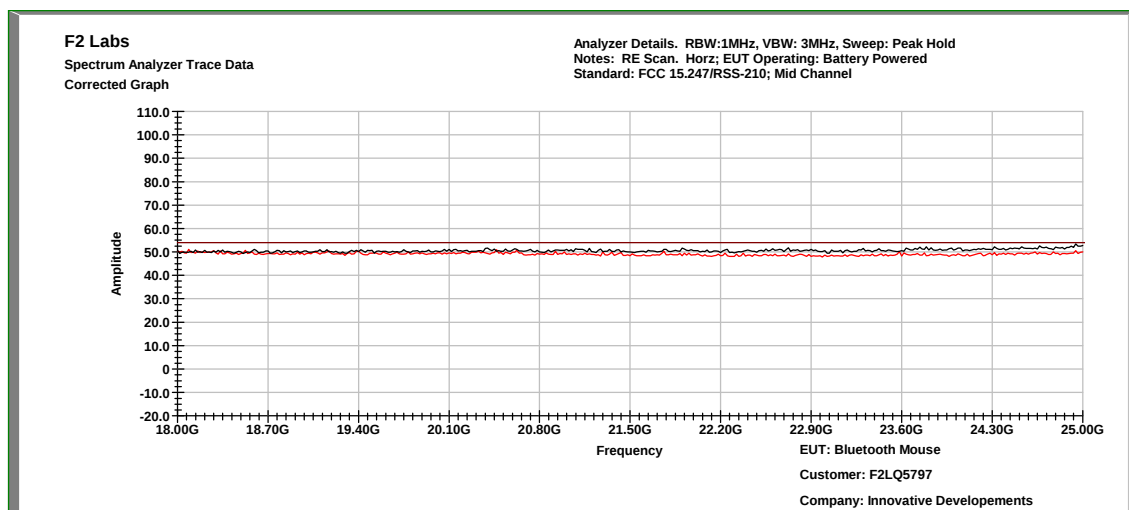


Radiated Spurious Emission with 0dBi Integral Antenna: Mid Channel, cont'd

18 GHz to 25 GHz, Vertical



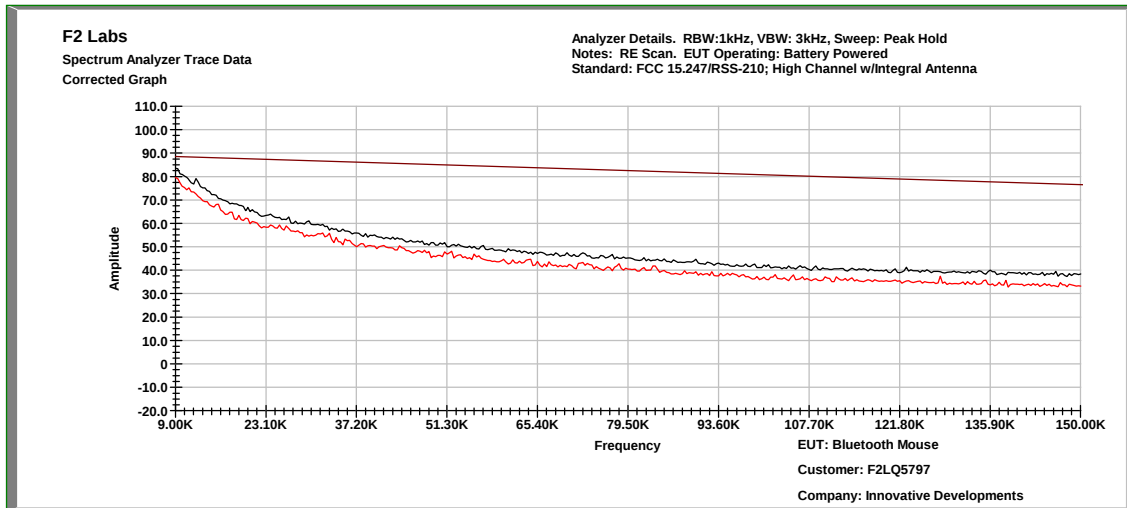
18 GHz to 25 GHz, Horizontal



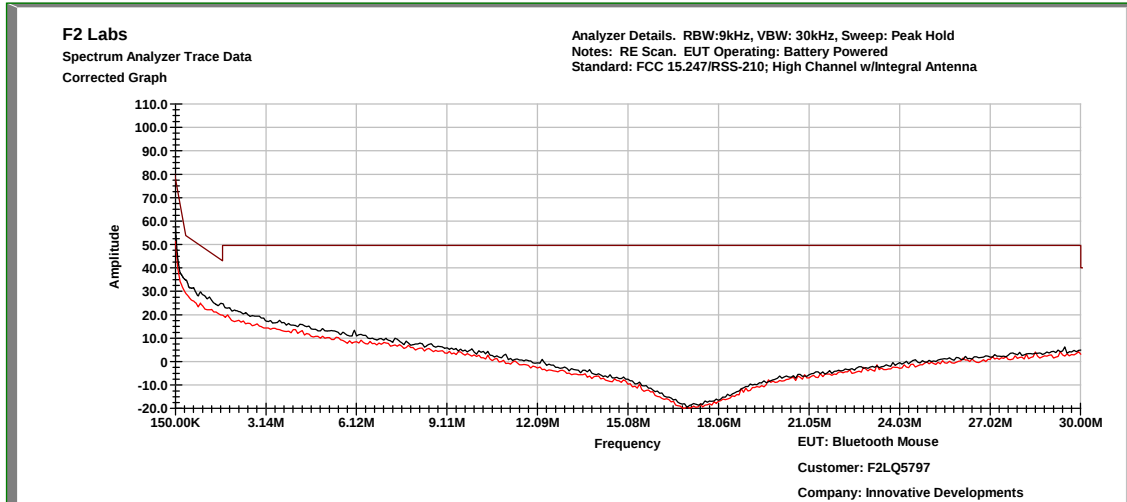


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel

.009 MHz to 0.15 MHz



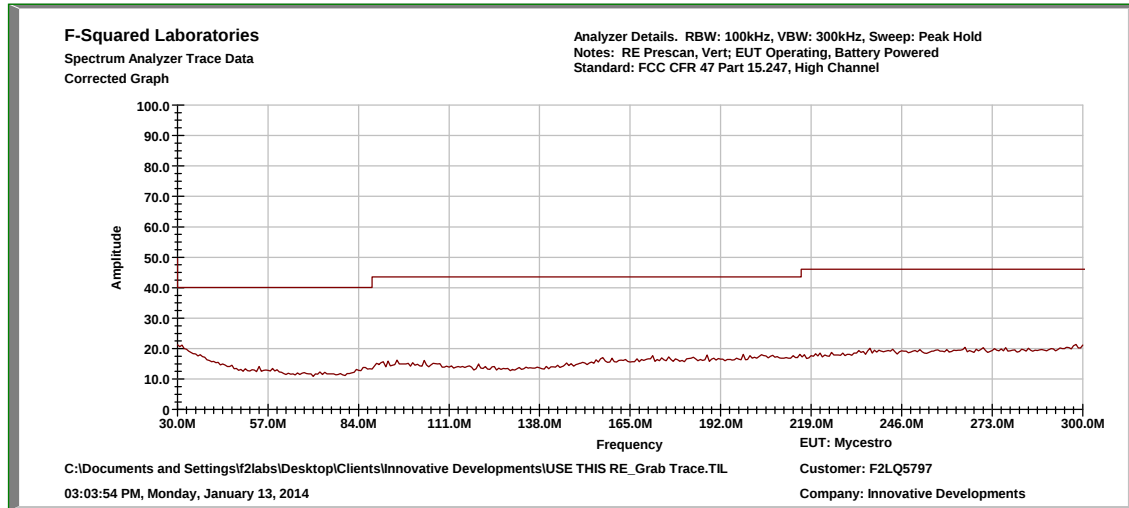
0.15 MHz to 30 MHz



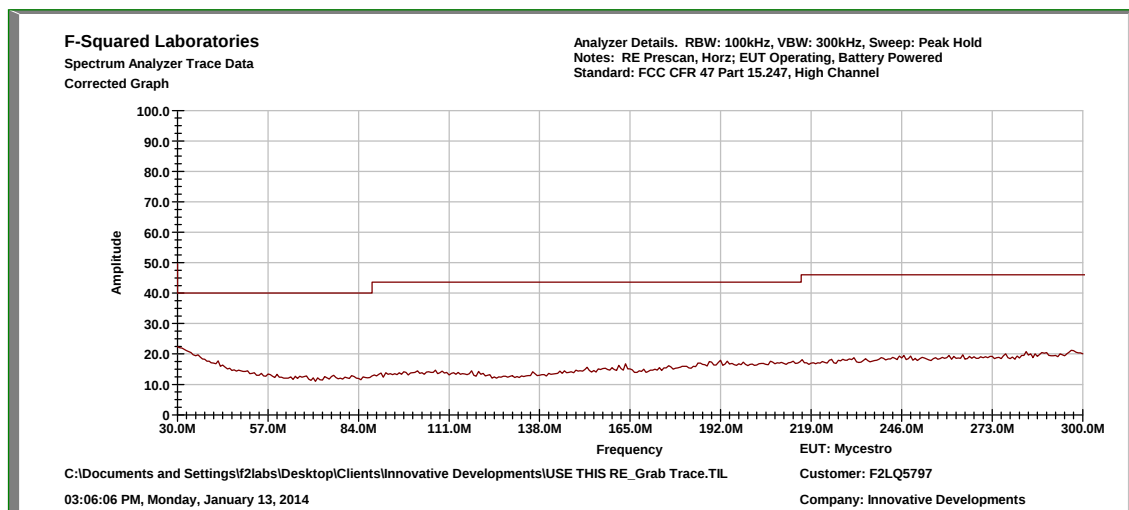


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel, cont'd

30 MHz to 300 MHz, Vertical



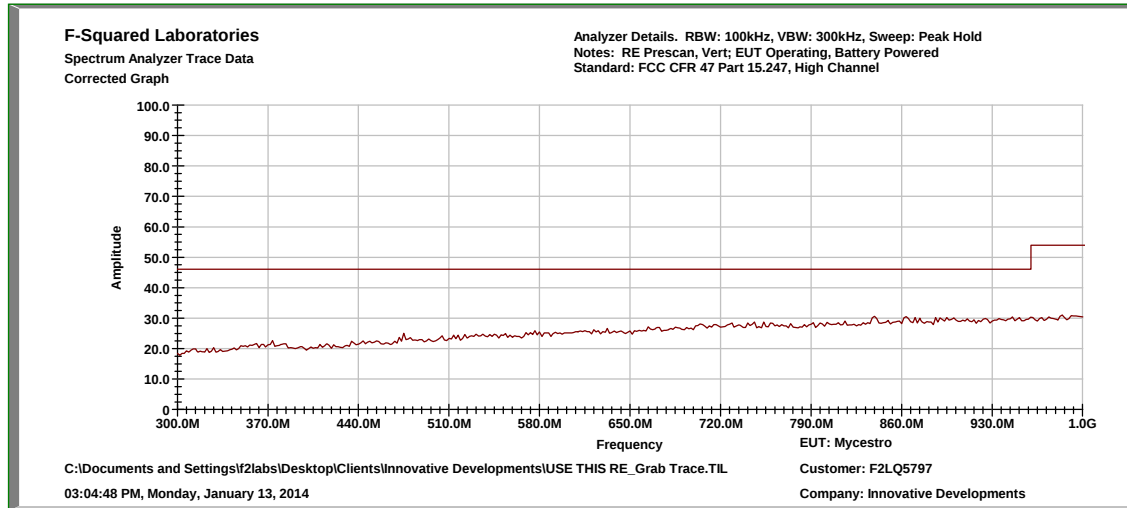
30 MHz to 300 MHz, Horizontal



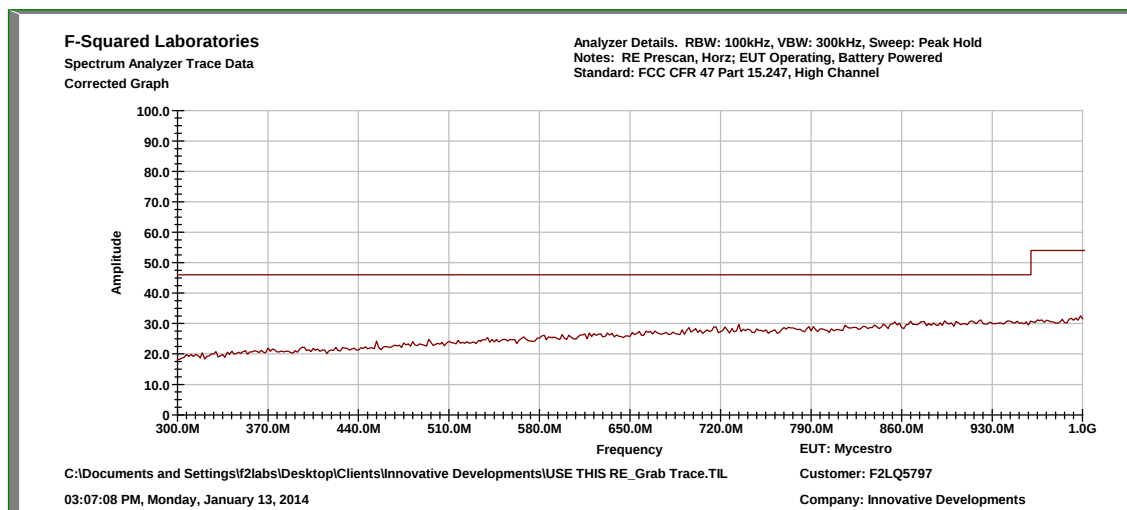


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel, cont'd

300 MHz to 1000 MHz, Vertical



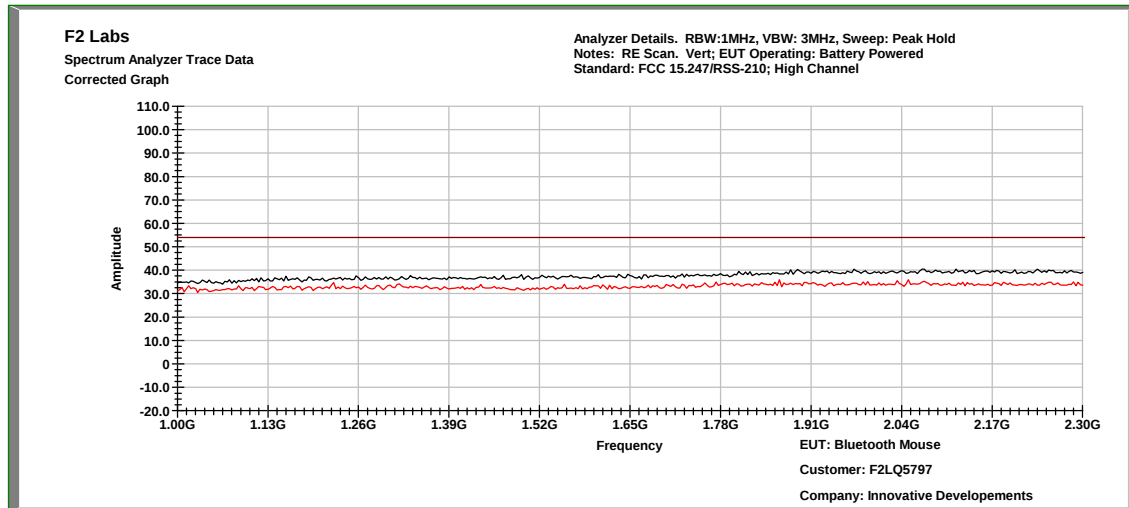
300 MHz to 1000 MHz, Horizontal



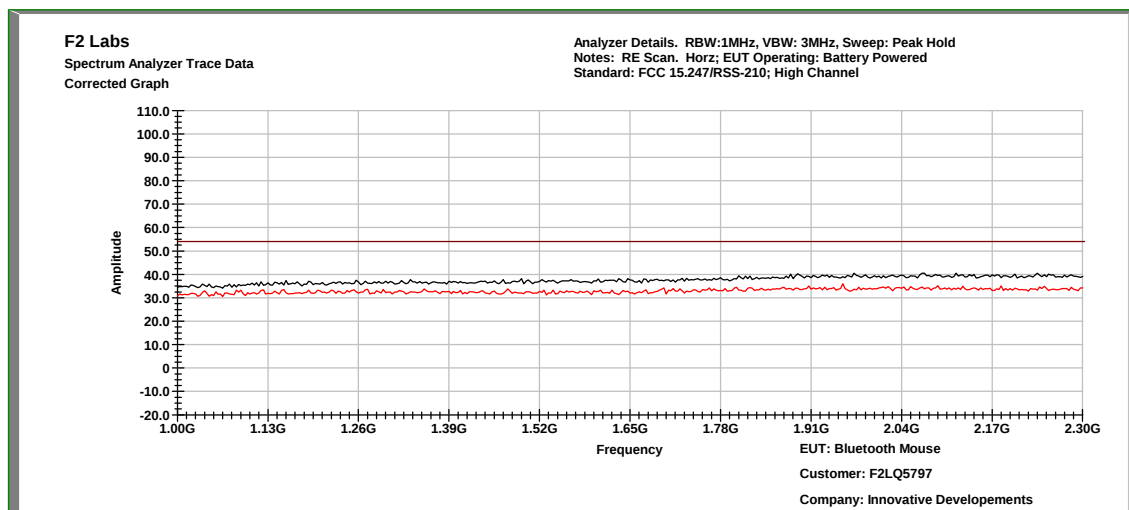


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel, cont'd

1000 MHz to 2300 MHz, Vertical



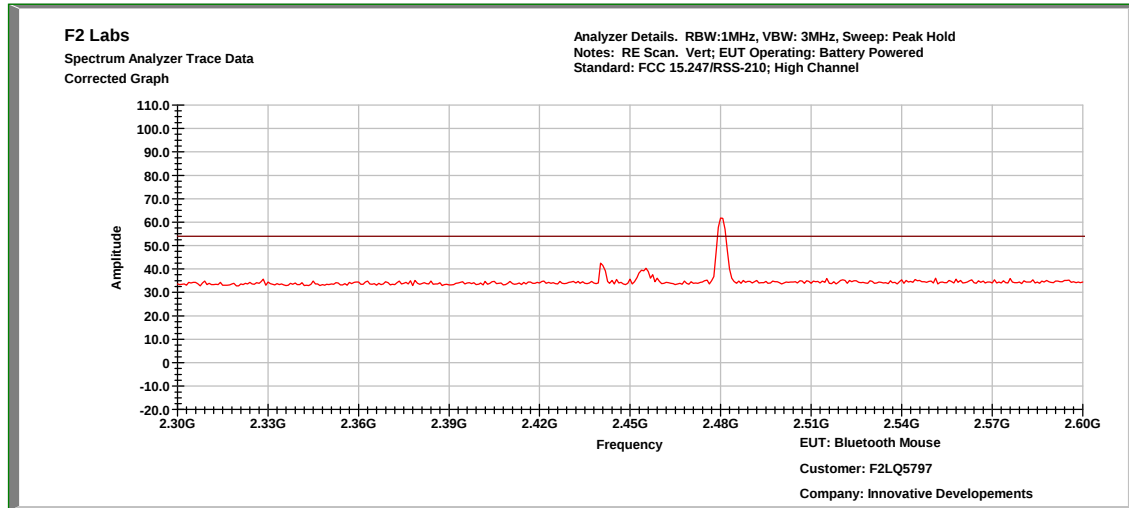
1000 MHz to 2300 MHz, Horizontal



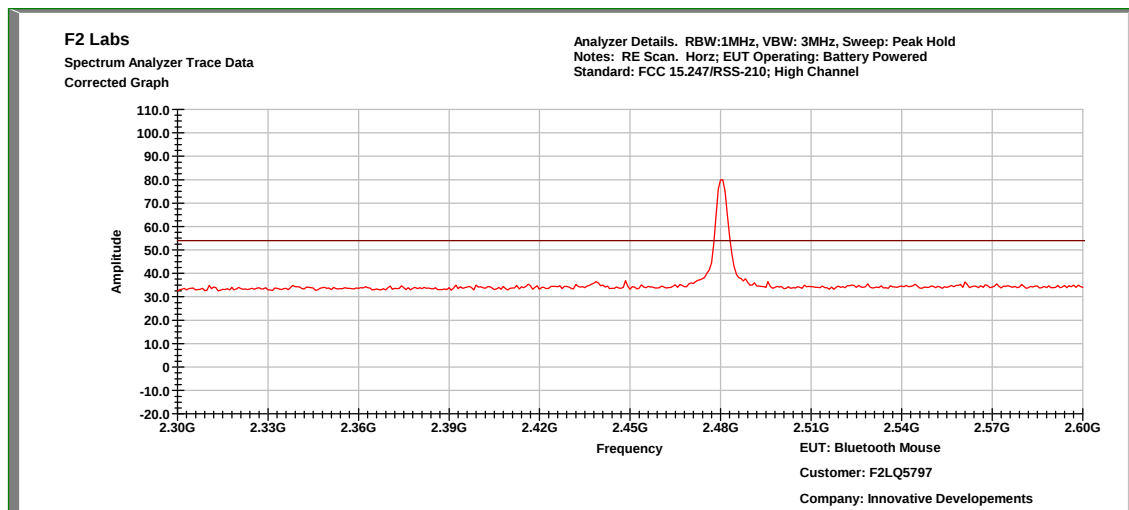


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel, cont'd

2300 MHz to 2600 MHz, Vertical



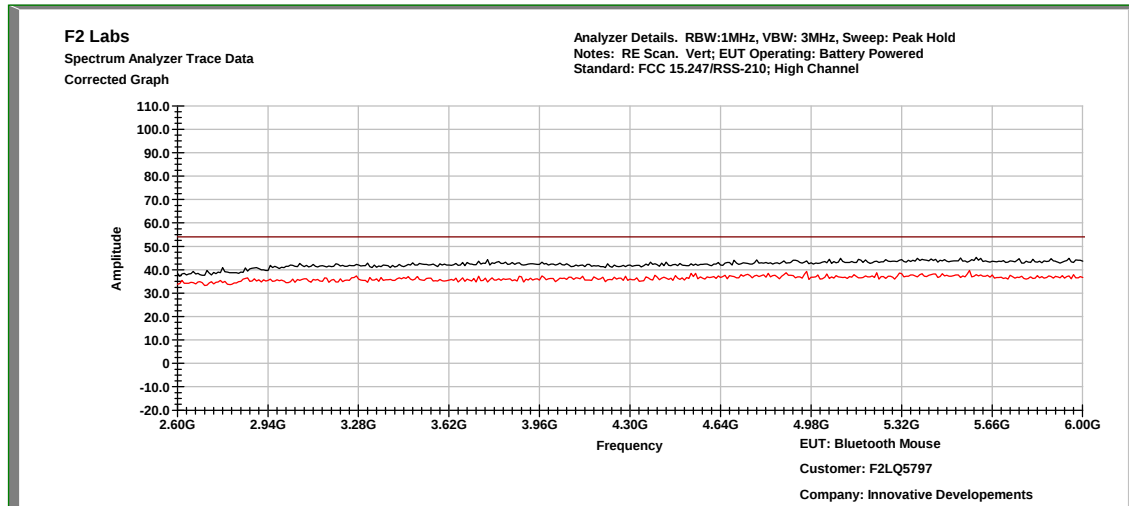
2300 MHz to 2600 MHz, Horizontal



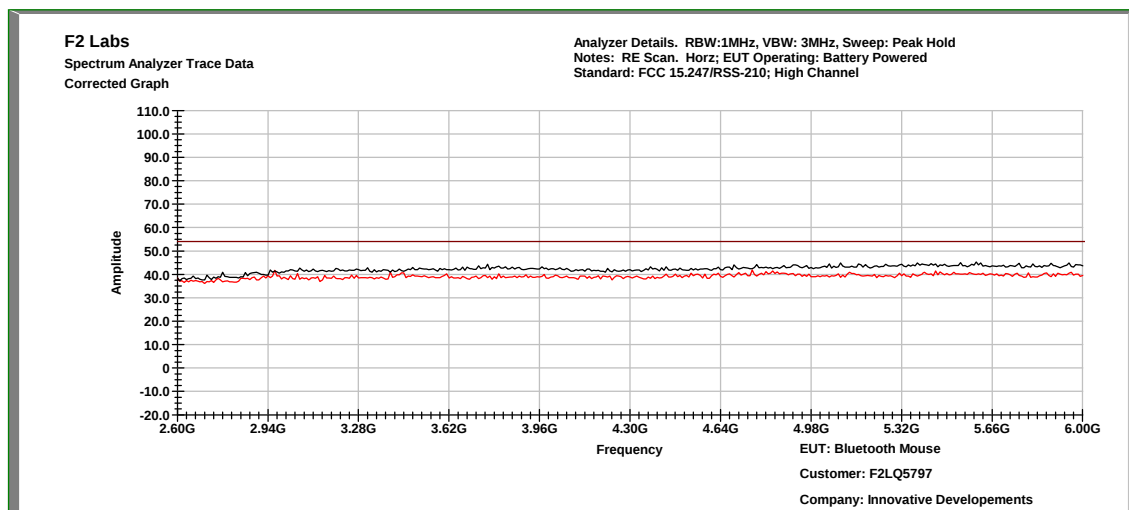


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel, cont'd

2.6 GHz to 6 GHz, Vertical



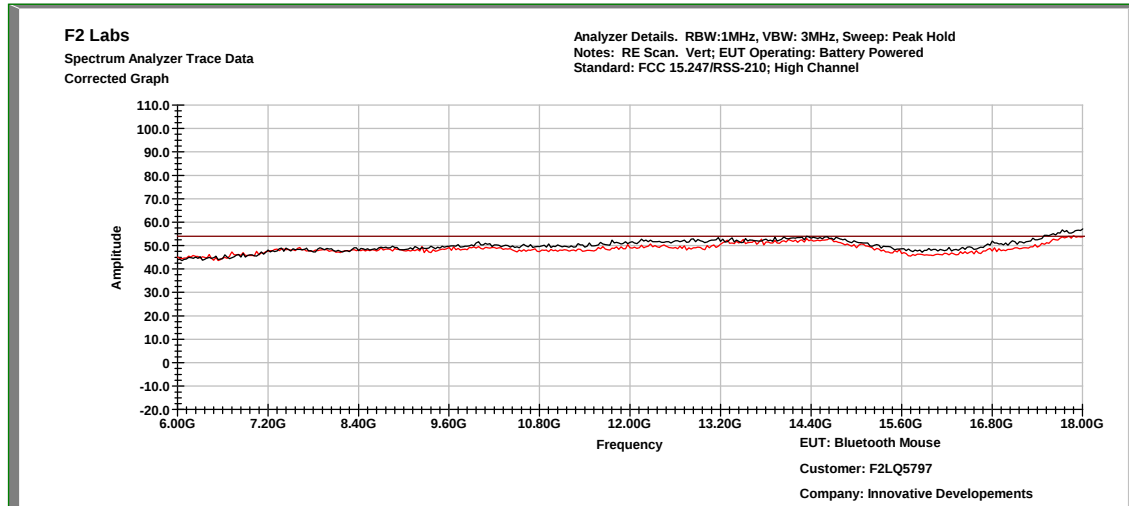
2.6 GHz to 6 GHz, Horizontal



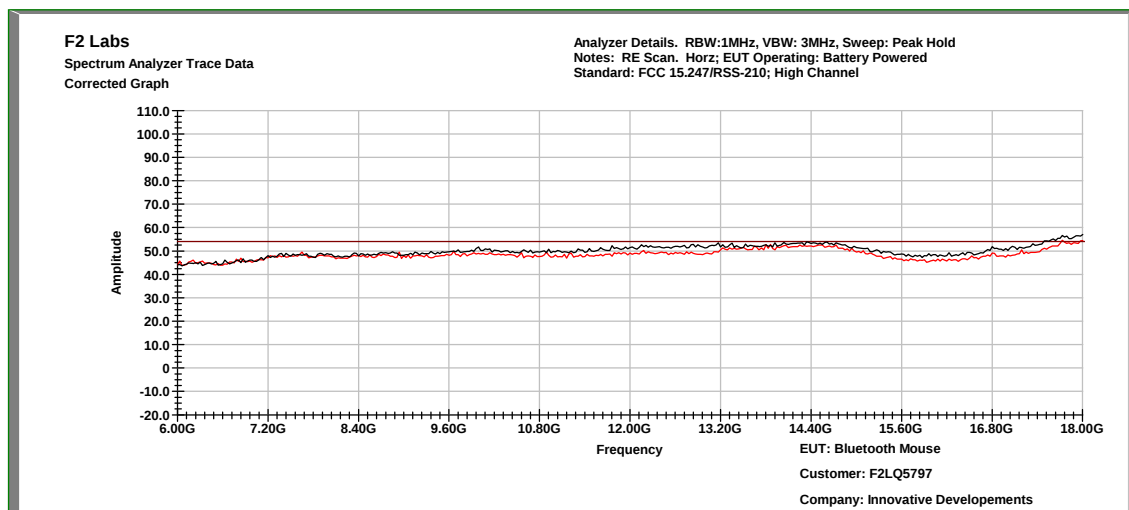


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel, cont'd

6 GHz to 18 GHz, Vertical



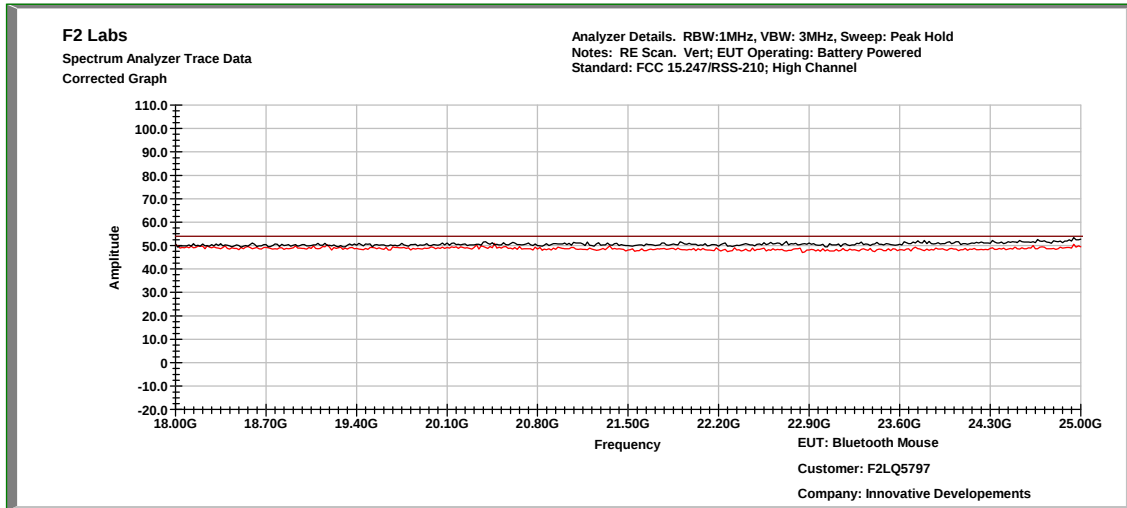
6 GHz to 18 GHz, Horizontal



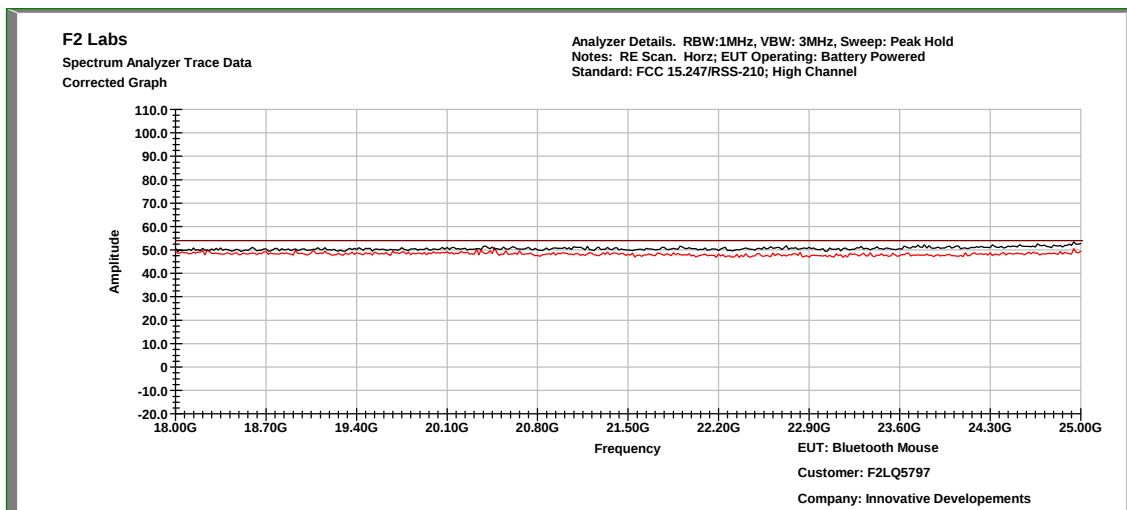


Radiated Spurious Emission with 0dBi Integral Antenna: High Channel, cont'd

18 GHz to 25 GHz, Vertical

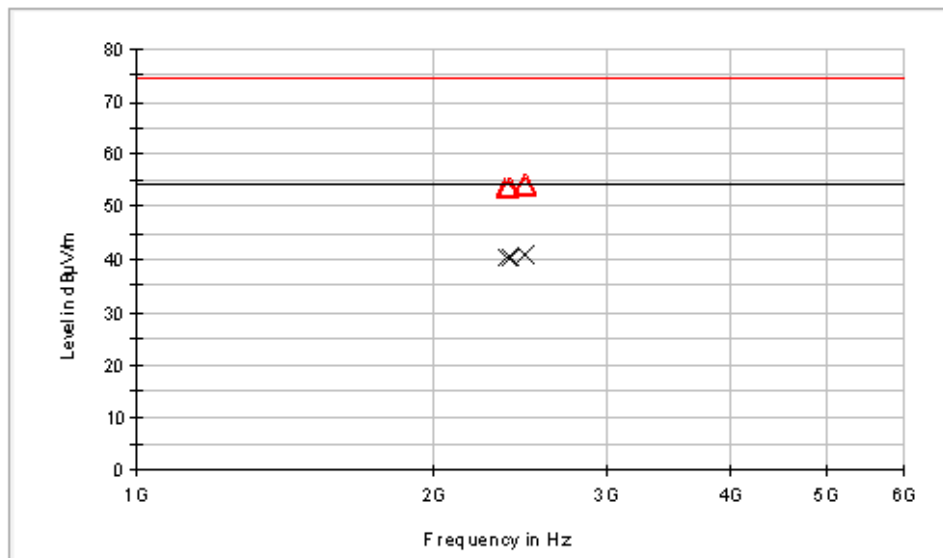
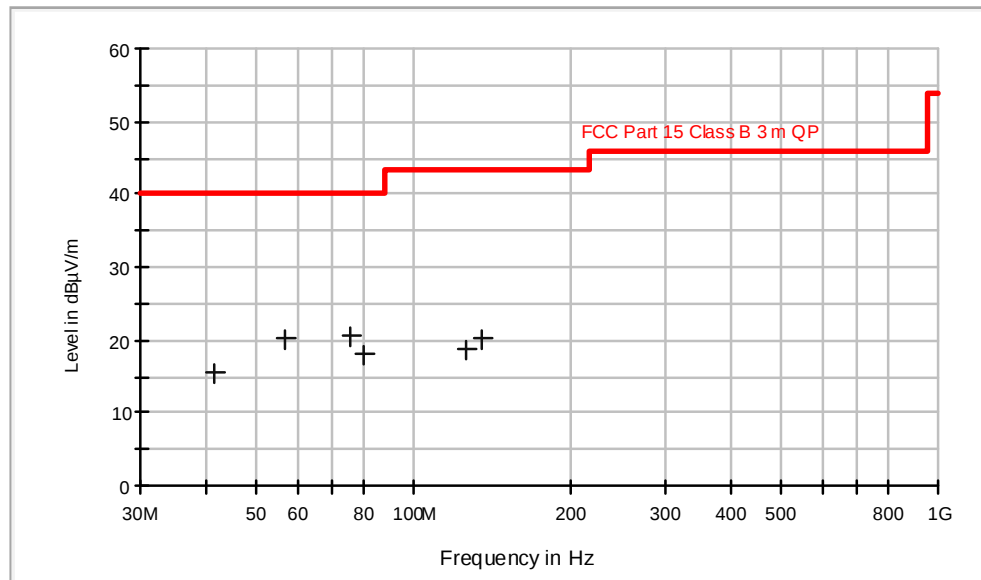


18 GHz to 25 GHz, Horizontal





Measurements – Low Channel



**Low Channel - QuasiPeak**

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
41.360000	H	2.1	13.5	15.60	40.0	-24.4
56.660000	V	11.4	8.8	20.20	40.0	-19.8
75.690000	H	10.7	9.9	20.60	40.0	-19.4
79.730000	V	9.1	8.8	17.90	40.0	-22.1
125.030000	H	3.8	15.1	18.90	43.5	-24.6
134.610000	V	5.6	14.7	20.30	43.5	-23.2

Low Channel - MaxPeak

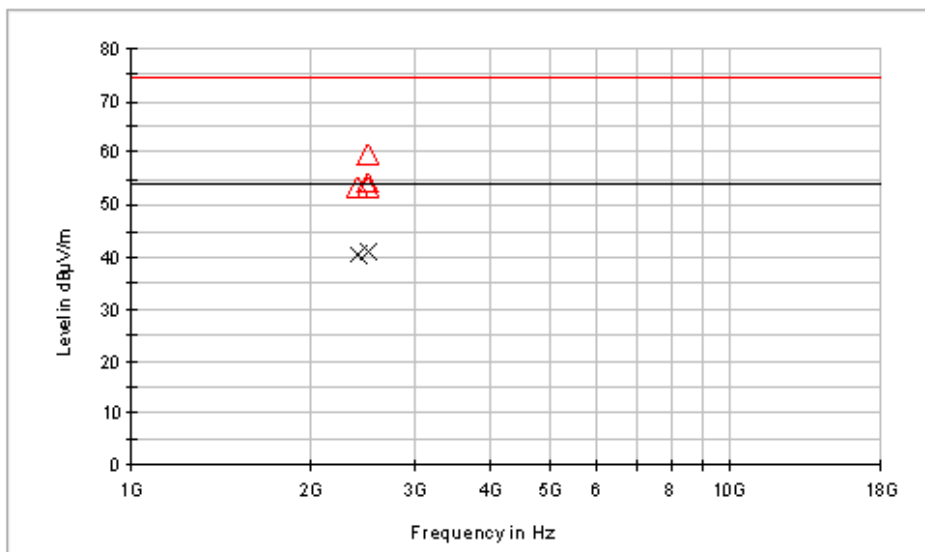
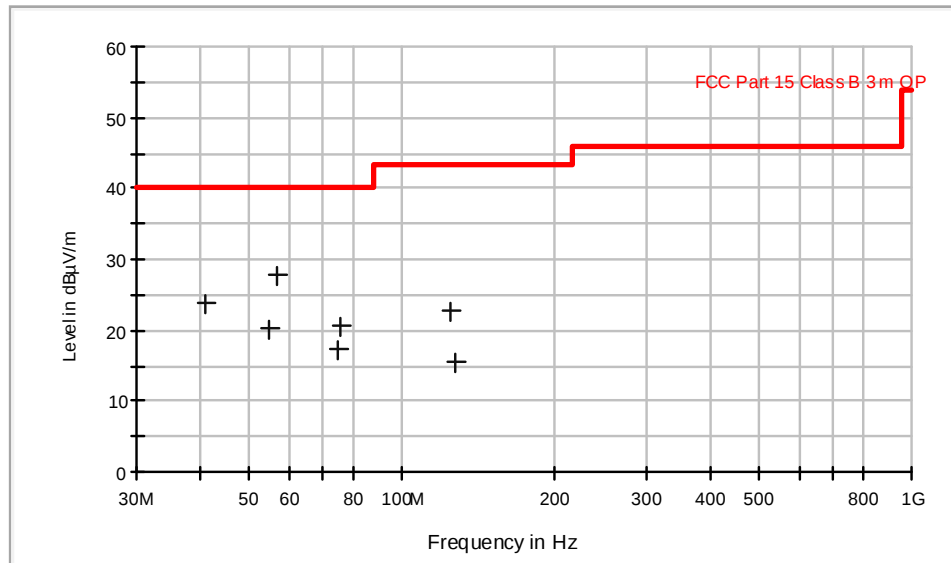
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Bandwidth (kHz)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2385.080000	H	25.2	1000.0	28.3	53.50	74.0	-20.5
2385.240000	V	25.8	1000.0	28.3	54.10	74.0	-19.9
2389.000000	V	25.9	1000.0	28.3	54.20	74.0	-19.8
2390.040000	H	25.9	1000.0	28.3	54.20	74.0	-19.8
2483.000000	H	25.8	1000.0	28.4	54.20	74.0	-19.8
2483.520000	V	25.6	1000.0	28.4	54.00	74.0	-20.0
2485.320000	H	25.9	1000.0	28.4	54.30	74.0	-19.7
2485.480000	V	25.9	1000.0	28.4	54.30	74.0	-19.7

Low Channel - Average

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Bandwidth (kHz)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2385.080000	H	12.2	1000.0	28.3	40.50	54.0	-13.5
2385.240000	V	12.2	1000.0	28.3	40.50	54.0	-13.5
2389.000000	V	12.3	1000.0	28.3	40.60	54.0	-13.4
2390.040000	H	12.2	1000.0	28.3	40.50	54.0	-13.5
2483.000000	H	12.6	1000.0	28.4	41.00	54.0	-13.0
2483.520000	V	12.6	1000.0	28.4	41.00	54.0	-13.0
2485.320000	H	12.6	1000.0	28.4	41.00	54.0	-13.0
2485.480000	V	12.6	1000.0	28.4	41.00	54.0	-13.0



Measurements – Mid Channel



**Mid Channel - QuasiPeak**

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
41.010000	H	10.2	13.7	23.90	40.0	-16.1
54.400000	H	11.9	8.5	20.40	40.0	-19.6
56.400000	V	19.3	8.7	28.00	40.0	-12.0
74.870000	H	7.6	9.7	17.30	40.0	-22.7
75.910000	V	11.3	9.1	20.40	43.5	-23.1
124.370000	V	6.8	15.9	22.70	43.5	-20.8
126.360000	H	0.4	15.2	15.60	43.5	-27.9

Mid Channel - MaxPeak

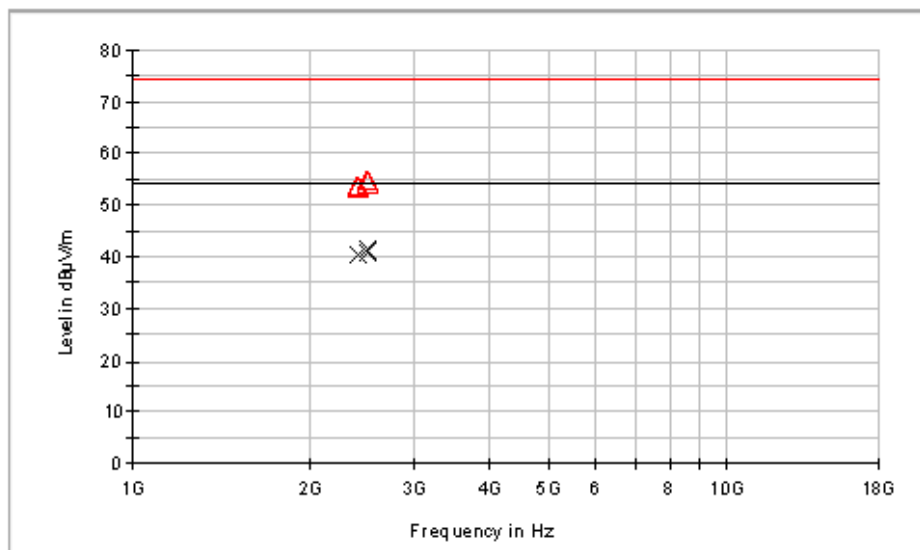
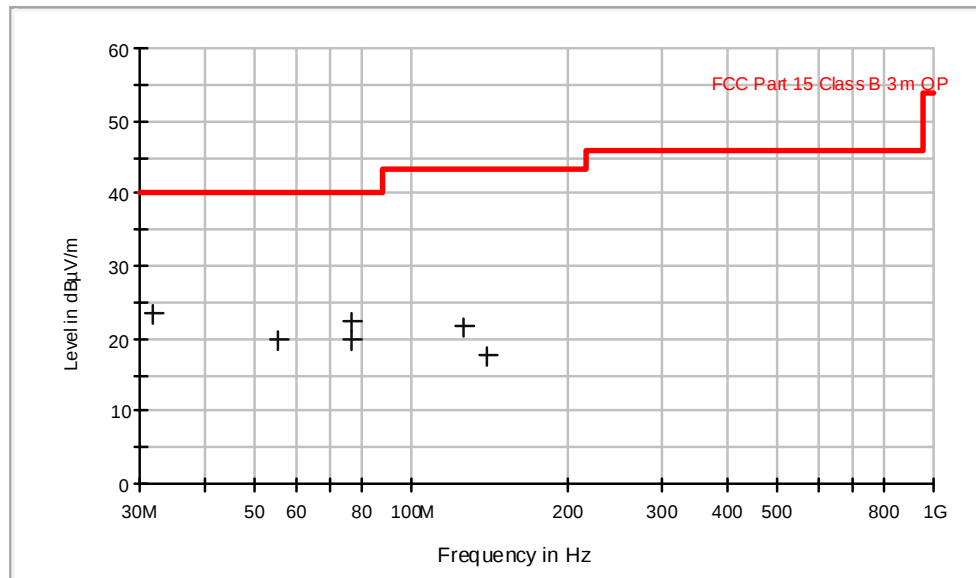
Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Bandwidth (kHz)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2387.520000	V	25.3	1000.0	28.3	53.60	74.0	-20.4
2388.040000	H	25.4	1000.0	28.3	53.70	74.0	-20.3
2392.160000	V	25.1	1000.0	28.3	53.40	74.0	-20.6
2392.240000	H	25.2	1000.0	28.3	53.50	74.0	-20.5
2478.400000	V	31.3	1000.0	28.4	59.70	74.0	-14.3
2483.200000	H	25.9	1000.0	28.4	54.30	74.0	-19.7
2483.200000	V	25.3	1000.0	28.4	53.70	74.0	-20.3
2486.880000	V	25.0	1000.0	28.4	53.40	74.0	-20.6

Mid Channel - Average

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Bandwidth (kHz)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2385.080000	V	12.3	1000.0	28.3	40.60	54.0	-13.4
2385.240000	H	12.3	1000.0	28.3	40.60	54.0	-13.4
2389.000000	V	12.2	1000.0	28.3	40.50	54.0	-13.5
2390.040000	H	12.3	1000.0	28.3	40.60	54.0	-13.4
2483.000000	V	12.6	1000.0	28.4	41.00	54.0	-13.0
2483.520000	H	12.6	1000.0	28.4	41.00	54.0	-13.0
2485.320000	V	12.6	1000.0	28.4	41.00	54.0	-13.0
2485.480000	V	12.6	1000.0	28.4	41.00	54.0	-13.0



Measurements – High Channel



**High Channel - QuasiPeak**

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
31.860000	V	3.7	19.9	23.60	40.0	-16.4
55.290000	H	11.6	8.2	19.80	40.0	-20.2
76.340000	H	12.6	9.9	22.50	40.0	-17.5
76.520000	V	10.8	9.0	19.80	40.0	-20.2
125.680000	V	5.8	16.0	21.80	43.5	-21.7
138.500000	H	3.4	14.4	17.80	43.5	-25.7

High Channel - MaxPeak

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Bandwidth (kHz)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2385.320000	H	25.0	1000.0	28.3	53.30	74.0	-20.7
2390.880000	H	25.8	1000.0	28.3	54.10	74.0	-19.9
2482.120000	V	26.1	1000.0	28.4	54.50	74.0	-19.5
2483.000000	H	26.1	1000.0	28.4	54.50	74.0	-19.5
2483.040000	V	26.2	1000.0	28.4	54.60	74.0	-19.4
2483.520000	V	26.1	1000.0	28.4	54.50	74.0	-19.5
2483.520000	H	26.5	1000.0	28.4	54.90	74.0	-19.1
2484.280000	V	25.9	1000.0	28.4	54.30	74.0	-19.7

High Channel - Average

Frequency (MHz)	Antenna Polarization	Reading (dBμV)	Bandwidth (kHz)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2385.320000	H	12.2	1000.0	28.3	40.50	54.0	-13.5
2390.880000	H	12.2	1000.0	28.3	40.50	54.0	-13.5
2482.120000	V	12.6	1000.0	28.4	41.00	54.0	-13.0
2483.000000	H	12.8	1000.0	28.4	41.20	54.0	-12.8
2483.040000	V	12.6	1000.0	28.4	41.00	54.0	-13.0
2483.520000	V	12.6	1000.0	28.4	41.00	54.0	-13.0
2483.520000	H	12.6	1000.0	28.4	41.00	54.0	-13.0
2484.280000	V	12.6	1000.0	28.4	41.00	54.0	-13.0



11 FCC PART 15.247 – PEAK POWER SPECTRAL DENSITY (PSD)

11.1 Procedure:

Power spectral density measurements were performed at a resolution bandwidth of 3 kHz (video bandwidth set at 10 KHz). The peak spectral densities were measured at the low, mid, and upper channels.

11.2 Requirements:

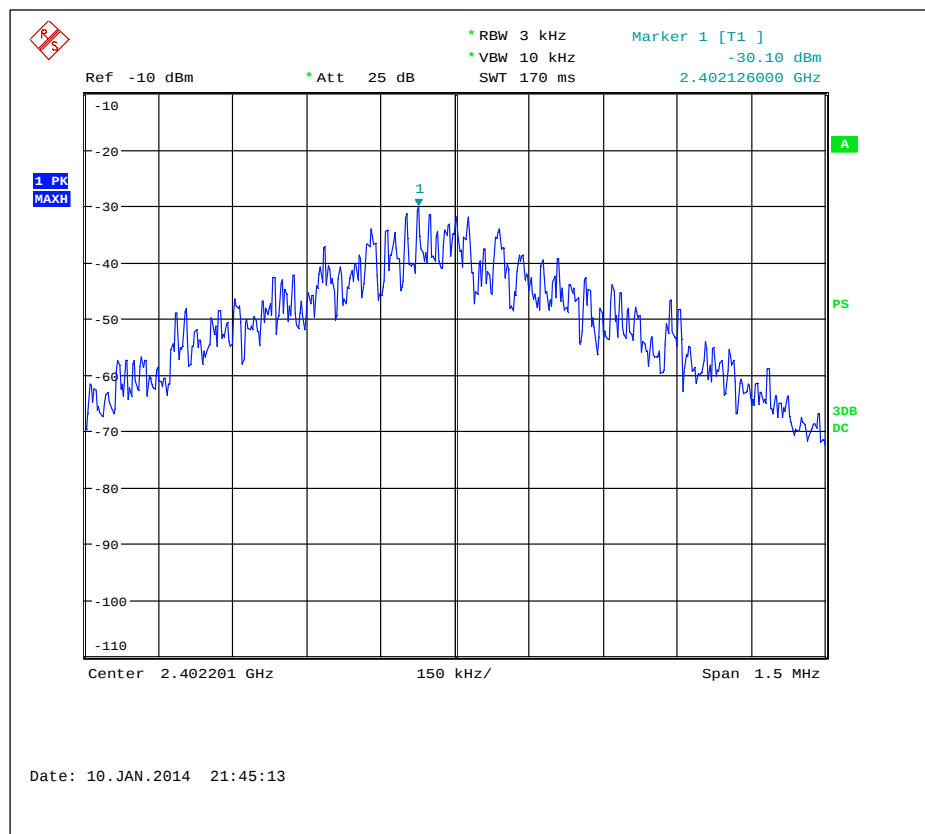
The peak power spectral density shall not exceed +8dBm in any 3 kHz band during any time interval of continuous transmission.



11.3 Peak Power Spectral Density Test Data

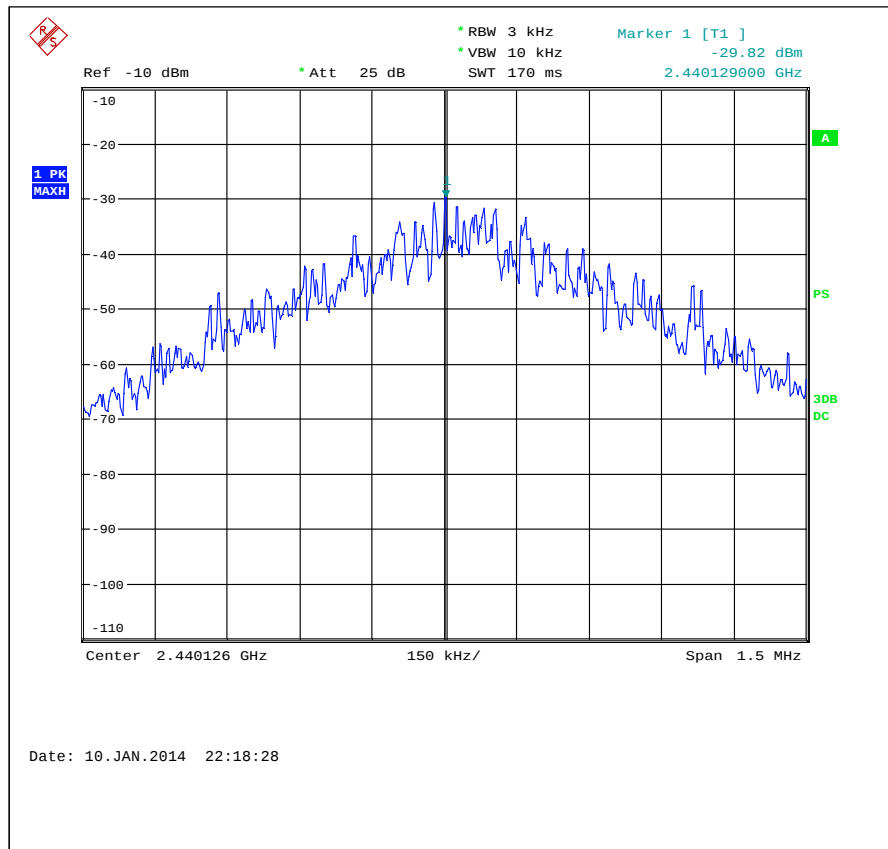
Test Date(s):	Jan. 16, 2014	Test Engineers:	J. Knepper; K. Littell
Standards:	CFR 47 Part 15.247; KDB558074	Air Temperature:	20.3C
		Relative Humidity:	39%

Low Channel



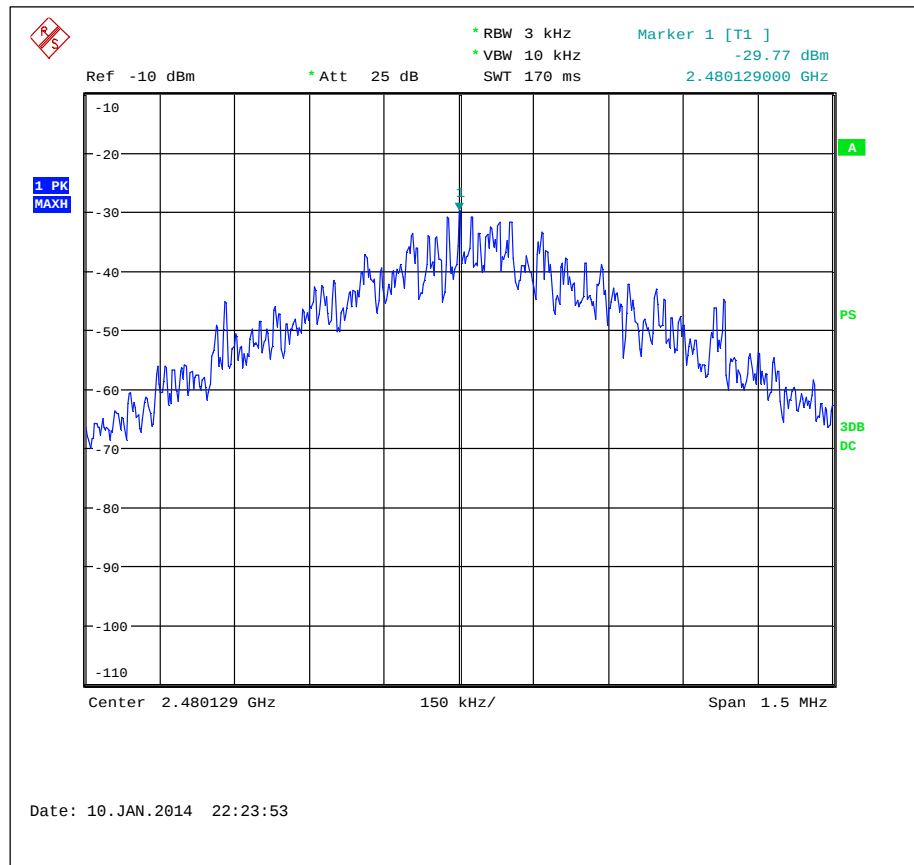


Mid Channel





High Channel





12 CONDUCTED EMISSIONS

12.1 Requirements

In accordance with FCC CFR 47 Part 15.207(a), "Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

12.2 Procedure

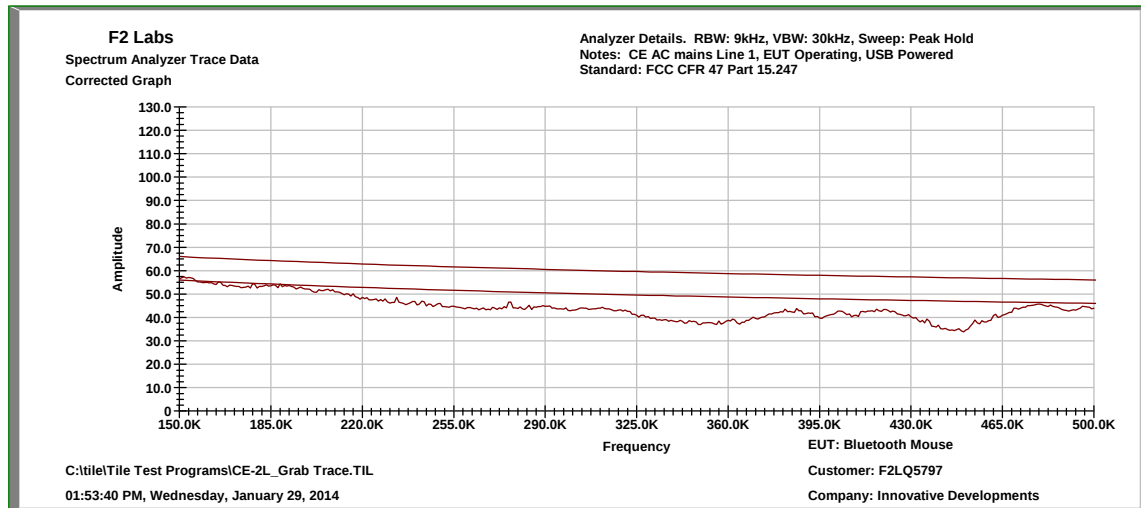
The EUT was placed on a 1.0 x 1.5 meter non-conductive table, 0.8 meter above a horizontal ground plane and 0.4 meter from a vertical ground plane. Power was provided to the EUT through a LISN bonded to a 3 x 2 meter ground plane. The LISN and peripherals were supplied power through a filtered AC power source. The output of the LISN was connected to the input of the receiver via a transient limiter, and emissions in the range 150 kHz to 30 MHz were measured. The measurements were recorded using the quasi-peak and average detectors as directed by the standard, and the resolution bandwidth during testing was 9 kHz. The raw measurements were corrected to allow for attenuation from the LISN, transient limiter and cables



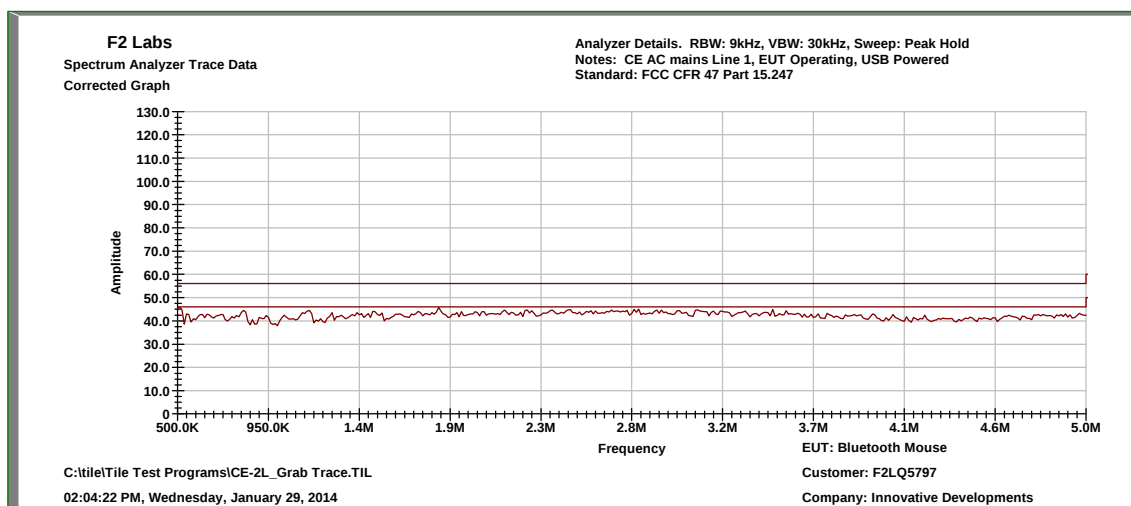
12.3 Conducted Emissions Test Data

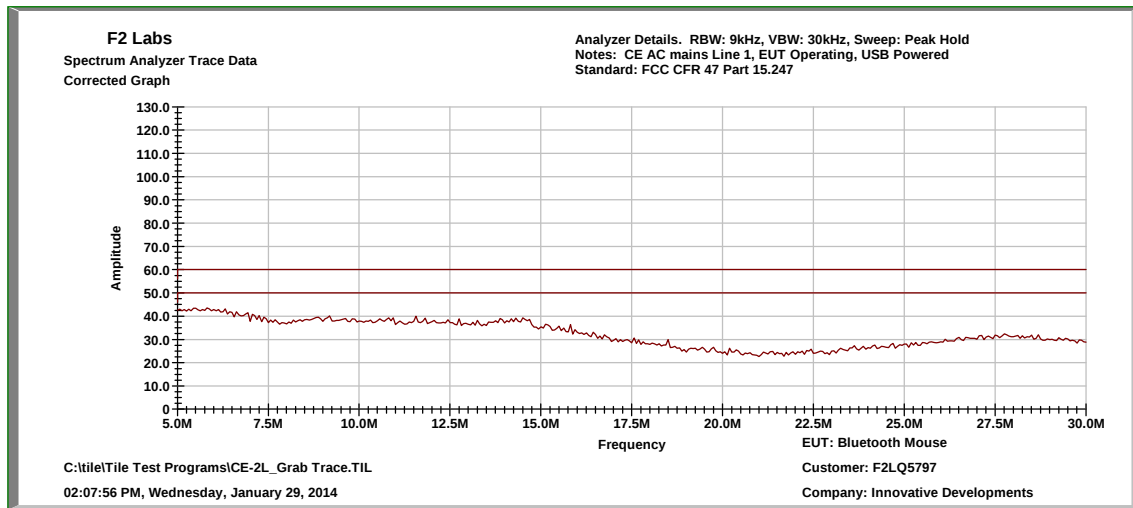
Test Date:	Jan. 29, 2014	Test Engineers:	J. Knepper; K. Littell
Rule:	15.207(a)	Air Temperature:	21.6° C
Test Results:	Pass	Relative Humidity:	36%

Conducted Test – Line 1: 0.15 MHz to 0.5 MHz, Low Channel



Conducted Test – Line 1: 0.5 MHz to 5.0 MHz, Low Channel

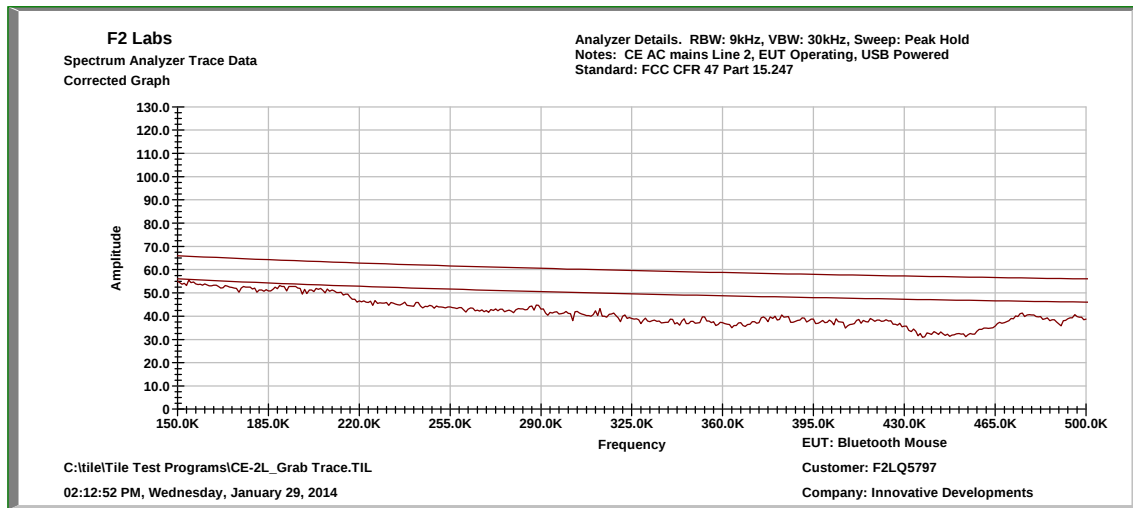


**Conducted Test – Line 1: 5.0 MHz to 30.0 MHz, Low Channel****Low Channel****Top Discrete Measurements**

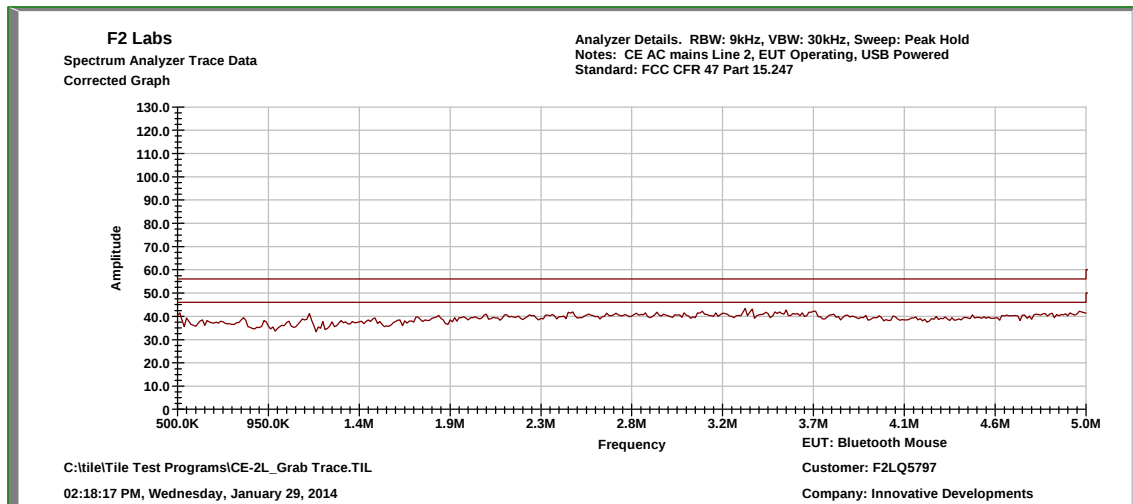
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.154	Quasi-Peak	36.38	11.0	47.38	65.762	-18.4
			Average	9.83	11.0	20.83	55.762	-34.9
2	Line 1	0.190	Quasi-Peak	35.03	11.0	46.03	64.04	-18.0
			Average	26.02	11.0	37.02	54.04	-17.0
3	Line 1	0.276	Quasi-Peak	29.38	11.0	40.38	60.94	-20.6
			Average	21.36	11.0	32.36	50.94	-18.6
4	Line 1	0.478	Quasi-Peak	32.01	11.0	43.01	56.372	-13.4
			Average	28.74	11.0	39.74	46.372	-6.6
5	Line 1	1.794	Quasi-Peak	32.37	11.0	43.37	56	-12.6
			Average	26.8	11.0	37.80	46	-8.2
6	Line 1	6.25	Quasi-Peak	27.08	11.0	38.08	60	-21.9
			Average	22.75	11.0	33.75	50	-16.3

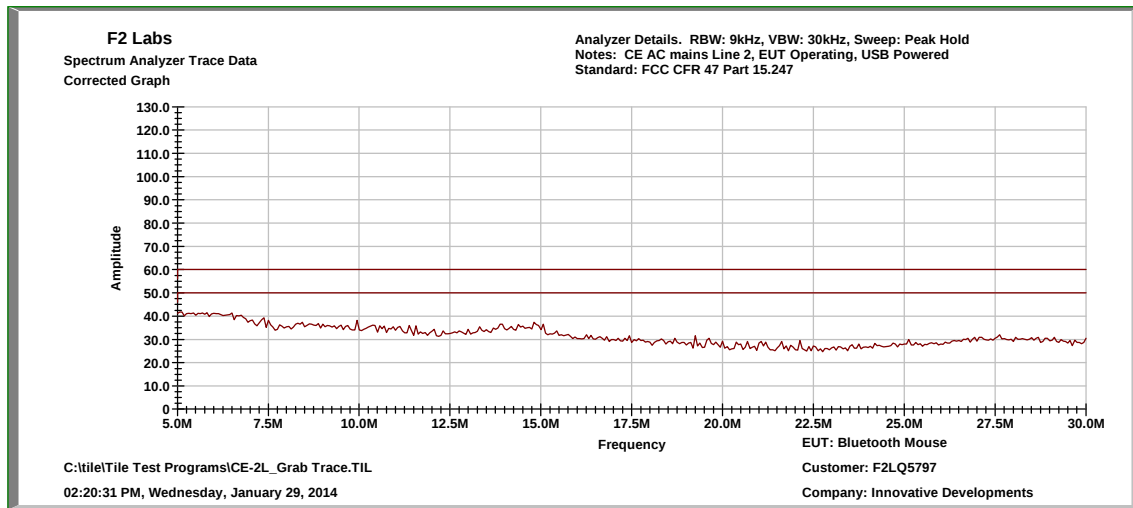


Conducted Test – Line 2: 0.15 MHz to 0.5 MHz, Low Channel



Conducted Test – Line 2: 0.5 MHz to 5.0 MHz, Low Channel

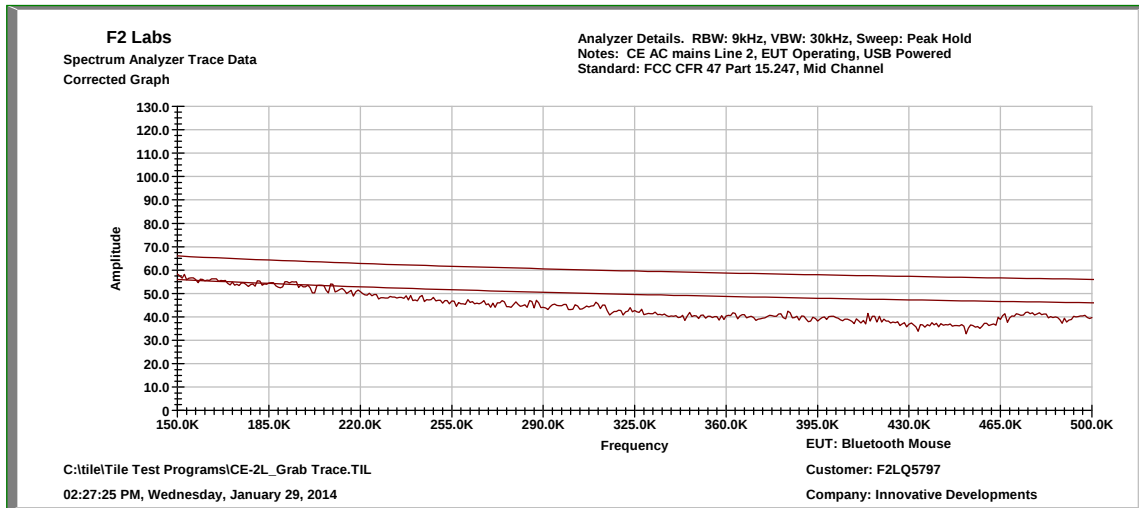


**Conducted Test – Line 2: 5.0 MHz to 30.0 MHz, Low Channel****Low Channel****Top Discrete Measurements**

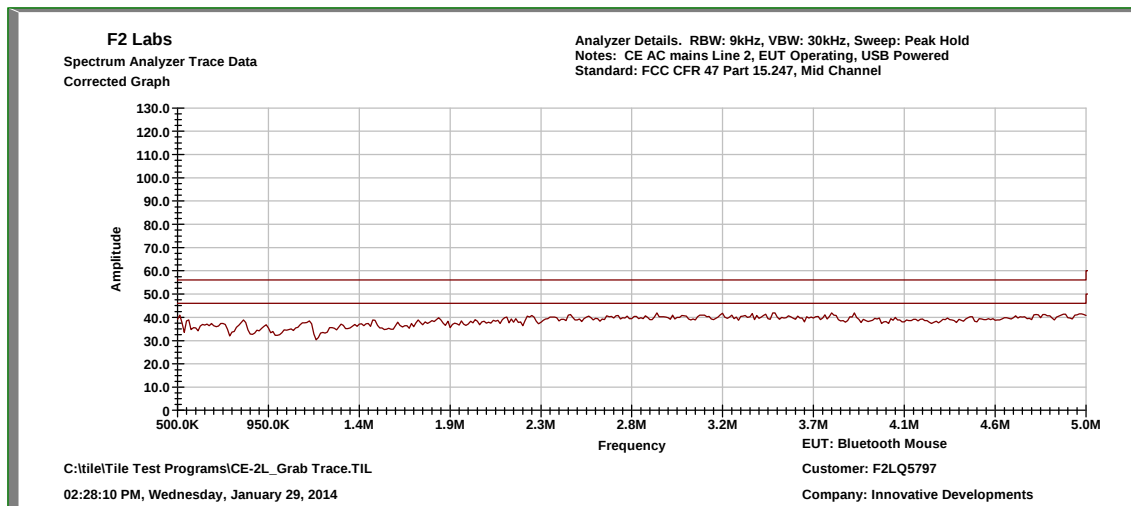
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 2	0.155	Quasi-Peak	38.16	11.0	49.16	65.728	-16.6
			Average	10.34	11.0	21.34	35.728	-14.4
2	Line 2	0.190	Quasi-Peak	34.44	11.0	45.44	64.040	-18.6
			Average	24.85	11.0	35.85	54.040	-18.2
3	Line 2	0.212	Quasi-Peak	35.62	11.0	46.62	63.12	-16.5
			Average	24.87	11.0	35.87	53.12	-17.3
4	Line 2	0.475	Quasi-Peak	27.68	11.0	38.68	56.43	-17.8
			Average	23.8	11.0	34.8	46.43	-11.6
5	Line 2	3.313	Quasi-Peak	25.64	11.0	36.64	56	-19.4
			Average	20.60	11.0	31.60	46	-14.4
6	Line 2	5.75	Quasi-Peak	26.87	11.0	37.87	60	-22.1
			Average	21.64	11.0	32.64	50	-17.4



Conducted Test – Line 1: 0.15 MHz to 0.5 MHz, Mid Channel

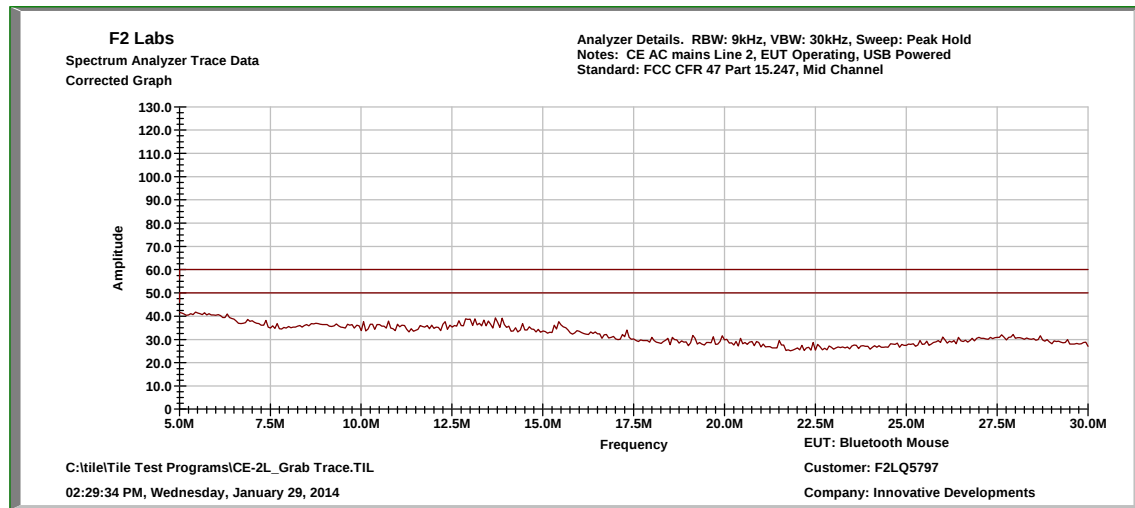


Conducted Test – Line 1: 0.5 MHz to 5.0 MHz, Mid Channel





Conducted Test – Line 1: 5.0 MHz to 30.0 MHz, Mid Channel

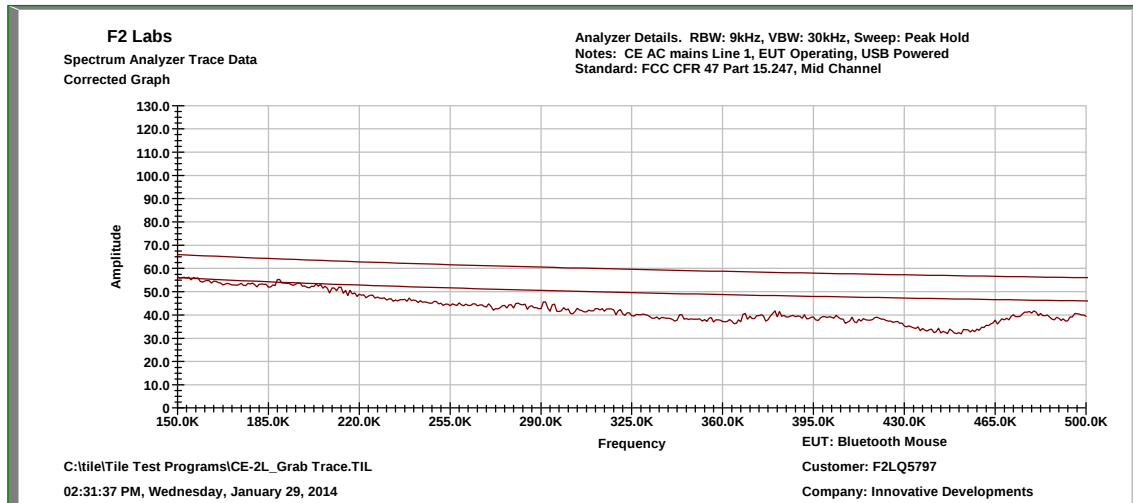


Mid Channel

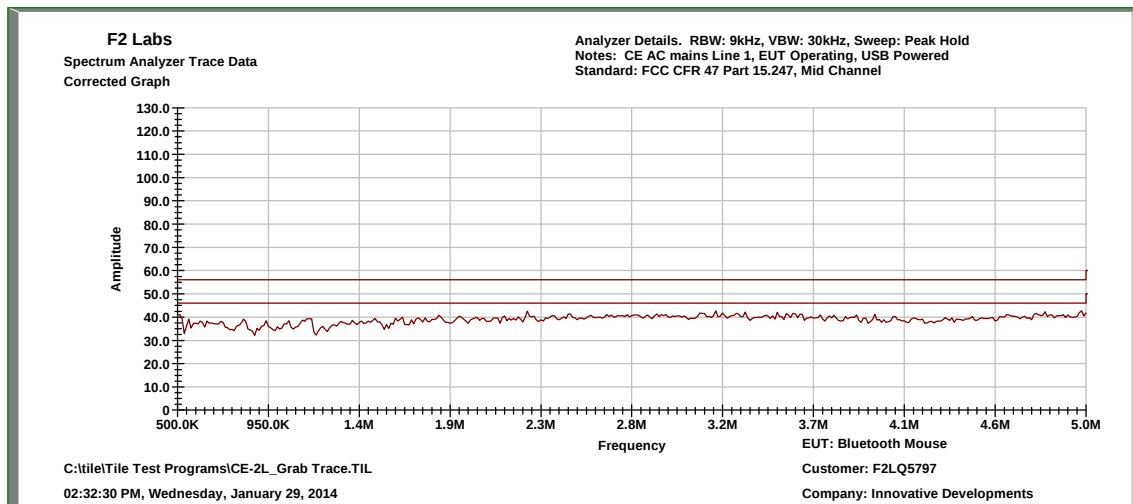
Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.154	Quasi-Peak	36.25	11.0	47.25	65.762	-18.5
			Average	9.72	11.0	20.72	55.762	-35.0
2	Line 1	0.190	Quasi-Peak	35.24	11.0	46.24	64.04	-17.8
			Average	26.14	11.0	37.14	54.04	-16.9
3	Line 1	0.276	Quasi-Peak	29.60	11.0	40.60	60.94	-20.3
			Average	21.45	11.0	32.45	50.94	-18.5
4	Line 1	0.478	Quasi-Peak	31.82	11.0	42.82	56.372	-13.6
			Average	28.59	11.0	39.59	46.372	-6.8
5	Line 1	1.794	Quasi-Peak	32.15	11.0	43.15	56	-12.9
			Average	26.49	11.0	37.49	46	-8.5
6	Line 1	6.25	Quasi-Peak	27.12	11.0	38.12	60	-21.9
			Average	22.63	11.0	33.63	50	-16.4

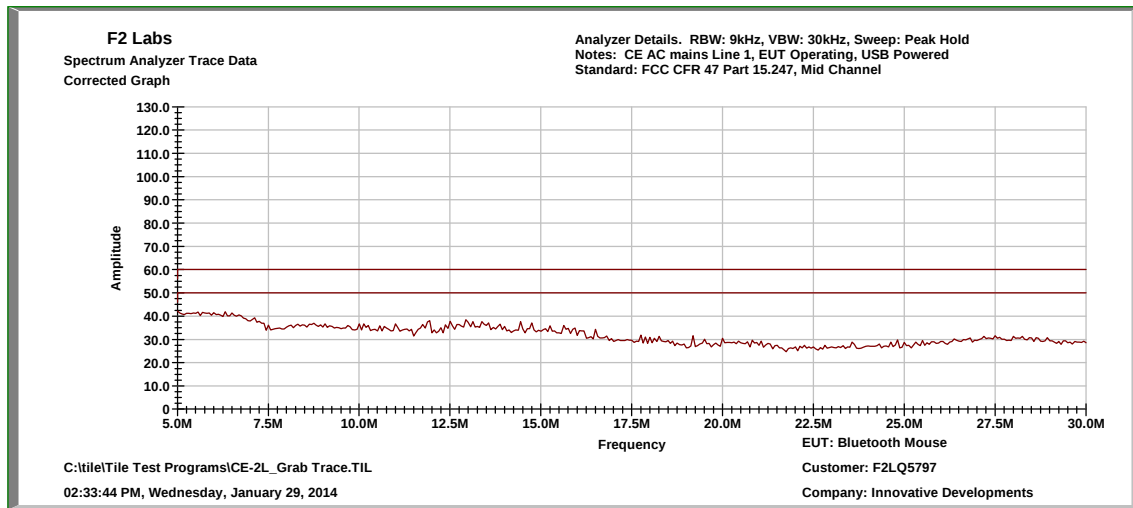


Conducted Test – Line 2: 0.15 MHz to 0.5 MHz, Mid Channel



Conducted Test – Line 2: 0.5 MHz to 5.0 MHz, Mid Channel

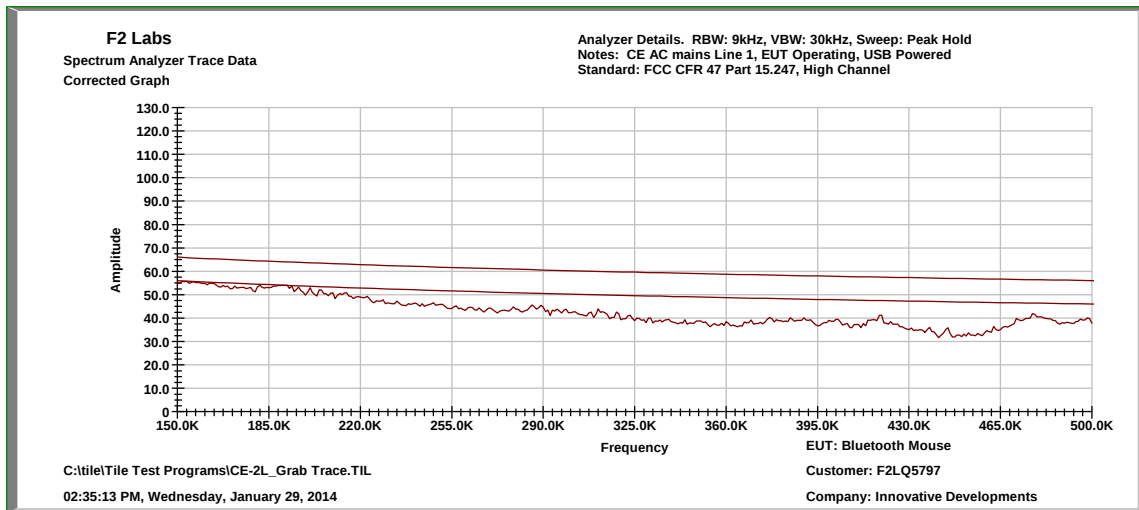


**Conducted Test – Line 2: 5.0 MHz to 30.0 MHz, Mid Channel****Mid Channel****Top Discrete Measurements**

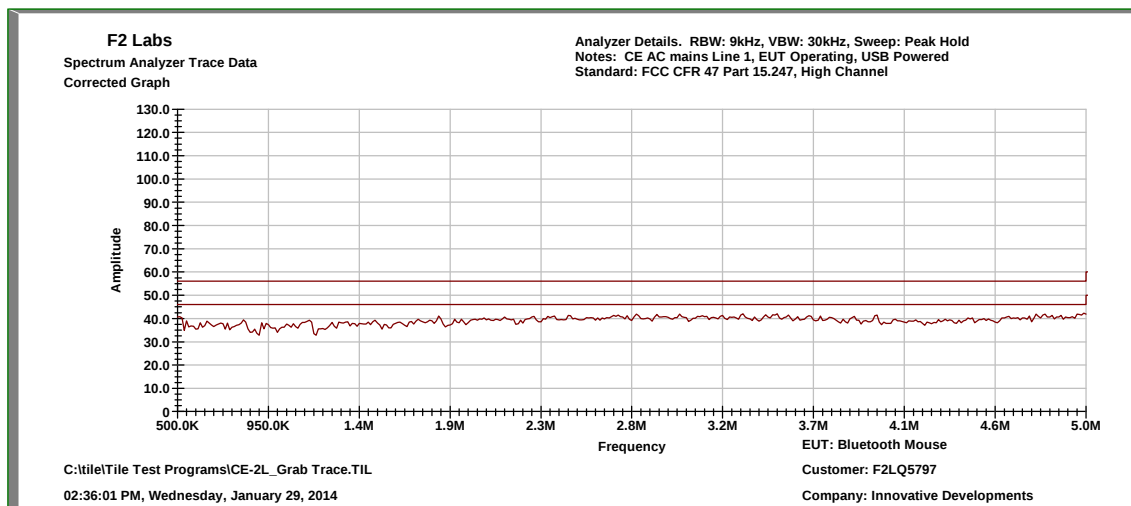
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 2	0.155	Quasi-Peak	38.26	11.0	49.26	65.728	-16.5
			Average	10.45	11.0	21.45	35.728	-14.3
2	Line 2	0.190	Quasi-Peak	34.23	11.0	45.23	64.040	-18.8
			Average	24.62	11.0	35.62	54.040	-18.4
3	Line 2	0.212	Quasi-Peak	35.87	11.0	46.87	63.12	-16.3
			Average	25.01	11.0	36.01	53.12	-17.1
4	Line 2	0.475	Quasi-Peak	27.92	11.0	38.92	56.43	-17.5
			Average	23.97	11.0	35.0	46.43	-11.5
5	Line 2	3.313	Quasi-Peak	25.42	11.0	36.42	56	-19.6
			Average	20.40	11.0	31.40	46	-14.6
6	Line 2	5.75	Quasi-Peak	26.99	11.0	37.99	60	-22.0
			Average	21.78	11.0	32.78	50	-17.2



Conducted Test – Line 1: 0.15 MHz to 0.5 MHz, High Channel

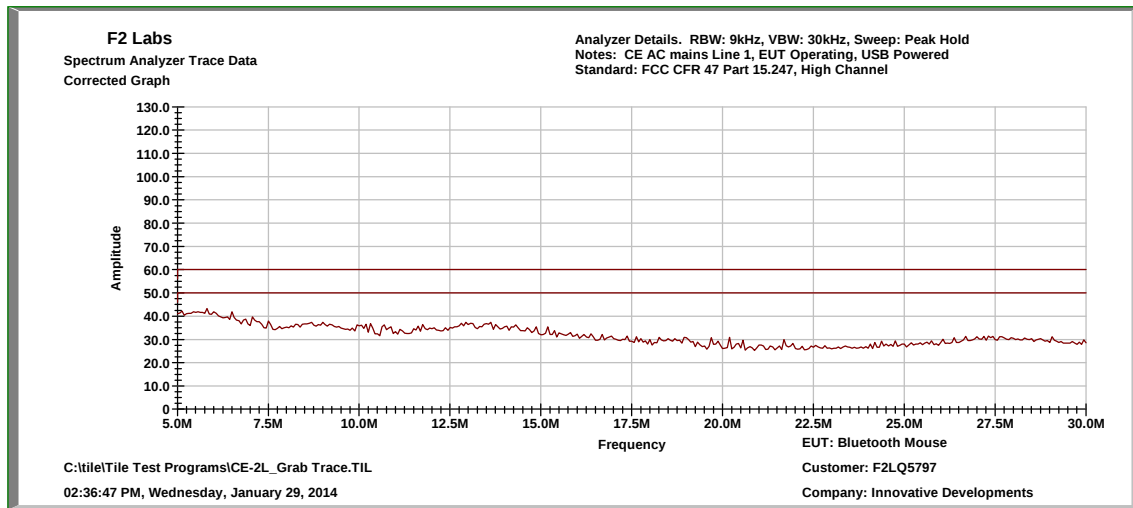


Conducted Test – Line 1: 0.5 MHz to 5.0 MHz, High Channel





Conducted Test – Line 1: 5.0 MHz to 30.0 MHz, High Channel



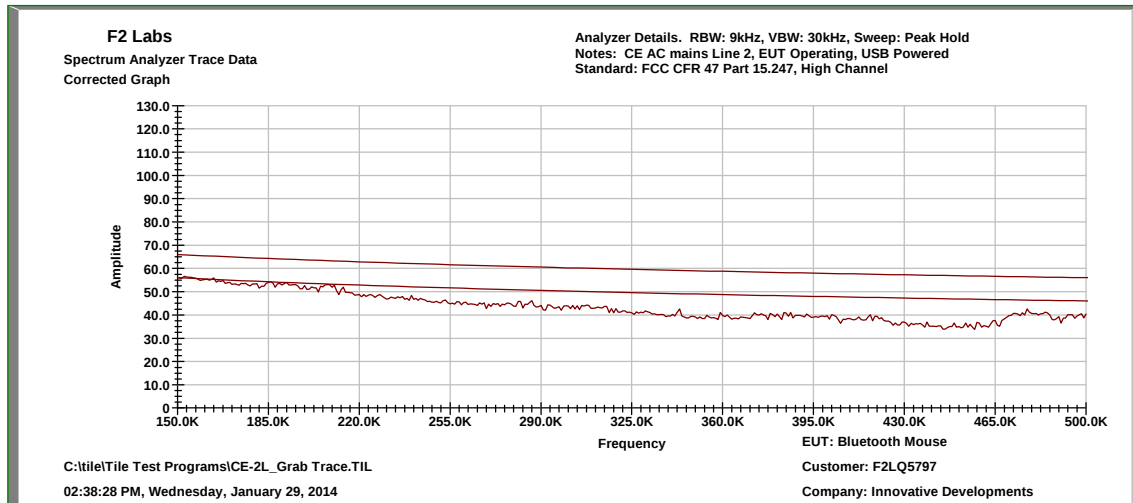
High Channel

Top Discrete Measurements

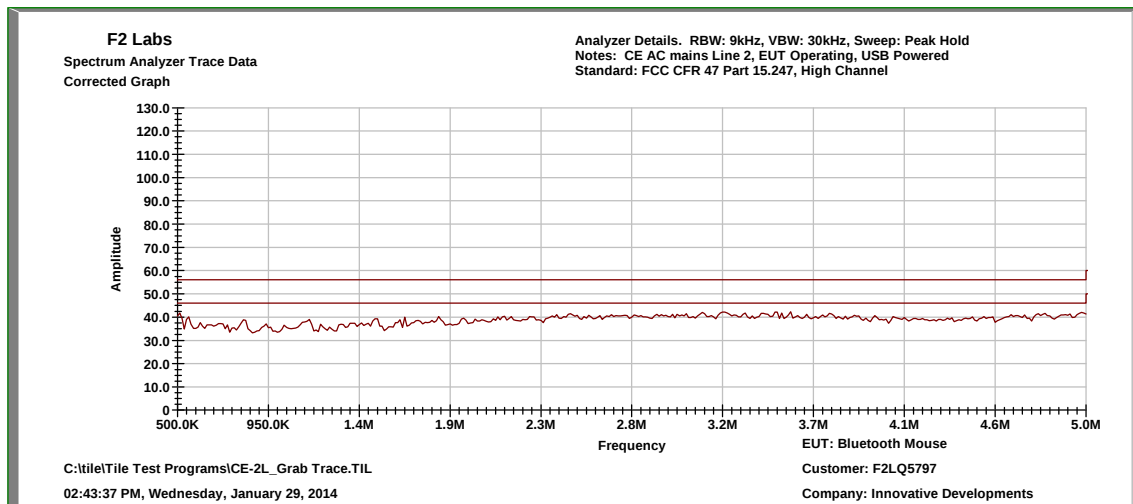
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.154	Quasi-Peak	36.40	11.0	47.40	65.762	-18.4
			Average	9.85	11.0	20.85	55.762	-34.9
2	Line 1	0.190	Quasi-Peak	35.12	11.0	46.12	64.04	-17.9
			Average	26.10	11.0	37.10	54.04	-16.9
3	Line 1	0.276	Quasi-Peak	29.21	11.0	40.21	60.94	-20.7
			Average	21.27	11.0	32.27	50.94	-18.7
4	Line 1	0.478	Quasi-Peak	32.05	11.0	43.05	56.372	-13.3
			Average	28.84	11.0	39.84	46.372	-6.5
5	Line 1	1.794	Quasi-Peak	32.44	11.0	43.44	56	-12.6
			Average	26.5	11.0	37.50	46	-8.5
6	Line 1	6.25	Quasi-Peak	27.43	11.0	38.43	60	-21.6
			Average	22.95	11.0	33.95	50	-16.1

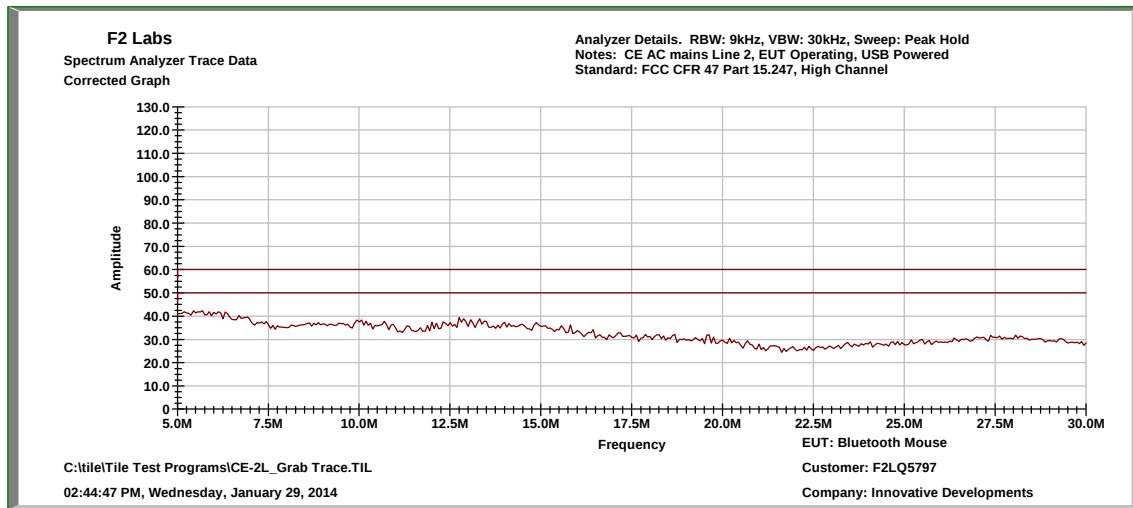


Conducted Test – Line 2: 0.15 MHz to 0.5 MHz, High Channel



Conducted Test – Line 2: 0.5 MHz to 5.0 MHz, High Channel



**Conducted Test – Line 2: 5.0 MHz to 30.0 MHz, High Channel****High Channel****Top Discrete Measurements**

No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 2	0.155	Quasi-Peak	38.19	11.0	49.19	65.728	-16.5
			Average	10.40	11.0	21.40	35.728	-14.3
2	Line 2	0.190	Quasi-Peak	34.20	11.0	45.20	64.040	-18.8
			Average	24.65	11.0	35.65	54.040	-18.4
3	Line 2	0.212	Quasi-Peak	35.67	11.0	46.67	63.12	-16.5
			Average	24.88	11.0	35.88	53.12	-17.2
4	Line 2	0.475	Quasi-Peak	27.83	11.0	38.83	56.43	-17.6
			Average	23.88	11.0	34.9	46.43	-11.6
5	Line 2	3.313	Quasi-Peak	25.40	11.0	36.40	56	-19.6
			Average	20.37	11.0	31.37	46	-14.6
6	Line 2	5.75	Quasi-Peak	26.65	11.0	37.65	60	-22.4
			Average	21.60	11.0	32.60	50	-17.4



13 PHOTOGRAPHS/EXHIBITS – PRODUCT PHOTOS, TEST SETUPS

Conducted Output Power, Conducted Spurious Emission, Peak Power Spectral Density



Radiated Spurious Emissions <1GHz



Radiated Spurious Emissions >1GHz





Conducted Emissions

