

TEST REPORT

Report Number: 101262612DEN-001C

Project Number: G101262612

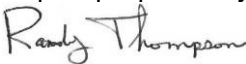
Report Issue Date: 9/27/2013


Product Designation: Model: M1 (Revolv Hub)

Standards: FCC 47 CFR Part 15 Subpart C, 15.249 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz

Tested by:
Intertek Testing Services NA, Inc.
1795 Dogwood St. Suite 200
Louisville, CO 80027

Client:
Revolv, Inc.
2060 Broadway, Suite 380
Boulder, CO 80302

Report prepared by

Randy Thompson
Senior EMC Project Engineer

Report reviewed by

Michael Spataro
Engineering Team Leader

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TABLE OF CONTENTS

1	<i>Introduction and Conclusion.....</i>	3
2	<i>Test Summary</i>	4
3	<i>Description of Equipment Under Test</i>	6
4	<i>System setup including cable interconnection details, support equipment and simplified block diagram</i>	9
5	<i>6dB Bandwidth (Reference Only).....</i>	13
6	<i>Radiated Field Strength Emissions – Tx Fundamental.....</i>	16
7	<i>Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions).....</i>	22
8	<i>Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge.....</i>	33
9	<i>Occupied Bandwidth (OBW) – Not Applicable.....</i>	53
10	<i>Requirements for fixed, point-to-point operation – Not Applicable.....</i>	54
11	<i>Duty Cycle Correction Factor – Not Used.....</i>	55
12	<i>AC Mains Conducted Emissions – Transmitter</i>	56
13	<i>Antenna Requirement.....</i>	64
14	<i>RF Exposure Requirements</i>	65
15	<i>Unintentional Radiated Emissions (Digital Part of Receiver)</i>	68
16	<i>AC Mains Conducted Emissions</i>	89
17	<i>Measurement Uncertainty.....</i>	96
18	<i>Revision History</i>	97

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded **the product tested complies with the requirements of the standard(s) indicated**. The results obtained in this test report pertain only to the item(s) tested.

Test Report Scope

The scope of this report was to qualify the “Insteon Radio” configured within the Revolv Model M1 product. This radio operates in the following Tx Band: 902 – 908 MHz (ISM)

Refer to the following Intertek Test Reports for the test results of the following radios configured within the Revolv Model M1 product:

- Unintentional Radiated and Conducted Emissions (DoC) 101262612DEN-001A
- Radio #1 (WiFi): 101262612DEN-001B
- **Radio #2 (Insteon): 101262612DEN-001C (This report)**
- Radio #3 (ZWave): 101262612DEN-001D
- Radio #5 (CC1101 #0): 101262612DEN-001E
- Radio #6 (CC1101 #1): 101262612DEN-001F
- Radio #7 (433MHz): 101262612DEN-001G

General Test Methodology

All measurements were performed according to the procedures in the following documents:

- ANSI C63.10:2009 – ANSI Standard for Testing Unlicensed Wireless Devices

Test Facility

Intertek Denver’s testing facilities are located at 1795 Dogwood St. Suite 200 Louisville, CO 80027. The testing facility is ISO17025:2005 accredited by A2LA, our lab code is 2506.02, our VCCI registration numbers are. R-1643, C-1752 and T-1558, our FCC designation no. US1121 and our IC lab no. 2042N.

Testing contained in this test report may not be covered under the laboratories scope of accreditation. A note will be placed in the specific test section for testing not covered under the laboratories scope.

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

2 Test Summary

Section	Test Specification	Test Description	Test Date	Result
5	Reference Only	6dB Bandwidth	08/15/2013	N/A note 3
6	FCC 15.249(a)	Radiated Field Strength Emissions – Tx Fundamental	08/15/2013	Pass
7	FCC 15.249(a)(e)	Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions)	08/15/2013	Pass
8	FCC 15.209/15.249(d)(e)/15.205	Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge	08/16/2013	Pass
9	FCC 15.215(c)	Occupied Bandwidth	---	N/A
10	FCC 15.249(b)	Requirements for Fixed – Point-to-Point Operation	-----	N/A
11	FCC 15.35(c)	Duty Cycle Correction Factor	-----	N/A
12	FCC 15.207	AC Power Transmitter AC Conducted Emissions	08/24/2013	Pass
13	FCC 15.203	Antenna Requirement	08/15/2013	Pass
14	FCC 15.247(b)(5)	RF Exposure Requirements	09/26/2013	Pass
15	FCC 15.109	Receiver/ Digital Device Radiated Emissions	08/14/2013	Pass
16	FCC 15.107	Digital Device AC Conducted Emissions	08/14/2013	Pass

Notes:

- 1) The radio is not a fixed, point-to-point operating system.
- 2) The product is ac-powered utilizing an ac power adapter.
- 3) The 6dB bandwidth was measured in order to determine the minimum RBW required when measuring the fundamental – reference only.

General Radio Test Notes:

- ANSI C63.10, Section 6.3: Testing was performed in 3 different orthogonal axes to determine the worst-case emissions from the device. The worst-case axis and emissions are shown in this report.
- ANSI C63.10, Section 5.13/ FCC CFR Part 15.31(e): For battery-operated equipment, the equipment tests shall be performed using a new battery. For ac-operated equipment, measurements of the fundamental frequency were performed with the supply voltage varied between 85% and 115% of the nominal rated voltage to determine worst-case.
- ANSI C63.10, Section 4.2.3.2/ FCC 15.35: Measurement detector functions and bandwidths utilized in this testing were per the preceding guidelines.
- ANSI C63.10, Section 4.2.3.2.2/ FCC 15.35(b): When an average limit is specified, the peak emission must also be measured to ensure the emissions is less than 20dB above the average limit and/or below the peak limit specified. This report includes both average and peak test data.
- ANSI C63.10, Section 4.2.3.2.4/ FCC 15.35(c): When the field strength (or envelope power) is not constant or when it pulses, and an average detector/limit is specified to be used, a duty cycle correction factor may be utilized to determine the pulsed "average" of the field strength or power. Duty cycle correction was not utilized in this report.
- ANSI C63.10, Section 5.3/ FCC 15.31: All radiated field strength measurements taken at an antenna-to-product test distance of 3-meters.
- ANSI C63.10, Section 5.5, Table 2/ FCC 15.33(a): The frequency range of measurement was per the requirements of the preceding standards. The product was tested from 30MHz to 10GHz.
- ANSI C63.10, Section 6.3.1/ FCC 15.35(b): Measurement bandwidths utilized for fundamental peak emissions were equal to or greater than the 6dB bandwidth of the emission.
- ANSI C63.10, Section 6.3/ FCC 15.31(m): Measurements were taken for at the lowest, near the middle and highest channels of the product tested.

3 Description of Equipment Under Test

Model:	M1
Type of EUT:	Revolv "Hub" – RF-enabled home automation
Serial Number:	FCC1
FCC ID:	2AAITJARVIS1
Industry Canada ID:	N/A
Related Submittal(s) Grants:	W7Z-ZICM357P2 (Zigbee radio)
Company:	Revolv, Inc.
Customer:	Revolv, Inc.
Address:	Revolv, Inc. 2060 Broadway, Suite 380 Boulder, CO 80302
Phone:	(720) 961-5009
Fax:	-----
e-mail:	mbergquist@revolv.com
Test Standards:	<input checked="" type="checkbox"/> 47 CFR, Part 15C:§15.249 <input type="checkbox"/> RSS-210, Issue 8, 2010 <input type="checkbox"/> RSS-Gen, Issue 3, 2010 <input checked="" type="checkbox"/> 47 CFR, Part 15B:§15.107 and §15.109, Class B <input type="checkbox"/> Other
Type of radio:	<input checked="" type="checkbox"/> Stand -alone <input type="checkbox"/> Module <input type="checkbox"/> Hybrid
Date Sample Submitted:	08/11/2013
Test Work Started:	08/11/2013
Test Work Completed:	09/18/2013
Test Sample Conditions:	<input type="checkbox"/> Damaged <input type="checkbox"/> Poor (Usable) <input checked="" type="checkbox"/> Good

Product Description:	Wireless RF-Enabled Home Automation Hub
Transmitter Type:	<input type="checkbox"/> FHSS <input checked="" type="checkbox"/> Digital Modulation <input type="checkbox"/> WiFi <input type="checkbox"/> Blue Tooth
Operating Frequency Range(s):	Range From 915 to 915 MHz (Single Channel)
Number of Channels:	1
Modulation:	FSK (deviation = 64kHz), Manchester Encoded, 38.4Kbaud
Emission Designator:	310KF1D
Antenna(s) Info:	Antenna: Type: Ceramic Gain: -1.0 dBi Connector Type: N/A Integral Antenna
Rated Power:	91.05 dBuV -4.18 dBm 0.382 mW
Antenna Installation:	<input type="checkbox"/> User <input type="checkbox"/> Professional <input checked="" type="checkbox"/> Factory
Transmitter power configuration:	<input type="checkbox"/> Internal battery <input checked="" type="checkbox"/> External power source
Special Test Arrangement:	Since the product can be mounted in several orientations, the EUT was rotated and tested in three orthogonal axes to determine the maximum emissions
Test Facility Accreditation:	A2LA (Certificate No. 2506.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2009 and FCC Publication Number 720338

Description of Equipment Under Test (provided by client)

The Revolv "Hub" is designed to link a variety of RF-enabled Home Automation products to a Wi-Fi Local Area Network and through that LAN to the cloud.

The product is configured with the following discrete radios:

- Wi-Fi: 2.4GHz ISM Band (802.11 b/g/n HT20)
- Insteon: 915MHz ISM Band (single channel)
- ZWave: 908.42 MHz ISM Band (single channel)
- Zigbee: 2.4GHz ISM Band (Certified Module)
- CC1101 #0: 903 – 927 MHz ISM Band (multi-channel)
- CC1101 #1: 902.6 – 927.4 MHz ISM Band (multi-channel)
- CC1101 #3: 431 – 437 MHz (control signals multi-channel)

Note the radios do not transmit simultaneously and each radio has a dedicated antenna.

There are no signal or I/O ports or cables configured on the product.

The product is powered from an external AC Adapter.

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
AC Adapter Input: 100-240VAC	0.3	50/60	1
AC Adapter Output: 5VDC	2.0	---	---

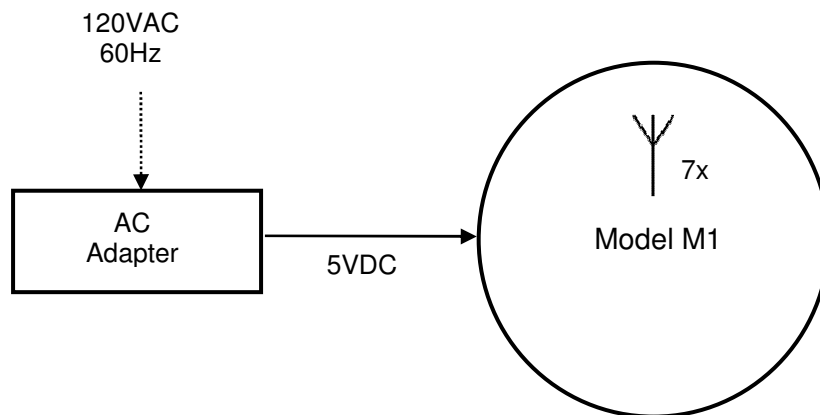
Descriptions of EUT Exercising	
<input checked="" type="checkbox"/>	Standby/Idle Mode
<input checked="" type="checkbox"/>	Continuous transmission, un-modulated carrier (CW)
<input checked="" type="checkbox"/>	Continuous transmission, modulated carrier (CW)
<input checked="" type="checkbox"/>	Continuous Receive Mode

Note: The chosen mode of operation described above is dependent upon the specific test to be performed.

4 System setup including cable interconnection details, support equipment and simplified block diagram

Method:

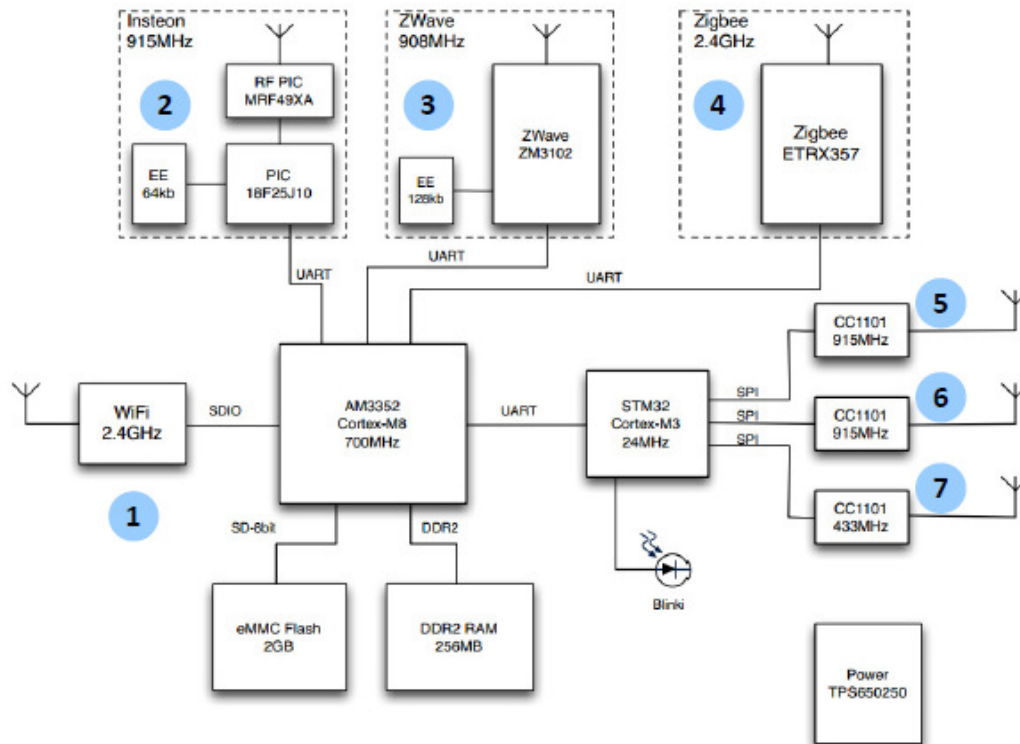
Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

EUT Block Diagram: EMC Perspective

Note: Dashed lines indicate auxiliary/support equipment

EUT Block Diagram: Detailed

The Hub contains a number of discrete radios as shown in this product block diagram:



Purpose of this document is to describe the Hub and describe each radio to facilitate creation of FCC certification test plan and quotation for testing and TCB service to obtain FCC certification.

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

Support Data:

ID	Description/ Function	Shield Type	Length	Connector	Connection	Ferrites
--	----	----	----	----	----	----

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	HP	---	---

Notes:

- 1) The laptop was utilized only to configure the product during testing (i.e. set channel, modulation, data rates, etc.).
- 2) The product has no signal or I/O cables.

Photograph: Product Tested – Test Axes**Model M1 (Revolv Hub)**

Axis 1 – Product Horizontal (Flat on Table)



Axis 2 – Product Vertical (Wall Mount)



Axis 3 – Product Vertical & Rotated 90 degrees CW



Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

5 6dB Bandwidth (Reference Only)

Method:

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.249.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification:

- ANSI C63.10: 2009, Section 6.3.1

Radiated measurements of the fundamental-signal peak field strength shall be made using instrumentation with a bandwidth equal to or greater than the 6 dB bandwidth of the emission.

Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	06/07/2013	06/07/2014
19936	Bilog Antenna 30MHz – 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2012	11/15/2013
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBU	VBU

Results:

Not applicable – measurement used for reference only.

Intertek

Report Number: 101262612DEN-001C

Issued:9/27/2013

Test Data:

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.249(a) 94dBuV/m	FCC 15.249(a)	(MHz)
Measurements to verify the 6dB bandwidth – used to determine the RBW used for measuring fundamental emissions												
914.9359	94.12	Pk	2.11	22.40	27.59	91.04	H	1.02	19.2	94.00	- 2.96	0.120
914.9359	94.27	Pk	2.11	22.40	27.59	91.19	H	1.00	19.2	94.00	- 2.81	0.500
914.9359	94.28	Pk	2.11	22.40	27.59	91.20	H	1.00	19.2	94.00	- 2.80	1.000

Test Method:

- N/A

Test Summary:

6dB Bandwidth Summary	
Channel/ Mode	6dB Bandwidth
915 MHz	177.88 kHz

Specification: Not applicable

Notes:

- 1) Measurements were taken using worst-case modulated (maximum bandwidth) mode, using maximum data packet length.
- 2) All measurements are radiated field strength.
- 3) For fundamental measurements, a RBW of 500kHz will be utilized per the plot and measurements above. No significant increase in field strength was measured when using a higher bandwidth.

Deviations, Additions, or Exclusions: None

6 Radiated Field Strength Emissions – Tx Fundamental

Method:

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.249.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification:

The maximum Radiated Field Strength shall not exceed 50mV/m.

Fundamental Frequency	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (uV/m)
902-928 MHz	50 (94dBuV/m)	500 (54dBuV/m)
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

- FCC 15.249(a)
- RSS-210 A2.9(a)

Test Equipment Used:

Asset ID	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	06/07/2013	06/07/2014
19936	Bilog Antenna 30MHz – 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2012	11/15/2013
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBU	VBU

Results:

The sample tested was found to comply.

Test Summary: Radiated Field Strength Emissions – Tx Fundamental

Fundamental	Radiated Field Strength @ 3-meters					
Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz					
Low Frequency MHz	Measured Field Strength (dBuV/m)	Duty Cycle Correction Factor (dB)	Final Corrected (dBuV/m)	Standard Limit (mV/m)	Limit (dBuV/m)	Margin dB
---	---	---	---	50	94	---
Mid Frequency MHz						
915.00	91.05	0.00	91.05	50	94	-2.95
High Frequency MHz						
---	---	---	---	50	94	---
RBW:	<input type="checkbox"/> 100kHz <input type="checkbox"/> 300kHz <input checked="" type="checkbox"/> 500kHz <input type="checkbox"/> 1MHz <input type="checkbox"/> 3MHz <input type="checkbox"/> 10MHz					
VBW:	<input type="checkbox"/> 300kHz <input type="checkbox"/> 1MHz <input checked="" type="checkbox"/> 1MHz <input type="checkbox"/> 3 MHz <input type="checkbox"/> 10MHz <input type="checkbox"/> 10MHz					
Antenna Gain:	<input checked="" type="checkbox"/> < 6dBi <input type="checkbox"/> >6dBi and = dBi, Output power reduction = dB					

Test Method:

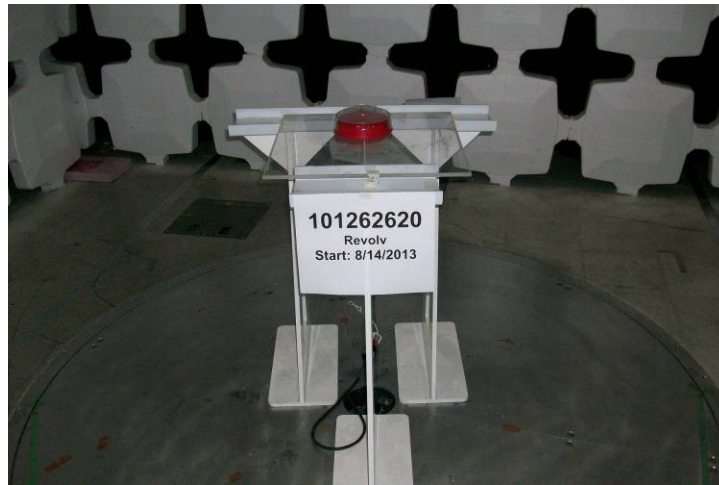
- FCC Publication 720338 & 433442
- ANSI C63.10:2009, Section 6.5

Notes:

1. All Fundamental measurements are radiated field - peak detector, max hold – 500kHz RBW.
2. The measurement bandwidth ≥6dB bandwidth – refer to section 5.
3. Product measured in (3) axes – refer to section 4 for details.
4. The product is a single-channel transmitter.
5. Measurements were not adjusted by the allowed duty cycle correction factor per FCC 15.35 – fundamental frequency is below 1GHz.

Setup Photographs: Radiated Field Strength Emissions – Tx Fundamental**Test Setup – Front View**

Axis 1



Axis 2



Axis 3

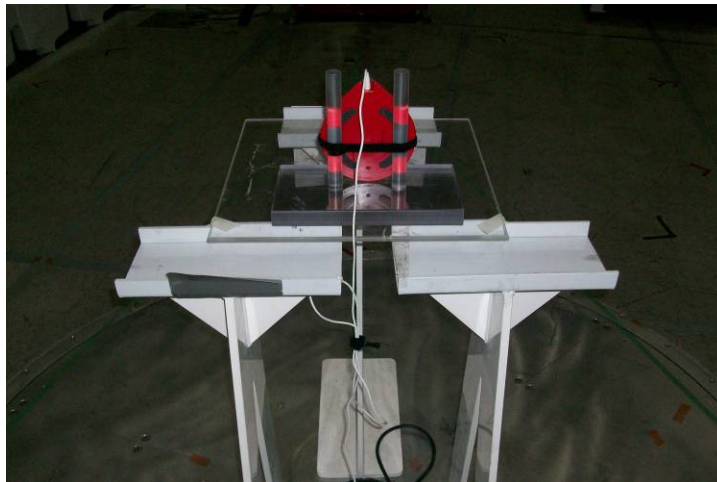


Setup Photographs: Radiated Field Strength Emissions – Tx Fundamental**Test Setup – Rear View**

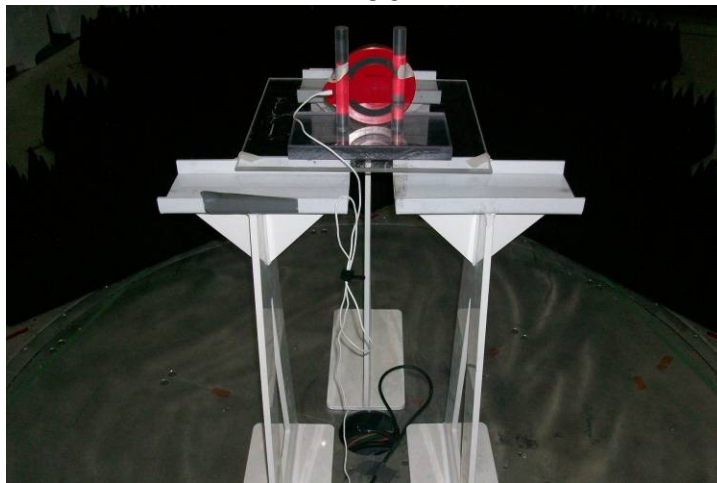
Axis 1



Axis 2



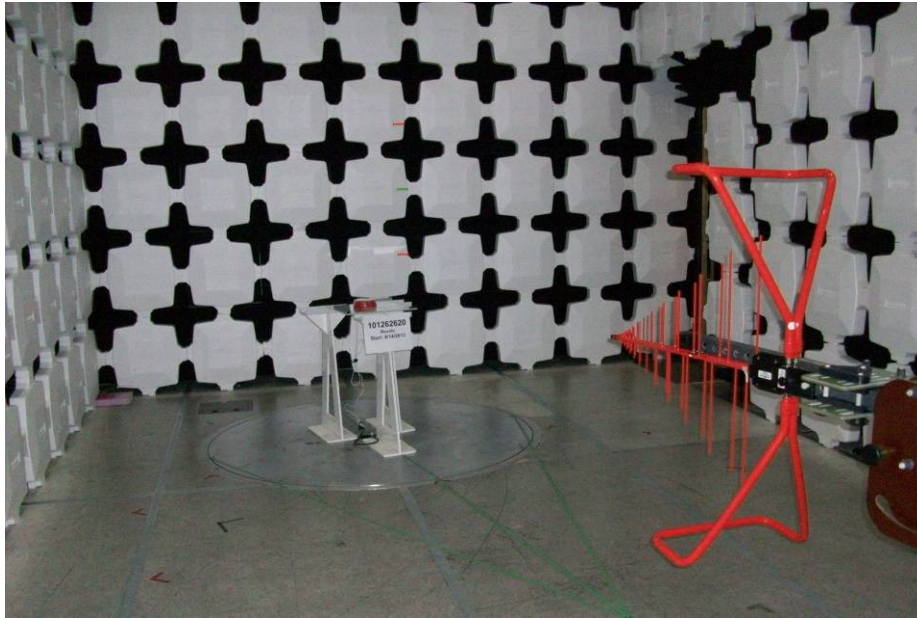
Axis 3



Setup Photographs: Radiated Field Strength Emissions – Tx Fundamental

Test Setup

Antenna – 30MHz to 1000MHz



Test Data: Radiated Field Strength Emissions – Tx Fundamental

Radiated Field Strength – Tx Fundamental

Test Report #:	G101262612	Test Area:	CC1 Radiated	Temperature:	22.7	°C
Test Method:	FCC 15.249(a)	Test Date:	15-Aug-2013	Relative Humidity:	29.1	%
EUT Model #:	M1	EUT Power:	120VAC/60Hz	Air Pressure:	83.1	kPa
EUT Serial #: FCC1						

Manufacturer:	Revolv, Inc.	Level Key	
EUT Description:	Revolv "Hub" – RF-Enabled Home Automation	Pk – Peak	Nb – Narrow Band
Notes:	Product transmitting continuously – Insteon Radio active – FSK Modulated	Qp – QuasiPeak	Bb – Broad Band
	Radio is a single channel: 915.00 MHz	Av - Average	
	All measurements peak detector – RBW > 6dB BW		

The following Duty Cycle was verified by Intertek: Not Applicable

Duty Cycle Correction Not Applied

Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.

The testing performed in accordance to FCC CFR47 Part 15.249 and delta limits were calculated as follows:

$$\text{Final Corrected Peak Measurement} - \text{Duty Cycle Correction Factor}^* = \text{Final Calculated Emission}$$

The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.249 and the emission/limit delta was calculated.

DTCF is calculated as follows $20 \cdot \log_{10}(\text{duty cycle in } 100\text{mS})$ – not to exceed 20dB.

FCC Part 15.249(a) Limit: 50mV/m = 94 dBuV/m

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBuV]	- [dB]	= [dBuV/m]	(V/H)	(m)	(DEG)	FCC 15.249(a) 94dBuV/m	FCC 15.249(a)	(MHz)

Fundamental Measurements - Axis 1 - EUT Flat on Table (Horizontal)

Tx Channel

914.936	85.26	Pk	2.11	22.40	27.59	82.18	0.00	82.18	V	1.68	95.0	94.00	- 11.82	0.500
914.936	94.13	Pk	2.11	22.40	27.59	91.05	0.00	91.05	H	1.00	19.2	94.00	- 2.95	0.500

Fundamental Measurements - Axis 2 - EUT Vertical on Table

Tx Channel

914.936	91.74	Pk	2.11	22.40	27.59	88.66	0.00	88.66	H	1.45	27.2	94.00	- 5.34	0.500
914.936	86.17	Pk	2.11	22.40	27.59	83.09	0.00	83.09	V	1.47	100.2	94.00	- 10.91	0.500

Fundamental Measurements - Axis 3 - EUT Vertical & Rotated 90 Degrees

Tx Channel

914.936	85.51	Pk	2.11	22.40	27.59	82.43	0.00	82.43	H	1.54	308.1	94.00	- 11.57	0.500
914.936	91.77	Pk	2.11	22.40	27.59	88.69	0.00	88.69	V	1.07	277.4	94.00	- 5.31	0.500

7 Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions)

Method:

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.249.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification

The maximum Radiated Field Strength of the Harmonics of the Fundamental shall not exceed 500uV/m.

Fundamental Frequency	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (uV/m)
902-928 MHz	50 (94dBuV/m)	500 (54dBuV/m)
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

In addition, as shown in FCC 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Attenuation below the general limits specified in 15.209(a) is not required.

- FCC 15.249(a)(e)

Test Equipment Used:

Asset ID	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	06/07/2013	06/07/2014
18906	RF Pre-Amp (1-4GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	06/10/2013	06/10/2014
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	06/10/2014	06/10/2014
18901	RF Pre-Amp (8-18GHz)	Avantek	AWT-18037	1002	06/10/2013	06/10/2014
19936	Bilog Antenna 30MHz – 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2012	11/15/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	03/19/2013	03/19/2014
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBU	VBU

Results:

The sample tested was found to comply.

**Test Summary: Radiated Field Strength - Harmonics of the Fundamental
(Out-of-Band Emissions)**

Harmonics of Fundamental	Radiated Field Strength @ 3-meters					
Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz					
Low Harmonic Frequency MHz	Measured Field Strength (dBuV/m)	Duty Cycle Correction Factor (dB)	Final Corrected (dBuV/m)	Standard Limit (uV/m)	Limit (dBuV/m)	Margin dB
---	---	---	---	500	54	---
---	---	---	---	---	74	---
Mid Harmonic Frequency MHz						
3660.00 (Average)	39.74	0.00	39.74	500	54	-14.26
1830.00 (Peak)	55.84	0.00	55.84	---	74	-18.16
High Harmonic Frequency MHz						
---	---	---	---	500	54	---
---	---	---	---	---	74	---
RBW:	<input type="checkbox"/> 100kHz <input type="checkbox"/> 300kHz <input type="checkbox"/> 500kHz <input checked="" type="checkbox"/> 1MHz <input type="checkbox"/> 3MHz <input type="checkbox"/> 10MHz					
VBW:	<input type="checkbox"/> 300kHz <input type="checkbox"/> 1MHz <input type="checkbox"/> 1MHz <input checked="" type="checkbox"/> 3 MHz <input type="checkbox"/> 10MHz <input type="checkbox"/> 10MHz					
Antenna Gain:	<input checked="" type="checkbox"/> < 6dBi <input type="checkbox"/> >6dBi and = dBi, Output power reduction = dB					

Test Method:

- FCC Publication 720338 & 433442
- ANSI C63.10:2009, Section 6.6

An intentional radiator shall be measured in accordance with 47 CFR 15.31-15.35. The detector functions and measuring bandwidths for these measurements are specified in 15.35. For measurements below 1 GHz, a quasi-peak detector shall be used. However, a peak detector may be used, since the measured value will generally be higher with a peak detector. For measurements above 1 GHz, the limits are in terms of using an instrument with an average detector, unstated otherwise for a specific type of device. For device operating under Section 15.249, the limit is in terms of average with an additional peak limit of 20 dB over the average limit (see 47 CFR 15.249(e)).

Notes:

1. All Harmonics of the Fundamental measurements are radiated field – peak/average detector, max hold measurements – 1MHz RBW.
2. The product was tested in (3) axes – refer to section 4 for details.
3. Transmitter is a single-channel.
4. Measurements were not adjusted by the allowed duty cycle correction factor per FCC 15.35

Setup Photographs: Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions)

Test Setup – Front View

Axis 1



Axis 2



Axis 3

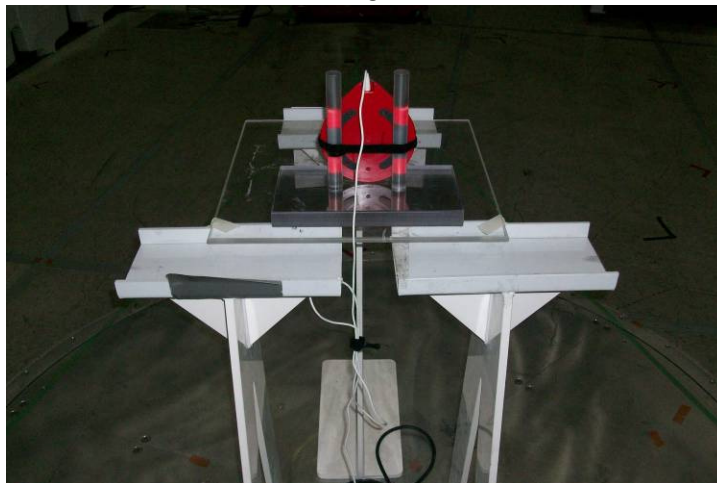


**Setup Photographs: Radiated Field Strength - Harmonics of the Fundamental
(Out-of-Band Emissions)**

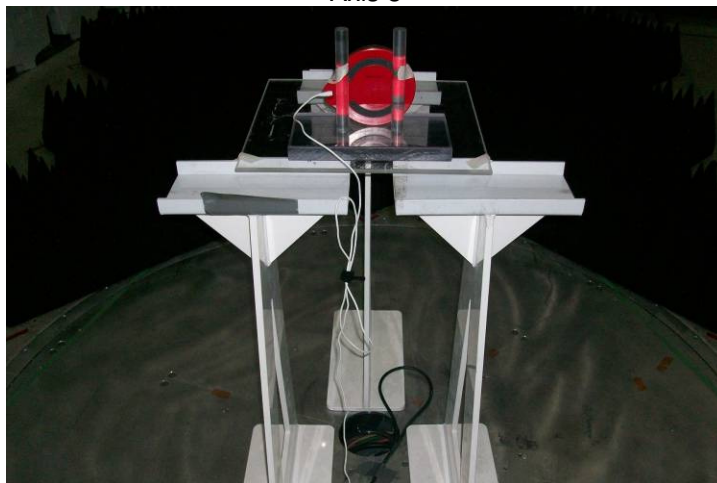
Test Setup – Rear View
Axis 1



Axis 2



Axis 3



**Setup Photographs: Radiated Field Strength - Harmonics of the Fundamental
(Out-of-Band Emissions)**

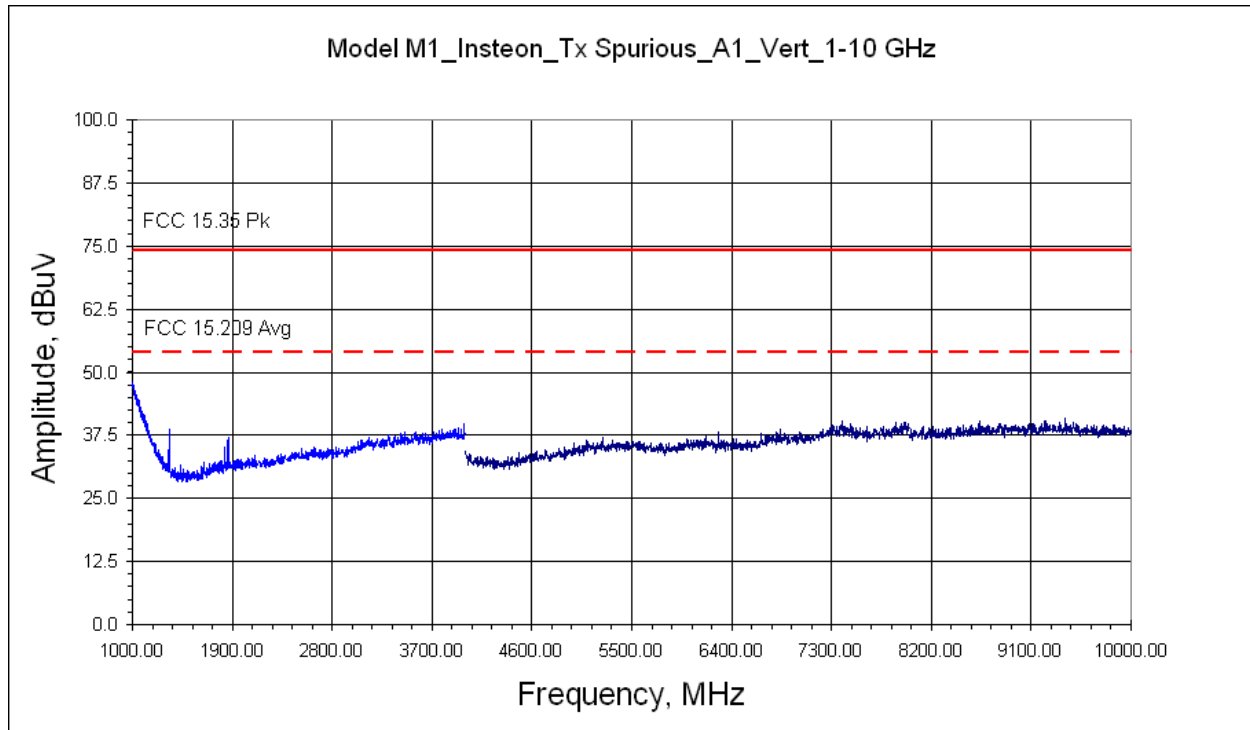
Test Setup

Antenna – 1GHz to 18GHz

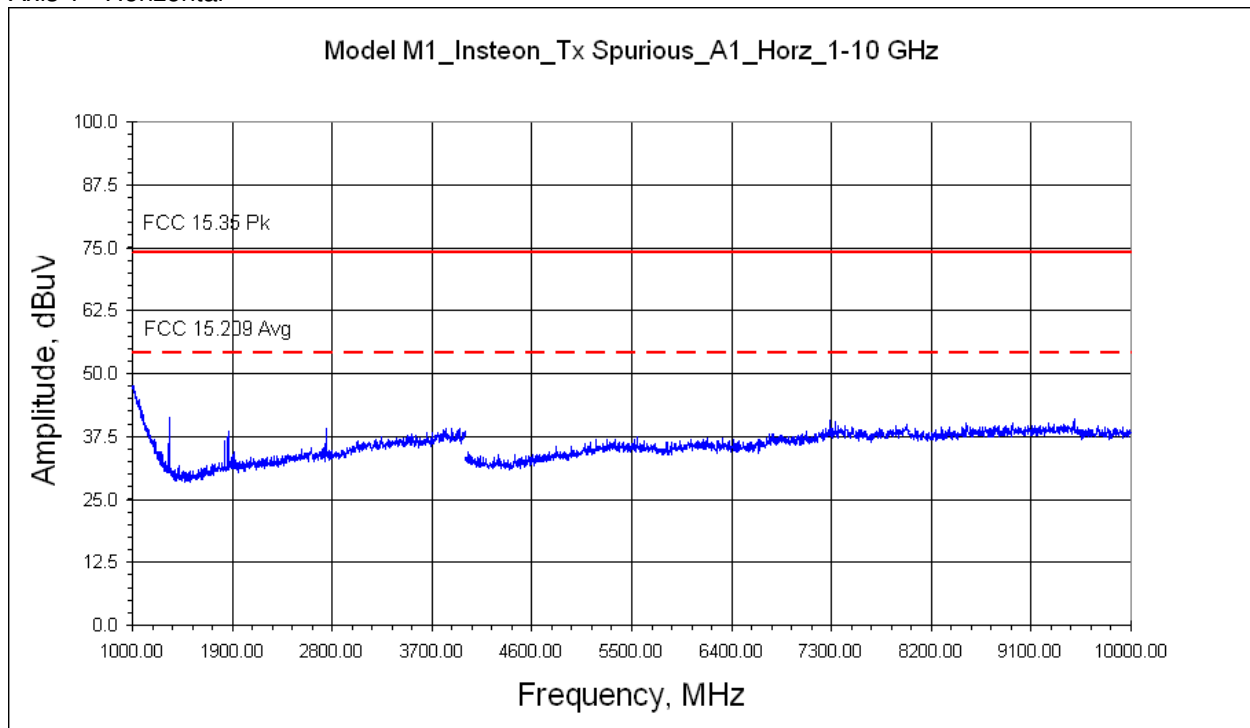


Plots: Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions)

Axis 1 - Vertical

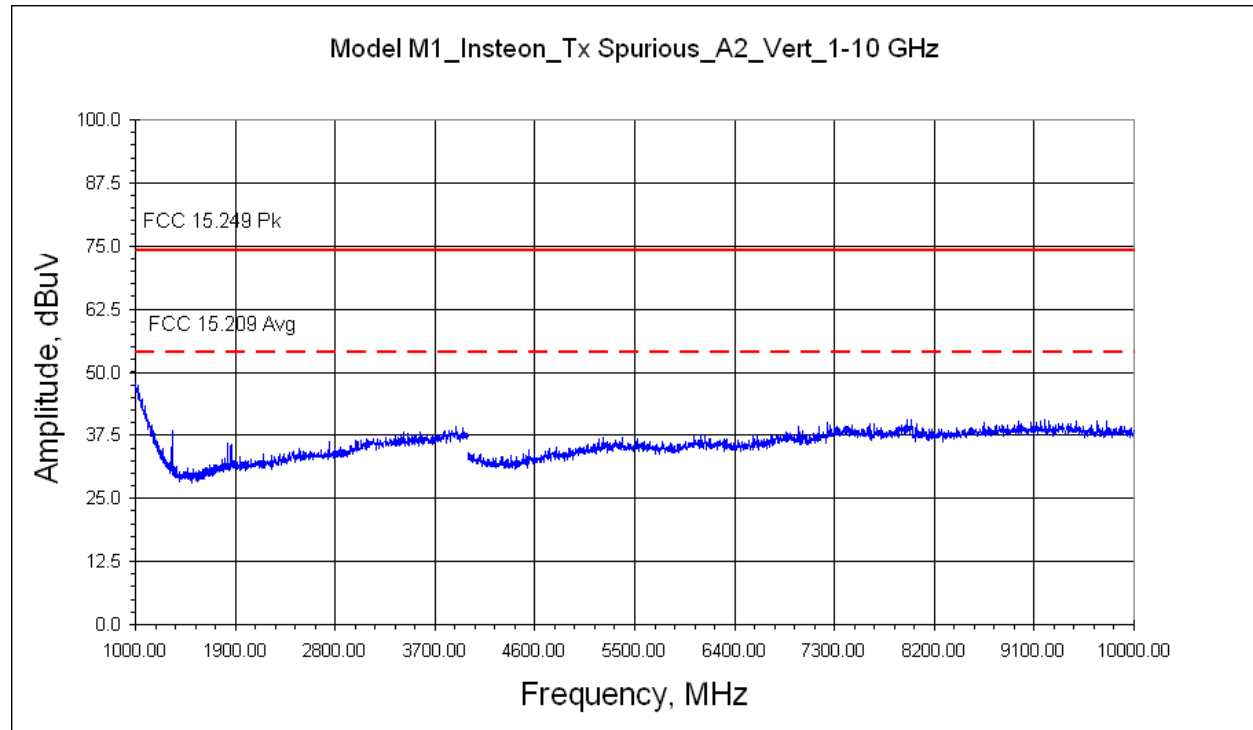


Axis 1 - Horizontal

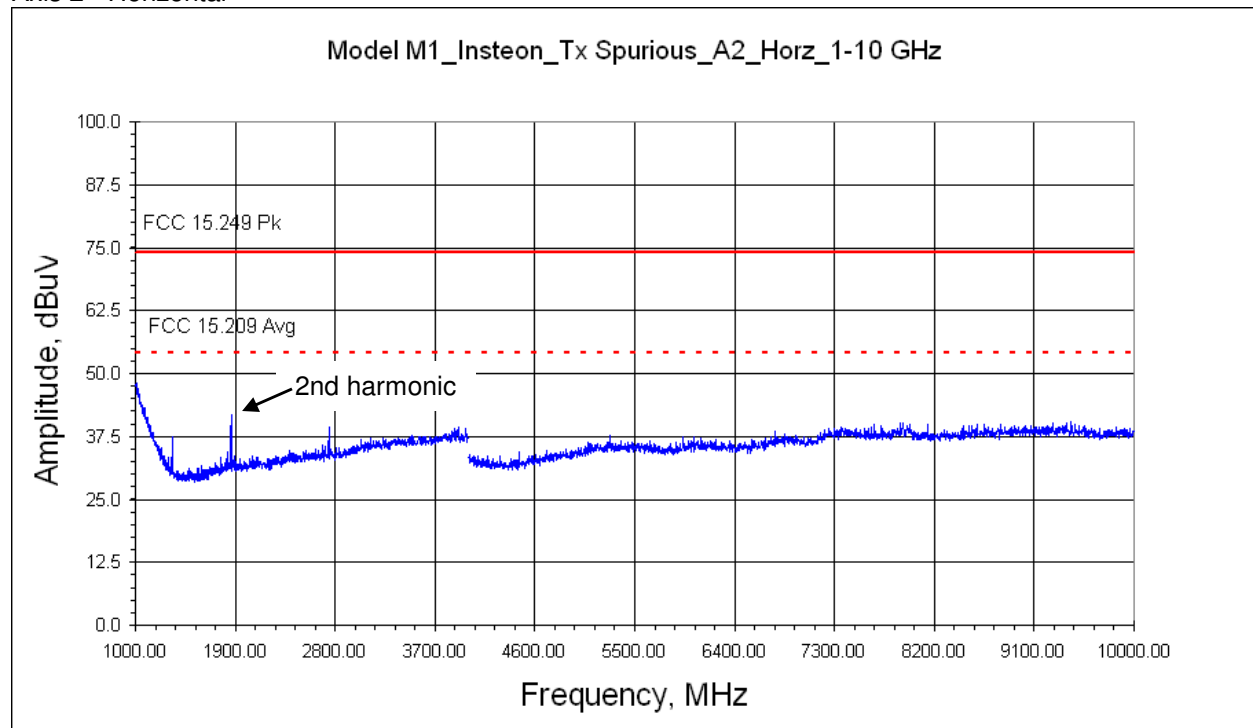


Plots: Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions)

Axis 2 - Vertical

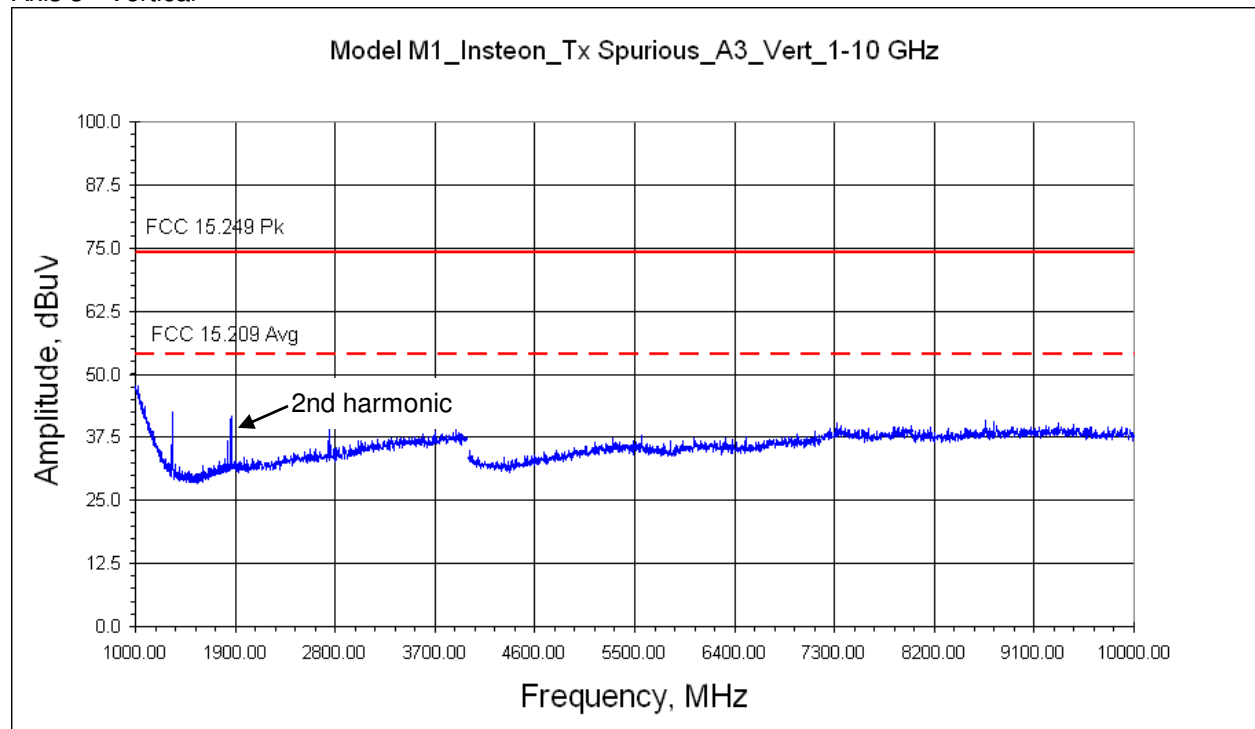


Axis 2 - Horizontal

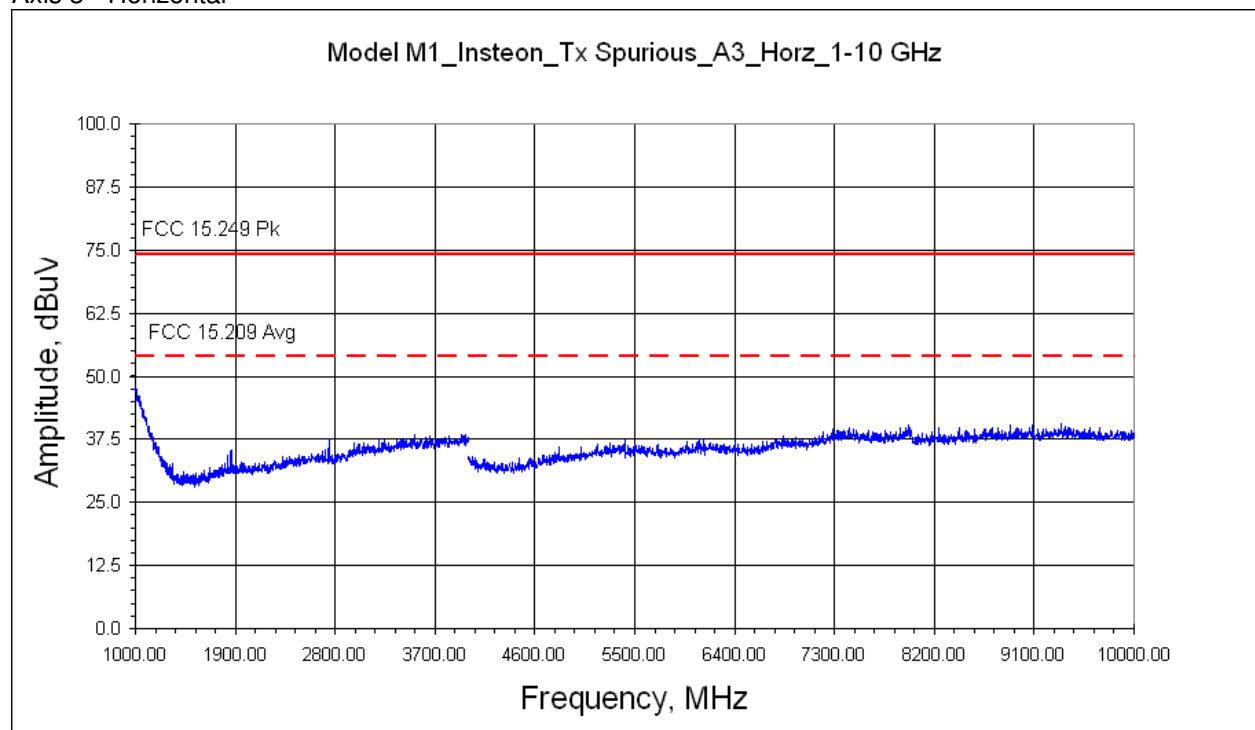


Plots: Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions)

Axis 3 - Vertical



Axis 3 - Horizontal



Intertek

Report Number: 101262612DEN-001C

Issued:9/27/2013

Test Data: Radiated Field Strength - Harmonics of the Fundamental (Out-of-Band Emissions)

Harmonics of the Fundamental - Radiated Field Measurements

Test Report #: G101262612	Test Area: CC1 Radiated	Temperature: 22.7 °C
Test Method: FCC 15.249(a)	Test Date: 15-Aug-2013	Relative Humidity: 29.1 %
EUT Model #: M1	EUT Power: 120VAC/60Hz	Air Pressure: 83.1 kPa
EUT Serial #: FCC1		

Manufacturer: Revolv, Inc.

EUT Description: Revolv "Hub" – RF-Enabled Home Automation

Notes: Product transmitting continuously – Insteon Radio active – FSK Modulated

Radio is a single channel: 915.00 MHz

All measurements peak detector – RBW > 6dB BW

Level Key

Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av – Average	

The following Duty Cycle was verified by Intertek: No Duty Cycle Correction was utilized in this test data.

Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.

The testing performed in accordance to FCC CFR47 Part 15.249 and delta limits were calculated as follows:

Final Corrected Peak Measurement – Duty Cycle Correction Factor* = Final Calculated Emission

The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.249 and the emission/limit delta was calculated.

DTCF is calculated as follows $20 \cdot \log_{10}$ (duty cycle in 100mS).

Part 15.249 (a) Limit: Average 500uV/m = 54 dBuV/m / Peak 74 dBuV/m (3-meter test distance)

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
MHz	duV/m	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBuV/m]	- [dB]	Corrected Final = [dBuV/m]	(V/H)	(m)	(DEG)	FCC 15.249(a) FCC 15.35(b)	FCC 15.249(a) FCC 15.35(b)	(MHz)

Harmonics of the Fundamental Measurements – Radiated Field [dBuV/m]

Tx Harmonics 1-4GHz: Axis 1 – Product Flat on Table (Horizontal)

1830.1280	39.97	Av	3.73	26.95	36.93	33.72	0.00	33.72	H	1.55	9.3	54.00	-20.28	1.000
1830.1280	57.40	Pk	3.73	26.95	36.93	51.15	0.00	51.15	H	1.55	9.3	74.00	-22.85	1.000
1830.1280	36.99	Av	3.73	26.95	36.93	30.74	0.00	30.74	V	1.43	23.6	54.00	-23.26	1.000
1830.1280	49.20	Pk	3.73	26.95	36.93	42.95	0.00	42.95	V	1.43	23.6	74.00	-31.05	1.000
2744.9040	39.50	Av	4.28	28.98	37.32	35.44	0.00	35.44	H	1.51	43.0	54.00	-18.56	1.000
2744.9040	50.47	Pk	4.28	28.98	37.32	46.41	0.00	46.41	H	1.51	43.0	74.00	-27.59	1.000
2744.9040	40.53	Av	4.28	28.98	37.32	36.47	0.00	36.47	V	1.69	43.6	54.00	-17.53	1.000
2744.9040	51.00	Pk	4.28	28.98	37.32	46.94	0.00	46.94	V	1.69	43.6	74.00	-27.06	1.000
3659.0000	40.28	Av	4.16	28.79	36.98	36.25	0.00	36.25	H	1.55	36.0	54.00	-17.75	1.000
3659.0000	51.98	Pk	4.16	28.79	36.98	47.95	0.00	47.95	H	1.55	36.0	74.00	-26.05	1.000
3659.0000	41.03	Av	4.16	28.79	36.98	37.00	0.00	37.00	V	1.59	48.0	54.00	-17.00	1.000
3659.0000	51.84	Pk	4.16	28.79	36.98	47.81	0.00	47.81	V	1.59	48.0	74.00	-26.19	1.000

Tx Harmonics 1-4GHz: Axis 2 – Product Vertical on Table

1830.1280	43.38	Av	3.73	26.95	36.93	37.13	0.00	37.13	H	1.64	359.9	54.00	-16.87	1.000
1830.1280	62.09	Pk	3.73	26.95	36.93	55.84	0.00	55.84	H	1.64	359.9	74.00	-18.16	1.000
2744.9040	42.27	Av	4.28	28.98	37.32	38.21	0.00	38.21	H	1.39	138.4	54.00	-15.79	1.000

Intertek														
Report Number: 101262612DEN-001C									Issued:9/27/2013					

2744.9040	51.67	Pk	4.28	28.98	37.32	47.61	0.00	47.61	H	1.39	138.4	74.00	-26.39	1.000
3659.0000	43.77	Av	4.16	28.79	36.98	39.74	0.00	39.74	H	1.40	148.0	54.00	-14.26	1.000
3659.0000	52.87	Pk	4.16	28.79	36.98	48.84	0.00	48.84	H	1.40	148.0	74.00	-25.16	1.000
Tx Harmonics 1-4GHz: Axis 3 – Product Vertical & Rotated 90 degrees														
1830.1280	42.78	Av	3.73	26.95	36.93	36.53	0.00	36.53	V	1.49	355.5	54.00	-17.47	1.000
1830.1280	41.98	Av	3.73	26.95	36.93	35.73	0.00	35.73	H	1.59	0.0	54.00	-18.27	1.000
1830.1280	54.12	Pk	3.73	26.95	36.93	47.87	0.00	47.87	V	1.49	355.5	74.00	-26.13	1.000
1830.1280	51.40	Pk	3.73	26.95	36.93	45.15	0.00	45.15	H	1.59	0.0	74.00	-28.85	1.000
2744.9040	40.31	Av	4.28	28.98	37.32	36.25	0.00	36.25	H	1.33	16.0	54.00	-17.75	1.000
2744.9040	50.67	Pk	4.28	28.98	37.32	46.61	0.00	46.61	H	1.33	16.0	74.00	-27.39	1.000
2744.9041	40.12	Av	4.28	28.98	37.32	36.06	0.00	36.06	V	1.75	263.1	54.00	-17.94	1.000
2744.9041	50.85	Pk	4.28	28.98	37.32	46.79	0.00	46.79	V	1.75	263.1	74.00	-27.21	1.000
3659.0000	41.12	Av	4.16	28.79	36.98	37.09	0.00	37.09	V	1.80	260.0	54.00	-16.91	1.000
3659.0000	41.15	Av	4.16	28.79	36.98	37.12	0.00	37.12	H	1.38	22.0	54.00	-16.88	1.000
3659.0000	51.24	Pk	4.16	28.79	36.98	47.21	0.00	47.21	V	1.80	260.0	74.00	-26.79	1.000
3659.0000	51.24	Pk	4.16	28.79	36.98	47.21	0.00	47.21	H	1.38	22.0	74.00	-26.79	1.000
Tx Harmonics 4-8GHz: Axis 2 – Worst Case														
4574.6800	34.05	Av	5.03	32.56	39.58	32.06	0.00	32.06	H	1.12	24.0	54.00	-21.94	1.000
4574.6800	47.41	Pk	5.03	32.56	39.58	45.42	0.00	45.42	H	1.12	24.0	74.00	-28.58	1.000
4574.6800	34.00	Av	5.03	32.56	39.58	32.01	0.00	32.01	V	1.30	151.0	54.00	-21.99	1.000
4574.6800	47.44	Pk	5.03	32.56	39.58	45.45	0.00	45.45	V	1.30	151.0	74.00	-28.55	1.000
5489.6160	33.37	Av	5.52	34.35	38.58	34.66	0.00	34.66	H	1.20	25.0	54.00	-19.34	1.000
5489.6160	47.18	Pk	5.52	34.35	38.58	48.47	0.00	48.47	H	1.20	25.0	74.00	-25.53	1.000
5489.6160	33.36	Av	5.52	34.35	38.58	34.65	0.00	34.65	V	1.33	121.0	54.00	-19.35	1.000
5489.6160	46.53	Pk	5.52	34.35	38.58	47.82	0.00	47.82	V	1.33	121.0	74.00	-26.18	1.000
6404.5520	33.88	Av	5.99	34.80	40.03	34.64	0.00	34.64	H	1.20	25.0	54.00	-19.36	1.000
6404.5520	47.07	Pk	5.99	34.80	40.03	47.83	0.00	47.83	H	1.20	25.0	74.00	-26.17	1.000
6404.5520	33.88	Av	5.99	34.80	40.03	34.64	0.00	34.64	V	1.27	96.0	54.00	-19.36	1.000
6404.5520	47.93	Pk	5.99	34.80	40.03	48.69	0.00	48.69	V	1.27	96.0	74.00	-25.31	1.000
7319.4880	33.84	Av	6.47	36.53	39.21	37.63	0.00	37.63	H	1.25	17.0	54.00	-16.37	1.000
7319.4880	47.47	Pk	6.47	36.53	39.21	51.26	0.00	51.26	H	1.25	17.0	74.00	-22.74	1.000
7319.4880	33.83	Av	6.47	36.53	39.21	37.62	0.00	37.62	V	1.15	58.0	54.00	-16.38	1.000
7319.4880	47.42	Pk	6.47	36.53	39.21	51.21	0.00	51.21	V	1.15	58.0	74.00	-22.79	1.000
Tx Harmonics 8-10GHz: Axis 2 – Worst Case														
8234.4240	38.50	Av	6.95	37.13	45.84	36.74	0.00	36.74	H	1.14	21.0	54.00	-17.26	1.000
8234.4240	51.82	Pk	6.95	37.13	45.84	50.06	0.00	50.06	H	1.14	21.0	74.00	-23.94	1.000
8234.4240	38.49	Av	6.95	37.13	45.84	36.73	0.00	36.73	V	1.28	43.0	54.00	-17.27	1.000
8234.4240	51.52	Pk	6.95	37.13	45.84	49.76	0.00	49.76	V	1.28	43.0	74.00	-24.24	1.000
9149.3600	39.04	Av	7.40	38.39	47.42	37.41	0.00	37.41	H	1.17	15.0	54.00	-16.59	1.000
9149.3600	52.07	Pk	7.40	38.39	47.42	50.44	0.00	50.44	H	1.17	15.0	74.00	-23.56	1.000
9149.3600	39.03	Av	7.40	38.39	47.42	37.40	0.00	37.40	V	1.24	34.0	54.00	-16.60	1.000
9149.3600	52.17	Pk	7.40	38.39	47.42	50.54	0.00	50.54	V	1.24	34.0	74.00	-23.46	1.000

Harmonics in Restricted Bands – Reference Only

fundamental				Harmonics						
MHz0	MHz1	MHz2	MHz3	MHz4	MHz5	MHz6	MHz7	MHz8	MHz9	MHz10
915	915.00	1830.00	2745.00	3660.00	4575.00	5490.00	6405.00	7320.00	8235.00	9150.00

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

8 Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge

Method:

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.249.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification:

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 FCC 15.209, whichever is the lesser attenuation.

As shown in FCC15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

- FCC 15.249(d)(e)/ 15.205/209

Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	06/07/2013	06/07/2014
18906	RF Pre-Amp (1-4GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	06/10/2013	06/10/2014
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	06/10/2014	06/10/2014
18901	RF Pre-Amp (8-18GHz)	Avantek	AWT-18037	1002	06/10/2013	06/10/2014
19936	Bilog Antenna 30MHz – 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2012	11/15/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	03/19/2013	03/19/2014
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBU	VBU

Results:

The sample tested was found to comply.

Test Summary: Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge

Tx Spurious Emissions	Radiated Field Strength @ 3-meters					
Frequency Range:	<input checked="" type="checkbox"/> 902-928MHz <input type="checkbox"/> 2400-2483.5MHz <input type="checkbox"/> 5725-5850MHz					
Low Frequency MHz	Measured Field Strength (dBuV/m)	Duty Cycle Correction Factor (dB)	Final Corrected (dBuV/m)	Standard Limit (uV/m)	Limit (dBuV/m)	Margin dB
Frequency MHz						
854.93 Quasi-Peak	40.27	0.00	40.27	---	46.02	- 5.75
RBW:	<input checked="" type="checkbox"/> 120kHz <input type="checkbox"/> 300kHz <input type="checkbox"/> 500kHz <input type="checkbox"/> 1MHz <input type="checkbox"/> 3MHz <input type="checkbox"/> 10MHz					
VBW:	<input checked="" type="checkbox"/> 300kHz <input type="checkbox"/> 1MHz <input type="checkbox"/> 1MHz <input type="checkbox"/> 3 MHz <input type="checkbox"/> 10MHz <input type="checkbox"/> 10MHz					
Antenna Gain:	<input checked="" type="checkbox"/> < 6dBi <input type="checkbox"/> >6dBi and = dBi, Output power reduction = dB					

Test Method:

- FCC Publication 720338 & 433442
- ANSI C63.10:2009, Section 6.6

An intentional radiator shall be measured in accordance with 47 CFR 15.31-15.35. The detector functions and measuring bandwidths for these measurements are specified in 15.35. For measurements below 1 GHz, a quasi-peak detector shall be used. However, a peak detector may be used, since the measured value will generally be higher with a peak detector. For measurements above 1 GHz, the limits are in terms of using an instrument with an average detector, unstated otherwise for a specific type of device. For device operating under Section 15.249, the limit is in terms of average with an additional peak limit of 20 dB over the average limit (see 47 CFR 15.249(e)).

Notes:

1. All Tx Spurious of the Fundamental measurements are radiated field – peak/average detector, max hold measurements – 1MHz RBW.
2. The product was tested in (3) axes – refer to section 4 for details.
3. The transmitter is single-channel.
4. Measurements were not adjusted by the allowed duty cycle correction factor per FCC 15.35.

Setup Photographs: Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge

Test Setup – Front View
Axis 1

Axis 2



Axis 3



Setup Photographs: Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge

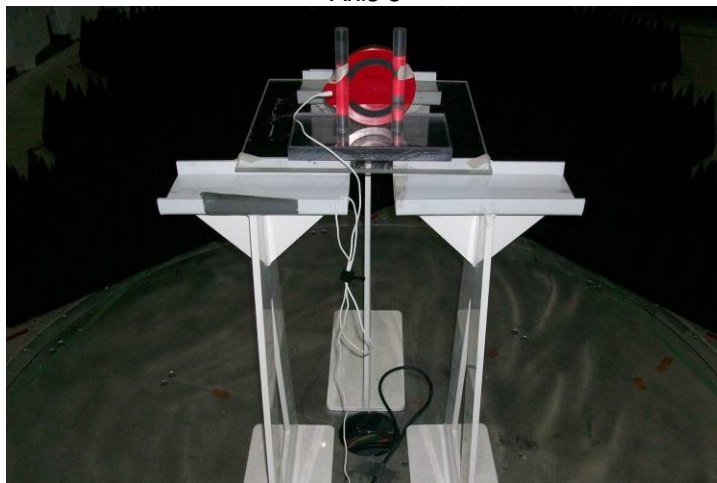
Test Setup – Rear View
Axis 1



Axis 2



Axis 3



Setup Photographs: Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge

Test Setup

Antenna – 30MHz to 1000MHz

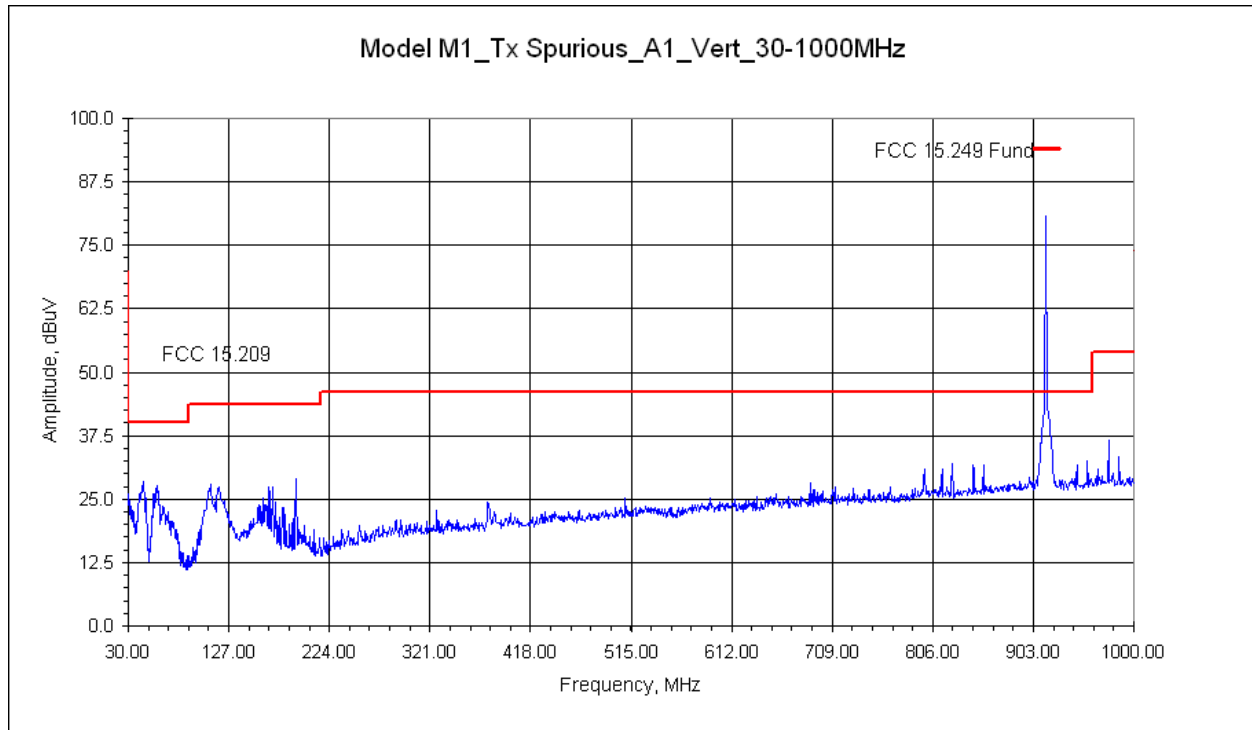


Antenna – 1GHz to 18GHz

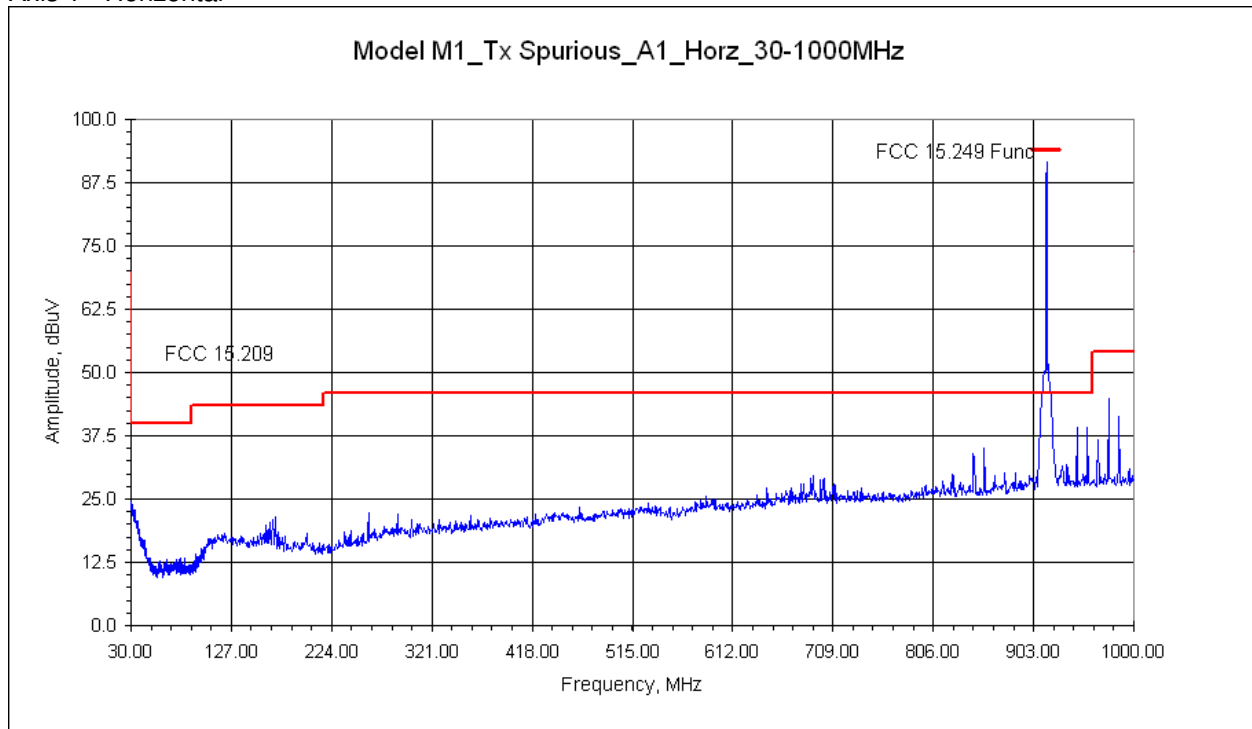


Plots: Tx Spurious Emissions 30-1000MHz (Mid Channel)

Axis 1 – Vertical

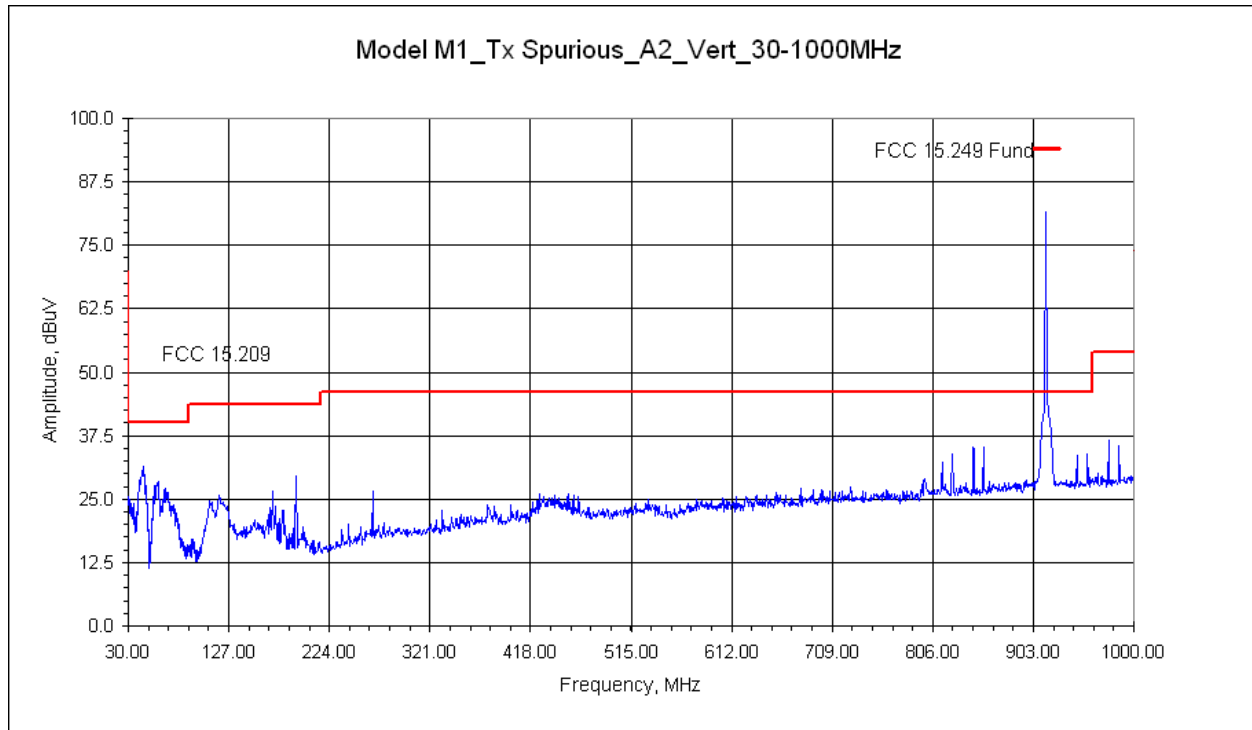


Axis 1 - Horizontal

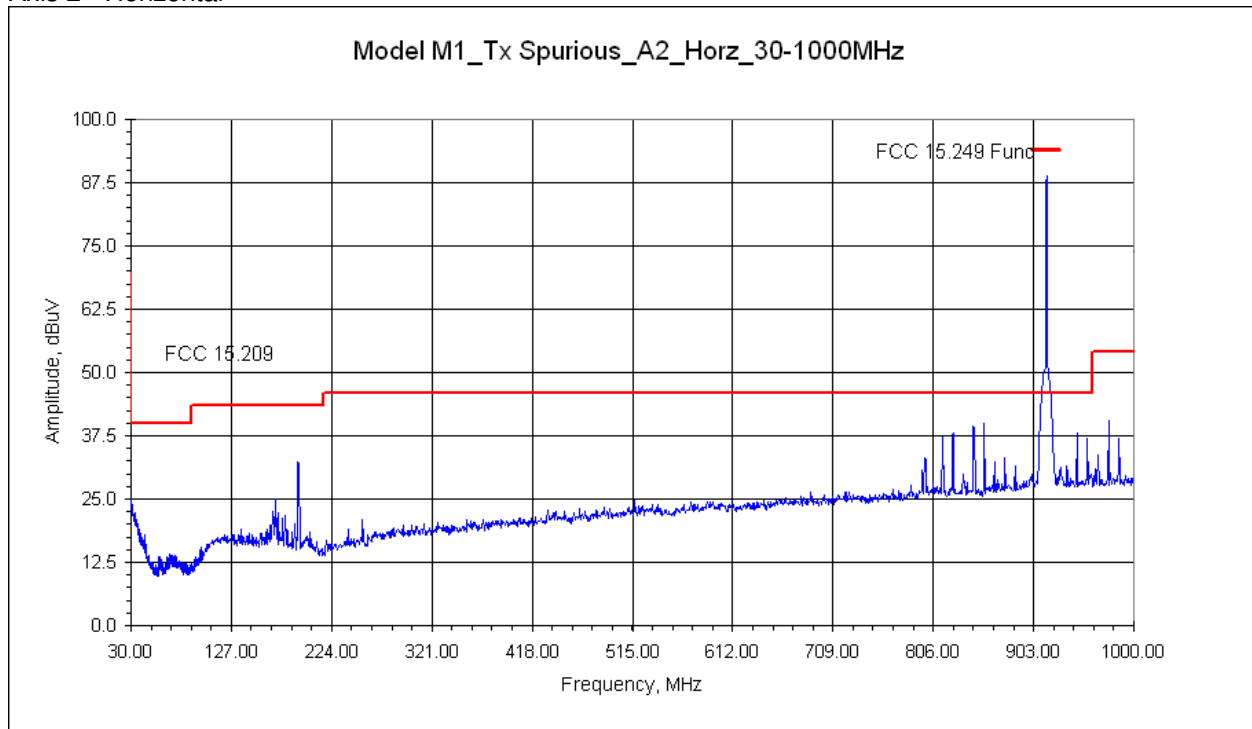


Plots: Tx Spurious Emissions 30-1000MHz (Mid Channel)

Axis 2 – Vertical

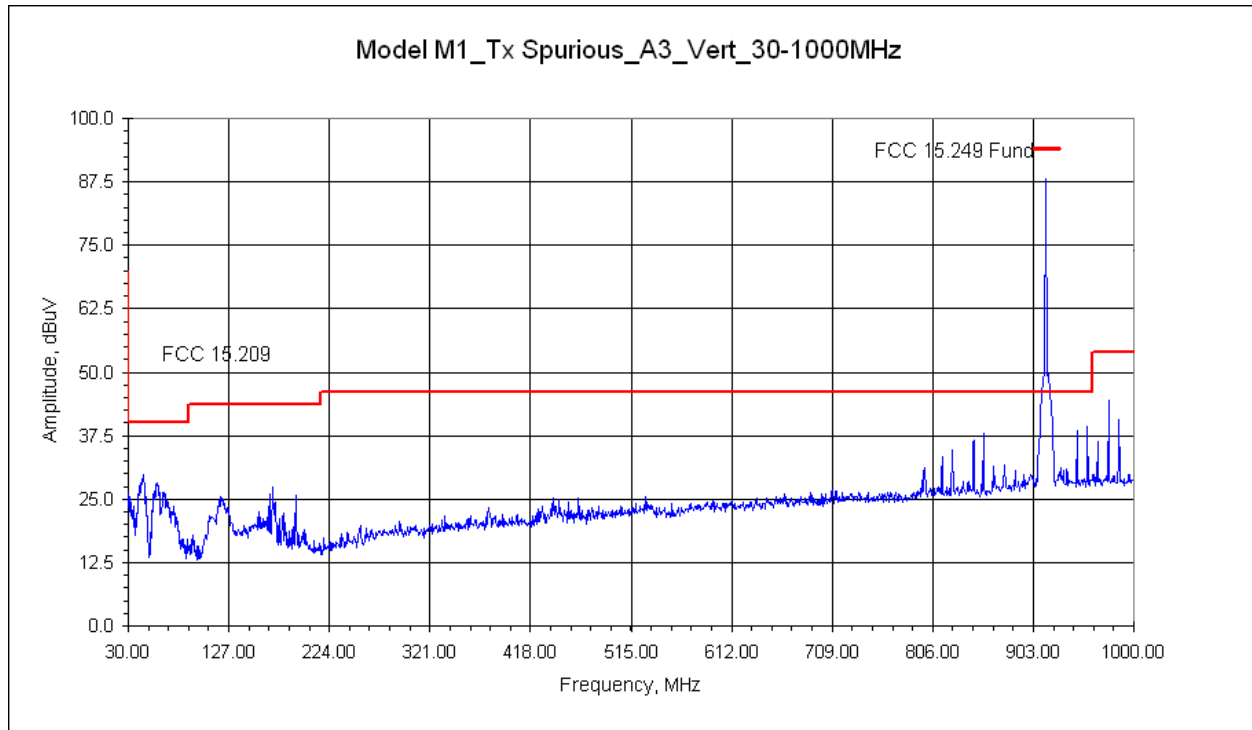


Axis 2 - Horizontal

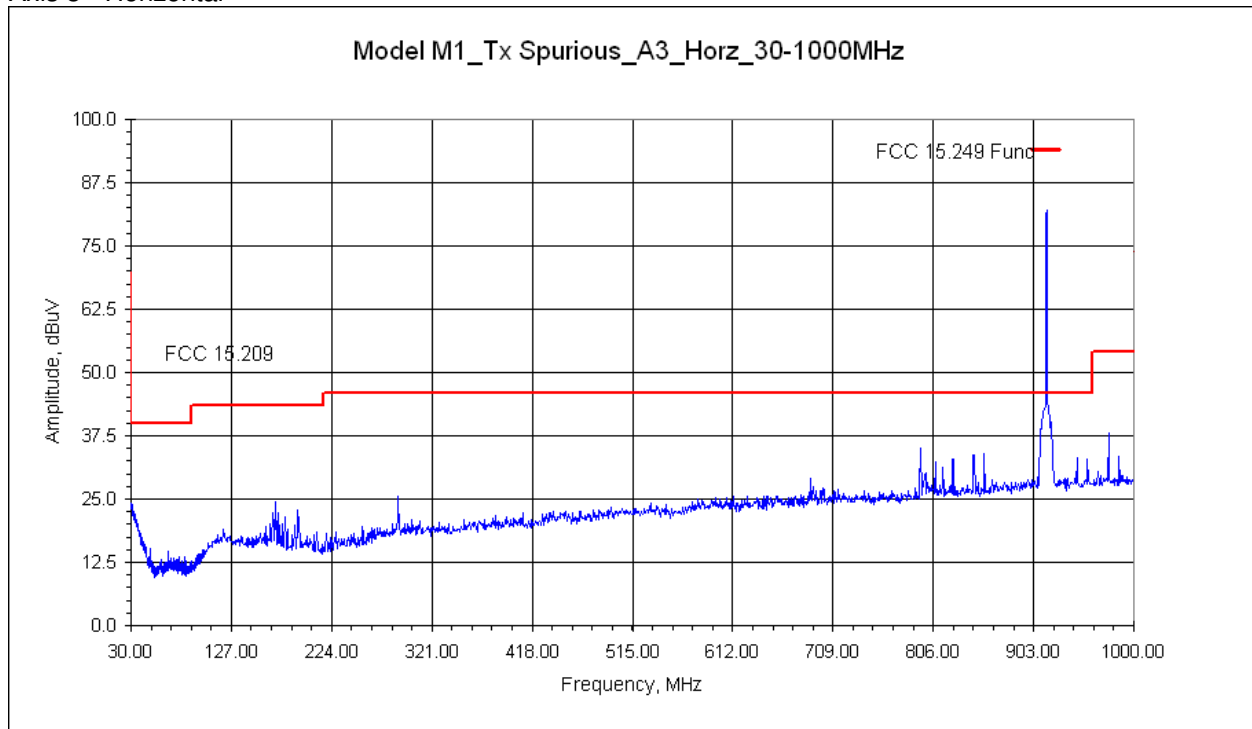


Plots: Tx Spurious Emissions 30-1000MHz (Mid Channel)

Axis 3 – Vertical

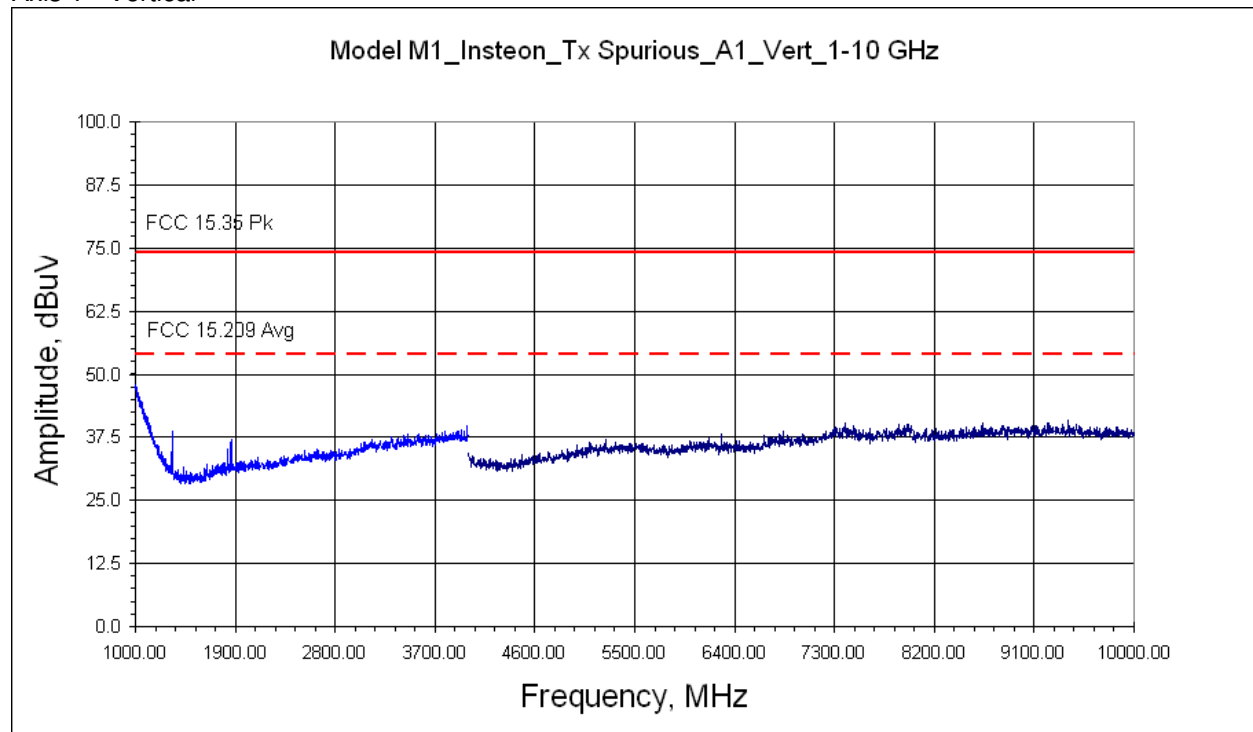


Axis 3 - Horizontal

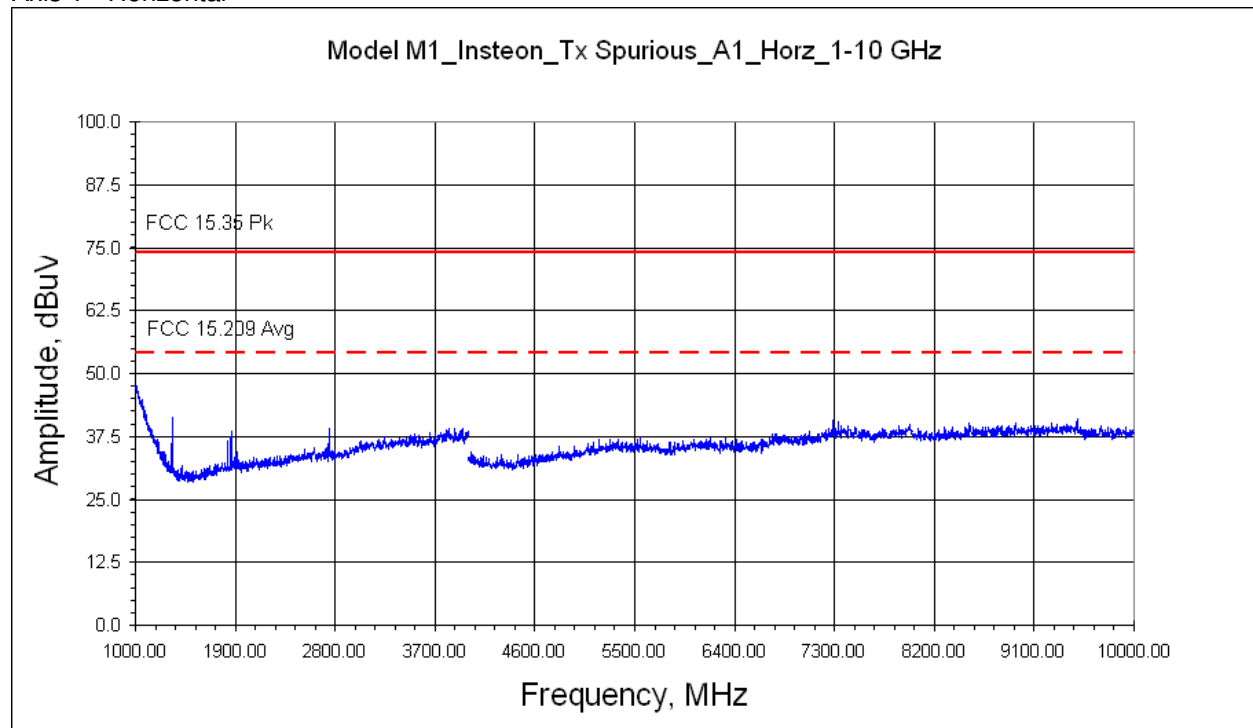


Plots: Tx Spurious Emissions 1-10GHz (Mid Channel)

Axis 1 - Vertical

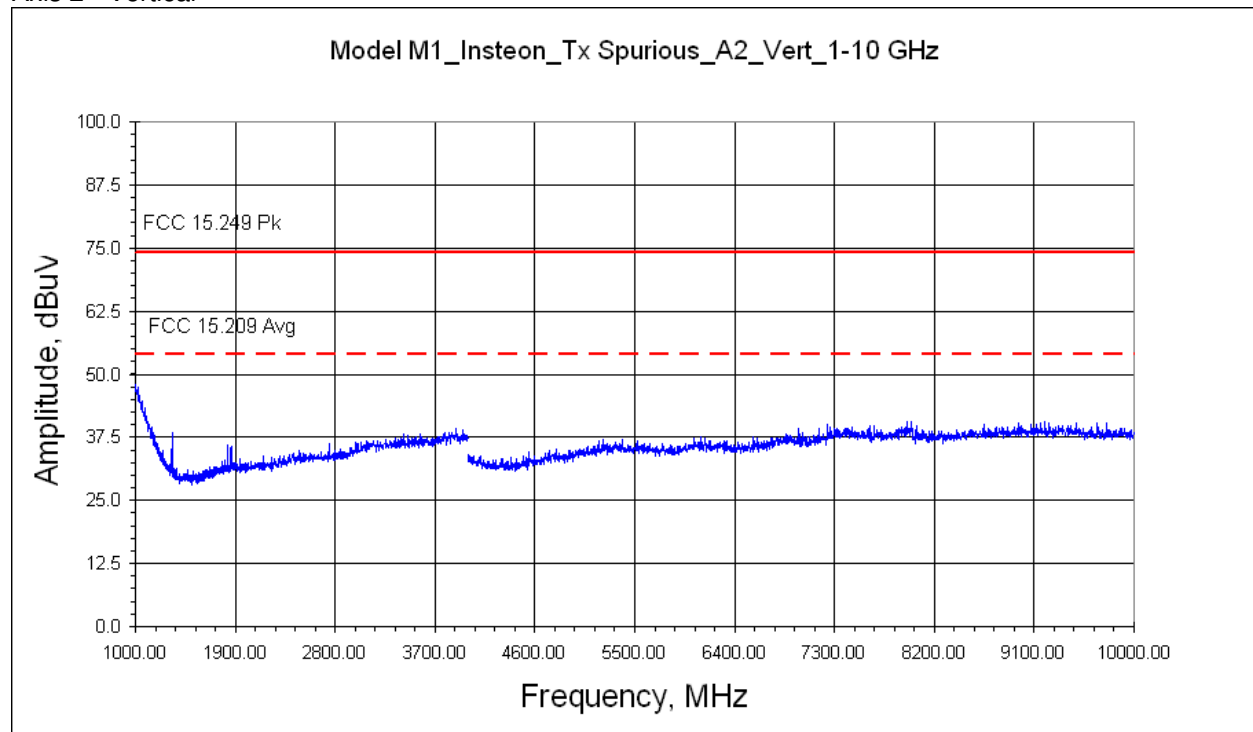


Axis 1 - Horizontal

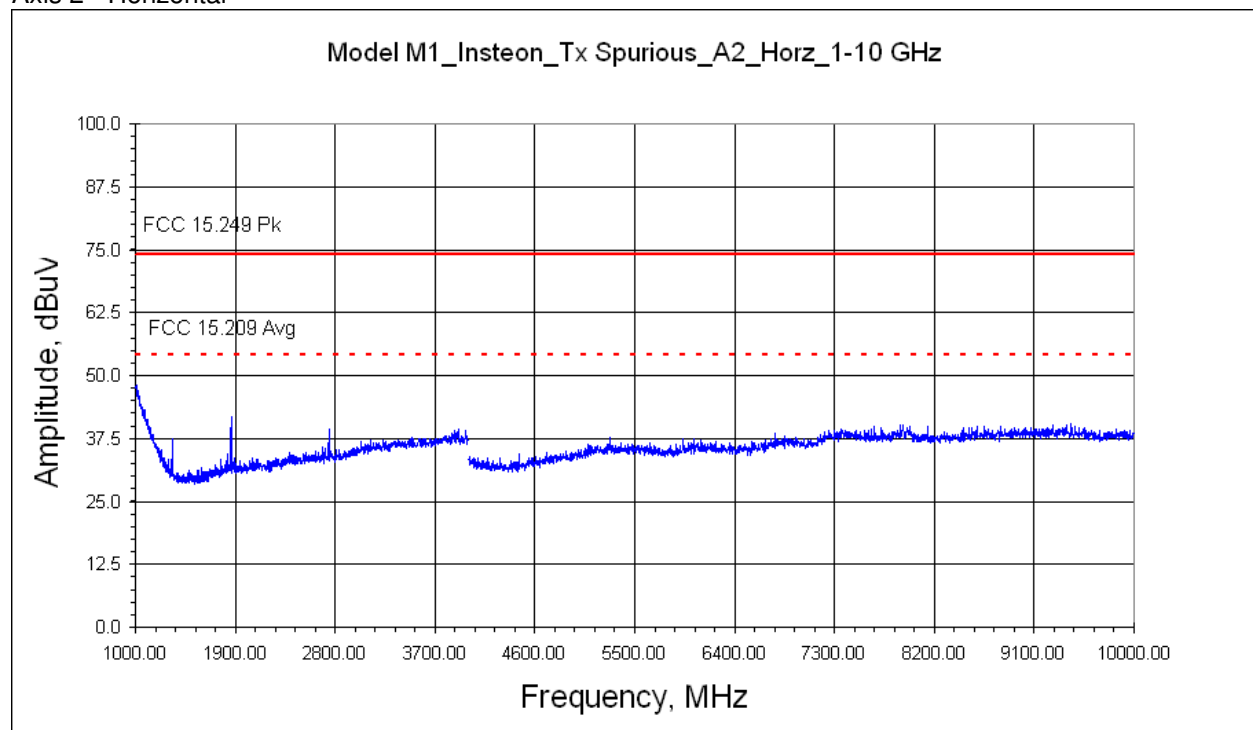


Plots: Tx Spurious Emissions 1-10GHz (Mid Channel)

Axis 2 - Vertical

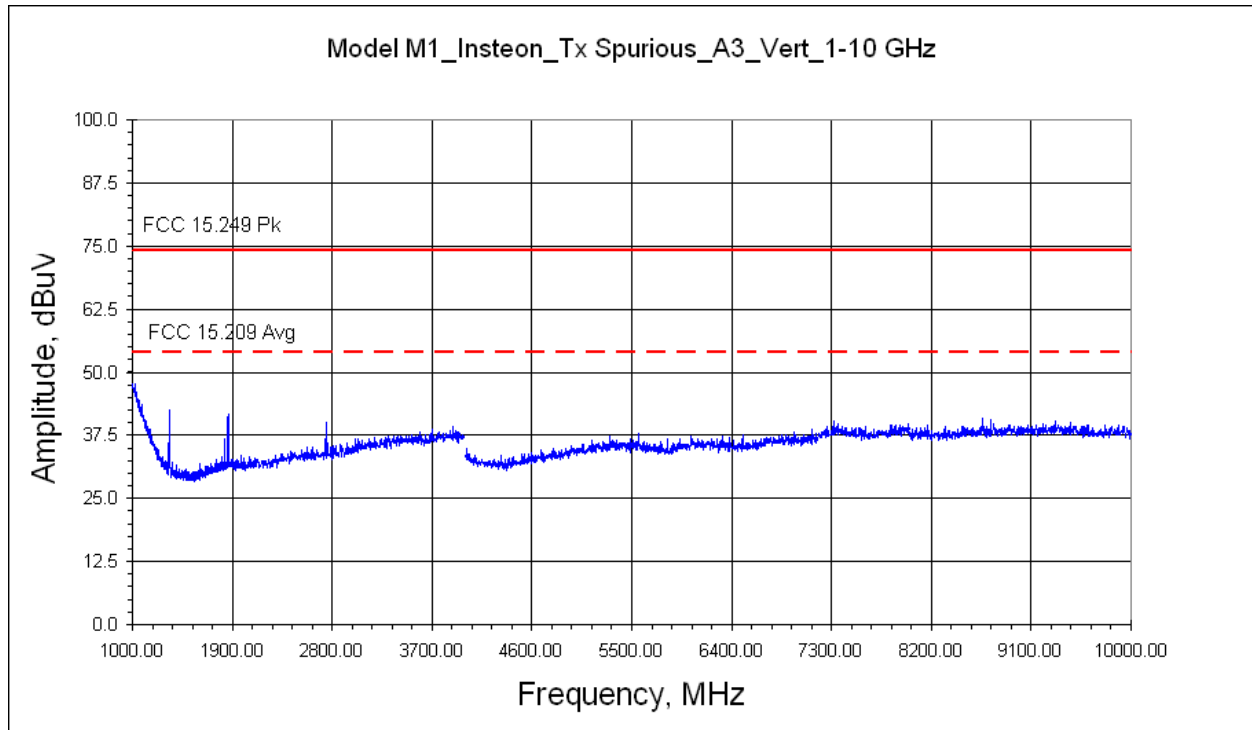


Axis 2 - Horizontal

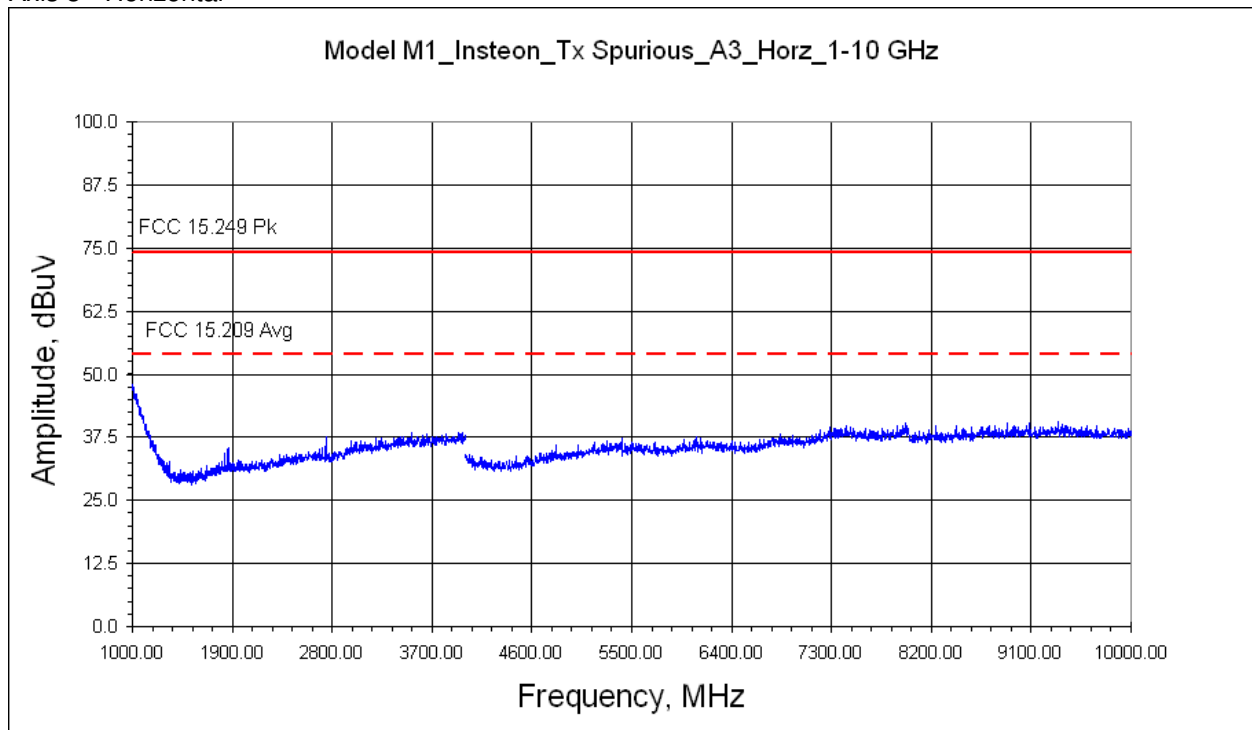


Plots: Tx Spurious Emissions 1-10GHz (Mid Channel)

Axis 3 - Vertical



Axis 3 - Horizontal



Intertek

Report Number: 101262612DEN-001C

Issued:9/27/2013

Test Data: Radiated Tx Spurious Emissions – Including Restricted Band & Band Edge

Tx Spurious (Non-Harmonics) - Radiated Field Measurements

Test Report #: G101262612	Test Area: CC1 Radiated	Temperature: 22.7 °C
Test Method: FCC 15.249(a)	Test Date: 15-Aug-2013	Relative Humidity: 29.1 %
EUT Model #: M1	EUT Power: 120VAC/60Hz	Air Pressure: 83.1 kPa
EUT Serial #: FCC1		

Manufacturer: Revolv, Inc.

EUT Description: Revolv "Hub" – RF-Enabled Home Automation

Notes: Product transmitting continuously – Insteon Radio active – FSK Modulated

Radio is a single channel: 915.00 MHz

All measurements peak detector – RBW > 6dB BW

Level Key

Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

The following Duty Cycle was verified by Intertek: No Duty Cycle Correction was utilized in this test data.

Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.

The testing performed in accordance to FCC CFR47 Part 15.249 and delta limits were calculated as follows:

Final Corrected Peak Measurement – Duty Cycle Correction Factor* = Final Calculated Emission

The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.249 and the emission/limit delta was calculated.

DTCF is calculated as follows $20 \cdot \log_{10}$ (duty cycle in 100mS).

Part 15.249 (a) Limit: Average 500uV/m = 54 dBuV/m / Peak 74 dBuV/m (3-meter test distance)

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	DELTA LIMIT	DELTA2 LIMIT	RBW
MHz	duV/m	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBuV/m]	- [dB]	Corrected Final = [dBuV/m]	(V/H)	(m)	(DEG)	FCC 15.209	FCC 15.35(b) Pk	(MHz)

Harmonics of the Fundamental Measurements – Radiated Field [dBuV/m]

Tx Spurious 30MHz to 1000MHz: Axis 1 – Product Flat on Table (Horizontal)

44.4199	38.59	Qp	0.77	10.85	28.20	22.01	0.00	22.01	V	1.00	230.8	- 17.99	NA	0.120
58.4423	40.12	Qp	0.77	7.54	28.16	20.27	0.00	20.27	V	1.00	68.9	- 19.73	NA	0.120
169.6519	42.24	Qp	0.87	12.23	27.63	27.72	0.00	27.72	V	1.07	332.2	- 15.80	NA	0.120
188.5077	35.60	Qp	0.92	11.40	27.54	20.38	0.00	20.38	V	1.00	319.2	- 23.14	NA	0.120
854.9281	44.62	Qp	2.04	21.40	27.79	40.27	0.00	40.27	H	1.04	14.4	- 5.75	NA	0.120
945.0923	41.55	Qp	2.15	22.40	27.50	38.60	0.00	38.60	H	1.00	145.2	- 7.42	NA	0.120
975.0808	46.37	Qp	2.18	22.70	27.40	43.86	0.00	43.86	H	1.56	146.3	- 10.12	NA	0.120

Tx Spurious 30MHz to 1000MHz: Axis 2 – Product Vertical on Table

44.9199	40.48	Qp	0.77	10.55	28.20	23.60	0.00	23.60	V	1.00	174.1	- 16.40	NA	0.120
58.4423	41.46	Qp	0.77	7.54	28.16	21.61	0.00	21.61	V	1.00	27.2	- 18.39	NA	0.120
169.6577	38.15	Qp	0.87	12.23	27.63	23.63	0.00	23.63	H	1.77	279.0	- 19.89	NA	0.120
192.0009	45.78	Qp	0.92	11.60	27.52	30.79	0.00	30.79	V	1.00	37.7	- 12.73	NA	0.120
855.0981	43.85	Qp	2.04	21.40	27.78	39.51	0.00	39.51	H	1.65	175.0	- 6.51	NA	0.120
945.0923	41.04	Qp	2.15	22.40	27.50	38.09	0.00	38.09	H	1.29	174.9	- 7.93	NA	0.120
975.0808	45.57	Qp	2.18	22.70	27.40	43.06	0.00	43.06	H	1.28	160.5	- 10.92	NA	0.120

Intertek

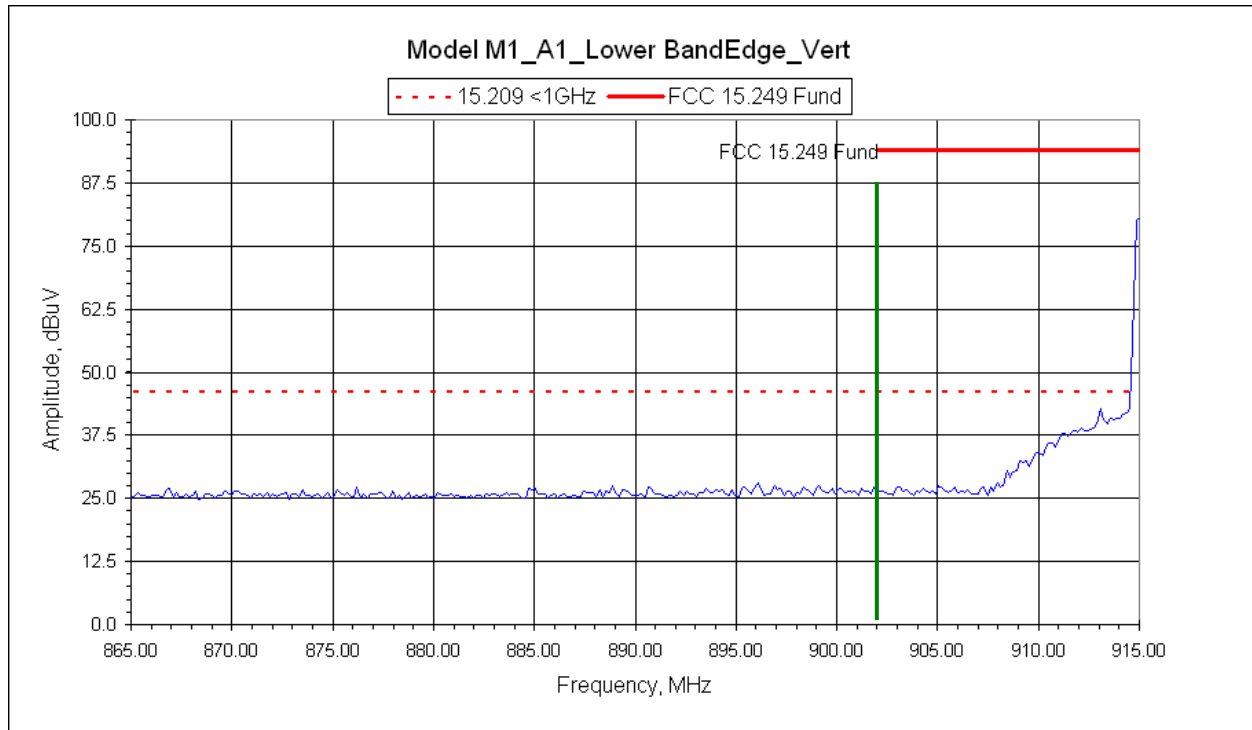
Report Number: 101262612DEN-001C

Issued:9/27/2013

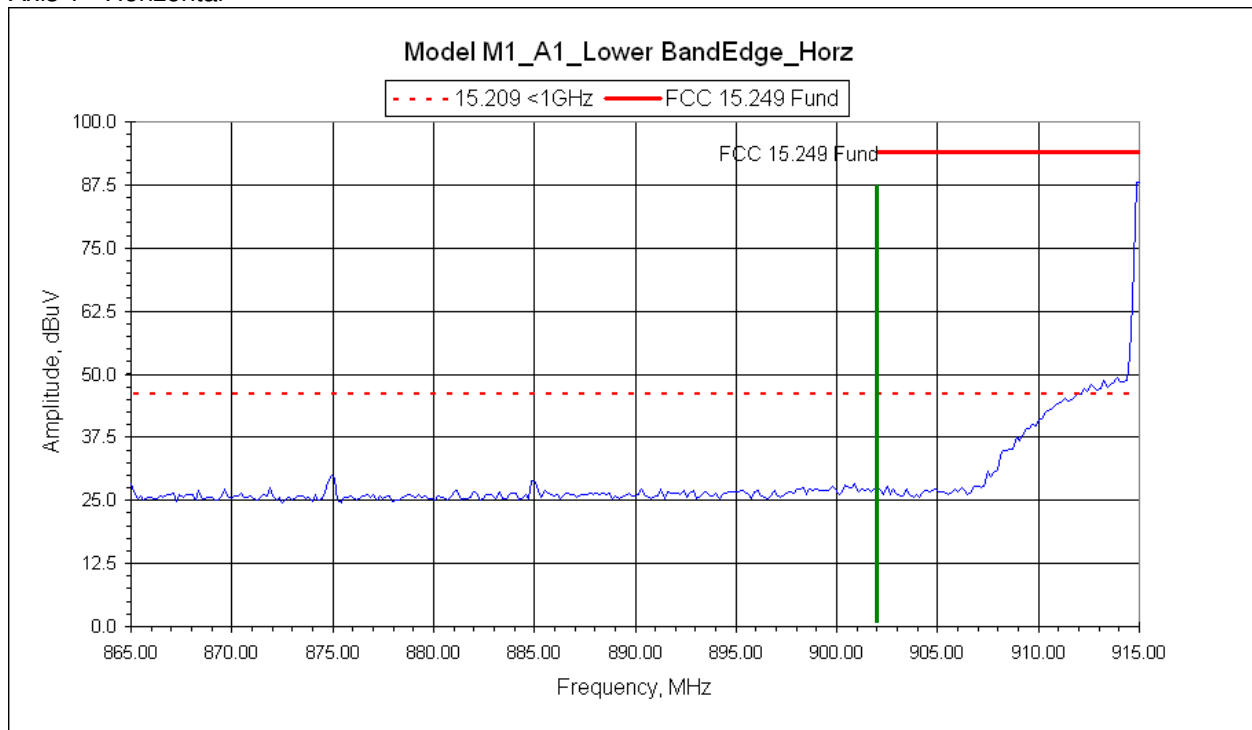
Tx Spurious 30MHz to 1000MHz: Axis 3 – Product Vertical & rotated 90 degrees														
44.4199	38.70	Qp	0.77	10.85	28.20	22.12	0.00	22.12	V	1.00	303.8	- 17.88	NA	0.120
58.4423	40.88	Qp	0.77	7.54	28.16	21.03	0.00	21.03	V	1.00	24.8	- 18.97	NA	0.120
169.6519	41.63	Qp	0.87	12.23	27.63	27.11	0.00	27.11	V	1.00	299.8	- 16.41	NA	0.120
192.0000	42.08	Qp	0.92	11.60	27.52	27.09	0.00	27.09	V	1.00	247.7	- 16.43	NA	0.120
855.0981	43.32	Qp	2.04	21.40	27.78	38.98	0.00	38.98	V	1.06	171.4	- 7.04	NA	0.120
945.0923	40.11	Qp	2.15	22.40	27.50	37.16	0.00	37.16	V	1.00	239.1	- 8.86	NA	0.120
Tx Harmonics 1-4GHz: Axis 2 – Product Vertical on Table														
1330.3280	58.04	Pk	4.86	25.21	36.89	51.23	0.00	51.23	V	1.71	173.2	NA	- 22.77	1.000
1330.3280	48.43	Av	4.86	25.21	36.89	41.62	0.00	41.62	V	1.71	173.2	- 12.38	NA	1.000
1862.8820	62.76	Pk	3.75	27.14	36.97	56.68	0.00	56.68	V	1.57	182.4	NA	- 17.32	1.000
1862.8820	46.91	Av	3.75	27.14	36.97	40.83	0.00	40.83	V	1.57	182.4	- 13.17	NA	1.000
Tx Harmonics 1-4GHz: Axis 3 – Product Vertical & Rotated 90 degrees														
1331.1280	58.68	Pk	4.85	25.21	36.89	51.85	0.00	51.85	H	1.83	143.9	NA	- 22.15	1.000
1331.1280	43.91	Av	4.85	25.21	36.89	37.08	0.00	37.08	H	1.83	143.9	- 16.92	NA	1.000
1862.8820	63.06	Pk	3.75	27.14	36.97	56.98	0.00	56.98	H	1.57	235.1	NA	- 17.02	1.000
1862.8820	45.93	Av	3.75	27.14	36.97	39.85	0.00	39.85	H	1.57	235.1	- 14.15	NA	1.000
No Tx Spurious signals found above 4GHz – refer to pre-scan plots														

Plots: Lower Band Edge

Axis 1 - Vertical

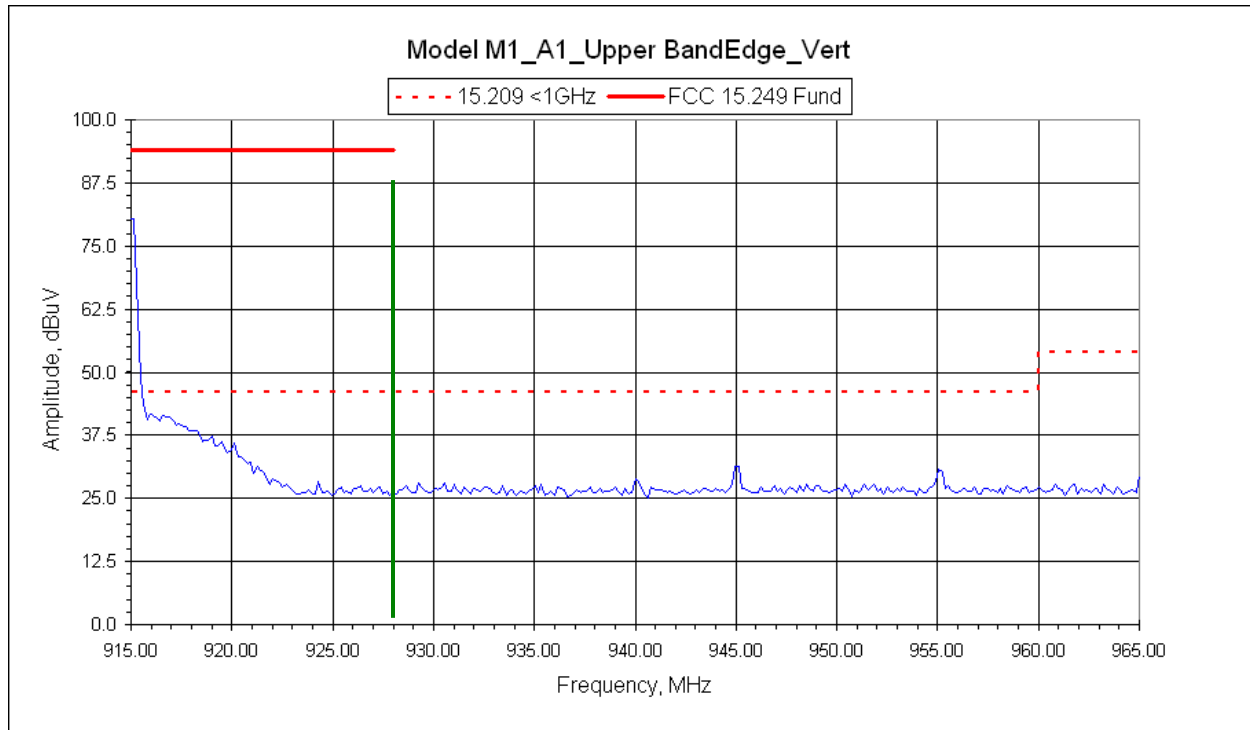


Axis 1 - Horizontal

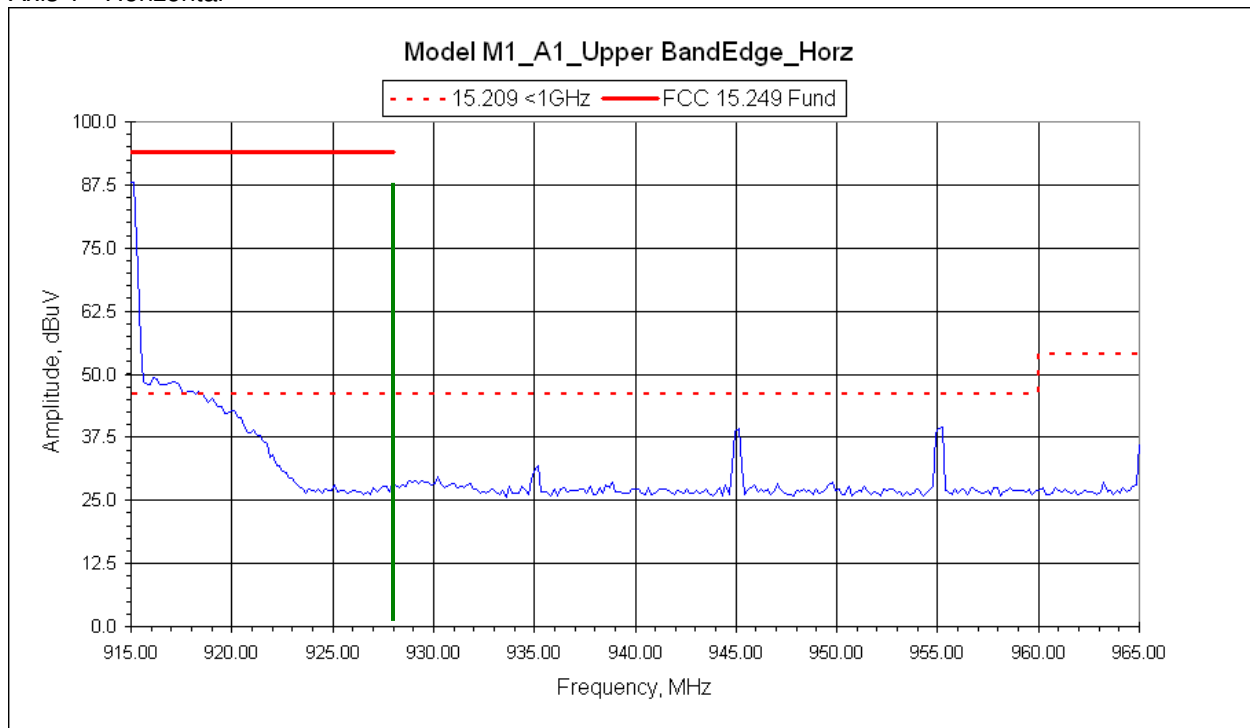


Plots: Upper Band Edge

Axis 1 - Vertical

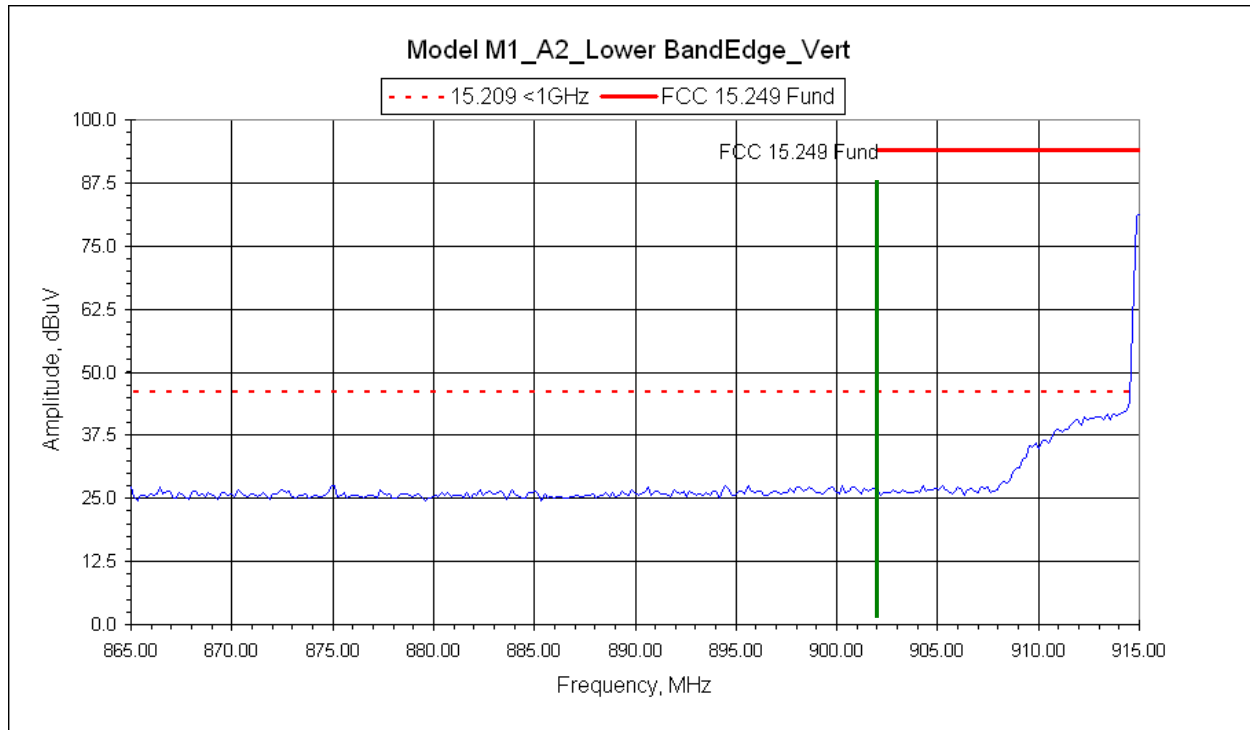


Axis 1 - Horizontal

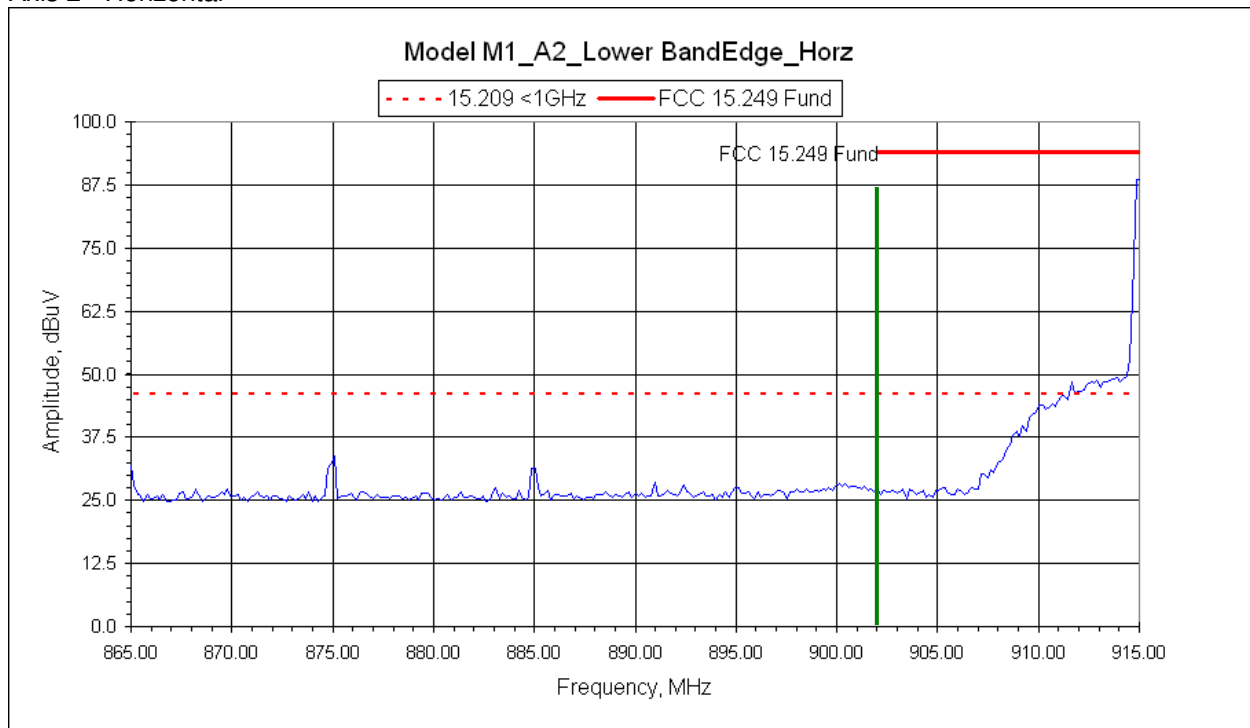


Plots: Lower Band Edge

Axis 2 - Vertical

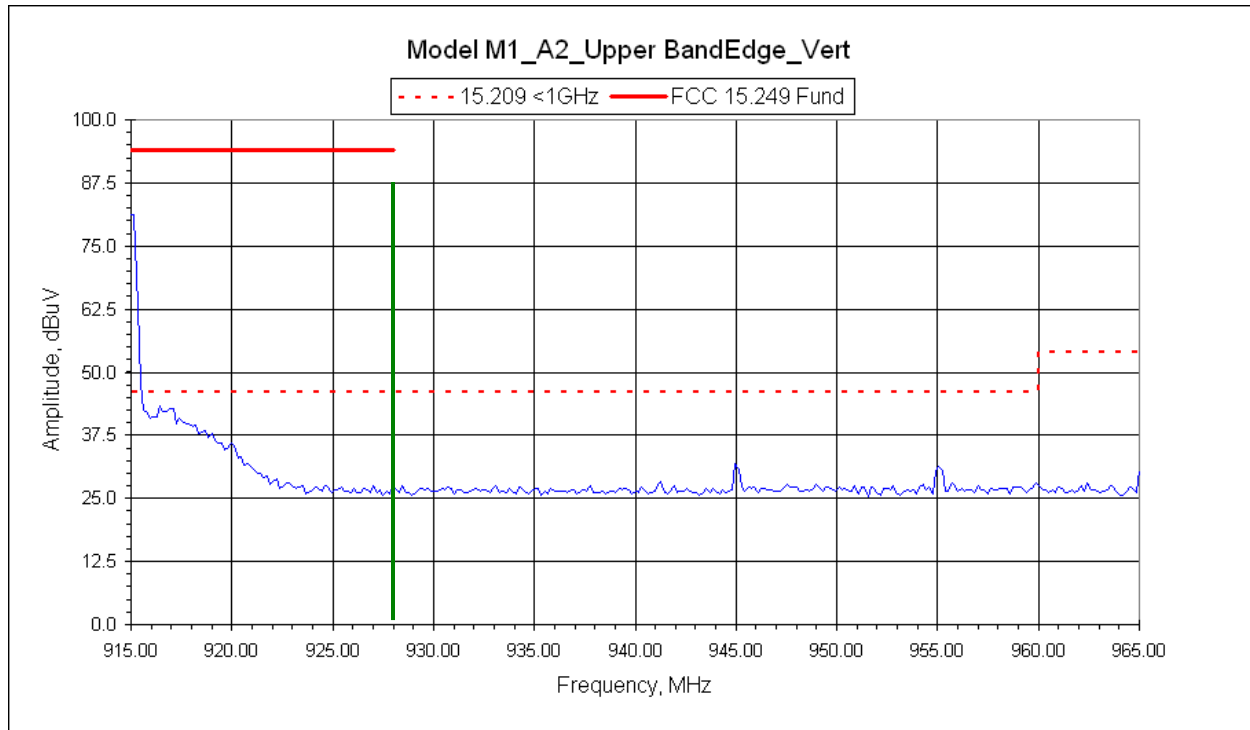


Axis 2 - Horizontal

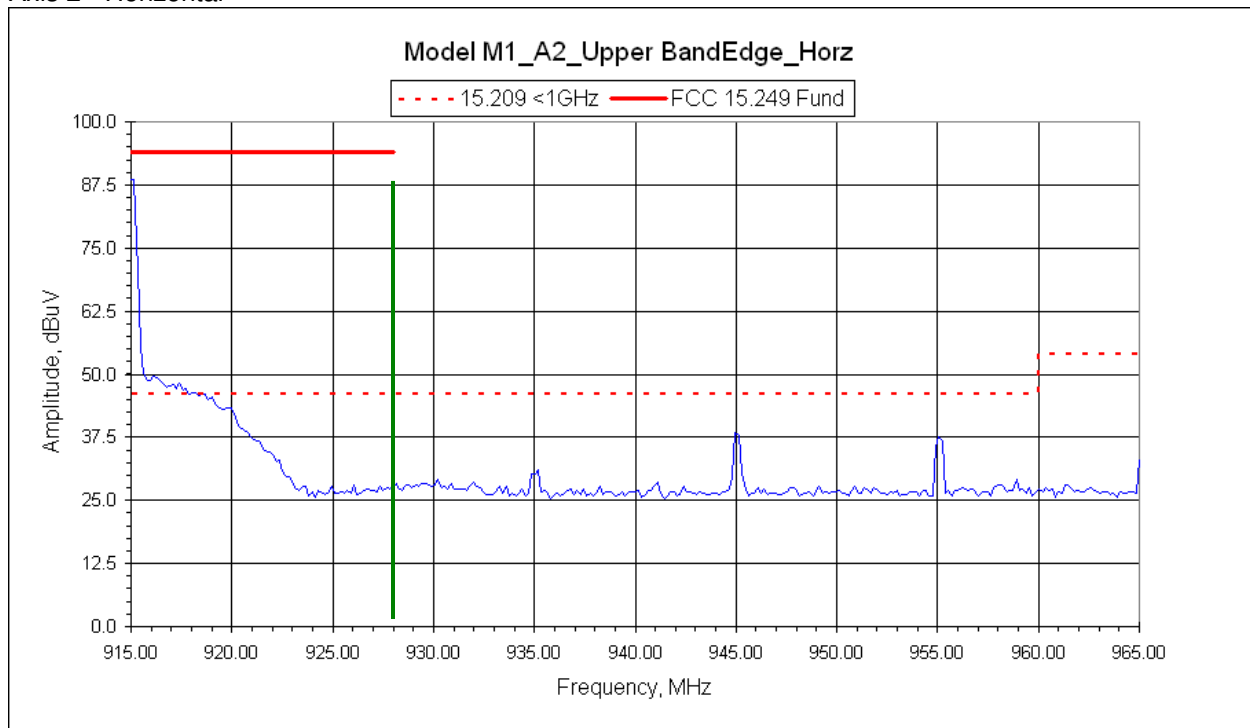


Plots: Upper Band Edge

Axis 2 - Vertical

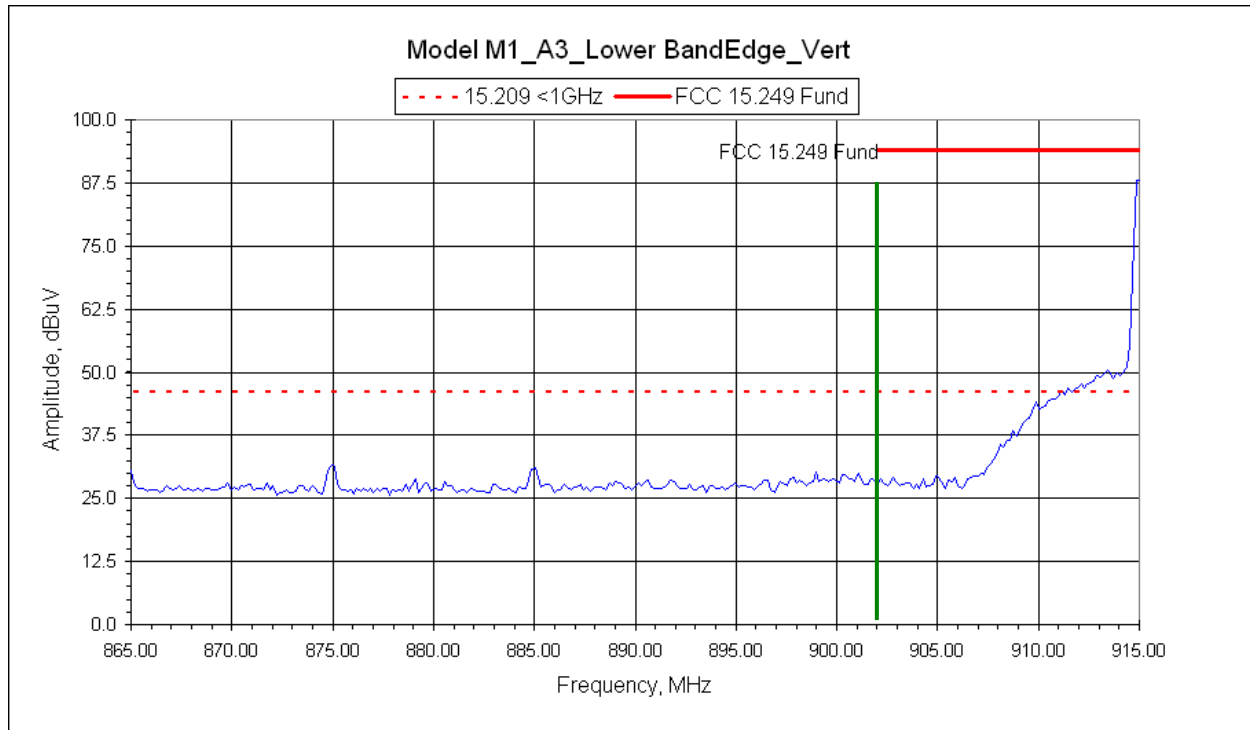


Axis 2 - Horizontal

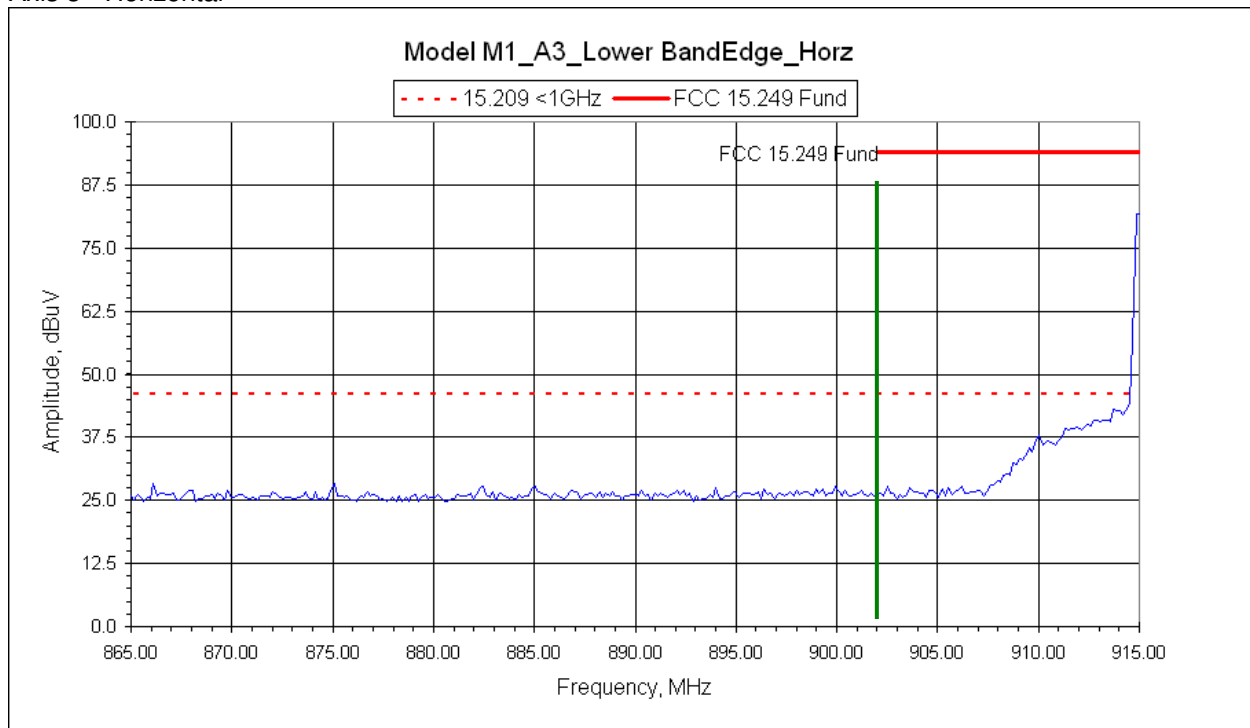


Plots: Lower Band Edge

Axis 3 - Vertical

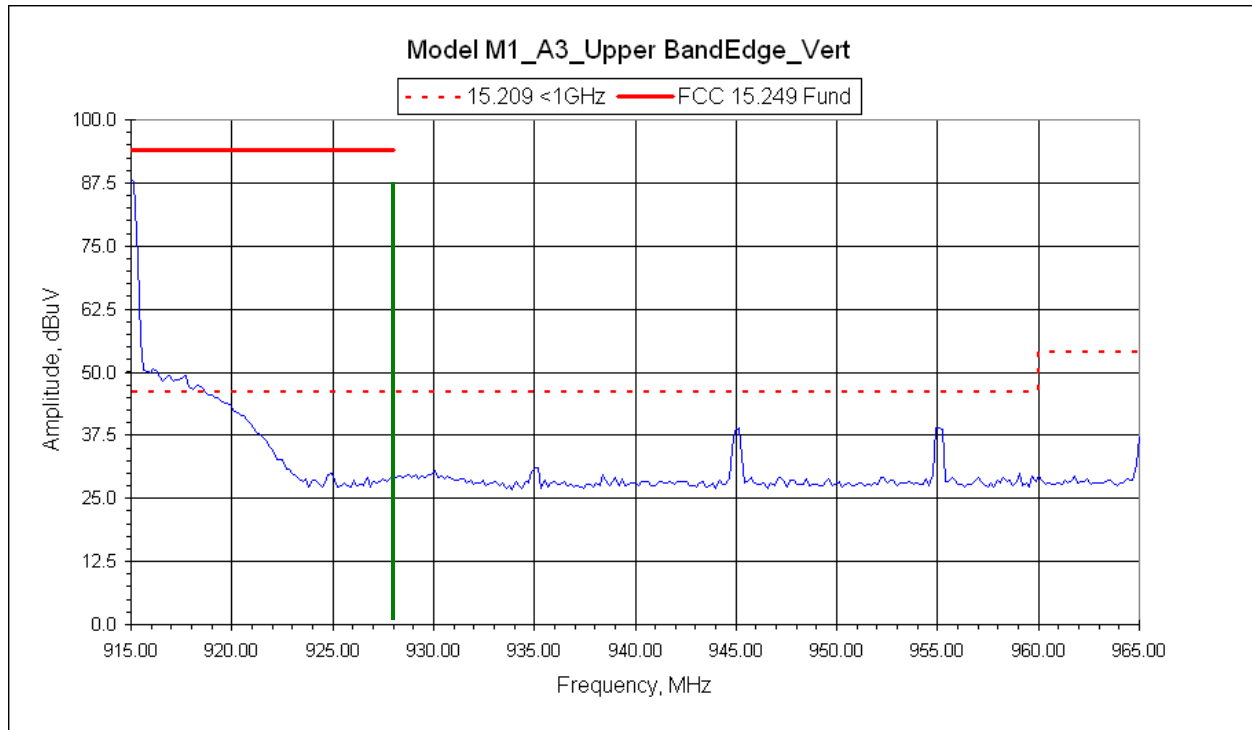


Axis 3 - Horizontal

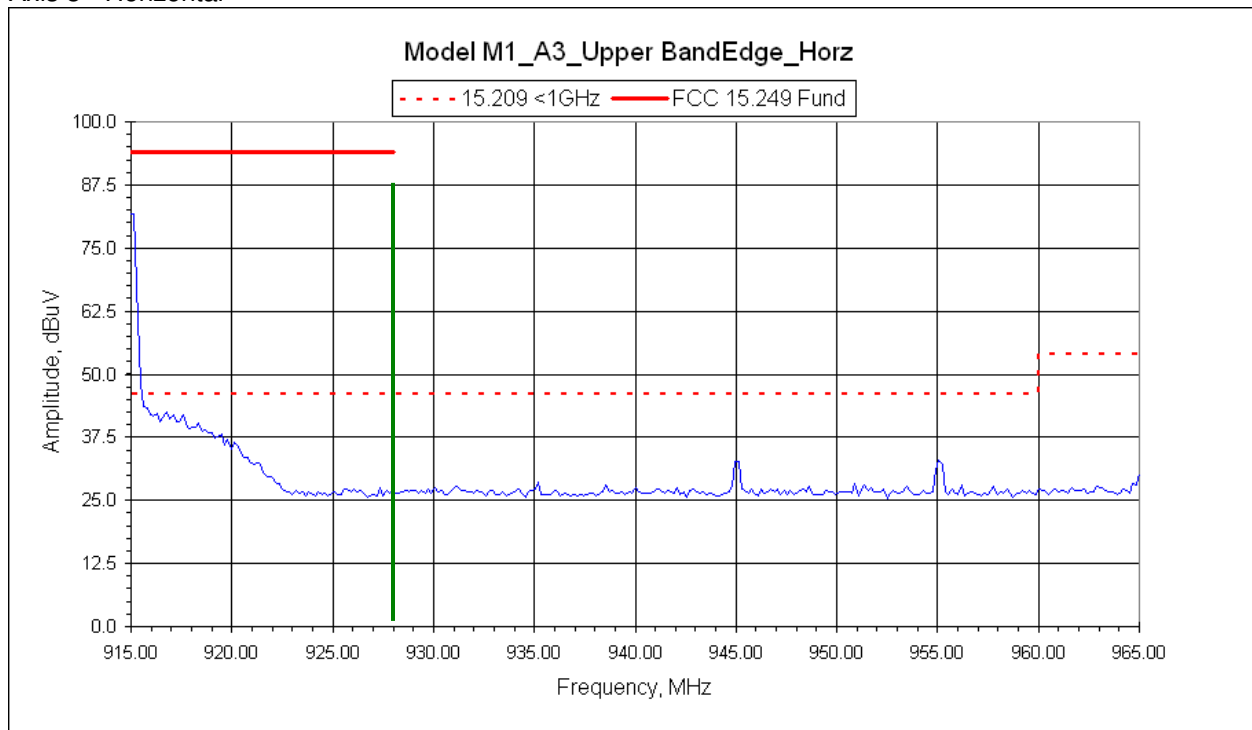


Plots: Upper Band Edge

Axis 3 - Vertical



Axis 3 - Horizontal



Test Data: Radiated Tx Spurious - Band Edge

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	DELTA LIMIT	DELTA2 LIMIT	RBW
<u>MHz</u>	<u>duV/m</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBuV/m]	- [dB]	Corrected Final = [dBuV/m]	(V/H)	(m)	(DEG)	FCC 15.209	FCC 15.35(b) Pk	(MHz)
Band Edge Measurements														
902.0000	11.04	Qp	2.18	22.64	0.00	35.86	0.00	35.86	V	1.53	336.0	- 18.12	NA	0.120
928.0000	10.37	Qp	2.18	22.70	0.00	35.25	0.00	35.25	V	1.46	187.7	- 18.72	NA	0.120
902.0000	11.52	Qp	2.10	22.40	0.00	36.02	0.00	36.02	H	1.00	25.0	- 10.00	NA	0.120
928.0100	13.15	Qp	2.13	22.40	0.00	37.68	0.00	37.68	H	1.00	27.0	- 8.34	NA	0.120

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

9 Occupied Bandwidth (OBW) – Not Applicable

Method:

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from IC RSS-GEN.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification:

When an occupied bandwidth value is not specified in the applicable standard, the transmitted signal bandwidth to be reported is its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

- IC RSS-GEN, Clause 4.6.1

Test Equipment Used:

<u>Asset ID:</u>	<u>Description:</u>	<u>Manufacturer:</u>	<u>Model:</u>	<u>Serial:</u>	<u>Cal Date</u>	<u>Cal Due</u>
------------------	---------------------	----------------------	---------------	----------------	-----------------	----------------

Results:

Not applicable – test not required per FCC standard.

Test Summary:

Occupied Bandwidth (OBW) Summary	
Channel/ Mode	OBW

Specification: 99% Power Emission Bandwidth

Test Method:

- IC RSS-GEN: 2010, Section 4.6.1
- ANSI C63.10:2009, Section 6.9.1

Test Setup Photographs:

Test Data:

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

10 Requirements for fixed, point-to-point operation – Not Applicable

Method:

The test methods used comply with ANSI C63.4 and CISPR 16. Unless otherwise stated no deviations were made from FCC 15.249 & RSS-210.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification:

- FCC 15.249(b)(e)
- RSS-210

Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>

Results:

Test not applicable – product is not a fixed, point-to-point system.

Test Summary:

Test Method:

Notes: None

Setup Photographs:

Plots:

Test Data:

Example calculation:

Measured Level		Transducer, Cable Loss & Amplifier corrections		Corrected Reading	Specification Limit		Corrected Reading		Delta Specification
(dBμV)	+	(dB)	=	(dBμV/m)	(dBμV/m)	-	(dBμV/m)	=	
14.0		14.9		28.9	40.0		28.9		-11.1

11 Duty Cycle Correction Factor – Not Used

No duty cycle correction factor was utilized during this testing – therefore, product duty cycle verification was not applicable.

Method:

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC CFR47 15.35(c) & IC RSS-GEN.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification:

Unless otherwise specified, e.g. §15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Determine the period of the pulse train, T, in mSec and record the results. T is defined as the time from the beginning of one pulse train to the beginning of the next pulse train.

Count the number of different types of pulses, N and record the results.

For each of the different types of pulses, count the number of occurrences within one pulse train.

Use the Duty Cycle Correction Factor, DCCF, from the results table and use it to adjust the field strength measurements recorded for radiated emissions.

- FCC 15.35(c)
- RSS-GEN, Clause 4.5

Test Equipment Used:

Results:

Not applicable

Test Method:

- ANSI C63.10: 2009, Clause 7.5

Test Summary:

Duty Cycle Measurements	

Plots:

Test Data:

Notes: None

12 AC Mains Conducted Emissions – Transmitter

Method:

The test methods used comply with ANSI C63.4 and CISPR 16. Unless otherwise stated no deviations were made from FCC 15.207/RSS-GEN.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification:

- FCC 15.207
- RSS-GEN Section 7.2.4 Table 4

The product must pass the AC Conducted average and quasi-peak Limits defined in FCC Part 15.207.

Test Equipment Used:

Asset ID	Description	Manufacture	Model	Serial	Cal Date	Cal Due
DEN-073	EMI Receiver	ROHDE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18885	Transient Limiter	Hewlett-Packard	11947A	3107A00700	05/05/2013	05/05/2014
18914	Single Phase LISN	EMCO	3816/NM	9408-1003	04/11/2013	04/11/2014
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 1.0	VBV	VBV

Test Procedure:

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at all frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.10.

Results:

The sample tested was found to comply.

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

Test Summary:

FREQ	LEVEL	DET	CABLE	LISN	PREAMP	ATTEN	FINAL	TEST POINT	DELTA1	DELTA2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	Line 1 Line2 (Neutral)	FCC 15.207 Average	FCC 15.207 Qp	(MHz)
Measured Data – 150kHz to 30MHz (worst-case)											
0.377	24.27	Av	0.10	0.03	0.00	9.97	34.37	Line 1	- 13.99	NA	0.009

Test Method:

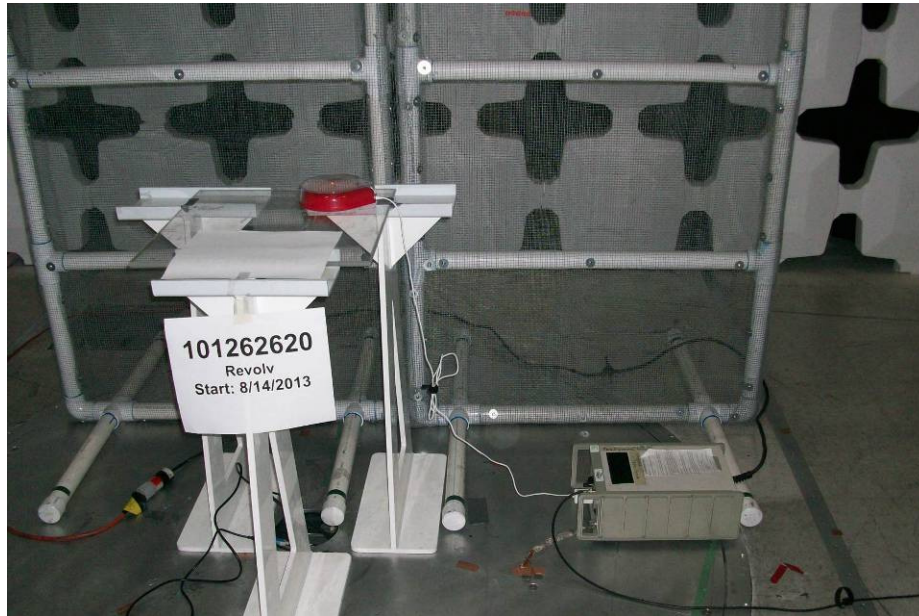
- ANSI C63.10:2009, Section 6.2
- RSS-GEN Section 7.2.4

Notes:

- All product radios (transmitters) were enabled and continuously transmitting during testing.

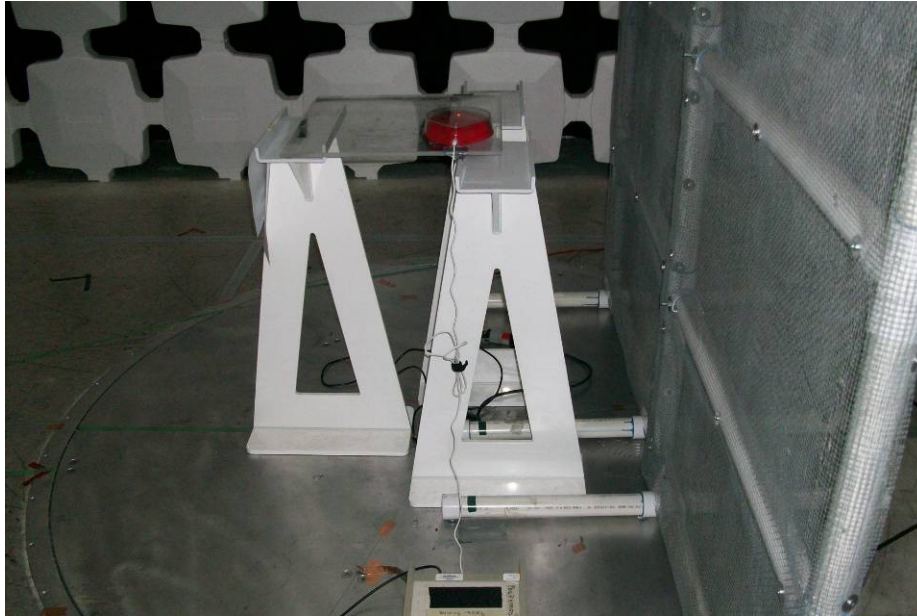
Setup Photographs: AC Mains Conducted Emissions – Transmitter

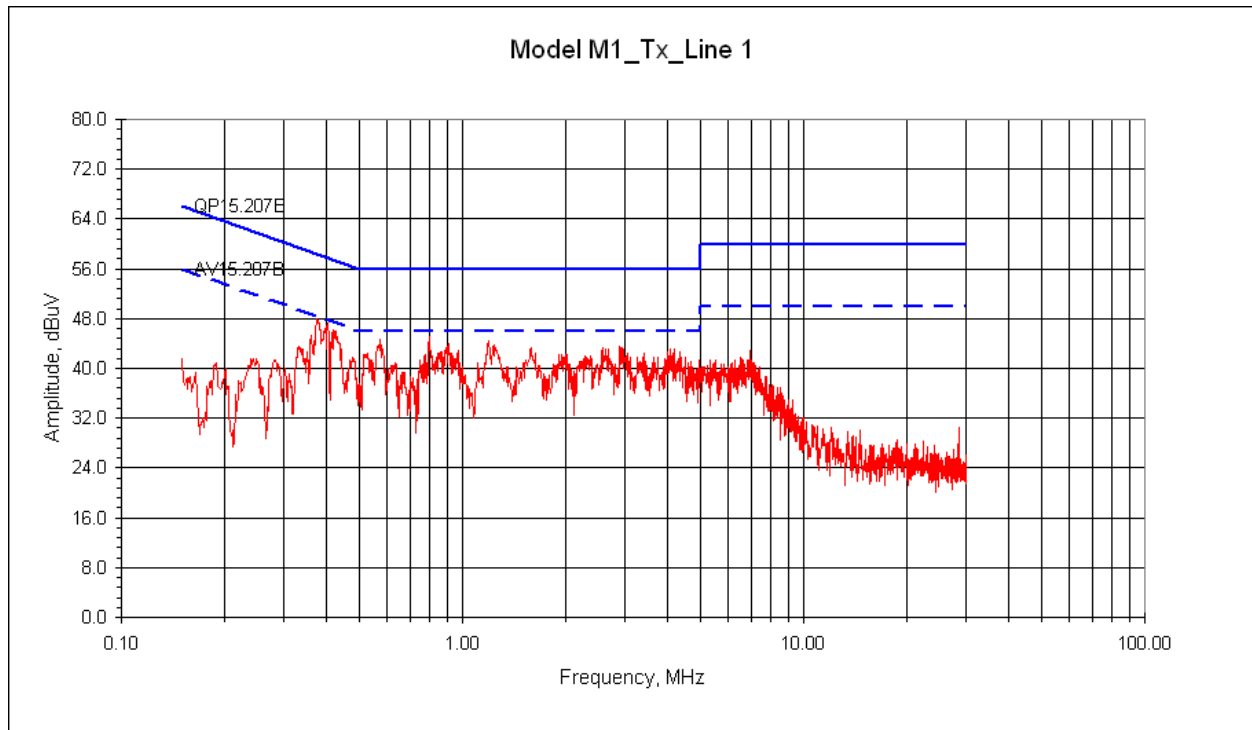
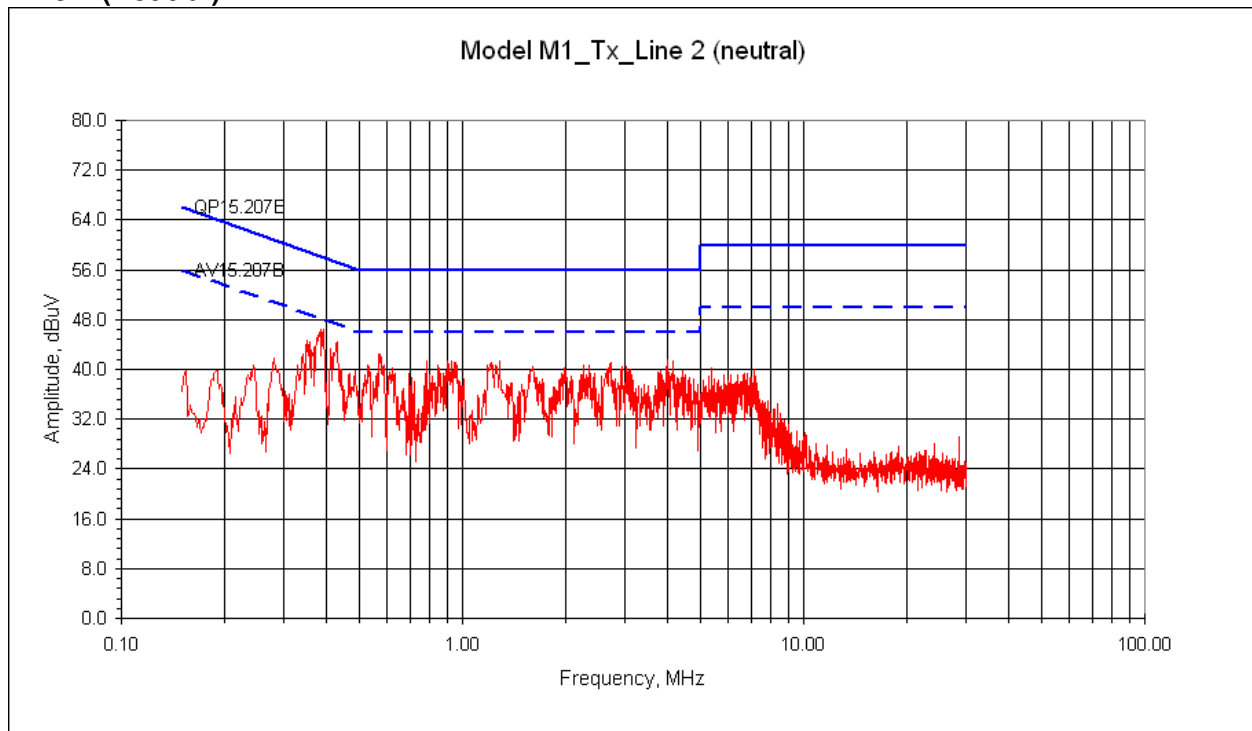
Test Setup – Front View



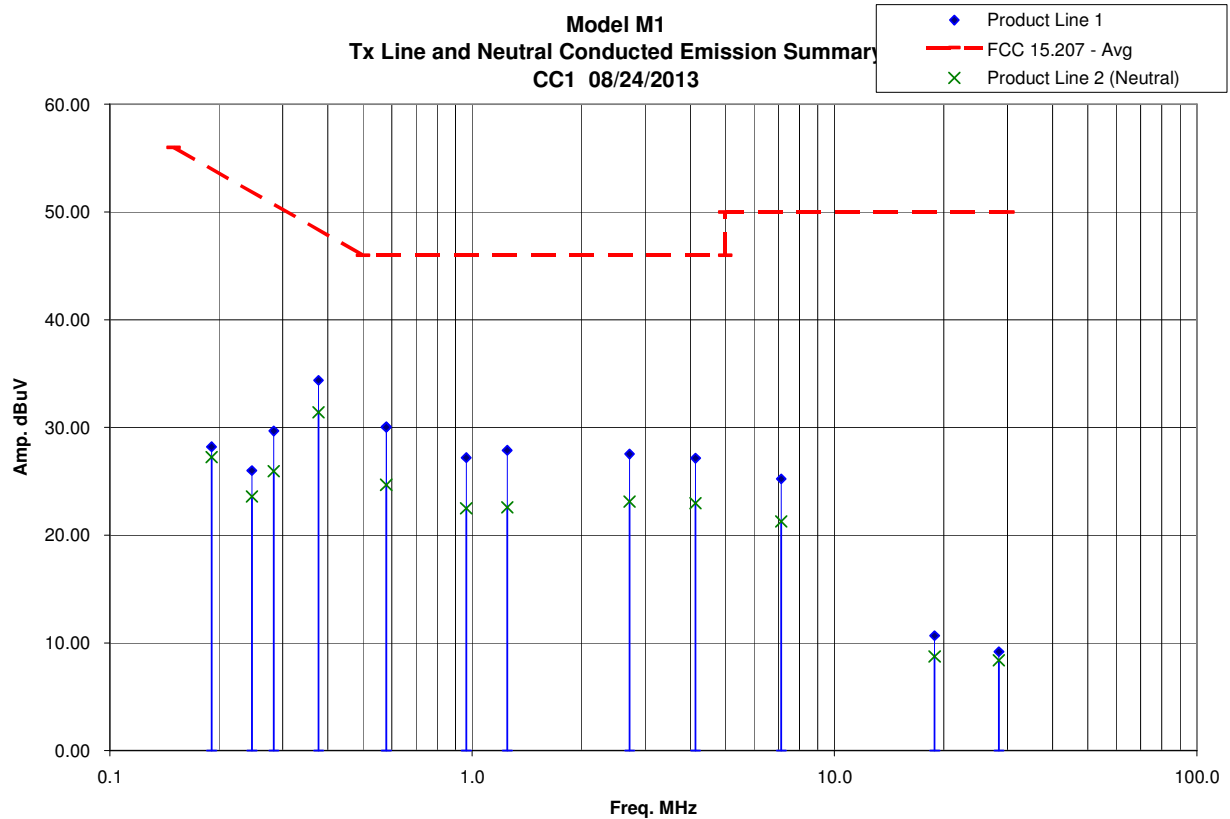
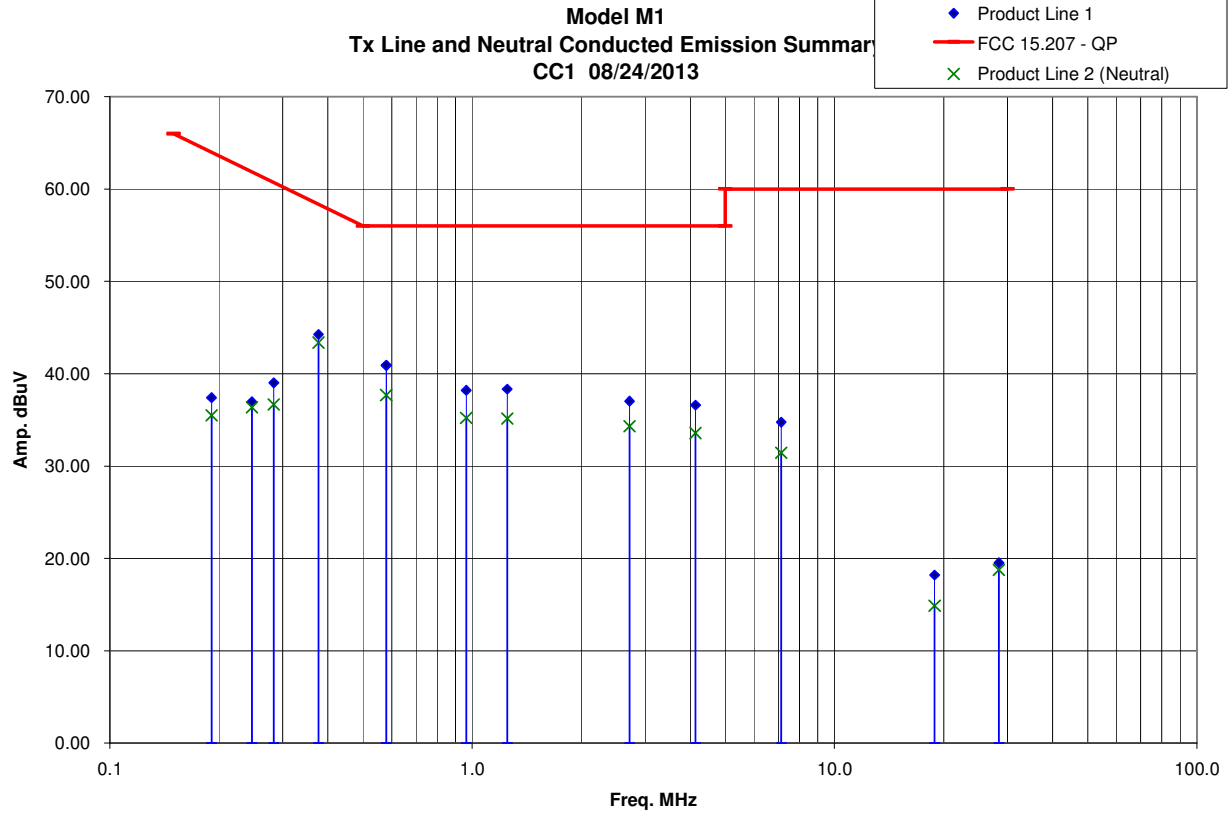
Setup Photographs: AC Mains Conducted Emissions – Transmitter

Test Setup – Rear View



Plots: AC Mains Conducted Emissions - Transmitter**Line 1****Line 2 (Neutral)**

Final Plots: AC Mains Conducted Emissions – Transmitter



Test Data: AC Mains Conducted Emissions – Transmitter

Tx AC Conducted Electromagnetic Emissions

Test Report #:	G101262620	Test Area:	CC1 Conducted	Temperature:	23.5	C
Test Method:	FCC 15.207	Test Date:	24-Aug-2013	Relative Humidity:	22.8	%
EUT Model #:	M1	EUT Power:	120V/ 60Hz	Air Pressure:	82.8	kPa
EUT Serial #:	FCC1					
Manufacturer:	Revolv					
EUT Description:	Revolv Hub – RF-enabled Home Automation					
Notes:	AC Adapter: Model UN310-0520					
	Product tested in Tx mode of operation – all radios active					

FREQ	LEVEL	DET	CABLE	LISN	PREAMP	ATTEN	FINAL	TEST POINT	DELTA1	DELTA2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	Line 1 Line2 (Neutral)	FCC 15.107 Class B Average	FCC 15.107 Class B Qp	(MHz)
Line 1 Data – 150kHz to 30MHz											
0.191	18.11	Av	0.10	0.03	0.00	9.96	28.21	Line 1	- 25.79	NA	0.009
0.191	27.31	Qp	0.10	0.03	0.00	9.96	37.41	Line 1	NA	- 26.59	0.009
0.247	15.91	Av	0.10	0.03	0.00	9.96	26.00	Line 1	- 25.86	NA	0.009
0.247	26.87	Qp	0.10	0.03	0.00	9.96	36.96	Line 1	NA	- 24.90	0.009
0.283	19.57	Av	0.10	0.03	0.00	9.97	29.66	Line 1	- 21.05	NA	0.009
0.283	28.92	Qp	0.10	0.03	0.00	9.97	39.01	Line 1	NA	- 21.70	0.009
0.377	24.27	Av	0.10	0.03	0.00	9.97	34.37	Line 1	- 13.99	NA	0.009
0.377	34.15	Qp	0.10	0.03	0.00	9.97	44.25	Line 1	NA	- 14.11	0.009
0.579	19.95	Av	0.10	0.02	0.00	9.97	30.05	Line 1	- 15.95	NA	0.009
0.579	19.92	Av	0.10	0.02	0.00	9.97	30.02	Line 1	- 15.98	NA	0.009
0.579	30.78	Qp	0.10	0.02	0.00	9.97	40.88	Line 1	NA	- 15.12	0.009
0.579	30.83	Qp	0.10	0.02	0.00	9.97	40.93	Line 1	NA	- 15.07	0.009
0.963	16.99	Av	0.20	0.03	0.00	9.98	27.19	Line 1	- 18.81	NA	0.009
0.963	28.02	Qp	0.20	0.03	0.00	9.98	38.22	Line 1	NA	- 17.78	0.009
1.250	17.67	Av	0.20	0.03	0.00	9.98	27.88	Line 1	- 18.12	NA	0.009
1.250	28.11	Qp	0.20	0.03	0.00	9.98	38.32	Line 1	NA	- 17.68	0.009
2.718	17.31	Av	0.20	0.03	0.00	9.98	27.53	Line 1	- 18.47	NA	0.009
2.718	26.80	Qp	0.20	0.03	0.00	9.98	37.02	Line 1	NA	- 18.98	0.009
4.135	16.83	Av	0.30	0.04	0.00	9.98	27.15	Line 1	- 18.85	NA	0.009
4.135	26.29	Qp	0.30	0.04	0.00	9.98	36.61	Line 1	NA	- 19.39	0.009
7.131	14.75	Av	0.40	0.07	0.00	9.99	25.21	Line 1	- 24.79	NA	0.009
7.131	24.28	Qp	0.40	0.07	0.00	9.99	34.74	Line 1	NA	- 25.26	0.009
18.910	- 0.67	Av	1.10	0.20	0.00	10.02	10.65	Line 1	- 39.35	NA	0.009
18.910	6.88	Qp	1.10	0.20	0.00	10.02	18.20	Line 1	NA	- 41.80	0.009
28.429	- 2.29	Av	1.31	0.12	0.00	10.04	9.18	Line 1	- 40.82	NA	0.009
28.429	8.06	Qp	1.31	0.12	0.00	10.04	19.53	Line 1	NA	- 40.47	0.009
Line 2 (Neutral) Data – 150kHz to 30MHz											
0.191	17.15	Av	0.10	0.03	0.00	9.96	27.25	Line 2	- 26.75	NA	0.009
0.191	25.38	Qp	0.10	0.03	0.00	9.96	35.48	Line 2	NA	- 28.52	0.009

0.247	13.50	Av	0.10	0.03	0.00	9.96	23.59	Line 2	- 28.28	NA	0.009
0.247	26.28	Qp	0.10	0.03	0.00	9.96	36.37	Line 2	NA	- 25.50	0.009
0.283	15.83	Av	0.10	0.03	0.00	9.97	25.92	Line 2	- 24.79	NA	0.009
0.283	26.57	Qp	0.10	0.03	0.00	9.97	36.66	Line 2	NA	- 24.05	0.009
0.377	21.31	Av	0.10	0.02	0.00	9.97	31.40	Line 2	- 16.95	NA	0.009
0.377	33.28	Qp	0.10	0.02	0.00	9.97	43.37	Line 2	NA	- 14.98	0.009
0.579	14.57	Av	0.10	0.02	0.00	9.97	24.67	Line 2	- 21.33	NA	0.009
0.579	27.59	Qp	0.10	0.02	0.00	9.97	37.69	Line 2	NA	- 18.31	0.009
0.963	12.27	Av	0.20	0.02	0.00	9.98	22.47	Line 2	- 23.53	NA	0.009
0.963	25.03	Qp	0.20	0.02	0.00	9.98	35.23	Line 2	NA	- 20.77	0.009
1.250	12.37	Av	0.20	0.03	0.00	9.98	22.58	Line 2	- 23.42	NA	0.009
1.250	24.95	Qp	0.20	0.03	0.00	9.98	35.16	Line 2	NA	- 20.84	0.009
2.718	12.89	Av	0.20	0.03	0.00	9.98	23.10	Line 2	- 22.90	NA	0.009
2.718	24.11	Qp	0.20	0.03	0.00	9.98	34.32	Line 2	NA	- 21.68	0.009
4.135	12.65	Av	0.30	0.03	0.00	9.98	22.97	Line 2	- 23.03	NA	0.009
4.135	23.24	Qp	0.30	0.03	0.00	9.98	33.56	Line 2	NA	- 22.44	0.009
7.131	10.79	Av	0.40	0.07	0.00	9.99	21.25	Line 2	- 28.75	NA	0.009
7.131	20.98	Qp	0.40	0.07	0.00	9.99	31.44	Line 2	NA	- 28.56	0.009
18.910	- 2.59	Av	1.10	0.20	0.00	10.02	8.73	Line 2	- 41.27	NA	0.009
18.910	3.53	Qp	1.10	0.20	0.00	10.02	14.85	Line 2	NA	- 45.15	0.009
28.429	- 3.17	Av	1.31	0.20	0.00	10.04	8.38	Line 2	- 41.62	NA	0.009
28.429	7.20	Qp	1.31	0.20	0.00	10.04	18.75	Line 2	NA	- 41.25	0.009

Example calculation:

Measured Level		Transducer, Cable Loss & Amplifier corrections		Corrected Reading	Specification Limit		Corrected Reading		Delta Specification
(dBμV)	+	(dB)	=	(dBμV/m)	(dBμV/m)	-	(dBμV/m)	=	
14.0		14.9		28.9	40.0		28.9		-11.1

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

13 Antenna Requirement

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC CFR47 15.203.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- FCC 15.203

Results:

The product utilizes an integral antenna – not user accessible; therefore, the sample tested was found to comply.

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

14 RF Exposure Requirements

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC OET 65 & IC RSS-102.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Requirement/Specification

- FCC OET Bulletin 65/ KDB 447498
- RSS-102

Results:

The sample tested was found to comply.

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

Test Data: RF Exposure-MPE

RF Exposure Requirements - MPE

Project #:	G101262612	Test Area:	Intertek Louisville
Test Method:	FCC CFR47 Part 1.1310	Test Date:	09/25/2013
EUT Model #:	M1		
EUT Serial #:	FCC1		
Manufacturer:	Revolv, Inc.		
EUT Description:	Wireless RF-enabled Home Automation Hub		
Notes:	Insteon Radio: 915MHz (single-channel)		

The following limit is from table 1 (B) Limits for General Population/Uncontrolled Exposure in FCC part 1.1310:

Power Density Limit for Frequency Range 300 – 1500 MHz: $F(\text{MHz})/1500 \text{ mW/cm}^2 = 915/1500 = 0.610 \text{ mW/cm}^2$

The following calculation was used to determine compliance to the above limit. The calculation is from FCC OET bulletin 65.

$$\text{Power Density}(S) = PG/4\pi R^2 \text{ or } S = \text{EIRP}/4\pi R^2$$

Where:

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (mW).

G = numeric power gain of the antenna in the direction of interest relative to an isotropic radiator.

R = distance to the center of radiation of the antenna (cm)

In this case, 20cm will be used.

Insteon 915MHz (Single-Channel) Radio

Maximum measured radiated field strength at 3-meters = 91.05 dBuV/m

Maximum typical gain declared by the manufacture = -1.0 dBi = 0.794 (numeric gain)

Production Tolerance declared = +/- 0.85dB

Calculated power input to the antenna = Measured Field Strength – Antenna Gain + Production Tolerance

$$91.05 \text{ dBuV/m} - (-1.0\text{dBi}) + 0.85\text{dB} = 92.90 \text{ dBuV/m} = 0.584953 \text{ mW}$$

Power Density

Power (mW)	Gain (dbi)	Gain numeric	Distance (cm)	Power Density (mW/cm ²)
0.584953	-1.0	0.794	20	0.0000924

$$\text{Therefore: Power Density Margin } (\Delta \text{ Limit}) = 0.0000924 - 0.610 = -0.60991 \text{ mW/cm}^2$$

To determine what minimum distance the product can satisfy the Power Density Limit:

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

$$R(\text{cm}) = \text{SQRT}[(P \cdot G)/(4 \cdot \pi \cdot S)] = 0.246135 \text{ cm}$$

$$\text{Therefore: Distance Margin } (\Delta \text{ Limit}) = 0.246135 \text{ cm} - 20 \text{ cm} = -19.753865 \text{ cm}$$

=====

Reference Conversion Equations:

1. Gain numeric = $10^{(\text{dBi}/10)}$
2. Gain (dBi) = $10 \log(\text{Gain numeric})$
3. dBm = dBuV/m – 107 (50 ohm system)
4. dBm to Watts (W) = $10^{((\text{dBm} - 30)/10)}$

15 Unintentional Radiated Emissions (Digital Part of Receiver)

Method:

Unless otherwise stated no deviations were made from FCC Part 15.109 – Class B.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Equipment Used:

Asset ID	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	06/07/2013	06/07/2014
18906	RF Pre-Amp (1-4GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	06/10/2013	06/10/2014
19936	Bilog Antenna 30MHz – 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2012	11/15/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	03/19/2013	03/19/2014
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBV	VBV

Test Requirement:

The product must pass Unintentional Radiated Emissions – Class B.

Unwanted emissions below 1GHz must comply with the general field strength limits defined in FCC Part 15.109, when measured with a quasi-peak detector. Unwanted emissions above 1GHz are measured with an average detector.

Test Procedure:

The Resolution Bandwidth is 120 kHz for frequencies 30 MHz -1000 MHz and 1 MHz for frequencies above 1000 MHz.

The EUT is placed on a plastic turntable that is 80 cm in height. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables are manipulated to produce worst-case emissions. The signal is maximized by rotating the turntable through a 360° rotation. The antenna height is varied from 1-4 meters. Both vertical and horizontal antenna configurations are utilized in the testing.

Radiated emissions are taken at 3-meter antenna-to-product test distance for all measurements.

Data is included for the worst-case configuration (the configuration which resulted in the highest emission levels).

Test Results:

The sample tested was found to Comply.

Setup Photographs: Product Axis 1 – Horizontal Position (Product Flat on Table)

Unintentional Radiated Emissions - Test setup (Front View)



Setup Photographs: Product Axis 1 – Horizontal Position (Product Flat on Table)

Unintentional Radiated Emissions - Test setup (Rear View)



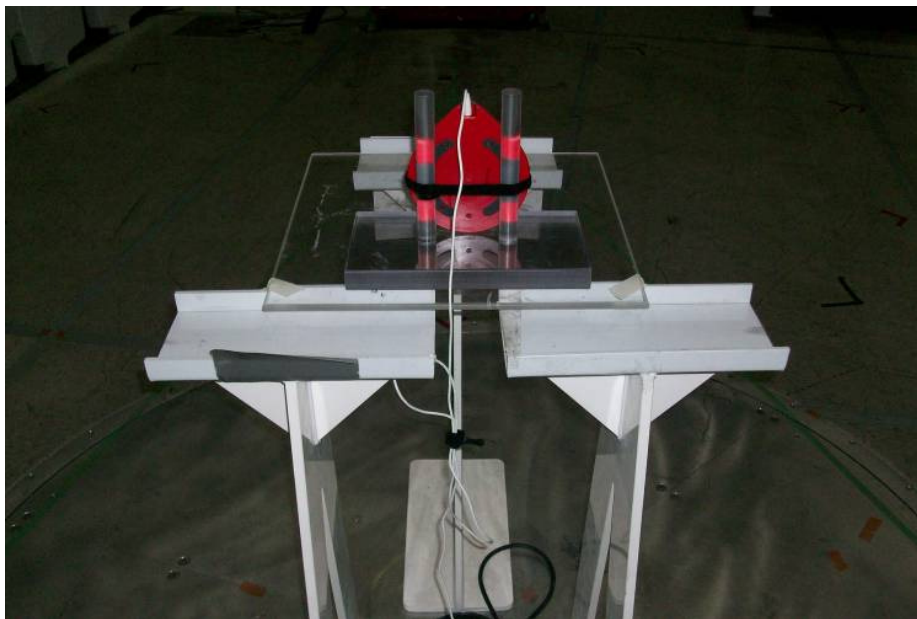
Setup Photographs: Product Axis 2 – Product Vertical on Table (Wall Mount)

Unintentional Radiated Emissions - Test setup (Front View)



Setup Photographs: Product Axis 2 – Product Vertical on Table (Wall Mount)

Unintentional Radiated Emissions - Test setup (Rear View)



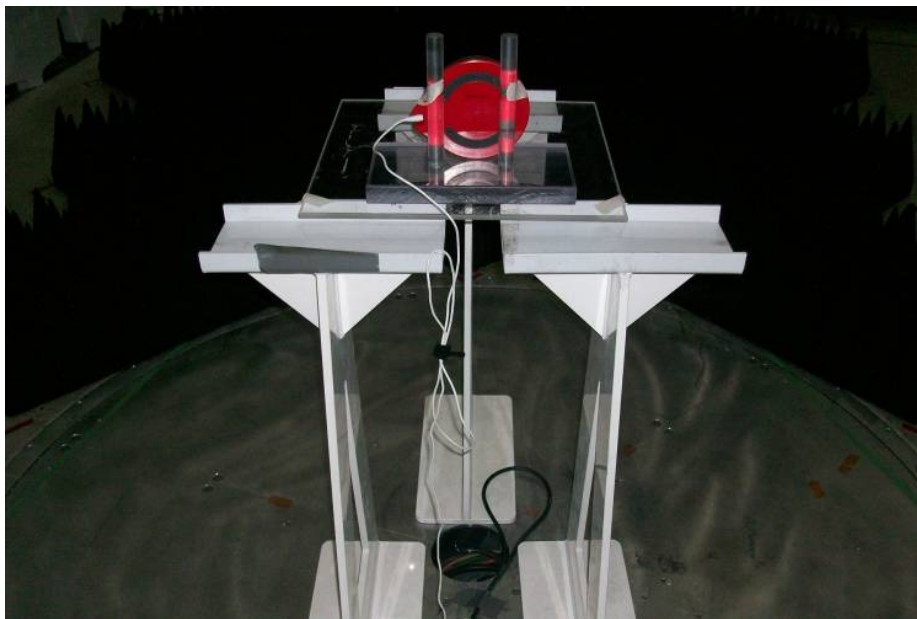
Setup Photographs: Product Axis 3 – Product Vertical & Rotated 90 Degrees

Unintentional Radiated Emissions - Test setup (Front View)



Setup Photographs: Product Axis 3 – Product Vertical & Rotated 90 Degrees

Unintentional Radiated Emissions - Test setup (Rear View)



Setup Photographs: Antennas

Antenna Setup – 30MHz to 1000MHz



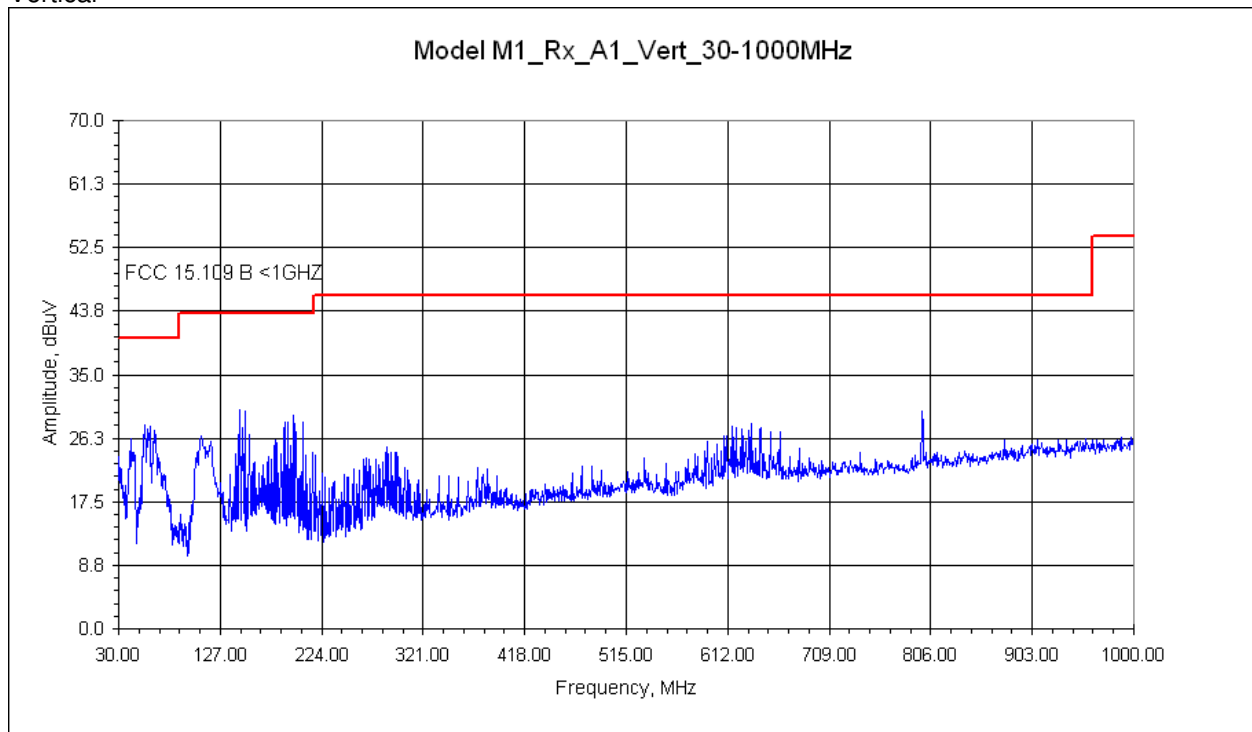
Antenna Setup – 1GHz to 2GHz



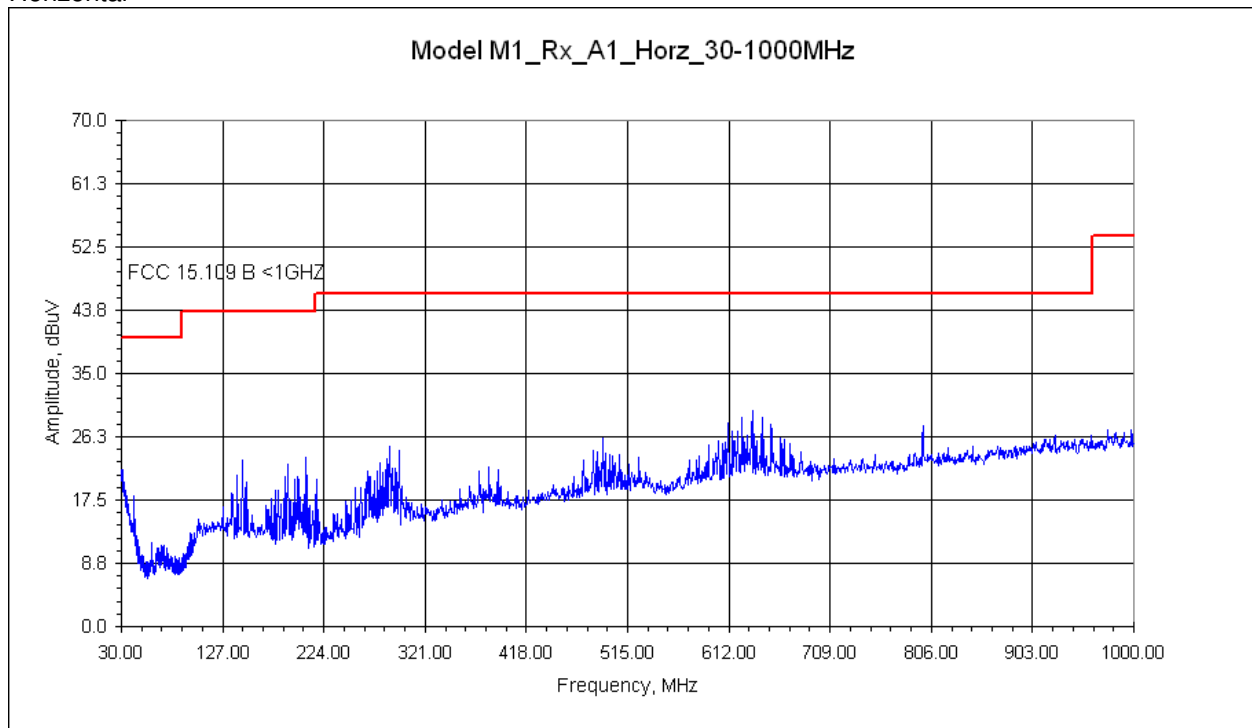
Pre-scan Plots: Radiated Emissions Product Axis 1 – Horizontal Position (Product Flat on Table)

30MHz to 1000MHz

Vertical



Horizontal

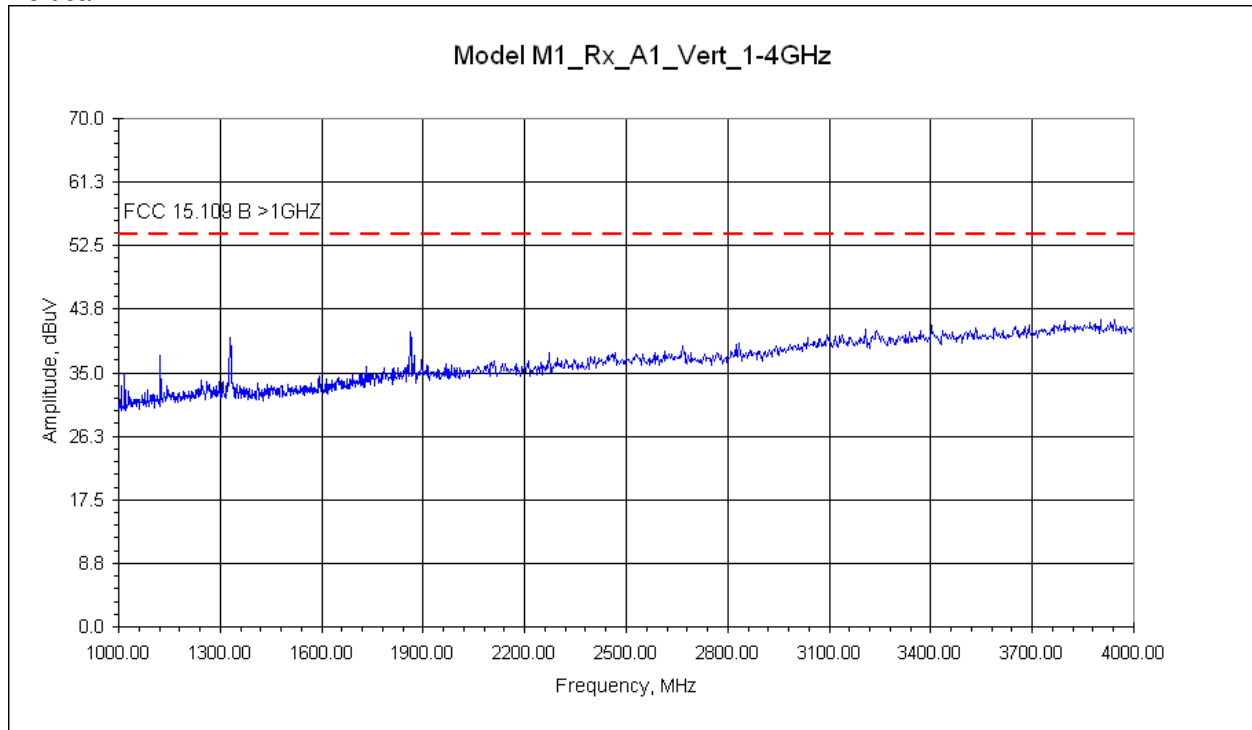


Reference only – to determine signals to be maximized

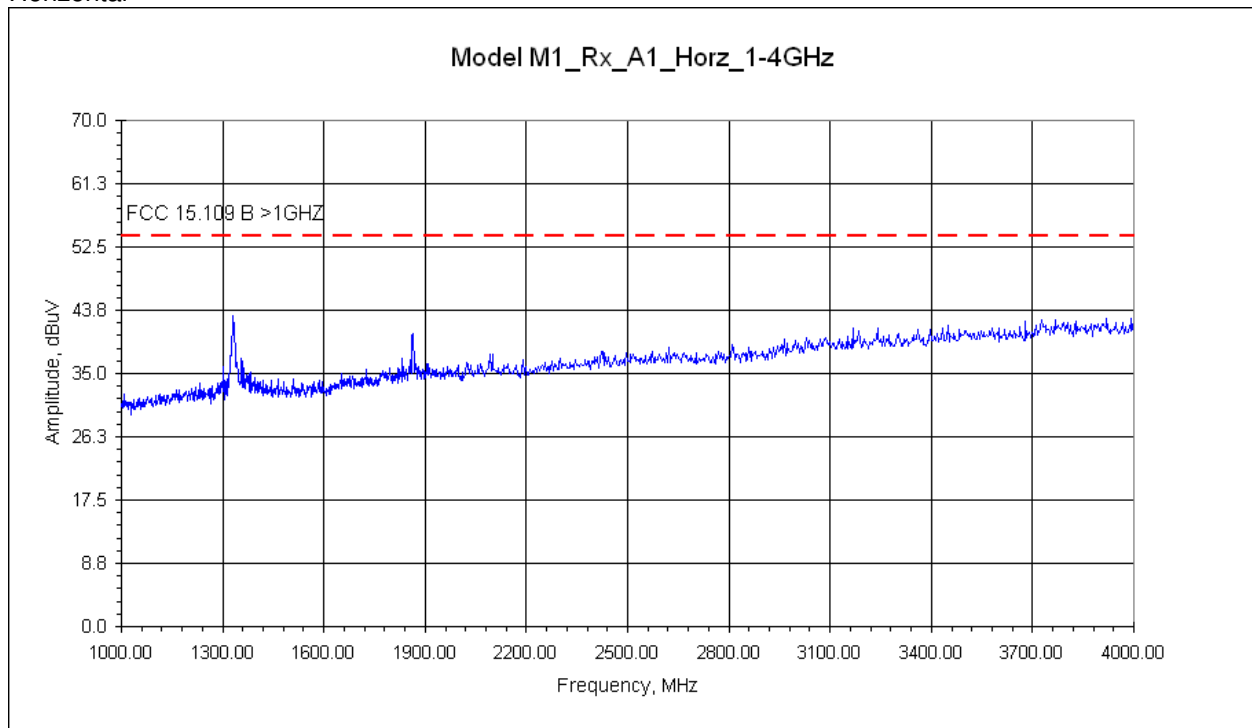
Pre-scan Plots: Radiated Emissions Product Axis 1 – Horizontal Position (Product Flat on Table)

1GHz to 4GHz

Vertical



Horizontal

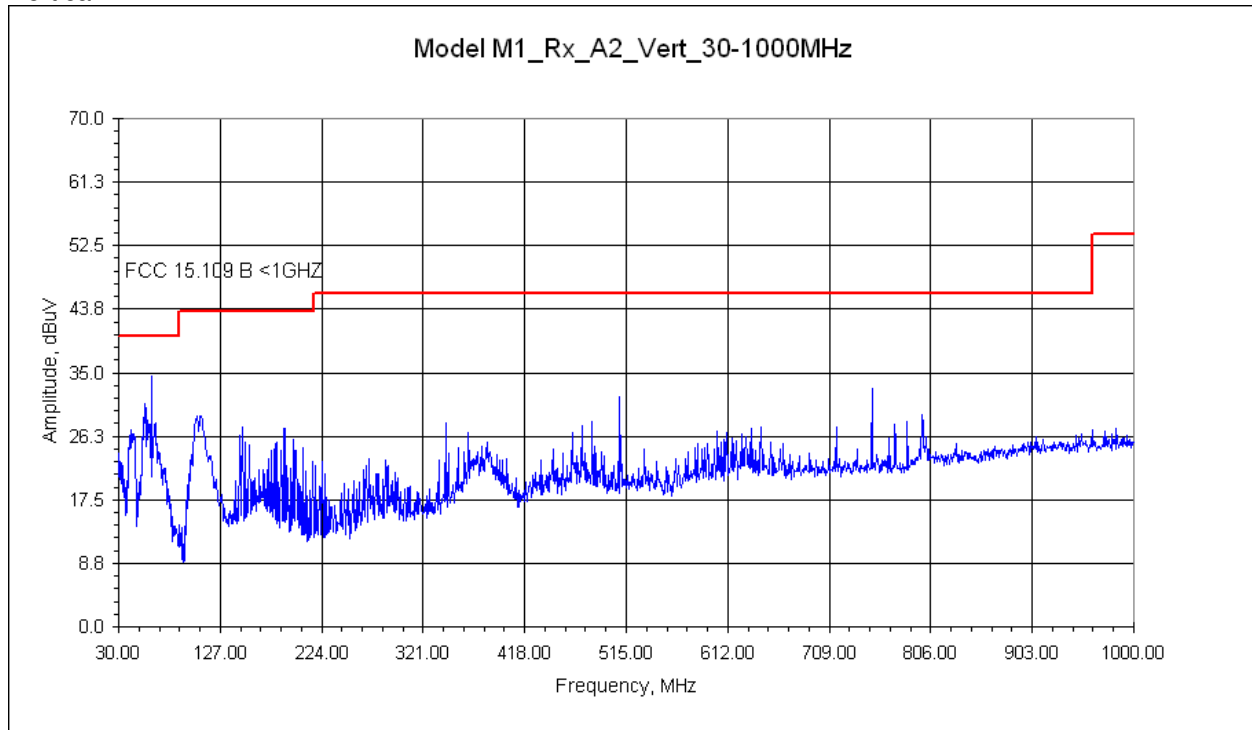


Reference only – to determine signals to be maximized

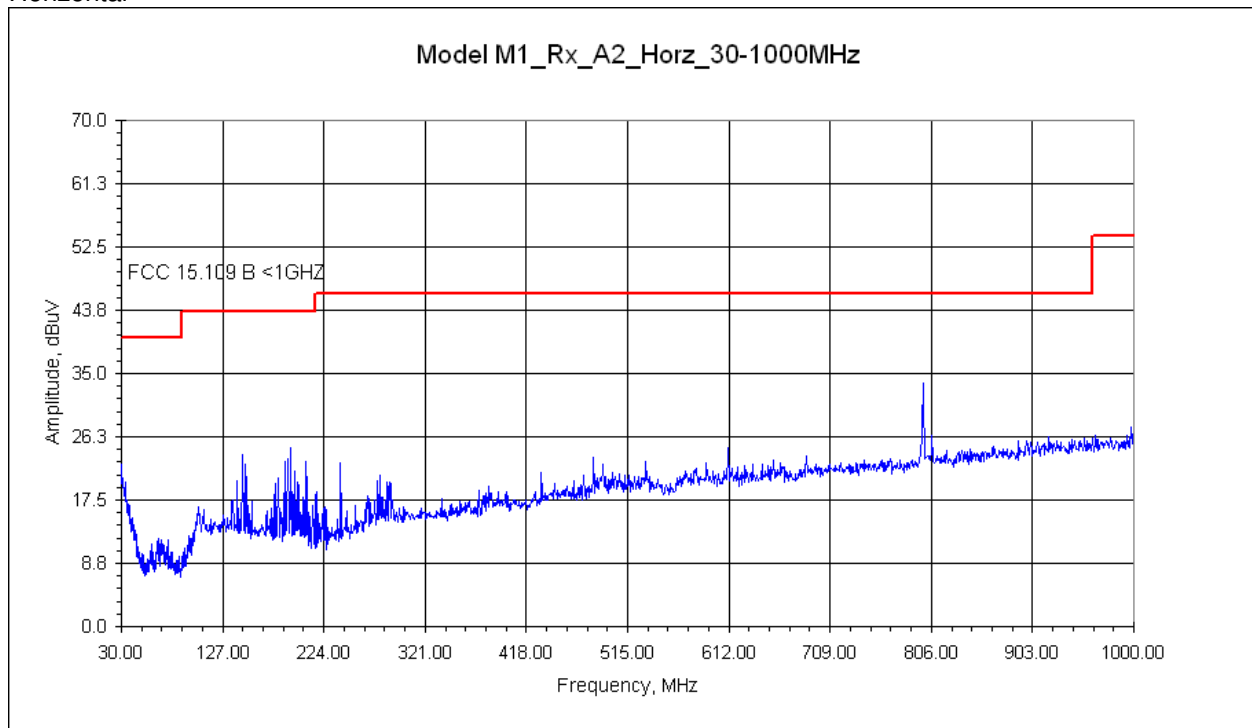
Pre-scan Plots: Radiated Emissions Product Axis 2 – Product Vertical on Table (Wall Mount)

30MHz to 1000MHz

Vertical



Horizontal

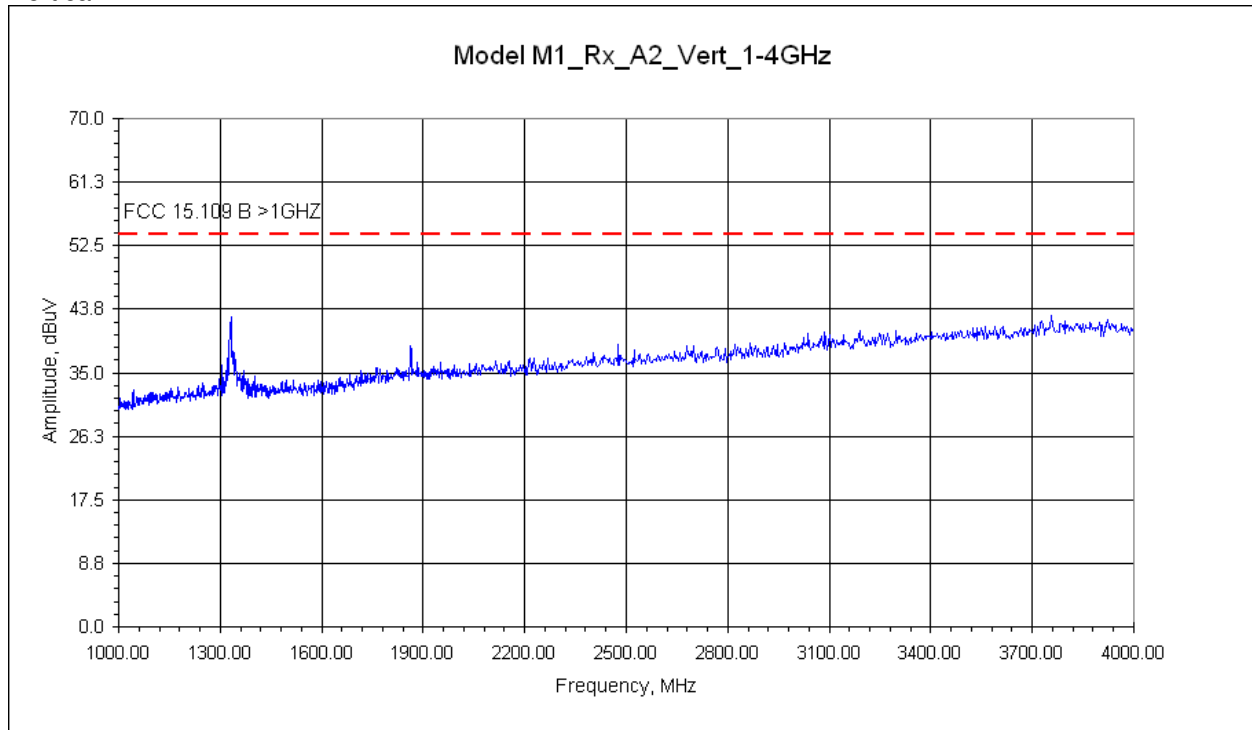


Reference only – to determine signals to be maximized

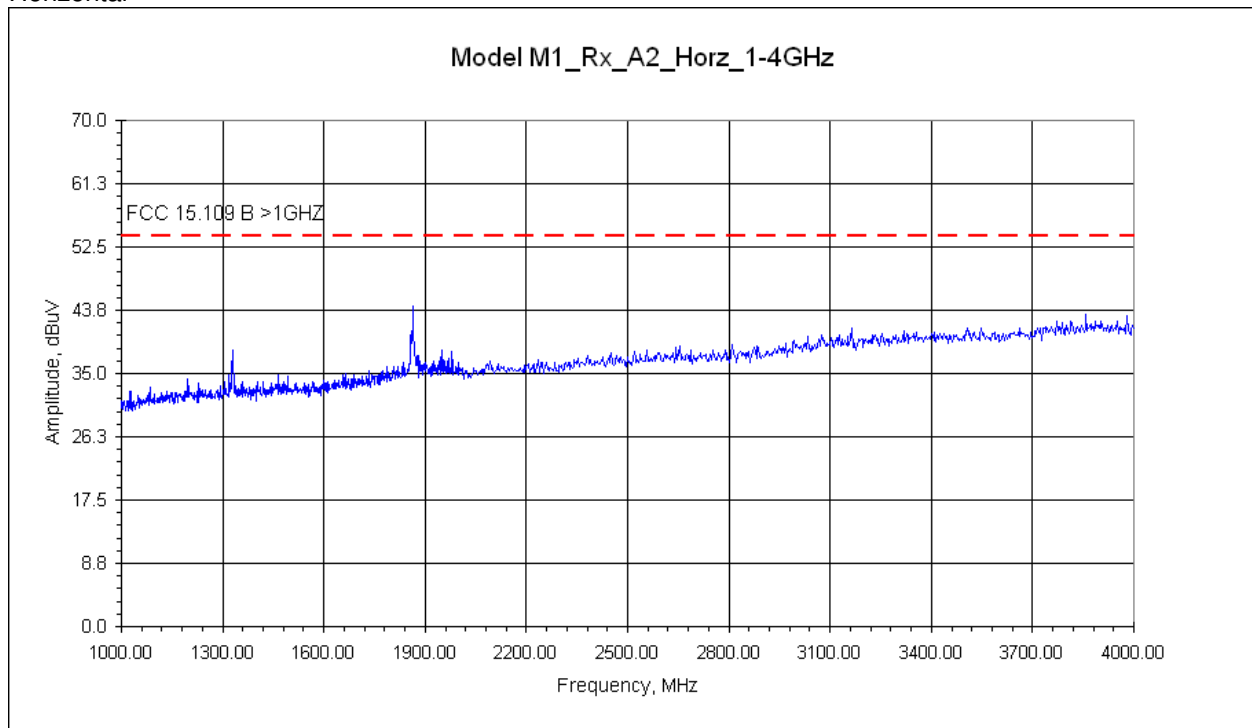
Pre-scan Plots: Radiated Emissions Product Axis 2 – Product Vertical on Table (Wall Mount)

1GHz to 4GHz

Vertical



Horizontal

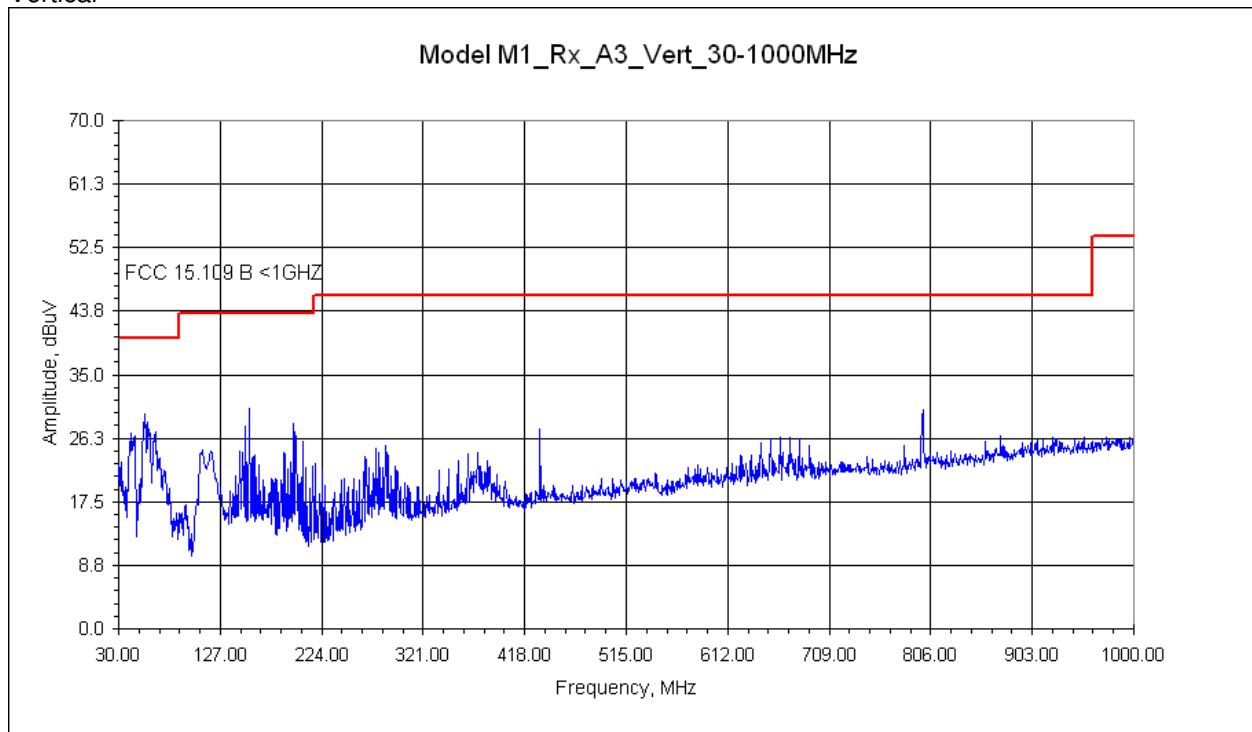


Reference only – to determine signals to be maximized

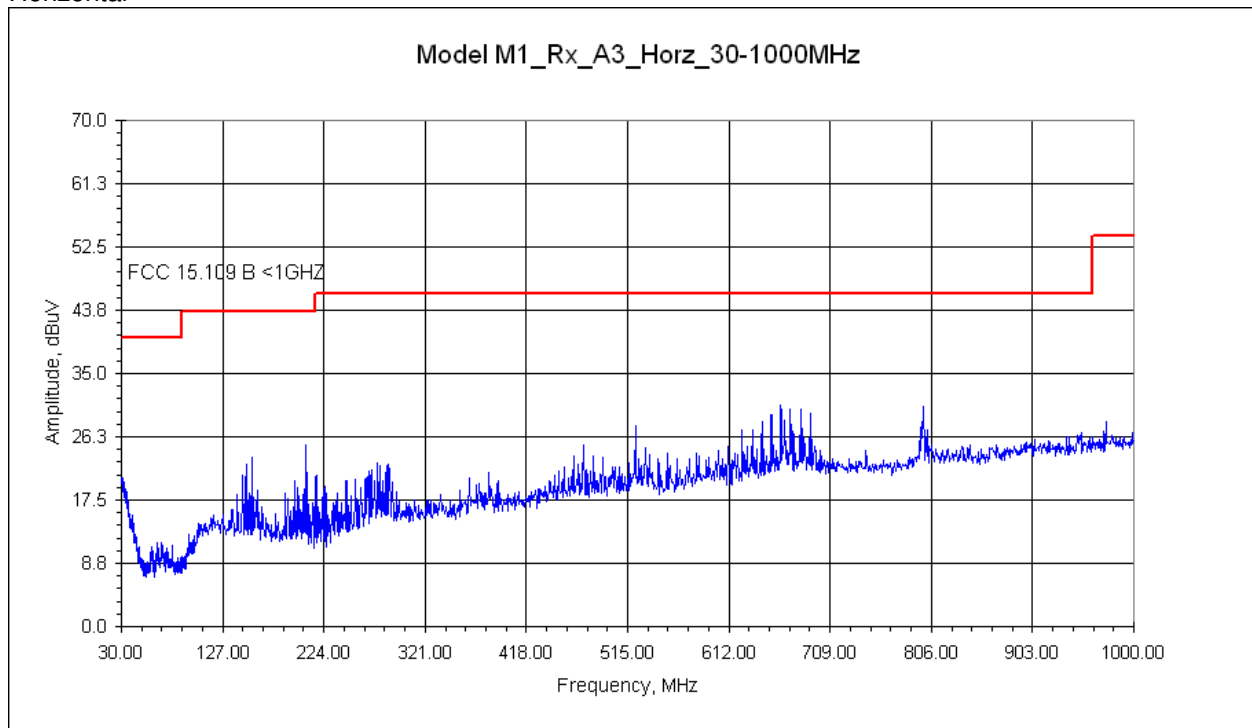
Pre-scan Plots: Radiated Emissions Product Axis 3 – Product Vertical & Rotated 90 Degrees

30MHz to 1000MHz

Vertical



Horizontal

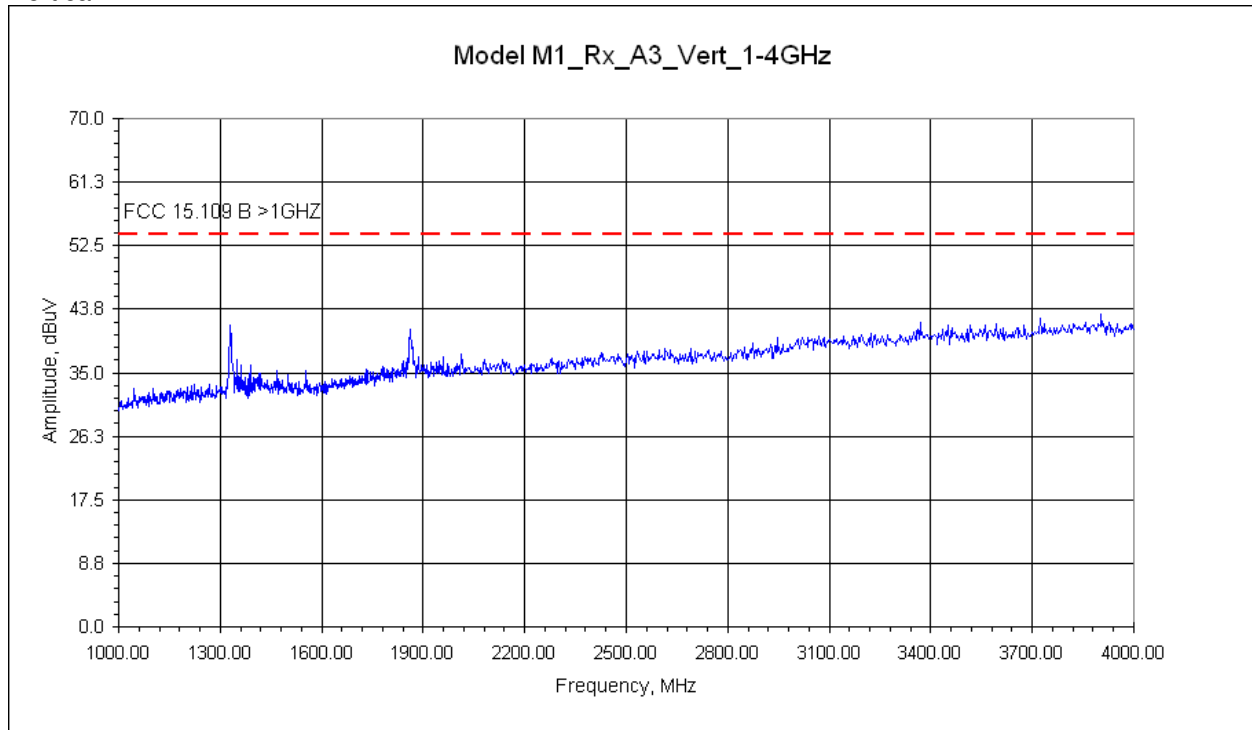


Reference only – to determine signals to be maximized

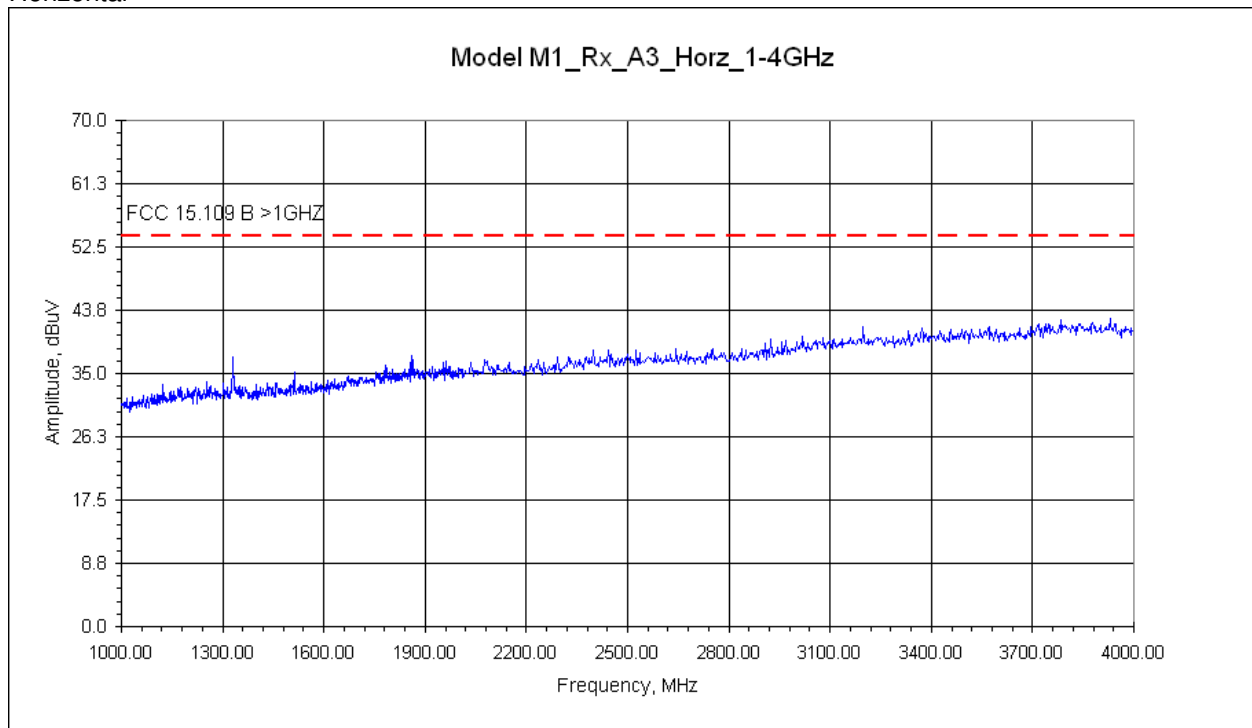
Pre-scan Plots: Radiated Emissions Product Axis 3 – Product Vertical & Rotated 90 Degrees

1GHz to 4GHz

Vertical



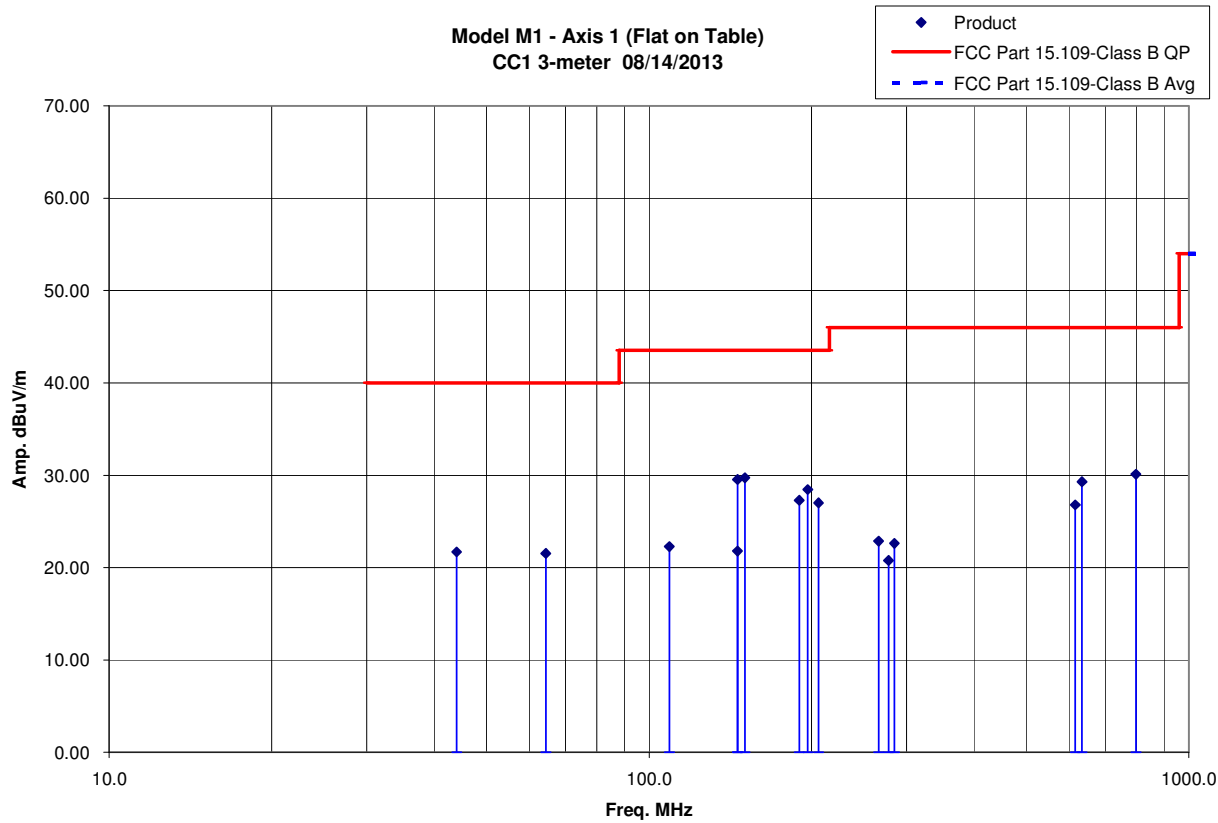
Horizontal



Reference only – to determine signals to be maximized

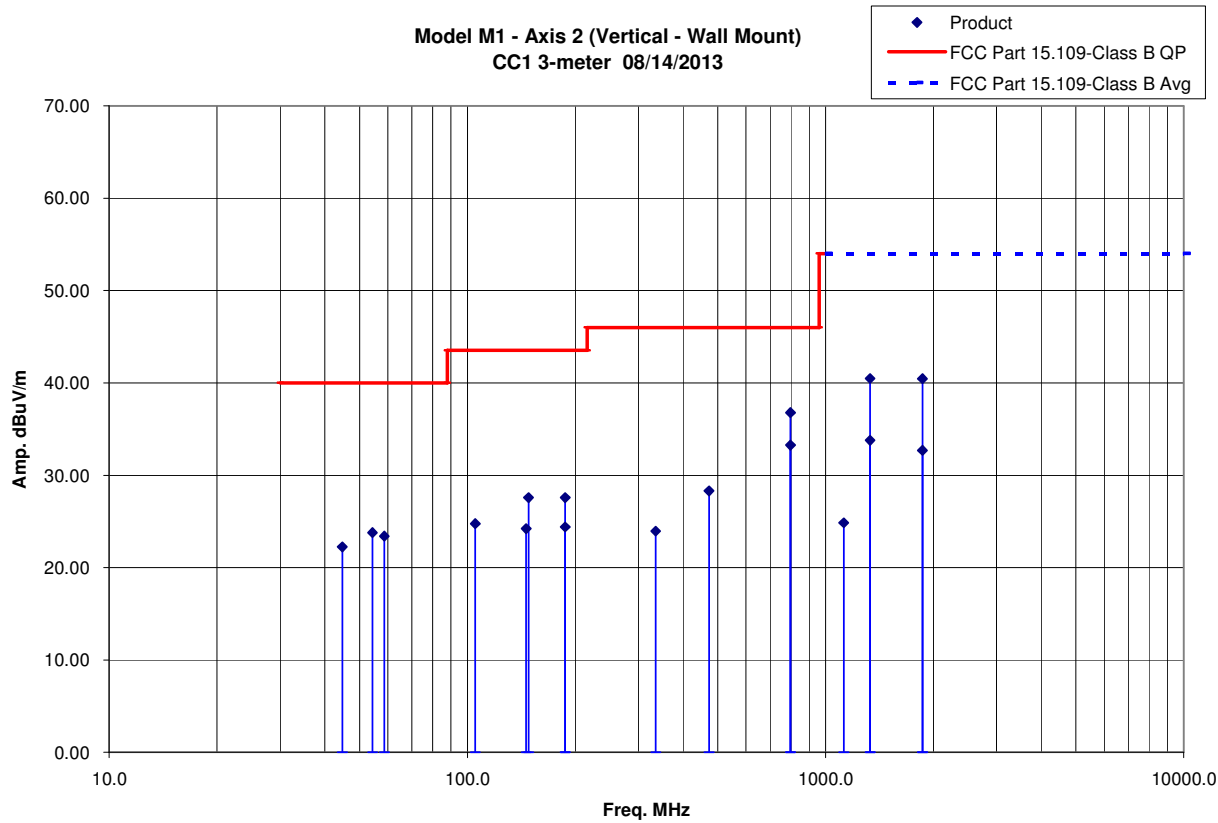
Final Plots: Radiated Emissions Product Axis 1 – Horizontal (Product Flat on Table)

FCC 15.109-Class B (30MHz to 1000MHz)



Final Plots: Radiated Emissions Product Axis 2 – Product Vertical on Table (Wall Mount)

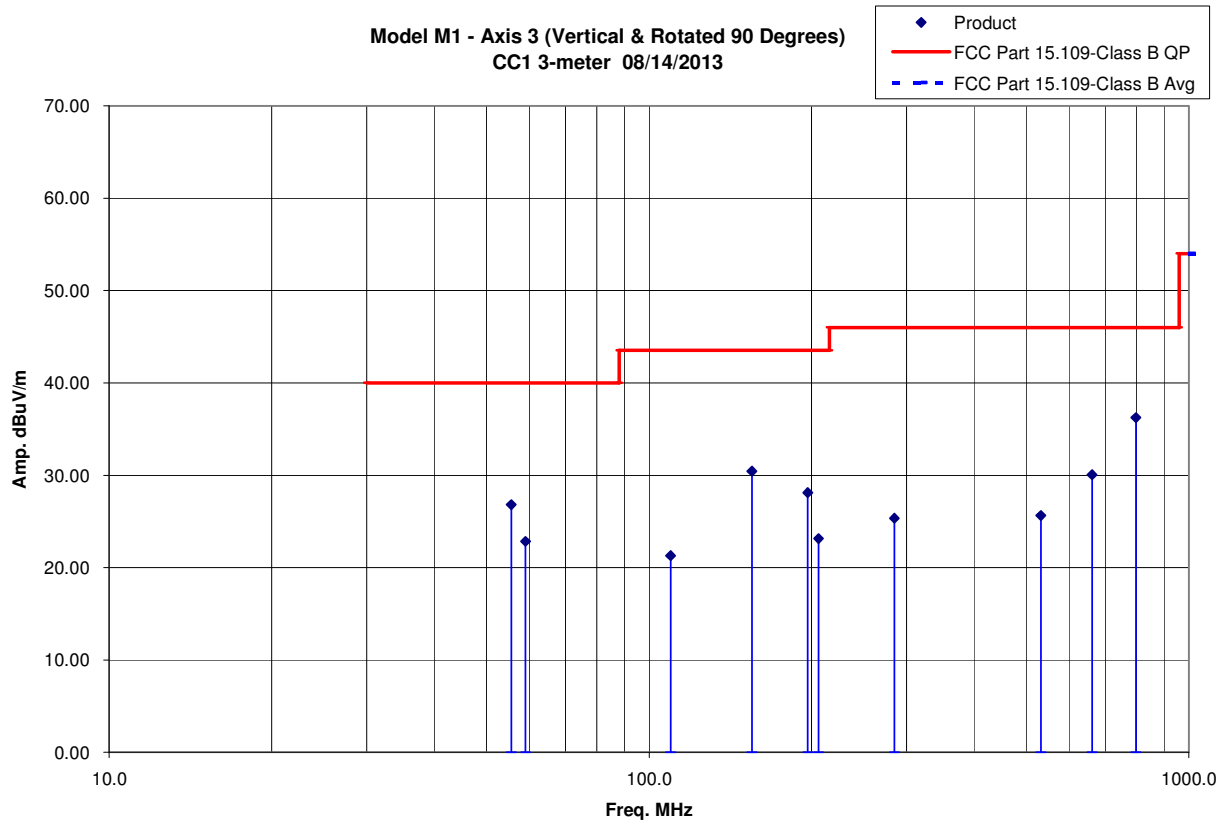
FCC 15.109-Class B (30MHz to 2GHz)



Note: Axis 2 was worst-case above 1GHz as determined from pre-scans

Final Plots: Radiated Emissions Product Axis 3 – Product Vertical & Rotated 90 Degrees

FCC 15.109-Class B (30MHz to 1000MHz)



Intertek

Report Number: 101262612DEN-001C

Issued:9/27/2013

Test Data: Radiated Emissions Axis 1 – Horizontal (Product Flat on Table)

Radiated Electromagnetic Emissions

Test Report #: G101262620	Test Area: <u>CC1 Radiated</u>	Temperature: <u>23.4</u> °C
Test Method: <u>FCC 15.109 – Class B</u>	Test Date: <u>08/14/2013</u>	Relative Humidity: <u>33.5</u> %
EUT Model #: <u>M1</u>	EUT Power: <u>120V/ 60Hz</u>	Air Pressure: <u>82.7</u> kPa
EUT Serial #: <u>FCC1</u>		

Manufacturer: Revolv

EUT Description: Revolv Hub – RF-enabled Home Automation wireless hub

Notes: AC Adapter: Unifive Model UN310-0520

Product tested in normal idle/standby receive mode of operation

Level Key

Pk – Peak

Qp – Quasi Peak

Av - Average

Measurements: Axis 1 (Product flat on table – horizontal position)

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.109 Class B	N/A	(MHz)
Measurements: 30MHz to 1000MHz - Product Axis 1 (Product flat on table – horizontal) – Vertical Antenna													
44.0000	38.02	Qp	0.77	11.10	28.20	0.00	21.69	V	1.00	250.7	- 18.31	NA	0.120
64.4000	40.99	Qp	0.77	7.90	28.13	0.00	21.53	V	1.00	184.5	- 18.47	NA	0.120
109.0000	36.81	Qp	0.77	12.60	27.92	0.00	22.26	V	1.00	246.2	- 21.24	NA	0.120
145.8665	43.84	Qp	0.81	12.61	27.74	0.00	29.53	V	1.00	168.7	- 13.97	NA	0.120
150.4965	43.98	Qp	0.82	12.65	27.72	0.00	29.74	V	1.00	198.4	- 13.76	NA	0.120
189.8565	42.40	Qp	0.92	11.49	27.53	0.00	27.28	V	1.00	319.7	- 16.22	NA	0.120
196.7965	42.96	Qp	0.94	12.06	27.50	0.00	28.46	V	1.00	311.5	- 15.04	NA	0.120
206.0665	42.30	Qp	0.96	11.21	27.45	0.00	27.01	V	1.10	14.6	- 16.49	NA	0.120
284.7865	34.91	Qp	1.15	13.69	27.12	0.00	22.63	V	1.34	205.5	- 23.37	NA	0.120
615.8487	34.53	Qp	1.72	18.88	28.34	0.00	26.79	V	1.27	61.7	- 19.21	NA	0.120
266.2500	35.77	Qp	1.10	13.15	27.16	0.00	22.86	V	1.00	358.2	- 23.14	NA	0.120
798.5000	34.97	Qp	1.97	21.14	27.97	0.00	30.12	V	1.80	239.0	- 15.88	NA	0.120
Measurements: 30MHz to 1000MHz Horizontal Antenna													
145.8700	36.10	Qp	0.81	12.61	27.74	0.00	21.79	H	2.42	96.0	- 21.71	NA	0.120
277.8635	33.23	Qp	1.13	13.51	27.11	0.00	20.77	H	1.70	285.0	- 25.23	NA	0.120
634.4100	36.86	Qp	1.75	19.01	28.33	0.00	29.30	H	1.56	99.7	- 16.70	NA	0.120

Intertek

Report Number: 101262612DEN-001C

Issued:9/27/2013

Test Data: Radiated Emissions Axis 2 – Product Vertical on Table (Wall Mount)

Radiated Electromagnetic Emissions

Test Report #: **G101262620** Test Area: CC1 Radiated Temperature: 23.4 °C
 Test Method: FCC 15.109 – Class B Test Date: 08/14/2013 Relative Humidity: 33.5 %
 EUT Model #: M1 EUT Power: 120V/ 60Hz Air Pressure: 82.7 kPa
 EUT Serial #: FCC1

Manufacturer: Revolv

EUT Description: Revolv Hub – RF-enabled Home Automation wireless hub

Notes AC Adapter: Unifive Model UN310-0520

Product tested in normal idle/standby mode of operation

Level Key

Pk – Peak

Qp – Quasi Peak

Av - Average

Measurements: Axis 2 (Product vertical – wall mount)

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.109 Class B	N/A	(MHz)
Measurements: 30MHz to 1000MHz - Product Axis 2 (Product vertical – wall mount) – Vertical Antenna													
44.7000	39.00	Qp	0.77	10.68	28.20	0.00	22.25	V	1.00	334.6	- 17.75	NA	0.120
54.3000	43.66	Qp	0.77	7.53	28.18	0.00	23.78	V	1.00	90.0	- 16.22	NA	0.120
58.6333	43.24	Qp	0.77	7.56	28.16	0.00	23.41	V	1.00	282.3	- 16.59	NA	0.120
105.2679	39.96	Qp	0.77	11.95	27.94	0.00	24.75	V	1.00	37.1	- 18.75	NA	0.120
148.1879	41.87	Qp	0.82	12.62	27.73	0.00	27.58	V	1.00	165.1	- 15.92	NA	0.120
187.5562	42.85	Qp	0.91	11.36	27.54	0.00	27.58	V	1.00	229.1	- 15.92	NA	0.120
335.7262	35.58	Qp	1.26	14.41	27.31	0.00	23.95	V	1.65	159.4	- 22.05	NA	0.120
472.3447	37.97	Qp	1.49	17.05	28.21	0.00	28.30	V	1.00	168.6	- 17.70	NA	0.120
798.1000	41.67	Qp	1.97	21.12	27.97	0.00	36.80	V	1.30	104.0	- 9.20	NA	0.120
Measurements: 30MHz to 1000MHz Horizontal Antenna													
145.8600	38.51	Qp	0.81	12.61	27.74	0.00	24.20	H	1.70	99.8	- 19.30	NA	0.120
187.5327	39.67	Qp	0.91	11.35	27.54	0.00	24.40	H	2.12	263.4	- 19.10	NA	0.120
798.4000	38.11	Qp	1.97	21.14	27.97	0.00	33.25	H	1.87	187.8	- 12.75	NA	0.120

Radiated Electromagnetic Emissions

Test Report #: G101262620	Test Area: CC1 Radiated	Temperature: <u>23.4</u> °C
Test Method: FCC 15.109 – Class B	Test Date: <u>08/14/2013</u>	Relative Humidity: <u>33.5</u> %
EUT Model #: M1	EUT Power: <u>120V/ 60Hz</u>	Air Pressure: <u>82.7</u> kPa
EUT Serial #: FCC1		

Manufacturer: Revolv

EUT Description: Revolv Hub – RF-enabled Home Automation wireless hub

Notes AC Adapter: Unifive Model UN310-0520

Product tested in normal idle/standby receive mode of operation

Level Key

Pk – Peak

Qp – Quasi Peak

Av - Average

Measurements: Axis 2 (Product vertical – wall mount) worst-case axis above 1GHz per pre-scans

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.109 Class B Average	N/A	(MHz)
Measurements: 1GHz to 2GHz - Product Axis 2 (Product vertical – wall mount) – Vertical Antenna													
1123.9000	35.06	Av	2.36	24.62	37.19	0.00	24.85	V	1.59	176.5	- 29.15	N/A	1.000
1331.0000	42.89	Av	2.57	25.21	36.89	0.00	33.78	V	1.53	140.8	- 20.22	N/A	1.000
1863.1000	39.46	Av	3.07	27.14	36.97	0.00	32.70	V	1.53	140.8	- 21.30	N/A	1.000
Measurements: 1GHz to 2GHz - Horizontal Antenna													
1330.8000	49.60	Av	2.56	25.21	36.89	0.00	40.49	H	1.90	184.8	- 13.51	N/A	1.000
1863.0000	47.22	Av	3.07	27.14	36.97	0.00	40.46	H	1.90	137.5	- 13.54	N/A	1.000

Test Data: Radiated Emissions Axis 3 – Product Vertical & Rotated 90 Degrees

Radiated Electromagnetic Emissions

Test Report #: G101262620	Test Area: <u>CC1 Radiated</u>	Temperature: <u>23.4</u> °C
Test Method: <u>FCC 15.109 – Class B</u>	Test Date: <u>08/14/2013</u>	Relative Humidity: <u>33.5</u> %
EUT Model #: <u>M1</u>	EUT Power: <u>120V/ 60Hz</u>	Air Pressure: <u>82.7</u> kPa
EUT Serial #: <u>FCC1</u>		

Manufacturer: <u>Revolv</u>	Level Key
EUT Description: <u>Revolv Hub – RF-enabled Home Automation wireless hub</u>	Pk – Peak Qp – Quasi Peak Av - Average
Notes: <u>AC Adapter: Unifive Model UN310-0520</u>	
<u>Product tested in normal idle/standby receive mode of operation</u>	

Measurements: Axis 3 (Product vertical & rotated 90 degrees – wall mount)

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.109 Class B	N/A	(MHz)
Measurements: 30MHz to 1000MHz - Product Axis 3 (Product vertical & rotated 90 degrees) – Vertical Antenna													
55.5700	46.74	Qp	0.77	7.49	28.17	0.00	26.82	V	1.00	292.6	- 13.18	NA	0.120
59.0700	42.62	Qp	0.77	7.60	28.16	0.00	22.83	V	1.00	84.4	- 17.17	NA	0.120
109.6758	35.63	Qp	0.77	12.80	27.91	0.00	21.29	V	1.10	212.7	- 22.21	NA	0.120
155.1258	44.60	Qp	0.84	12.70	27.70	0.00	30.44	V	1.00	289.7	- 13.06	NA	0.120
196.7958	42.61	Qp	0.94	12.06	27.50	0.00	28.11	V	1.07	333.0	- 15.39	NA	0.120
284.7841	37.62	Qp	1.15	13.69	27.12	0.00	25.34	V	1.54	273.6	- 20.66	NA	0.120
798.3000	41.11	Qp	1.97	21.13	27.97	0.00	36.25	V	1.38	203.0	- 9.75	NA	0.120
Measurements: 30MHz to 1000MHz Horizontal Antenna													
206.0800	38.44	Qp	0.96	11.20	27.45	0.00	23.15	H	2.35	111.6	- 20.35	NA	0.120
532.0646	33.76	Qp	1.58	18.70	28.41	0.00	25.64	H	1.85	308.0	- 20.36	NA	0.120
662.1772	36.91	Qp	1.80	19.66	28.30	0.00	30.06	H	1.43	352.1	- 15.94	NA	0.120

Example calculation:

Measured Level	+	Cable Loss	+	Antenna Factor	-	Pre-Amp	+	Atten	=	Final Corrected Reading	Specification Limit	-	Final Corrected Reading	=	Delta Specification
(dBuV)		(dB)		(dB)		(dB)		(dB)		(dBuV/m)	(dBuV/m)		(dBuV/m)		
20.0		3.0		5.0		10.0		0.0		18.0	40.0		18.0		- 22.0

Notes:

- 1) For due diligence, the product fully tested in (3) axes (product orientations).
- 2) The highest product clock was 266MHz – testing up to 2GHz required per standard.
- 3) Product tested in idle/standby receive mode of operation.

Deviations, Additions, or Exclusions: None

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

16 AC Mains Conducted Emissions

Method:

Unless otherwise stated no deviations were made from FCC Part 15.107 – Class B.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Test Equipment Used:

Asset ID	Description	Manufacture	Model	Serial	Cal Date	Cal Due
DEN-073	EMI Receiver	ROHDE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18885	Transient Limiter	Hewlett-Packard	11947A	3107A00700	05/05/2013	05/05/2014
18914	Single Phase LISN	EMCO	3816/NM	9408-1003	04/11/2013	04/11/2014
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 1.0	VBV	VBV

Test Requirement:

The product must pass the AC Conducted average and quasi-peak Class B Limits defined in FCC Part 15.107.

Test Procedure:

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at all frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

Test Results:

The sample tested was found to Comply.

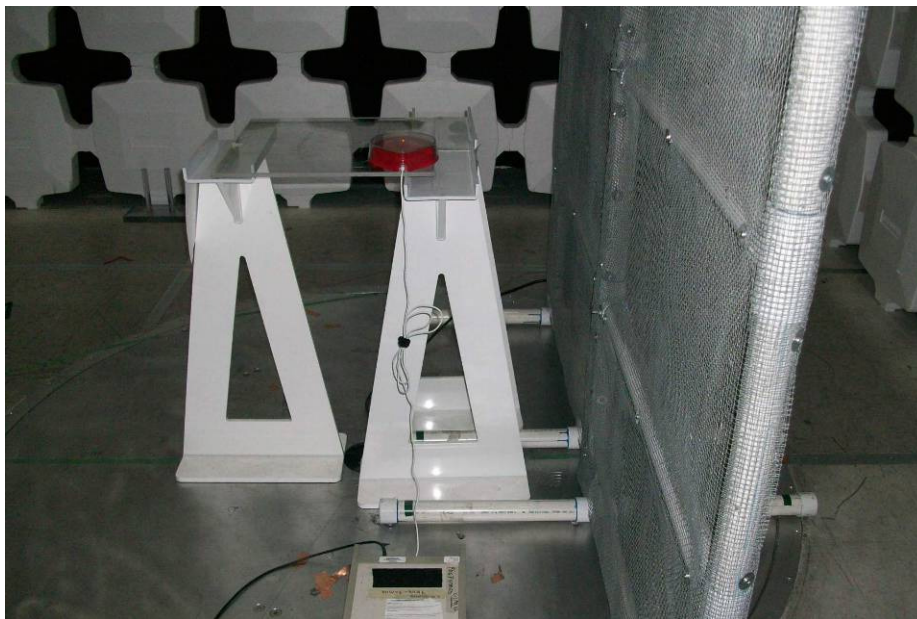
Setup Photographs: AC Conducted

AC Conducted Emissions – Test Setup (Front View)



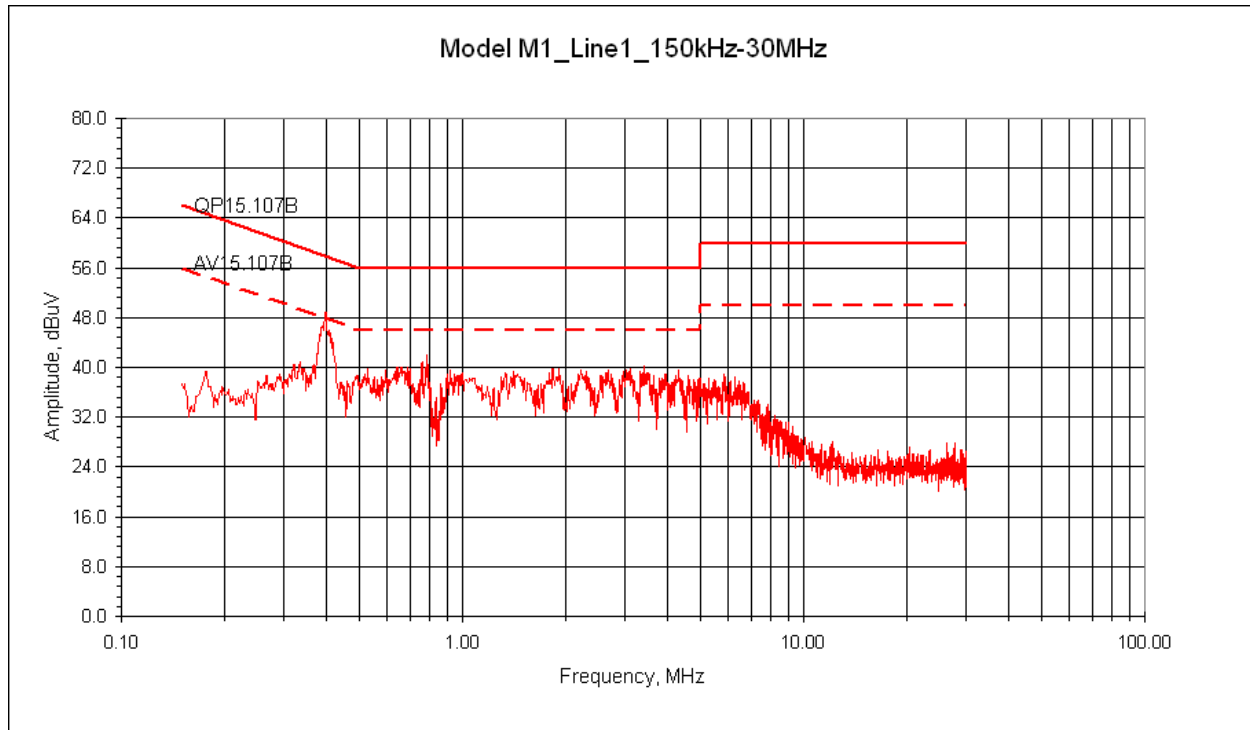
Set-up Photographs: AC Conducted

AC Conducted Emissions – Test Setup (Side View)

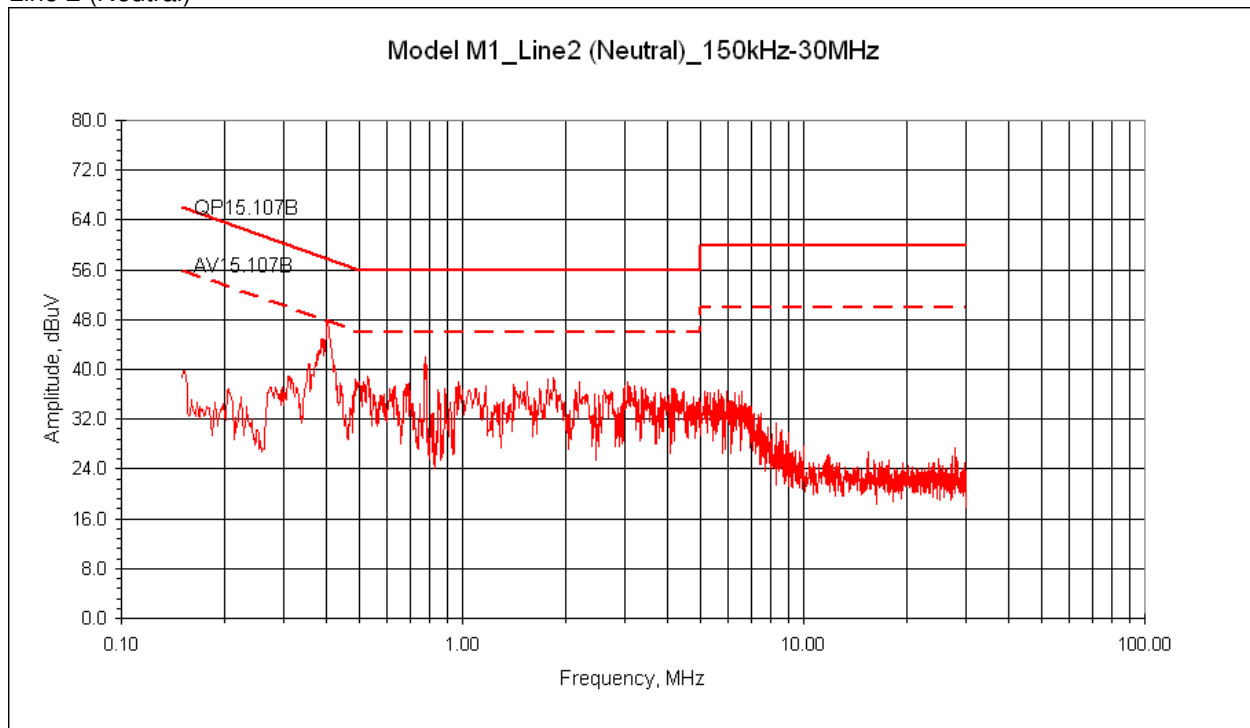


Pre-scan Plots: AC Conducted - Reference Only

Line 1

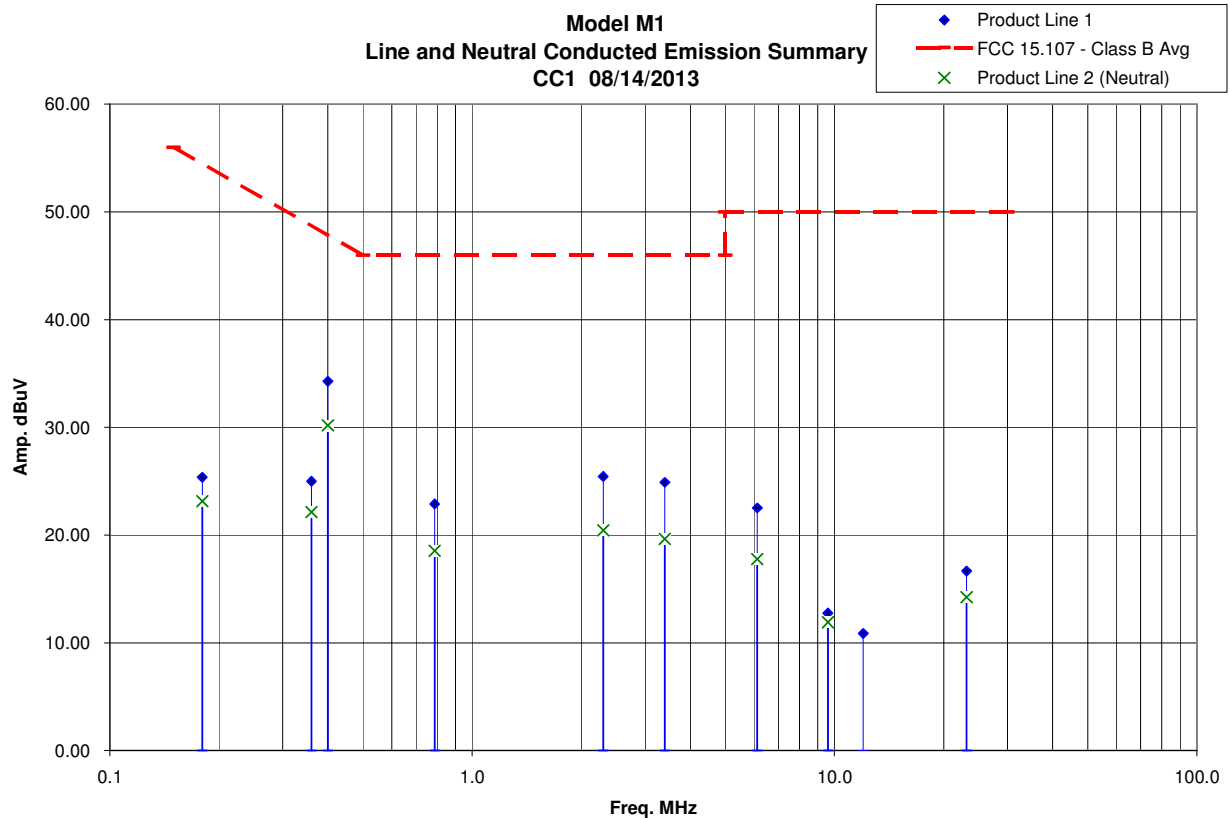
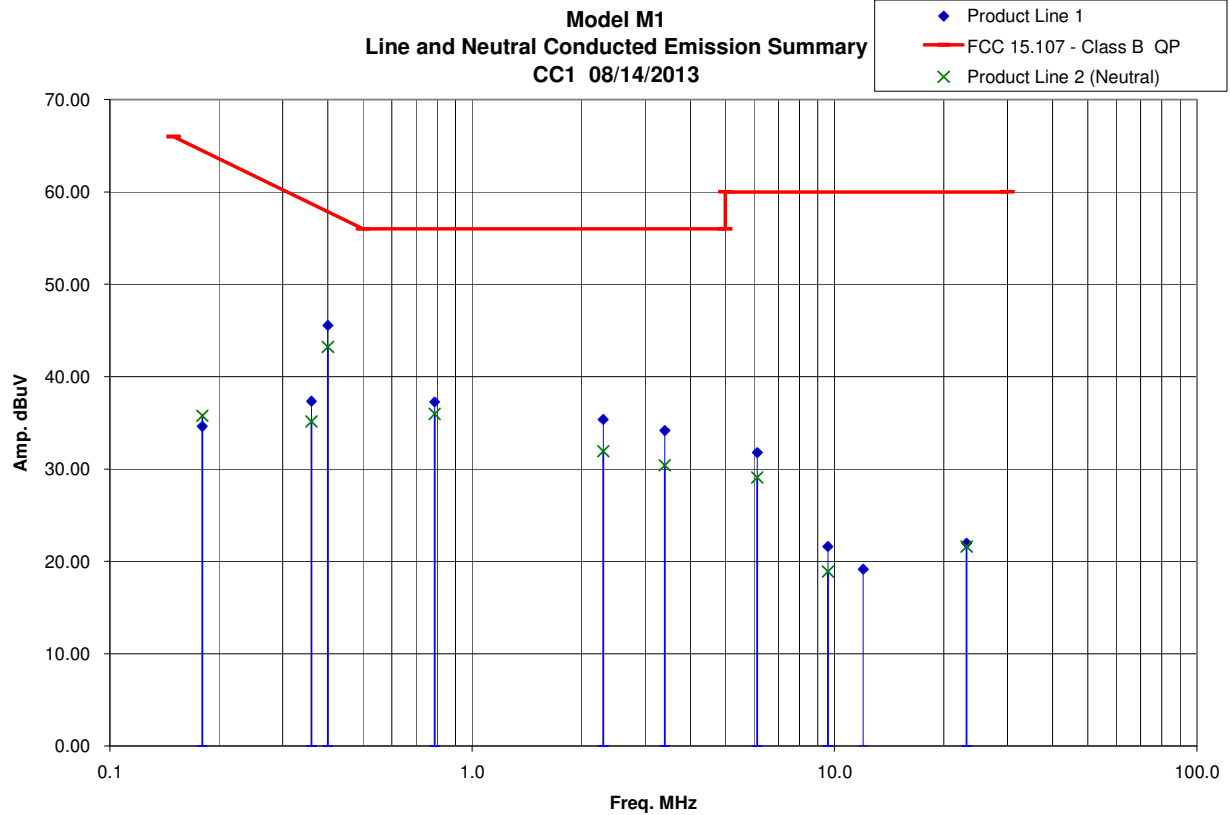


Line 2 (Neutral)



Reference only – to determine signals to be maximized

Final Plots: AC Conducted
FCC 15.107 – Class B (150kHz to 30MHz)



Test Data: AC Conducted

AC Conducted Electromagnetic Emissions

Test Report #:	G101262620	Test Area:	CC1 Conducted	Temperature:	23.1	C
Test Method:	FCC 15.107 – Class B	Test Date:	14-Aug-2013	Relative Humidity:	32.8	%
EUT Model #:	M1	EUT Power:	120V/ 60Hz	Air Pressure:	83.1	kPa
EUT Serial #:	FCC1					
Manufacturer:	Revolv					
EUT Description:	Revolv Hub – RF-enabled Home Automation					
Notes:	AC Adapter: Unifive Model UN310-0520					
	Product tested in normal standby/idle receive mode of operation					

FREQ	LEVEL	DET	CABLE	LISN	PREAMP	ATTEN	FINAL	TEST POINT	DELTA1	DELTA2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	Line 1 Line2 (Neutral)	FCC 15.107 Class B Average	FCC 15.107 Class B Qp	(MHz)
Line 1 Data – 150kHz to 30MHz											
0.180	15.26	Av	0.10	0.03	0.00	9.96	25.36	Line 1	- 29.13	NA	0.009
0.180	24.51	Qp	0.10	0.03	0.00	9.96	34.61	Line 1	NA	- 29.88	0.009
0.360	14.89	Av	0.10	0.03	0.00	9.97	24.99	Line 1	- 23.74	NA	0.009
0.360	27.23	Qp	0.10	0.03	0.00	9.97	37.33	Line 1	NA	- 21.40	0.009
0.400	24.18	Av	0.10	0.03	0.00	9.97	34.28	Line 1	- 13.58	NA	0.009
0.400	35.45	Qp	0.10	0.03	0.00	9.97	45.55	Line 1	NA	- 12.31	0.009
0.788	12.68	Av	0.20	0.03	0.00	9.98	22.88	Line 1	- 23.12	NA	0.009
0.788	27.06	Qp	0.20	0.03	0.00	9.98	37.26	Line 1	NA	- 18.74	0.009
2.301	15.23	Av	0.20	0.03	0.00	9.98	25.44	Line 1	- 20.56	NA	0.009
2.301	25.15	Qp	0.20	0.03	0.00	9.98	35.36	Line 1	NA	- 20.64	0.009
3.402	14.58	Av	0.30	0.03	0.00	9.98	24.90	Line 1	- 21.10	NA	0.009
3.402	23.85	Qp	0.30	0.03	0.00	9.98	34.17	Line 1	NA	- 21.83	0.009
6.122	12.08	Av	0.40	0.05	0.00	9.99	22.52	Line 1	- 27.48	NA	0.009
6.122	21.33	Qp	0.40	0.05	0.00	9.99	31.77	Line 1	NA	- 28.23	0.009
9.596	2.04	Av	0.60	0.11	0.00	10.00	12.75	Line 1	- 37.25	NA	0.009
9.596	10.90	Qp	0.60	0.11	0.00	10.00	21.61	Line 1	NA	- 38.39	0.009
12.000	- 0.05	Av	0.80	0.12	0.00	10.00	10.87	Line 1	- 39.13	NA	0.009
12.000	8.23	Qp	0.80	0.12	0.00	10.00	19.15	Line 1	NA	- 40.85	0.009
23.157	5.29	Av	1.10	0.22	0.00	10.03	16.64	Line 1	- 33.36	NA	0.009
23.157	10.60	Qp	1.10	0.22	0.00	10.03	21.95	Line 1	NA	- 38.05	0.009
Line 2 (Neutral) Data – 150kHz to 30MHz											
0.180	13.04	Av	0.10	0.03	0.00	9.96	23.14	Line 2	- 31.35	NA	0.009
0.180	25.67	Qp	0.10	0.03	0.00	9.96	35.77	Line 2	NA	- 28.72	0.009
0.360	12.04	Av	0.10	0.02	0.00	9.97	22.13	Line 2	- 26.60	NA	0.009
0.360	25.04	Qp	0.10	0.02	0.00	9.97	35.13	Line 2	NA	- 23.60	0.009
0.400	20.08	Av	0.10	0.02	0.00	9.97	30.17	Line 2	- 17.68	NA	0.009
0.400	33.14	Qp	0.10	0.02	0.00	9.97	43.23	Line 2	NA	- 14.62	0.009
0.788	8.33	Av	0.20	0.02	0.00	9.98	18.53	Line 2	- 27.47	NA	0.009

Intertek											
Report Number: 101262612DEN-001C						Issued:9/27/2013					

0.788	25.75	Qp	0.20	0.02	0.00	9.98	35.95	Line 2	NA	- 20.05	0.009
2.301	10.24	Av	0.20	0.03	0.00	9.98	20.45	Line 2	- 25.55	NA	0.009
2.301	21.73	Qp	0.20	0.03	0.00	9.98	31.94	Line 2	NA	- 24.06	0.009
3.402	9.33	Av	0.30	0.03	0.00	9.98	19.64	Line 2	- 26.36	NA	0.009
3.402	20.09	Qp	0.30	0.03	0.00	9.98	30.40	Line 2	NA	- 25.60	0.009
6.122	7.33	Av	0.40	0.05	0.00	9.99	17.77	Line 2	- 32.23	NA	0.009
6.122	18.62	Qp	0.40	0.05	0.00	9.99	29.06	Line 2	NA	- 30.94	0.009
9.596	- 1.30	Av	0.60	0.11	0.00	10.00	9.41	Line 2	- 40.59	NA	0.009
9.596	8.17	Qp	0.60	0.11	0.00	10.00	18.88	Line 2	NA	- 41.12	0.009
23.157	2.75	Av	1.10	0.36	0.00	10.03	14.24	Line 2	- 35.76	NA	0.009
23.157	10.12	Qp	1.10	0.36	0.00	10.03	21.61	Line 2	NA	- 38.39	0.009

Example calculation:

Measured Level	+	Transducer, Cable Loss & Amplifier corrections	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dBμV)		(dB)		(dBμV/m)	(dBμV/m)		(dBμV/m)		
14.0		14.9		28.9	40.0		28.9		-11.1

Notes:

- 1) Product tested in idle/standby receive mode of operation.

Deviations, Additions, or Exclusions: None

17 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of $k = 2$, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty \pm	Notes
Radiated emissions, 10kHz to 30 MHz	3.4 dB	
Radiated emissions, 30 to 200 MHz HP	2.2 dB	
Radiated emissions, 30 to 200 MHz VP	3.8 dB	
Radiated emissions, 200 to 1000 MHz HP	2.8 dB	
Radiated emissions, 200 to 1000 MHz VP	2.7 dB	
Radiated emissions, 1 to 18 GHz	5.2 dB	
Conducted port emissions 10kHz to 1000 MHz	1.0 dB	
Conducted port emissions 10kHz to 1000 MHz	1.6 dB	
AC mains Conducted emissions, 9kHz to 30 MHz	3.1 dB	

Intertek	
Report Number: 101262612DEN-001C	Issued:9/27/2013

18 Revision History

Revision Level	Date	Report Number	Notes
0	9/27/2013	101262612DEN-001C	Original Issue