731 Enterprise Drive
Lexington, KY 40510

Telephone: 859-226-1000
Facsimile: 859-226-1040
www.intertek-etlsemko.com

FHSS TEST REPORT

Report Number:	**101078559LEX-004**
Project Number:	**G101078559**
Report Issue Date:	**6/14/2013**
Product Name:	**iX101T1 Rugged Tablet**
Model Number:	**iX101T1**
FCCID:	**Q2GWG7550**
ICID:	**4596A-WG7550**
Standards:	**Title 47 CFR Part 15 Subpart C and RSS-210 Issue 8**
Radios Under Test:	**Bluetooth**

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

Client:
Xplore Technologies
14000 Summit Dr.
Austin, TX 78728

Report prepared by

Bryan Taylor, Team Leader

Report reviewed by

Jason Centers, Senior Project Engineer

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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
38	Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (6.1)	Pass
42	AC Powerline Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Pass
45	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	Xplore Technologies
Model Number	iX101T1
Serial Number	Test Sample #2
FCC Identifier	Q2GWG7550
Industry Canada Identifier	4596A-WG7550
Receive Date	3/20/2013
Test Start Date	3/21/2013
Test End Date	4/10/2013
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	6.86dBm
Test Channels	2402MHz, 2441MHz, and 2480MHz
Antenna Type (15.203)	Internal
Operating Voltage	115VAC/60Hz (Via AC / DC Power Adapter)

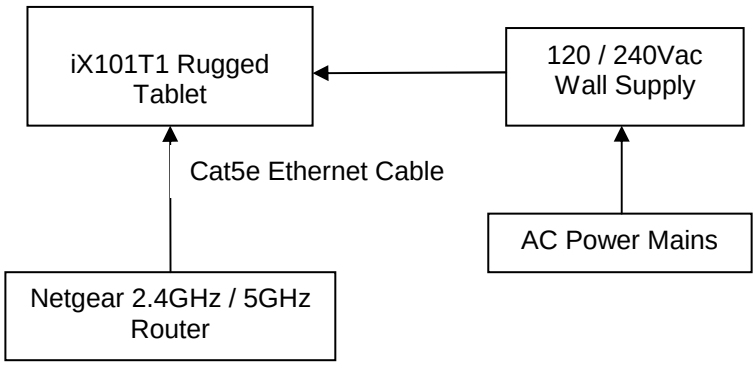
Description of Equipment Under Test
The iX101T1 is a ruggedized tablet PC.

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
120 / 240Vac Power Cable	1m	No	No	120 / 240Vac Wall Supply	Xplore Tablet
Cat5e Ethernet Cable	1m	No	No	Netgear Ethernet / Wi-Fi Router	Xplore Tablet
HDMI Mini Cable	1m	Yes	No	Xplore Tablet	Unterminated
HDMI Cable	1m	Yes	No	Xplore Tablet	Unterminated
Micro USB Cable	1m	Yes	No	Xplore Tablet	Unterminated
USB Cable	1m	Yes	No	USB Mouse	Xplore Tablet

3.4 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Wireless Router	Netgear	WNDR3700v4	311315801CC9

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

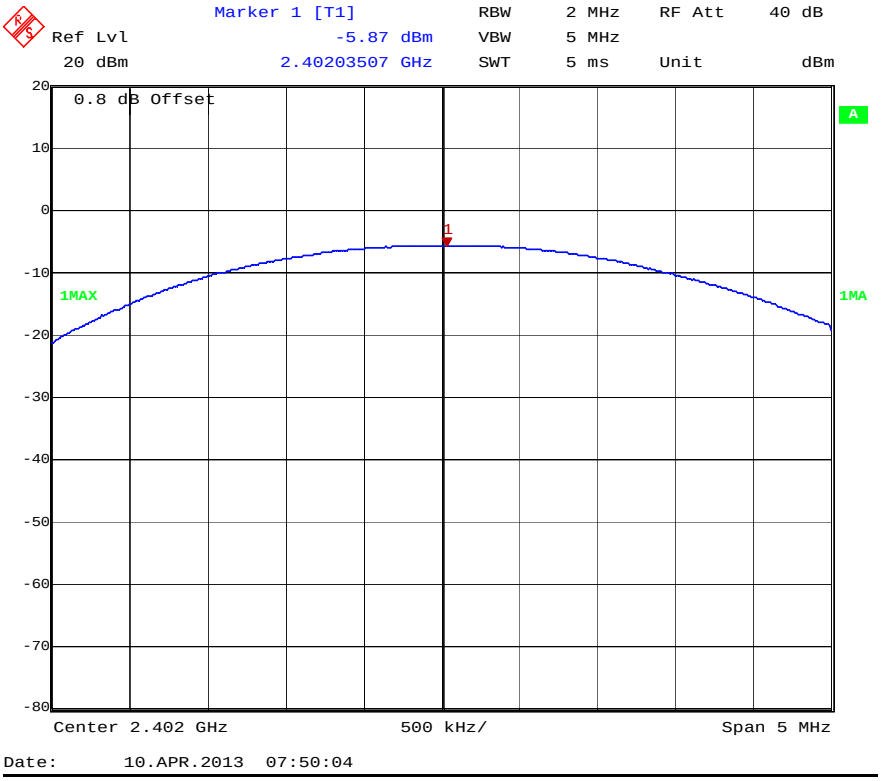
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. The peak output power was measured using the marker to peak function of the spectrum analyzer.

4.3 Test Equipment Used:

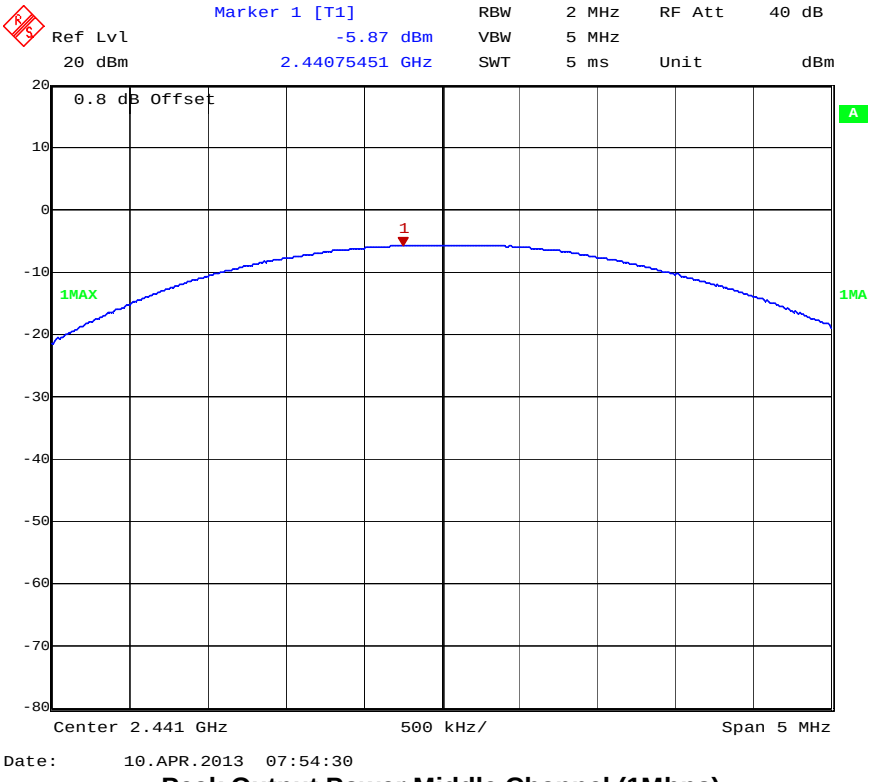
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

4.4 Results:

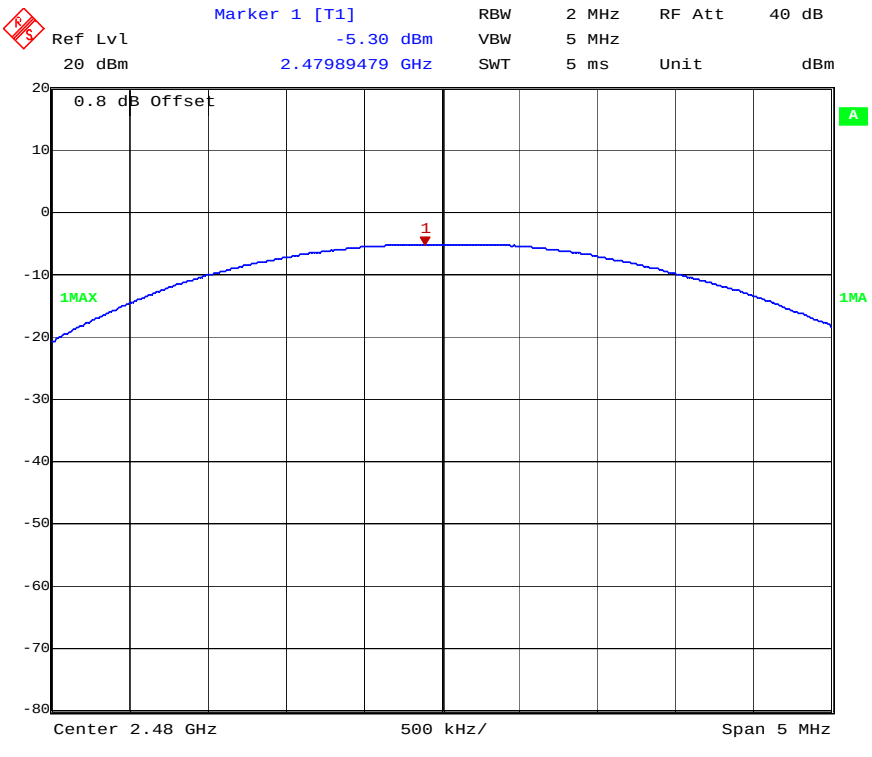
Channel	Frequency (MHz)	Data Rate	Output Power (dBm)	Limit (dBm)	Pass / Fail
Low	2402	1Mbps	-5.87dBm	30dBm	Pass
Mid	2441	1Mbps	-5.87dBm	30dBm	Pass
High	2480	1Mbps	-5.30dBm	30dBm	Pass
Low	2402	2Mbps	6.86dBm	30dBm	Pass
Mid	2441	2Mbps	6.41dBm	30dBm	Pass
High	2480	2Mbps	6.35dBm	30dBm	Pass
Low	2402	3Mbps	-2.99dBm	30dBm	Pass
Mid	2441	3Mbps	-2.87dBm	30dBm	Pass
High	2480	3Mbps	-2.4dBm	30dBm	Pass



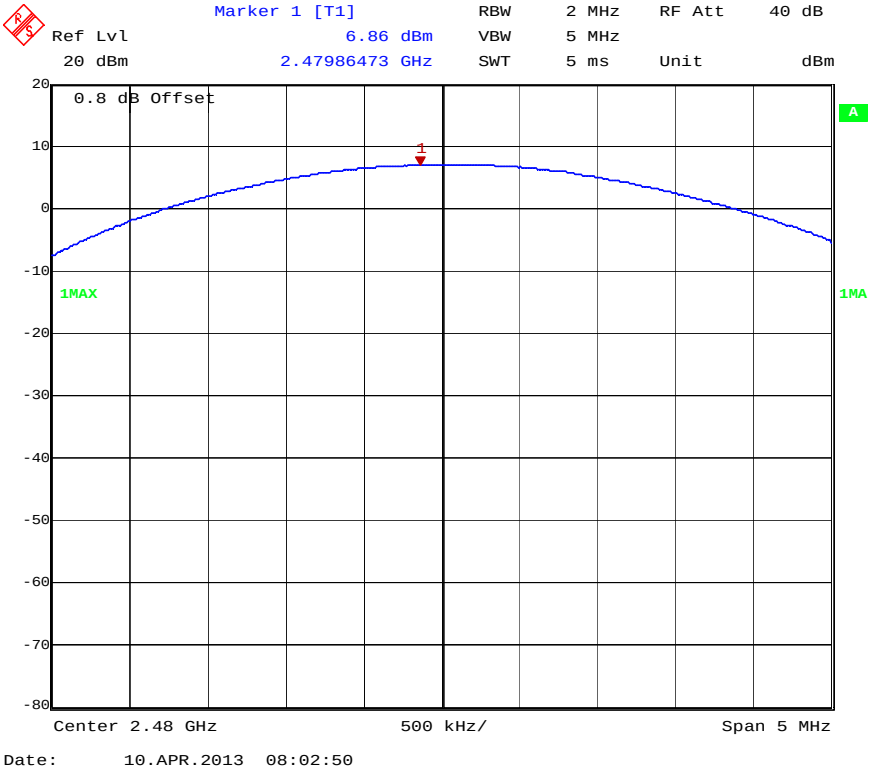
Peak Output Power Low Channel (1Mbps)



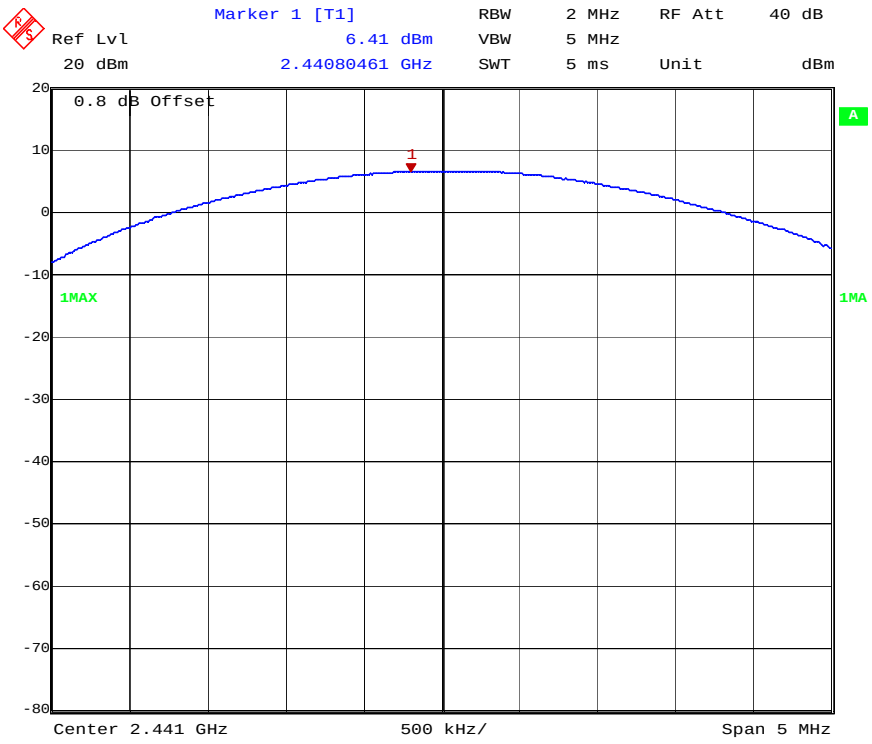
Peak Output Power Middle Channel (1Mbps)



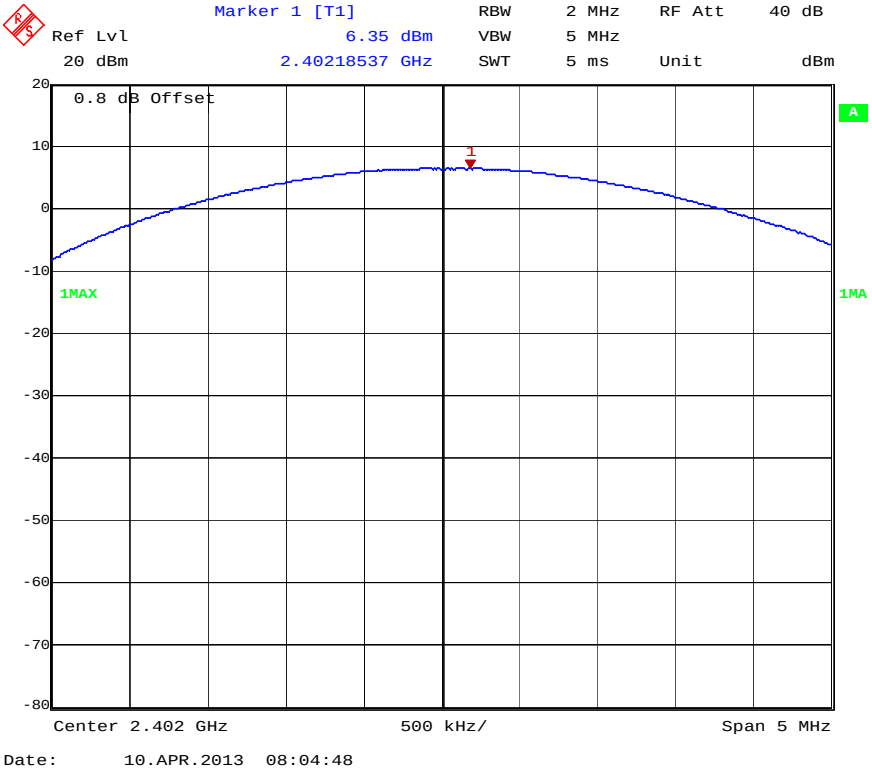
Peak Output Power High Channel (1Mbps)



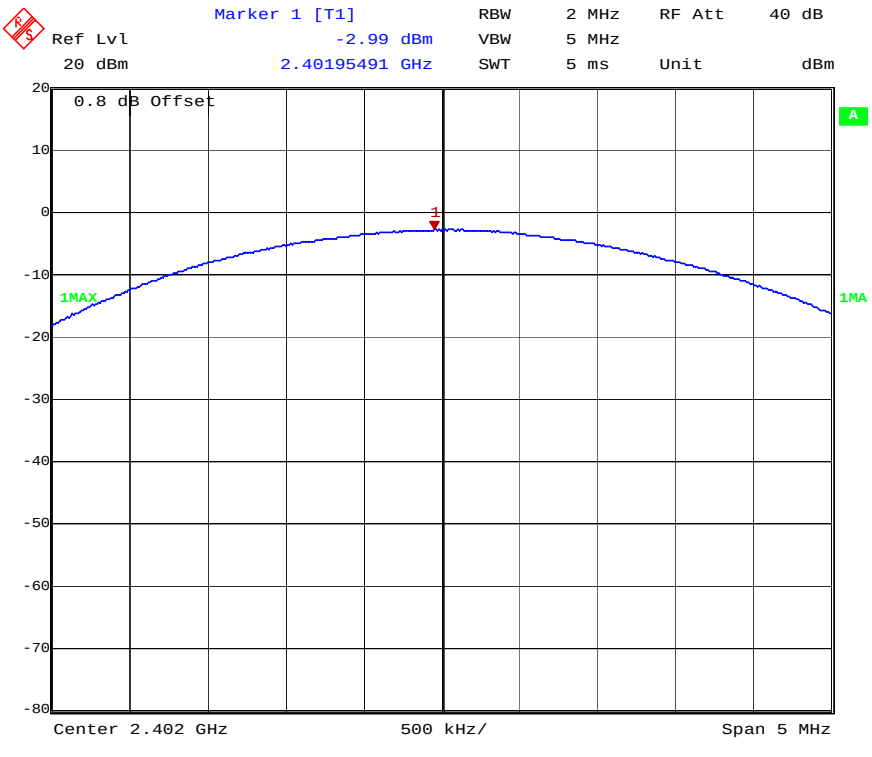
Peak Output Power Low Channel (2Mbps)



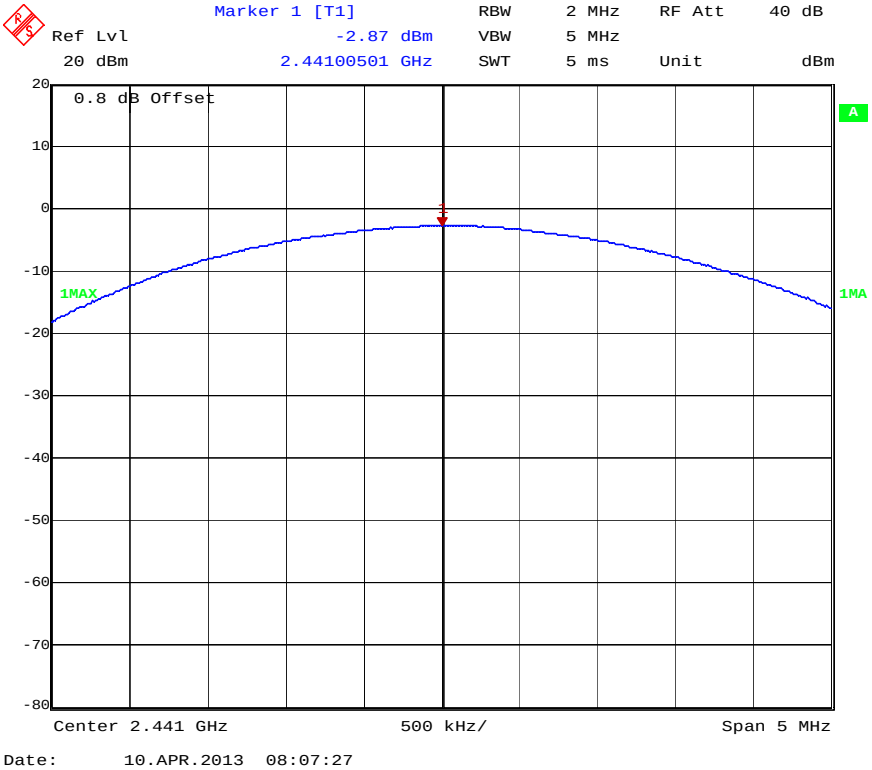
Peak Output Power Middle Channel (2Mbps)



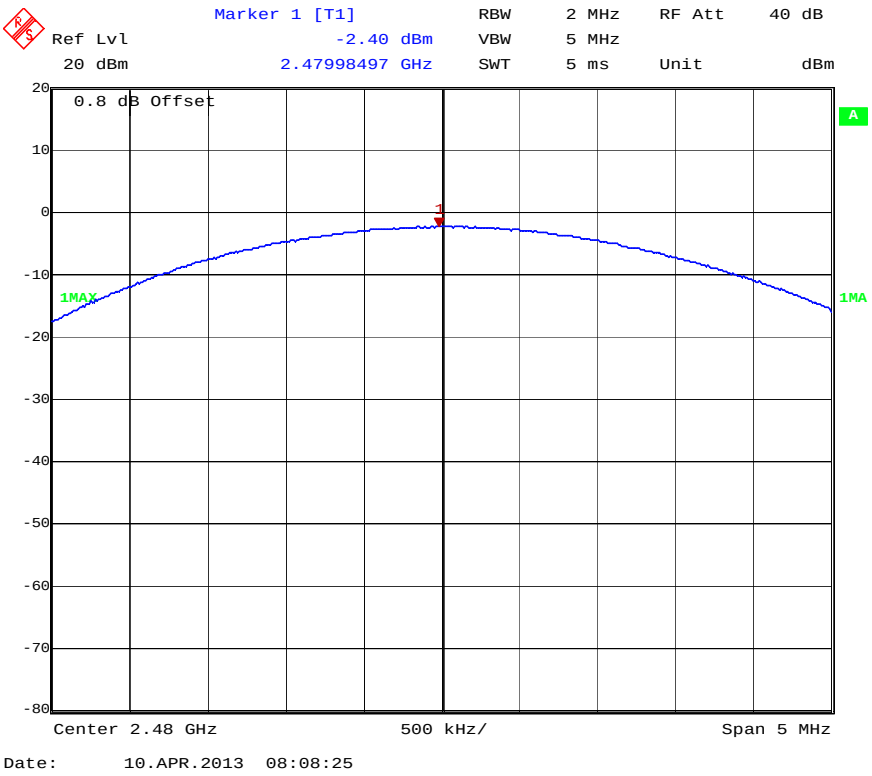
Peak Output Power High Channel (2Mbps)



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.

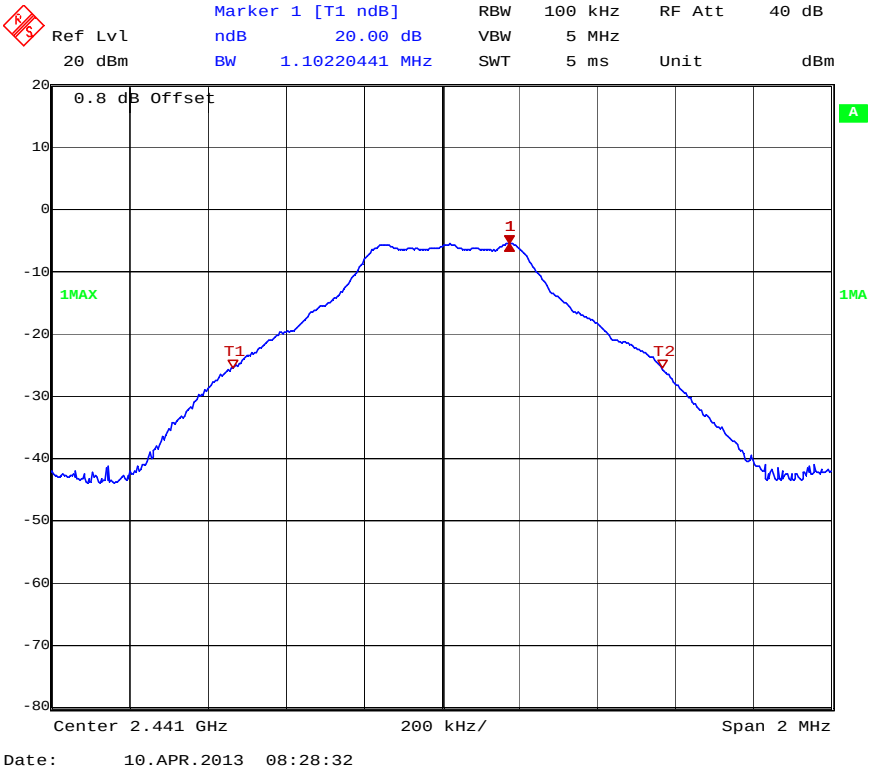
5.3 Test Equipment Used:

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

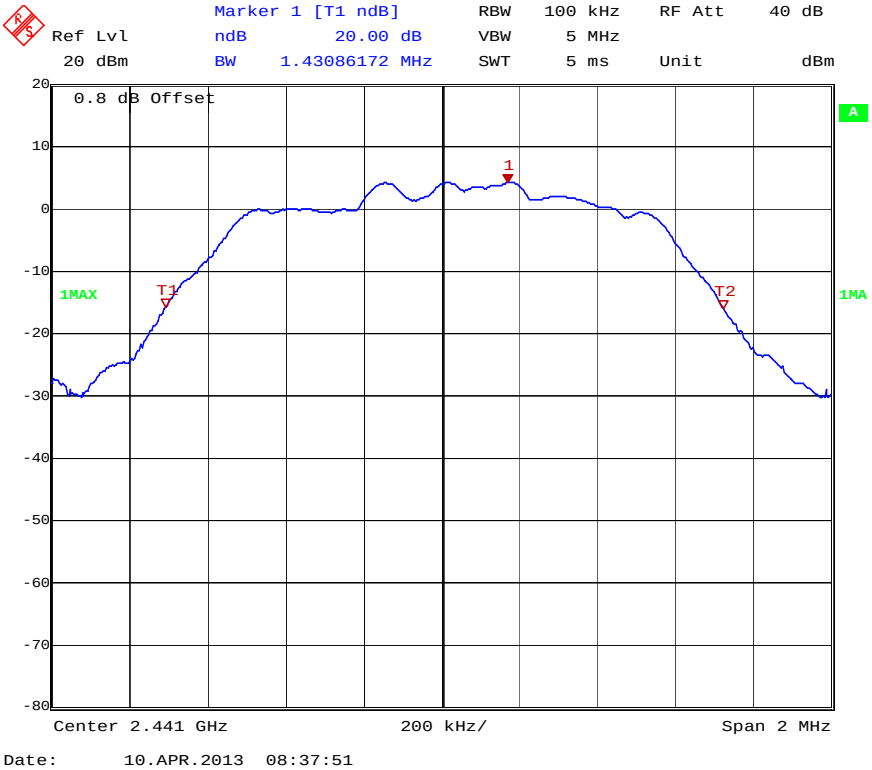
5.4 Results:

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

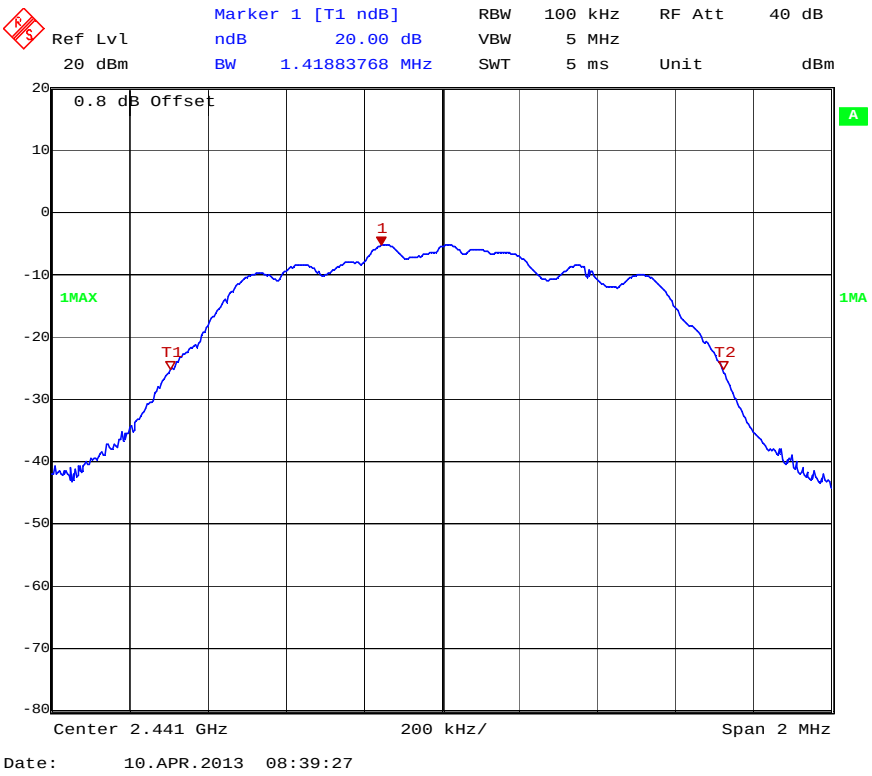
Channel	Data Rate	Frequency (MHz)	20dB Bandwidth (kHz)
Low	1Mbps	2441	1.102MHz
Mid	2Mbps	2441	1.43MHz
High	3Mbps	2441	1.42MHz



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

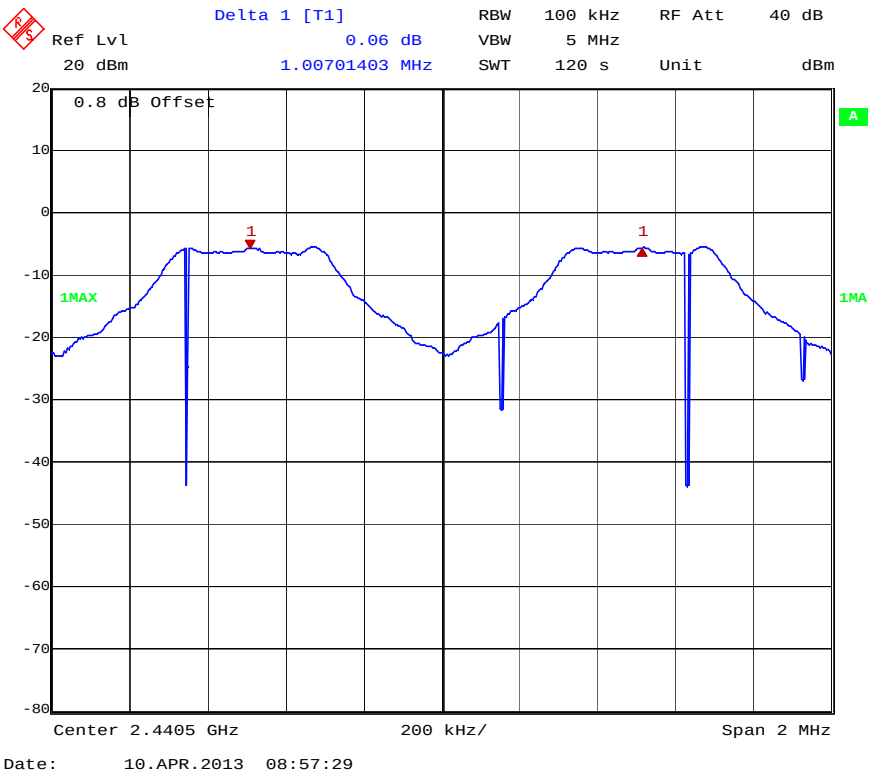
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

6.3 Test Equipment Used:

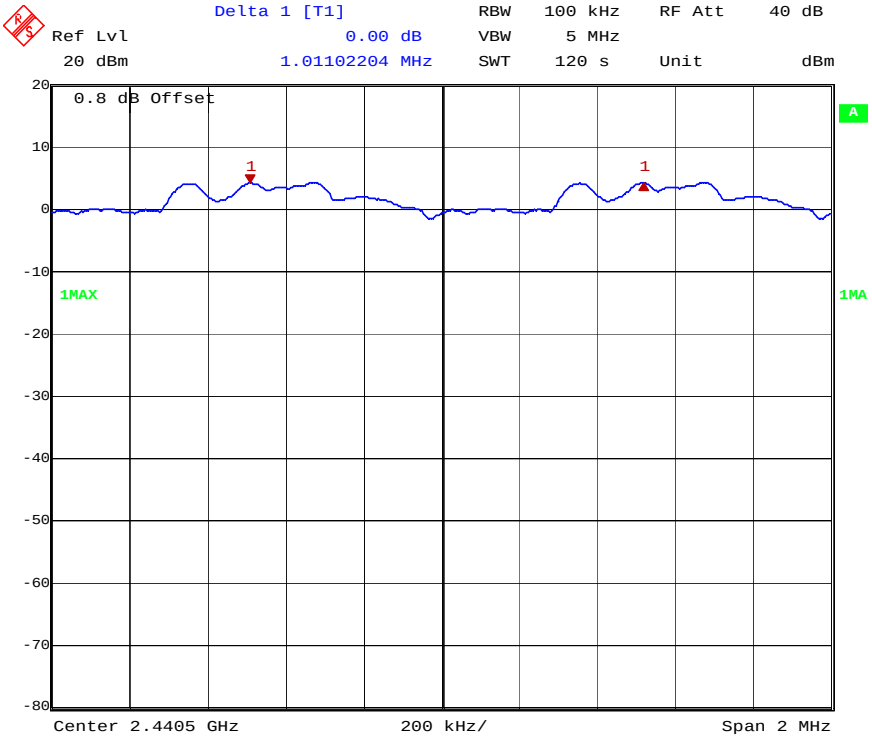
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

6.4 Results:

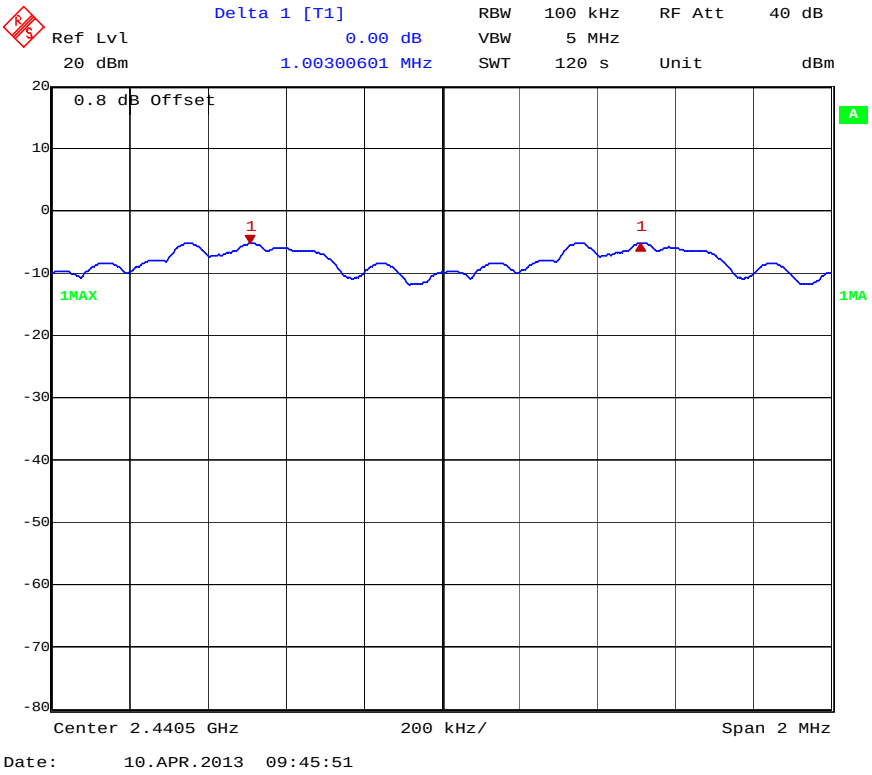
The plot below shows that the carrier frequency separation is 1MHz.



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:

(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

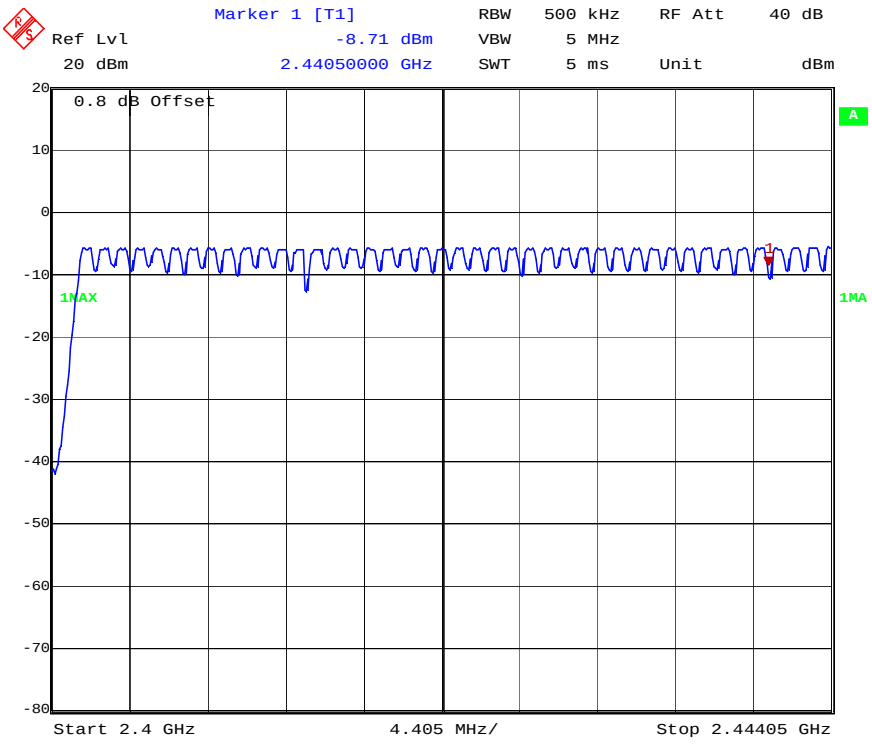
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

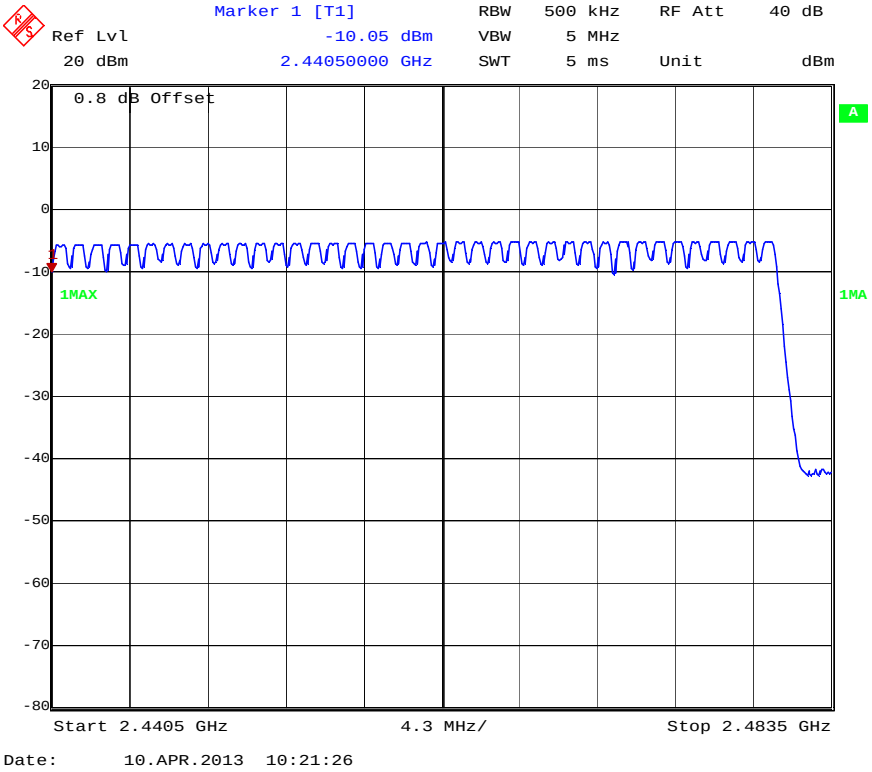
7.3 Test Equipment Used:

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

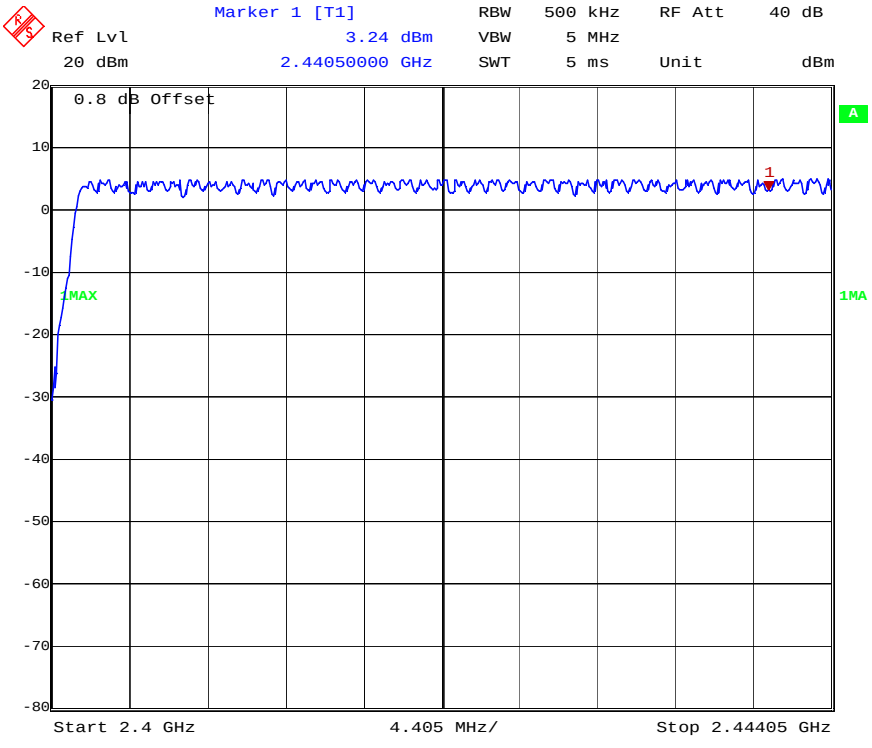
7.4 Results:

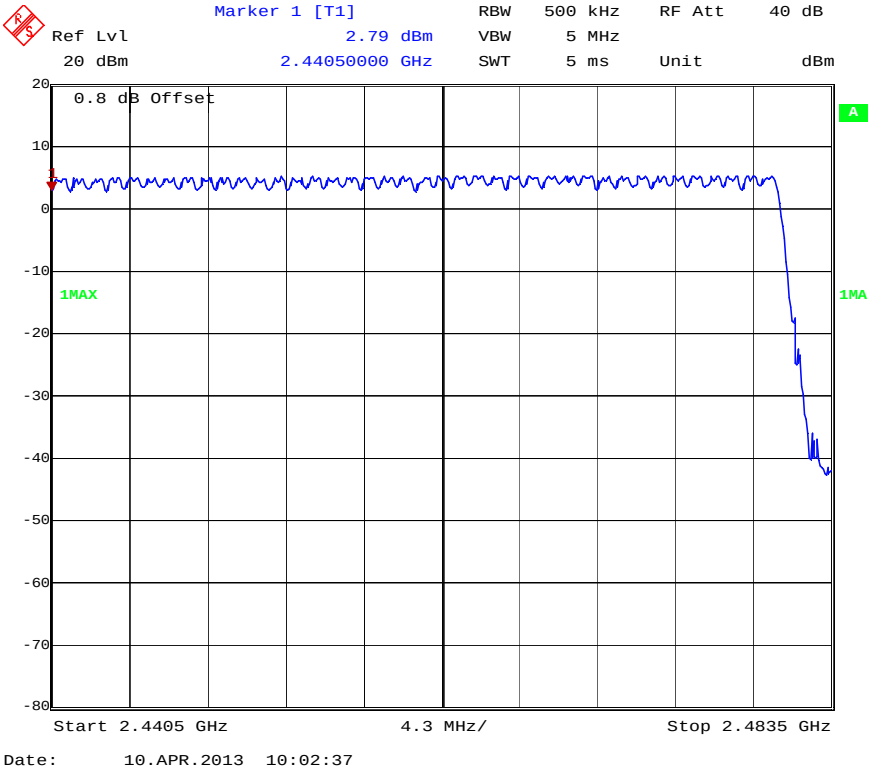
The plot below shows that there are 79 hopping frequencies channels being used.



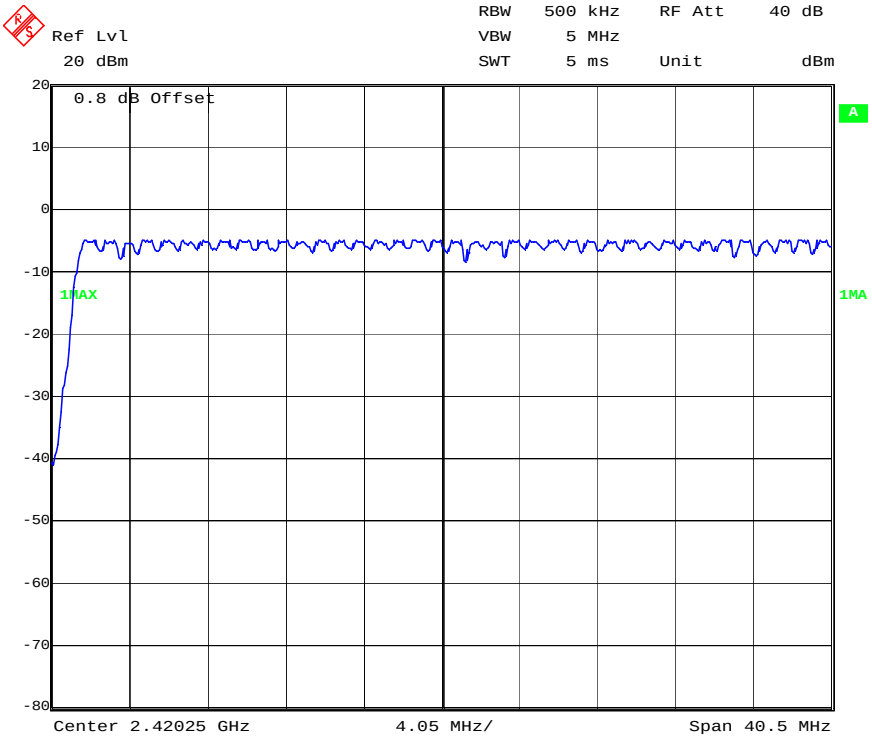


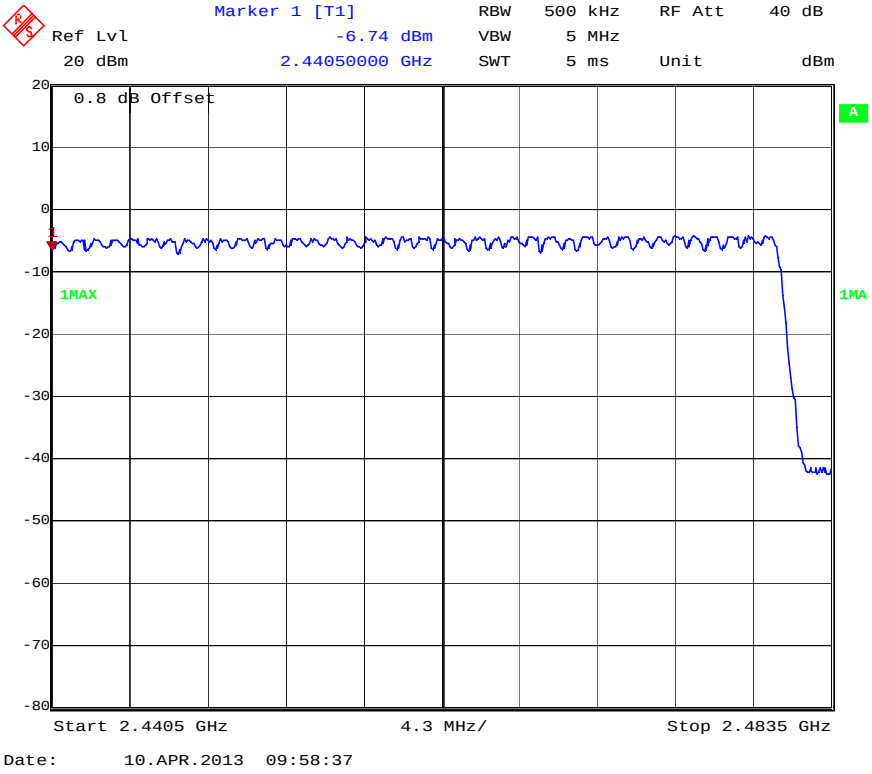
Number of Hopping Frequencies (1Mbps)





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:

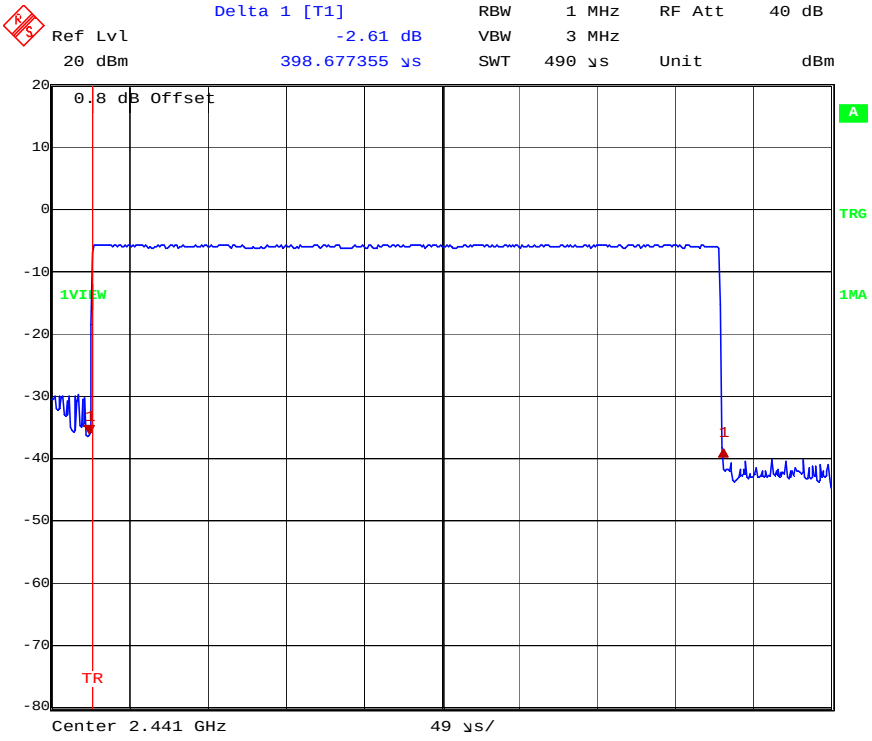
The total “on” time over the measurement period is less than the 400mS limit.

Measurement Period Calculation

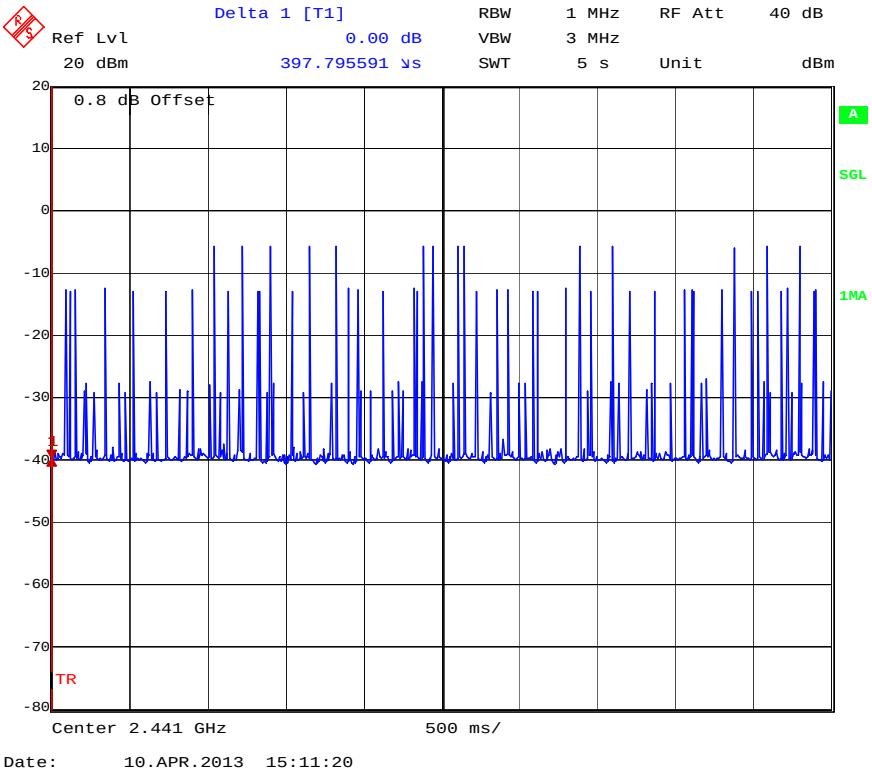
Number of Hopping Channels Used = 79
Measurement Period = 0.4 x N
Measurement Period = 0.4 x 79
Measurement Period = 31.6 seconds

Time of Occupancy Calculation

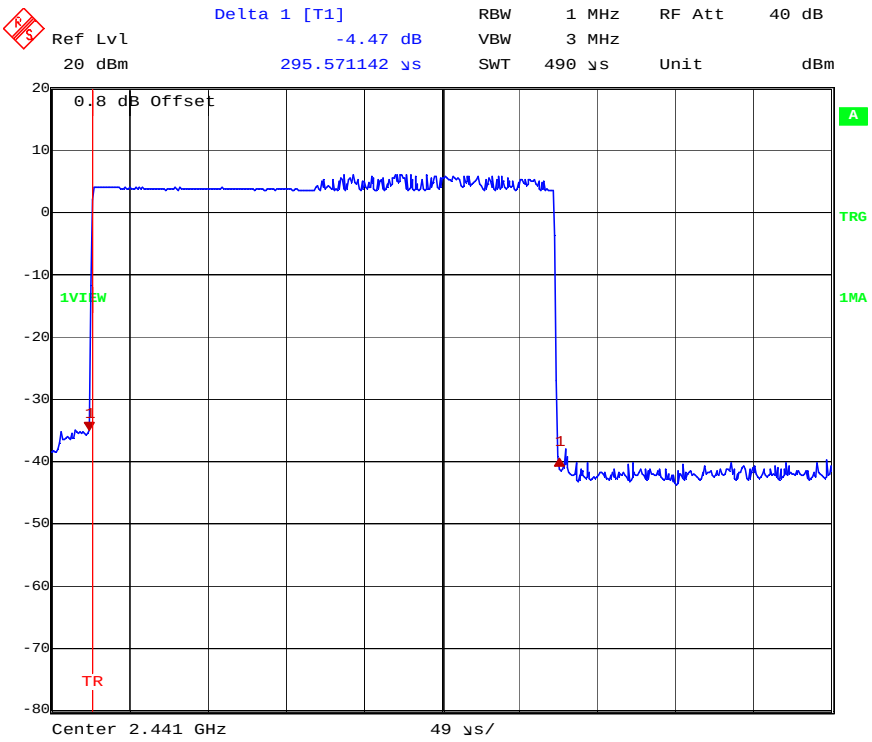
Mode	Number of Transmissions in a 31.6sec Frame (79 Hopping Ch x 0.4)	Transmission Single Pulse On Time (mS)	Result (mS)	Limit (mS)
1Mbps	49 (times in 5sec) * (31.6sec / 5sec) = 310	0.399	123.69	400
2Mbps	45 (times in 5sec) * (31.6sec / 5sec) = 284.4	0.296	84.18	400
3Mbps	52 (times in 5sec) * (31.6sec / 5sec) = 328.6	0.262	86.09	400
Time of occupancy = Transmission Single Pulse On Time x Number of Transmissions				



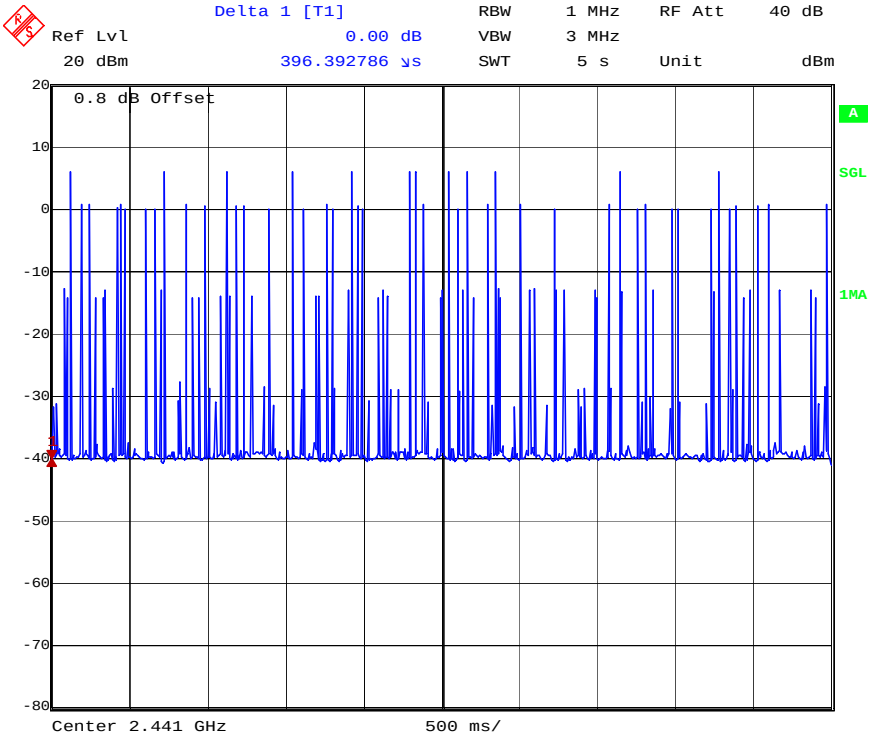
Channel Occupancy Time (1Mbps)



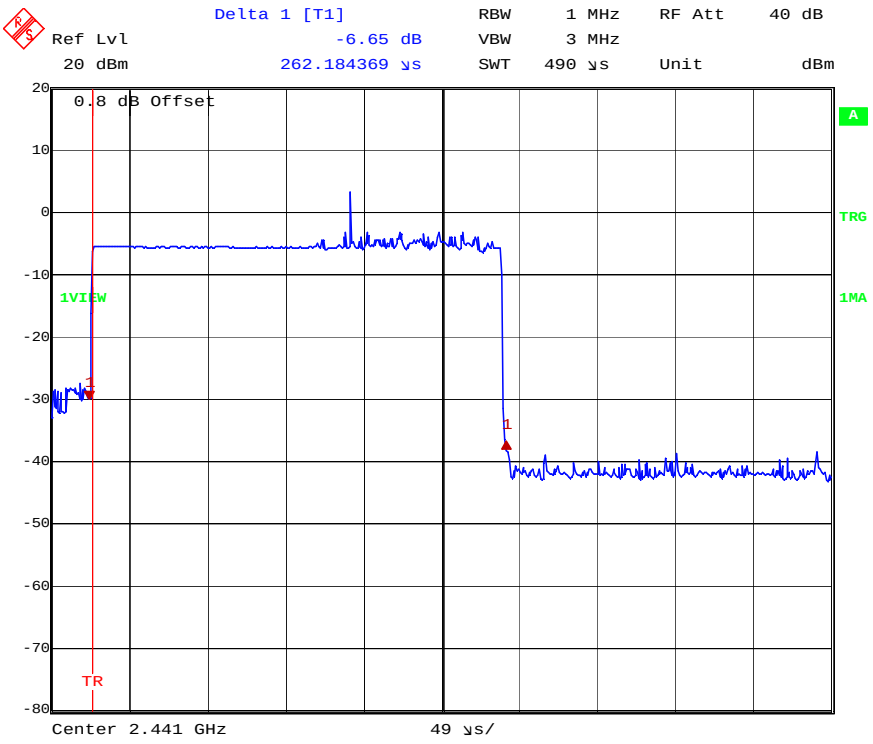
Number of Transmissions in 5 Seconds (1Mbps)



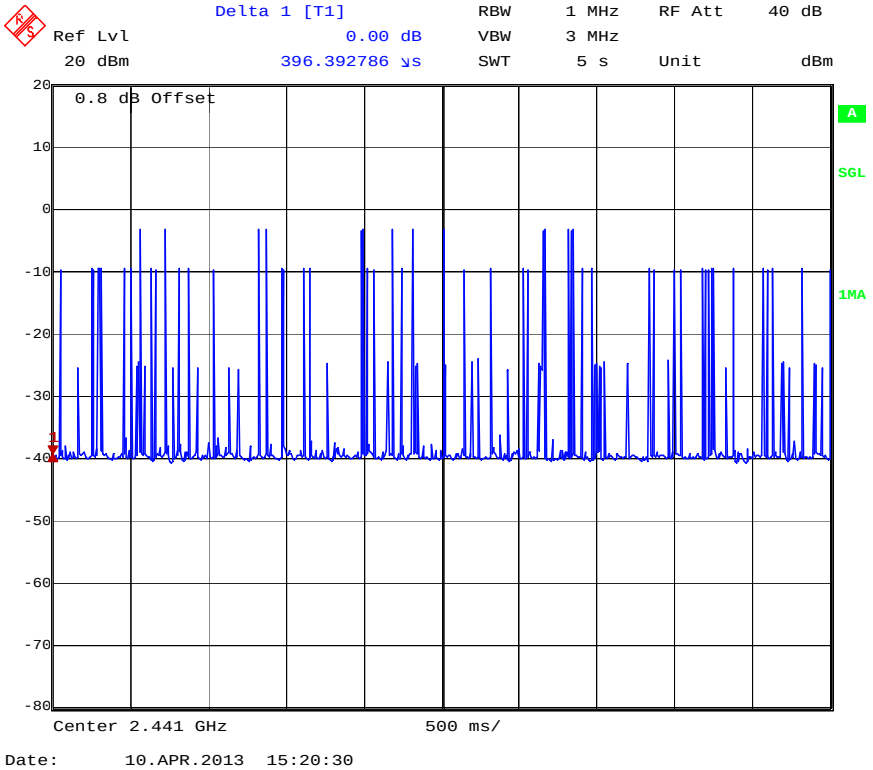
Channel Occupancy Time (2Mbps)



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

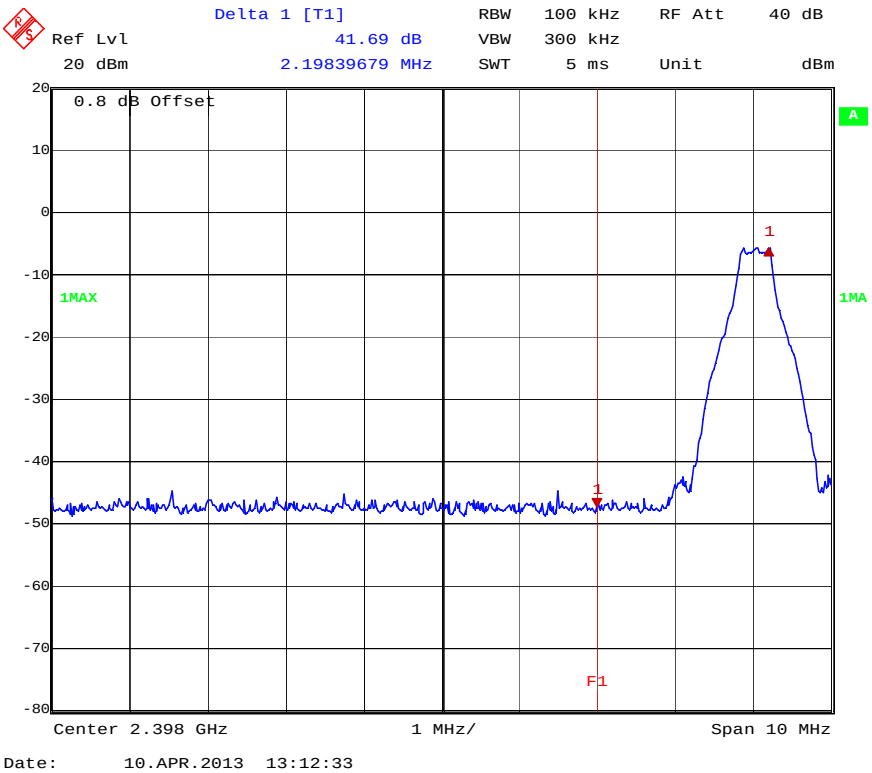
ANSI C63.10: 2009 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

9.3 Test Equipment Used:

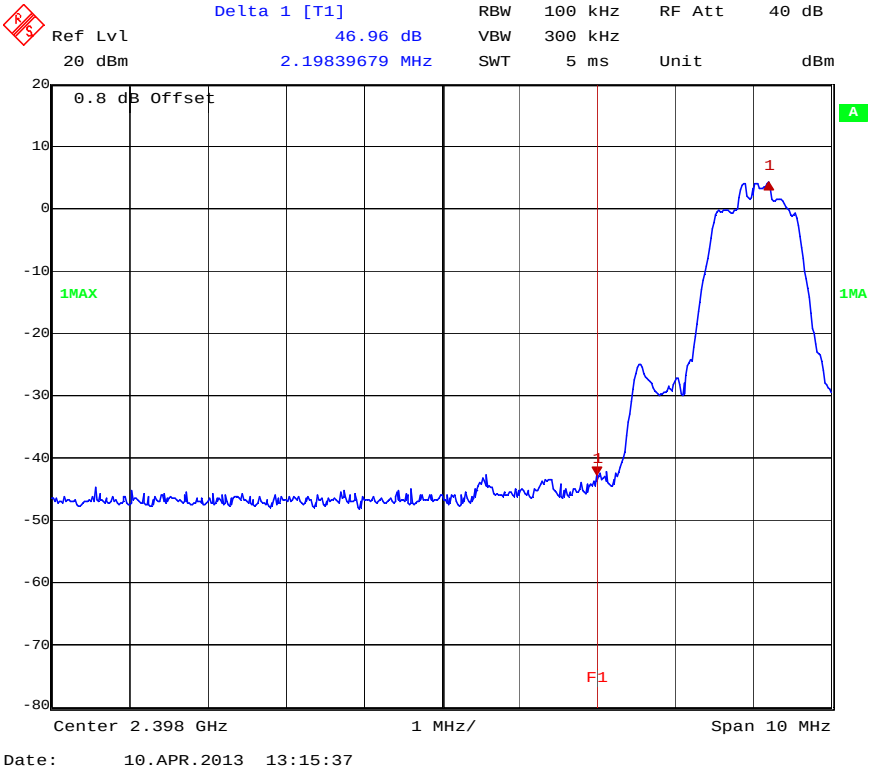
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	11/26/2012	11/26/2013

9.4 Results:

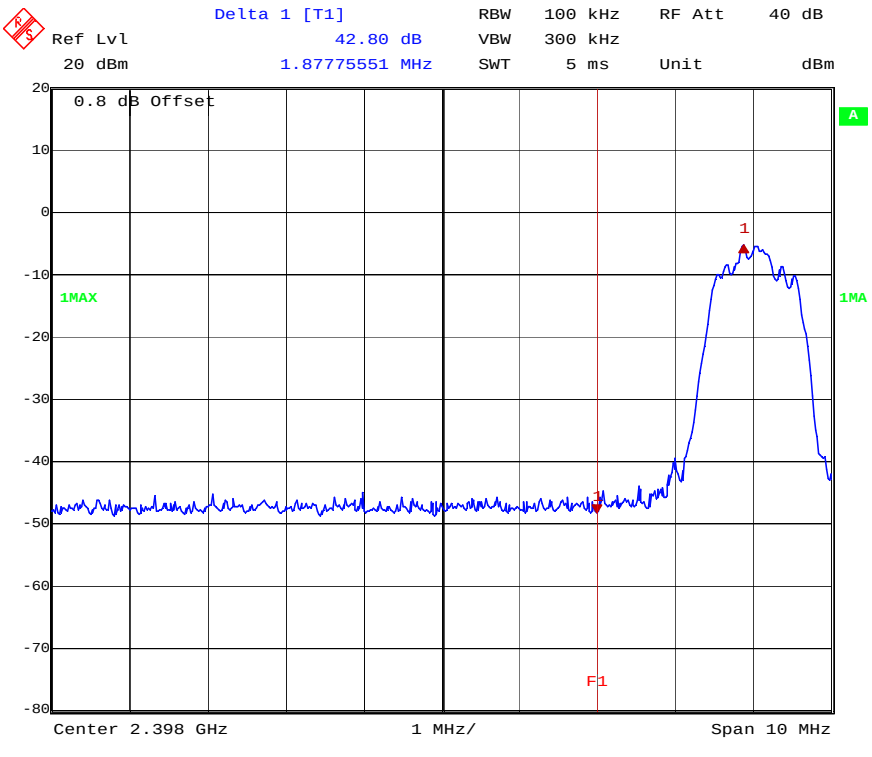
The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria. Plots are also presented showing the band edge compliance with the band edge centered on the analyzer display.



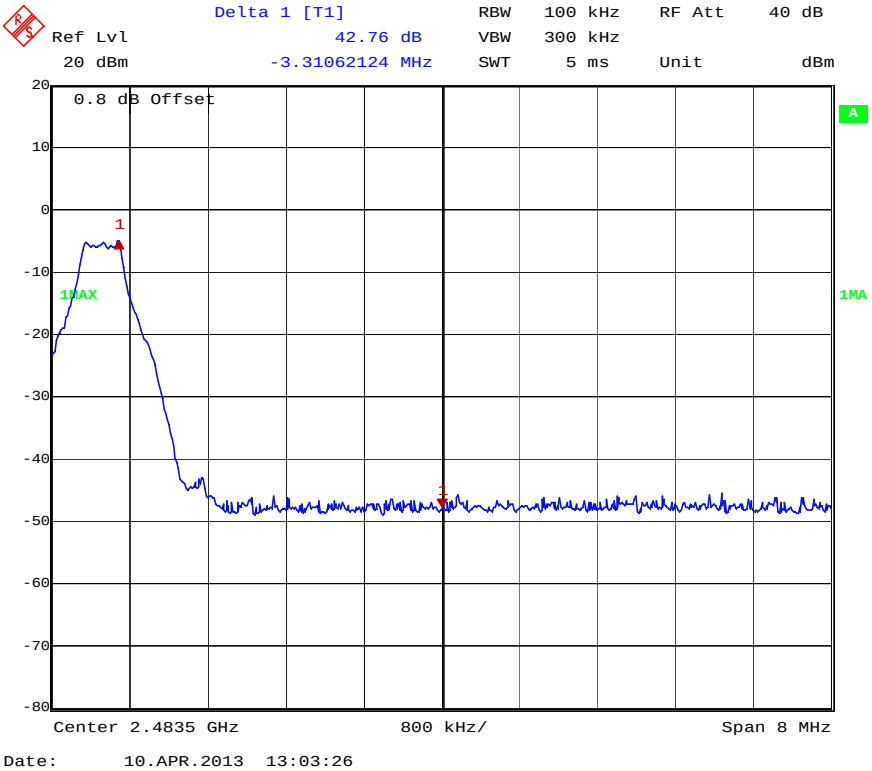
Conducted Band Edge Low Channel (1Mbps)



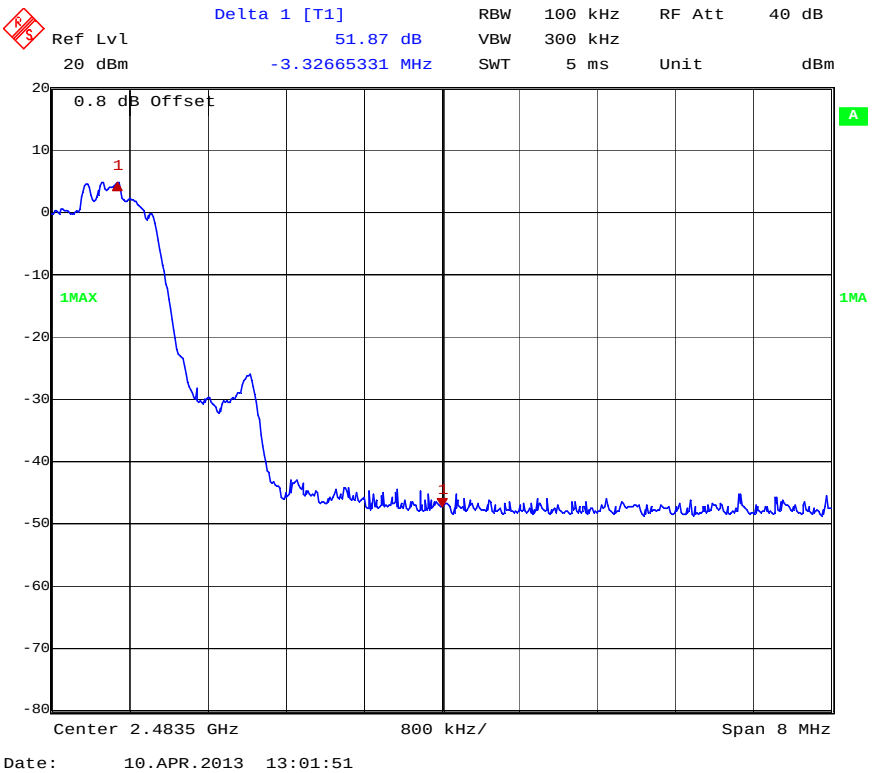
Conducted Band Edge Low Channel (2Mbps)



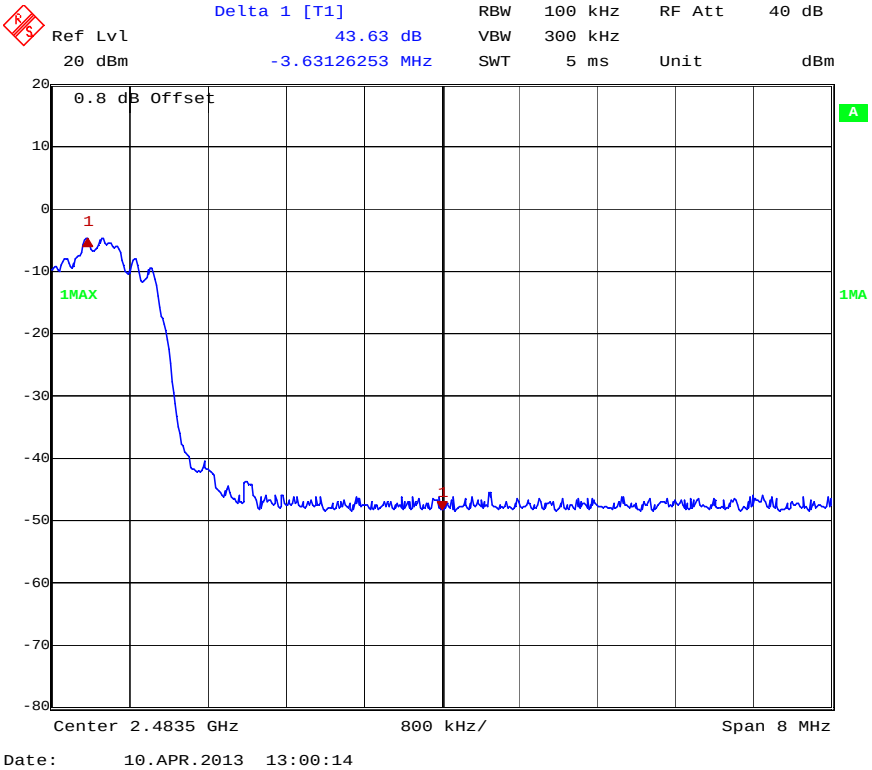
Conducted Band Edge Low Channel (3Mbps)



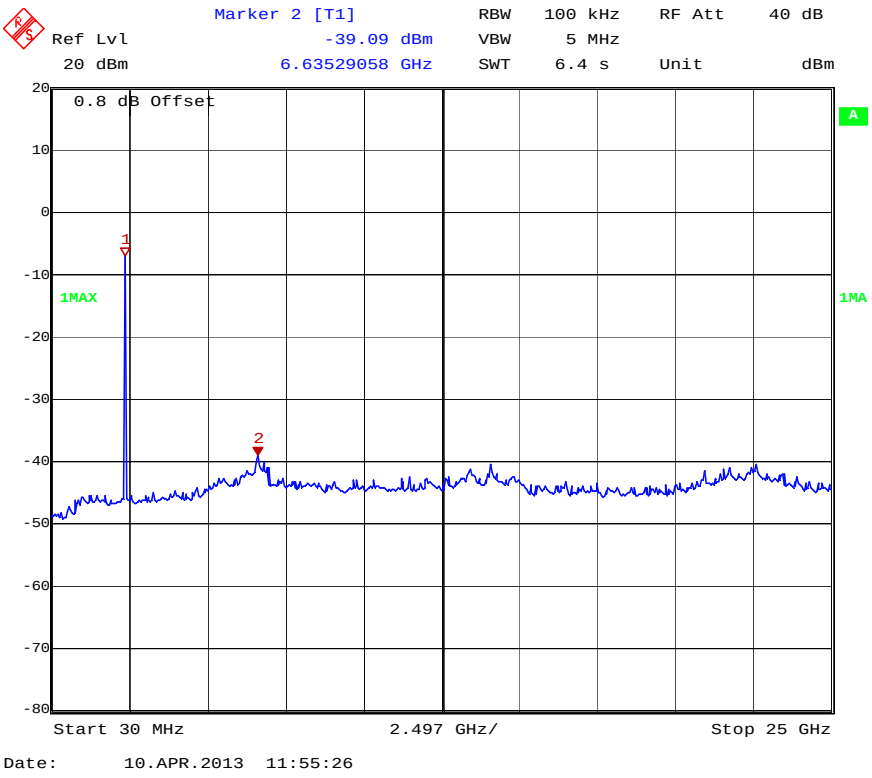
Conducted Band Edge High Channel (1Mbps)



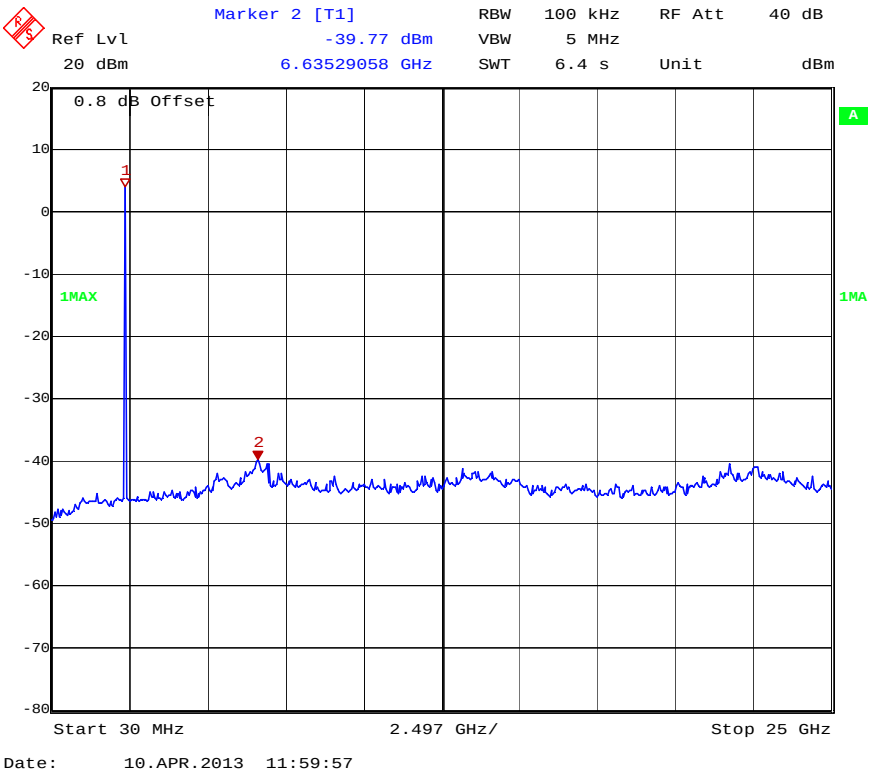
Conducted Band Edge High Channel (2Mbps)



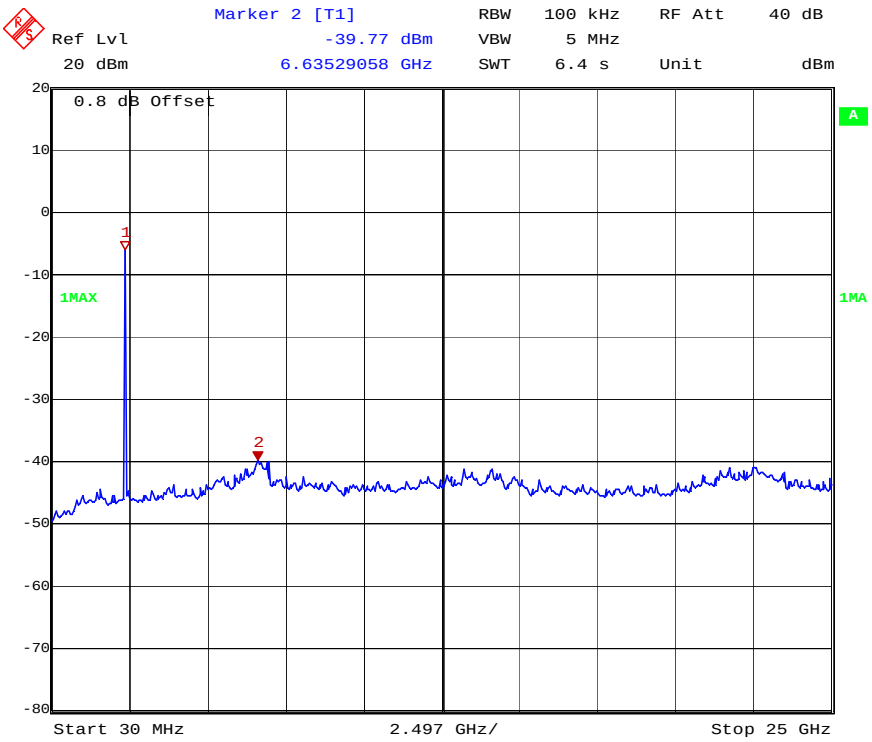
Conducted Band Edge High Channel (3Mbps)



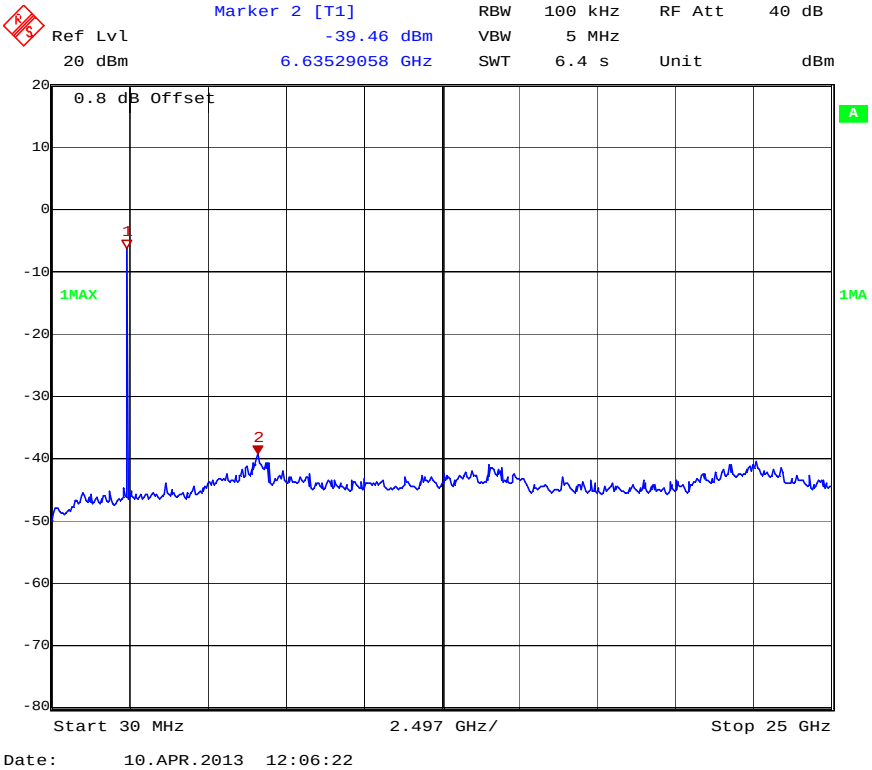
Conducted Spurious Emissions (Low Channel, 1Mbps)



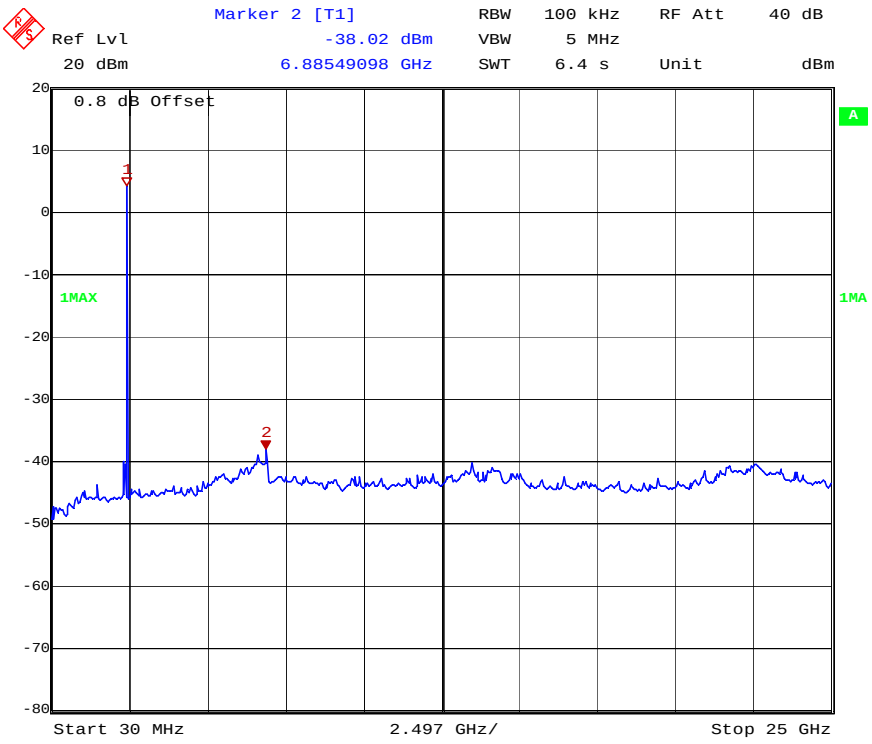
Conducted Spurious Emissions (Low Channel, 2Mbps)



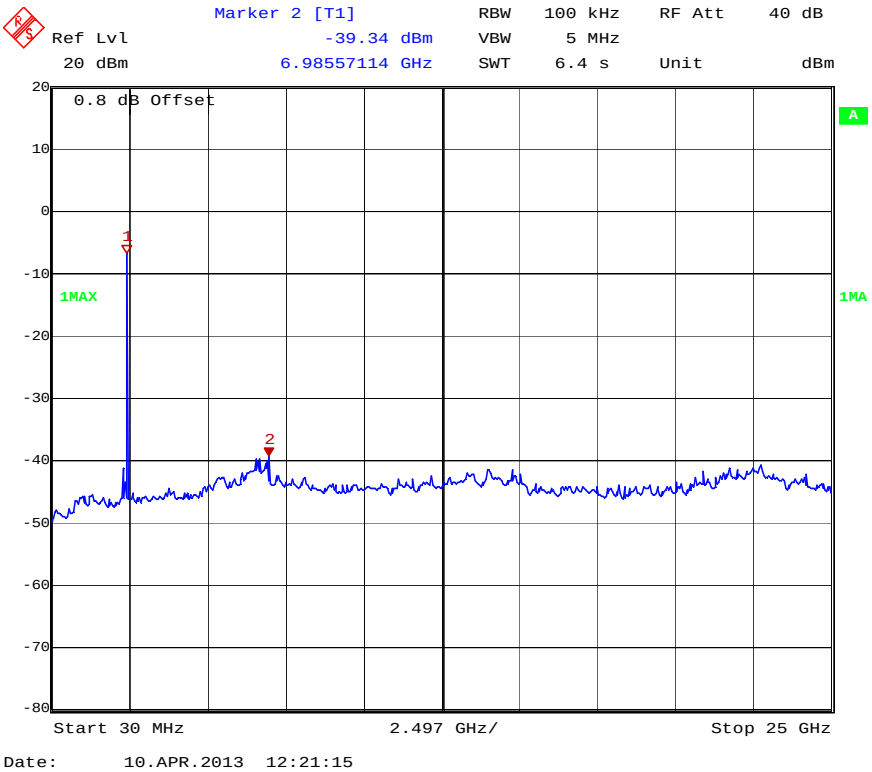
Conducted Spurious Emissions (Low Channel, 3Mbps)



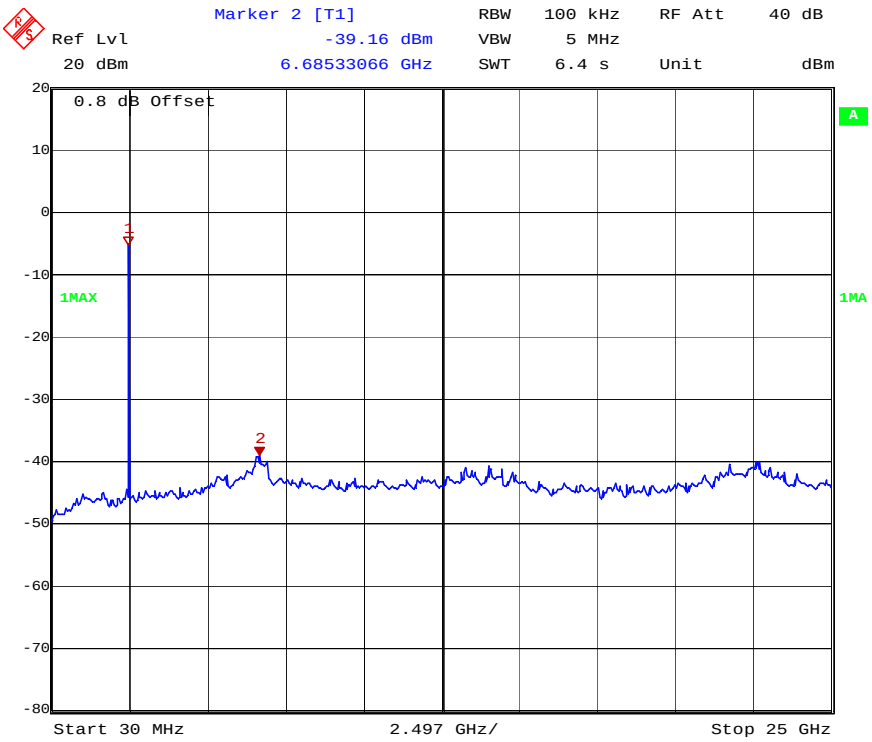
Conducted Spurious Emissions (Mid Channel, 1Mbps)



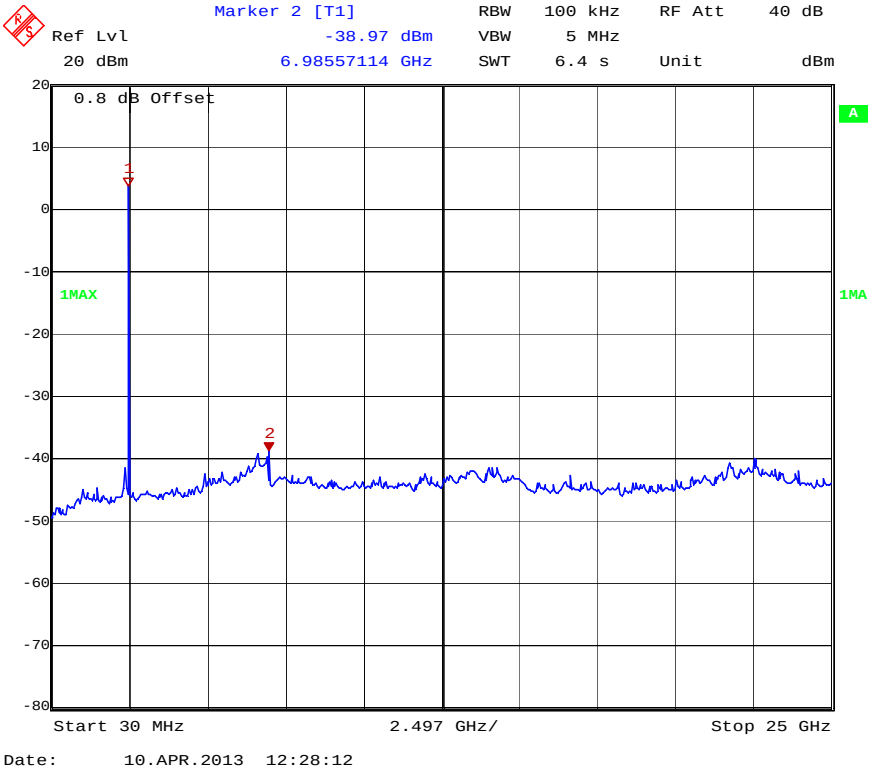
Conducted Spurious Emissions (Mid Channel, 2Mbps)



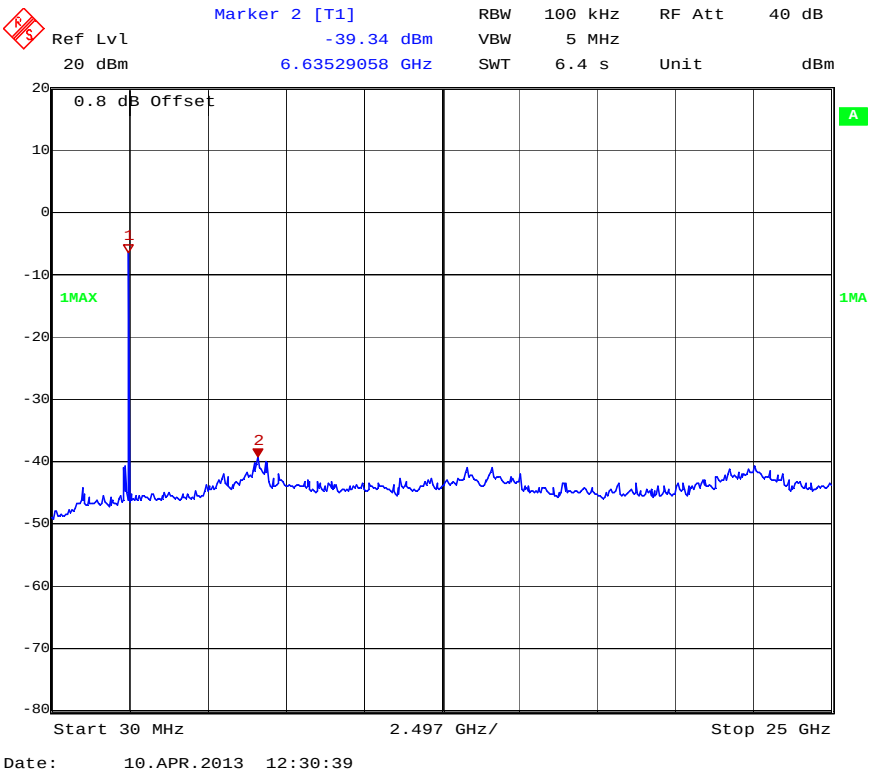
Conducted Spurious Emissions (Mid Channel, 3Mbps)



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 tables are the worst case emissions. Emissions not reported were at or below the measurement noise floor. The test sample was evaluated on three orthogonal axes since it was a hand held device and could be used in any orientation.

Worst Case Spurious Measurements (GMSK)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
Low (2402MHz)	4.804 GHz	V	36.395	25.195	74	54	**Compliant**	GMSK
	7.206 GHz	V	44.458	37.838	74	54	**Compliant**	GMSK
	4.804 GHz	H	36.915	29.065	74	54	**Compliant**	GMSK
	7.206 GHz	H	39.528	30.738	74	54	**Compliant**	GMSK
Mid (2437MHz)	4.874 GHz	V	37.153	26.763	74	54	**Compliant**	GMSK
	7.311 GHz	V	41.666	32.426	74	54	**Compliant**	GMSK
	4.874 GHz	H	35.563	26.703	74	54	**Compliant**	GMSK
	7.311 GHz	H	40.776	32.476	74	54	**Compliant**	GMSK
High (2480MHz)	4.96 GHz	V	37.181	33.191	74	54	**Compliant**	GMSK
	7.4401 GHz	V	40.981	31.471	74	54	**Compliant**	GMSK
	4.96 GHz	H	35.711	26.321	74	54	**Compliant**	GMSK
	7.44 GHz	H	42.841	31.591	74	54	**Compliant**	GMSK

Worst Case Spurious Measurements (Pi/4 DPSK)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
Low (2402MHz)	4.804 GHz	V	44.458	37.838	74	54	**Compliant**	Pi/4 DPSK
	7.206 GHz	V	40.808	31.208	74	54	**Compliant**	Pi/4 DPSK
	4.804 GHz	H	34.105	26.105	74	54	**Compliant**	Pi/4 DPSK
	7.206 GHz	H	41.208	31.368	74	54	**Compliant**	Pi/4 DPSK
Mid (2437MHz)	4.874 GHz	V	46.483	46.213	74	54	**Compliant**	Pi/4 DPSK
	7.3111 GHz	V	41.806	33.526	74	54	**Compliant**	Pi/4 DPSK
	4.8744 GHz	H	44.284	44.944	74	54	**Compliant**	Pi/4 DPSK
	7.311 GHz	H	42.366	32.006	74	54	**Compliant**	Pi/4 DPSK
High (2480MHz)	4.9599 GHz	V	50.151	50.331	74	54	**Compliant**	Pi/4 DPSK
	7.4401 GHz	V	42.561	39.521	74	54	**Compliant**	Pi/4 DPSK
	4.96 GHz	H	53.281	48.811	74	54	**Compliant**	Pi/4 DPSK
	7.44 GHz	H	41.241	32.001	74	54	**Compliant**	Pi/4 DPSK

Worst Case Spurious Measurements (8DPSK)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
Low (2402MHz)	4.804 GHz	V	42.605	39.385	74	54	**Compliant**	8 DPSK
	7.206 GHz	V	40.928	33.498	74	54	**Compliant**	8 DPSK
	4.804 GHz	H	40.125	36.535	74	54	**Compliant**	8 DPSK
	7.206 GHz	H	40.808	31.298	74	54	**Compliant**	8 DPSK
Mid (2437MHz)	4.874 GHz	V	41.623	40.873	74	54	**Compliant**	8 DPSK
	7.3111 GHz	V	42.226	32.136	74	54	**Compliant**	8 DPSK
	4.8744 GHz	H	35.564	26.704	74	54	**Compliant**	8 DPSK
	7.311 GHz	H	40.776	32.346	74	54	**Compliant**	8 DPSK
High (2480MHz)	4.9599 GHz	V	42.271	38.921	74	54	**Compliant**	8 DPSK
	7.4401 GHz	V	41.361	32.151	74	54	**Compliant**	8 DPSK
	4.96 GHz	H	46.771	40.491	74	54	**Compliant**	8 DPSK
	7.4401 GHz	H	42.971	32.661	74	54	**Compliant**	8 DPSK

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

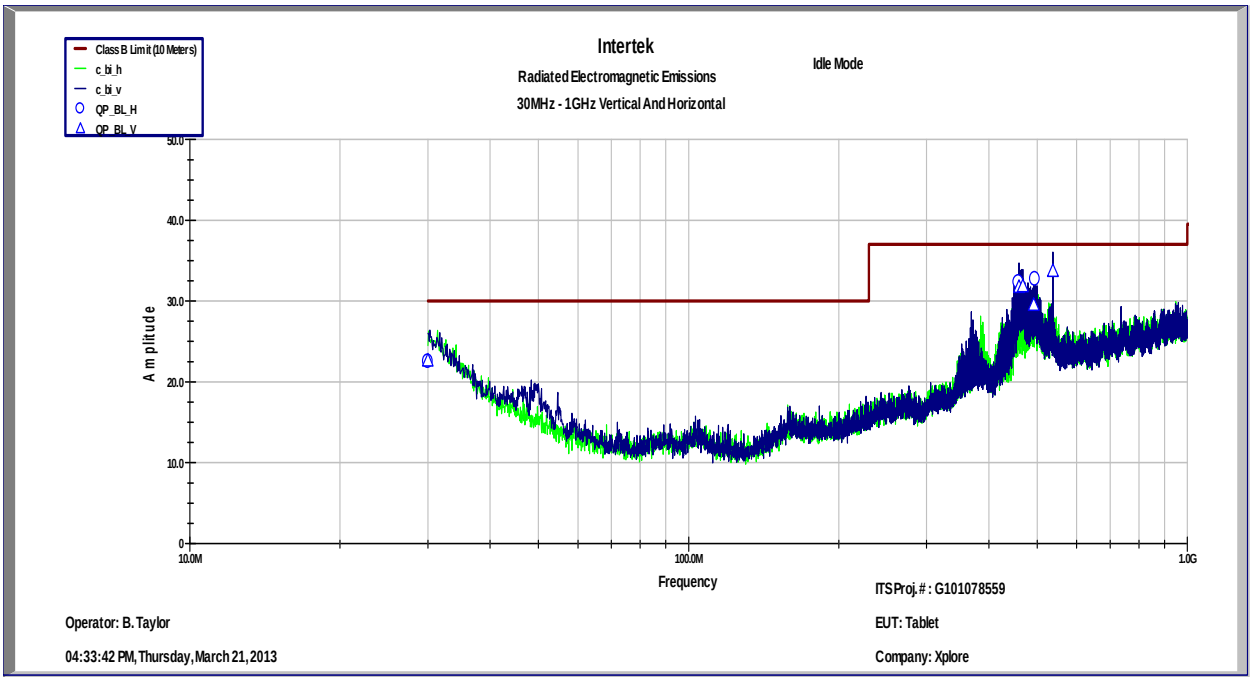
11.4 Results:

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.

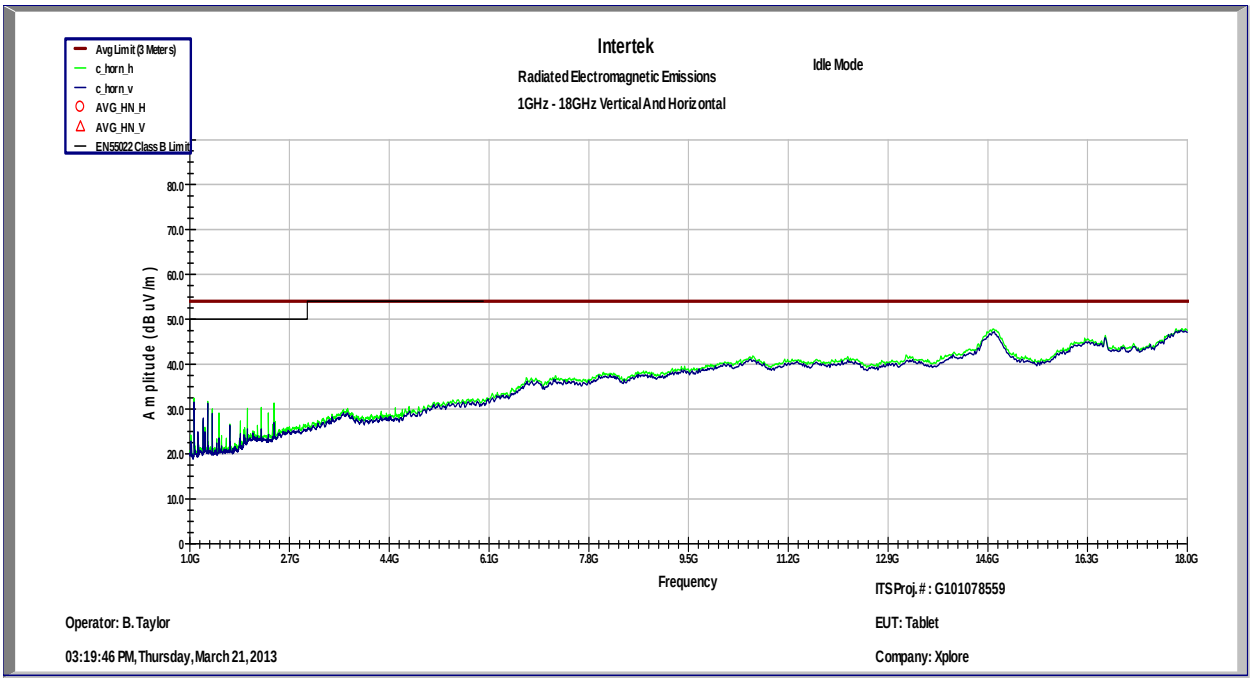
11.5 Test Data:

Radiated Emissions										
Test Engineer:	Bryan Taylor	**Start Date:**	3/21/2013		**End Date:**	3/21/2013				
Temperature:	23.4C	**Humidity:**	38.20%		**Pressure:**	987.8mBar				
Specification:	FCC Part 15 / EN55022				**Test Limit:**	Class B				
Notes:	Idle Mode									
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**
30.0 MHz	V	19.08	-13.77	17.3	22.61	30	-7.39	120kHz / QP	10m	**Compliant**
459.8 MHz	V	26.49	-11.4	16.62	31.71	37	-5.29	120kHz / QP	10m	**Compliant**
467.9 MHz	V	25.71	-11.36	17.43	31.78	37	-5.22	120kHz / QP	10m	**Compliant**
492.1 MHz	V	22.3	-11.26	18.44	29.48	37	-7.52	120kHz / QP	10m	**Compliant**
537.6 MHz	V	25.96	-10.95	18.69	33.7	37	-3.3	120kHz / QP	10m	**Compliant**
30.0 MHz	H	18.98	-13.77	17.3	22.51	30	-7.49	120kHz / QP	10m	**Compliant**
458.7 MHz	H	27.01	-11.42	16.73	32.32	37	-4.68	120kHz / QP	10m	**Compliant**
494.47 MHz	H	25.48	-11.25	18.49	32.72	37	-4.28	120kHz / QP	10m	**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

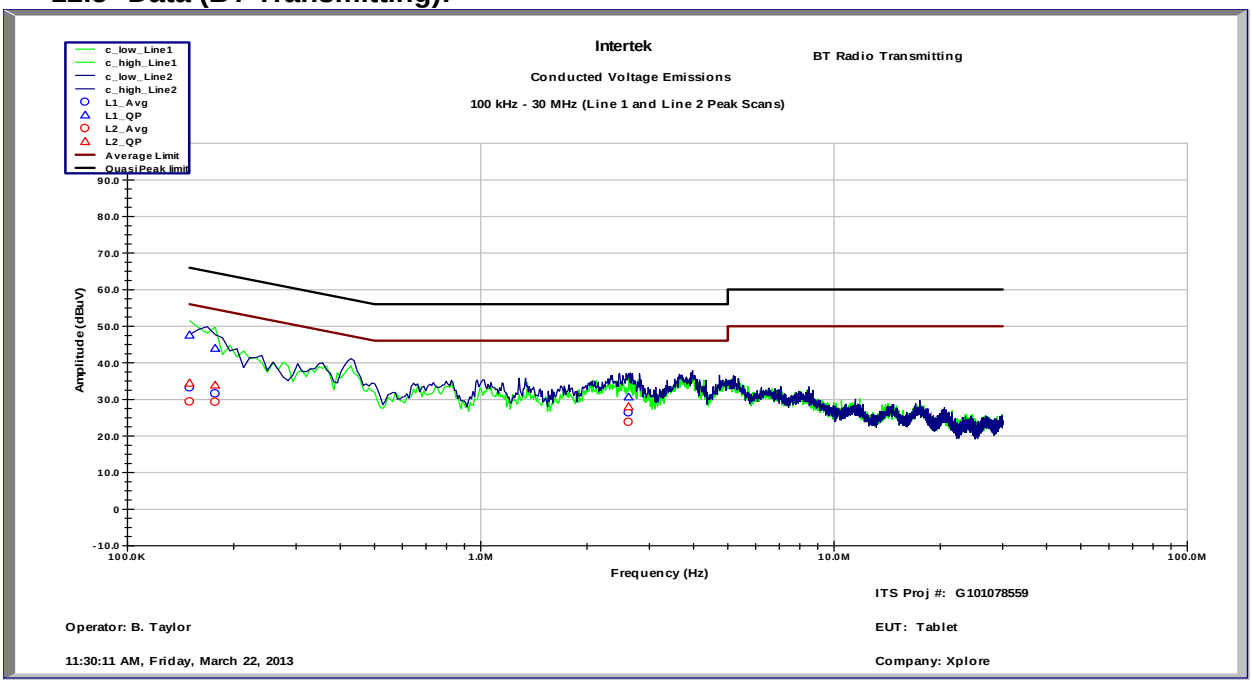
12.3 Test Equipment Used:

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 (BT Transmitting):

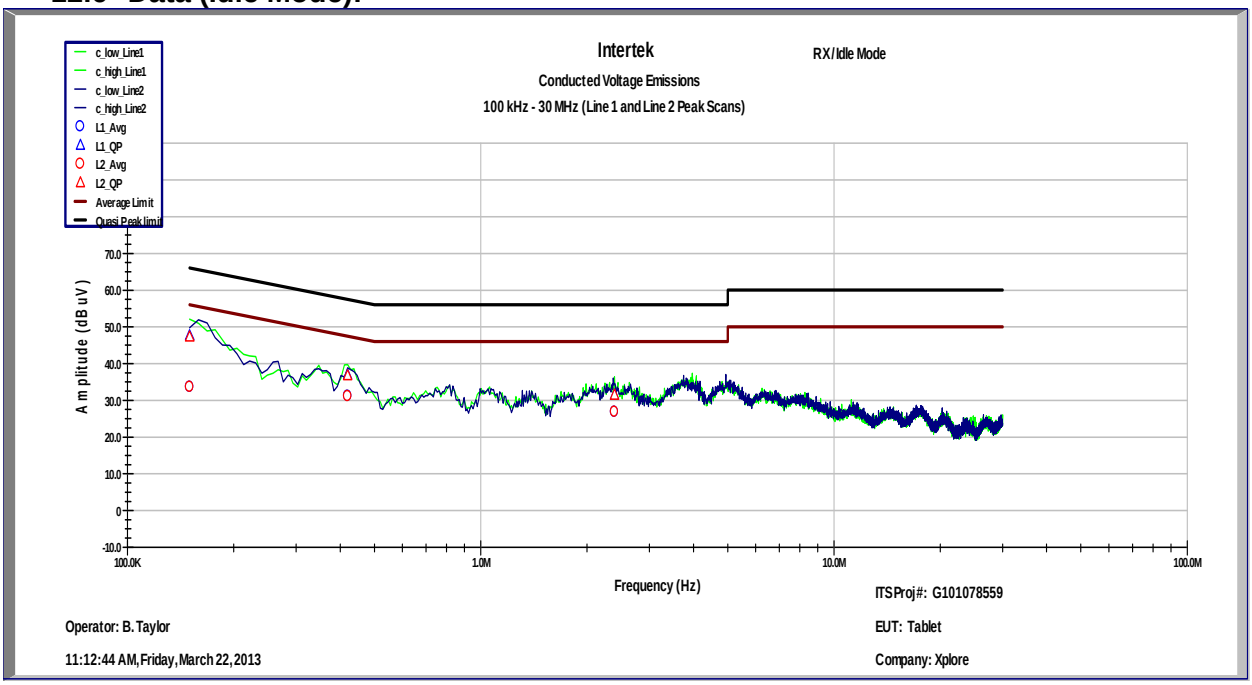


Conducted Voltage Emissions on Power Lines					
Test Engineer:	Bryan Taylor	**Start Date:**	3/21/2013	**End Date:**	3/21/2013
Temperature:	23.4C	**Humidity:**	38.20%	**Pressure:**	987.8mBar
Specification:	FCC Part 15 / EN55022	**Test Limit:**	Class B	**RBW:**	9kHz
Notes:	BT Radio Transmitting				

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
Line 1	150.0 KHz	47.54	66	-18.46	33.19	56	-22.81	**Compliant**
Line 1	177.0 KHz	43.9	64.63	-20.73	31.56	54.63	-23.07	**Compliant**
Line 1	2.62 MHz	30.63	56	-25.37	26.37	46	-19.63	**Compliant**
Line 2	150.0 KHz	34.44	66	-31.56	29.37	56	-26.63	**Compliant**
Line 2	177.0 KHz	33.87	64.63	-30.76	29.25	54.63	-25.38	**Compliant**
Line 2	2.62 MHz	27.98	56	-28.02	23.77	46	-22.23	**Compliant**

Deviations, Additions, or Exclusions: None

12.6 Data (Idle Mode):



Conducted Voltage Emissions on Power Lines								
Test Engineer:	Bryan Taylor		**Start Date:**	3/21/2013		**End Date:**	3/21/2013	
Temperature:	23.4C		**Humidity:**	38.20%		**Pressure:**	987.8mBar	
Specification:	FCC Part 15 / EN55022		**Test Limit:**	Class B		**RBW:**	9kHz	
Notes:	Idle Mode							
Line	**Frequency (MHz)**	**Quasi-Peak (dBuV)**	**Quasi-Peak Limit (dBuV)**	**Quasi-Peak Delta (dB)**	**Average (dBuV)**	**Average Limit (dBuV)**	**Average Delta (dB)**	**Results**
Line 1	150.0 KHz	47.66	66	-18.34	33.64	56	-22.36	**Compliant**
Line 1	420.0 KHz	36.94	57.45	-20.51	31.2	47.45	-16.25	**Compliant**
Line 1	2.391 MHz	31.47	56	-24.53	26.82	46	-19.18	**Compliant**
Line 2	150.0 KHz	47.29	66	-18.71	33.57	56	-22.43	**Compliant**
Line 2	420.0 KHz	36.73	57.45	-20.72	31.1	47.45	-16.35	**Compliant**
Line 2	2.391 MHz	31.47	56	-24.53	26.85	46	-19.15	**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	6/14/2013	101078559LEX-004	Original Issue