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FHSS TEST REPORT

Report Number: **100753208LEX-003**
Project Number: **G100753208**

Report Issue Date: **6/17/2012**

Product Name: **Basestation**
FCCID: **OWX-B1000**
Standards: **Title CFR 47 Part 15 Subpart C**

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510

Client:
Gryphex Electronic Monitoring
1035 Windward Ridge Pkwy Suite 575
Alpharetta, GA 30005

Report prepared by
Bryan Taylor, Team Leader

Report reviewed by
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TABLE OF CONTENTS

1 Introduction and Conclusion

The tests indicated in Section 2 were performed on the product constructed as described in Section 3. 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 complied with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

The INTERTEK-Lexington facility is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1 and ANSI C63.4. For radiated measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters. The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.

2 Test Summary

Page	Test full name	FCC Reference	IC Reference	Result
6	Peak Output Power	§ 15.247(b)(1)	RSS210 (A8.4)	Pass
9	20dB Bandwidth	§ 15.247(a)(1)	RSS210 (A8.1)	Pass
11	Channel Separation	§ 15.247(a)(1)	RSS210 (A8.1)	Pass
12	Number of Hopping Channels	§ 15.247(a)(1)(iii)	RSS210(A8.1)	Pass
13	Time of Occupancy	§ 15.247(a)(1)(iii)	RSS210 (A8.1)	Pass
18	Conducted Spurious Emissions	§ 15.247(d)	RSS210 (A8.5)	Pass
24	Radiated Spurious Emissions (Transmitter)	§ 15.247(d), § 15.209, and § 15.205	RSS-210 (A8.5)	Pass
28	Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (6.1)	Pass
32	AC Powerline Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Pass
35	Antenna Requirement per FCC Part 15.203	§ 15.203	RSS-Gen (7.1.2)	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Gryphex Electronic Monitoring
Model Number	Basestation
Serial Number	Test Sample 1
FCC Identifier	OWX-B1000
Receive Date	5/11/2012
Test Start Date	5/11/2012
Test End Date	5/17/2012
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	903.2MHz – 927MHz
Modulation Type	FHSS
Transmission Control	Test Commands
Maximum Output Power	8.678dBm
Test Channels	7, 63, 121
Antenna Type (15.203)	Internal
Operating Voltage	115VAC/60Hz

Description of Equipment Under Test
The Basestation was a base station for use as part of a house arrest system. The system is used to track offenders who have been placed under house arrest and monitor their whereabouts.

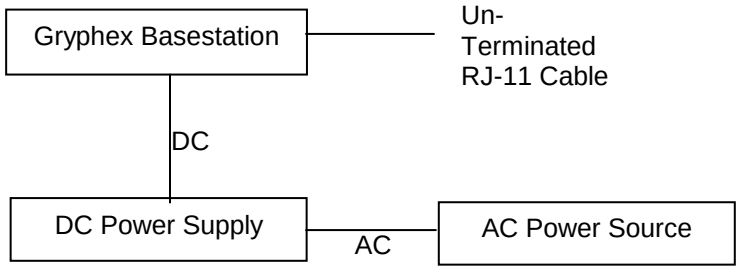
Operating modes of the EUT:

No.	**Descriptions of EUT Exercising**
1	Transmitting a FHSS signal with the hopping enabled.
2	Transmitting continuously on a single channel.
3	Receive / idle mode.

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

3.2 EUT Block Diagram:

The test sample was tested in stand alone mode and was not connected to any support equipment during the evaluation.



3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
AC Power Cable	5 ft	None	None	AC Power Source	AC/DC Power Adapter
DC Power Cable	3 ft	None	Yes	AC/DC Power Adapter	Test Sample
RJ-11 Cable	10 ft	None	None	Test Sample	Un-Terminated

3.4 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop Computer	Dell	E6410	86Y90P1

* The laptop computer was used to configure the test sample prior to execution of the test. It was disconnected before the test was conducted.

4 Peak Output Power

4.1 Test Limits

§ 15.247(b): The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

4.2 Test Procedure

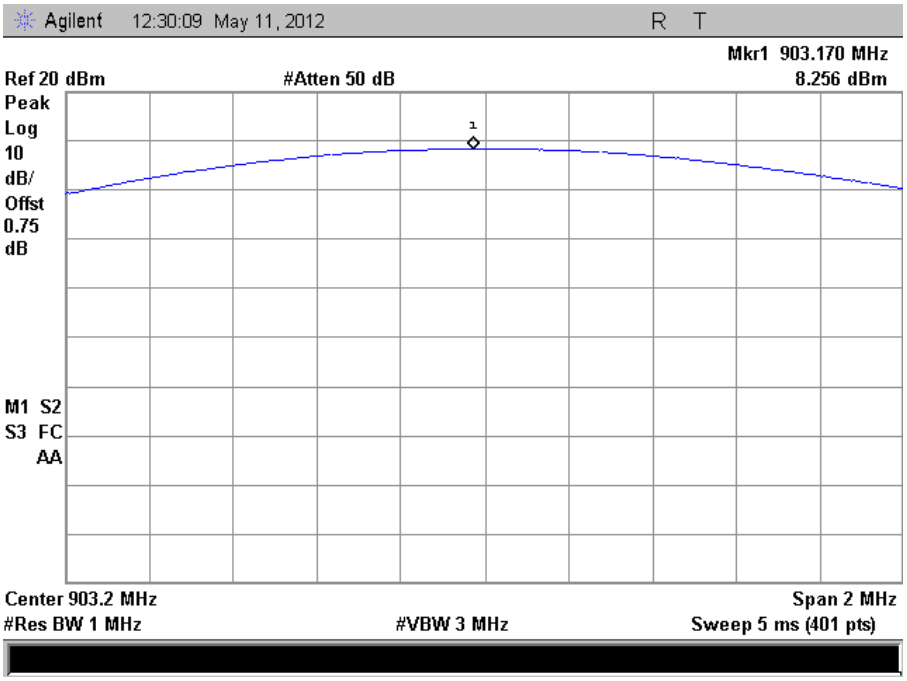
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. The peak output power was measured using the marker to peak function of the spectrum analyzer.

4.3 Test Equipment Used:

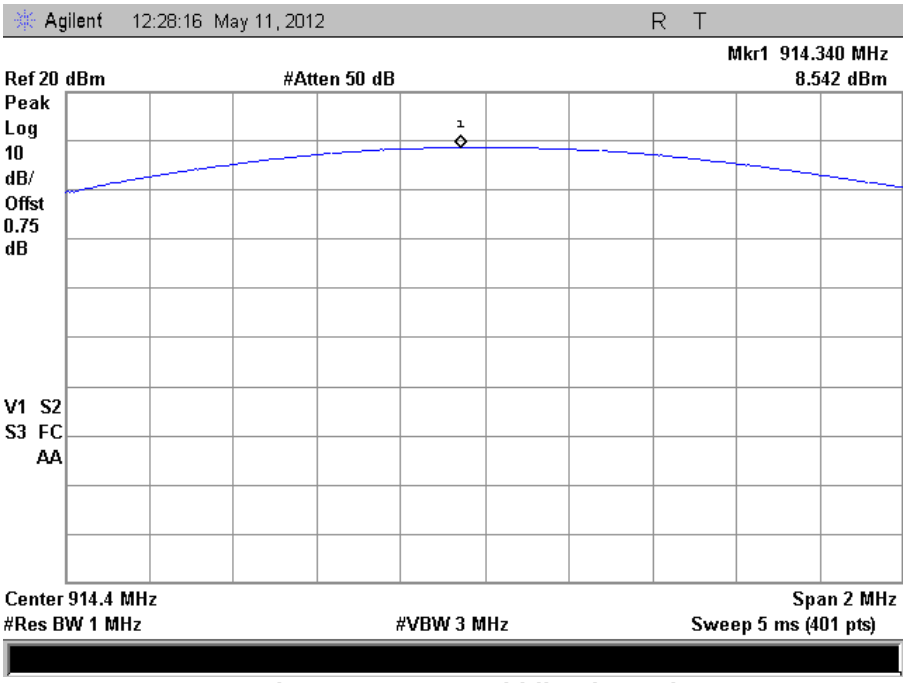
Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	3/20/2012	3/20/2013

4.4 Results:

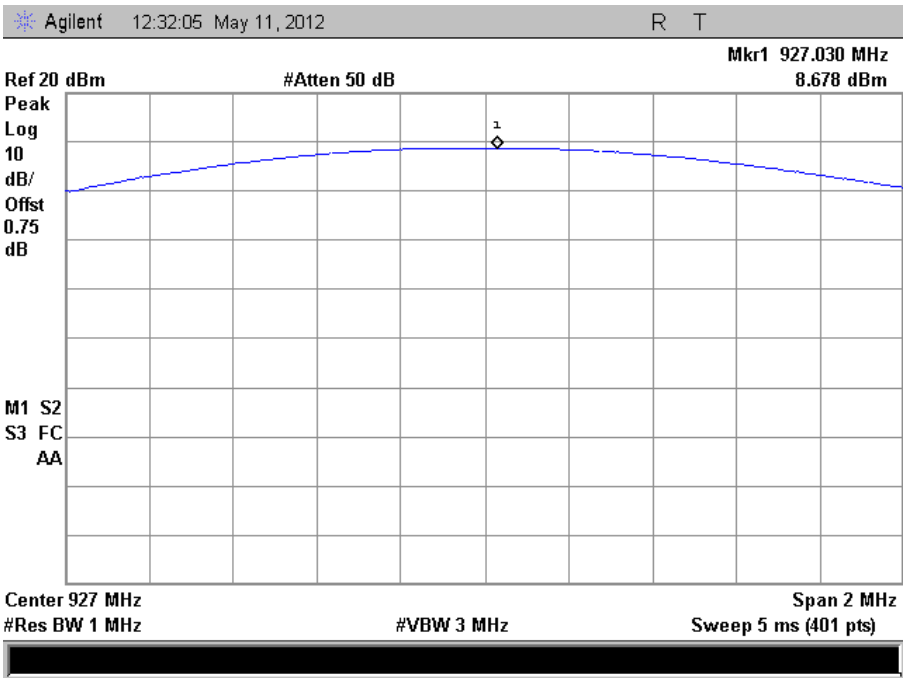
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Pass / Fail
Low	903.17MHz	8.256dBm	30dBm	Pass
Mid	914.34MHz	8.542dBm	30dBm	Pass
High	927.03MHz	8.678dBm	30dBm	Pass



Peak Output Power Low Channel



Peak Output Power Middle Channel



Peak Output Power High Channel

5 20dB Bandwidth

5.1 Test Limits

§ 15.247(a): Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz

5.2 Test Procedure

ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

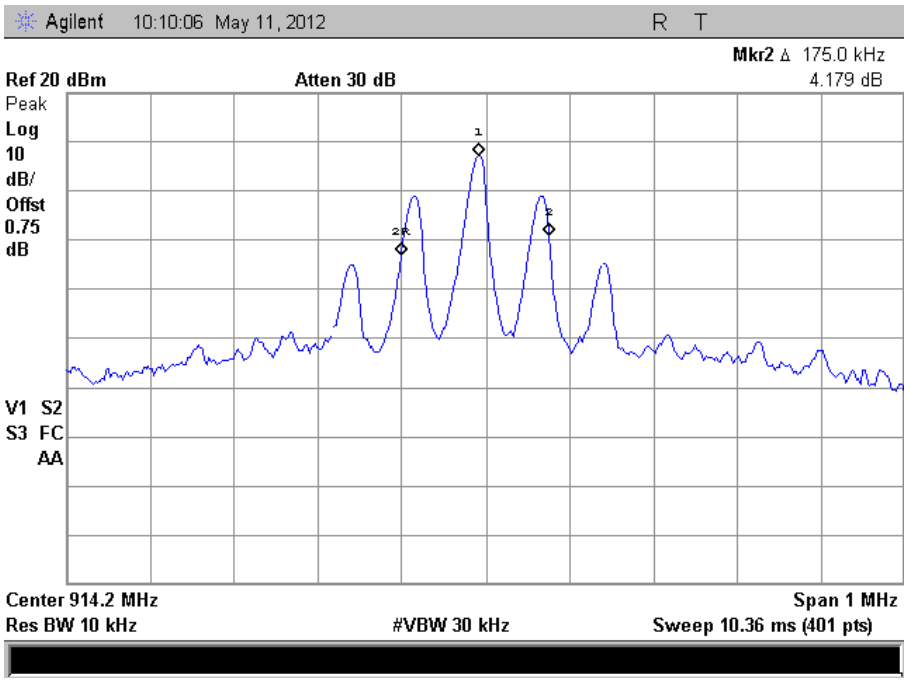
5.3 Test Equipment Used:

Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	3/20/2012	3/20/2013

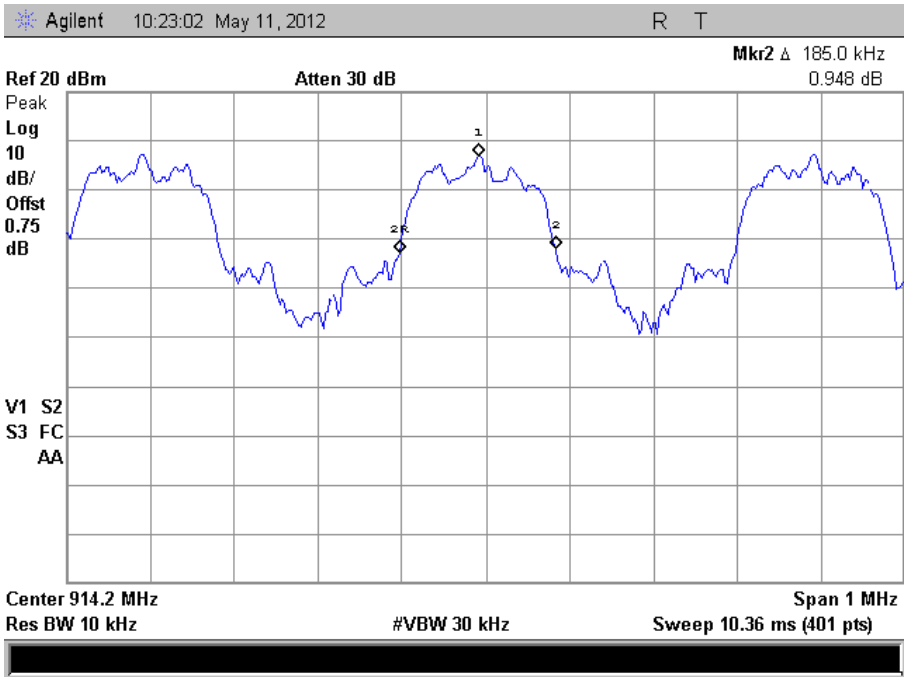
5.4 Results:

The 20dB bandwidth measurements are shown below. The 20dB bandwidth is also used as the 99% bandwidth.

Channel	TX Mode	Frequency (MHz)	20dB Bandwidth (kHz)
63	Constant Transmit on One Channel	914.2MHz	175kHz
63	Hopping Enabled	914.2MHz	185kHz



20dB Bandwidth (Constant TX on One Frequency)



20dB Bandwidth (Normal Hopping Mode)

6 Channel Separation

6.1 Test Limits

§ 15.247(a): Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.2 Test Procedure

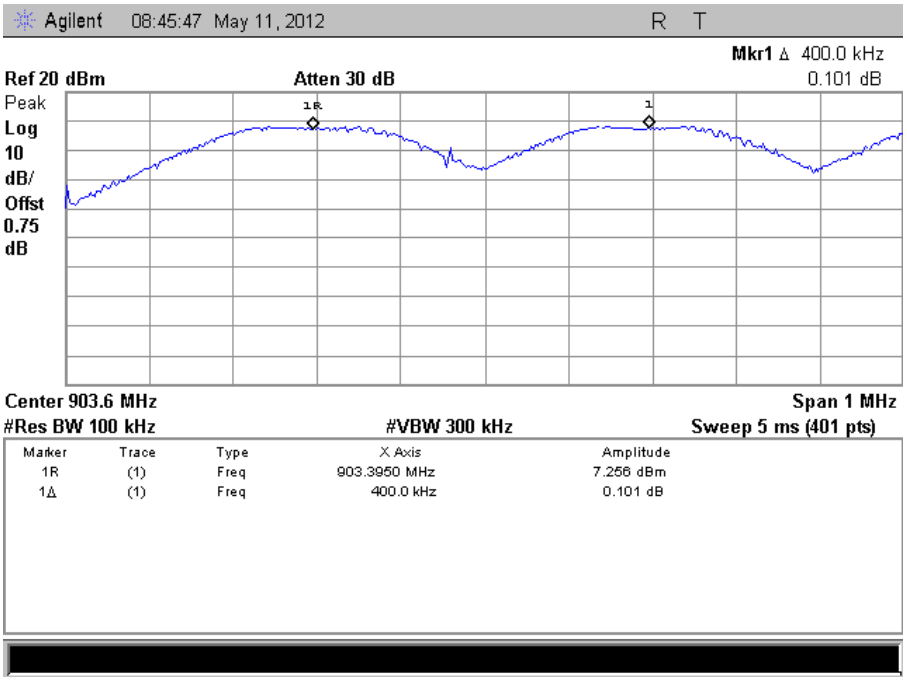
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

6.3 Test Equipment Used:

Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	3/20/2012	3/20/2013

6.4 Results:

The plot below shows that the carrier frequency separation is 400kHz.



Carrier Frequency Separation

7 Number of Hopping Channels

7.1 Test Limits

§ 15.247(a): Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) (i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

7.2 Test Procedure

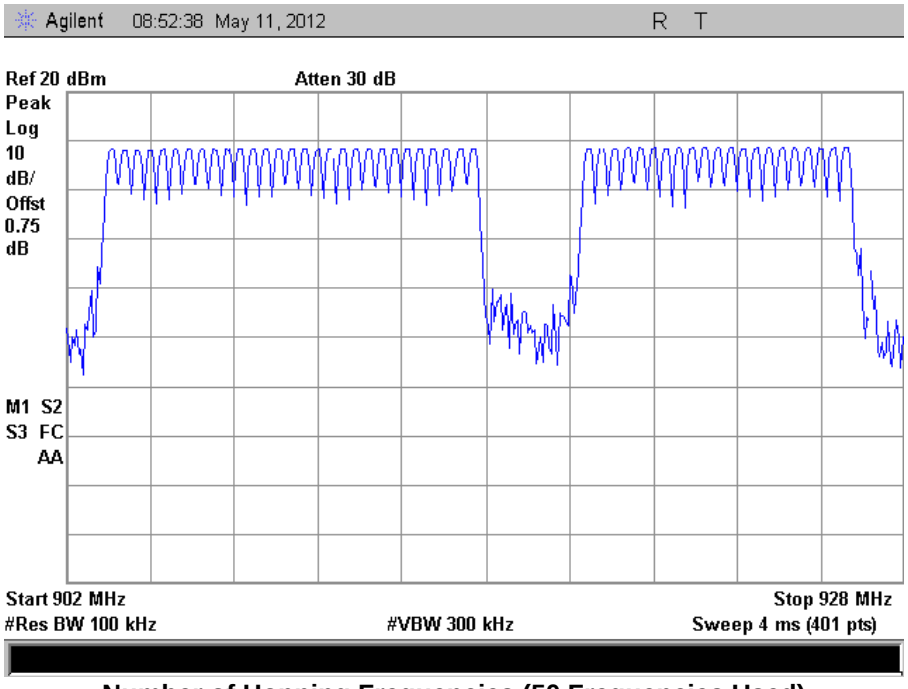
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

7.3 Test Equipment Used:

Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	3/20/2012	3/20/2013

7.4 Results:

The plot below shows that there are 50 hopping frequencies channels being used. The middle of the hopping spectrum was filtered out in order to avoid potential interference with some cordless phones.



Number of Hopping Frequencies (50 Frequencies Used)

8 Time of Occupancy

8.1 Test Limits

§ 15.247(a): Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) (i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

8.2 Test Procedure

ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

8.3 Test Equipment Used:

Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	3/20/2012	3/20/2013

8.4 Results:

The time of occupancy calculations are shown below. The plots which follow illustrate the on time of the pulses (two lengths) and the number of pulse trains in 20 seconds. The total “on” time is less than the 400mS limit for this product.

(Beacon On Time) = 25 Beacon Pulses * 1.25mS = 31.25mS

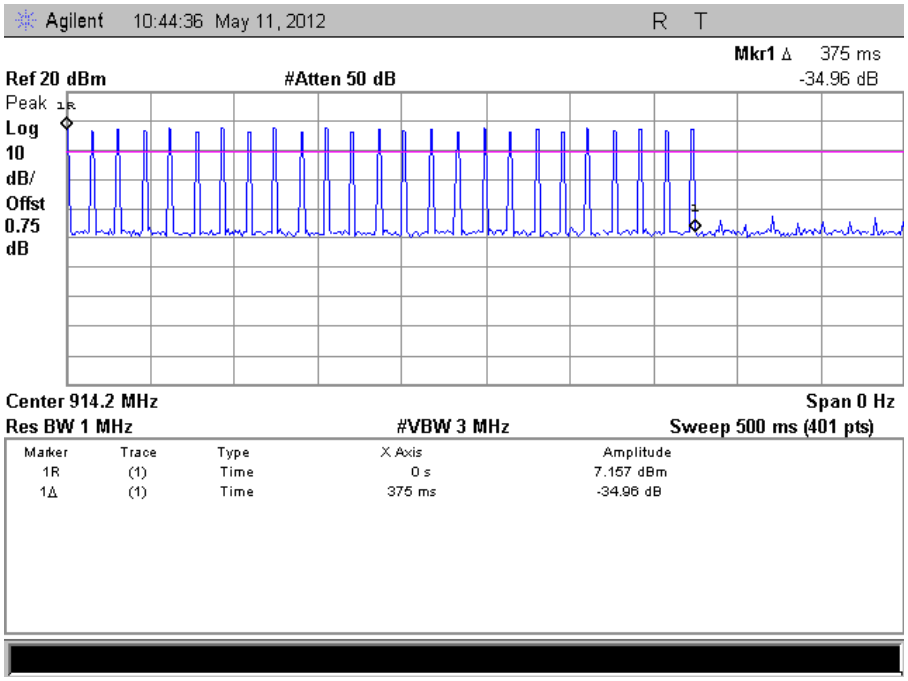
(Data On Time) = 25 Data Pulses * 4.05mS = 101.25mS

Number of Pulse Trains in 20 Seconds = 2

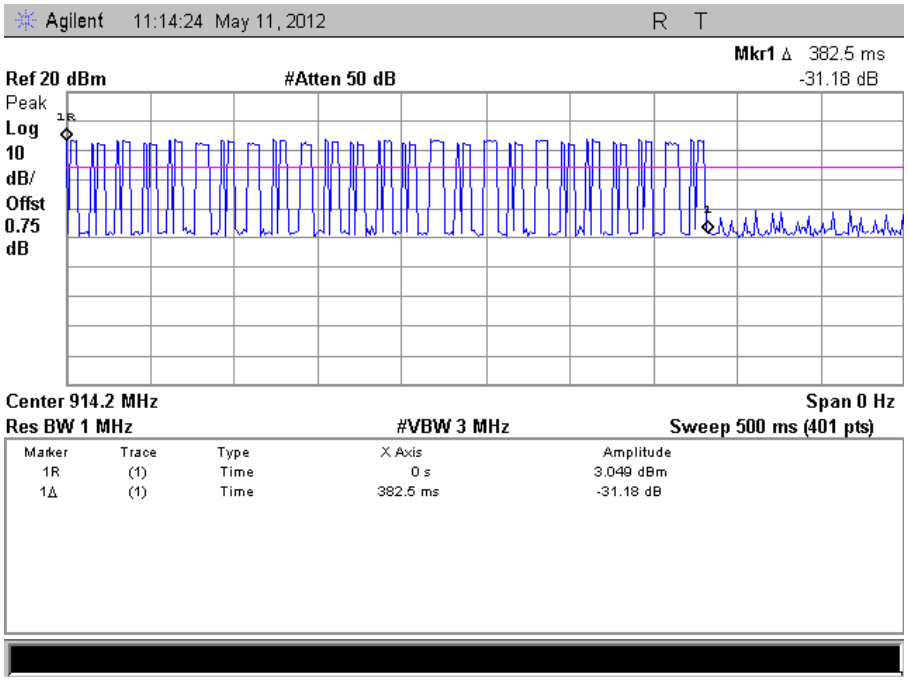
(Total On Time in 20 Seconds) = (31.25mS + 101.25mS) * 2 = 265mS

Limit = 400mS

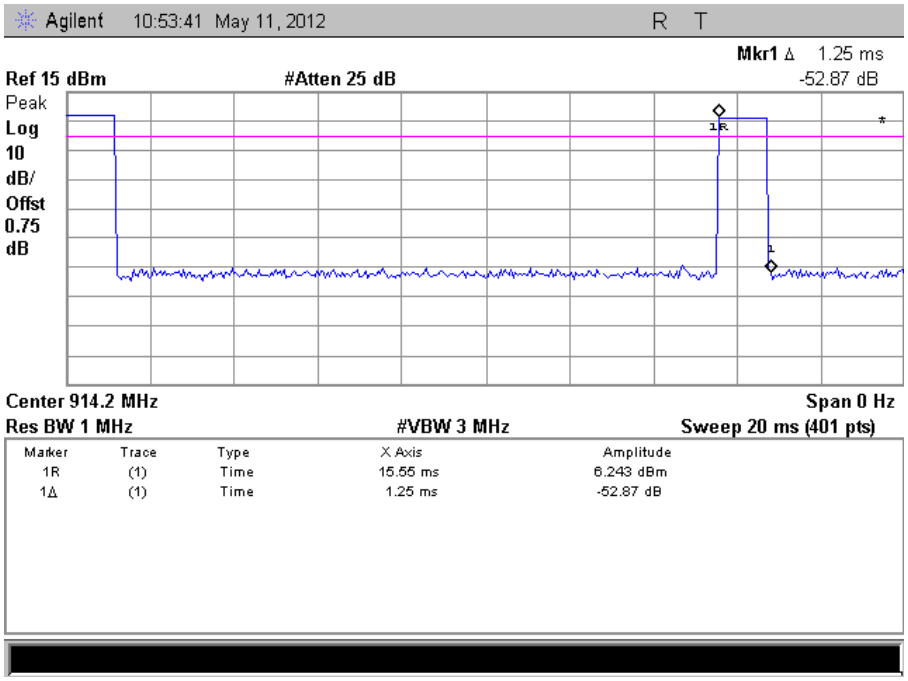
Time of Occupancy Calculation



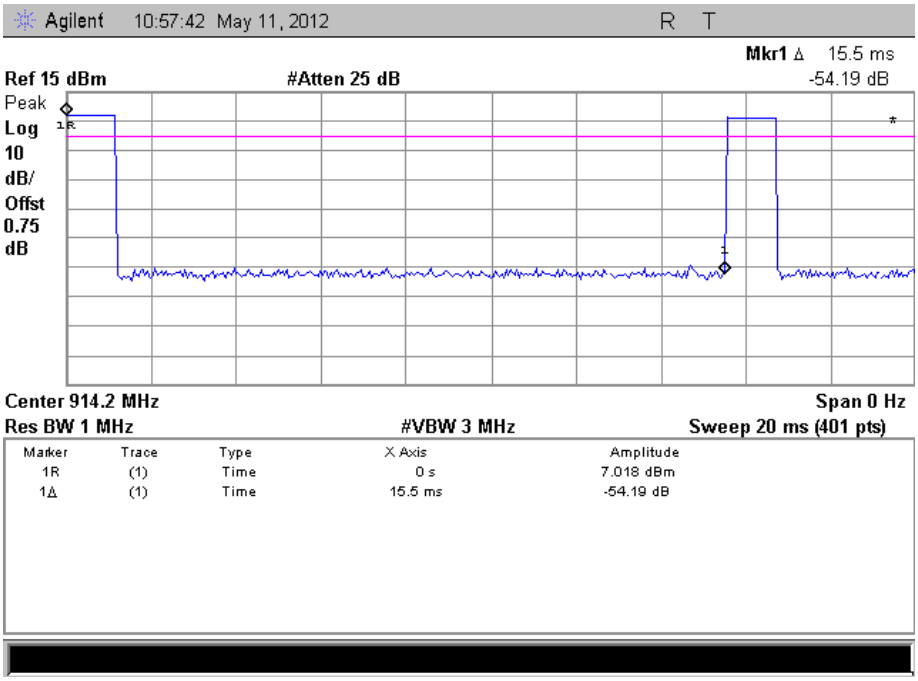
Beacon Pulses in one Train = 25



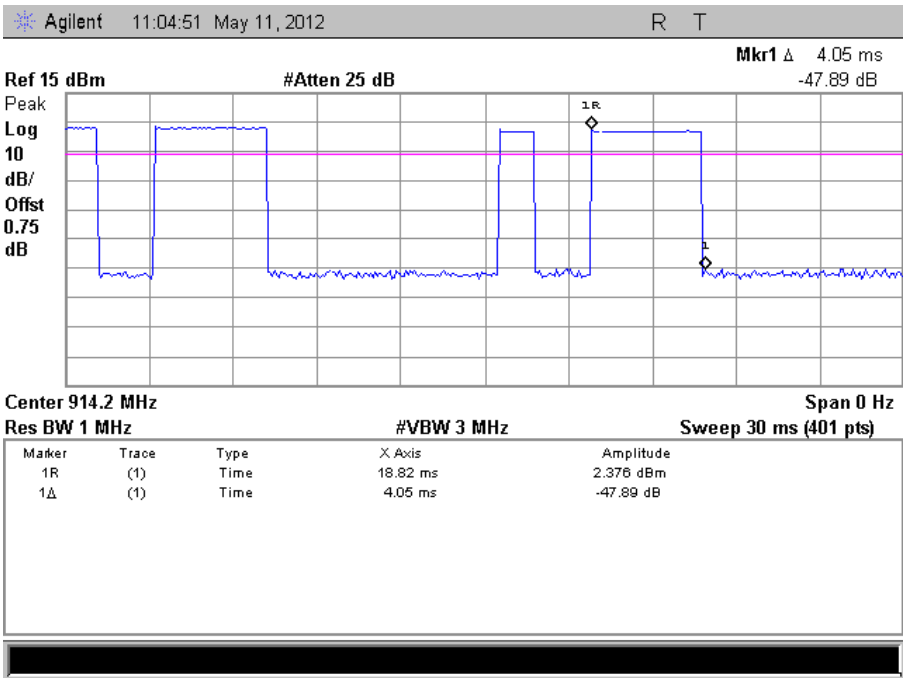
Data Pulses in one Train = 25



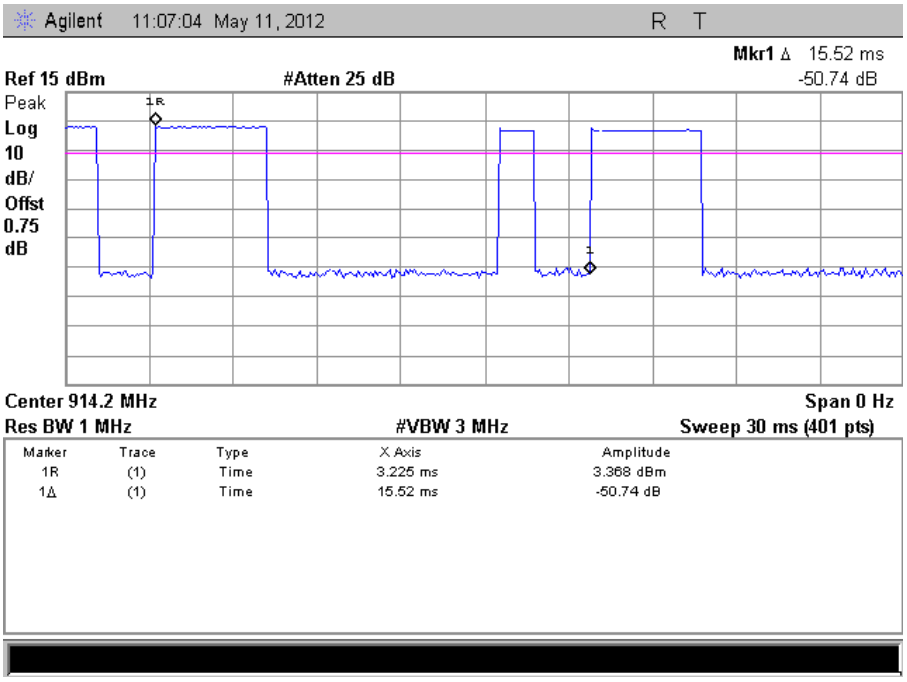
Beacon On Time = 1.25mS



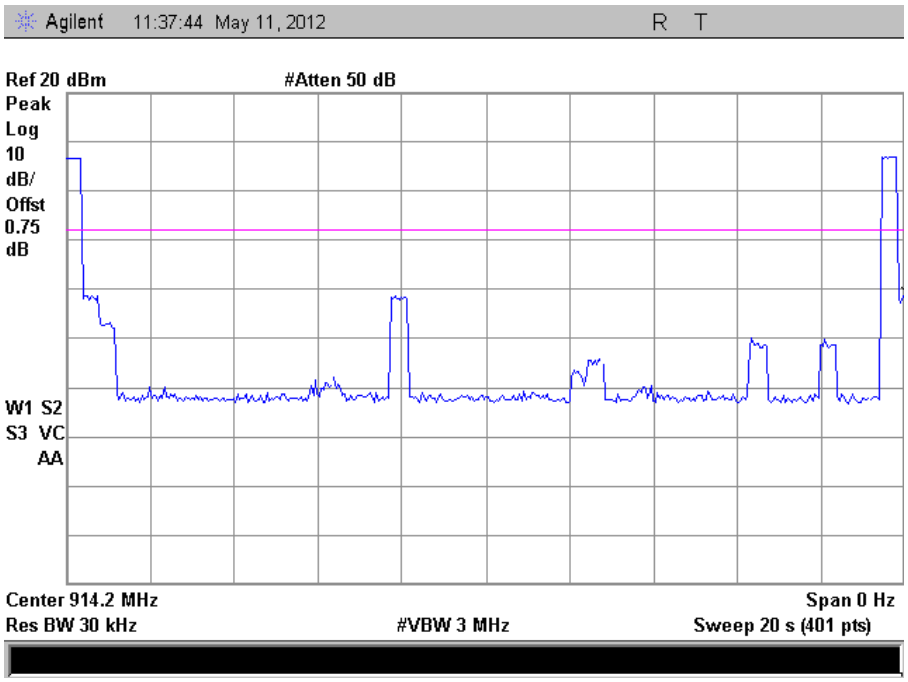
Beacon Total Time



Data On Time = 4.05mS



Data Total Time



Number of Pulse Trains in 20 Seconds = 2

9 Conducted Spurious Emissions

9.1 Test Limits

§ 15.247(d): 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

9.2 Test Procedure

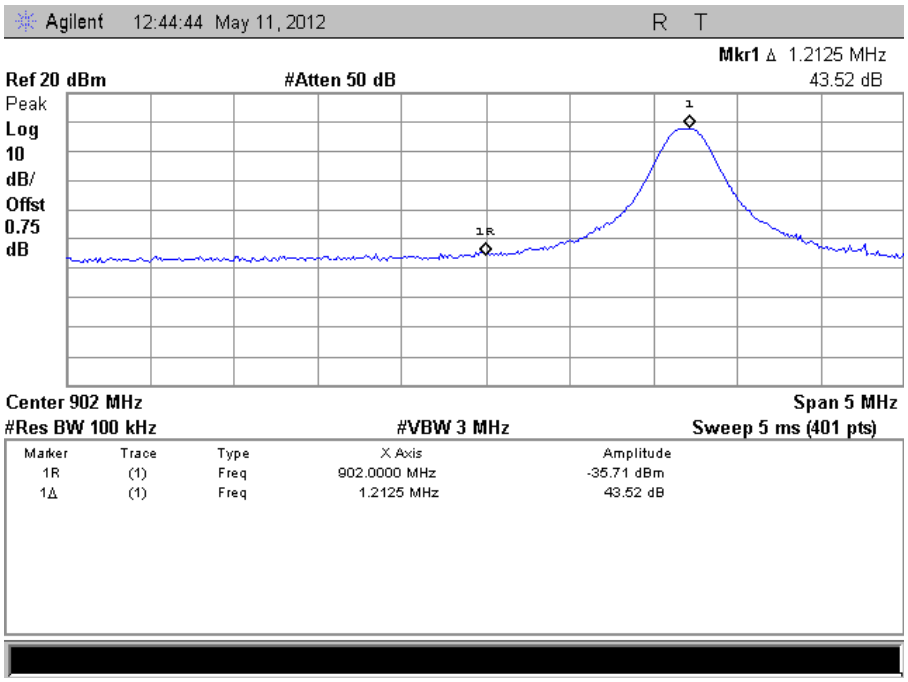
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

9.3 Test Equipment Used:

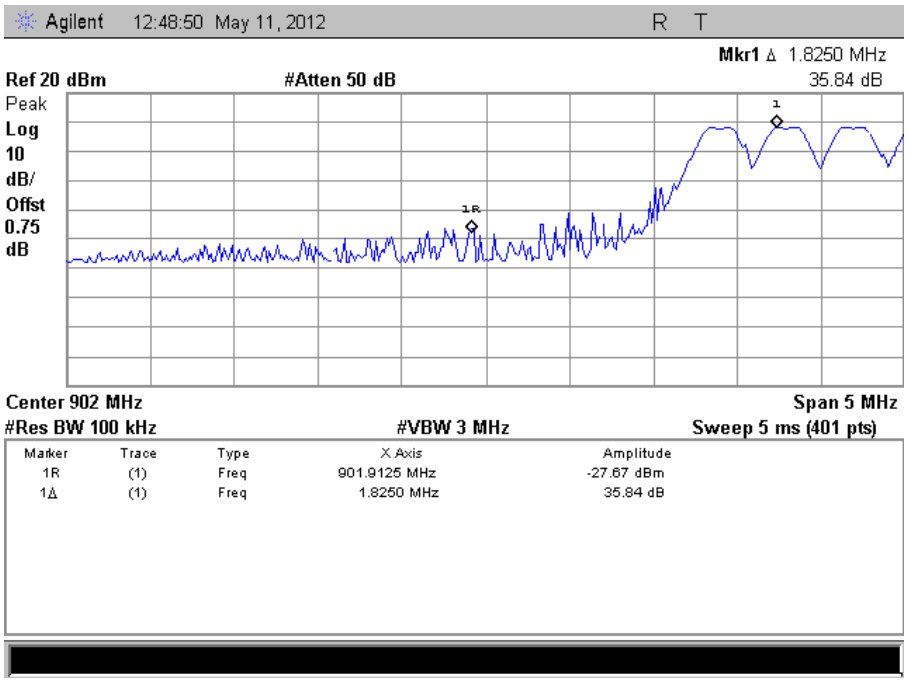
Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	3/20/2012	3/20/2013

9.4 Results:

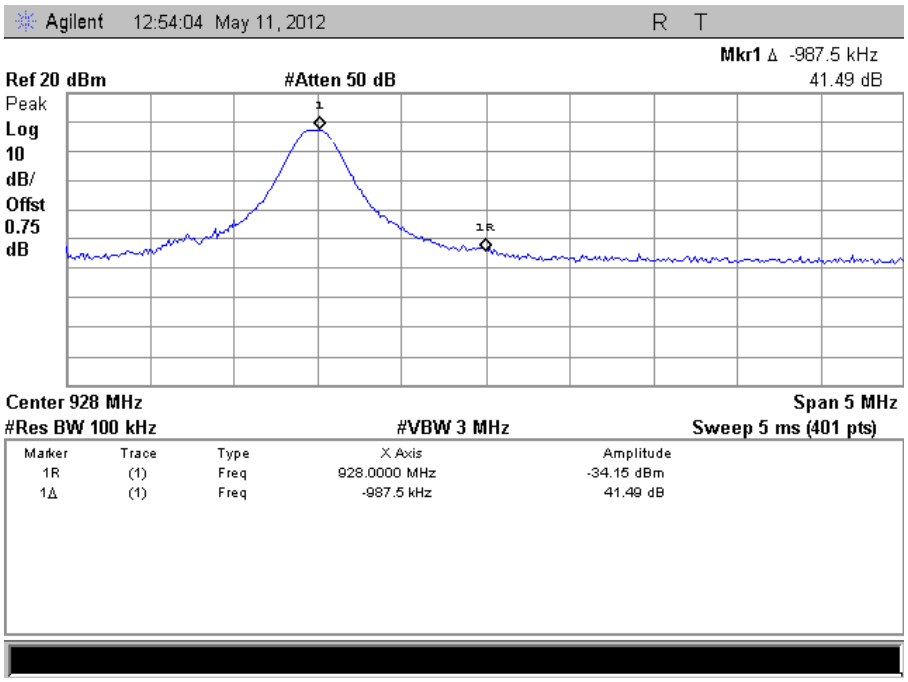
The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria. Plots are also presented showing the band edge compliance with the band edge centered on the analyzer display.



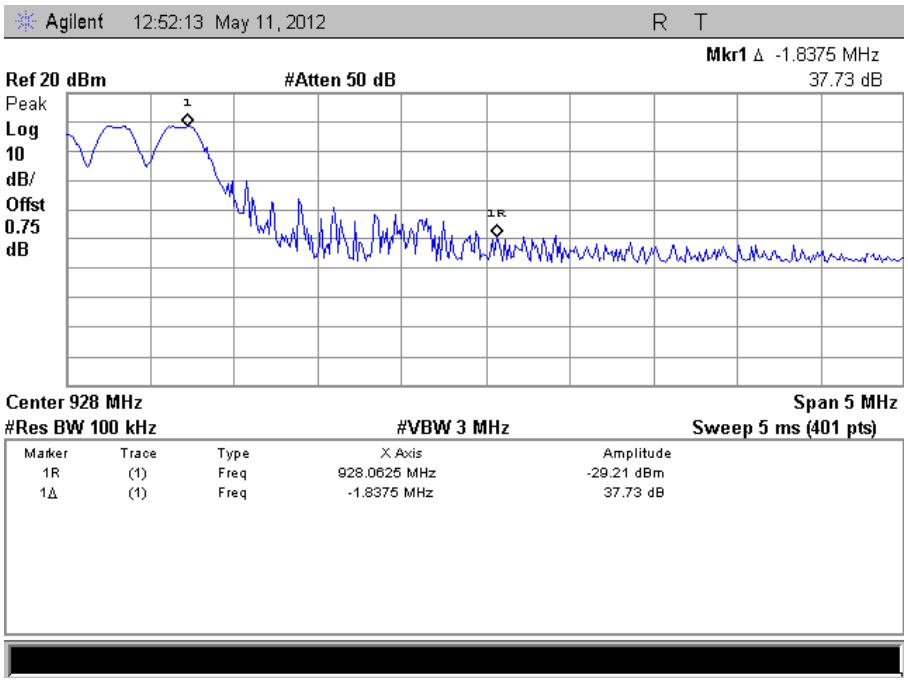
Conducted Band Edge Low Channel (Constant TX)



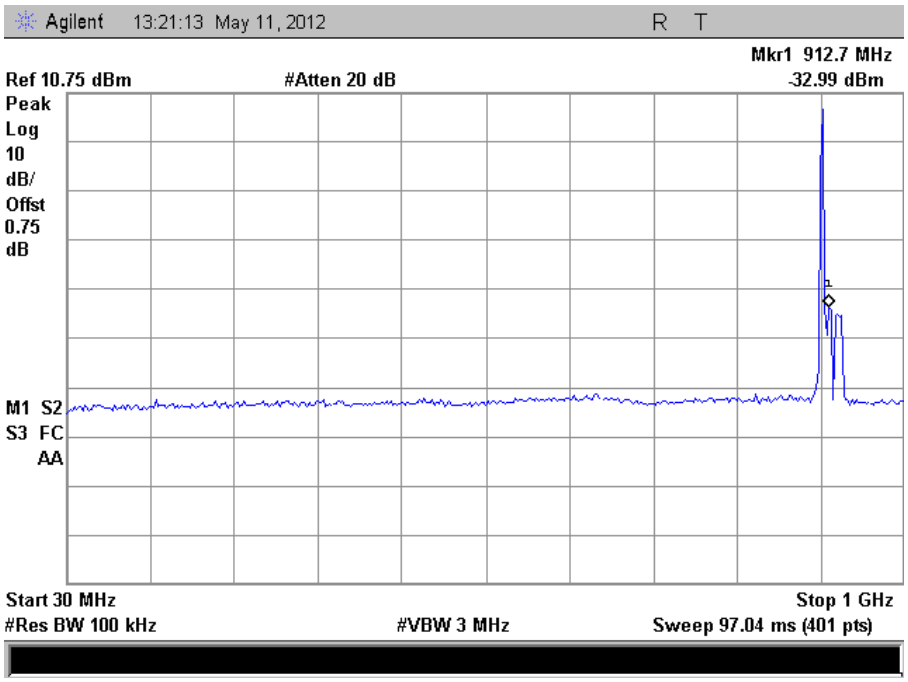
Conducted Band Edge Low Channel (Hopping Enabled)

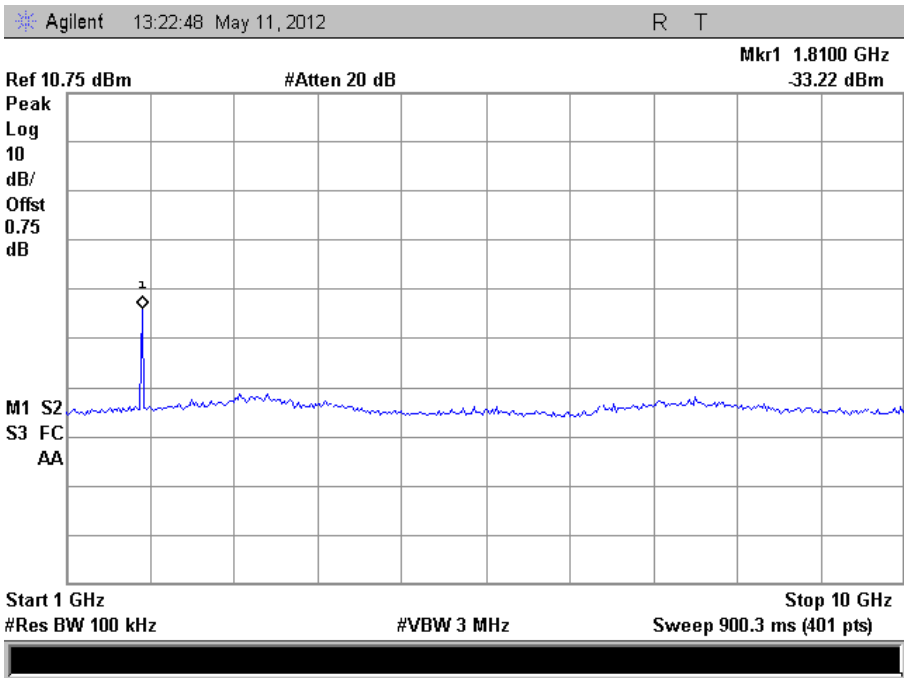


Conducted Band Edge High Channel (Constant TX)

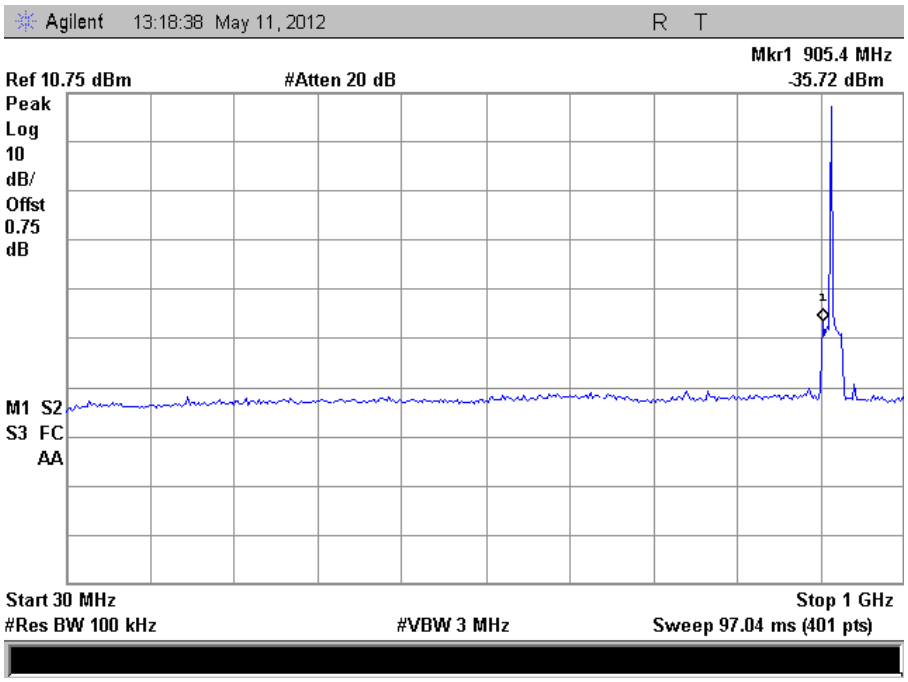


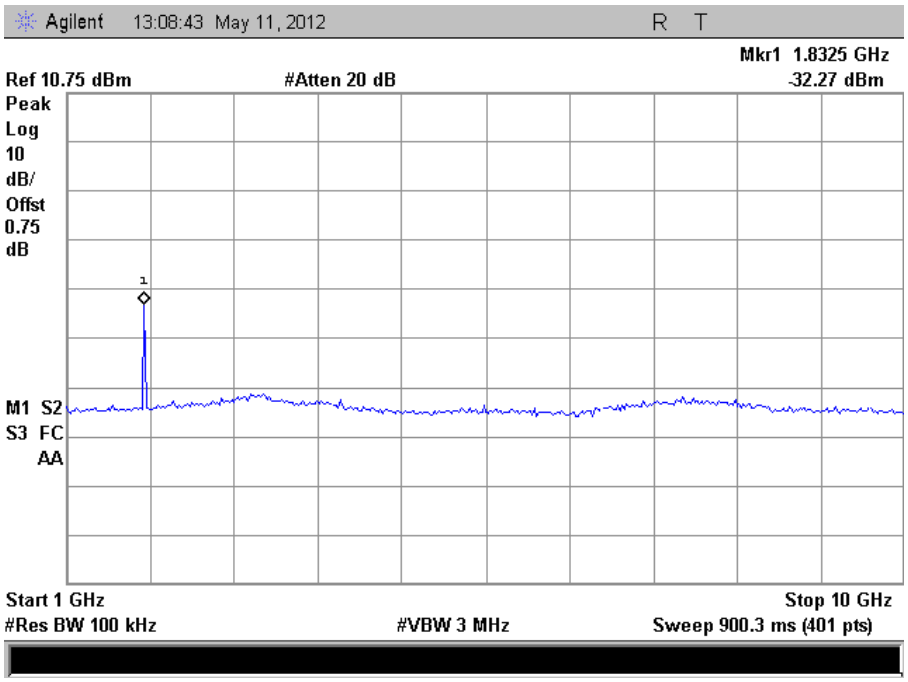
Conducted Band Edge High Channel (Hopping Enabled)



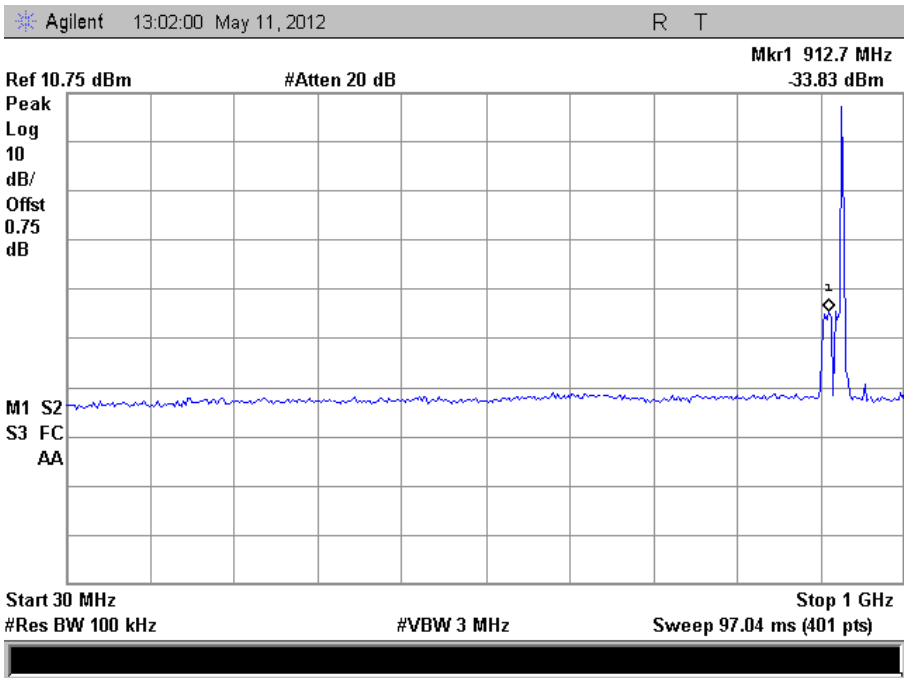


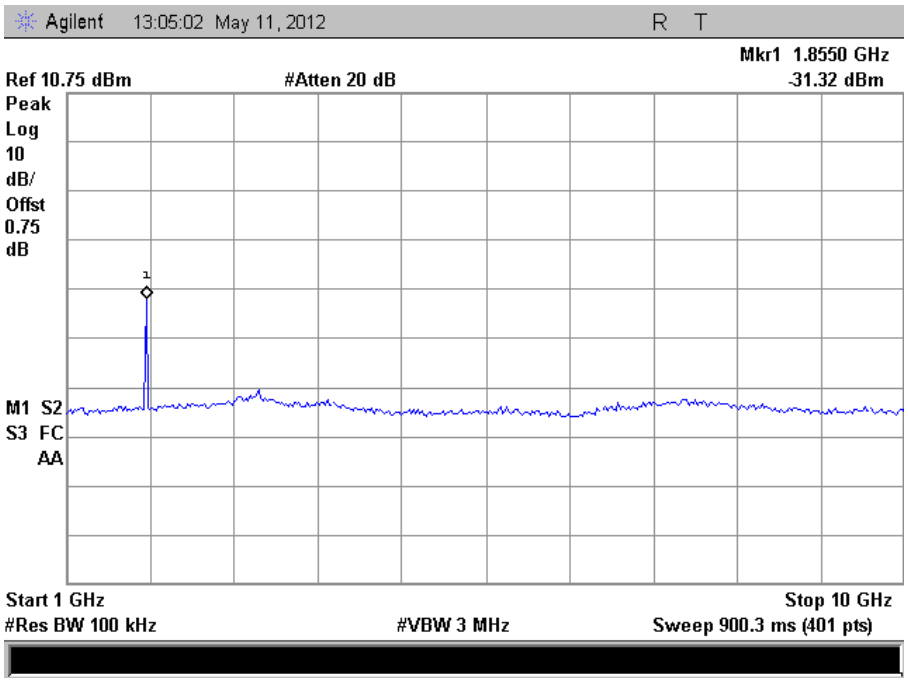
Conducted Spurious Emissions (Low Channel)





Conducted Spurious Emissions (Middle Channel)





Conducted Spurious Emissions (High Channel)

10 Radiated Spurious Emissions (Transmitter)

10.1 Test Limits

§ 15.247(d): 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. 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) (see §15.205(c)).

Part 15.205(a): Restricted Bands of Operations

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

Part 15.209(a): Field Strength Limits for Restricted Bands of Operation

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

10.2 Test Procedure

ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

10.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBμV/m
RA = Receiver Amplitude in dBμV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBμV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

10.4 Test Equipment Used:

Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2011	6/29/2012
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	9/12/2011	9/12/2012
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	9/12/2011	9/12/2012
Biconnilog Antenna	00051864	ETS	3142C	12/20/2011	12/20/2012
Horn Antenna	6556	ETS	3115	8/24/2011	8/24/2012
System Controller	121701-1	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
High Pass Filter	3986-01 DC0408	Microwave Circuits, Inc.	H3G020G2	Verify at Time of Use	Verify at Time of Use

10.5 Results:

All spurious emissions were attenuated by at least 20dB below the level of the fundamental as required by Part 15.247(d). Additionally, all emissions falling within restricted bands of operation and at the band edges were found to be below the limit specified in Part 15.209(a). The spurious emissions listed in the following table are the worst case emissions.

Worst Case Spurious Measurements (Low Channel)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Avg Reading. (dBuV/m)	Duty Cycle Factor (dB)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
Low	903.2 MHz	V	101.334	101.194	0	101.194	-	-	-	Fundamental
Low	903.2 MHz	H	106.704	106.444	0	106.444	-	-	-	Fundamental
Low	1.8064 GHz	V	61.469	49.199	0	49.199	20dBd	20dBd	Compliant	
Low	2.7096 GHz	V	65.488	51.848	0	51.848	74	54	Compliant	Restricted Band
Low	1.8064 GHz	H	61.219	56.089	0	56.089	20dBd	20dBd	Compliant	
Low	2.7096 GHz	H	64.868	51.918	0	51.918	74	54	Compliant	Restricted Band
Low	3.613 GHz	V	34.921	24.811	0	24.811	74	54	Compliant	Restricted Band
Low	4.516 GHz	V	35.47	26.15	0	26.15	74	54	Compliant	Restricted Band
Low	5.4192 GHz	V	40.299	39.869	0	39.869	74	54	Compliant	Restricted Band
Low	6.3224 GHz	V	40.605	32.155	0	32.155	20dBd	20dBd	Compliant	
Low	7.2256 GHz	V	46.586	36.266	0	36.266	20dBd	20dBd	Compliant	
Low	9.323 GHz	V	44.159	33.979	0	33.979	74	54	Compliant	Restricted Band
Low	3.6128 GHz	H	34.548	25.068	0	25.068	74	54	Compliant	Restricted Band
Low	4.5128 GHz	H	39.454	26.394	0	26.394	74	54	Compliant	Restricted Band
Low	5.4192 GHz	H	39.529	34.929	0	34.929	74	54	Compliant	Restricted Band
Low	6.3224 GHz	H	38.985	30.655	0	30.655	20dBd	20dBd	Compliant	
Low	7.2256 GHz	H	40.916	34.286	0	34.286	20dBd	20dBd	Compliant	
Low	9.3228 GHz	H	41.749	33.739	0	33.739	74	54	Compliant	Restricted Band

Worst Case Spurious Measurements (Middle Channel)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Avg Reading. (dBuV/m)	Duty Cycle Factor (dB)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
Mid	914.0 MHz	V	100.192	100.042	0	100.042	-	-	-	Fundamental
Mid	914.0 MHz	H	105.152	104.792	0	104.792	-	-	-	Fundamental
Mid	1.828 GHz	V	59.481	46.621	0	46.621	20dBd	20dBd	Compliant	
Mid	2.742 GHz	V	64.533	51.663	0	51.663	74	54	Compliant	Restricted Band
Mid	1.828 GHz	H	63.961	56.311	0	56.311	20dBd	20dBd	Compliant	
Mid	2.742 GHz	H	60.403	51.643	0	51.643	74	54	Compliant	Restricted Band
Mid	3.656 GHz	H	39.412	23.862	0	23.862	74	54	Compliant	Restricted Band
Mid	4.57 GHz	H	38.626	25.526	0	25.526	74	54	Compliant	Restricted Band
Mid	5.484 GHz	H	44.82	35.98	0	35.98	20dBd	20dBd	Compliant	
Mid	6.398 GHz	H	43.217	29.237	0	29.237	20dBd	20dBd	Compliant	
Mid	7.312 GHz	H	44.118	31.918	0	31.918	74	54	Compliant	Restricted Band
Mid	8.226 GHz	H	45.698	30.748	0	30.748	74	54	Compliant	Restricted Band
Mid	9.14 GHz	H	45.431	31.881	0	31.881	74	54	Compliant	Restricted Band
Mid	3.656 GHz	V	37.683	24.133	0	24.133	74	54	Compliant	Restricted Band
Mid	4.57 GHz	V	39.006	26.276	0	26.276	74	54	Compliant	Restricted Band
Mid	5.484 GHz	V	45.21	33.43	0	33.43	20dBd	20dBd	Compliant	
Mid	6.398 GHz	V	42.337	29.387	0	29.387	20dBd	20dBd	Compliant	
Mid	7.312 GHz	V	44.518	29.488	0	29.488	74	54	Compliant	Restricted Band
Mid	8.226 GHz	V	44.488	31.198	0	31.198	74	54	Compliant	Restricted Band
Mid	9.14 GHz	V	45.431	32.181	0	32.181	74	54	Compliant	Restricted Band

Worst Case Spurious Measurements (High Channel)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Avg Reading. (dBuV/m)	Duty Cycle Factor (dB)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
High	926.98 MHz	V	99.512	99.212	0	99.212	-	-	-	Fundamental
High	927.01 MHz	H	105.272	105.182	0	105.182	-	-	-	Fundamental
High	1.854 GHz	V	63.576	53.476	0	53.476	20dBd	20dBd	Compliant	
High	2.781 GHz	V	62.227	52.797	0	52.797	74	54	Compliant	Restricted Band
High	1.854 GHz	H	66.026	55.526	0	55.526	20dBd	20dBd	Compliant	
High	2.781 GHz	H	61.677	52.997	0	52.997	74	54	Compliant	Restricted Band
High	3.7088 GHz	H	41.905	25.945	0	25.945	74	54	Compliant	Restricted Band
High	4.635 GHz	H	40.263	25.803	0	25.803	74	54	Compliant	Restricted Band
High	5.562 GHz	H	42.004	28.814	0	28.814	20dBd	20dBd	Compliant	
High	6.489 GHz	H	43.541	29.051	0	29.051	20dBd	20dBd	Compliant	
High	7.416 GHz	H	43.645	29.945	0	29.945	74	54	Compliant	Restricted Band
High	8.343 GHz	H	44.941	30.851	0	30.851	20dBd	20dBd	Compliant	
High	9.27 GHz	H	45.741	32.781	0	32.781	20dBd	20dBd	Compliant	
High	3.7082 GHz	V	39.619	24.629	0	24.629	74	54	Compliant	Restricted Band
High	4.635 GHz	V	39.373	25.763	0	25.763	74	54	Compliant	Restricted Band
High	5.562 GHz	V	44.604	34.784	0	34.784	20dBd	20dBd	Compliant	
High	6.489 GHz	V	42.911	29.541	0	29.541	20dBd	20dBd	Compliant	
High	7.416 GHz	V	43.925	30.205	0	30.205	74	54	Compliant	Restricted Band
High	8.343 GHz	V	44.801	31.061	0	31.061	20dBd	20dBd	Compliant	
High	9.27 GHz	V	46.141	33.031	0	33.031	20dBd	20dBd	Compliant	

11 Radiated Spurious Emissions (Receiver)

11.1 Test Limits

§ 15.109: Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m)
30–88	100	40
88–216	150	43.5
216–960	200	46
Above 960	500	54

These limits are identical to those in RSS-GEN

11.2 Test Procedure

ANSI C63.4: 2009

11.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBµV/m
RA = Receiver Amplitude in dBµV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBµV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBµV/m
Level in µV/m = Common Antilogarithm [(38.78 dBµV/m)/20] = 86.89 µV/m

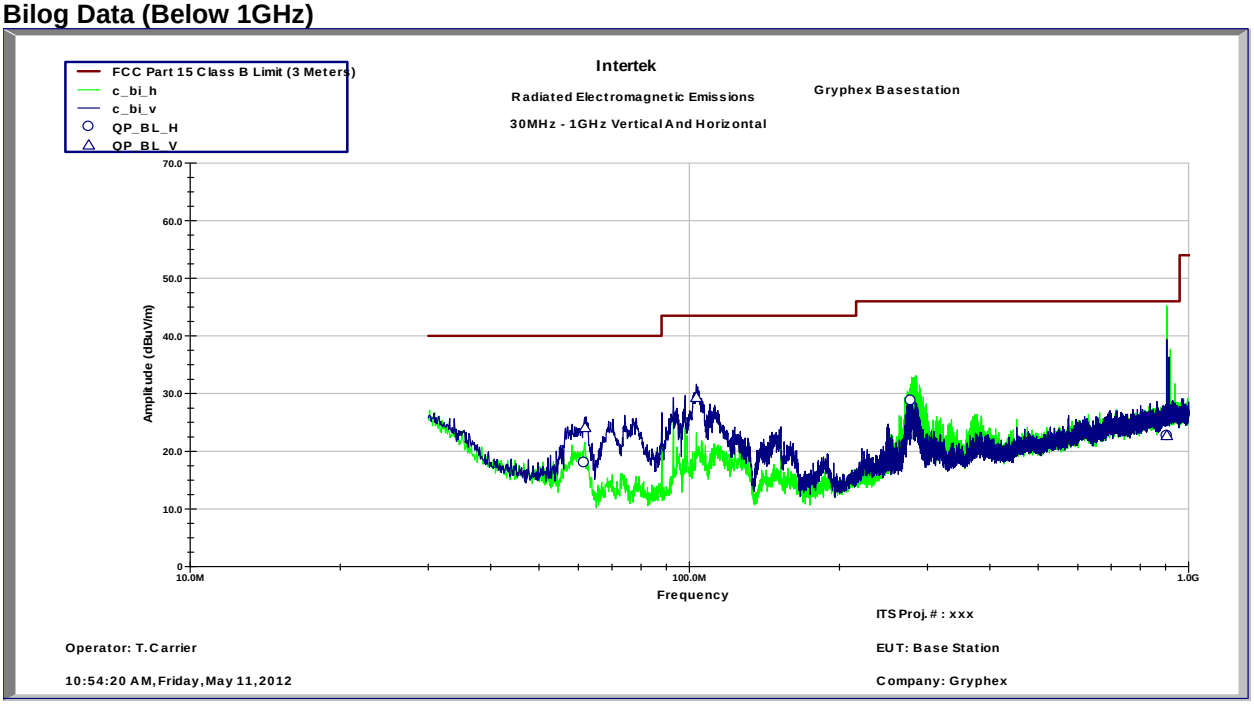
11.4 Test Equipment Used:

Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2011	6/29/2012
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	9/12/2011	9/12/2012
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	9/12/2011	9/12/2012
Biconnilog Antenna	00051864	ETS	3142C	12/20/2011	12/20/2012
Horn Antenna	6556	ETS	3115	8/24/2011	8/24/2012
System Controller	121701-1	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use

11.5 Results:

All spurious emissions with the test sample in receive mode were below the limits specified in Part 15.109 for a class B digital device and RSS-GEN Section 6.1. All peak detected emissions were at least 15dB below the limit.

Bilog Data (Below 1GHz)

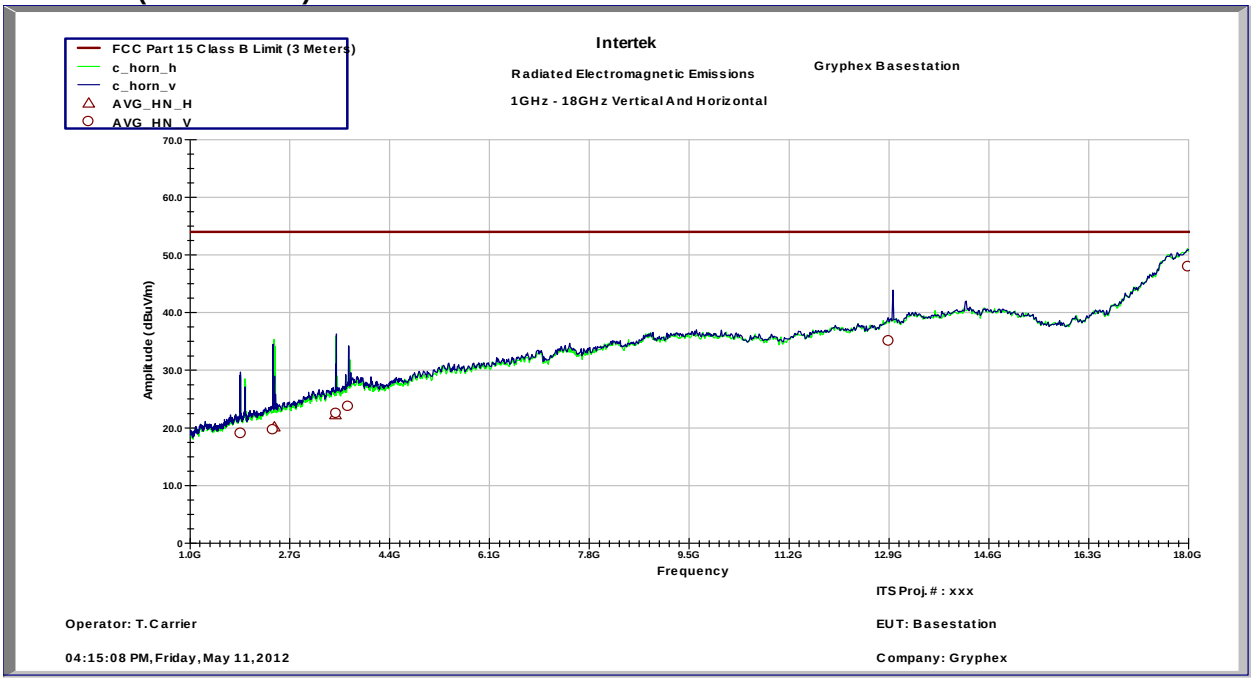


Radiated Emissions										
Test Engineer:	T. Carrier	**Start Date:**	5/11/2012	**End Date:**	5/11/2012					
Temperature:	27.6°C	**Humidity:**	41.00%	**Pressure:**	984.6 mbar					
Specification:	FCC Part 15	**Test Limit:**	Class B							
Notes:	Gryphex Basestation									

A	B	C	D	E	F	G	H	I	J	K
Frequency	**Polarity (H/V)**	**Raw Reading (dBuV)**	**Cab. (dB)**	**Ant. (dB)**	**Corr. Reading. (dBuV/m)**	**Limit (dBuV/m)**	**Delta (dB)**	**RBW / Detector**	**Test Distance**	**Results**
61.539 MHz	H	26.49	-15.82	7.3	17.97	40	-22.03	120kHz/QP	3m	**Compliant**
277.82 MHz	H	30.03	-14.17	12.9	28.76	46.02	-17.26	120kHz/QP	3m	**Compliant**
905.47 MHz	H	10.41	-11.05	23.32	22.68	46.02	-23.34	120kHz/QP	3m	**Compliant**
61.897 MHz	V	32.59	-15.81	7.3	24.08	40	-15.92	120kHz/QP	3m	**Compliant**
103.34 MHz	V	36.12	-15.44	8.63	29.32	43.52	-14.2	120kHz/QP	3m	**Compliant**
905.36 MHz	V	10.46	-11.05	23.31	22.73	46.02	-23.29	120kHz/QP	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Peak Scan (Receive Mode)

Horn Data (Above 1GHz)



Radiated Emissions					
Test Engineer:	T. Carrier	**Start Date:**	5/11/2012	**End Date:**	5/11/2012
Temperature:	27.6°C	**Humidity:**	41.00%	**Pressure:**	984.6 mbar
Specification:	FCC Part 15	**Test Limit:**	Class B		
Notes:	Gryphex Basestation				

A	B	C	D	E	F	G	H	I	J	K
Frequency	**Polarity (H/V)**	**Raw Reading (dBuV)**	**Cab. (dB)**	**Ant. (dB)**	**Corr. Reading. (dBuV/m)**	**Limit (dBuV/m)**	**Delta (dB)**	**RBW / Detector**	**Test Distance**	**Results**
2.4342 GHz	H	27.84	-36.1	28.41	20.14	53.98	-33.84	1MHz/AVG	3m	**Compliant**
3.4788 GHz	H	25.01	-34.16	31.4	22.25	53.98	-31.73	1MHz/AVG	3m	**Compliant**
1.8649 GHz	V	28.89	-36.85	26.94	18.99	53.98	-34.99	1MHz/AVG	3m	**Compliant**
2.4132 GHz	V	27.39	-36.13	28.37	19.63	53.98	-34.35	1MHz/AVG	3m	**Compliant**
3.4885 GHz	V	25.2	-34.14	31.43	22.49	53.98	-31.49	1MHz/AVG	3m	**Compliant**
3.6933 GHz	V	25.13	-33.82	32.38	23.69	53.98	-30.29	1MHz/AVG	3m	**Compliant**
12.897 GHz	V	17.88	-21.91	39.07	35.05	53.98	-18.93	1MHz/AVG	3m	**Compliant**
17.996 GHz	V	16.08	-14.08	45.94	47.95	53.98	-6.03	1MHz/AVG	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Peak Scan (Receive Mode)

12 AC Powerline Conducted Emissions

12.1 Test Limits

§ 15.107(e): Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

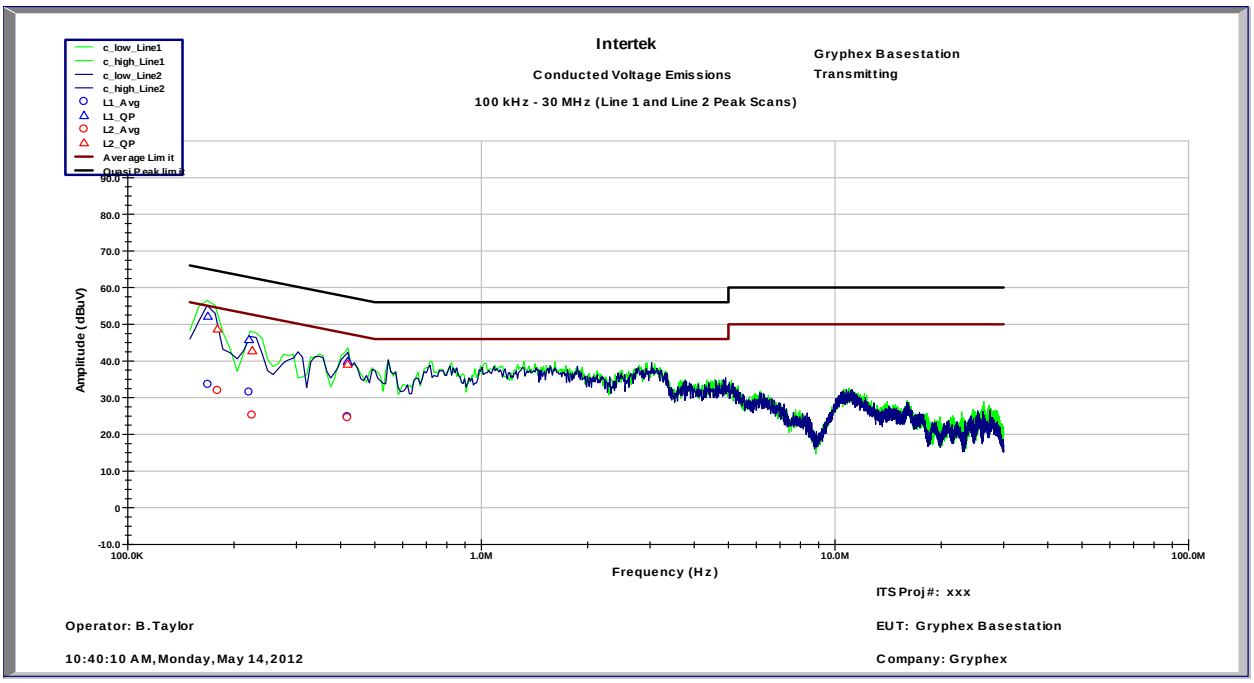
12.2 Test Procedure

ANSI C63.4: 2009

12.3 Test Equipment Used:

Description	Serial/ID Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2011	6/29/2012
LISN	1026	Fischer Custom Communication	FCC-LISN-50-50-2M	6/16/2011	6/16/2012

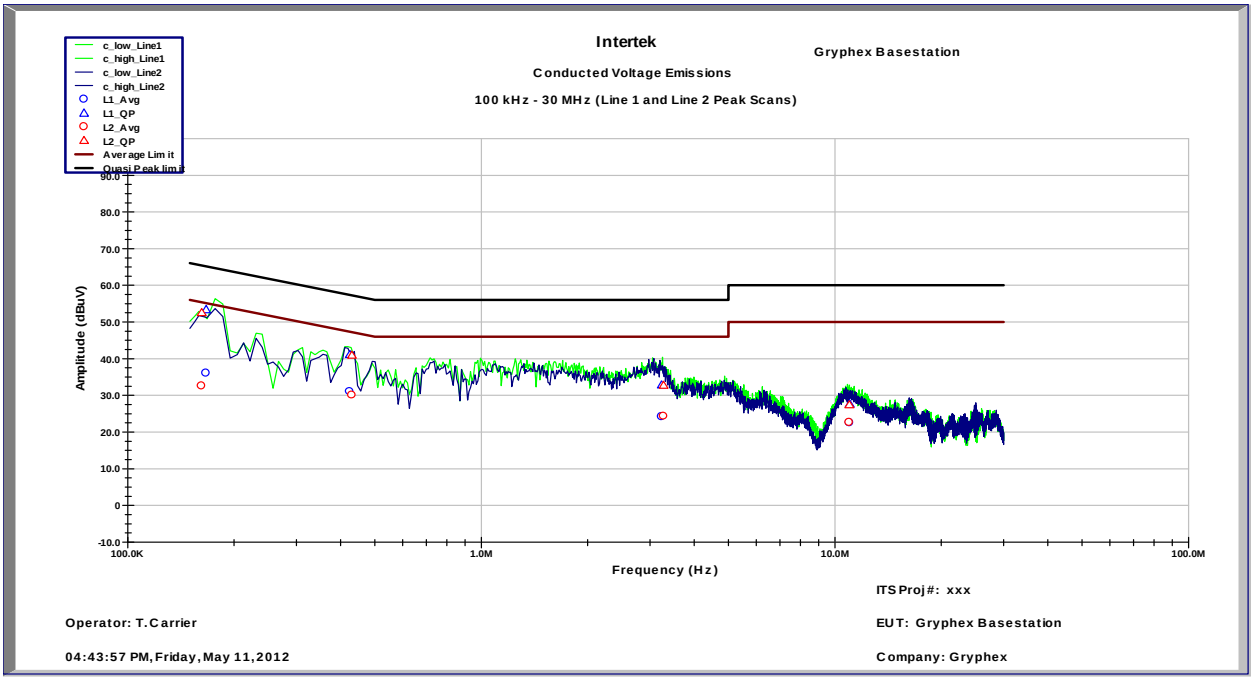
12.4 Results:



Conducted Voltage Emissions on Power Lines					
Test Engineer:	B. Taylor	**Start Date:**	5/14/2012	**End Date:**	5/14/2012
Temperature:	26.6°C	**Humidity:**	43.10%	**Pressure:**	985.1 mbar
Specification:	FCC Part 15	**Test Limit:**	Class B	**RBW:**	9kHz
Notes:	Base Station Transmitting				

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	168.7 KHz	52.21	65.02	-12.82	33.62	55.02	-21.41	**Compliant**
L1	220.6 KHz	45.81	62.8	-16.99	31.51	52.8	-21.29	**Compliant**
L1	418.8 KHz	39.88	57.47	-17.59	24.72	47.47	-22.75	**Compliant**
L2	179.6 KHz	48.72	64.5	-15.78	31.9	54.5	-22.6	**Compliant**
L2	225.0 KHz	42.82	62.63	-19.81	25.23	52.63	-27.4	**Compliant**
L2	418.8 KHz	39.13	57.47	-18.34	24.48	47.47	-22.99	**Compliant**

Quasi-Peak and Average Measurements (Transmitting Mode)



Conducted Voltage Emissions on Power Lines					
Test Engineer:	T. Carrier	**Start Date:**	5/11/2012	**End Date:**	5/11/2012
Temperature:	26.6°C	**Humidity:**	43.10%	**Pressure:**	985.1 mbar
Specification:	FCC Part 15	**Test Limit:**	Class B	**RBW:**	9kHz
Notes:	Gryphex Basestation				

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	166.7 KHz	53.37	65.12	-11.76	36	55.12	-19.13	**Compliant**
L1	425.2 KHz	41.09	57.35	-16.25	31	47.35	-16.34	**Compliant**
L1	3.2373 MHz	32.83	56	-23.17	24.13	46	-21.87	**Compliant**
L1	11.007 MHz	27.63	60	-32.37	22.46	50	-27.54	**Compliant**
L2	162.0 KHz	52.54	65.36	-12.83	32.51	55.36	-22.86	**Compliant**
L2	430.8 KHz	40.92	57.24	-16.31	30.04	47.24	-17.19	**Compliant**
L2	3.278 MHz	32.73	56	-23.27	24.29	46	-21.71	**Compliant**
L2	10.988 MHz	27.41	60	-32.59	22.59	50	-27.41	**Compliant**

Quasi-Peak and Average Measurements (Receive Mode)

13 Antenna Requirement per FCC Part 15.203

13.1 Test Limits

§ 15.203: 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

13.2 Results:

The sample tested met the antenna requirement. The antenna used was permanently attached and integral to the PCB.

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	Notes
Radiated emissions, 30 to 1000 MHz	±3.9dB	
Radiated emissions, 1 to 18 GHz	±4.2dB	
Radiated emissions, 18 to 40 GHz	±4.3dB	
Power Port Conducted emissions, 150kHz to 30 MHz	±2.8dB	

15 Revision History

Revision Level	Date	Report Number	Notes
0	6/17/2012	100753208LEX-003	Original Issue