TEST REPORT

Report Number: 101122982DEN-002
Project Number: G101122982

Report Issue Date: 5/17/2013

Product Designation: **Model: Lively 1.0 Sensor**

Standards: FCC 47 CFR Part 15.247
RSS-210:2010
RSS-GEN:2010

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

Client:
Hamlet, Inc.
682 Schofield Road
San Francisco, CA 94129

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Senior EMC Project Engineer

Report reviewed by
Mike Spataro
Engineering Team Leader

TABLE OF CONTENTS

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 Lively 1.0 Wireless Sensor Unit – a Low-Power Sensor DSS radio product operating in the following transmit band: 2.4GHz to 2.4835 GHz. This product is a component of the LivelyHome System.

The Hub (Master Unit) is a receiver-only product and was also fully tested – refer to the following Intertek report for details.

- 101122982DEN-001

General Test Methodology

Both RF conducted port and radiated emissions measurements were performed according to the procedures in the following documents:

- ANSI C63.10:2009 – ANSI Standard for Testing Unlicensed Wireless Devices
- FCC Publication 558074: 2013 – “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247

Radiated emissions tests were performed at an antenna-to-product distance of 3-meters.

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 coved under the laboratories scope.

2 Test Summary

Section	Test full name	Test date	Result
5	Digital Modulation (DTS) Requirements – FCC 15.247(a) (Covers RSS-210 A8.2	04/12/2013	Pass
6	6dB (DTS) Bandwidth – FCC 15.247(a)(2) (Covers RSS-210 A8.2(a))	04/17/2013	Pass
7	Transmitter Output Power – EIRP Requirements – FCC 15.247(b)(3) (Covers RSS-210 A8.4(4)	04/15/2013	Pass
8	Harmonics of the Fundamental - Out-of-Band Emissions (-20dBc) FCC 15.247(d) (Covers RSS-210 A8.5)	04/15/2013	Pass
9	Antenna Port Spurious Emissions – Non-Restricted Bands - 30MHz to 25GHz (-20dBc/ Band Edge) - FCC 15.247(d) (Covers RSS-210 A8.5)	04/15/2013	Pass
10	Radiated Emissions – Unintentional and Spurious/ Band Edge FCC 15.209/15.247(d)/15.205 (Covers RSS-210 A8.5, RSS-GEN 7.2.2)	04/17/2013	Pass
11	Power Spectral Density (PSD) – FCC 15.247(e) (Covers RSS-210 A8.2(b))	04/18/2013	Pass
12	Occupied Bandwidth – RSS-GEN, Section 4.6.1	04/19/2013	Pass
13	Receiver Emissions – FCC 15.109 (Covers RSS-GEN, 6.1)	-----	N/A
14	AC Conducted Emissions – FCC 15.207 (Covers RSS-GEN Section 7.2.4)	-----	N/A
15	Duty Cycle Correction Factor – FCC 15.35(c) (Covers RSS-GEN, 4.5)	-----	N/A
16	Antenna Requirement – FCC 15.203	04/12/2013	Pass
17	RF Exposure Requirements – FCC 15.247(b)(5) (Covers RSS-102)	04/19/2013	Pass

Notes:

1) Product has no AC power port – therefore, AC Conducted Emissions not applicable.

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. A new battery was used for testing.
- 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 measurements taken at an antenna-to-product test distance of 3-meters for the following frequency range: 30MHz to 18GHz. All measurements taken at an antenna-to-product test distance of 1-meter for the following frequency range: 18GHz to 40GHz. The measurements were then extrapolated to 3-meters using a factor of 20dB/decade.
- ANSI C63.10, Section 5.5, Table 2/ FCC 15.33(a): The frequency range of measurement per the requirements of the preceding standards. The product was tested from 30MHz to 25GHz.
- ANSI C63.10, Section 6.3.1/ FCC 15.35(b): Measurement bandwidths utilized for 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, middle and highest channels of the product tested. The product utilizes 40-channels.

Product-Specific Radio Notes:

1. The product is not a fixed, point-to-point operating system.
2. The product is a battery-operated device – therefore no ac port testing was required.
3. The product is configured with an integral antenna – not user accessible. Therefore, FCC 15.203 antenna requirements were satisfied. The declared antenna gain is +2.41dBi.
4. Duty Cycle Correction Factors were not utilized in this testing and report.
5. The product uses GFSK modulation (1MHz)
6. Product FCC ID: R6N-0002, IC ID: 11045A-0002

3 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
LivelyHome System Sensor Unit (Normal Configuration)	Hamlet, Inc.	Lively 1.0	DVT101
LivelyHome System Sensor Unit (Integral Antenna) (programmable)	Hamlet, Inc.	Lively 1.0	DVT102
LivelyHome System Sensor Unit (RF Conducted Port) (programmable)	Hamlet, Inc.	Lively 1.0	DVT103

Receive Date:	04/11/2013
Received Condition:	Good
Type:	Production Samples

Description of Equipment Under Test (provided by client)
Hamlet, Inc. through their Lively business unit has developed the LivelyHome System. LivelyHome was designed to allow the elderly to continue living independently for longer by facilitating care from family members. The system uses sensor technology to “learn” about the way a person lives – how often they spend time in the kitchen, take their medication or get out of the house. When a pattern shifts, LivelyHome notices – and updates the network of people who want to know. The LivelyHome System consists of a master unit, or “Hub” and Sensor units. Two RF interfaces are utilized by the system. The Hub has a cellular modem (Part 68 Certified) for connection to the cellular network. A low-power link is used to connect the Hub to the Sensor units. Specifically, 2.4GHz ISM Low-Power Sensor DSS technology is utilized in the Sensor units. Modulation scheme is GFSK. The typical duty cycle is 1Hz maximum. The product has a single PWB with the option of containing an accelerometer. The Hub is AC-powered, while the Sensors are Battery-Powered. The product will be marketed in the US and Canada.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3VDC CR2032 Lithium Cell	---	---	---

Operating modes of the EUT: Intentional Tx Testing

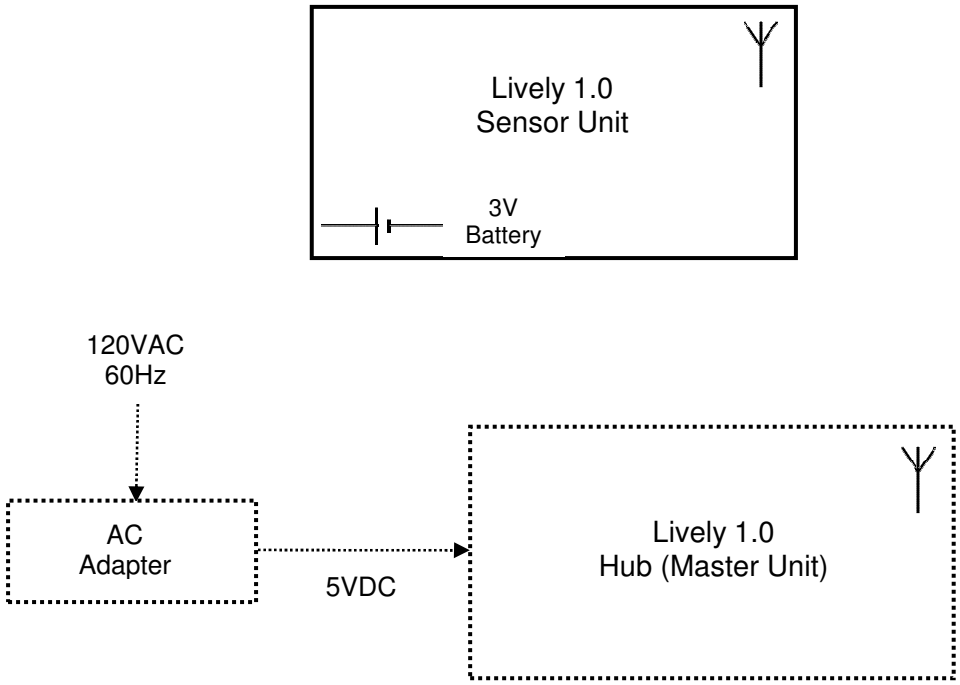
No.	Descriptions of EUT Exercising
1	Product configured for continuous transmission, full power, CW signal.
2	Product configured for continuous transmission, full power with modulation/data transfer enabled.
3	Product configured in “normal” operating mode and duty cycle.

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:



Note: Dashed lines indicate auxiliary/support equipment

Support Data:

ID	Description/ Function	Shield Type	Length	Connector	Connection	Ferrites
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Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Lively 1.0 Hub	Hamlet, Inc.	Lively 1.0	DVT103

Notes:

1) The LivelyHome Hub was utilized in specific tests as a receiver for the product under test.
2) The product has no power, signal or I/O cables.

5 Digital Modulation (DTS)

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC CFR47 15.247 & IC RSS-210.

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

Test Requirement/Specification

Products operating under the provisions of the above standards are limited to frequency-hopping and digital transmissions systems (DTS) using digital modulation techniques operating in the 2400MHz to 2483.5MHz band.

- FCC 15.247(a)
- RSS-210 A8.2

Results:

The sample tested was found to comply.

The product is a Low-Power device which utilizes GFSK modulation and is Direct-Sequence Spread Spectrum (DSSS).

6 6dB Bandwidth (DTS Bandwidth)

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.247 & IC RSS-210.

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

Test Requirement/Specification

The minimum 6dB Bandwidth (modulated) shall be at least 500 kHz.

- FCC 15.247(a)(2)
- RSS-210 A8.2(a)

Test Equipment Used:

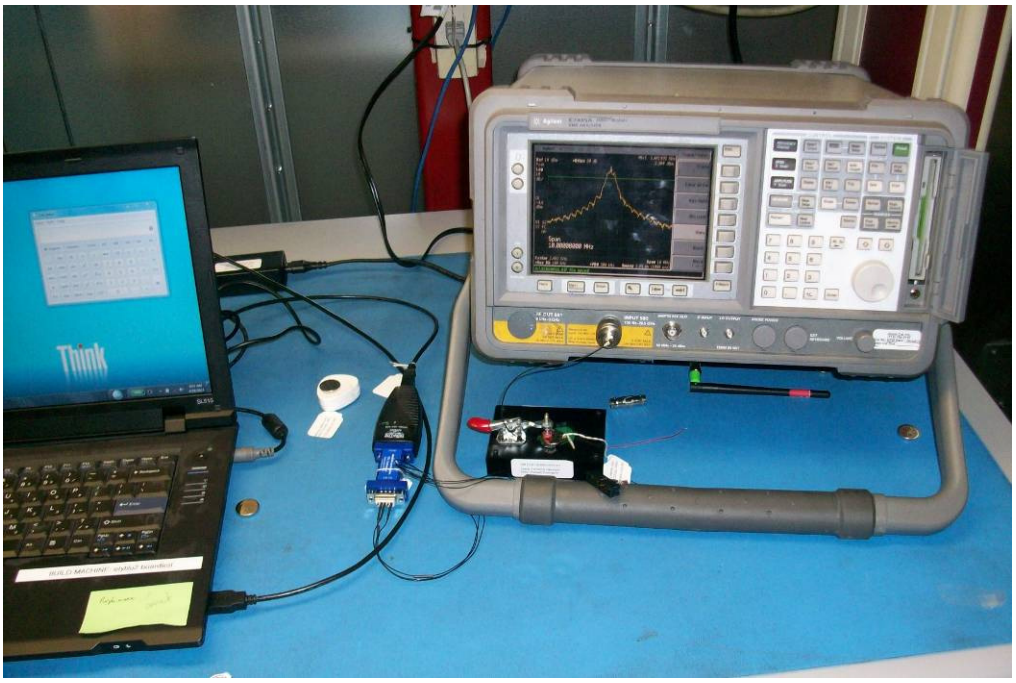
Asset ID:	Description:	Manufacturer:	Model:	Serial:	Cal Date	Cal Due
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013

Results:

The sample tested was found to comply.

Setup Photographs

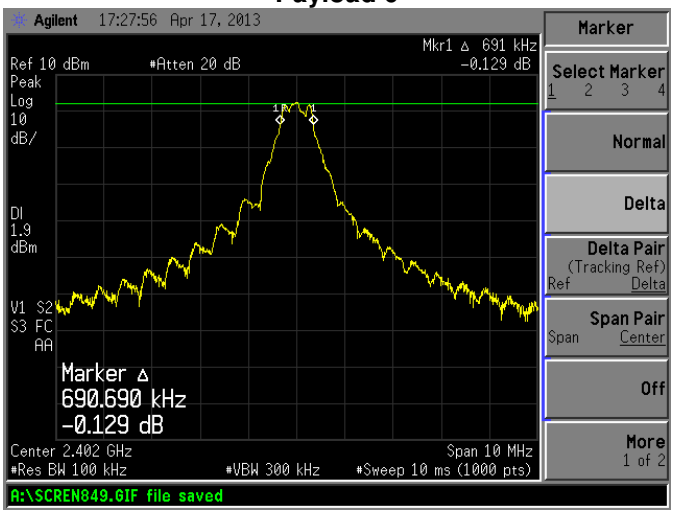
Test Setup



Test Data: Low Channel

6 dB Bandwidth (DTS Bandwidth) – LivelyHome Sensor
FCC 15.247(a)(2) / RSS-210 A8.2(a)

Low Channel – 2402 MHz
Payload 0



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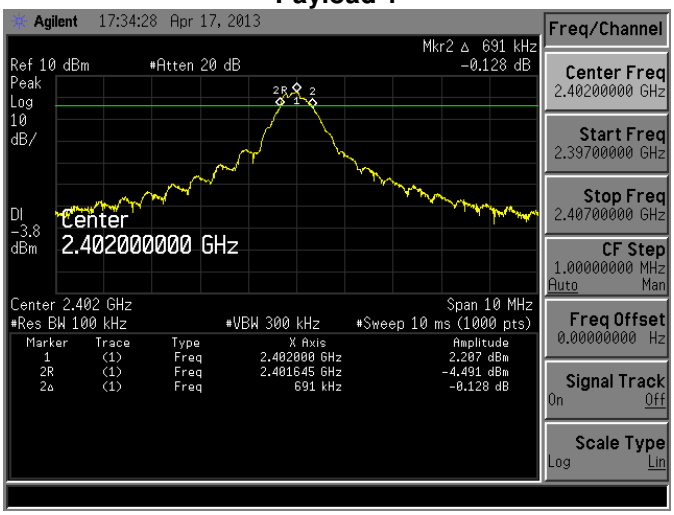

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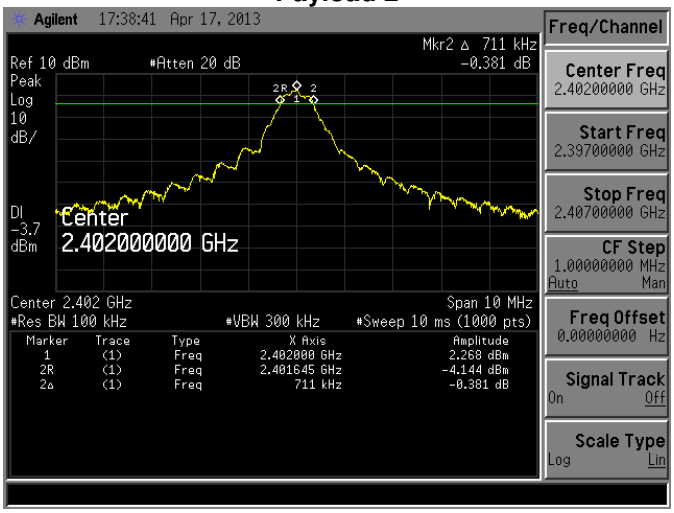


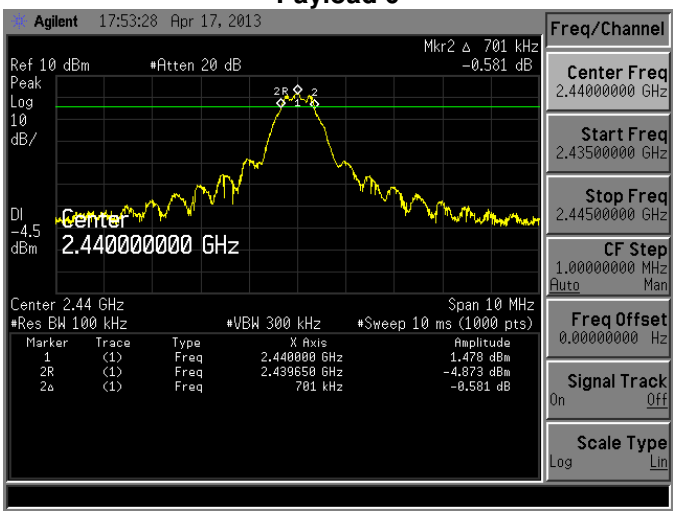
Specification: 6dB Bandwidth > 500 kHz

Test Data: Mid Channel

6 dB Bandwidth (DTS Bandwidth)
FCC 15.247(a)(2) / RSS-210 A8.2(a)

Mid Channel – 2440 MHz

Payload 0



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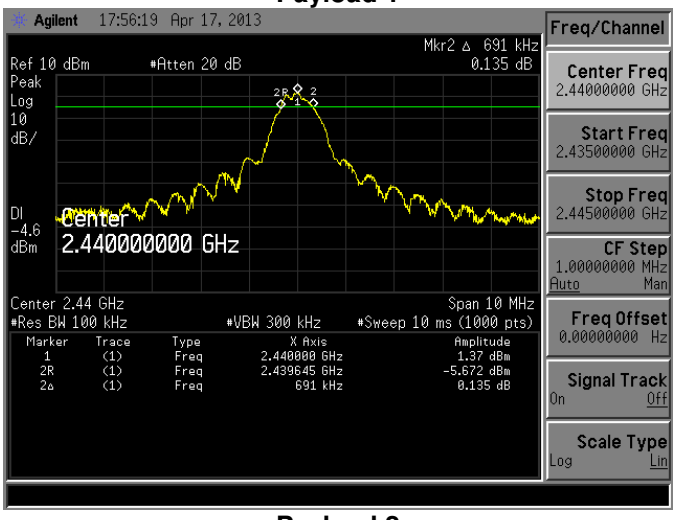

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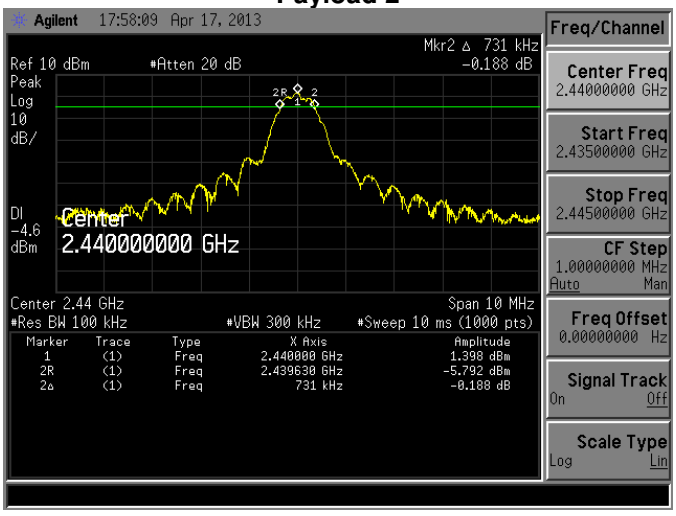
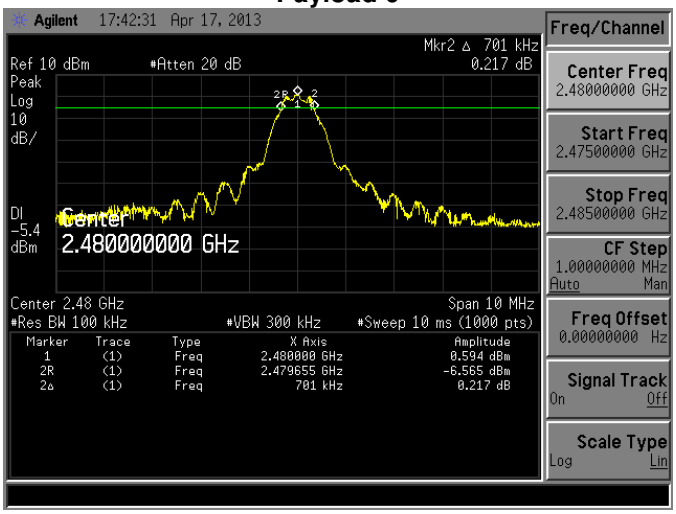


Specification: 6dB Bandwidth > 500 kHz

Test Data: High Channel

6 dB Bandwidth (DTS Bandwidth)
FCC 15.247(a)(2) / RSS-210 A8.2(a)

High Channel – 2480 MHz
Payload 0



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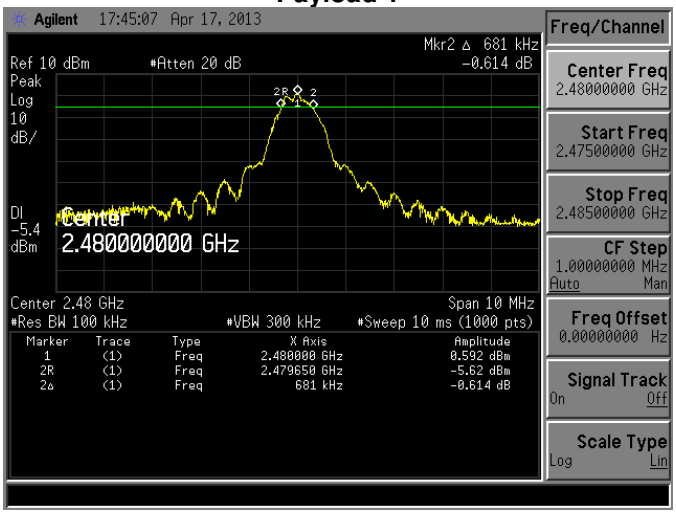
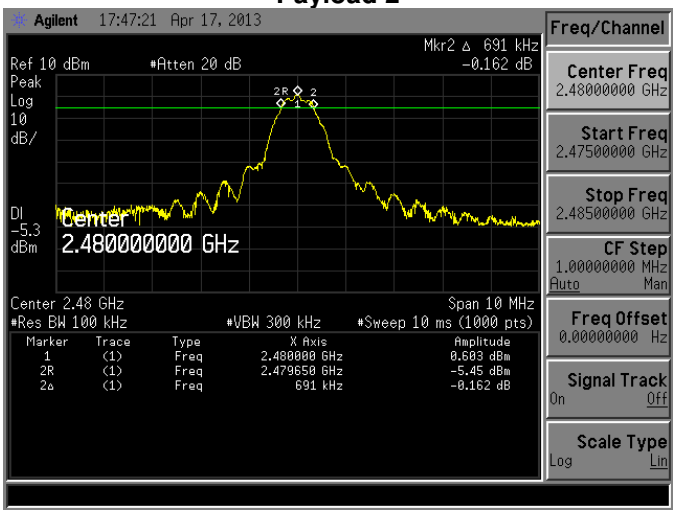


Payload 2



Specification: 6dB Bandwidth > 500 kHz

Test Method:

- FCC 558074 D01 DTS Measurement Guidance: 2013, Section 8.0, Option 1

Test Summary:

6dB Bandwidth (DTS Bandwidth) Summary	
Channel/ Mode	**6dB Bandwidth**
Low/ Payload 0	691kHz
Mid/ Payload 1	691kHz
High/ Payload 1	681kHz

Specification: 6dB Bandwidth > 500 kHz

Notes:

1) Measurements were taken using worst-case modulated (minimum bandwidth) mode, using minimum data packet length.
2) All measurements are RF conducted port.

Deviations, Additions, or Exclusions: None

7 Transmitter Output Power – EIRP Requirements

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.247 & IC RSS-210.

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

Test Requirement/Specification

The maximum peak conducted output power shall not exceed 1 Watt. The EIRP shall not exceed 4 Watts.

The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi.

- FCC 15.247(b)(3)
- RSS-210 A8.4(4)

Test Equipment Used:

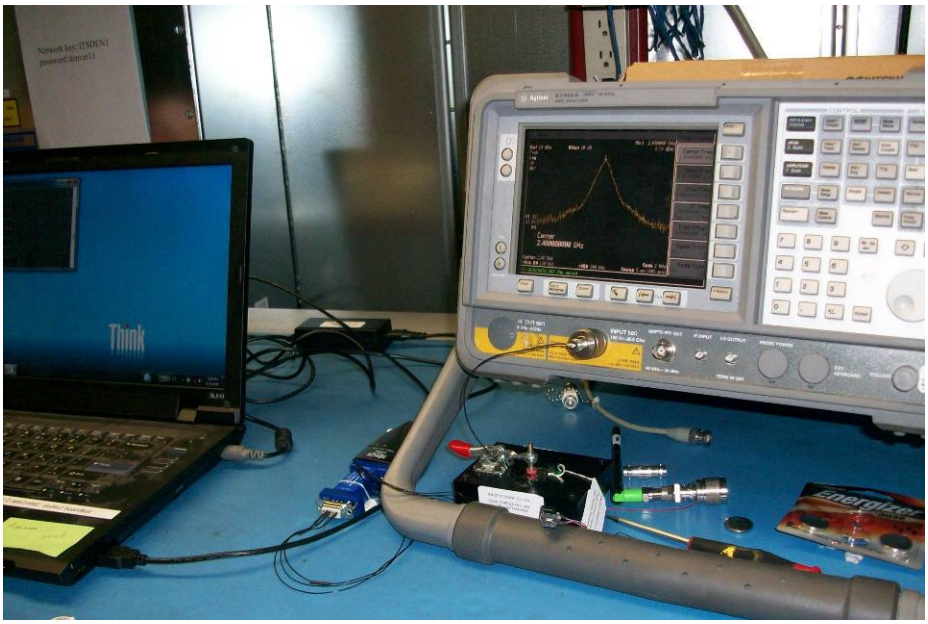
Asset ID:	Description:	Manufacturer:	Model:	Serial:	Cal Date	Cal Due
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013

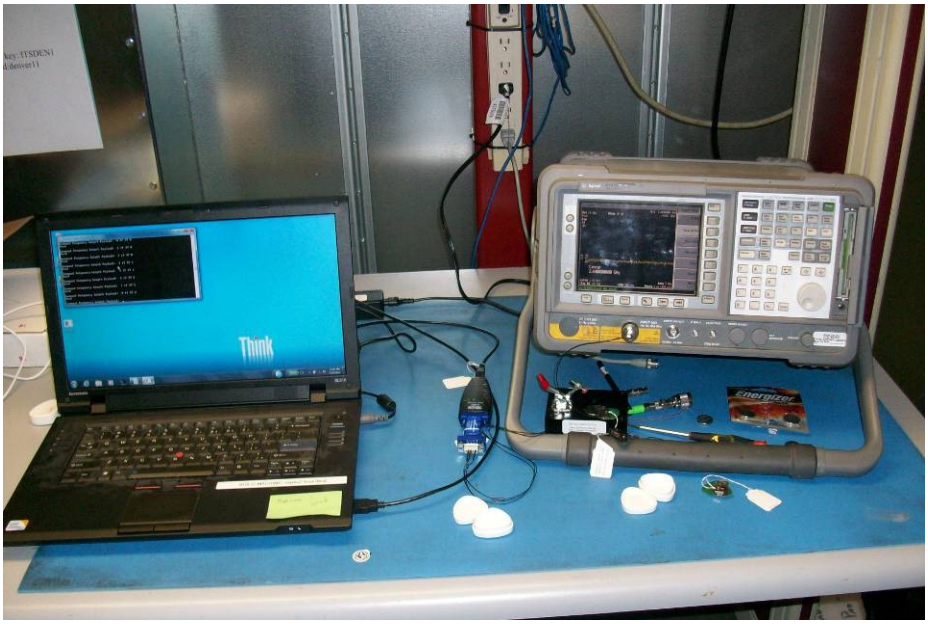
Results:

The sample tested was found to comply.

Setup Photographs

Test Setup





Test Data:

Transmitter Output Power - Fundamental

Test Report #:	**G101122982**	Test Area:	CC1 Radiated	Temperature:	22.8	°C
Test Method:	FCC 15.247(b)(3) DTS RSS-210 A8.4(4)	Test Date:	15-Apr-2013	Relative Humidity:	23.7	%
EUT Model #:	LivelyHome Sensor	EUT Power:	3V Battery	Air Pressure:	82.9	kPa
EUT Serial #:	DVT103					
Manufacturer:	Hamlet, Inc.					
EUT Description:	RF 2.4GHz Wireless Sensor for the Lively Home System					
Notes:	Product transmitting continuously – worst-case modulation and data rate					
	(3) Test Axes measured; Lowest, Middle and Highest Channels measured					
	RF Conducted Port Measurements, Peak detector, max hold – 100% Duty Cycle					

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

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 15.247 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 15.247 and the emission/limit delta was calculated.

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

Part 15.247 DTS

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
MHz	dBm	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBm]	[dB]	FINAL	(V/H)	(m)	(DEG)	FCC 15.247 (b)(3) [dBm]	[dB]	(MHz)
Fundamental Measurements – RF Conducted Port [dBm]														
Tx Lowest Channel														
2402.0000	3.17	Pk	1.31	0.00	0.00	4.48	0.00	4.48	N/A	N/A	N/A	30.00	- 25.52	1.000
Tx Mid Channel														
2440.0000	2.78	Pk	1.32	0.00	0.00	4.10	0.00	4.10	N/A	N/A	N/A	30.00	- 25.90	1.000
Tx Highest Channel														
2480.0000	1.97	Pk	1.34	0.00	0.00	3.31	0.00	3.31	N/A	N/A	N/A	30.00	- 26.69	1.000

Test Method:

- FCC 558074 D01 DTS Measurement Guidance: 2013, Section 9.0, Option 9.1.1 (RBW ≥DTS Bandwidth - Peak)
- ANSI C63.10:2009, Section 6.10.2.1(a) (Peak detector)

Test Summary:

Worst Case Fundamental Measurement: 2402 MHz, 4.48dBm (-25.52dB under limit)														
FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
MHz	dBm	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBm]	[dB]	FINAL	(V/H)	(m)	(DEG)	FCC 15.247 (b)(3) [dBm]	[dB]	(MHz)
2402.0000	3.17	Pk	1.31	0.00	0.00	4.48	0.00	4.48	N/A	N/A	N/A	30.00	- 25.52	1.000

Specification: Maximum Peak Conducted Output Power 1W (+30dBm)

Calculation from Power (dBm) to Power (W):

The following calculations convert the measured signal in dBm to power in Watts for comparison to the limit:

For a 50 ohm measurement system: 1 dBm = .0012589 W

Worst-case Fundamental (Low-Channel): 4.48dBm

4.48dBm = 2.81mW = 0.00281 W

Limit per FCC 15.247(b)(3): 1W

Therefore, Delta from Limit: 1 W - 0.00281 W = **0.9972 W (below the limit)**

Calculation of EIRP (reference only):

Maximum antenna gain = 2.41dBi

EIRP = 4.48dBm + 2.41dB = 6.89dBm

6.89dBm = 4.887mW = 0.004887 W

Limit per FCC 15.247(b)(3) = 4W

Therefore, Delta from Limit: 4W – 0.004887W = 3.9951 W (below the limit)

Notes:

1. All Fundamental and Harmonics measurements are rf conducted port - peak detector, max hold – 1MHz RBW.
2. Measurements were not adjusted by the allowed duty cycle correction factor per FCC 15.35/ IC RSS-GEN, Section 4.5.
3. The limit for RSS-210 is identical to the limit for FCC 15.247.

8 Harmonics of the Fundamental (Out-of-Band Emissions) -20dBc

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.247 & IC RSS-210.

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

Test Requirement/Specification

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator's harmonics shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

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

- FCC 15.247(d)
- RSS-210 A8.5

Test Equipment Used:

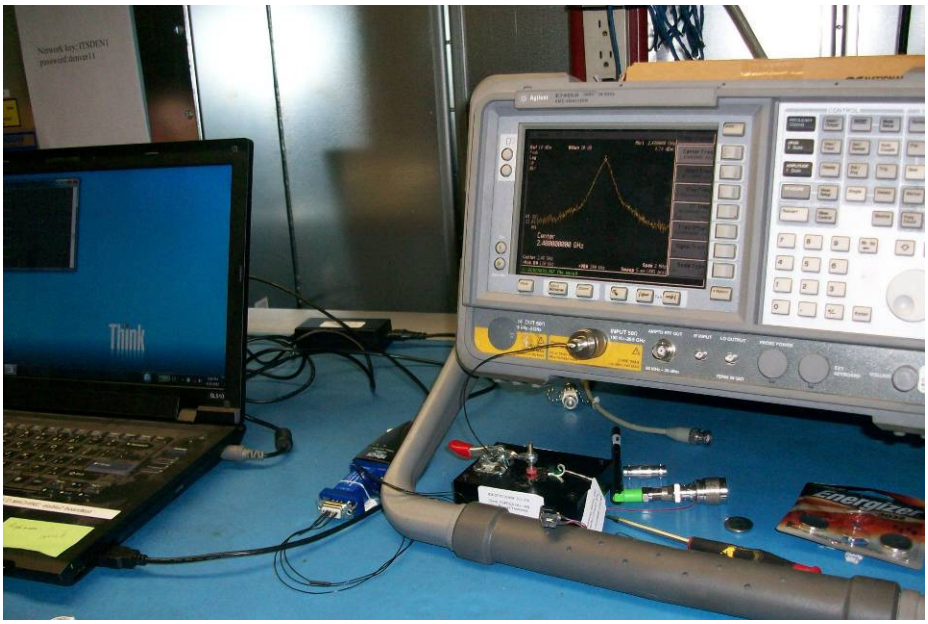
Asset ID:	Description:	Manufacturer:	Model:	Serial:	Cal Date	Cal Due
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013

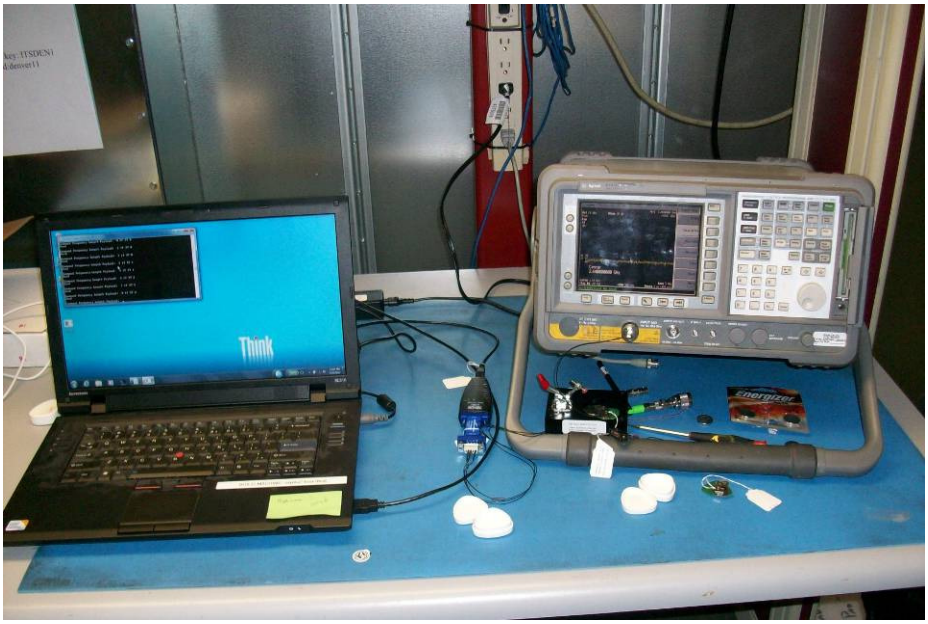
Results:

The sample tested was found to comply.

Setup Photographs

Test Setup





Test Data:

Spurious Harmonics of the Transmitter

Test Report #:	**G101122982**	Test Area:	CC1 Radiated	Temperature:	22.8 °C
Test Method:	FCC 15.247 DTS	Test Date:	15-Apr-2013	Relative Humidity:	23.7 %
EUT Model #:	LivelyHome Sensor	EUT Power:	3V Battery	Air Pressure:	82.9 kPa
EUT Serial #:	DVT103				
Manufacturer:	Hamlet, Inc.				
EUT Description:	RF 2.4GHz Wireless Sensor for the Lively Home System				
Notes:	Product transmitting continuously – worst-case modulation and data rate				
	(3) Test Axes measured; Lowest, Middle and Highest Channels measured				
	RF Conducted Port Measurements, Peak detector, max hold – 100kHz RBW				

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

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
MHz	dBm	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBm]	[dB]	FINAL	(V/H)	(m)	(DEG)	FCC 15.247 (b)(3) [dBm]	[dB]	(MHz)
Fundamental Measurements – RF Conducted Port [dBm]														
Measurement using 100kHz RBW (300kHz VBW) to determine limits for the Harmonics of the Fundamental														
Tx Lowest Channel														
2402.0000	3.12	Pk	1.31	0.00	0.00	4.43	0.00	4.43	N/A	N/A	N/A	N/A	N/A	0.100
Harmonic Low Channel Limit: 4.43dBm - 20dB = -15.57dBm														
Tx Mid Channel														
2440.0000	2.76	Pk	1.31	0.00	0.00	4.07	0.00	4.07	N/A	N/A	N/A	N/A	N/A	0.100
Harmonic Mid Channel Limit: 4.07dBm - 20dB = -15.93dBm														
Tx Highest Channel														
2480.0000	1.95	Pk	1.31	0.00	0.00	3.26	0.00	3.26	N/A	N/A	N/A	N/A	N/A	0.100
Harmonic High Channel Limit: 3.26dBm - 20dB = -16.74dBm														

Test Data:

Spurious Harmonics of the Transmitter

FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
MHz	dBm	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBm]	[dB]	FINAL	(V/H)	(m)	(DEG)	FCC 15.247 (b)(3) [dBm]	[dB]	(MHz)
Harmonics (Spurious) of the Fundamental Measurements – RF Conducted Port [dBm]														
Tx Lowest Channel														
4804.0000	- 51.29	Pk	2.16	0.00	0.00	- 49.13	0.00	-49.13	N/A	N/A	N/A	-15.57	-33.56	0.100
7206.0000	- 42.55	Pk	3.18	0.00	0.00	- 39.37	0.00	-39.37	N/A	N/A	N/A	-15.57	-23.80	0.100
9608.0000	- 64.64	Pk	4.56	0.00	0.00	- 60.08	0.00	-60.08	N/A	N/A	N/A	-15.57	-44.51	0.100
12010.0000	- 59.41	Pk	6.26	0.00	0.00	- 53.15	0.00	-53.15	N/A	N/A	N/A	-15.57	-37.58	0.100
14412.0000	- 61.79	Pk	7.29	0.00	0.00	- 54.50	0.00	-54.50	N/A	N/A	N/A	-15.57	-38.93	0.100
16814.0000	- 66.34	Pk	11.41	0.00	0.00	- 54.93	0.00	-54.93	N/A	N/A	N/A	-15.57	-39.36	0.100
19216.0000	- 65.66	Pk	15.05	0.00	0.00	- 50.61	0.00	-50.61	N/A	N/A	N/A	-15.57	-35.04	0.100
21618.0000	- 65.03	Pk	14.78	0.00	0.00	- 50.25	0.00	-50.25	N/A	N/A	N/A	-15.57	-34.68	0.100
24020.0000	- 65.19	Pk	14.78	0.00	0.00	- 50.41	0.00	-50.41	N/A	N/A	N/A	-15.57	-34.84	0.100
Tx Mid Channel														
4880.0000	- 49.90	Pk	2.16	0.00	0.00	- 47.74	0.00	-47.74	N/A	N/A	N/A	-15.93	-31.81	0.100
7320.0000	- 45.68	Pk	3.14	0.00	0.00	- 42.54	0.00	-42.54	N/A	N/A	N/A	-15.93	-26.61	0.100
9760.0000	- 61.05	Pk	5.00	0.00	0.00	- 56.05	0.00	-56.05	N/A	N/A	N/A	-15.93	-40.12	0.100
12200.0000	- 62.74	Pk	5.69	0.00	0.00	- 57.05	0.00	-57.05	N/A	N/A	N/A	-15.93	-41.12	0.100
14640.0000	- 62.12	Pk	8.95	0.00	0.00	- 53.17	0.00	-53.17	N/A	N/A	N/A	-15.93	-37.24	0.100
17080.0000	- 66.00	Pk	13.15	0.00	0.00	- 52.85	0.00	-52.85	N/A	N/A	N/A	-15.93	-36.92	0.100
19520.0000	- 66.06	Pk	11.64	0.00	0.00	- 54.42	0.00	-54.42	N/A	N/A	N/A	-15.93	-38.49	0.100
21960.0000	- 65.75	Pk	14.78	0.00	0.00	- 50.97	0.00	-50.97	N/A	N/A	N/A	-15.93	-35.04	0.100
24400.0000	- 65.77	Pk	14.78	0.00	0.00	- 50.99	0.00	-50.99	N/A	N/A	N/A	-15.93	-35.06	0.100
Tx Highest Channel														
4960.0000	- 45.50	Pk	2.16	0.00	0.00	- 43.34	0.00	-43.34	N/A	N/A	N/A	-16.74	-26.60	0.100
7440.0000	- 47.26	Pk	3.37	0.00	0.00	- 43.89	0.00	-43.89	N/A	N/A	N/A	-16.74	-27.15	0.100
9920.0000	- 58.61	Pk	4.96	0.00	0.00	- 53.65	0.00	-53.65	N/A	N/A	N/A	-16.74	-36.91	0.100
12400.0000	- 64.88	Pk	5.72	0.00	0.00	- 59.16	0.00	-59.16	N/A	N/A	N/A	-16.74	-42.42	0.100
14880.0000	- 63.05	Pk	10.30	0.00	0.00	- 52.75	0.00	-52.75	N/A	N/A	N/A	-16.74	-36.01	0.100
17360.0000	- 65.00	Pk	11.27	0.00	0.00	- 53.73	0.00	-53.73	N/A	N/A	N/A	-16.74	-36.99	0.100
19840.0000	- 65.82	Pk	14.78	0.00	0.00	- 51.04	0.00	-51.04	N/A	N/A	N/A	-16.74	-34.30	0.100
22320.0000	- 65.43	Pk	14.78	0.00	0.00	- 50.65	0.00	-50.65	N/A	N/A	N/A	-16.74	-33.91	0.100
24800.0000	- 65.29	Pk	14.78	0.00	0.00	- 50.51	0.00	-50.51	N/A	N/A	N/A	-16.74	-33.77	0.100

Test Method:

- FCC 558074 D01 DTS Measurement Guidance: 2013, Section 11.3
- ANSI C63.10:2009, Section 6.7

Test Summary:

Worst Case Harmonic of the Fundamental Measurement: Low Channel: 7206 MHz, -39.37dBm (-23.80dB under limit)														
FREQ	LEVEL	DET	CABLE	Antenna	PREAMP	FINAL	Duty Cycle CF	Duty Cycle Corrected	POL	HGT	AZ	LIMIT	DELTA LIMIT	RBW
MHz	dBm	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	= [dBm]	[dB]	FINAL	(V/H)	(m)	(DEG)	FCC 15.247 (b)(3) [dBm]	[dB]	(MHz)
7206.0000	- 42.55	Pk	3.18	0.00	0.00	- 39.37	0.00	-39.37	N/A	N/A	N/A	-15.57	-23.80	0.100

Specification: All Harmonic Emissions < -20dBc

Notes:

1. All Harmonics of the Fundamental measurements are RF Conducted Port – peak detector, max hold measurements – 100kHz RBW.
2. Measurements were not adjusted by the allowed duty cycle correction factor per FCC 15.35/ IC RSS-GEN, Section 4.5.

9 Antenna Port Spurious Emissions 30MHz to 25GHz – Non-Restricted Bands (-20dBc & Band Edge)

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.247 & IC RSS-210.

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

Test Requirement/Specification

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

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

- FCC 15.247(c)
- RSS-210 A8.5

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

Results:

The sample tested was found to comply.

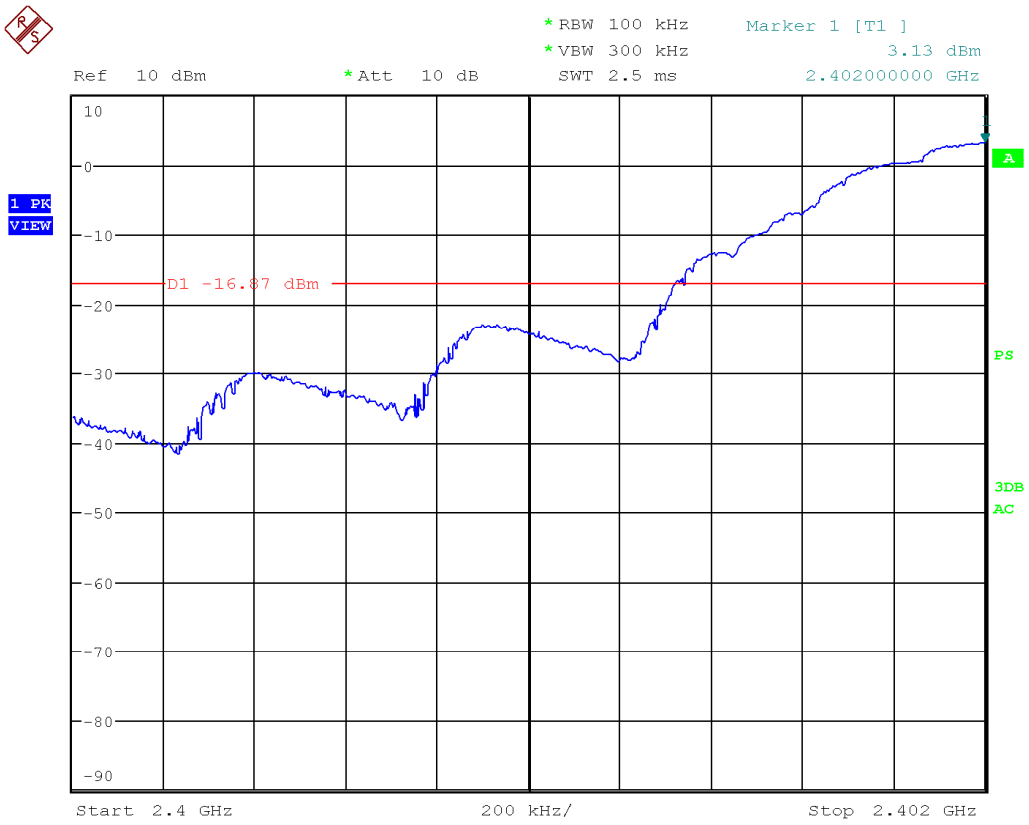
Setup Photographs

Test Setup

Test Data: -20dBc Low Channel

LivelyHome Sensor
Tx Spurious Antenna Port -20dBc Requirement
FCC 15.247(d) / RSS-210 A8.5

Low Channel – 2402 MHz

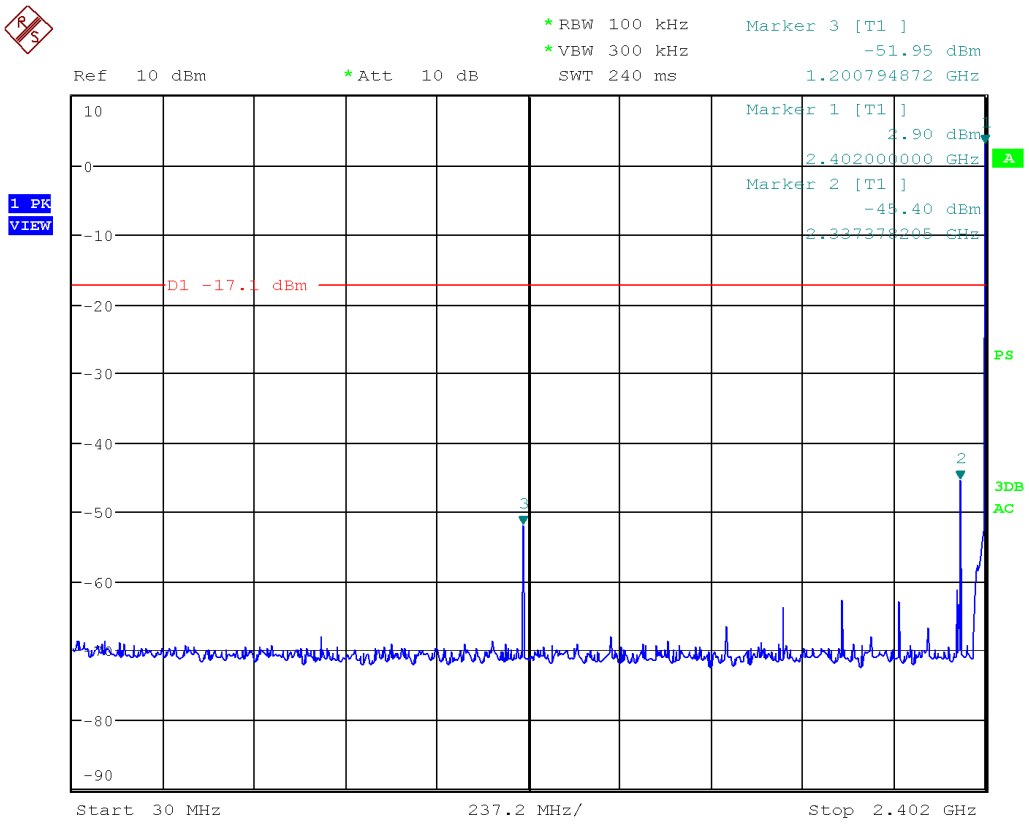


Reference Only – Plot Within Allowable Transmit Band

Notes:

1) Plot above illustrates the product Low Channel, within the allowable transmit band starting at 2.4GHz and ending at 2.402GHz (center of product low channel). The spectrum analyzer display line is set 20dB lower than the low channel maximum emission amplitude.

Low Channel – 2402 MHz



Specification: Tx Spurious emissions outside allowable transmit band ≥ 20dBc (100kHz bandwidth)

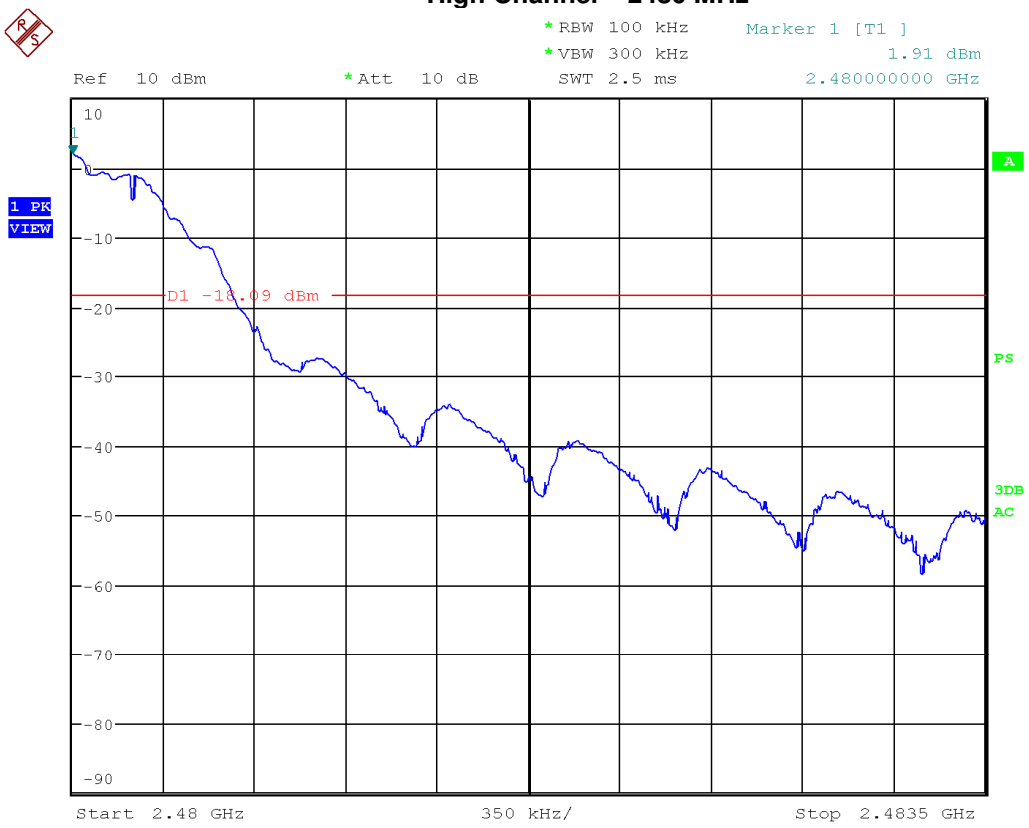
Notes:

1) The plot above illustrates the product Low Channel center frequency relative to all antenna port spurious emissions starting from 30MHz and ending at the low channel center frequency. The spectrum analyzer display line is set 20dB below the low channel maximum emission amplitude.

Test Data: -20dBc High Channel

Tx Spurious Antenna Port -20dBc Requirement
FCC 15.247(d) / RSS-210 A8.5

High Channel – 2480 MHz

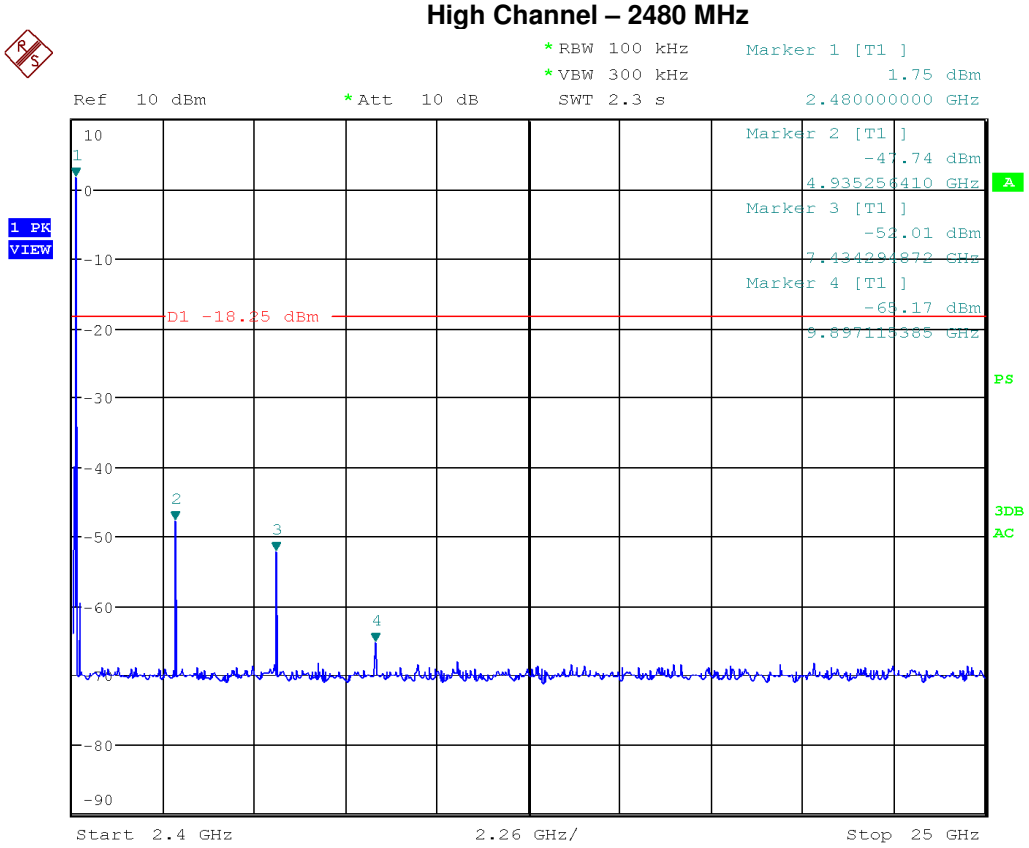


Reference Only – Plot Within Allowable Transmit Band

Notes:

1) Plot above illustrates the product High Channel, within the allowable transmit band starting at 2.480GHz (center of product high channel) and ending at 2.4835GHz (end of allowable transmit band). The spectrum analyzer display line is set 20dB lower than the high channel maximum emission amplitude.

High Channel – 2480 MHz

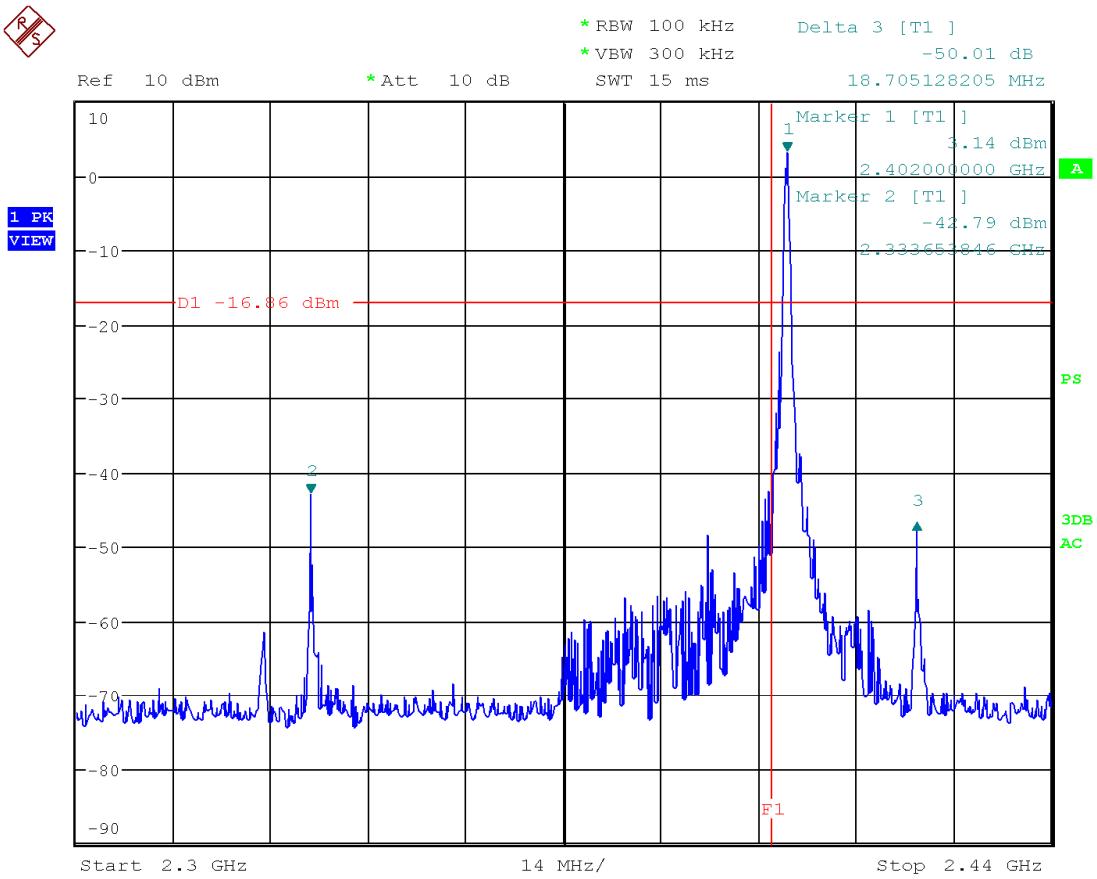


Specification: Tx Spurious emissions outside allowable transmit band ≤ -20dBc (100kHz bandwidth)

Notes:

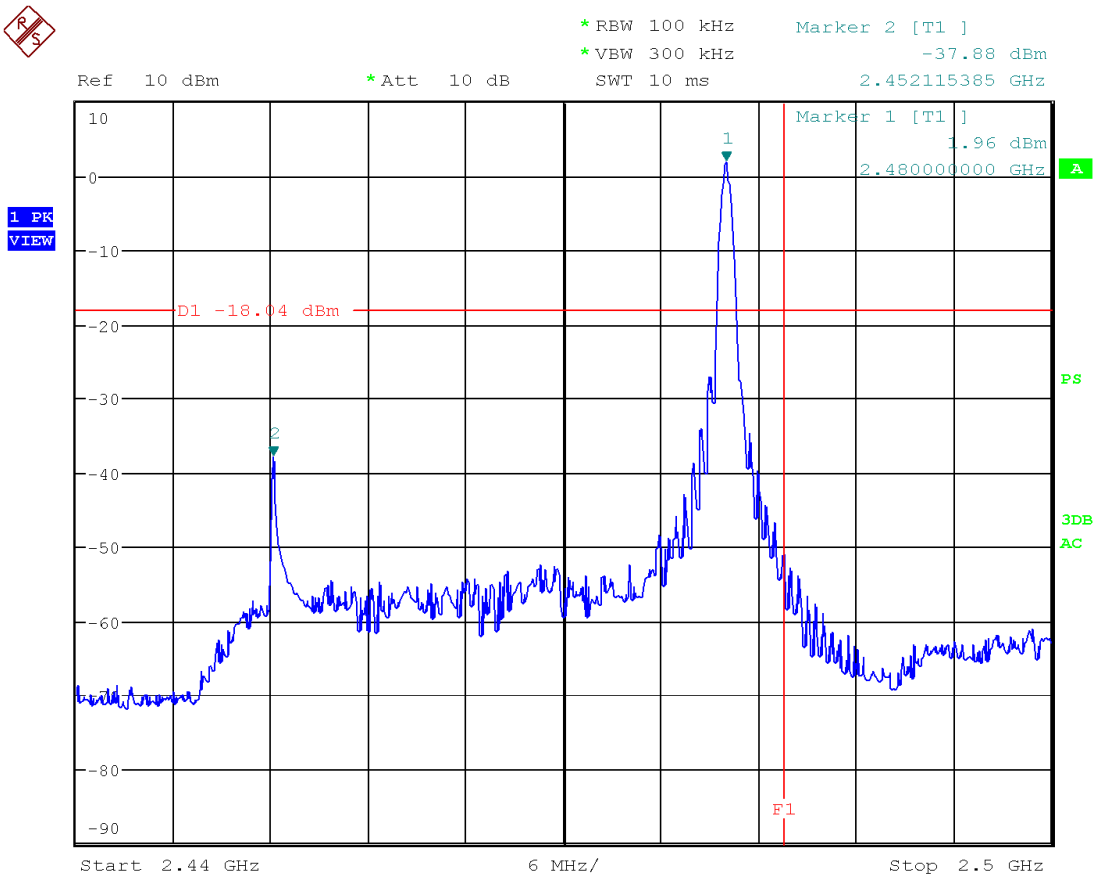
1) The plot above illustrates the product High Channel center frequency relative to all antenna port spurious emissions starting from 2.48GHz (center of product high channel) and ending at 25GHz.The spectrum analyzer display line is set 20dB below the high channel maximum emission amplitude.

Test Data: Low Band Edge



Date: 15.APR.2013 16:50:49

Test Data: High Band Edge



Date: 15.APR.2013 17:02:52

Test Method:

- FCC 558074 D01 DTS Measurement Guidance: 2013, Section 11.3
- ANSI C63.10:2009, Section 6.7

Test Summary:

Tx Spurious Antenna Port -20dBc Worst-Case	
Channel	**Result**
Low	-45.93dBc at 2.337GHz

Specification: Tx Spurious emissions ≤ -20dBc in 100kHz bandwidth

Notes:

1) Measurements were taken using worst-case modulated (minimum bandwidth/maximum amplitude) mode, using worst-case data packet length.
2) All measurements RF conducted port.

Deviations, Additions, or Exclusions: None

10 Radiated Spurious Emissions 30MHz to 25GHz – Restricted Band & Band Edge

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.247 & IC RSS-210.

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

Test Requirement/Specification

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Attenuation below the general limits specified in 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

- FCC 15.247(d)/ 15.205/209
- RSS-210 A8.5/ RSS-GEN 7.2.2

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
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	03/19/2013	03/19/2014
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	06/07/2012	06/07/2013
18901	RF Pre-Amp (8-18GHz)	Avantek	AWT-18037	1002	06/07/2012	06/07/2013
18906	RF Pre-Amp (1-4GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	06/07/2012	06/07/2013
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	6/6/2012	6/6/2013
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
18805	HF Active Antenna/Harmonic Mixer 18 GHz to 26.5 GHz	Hewlett-Packard	11970K	2332A01280	01/30/2013	01/30/2014

Results:

The sample tested was found to comply.

Setup Photographs

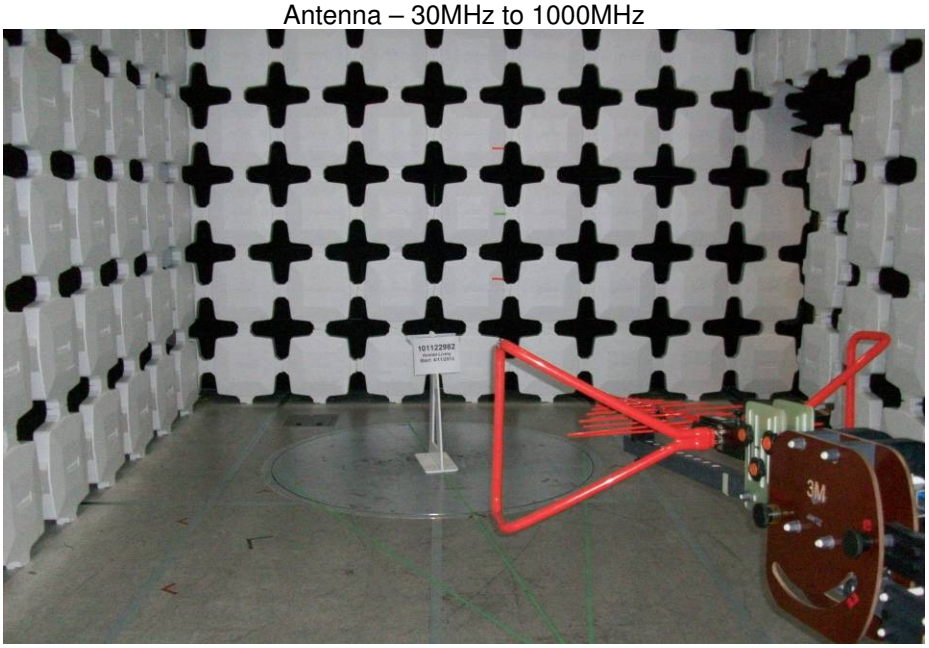
Test Setup
Axis 1

Axis 2

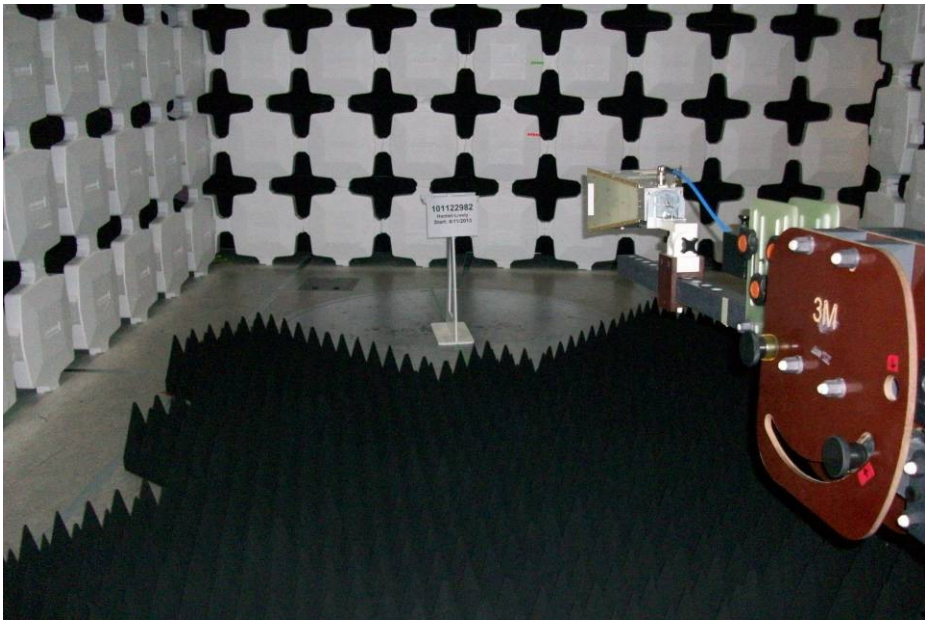
Axis 3

Setup Photographs

Test Setup
Antenna – 30MHz to 1000MHz



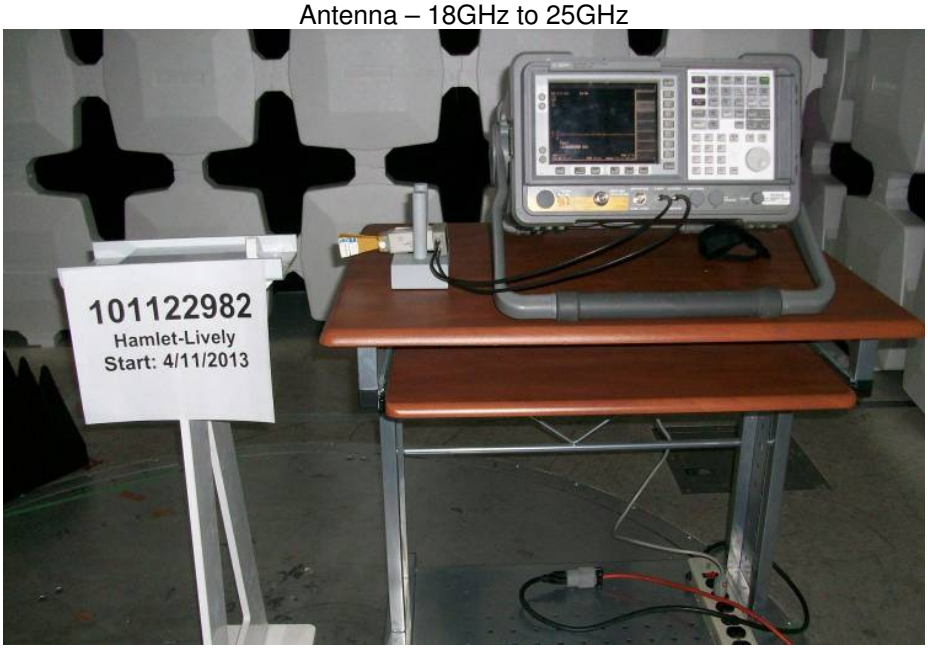
Antenna – 1GHz to 18GHz



Setup Photographs

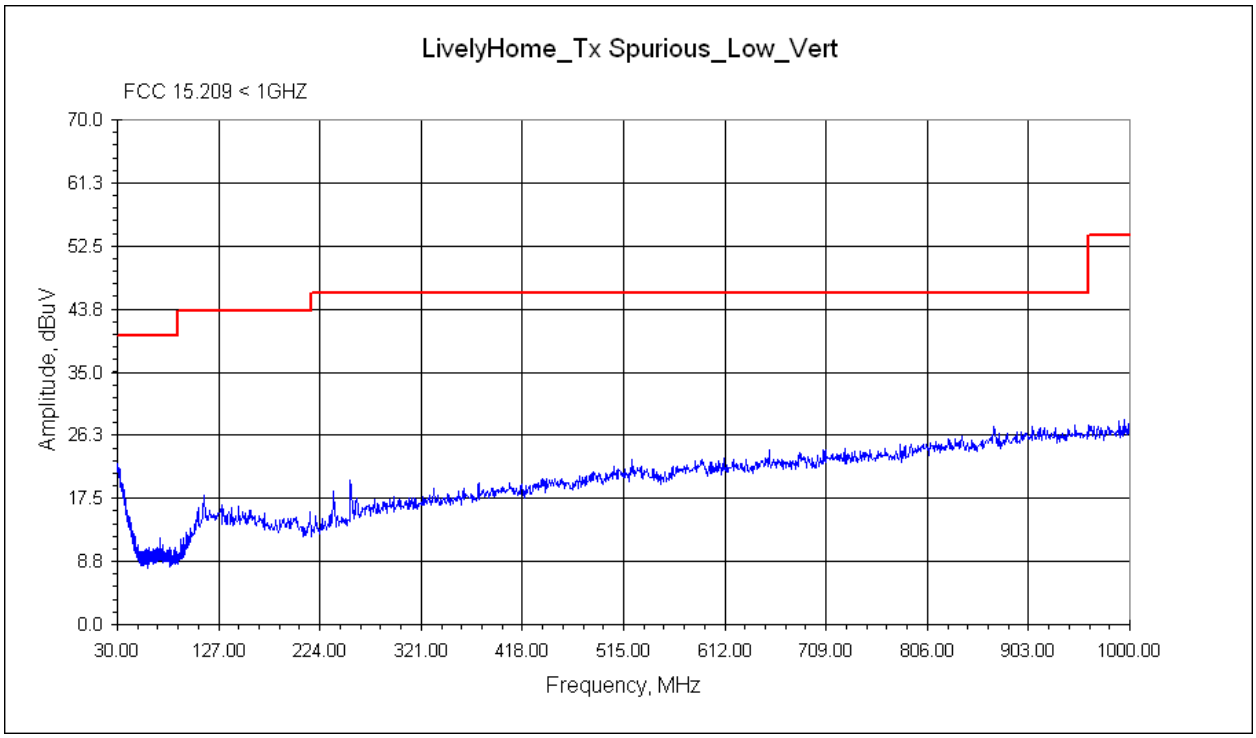
Test Setup

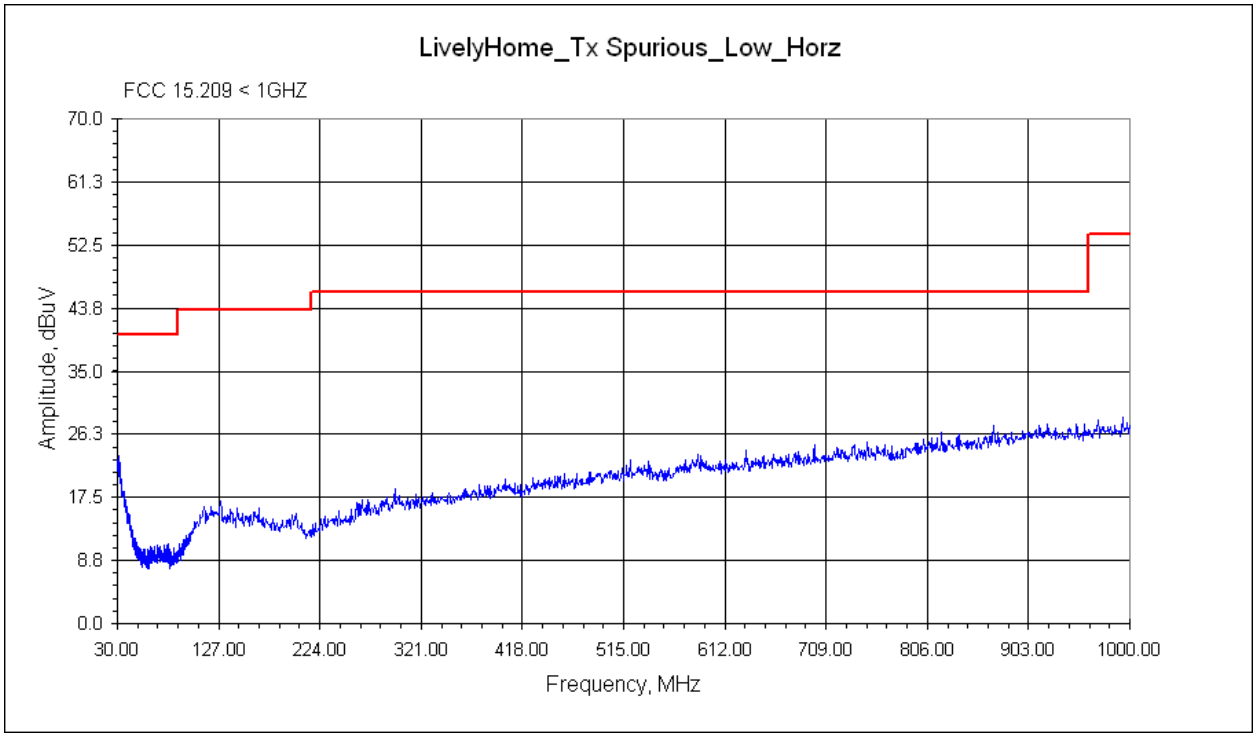
Antenna – 18GHz to 25GHz



Pre-scan Plots: Low Channel

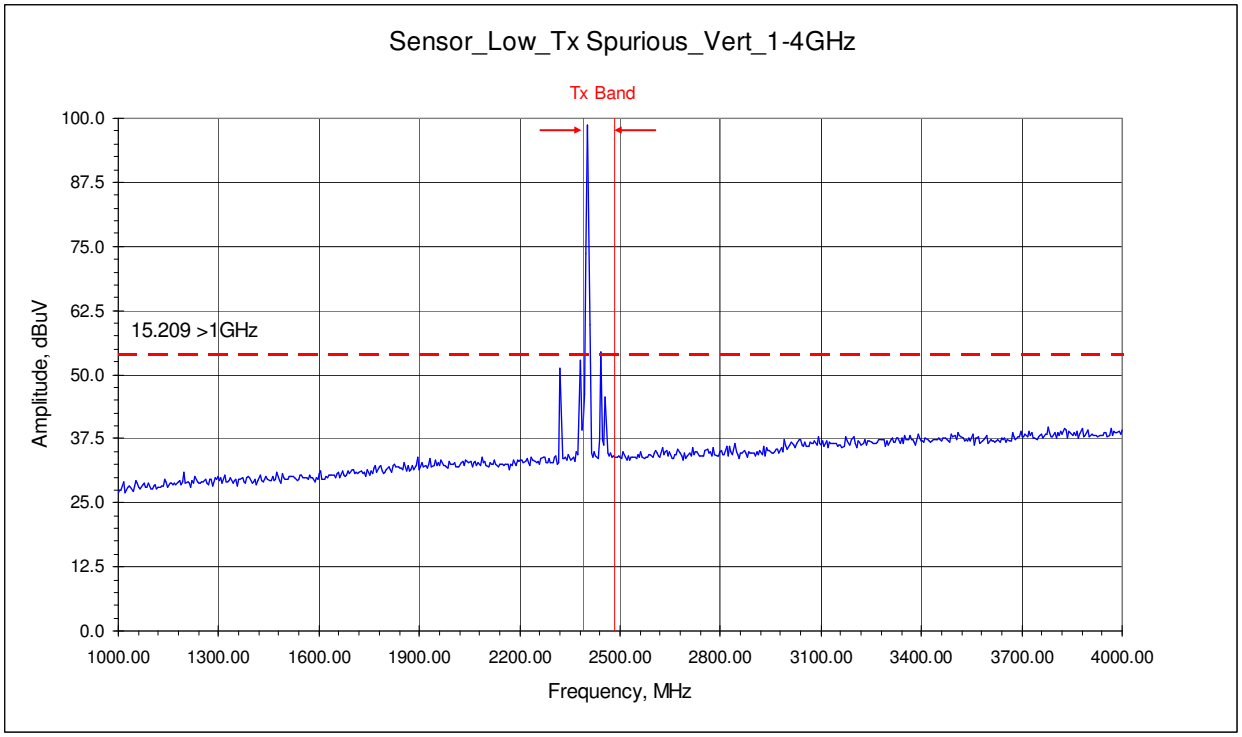
30MHz to 1000MHz

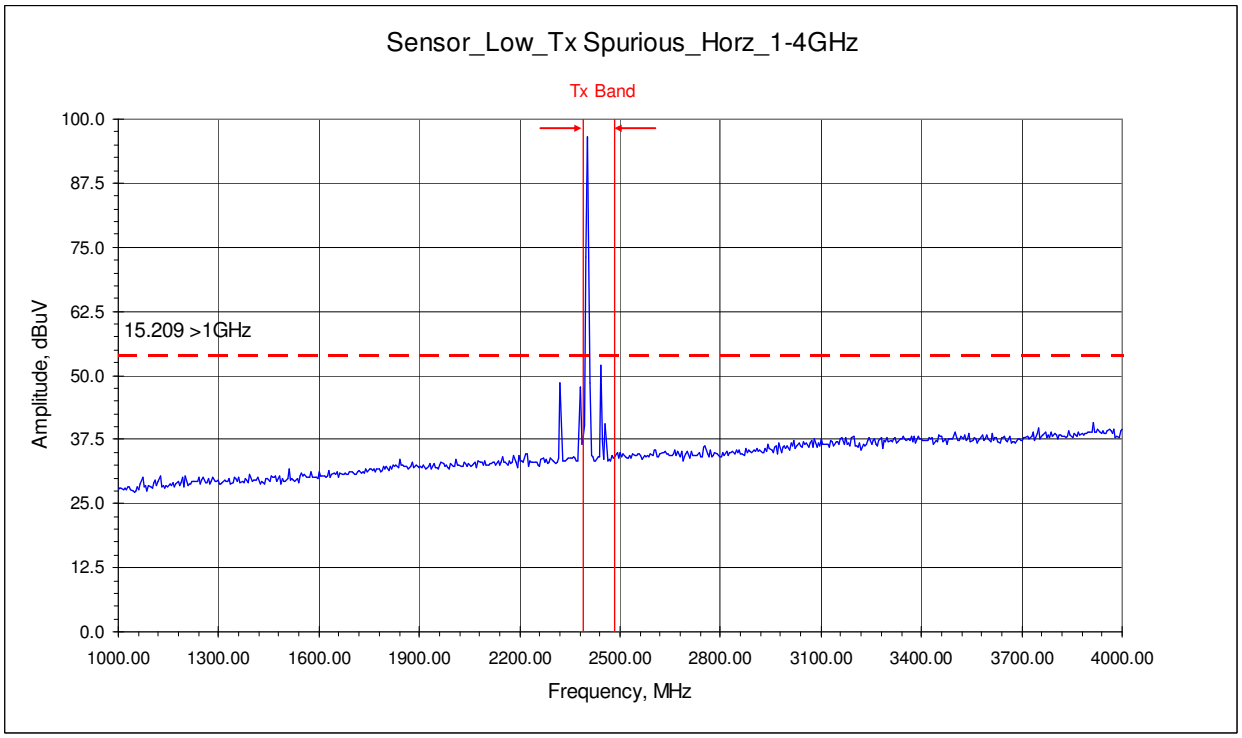




Pre-scan Plots: Low Channel

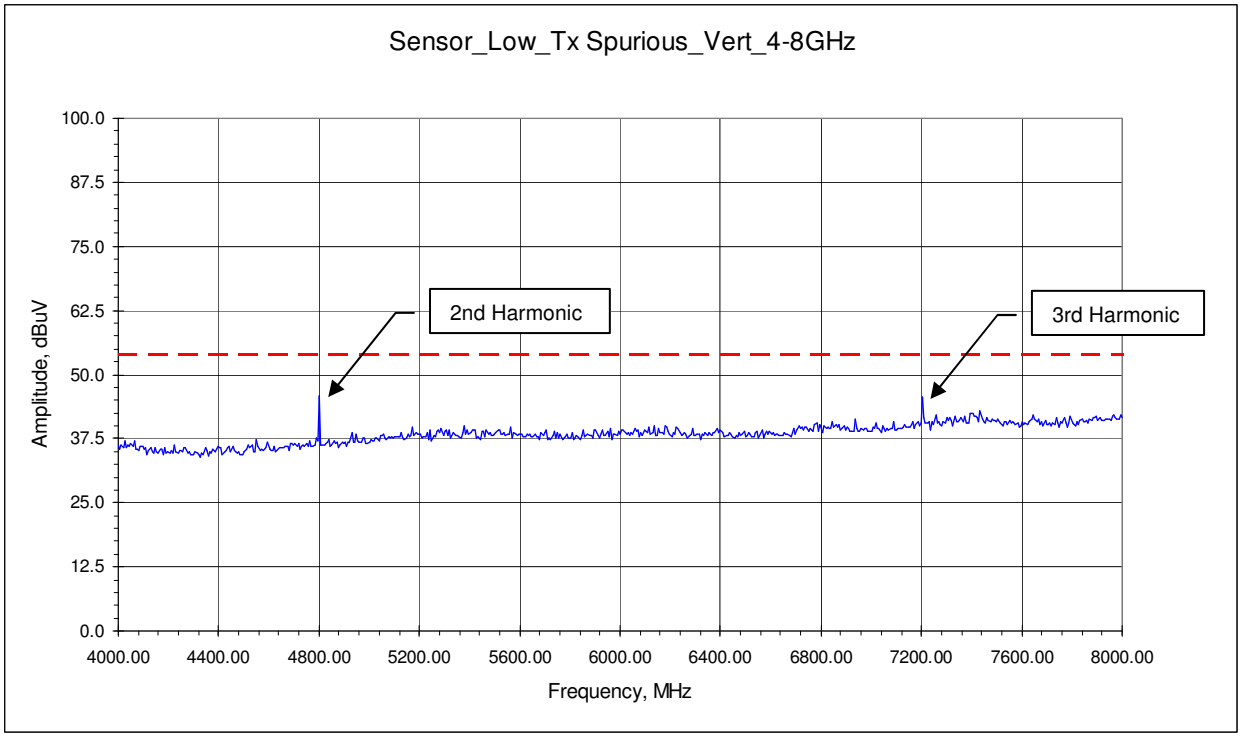
1GHz to 4GHz

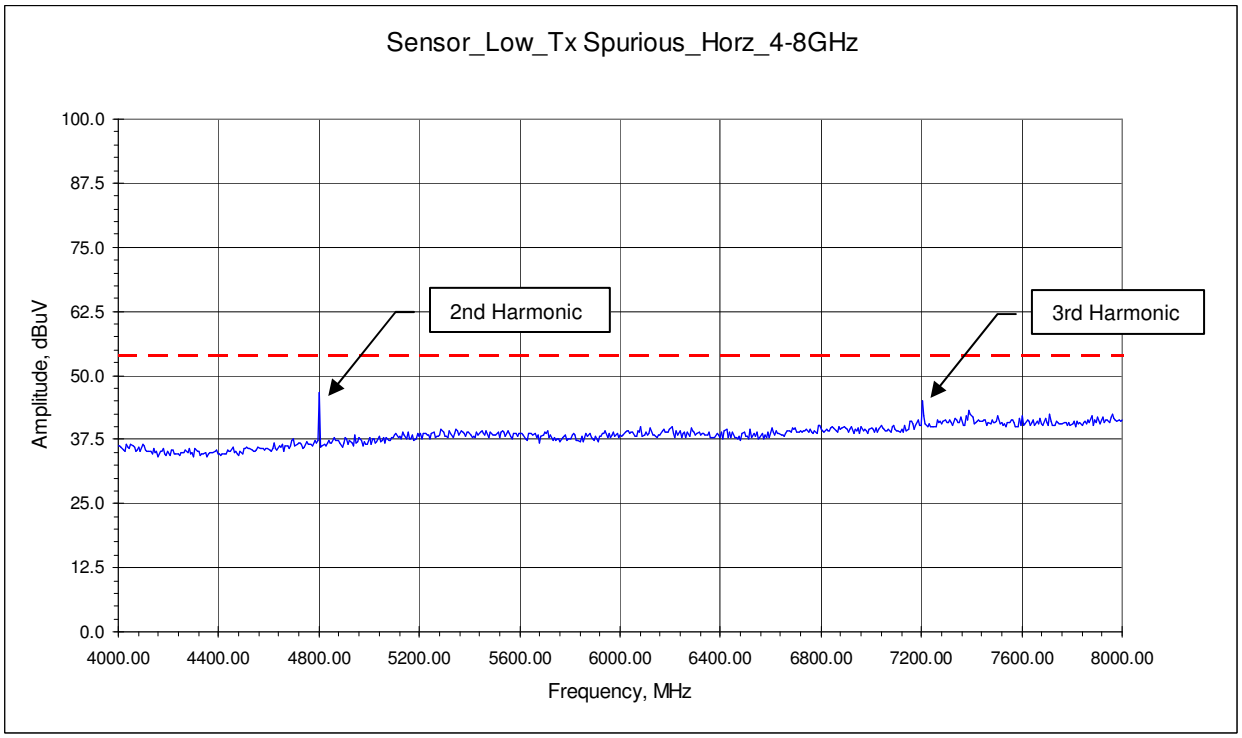




Pre-scan Plots: Low Channel

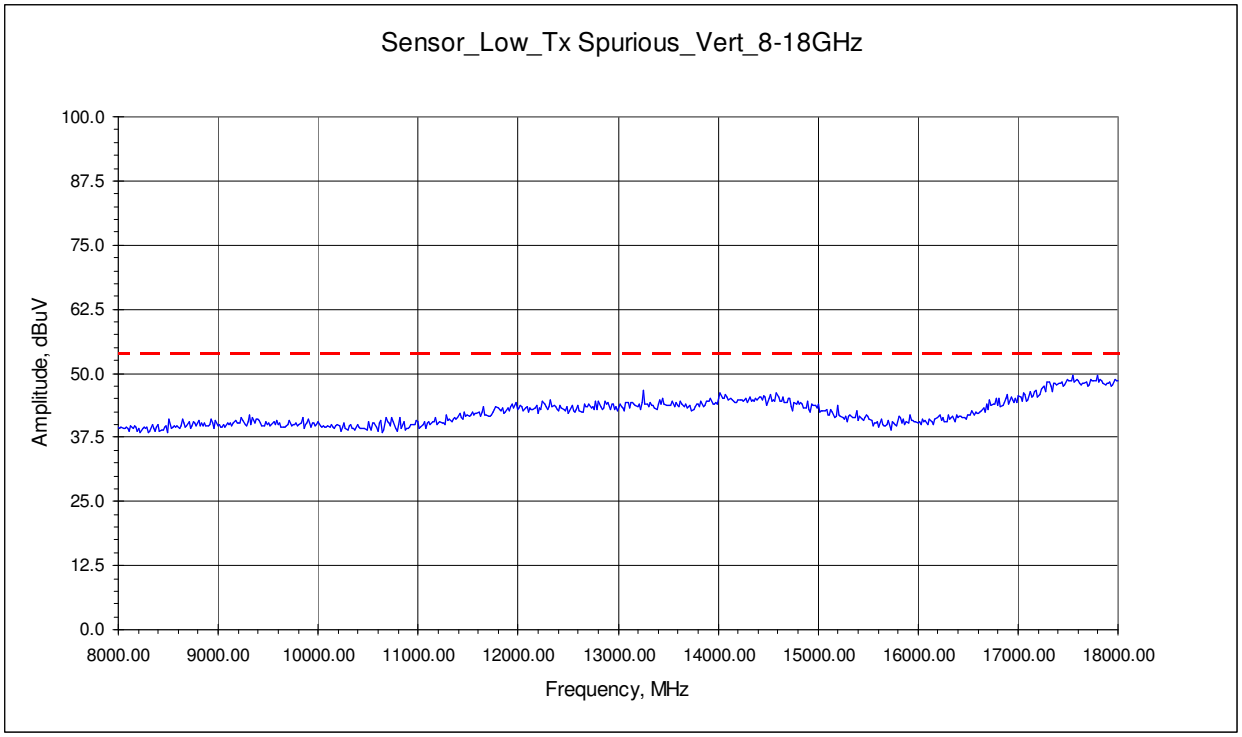
4GHz to 8GHz

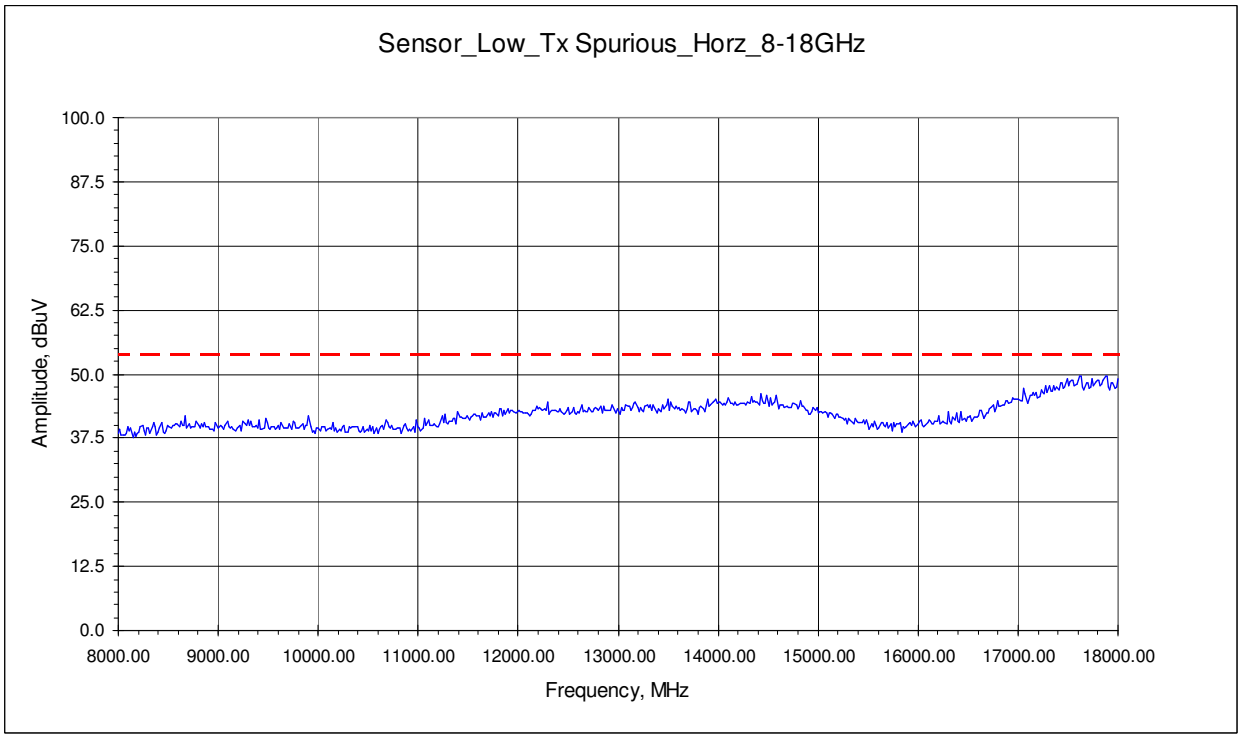




Pre-scan Plots: Low Channel

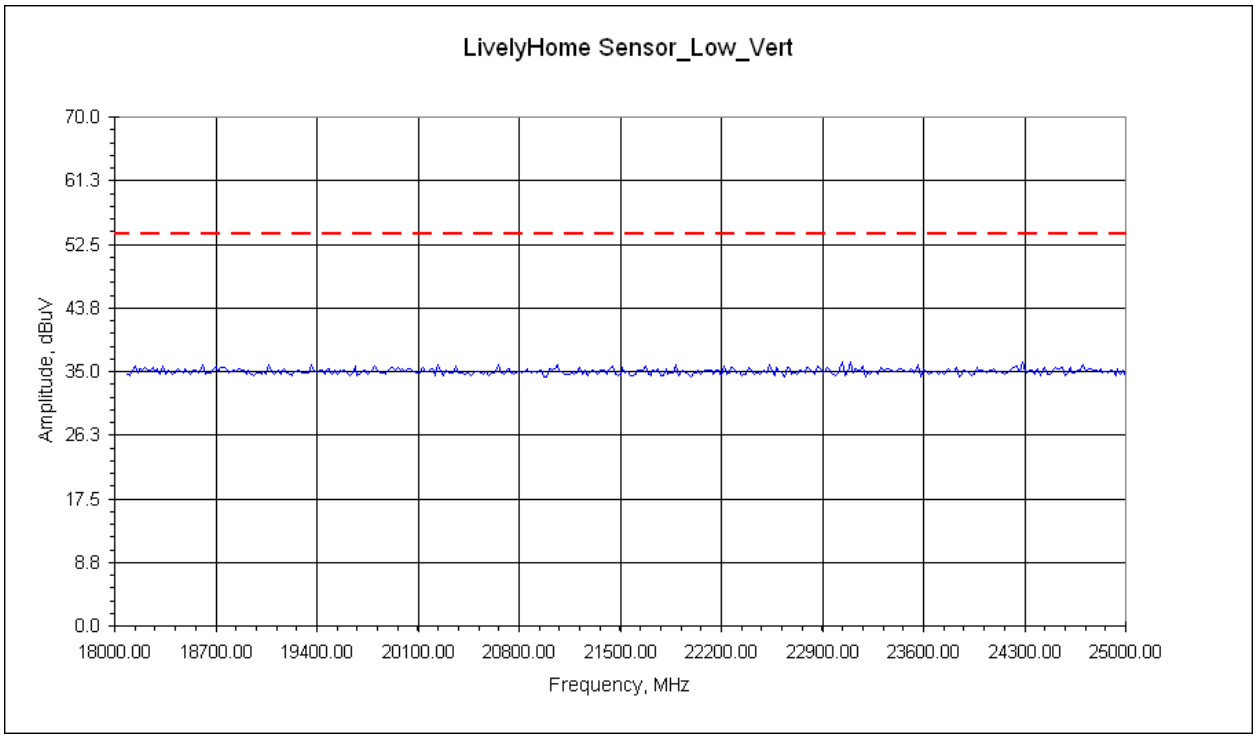
8GHz to 18GHz

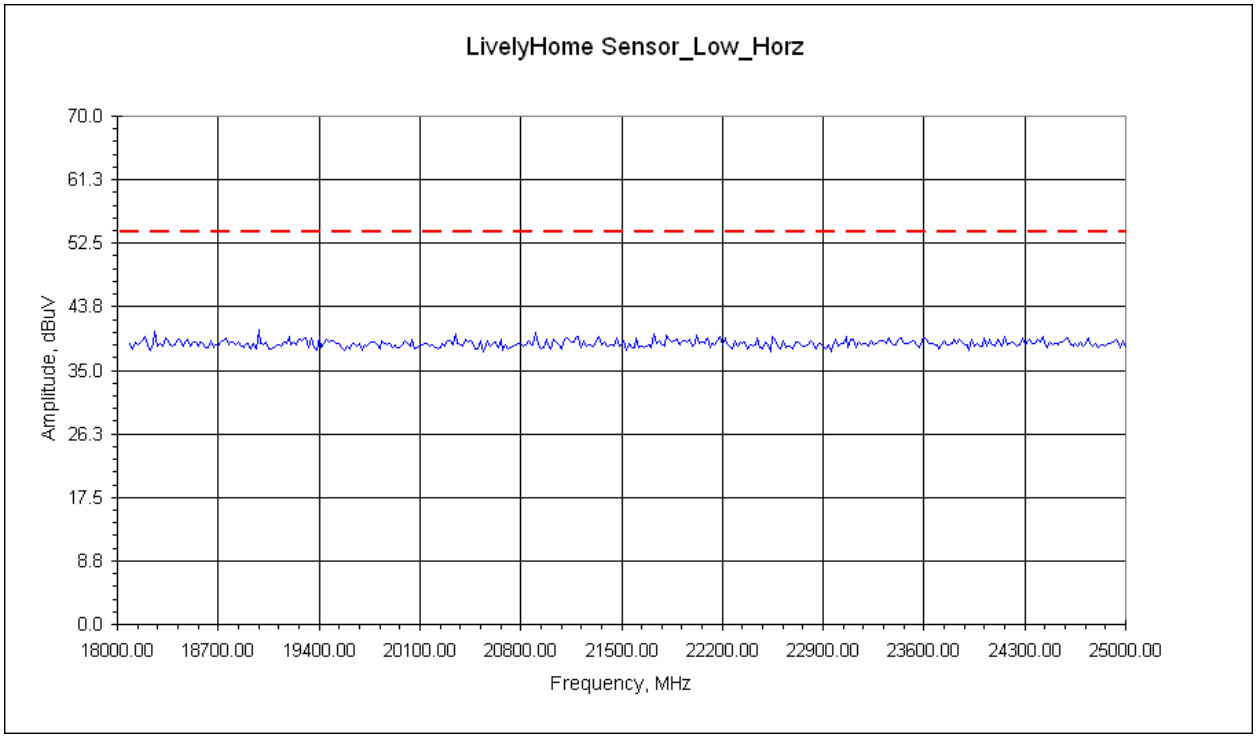




Pre-scan Plots: Low Channel

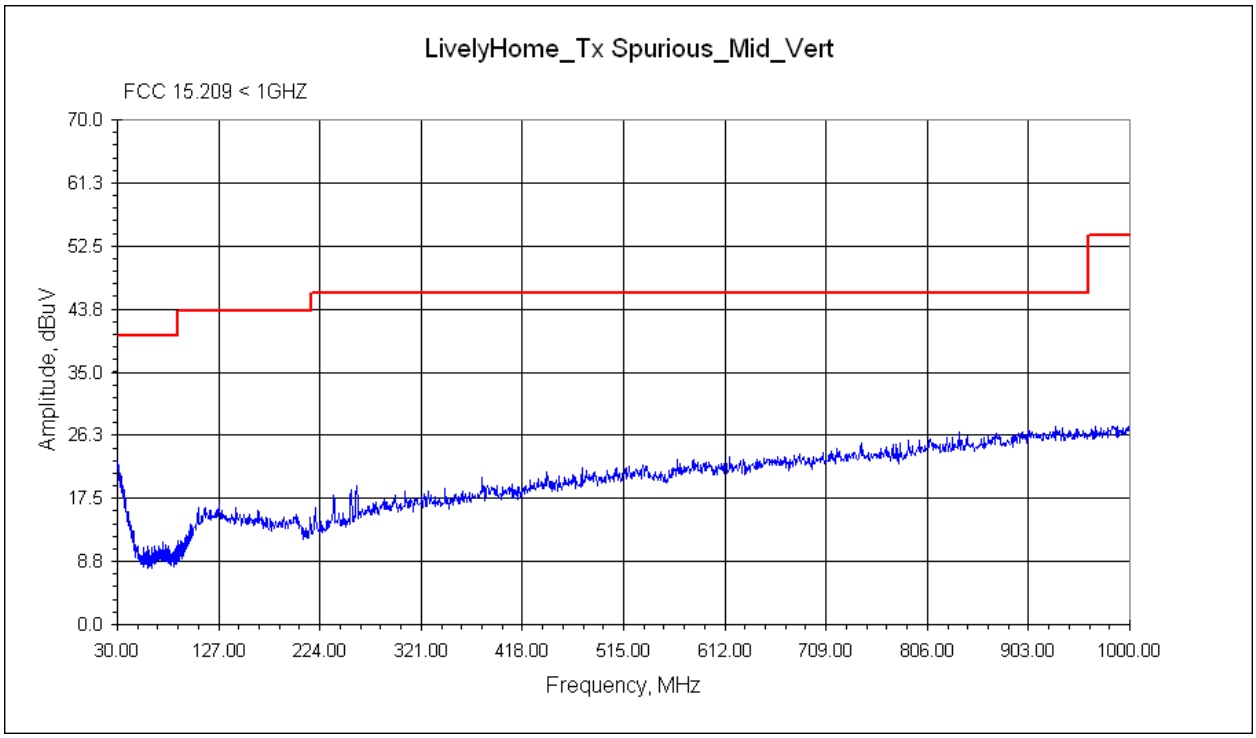
18GHz to 25GHz

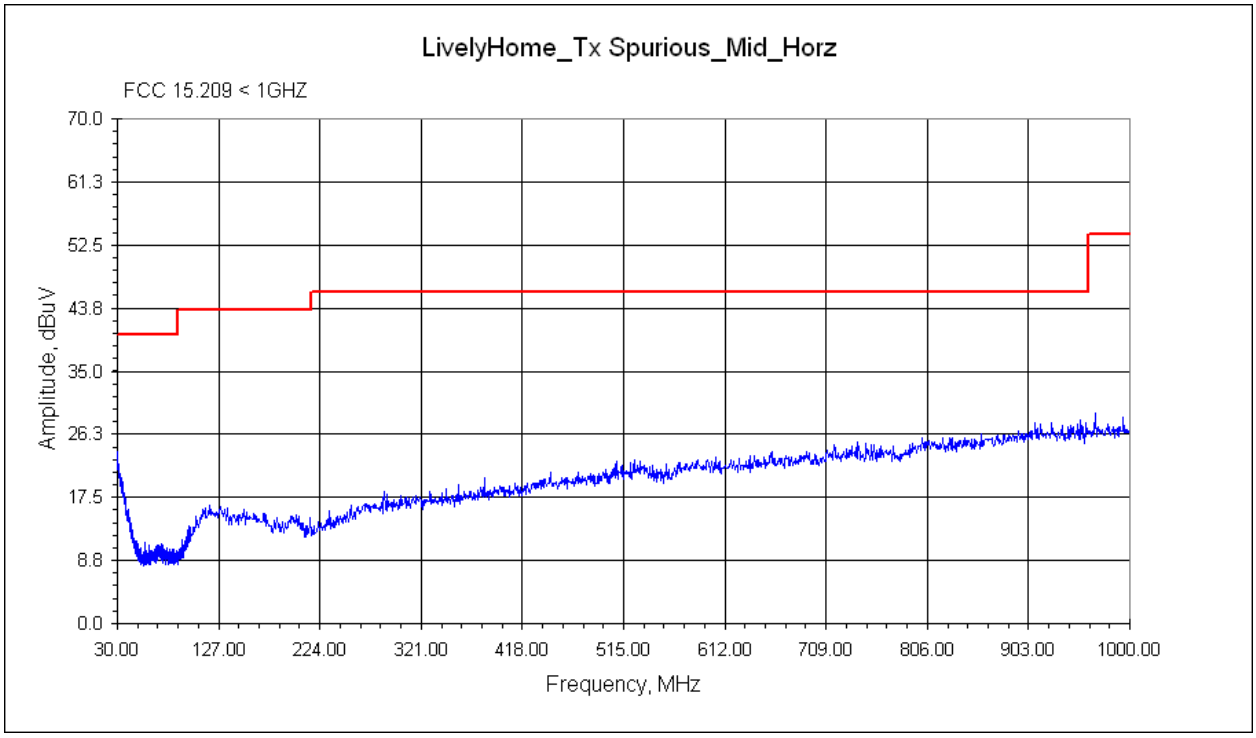




Pre-scan Plots: Mid Channel

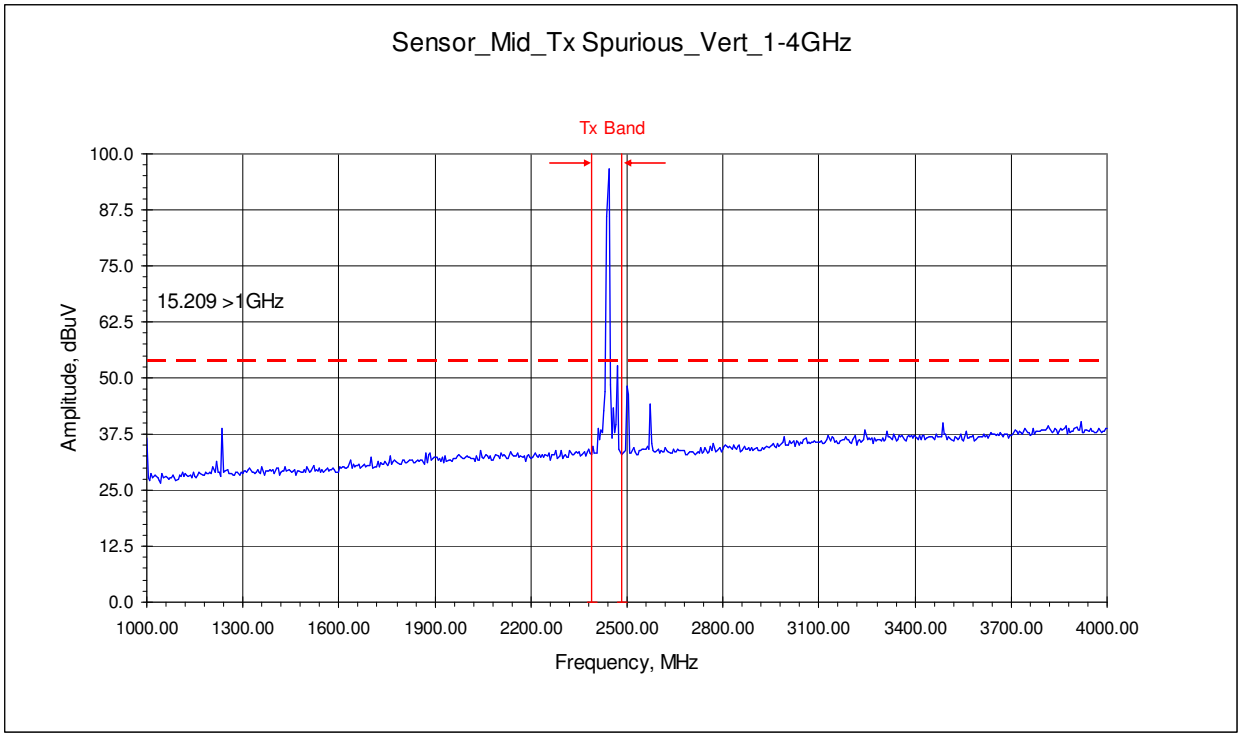
30MHz to 1000MHz

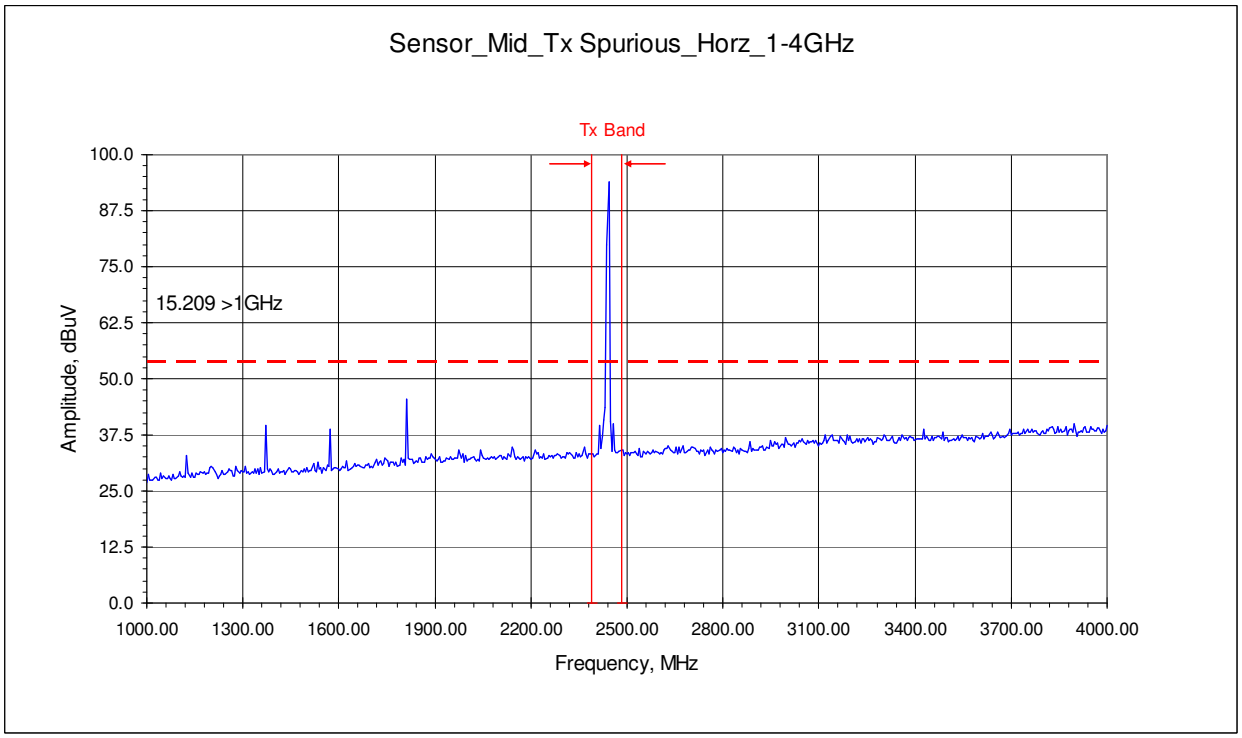




Pre-scan Plots: Mid Channel

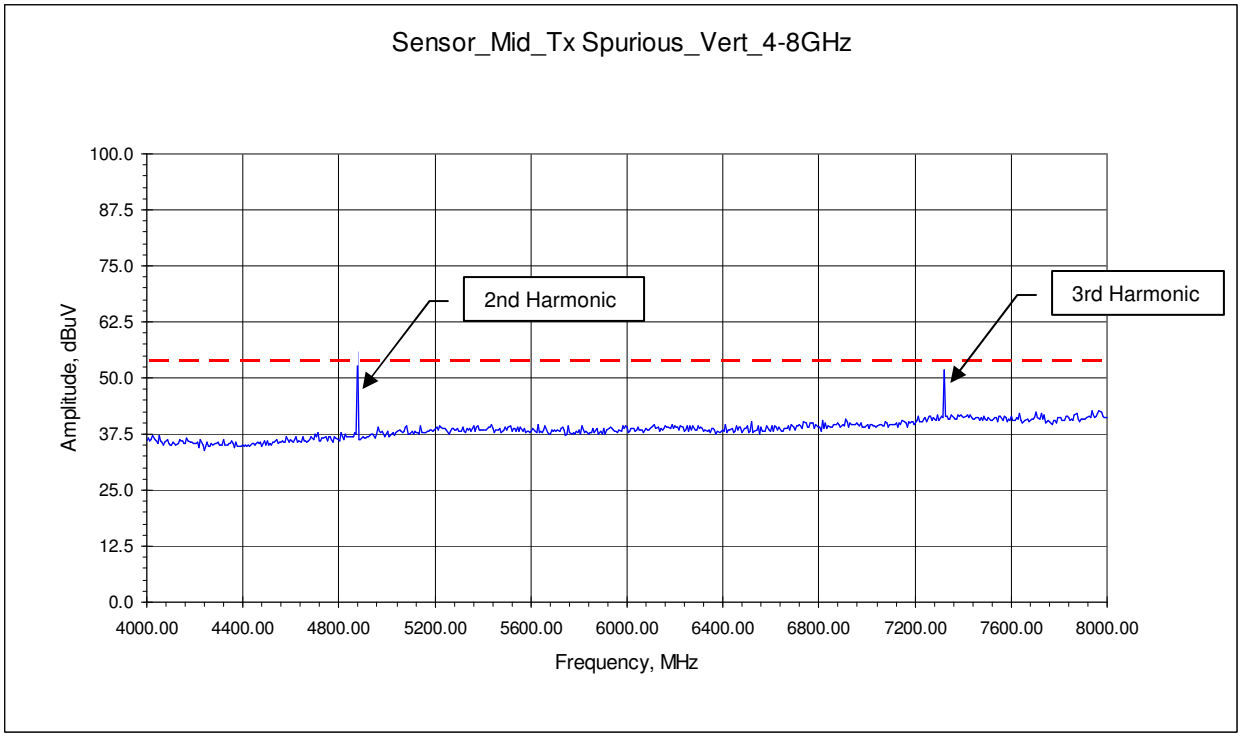
1GHz to 4GHz

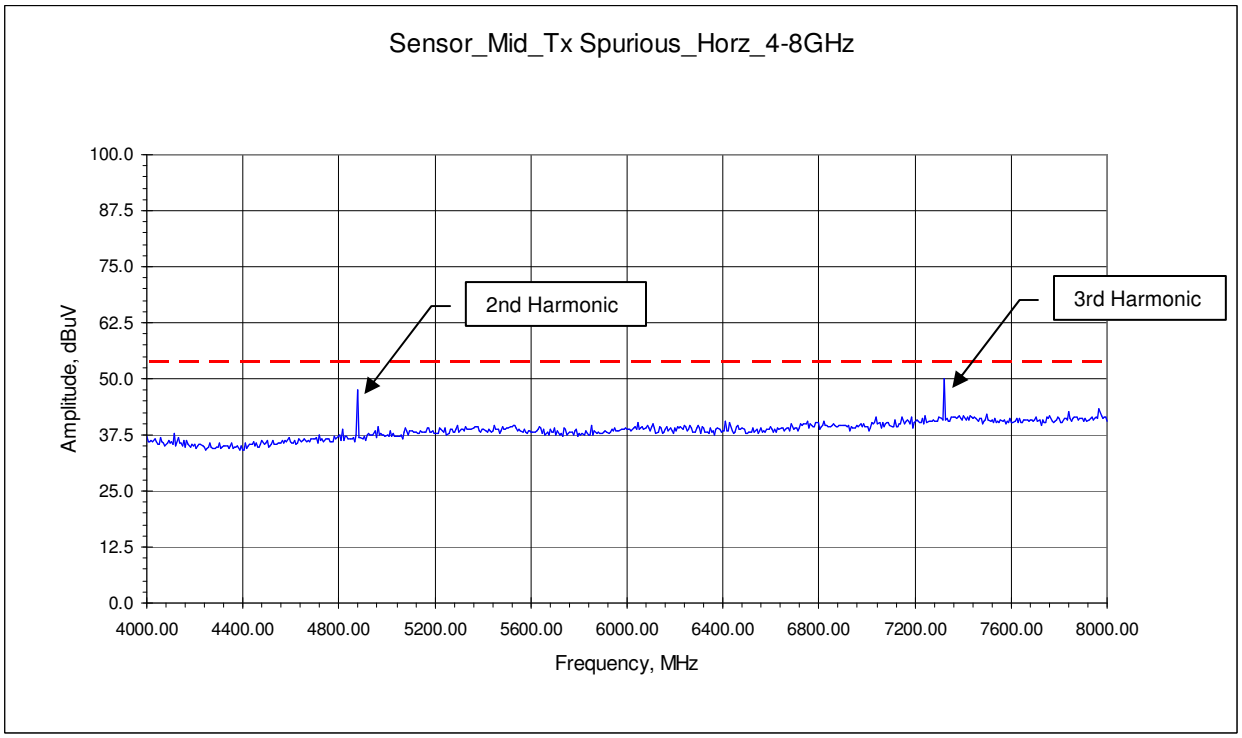




Pre-scan Plots: Mid Channel

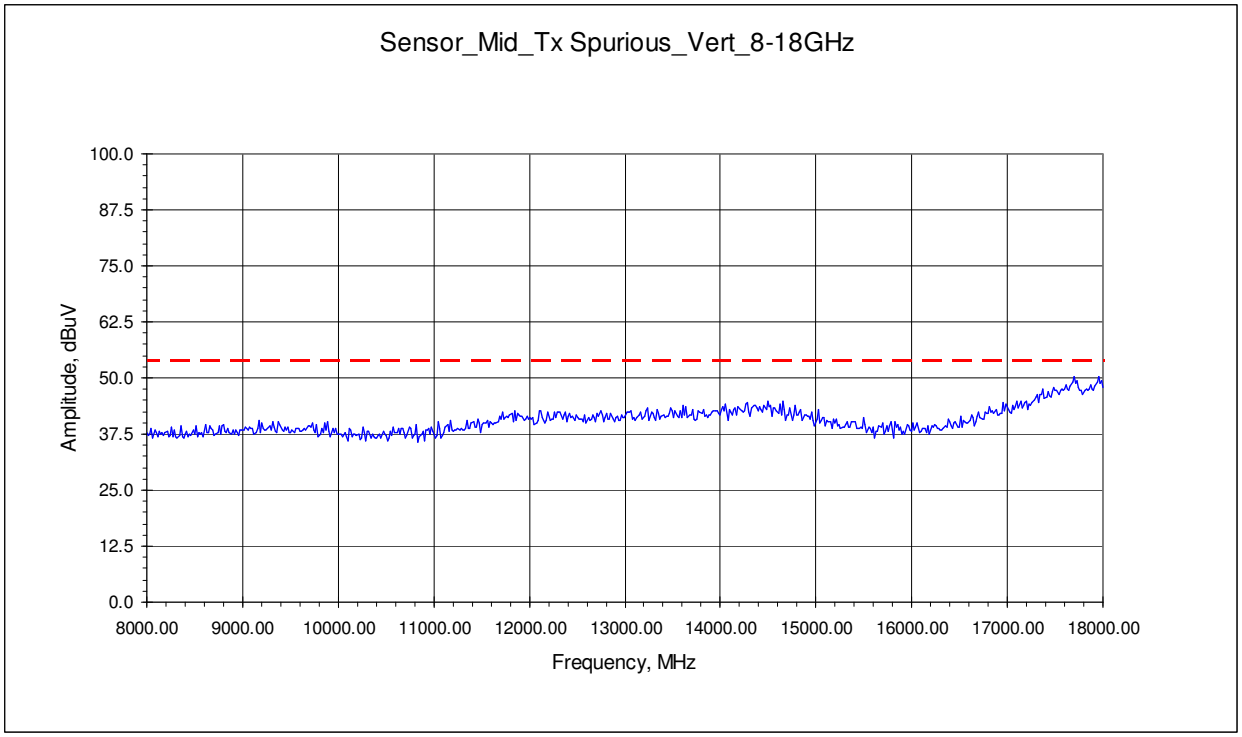
4GHz to 8GHz

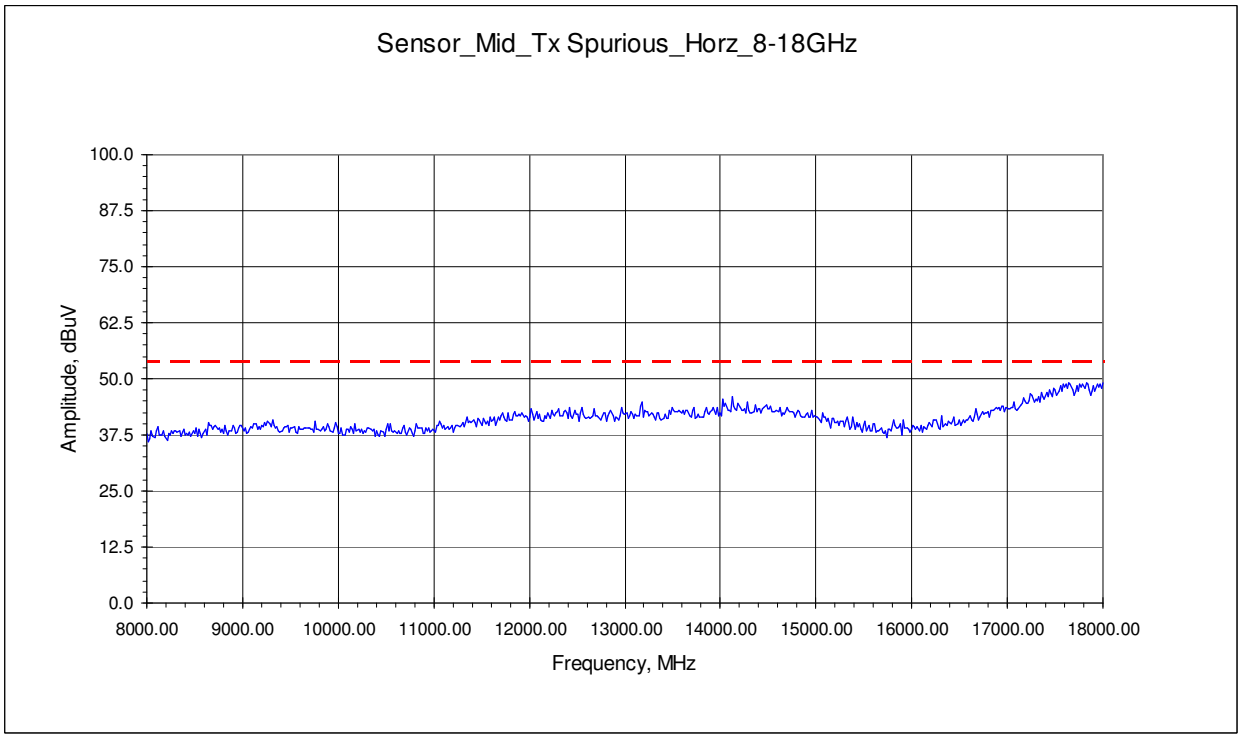




Pre-scan Plots: Mid Channel

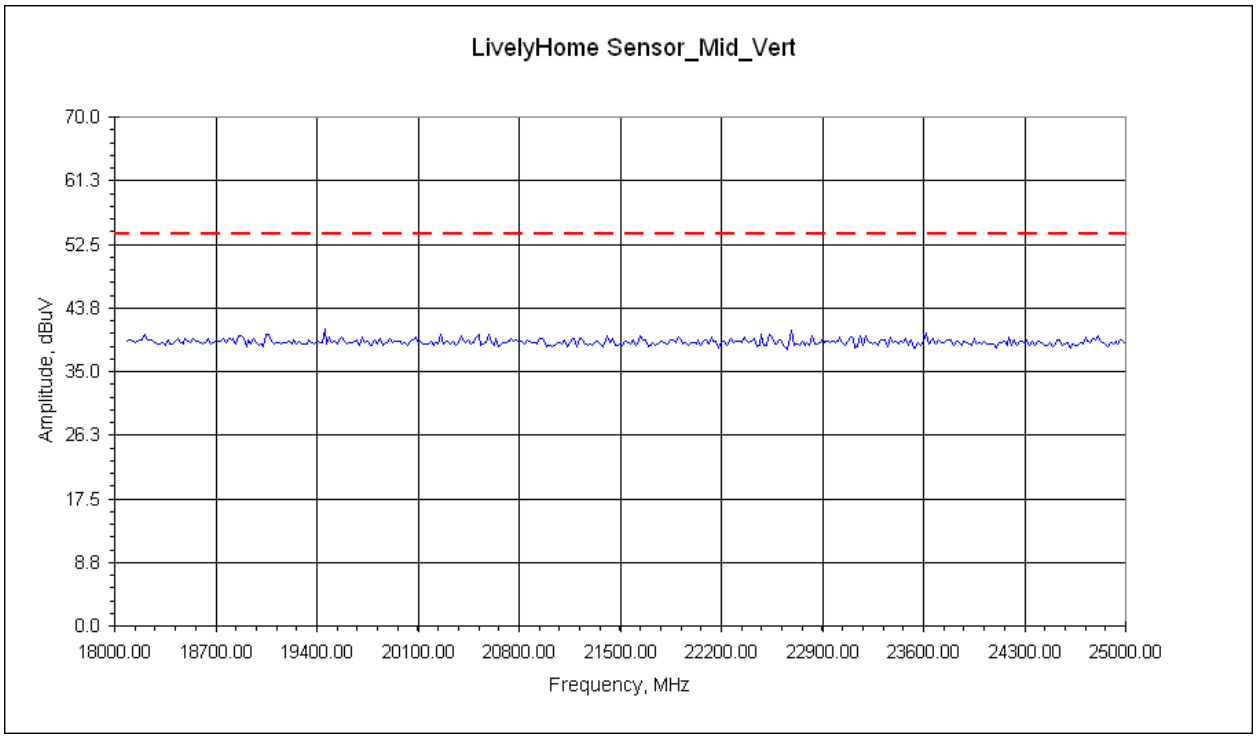
8GHz to 18GHz

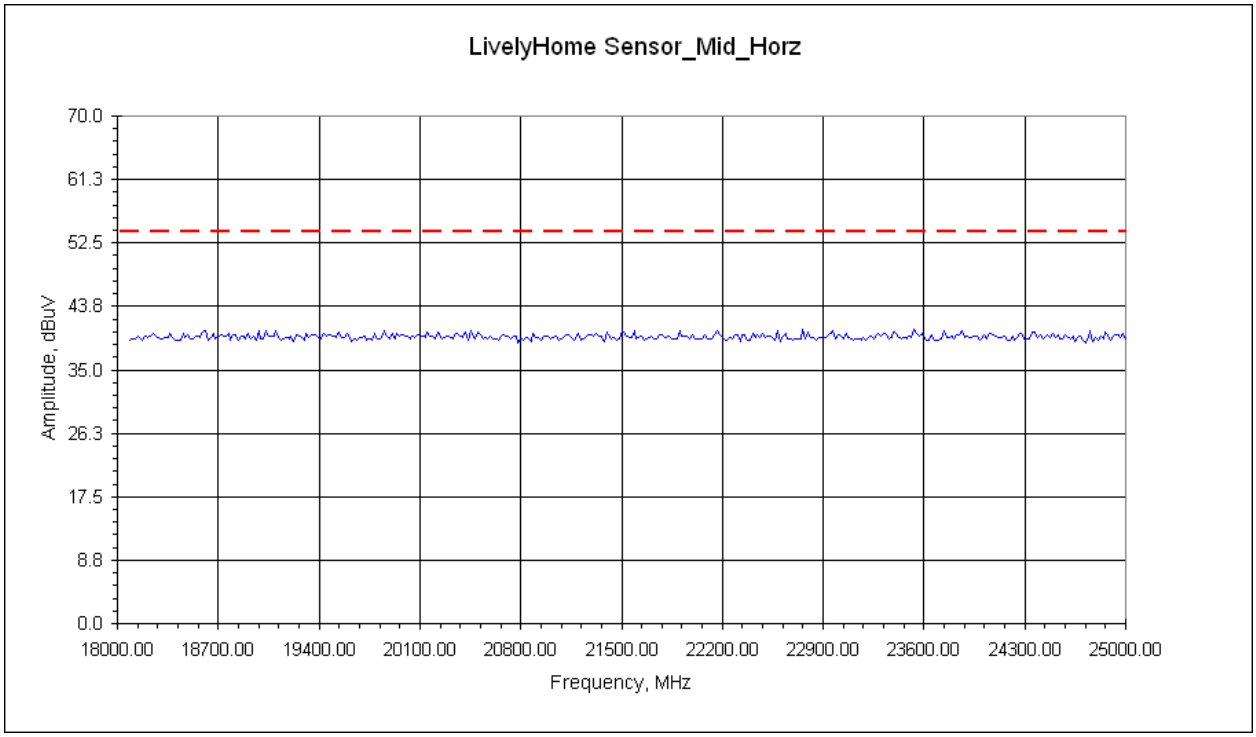




Pre-scan Plots: Mid Channel

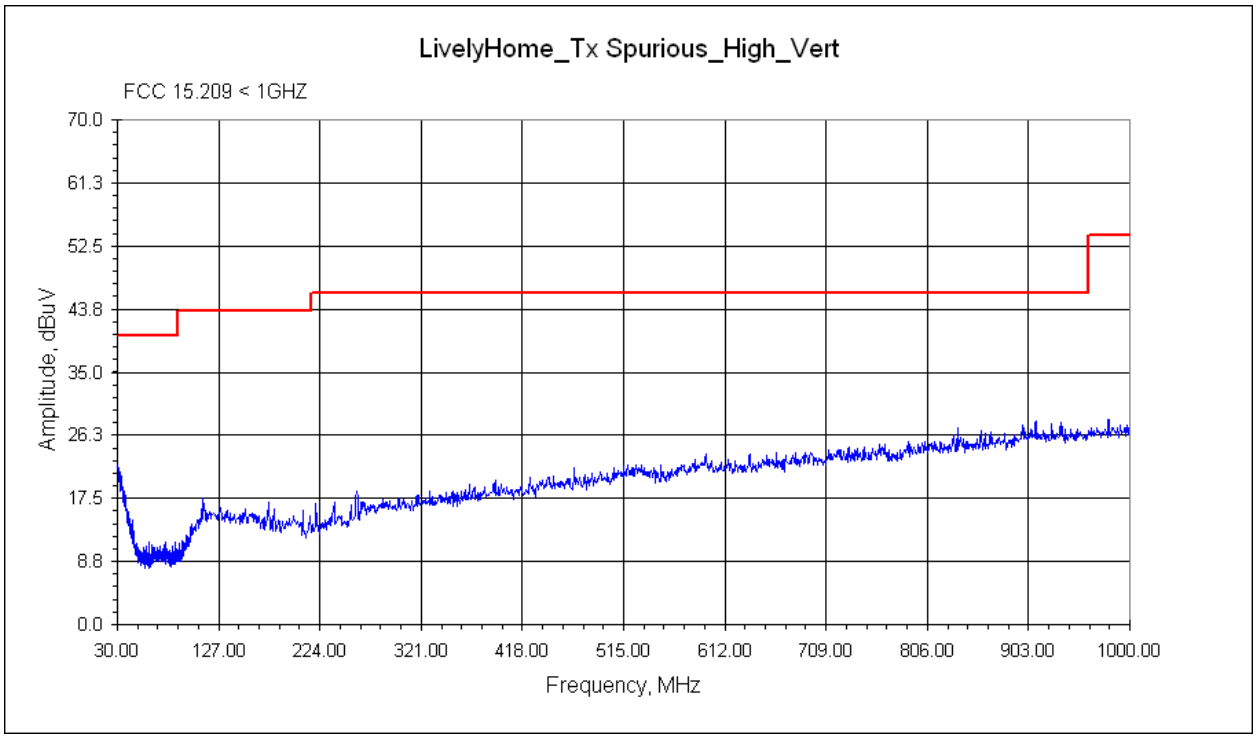
18GHz to 25GHz

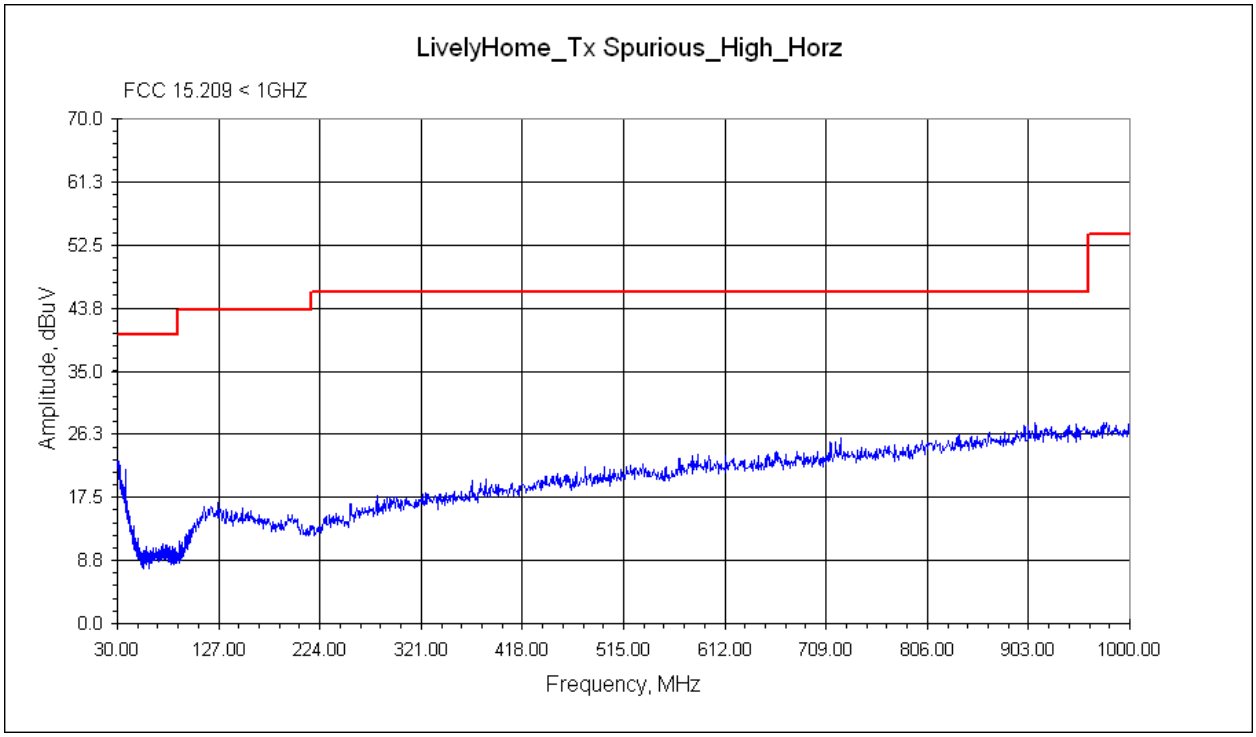




Pre-scan Plots: High Channel

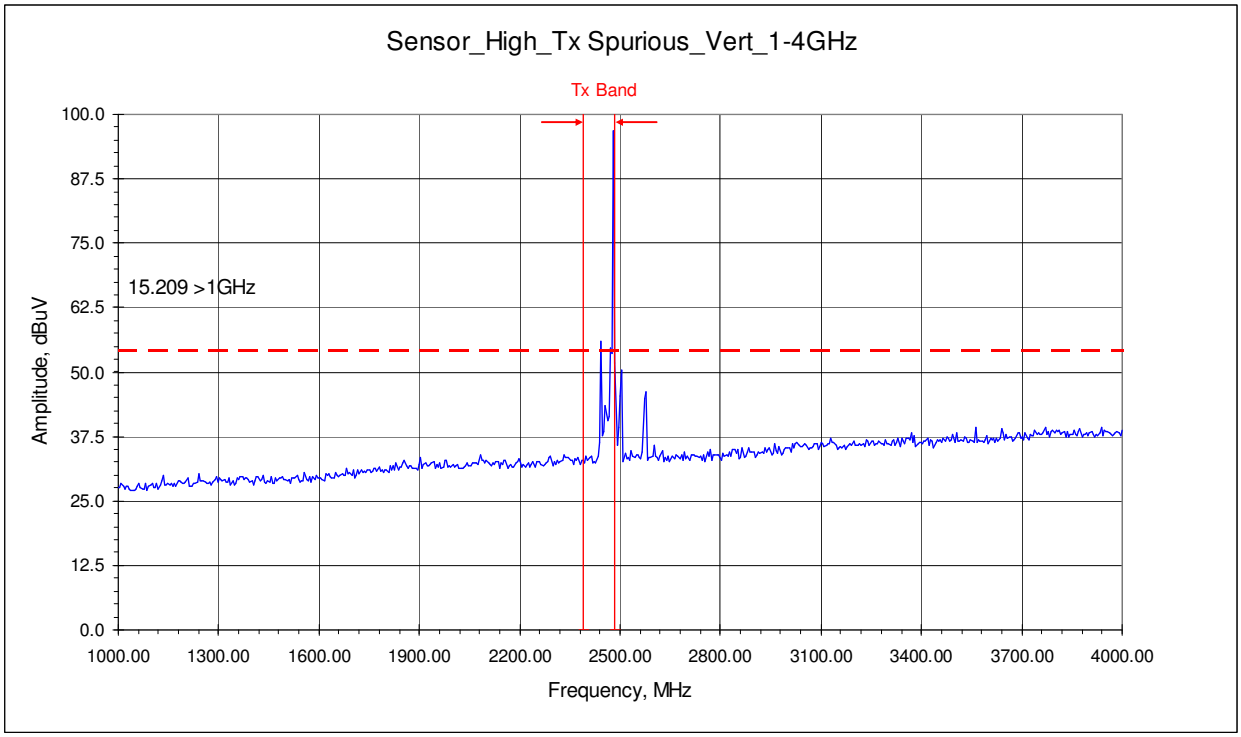
30MHz to 1000MHz

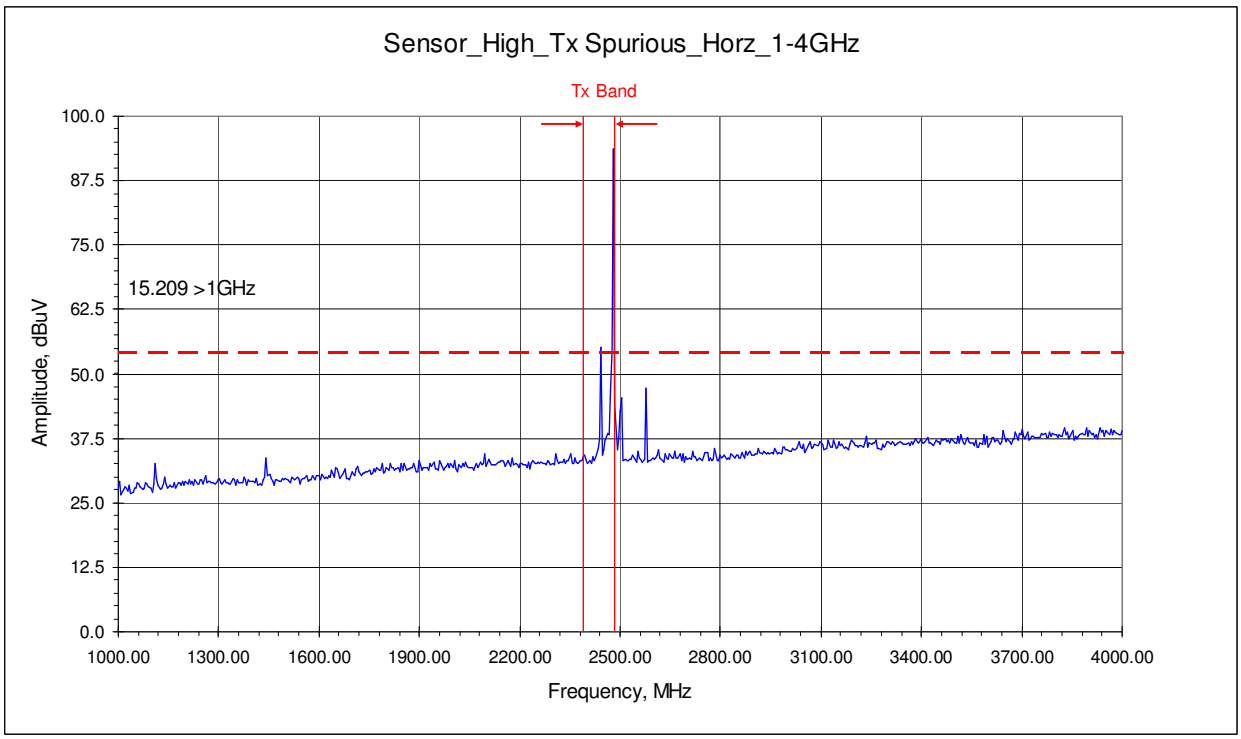




Pre-scan Plots: High Channel

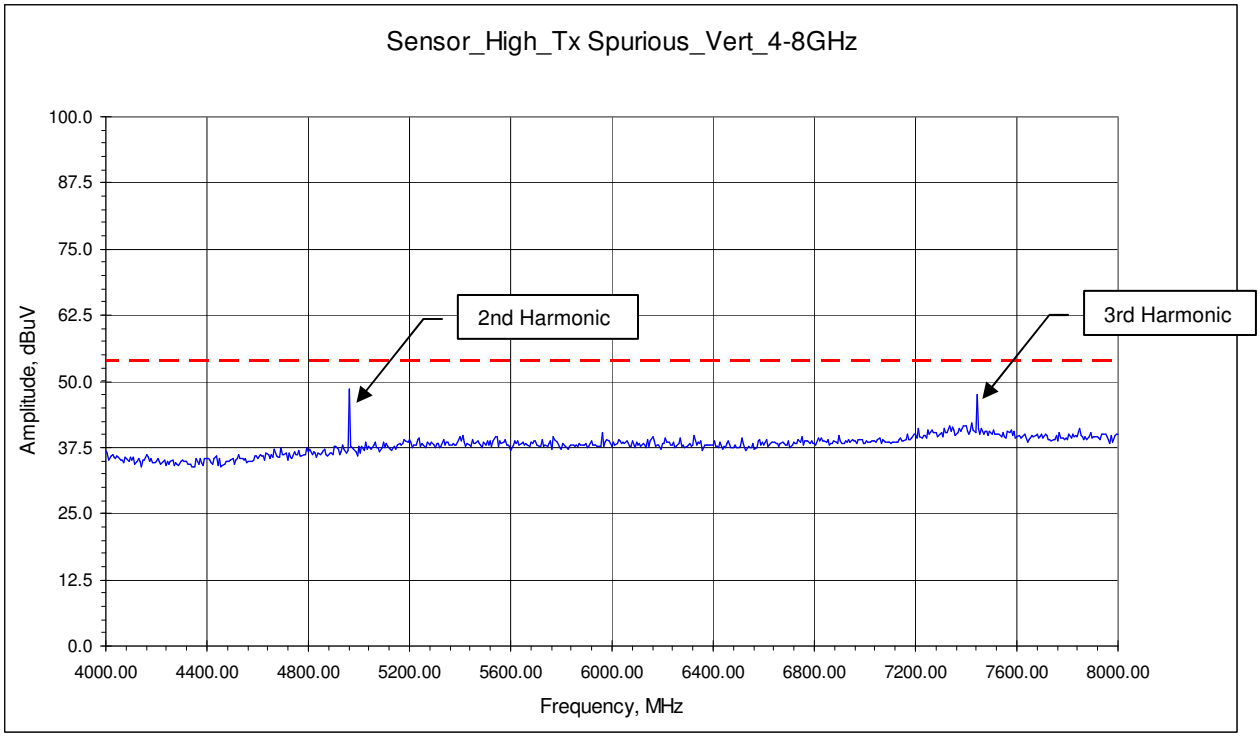
1GHz to 4GHz

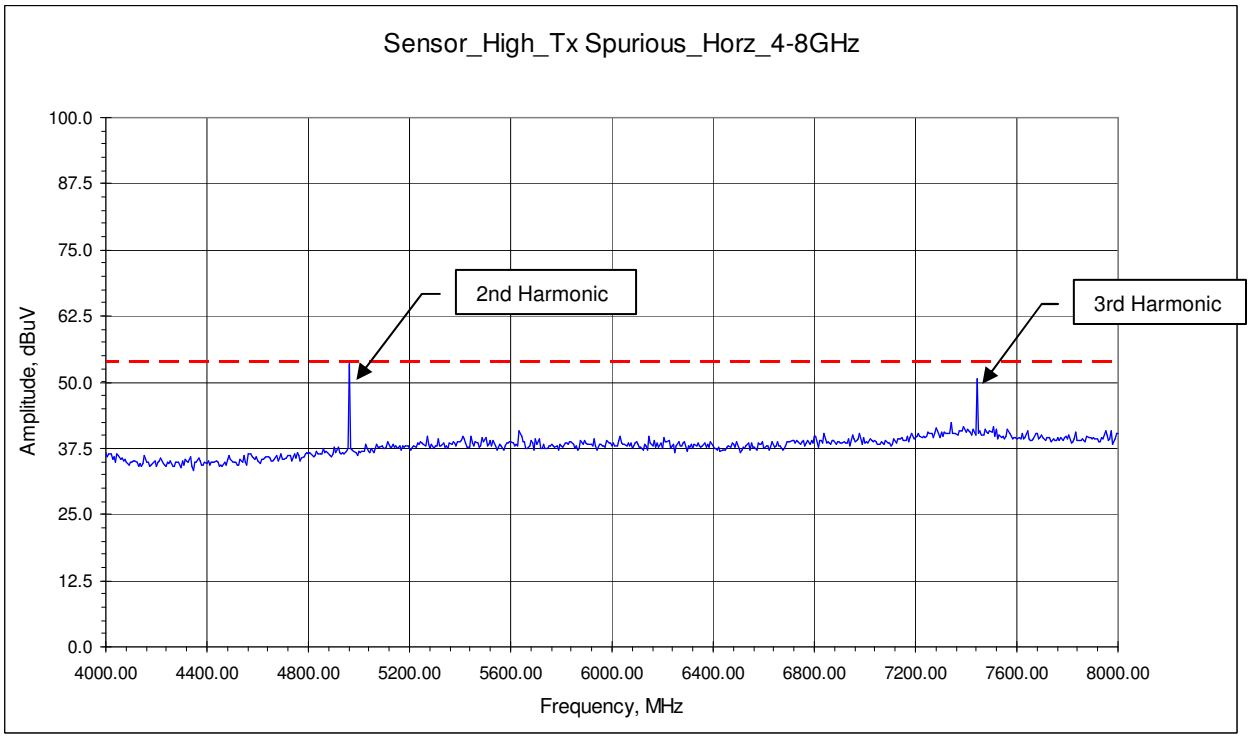




Pre-scan Plots: High Channel

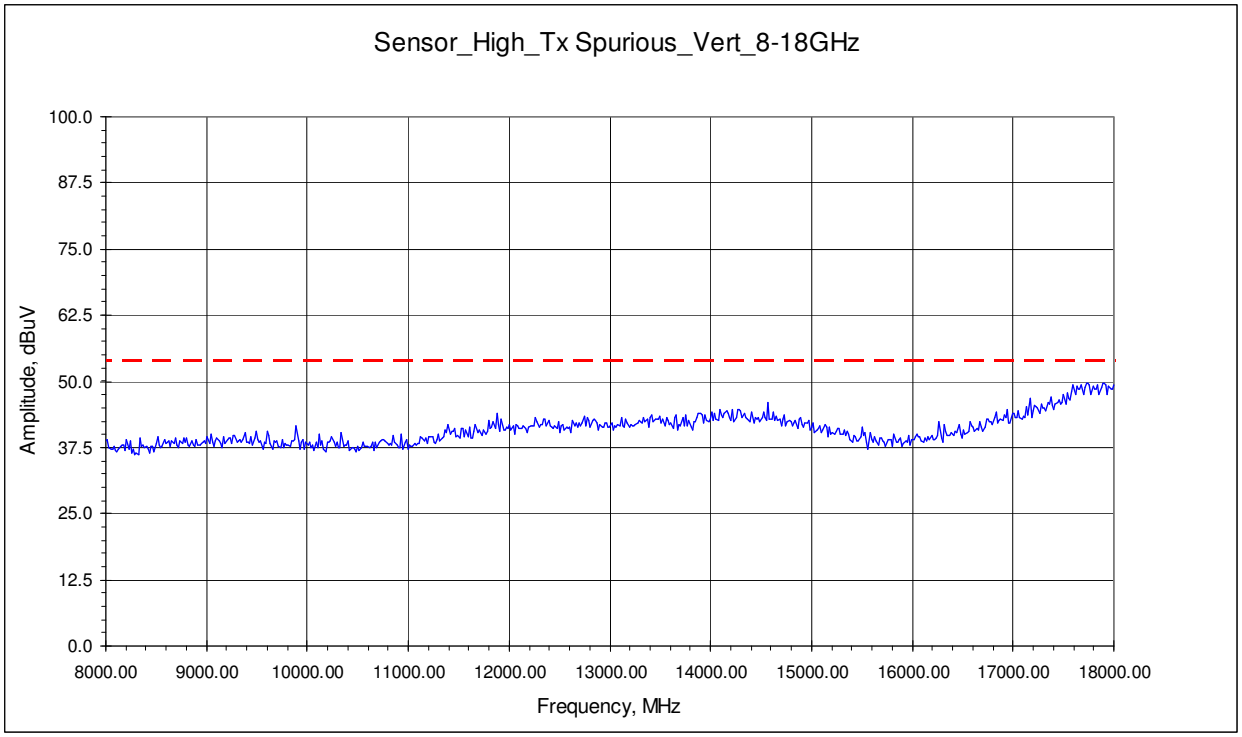
4GHz to 8GHz

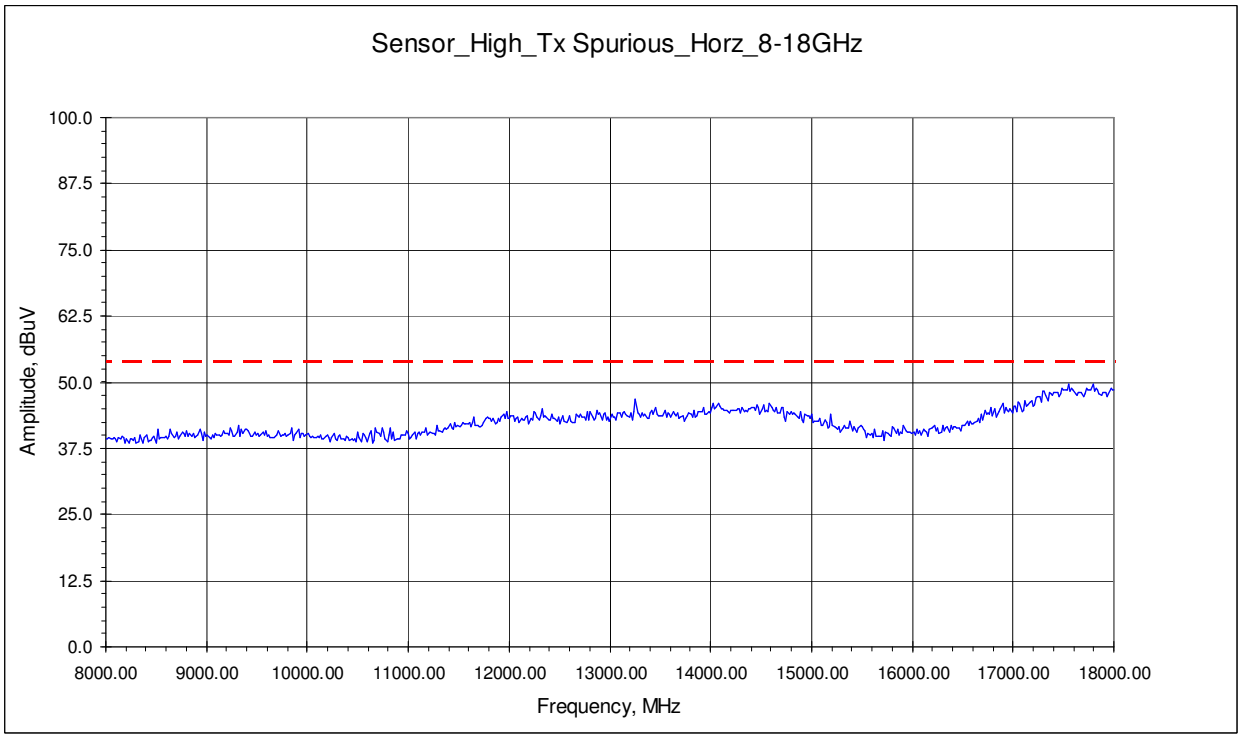




Pre-scan Plots: High Channel

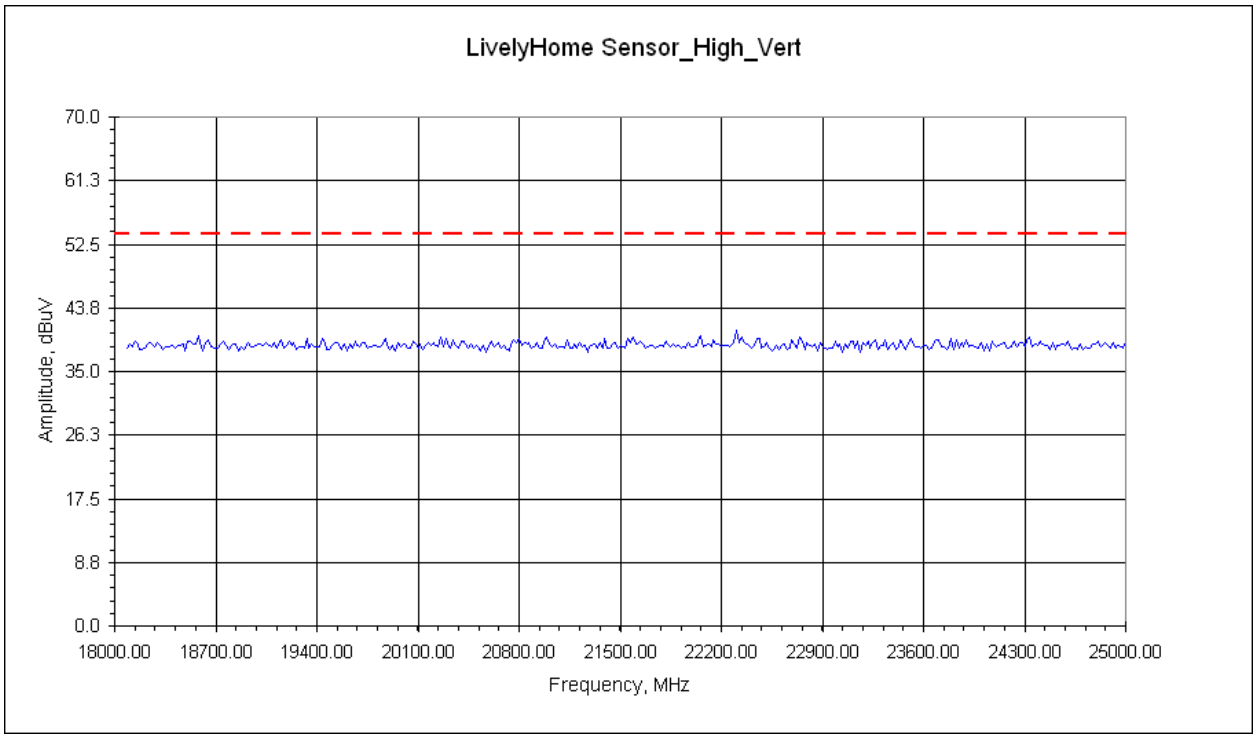
8GHz to 18GHz

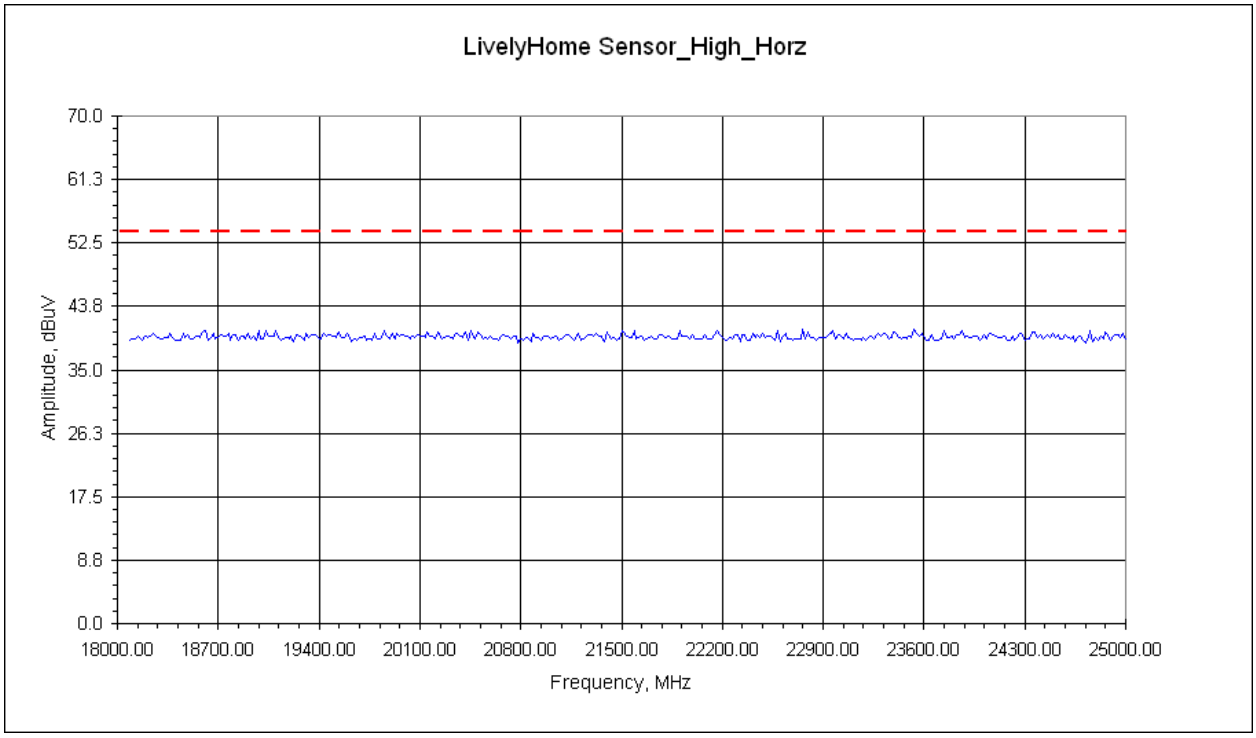




Pre-scan Plots: High Channel

18GHz to 25GHz





Test Data: Spurious Emissions – Harmonics in Restricted Bands

Radiated Electromagnetic Emissions

Test Report #:	**G101122982**	Test Area:	CC1 Radiated	Temperature:	24.1 °C
Test Method:	FCC 15.205/ 15.209 IC RSS-GEN, 6.1 Table 2	Test Date:	04/13/2013	Relative Humidity:	28.7 %
EUT Model #:	LivelyHome Sensor	EUT Power:	120VAC/60Hz	Air Pressure:	83.3 kPa
EUT Serial #:	DVT102				
Manufacturer:	Hamlet, Inc.				
EUT Description:	Sensor for the LivelyHome Wireless System				
Notes:	Product configured in Tx mode of operation, modulated, worst-case data				
	Harmonics in the FCC/IC Restricted Bands				
	No duty cycle correction utilized				

Level Key
Pk – Peak
Qp – Quasi Peak
Av - Average

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Limit	Delta Limit	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 RSS-GEN 6.1	FCC 15.209 RSS-GEN 6.1	(MHz)
Low Channel Harmonics													
4804.0000	37.31	Av	5.16	32.89	38.97	0.00	36.39	V	1.03	96.2	54.0	- 17.61	1.000
4804.0000	36.52	Av	5.16	32.89	38.97	0.00	35.60	H	1.53	82.1	54.0	- 18.40	1.000
12010.0000	38.40	Av	8.71	39.21	45.61	0.00	40.71	H	1.19	6.0	54.0	- 13.29	1.000
12010.0000	38.43	Av	8.71	39.21	45.61	0.00	40.74	V	1.20	44.0	54.0	- 13.26	1.000
19216.0000	1.79	Av	0.00	21.88	0.00	0.00	23.67	V	1.00	0.0	54.0	- 30.33	1.000
19216.0000	1.84	Av	0.00	21.88	0.00	0.00	23.72	H	1.00	0.0	54.0	- 30.28	1.000
4804.0000	52.28	Pk	5.16	32.89	38.97	0.00	51.36	V	1.03	96.2	74.0	- 22.64	1.000
4804.0000	49.30	Pk	5.16	32.89	38.97	0.00	48.38	H	1.53	82.1	74.0	- 25.62	1.000
12010.0000	50.21	Pk	8.71	39.21	45.61	0.00	52.52	H	1.19	6.0	74.0	- 21.48	1.000
12010.0000	50.34	Pk	8.71	39.21	45.61	0.00	52.65	V	1.20	44.0	74.0	- 21.35	1.000
19216.0000	14.18	Pk	0.00	21.88	0.00	0.00	36.06	V	1.00	0.0	74.0	- 37.94	1.000
19216.0000	14.67	Pk	0.00	21.88	0.00	0.00	36.55	H	1.00	0.0	74.0	- 37.45	1.000
Mid Channel Harmonics													
4880.0000	37.59	Av	5.20	32.99	38.83	0.00	36.95	V	1.51	81.3	54.0	- 17.05	1.000
4880.0000	37.96	Av	5.20	32.99	38.83	0.00	37.32	H	1.83	120.1	54.0	- 16.68	1.000
7320.0000	35.53	Av	6.47	36.54	39.21	0.00	39.32	V	1.61	134.8	54.0	- 14.68	1.000
7320.0000	34.56	Av	6.47	36.54	39.21	0.00	38.35	H	1.75	113.6	54.0	- 15.65	1.000
12200.0000	37.93	Av	8.82	38.99	45.31	0.00	40.42	V	1.24	16.0	54.0	- 13.58	1.000
12200.0000	37.95	Av	8.82	38.99	45.31	0.00	40.44	H	1.31	68.0	54.0	- 13.56	1.000
19520.0000	1.67	Av	0.00	22.22	0.00	0.00	23.89	V	1.00	0.0	54.0	- 30.11	1.000
19520.0000	1.77	Av	0.00	22.22	0.00	0.00	23.99	H	1.00	0.0	54.0	- 30.01	1.000
4880.0000	58.81	Pk	5.20	32.99	38.83	0.00	58.17	V	1.51	81.3	74.0	- 15.83	1.000
4880.0000	52.22	Pk	5.20	32.99	38.83	0.00	51.58	H	1.83	120.1	74.0	- 22.42	1.000
7320.0000	51.02	Pk	6.47	36.54	39.21	0.00	54.81	V	1.61	134.8	74.0	- 19.19	1.000
7320.0000	51.87	Pk	6.47	36.54	39.21	0.00	55.66	H	1.75	113.6	74.0	- 18.34	1.000
12200.0000	50.69	Pk	8.82	38.99	45.31	0.00	53.18	V	1.24	16.0	74.0	- 20.82	1.000
12200.0000	50.27	Pk	8.82	38.99	45.31	0.00	52.76	H	1.31	68.0	74.0	- 21.24	1.000
19520.0000	13.97	Pk	0.00	22.22	0.00	0.00	36.19	V	1.00	0.0	74.0	- 37.81	1.000

19520.0000	14.21	Pk	0.00	22.22	0.00	0.00	36.43	H	1.00	0.0	74.0	- 37.57	1.000
High Channel Harmonics													
4960.0000	30.01	Av	5.24	33.16	34.96	0.00	33.45	V	1.30	97.2	54.0	- 20.55	1.000
4960.0000	34.57	Av	5.24	33.16	38.69	0.00	34.28	H	1.80	107.0	54.0	- 19.72	1.000
7440.0000	33.63	Av	6.53	36.66	39.24	0.00	37.57	V	1.88	103.6	54.0	- 16.43	1.000
7440.0000	34.08	Av	6.53	36.66	39.24	0.00	38.02	H	1.72	68.6	54.0	- 15.98	1.000
12400.0000	37.81	Av	8.93	38.85	45.00	0.00	40.59	H	1.26	48.0	54.0	- 13.41	1.000
12400.0000	37.86	Av	8.93	38.85	45.00	0.00	40.64	V	1.07	18.0	54.0	- 13.36	1.000
19840.0000	1.66	Av	0.00	22.14	0.00	0.00	23.80	V	1.00	0.0	54.0	- 30.20	1.000
19840.0000	1.78	Av	0.00	22.14	0.00	0.00	23.92	H	1.00	0.0	54.0	- 30.08	1.000
22320.0000	1.72	Av	0.00	20.55	0.00	0.00	22.27	V	1.00	0.0	54.0	- 31.73	1.000
22320.0000	1.91	Av	0.00	20.55	0.00	0.00	22.46	H	1.00	0.0	54.0	- 31.54	1.000
4960.0000	43.87	Pk	5.24	33.16	34.96	0.00	47.31	V	1.30	97.2	74.0	- 26.69	1.000
4960.0000	52.96	Pk	5.24	33.16	38.69	0.00	52.67	H	1.80	107.0	74.0	- 21.33	1.000
7440.0000	47.62	Pk	6.53	36.66	39.24	0.00	51.56	V	1.88	103.6	74.0	- 22.44	1.000
7440.0000	49.38	Pk	6.53	36.66	39.24	0.00	53.32	H	1.72	68.6	74.0	- 20.68	1.000
12400.0000	49.76	Pk	8.93	38.85	45.00	0.00	52.54	H	1.26	48.0	74.0	- 21.46	1.000
12400.0000	51.34	Pk	8.93	38.85	45.00	0.00	54.12	V	1.07	18.0	74.0	- 19.88	1.000
19840.0000	13.74	Pk	0.00	22.14	0.00	0.00	35.88	V	1.00	0.0	74.0	- 38.12	1.000
19840.0000	14.12	Pk	0.00	22.14	0.00	0.00	36.26	H	1.00	0.0	74.0	- 37.74	1.000
22320.0000	15.39	Pk	0.00	20.55	0.00	0.00	35.94	V	1.00	0.0	74.0	- 38.06	1.000
22320.0000	15.57	Pk	0.00	20.55	0.00	0.00	36.12	H	1.00	0.0	74.0	- 37.88	1.000

Reference Only – Restricted Band Harmonics

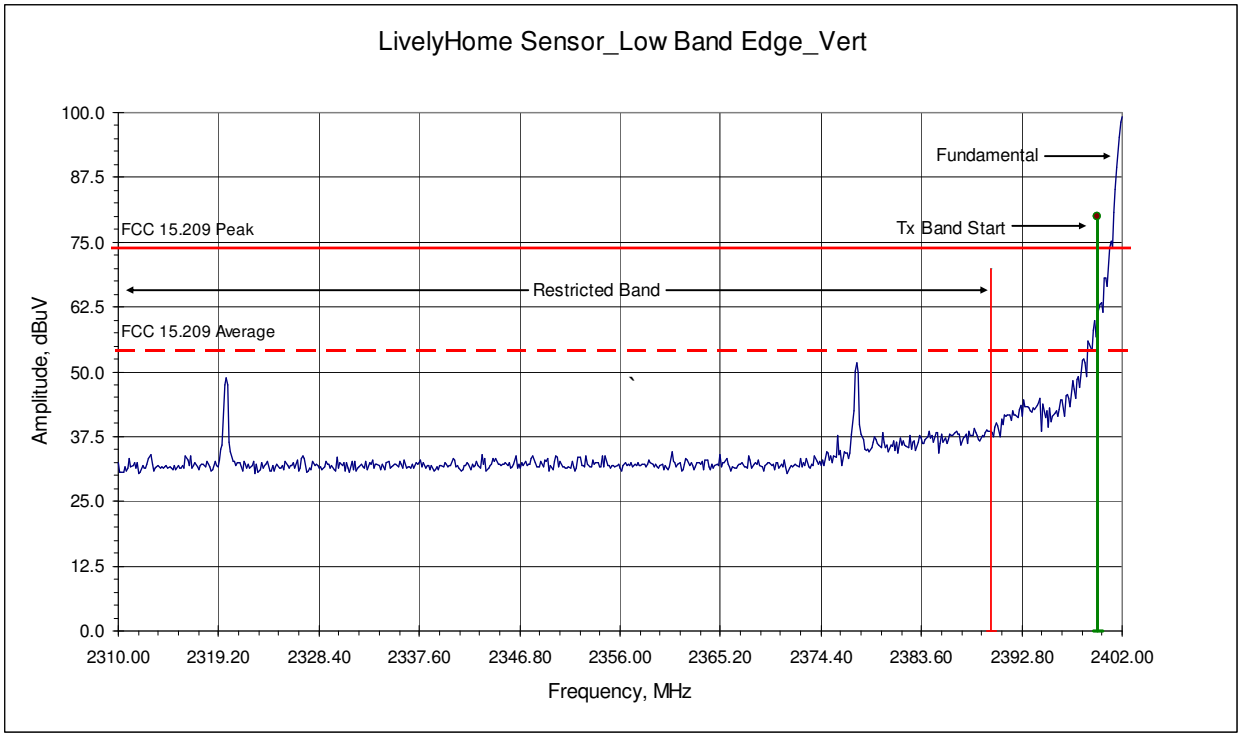
Fundamental				**Harmonics**						
MHz0	MHz1	MHz2	MHz3	MHz4	MHz5	MHz6	MHz7	MHz8	MHz9	MHz10
2402	2402.00	**4804.00**	7206.00	9608.00	**12010.00**	14412.00	16814.00	**19216.00**	21618.00	24020.00
2440	2440.00	**4880.00**	**7320.00**	9760.00	**12200.00**	14640.00	17080.00	**19520.00**	21960.00	24400.00
2480	2480.00	**4960.00**	**7440.00**	9920.00	**12400.00**	14880.00	17360.00	**19840.00**	**22320.00**	24800.00

Worst Case Radiated Spurious Band Edge Emission: 12010.00 MHz, 40.74dBuV (-13.26dB under limit)													
Freq	**Level**	**Det**	**Cable**	**Ant**	**Preamp**	**Atten**	**Final**	**Pol**	**Hgt**	**Az**	**Average Limit**	**Delta Limit**	**RBW**
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 RSS-GEN 6.1	FCC 15.209 RSS-GEN 6.1	(MHz)
12010.0000	38.43	Av	8.71	39.21	45.61	0.00	40.74	V	1.20	44.0	54.0	- 13.26	1.000

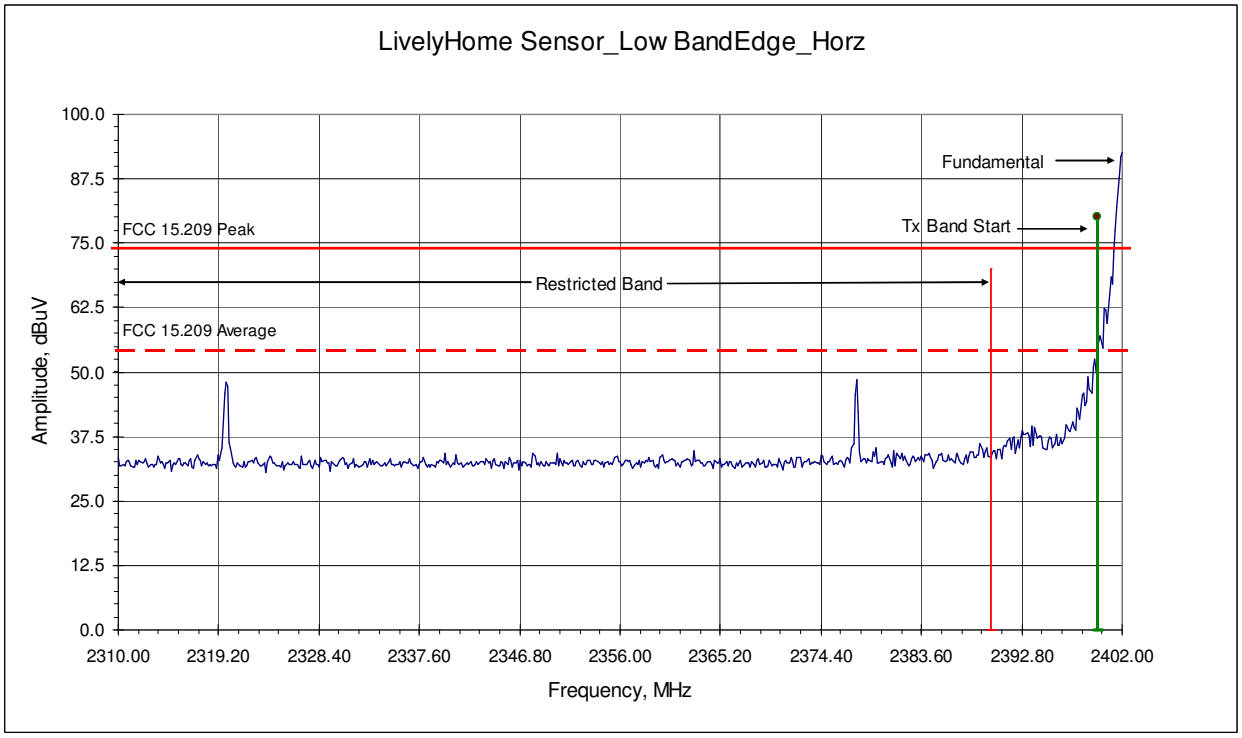
Specification: FCC Part 15.209 in Restricted Band or ≤ -20dBc in Non-Restricted Band

Plots: Low Band Edge

Vertical

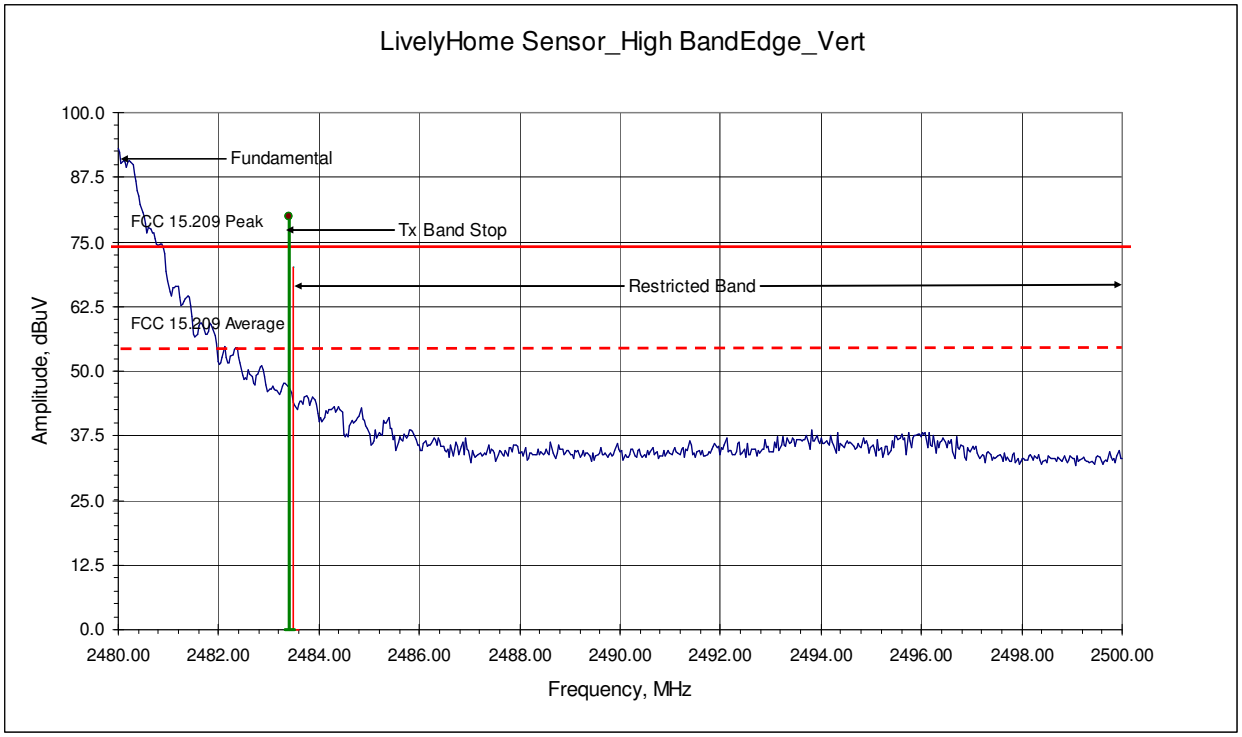


Horizontal

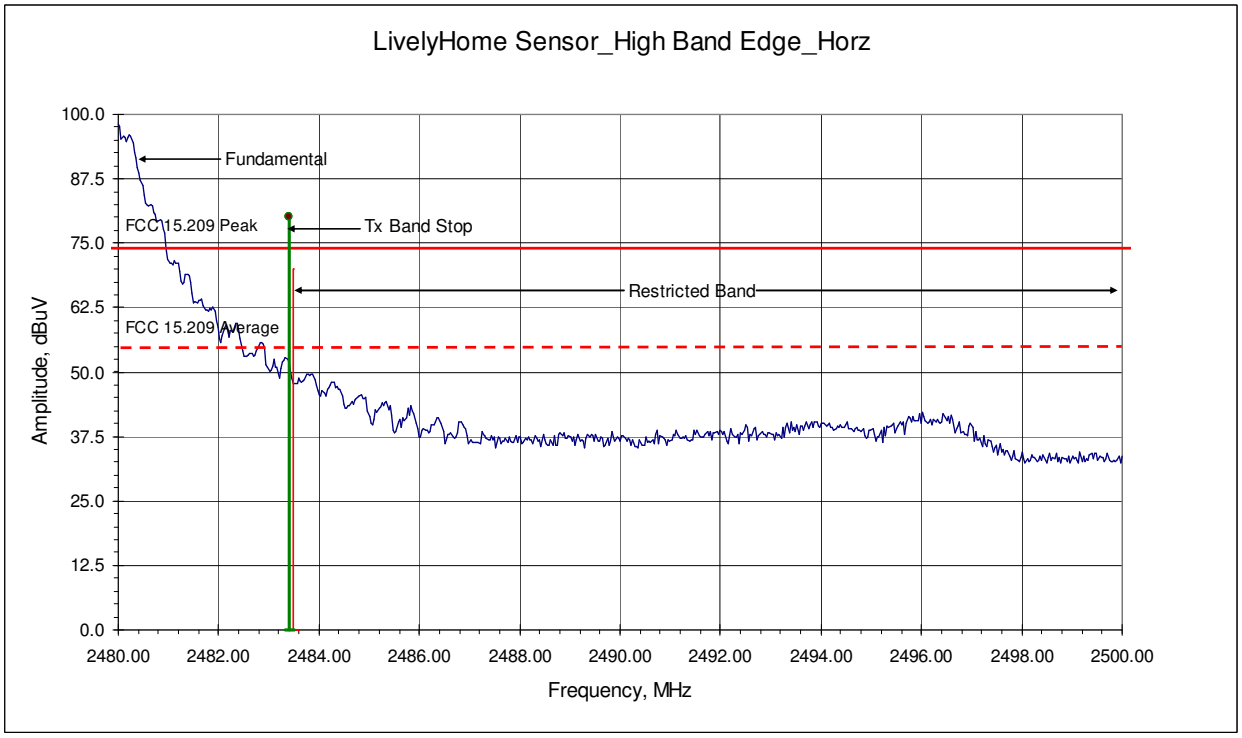


Plots: High Band Edge

Vertical



Horizontal



Test Data: Radiated Tx Spurious - Band Edge

Radiated Electromagnetic Emissions

Test Report #:	**G101122982**	Test Area:	CC1 Radiated	Temperature:	24.1 °C
Test Method:	FCC 15.205/ 15.209 IC RSS-GEN, 6.1 Table 2	Test Date:	04/13/2013	Relative Humidity:	28.7 %
EUT Model #:	LivelyHome Sensor	EUT Power:	120VAC/60Hz	Air Pressure:	83.3 kPa
EUT Serial #:	DVT102				
Manufacturer:	Hamlet, Inc.				
EUT Description:	Sensor for the LivelyHome Wireless System				
Notes:	Product configured in Tx mode of operation, modulated				
	Band Edge Measurements – including restricted bands				
	No duty cycle correction utilized				

Level Key
Pk – Peak
Qp – Quasi Peak
Av - Average

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Limit	Delta Limit	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 RSS-GEN 6.1	FCC 15.209 RSS-GEN 6.1	(MHz)
Low Band Edge Measurements													
2319.9000	36.29	Av	3.45	28.07	37.30	0.00	30.51	V	1.10	110.4	54.0	- 23.49	1.000
2319.9000	36.22	Av	3.45	28.07	37.30	0.00	30.44	H	1.62	70.2	54.0	- 23.56	1.000
2377.6000	36.50	Av	3.49	28.44	37.35	0.00	31.07	V	1.09	134.0	54.0	- 22.93	1.000
2400.0000	46.81	Av	3.51	28.58	37.38	0.00	41.52	V	1.39	129.7	54.0	- 12.48	1.000
2400.0000	45.99	Av	3.51	28.58	37.38	0.00	40.70	H	1.90	0.2	54.0	- 13.30	1.000
2319.9000	63.90	Pk	3.45	28.07	37.30	0.00	58.12	V	1.10	110.4	74.0	- 15.88	1.000
2319.9000	63.48	Pk	3.45	28.07	37.30	0.00	57.70	H	1.62	70.2	74.0	- 16.30	1.000
2377.6000	64.60	Pk	3.49	28.44	37.35	0.00	59.17	V	1.09	134.0	74.0	- 14.83	1.000
2377.6000	62.89	Pk	3.49	28.44	37.35	0.00	57.46	H	1.57	61.6	74.0	- 16.54	1.000
2377.6000	41.96	Pk	3.49	28.44	37.35	0.00	36.53	H	1.62	70.2	74.0	- 37.47	1.000
2400.0000	75.70	Pk	3.51	28.58	37.38	0.00	70.41	V	1.39	129.7	74.0	- 3.59	1.000
2400.0000	74.52	Pk	3.51	28.58	37.38	0.00	69.23	H	1.90	0.2	74.0	- 4.77	1.000
High Band Edge Measurements													
2483.5000	37.91	Av	3.58	28.69	37.61	0.00	32.57	V	1.30	116.7	54.0	- 21.43	1.000
2483.5000	36.04	Av	3.58	28.69	37.61	0.00	30.70	H	1.83	55.5	54.0	- 23.30	1.000
2502.5000	37.08	Av	3.59	28.72	37.61	0.00	31.78	H	1.86	60.9	54.0	- 22.22	1.000
2574.1000	35.59	Av	3.65	28.95	37.61	0.00	30.58	H	1.73	54.7	54.0	- 23.42	1.000
2574.1000	35.92	Av	3.65	28.95	37.61	0.00	30.91	V	1.26	100.6	54.0	- 23.09	1.000
2483.5000	65.50	Pk	3.58	28.69	37.61	0.00	60.16	V	1.30	116.7	74.0	- 13.84	1.000
2483.5000	57.26	Pk	3.58	28.69	37.61	0.00	51.92	H	1.83	55.5	74.0	- 22.08	1.000
2502.5000	63.78	Pk	3.59	28.72	37.61	0.00	58.48	H	1.86	60.9	74.0	- 15.52	1.000
2574.1000	56.47	Pk	3.65	28.95	37.61	0.00	51.46	H	1.73	54.7	74.0	- 22.54	1.000
2574.1000	60.67	Pk	3.65	28.95	37.61	0.00	55.66	V	1.26	100.6	74.0	- 18.34	1.000

Test Method:

- FCC 558074 D01 DTS Measurement Guidance: 2013, Section 12.1
- ANSI C63.10:2009, Section 6.5

Test Summary:

Worst Case Radiated Spurious Emission: 12010.00 MHz, 40.74dBuV (-13.26dB under limit)													
Freq	**Level**	**Det**	**Cable**	**Ant**	**Preamp**	**Atten**	**Final**	**Pol**	**Hgt**	**Az**	**Average Limit**	**Delta Limit**	**RBW**
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 RSS-GEN 6.1	FCC 15.209 RSS-GEN 6.1	(MHz)
12010.0000	38.43	Av	8.71	39.21	45.61	0.00	40.74	V	1.20	44.0	54.0	- 13.26	1.000

Specification: FCC Part 15.209 in Restricted Band or ≤ -20dBc in Non-Restricted Band

Worst Case Radiated Spurious Band Edge Emission: 2400 MHz, 70.41dBuV (-3.59dB under limit)													
Freq	**Level**	**Det**	**Cable**	**Ant**	**Preamp**	**Atten**	**Final**	**Pol**	**Hgt**	**Az**	**Peak Limit**	**Delta Limit**	**RBW**
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 RSS-GEN 6.1	FCC 15.209 RSS-GEN 6.1	(MHz)
2400.0000	75.70	Pk	3.51	28.58	37.38	0.00	70.41	V	1.39	129.7	74.0	- 3.59	1.000

Specification: FCC Part 15.209 in Restricted Band or ≤ -20dBc in Non-Restricted Band

Notes:

1) Measurements were taken using worst-case modulated (minimum bandwidth/maximum amplitude) mode, using worst-case data packet length.
2) All measurements Radiated Emissions.

Deviations, Additions, or Exclusions: None

11 Power Spectral Density (PSD)

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC 15.247 & IC RSS-210.

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

Test Requirement/Specification:

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. The same method of determining the conducted output power shall be used to determine the power spectral density.

- FCC 15.247(e)
- IC RSS-210 A8.2(b)

Test Equipment Used:

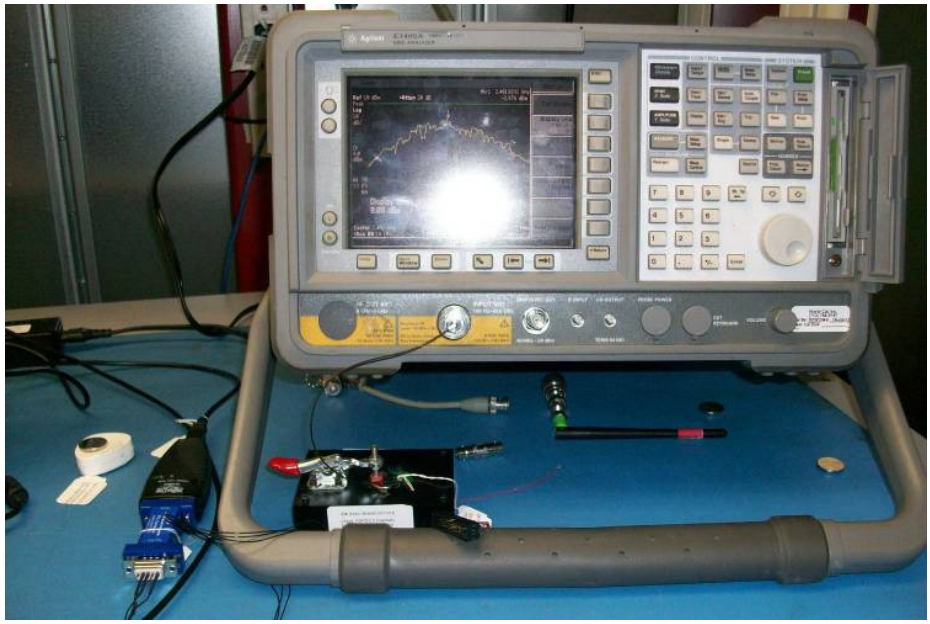
Asset ID:	Description:	Manufacturer:	Model:	Serial:	Cal Date	Cal Due
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013

Results:

The sample tested was found to comply.

Test Setup Photographs:

Test Setup



Test Data: Low Channel

Power Spectral Density (PSD) – LivelyHome Sensor
FCC 15.247(e) / RSS-210 A8.2(b)

Low Channel – 2402 MHz
Payload 0

Payload 1

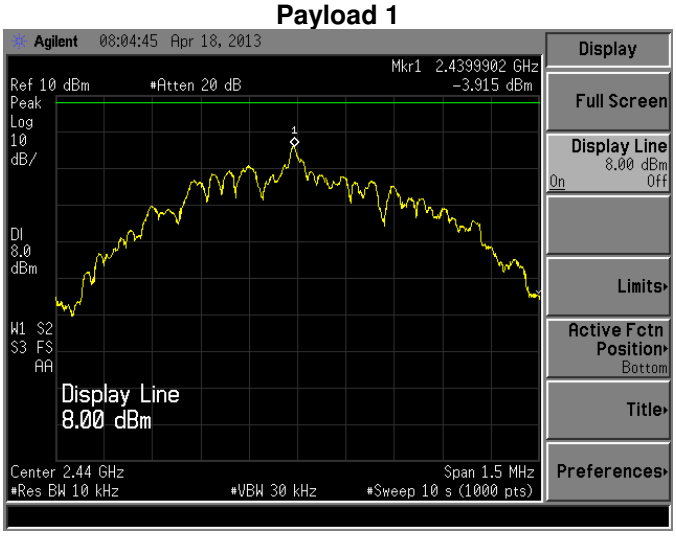
Payload 2

Specification: PSD < +8 dBm

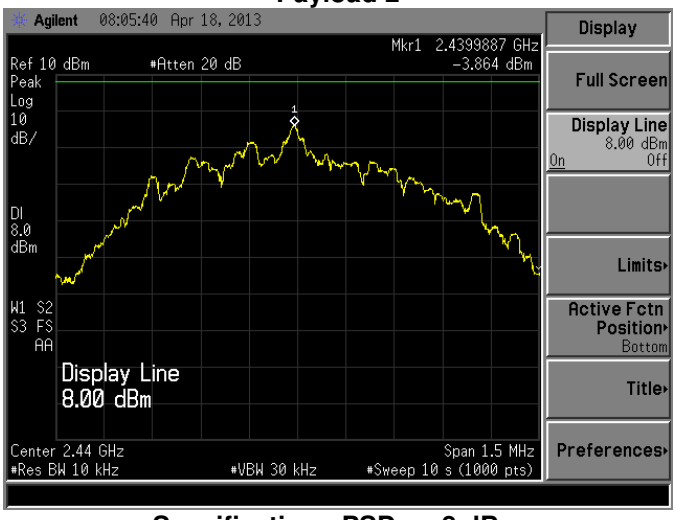
Test Data: Mid Channel

Power Spectral Density (PSD)
FCC 15.247(e) / RSS-210 A8.2(b)
Mid Channel – 2440 MHz
Payload 0

Payload 1



Payload 2



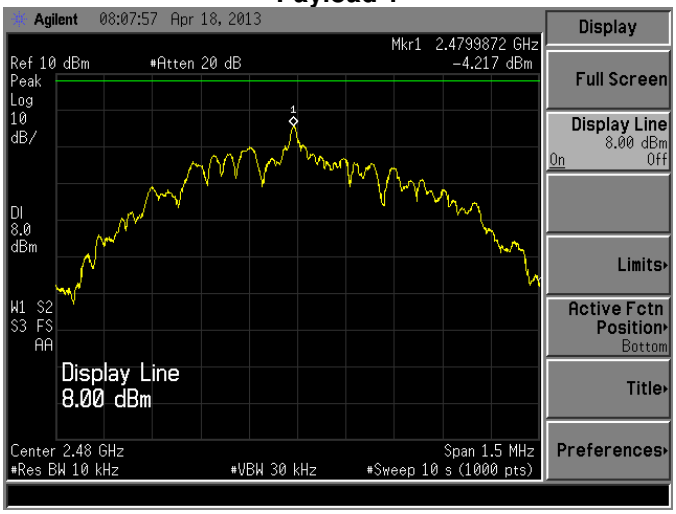
Specification: PSD < +8 dBm

Test Data: High Channel

Power Spectral Density (PSD)
FCC 15.247(e / RSS-210 A8.2(b)

High Channel – 2480 MHz
Payload 0

Payload 1



Payload 2

Specification: PSD < +8 dBm

Test Method:

- FCC 558074 D01 DTS Measurement Guidance: 2013, Section 10.0, Option 10.2 (Peak PSD)
- ANSI C63.10:2009, Section 6.11.2.3

Test Summary:

Power Spectral Density (PSD) Summary	
Channel/ Mode	**PSD**
Low/ Payload 0	-2.976 dBm
Mid/ Payload 2	-3.864 dBm
High/ Payload 2	-4.173 dBm

Specification: PSD per 3kHz Bandwidth less than +8dBm

Notes:

(1) All measurements are RF Conducted Port – worst-case modulated (highest amplitude) data packet/payload.

(2) Spectrum analyzer display line limit of +8dBm corrected for RF port cable loss.

Deviations, Additions, or Exclusions: None

12 Occupied Bandwidth (OBW)

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 RSS, the transmitted signal bandwidth to be reported is to be 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:

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

Results:

The sample tested was found to comply.

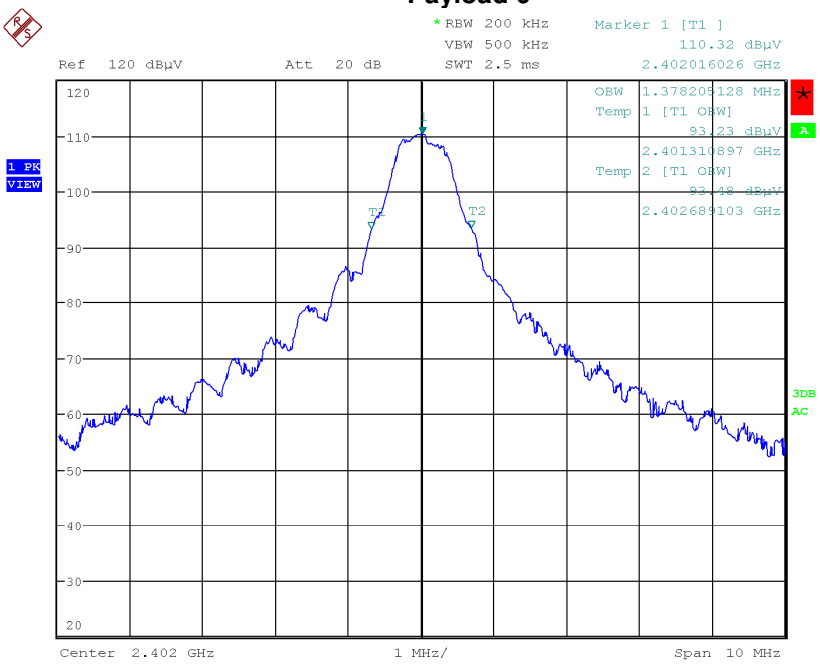
Test Setup Photographs:

Test Setup

Test Data: Low Channel

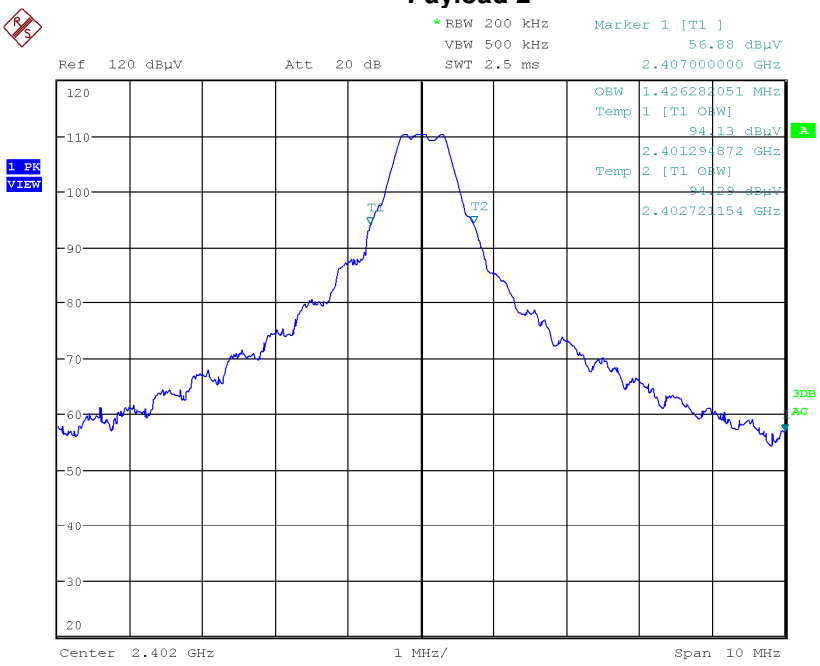
Occupied Bandwidth – LivelyHome Sensor
(RSS-GEN, Section 4.6.1)

Low Channel – 2402 MHz
Payload 0



Date: 19.APR.2013 08:24:19

Payload 2

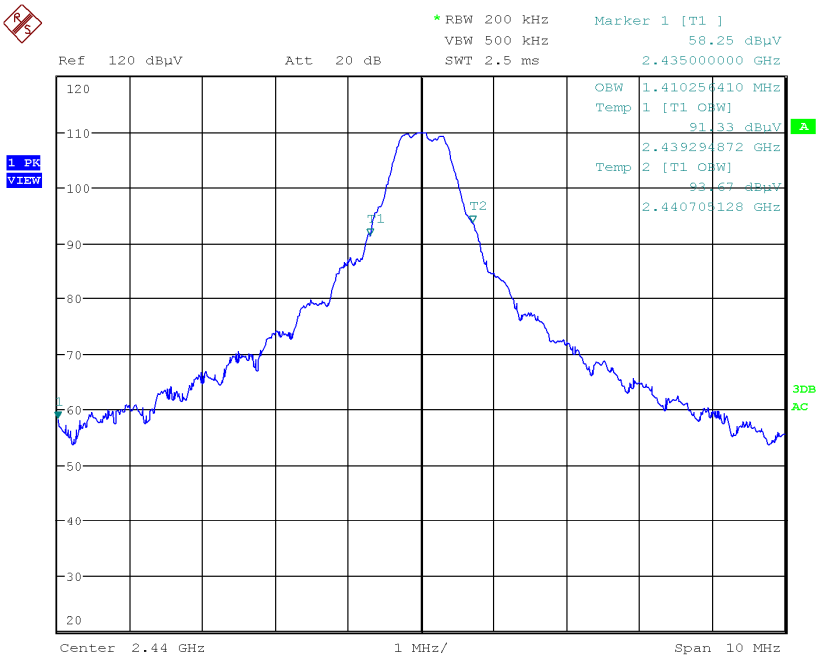


Date: 19.APR.2013 08:36:17

Test Data: Mid Channel

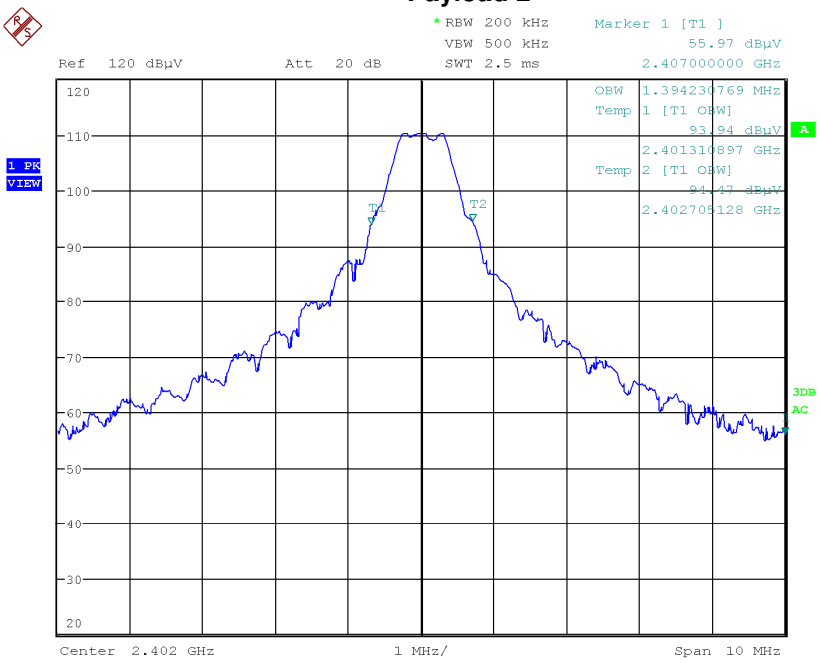
Occupied Bandwidth - (RSS-GEN, Section 4.6.1)

Mid Channel – 2440 MHz
Payload 0



Date: 19.APR.2013 08:28:14

Payload 2

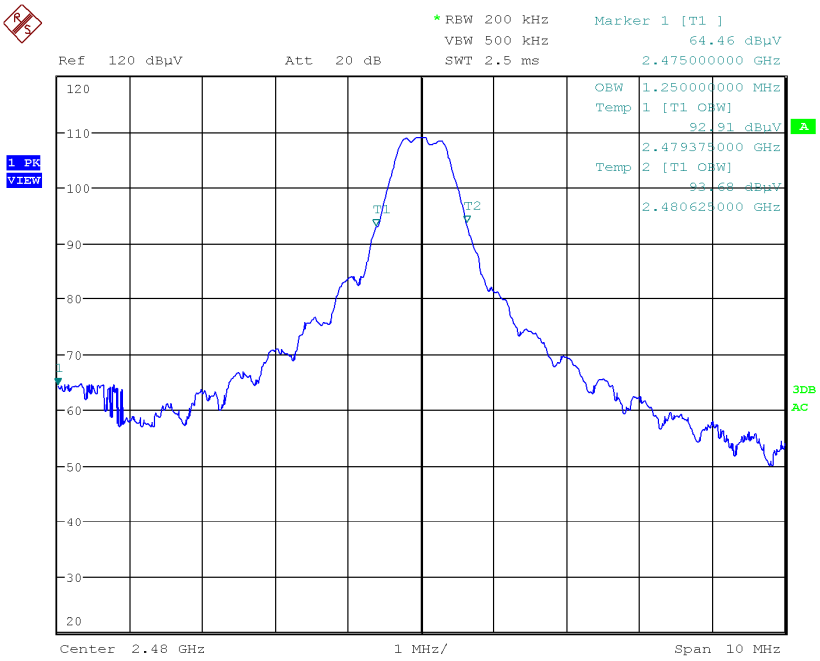


Date: 19.APR.2013 08:39:17

Test Data: High Channel

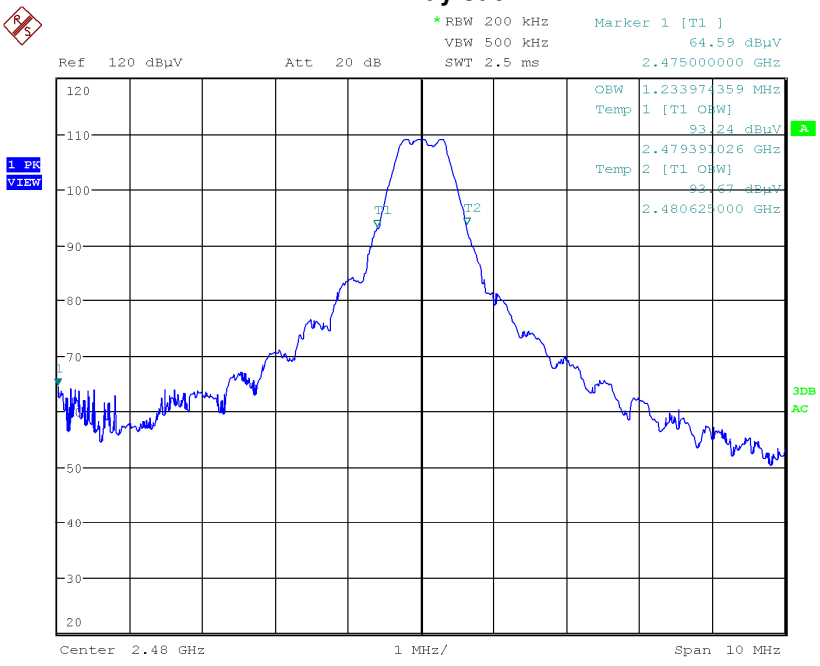
Occupied Bandwidth - (RSS-GEN, Section 4.6.1)

High Channel – 2480 MHz
Payload 0



Date: 19.APR.2013 08:32:01

Payload 2



Date: 19.APR.2013 08:41:42

Test Method:

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

Test Summary:

Occupied Bandwidth (OBW) Summary	
Channel/ Mode	**OBW**
Low/ Payload 2	1.426 MHz
Mid/ Payload 0	1.410 MHz
High/ Payload 2	1.250 MHz

Specification: 99% Power Emission Bandwidth

Notes:

1) All measurements are RF Conducted Port – worst-case modulated (widest bandwidth) data packet/payload.

Deviations, Additions, or Exclusions: None

13 Receiver Emissions – Not Applicable

Method

The test methods used comply with ANSI C63.4 and CISPR 16. Unless otherwise stated no deviations were made from FCC 15.109/RSS-GEN.

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

Test Requirement/Specification:

- FCC 15.109 - Class B
- RSS-GEN Section 6.1 Table 2

Test Equipment Used:

Asset ID	Description	Manufacturer	Model	Serial	Cal Date	Cal Due

Results:

Test not applicable – product is a transmitter only.

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**

Test Method:

Test Summary:

Notes: None

Deviations, Additions, or Exclusions: None

14 AC Mains Conducted Emissions – Not Applicable

Method

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

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

Test Requirement/Specification:

- FCC 15.207/15.107 Class B
- RSS-GEN Section 7.2.4 Table 4

Test Equipment Used:

Asset ID	Description	Manufacturer	Model	Serial	Cal Date	Cal Due

Results:

Test not applicable – product has no ac power port.

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**

Test Method:

Test Summary:

Notes: None

Deviations, Additions, or Exclusions: None

15 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 15.247 & IC RSS-GEN.

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

Test Requirement/Specification

- FCC 15.203
- RSS-GEN, Clause 4.5

Results:

Not applicable

Test Method:

- ANSI C63.10: 2009, Clause 7.5

Test Summary:

Duty Cycle Measurements	

Notes: None

Deviations, Additions, or Exclusions: None

16 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.

17 RF Exposure Requirements – SAR

Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from FCC KDB 447498.

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

Test Requirement/Specification

- FCC KDB 447498

Results:

The sample tested was found to comply.

Test Data: Specific Absorbtion Rate (SAR)

RF Exposure- Specific Absorption Rate (SAR)

Project #:	**G101122982**	Test Area:	Intertek Louisville
Test Method:	FCC CFR47 Part 1.1310	Test Date:	April-2013
EUT Model #:	Lively 1.0		
EUT Serial #:	DVT101		
Manufacturer:	Hamlet, Inc.		
EUT Description:	LivelyHome System Wireless Sensor – Low-Power DSS		
Notes:	Sensor can be body-worn and/or < 20cm from user		

General SAR test reduction and exclusion guidance - KDB 447498 D01 General RF Exposure Guidance, May 28th, 2013

Standalone SAR test exclusion considerations

Unless specifically required by the *published RF exposure KDB procedures*, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding *SAR Test Exclusion Threshold* condition, listed below, is satisfied.

These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum *test separation distance* required for the exposure conditions. The minimum *test separation distance* is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.

To qualify for SAR test exclusion, the *test separation distances* applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required *published RF exposure KDB procedures*.

When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other *published RF exposure KDB procedures* must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.

Maximum conducted and radiated power should both be taken into consideration to establish the worst case aggregate maximum output power.

Test exclusion is applied to the required test channels on a channel by channel basis.

17.1.1 Test Methodology

The purpose of this document is to demonstrate the RF Exposure Safety of Radiation harmfulness to the human body for the product.

If applicable, the gain of the antenna used in this product has been declared by the manufacturer and/or taken directly from the antenna specification sheet.

EUT Operation
The software provided by Manufacturer enabled the EUT to transmit data at lowest, middle and highest channel individually.

Classification
The antenna of the product, under normal use condition, is minimum 2.1 cm away from the body of the user. A warning statement to the user for keeping at least 2.1 cm or more separation distance with the antenna should be included in users manual. This device is classified as a Portable Device.

SAR Exclusion Limit Criteria – Numeric Threshold

The following limit is from FCC KDB 447498. Refer to Appendix A of this report for details.

- RF Exposure SAR Exclusion Threshold: ≤ 3.0 (1-g head/body)

Determination of SAR Test Exclusion Threshold

Minimum Test Separation Distance

Manufacturer Statement:
"For the low power exclusion calculation here are the dimensions that set the guaranteed minimum separation distance between the user and the TX antenna:

The result of the mechanical team's review of the Lively keyfob assembly was that the smallest nominal distance between the antenna and the exterior surface was:

- 2.14mm of plastic + air gap
- There is typically 0.5mm of gap between antenna and board edge
- So the nominal separation distance is 2.14 mm + 0.5 mm = 2.64 mm
- However, the minimum distance over production variability, if all tolerance stack **worst case the absolute smallest possible distance is 2.1 mm**."

The following calculation was used to determine compliance to the above limit.

The following is from FCC KDB 447498 D01 General RF Exposure Guidance, May 28th, 2013.

1. The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] * [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity
Where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz.

Note: When the minimum *test separation distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

==========

S = (P/D) * √ f

Where:

S = SAR test exclusion threshold (1-g or 10-g)
P = max power input to the antenna (mW)
f = frequency (GHz)
D = test separation distance to the center of radiation of the antenna (cm)

Low-Power DSS 2.4GHz Radio

- Maximum conducted output power to antenna = 2.81mW
  (see test report 101122982DEN-002)
- Lowest Channel: 2.402GHz
- Highest Channel: 2.480GHz
- Minimum Test Separation Distance: 2.1mm (declared by manufacturer)

Final Calculations:

Actual minimum test distance = 2.1mm per manufacturer = 2.0mm (rounded to nearest mm). Per guideline above, when minimum test separation distance is < 5mm, a distance of 5 mm is applied to determine SAR test exclusion.

Maximum measured conducted output power = 2.81mW = 3.0mW (rounded to nearest mW - per guideline)

Using worst-case 1-g head/body test exclusion limit (numeric threshold) of 3.0

Low Channel
{Max Power of channel mW) / (Min test separation distance) * √fGHz ≤ 3.0
(3mW / 5mm) * √2.402 = 0.93

High Channel
{Max Power of channel mW) / (Min test separation distance) * √fGHz ≤ 3.0
(3mW / 5mm) * √2.480 = 0.94

Result:

Therefore, SAR test exclusion applies since the calculated 0.94 ≤ the numeric threshold of 3.0.

Appendix A – Reference Only to determine appropriate calculation

KDB 447498 D01 General RF Exposure Guidance, May 28th, 2013

1. The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] * [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity

Where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz.

Note: When the minimum *test separation distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2. At 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B:26
Case 1: [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance – 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz

Case 2: [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance – 50 mm) * 10] mW at > 1500 MHz and ≤ 6 GHz

3. At frequencies below 100 MHz, the following may be considered for SAR test exclusion, and as illustrated in Appendix C:27
Case 1: The power threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by [1 + log(100/f(MHz))] for *test separation distances* > 50 mm and < 200 mm

Case 2: The power threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by ½ for *test separation distances* ≤ 50 mm

Case 3: SAR measurement procedures are not established below 100 MHz. When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any test results to be acceptable.

4. For Simultaneous transmission SAR test exclusion considerations, refer to Section 4.3.2

18 Measurement Uncertainty

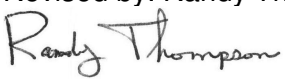
The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

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 ±	Notes
Radiated emissions, 10kHz to 1000 MHz	4.4 dB	
Radiated emissions, 1 to 18 GHz	4.7 dB	
AC mains Conducted emissions, 9kHz to 30 MHz	3.14 dB	

19 Revision History

Revision Level	Date	Report Number	Notes
0	05/17/2013	101122982DEN-002	Original Issue
1	06/10/2013	101122982DEN-002	Revised per TCB Review 1. Corrected test methodology references, page 24 2. Removed all references to Bluetooth LE technology. Changed to 2.4GHz low-power sensor DSS technology Revised by: Randy Thompson  Reviewed by: Michael Spataro 
2	06/14/2013	101122982DEN-002	Revised per TCB Review 1. added SAR data/calculations, pages 75-79 Revised by: Randy Thompson  Reviewed by: Michael Spataro