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FHSS TEST REPORT

Report Number:	**101159678LEX-002**
Project Number:	**G101159678**
Report Issue Date:	**6/3/2014**
Product Name:	**WF10040 WiFi, Bluetooth Module**
FCCID:	**URZ-WF10040**
ICID:	**68270-WF10040**
Standards:	**CFR Title 47 Part 15 B and C, RSS 210-Issue 8**
Radio Under Test:	**Bluetooth**

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

Client:
HandEra, Inc.
2859 104th St
Des Moines, IA 50322

Report prepared by
Toby Carrier, Technician

Report reviewed by
Bryan Taylor, Team Leader

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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
12	20dB Bandwidth	§ 15.247(a)(1)	RSS210 (A8.1)	Pass
15	Channel Separation	§ 15.247(a)(1)	RSS210 (A8.1)	Pass
17	Number of Hopping Channels	§ 15.247(a)(1)(iii)	RSS210(A8.1)	Pass
21	Time of Occupancy	§ 15.247(a)(1)(iii)	RSS210 (A8.1)	Pass
25	Conducted Spurious Emissions	§ 15.247(d)	RSS210 (A8.5)	Pass
34	Radiated Spurious Emissions (Transmitter)	§ 15.247(d), § 15.209, and § 15.205	RSS-210 (A8.5)	Pass
40	Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (6.1)	Pass
44	AC Powerline Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Pass
47	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	HandEra, Inc.
Model Number	WF10040
Serial Number	Test Sample 1
FCC Identifier	URZ-WF10040
IC Identifier	68270-WF10040
Receive Date	5/8/2013
Test Start Date	5/8/2013
Test End Date	5/23/2013
Device Received Condition	Good
Test Sample Type	Production
Frequency Range	2402 – 2480MHz
Modulation Type	GFSK (1Mbps), pi/4 DPSK (2Mbps), 8DPSK (3Mbps)
Transmission Control	Test Commands
Maximum Output Power	9.89dBm
Test Channels	2402MHz, 2441MHz, and 2480MHz
Antenna Type (15.203)	Internal
Antenna Gain	2.1dBi
Operating Voltage	DC

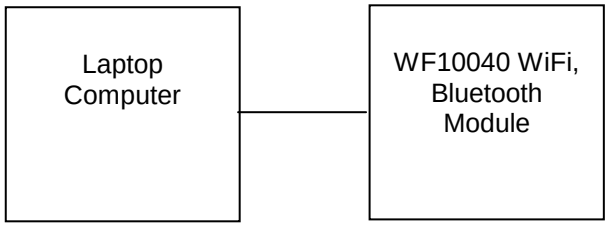
Description of Equipment Under Test
The equipment under test was a Bluetooth / WiFi Module

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:



3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
DC Power Cable	4 ft	None	Yes	AC/DC Power Adapter	DC Input to Test Jig
Serial Cable	6 ft	Yes	None	Laptop Computer	Serial Port on Test Jig

3.4 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	HP	EliteBook 8470p	Unknown
Test Jig	Test Jig	Not Labeled	Not Labeled

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

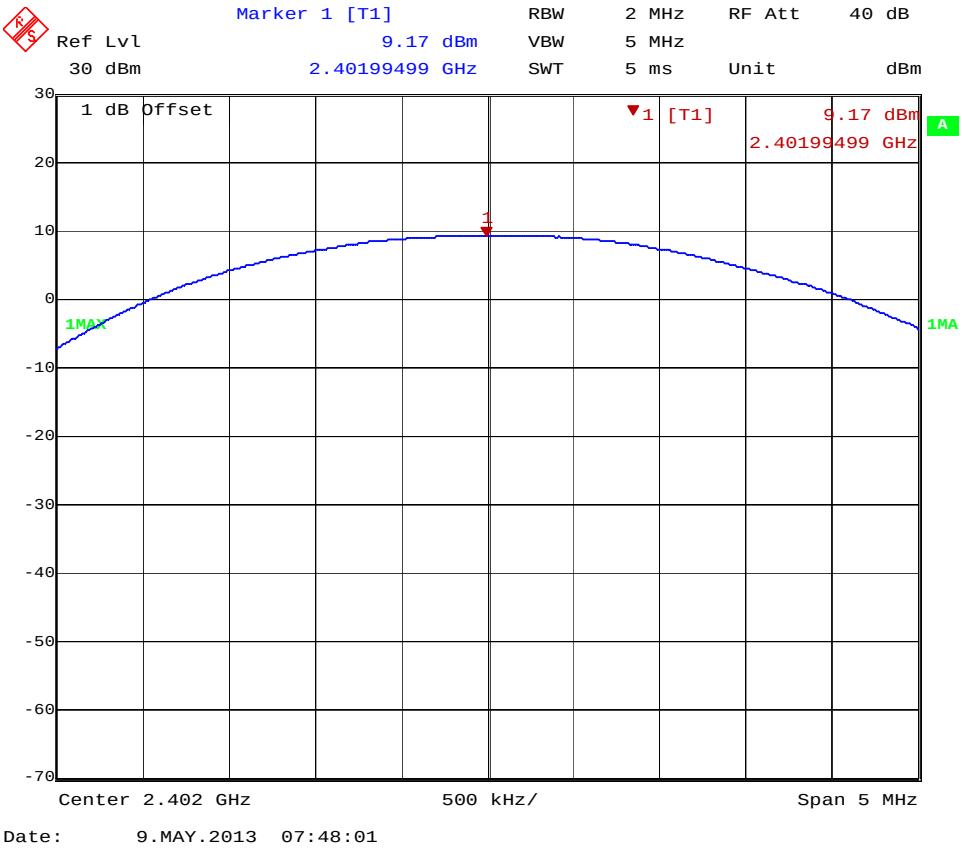
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. The peak output power was measured using the marker to peak function of the spectrum analyzer.

4.3 Test Equipment Used:

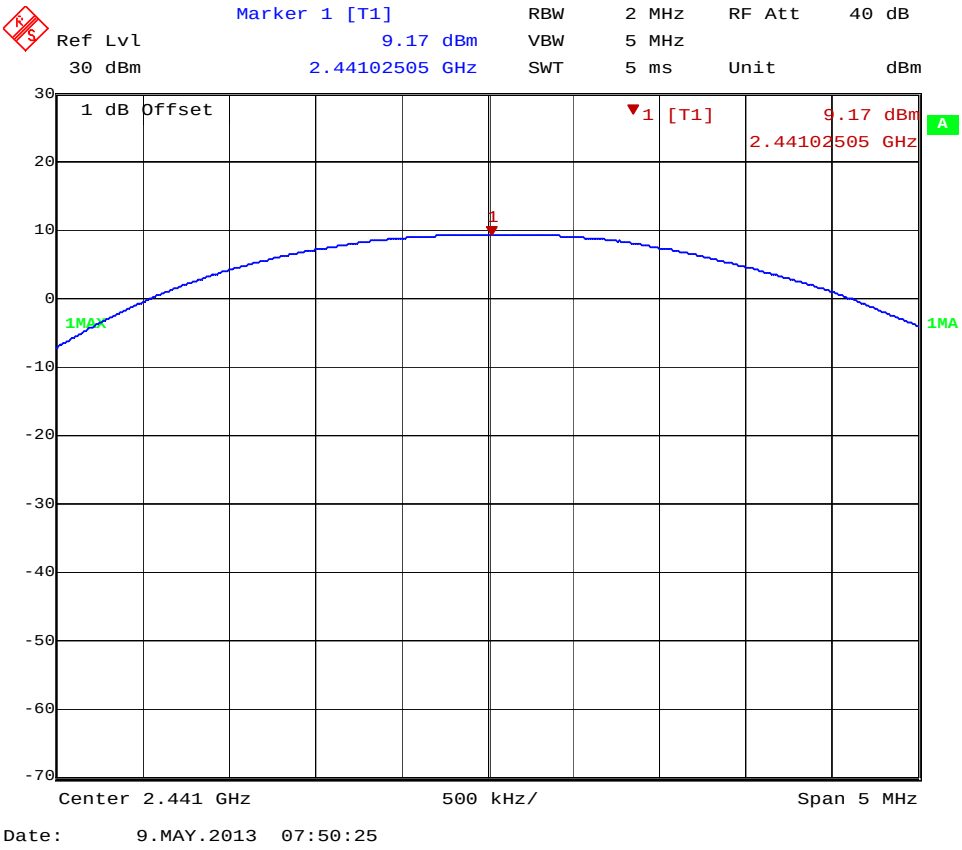
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

4.4 Results:

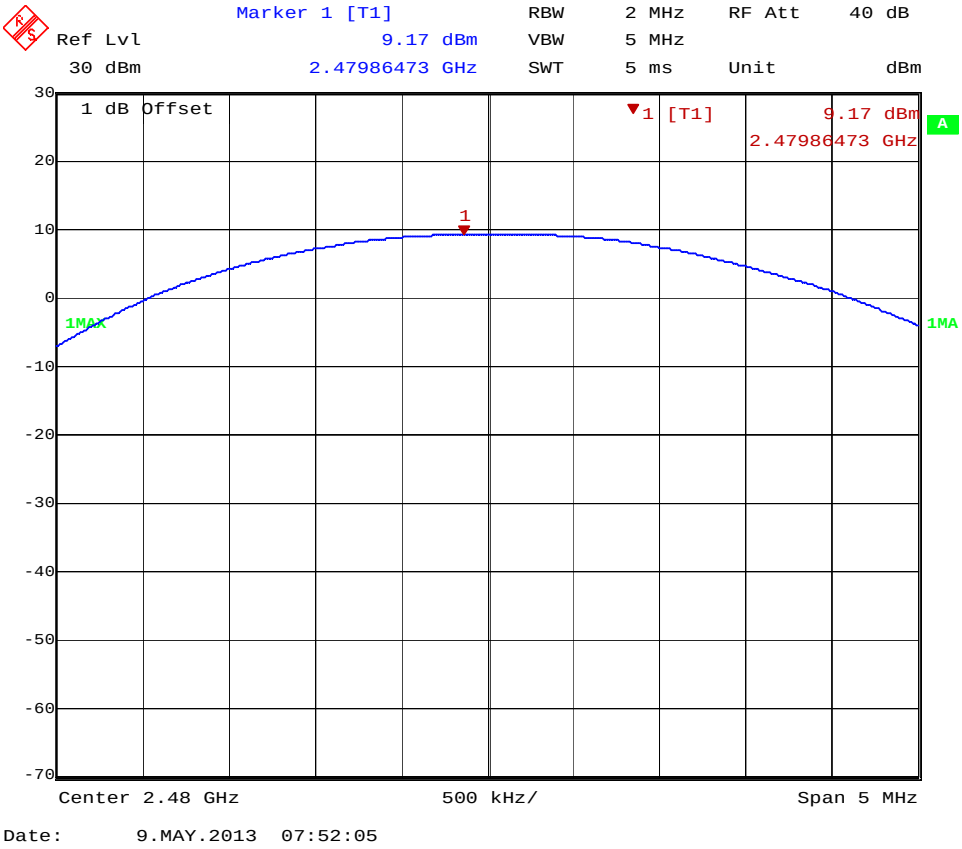
Channel	Frequency (MHz)	Data Rate	Output Power (dBm)	Limit (dBm)	Pass / Fail
Low	2402	1Mbps	9.17dbm	30dBm	Pass
Mid	2441	1Mbps	9.17dbm	30dBm	Pass
High	2480	1Mbps	9.17dbm	30dBm	Pass
Low	2402	2Mbps	9.11dbm	30dBm	Pass
Mid	2441	2Mbps	9.17dbm	30dBm	Pass
High	2480	2Mbps	9.17dbm	30dBm	Pass
Low	2402	3Mbps	9.76dbm	30dBm	Pass
Mid	2441	3Mbps	9.89dbm	30dBm	Pass
High	2480	3Mbps	9.89dbm	30dBm	Pass



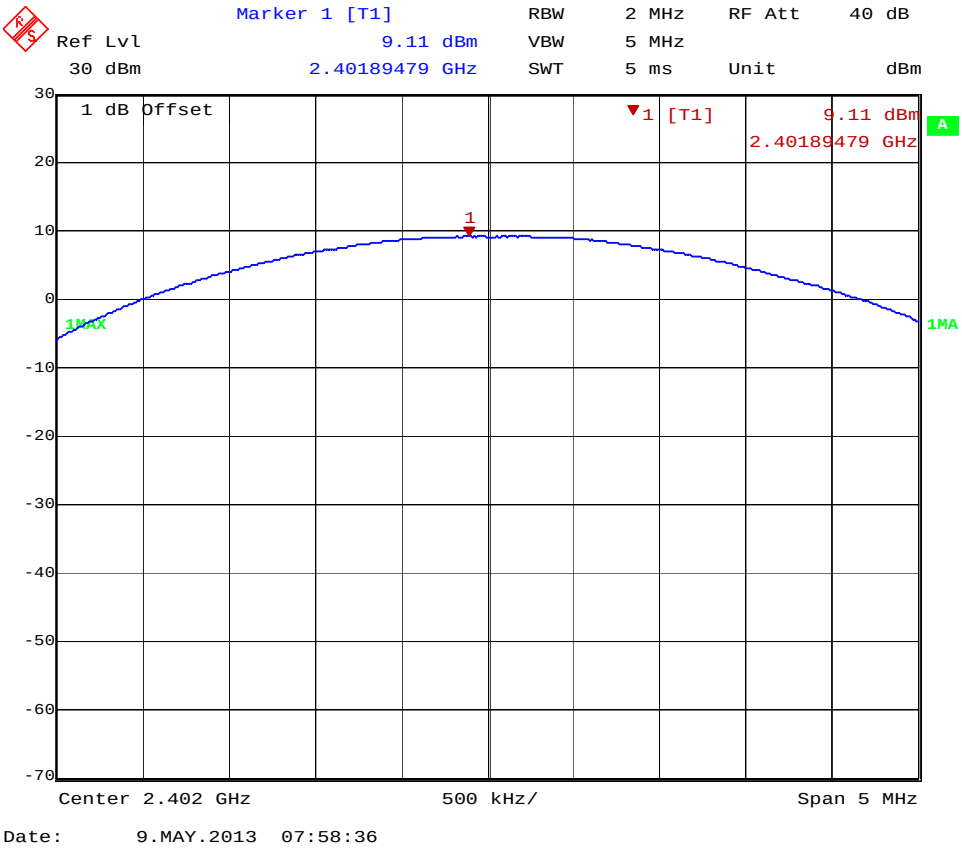
Peak Output Power Low Channel (1Mbps)



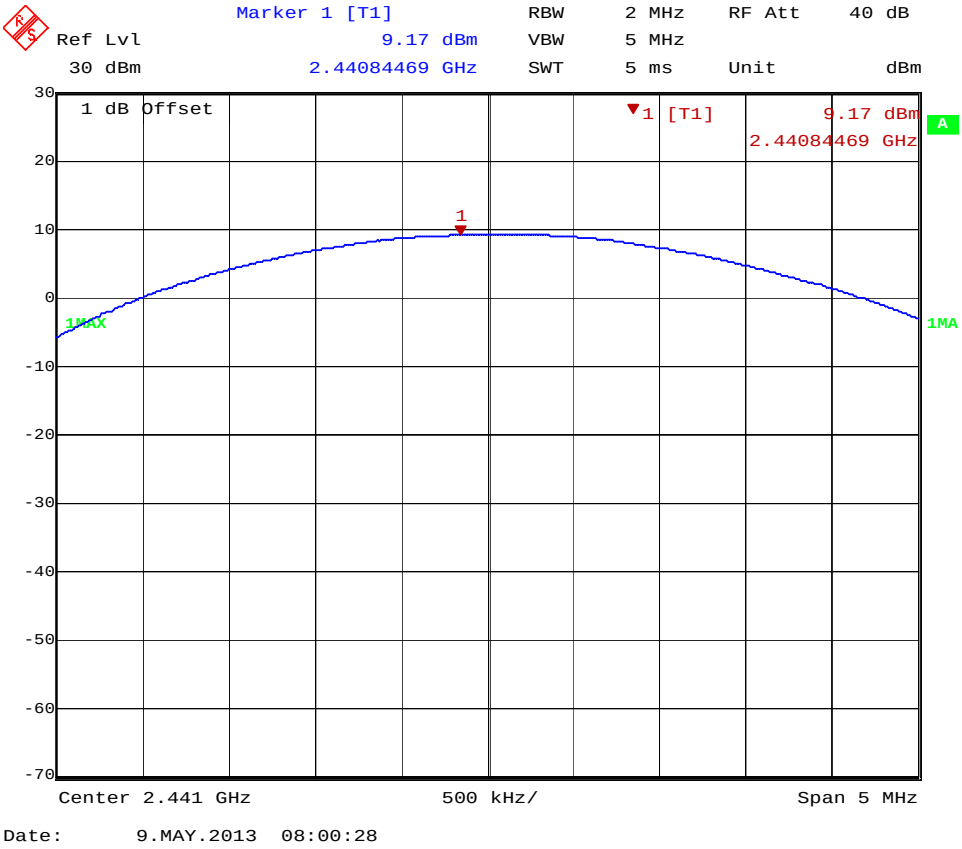
Peak Output Power Middle Channel (1Mbps)



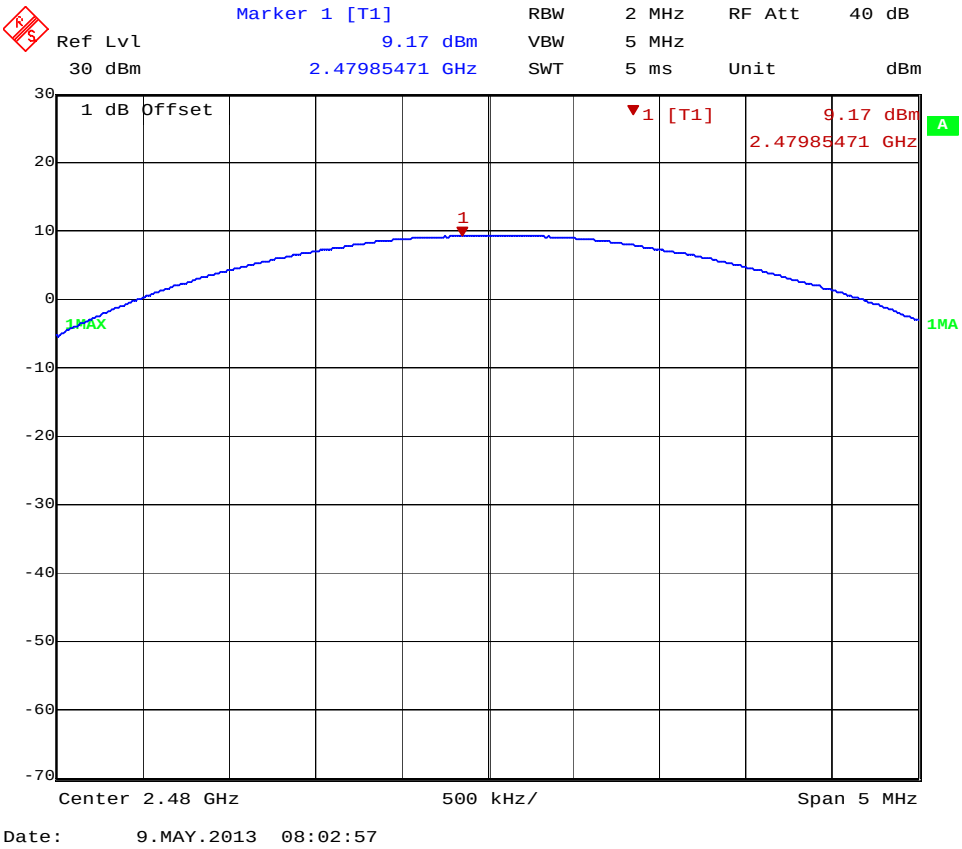
Peak Output Power High Channel (1Mbps)



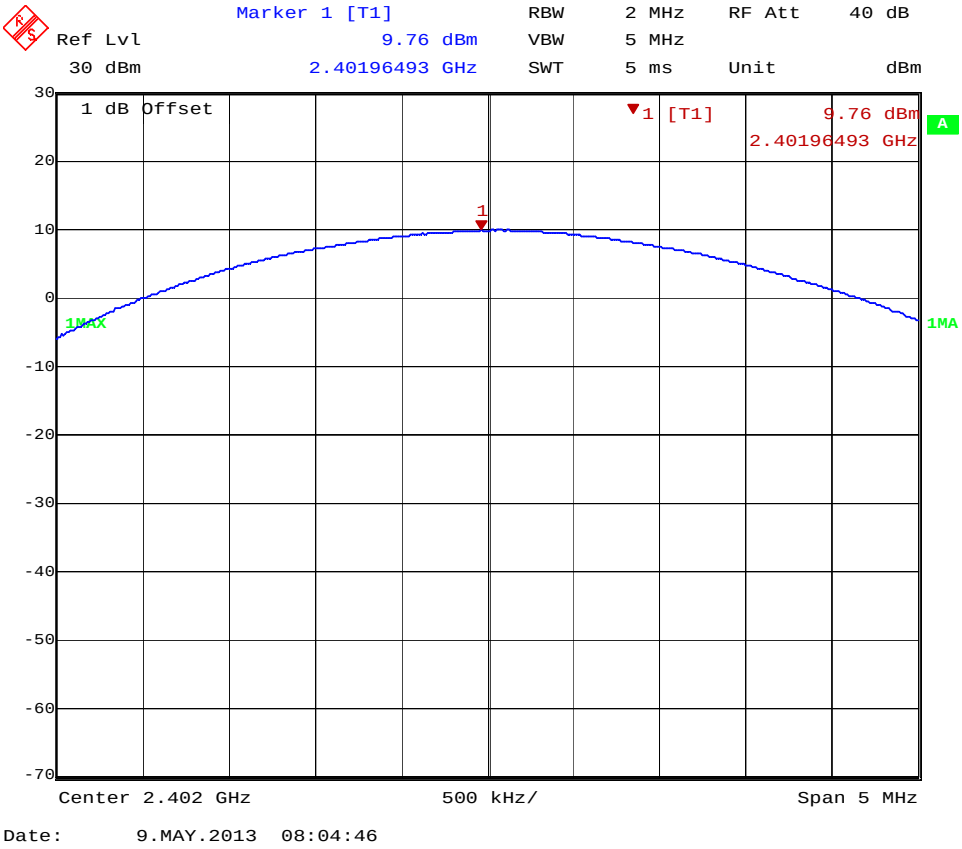
Peak Output Power Low Channel (2Mbps)



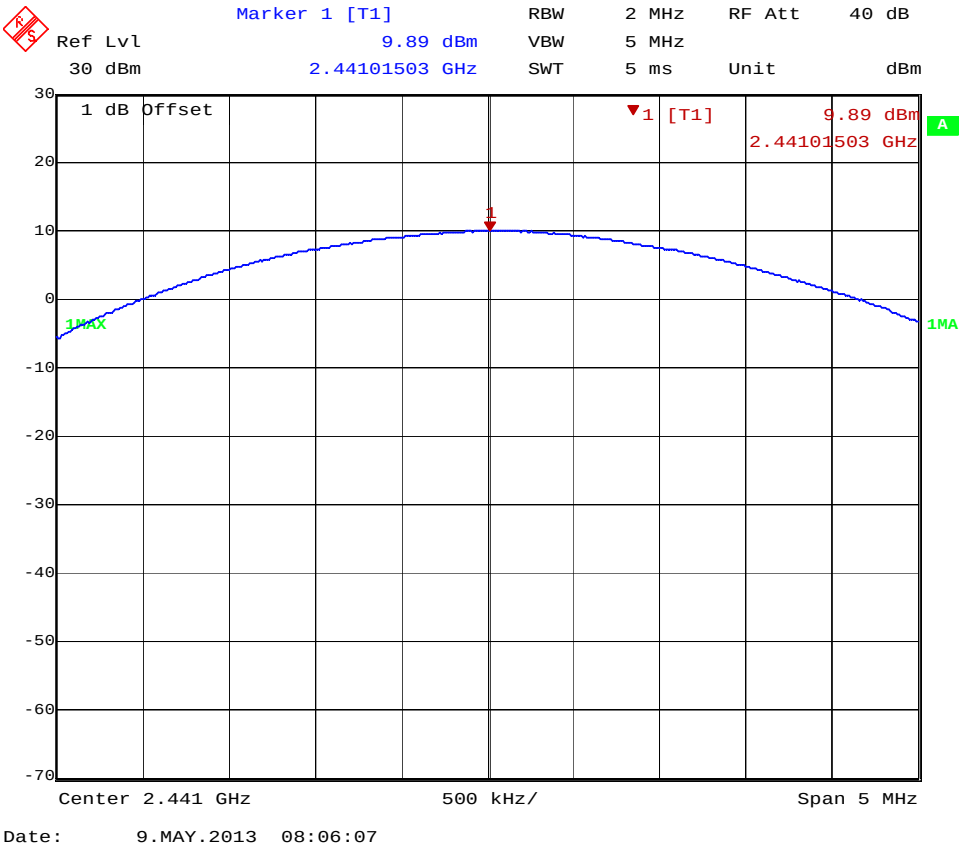
Peak Output Power Middle Channel (2Mbps)



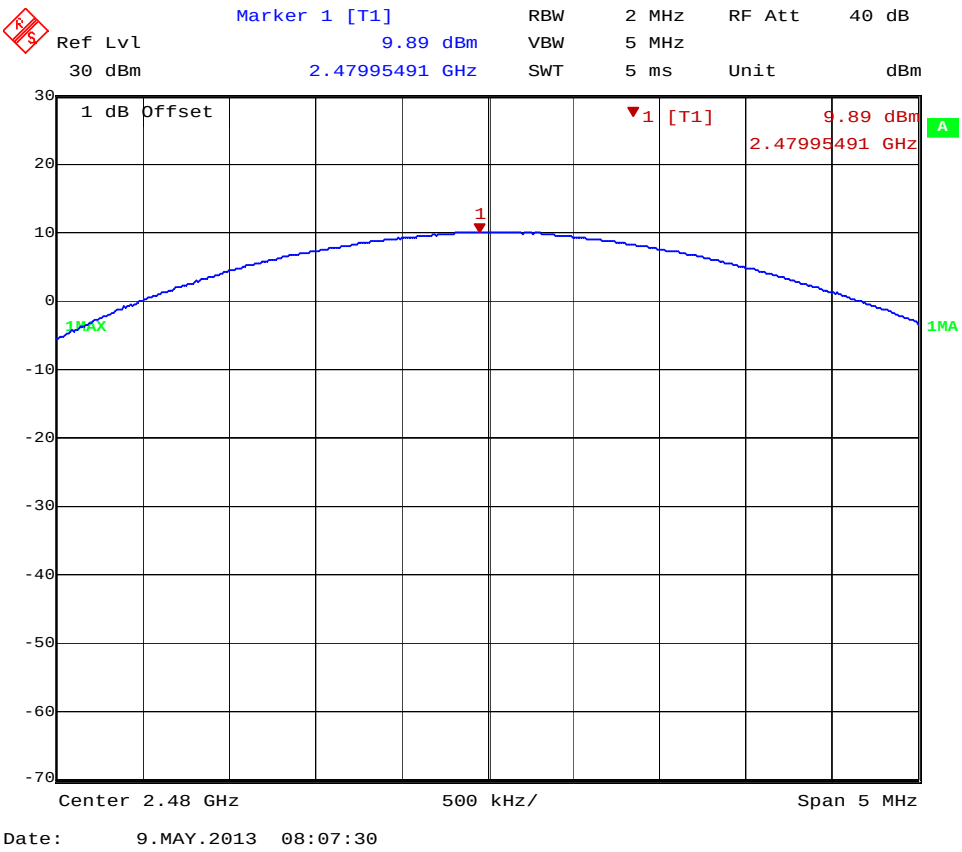
Peak Output Power High Channel (2Mbps)



Peak Output Power Low Channel (3Mbps)



Peak Output Power Middle Channel (3Mbps)



Peak Output Power High Channel (3Mbps)

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.

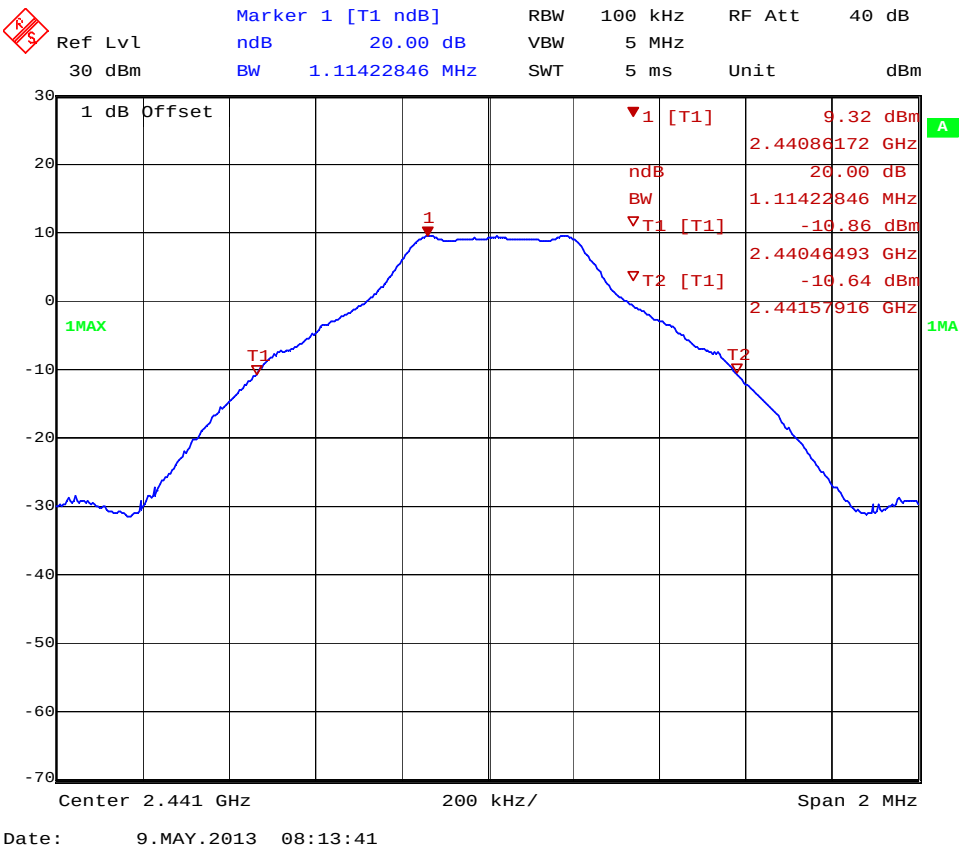
5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

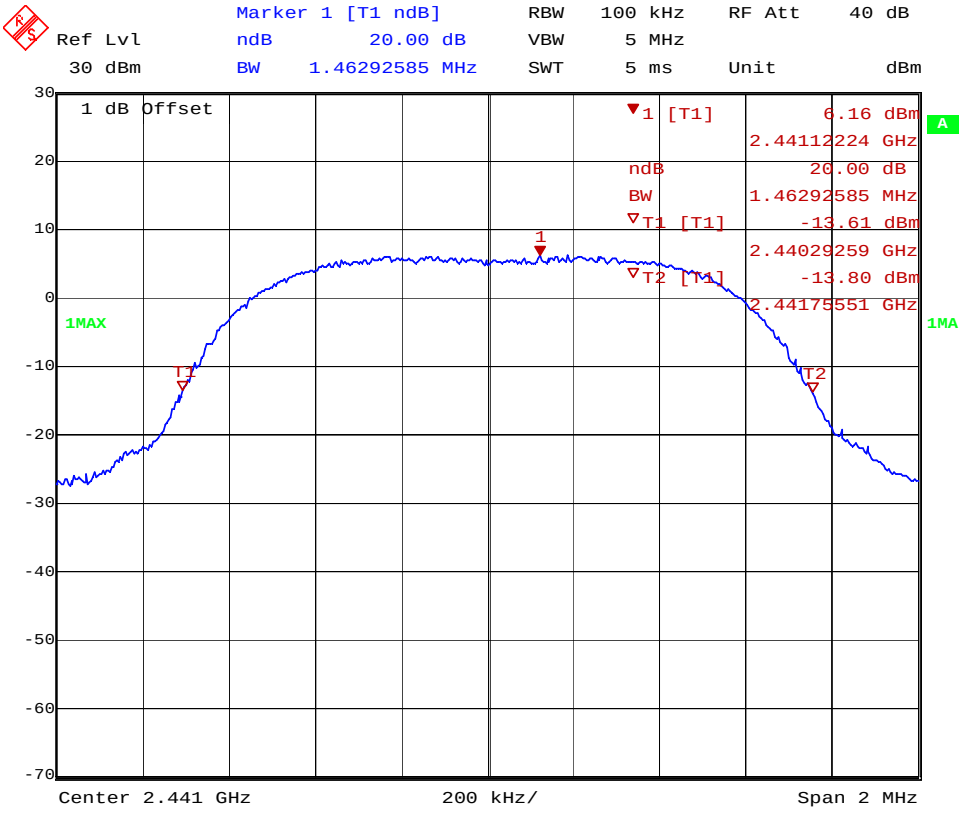
5.4 Results:

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

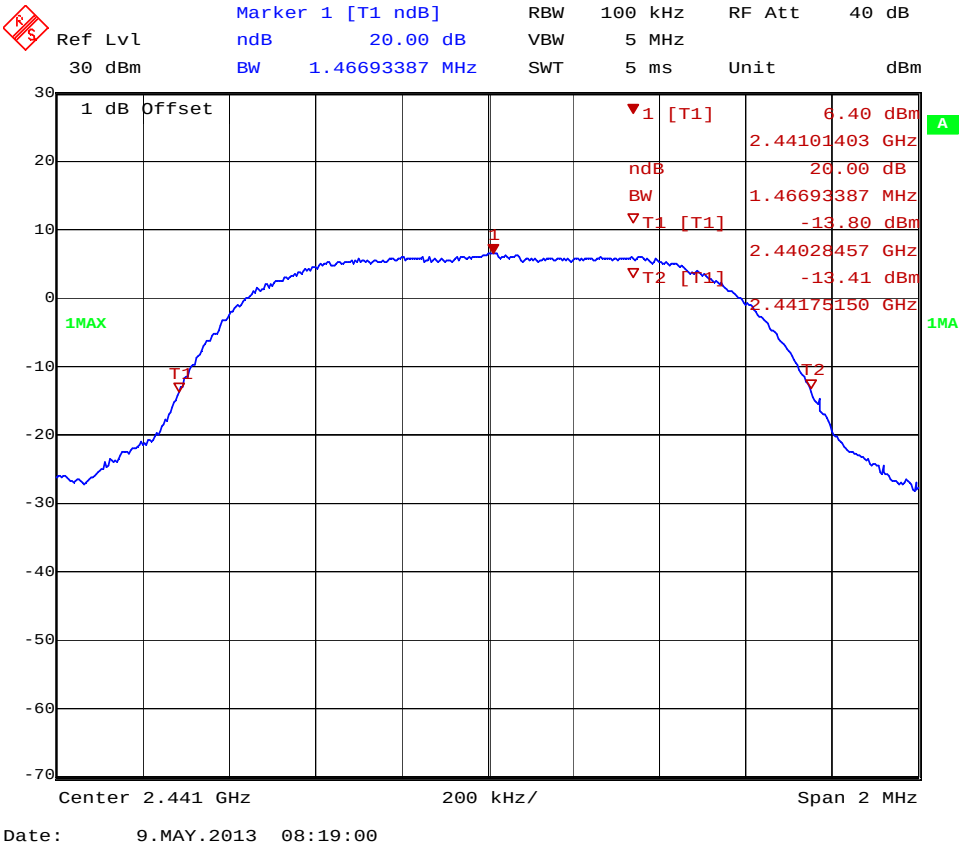
Channel	Data Rate	Frequency (MHz)	20dB Bandwidth (kHz)
Mid	1Mbps	2441	1.114MHz
Mid	2Mbps	2441	1.458MHz
Mid	3Mbps	2441	1.466MHz



20dB Bandwidth (1Mbps)



20dB Bandwidth (2Mbps)



20dB Bandwidth (3Mbps)

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

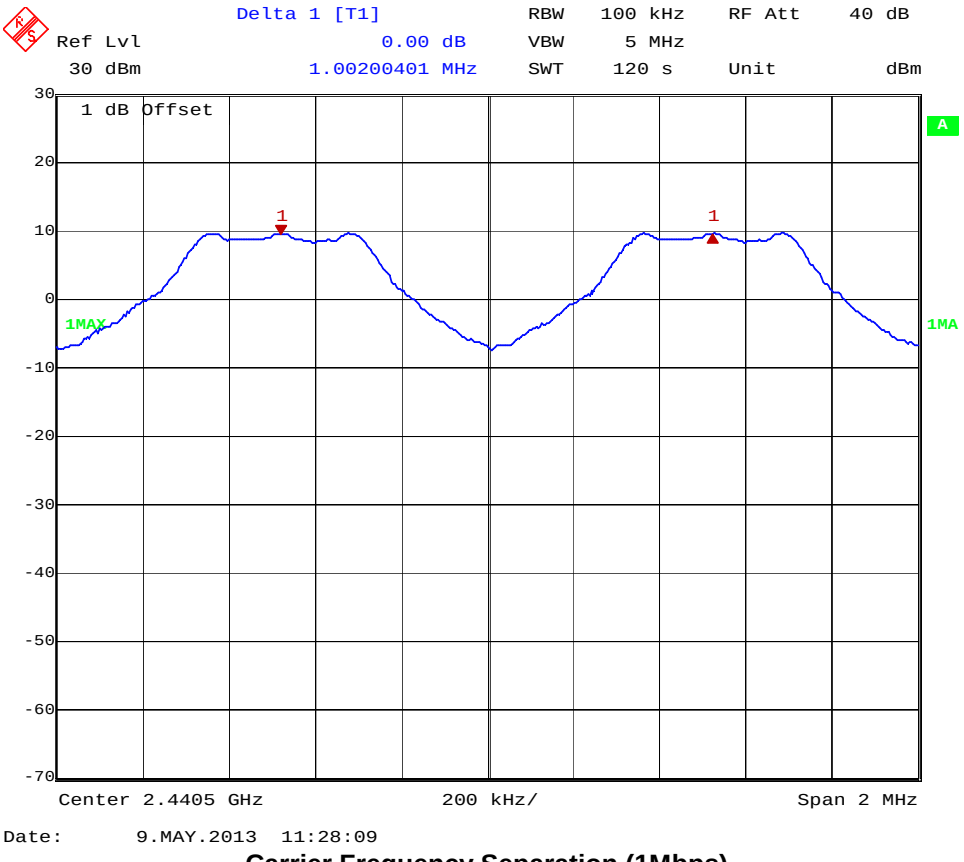
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

6.3 Test Equipment Used:

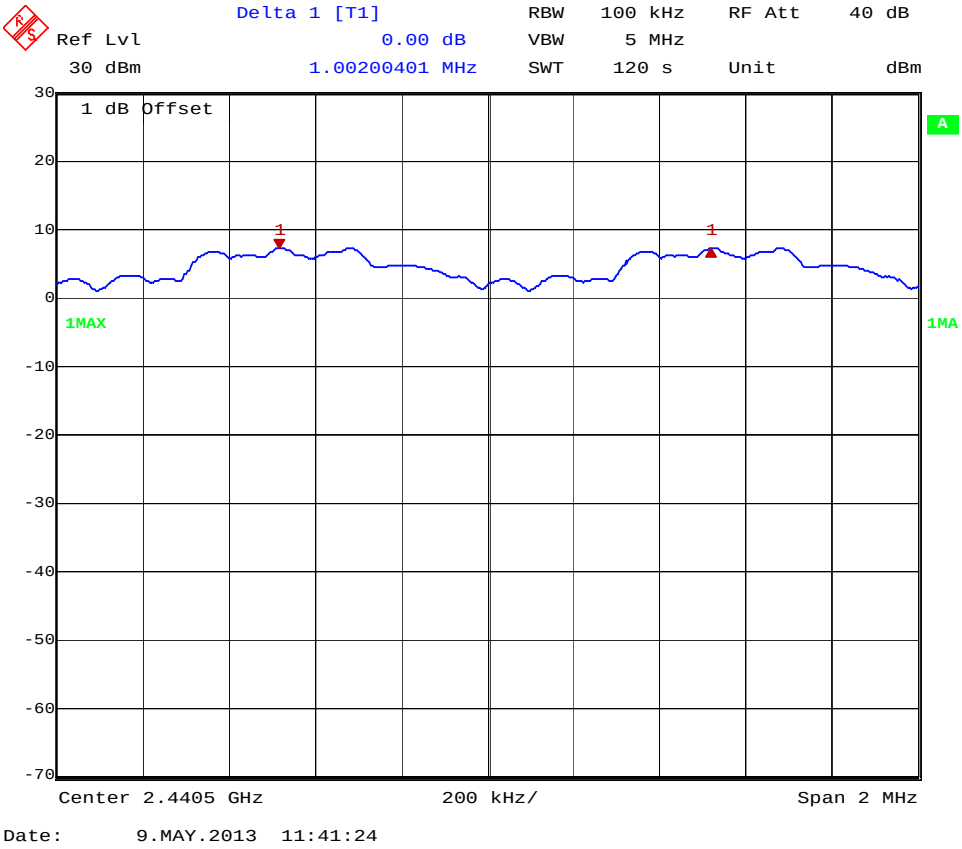
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

6.4 Results:

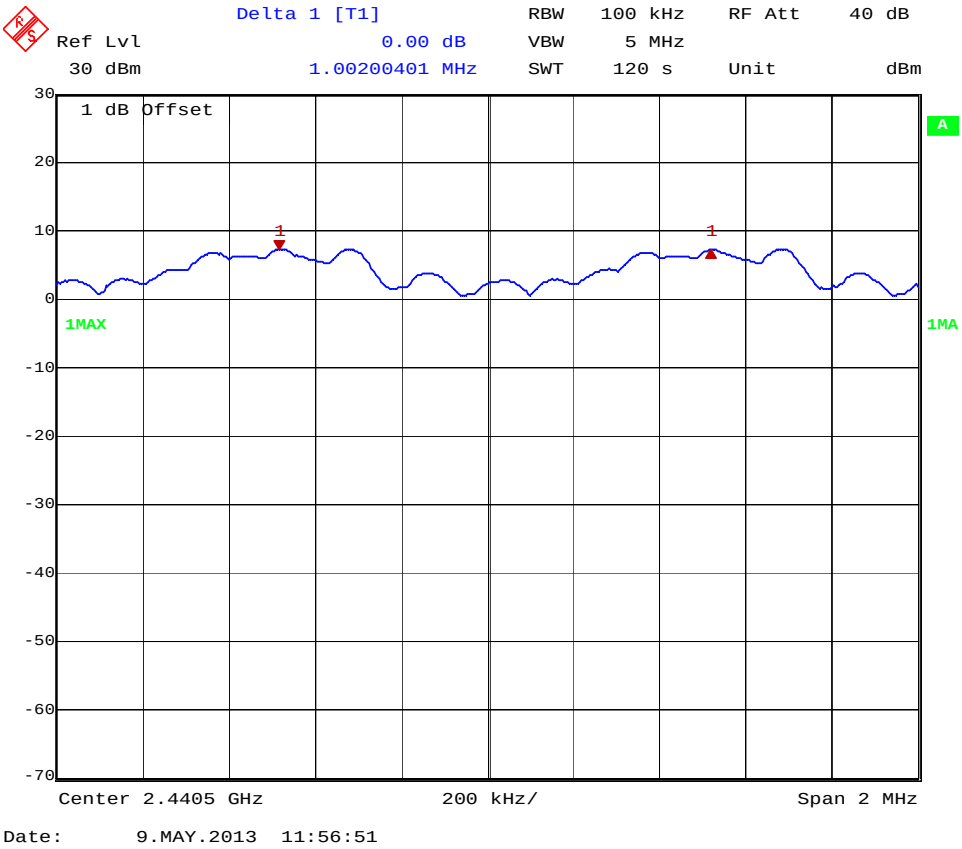
The plot below shows that the carrier frequency separation is 1MHz.



Carrier Frequency Separation (1Mbps)



Carrier Frequency Separation (2Mbps)



Carrier Frequency Separation (3Mbps)

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:

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

7.2 Test Procedure

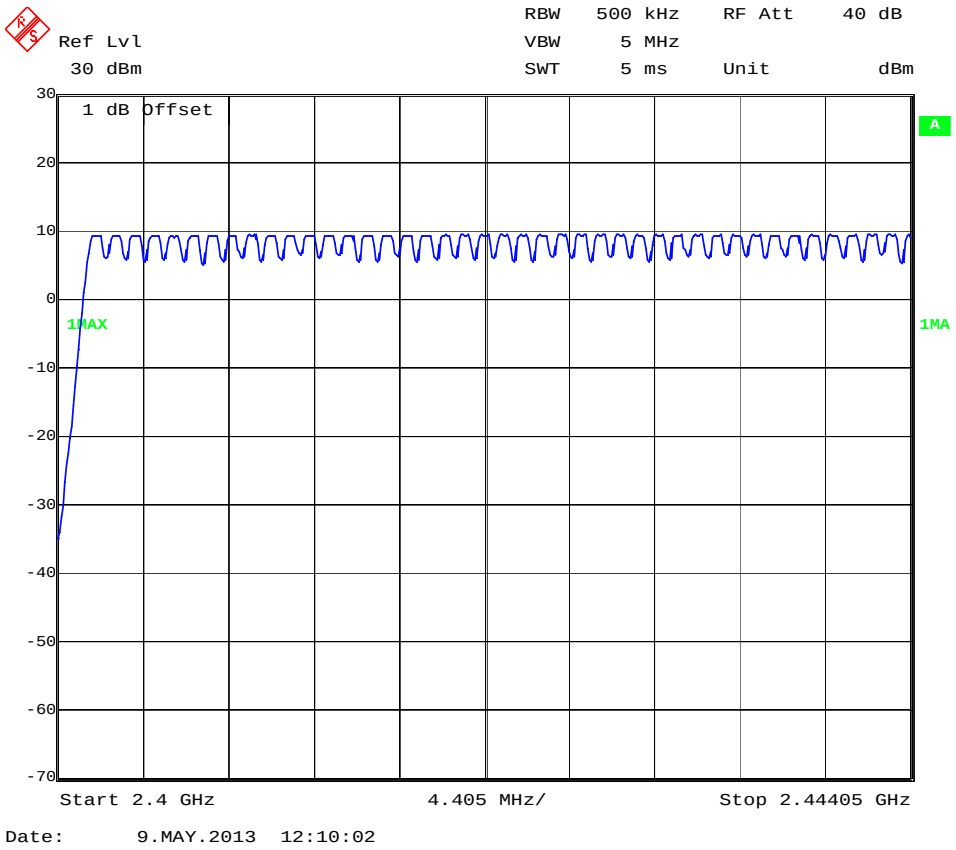
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

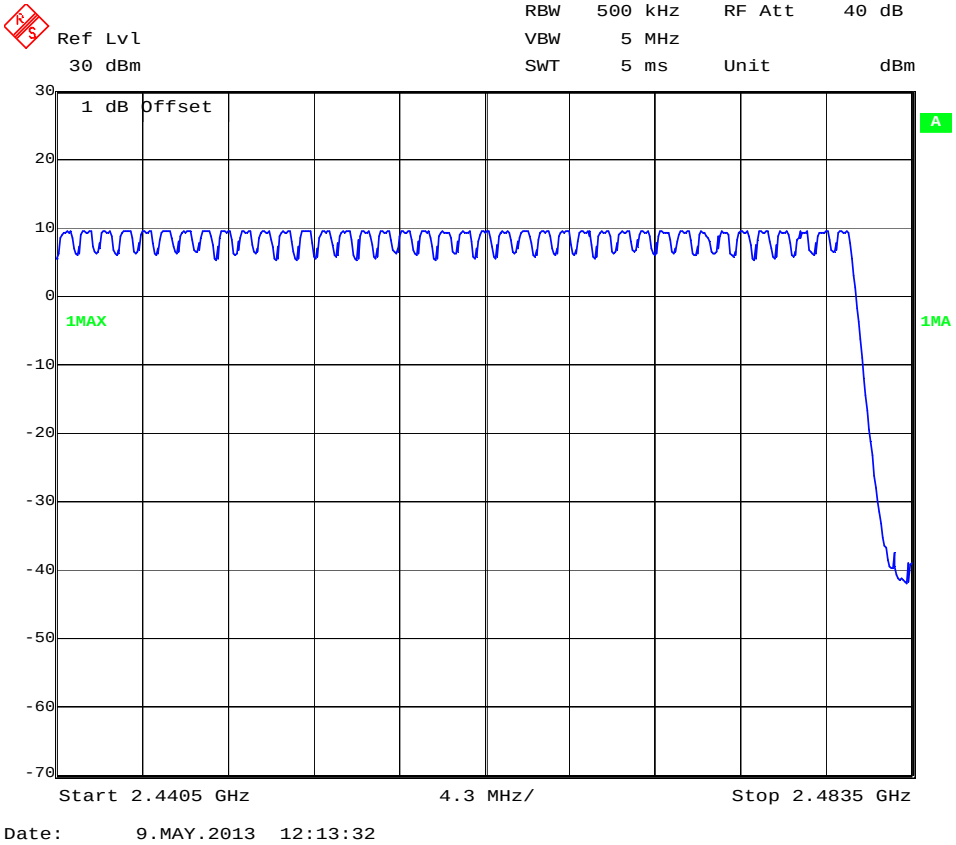
7.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

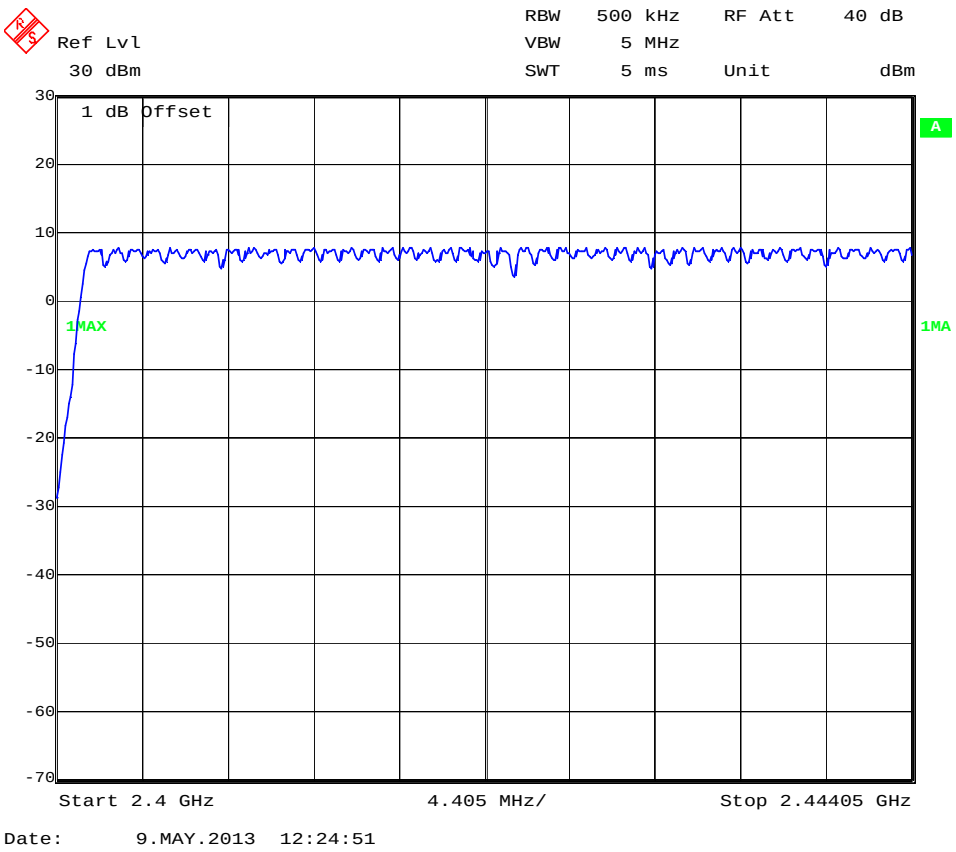
7.4 Results:

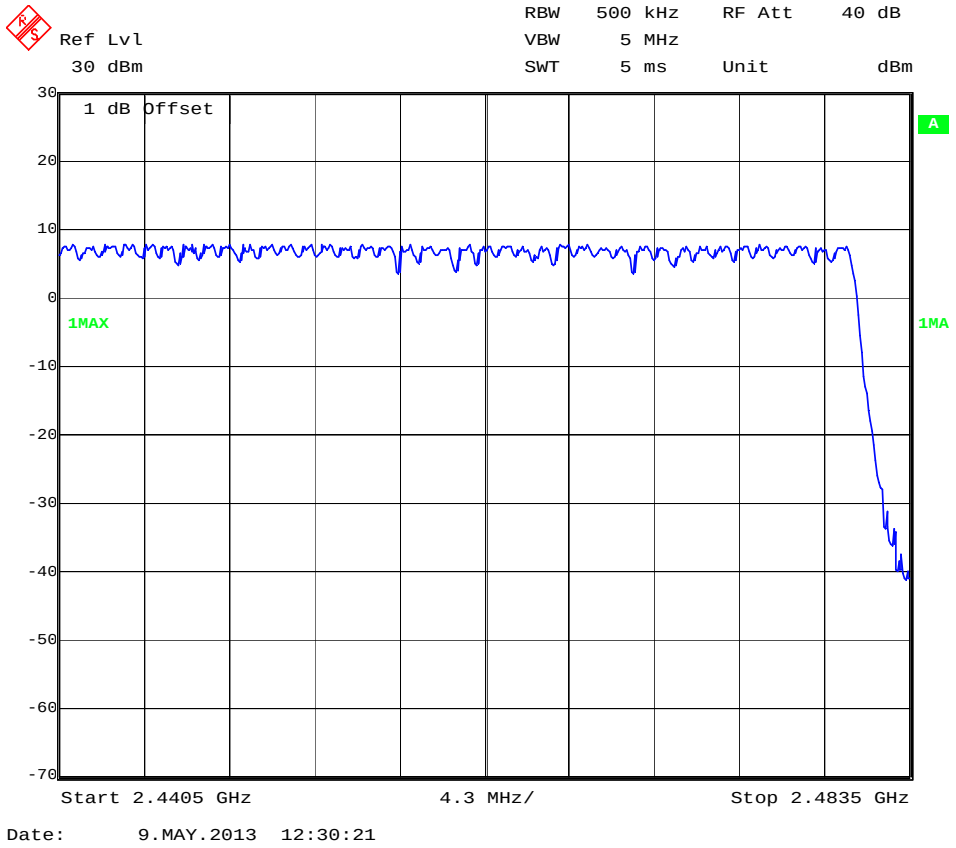
The plot below shows that there are 79 hopping frequencies channels being used.



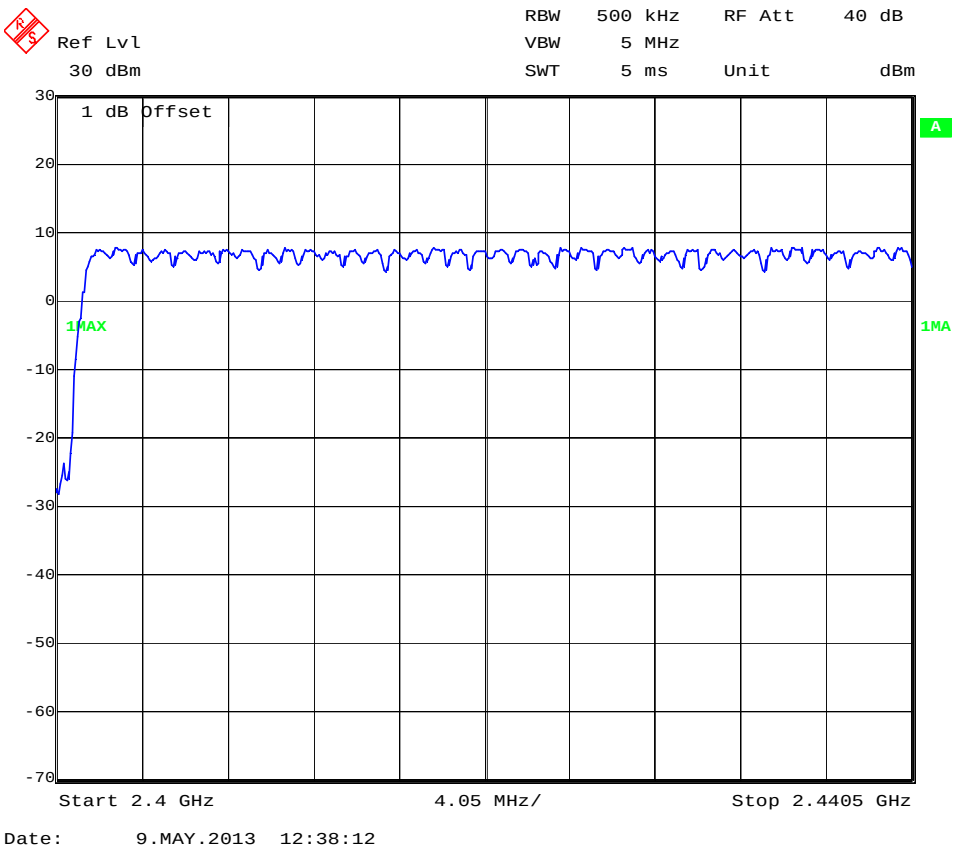


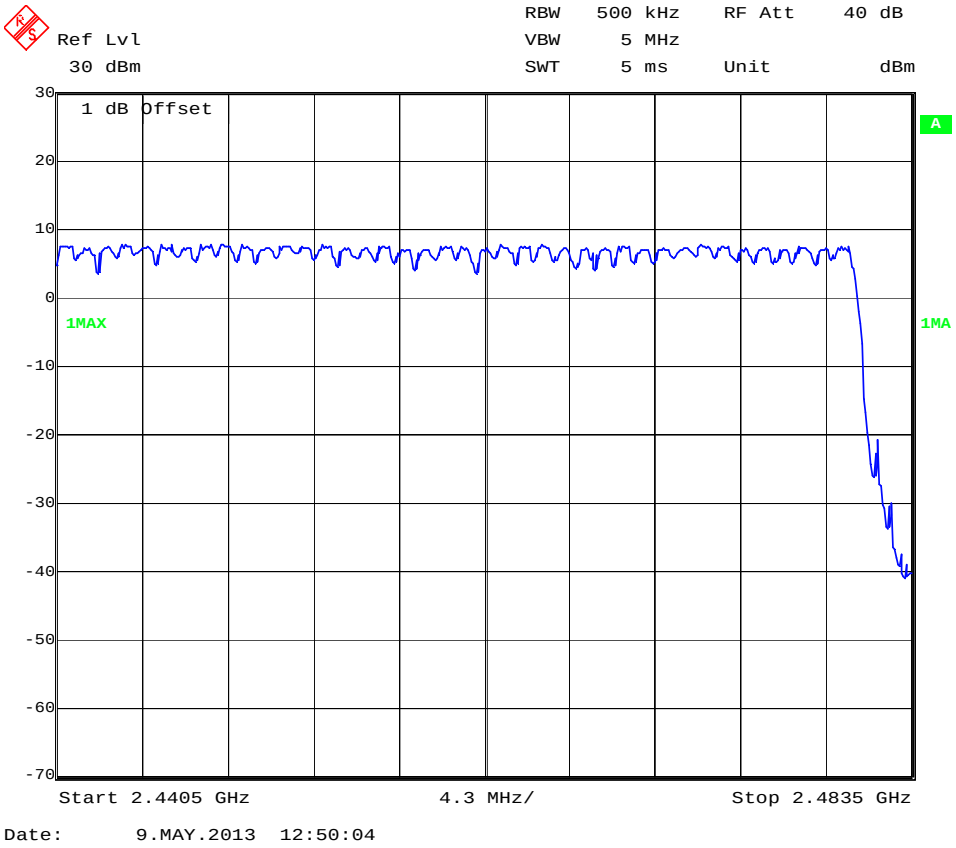
Number of Hopping Frequencies (1Mbps)





Number of Hopping Frequencies (2Mbps)





Number of Hopping Frequencies (3Mbps)

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)(iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used

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 Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

8.4 Results:

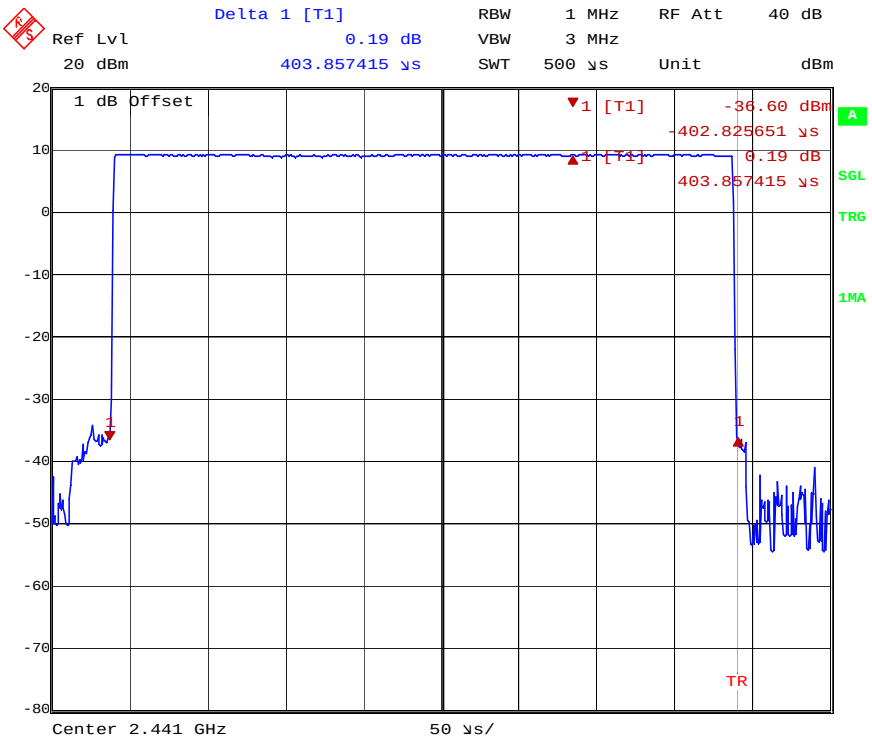
The total “on” time over the measurement period is less than the 400mS limit.

Measurement Period Calculation

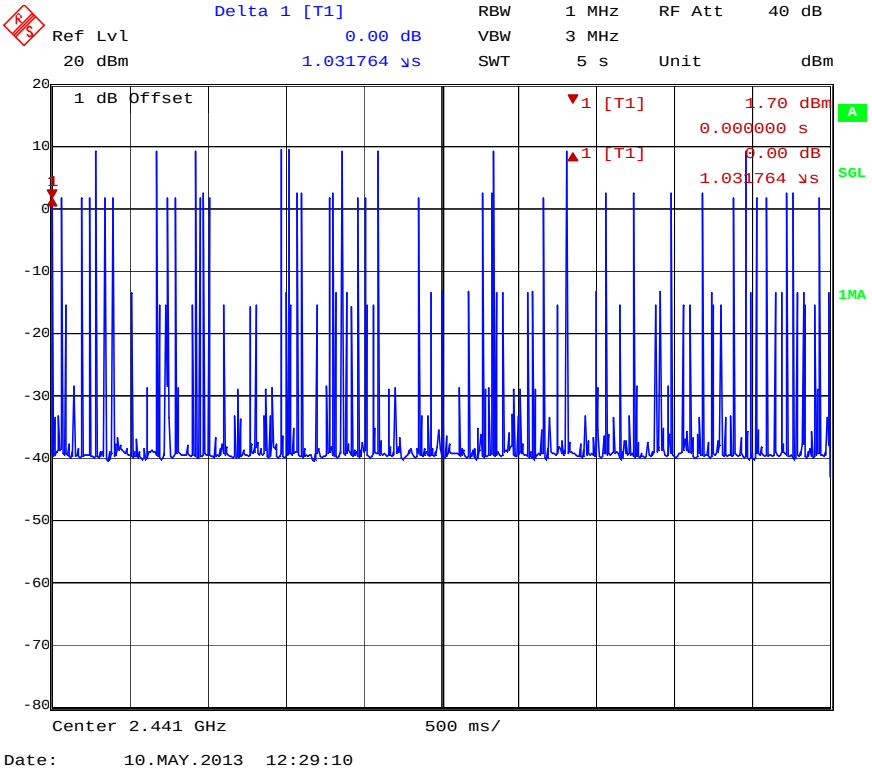
Number of Hopping Channels Used = 79
Measurement Period = 0.4 x N
Measurement Period = 0.4 x 79
Measurement Period = 31.6 seconds

Time of Occupancy Calculation

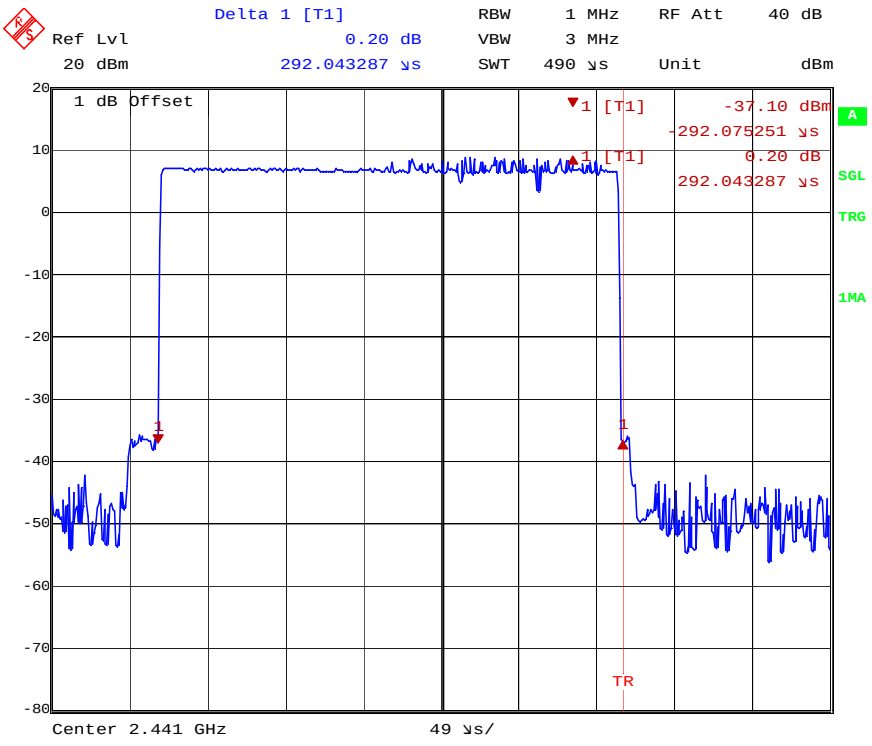
Mode	Number of Transmissions in a 31.6sec Frame (79 Hopping Ch x 0.4)	Transmission Single Pulse On Time (mS)	Result (mS)	Limit (mS)
1Mbps	41 (times in 5sec) * (31.6sec / 5sec) = 259.12	0.402	104.16	400
2Mbps	39 (times in 5sec) * (31.6sec / 5sec) = 246.48	0.292	71.97	400
3Mbps	36 (times in 5sec) * (31.6sec / 5sec) = 227.52	0.251	57.10	400
Time of occupancy = Transmission Single Pulse On Time x Number of Transmissions				



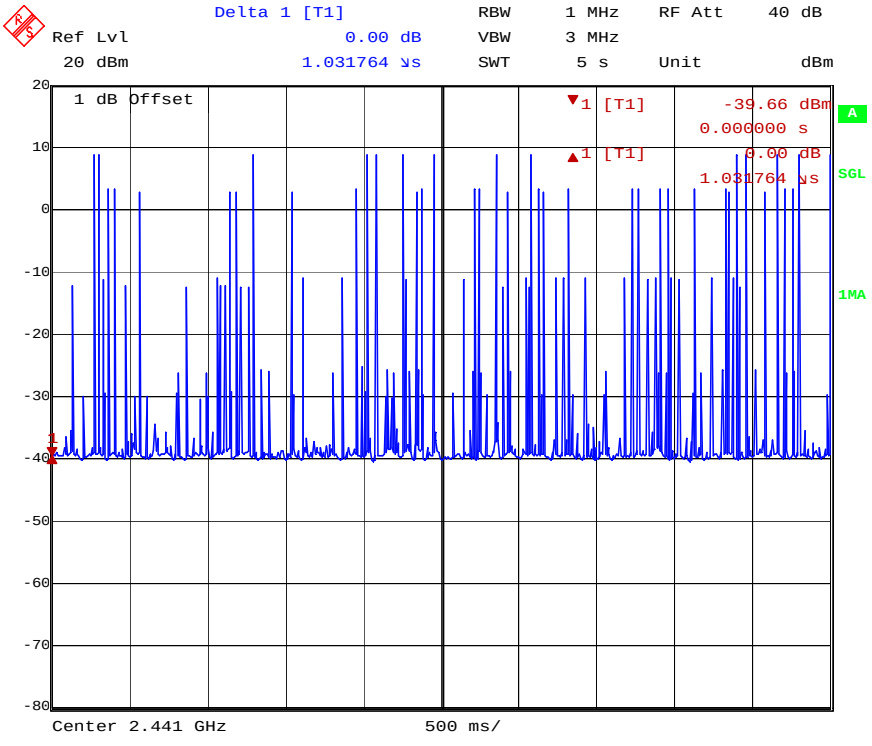
Channel Occupancy Time (1Mbps)



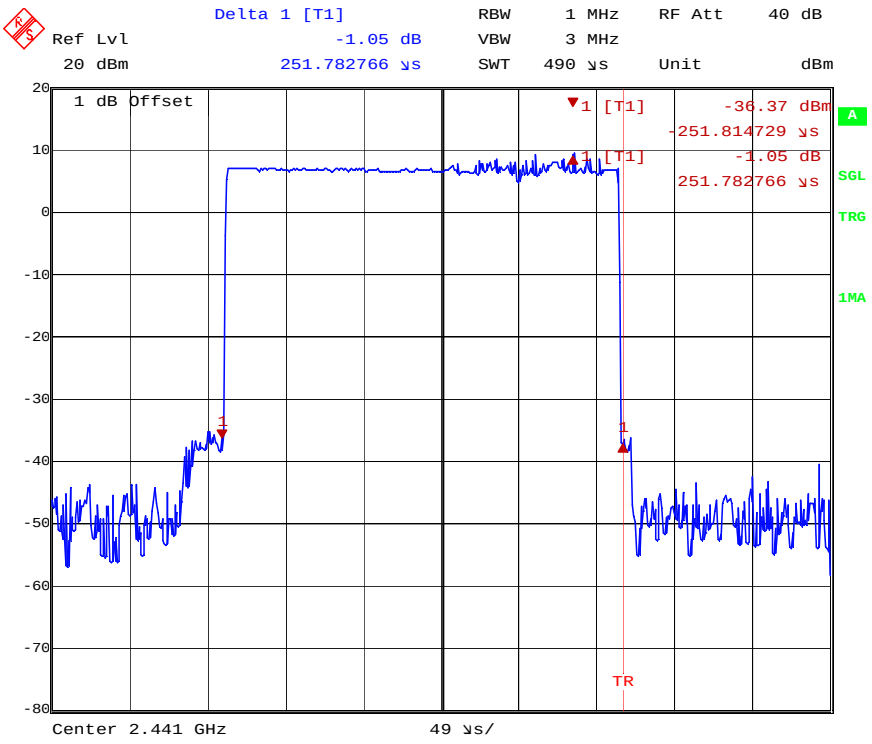
Number of Transmissions in 5 Seconds (1Mbps)



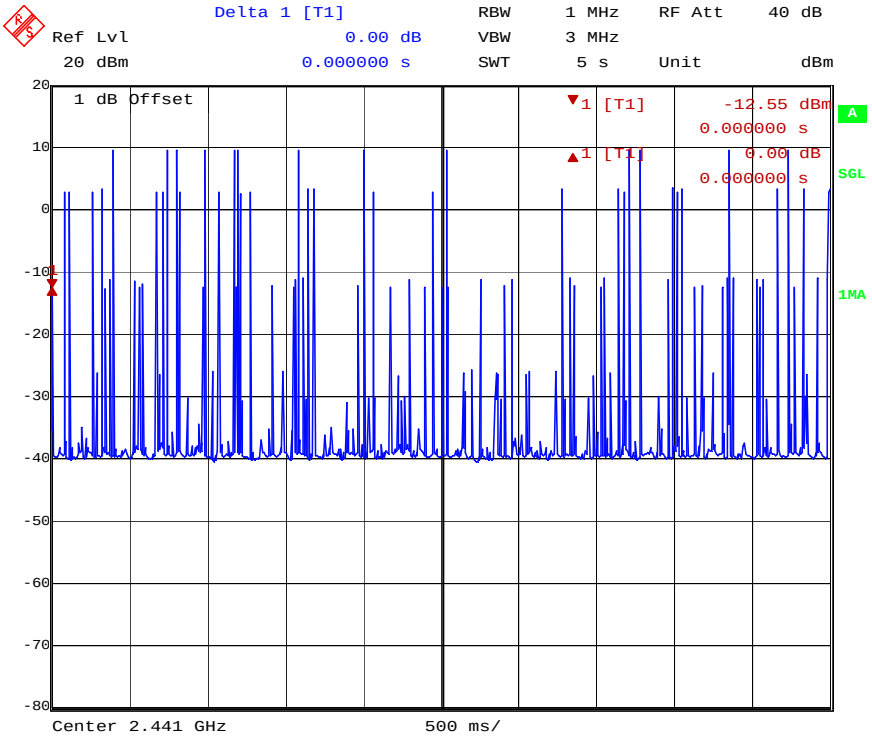
Channel Occupancy Time (2Mbps)



Number of Transmissions in 5 Seconds (2Mbps)



Channel Occupancy Time (3Mbps)



Number of Transmissions in 5 Seconds (3Mbps)

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

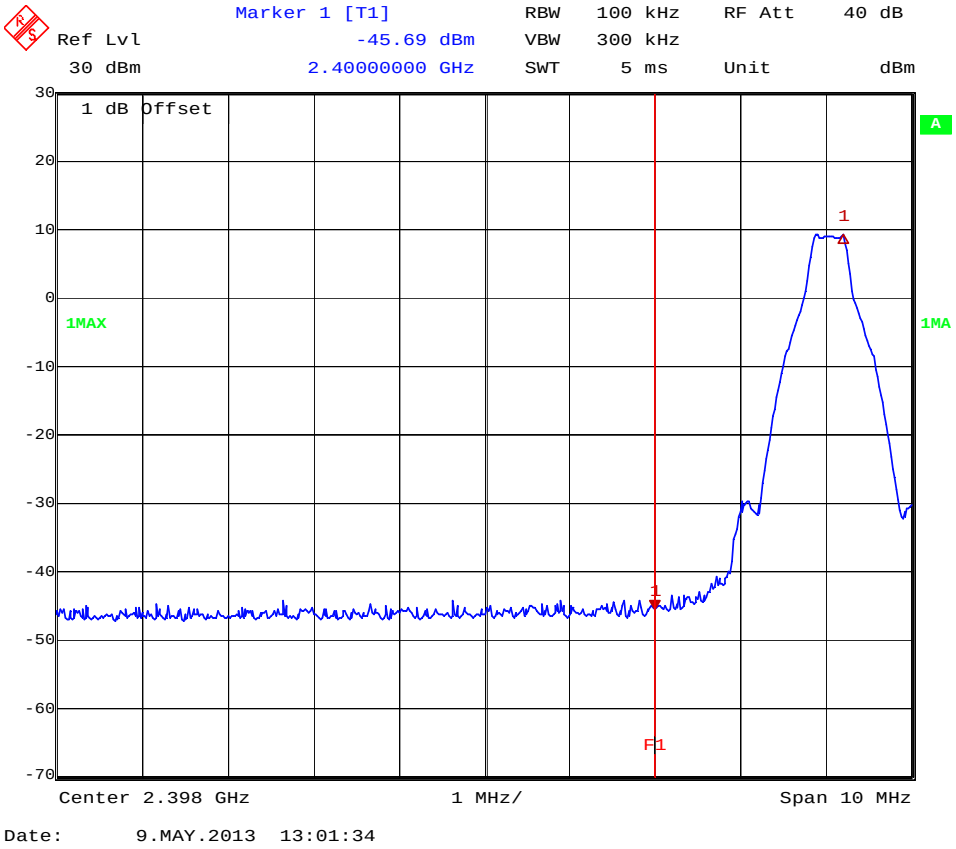
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

9.3 Test Equipment Used:

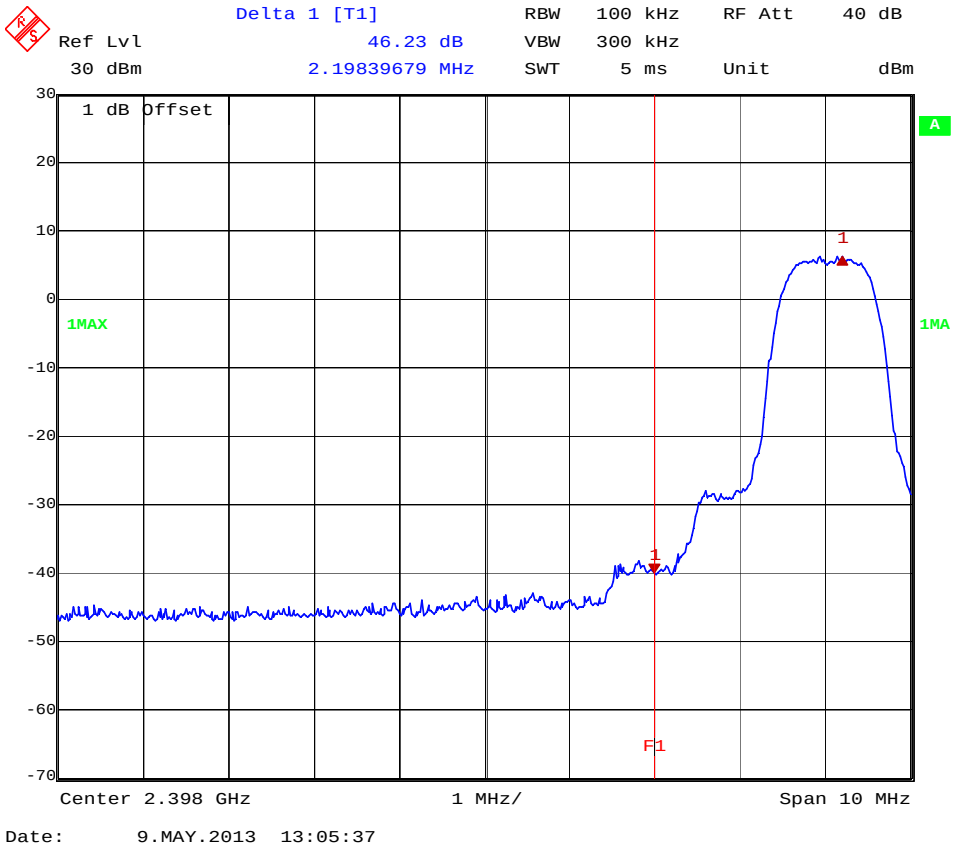
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

9.4 Results:

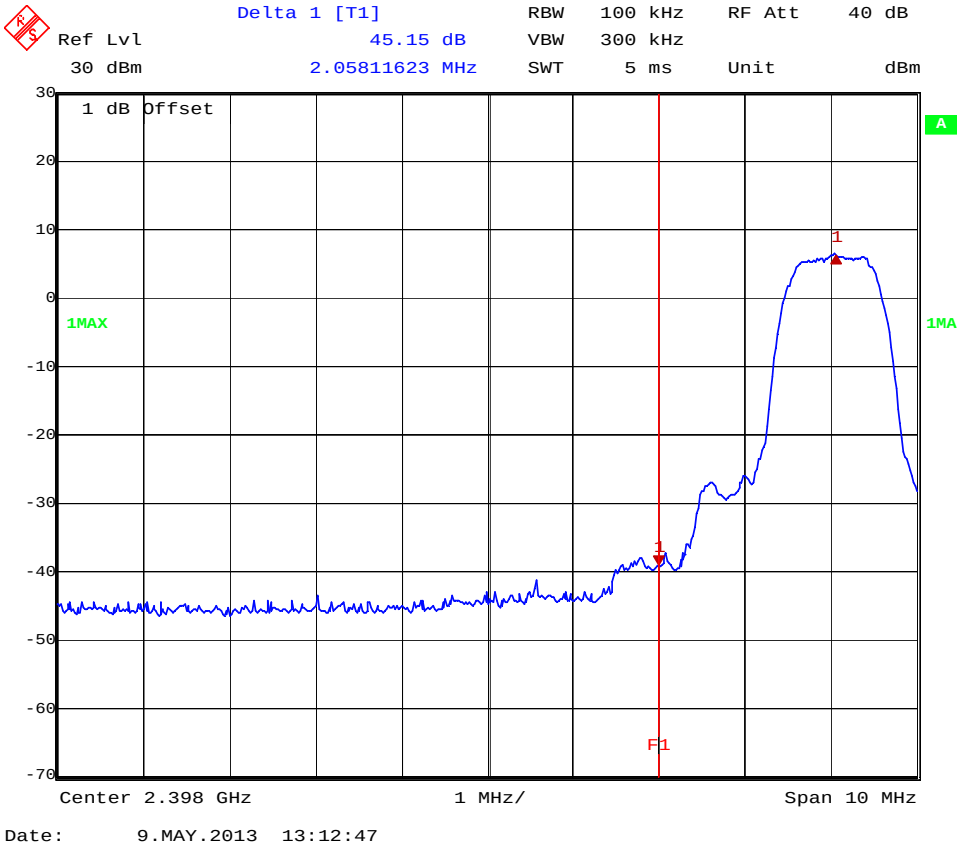
The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria. Plots are also presented showing the band edge compliance with the band edge centered on the analyzer display.



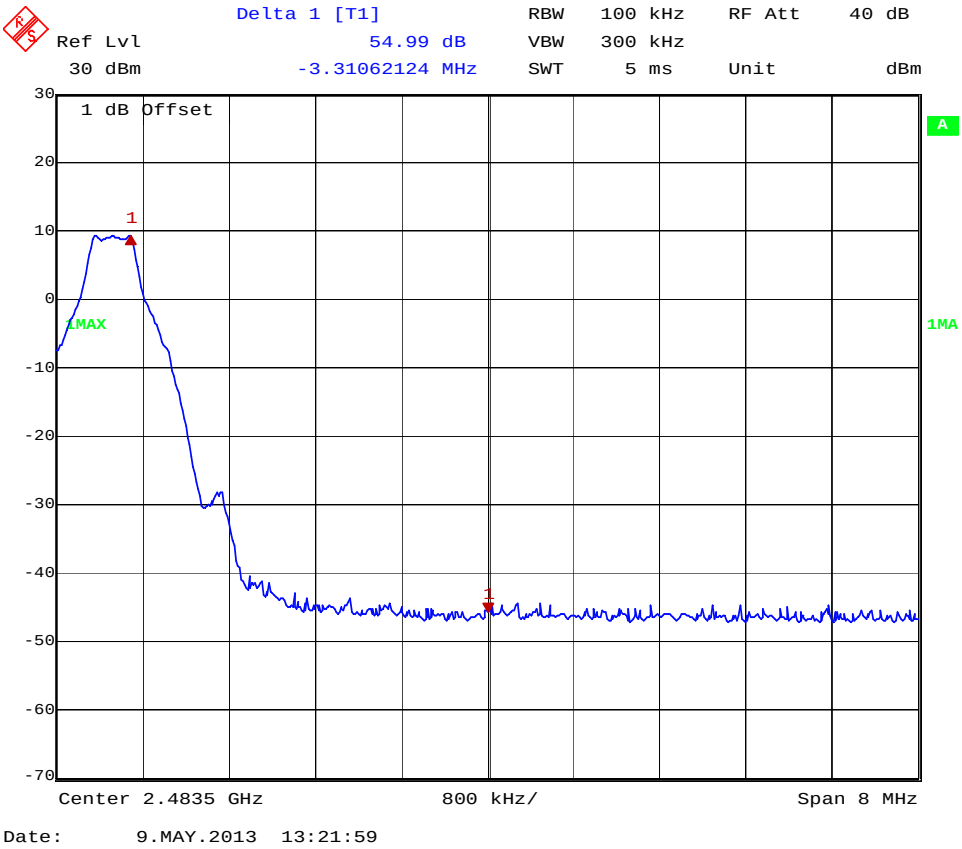
Conducted Band Edge Low Channel (1Mbps)



Conducted Band Edge Low Channel (2Mbps)



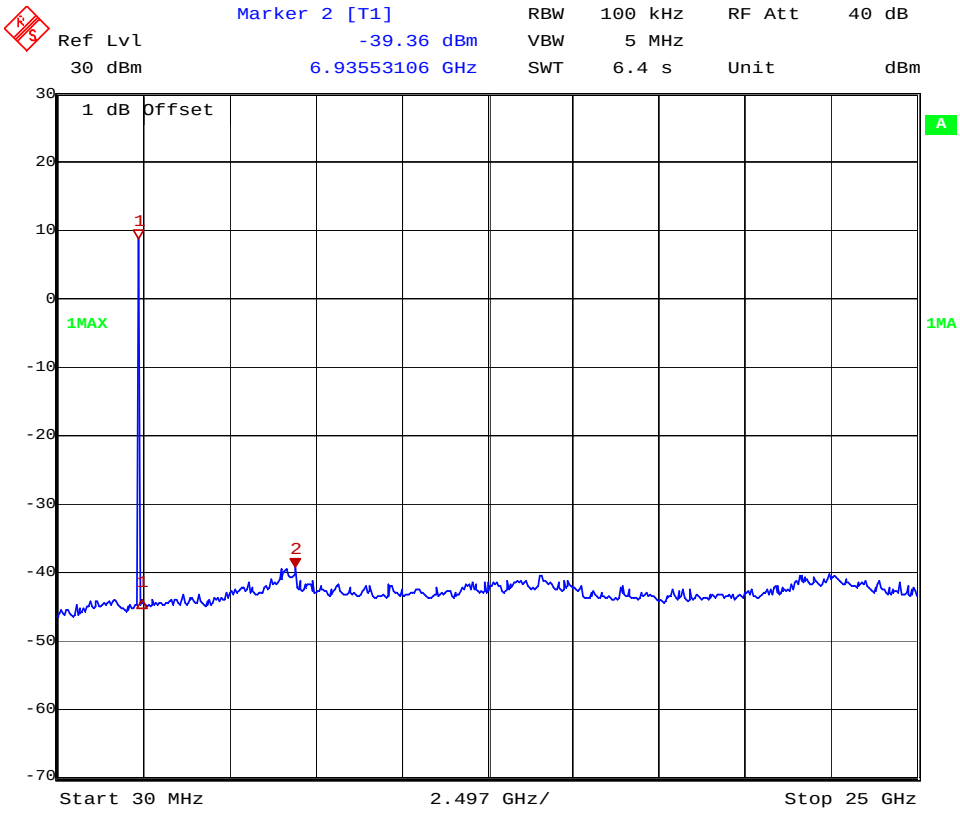
Conducted Band Edge Low Channel (3Mbps)



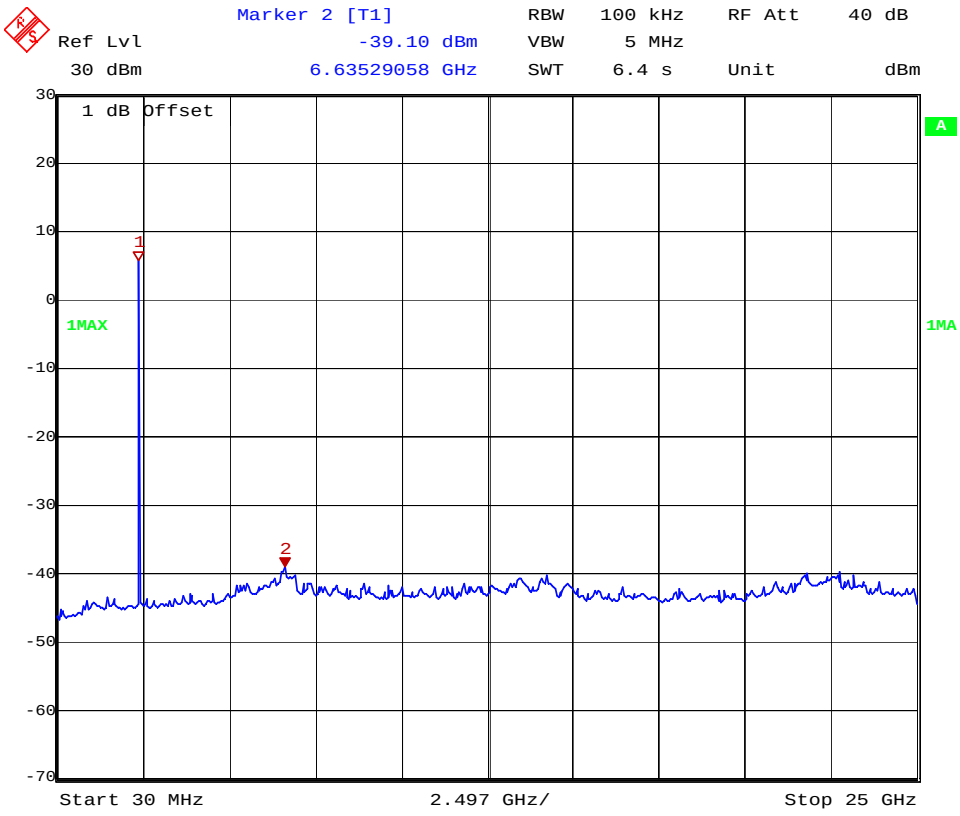
Conducted Band Edge High Channel (1Mbps)

Conducted Band Edge High Channel (2Mbps)

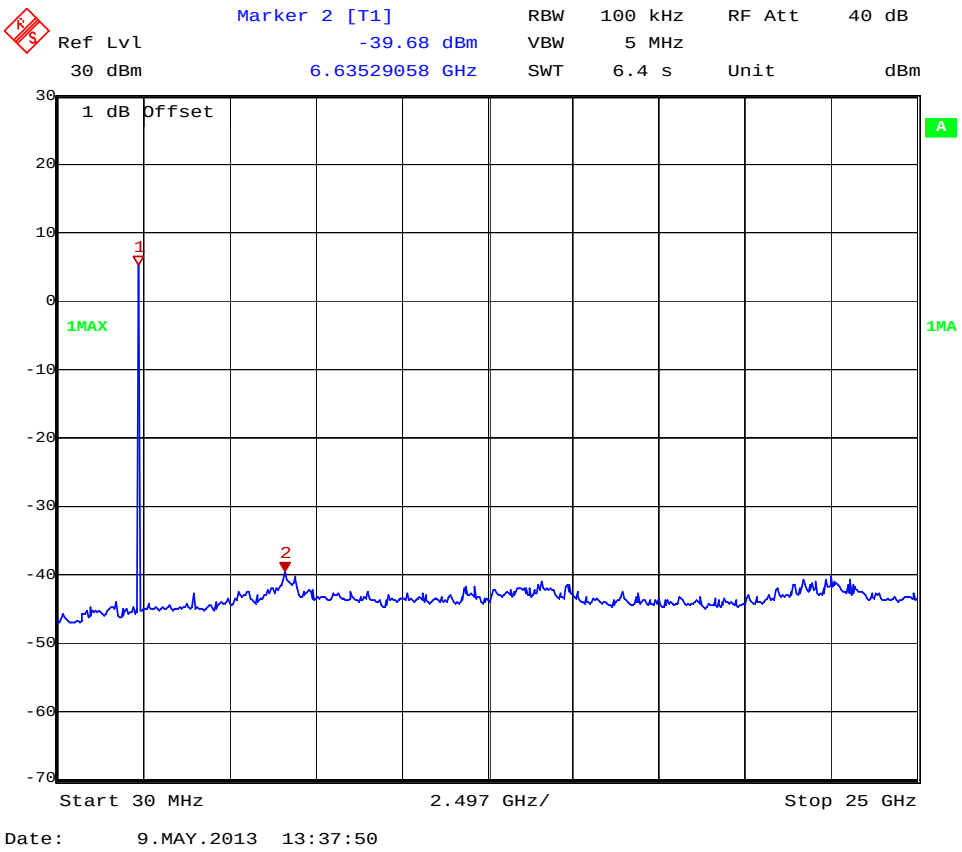
Conducted Band Edge High Channel (3Mbps)



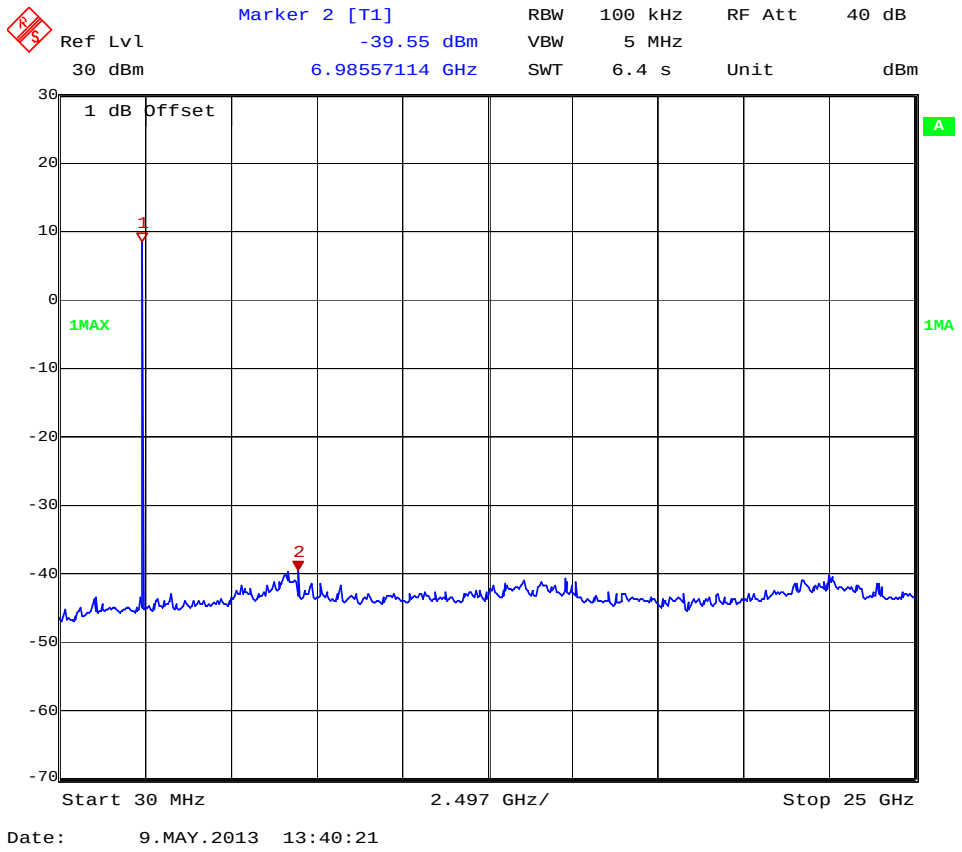
Conducted Spurious Emissions (Low Channel, 1Mbps)



Conducted Spurious Emissions (Low Channel, 2Mbps)

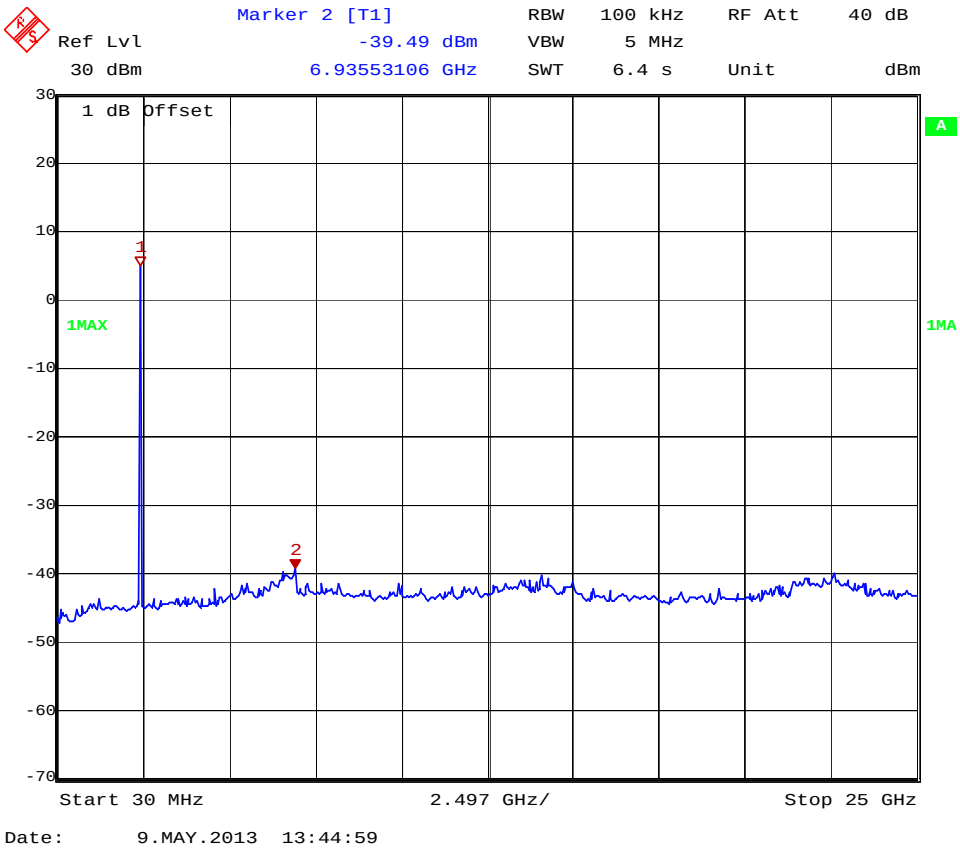


Conducted Spurious Emissions (Low Channel, 3Mbps)

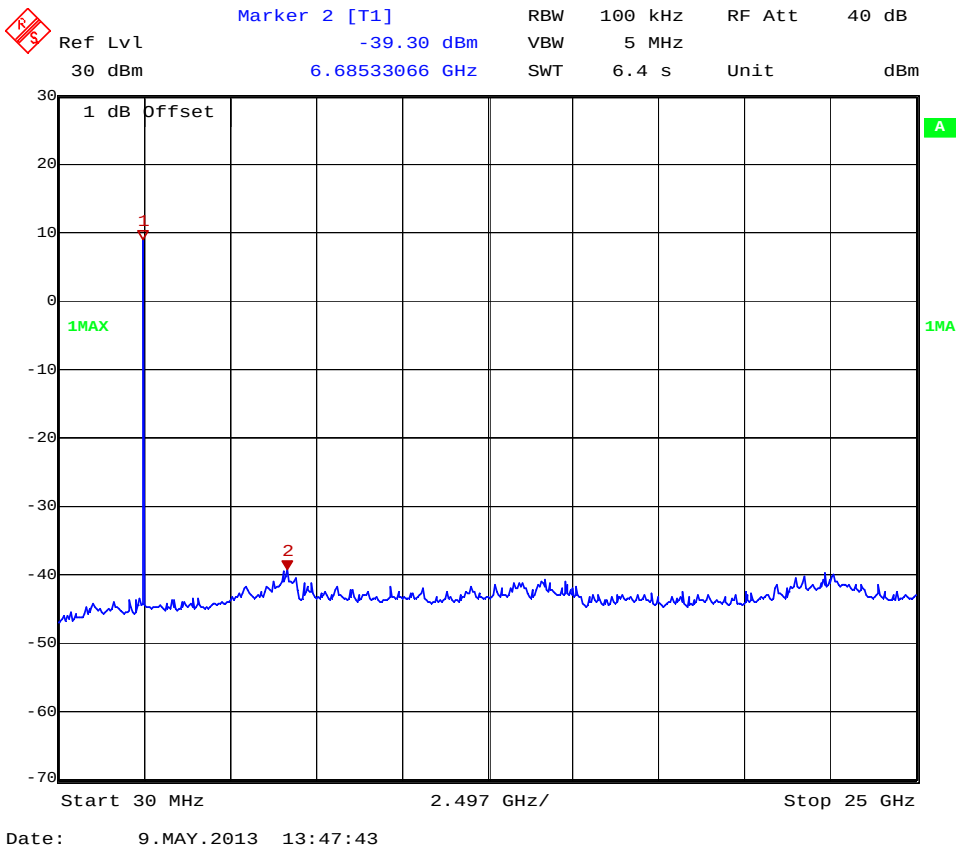


Conducted Spurious Emissions (Mid Channel, 1Mbps)

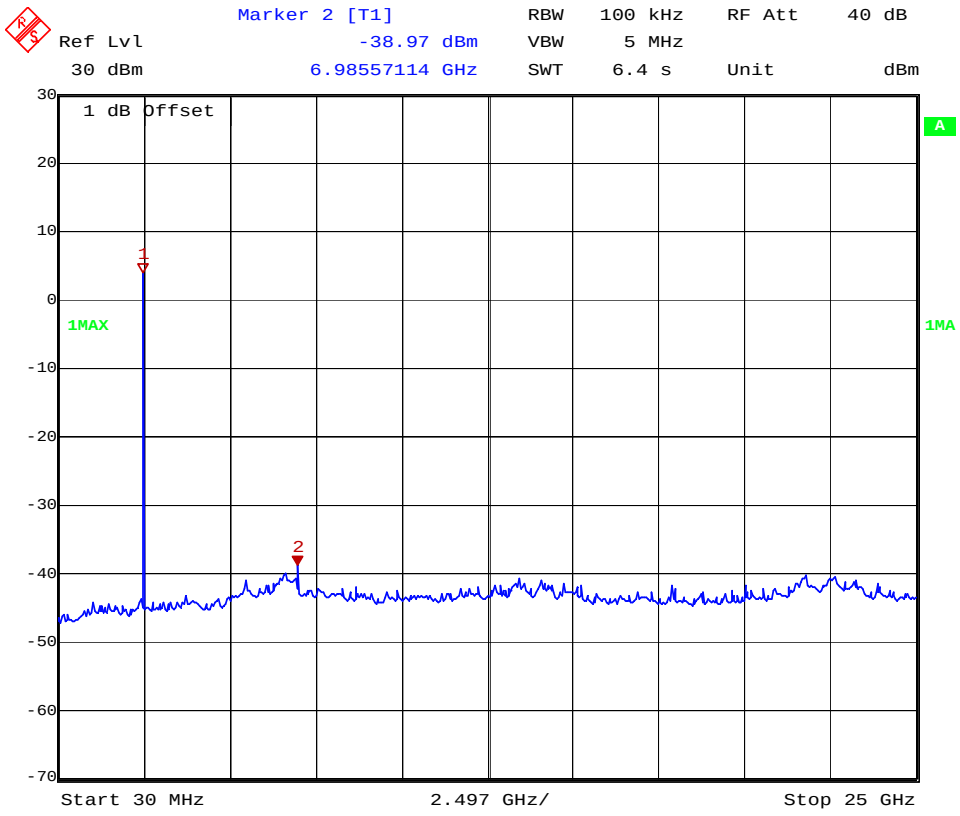
Conducted Spurious Emissions (Mid Channel, 2Mbps)



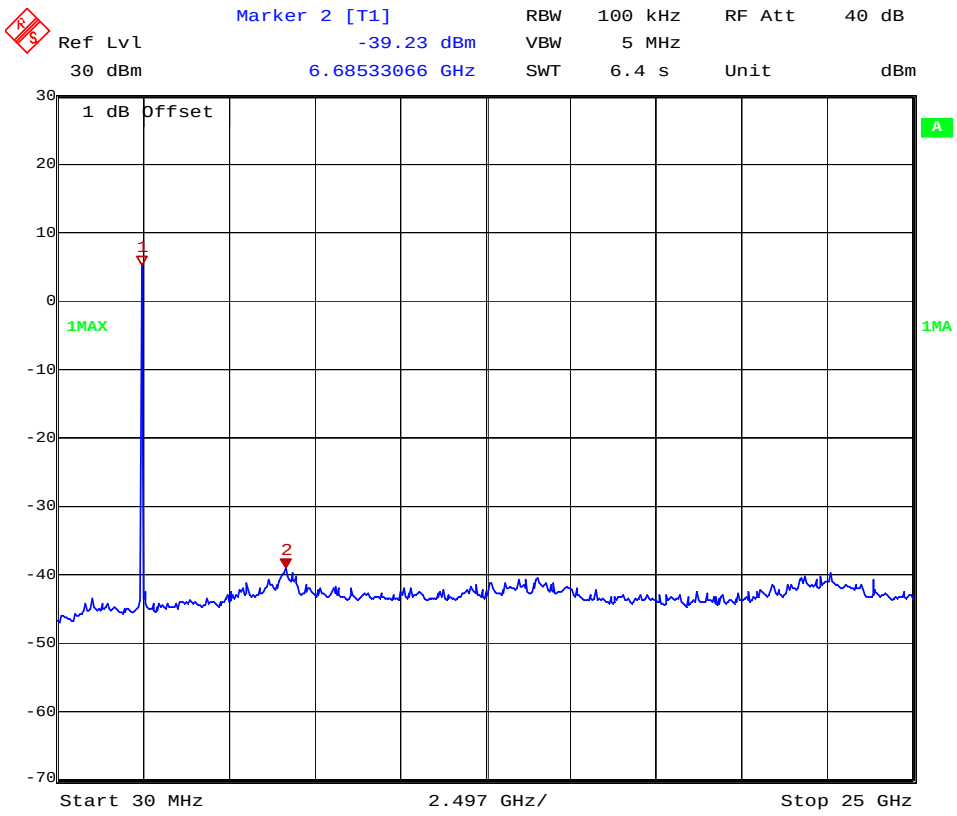
Conducted Spurious Emissions (Mid Channel, 3Mbps)



Conducted Spurious Emissions (High Channel, 1Mbps)



Conducted Spurious Emissions (High Channel, 2Mbps)



Conducted Spurious Emissions (High Channel, 3Mbps)

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 Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/15/2012	9/14/2013
Spectrum Analyzer	3720	Rohde & Schwarz	FSEK30	11/26/2012	11/26/2013
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	9/4/2012	9/4/2013
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	9/4/2012	9/4/2013
Biconnilog Antenna	00051864	ETS	3142C	12/14/2012	12/14/2013
Horn Antenna	6556	ETS	3115	9/13/2012	9/13/2013
System Controller	121701-1	Sunol Sciences	SC99V	Calibration Not Required	Calibration Not Required
High Pass Filter	3986-01 DC0408	Microwave Circuits, Inc.	H3G020G2	Calibrate at Time Of Use	Calibrate 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, 1Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, Low Channel , GFSK Modulation									
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 / VBW / Detector**	**Test Distance**	**Results**
4804	H	42.45	-32.215	32.898	43.133	54	-10.867	1MHZ/1MHz/AVG	3m	**Compliant**
12010	H	28.34	-23.342	39.059	44.057	54	-9.943	1MHZ/1MHz/AVG	3m	**Compliant**
4804	V	38.26	-32.215	32.898	38.943	54	-15.057	1MHZ/1MHz/AVG	3m	**Compliant**
12010	V	30.12	-23.342	39.059	45.837	54	-8.163	1MHZ/1MHz/AVG	3m	**Compliant**
4804	H	44.76	-32.215	32.898	45.443	74	-28.557	1MHz/1MHz/PK	3m	**Compliant**
12010	H	32.94	-23.342	39.059	48.657	74	-25.343	1MHz/1MHz/PK	3m	**Compliant**
4804	V	42.06	-32.215	32.898	42.743	74	-31.257	1MHz/1MHz/PK	3m	**Compliant**
12010	V	31.89	-23.342	39.059	47.607	74	-26.393	1MHz/1MHz/PK	3m	**Compliant**
Band Edge Measruements Below										
2390	H	46.555	-35.891	28.046	38.71	54	-15.29	1MHZ/1MHz/AVG	3m	**Compliant**
2390	V	46.605	-35.891	28.046	38.76	54	-15.24	1MHZ/1MHz/AVG	3m	**Compliant**
2390	H	55.895	-35.891	28.046	48.05	74	-25.95	1MHz/1MHz/PK	3m	**Compliant**
2390	V	56.855	-35.891	28.046	49.01	74	-24.99	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (Middle Channel, 1Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, Mid Channel, GFSK Modulation									
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 / VBW / Detector**	**Test Distance**	**Results**
4882	H	42.68	-32.215	32.898	43.363	54	-10.637	1MHZ/1MHz/AVG	3m	**Compliant**
7323	H	35.44	-26.741	36.525	45.224	54	-8.776	1MHZ/1MHz/AVG	3m	**Compliant**
4882	V	34.56	-32.215	32.898	35.243	54	-18.757	1MHZ/1MHz/AVG	3m	**Compliant**
7323	V	33.87	-26.741	36.525	43.654	54	-10.346	1MHZ/1MHz/AVG	3m	**Compliant**
4882	H	45.31	-32.215	32.898	45.993	74	-28.007	1MHz/1MHz/PK	3m	**Compliant**
7323	H	41.32	-26.741	36.525	51.104	74	-22.896	1MHz/1MHz/PK	3m	**Compliant**
4882	V	37.34	-32.215	32.898	38.023	74	-35.977	1MHz/1MHz/PK	3m	**Compliant**
7323	V	37.84	-26.741	36.525	47.624	74	-26.376	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (High Channel, 1Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, High Channel, GFSK Modulation									
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 / VBW / Detector**	**Test Distance**	**Results**
4960	H	44.12	-32.033	33.048	45.135	54	-8.865	1MHZ/1MHz/AVG	3m	**Compliant**
7440	H	33.27	-26.621	36.755	43.404	54	-10.596	1MHZ/1MHz/AVG	3m	**Compliant**
4960	V	38.27	-32.033	33.048	39.285	54	-14.715	1MHZ/1MHz/AVG	3m	**Compliant**
7440	V	31.58	-26.621	36.755	41.714	54	-12.286	1MHZ/1MHz/AVG	3m	**Compliant**
4960	H	47.96	-32.033	33.048	48.975	74	-25.025	1MHz/1MHz/PK	3m	**Compliant**
7440	H	38.68	-26.621	36.755	48.814	74	-25.186	1MHz/1MHz/PK	3m	**Compliant**
4960	V	45.12	-32.033	33.048	46.135	74	-27.865	1MHz/1MHz/PK	3m	**Compliant**
7440	V	38.75	-26.621	36.755	48.884	74	-25.116	1MHz/1MHz/PK	3m	**Compliant**
Band Edge Measruements Below										
2483	H	47.564	-35.994	28.48	40.05	54	-13.95	1MHZ/1MHz/AVG	3m	**Compliant**
2483	V	47.034	-35.994	28.48	39.52	54	-14.48	1MHZ/1MHz/AVG	3m	**Compliant**
2483	H	56.184	-35.994	28.48	48.67	74	-25.33	1MHz/1MHz/PK	3m	**Compliant**
2483	V	57.834	-35.994	28.48	50.32	74	-23.68	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (Low Channel, 2Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, Low Channel , PI/4-DPSK									
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 / VBW / Detector**	**Test Distance**	**Results**
4804	H	41.5	-32.215	32.898	42.183	54	-11.817	1MHZ/1MHz/AVG	3m	**Compliant**
12010	H	27.32	-23.342	39.059	43.037	54	-10.963	1MHZ/1MHz/AVG	3m	**Compliant**
4804	V	36.47	-32.215	32.898	37.153	54	-16.847	1MHZ/1MHz/AVG	3m	**Compliant**
12010	V	27.22	-23.342	39.059	42.937	54	-11.063	1MHZ/1MHz/AVG	3m	**Compliant**
4804	H	41.98	-32.215	32.898	42.663	74	-31.337	1MHz/1MHz/PK	3m	**Compliant**
12010	H	31.67	-23.342	39.059	47.387	74	-26.613	1MHz/1MHz/PK	3m	**Compliant**
4804	V	36.76	-32.215	32.898	37.443	74	-36.557	1MHz/1MHz/PK	3m	**Compliant**
12010	V	31.82	-23.342	39.059	47.537	74	-26.463	1MHz/1MHz/PK	3m	**Compliant**
Band Edge Measruements Below										
2390	H	46.675	-35.891	28.046	38.83	54	-15.17	1MHZ/1MHz/AVG	3m	**Compliant**
2390	V	46.565	-35.891	28.046	38.72	54	-15.28	1MHZ/1MHz/AVG	3m	**Compliant**
2390	H	55.255	-35.891	28.046	47.41	74	-26.59	1MHz/1MHz/PK	3m	**Compliant**
2390	V	56.985	-35.891	28.046	49.14	74	-24.86	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (Middle Channel, 2Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, Mid Channel , PI/4-DPSK									
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 / VBW / Detector**	**Test Distance**	**Results**
4882	H	38.56	-32.215	32.898	39.243	54	-14.757	1MHZ/1MHz/AVG	3m	**Compliant**
7323	H	34.57	-26.741	36.525	44.354	54	-9.646	1MHZ/1MHz/AVG	3m	**Compliant**
4882	V	31.44	-32.215	32.898	32.123	54	-21.877	1MHZ/1MHz/AVG	3m	**Compliant**
7323	V	33.41	-26.741	36.525	43.194	54	-10.806	1MHZ/1MHz/AVG	3m	**Compliant**
4882	H	43.59	-32.215	32.898	44.273	74	-29.727	1MHz/1MHz/PK	3m	**Compliant**
7323	H	36.79	-26.741	36.525	46.574	74	-27.426	1MHz/1MHz/PK	3m	**Compliant**
4882	V	35.42	-32.215	32.898	36.103	74	-37.897	1MHz/1MHz/PK	3m	**Compliant**
7323	V	33.75	-26.741	36.525	43.534	74	-30.466	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (High Channel, 2Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, High Channel , PI/4-DPSK									
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 / VBW / Detector**	**Test Distance**	**Results**
4960	H	41.87	-32.033	33.048	42.885	54	-11.115	1MHZ/1MHz/AVG	3m	**Compliant**
7440	H	30.08	-26.621	36.755	40.214	54	-13.786	1MHZ/1MHz/AVG	3m	**Compliant**
4960	V	35.49	-32.033	33.048	36.505	54	-17.495	1MHZ/1MHz/AVG	3m	**Compliant**
7440	V	31.22	-26.621	36.755	41.354	54	-12.646	1MHZ/1MHz/AVG	3m	**Compliant**
4960	H	46.48	-32.033	33.048	47.495	74	-26.505	1MHz/1MHz/PK	3m	**Compliant**
7440	H	36.24	-26.621	36.755	46.374	74	-27.626	1MHz/1MHz/PK	3m	**Compliant**
4960	V	41.35	-32.033	33.048	42.365	74	-31.635	1MHz/1MHz/PK	3m	**Compliant**
7440	V	34.76	-26.621	36.755	44.894	74	-29.106	1MHz/1MHz/PK	3m	**Compliant**
Band Edge Measruements Below										
2483	H	48.594	-35.994	28.48	41.08	54	-12.92	1MHZ/1MHz/AVG	3m	**Compliant**
2483	V	47.724	-35.994	28.48	40.21	54	-13.79	1MHZ/1MHz/AVG	3m	**Compliant**
2483	H	57.564	-35.994	28.48	50.05	74	-23.95	1MHz/1MHz/PK	3m	**Compliant**
2483	V	56.884	-35.994	28.48	49.37	74	-24.63	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (Low Channel, 3Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, Low Channel, 8DPSK									
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 / VBW / Detector**	**Test Distance**	**Results**
4804	H	42.05	-32.215	32.898	42.733	54	-11.267	1MHZ/1MHz/AVG	3m	**Compliant**
12010	H	28.87	-23.342	39.059	44.587	54	-9.413	1MHZ/1MHz/AVG	3m	**Compliant**
4804	V	37.32	-32.215	32.898	38.003	54	-15.997	1MHZ/1MHz/AVG	3m	**Compliant**
12010	V	28.7	-23.342	39.059	44.417	54	-9.583	1MHZ/1MHz/AVG	3m	**Compliant**
4804	H	43.04	-32.215	32.898	43.723	74	-30.277	1MHz/1MHz/PK	3m	**Compliant**
12010	H	33.79	-23.342	39.059	49.507	74	-24.493	1MHz/1MHz/PK	3m	**Compliant**
4804	V	41.38	-32.215	32.898	42.063	74	-31.937	1MHz/1MHz/PK	3m	**Compliant**
12010	V	32.91	-23.342	39.059	48.627	74	-25.373	1MHz/1MHz/PK	3m	**Compliant**
Band Edge Measruements Below										
2390	H	46.795	-35.891	28.046	38.95	54	-15.05	1MHZ/1MHz/AVG	3m	**Compliant**
2390	V	46.615	-35.891	28.046	38.77	54	-15.23	1MHZ/1MHz/AVG	3m	**Compliant**
2390	H	56.985	-35.891	28.046	49.14	74	-24.86	1MHz/1MHz/PK	3m	**Compliant**
2390	V	55.125	-35.891	28.046	47.28	74	-26.72	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (Middle Channel, 3Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, Mid Channel, 8DPSK									
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 / VBW / Detector**	**Test Distance**	**Results**
4882	H	41.48	-32.215	32.898	42.163	54	-11.837	1MHZ/1MHz/AVG	3m	**Compliant**
7323	H	36.78	-26.741	36.525	46.564	54	-7.436	1MHZ/1MHz/AVG	3m	**Compliant**
4882	V	33.99	-32.215	32.898	34.673	54	-19.327	1MHZ/1MHz/AVG	3m	**Compliant**
7323	V	33.21	-26.741	36.525	42.994	54	-11.006	1MHZ/1MHz/AVG	3m	**Compliant**
4882	H	46.23	-32.215	32.898	46.913	74	-27.087	1MHz/1MHz/PK	3m	**Compliant**
7323	H	38.24	-26.741	36.525	48.024	74	-25.976	1MHz/1MHz/PK	3m	**Compliant**
4882	V	42.46	-32.215	32.898	43.143	74	-30.857	1MHz/1MHz/PK	3m	**Compliant**
7323	V	36.39	-26.741	36.525	46.174	74	-27.826	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Worst Case Spurious Measurements (High Channel, 3Mbps)

Radiated Emissions										
Test Engineer:	Toby Carrier		**Start Date:**	5/16/2013		**End Date:**	5/16/2013			
Temperature:	24℃		**Humidity:**	52.30%		**Pressure:**	986 mbar			
Specification:	FCC		**Test Limit:**	15.205						
Notes:	Bluetooth, High Channel, 8DPSK									
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 / VBW / Detector**	**Test Distance**	**Results**
4960	H	43.87	-32.033	33.048	44.885	54	-9.115	1MHZ/1MHz/AVG	3m	**Compliant**
7440	H	32.29	-26.621	36.755	42.424	54	-11.576	1MHZ/1MHz/AVG	3m	**Compliant**
4960	V	37.39	-32.033	33.048	38.405	54	-15.595	1MHZ/1MHz/AVG	3m	**Compliant**
7440	V	30.2	-26.621	36.755	40.334	54	-13.666	1MHZ/1MHz/AVG	3m	**Compliant**
4960	H	47.07	-32.033	33.048	48.085	74	-25.915	1MHz/1MHz/PK	3m	**Compliant**
7440	H	37.01	-26.621	36.755	47.144	74	-26.856	1MHz/1MHz/PK	3m	**Compliant**
4960	V	43.24	-32.033	33.048	44.255	74	-29.745	1MHz/1MHz/PK	3m	**Compliant**
7440	V	36.89	-26.621	36.755	47.024	74	-26.976	1MHz/1MHz/PK	3m	**Compliant**
Band Edge Measruements Below										
2483	H	47.664	-35.994	28.48	40.15	54	-13.85	1MHZ/1MHz/AVG	3m	**Compliant**
2483	V	47.684	-35.994	28.48	40.17	54	-13.83	1MHZ/1MHz/AVG	3m	**Compliant**
2483	H	57.974	-35.994	28.48	50.46	74	-23.54	1MHz/1MHz/PK	3m	**Compliant**
2483	V	57.154	-35.994	28.48	49.64	74	-24.36	1MHz/1MHz/PK	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

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

Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/15/2012	9/14/2013
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	9/4/2012	9/4/2013
Biconnilog Antenna	00051864	ETS	3142C	12/14/2012	12/14/2013
Horn Antenna	6556	ETS	3115	9/13/2012	9/13/2013
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use

11.4 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.

11.5 Test Data: Bilog

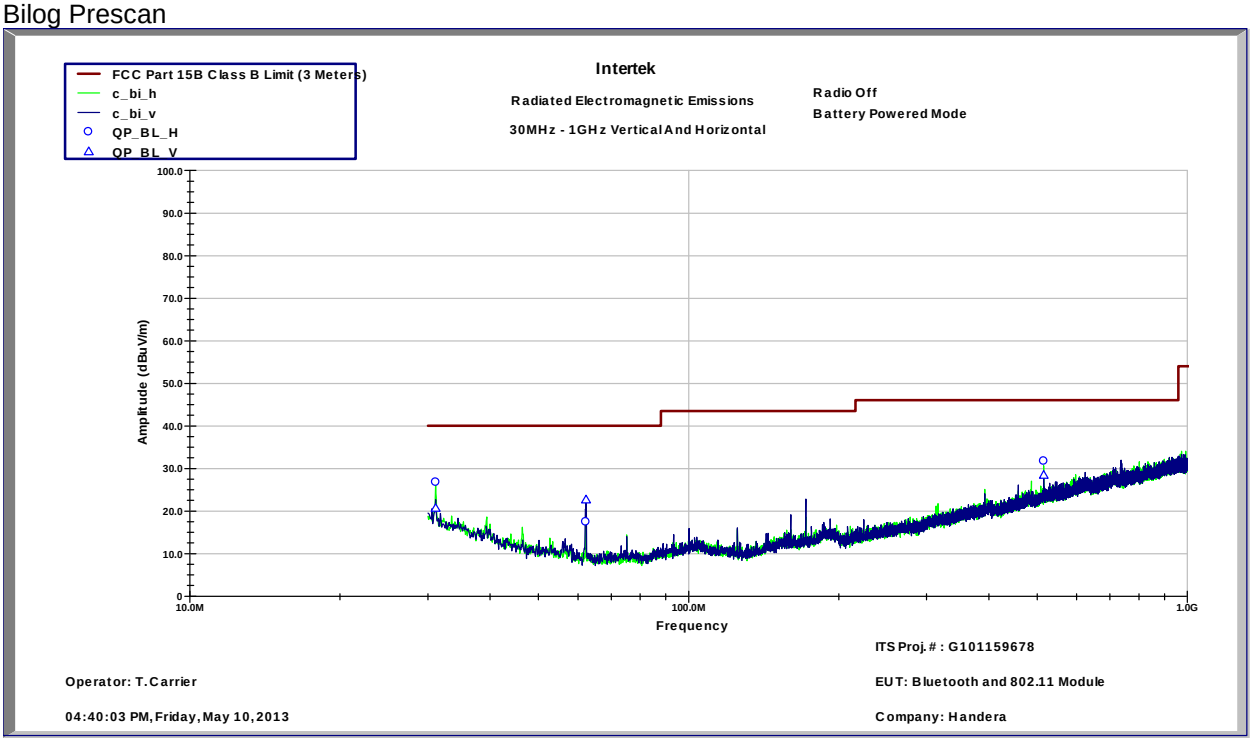
Radiated Emissions										
Test Engineer:	Toby Carrier	**Start Date:**	5/10/2013		**End Date:**	5/10/2013				
Temperature:	23.05°	**Humidity:**	30.70%		**Pressure:**	988.9 mbar				
Specification:	FCC Part 15B	**Test Limit:**	Class B							
Notes:	Radio Off									
A	**B**	**C**	**D**	**E**	**F**	**G**	**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**
31.129 MHz	H	8.7	0.71	17.35	26.75	40	-13.25	120kHz/QP	3m	**Compliant**
62.257 MHz	H	9.1	1.02	7.27	17.4	40	-22.6	120kHz/QP	3m	**Compliant**
515.43 MHz	H	9.98	3.11	18.62	31.7	46.02	-14.32	120kHz/QP	3m	**Compliant**
31.114 MHz	V	2.63	0.71	17.35	20.69	40	-19.31	120kHz/QP	3m	**Compliant**
62.267 MHz	V	14.36	1.02	7.27	22.66	40	-17.34	120kHz/QP	3m	**Compliant**
515.48 MHz	V	6.75	3.11	18.62	28.48	46.02	-17.54	120kHz/QP	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

11.6 Test Data: Horn

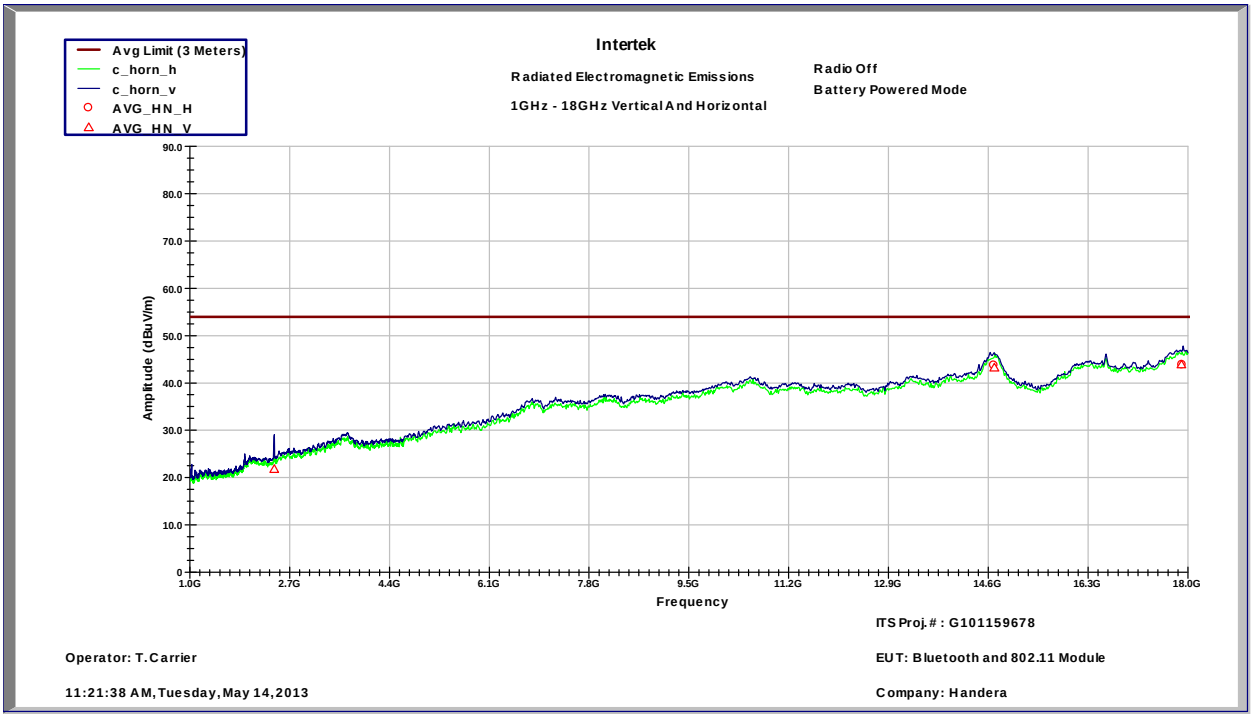
Radiated Emissions										
Test Engineer:	Toby Carrier	**Start Date:**	5/14/2013		**End Date:**	5/14/2013				
Temperature:	23.05°	**Humidity:**	30.70%		**Pressure:**	988.9 mbar				
Specification:	FCC Part 15B	**Test Limit:**	Class B							
Notes:	Radio Off									
A	**B**	**C**	**D**	**E**	**F**	**G**	**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**
14.694 GHz	H	19.11	-22.24	46.81	43.67	53.98	-10.31	1MHz/AVG	3m	**Compliant**
17.902 GHz	H	15.48	-16.81	45.14	43.81	53.98	-10.17	1MHz/AVG	3m	**Compliant**
2.4358 GHz	V	29.09	-35.91	28.55	21.73	53.98	-32.25	1MHz/AVG	3m	**Compliant**
14.705 GHz	V	18.64	-22.24	46.77	43.17	53.98	-10.81	1MHz/AVG	3m	**Compliant**
17.89 GHz	V	15.54	-16.83	45.13	43.84	53.98	-10.14	1MHz/AVG	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Deviations, Additions, or Exclusions: None

Bilog Prescan



Horn Prescan



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 Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/15/2012	9/14/2013
LISN	3333	Teseq	NNB52	3/11/2013	3/11/2014

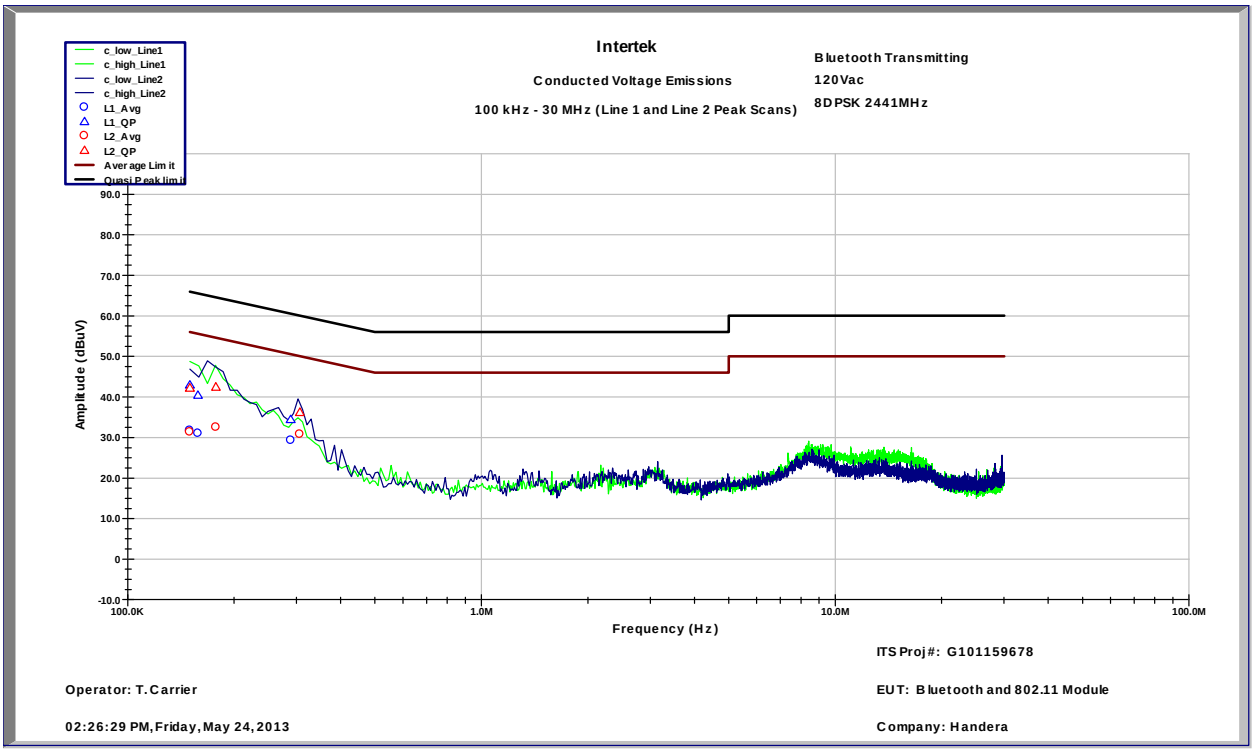
12.4 Results:

The sample tested was found to Comply.

12.5 Data (Bluetooth Transmitting):

Conducted Voltage Emissions on Power Lines								
Test Engineer:	Toby Carrier	**Start Date:**	5/24/2013	**End Date:**	5/24/2013			
Temperature:	25.5℃	**Humidity:**	31.20%	**Pressure:**	984.5 mbar			
Specification:	FCC Part 15B	**Test Limit:**	Class B	**RBW:**	9kHz			
Notes:	Radio Transmitting (Bluetooth)							

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	150.0 KHz	42.97	66	-23.03	31.72	56	-24.28	**Compliant**
L1	158.1 KHz	40.43	65.56	-25.13	30.99	55.56	-24.57	**Compliant**
L1	288.9 KHz	34.44	60.56	-26.12	29.28	50.56	-21.28	**Compliant**
L2	150.0 KHz	42.2	66	-23.8	31.37	56	-24.63	**Compliant**
L2	177.6 KHz	42.44	64.6	-22.16	32.49	54.6	-22.11	**Compliant**
L2	306.7 KHz	36.21	60.06	-23.85	30.79	50.06	-19.27	**Compliant**

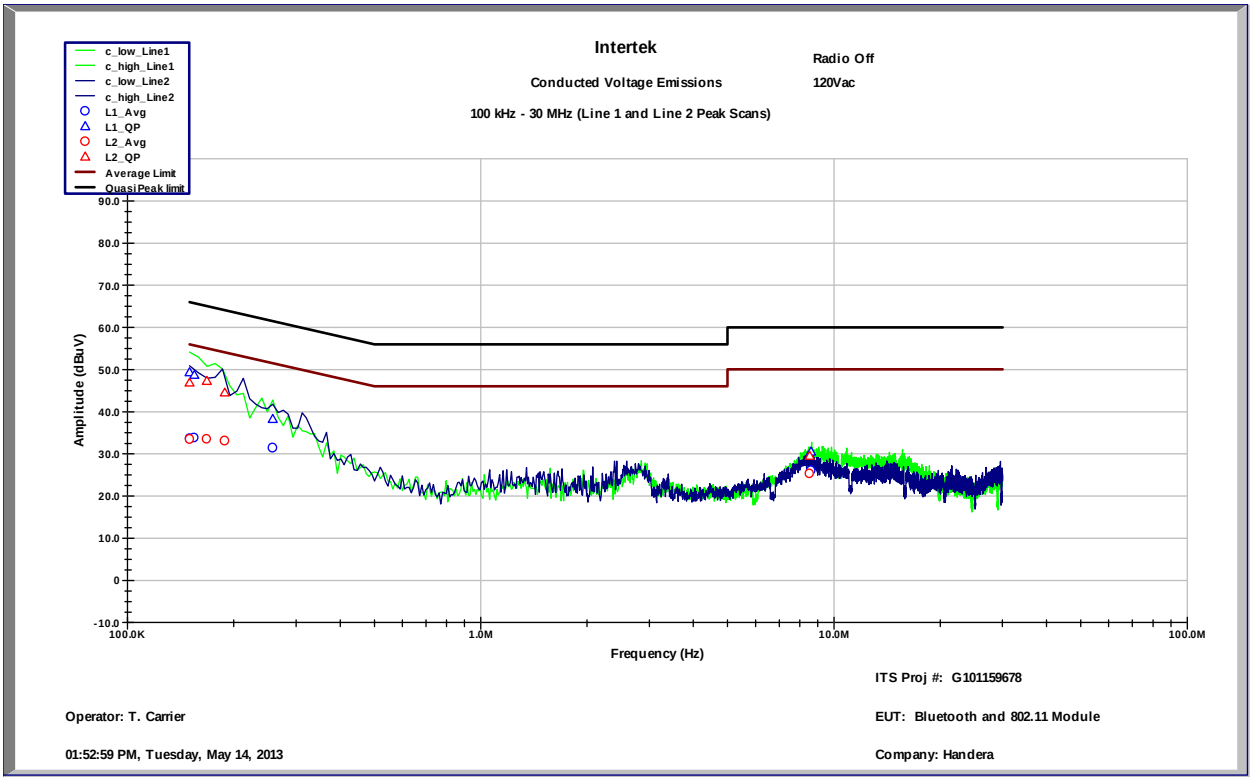


Deviations, Additions, or Exclusions: None

12.6 Data (Idle Mode):

Conducted Voltage Emissions on Power Lines								
Test Engineer:	Toby Carrier	**Start Date:**	5/14/2013	**End Date:**	5/14/2013			
Temperature:	25.5℃	**Humidity:**	31.20%	**Pressure:**	984.5 mbar			
Specification:	FCC Part 15B	**Test Limit:**	Class B	**RBW:**	9kHz			
Notes:	Radio Off							

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	150.0 KHz	49.3	66	-16.7	33.63	56	-22.37	**Compliant**
L1	154.6 KHz	48.67	65.75	-17.08	33.8	55.75	-21.95	**Compliant**
L1	257.5 KHz	38.23	61.51	-23.28	31.39	51.51	-20.12	**Compliant**
L1	8.6133 MHz	30.49	60	-29.51	26	50	-24	**Compliant**
L2	150.0 KHz	46.86	66	-19.14	33.46	56	-22.54	**Compliant**
L2	167.6 KHz	47.26	65.08	-17.82	33.49	55.08	-21.59	**Compliant**
L2	188.7 KHz	44.51	64.09	-19.59	33.07	54.09	-21.03	**Compliant**
L2	8.5301 MHz	29.52	60	-30.48	25.31	50	-24.69	**Compliant**



Deviations, Additions, or Exclusions: None

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	6/3/2014	101159678LEX-002	Original Issue