



F2 Labs
16740 Peters Road
Middlefield, Ohio 44062
United States of America
www.f2labs.com

CERTIFICATION TEST REPORT

Manufacturer: ActiGraph, LLC
49 East Chase Street
Pensacola, Florida 32502
United States of America

Applicant: Same As Above

Product: Ambulatory Activity Monitor

Model: wGT3X-BT

FCC ID: DFW-02

Testing Commenced: Oct. 8, 2013

Testing Ended: Jan. 29, 2014

Summary of Test Results: 5

Rules:

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



Order Number: F2LQ5768

Client: ActiGraph, LLC

Model: wGT3X-BT

Evaluation Conducted by:

Joe Knepper, EMC Proj. Eng.

Ken Littell, EMC Tech. Mgr.

Report Reviewed by:

Wendy Fuster, President

F2 Labs
26501 Ridge Road
Damascus, MD 20872
Ph 301.253.4500
Fax 301.253.5179

F2 Labs
16740 Peters Road
Middlefield, OH 44062
Ph 440.632.5541
Fax 440.632.5542

This test report may be reproduced in full; partial reproduction only may be made with the written consent of F2 Labs. The results in this report apply only to the equipment tested.



TABLE OF CONTENTS

Section	Title	Page
1	ADMINISTRATIVE INFORMATION	4
2	SUMMARY OF TEST RESULTS/MODIFICATIONS	5
3	TABLE OF MEASURED RESULTS	6
4	ENGINEERING STATEMENT	7
5	EUT INFORMATION AND DATA	8
6	LIST OF MEASUREMENT INSTRUMENTATION	9
7	FCC Part 15.247(a)(2) – -6dB Occupied Bandwidth	10
8	FCC Part 15.247(b)(3) – Conducted Output Power	14
9	FCC Part 15.247(d) – Conducted Spurious Emissions	18
10	Radiated Spurious Emission	31
11	FCC PART 15.247 – Peak Power Spectral Density (PSD)	60
12	FCC PART 15.207 – Conducted Emissions	63
13	Photos/Exhibits – Product Photos, Test Setups	76



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 -) 2.24 dB
- ❖ Expanded Uncertainty (+ or -) 4.48 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
F2LQ5768-01E	First Issue	Nov. 21, 2013	W. Fuster
F2LQ5768-01E Rev. 1	Revisions for TCB feedback	Jan. 21, 2014	W. Fuster
F2LQ5768-01E Rev. 2	Addition of test results for 15.207	Jan. 30, 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 0.5dBi 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 2.405GHz
Conducted Output Power	.24322mW (-6.14dBm)	.23933mW (-6.21dBm)	.24322mW (-6.14dBm)
Conducted Output Power Limit	1 Watt, (30dBm)	1 Watt, (30dBm)	1 Watt, (30dBm)
E.I.R.P. with 0.5dBi Integral antenna	.27289mW (-5.64dBm)	.26853mW (-5.71dBm)	.27289mW (-5.64dBm)
E.I.R.P. Limit	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)
Peak Power Spectral Density	-17.62 dBm	-15.96 dBm	-15.9 dBm
Peak Power Spectral Density Limit	8 dBm	8 dBm	8 dBm
-6dB Occupied bandwidth	1.0896 MHz	1.0956 MHz	1.0989 MHz
-6dB Occupied Bandwidth Limit	≥ 500KHz	≥ 500KHz	≥ 500KHz



4 ENGINEERING STATEMENT

This report has been prepared on behalf of ActiGraph, LLC to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.247 and Part 15.207 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: Ambulatory Activity Monitor

Model: wGT3X-BT

Serial No.: None

FCC ID: DFW-02

5.2 Trade Name:

ActiGraph, LLC

5.3 Power Supply:

Rechargeable Internal Battery

5.4 Applicable Rules:

CFR 47, Part 15.247, subpart C

CFR 47, Part 15.207

5.5 Equipment Category:

Radio Transmitter-DTS

5.6 Antenna:

0.5dBi gain Integral Chip Antenna

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	0139	Hewlett Packard	83006A	3104A00500	Feb. 20, 2014
Active 18" Loop Antenna	CL082	A.H. Systems, Inc.	SAS-562B	241	Sept. 6, 2014
Antenna, Horn	CL098	Emco	3115	9809-5580	Nov. 30, 2013
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	Nov. 30, 2013
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. 2, 2014
Spectrum Analyzer	0204	Hewlett Packard	HP8591A	3149A02546	Dec. 9, 2014
Software:	EMC Analyzer 85712D Rev. A.00.01			Date Verified:	Jan. 29, 2014
Transient Limiter	0202	Hewlett Packard	11947A	3107A00729	June 27, 2018
LISN 1	0149	Solar	8028-50-TS-24-BNC	1130	Oct. 18, 2016
LISN 3	0148	Solar	8028-50-TS-24-BNC	1129	Oct. 18, 2016
Software:	Tile Version 1.0 Software Verified: Jan. 29, 2014				



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

7.1 Requirements

The 6dB bandwidth shall be greater than 500 kHz.

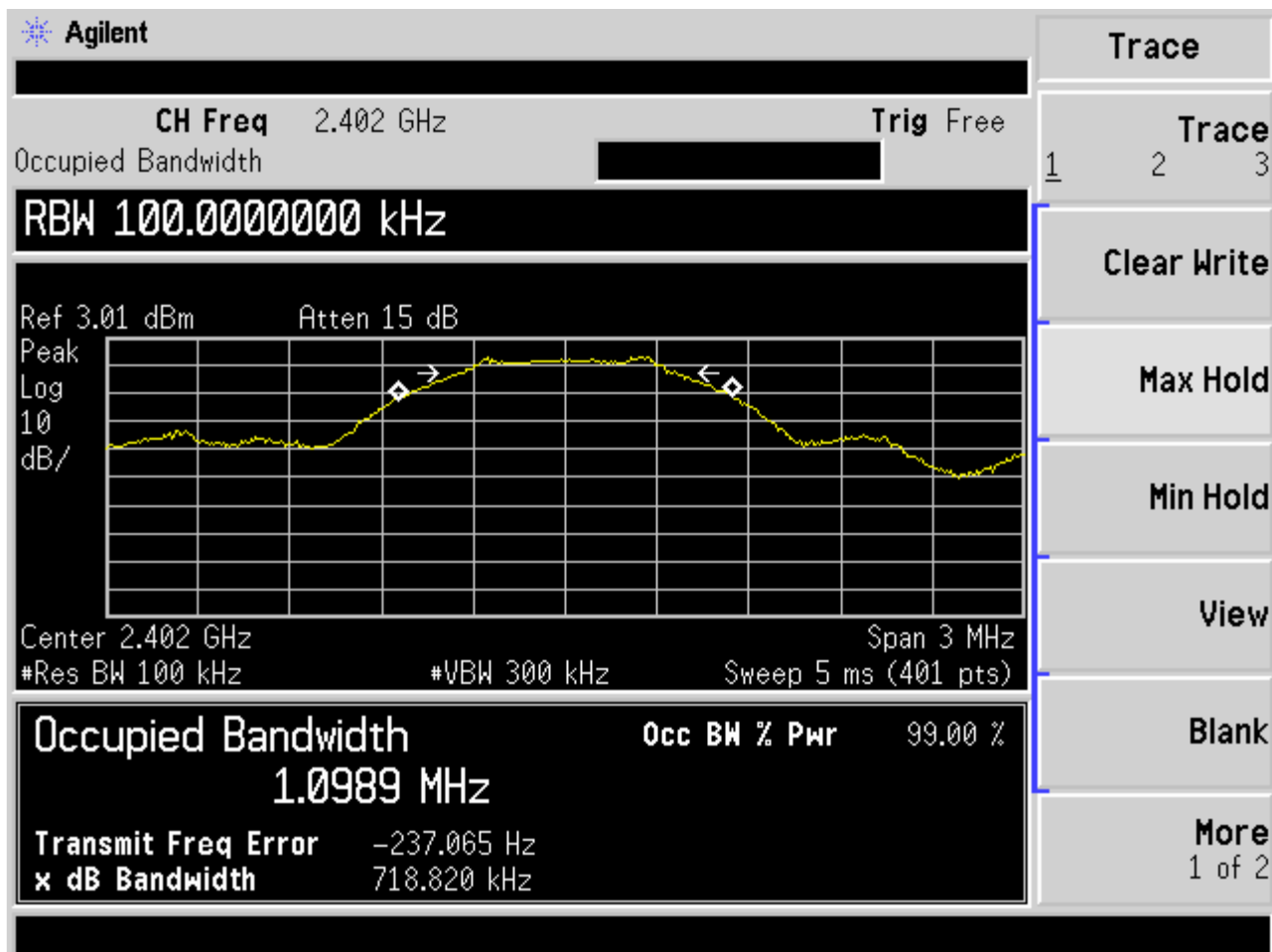
Bandwidth measurements were made at the low (2.402GHz), mid (2.44GHz) and upper (2.48GHz) frequencies with the resolution Bandwidth set at 100 kHz (video bandwidth set at 300 kHz) while the span was set at 3MHz. The bandwidth was measured using the analyzer's marker function.



7.2 Occupied Bandwidth Test Data

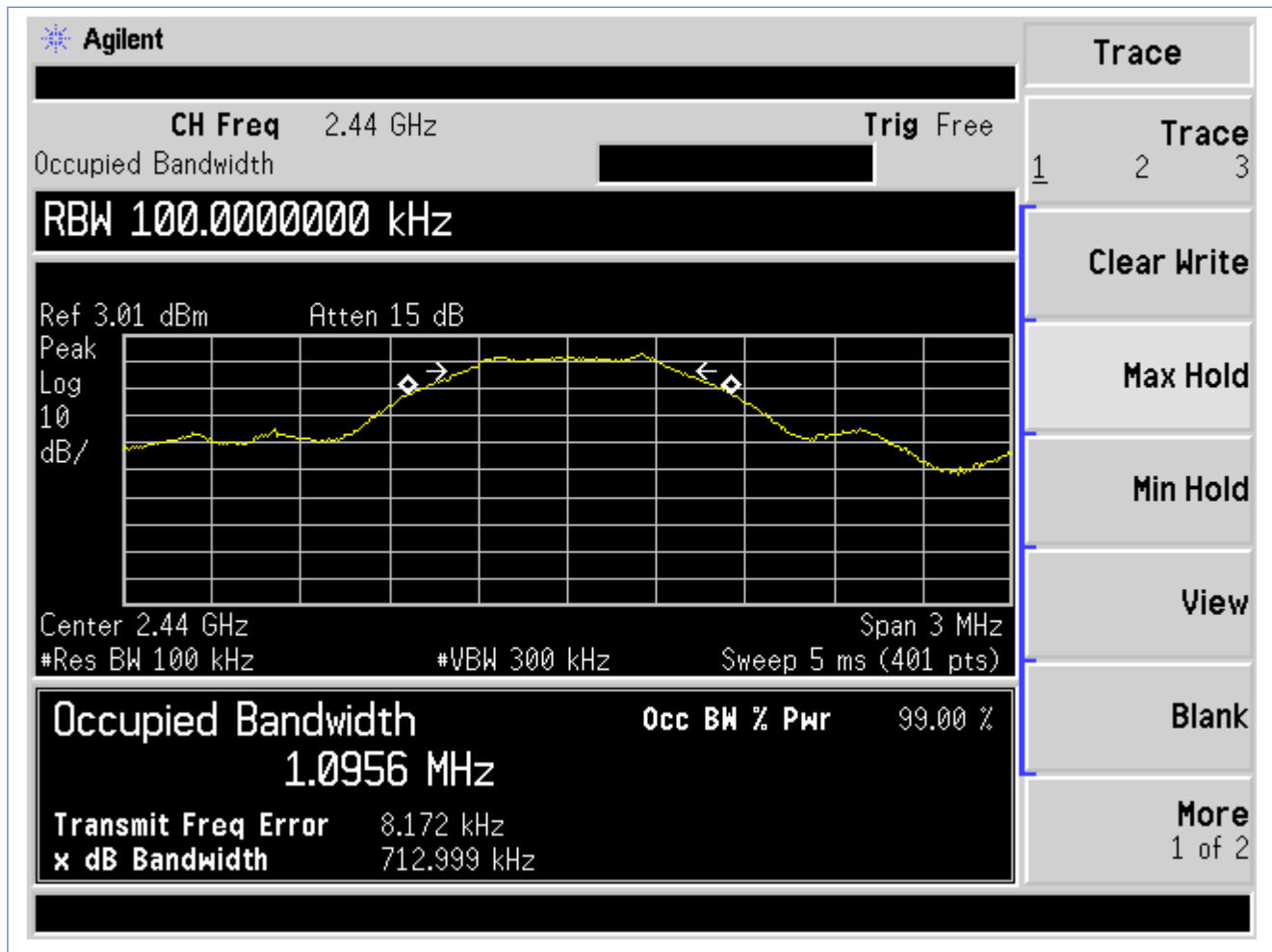
Test Date:	Nov. 13, 2013	Test Engineer:	K. Littell
Standards:	CFR 47 Part 15.247(a)(2); KDB558074	Air Temperature:	21.1°C
		Relative Humidity:	46%

Low Channel



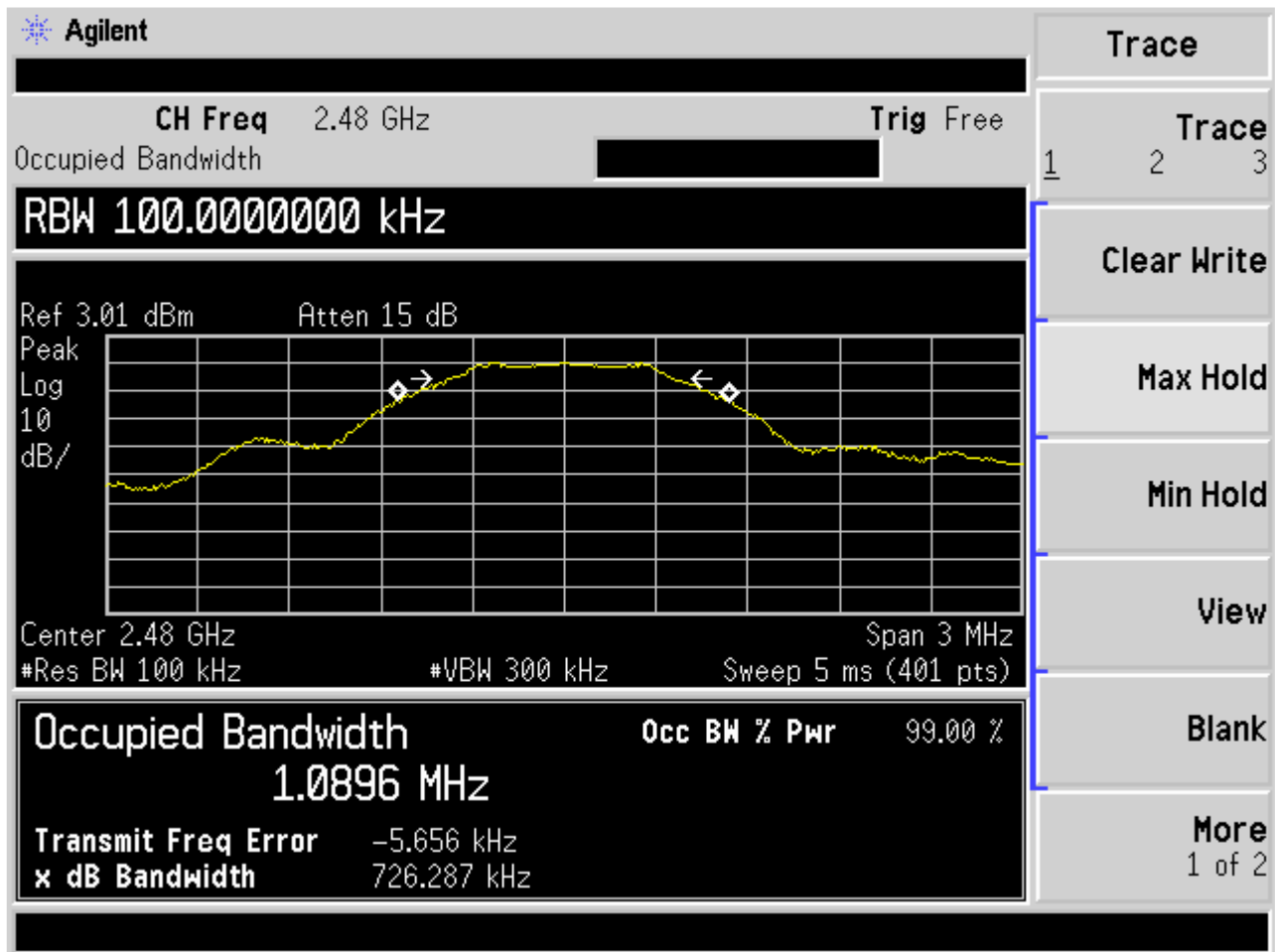


Mid Channel





High Channel





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

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.

8.1 Requirements

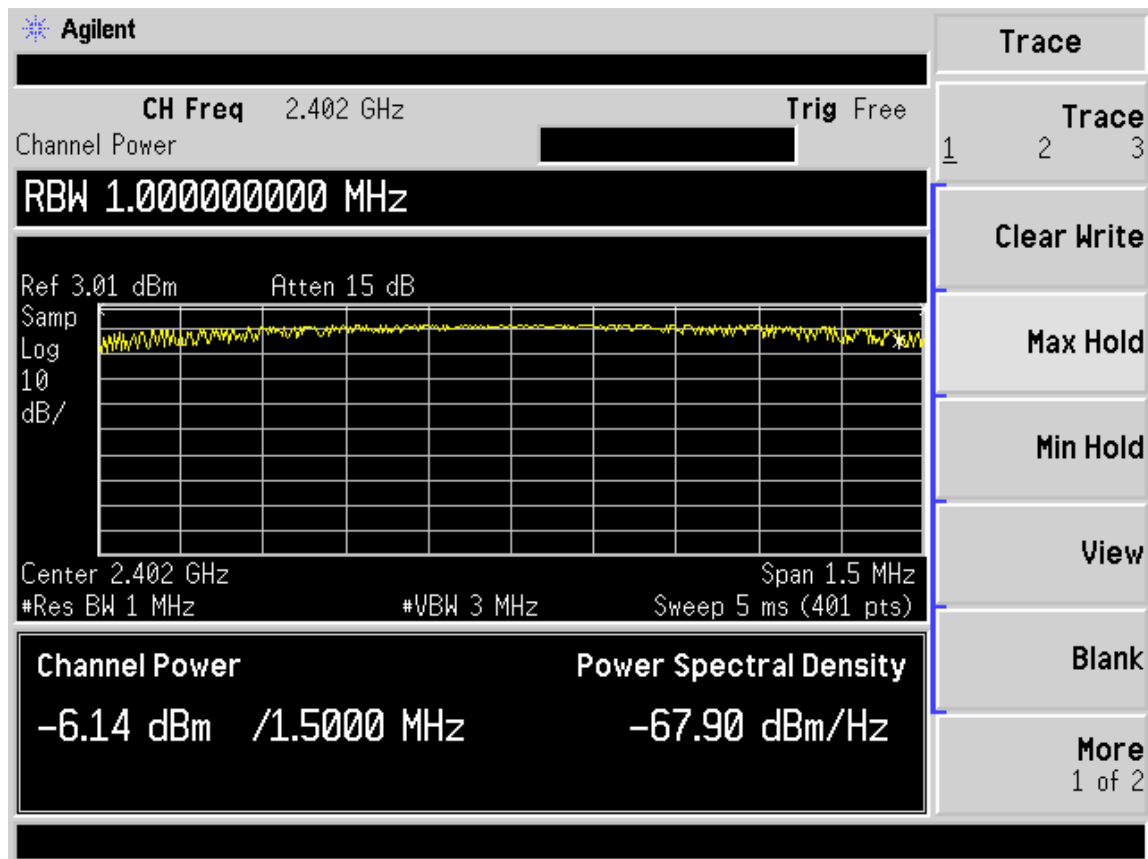
The peak power output shall be 1 watt (30 dBm) or less when using an antenna with a gain of less than 6dBi. For antennas having a gain of more than 6dBi, the limit is reduced by 1dB for every dB the antenna gain is over 6dBi.



8.2 Conducted Output Power Test Data

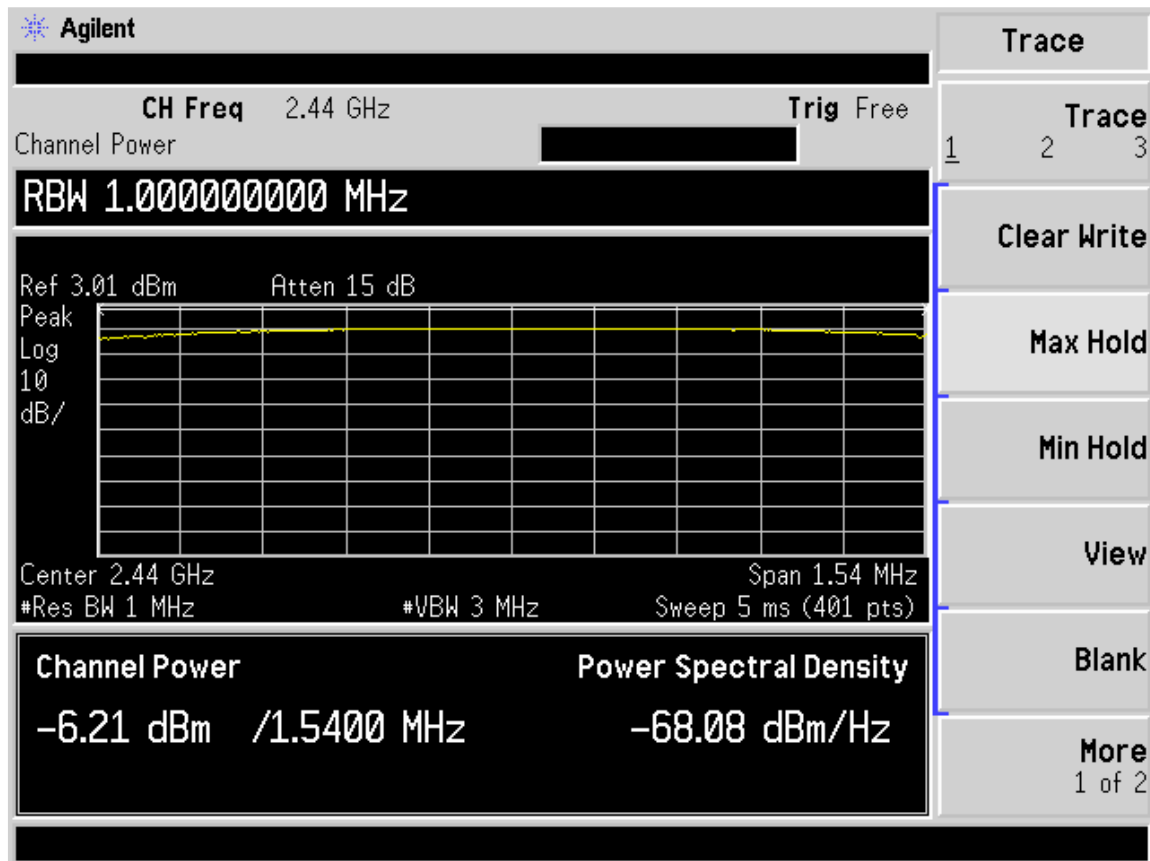
Test Date:	Nov. 13, 2013	Test Engineer:	K. Littell
Standards:	CFR 47 Part 15.247(b)(3); KDB558074	Air Temperature:	20.6°C
		Relative Humidity:	47%

Low Channel



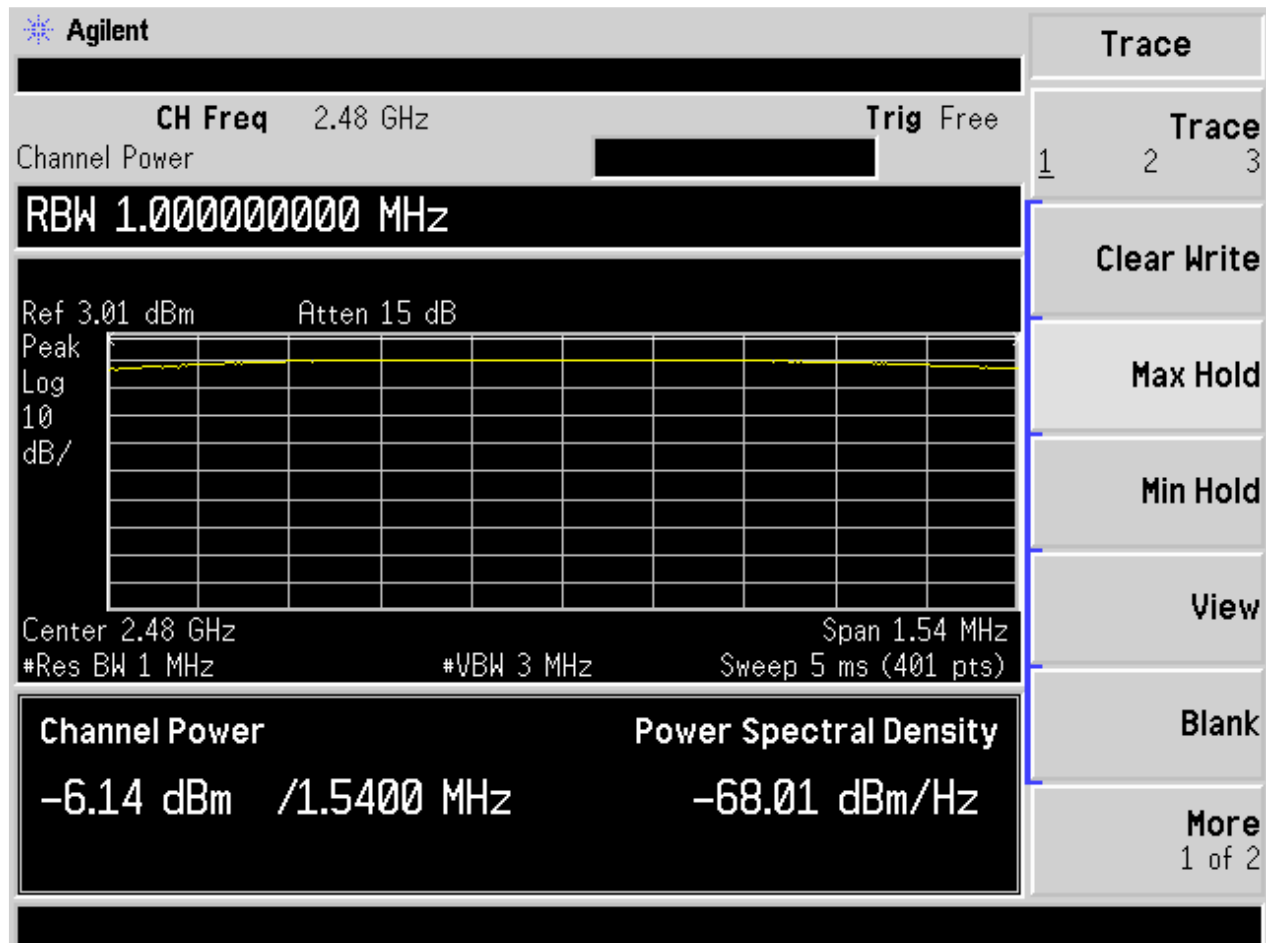


Mid Channel





High Channel





9 FCC Part 15.247(c) – CONDUCTED SPURIOUS EMISSIONS

The following tests were performed to demonstrate compliance.

RF Antenna Conducted Test

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

9.1 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.

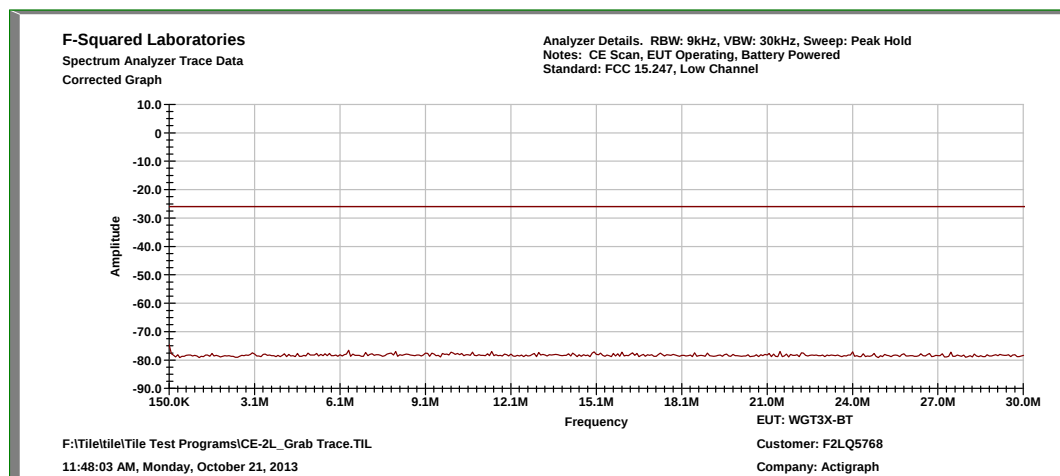
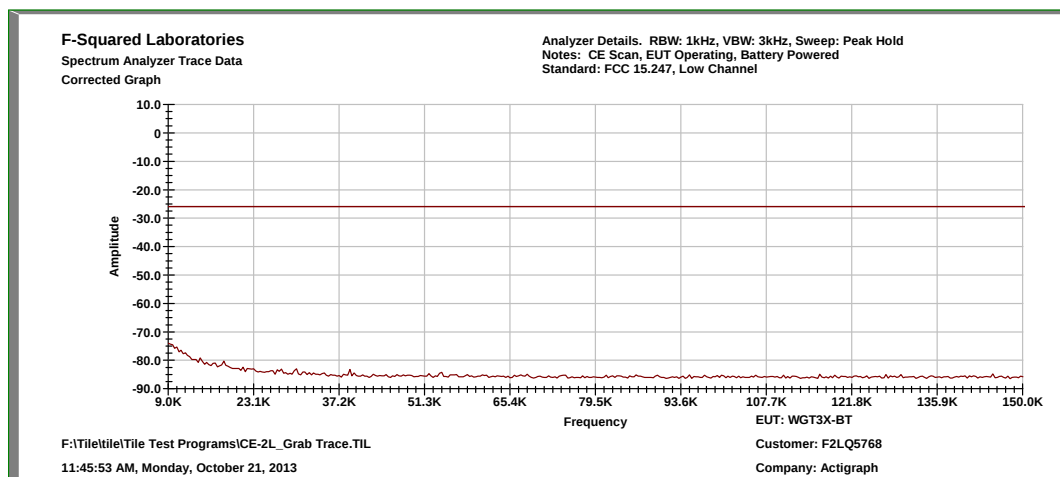
Spurious emissions measurements were made at the low, mid, and upper channels with the appropriate spectrum analyzer impulse bandwidth. Additionally, 20dB down points were measured for the low and high channels to verify band edge compliance.



9.2 Conducted Spurious Emissions Test Data

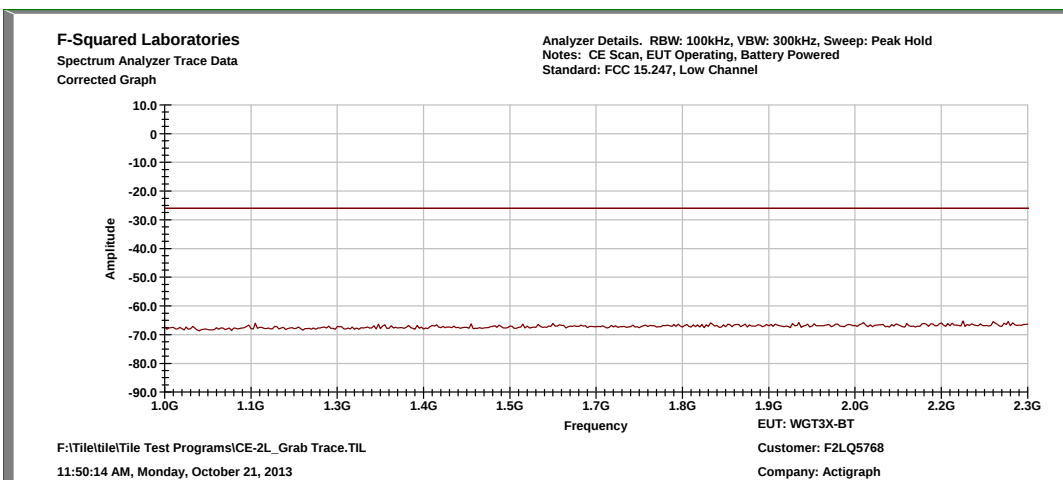
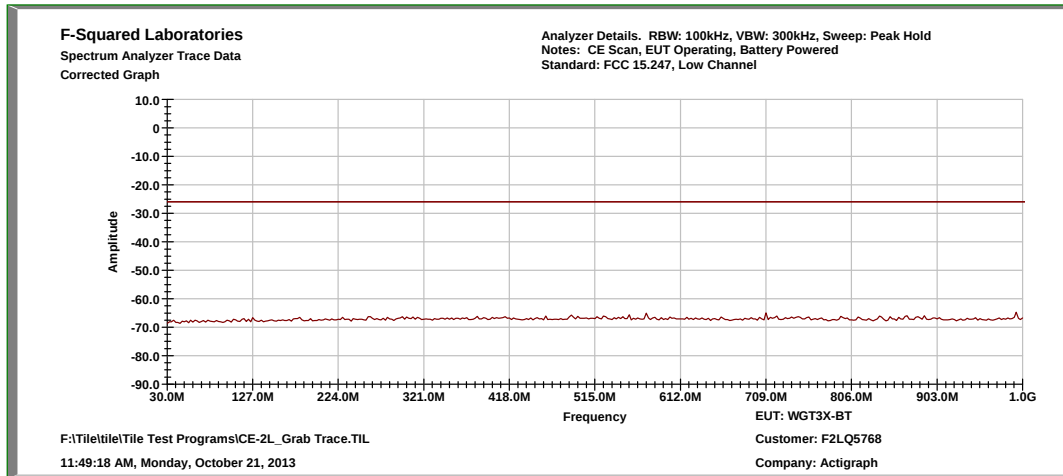
Test Date:	Oct. 17-21, 2013	Test Engineer:	K. Littell
Standards:	CFR 47 Part 15.247(d) / Part 15.209; KDB558074	Air Temperature:	21.6°C
		Relative Humidity:	45%

Low Channel



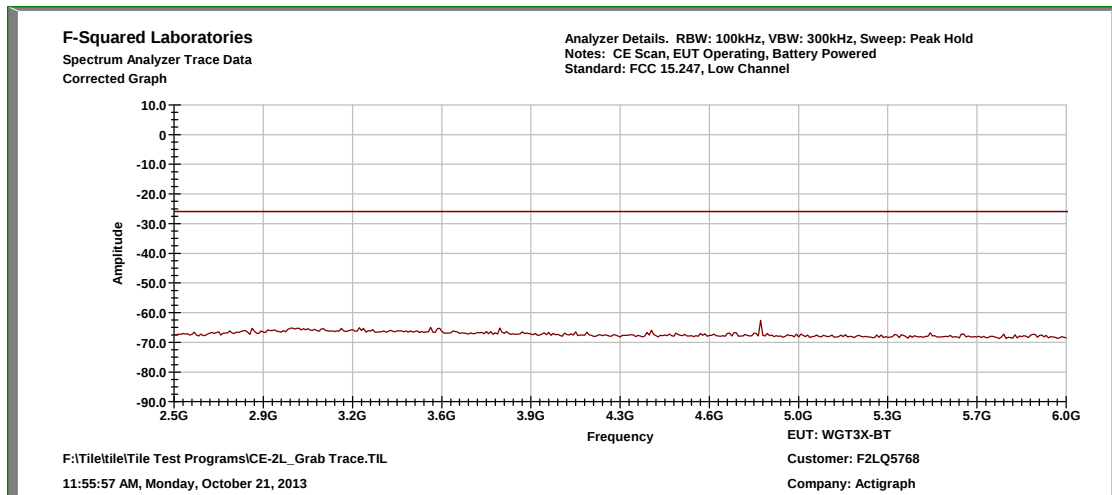
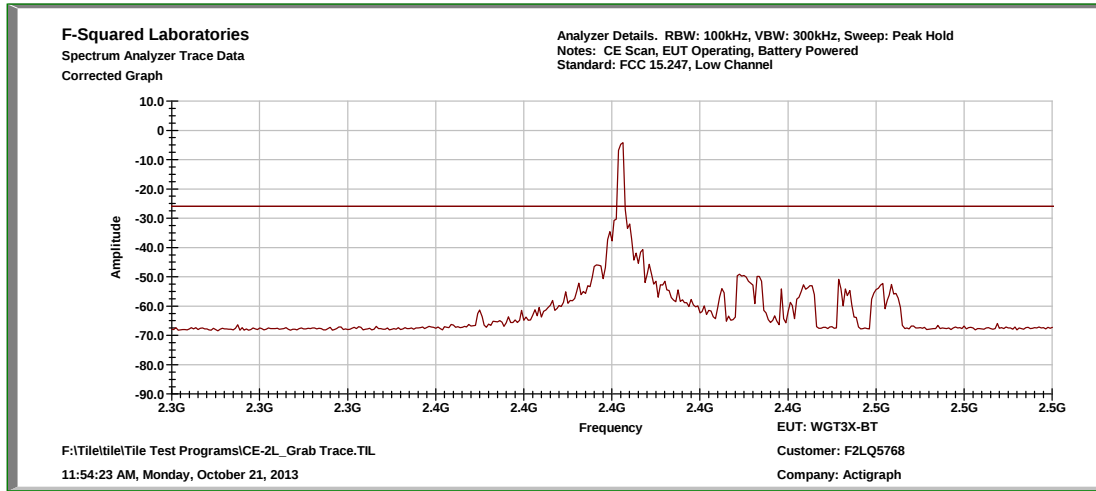


Low Channel, cont'd



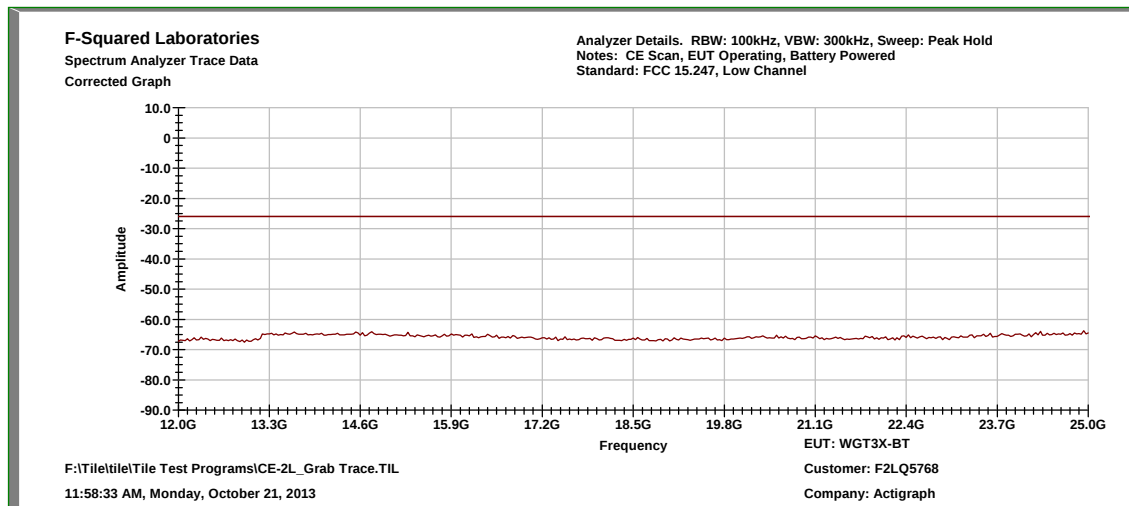
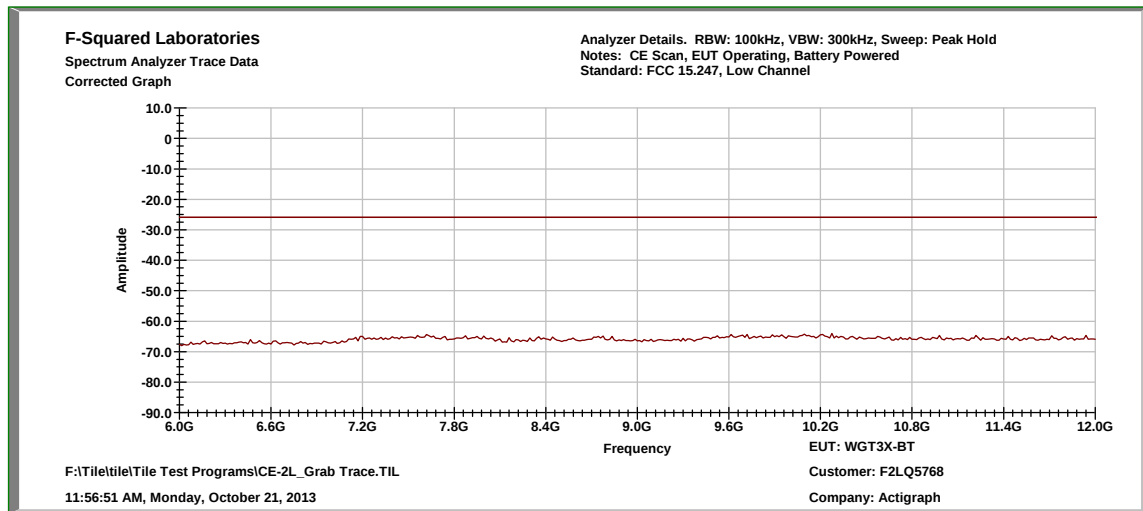


Low Channel, cont'd



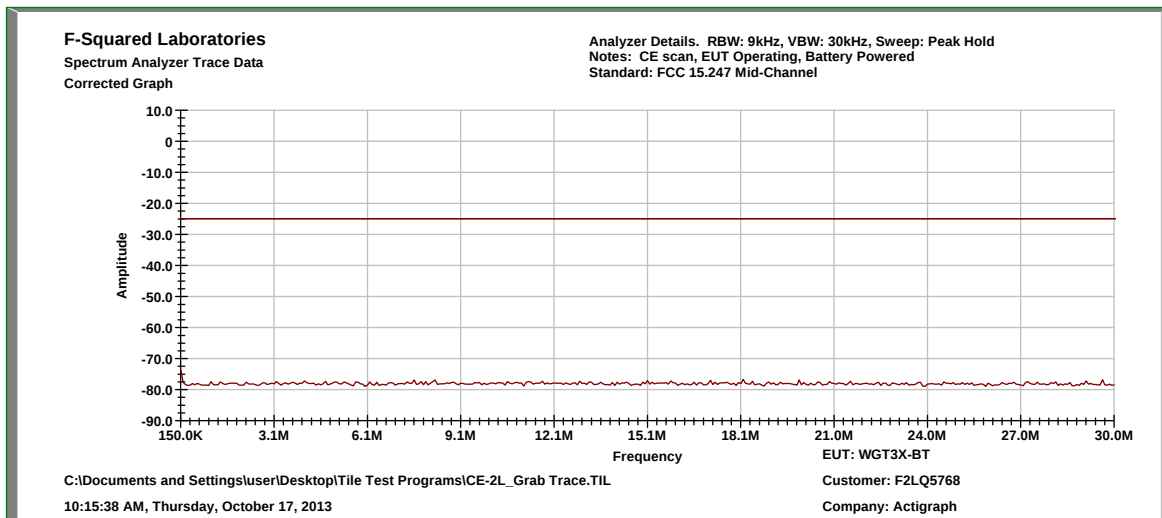
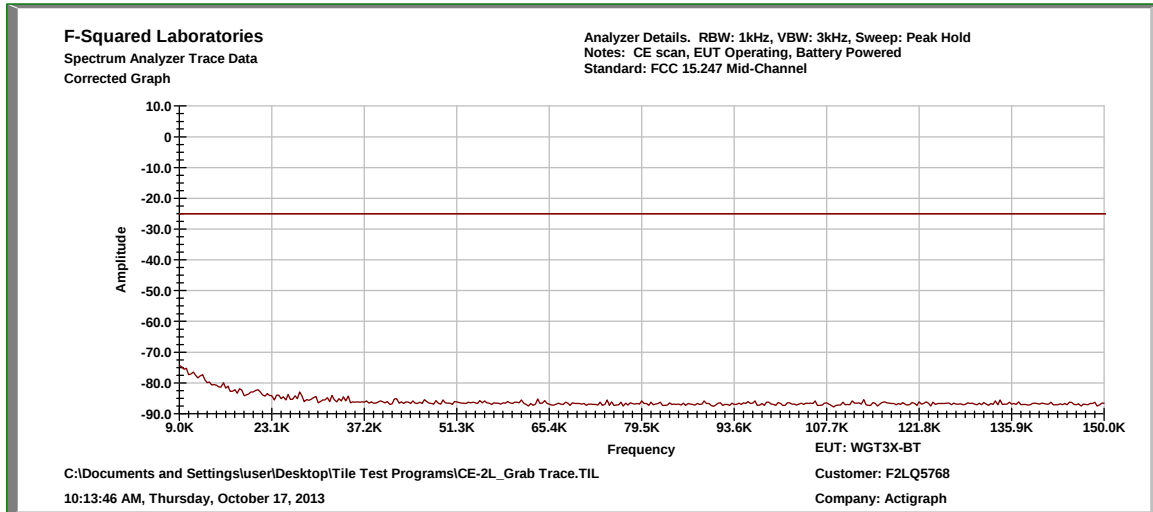


Low Channel, cont'd



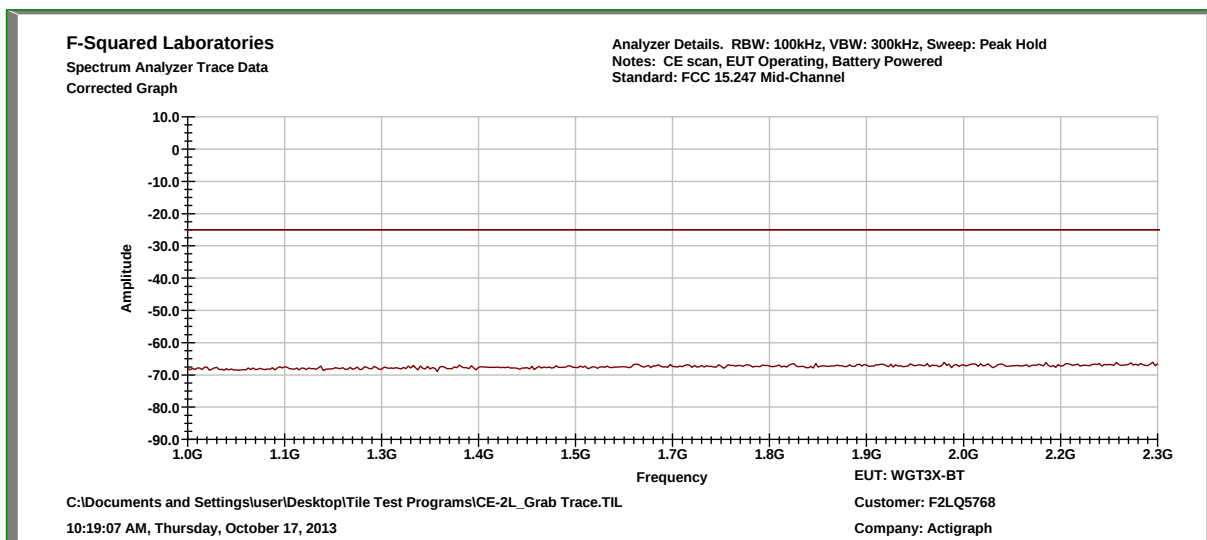
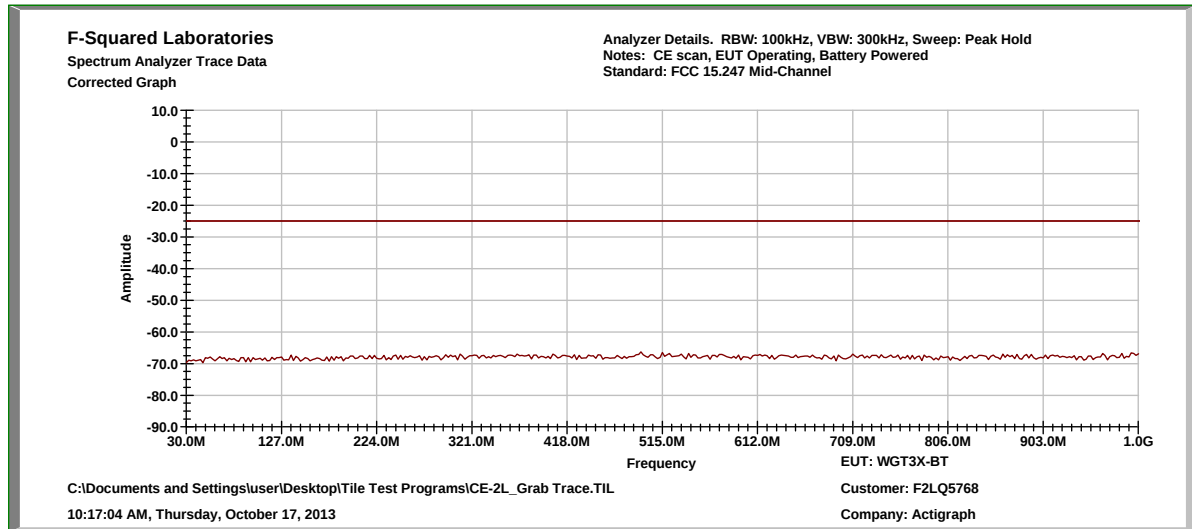


Mid-Channel



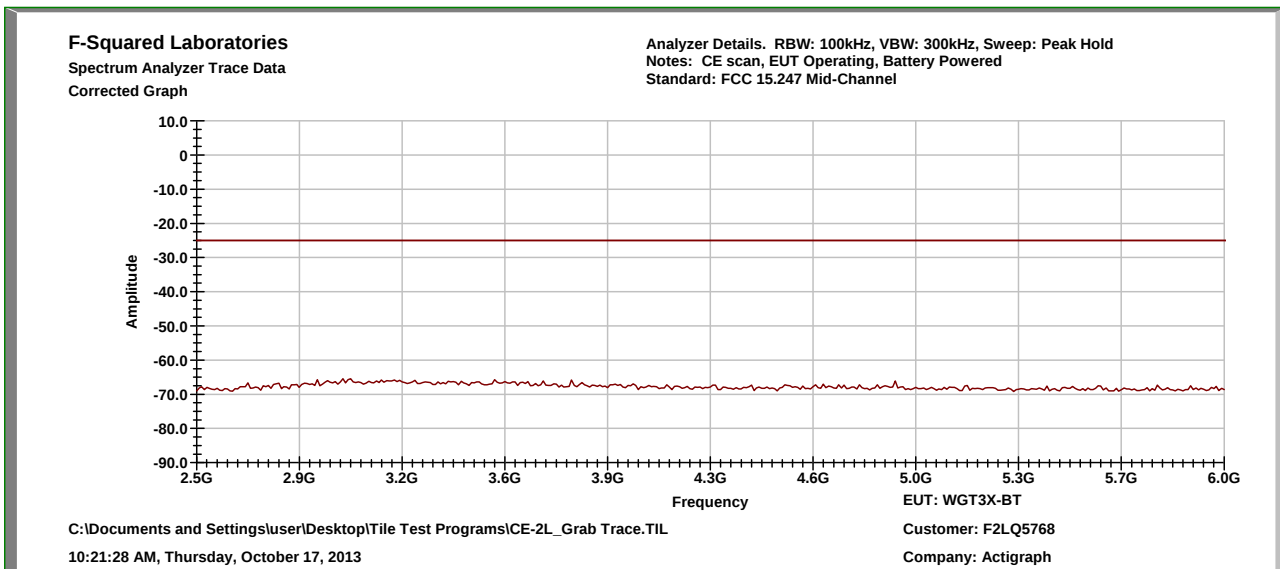
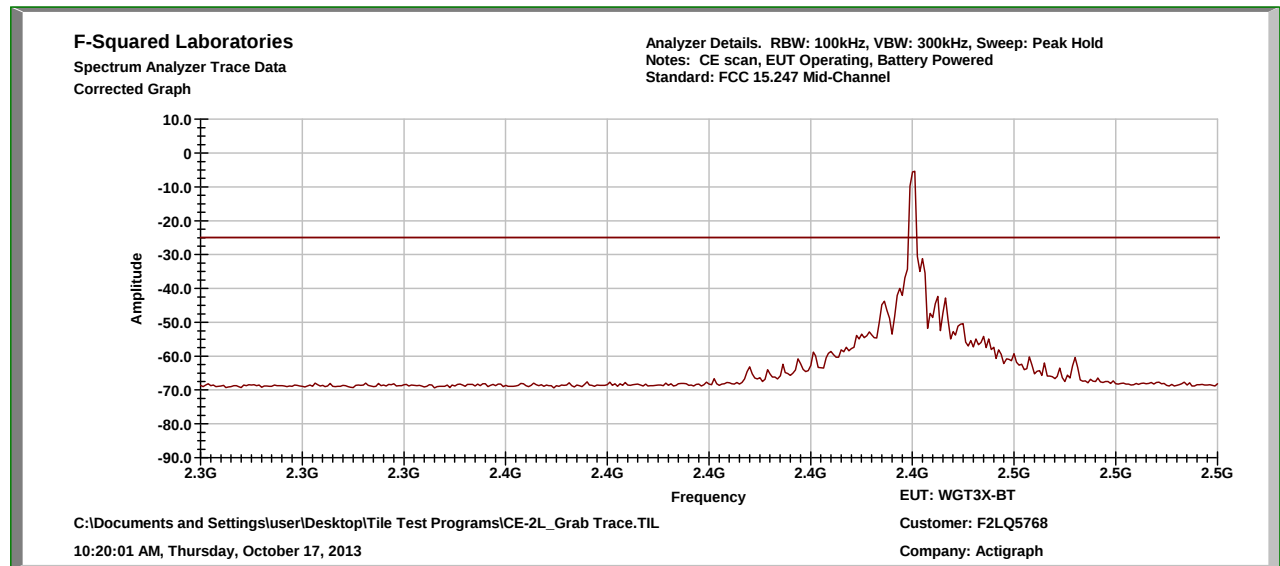


Mid-Channel, cont'd



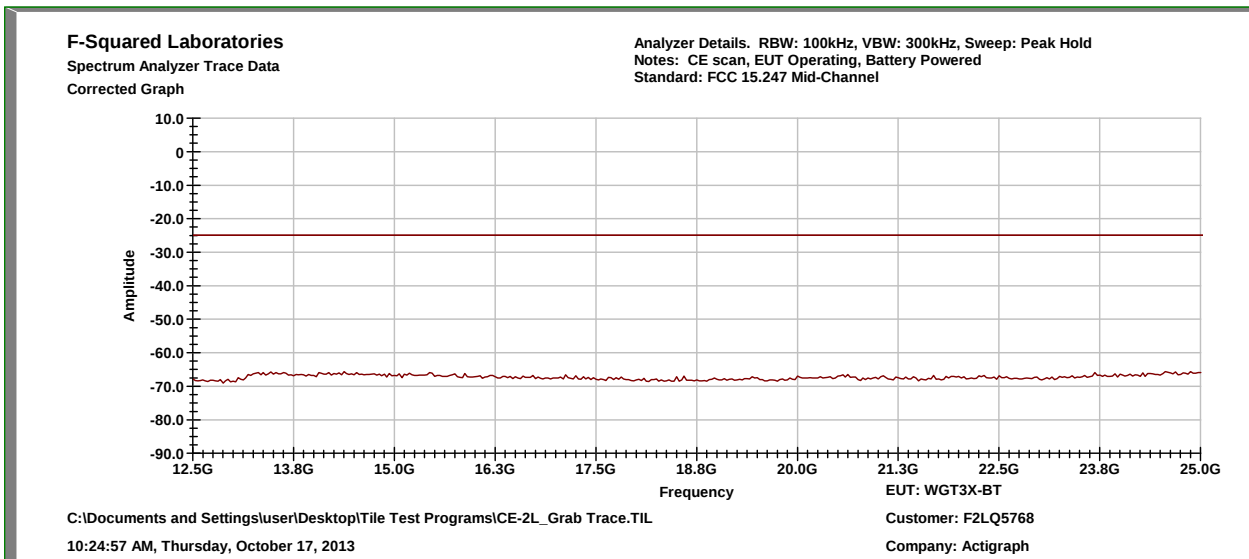
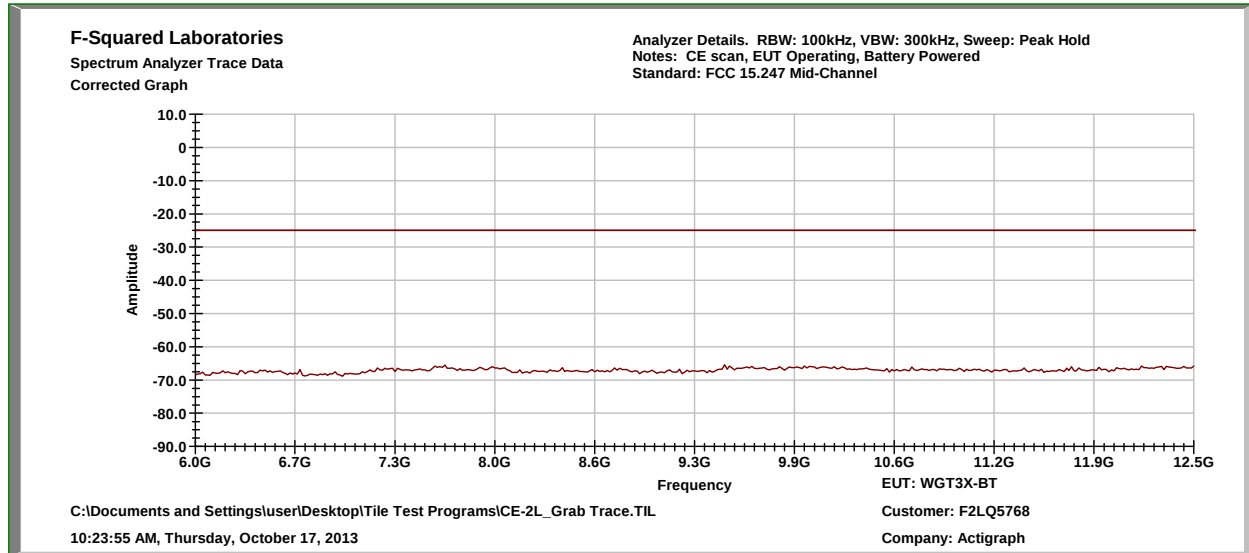


Mid-Channel, cont'd



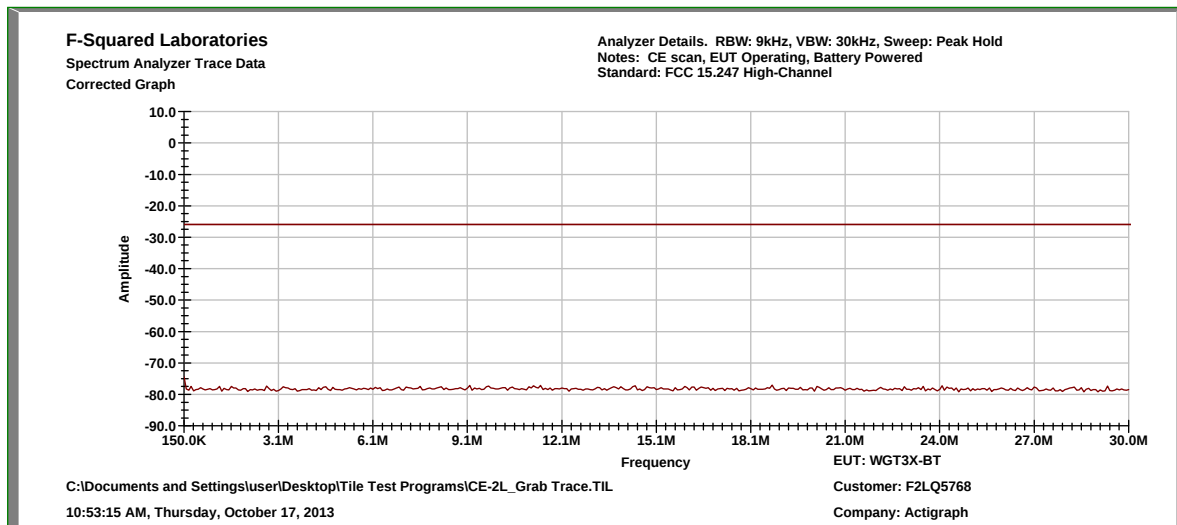
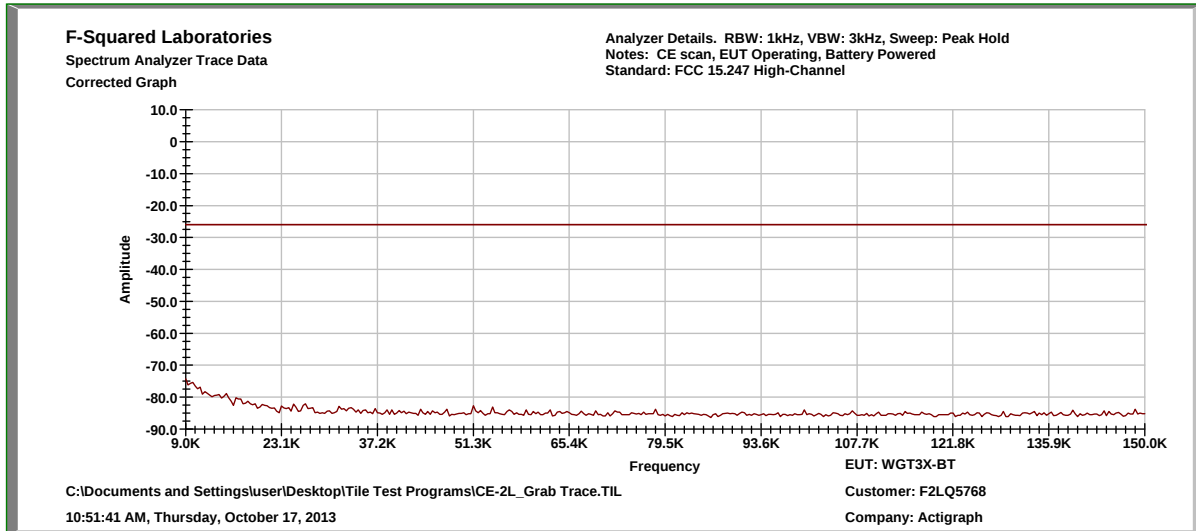


Mid-Channel, cont'd



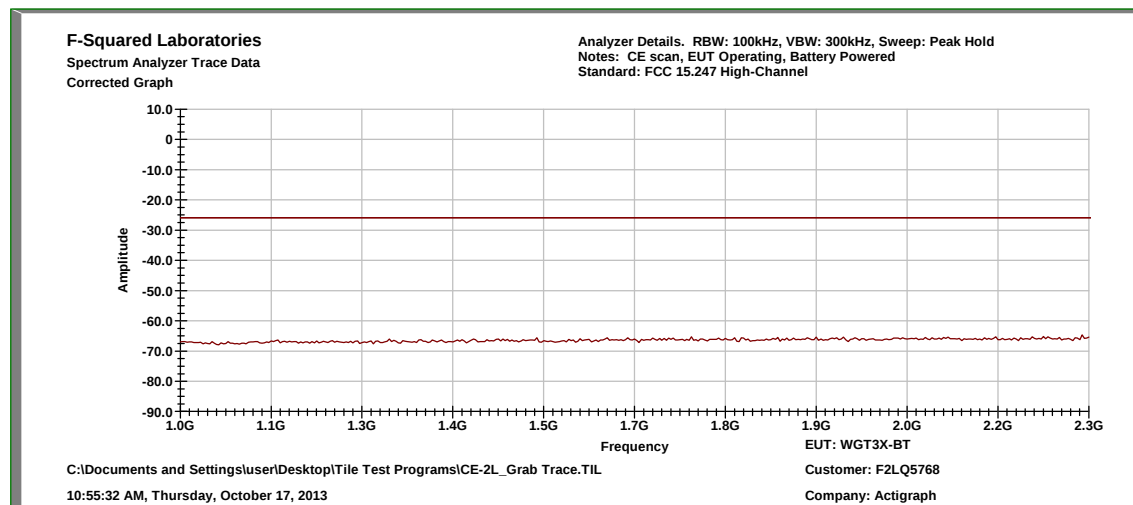
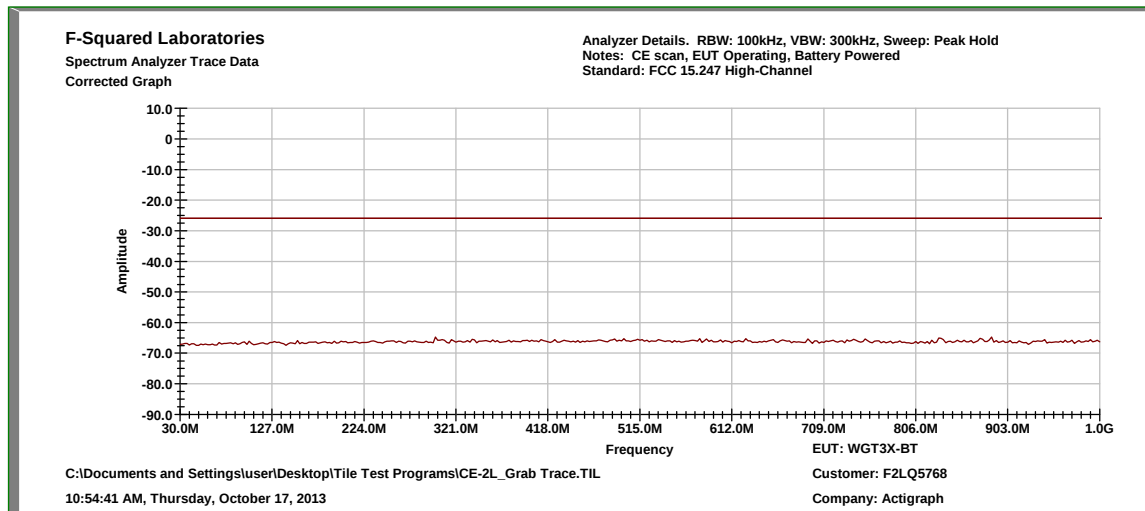


High Channel



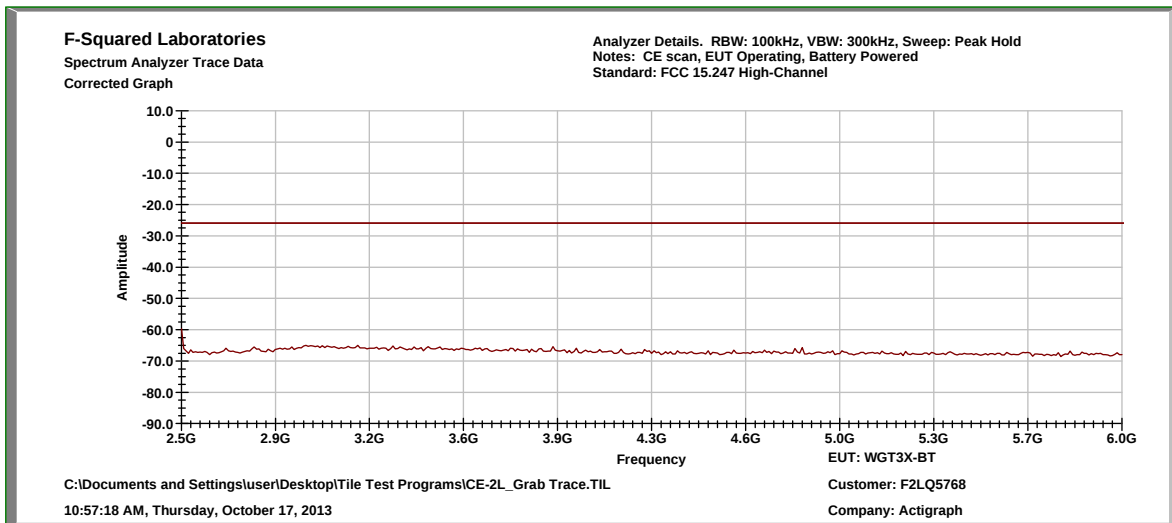
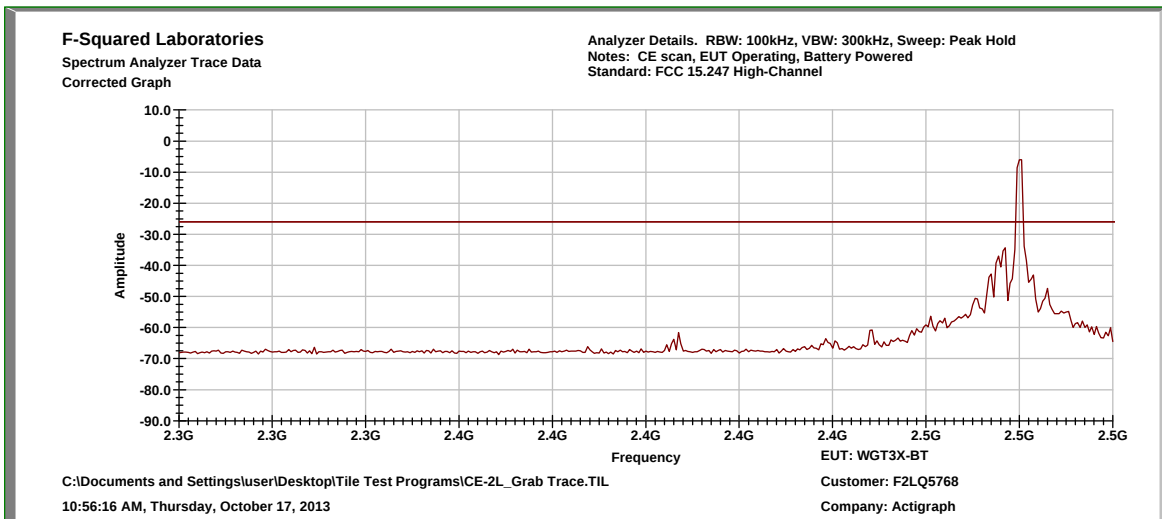


High Channel, cont'd



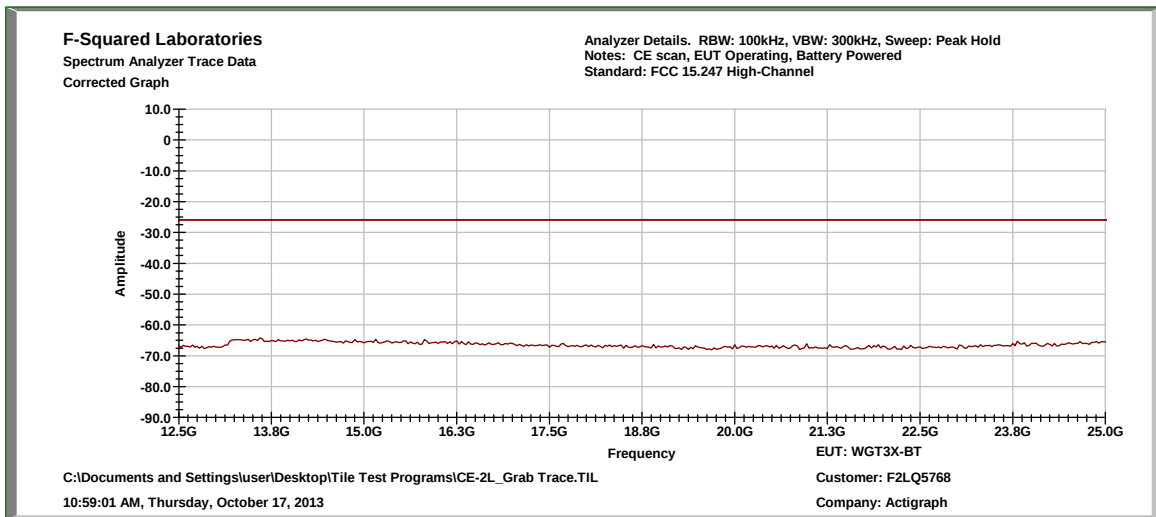
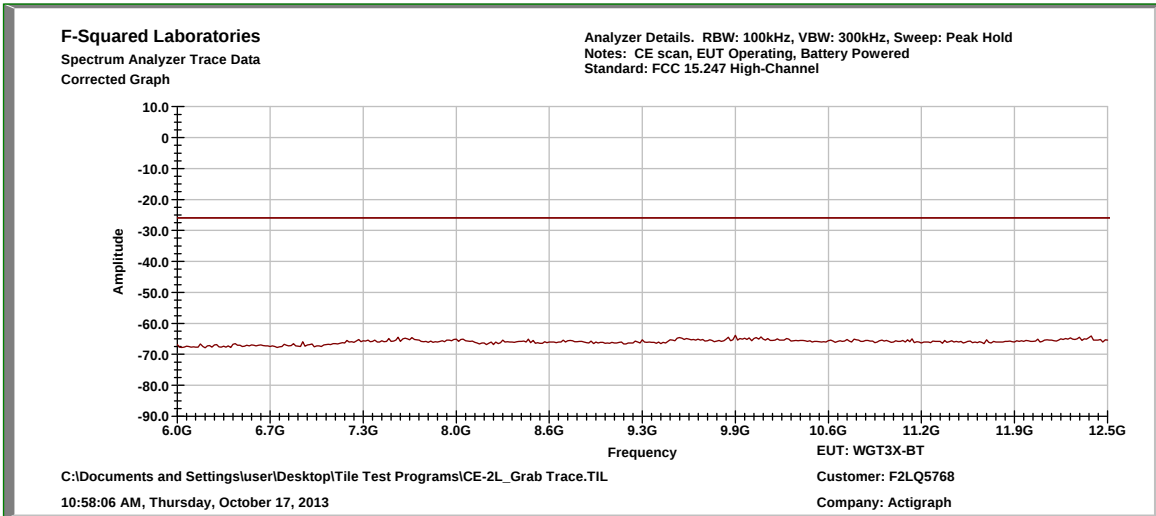


High Channel, cont'd





High Channel, cont'd





10 RADIATED SPURIOUS EMISSION

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.

10.1 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).



10.2 Radiated Spurious Emission Test Data

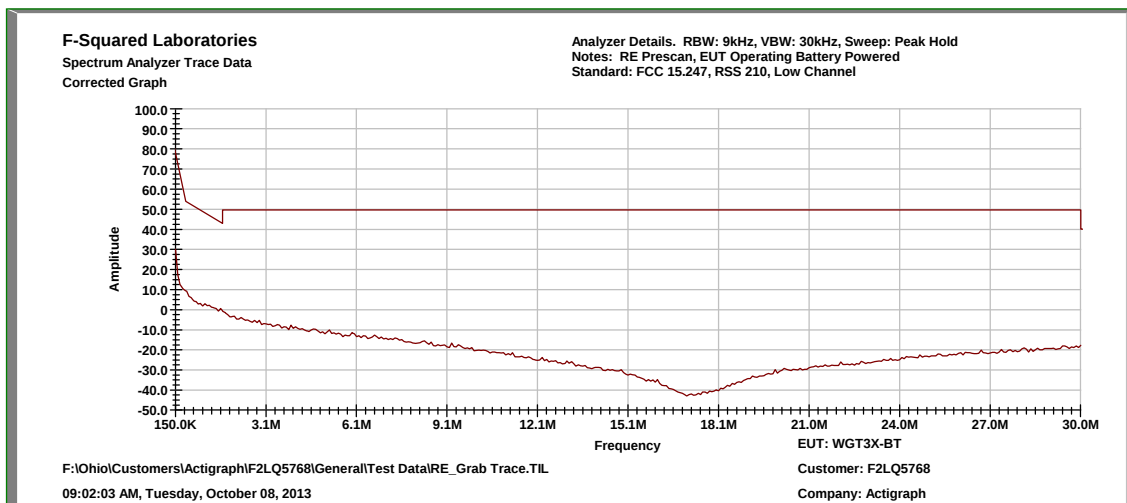
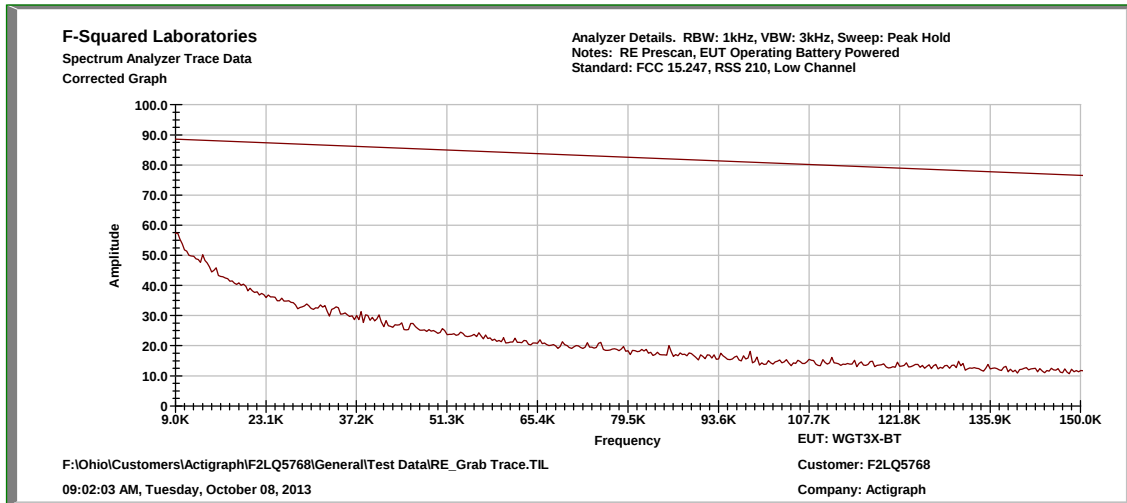
Test Dates:	Oct. 8, 2013	Test Engineer:	K. Littell
Standards:	CFR 47 Part 15.247(d); Part 15.209 / KDB558074	Air Temperature:	20.9°C
		Relative Humidity:	42%

Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. 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 on the Open Area Test Site. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions, 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.

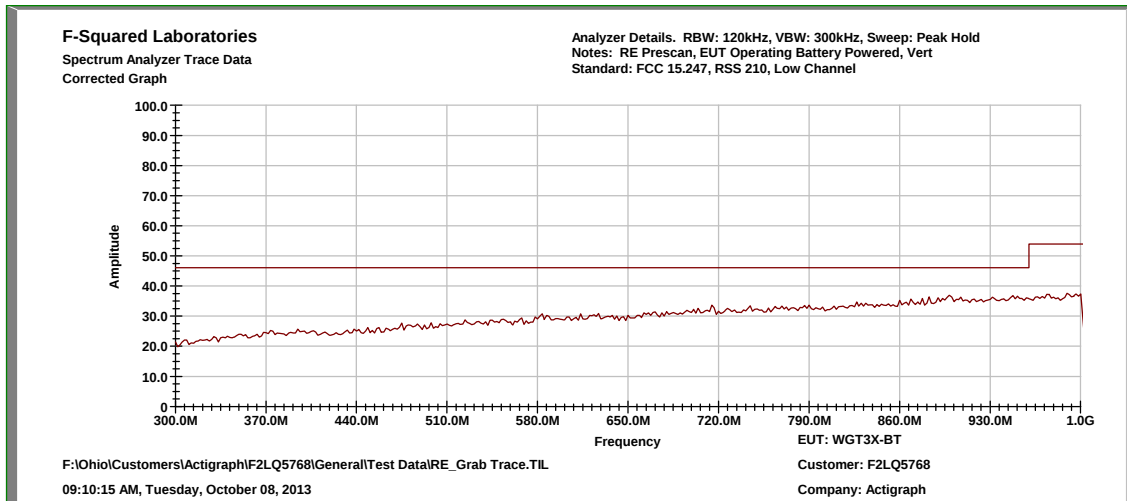
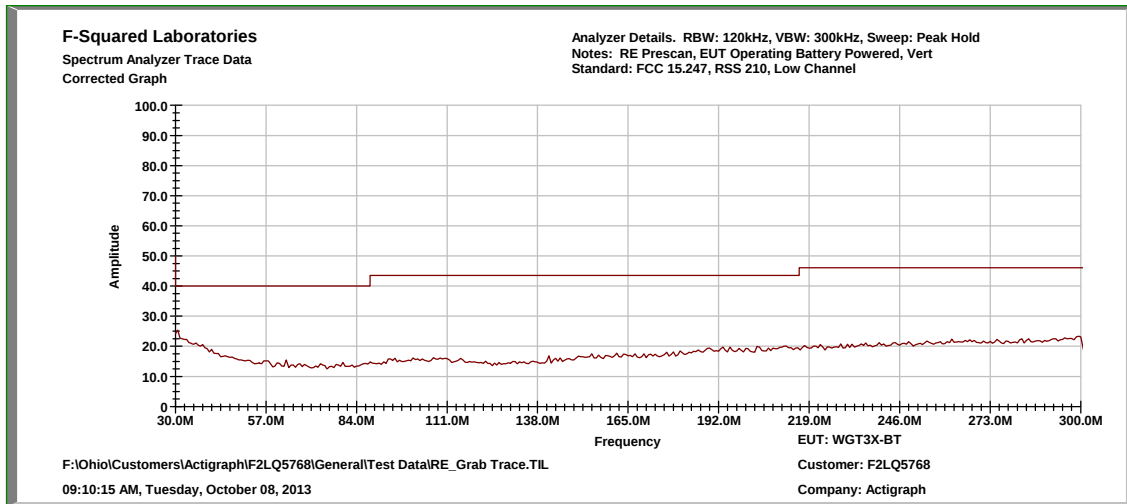


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel



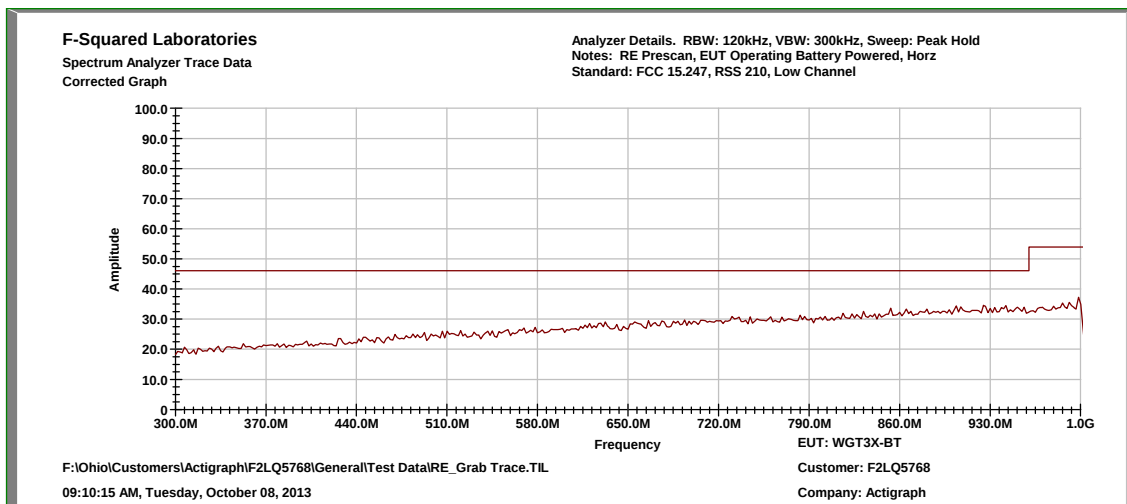
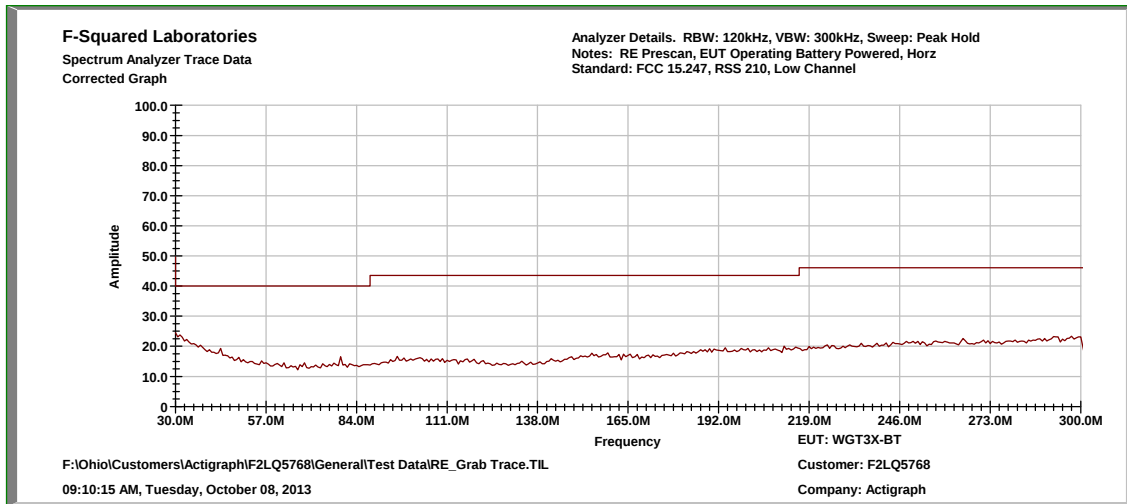


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel, cont'd



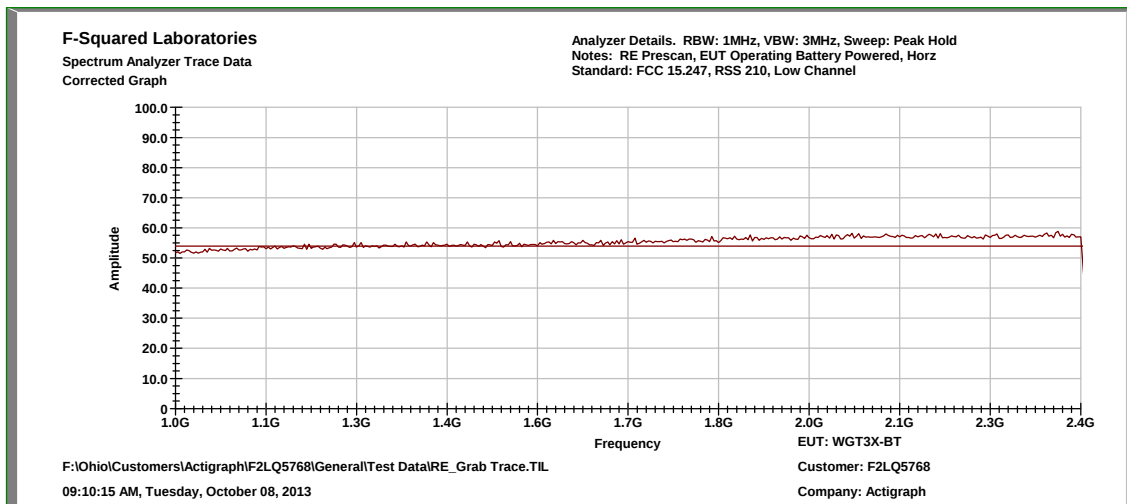
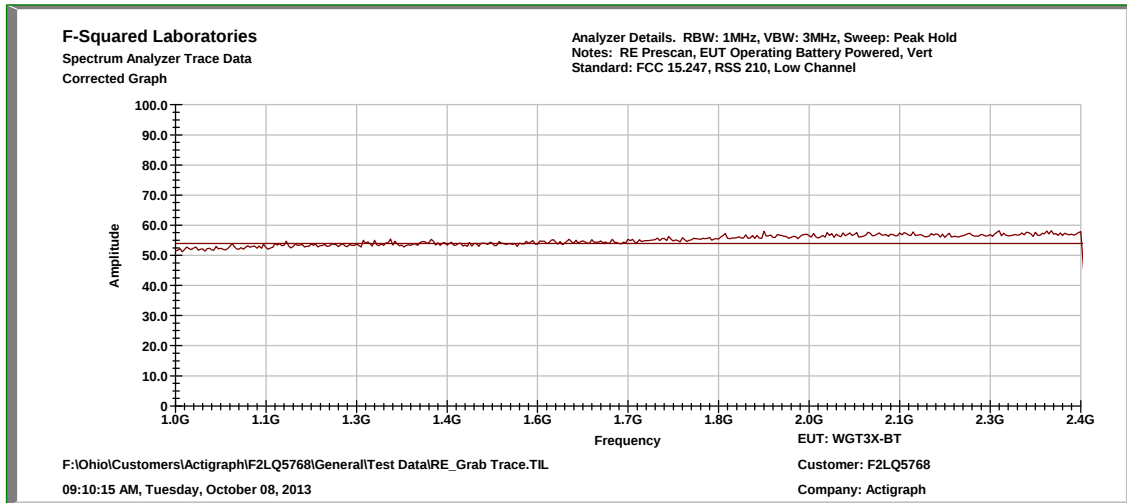


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel, cont'd



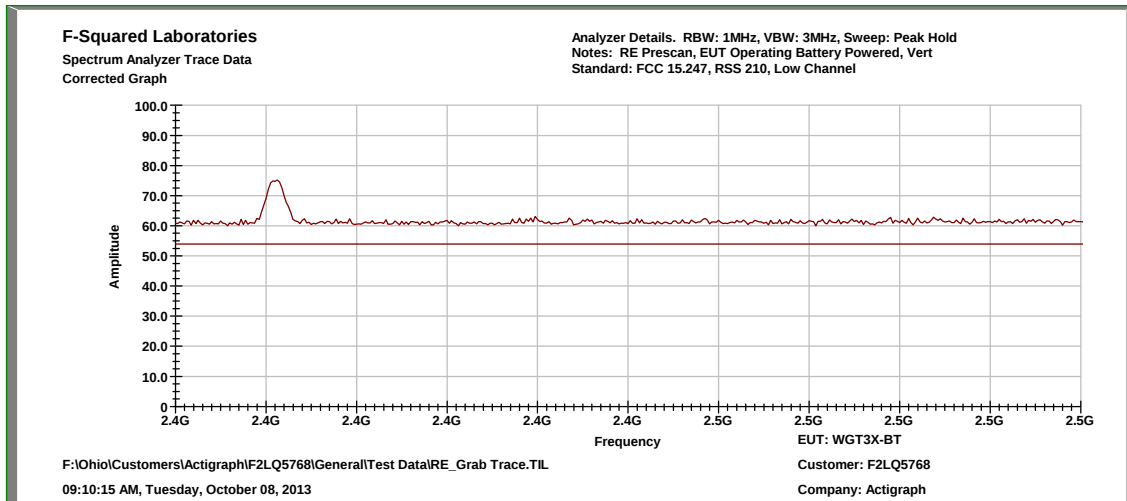
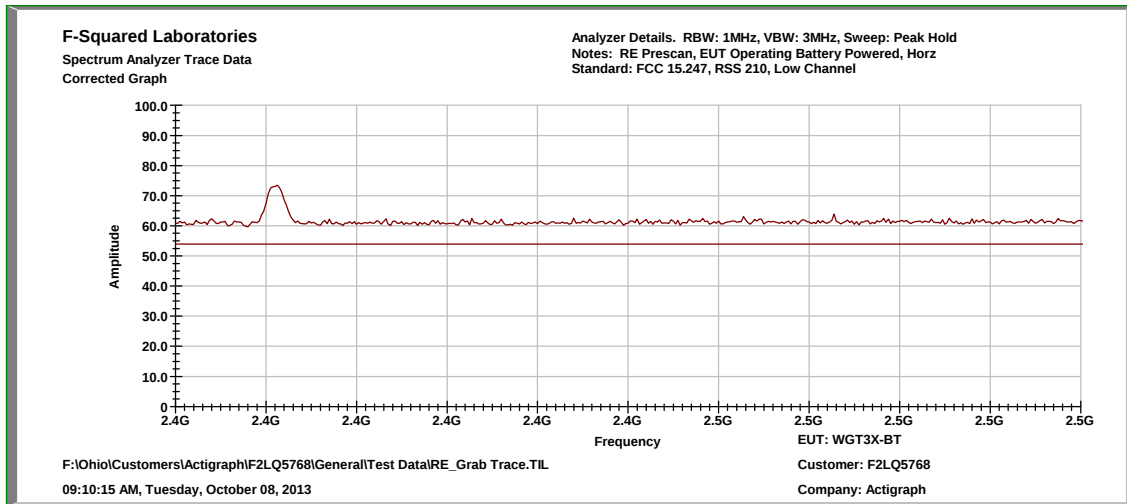


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel, cont'd



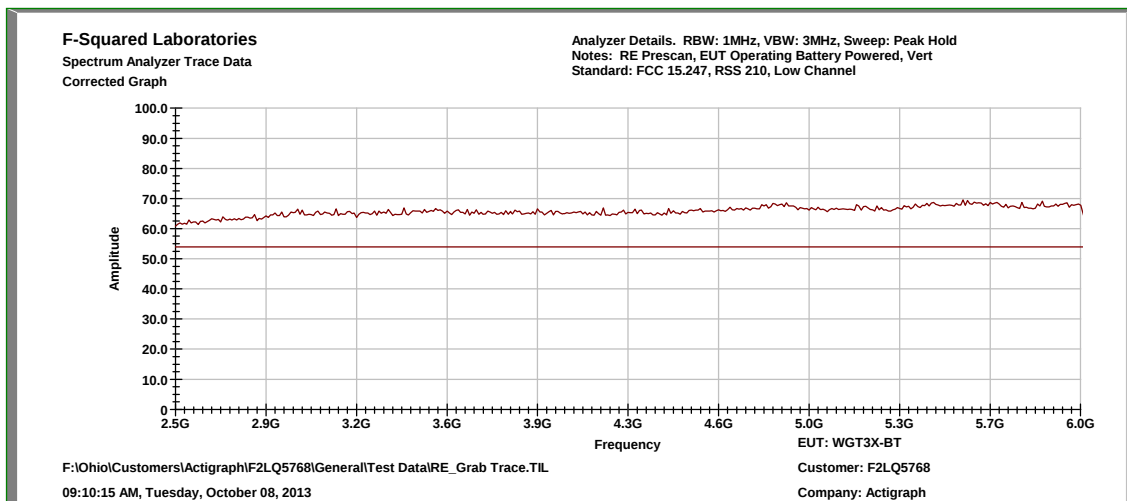
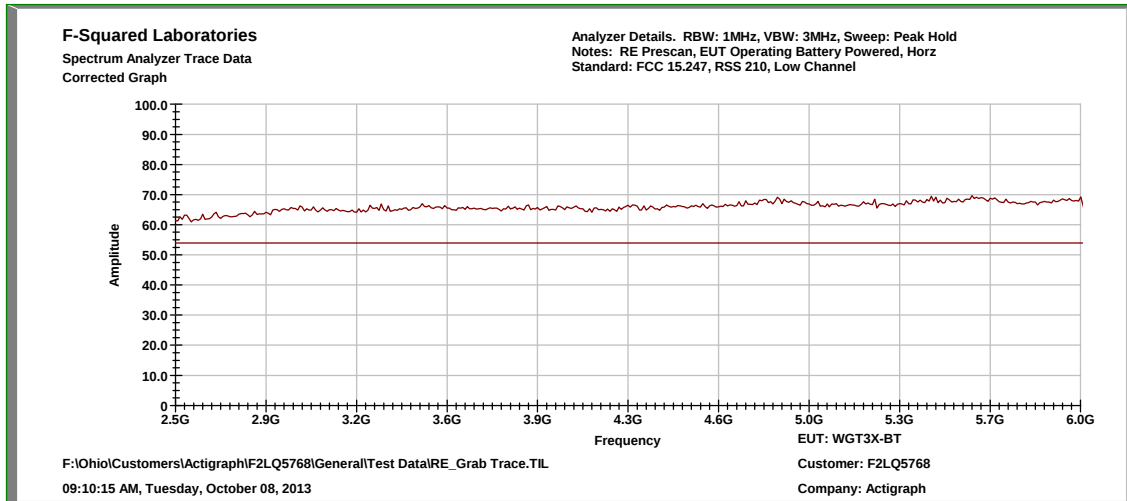


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel, cont'd



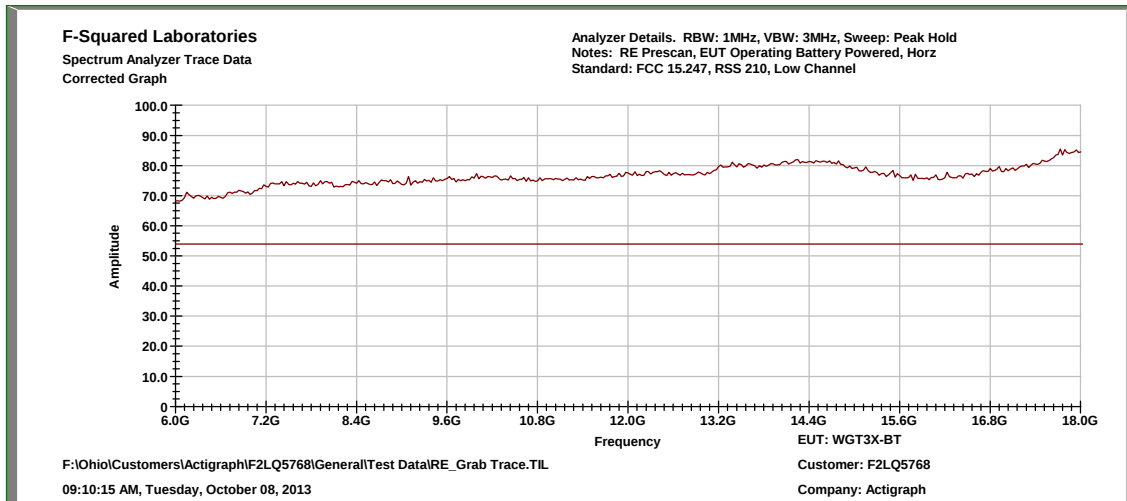
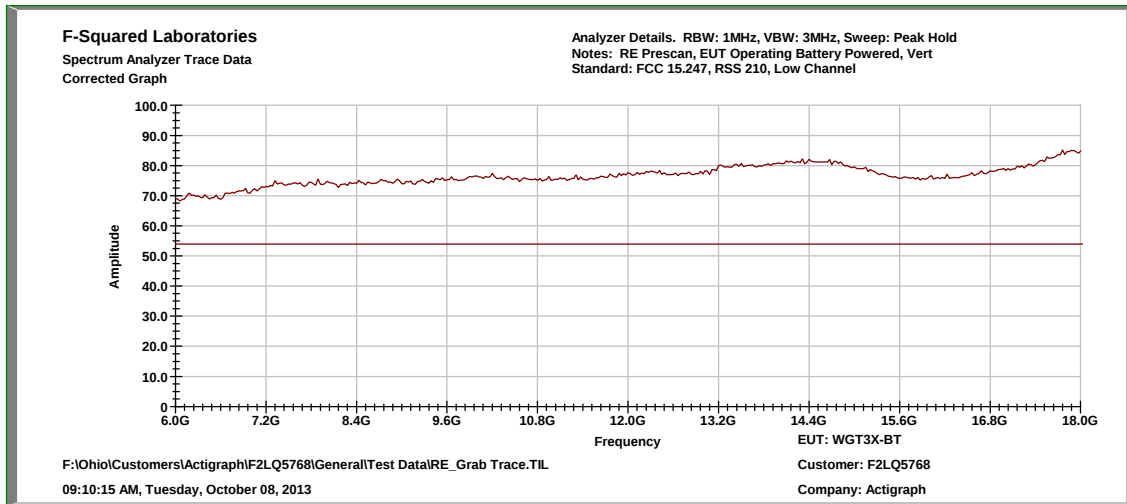


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel, cont'd



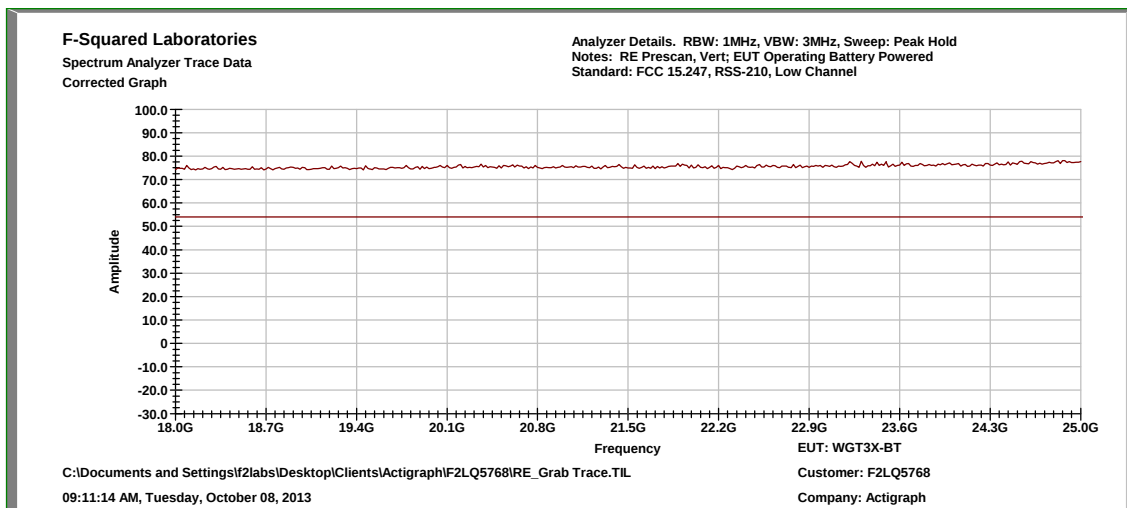
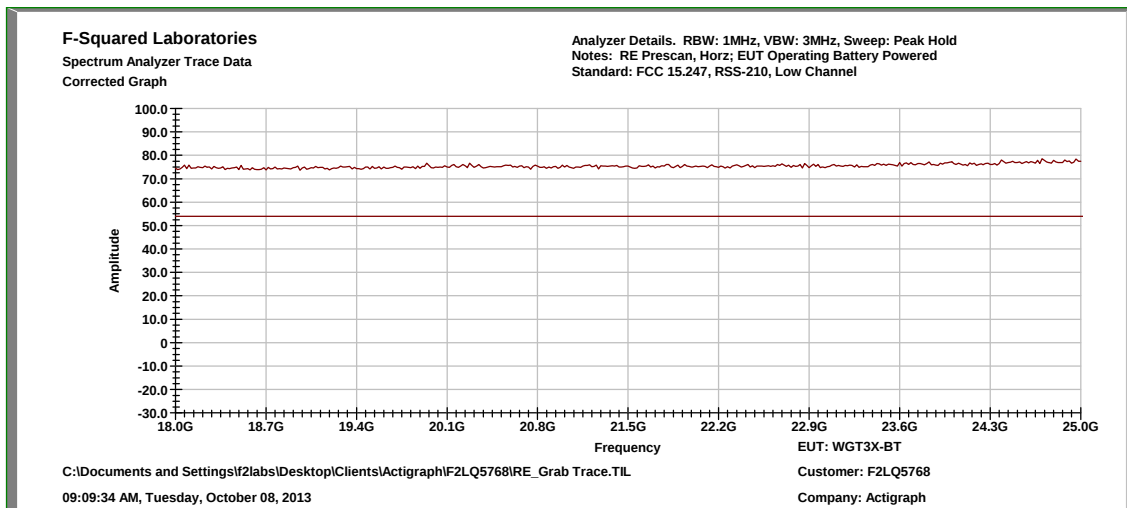


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel, cont'd



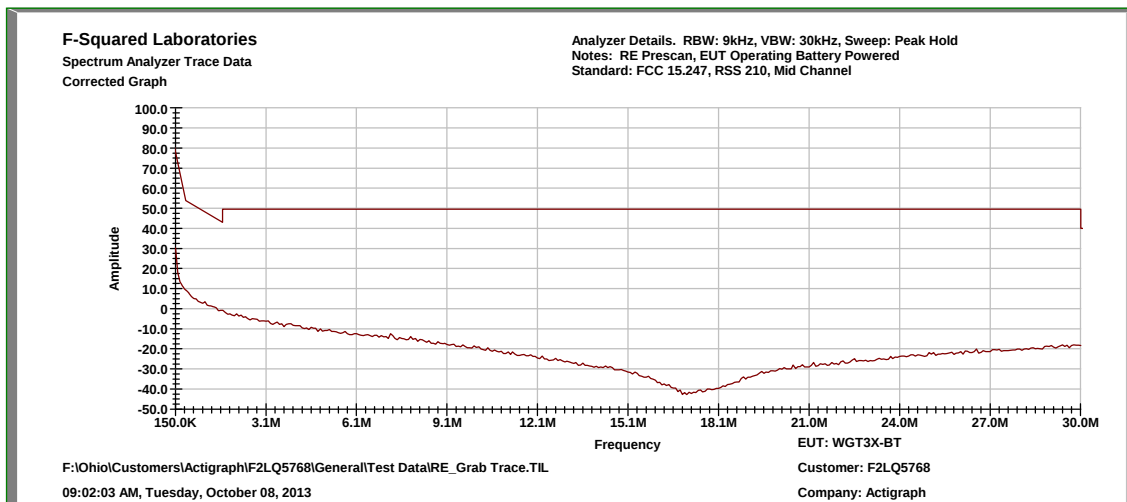
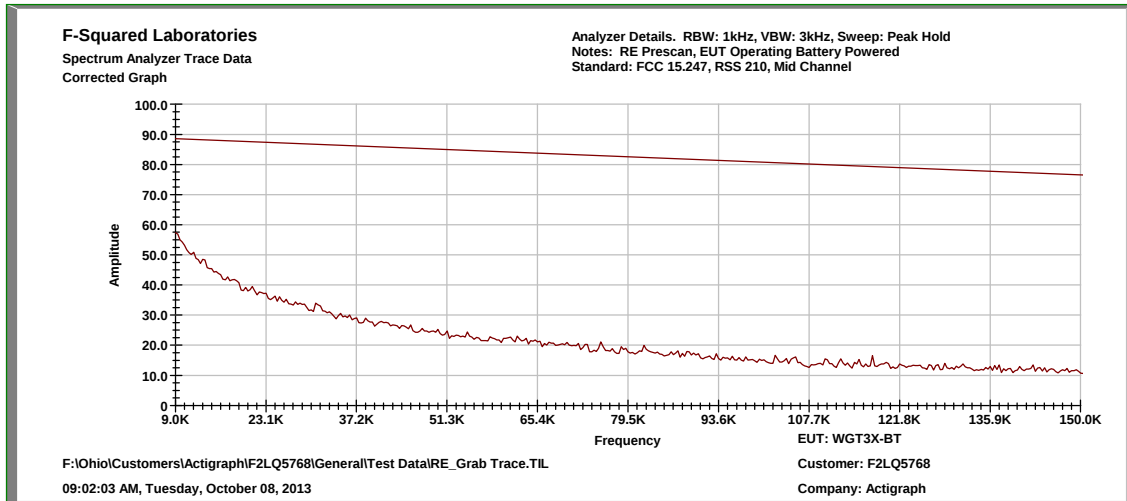


Radiated Spurious Emission with 0.5dBi Integral Antenna: Low Channel, cont'd



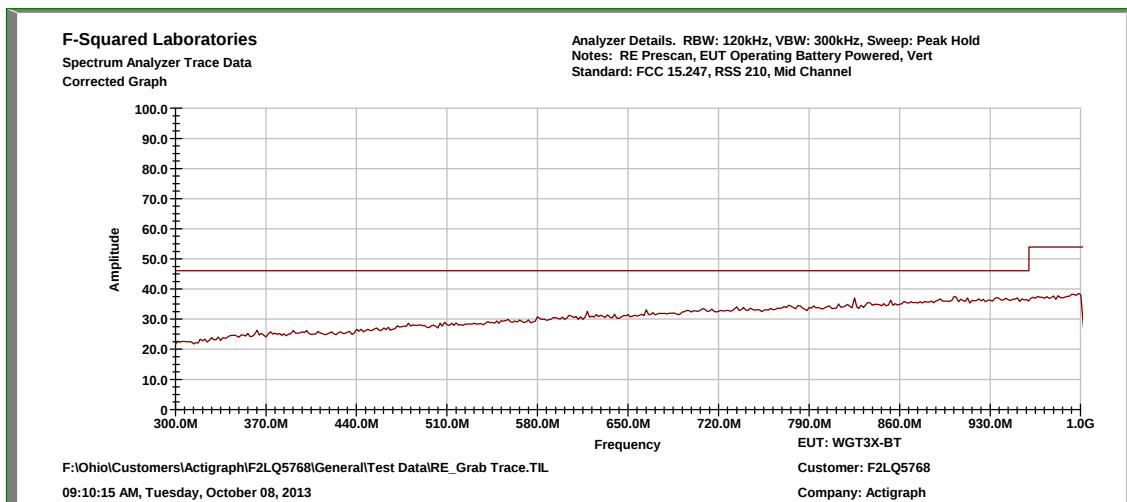
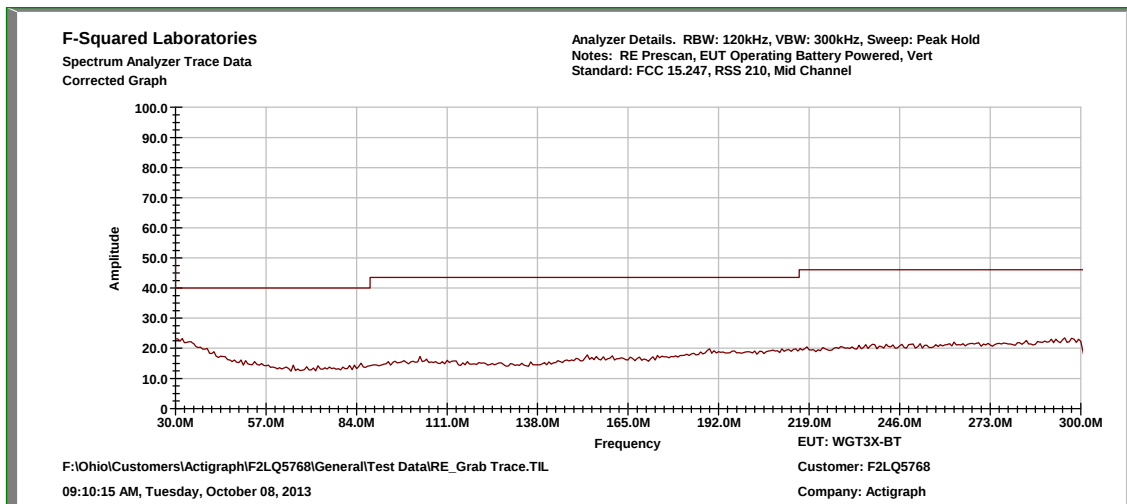


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel



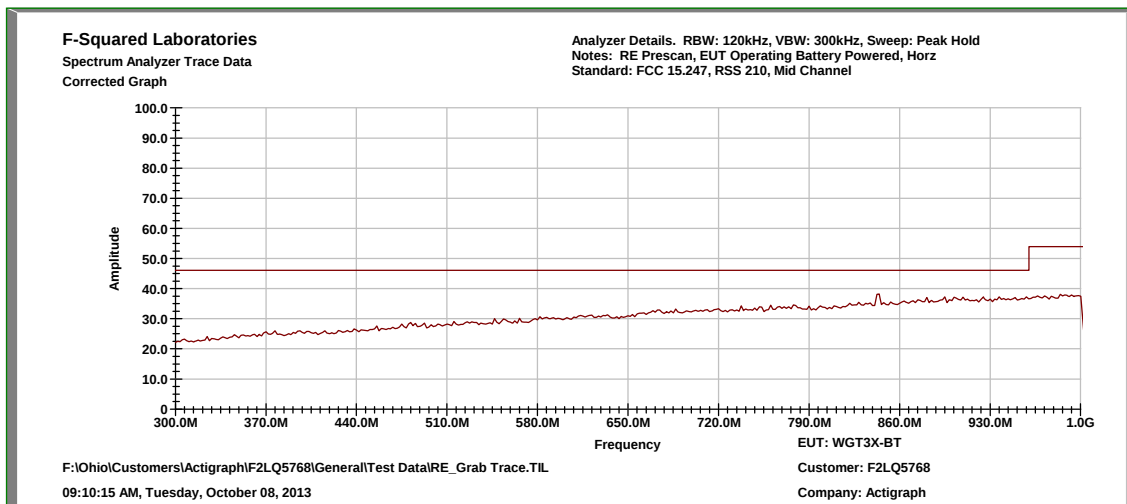
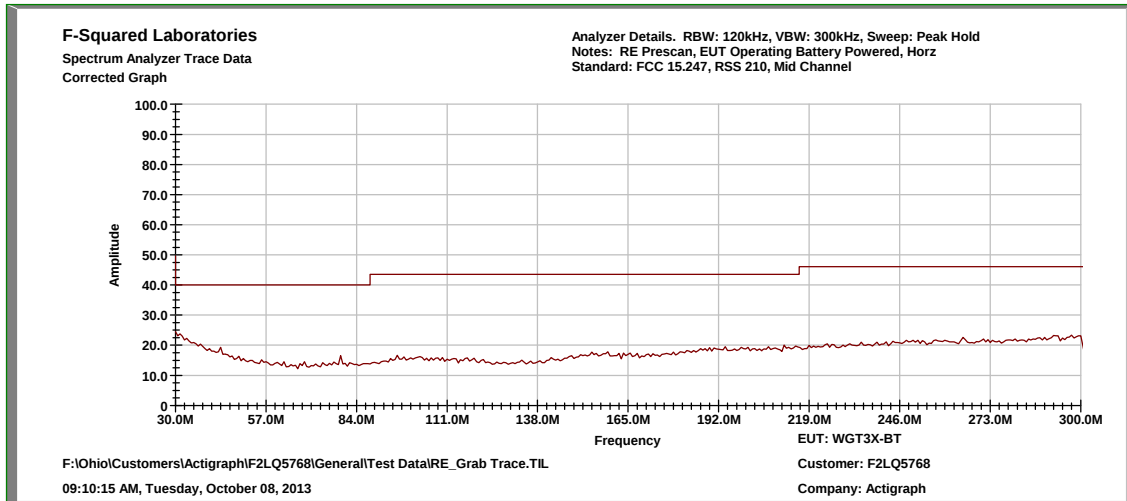


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel, cont'd



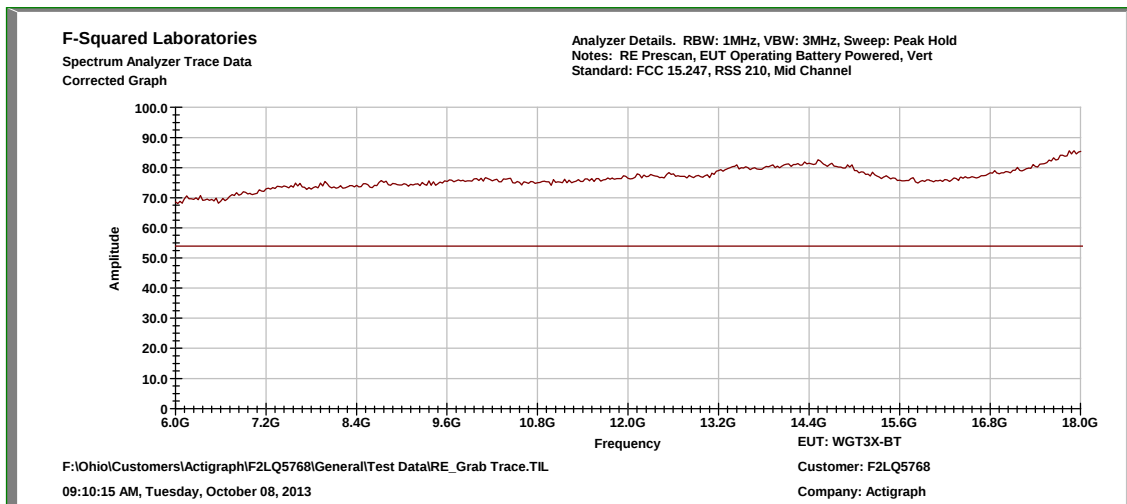
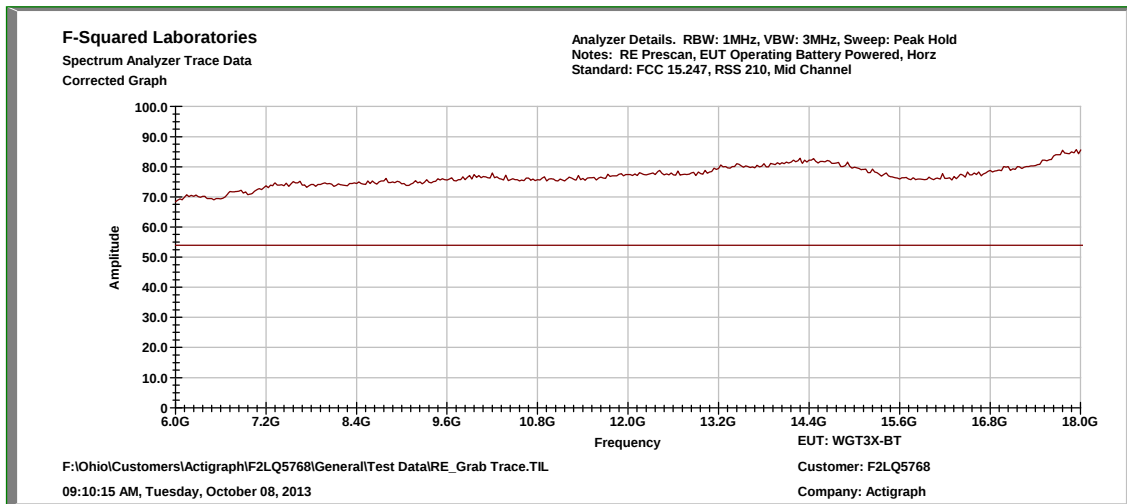


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel, cont'd



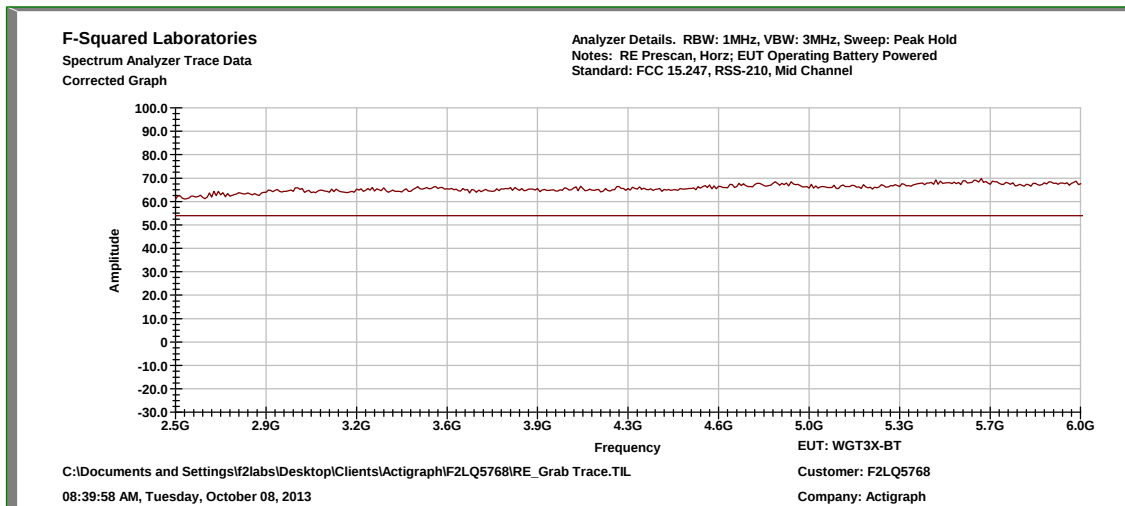
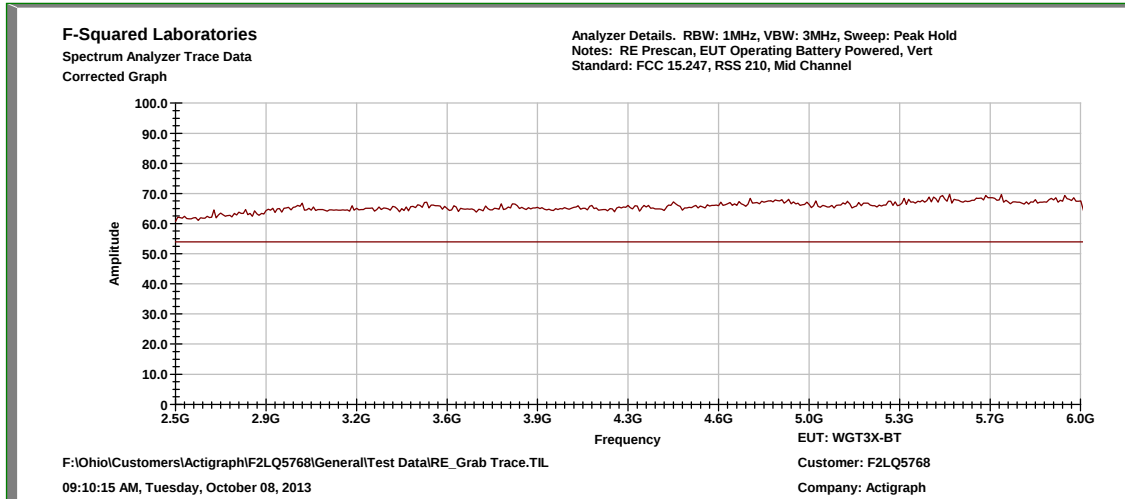


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel, cont'd



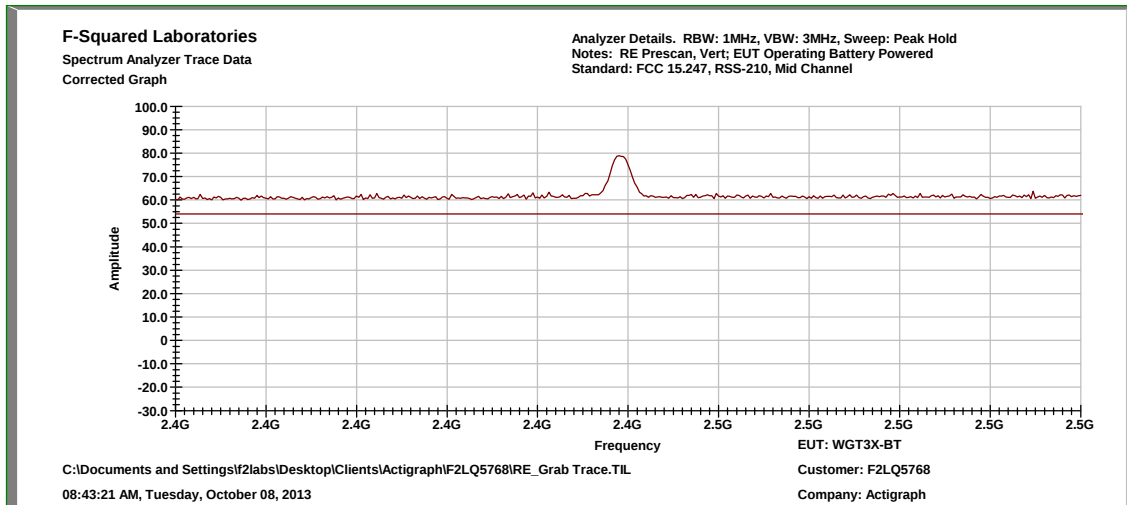
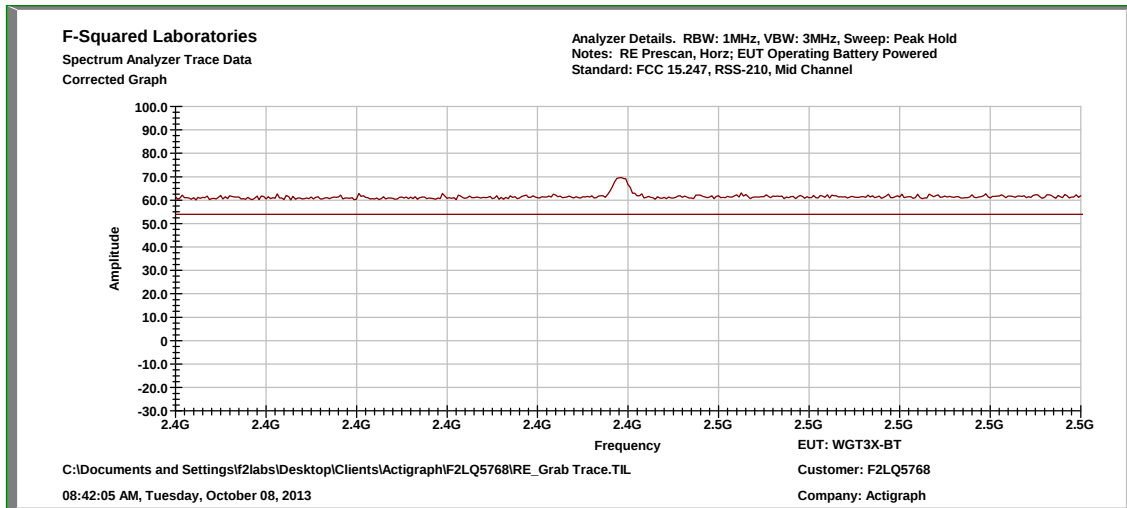


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel, cont'd



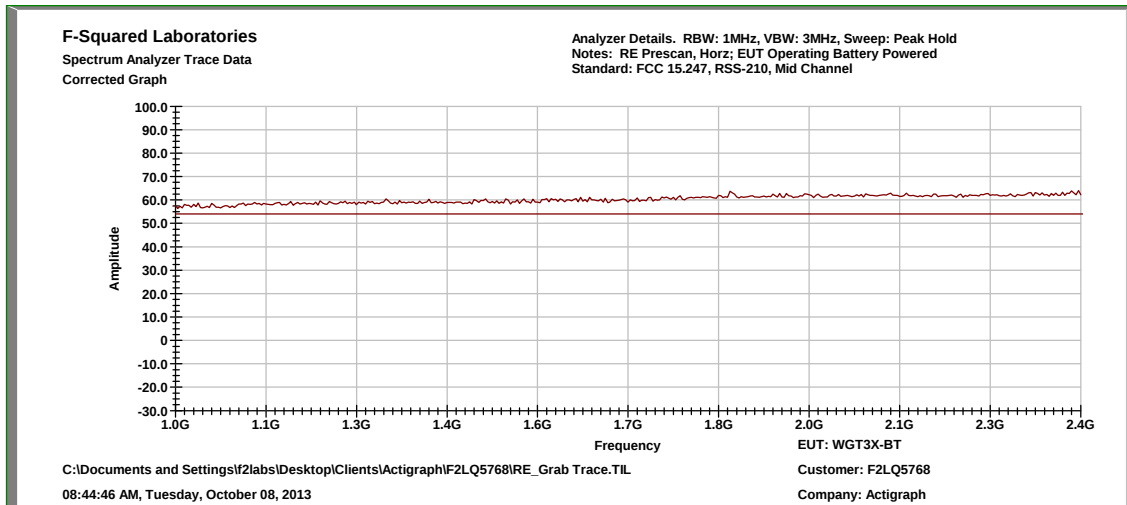
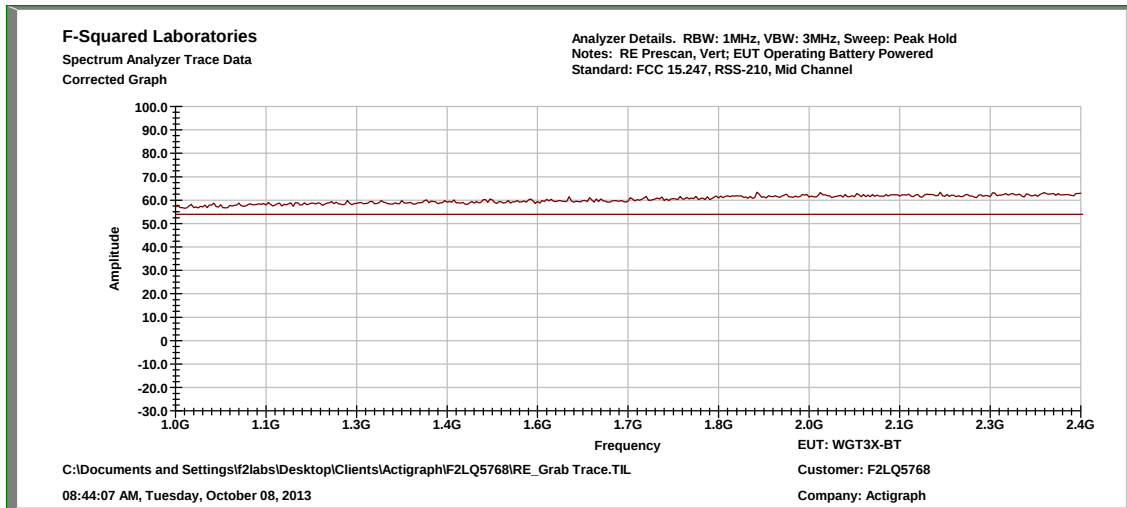


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel, cont'd



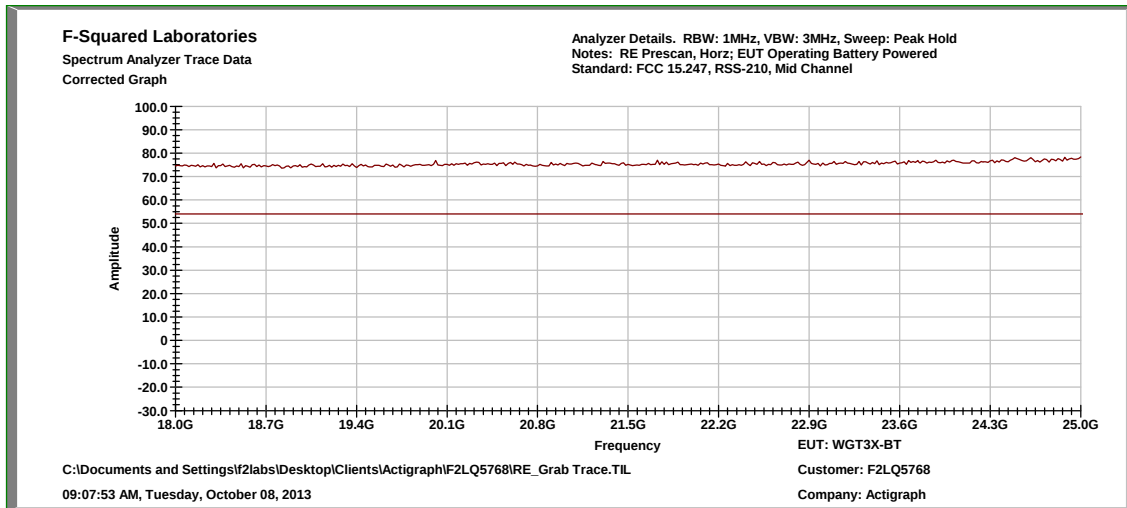
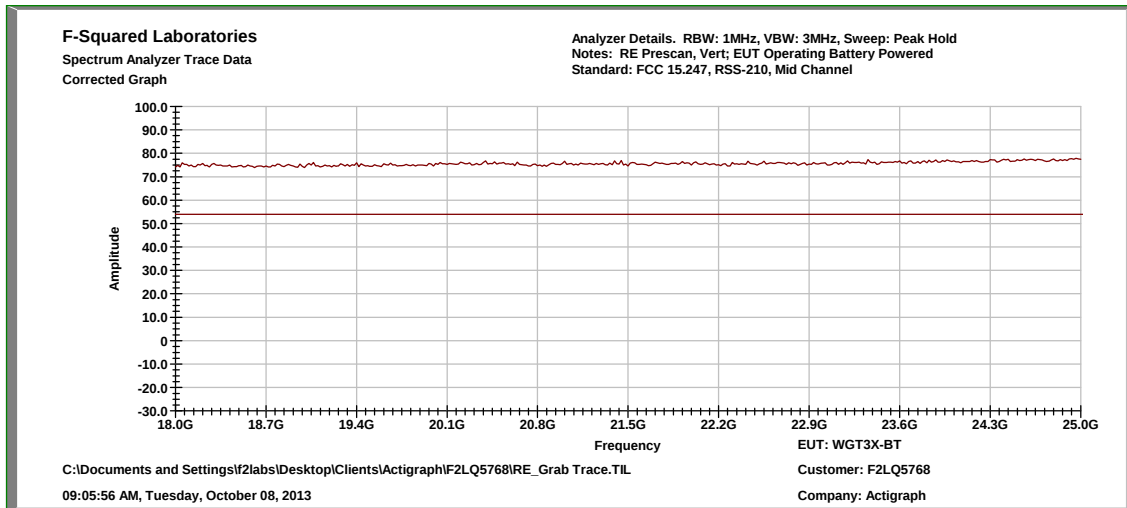


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel, cont'd



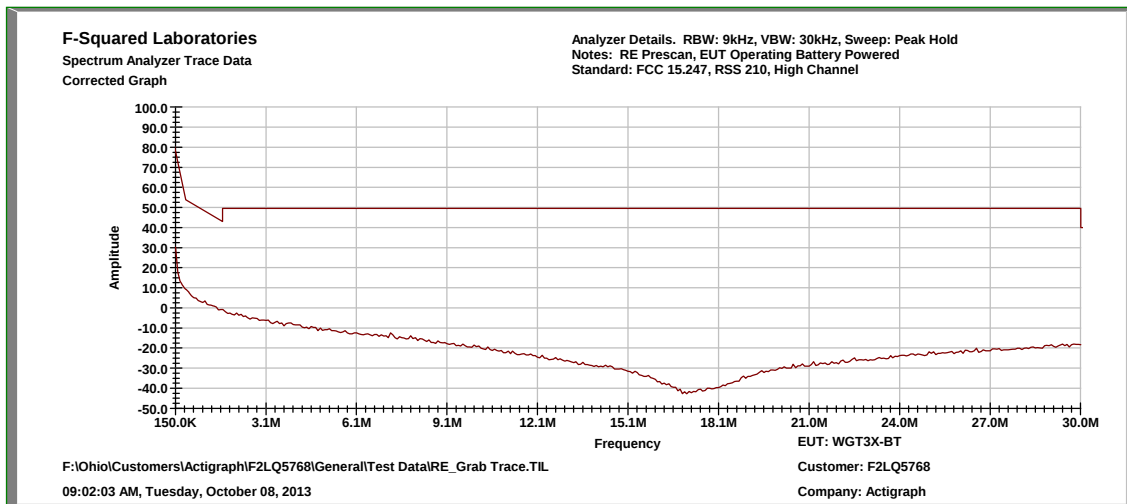
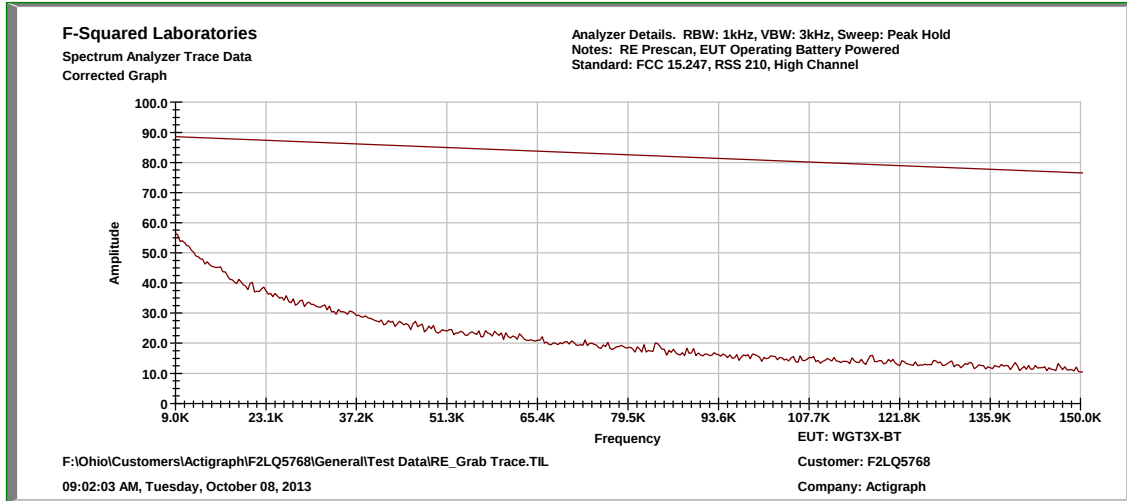


Radiated Spurious Emission with 0.5dBi Integral Antenna: Mid Channel, cont'd



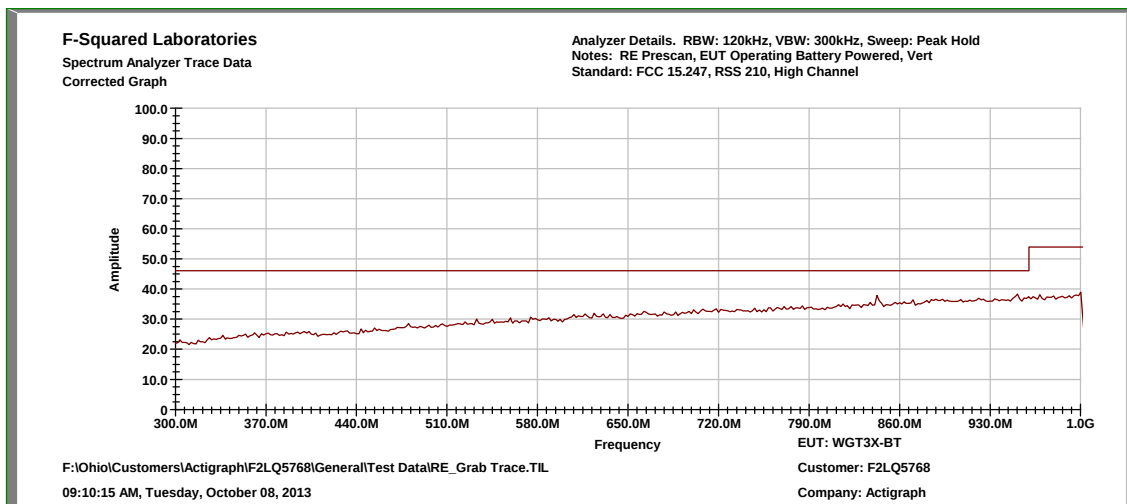
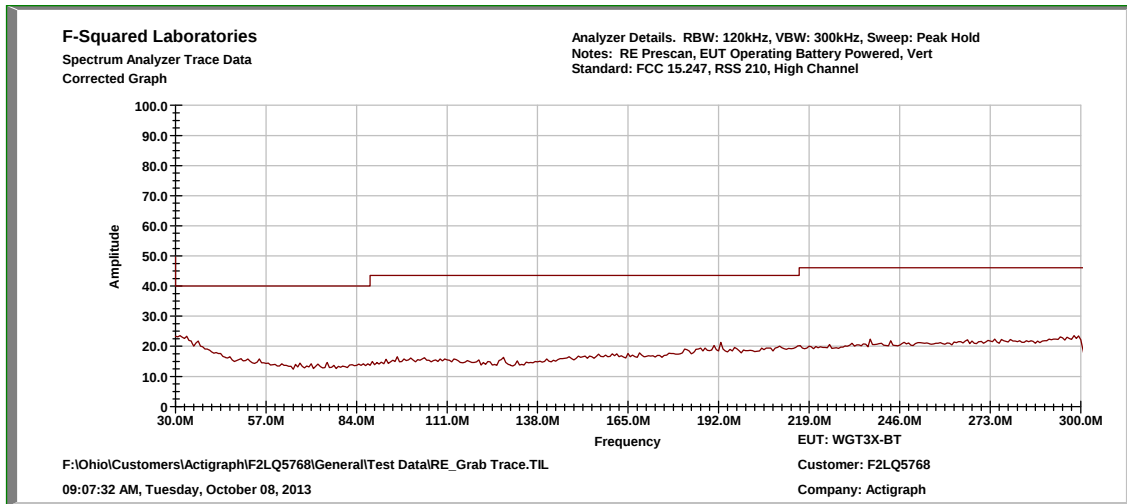


Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel



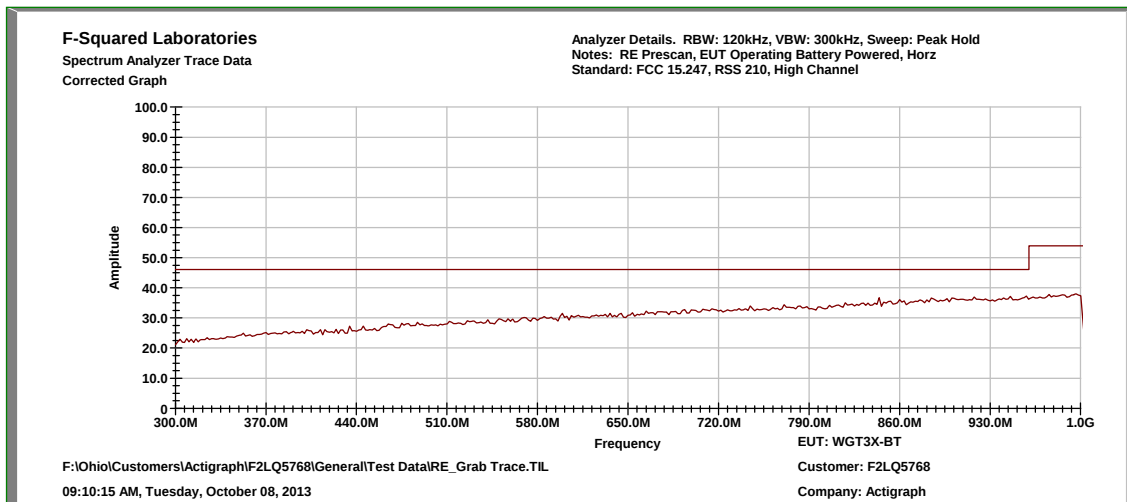
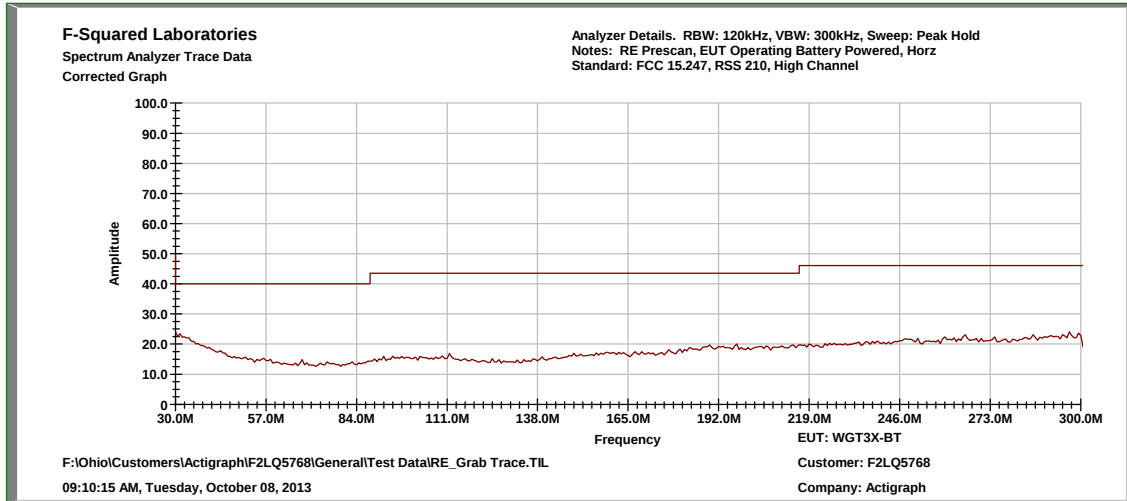


Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel, cont'd



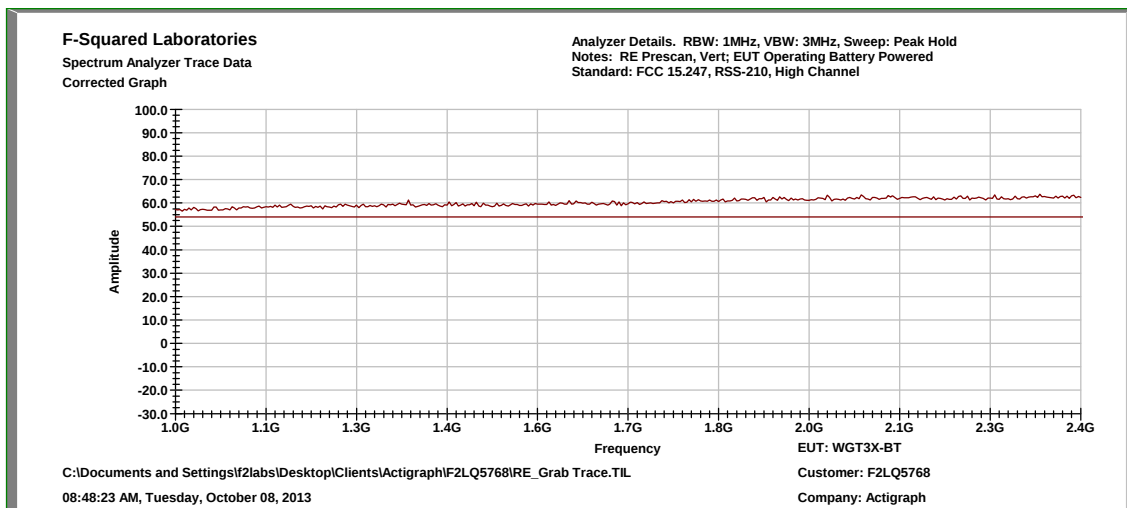
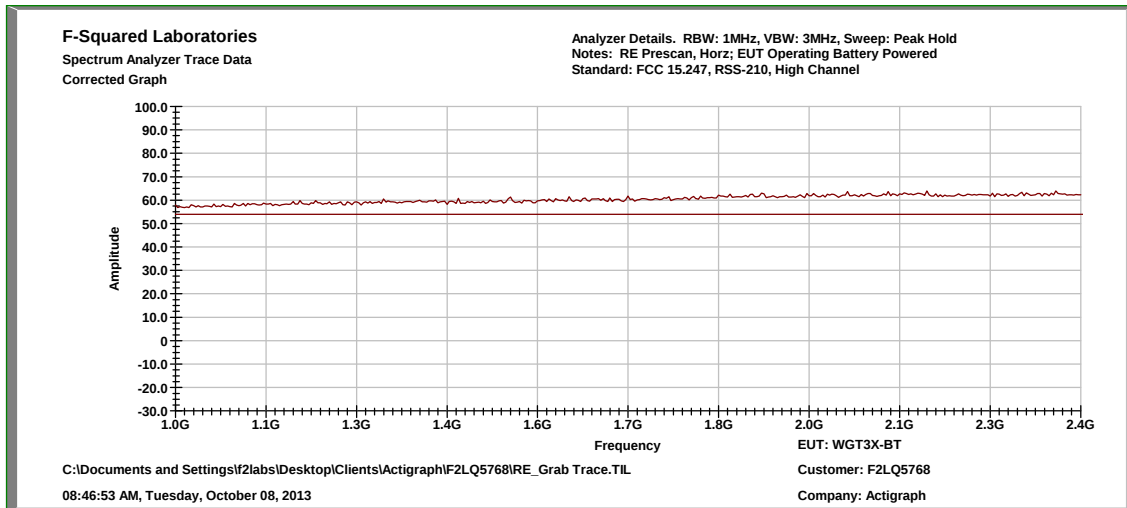


Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel, cont'd



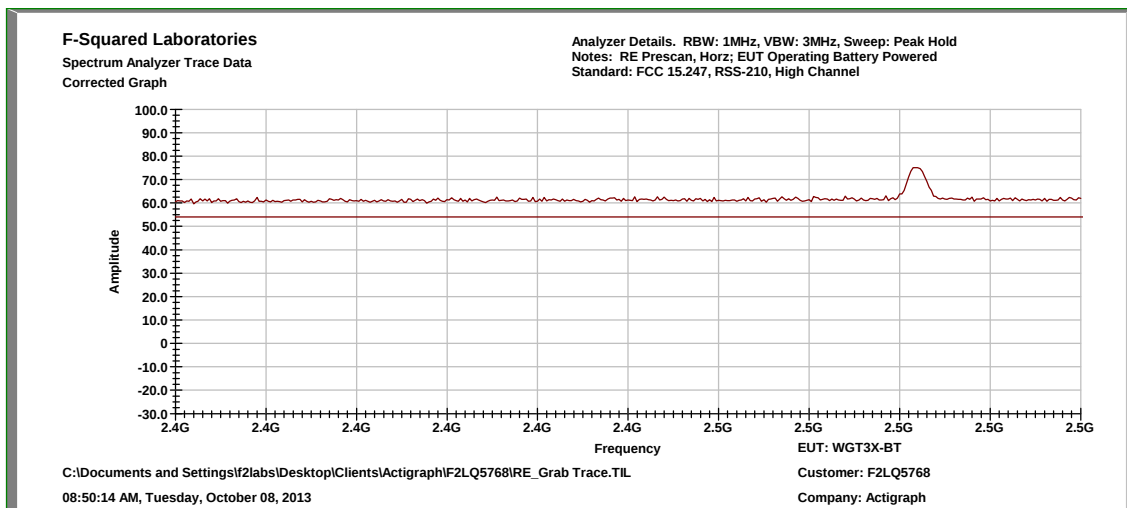
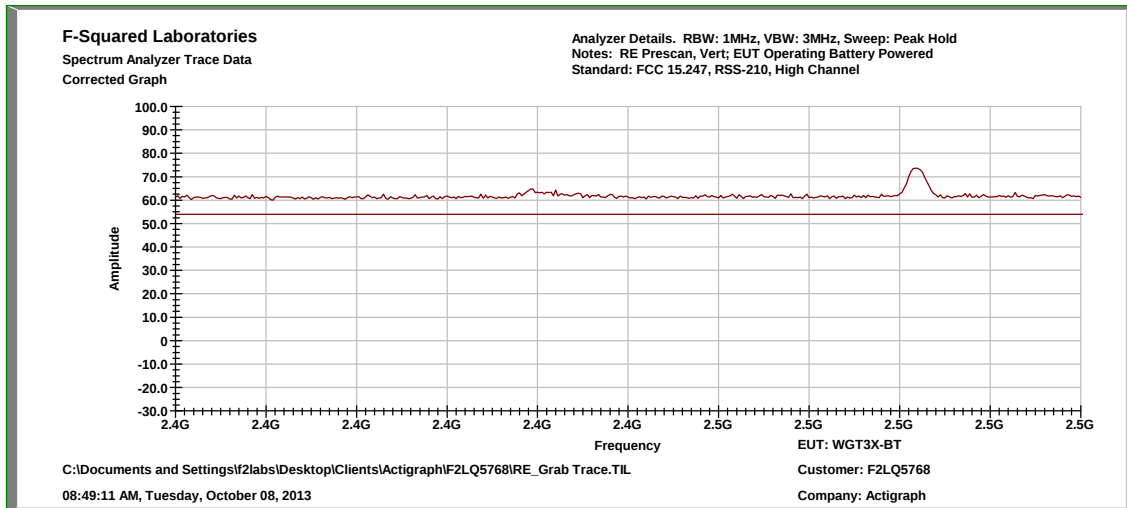


Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel, cont'd



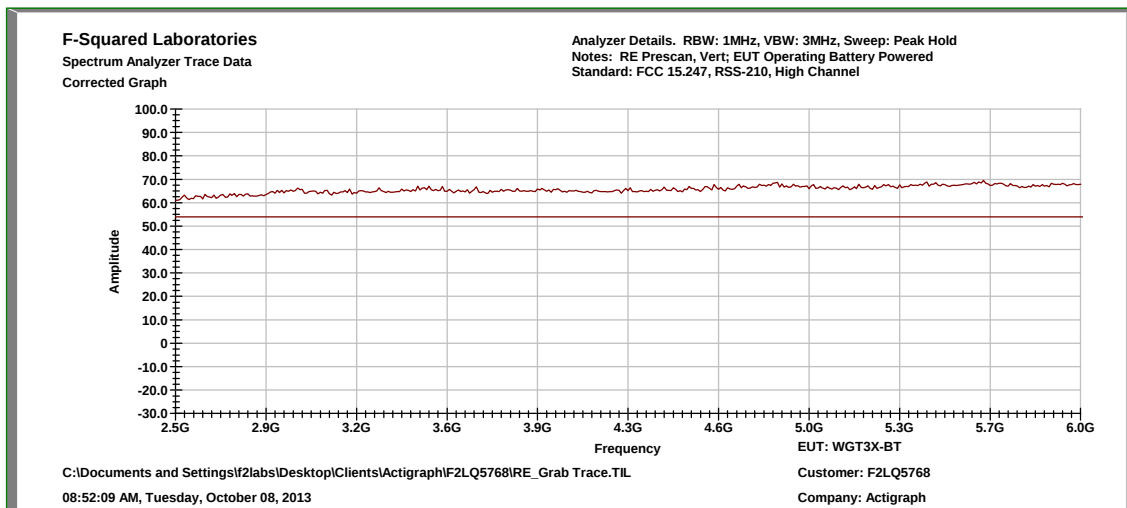
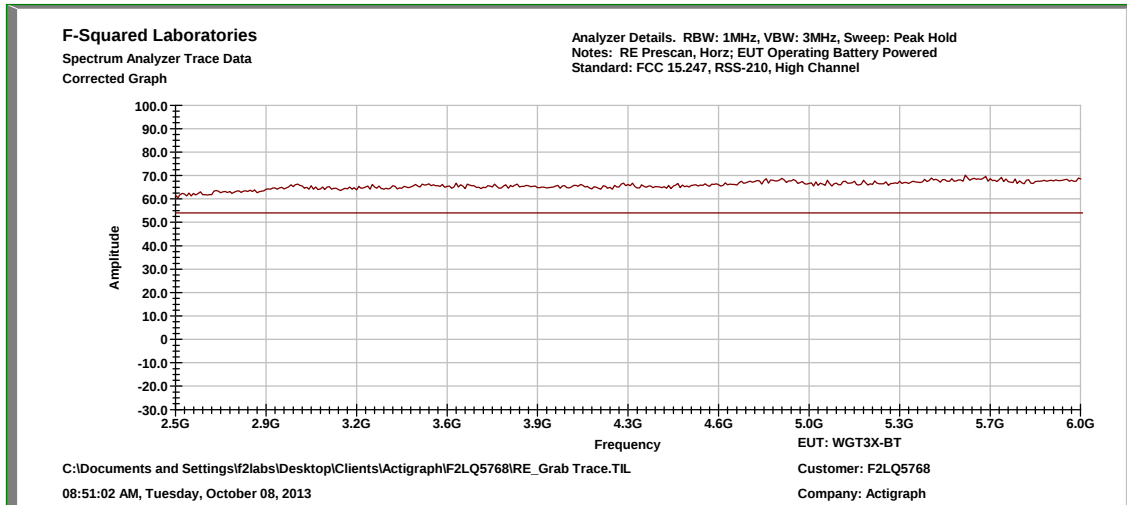


Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel, cont'd



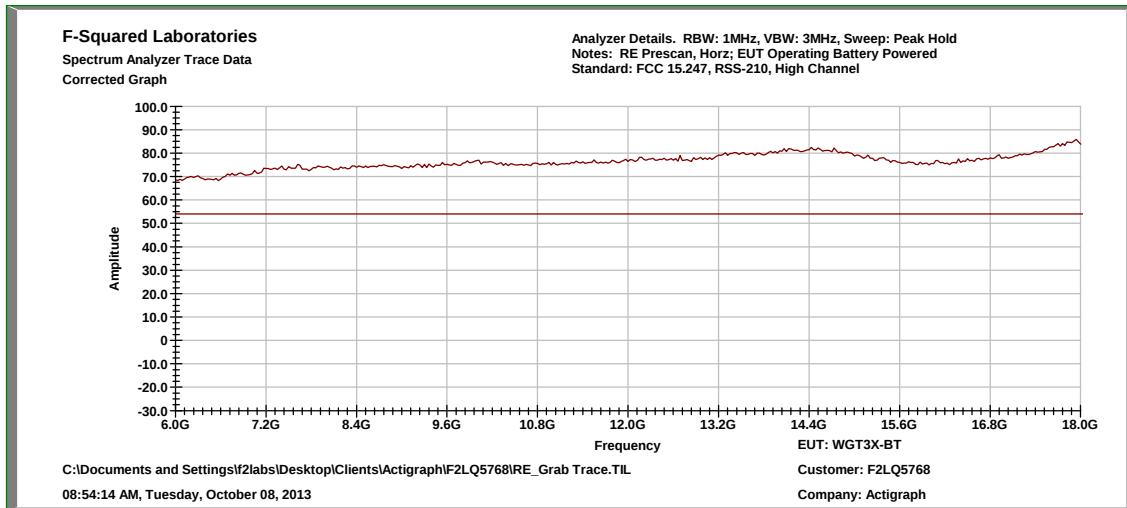
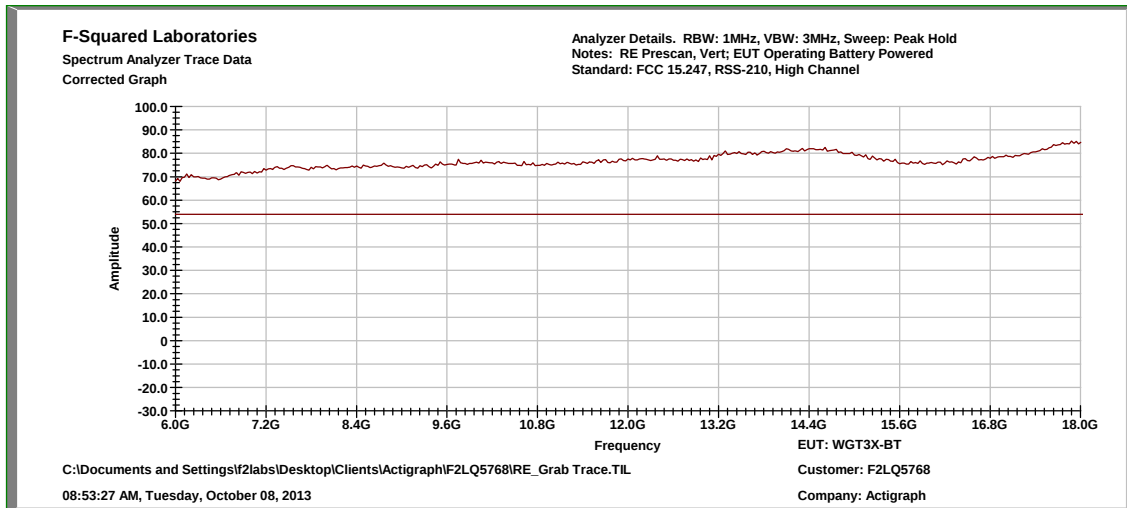


Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel, cont'd



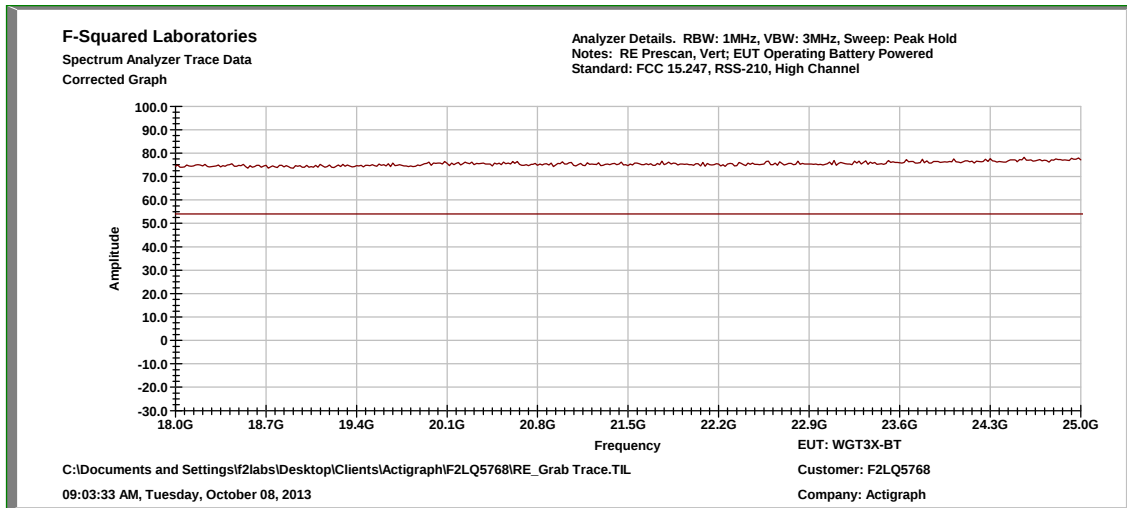
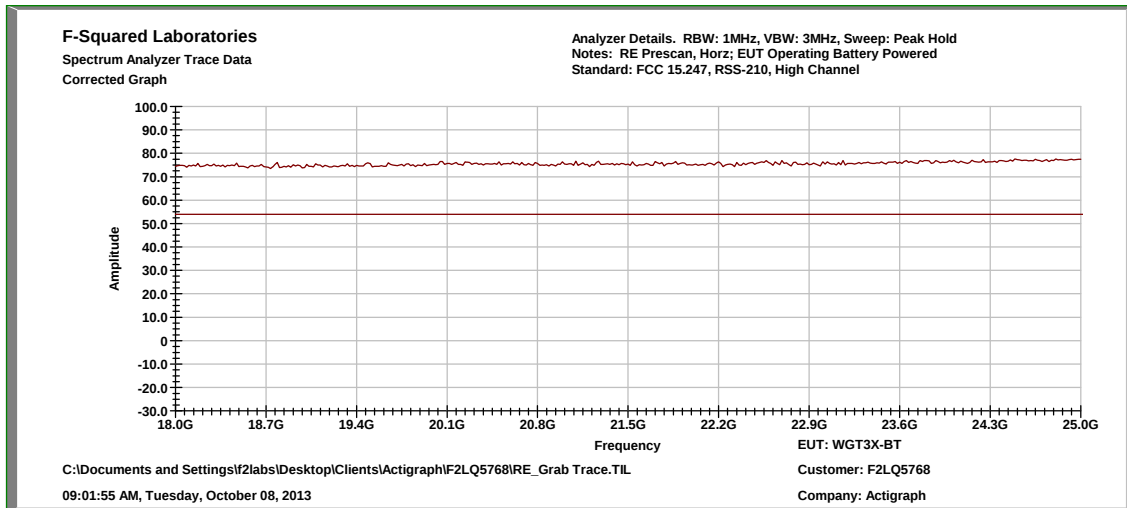


Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel, cont'd





Radiated Spurious Emission with 0.5dBi Integral Antenna: High Channel, cont'd





Measurements

Low Channel

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Bandwidth (kHz)	Polarity	Corr. (dB)
63.990000	----	----	29.0	40.0	----	----	120.000	H	19.7
113.150000	----	----	32.1	43.5	----	----	120.000	V	19.4
140.450000	----	----	26.1	43.5	----	----	120.000	V	8.9
154.680000	----	----	28.3	43.5	----	----	120.000	H	8.6
191.630000	----	----	21.8	43.5	----	----	120.000	V	9.0
197.660000	----	----	30.0	43.5	----	----	120.000	H	9.6
645.540000	----	----	33.4	46.5	----	----	120.000	V	15.5
645.540000	----	----	33.3	46.5	----	----	120.000	H	15.8
773.050000	----	----	35.5	46.5	----	----	120.000	H	14.5
842.000000	----	----	36.5	46.5	----	----	120.000	H	14.2
843.850000	----	----	35.7	46.5	----	----	120.000	V	13.9
890.800000	----	----	36.8	46.5	----	----	120.000	H	14.1
941.640000	----	----	37.9	46.5	----	----	120.000	V	14.5
2375.00000	42.55	74.0	----	----	32.79	54.0	1000.000	V	28.7
2375.00000	43.01	74.0	----	----	32.20	54.0	1000.000	H	28.9
2380.00000	43.28	74.0	----	----	34.12	54.0	1000.000	H	28.9
2380.00000	43.89	74.0	----	----	35.94	54.0	1000.000	V	28.7
2400.00000	47.99	74.0	----	----	37.76	54.0	1000.000	V	29.8
2400.00000	48.23	74.0	----	----	38.15	54.0	1000.000	H	30.0
2415.00000	44.26	74.0	----	----	32.88	54.0	1000.000	V	29.9
2415.00000	44.09	74.0	----	----	32.72	54.0	1000.000	H	30.2
2425.00000	42.00	74.0	----	----	30.52	54.0	1000.000	H	29.6
2425.00000	41.97	74.0	----	----	31.03	54.0	1000.000	V	29.4



Mid Channel

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Bandwidth (kHz)	Polarity	Corr. (dB)
63.990000	----	----	28.5	40.0	----	----	120.000	H	19.7
113.150000	----	----	28.2	43.5	----	----	120.000	V	19.4
140.450000	----	----	22.7	43.5	----	----	120.000	V	8.9
154.680000	----	----	22.6	43.5	----	----	120.000	H	8.6
191.630000	----	----	21.6	43.5	----	----	120.000	V	9.0
197.660000	----	----	26.2	43.5	----	----	120.000	H	9.6
645.540000	----	----	33.2	46.5	----	----	120.000	V	15.5
773.050000	----	----	35.6	46.5	----	----	120.000	H	15.8
842.000000	----	----	36.5	46.5	----	----	120.000	H	14.5
843.850000	----	----	35.8	46.5	----	----	120.000	H	14.2
890.800000	----	----	36.8	46.5	----	----	120.000	V	13.9
941.640000	----	----	37.9	46.5	----	----	120.000	V	15.4
2200.00000	36.21	74.0	----	----	31.66	54.0	1000.000	V	28.3
2200.00000	36.94	74.0	----	----	31.47	54.0	1000.000	H	28.5
2350.00000	39.77	74.0	----	----	33.81	54.0	1000.000	H	28.9
2350.00000	40.35	74.0	----	----	34.98	54.0	1000.000	V	28.7
2400.00000	43.69	74.0	----	----	35.64	54.0	1000.000	V	29.4
2400.00000	44.22	74.0	----	----	34.21	54.0	1000.000	H	29.6
2480.00000	45.13	74.0	----	----	36.69	54.0	1000.000	V	29.8
2480.00000	45.86	74.0	----	----	35.22	54.0	1000.000	H	30.0
2520.00000	35.05	74.0	----	----	32.06	54.0	1000.000	H	30.2
2520.00000	35.10	74.0	----	----	32.59	54.0	1000.000	V	29.9



High Channel

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Bandwidth (kHz)	Polarity	Corr. (dB)
63.990000	----	----	22.9	40.0	----	----	120.000	H	9.3
113.150000	----	----	28.6	43.5	----	----	120.000	V	15.3
140.450000	----	----	23.0	43.5	----	----	120.000	V	15.2
154.680000	----	----	22.8	43.5	----	----	120.000	H	14.9
191.630000	----	----	21.7	43.5	----	----	120.000	V	14.4
197.660000	----	----	26.8	43.5	----	----	120.000	H	15.8
645.540000	----	----	33.3	46.5	----	----	120.000	V	25.4
773.050000	----	----	35.5	46.5	----	----	120.000	H	27.2
842.000000	----	----	36.5	46.5	----	----	120.000	H	28.3
843.850000	----	----	35.7	46.5	----	----	120.000	H	27.6
890.800000	----	----	36.8	46.5	----	----	120.000	V	28.4
941.640000	----	----	37.9	46.5	----	----	120.000	V	28.6
2470.00000	43.65	74.0	----	----	31.90	54.0	1000.000	V	27.5
2470.00000	44.25	74.0	----	----	30.66	54.0	1000.000	H	28.1
2475.00000	47.11	74.0	----	----	32.59	54.0	1000.000	H	28.9
2475.00000	47.35	74.0	----	----	31.88	54.0	1000.000	V	28.7
2479.92000	51.63	74.0	----	----	39.74	54.0	1000.000	V	29.4
2479.92000	52.06	74.0	----	----	38.61	54.0	1000.000	H	29.6
2483.00000	50.98	74.0	----	----	38.00	54.0	1000.000	V	29.9
2483.00000	51.60	74.0	----	----	37.54	54.0	1000.000	H	30.2



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

Peak power spectral density measurements were performed.

11.1 Requirements

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

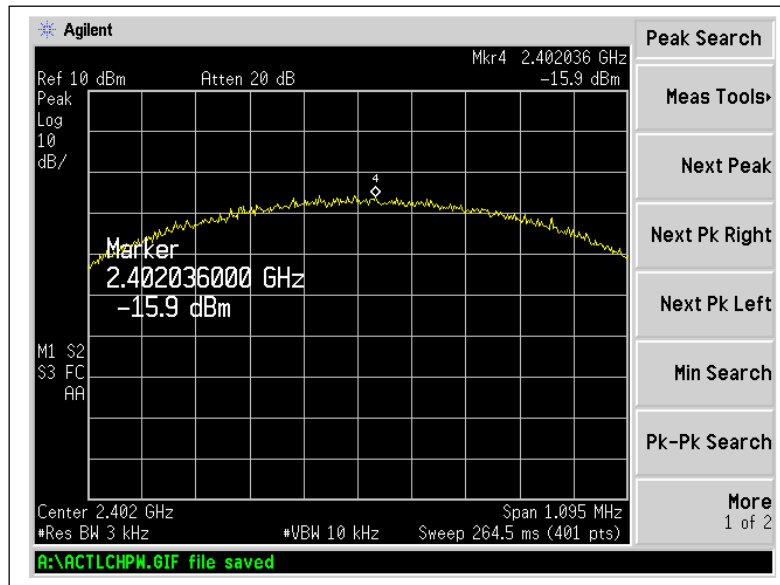
Power spectral density measurements were performed at a resolution bandwidth of 3 kHz (video bandwidth set at 10 KHz). The peak spectral densities were measured at the low, mid, and upper channels.



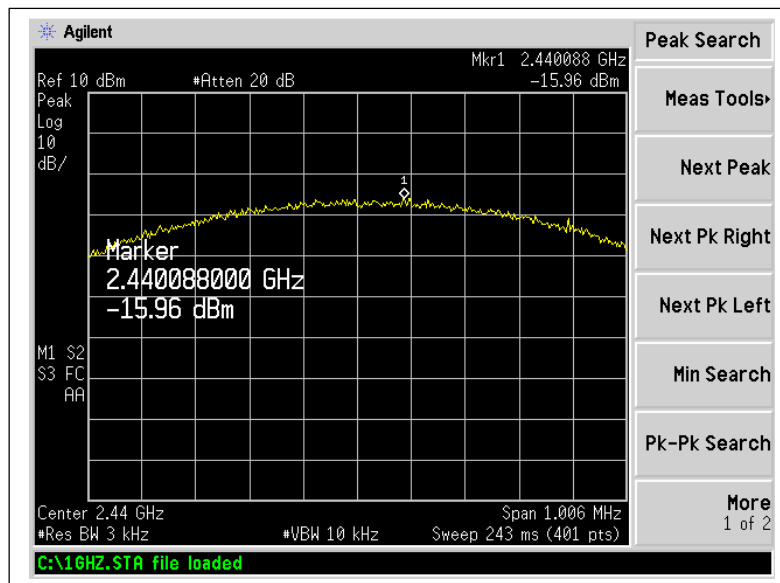
11.2 Peak Power Spectral Density Test Data

Test Date:	Oct. 17, 2013	Test Engineer:	K. Littell
Standards:	CFR 47 Part 15.247; KDB558074	Air Temperature:	21.7°C
		Relative Humidity:	45%

Low Channel

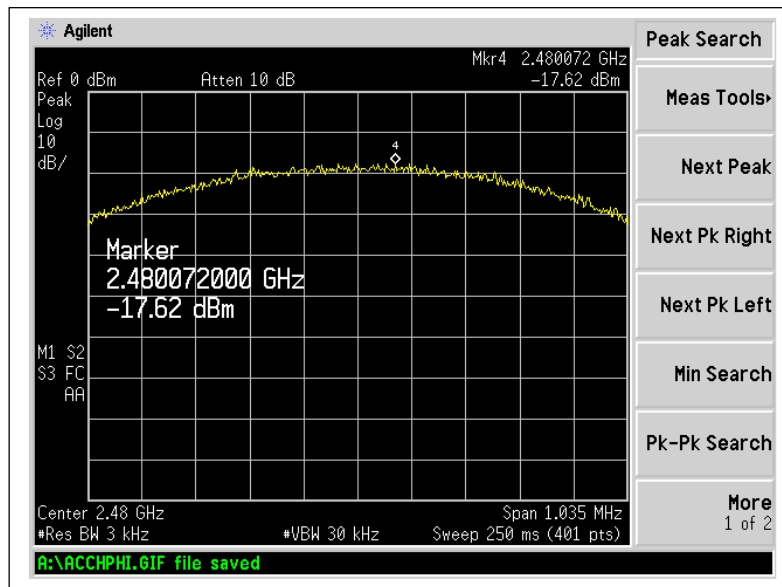


Mid Channel





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

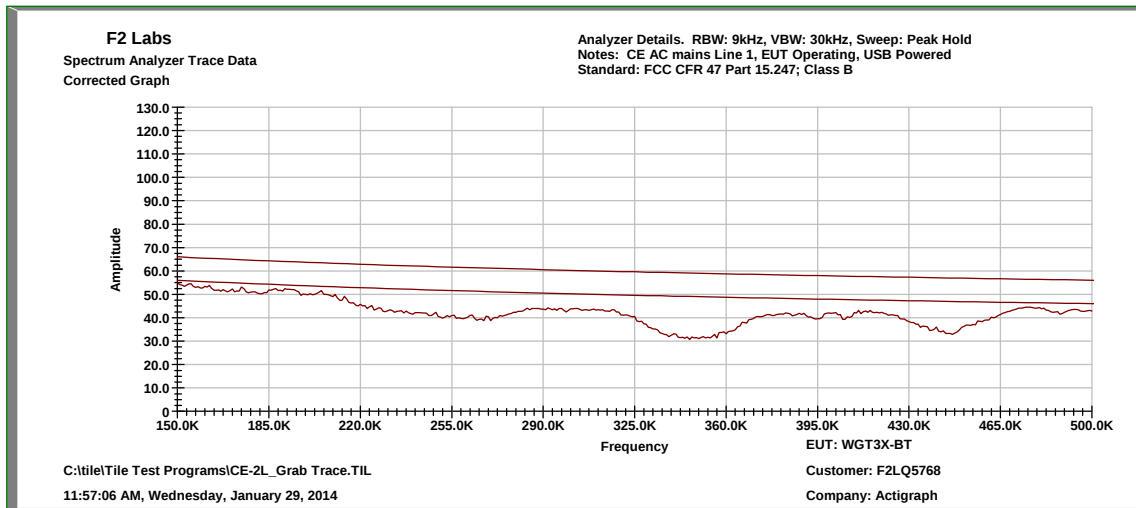
The EUT was placed on a 1.0 x 1.5 meter non-conductive table, 0.8 meter above a horizontal ground plane and 0.4 meter from a vertical ground plane. Power was provided to the EUT through a LISN bonded to a 3 x 2 meter ground plane. The LISN and peripherals were supplied power through a filtered AC power 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



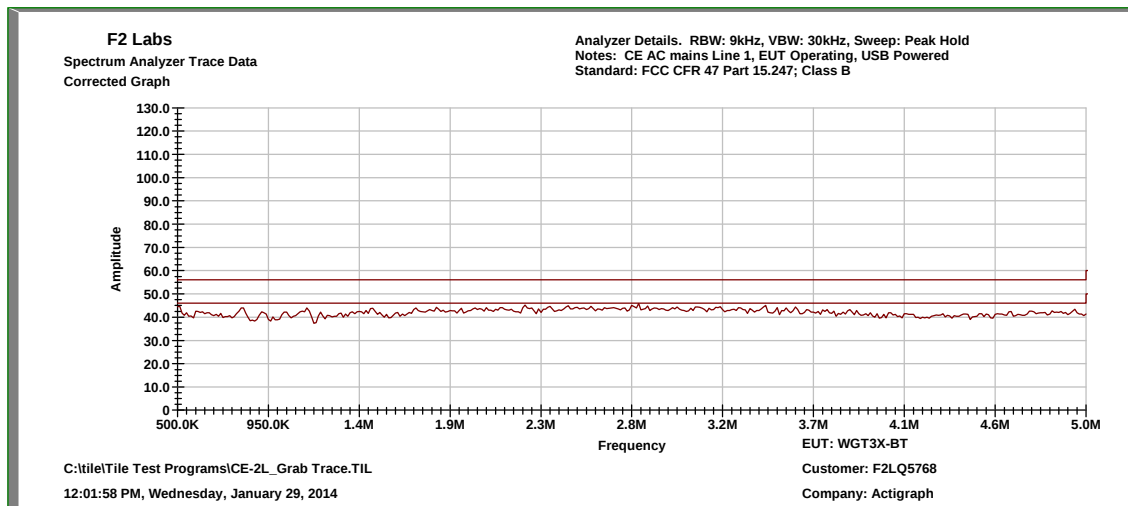
12.3 Conducted Emissions Test Data

Test Date:	Jan. 29, 2014	Test Engineer:	J. Knepper
Rule:	15.207(a)	Air Temperature:	20.3° C
Test Results:	Pass	Relative Humidity:	38%

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

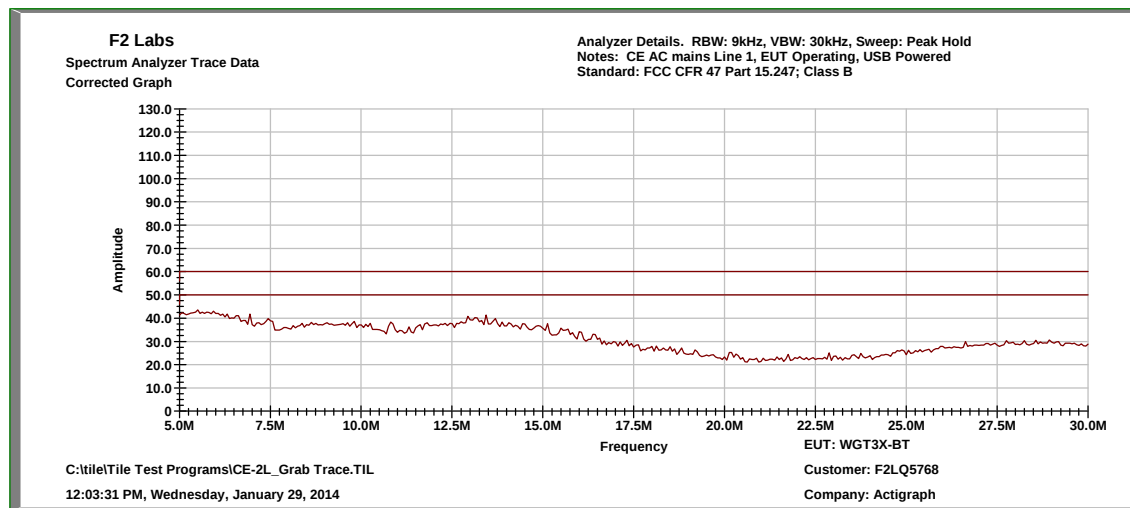


Conducted Test – Line 1: 0.5 MHz to 5.0 MHz, Low Channel





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



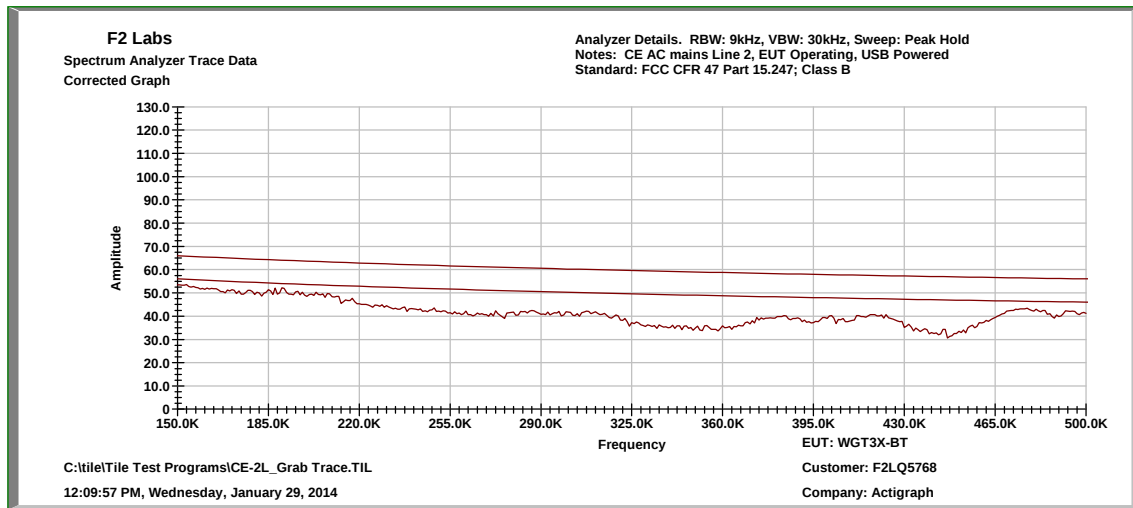
Low Channel

Top Discrete Measurements

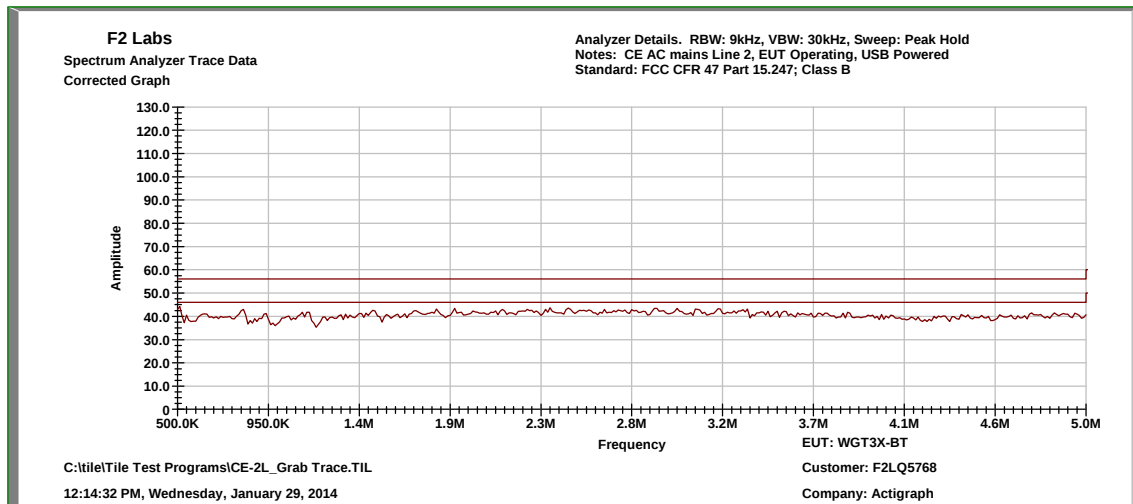
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.162	Quasi-Peak	36.01	11.0	47.01	65.349	-18.3
			Average	8.11	11.0	19.11	55.349	-36.2
2	Line 1	0.192	Quasi-Peak	33.67	11.0	44.67	63.951	-19.3
			Average	22.43	11.0	33.43	53.951	-20.5
3	Line 1	0.474	Quasi-Peak	31.55	11.0	42.55	56.43	-13.9
			Average	27.81	11.0	38.81	46.43	-7.6
4	Line 1	2.78	Quasi-Peak	30.42	11.0	41.42	56	-14.6
			Average	23.92	11.0	34.92	46	-11.1
5	Line 1	5.5	Quasi-Peak	28.54	11.0	39.54	60	-20.5
			Average	21.68	11.0	32.68	50	-17.3
6	Line 1	6.94	Quasi-Peak	26.39	11.0	37.39	60	-22.6
			Average	19.75	11.0	30.75	50	-19.3



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

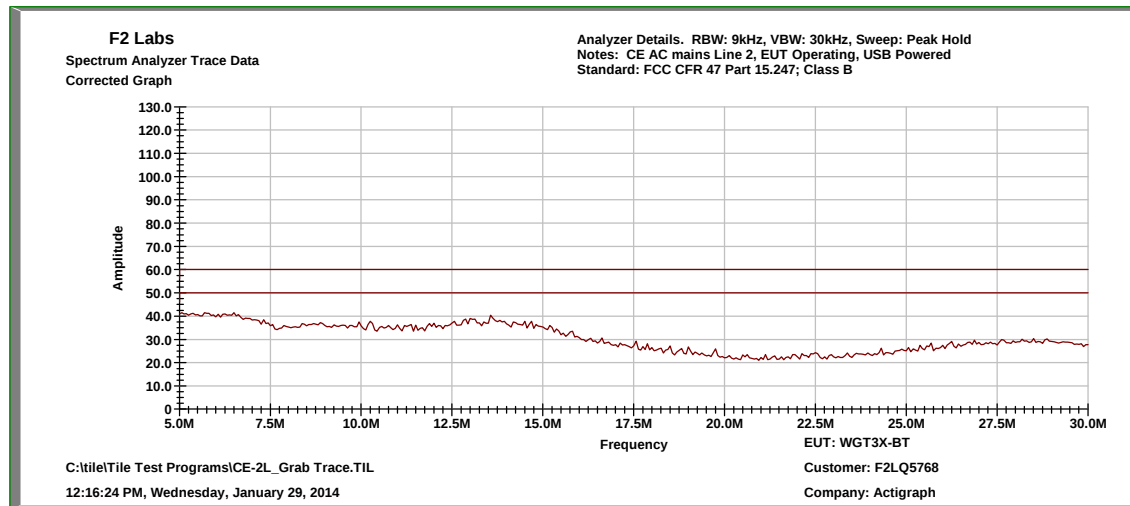


Conducted Test – Line 2: 0.5 MHz to 5.0 MHz, Low Channel





Conducted Test – Line 2: 5.0 MHz to 30.0 MHz, Low Channel



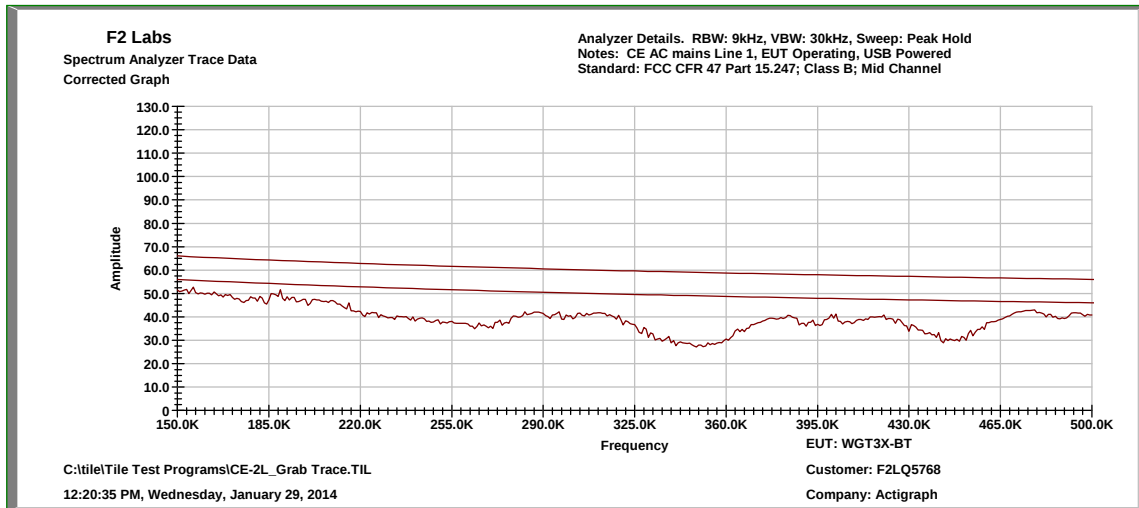
Low Channel

Top Discrete Measurements

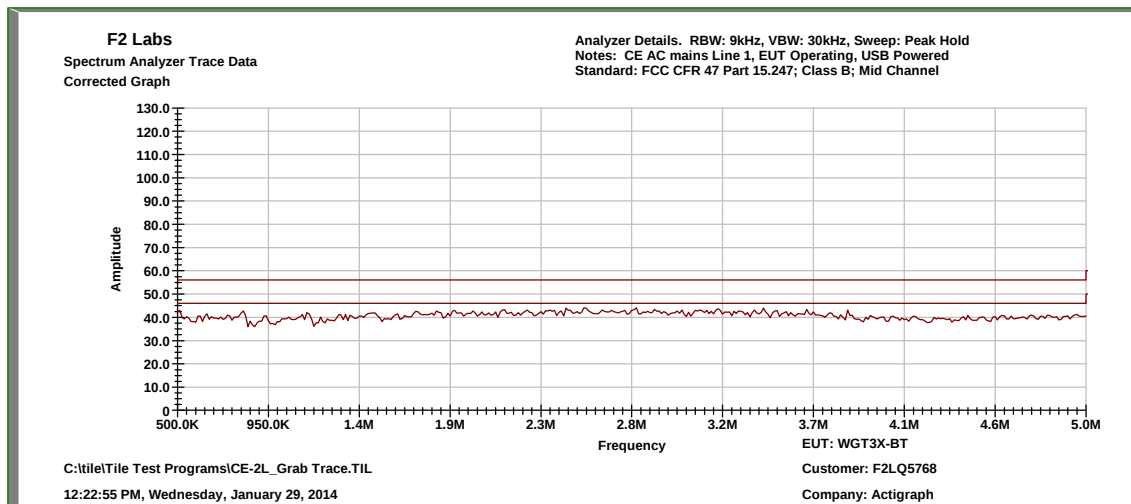
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 2	0.1535	Quasi-Peak	34.86	11.0	45.86	65.81	-20.0
			Average	9.20	11.0	20.20	55.81	-35.6
2	Line 2	0.19	Quasi-Peak	31.74	11.0	42.74	64.04	-21.3
			Average	25.49	11.0	36.49	54.04	-17.6
3	Line 2	0.209	Quasi-Peak	30.67	11.0	41.67	63.225	-21.6
			Average	25.49	11.0	36.49	53.225	-16.7
4	Line 2	0.477	Quasi-Peak	30.59	11.0	41.59	56.39	-14.8
			Average	26.73	11.0	37.73	46.39	-8.7
5	Line 2	0.826	Quasi-Peak	30.09	11.0	41.09	56	-14.9
			Average	26.58	11.0	37.58	46	-8.4
6	Line 2	5.44	Quasi-Peak	26.3	11.0	37.30	60	-22.7
			Average	20.19	11.0	31.19	50	-18.8



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

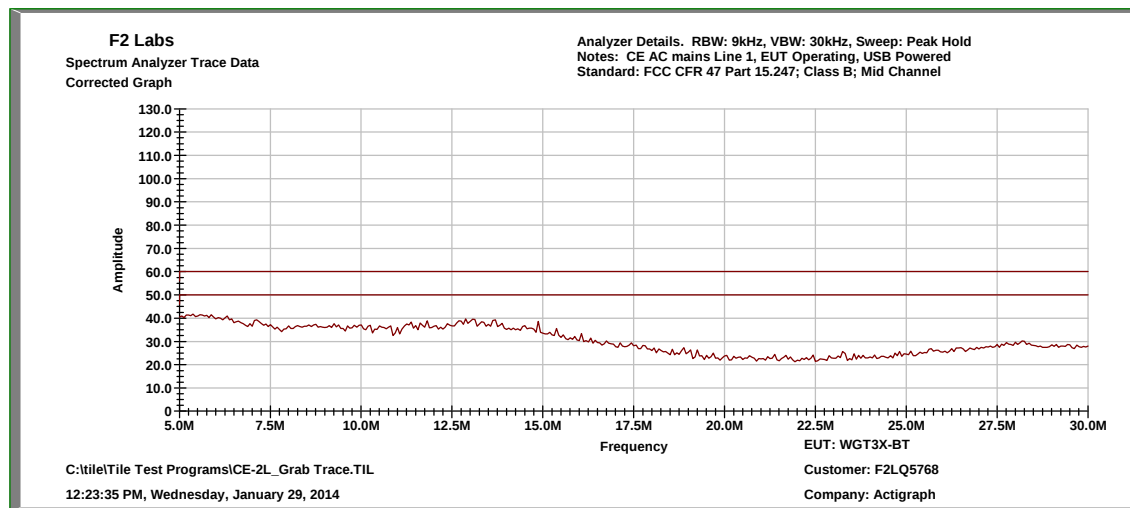


Conducted Test – Line 1: 0.5 MHz to 5.0 MHz, Mid Channel





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



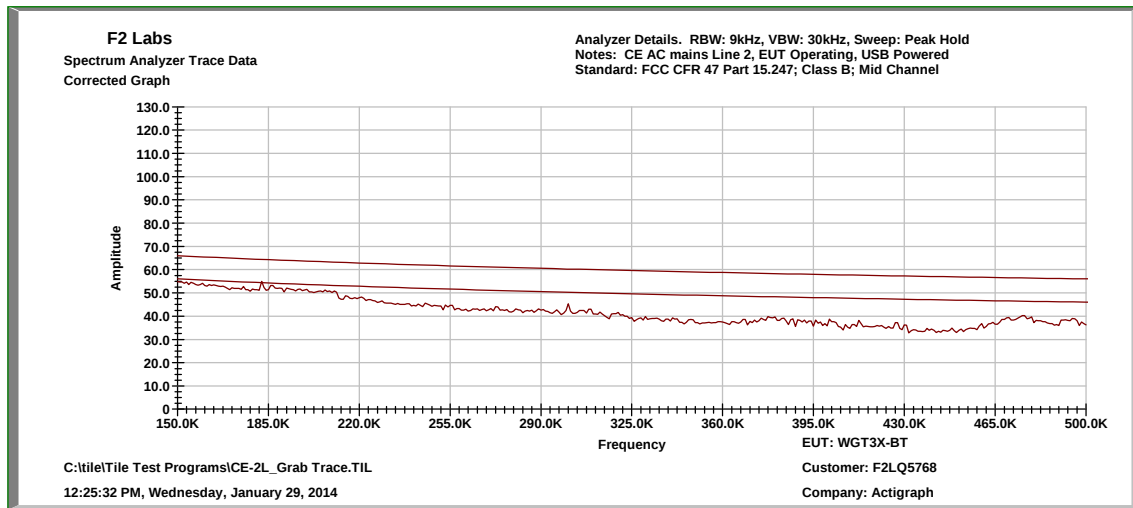
Mid Channel

Top Discrete Measurements

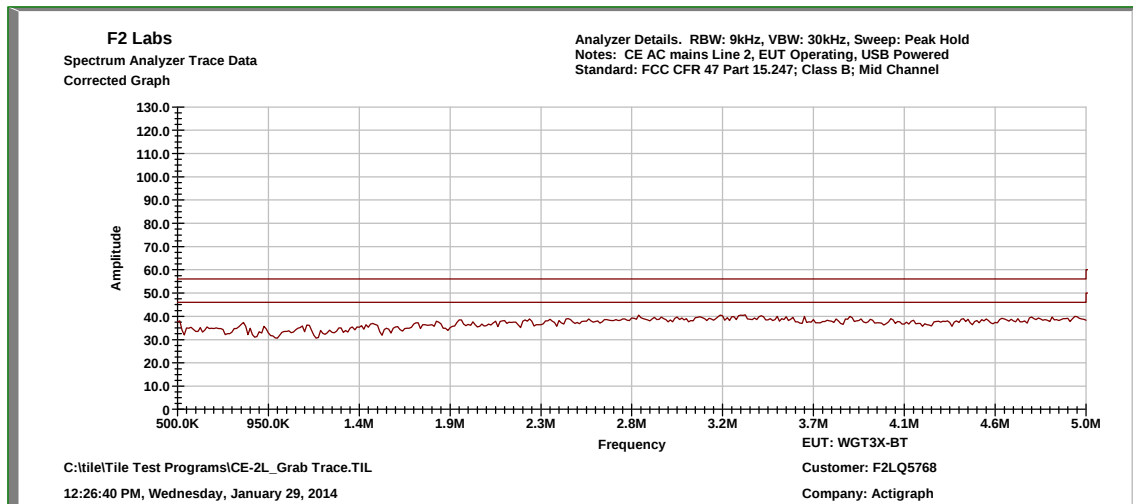
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.162	Quasi-Peak	35.89	11.0	46.89	65.349	-18.5
			Average	8.37	11.0	19.37	55.349	-36.0
2	Line 1	0.192	Quasi-Peak	32.58	11.0	43.58	63.951	-20.4
			Average	22.35	11.0	33.35	53.951	-20.6
3	Line 1	0.474	Quasi-Peak	31.62	11.0	42.62	56.43	-13.8
			Average	28.03	11.0	39.03	46.43	-7.4
4	Line 1	2.78	Quasi-Peak	30.33	11.0	41.33	56	-14.7
			Average	24.12	11.0	35.12	46	-10.9
5	Line 1	5.5	Quasi-Peak	28.35	11.0	39.35	60	-20.7
			Average	21.44	11.0	32.44	50	-17.6
6	Line 1	6.94	Quasi-Peak	26.32	11.0	37.32	60	-22.7
			Average	19.82	11.0	30.82	50	-19.2



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

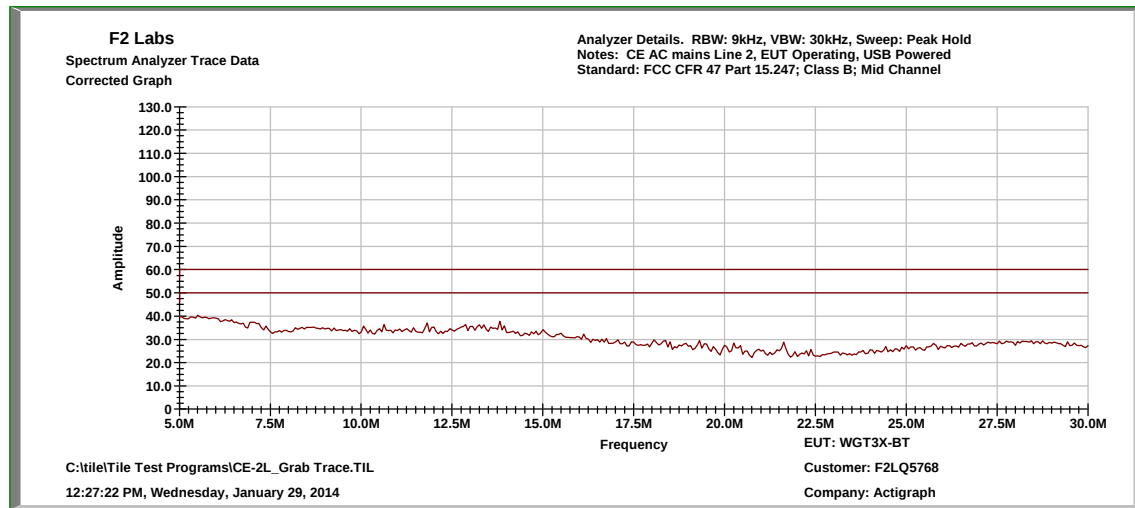


Conducted Test – Line 2: 0.5 MHz to 5.0 MHz, Mid Channel





Conducted Test – Line 2: 5.0 MHz to 30.0 MHz, Mid Channel



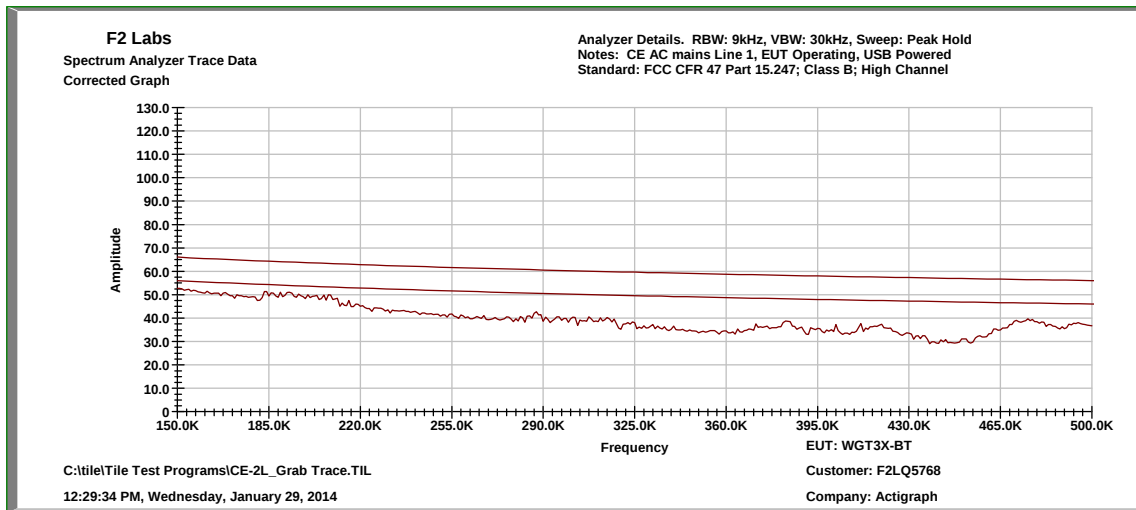
Mid Channel

Top Discrete Measurements

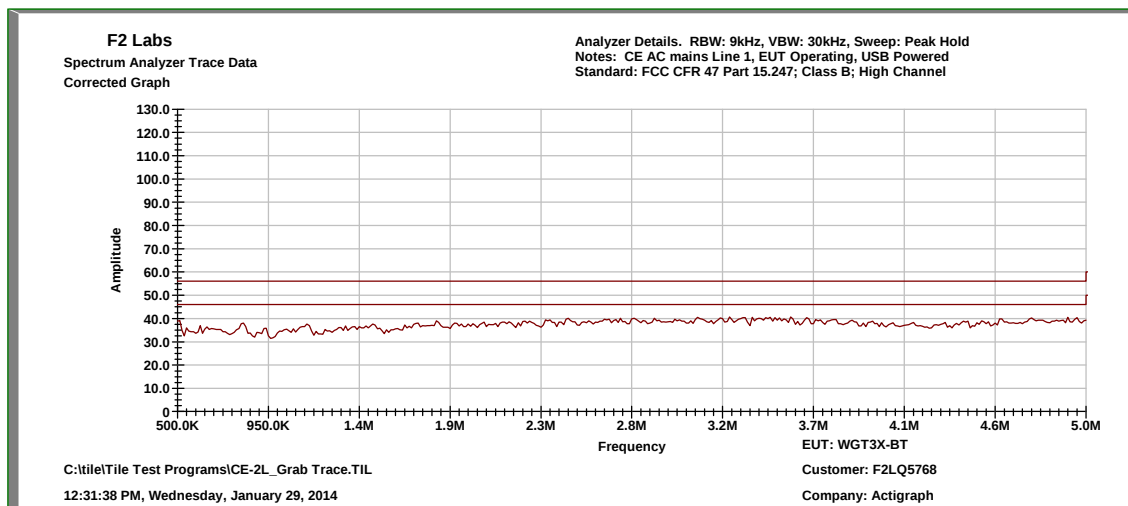
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 2	0.1535	Quasi-Peak	34.72	11.0	45.72	65.81	-20.1
			Average	9.12	11.0	20.12	55.81	-35.7
2	Line 2	0.190	Quasi-Peak	32.05	11.0	43.05	64.04	-21.0
			Average	25.68	11.0	36.68	54.04	-17.4
3	Line 2	0.209	Quasi-Peak	30.48	11.0	41.48	63.225	-21.7
			Average	25.23	11.0	36.23	53.225	-17.0
4	Line 2	0.477	Quasi-Peak	30.5	11.0	41.50	56.39	-14.9
			Average	26.43	11.0	37.43	46.39	-9.0
5	Line 2	0.826	Quasi-Peak	30.22	11.0	41.22	56	-14.8
			Average	26.75	11.0	37.75	46	-8.3
6	Line 2	5.44	Quasi-Peak	26.32	11.0	37.32	60	-22.7
			Average	20.31	11.0	31.31	50	-18.7



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

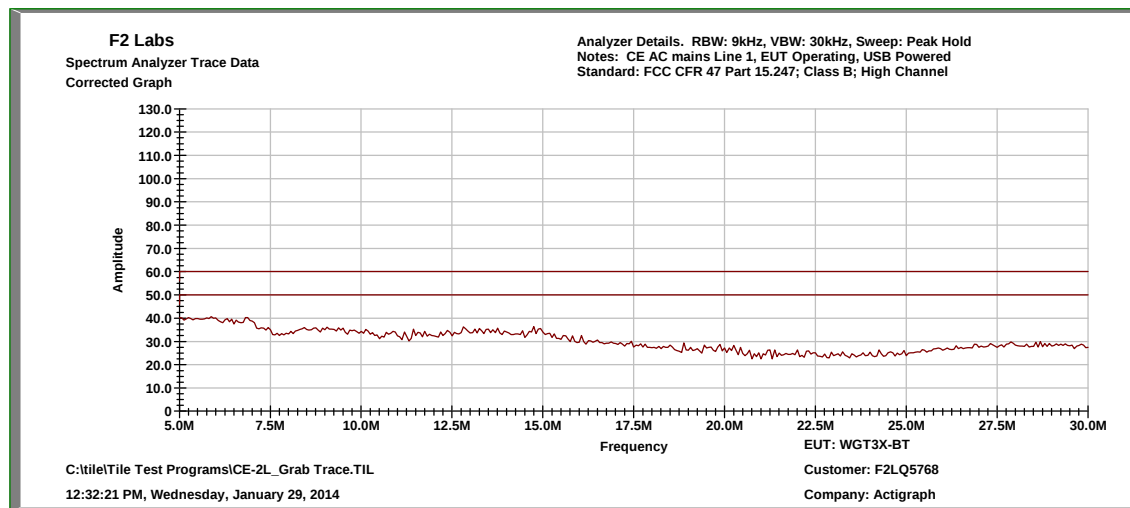


Conducted Test – Line 1: 0.5 MHz to 5.0 MHz, High Channel





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



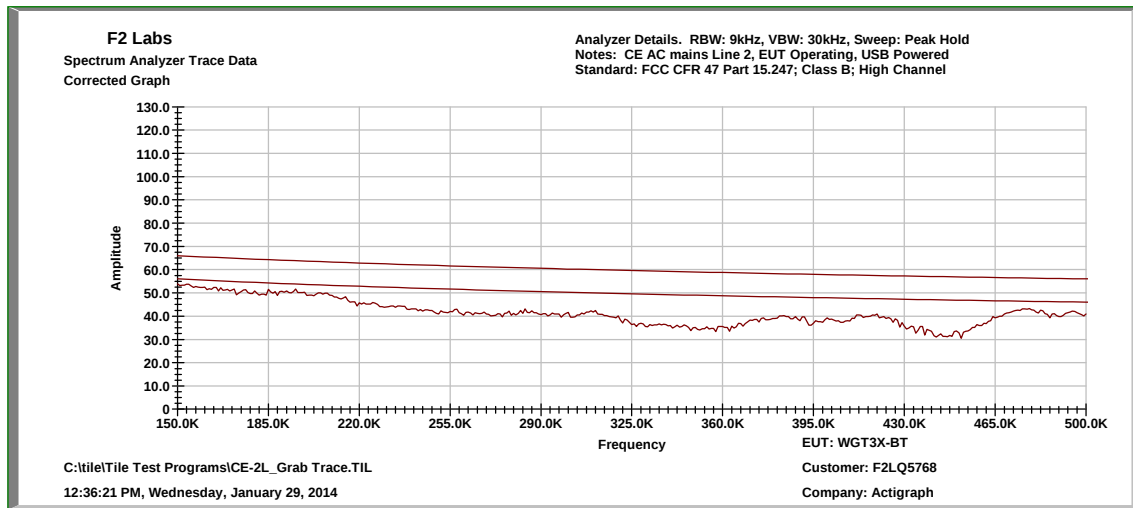
High Channel

Top Discrete Measurements

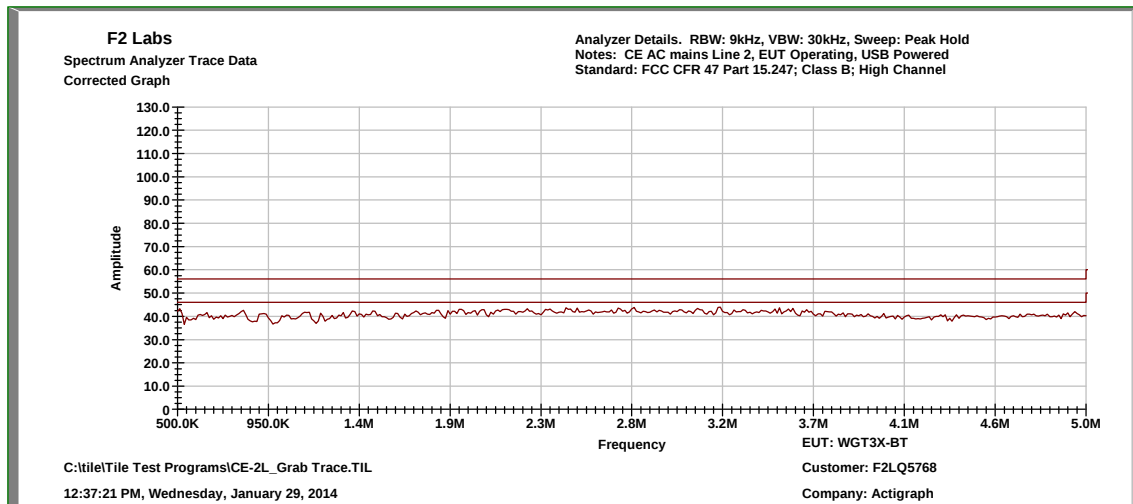
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.162	Quasi-Peak	36.07	11.0	47.07	65.349	-18.3
			Average	8.15	11.0	19.15	55.349	-36.2
2	Line 1	0.192	Quasi-Peak	33.05	11.0	44.05	63.951	-19.9
			Average	22.53	11.0	33.53	53.951	-20.4
3	Line 1	0.474	Quasi-Peak	31.47	11.0	42.47	56.43	-14.0
			Average	27.64	11.0	38.64	46.43	-7.8
4	Line 1	2.78	Quasi-Peak	30.51	11.0	41.51	56	-14.5
			Average	25.2	11.0	36.20	46	-9.8
5	Line 1	5.5	Quasi-Peak	28.66	11.0	39.66	60	-20.3
			Average	21.72	11.0	32.72	50	-17.3
6	Line 1	6.94	Quasi-Peak	26.31	11.0	37.31	60	-22.7
			Average	20.32	11.0	31.32	50	-18.7

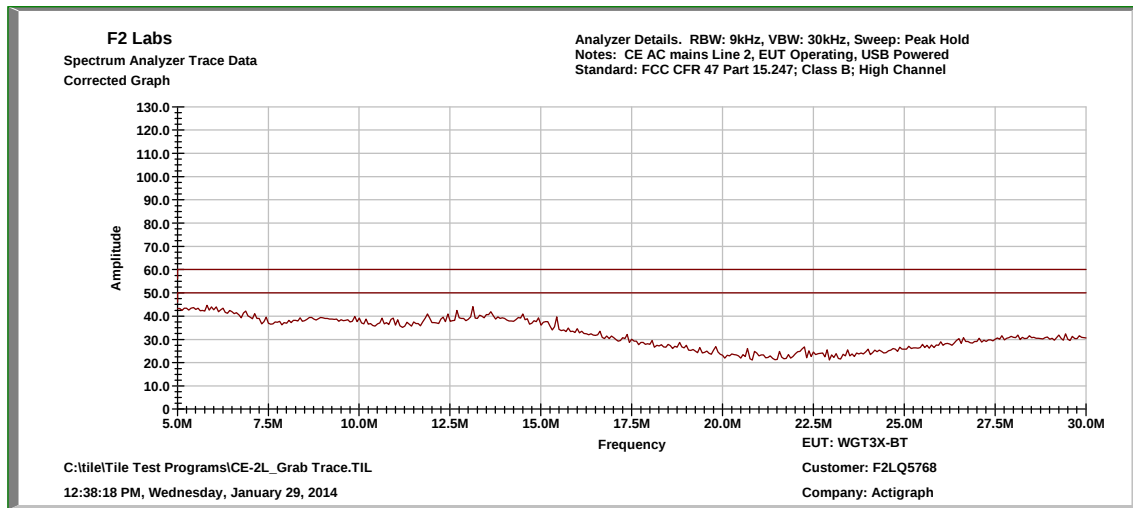


Conducted Test – Line 2: 0.15 MHz to 0.5 MHz, High Channel



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

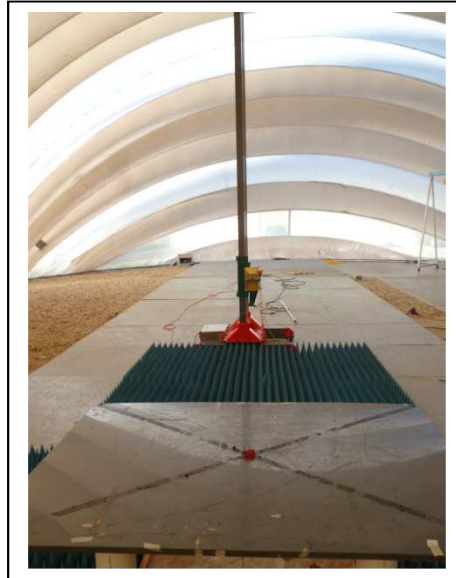


**Conducted Test – Line 2: 5.0 MHz to 30.0 MHz, High Channel****High Channel**

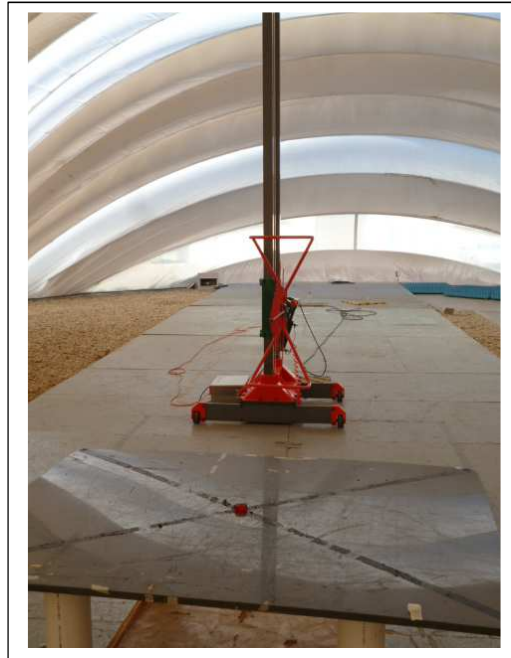
Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 2	0.1535	Quasi-Peak	34.75	11.0	45.75	65.81	-20.1
			Average	9.15	11.0	20.15	55.81	-35.7
2	Line 2	0.19	Quasi-Peak	31.82	11.0	42.82	64.04	-21.2
			Average	25.66	11.0	36.66	54.04	-17.4
3	Line 2	0.209	Quasi-Peak	30.56	11.0	41.56	63.225	-21.7
			Average	25.37	11.0	36.37	53.225	-16.9
4	Line 2	0.477	Quasi-Peak	30.71	11.0	41.71	56.39	-14.7
			Average	27.01	11.0	38.01	46.39	-8.4
5	Line 2	0.826	Quasi-Peak	29.89	11.0	40.89	56	-15.1
			Average	26.42	11.0	37.42	46	-8.6
6	Line 2	5.44	Quasi-Peak	26.45	11.0	37.45	60	-22.6
			Average	20.35	11.0	31.35	50	-18.7

13 PHOTOGRAPHS/EXHIBITS – PRODUCT PHOTOS, TEST SETUPS

Radiated Spurious Emission with 0.5dBi Integral Antenna



Radiated Spurious Emission with 0.5dBi Integral Antenna, cont'd



**Conducted Output Power, Peak Power Spectral Density,
-6dB Occupied Bandwidth, and Conducted Spurious Emissions**





Conducted Emissions

