

TEST REPORT

Report Number: 100946804DEN-001

Project Number: G100946804

Report Issue Date: 12/20/2012

Product Designation: EN1252

Standards: FCC title 47 CFR part 15 subpart C
IC RSS-210 Issue 8: 2010
IC RSS-Gen Issue 3: 2010
AS/NZS 4268:2008

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

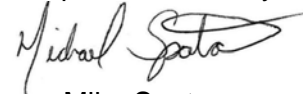
Client:
Inovonics Wireless Corp.
397 S. Taylor Ave.
Louisville, CO 80027

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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 Passed the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2 Test Summary

Section	Test full name	Test date	Result
5	Radiated Emissions – Output power of the Fundamental & Harmonics of the Fundamental - FCC 247(b)(2) (d)/15.205 Covers RSS-210 A8.4(1)	12/12/2012 12/26/2012	Pass
6	Restricted Band Edge – FCC 15.205 Covers RSS-210 A8.5/RSS-GEN	12/19/2012	Pass
7	Radiated Emissions – Unintentional & Spurious - FCC 15.247(d) / FCC 15.209/109 Covers RSS-210 A8.5/RSS-GEN	12/13/2012 12/19/2012	Pass
8	20 dB Bandwidth – FCC 15.247 (a)(1)(i) Covers RSS-210 A8.1(c)	11/8/2012	Pass
9	Carrier Frequency Separation – FCC 15.247 (a)(1) Covers RSS-210 A8.1(b)	11/8/2012, 1/15/2013	Pass
10	Number of Hopping Frequencies – FCC 15.247 (a)(1)(i) Covers RSS-210 A8.1(c)	11/8/2012	Pass
11	Time of Occupancy (Dwell Time) – FCC 15.247 (a)(1)(i) Covers RSS-210 A8.1(c)	11/8/2012, 1/15/2013	Pass
12	Occupied Bandwidth (OBW) – RSS Gen: 2010	11/8/2012 1/15/2013	Pass
13	AC Conducted Emissions – FCC 15.207 Covers RSS-Gen 7.2.4	-----	N/A

Notes:

- 1) FCC CFR47 Part 15.31: Measurement Standards: In any case where the device is powered off a battery, a fresh battery was used during test.
- 2) Only the high channel of the transmitter at 927.58 MHz falls within the frequency band specified in AS/NZS 4268:2012

3 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
High-Power Universal Transmitter	Inovonics	EN1252	Intentional & Unintentional – SN: 91017145 All bench testing – SN: 910171146

Receive Date:	11/5/2012
Received Condition:	Good
Type:	Production Sample

Description of Equipment Under Test (provided by client)
Dual Input High Power Universal Transmitter

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
(Internal Battery Only)	NA	NA	NA

Operating modes of the EUT: Intentional Tx Testing

No.	Descriptions of EUT Exercising
1	EUT shall be powered by an internal battery, energized as intended & programmed to broadcast continuously at one of three channel frequencies, low (902.4MHz), center (914.8MHz) and high (927.6MHz).
2	

Operating modes of the EUT: Unintentional Rx Testing

No.	Descriptions of EUT Exercising
1	EUT shall be powered by an internal battery, energized as intended & programmed to broadcast continuous alarm mode.

Clock Frequencies of the EUT:

No.	Descriptions of EUT Exercising
1	32.768kHz – micro-controller clock.
2	30.0MHz – radio clock frequency
3	2MHz ~ 3MHz switching regulator for power amplifier (PA) circuit.

3.1 Product Photo:

Product Tested – Model: EN1252



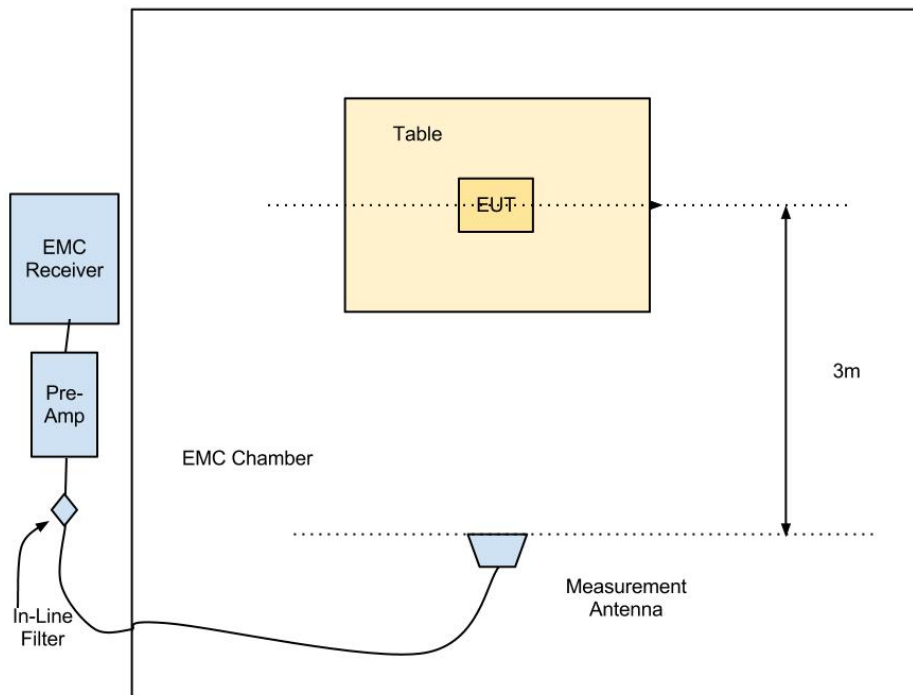
Product Back Panel Ports/Connectors

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

4.1 Method:

The EUT is a stand-alone device powered by an internal battery. No external support cables are necessary for normal operation.

4.2 EUT Block Diagram:



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Support Data:

ID	Description/ Function	Shield Type	Length	Connector	Connection	Ferrites
NA	Not Applicable (NA)	NA	NA	NA	NA	NA

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Not Applicable (NA)	NA	NA	NA

General notes:

1. Product has no I/O or signal cables.
2. Product did not require any support equipment.

5 Radiated Emissions – Intentional Radiators: Output Power - Fundamental & Harmonics of the Fundamental – FCC 15.247

5.1 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.

5.2 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	RHODE & SCHWARZ	ESU 26	100265	1/11/2012	1/10/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	2/28/2012	2/27/2013
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	6/7/2012	6/7/2013
18901	RF Pre-Amplifier (8-16 GHz)	Avantek	AWT-18037	1002	6/7/2012	6/7/2013
18906	Amplifier (1-4 GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	6/7/2012	6/7/2013
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	6/6/2012	6/6/2013
19937	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-2	3/7/2012	3/7/2013
DEN-060	1GHz low Pass Filter	Mini-Circuits	VHF-1300+	3 1022	11/06/2012	11/06/2013
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBU	VBU

5.3 Results:

The sample tested was found to Comply.

5.4 Setup Photographs:

Front



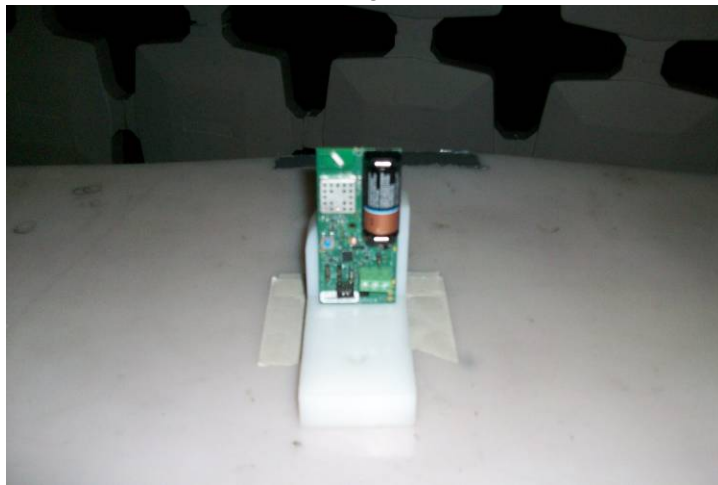
Rear



Axis 1



Axis 2



Axis 3



Antenna Setup (30-1000 MHz)



Antenna Setup (1-10 GHz)



5.5 Test Data:

**Field Strength Measurements
(Fundamental & Spurious)**

Test Report #: <u>12/13/2012, 12/26/12</u>	Test Area: <u>CC1</u>	Temperature: <u>23.0, °C 21.9</u>
Test Method: <u>N/A</u>	Test Date: <u>12/13/2012, 12/26/2012</u>	Relative Humidity: <u>25.0, % 20.5</u>
EUT Model #: <u>EN1252</u>	EUT Power: <u>3.3VDC Battery</u>	Air Pressure: <u>832.1, kPa 823.0</u>
EUT Serial #: _____		

EUT Serial #: _____

Manufacturer: Inovonics

EUT Description: _____

Notes: _____

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

A Duty Cycle Correction (DTCF) of 13.66dB was used for Harmonics. This amount was added to the Limits.

Fundamental

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 247	(MHz)

Limit = 125dBuV/m (Gain = 4)

Axis 1 - Fundamental Low Channel (Flat on Table)

902.3904	84.74	Pk	2.10	21.50	0.00	0.00	108.34	V	1.59	26.0	- 16.66	1.000
902.3904	92.96	Pk	2.10	21.50	0.00	0.00	116.56	H	1.53	117.0	- 8.44	1.000

Axis 2 - Low Channel (Vertical)

902.3904	81.36	Pk	2.10	21.50	0.00	0.00	104.96	H	2.19	185.9	- 20.04	1.000
902.3904	90.29	Pk	2.10	21.50	0.00	0.00	113.89	V	1.17	256.4	- 11.11	1.000

Axis 3 - Low Channel (Vertical & rotated 90 degrees CW)

902.3904	84.29	Pk	2.10	21.50	0.00	0.00	107.89	V	1.13	152.4	- 17.11	1.000
902.3904	90.24	Pk	2.10	21.50	0.00	0.00	113.84	H	1.57	199.7	- 11.16	1.000

Axis 1 - Fundamental - Mid Channel

914.7888	91.30	Pk	2.11	21.79	0.00	0.00	115.20	H	1.00	120.0	- 9.80	1.000
914.7888	82.88	Pk	2.11	21.79	0.00	0.00	106.78	V	1.68	32.6	- 18.22	1.000

Axis 2 - Mid Channel

914.7888	83.54	Pk	2.11	21.79	0.00	0.00	107.44	H	1.47	202.1	- 17.56	1.000
914.7888	91.11	Pk	2.11	21.79	0.00	0.00	115.01	V	1.18	1.1	- 9.99	1.000

Axis 3 - Mid Channel

914.7888	84.86	Pk	2.11	21.79	0.00	0.00	108.76	V	1.18	154.3	- 16.24	1.000
914.7888	90.31	Pk	2.11	21.79	0.00	0.00	114.21	H	2.36	176.7	- 10.79	1.000

Axis 1 - High Channel

927.5888	89.56	Pk	2.13	21.94	0.00	0.00	113.63	H	1.00	112.6	- 11.37	1.000
927.5888	77.90	Pk	2.13	21.94	0.00	0.00	101.97	V	1.27	32.0	- 23.03	1.000

Axis 2 - High Channel

927.5888	82.13	Pk	2.13	21.94	0.00	0.00	106.20	H	2.13	192.4	- 18.80	1.000
927.5888	90.87	Pk	2.13	21.94	0.00	0.00	114.94	V	1.16	150.5	- 10.06	1.000

Axis 3 - High Channel

927.5888	84.92	Pk	2.13	21.94	0.00	0.00	108.99	V	1.14	148.2	- 16.01	1.000
927.5888	89.03	Pk	2.13	21.94	0.00	0.00	113.10	H	2.36	203.1	- 11.90	1.000

Harmonics

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(Yellow cells indicate restricted bands)

FREQ	LEVEL	DET	CABLE	ANT	PRE-AMP	ATTEN	DTCF	FINAL	POL	HGT	AZ	LIMIT	DELTA2	RBW
<u>MHz</u>	<u>dBuV</u>	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	- [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209	15.209 >1GHz	(MHz)

Axis 1 worst-case (flat on table)

Harmonics Testing-1GHz to 4GHz

Low Channel

1804.78	59.61	Pk	3.02	27.32	36.89	0.71	13.66	40.11	H	1.89	145.6	74.9	-34.79	1
1804.78	58.52	Pk	3.02	27.32	36.89	0.71	13.66	39.02	V	1.65	249.2	74.9	-35.88	1
2707.17	69.28	Pk	3.76	29.31	37.35	0.5	13.66	51.84	H	1.27	201.8	54	-2.16	1
2707.17	62.45	Pk	3.76	29.31	37.35	0.5	13.66	45.01	V	2.09	273	54	-8.99	1
3609.56	52.2	Pk	4.42	31.99	37.68	0.39	13.66	37.66	H	1.2	158.9	54	-16.34	1
3609.56	50.87	Pk	4.42	31.99	37.68	0.39	13.66	36.33	V	1.26	320	54	-17.67	1
4511.95	48.82	Pk	4.99	32.76	39.75	0	13.66	33.16	H	1.54	66.1	54	-20.84	1
4511.95	50.08	Pk	4.99	32.76	39.75	0	13.66	34.42	V	1.82	153.7	54	-19.58	1
5414.34	43.47	Pk	5.48	34.6	38.47	0	13.66	31.42	H	1.6	83	54	-22.58	1
5414.34	43.22	Pk	5.48	34.6	38.47	0	13.66	31.17	V	1.78	260	54	-22.83	1
6316.73	47.9	Pk	5.95	35.03	39.84	0	13.66	35.38	H	1.86	356.7	74.9	-39.52	1
6316.73	51.02	Pk	5.95	35.03	39.84	0	13.66	38.5	V	1.4	0.6	74.9	-36.4	1
7219.12	49.16	Pk	6.41	36.41	39.47	0	13.66	38.85	H	2.43	362	74.9	-36.05	1
7219.12	46.12	Pk	6.41	36.41	39.47	0	13.66	35.81	V	1.27	0	74.9	-39.09	1
8121.51	49.02	Pk	6.89	36.95	46.86	0	13.66	32.34	H	1.64	27.9	54	-21.66	1
8121.51	47.62	Pk	6.89	36.95	46.86	0	13.66	30.94	V	1.46	292.5	54	-23.06	1
9023.9	51.22	Pk	7.34	37.27	47.9	0	13.66	34.27	H	1.58	30.8	54	-19.73	1
9023.9	49.34	Pk	7.34	37.27	47.9	0	13.66	32.39	V	1.12	151.6	54	-21.61	1

Harmonics - Mid Channel

1829.58	56.28	Pk	3.04	27.41	36.93	0.69	13.66	36.83	H	1.82	114.6	76.7	-39.87	1
1829.58	54.85	Pk	3.04	27.41	36.93	0.69	13.66	35.4	V	1.9	267.8	76.7	-41.3	1
2744.37	67.07	Pk	3.79	29.36	37.32	0.49	13.66	49.73	H	1.51	199.8	54	-4.27	1
2744.37	62.27	Pk	3.79	29.36	37.32	0.49	13.66	44.93	V	1.69	250.6	54	-9.07	1
3659.16	49.56	Pk	4.45	32.08	37.78	0.39	13.66	35.04	H	1.28	359.9	54	-18.96	1
3659.16	49.63	Pk	4.45	32.08	37.78	0.39	13.66	35.11	V	1.31	355.7	54	-18.89	1
4573.95	46.64	Pk	5.03	32.74	39.59	0	13.66	31.16	H	1.36	329.1	54	-22.84	1
4573.95	47.13	Pk	5.03	32.74	39.59	0	13.66	31.65	V	1.34	144.7	54	-22.35	1
5488.74	43.99	Pk	5.52	34.6	38.58	0	13.66	31.87	H	1.32	359.9	76.7	-44.83	1
5488.74	46.18	Pk	5.52	34.6	38.58	0	13.66	34.06	V	1.4	290.1	76.7	-42.64	1
6403.53	46.14	Pk	5.99	34.95	40.04	0	13.66	33.38	H	1.41	176.2	76.7	-43.32	1
6403.53	47.44	Pk	5.99	34.95	40.04	0	13.66	34.68	V	1.35	5.7	76.7	-42.02	1
7318.32	46.82	Pk	6.47	36.74	39.22	0	13.66	37.15	H	1.82	0.2	54	-16.85	1
7318.32	43.97	Pk	6.47	36.74	39.22	0	13.66	34.3	V	1.68	313.9	54	-19.7	1
8233.11	46.21	Pk	6.95	36.93	46.96	0	13.66	29.47	H	1.43	152.1	54	-24.53	1
8233.11	46.58	Pk	6.95	36.93	46.96	0	13.66	29.84	V	1.21	2.8	54	-24.16	1
9147.9	53.03	Pk	7.4	37.26	48.06	0	13.66	35.97	H	1.6	38.8	54	-18.03	1
9147.9	51.6	Pk	7.4	37.26	48.06	0	13.66	34.54	V	1.71	241.5	54	-19.46	1

Harmonics - High Channel

1855.18	58.03	Pk	3.07	27.5	36.96	0.68	13.66	38.66	H	1.71	150.6	71.9	-33.24	1
1855.18	54.55	Pk	3.07	27.5	36.96	0.68	13.66	35.18	V	1.8	118.4	71.9	-36.72	1

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FREQ	LEVEL	DET	CABLE	ANT	PRE-AMP	ATTEN	DTCF	FINAL	POL	HGT	AZ	LIMIT	DELTA2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	- [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209	15.209 >1GHz	(MHz)
2782.77	62.56	Pk	3.82	29.42	37.36	0.49	13.66	45.27	H	1.22	195.9	54	-8.73	1
2782.77	57.77	Pk	3.82	29.42	37.36	0.49	13.66	40.48	V	1.67	216.5	54	-13.52	1
3710.36	49.62	Pk	4.48	32.22	37.76	0.38	13.66	35.28	H	1.46	102.5	54	-18.72	1
3710.36	49.52	Pk	4.48	32.22	37.76	0.38	13.66	35.18	V	1.36	80	54	-18.82	1
4637.95	45.16	Pk	5.07	32.87	39.41	0	13.66	30.03	H	1.15	257.8	54	-23.97	1
4637.95	45.38	Pk	5.07	32.87	39.41	0	13.66	30.25	V	1.15	33.9	54	-23.75	1
5565.54	43.79	Pk	5.56	34.53	38.68	0	13.66	31.54	H	1.74	355.2	71.9	-40.36	1
5565.54	43.68	Pk	5.56	34.53	38.68	0	13.66	31.43	V	1.59	0	71.9	-40.47	1
6493.13	45.29	Pk	6.04	34.91	39.98	0	13.66	32.6	H	1	285.2	71.9	-39.3	1
6493.13	44.78	Pk	6.04	34.91	39.98	0	13.66	32.09	V	1.37	359.9	71.9	-39.81	1
7420.72	43.79	Pk	6.52	36.81	39.22	0	13.66	34.24	H	1.88	358.9	54	-19.76	1
7420.72	42.97	Pk	6.52	36.81	39.22	0	13.66	33.42	V	1.2	0	54	-20.58	1
8348.31	47.64	Pk	7.01	37.02	47.08	0	13.66	30.93	H	1.37	147	54	-23.07	1
8348.31	47.52	Pk	7.01	37.02	47.08	0	13.66	30.81	V	1.13	11.8	54	-23.19	1
9275.9	50.65	Pk	7.46	37.37	48.21	0	13.66	33.61	H	1.33	24.3	71.9	-38.29	1
9275.9	50.15	Pk	7.46	37.37	48.21	0	13.66	33.11	V	1.2	179.6	71.9	-38.79	1

Example calculation for Intentional Radiated Emissions:

Measured Level	+	Transducer, Cable Loss Pre-Amplifier	=	Corrected Reading	-	Duty Cycle Correction	=	FINAL Measurement	-	Specification Limit	=	Delta from Specification Limit
(dB μ V)		(dB)		(dB μ V/m)		(dB μ V/m)		(dB μ V/m)		(dB μ V/m)		
24.0		14.9		38.9		10.0		28.9		40.0		-11.1

Conversion of RF Port Output Power of the Fundamental Limit to Radiated Field Strength Limit

When limits are defined as conducted port power measurements and the product has an integral antenna, radiated field strength tests to demonstrate compliance are acceptable per FCC 15.247.

The following equation was used to convert RF Port Power (Watts) limit into a Radiated Field Strength (dB μ V/m) limit:

$$P [W] = \frac{(E*d)^2}{30G}$$

Therefore:

$$E [V/m] = \frac{\sqrt{(30PG)}}{d}$$

Power Limit Fundamental Frequency = 250mW => E = 125 dB μ V/m

Where:

E = Measured Field Strength in V/m (converted to dB μ V/m in test data)

P = 250mW Fundamental Limit

G = Numeric Gain of transmitting antenna over an ideal isotropic radiator = 4

d = EUT-to-Antenna Test Distance = 3-meters

Duty Cycle Correction Factor

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

The plots in section 11 (Dwell Time) show that the max duty cycle is 21mS per 100mS period (0.21%) yielding 13.55dB correction.

Notes:

- 1) The device was measured at 3 meters.
- 2) The device was placed on a turntable 80 cm high, it was rotated 360 degrees and the measurement antenna was raised and lowered between 1 and 4 meters to maximize emissions from this device.

6 Restricted Band Edge – FCC 15.205

6.1 Method

Unless otherwise stated no deviations were made from ANSI C63.10 and FCC public notice DA 00-705.

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

6.2 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	RHODE & SCHWARZ	ESU 26	100265	1/11/2012	1/10/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	2/28/2012	2/27/2013
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	6/7/2012	6/7/2013
18901	RF Pre-Amplifier (8-16 GHz)	Avantek	AWT-18037	1002	6/7/2012	6/7/2013
18906	Amplifier (1-4 GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	6/7/2012	6/7/2013
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	6/6/2012	6/6/2013
19937	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-2	3/7/2012	3/7/2013

SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBU	VBU
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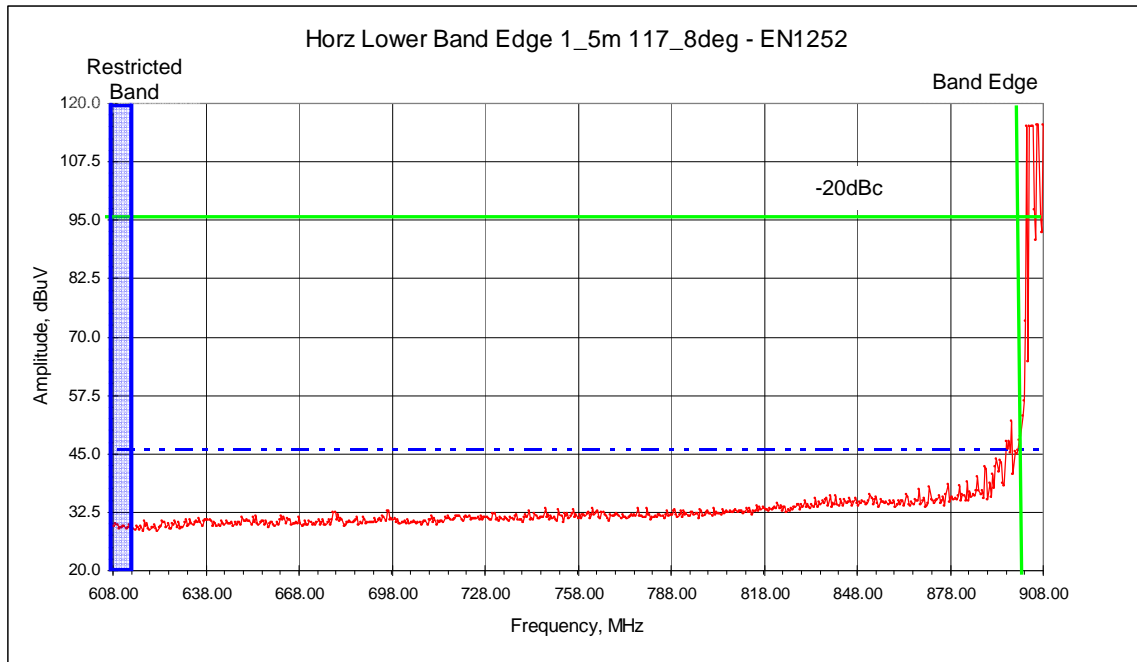
18897	Magnetic loop	EMCO	6502	9205-2738	11/29/2012	11/29/2013
-------	---------------	------	------	-----------	------------	------------

6.3 Results:

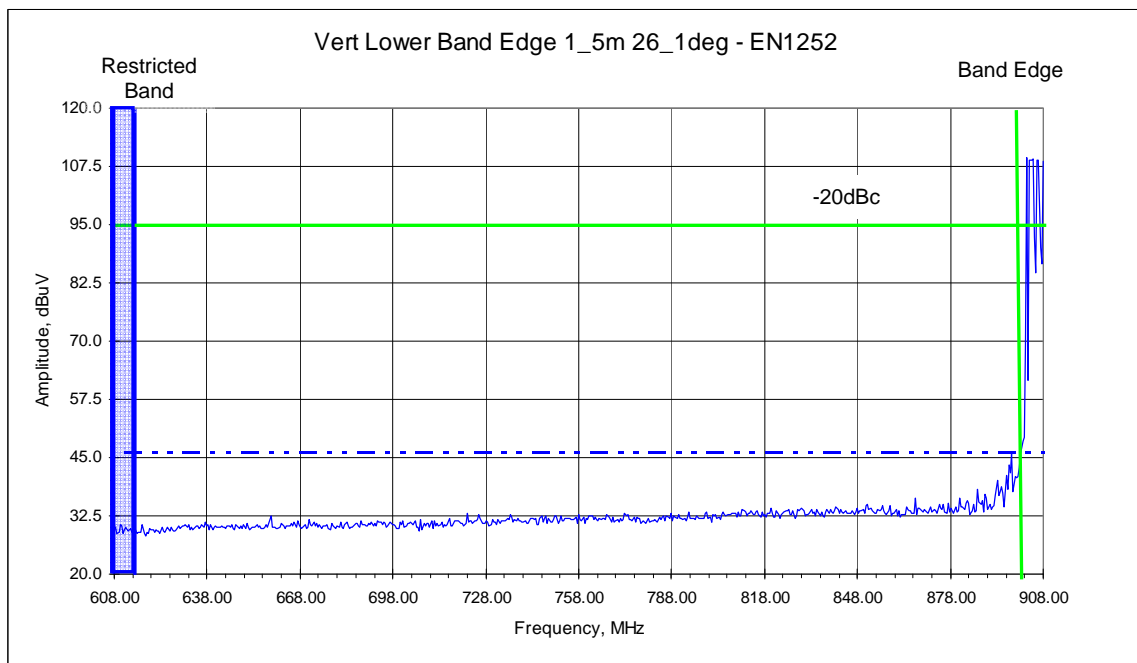
The sample tested was found to Comply.

6.4 Plots:

Lower Band Edges

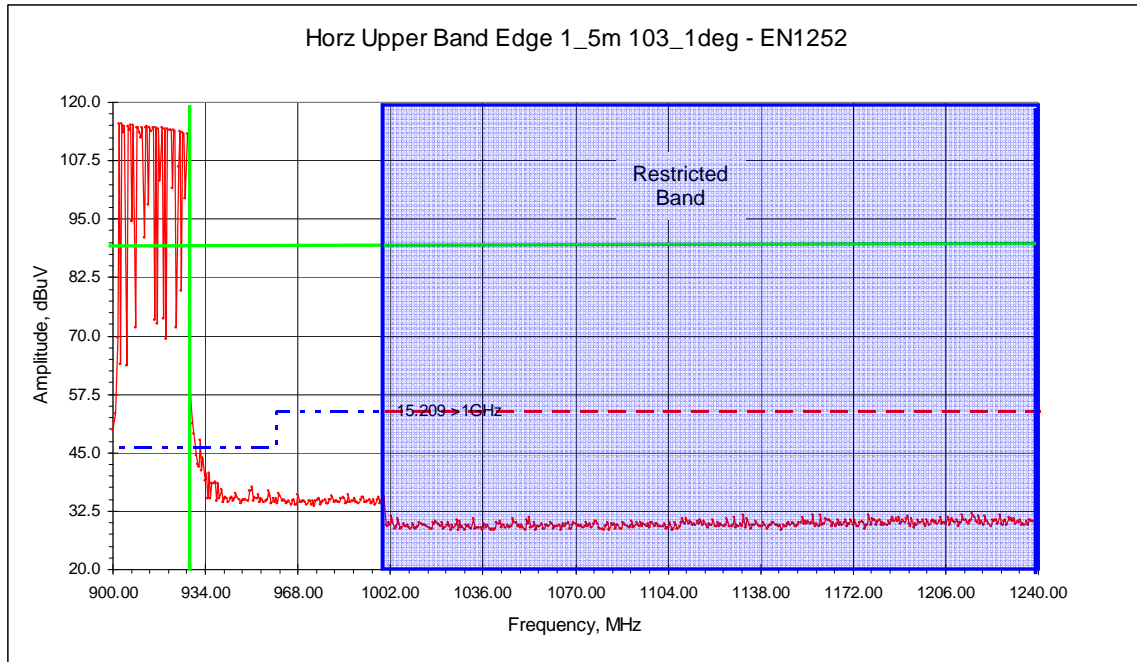


Actual measurement at Lower Band Edge (902MHz) = 56.38dBuV/m (-39.08dB below -20dBc)

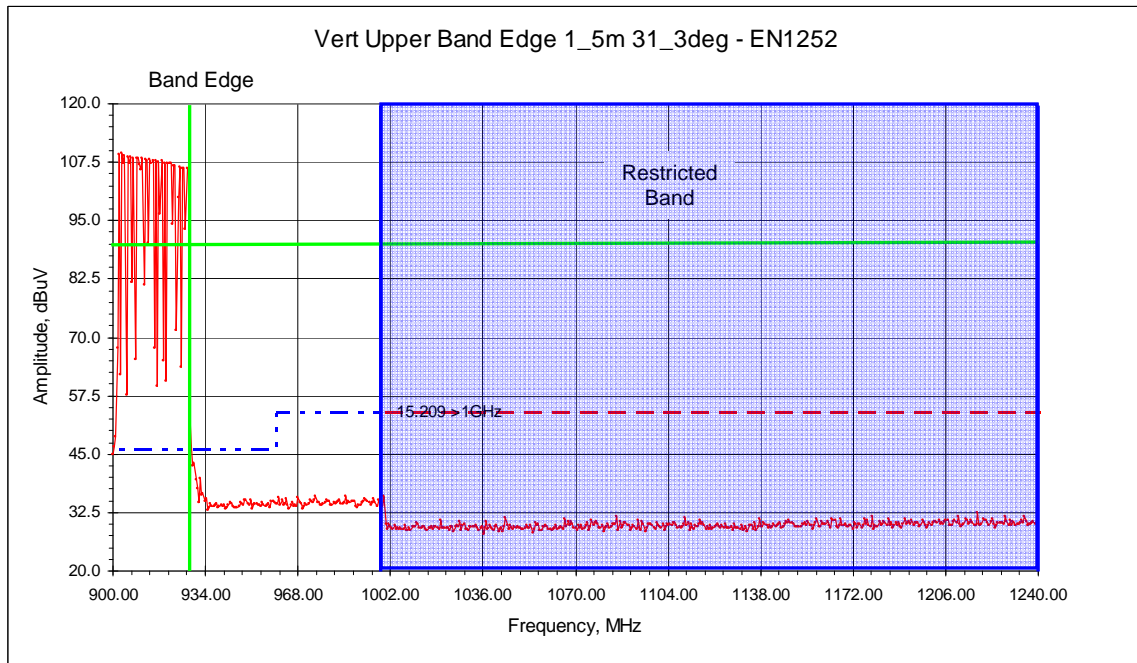


Actual measurement at Lower Band Edge (902MHz) = 49.26dBuV/m (-40.17dB below -20dBc)

Upper Band Edges



Actual measurement at Upper Band Edge (928MHz) = 58.96dBuV/m (-36.35dB below -20dBc)



Actual measurement at Upper Band Edge (928MHz) = 52.19dBuV/m (-37.13dB below -20dBc)

Notes:

- 1) The device was measured at 3 meters.
- 2) The device was placed on a turntable 80 cm high, it was rotated 360 degrees and the measurement antenna was raised and lowered between 1 and 4 meters to maximize emissions from this device.

7 Radiated Emissions Unintentional & Spurious

7.1 Method

Unless otherwise stated no deviations were made from ANSI C63.10 and FCC public notice DA 00-705.

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

7.2 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	RHODE & SCHWARZ	ESU 26	100265	1/11/2012	1/10/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	2/28/2012	2/27/2013
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	6/7/2012	6/7/2013
18901	RF Pre-Amplifier (8-16 GHz)	Avantek	AWT-18037	1002	6/7/2012	6/7/2013
18906	Amplifier (1-4 GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	6/7/2012	6/7/2013
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	6/6/2012	6/6/2013
19937	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-2	3/7/2012	3/7/2013

SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 3.0	VBU	VBU
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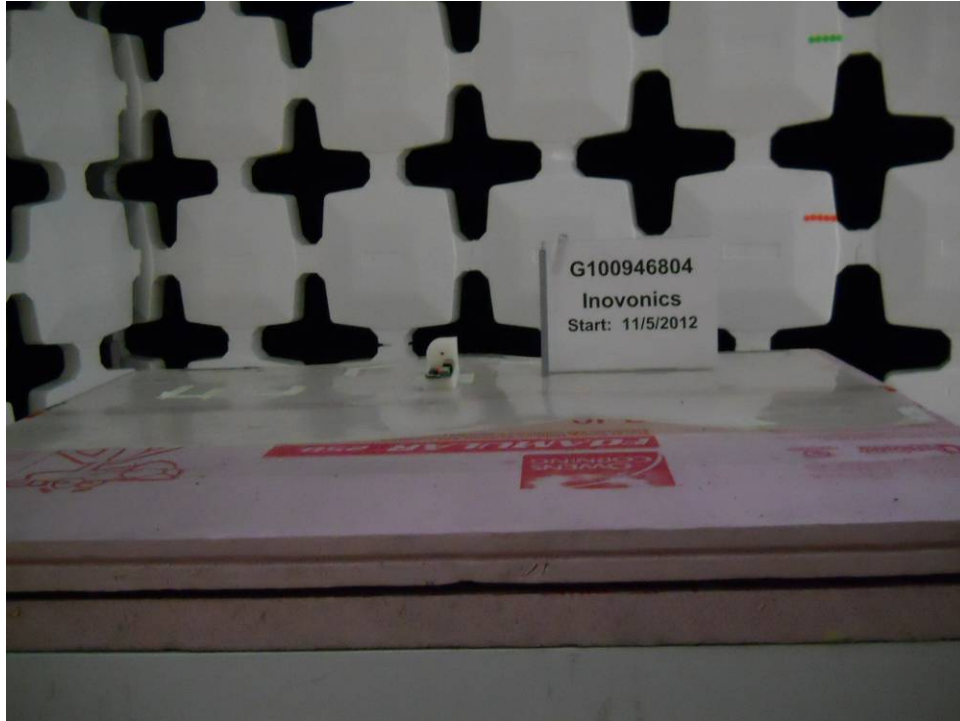
18897	Magnetic loop	EMCO	6502	9205-2738	11/29/2012	11/29/2013
-------	---------------	------	------	-----------	------------	------------

7.3 Results:

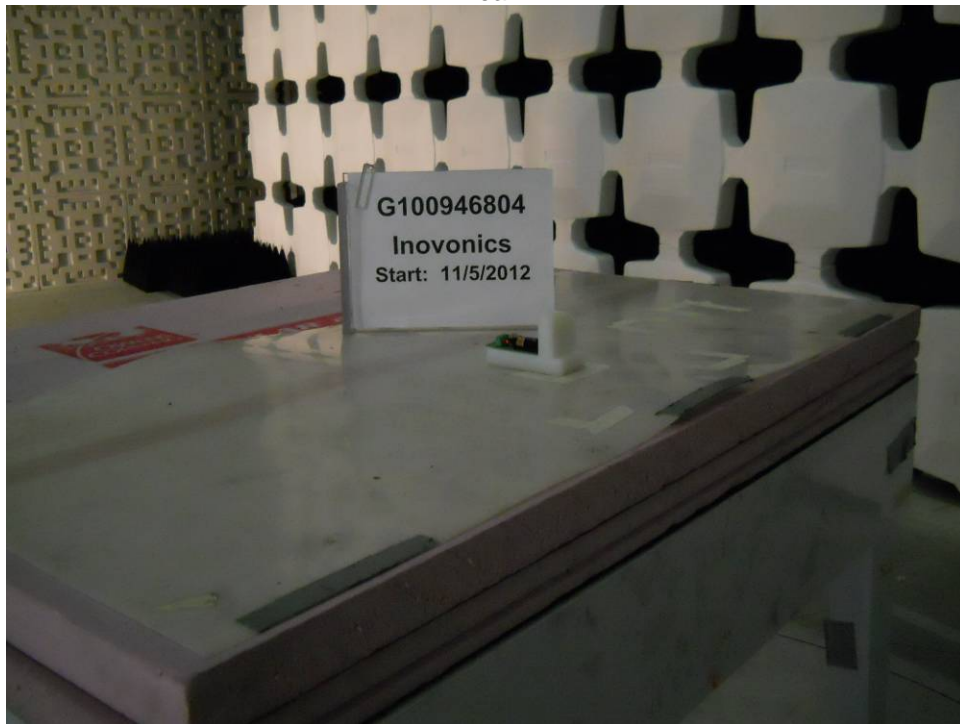
The sample tested was found to Comply.

7.4 Setup Photographs:

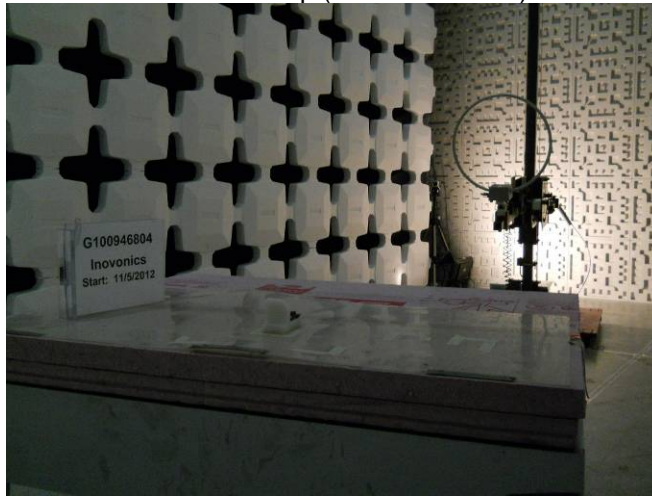
Front



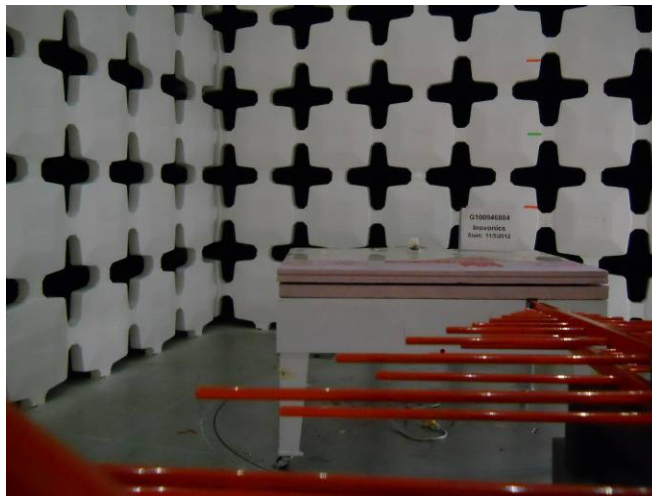
Rear



Antenna Setup (10kHz – 30MHz)



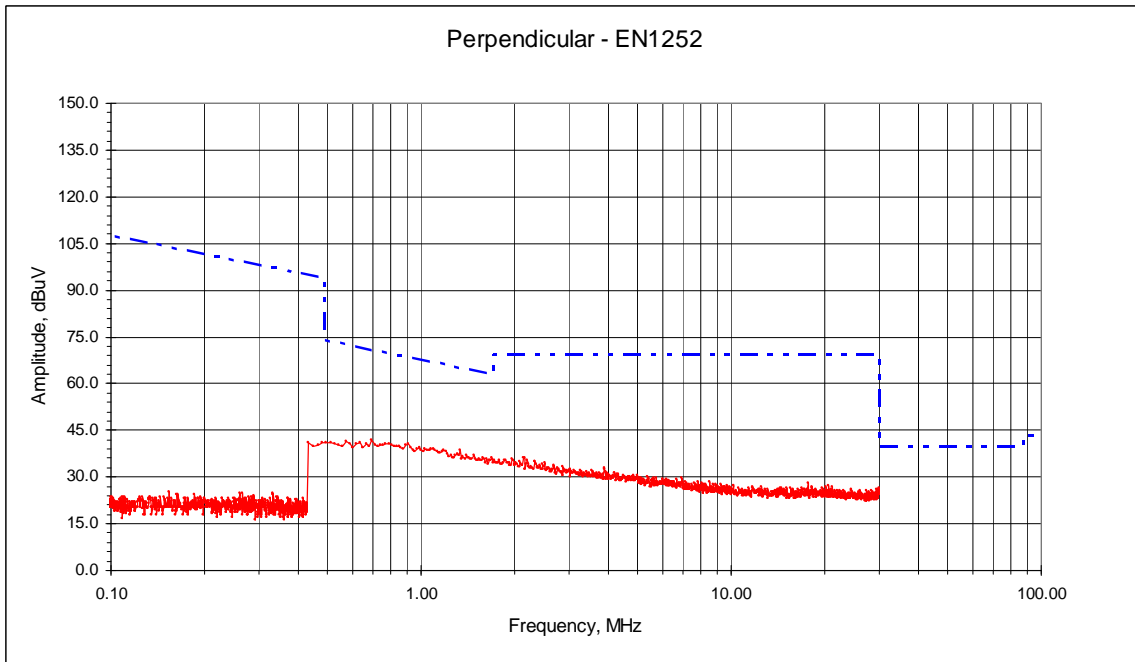
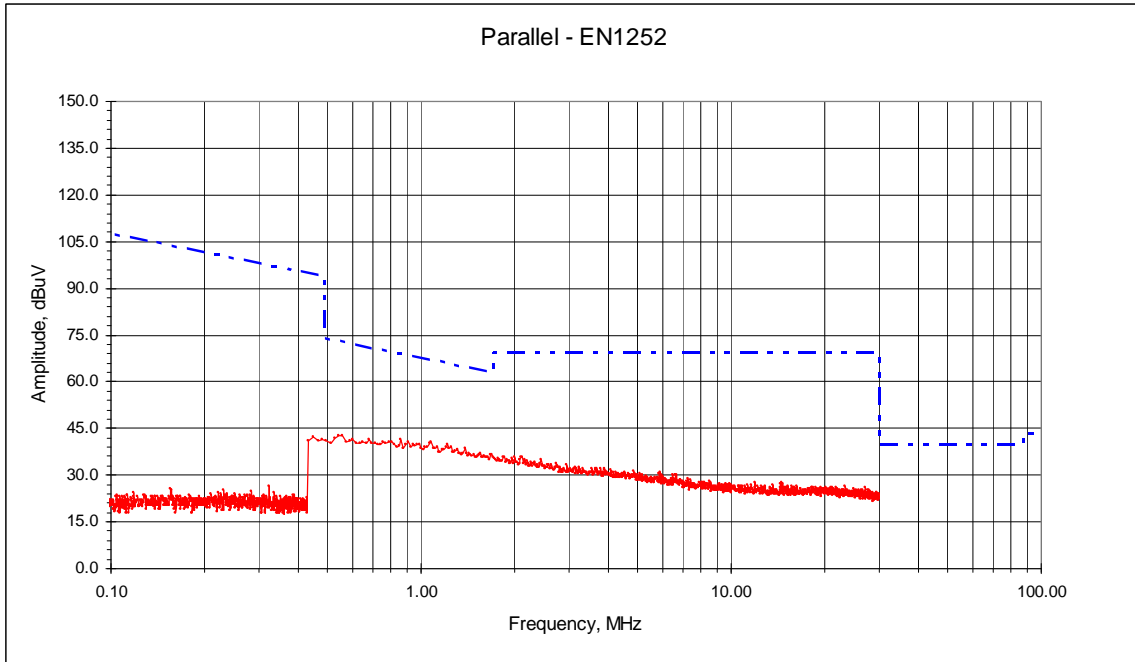
30-1000 MHz

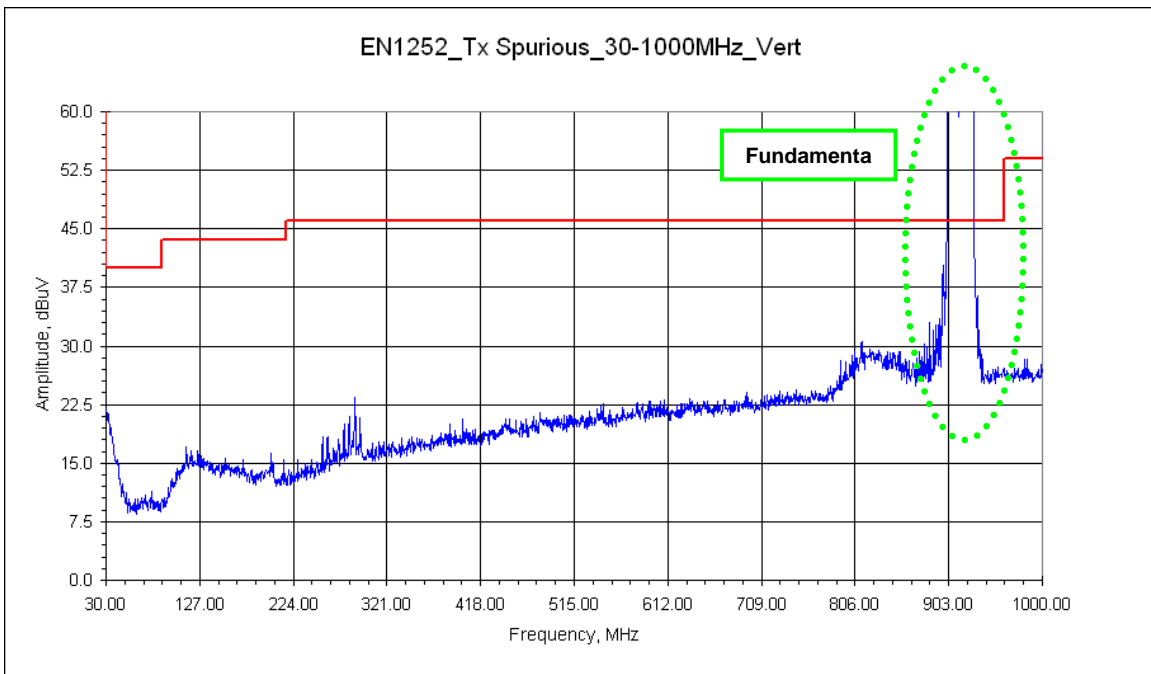
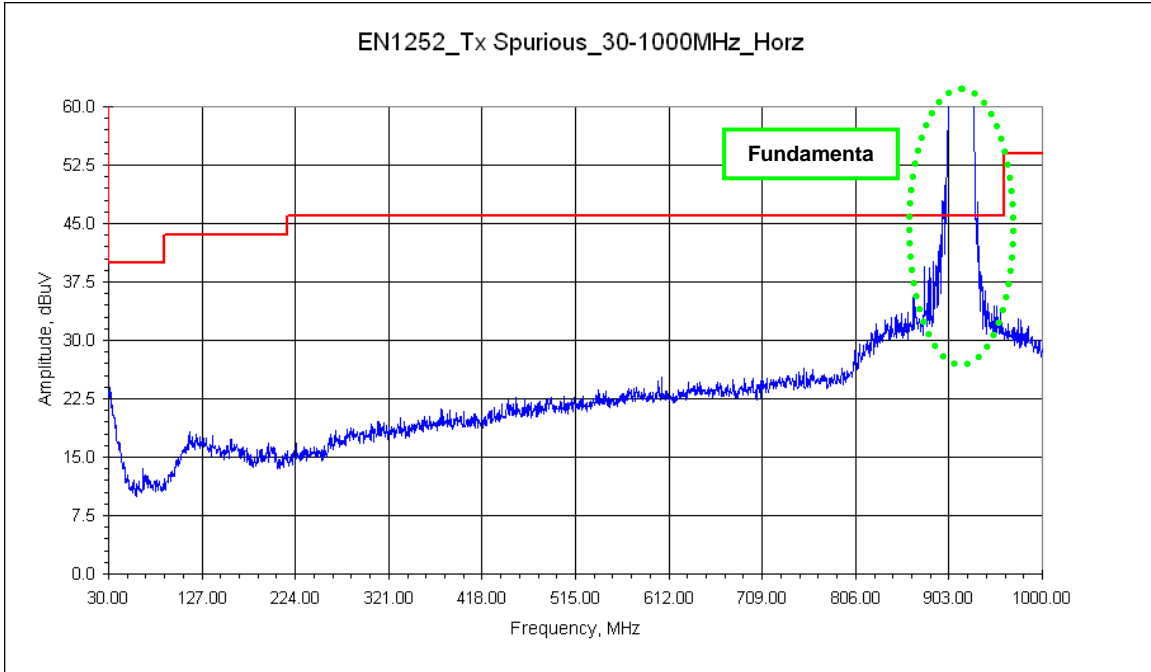


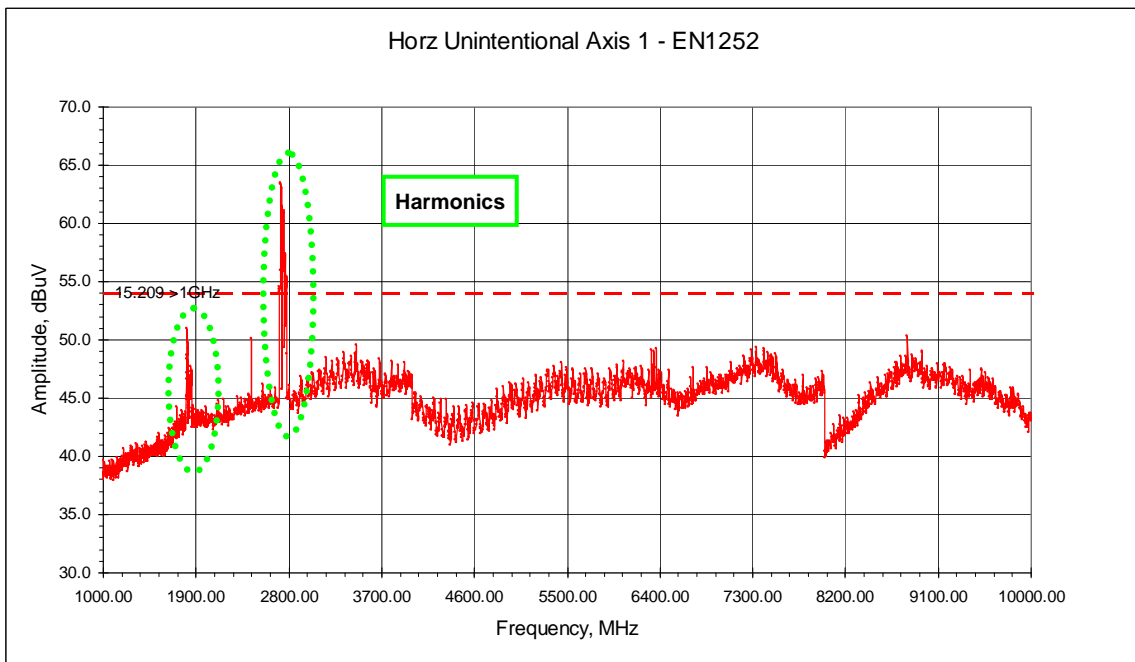
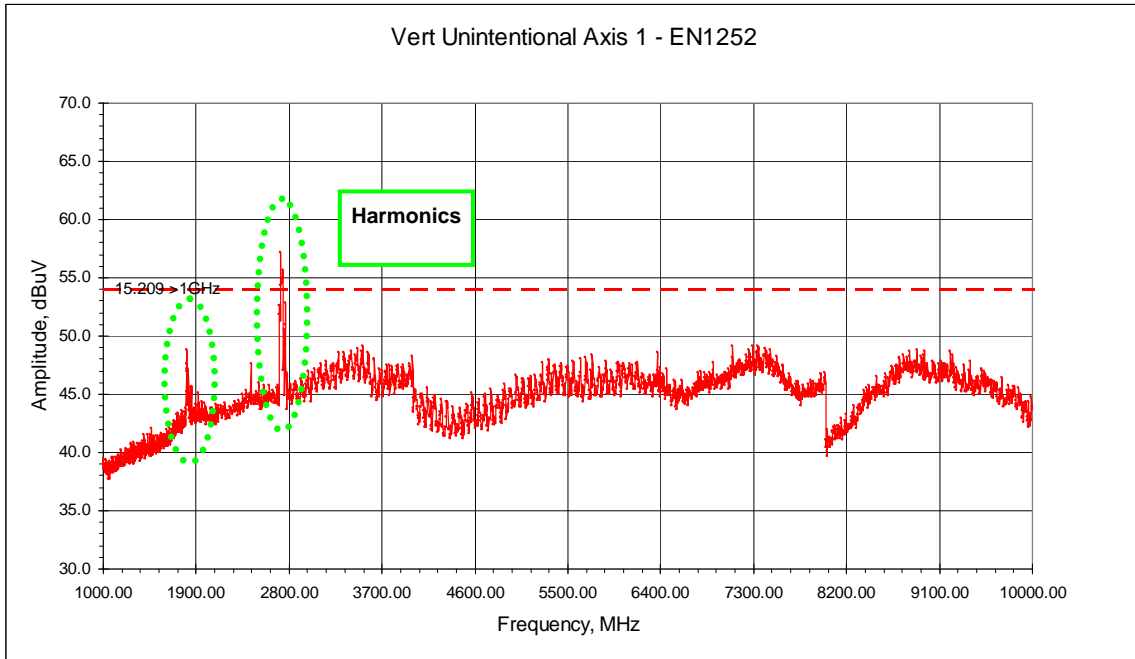
1-10 GHz



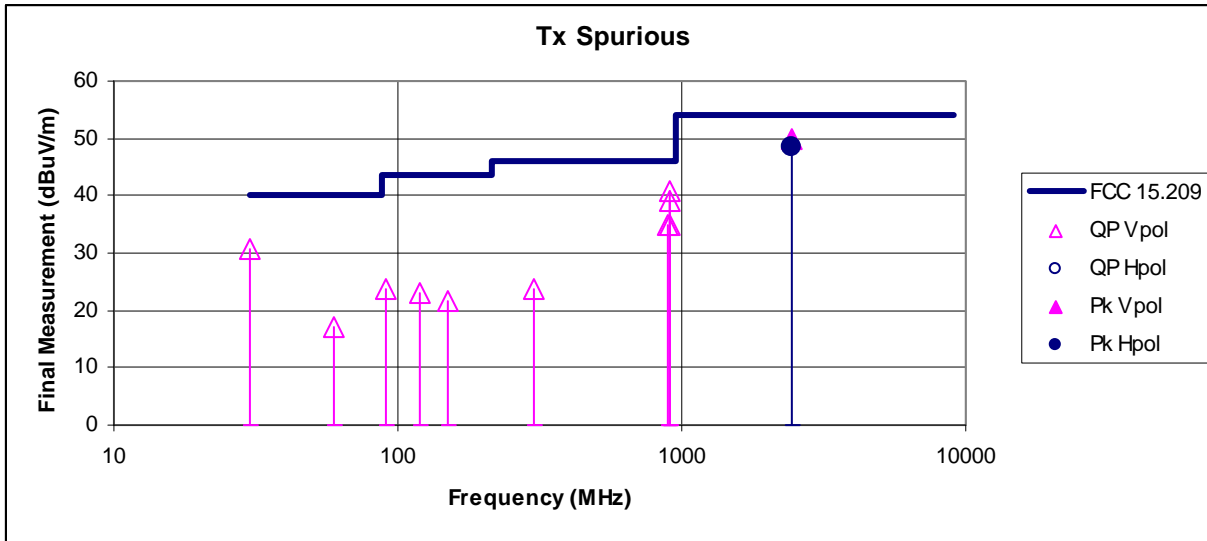
7.5 Plots:







Final Measurement Plots



7.6 Data:

Radiated Electromagnetic Emissions

Test Report #: G100946804	Test Area: CC1 Radiated	Temperature: 23.0 °C
Test Method: EN55022	Test Date: 12/13/2012 12/19/2012	Relative Humidity: 25.0 %
EUT Model #: EN1252	EUT Power: 3V Battery	Air Pressure: 832.1 kPa

EUT Serial #: _____
 Manufacturer: Inovonics

EUT Description: _____

Notes: For testing <150kHz the CISPR QP bandwidth settings were used - 200Hz

For testing 150kHz to 30MHz the CISPR QP bandwidth settings were used - 9kHz

For testing >30MHz the CISPR QP bandwidth settings were used - 120kHz

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

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	15.209	(MHz)

Start Tx Spurious - 30MHz to 1000MHz

No receiver in device

Using internal PA

30.0000	9.14	Qp	0.40	21.30	0.00	0.00	30.84	V	1.00	219.6	- 9.16	0.120
60.0000	8.62	Qp	0.77	7.70	0.00	0.00	17.09	V	1.00	97.0	- 22.91	0.120
90.0000	14.73	Qp	0.77	8.10	0.00	0.00	23.60	V	1.00	181.5	- 19.92	0.120
120.0000	8.64	Qp	0.77	13.50	0.00	0.00	22.91	V	1.00	195.4	- 20.61	0.120
150.0000	8.29	Qp	0.82	12.40	0.00	0.00	21.51	V	1.00	0.0	- 22.01	0.120
300.0000	9.13	Qp	1.19	13.40	0.00	0.00	23.71	V	1.00	165.1	- 22.31	0.120
899.7300	11.20	Qp	2.09	21.50	0.00	0.00	34.79	V	1.23	140.6	- 11.23	0.120
901.0000	15.45	Qp	2.10	21.50	0.00	0.00	39.05	V	1.75	208.7	- 6.97	0.120
901.8800	17.09	Qp	2.10	21.50	0.00	0.00	40.69	V	1.75	208.7	- 5.33	0.120
901.7821	11.26	Qp	2.10	21.50	0.00	0.00	34.86	V	1.75	208.7	- 11.16	0.120

10kHz - 30MHz Tx Spurious - No discernable signals

1-8 GHz Tx Spurious

2439.4235	53.71	Pk	3.54	28.67	37.42	0.00	48.50	H	1.52	351.0	- 5.50	1.000
2439.4235	34.92	Av	3.54	28.67	37.42	0.00	29.71	H	1.52	351.0	- 24.29	1.000
2439.4235	55.15	Pk	3.54	28.67	37.42	0.00	49.94	V	1.69	326.0	- 4.06	1.000
2439.4235	35.72	Av	3.54	28.67	37.42	0.00	30.51	V	1.69	326.0	- 23.49	1.000

Example calculation for Unintentional Radiated Emissions:

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

Deviations, Additions, or Exclusions: None

8 20 dB Bandwidth – FCC 15.247 (a)(1)(i)

8.1 Method

Unless otherwise stated no deviations were made from ANSI C63.10 and FCC public notice DA 00-705.

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

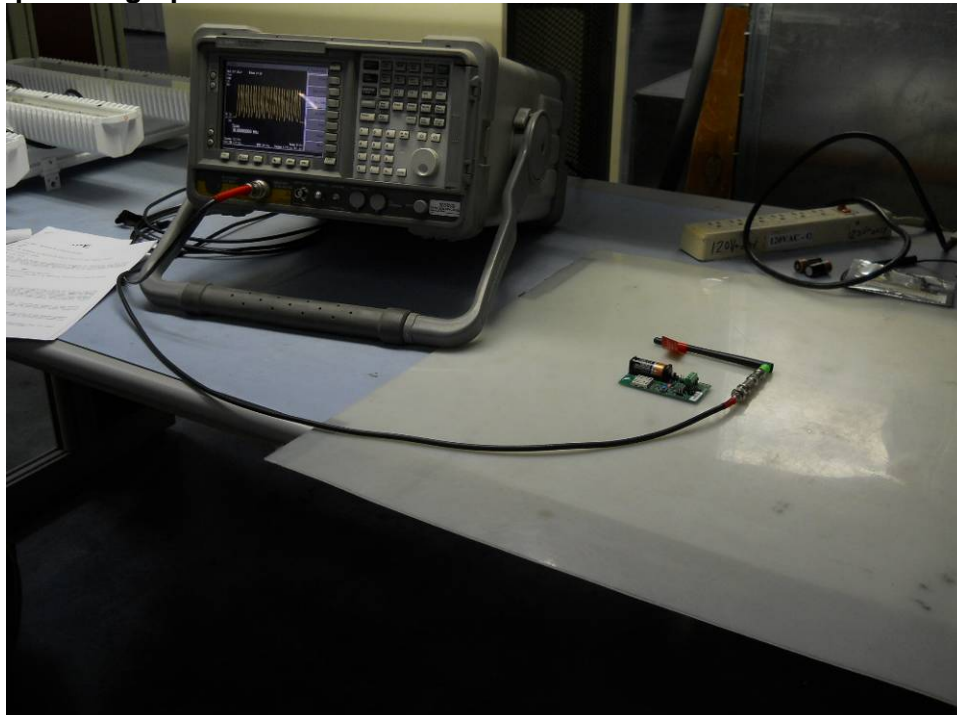
8.2 Test Equipment Used:

<u>Asset ID:</u>	<u>Description:</u>	<u>Manufacturer:</u>	<u>Model:</u>	<u>Serial:</u>	<u>Cal Date</u>	<u>Cal Due</u>
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013
EMC-xx	Whip antenna	xxx	xxx	xxx	VBU	VBU

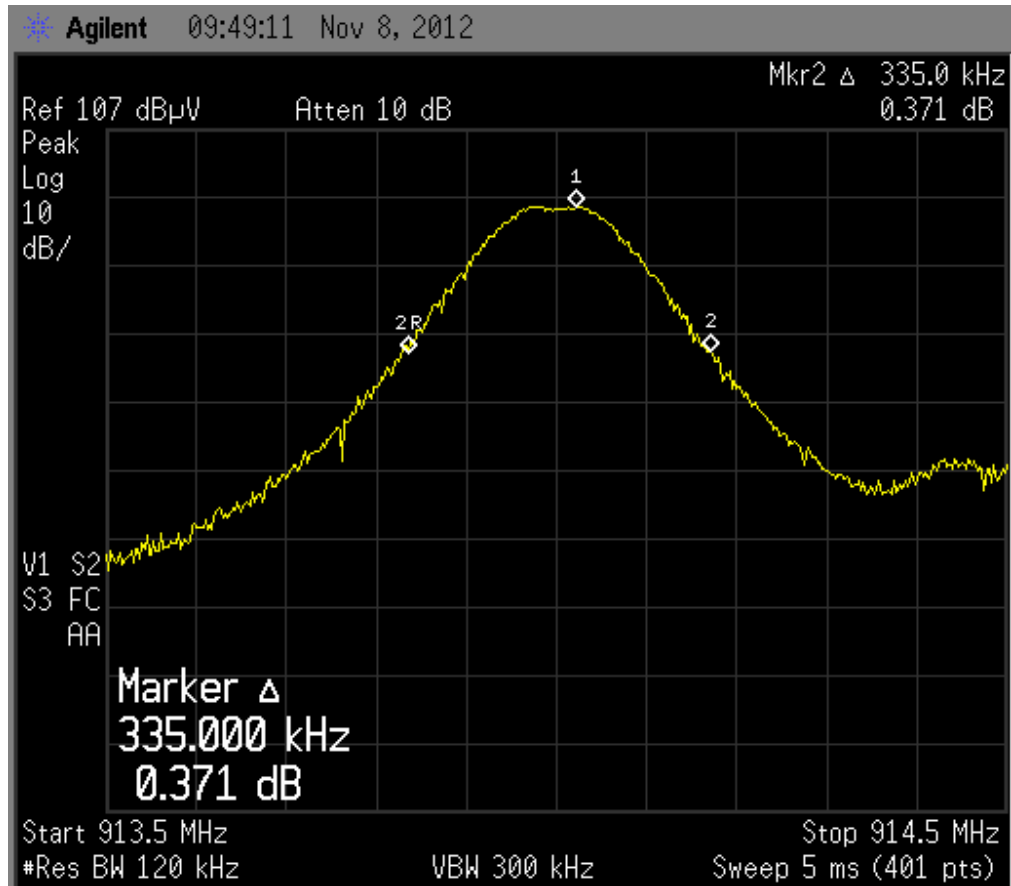
8.3 Results:

The sample tested was found to Comply.

8.4 Setup Photographs:



8.5 Plots:



Requirement: The minimum allowed 20dB Bandwidth is 250 kHz.

The 20dB Bandwidth was found to be 335 kHz.

9 Carrier Frequency Separation – FCC 15.247 (a)(1)(i)

9.1 Method

Unless otherwise stated no deviations were made from ANSI C63.10 and FCC public notice DA 00-705.

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

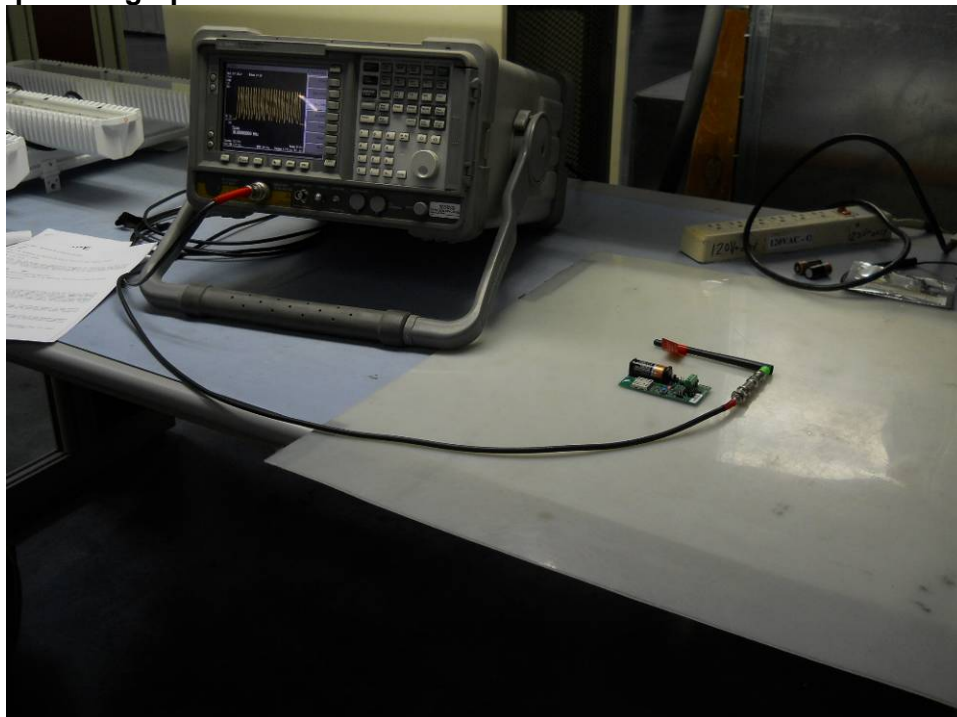
9.2 Test Equipment Used:

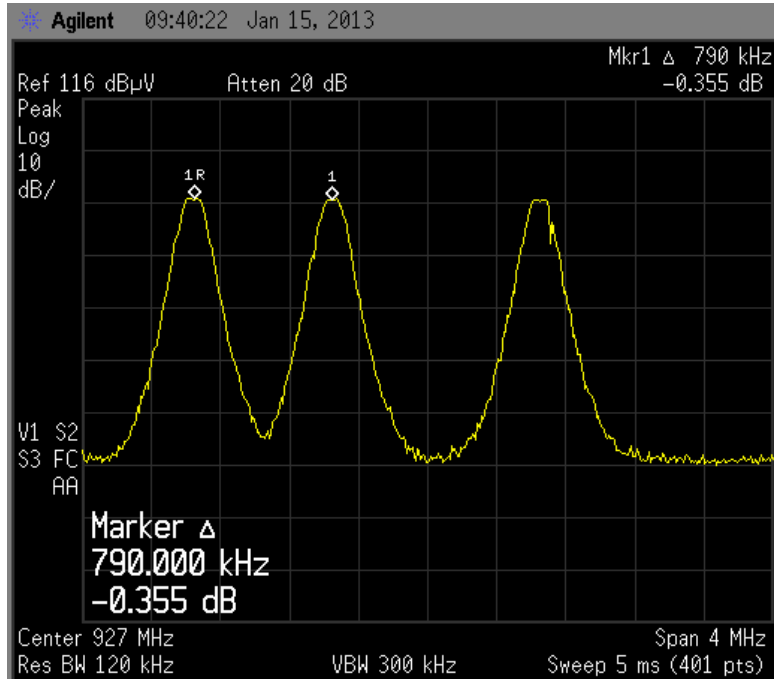
<u>Asset ID:</u>	<u>Description:</u>	<u>Manufacturer:</u>	<u>Model:</u>	<u>Serial:</u>	<u>Cal Date</u>	<u>Cal Due</u>
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013
EMC-xx	Whip antenna	xxx	xxx	xxx	VBU	VBU

9.3 Results:

The sample tested was found to Comply.

9.4 Setup Photographs:



9.5 Plots:

Requirement: The minimum hopping channel carrier frequency separation is the greater of the 20dB Bandwidth and 25 kHz.

The 20dB Bandwidth was found to be 335 kHz. The minimum hopping channel frequency separation was found to be 790 kHz which is greater than 335 kHz.

10 Number of Hopping Frequencies – FCC 15.247 (a)(1)(i)

10.1 Method

Unless otherwise stated no deviations were made from ANSI C63.10 and FCC public notice DA 00-705.

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

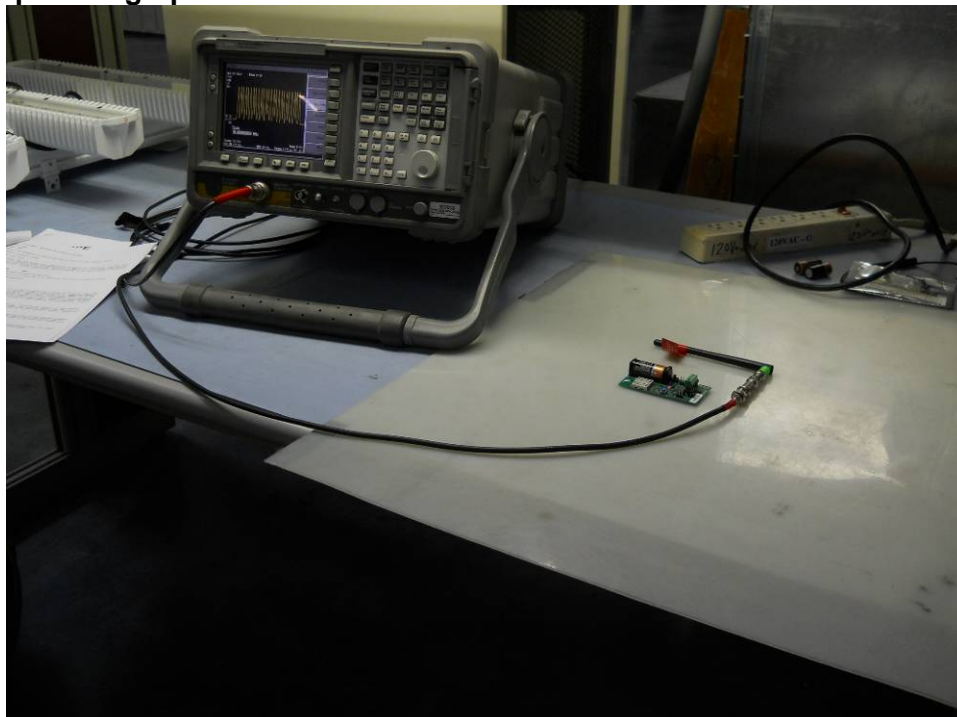
10.2 Test Equipment Used:

<u>Asset ID:</u>	<u>Description:</u>	<u>Manufacturer:</u>	<u>Model:</u>	<u>Serial:</u>	<u>Cal Date</u>	<u>Cal Due</u>
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013
EMC-xx	Whip antenna	xxx	xxx	xxx	VBU	VBU

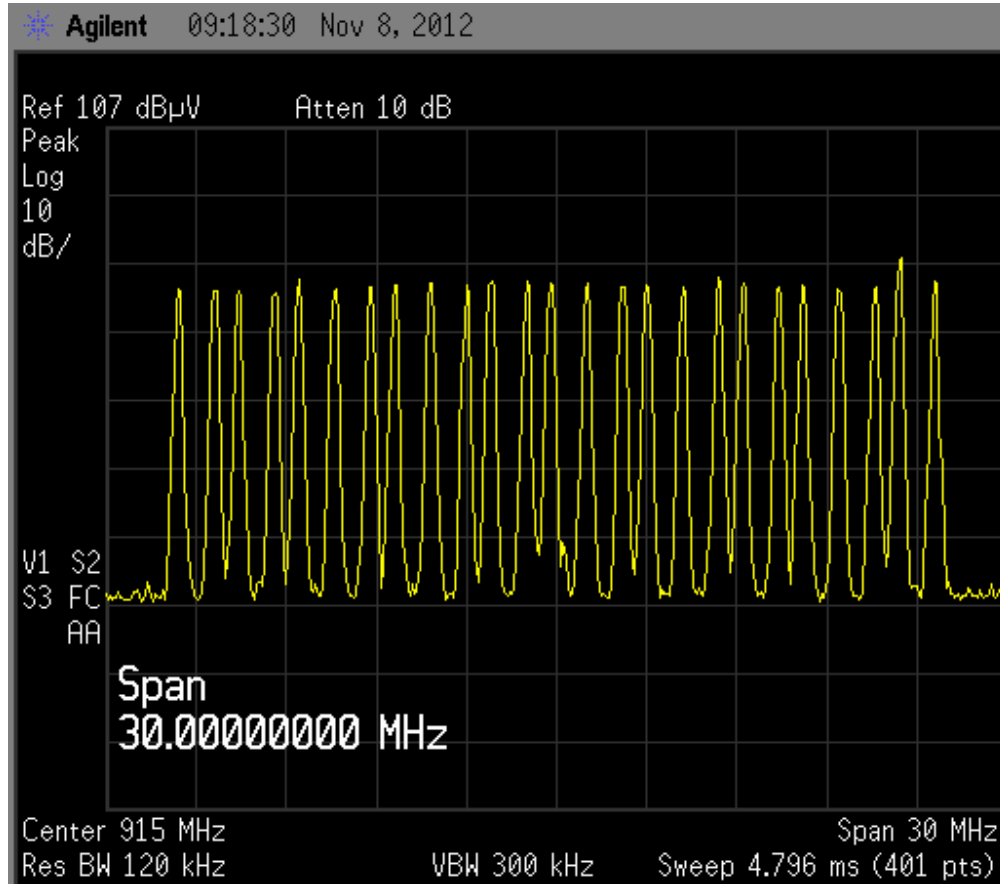
10.3 Results:

The sample tested was found to Comply.

10.4 Setup Photographs:



10.5 Plots:



Note: Requirement: Systems where the 20dB Bandwidth is greater than 250 kHz (measured 20dB BW = 335 kHz) require the usage of at least 25 hopping frequencies.

This device was found to use 25 hopping frequencies.

11 Time of Occupancy (Dwell Time) – FCC 15.247 (a)(1)(i)

11.1 Method

Unless otherwise stated no deviations were made from ANSI C63.10 and FCC public notice DA 00-705.

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

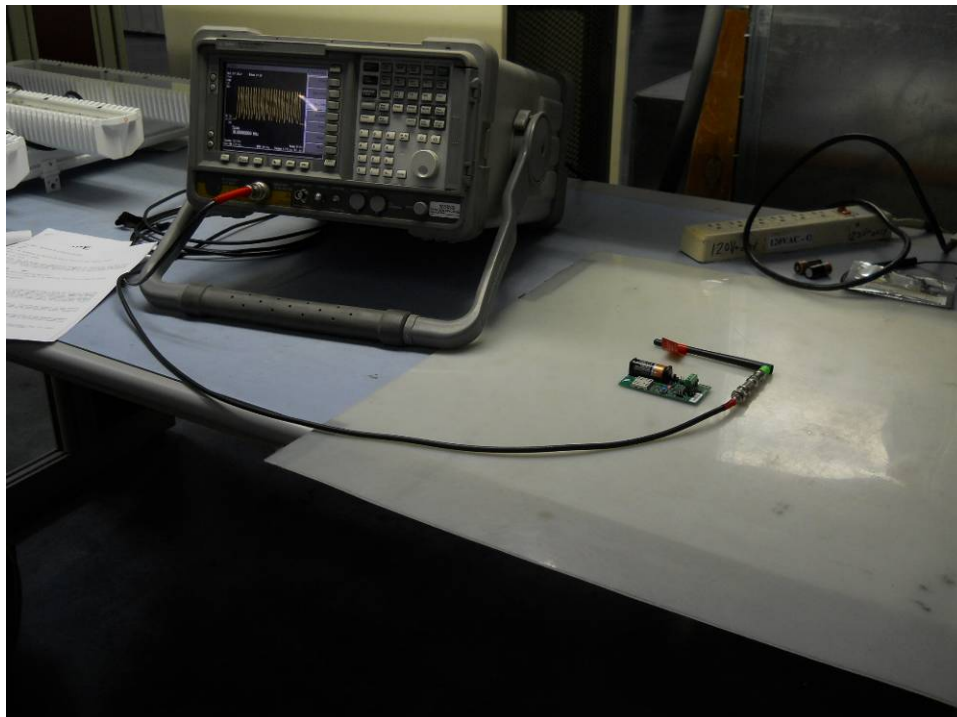
11.2 Test Equipment Used:

<u>Asset ID:</u>	<u>Description:</u>	<u>Manufacturer:</u>	<u>Model:</u>	<u>Serial:</u>	<u>Cal Date</u>	<u>Cal Due</u>
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013
EMC-xx	Whip antenna	xxx	xxx	xxx	VBU	VBU

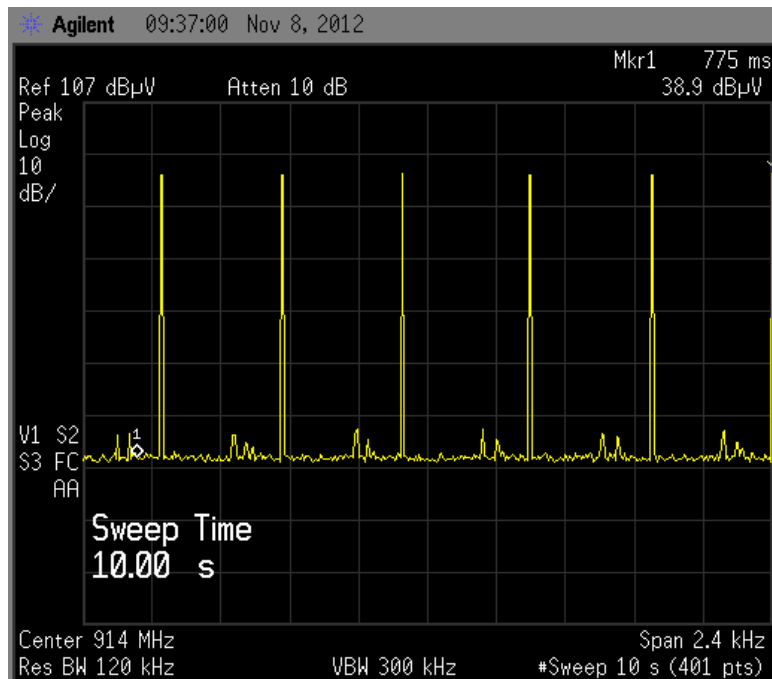
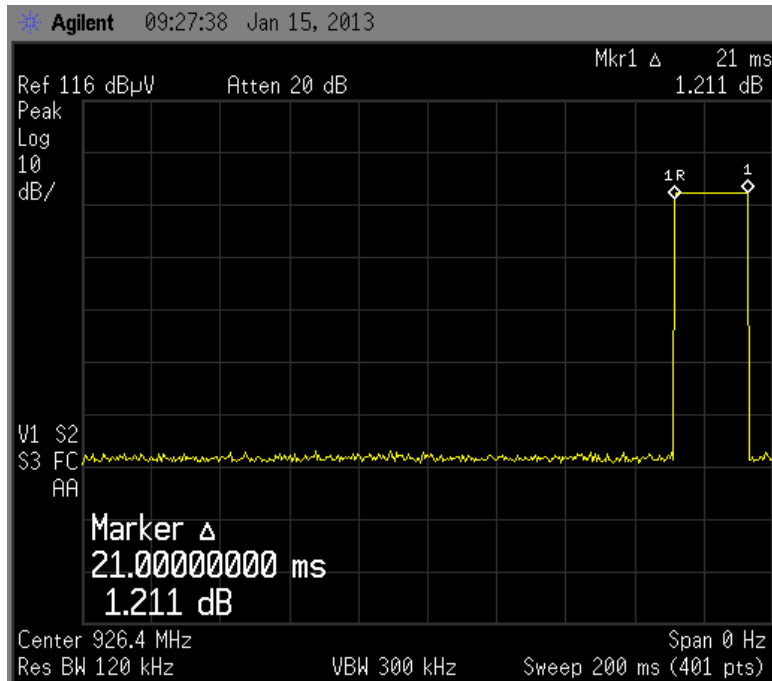
11.3 Results:

The sample tested was found to Comply.

11.4 Setup Photographs:



11.5 Plots:



Note: Requirement: The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

This device was found to occupy the frequency for 0.126 seconds (0.021sec x 6).

12 Occupied Bandwidth (OBW) – RSS Gen: 2010

12.1 Method

The test methods used comply with ANSI C63.10. Unless otherwise stated no deviations were made from **IC RSS-GEN Issue 3: 2010**.

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

12.2 Test Equipment Used:

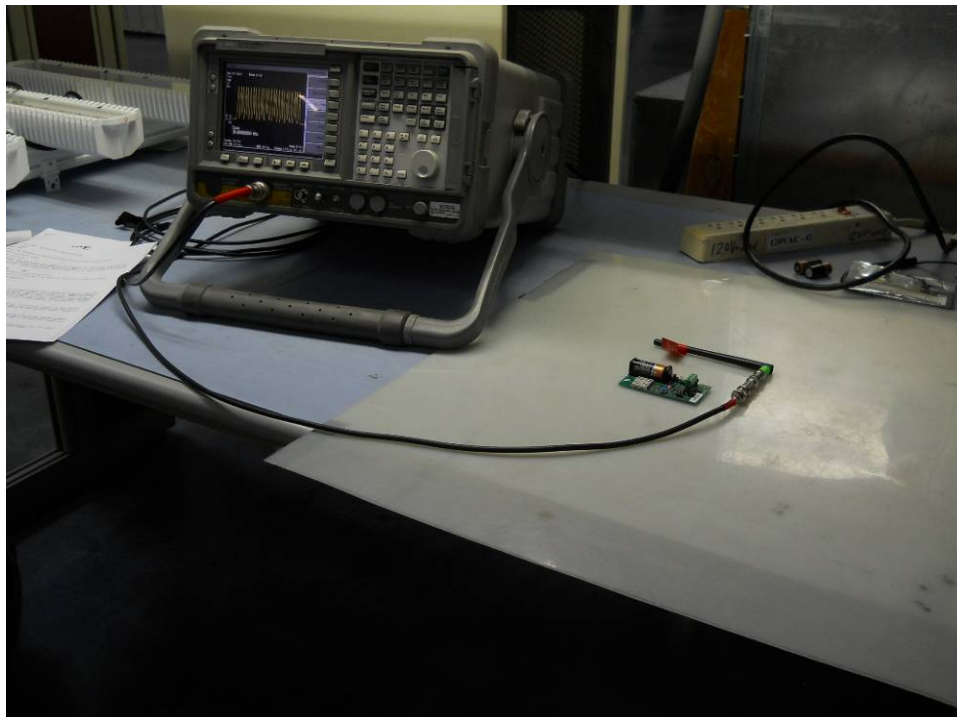
<u>Asset ID:</u>	<u>Description:</u>	<u>Manufacturer:</u>	<u>Model:</u>	<u>Serial:</u>	<u>Cal Date</u>	<u>Cal Due</u>
18913	Spectrum Analyzer	Hewlett-Packard	E7405A	My44211889	7/16/2012	7/16/2013
EMC-xx	Whip antenna	xxx	xxx	xxx	VBU	VBU

12.3 Results:

The sample tested was found to comply with the requirements of:

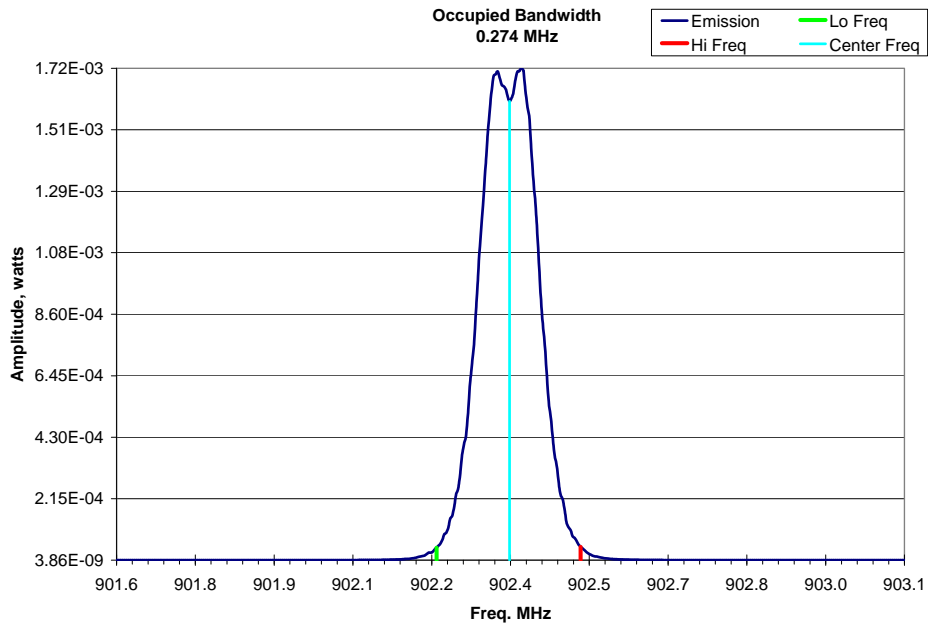
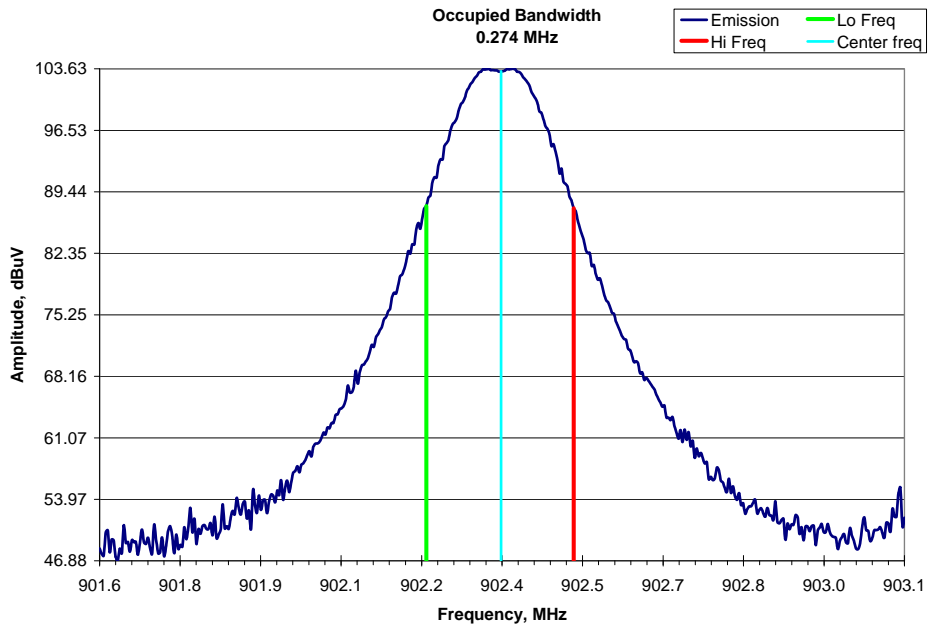
- RSS-GEN, Section 4.6.1

12.4 Setup Photographs:

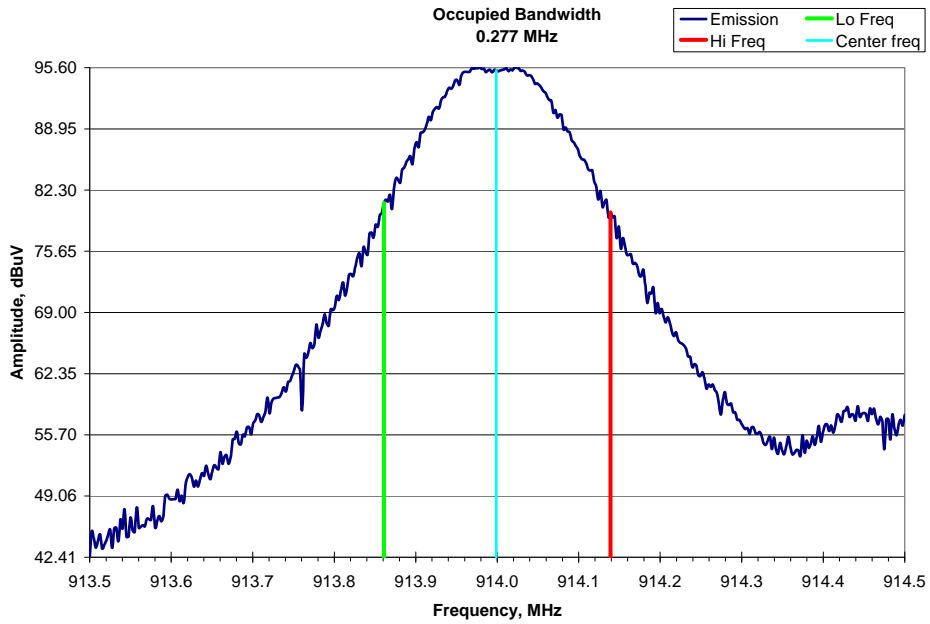


12.5 Test Data:

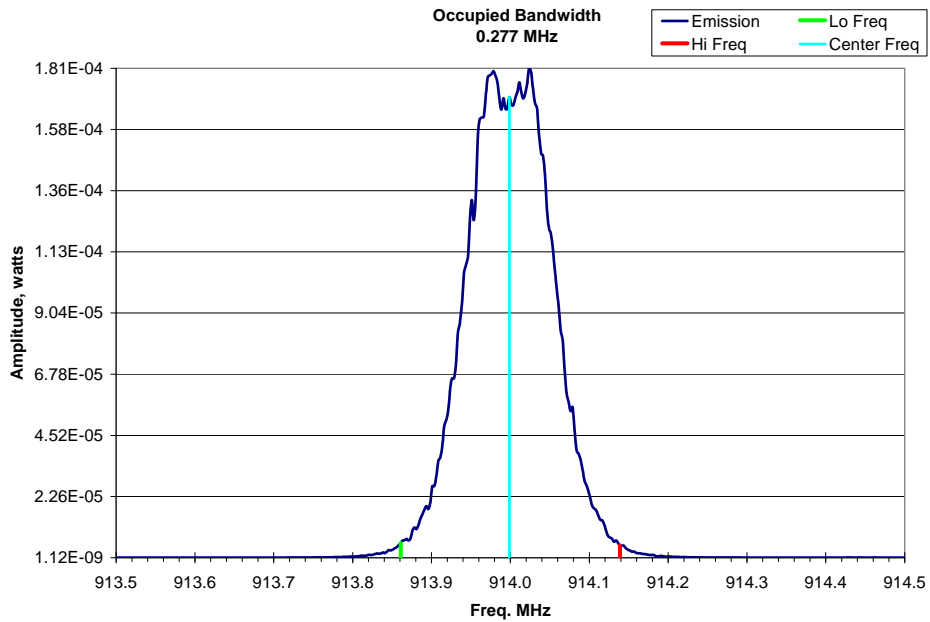
Low Channel



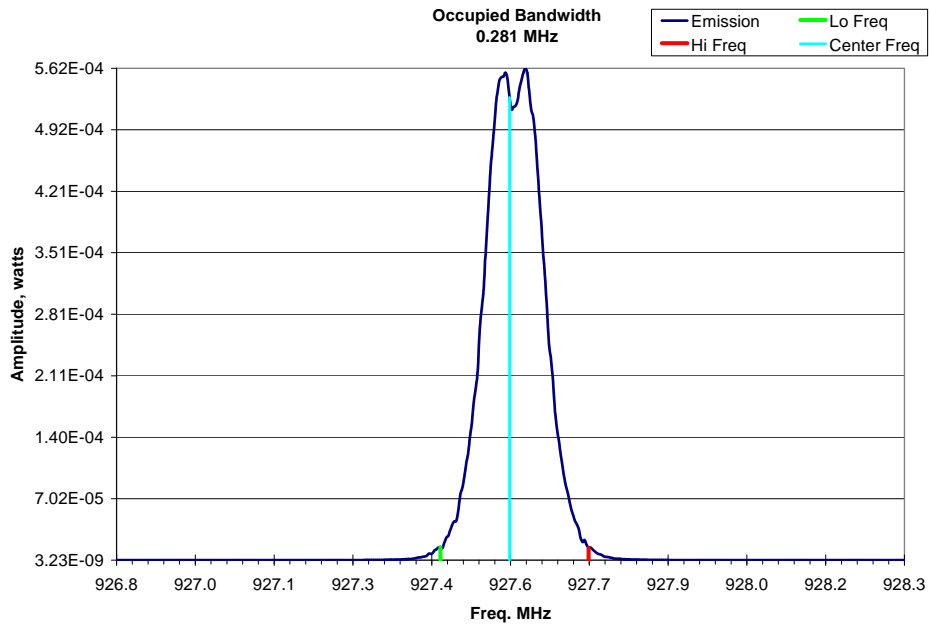
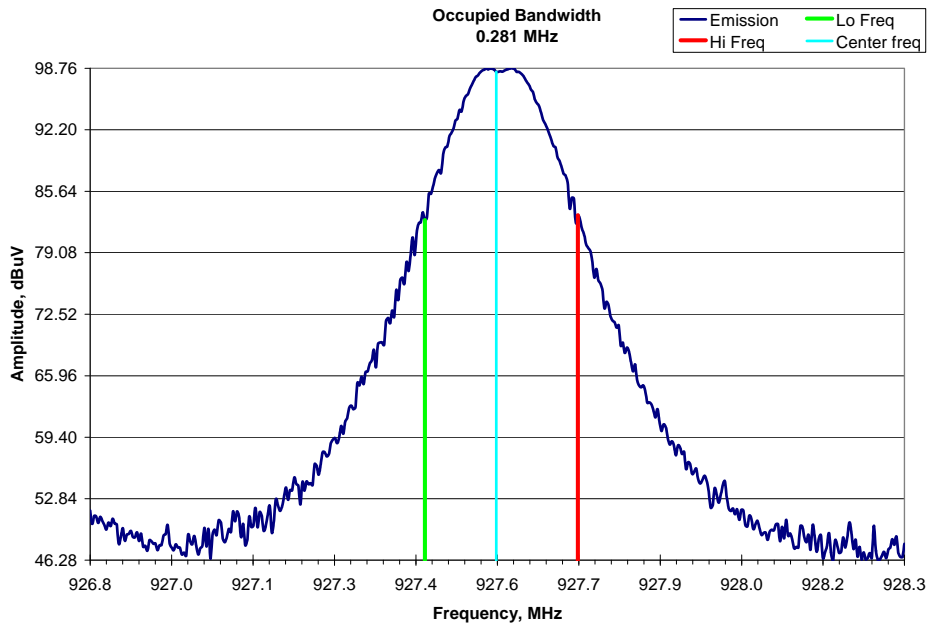
Mid Channel Field Strength Graph



Power Graph



High Channel



Notes: None

Deviations, Additions, or Exclusions: None

13 AC Mains Conducted Emissions – Not required, device is battery powered.**14 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 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	

15 Appendix A: Modifications required

- An additional low-pass filter and a notch filter for the 3rd harmonic was added. All radiated emissions tests were repeated with the modified unit.

16 Revision History

Revision Level	Date	Report Number	Notes
0	12/20/2012	100946804DEN-001	Original
1	1/2/2013	100946804DEN-001_Rev001	<p>Removed Section Breaks for Pages 20 and 28.</p> <p>Equipment Lists - Add the band-pass filter(s). - Added</p> <p>Pg 24 - Spelling error. It looks like the 'l' in Fundamental was cropped off. – Increased text box width so hopefully there aren't issues when converting to PDF.</p> <p>Pg 29 - Measurement antenna needs to be added to equipment list. All the bench test equipment lists should be updated. – Updated</p> <p>Author: Michael Kanda <i>MK</i></p> <p>Reviewer: Mike Spataro <i>MAS</i></p>
2	1/15/2013	100946804DEN-001_Rev002	<p>Section 5 – Duty Cycle Calculation: The verbiage was changed slightly to “The plots in Section 11 (Dwell Time) show that the max duty cycle is 21mS per 100mS period (0.21%) yielding 13.55dB correction” for clarity to reflect the actual measurements taken in Section 11.</p> <p>Sections 5 and 6 – the following descriptive notes were added to both sections:</p> <p>Notes:</p> <ol style="list-style-type: none"> 1) The device was measured at 3 meters. 2) The device was placed on a turntable 80 cm high, it was rotated 360 degrees and the measurement antenna was raised and lowered between 1 and 4 meters to maximize emissions from this device. <p>Section 9 – Carrier Frequency Separation: The carrier frequency separation was corrected to 790kHz. The plot showing</p>

			<p>the correct markers was inserted.</p> <p>Section 11 – Dwell Time: The plot showing the pulse was changed to show only a single pulse. The dwell time was changed slightly to reflect the slight change in measured pulse width.</p> <p>Section 12 – Occupied Band Width: The section was updated to add high and low channel measurements.</p> <p>Section 15 – Removed: “The bench test measurements were not repeated because the bench tests verify parameters that are controlled in firmware which did not change” because it is immaterial.</p> <p>Author: Michael Kanda <i>mk</i></p> <p>Reviewer: Mike Spataro <i>MAS</i></p>
3	1/17/2013	100946804DEN-001_Rev003	<p>Corrected client address: Administrative change.</p> <p>Inovonics 397 S. Taylor Ave Louisville, CO 80027</p> <p>Author: Michael Kanda <i>mk</i></p> <p>Reviewer: Richard Georgerian <i>RG</i></p>