



**F2 Labs**  
**16740 Peters Road**  
**Middlefield, Ohio 44062**  
**United States of America**  
**[www.f2labs.com](http://www.f2labs.com)**

## **CERTIFICATION TEST REPORT**

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**Manufacturer:** Sonic Notify Inc.  
251 Fifth Avenue, Floor 6  
New York, New York 10016  
United States of America

**Applicant:** Same As Above

**Product:** Shelf Beacon

**Model:** 4.70DC

**FCC ID:** 2ACB9470-DC

**Testing Commenced:** May 6, 2014

**Testing Ended:** June 2, 2014

**Summary of Test Results:** Page 5

**Standards:**

- ❖ **FCC Part 15 Subpart C, Section 15.249**
- ❖ **FCC Part 15 Subpart C, Section 15.215(c) – Additional provisions to the general radiated emission limitations**
- ❖ **FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards**



**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

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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 2009 version of ANSI C63.4 and recommended FCC procedure of measurement of DTS operating under Section 15.249. 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
F2LQ6064C-05E	First Issue	June 26, 2014	W. Fuster



**2 SUMMARY OF TEST RESULTS**

Test Name	Standard(s)	Results
-20dB Occupied Bandwidth	CFR 47 Part 15.215(c)	Complies
Field Strength of Emissions	CFR 47 Part 15.249(a)(d)	Complies

Note: product was operated using 2-“C” batteries.  
Requirements of 15.31 were met by using new batteries.

Modifications Made to the Equipment
None

**3 TABLE OF MEASURED RESULTS**

Test	High Channel 2.480GHz	Mid Channel 2.440GHz	Low Channel 2.402GHz
Average Field Strength of Fundamental	91.45 dB $\mu$ V/m	88.26 dB $\mu$ V/m	90.56 dB $\mu$ V/m
Peak Field Strength of Fundamental	92.35 dB $\mu$ V/m	88.46 dB $\mu$ V/m	91.6 dB $\mu$ V/m
Average Limit for Fundamental	50 millivolts/meter (93.98 dB $\mu$ V/m)	50 millivolts/meter (93.98 dB $\mu$ V/m)	50 millivolts/meter (93.98 dB $\mu$ V/m)
Peak Limit for Fundamental	(113.98dBuV/m)	(113.98dBuV/m)	(113.98dBuV/m)
-20dB Occupied Bandwidth	132.650kHz	135.187kHz	132.811kHz

The 20 dB bandwidth of the emission shall be contained within the frequency band designated in the rule section under which the equipment is operated.



#### **4 ENGINEERING STATEMENT**

This report has been prepared on behalf of Sonic Notify Inc. to provide documentation for the testing described herein. This equipment has been tested and found to comply with part 15.249 of the FCC Rules using ANSI C63.4 2009 standard. 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: Shelf Beacon  
Model: 4.70DC  
Serial No.: 803600  
FCC ID: **2ACB9470-DC**

**5.2 Trade Name:**

Sonic Notify Inc.

**5.3 Power Supply:**

Battery-Operated

**5.4 Applicable Rules:**

CFR 47, Part 15.249

**5.5 Equipment Category:**

Radio Transmitter-DTS

**5.6 Antenna:**

0dBi Gain Integral 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:**

EUT was set up in a normal operating mode, connected to a smart phone via Bluetooth, pinging to a smart phone. Device was transmitting in three different channels (low, mid and high). Device was 12V DC powered.



**6 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shield Room	0175	Ray Proof	N/A	11645	Aug. 7, 2014
Temp./Humidity Recorder	CL119	Extech	RH520	H005869	Jan. 8, 2015
OATS-3m	CL017	Compliance Labs	N/A	001	Dec. 13, 2014
OATS-10m	CL017	Compliance Labs	N/A	001	Dec. 13, 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
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 3, 2015
Horn Antenna	CL114	A.H. Systems, Inc.	SAS-572	237	Sept. 16, 2014
Pre-Amplifier	CL045	Hewlett-Packard	8447D	2944A08445	Nov. 15, 2015
Pre-Amplifier	CL153	Agilent	83006-69007	MY39500900	Jan. 9, 2015
Amp. w/Monopole & 18" Loop	CL163	A.H. Systems, Inc.	EHA-52B	100	Apr. 24, 2015
Software:	Tile Version 1.0		Software Verified: May 5, 2014		
Software:	EMC 32, Version 5.20.2		Software Verified: May 5, 2014		



## 7 FCC PART 15.215(e) – OCCUPIED BANDWIDTH

### 7.1 Requirements:

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

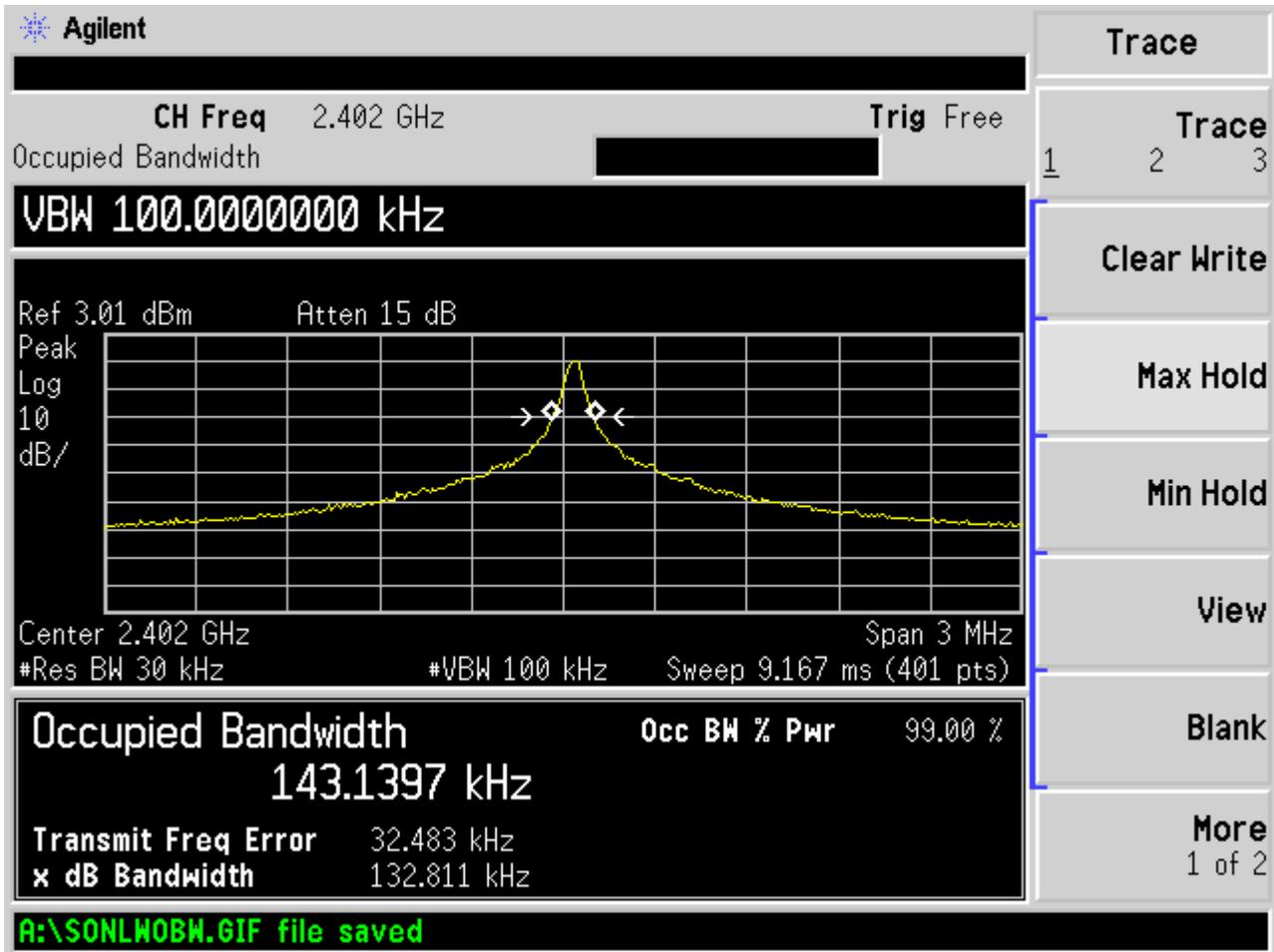
Bandwidth measurements were made at the low (2.404 GHz), mid (2.440 GHz) and upper (2.480 GHz) frequencies. The bandwidth was measured using the analyzer's marker function.



### 7.2 Occupied Bandwidth Test Data

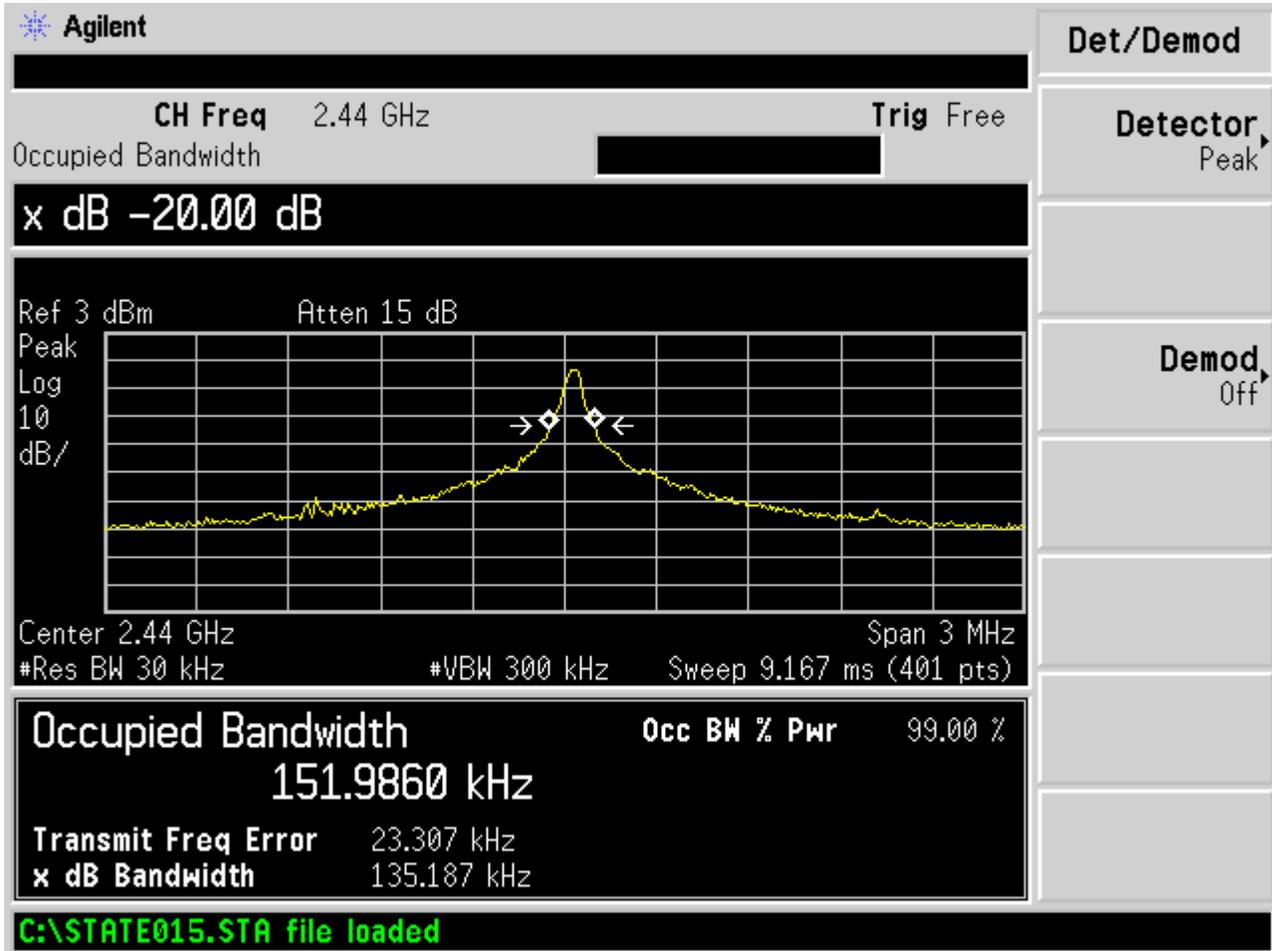
<b>Test Date:</b>	May 13-15, 2014	<b>Test Engineers:</b>	J. Knepper, K. Littell
<b>Standards:</b>	CFR 47 Part 15.215(c)	<b>Air Temperature:</b>	20.7°C
		<b>Relative Humidity:</b>	49%

#### Low Channel



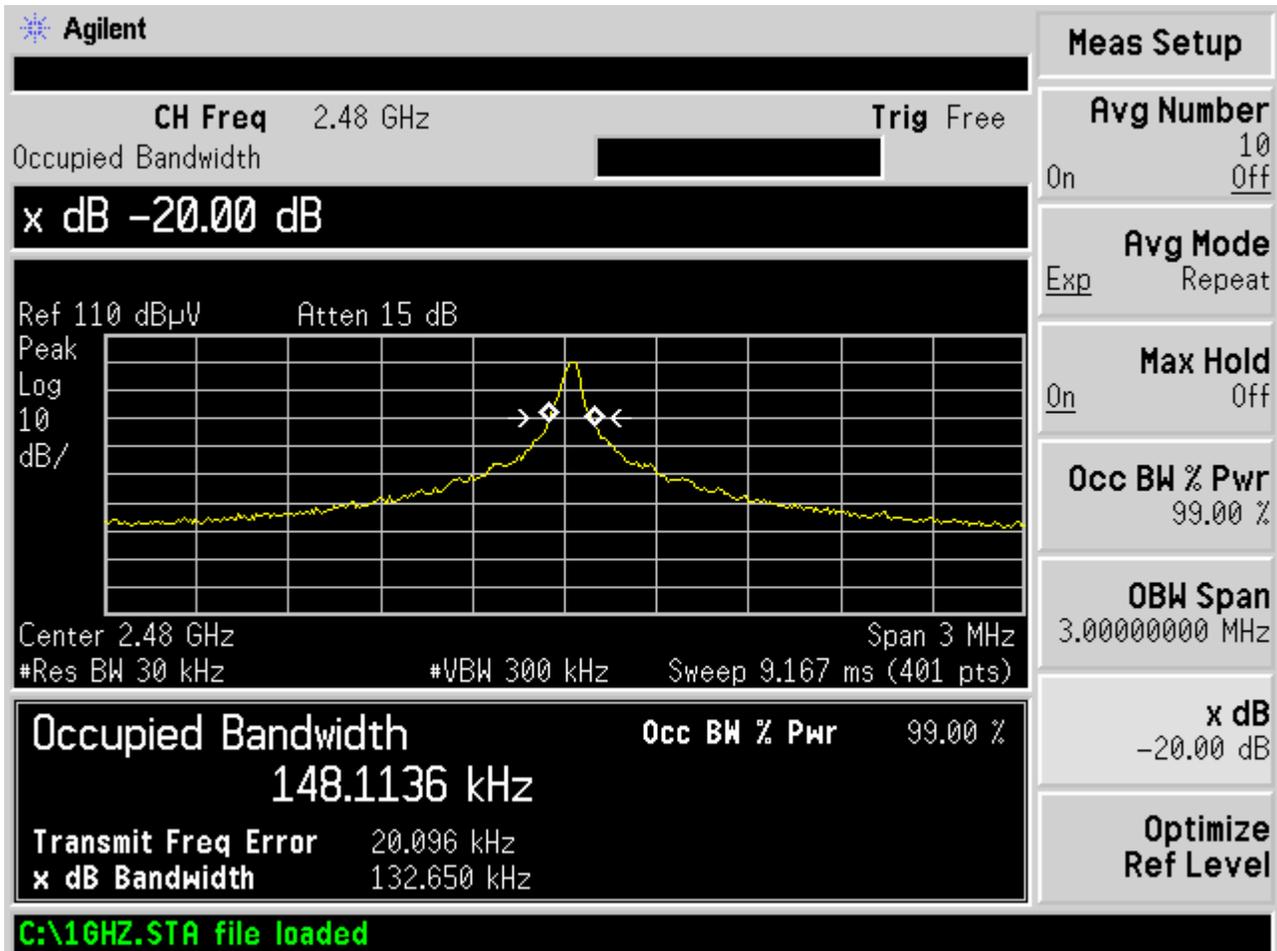


### Mid Channel





### High Channel





**8 FCC PART 15.249(a)(d) – FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS**

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

<b>Fundamental frequency</b>	<b>Field strength of fundamental (millivolts/meter)</b>	<b>Field strength of harmonics (microvolts/meter)</b>
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

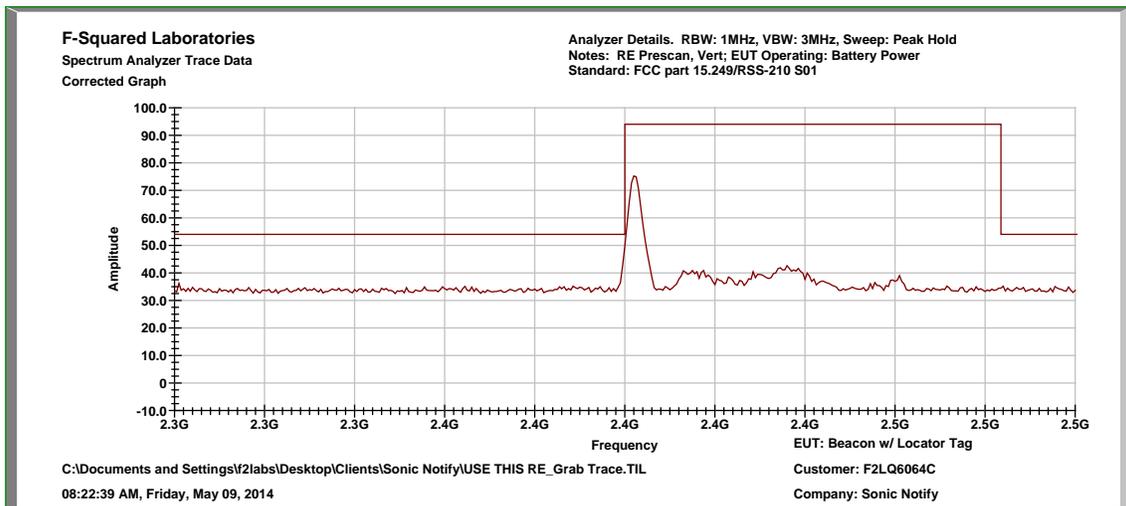
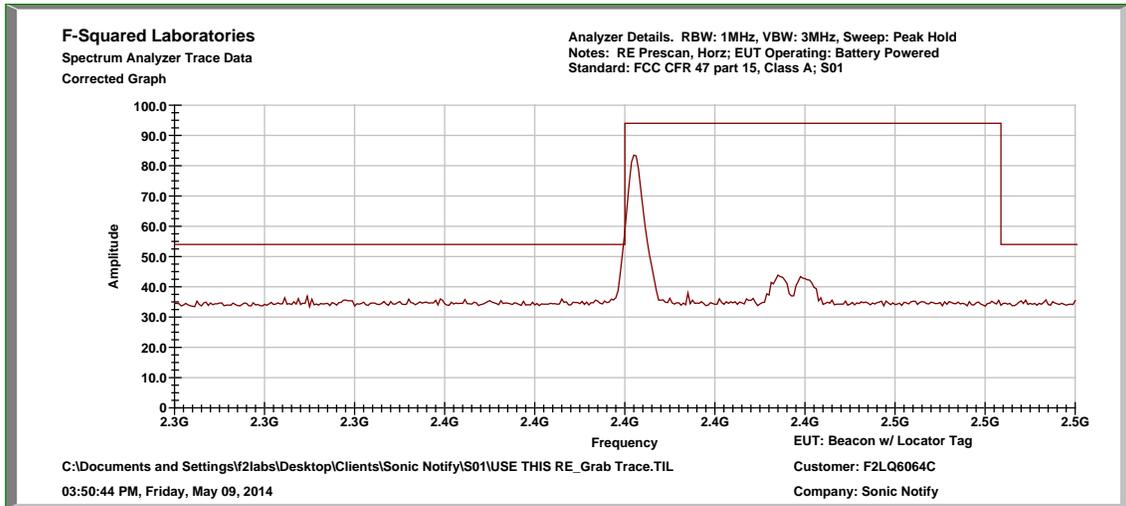
At least 6 of the highest frequencies were measured per ANSI 63.4 on the Open Area Test Site. Frequencies below 1GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit.



### 8.1 Test Data - Field Strength of Emissions from Intentional Radiators

<b>Test Date:</b>	June 2, 2014	<b>Test Engineers:</b>	J. Knepper, K. Littell
<b>Standards:</b>	CFR 47 Part 15.249(a)	<b>Air Temperature:</b>	24.1°C
		<b>Relative Humidity:</b>	59%

#### Low Channel



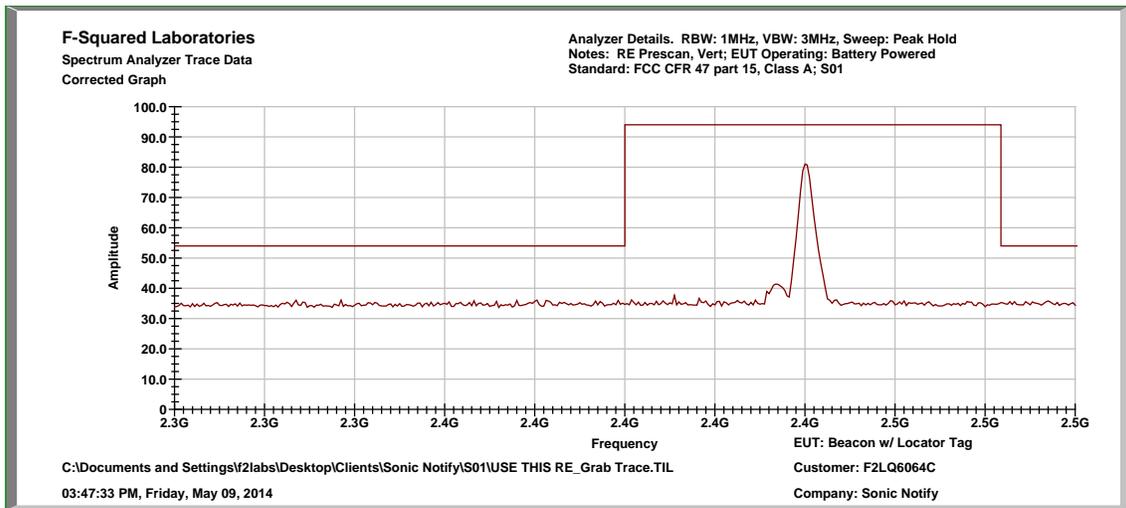
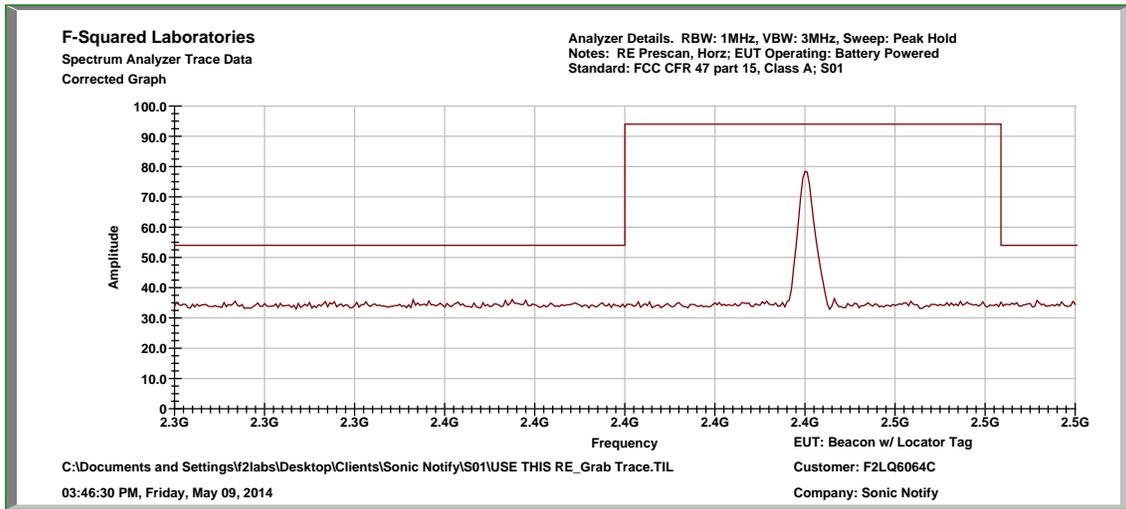


### Low Channel

Frequency (MHz)	Polarity	Corr. (dB)	MaxPeak (dBµV/m)	MaxPeak (dBµV/m) Limit	MaxPeak Margin	Average (dBµV/m)	Average (dBµV/m) Limit	Average Margin	Bandwidth (kHz)
2399.000000	V	6.96	57.16	74	-16.8	32.06	54	-21.9	1000.000
2399.000000	H	6.96	43.86	74	-30.1	31.16	54	-22.8	1000.000
2401.000000	H	6.96	60.36	113.97	-53.6	52.56	93.97	-41.4	1000.000
2402.000000	H	6.96	80.76	113.97	-33.2	80.06	93.97	-13.9	1000.000
2402.000000	V	6.96	91.16	113.97	-22.8	90.56	93.97	-3.4	1000.000
2405.000000	H	6.96	54.26	74	-19.7	31.36	54	-22.6	1000.000
2406.000000	H	6.96	56.86	74	-17.1	31.66	54	-22.3	1000.000
2406.000000	V	6.96	61.56	74	-12.4	31.76	54	-22.2	1000.000
2407.000000	V	6.96	54.56	74	-19.4	31.56	54	-22.4	1000.000
2484.000000	H	7.05	44.75	74	-29.3	31.35	54	-22.7	1000.000
2484.000000	V	7.05	57.55	74	-16.5	32.35	54	-21.7	1000.000



### Mid Channel



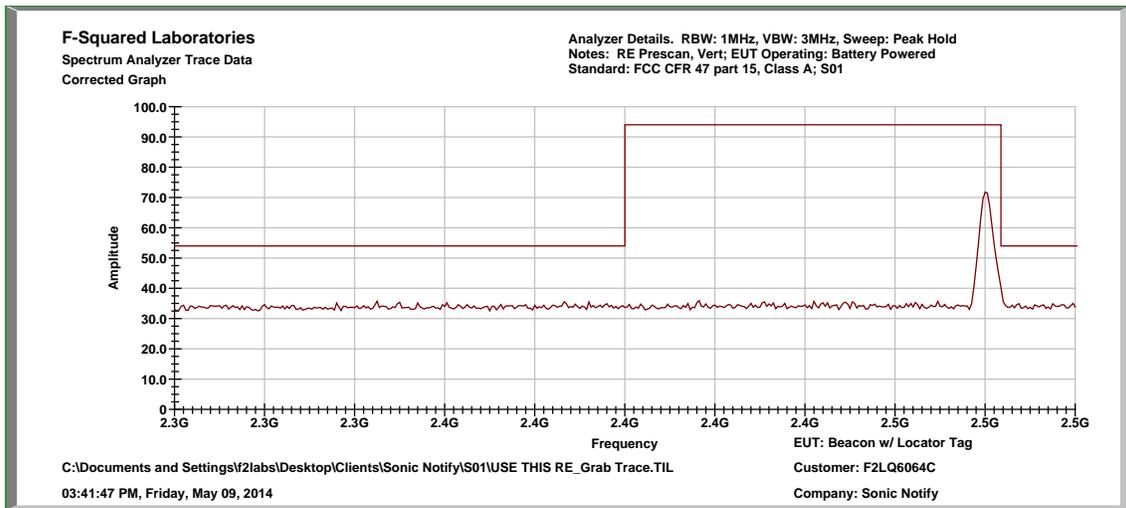
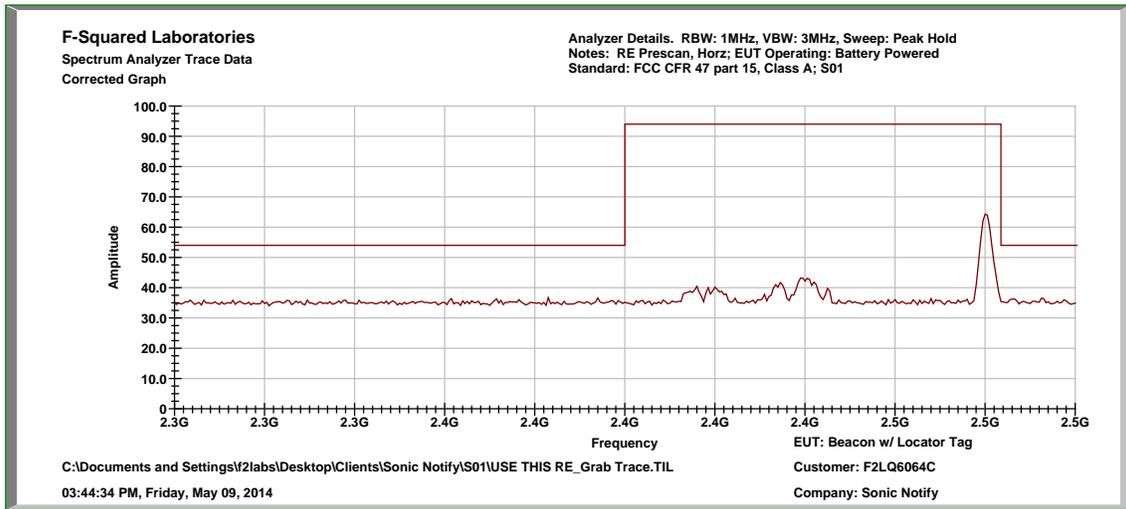


Mid Channel

Frequency (MHz)	Polarity	Corr. (dB)	MaxPeak (dB $\mu$ V/m)	MaxPeak (dB $\mu$ V/m) Limit	MaxPeak Margin	Average (dB $\mu$ V/m)	Average (dB $\mu$ V/m) Limit	Average Margin	Bandwidth (kHz)
2390.000000	V	6.96	32.16	74	-41.8	19.26	54	-34.7	1000.000
2390.000000	H	6.96	41.06	74	-32.9	27.76	54	-26.2	1000.000
2435.000000	V	6.96	32.96	74	-41.0	19.66	54	-34.3	1000.000
2435.000000	H	6.96	58.26	74	-15.7	32.96	54	-21.0	1000.000
2438.000000	H	6.96	56.46	74	-17.5	30.16	54	-23.8	1000.000
2438.000000	V	6.96	33.36	74	-40.6	19.66	54	-34.3	1000.000
2440.000000	V	6.96	88.46	113.97	-25.5	88.26	93.97	-5.7	1000.000
2440.000000	H	6.96	82.16	113.97	-31.8	81.86	93.97	-12.1	1000.000
2484.000000	H	6.96	41.86	74	-32.1	27.96	54	-26.0	1000.000
2484.000000	V	7.05	41.85	74	-32.2	28.25	54	-25.8	1000.000



### High Channel





### High Channel

Frequency (MHz)	Polarity	Corr. (dB)	MaxPeak (dBµV/m)	MaxPeak (dBµV/m) Limit	MaxPeak Margin	Average (dBµV/m)	Average (dBµV/m) Limit	Average Margin	Bandwidth (kHz)
2390.000000	V	6.96	44.76	74	-29.2	31.36	54	-22.6	1000.000
2390.000000	H	6.96	44.06	74	-29.9	31.26	54	-22.7	1000.000
2479.000000	V	7.05	64.85	113.97	-49.1	61.25	93.97	-32.7	1000.000
2479.000000	H	7.05	60.85	113.97	-53.1	56.85	93.97	-37.1	1000.000
2480.000000	H	7.05	82.35	113.97	-31.6	81.55	93.97	-12.4	1000.000
2480.000000	V	7.05	92.35	113.97	-21.6	91.45	93.97	-2.5	1000.000
2481.000000	H	7.05	58.45	113.97	-55.5	55.75	93.97	-38.2	1000.000
2481.000000	V	7.05	62.55	113.97	-51.4	60.25	93.97	-33.7	1000.000
2484.000000	H	7.05	45.25	74	-28.8	31.75	54	-22.3	1000.000
2484.000000	V	7.05	45.75	74	-28.3	32.45	54	-21.6	1000.000



## 8.2 Test Data – Spurious Emissions

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. At some frequencies, 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. Frequencies below 1GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit.

In the following plots, the black line indicates ambient noise and the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables below.

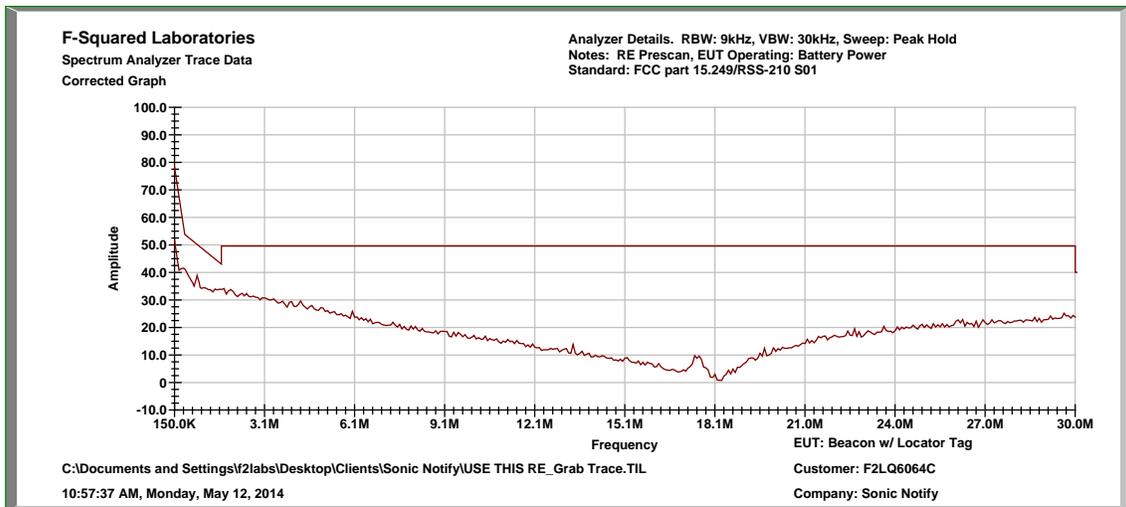


<b>Test Dates:</b>	May 6-12, 2014	<b>Test Engineers:</b>	J. Knepper, K. Littell
<b>Standards:</b>	CFR 47 Part 15.249(d) / Part 15.209	<b>Air Temperature:</b>	24.8°C
		<b>Relative Humidity:</b>	58%

Low Channel, .009 to 0.15 MHz

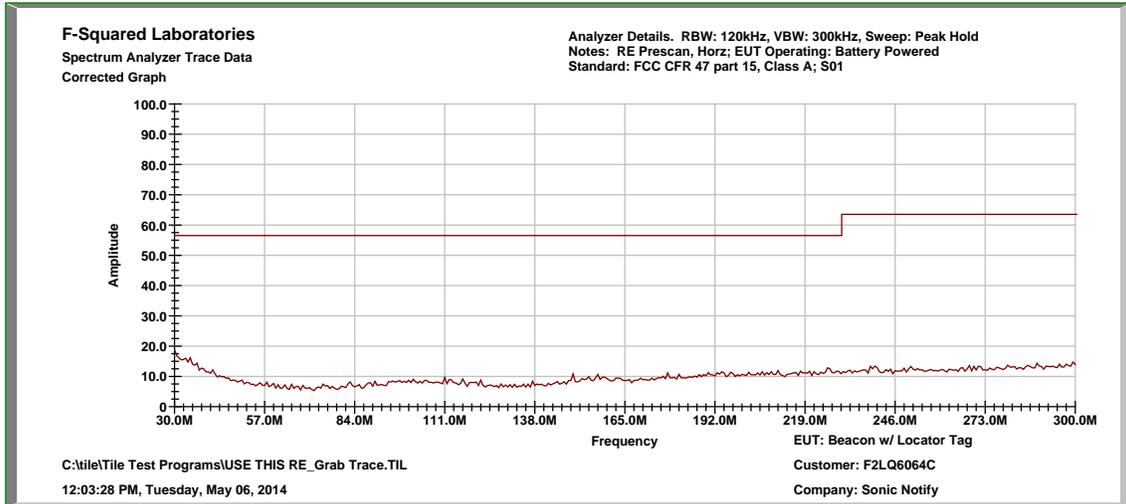


Low Channel, 0.15 MHz to 30 MHz

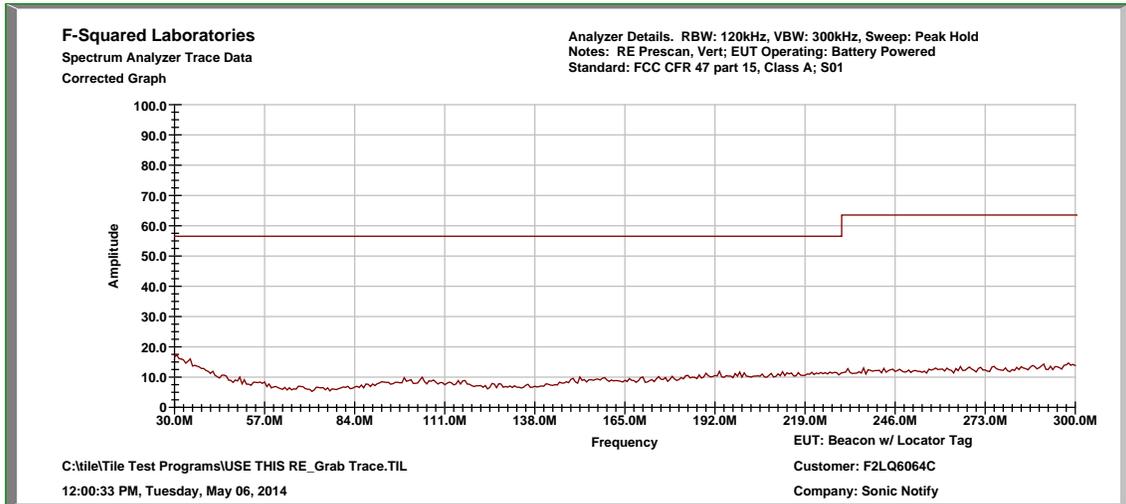




### Low Channel, 30 MHz to 300 MHz, Horizontal

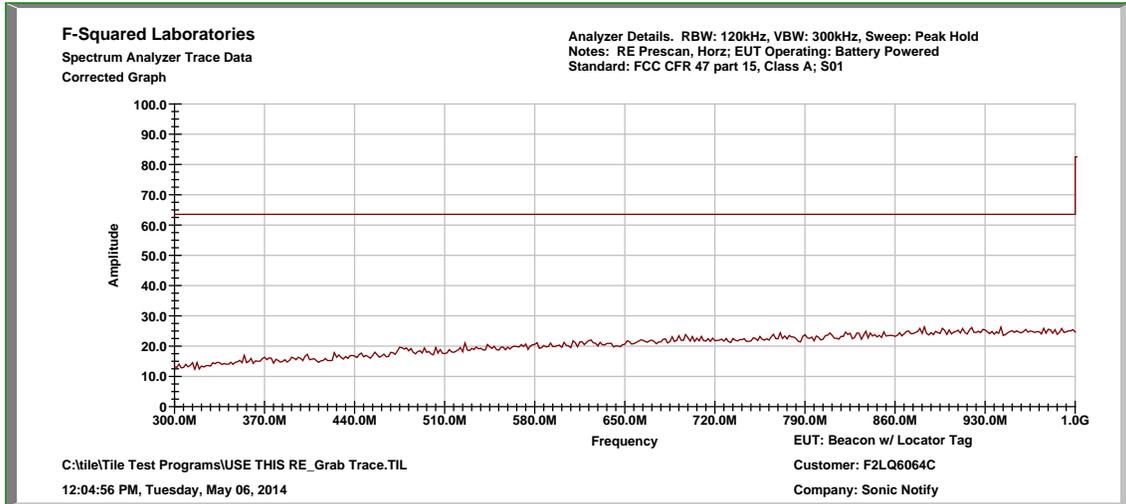


### Low Channel, 30 MHz to 300 MHz, Vertical

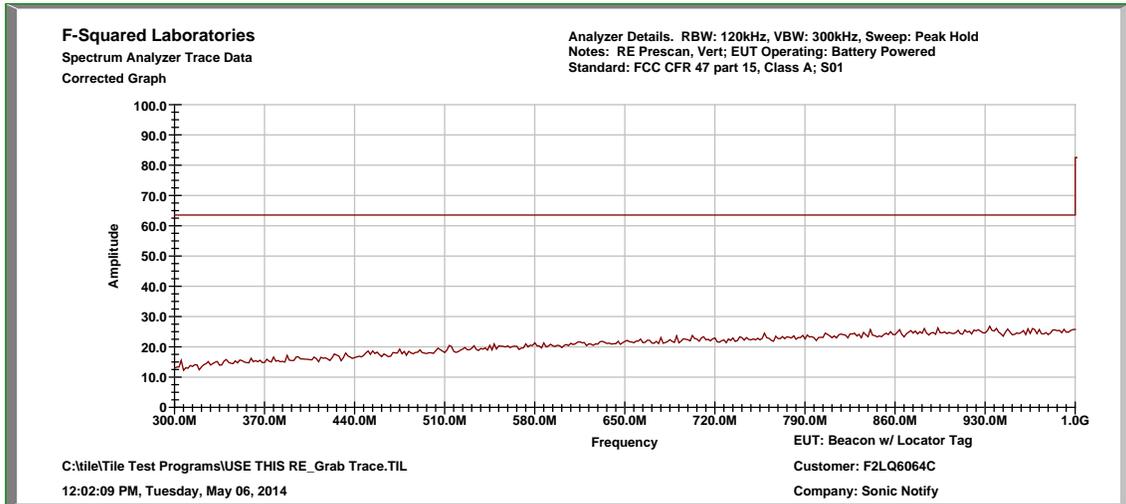




### Low Channel, 300 MHz to 1 GHz, Horizontal

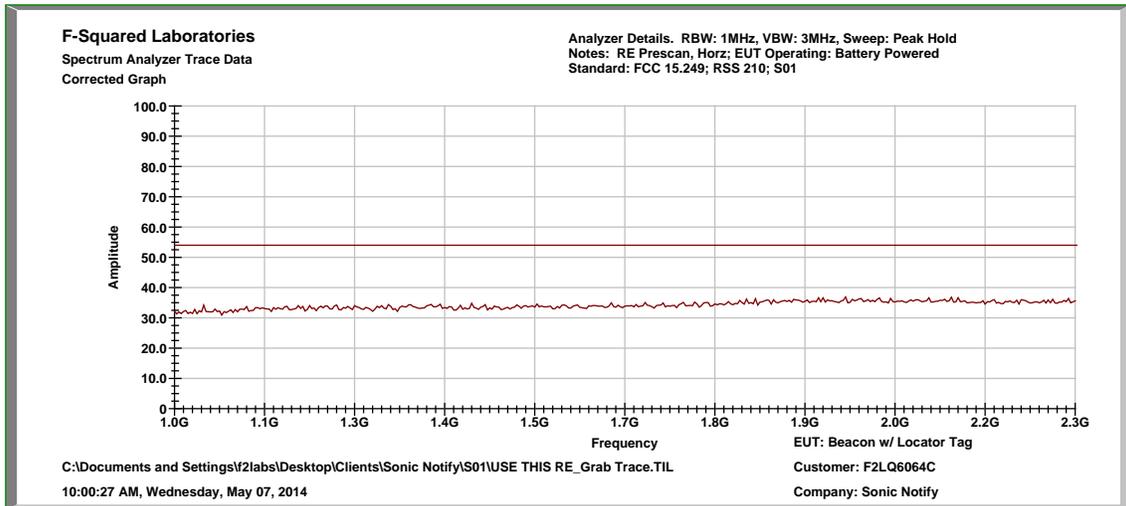


### Low Channel, 30 MHz to 1 GHz, Vertical

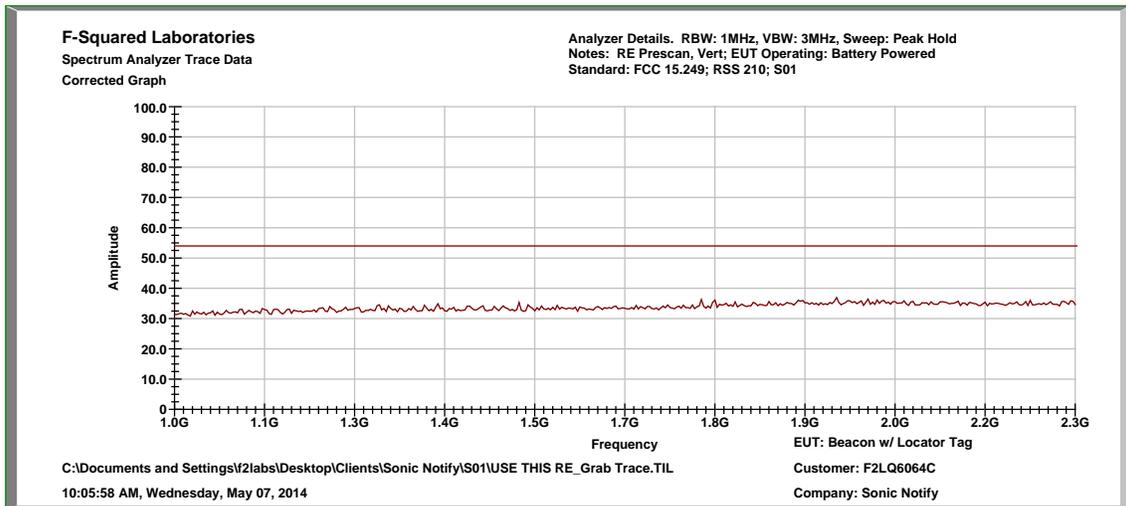




### Low Channel, 1 GHz to 2.3 GHz, Horizontal

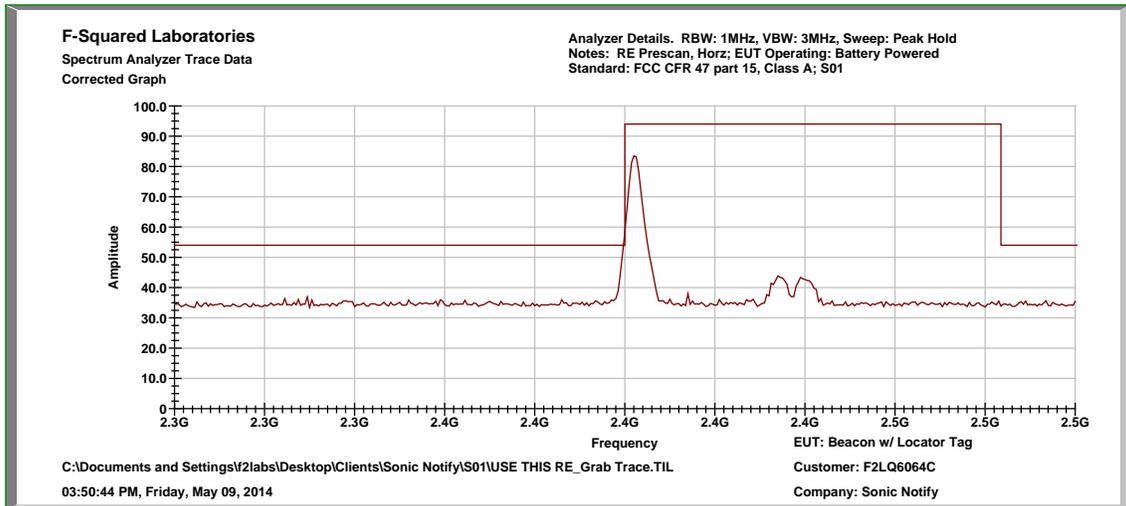


### Low Channel, 1 GHz to 2.3 GHz, Vertical





### Low Channel, 2.3 GHz to 2.5 GHz, Horizontal

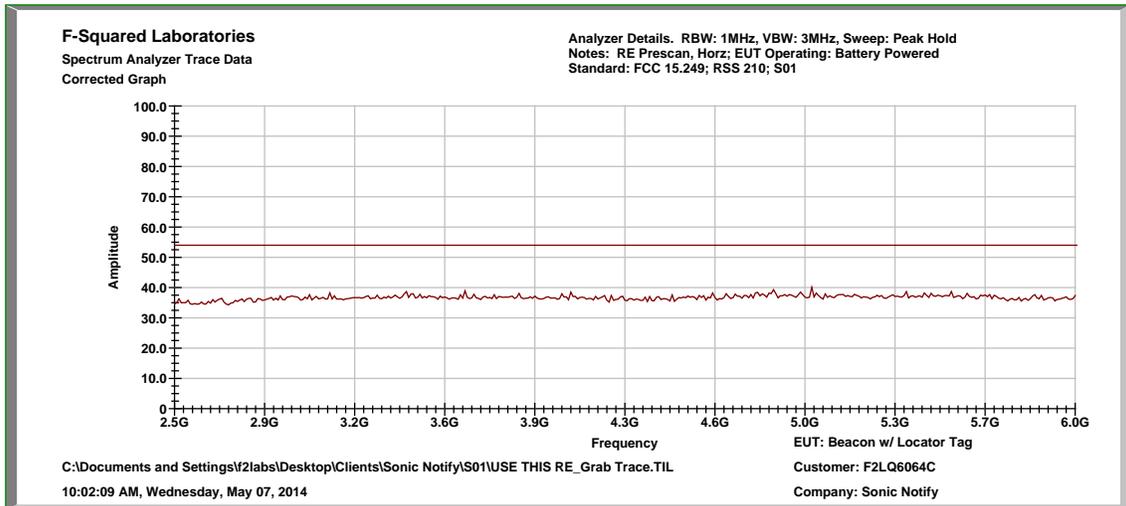


### Low Channel, 2.3 GHz to 2.5 GHz, Vertical

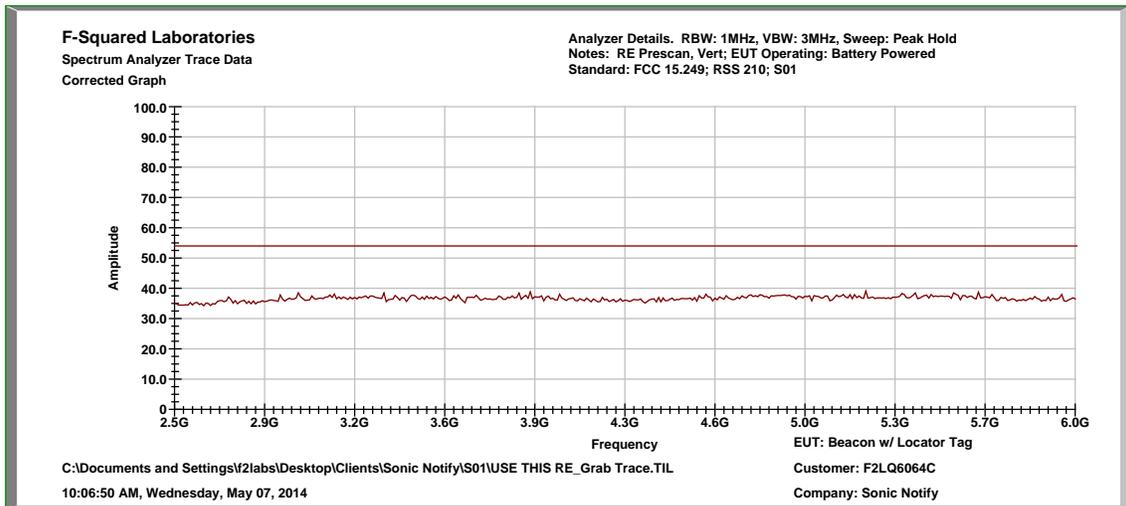




### Low Channel, 2.5 GHz to 6 GHz, Horizontal



### Low Channel, 2.5 GHz to 6 GHz, Vertical

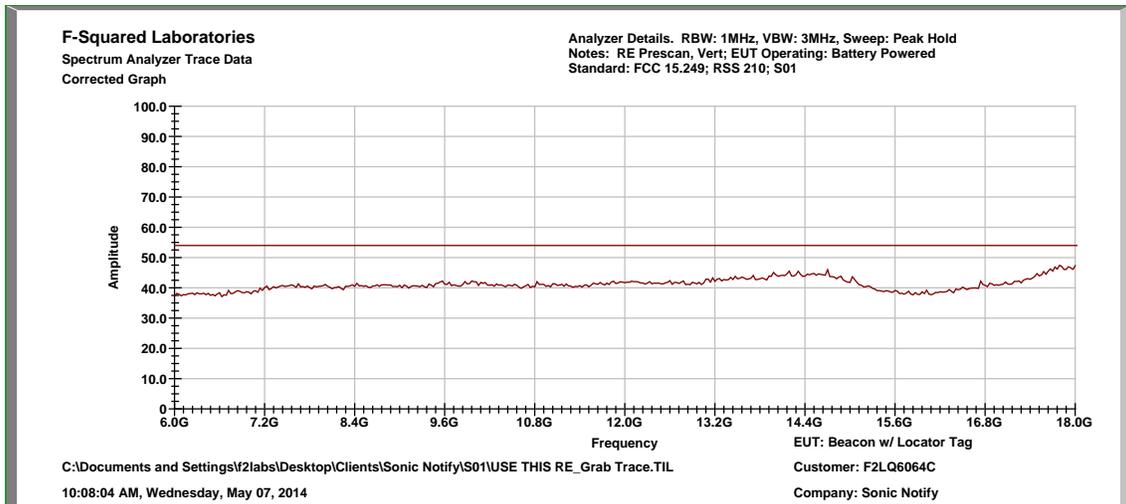




### Low Channel, 6 GHz to 18 GHz, Horizontal

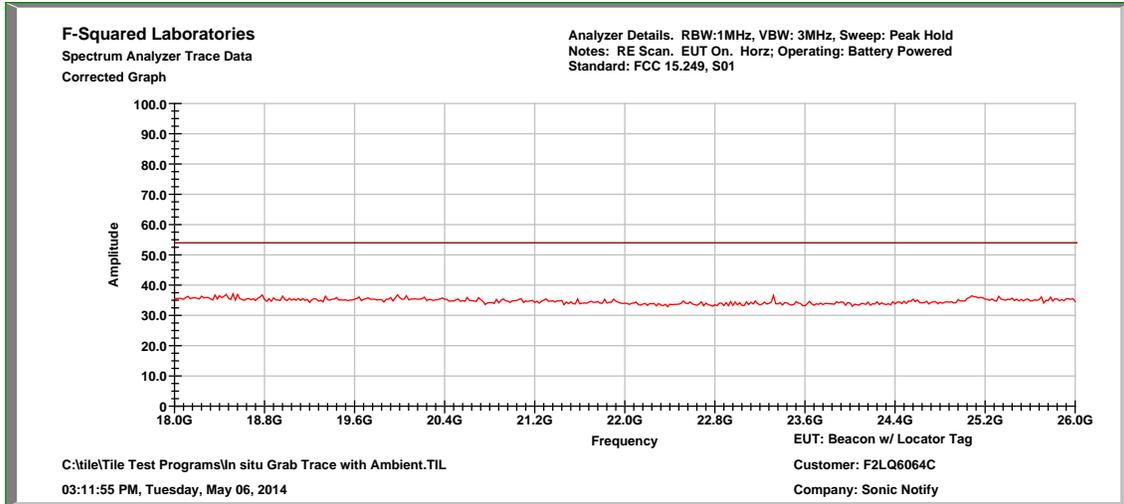


### Low Channel, 6 GHz to 18 GHz, Vertical

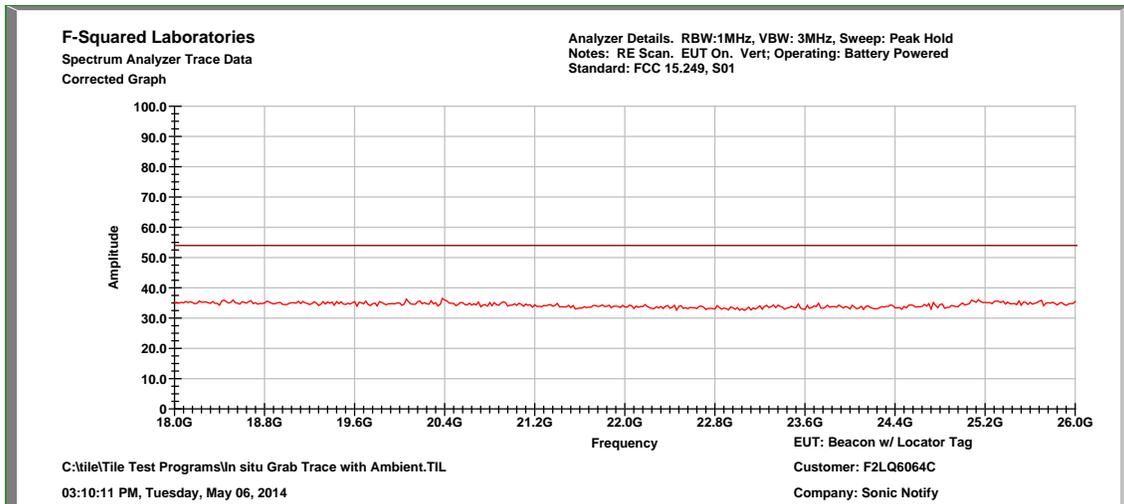




### Low Channel, 18 GHz to 26 GHz, Horizontal

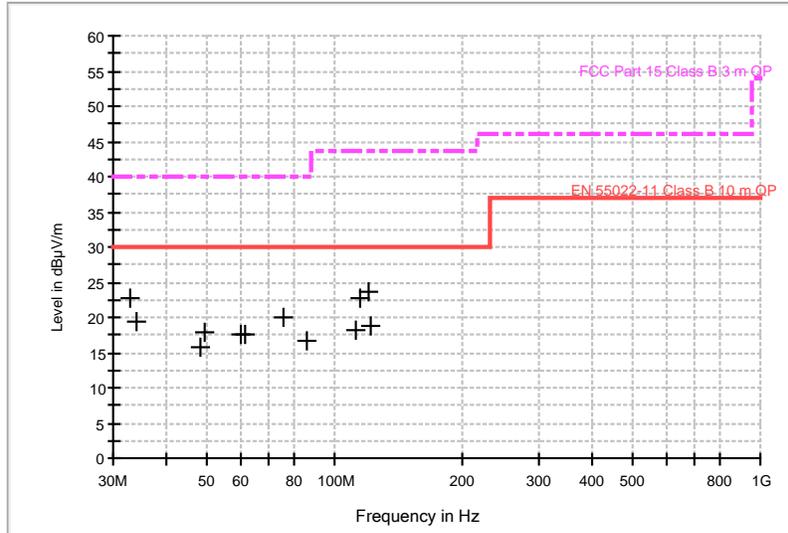


### Low Channel, 18 GHz to 26 GHz, Vertical





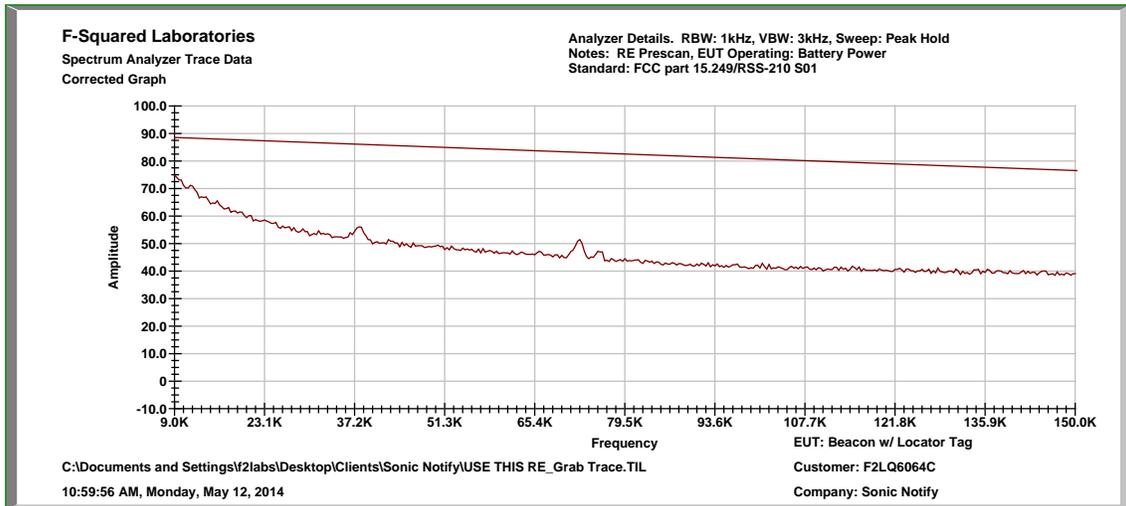
Low Channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
33.020000	22.7	50.0	120.000	155.0	V	19.7	17.3	40.0
34.180000	19.5	50.0	120.000	155.0	H	19.9	20.5	40.0
48.360000	15.8	50.0	120.000	155.0	H	10.9	24.2	40.0
49.490000	17.8	50.0	120.000	155.0	V	10.4	22.2	40.0
59.870000	17.5	50.0	120.000	155.0	H	10.9	22.5	40.0
61.270000	17.6	50.0	120.000	155.0	V	10.5	22.4	40.0
75.780000	19.9	50.0	120.000	155.0	H	11.0	20.1	40.0
85.210000	16.6	50.0	120.000	155.0	V	11.3	23.4	40.0
111.250000	18.0	50.0	120.000	155.0	H	17.0	25.5	43.5
115.000000	22.8	50.0	120.000	155.0	V	16.9	20.8	43.5
120.020000	23.7	50.0	120.000	155.0	V	17.8	19.8	43.5
121.370000	18.8	50.0	120.000	155.0	H	17.7	24.7	43.5



### Mid Channel, .009 to 0.15 MHz

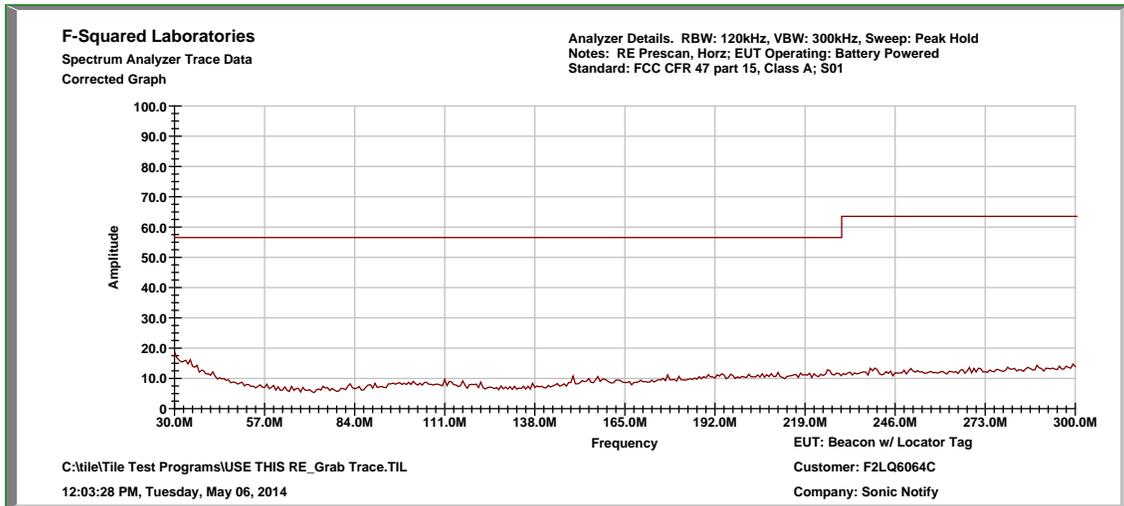


### Mid Channel, 0.15 MHz to 30 MHz

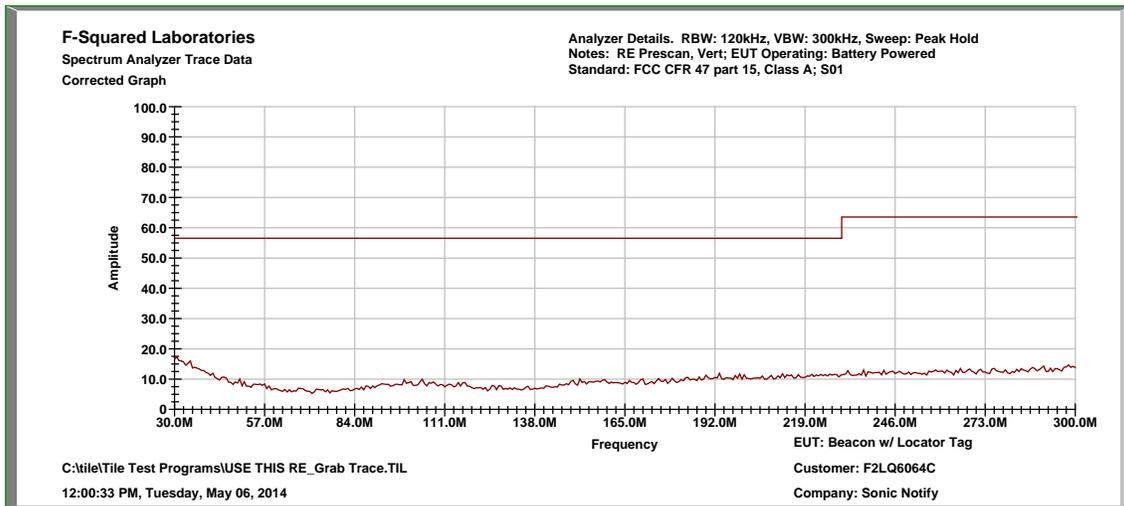




### Mid Channel, 30 MHz to 300 MHz, Horizontal

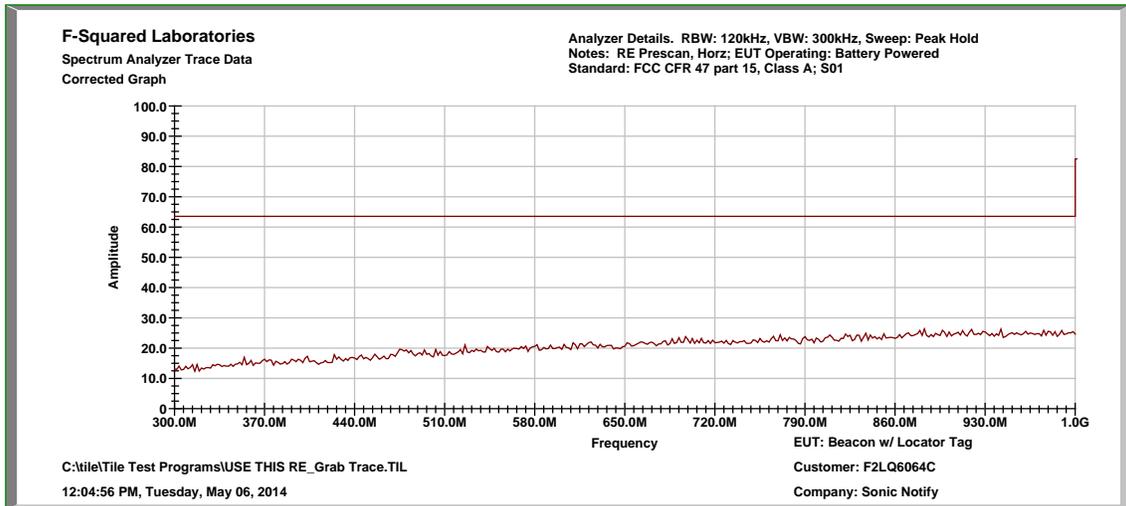


### Mid Channel, 30 MHz to 300 MHz, Vertical

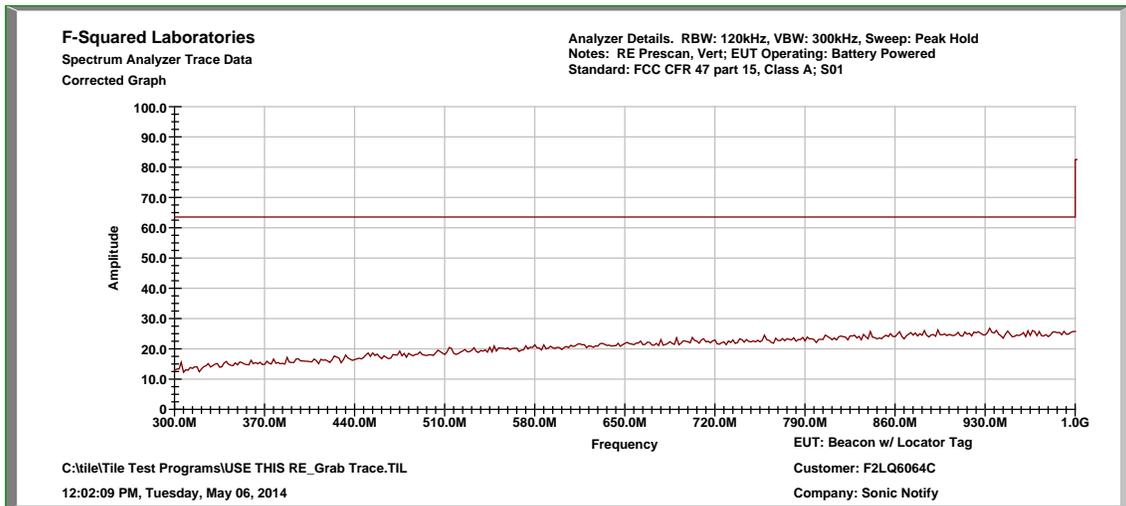




### Mid Channel, 300 MHz to 1 GHz, Horizontal

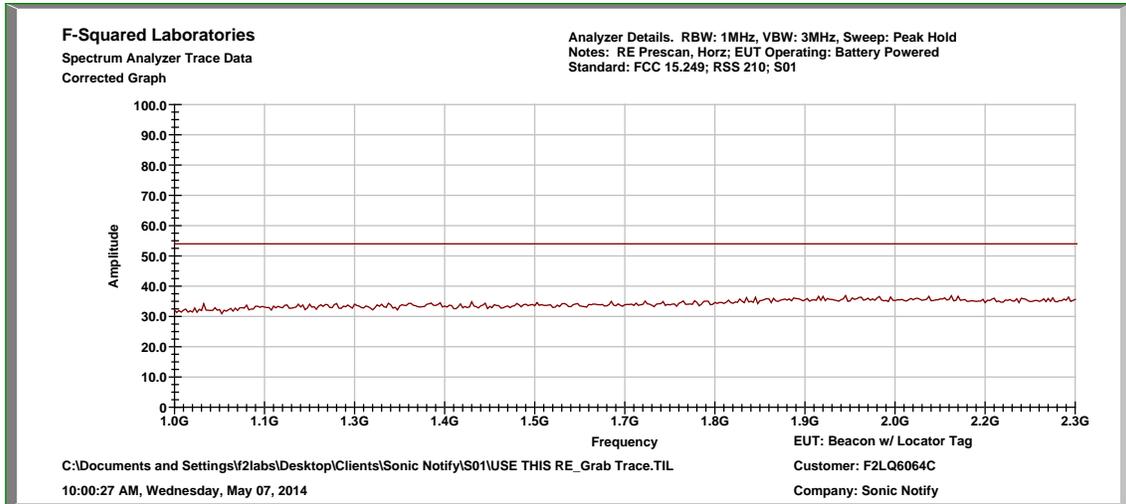


### Mid Channel, 300 MHz to 1 GHz, Vertical

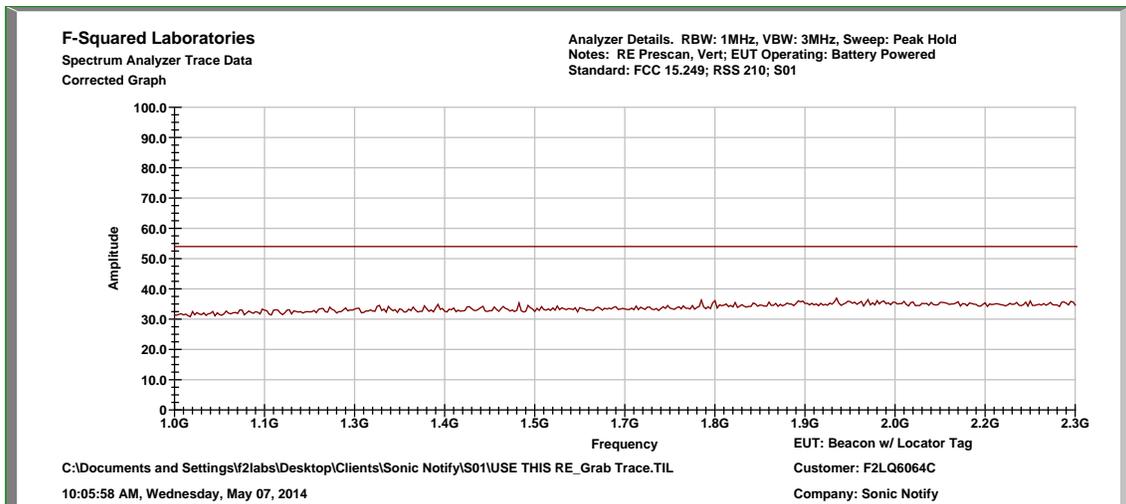




### Mid Channel, 1 GHz to 2.3 GHz, Horizontal

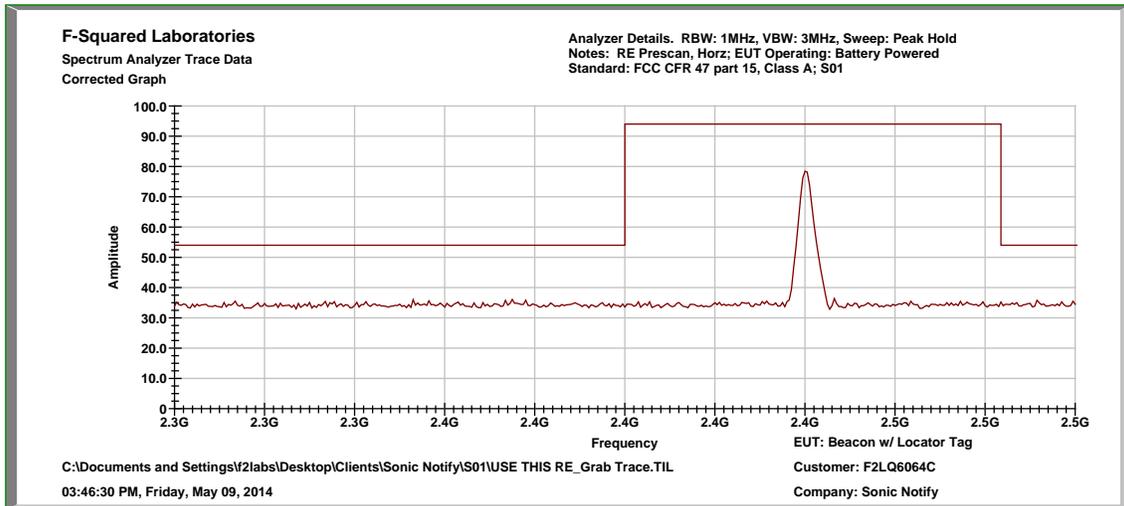


### Mid Channel, 1 GHz to 2.3 GHz, Vertical

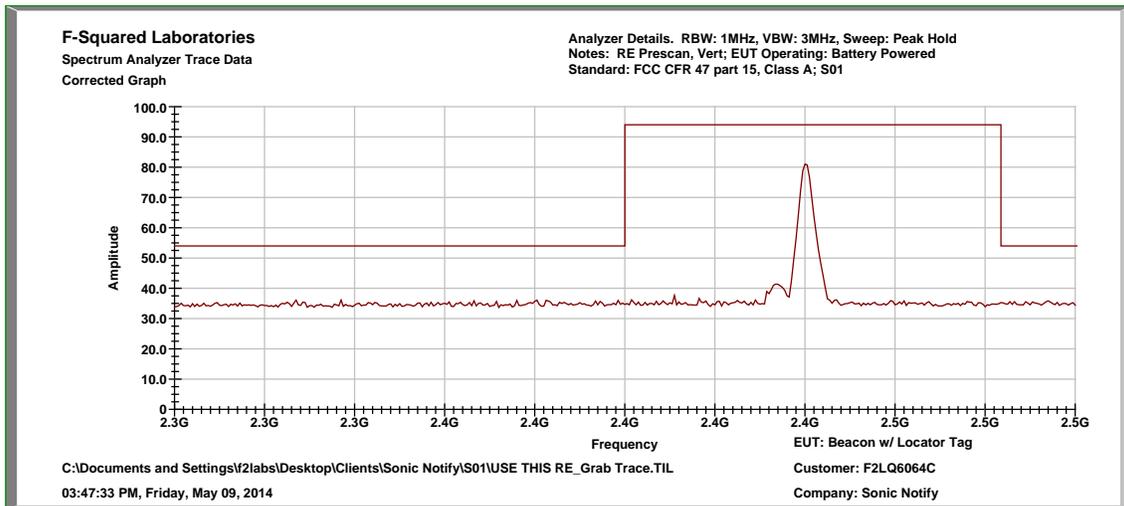




### Mid Channel, 2.3 GHz to 2.5 GHz, Horizontal

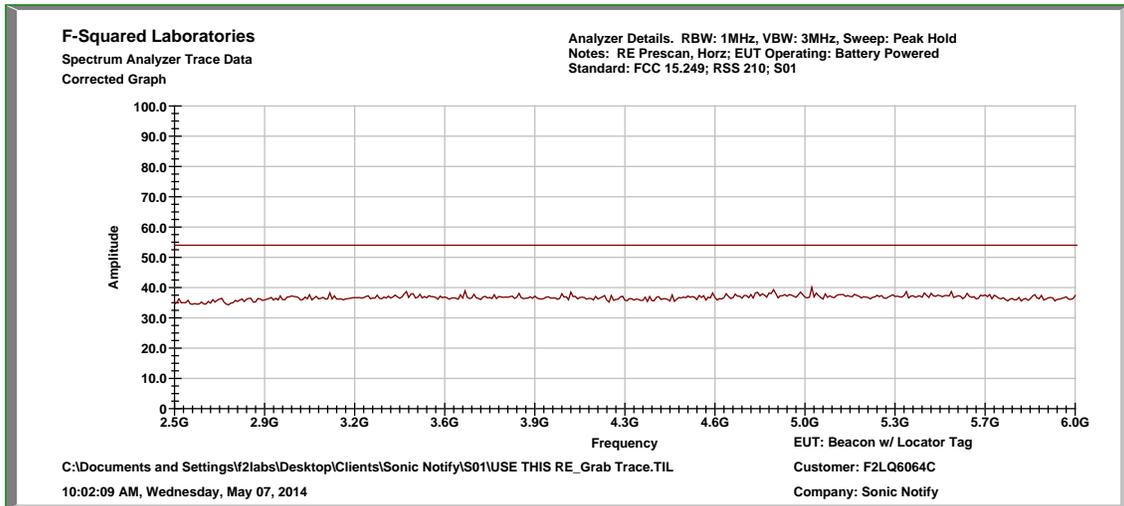


### Mid Channel, 2.3 GHz to 2.5 GHz, Vertical

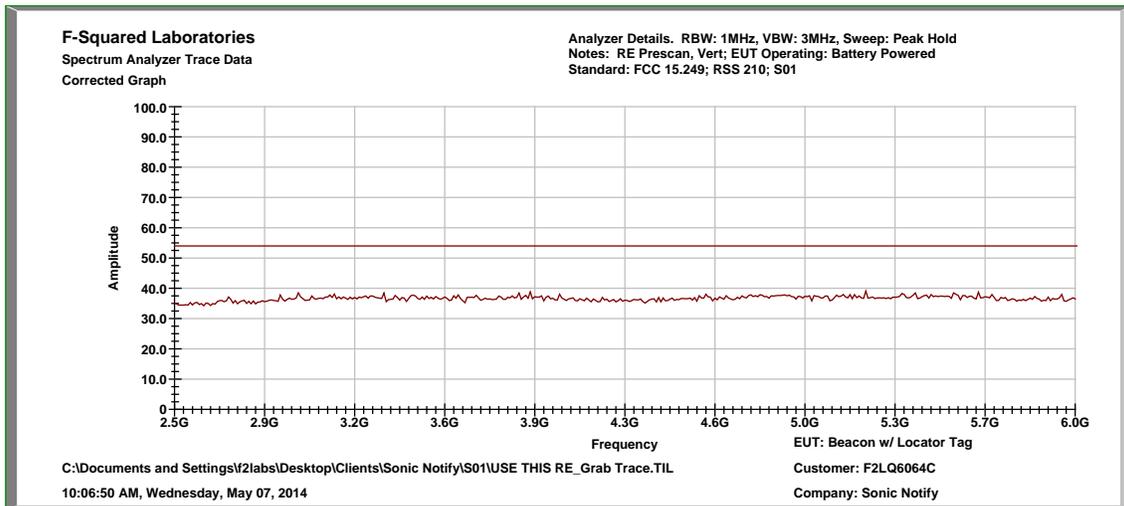




### Mid Channel, 2.5 GHz to 6 GHz, Horizontal



### Mid Channel, 2.5 GHz to 6 GHz, Vertical

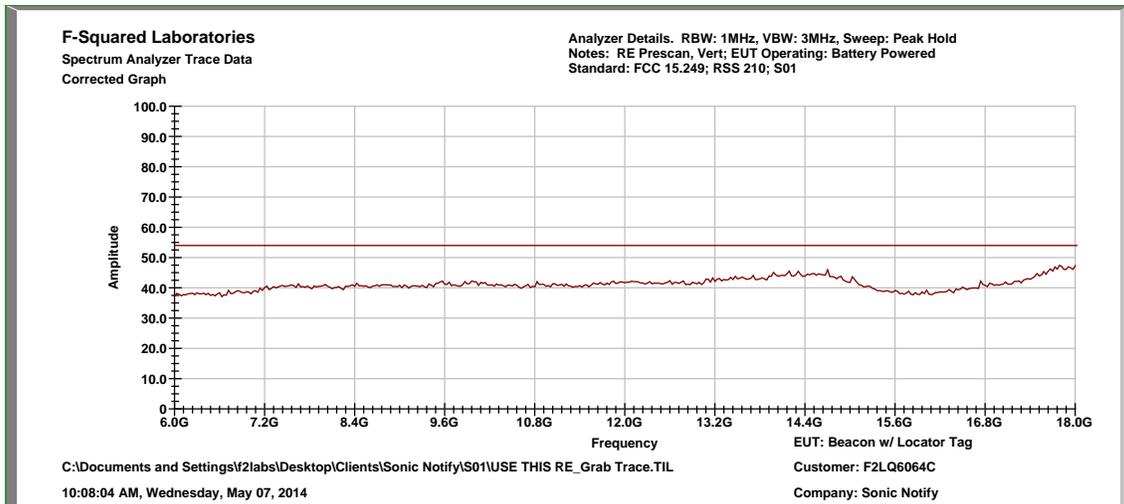




### Mid Channel, 6 GHz to 18 GHz, Horizontal

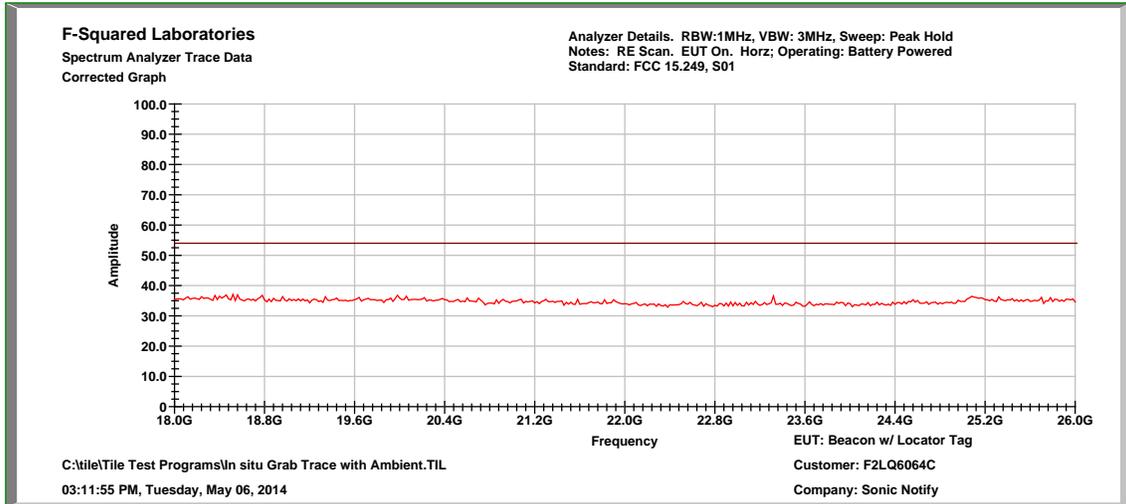


### Mid Channel, 6 GHz to 18 GHz, Vertical

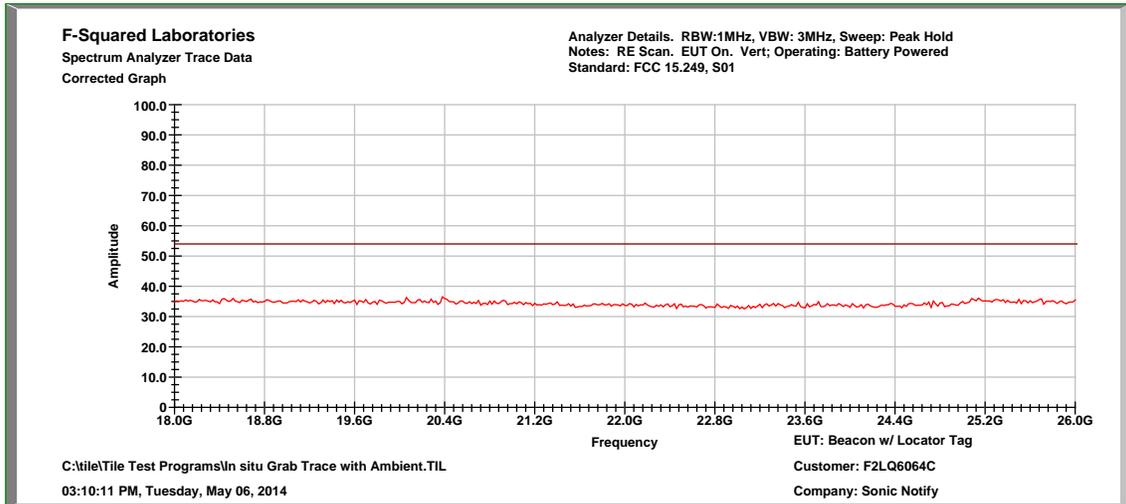




### Mid Channel, 18 GHz to 26 GHz, Horizontal

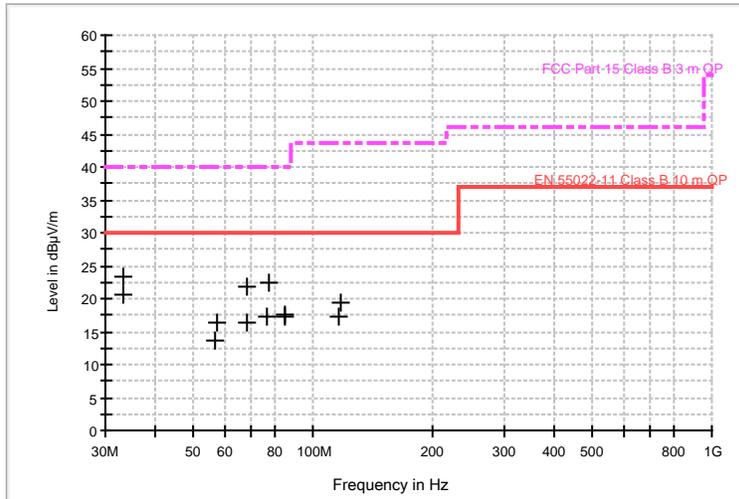


### Mid Channel, 18 GHz to 26 GHz, Vertical





Mid Channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
33.390000	23.2	50.0	120.000	155.0	V	19.4	16.8	40.0
33.460000	20.5	50.0	120.000	155.0	H	20.4	19.5	40.0
56.660000	13.6	50.0	120.000	155.0	H	10.4	26.4	40.0
57.210000	16.5	50.0	120.000	155.0	V	10.6	23.5	40.0
67.700000	16.3	50.0	120.000	155.0	H	11.1	23.7	40.0
68.260000	21.7	50.0	120.000	155.0	V	10.6	18.3	40.0
76.210000	17.2	50.0	120.000	155.0	H	11.0	22.8	40.0
77.000000	22.5	50.0	120.000	155.0	V	10.9	17.6	40.0
84.330000	17.5	50.0	120.000	155.0	V	11.3	22.5	40.0
85.120000	17.1	50.0	120.000	155.0	H	10.7	22.9	40.0
115.850000	17.3	50.0	120.000	155.0	H	17.4	26.2	43.5
117.330000	19.3	50.0	120.000	155.0	V	17.3	24.2	43.5



### High Channel, .009 to 0.15 MHz

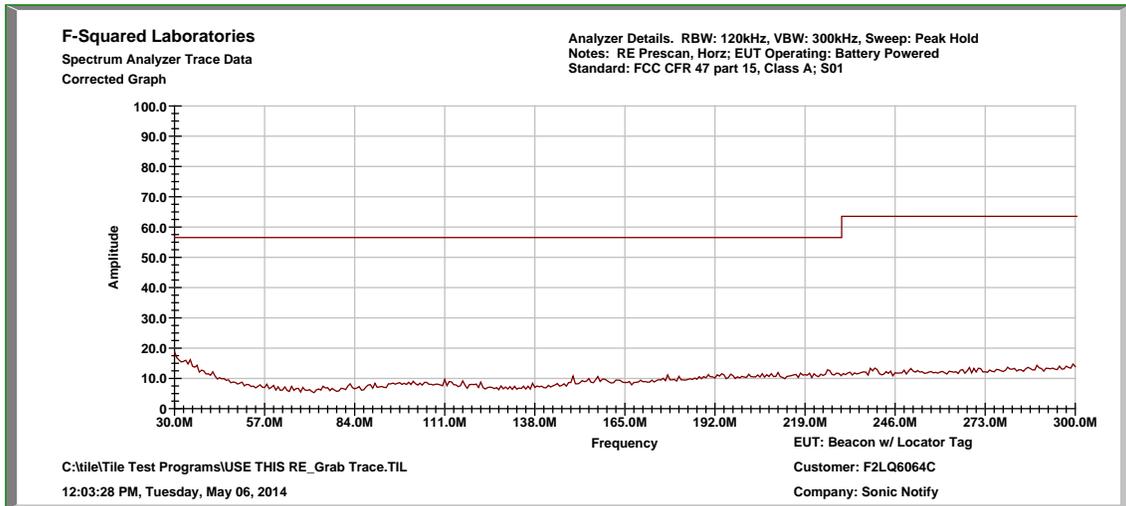


### High Channel, 0.15 MHz to 30 MHz

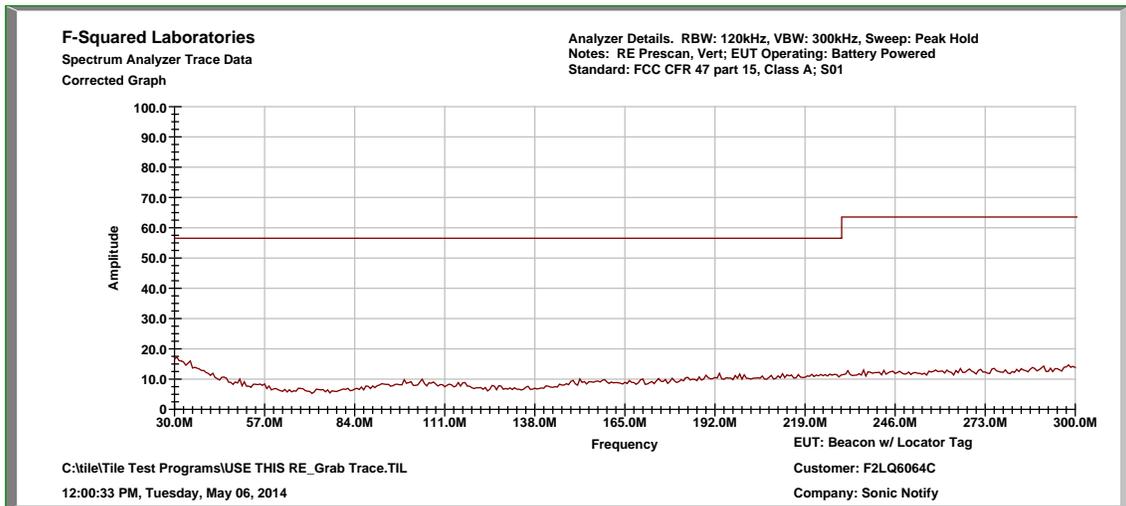




### High Channel, 30 MHz to 300 MHz, Horizontal

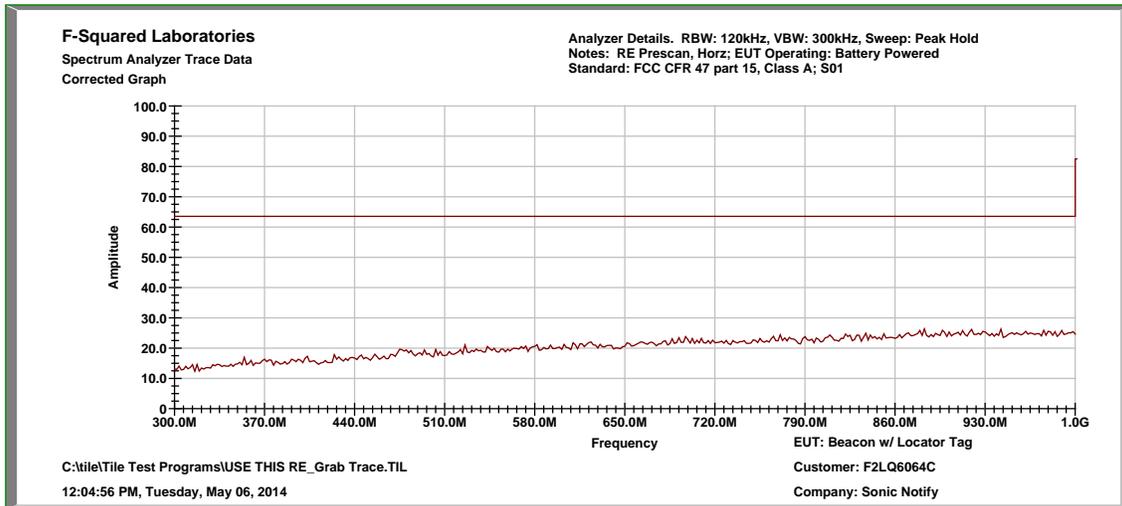


### High Channel, 30 MHz to 300 MHz, Vertical

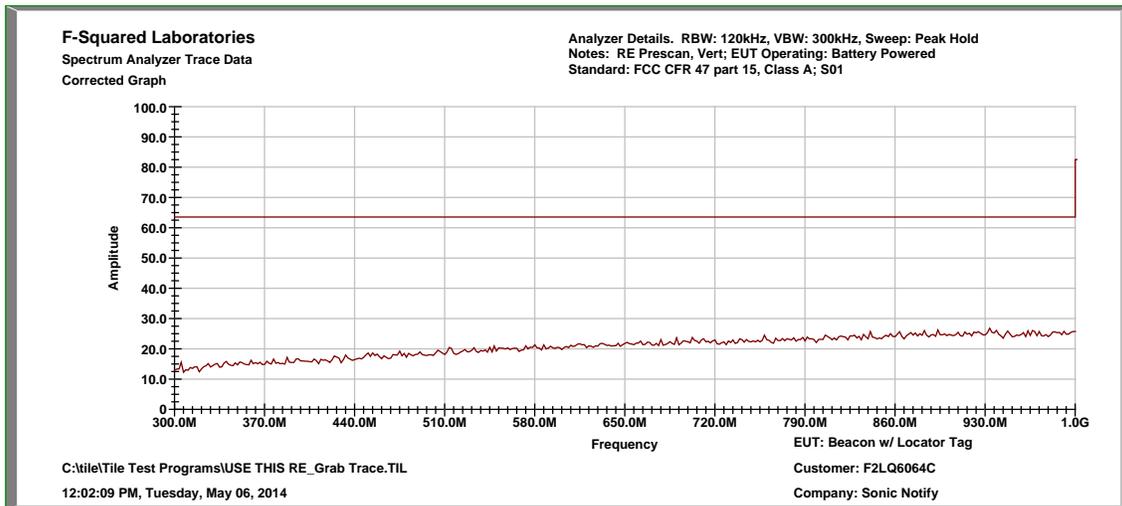




### High Channel, 300 MHz to 1 GHz, Horizontal

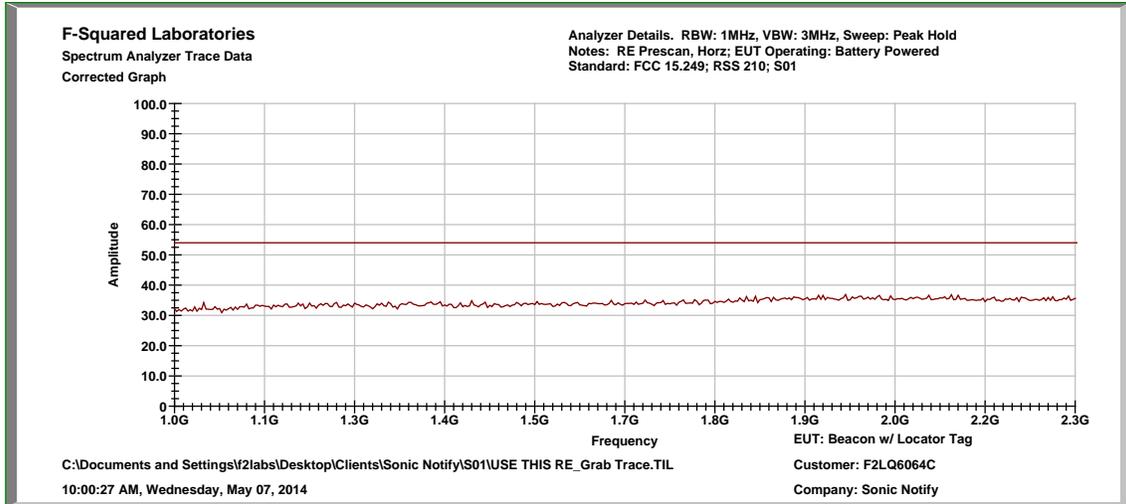


### High Channel, 30 MHz to 1 GHz, Vertical

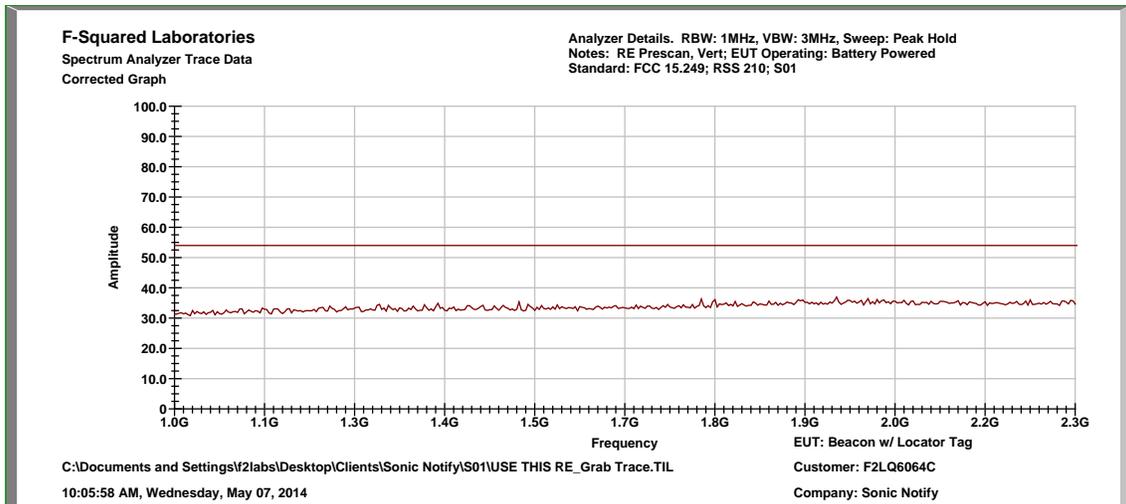




### High Channel, 1 GHz to 2.3 GHz, Horizontal

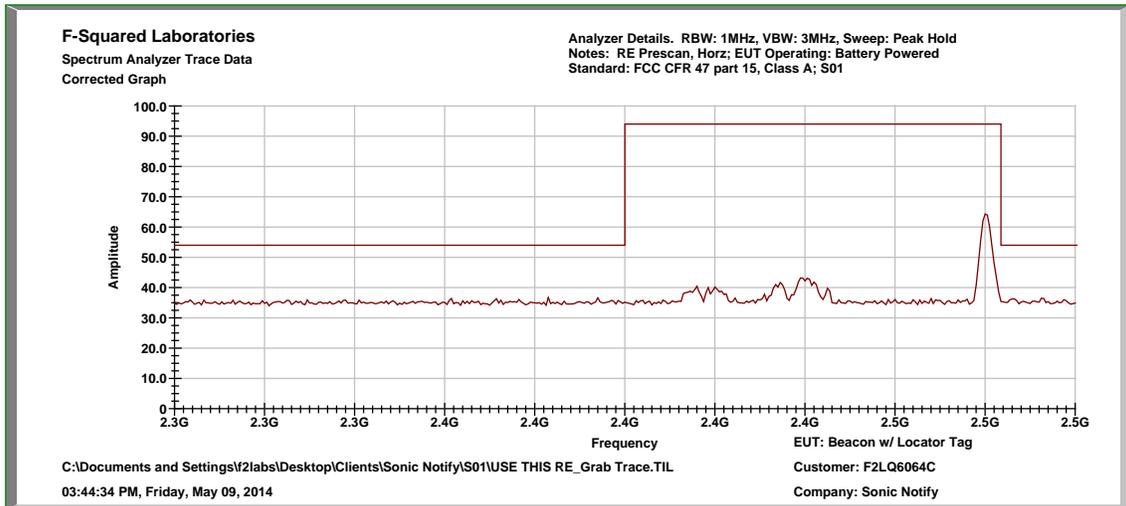


### High Channel, 1 GHz to 2.3 GHz, Vertical

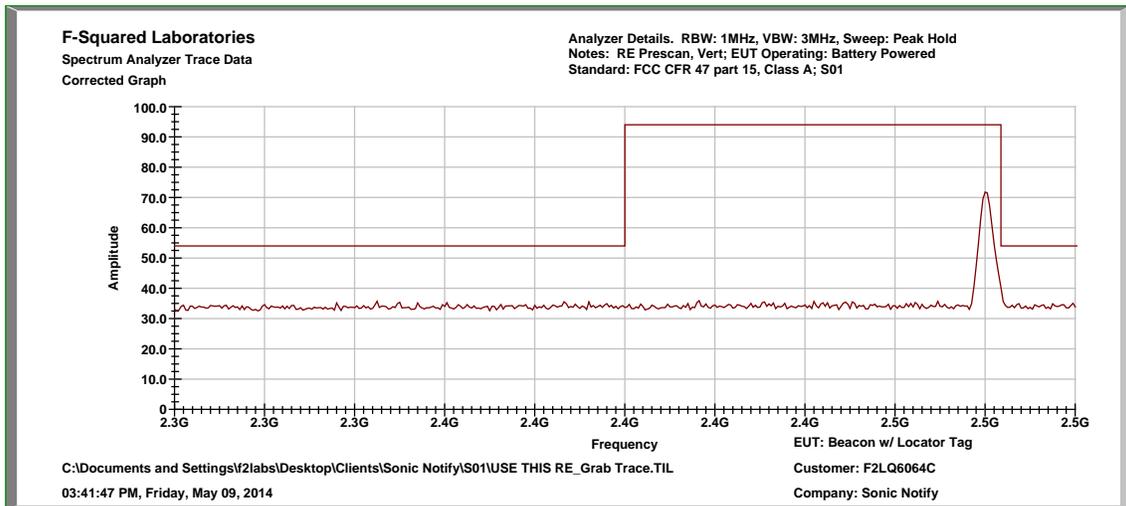




### High Channel, 2.3 GHz to 2.5 GHz, Horizontal

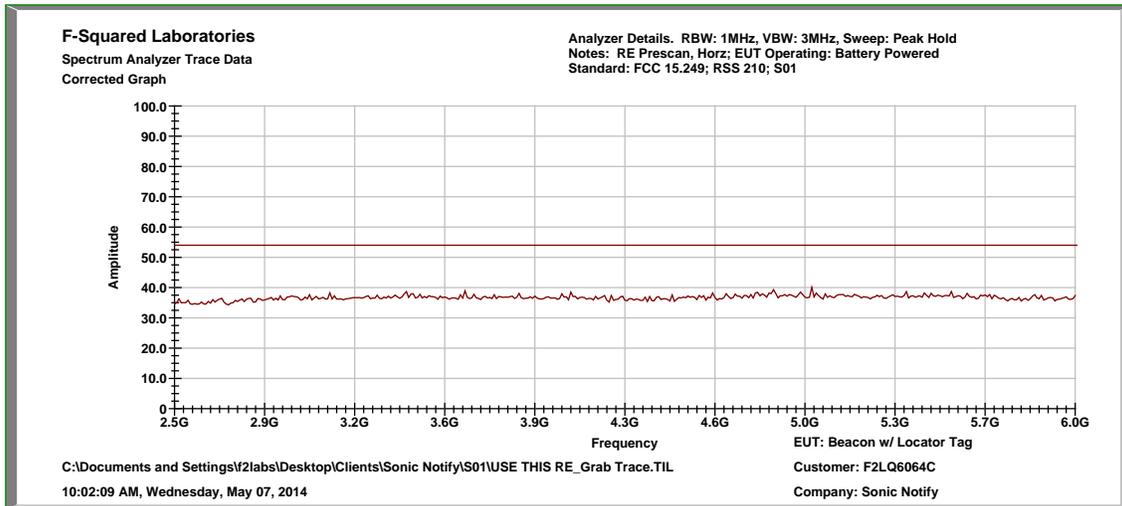


### High Channel, 2.3 GHz to 2.5 GHz, Vertical

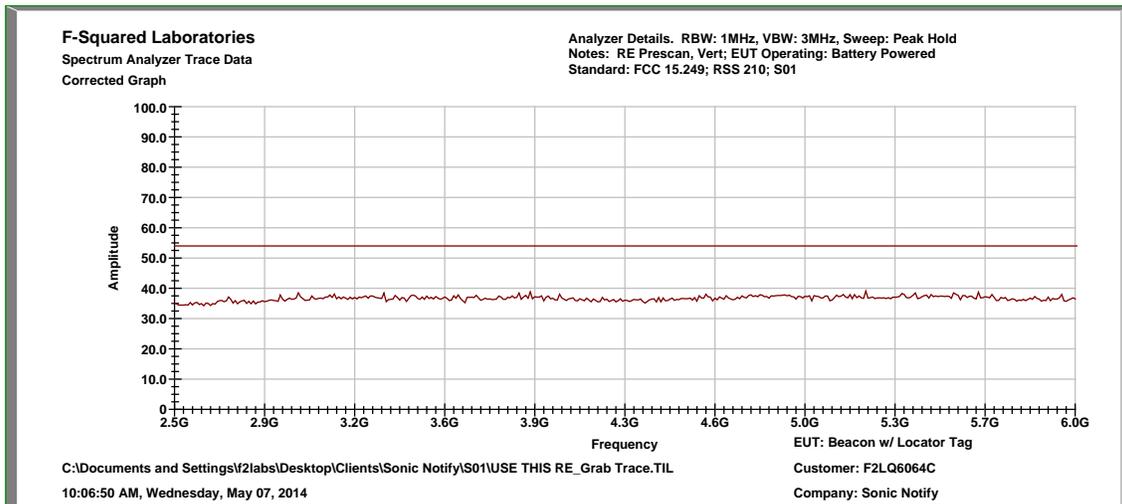




### High Channel, 2.5 GHz to 6 GHz, Horizontal



### High Channel, 2.5 GHz to 6 GHz, Vertical





### High Channel, 6 GHz to 18 GHz, Horizontal

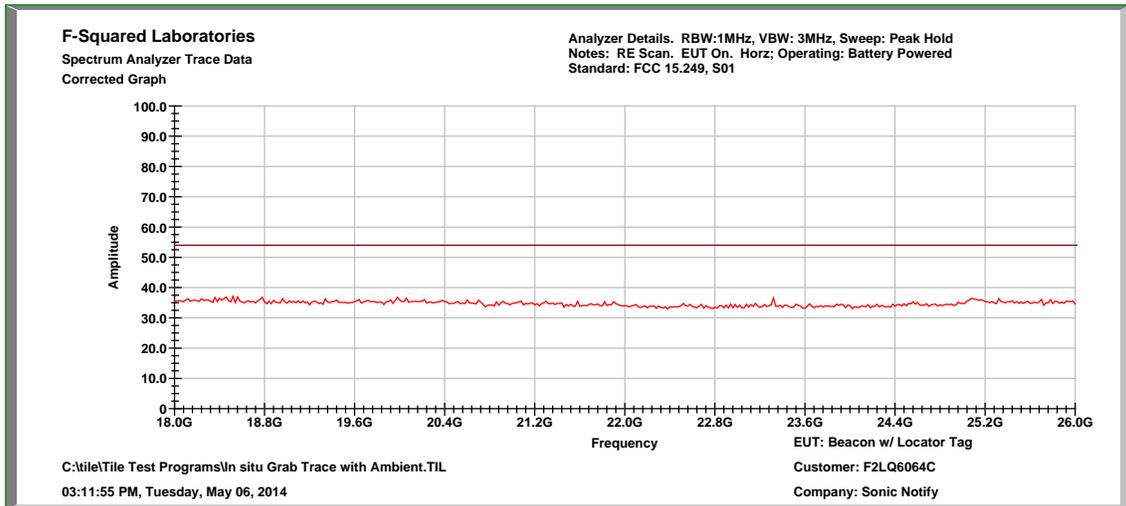


### High Channel, 6 GHz to 18 GHz, Vertical

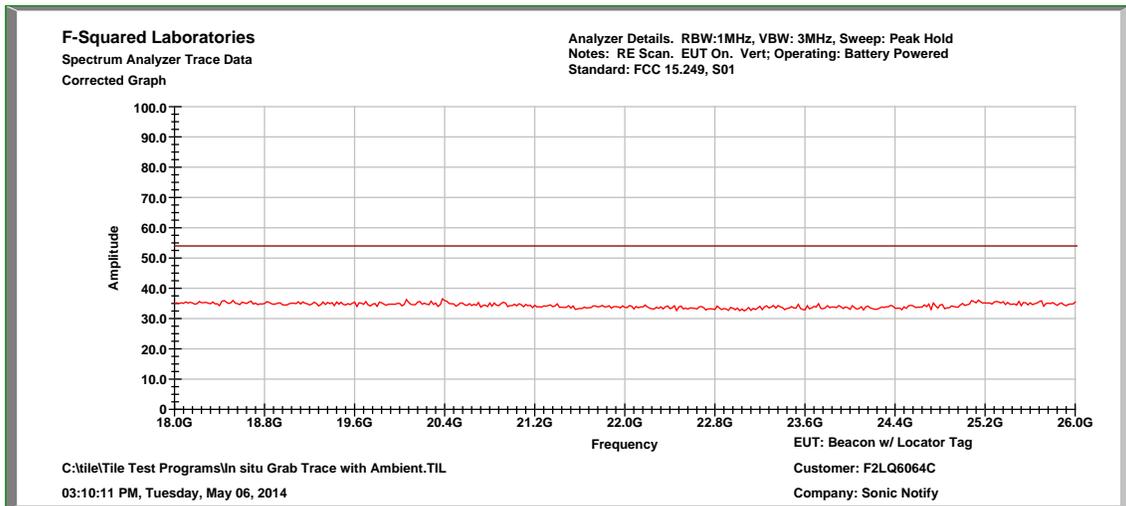




### High Channel, 18 GHz to 26 GHz, Horizontal

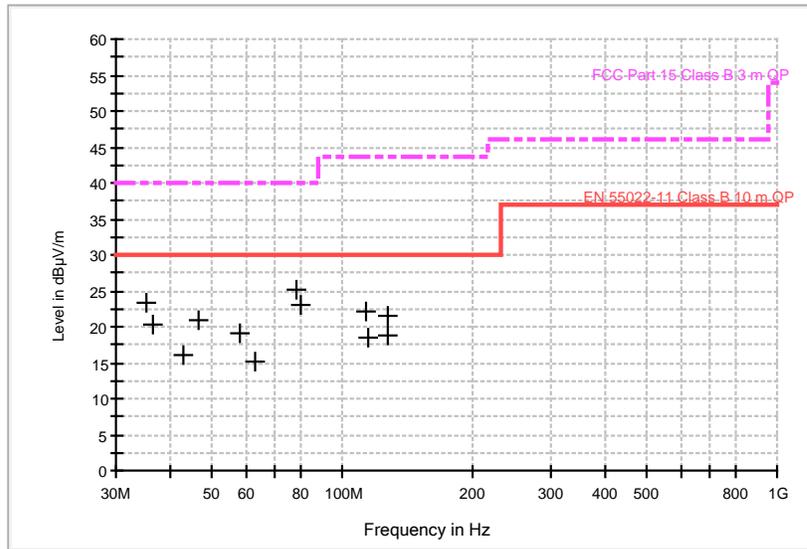


### High Channel, 18 GHz to 26 GHz, Vertical





### High Channel



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
35.100000	23.2	50.0	120.000	155.0	V	18.2	16.8	40.0
36.440000	20.4	50.0	120.000	155.0	H	18.3	19.6	40.0
42.990000	16.0	50.0	120.000	155.0	H	13.7	24.0	40.0
46.700000	21.0	50.0	120.000	155.0	V	11.4	19.0	40.0
58.110000	19.0	50.0	120.000	155.0	V	10.7	21.0	40.0
62.780000	15.2	50.0	120.000	155.0	H	10.9	24.8	40.0
78.000000	25.1	50.0	120.000	155.0	V	10.9	14.9	40.0
80.250000	23.0	50.0	120.000	155.0	H	10.8	17.0	40.0
112.870000	22.2	50.0	120.000	155.0	V	16.6	21.3	43.5
114.520000	18.4	50.0	120.000	155.0	H	17.3	25.1	43.5
126.390000	21.4	50.0	120.000	155.0	V	18.1	22.1	43.5
127.190000	18.8	50.0	120.000	155.0	H	17.8	24.7	43.5



10 PHOTOGRAPHS/EXHIBITS – PRODUCT PHOTOS, TEST SETUPS

Spurious Emissions





### Field Strength of Emissions, Occupied Bandwidth

