

TEST REPORT

Report Number: 102048164LEX-004

Project Number: G102048164

Report Issue Date: 3/9/2015

Product Name: XT6360

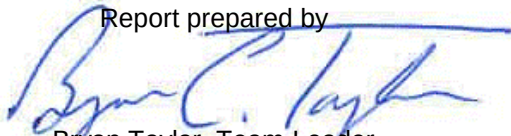
Standards: Title 47 CFR Part 15
Subpart C, RSS-210 Issue 8

Radios Under Test: Bluetooth

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

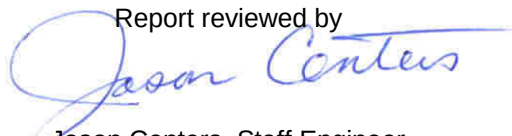
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Camarillo, CA 93012

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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 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 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
10	20dB Bandwidth	§ 15.247(a)(1)	RSS210 (A8.1)	Pass
14	Channel Separation	§ 15.247(a)(1)	RSS210 (A8.1)	Pass
17	Number of Hopping Channels	§ 15.247(a)(1)(iii)	RSS210(A8.1)	Pass
19	Time of Occupancy	§ 15.247(a)(1)(iii)	RSS210 (A8.1)	Pass
23	Conducted Spurious Emissions	§ 15.247(d)	RSS210 (A8.5)	Pass
27	Radiated Spurious Emissions (Transmitter)	§ 15.247(d), § 15.209, and § 15.205	RSS-210 (A8.5)	Pass
36	AC Powerline Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Pass
39	Antenna Requirement per FCC Part 15.203	§ 15.203	RSS-Gen (7.1.2)	Pass

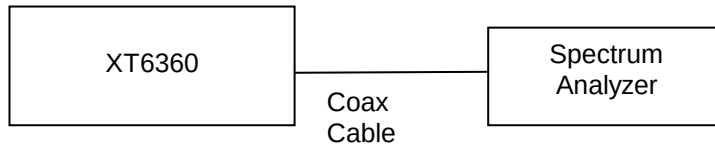
3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Xirgo Technologies
Model Number	XT6360
Serial Number	2
Receive Date	1/19/2015
Test Start Date	1/19/2015
Test End Date	2/27/2015
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	2402 – 2480MHz
Mode(s) of Operation	Bluetooth
Modulation Type	FHSS
Transmission Control	Test Commands
Maximum Output Power	11.219dBm
Test Channels	0, 39, 78
Antenna Type (15.203)	Internal
Operating Voltage	12VDC

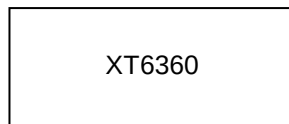
Description of Equipment Under Test
The XT6360 is a Vehicle GPS/Cellular Tracking Device with BT

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting BT Signal on low mid or high channels
2	Receive / idle mode

3.1 System setup including cable interconnection details, support equipment and simplified block diagram**3.2 EUT Block Diagram:**

Conducted Output Measurements



Radiated Measurements

3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
DC Power Cable	3ft	None	None	DC Power Supply	Test Sample

3.4 Support Equipment:

No support equipment was used during this evaluation.

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:

(1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

4.2 Test Procedure

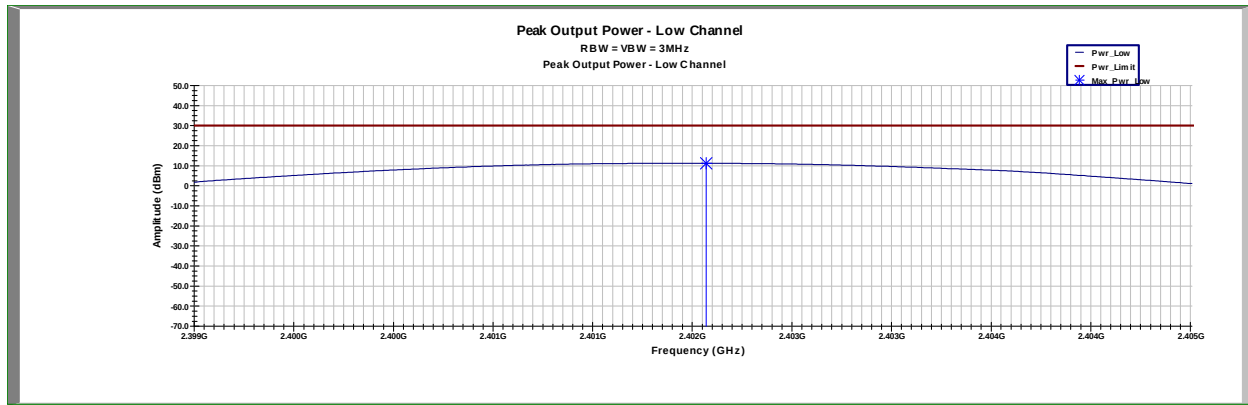
ANSI C63.10: 2013 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. The peak output power was measured using the marker to peak function of the spectrum analyzer.

4.3 Test Equipment Used:

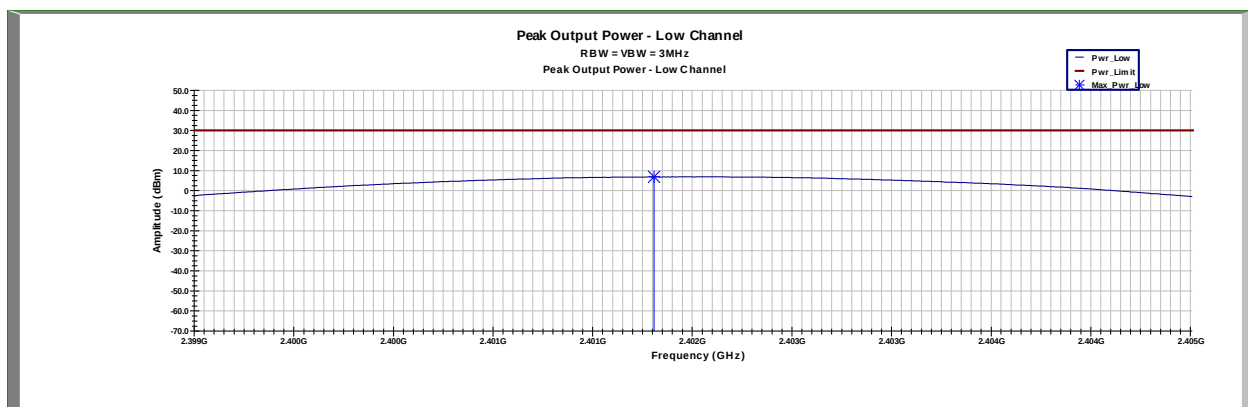
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

4.4 Results:

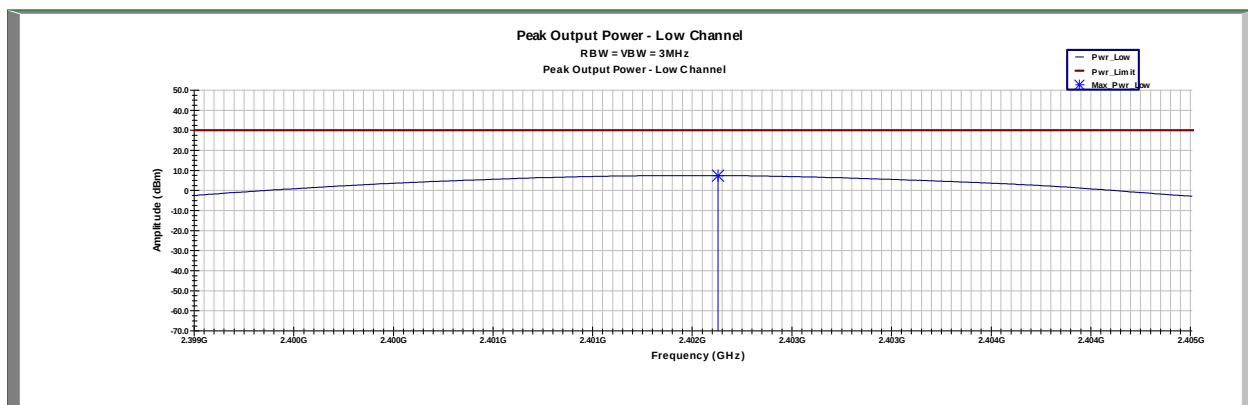
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Pass / Fail
GFSK				
0	2402	11.157	30	Pass
39	2441	11.219	30	Pass
78	2480	11.159	30	Pass
EDR2				
0	2402	6.815	30	Pass
39	2441	7.174	30	Pass
78	2480	7.394	30	Pass
EDR3				
0	2402	7.413	30	Pass
39	2441	7.770	30	Pass
78	2480	7.903	30	Pass



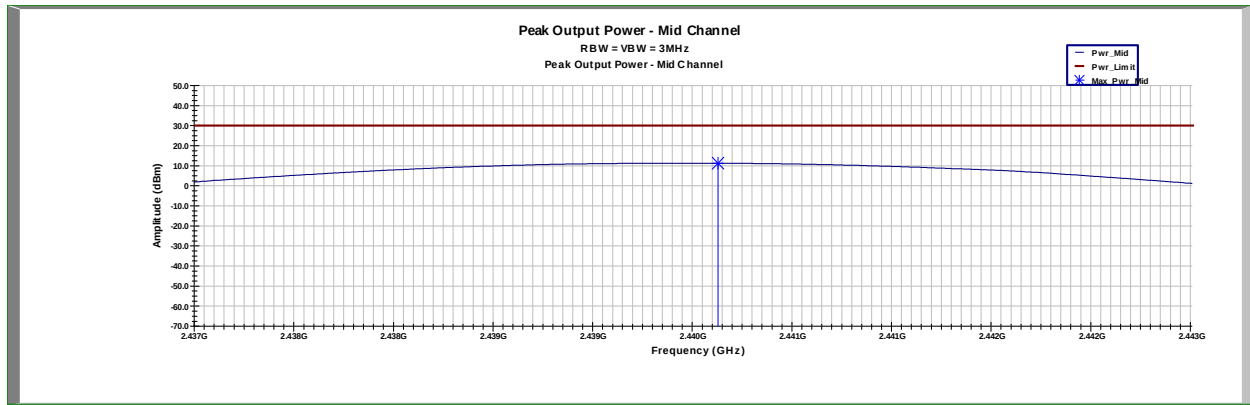
Max Output Power Channel 0, GFSK



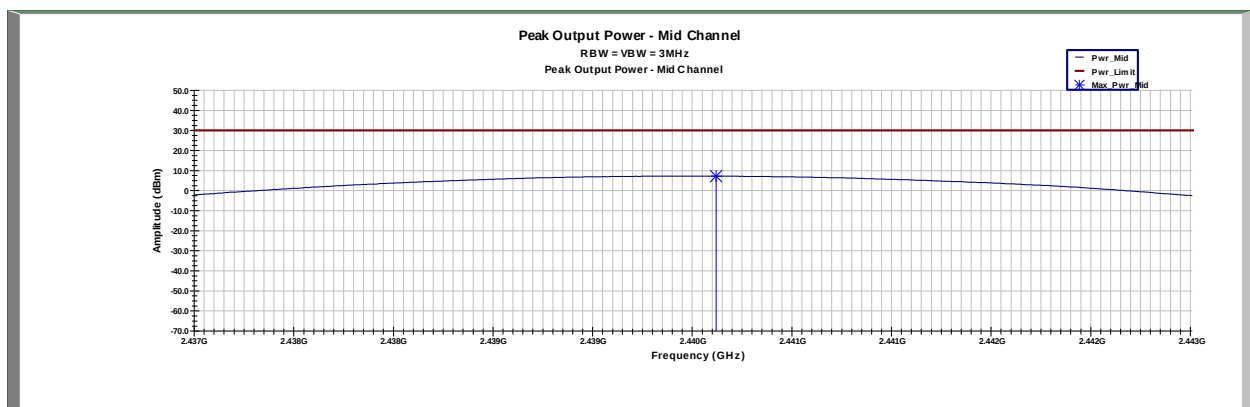
Max Output Power Channel 0, EDR2



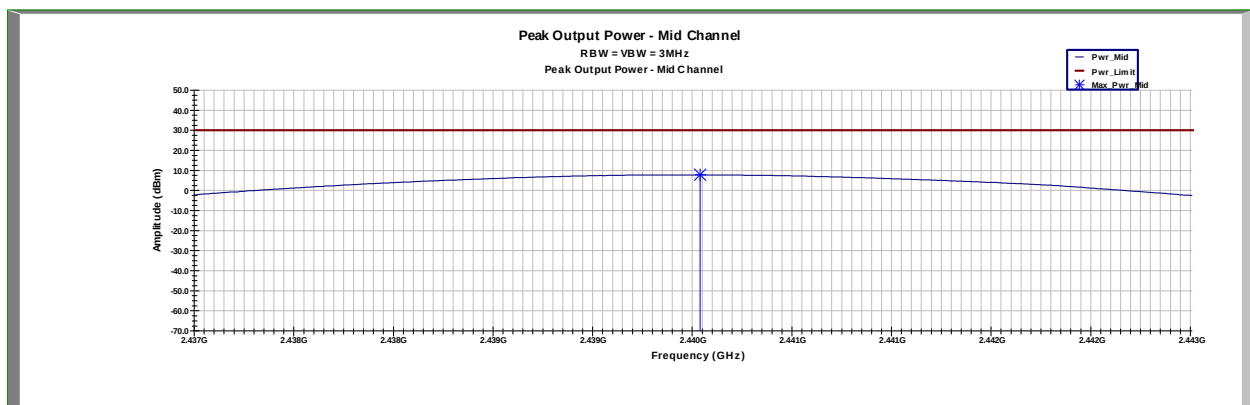
Max Output Power Channel 0, EDR3



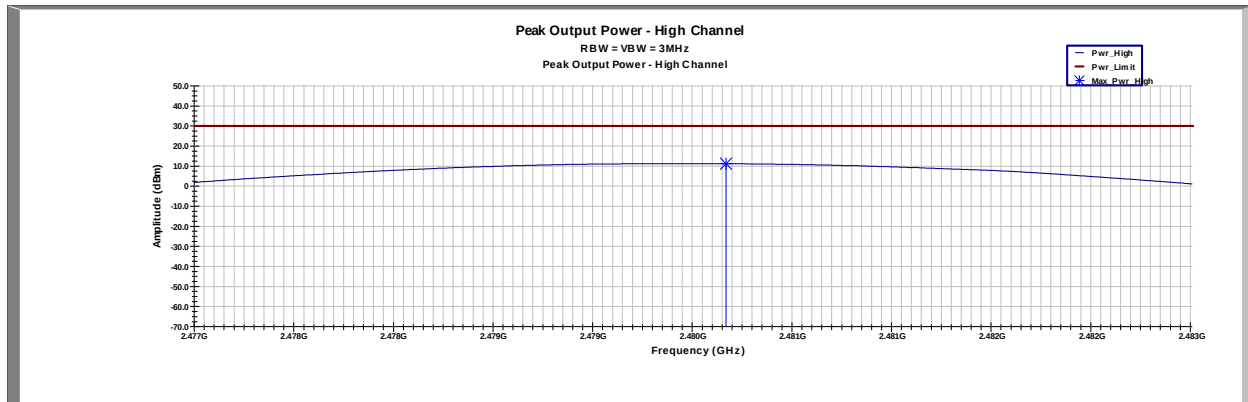
Max Output Power Channel 39, GFSK



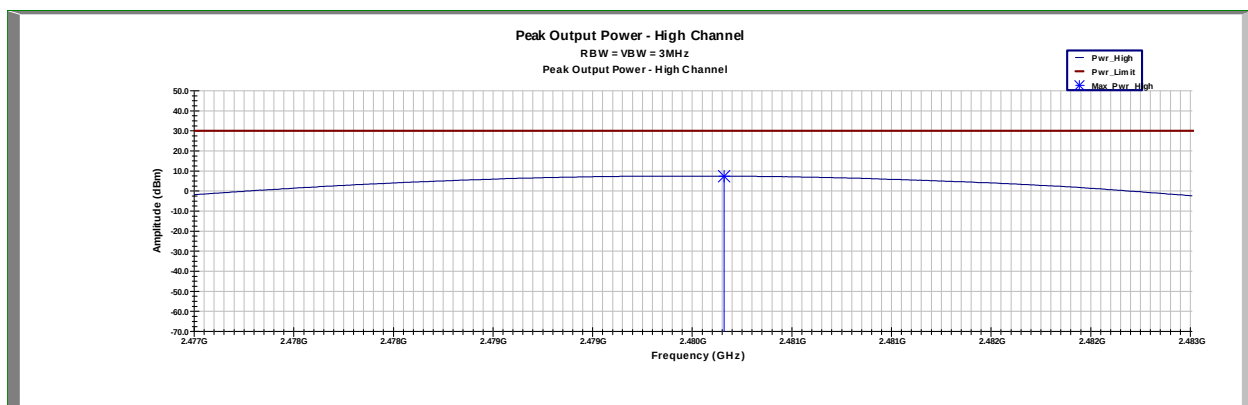
Max Output Power Channel 39, EDR2



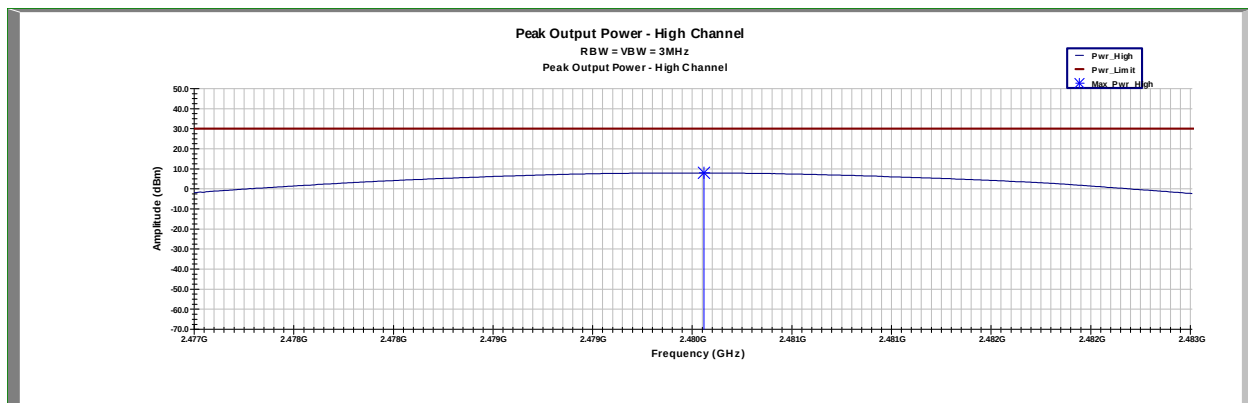
Max Output Power Channel 39, EDR3



Max Output Power Channel 78, GFSK



Max Output Power Channel 78, EDR2



Max Output Power Channel 78, EDR3

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.

5.2 Test Procedure

ANSI C63.10: 2013 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

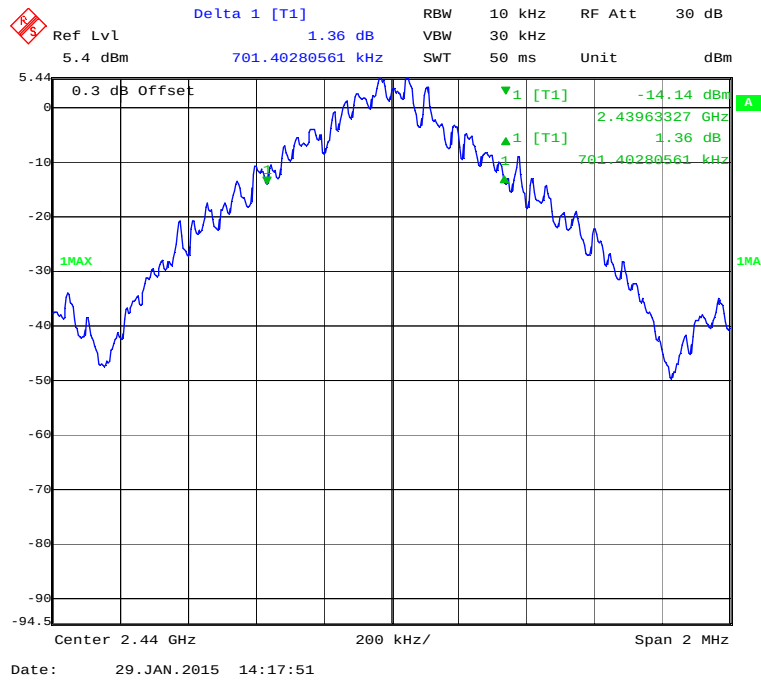
5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

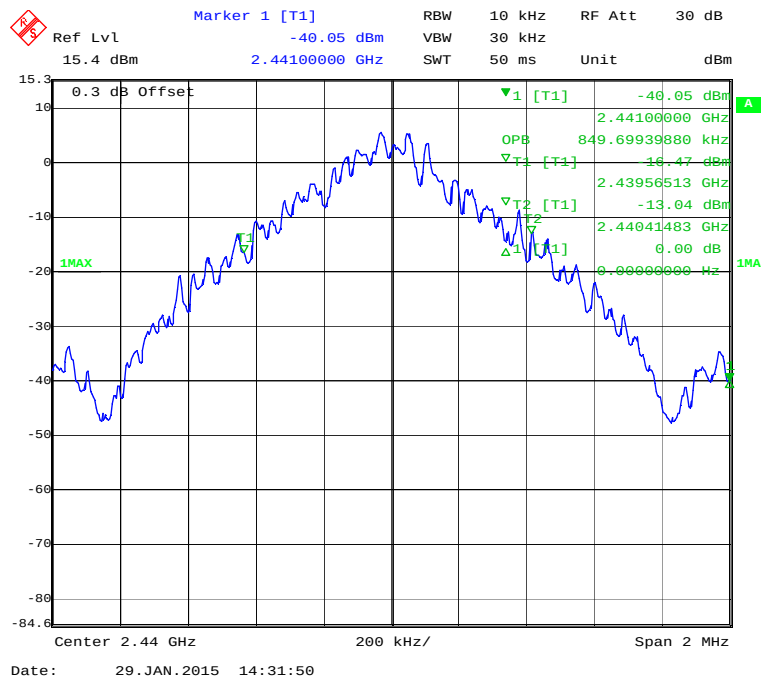
5.4 Results:

The 20dB bandwidth measurements are shown below. A 99% bandwidth measurement was also performed.

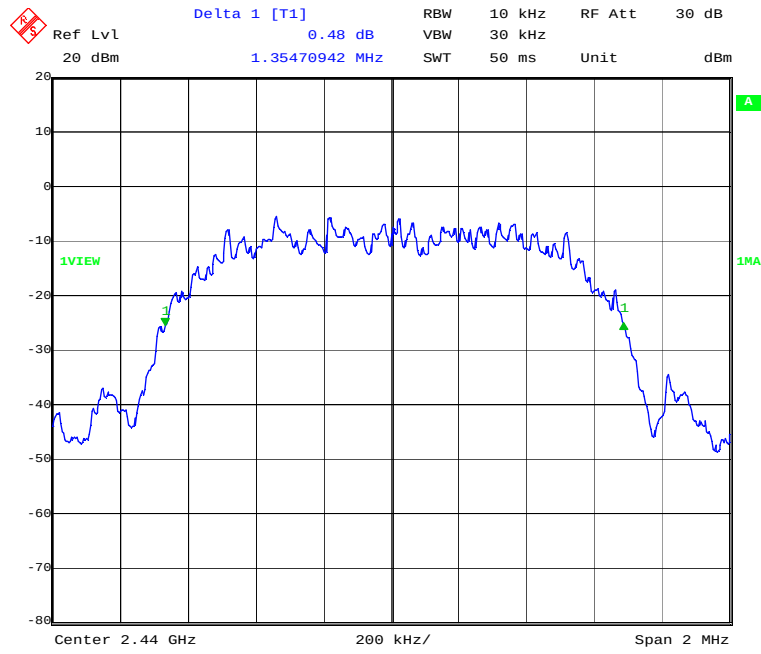
Channel	Frequency (MHz)	20dB Bandwidth	99% Power Bandwidth	Result
GFSK	2440	701kHz	849kHz	Pass
EDR2	2440	1.35MHz	1.22MHz	Pass
EDR3	2440	1.35MHz	1.22MHz	Pass



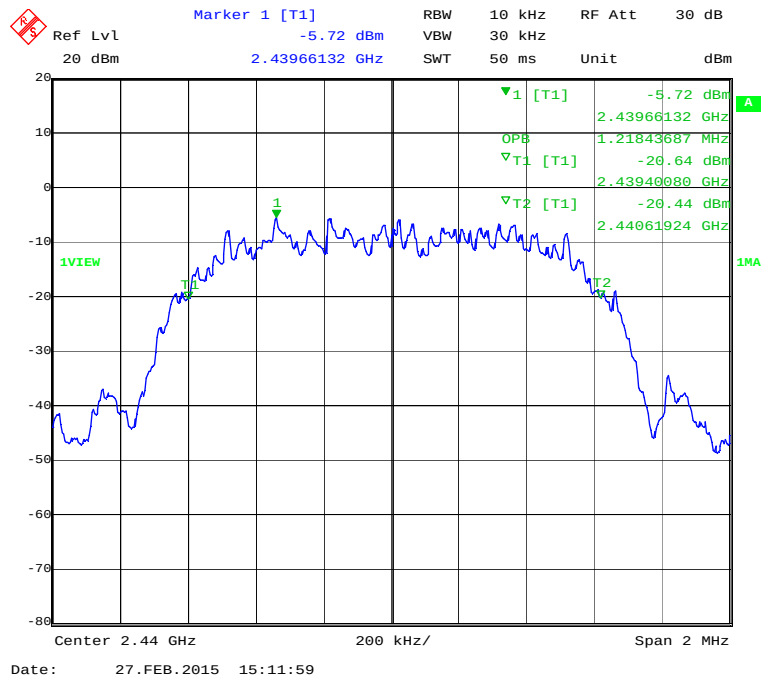
20dB Bandwidth, GFSK



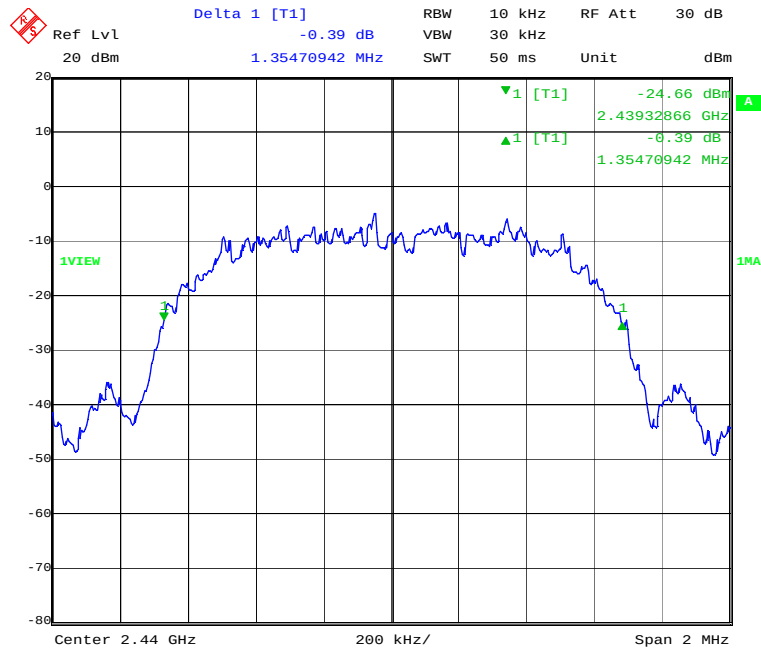
99% Bandwidth, GFSK



20dB Bandwidth, EDR2

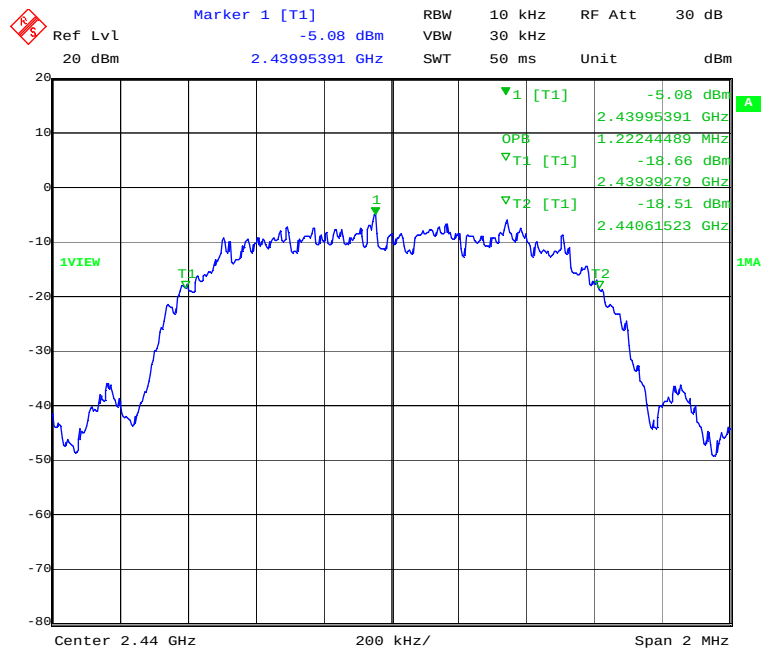


99% Bandwidth, EDR2



Date: 27.FEB.2015 15:14:43

20dB Bandwidth, EDR3



Date: 27.FEB.2015 15:13:29

99% Bandwidth, EDR3

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. 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.

6.2 Test Procedure

ANSI C63.10: 2013 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

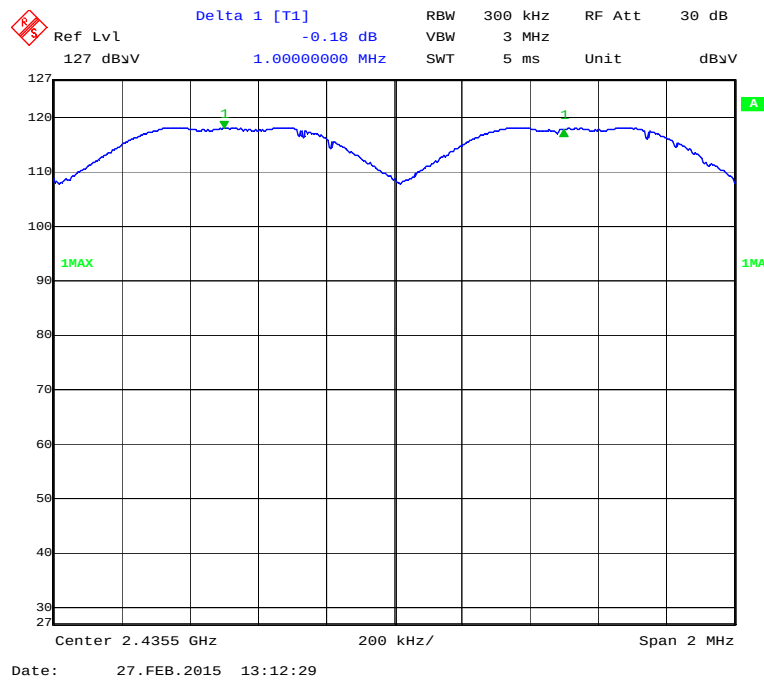
6.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

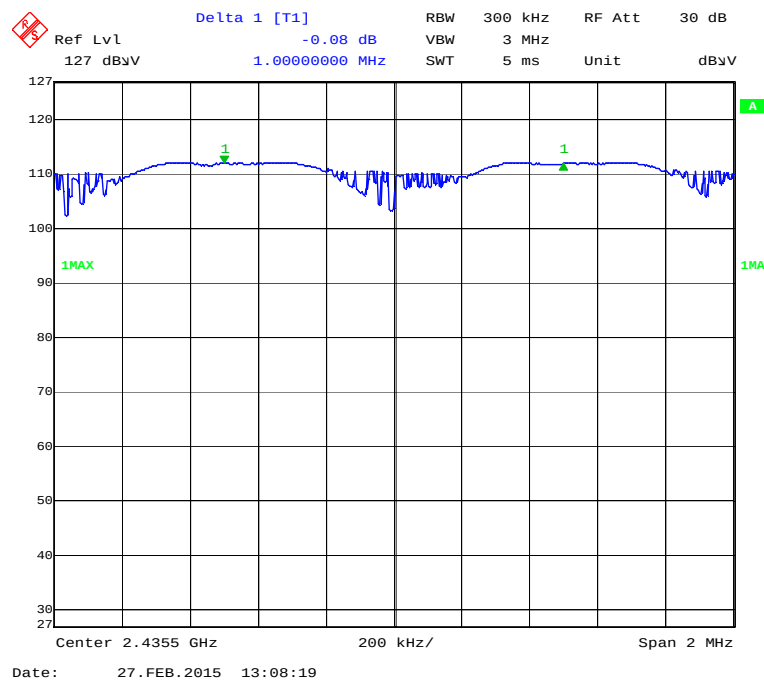
6.4 Results:

TX Mode	Adjacent Channel Separation (kHz)	Minimum Limit (kHz)*	Pass / Fail
EDR2	1000	25	Pass
EDR3	1000	25	Pass
GFSK	1000	25	Pass

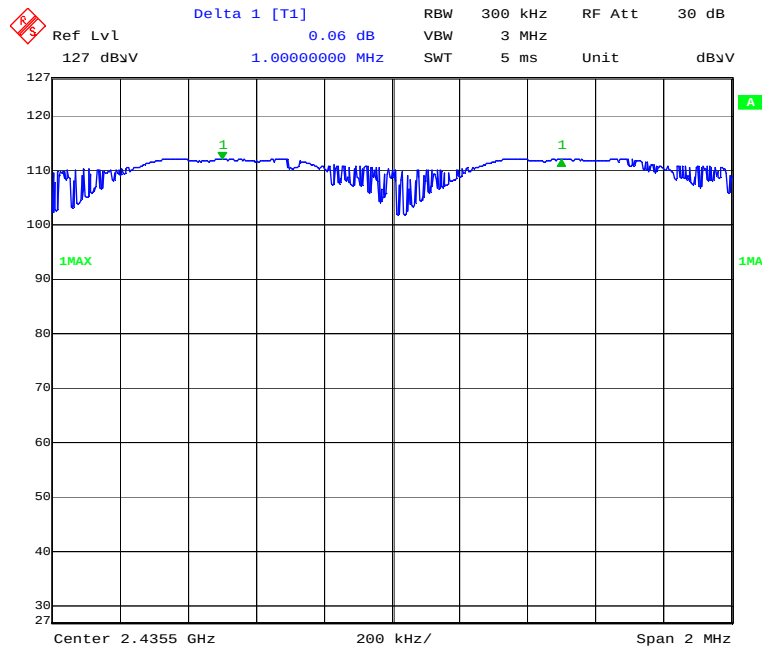
*Limit is derived from 2/3 of the the 20dB bandwidth



Hopping Channel Separation (GFSK)



Hopping Channel Separation (EDR2)



Date: 27.FEB.2015 13:01:59

Hopping Channel Separation (EDR3)

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)(iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

7.2 Test Procedure

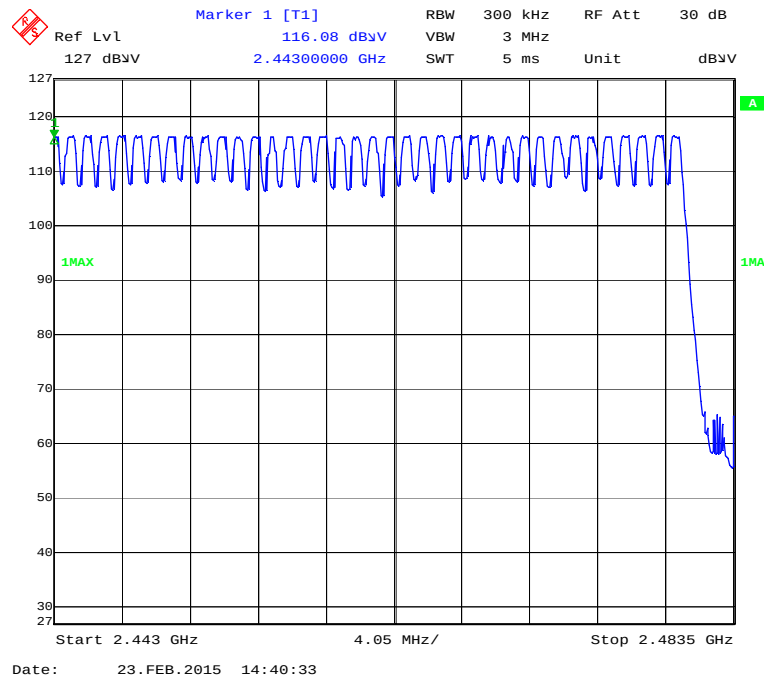
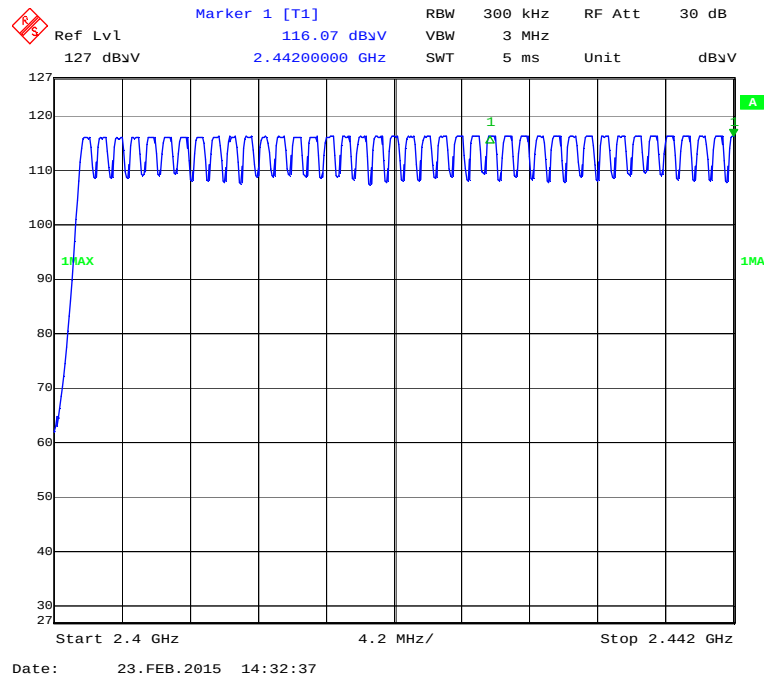
ANSI C63.10: 2013 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

7.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

7.4 Results:

The XT6360 used 79 hopping channels as shown in the following plots. The number of hopping channels used was identical for GFSK, EDR2, and EDR3 modes.



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

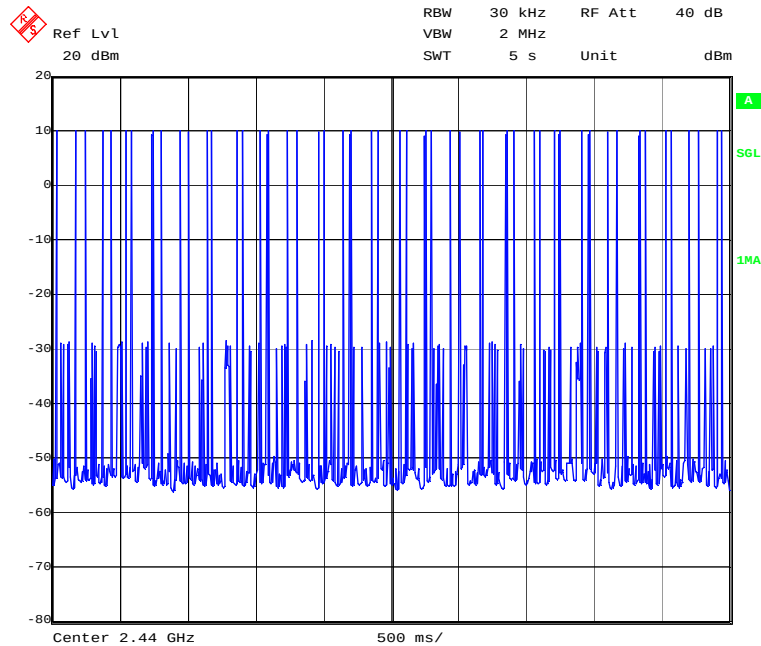
ANSI C63.10: 2013 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

8.3 Test Equipment Used:

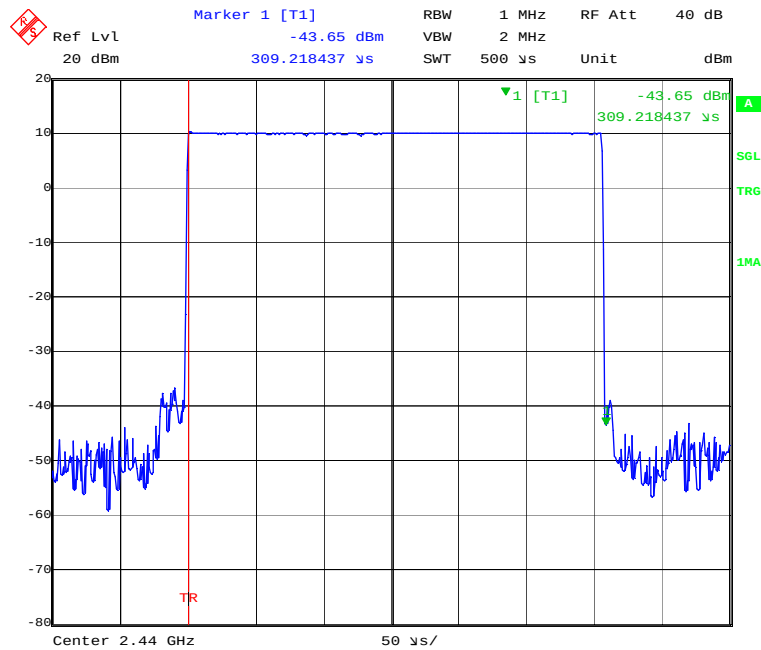
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

8.4 Results:

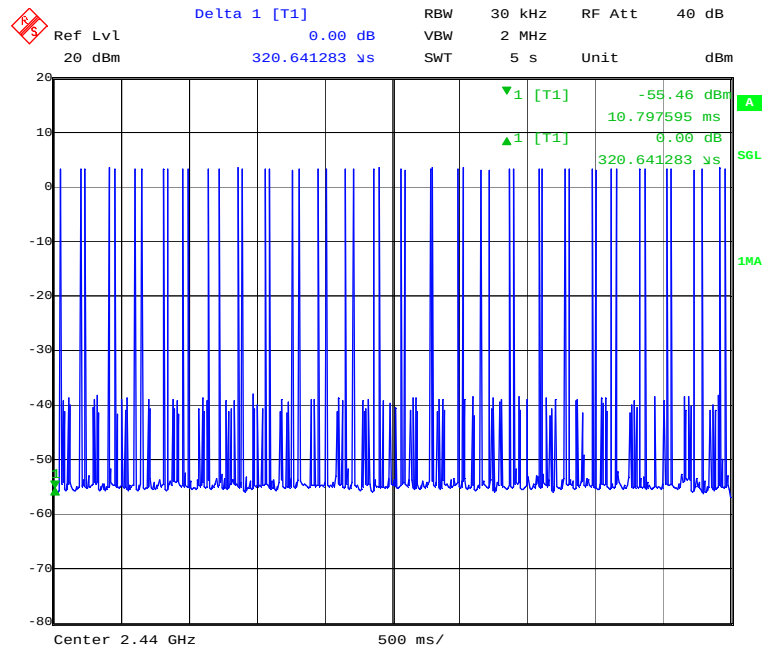
Mode	Number of Transmissions in a 31.6sec Frame (79 Hopping Ch x 0.4)	Hop Transmission Time (mS)	Result (mS)	Limit (mS)
GFSK	49 (times in 5sec) * (31.6sec / 5sec) = 310	0.309mS	95.79mS	400
EDR2	49 (times in 5sec) * (31.6sec / 5sec) = 310	0.248mS	76.88mS	400
EDR3	49 (times in 5sec) * (31.6sec / 5sec) = 310	0.220mS	68.2mS	400
Time of occupancy = Hop Transmission Time x Number of Transmissions				



Dwell Time, GFSK

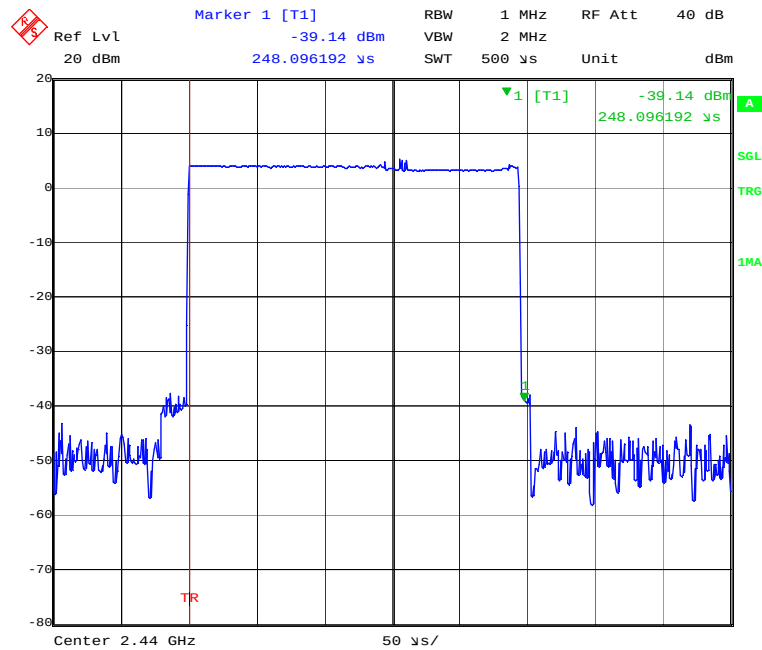


Dwell Time, GFSK (Single Pulse)



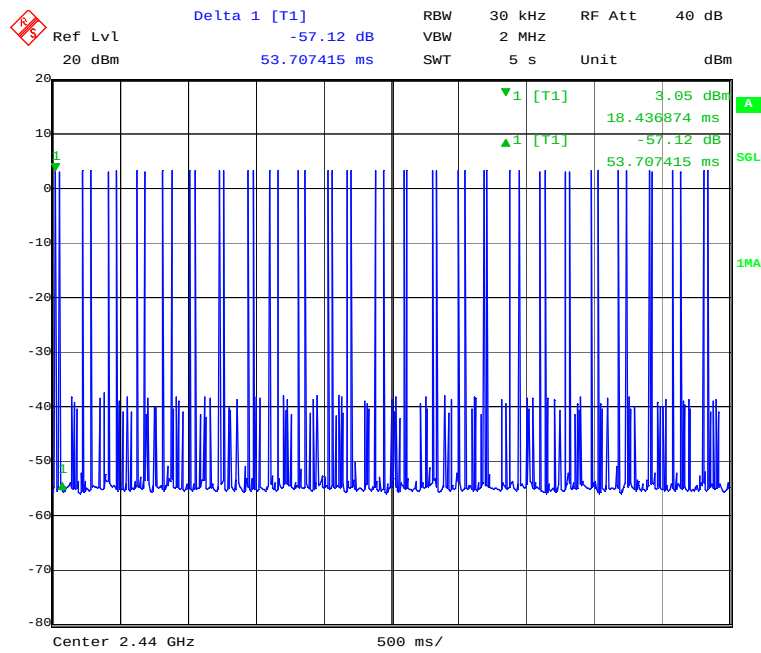
Date: 3.MAR.2015 15:41:03

Dwell Time, EDR2



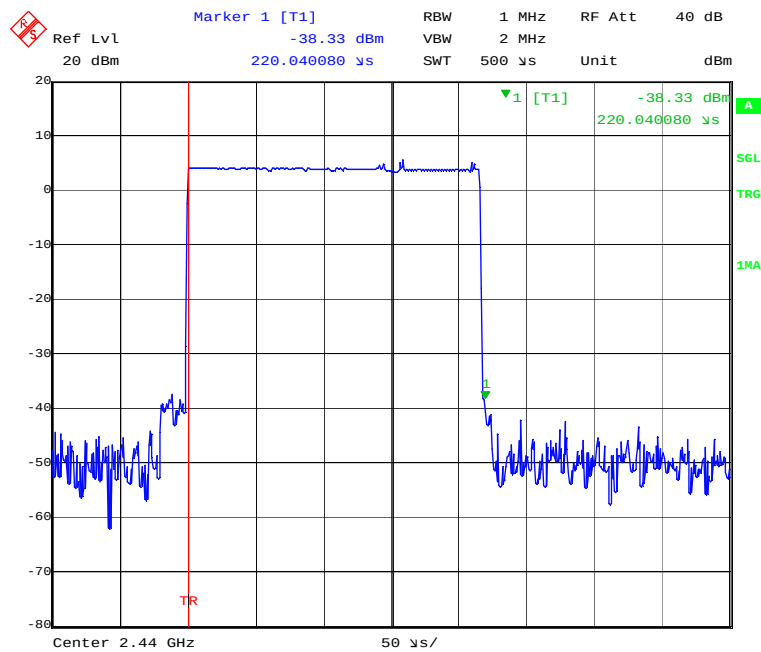
Date: 3.MAR.2015 16:35:08

Dwell Time, EDR2 (Single Pulse)



Date: 3.MAR.2015 16:09:19

Dwell Time, EDR3



Date: 3.MAR.2015 16:25:00

Dwell Time, EDR3 (Single Pulse)

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

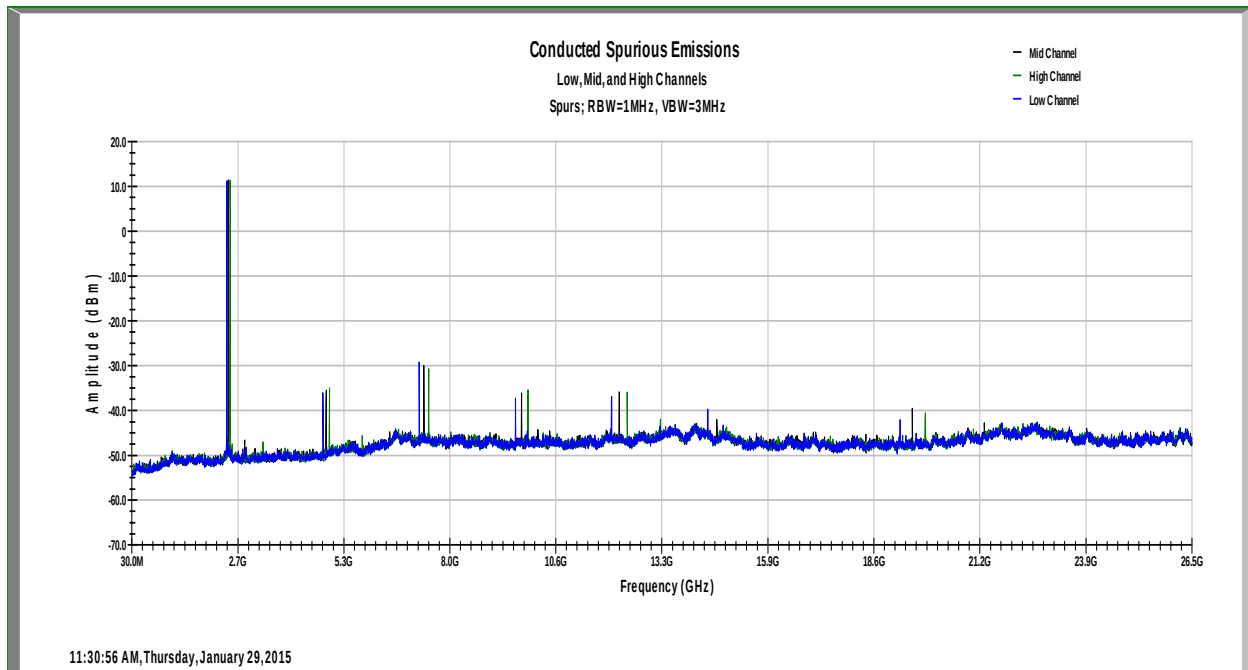
ANSI C63.10: 2013 and FCC Public Notice DA 00-705 Released March 30, 2000: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

9.3 Test Equipment Used:

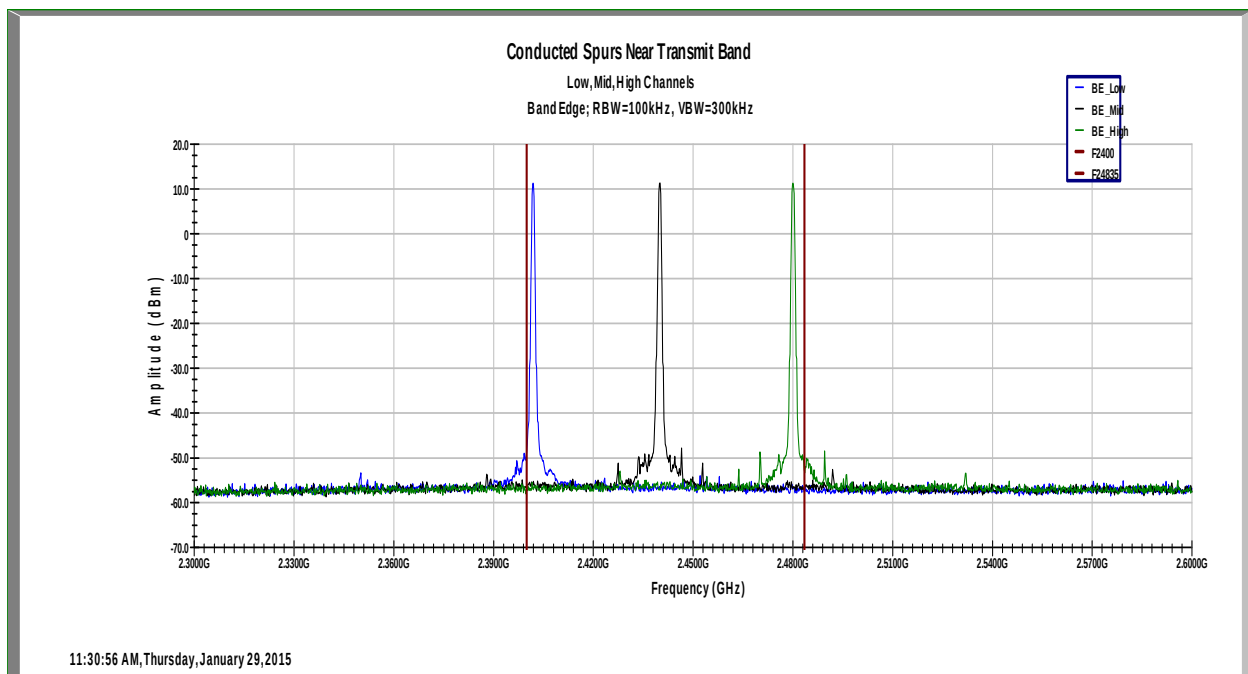
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

9.4 Results:

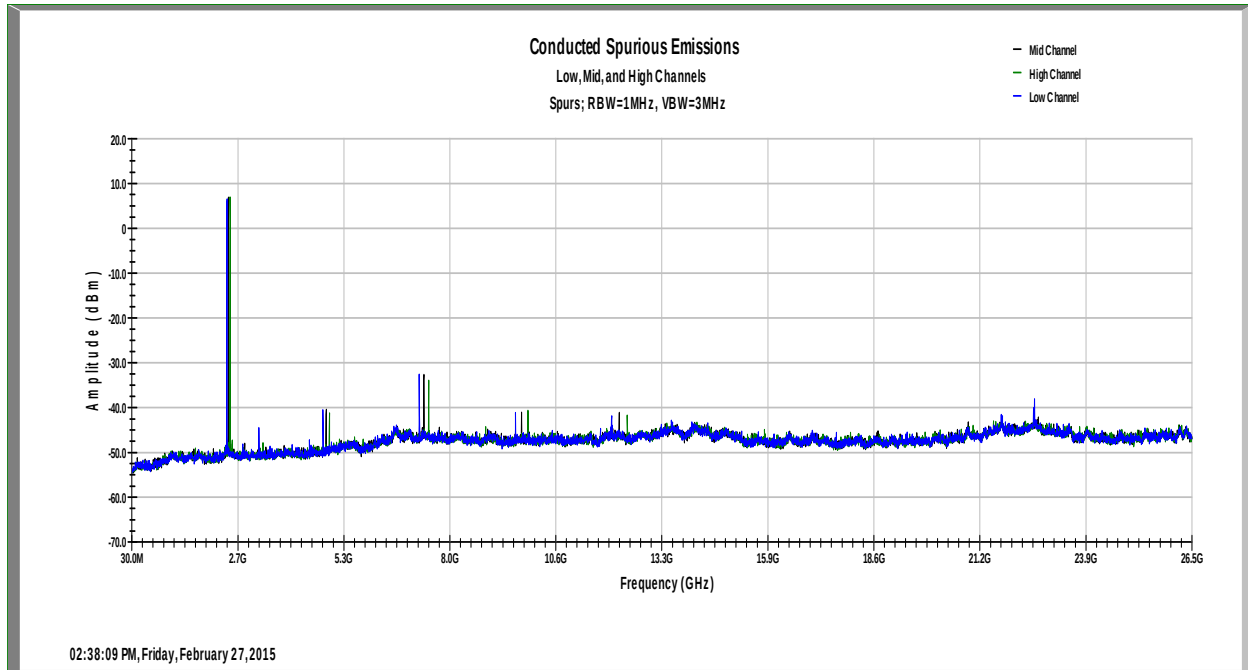
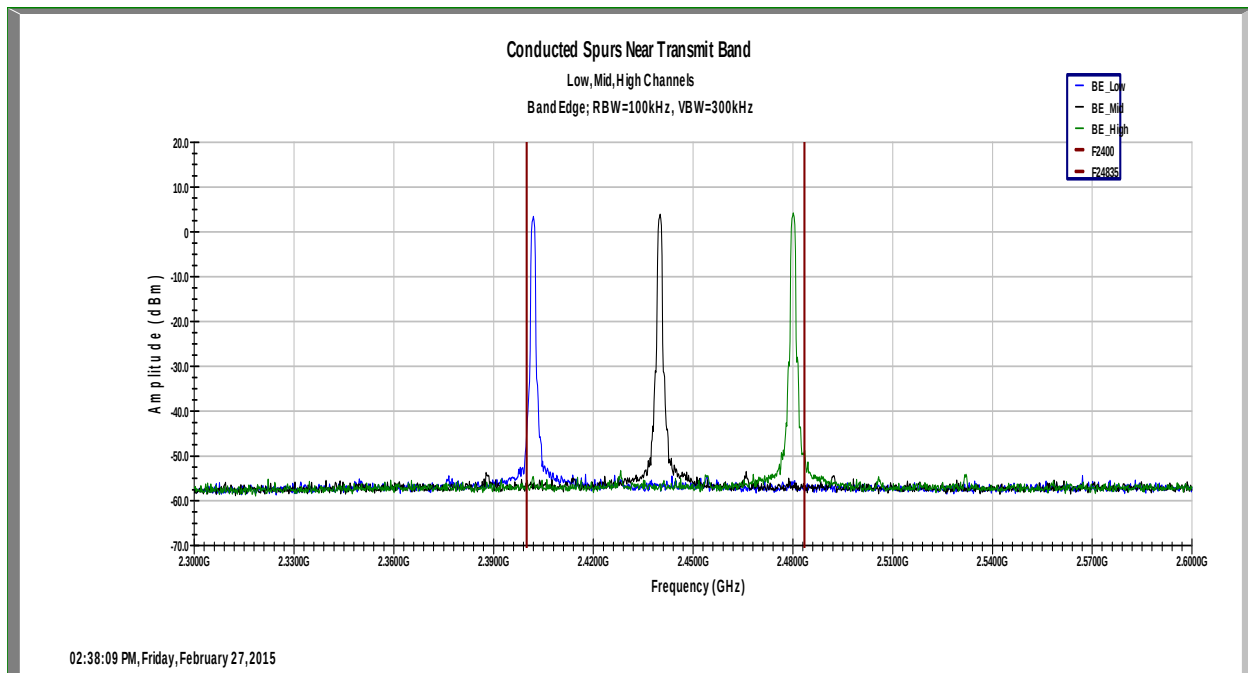
The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria. Plots are also presented showing the band edge compliance.

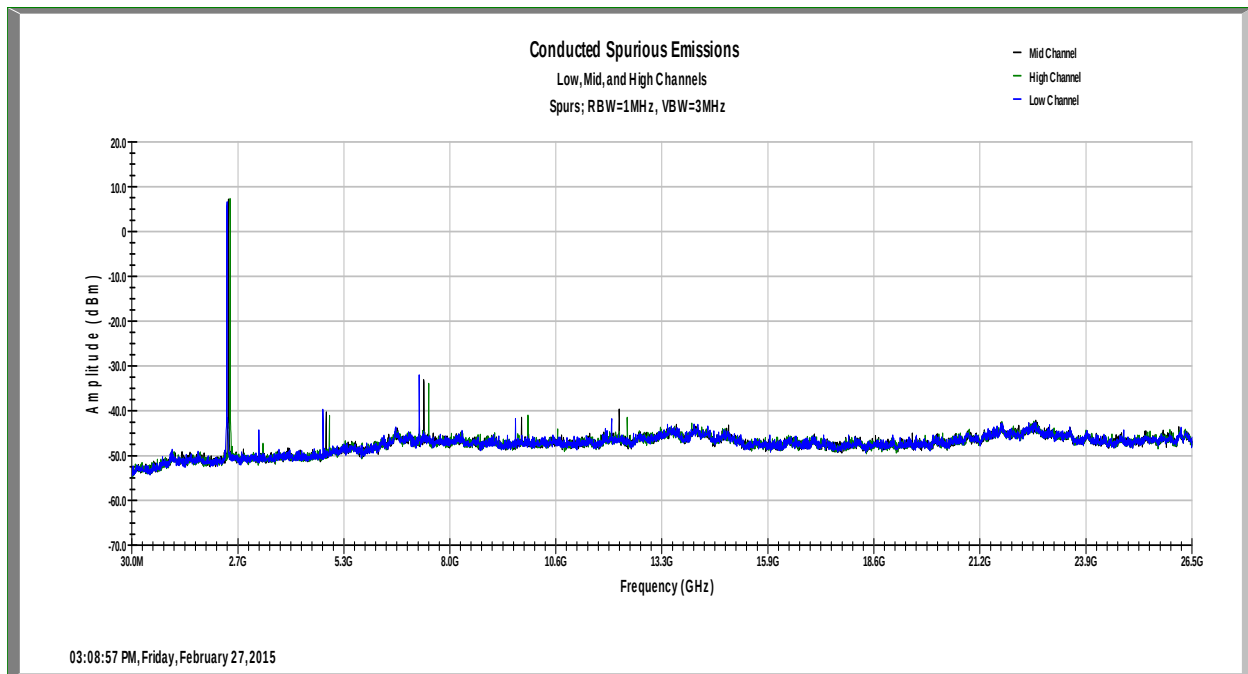


Conducted Spurious Emissions at Antenna Port GFSK (Low Mid and High Channels)

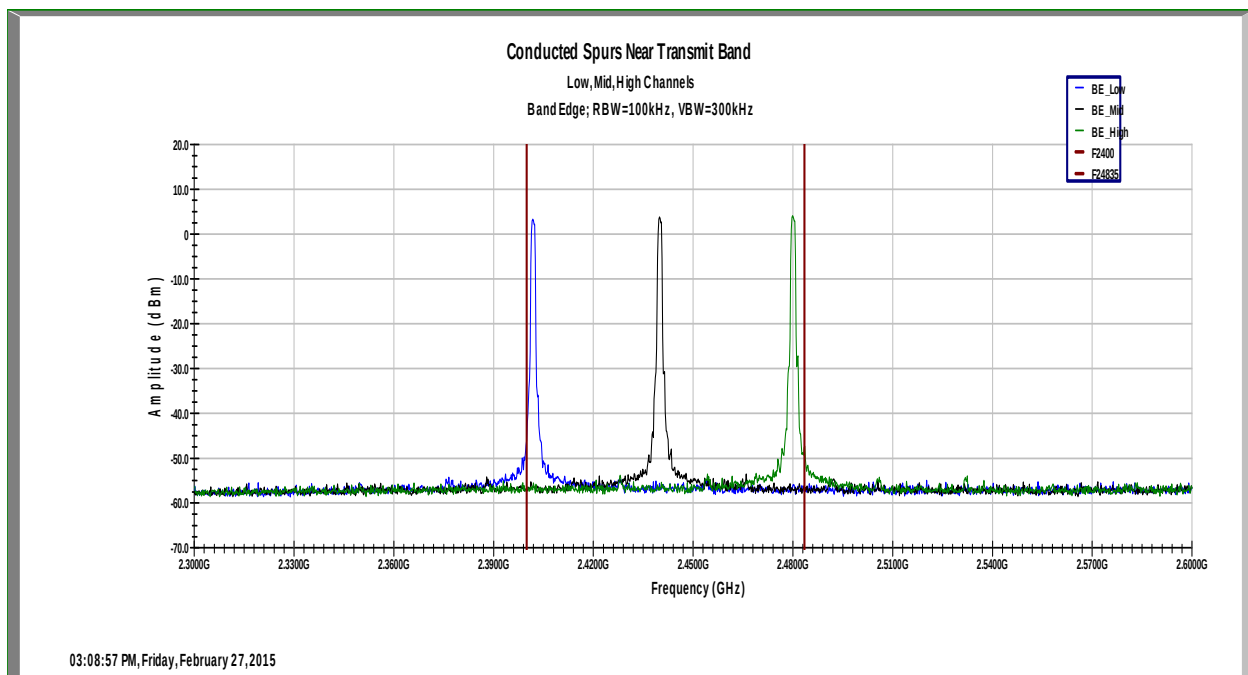


Conducted Spurious Emissions at Antenna Port GFSK (Low Mid and High Channels)

**Conducted Spurious Emissions at Antenna Port EDR2 (Low Mid and High Channels)****Conducted Spurious Emissions at Antenna Port EDR2 (Low Mid and High Channels)**



Conducted Spurious Emissions at Antenna Port EDR3 (Low Mid and High Channels)



Conducted Spurious Emissions at Antenna Port EDR3 (Low Mid and High Channels)

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
10.495–0.505	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: 2013 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 dB μ V/m

RA = Receiver Amplitude in dB μ V

AF = Antenna Factor in dB

CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dB μ V

AF = 18.52 dB

CF = 0.78 dB

$$FS = 19.48 + 18.52 + 0.78 = 38.78 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(38.78 \text{ dB}\mu\text{V/m})/20] = 86.89 \mu\text{V/m}$$

10.4 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1302.6005.40	Rohde&Schwarz	ESU40	9/17/2014	9/17/2015
Preamplifier	122005	Rohde&Schwarz	TS-PR18	11/26/2014	11/26/2015
Preamplifier	100050	Rohde&Schwarz	TS-PR26	11/26/2014	11/26/2015
Horn Antenna (18 – 40GHz)	00117798	ETS	3116c	5/13/2014	5/13/2015
Horn Antenna	00156319	ETS	3117	5/2/2014	5/2/2015
Bilog Antenna	2564	Schaffner	CBL6111C	4/21/2014	4/21/2015
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use
EMC Software	Version 9.15.02	Rohde&Schwarz	EMC32	Time of Use	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. Plots are also presented showing compliance with the restricted bands immediately adjacent to the transmit band.

Emissions were investigated with the test sample positioned in 3 orthogonal axis and the worst case reported.

In the tables that follow, the average readings in parentheses “()” were adjusted by a duty cycle correction factor of -44.1dB, 20log(dwell time/100mS).

Frequency (MHz)	Average (dBμV/m)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3202.700000	---	43.83	74.00	30.17	1000.000	293.0	H	327.0	5.0
3202.700000	40.22	---	54.00	13.78	1000.000	293.0	H	327.0	5.0
4803.900000	---	47.30	74.00	26.70	1000.000	410.0	V	329.0	7.5
4803.900000	42.31	---	54.00	11.69	1000.000	410.0	V	329.0	7.5
7205.900000	---	58.39	74.00	15.61	1000.000	339.0	V	336.0	10.4
7205.900000	(11.81)	---	54.00	42.19	1000.000	339.0	V	336.0	10.4
9607.200000	---	55.11	74.00	18.89	1000.000	138.0	H	72.0	13.6
9607.200000	46.24	---	54.00	7.76	1000.000	138.0	H	72.0	13.6
9608.500000	---	50.54	74.00	23.46	1000.000	208.0	H	278.0	13.6
9608.500000	44.08	---	54.00	9.92	1000.000	208.0	H	278.0	13.6
12010.300000	---	50.85	74.00	23.15	1000.000	98.0	H	136.0	17.4
12010.300000	42.71	---	54.00	11.29	1000.000	98.0	H	136.0	17.4
14412.500000	---	50.78	74.00	23.22	1000.000	234.0	H	260.0	17.0
14412.500000	42.77	---	54.00	11.23	1000.000	234.0	H	260.0	17.0
16813.500000	---	49.87	74.00	24.13	1000.000	296.0	V	0.0	21.5
16813.500000	41.80	---	54.00	12.20	1000.000	296.0	V	0.0	21.5

Bluetooth, Channel 2402, GFSK

Frequency (MHz)	Average (dBμV/m)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2390.000000	---	52.57	74.00	21.43	1000.000	406.0	H	317.0	37.7
2390.000000	41.51	---	54.00	12.49	1000.000	406.0	H	317.0	37.7

Bluetooth, Channel 2402, GFSK, Band Edge

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3202.500000	---	46.14	74.00	27.86	1000.000	341.0	H	326.0	5.0
3202.500000	40.27	---	54.00	13.73	1000.000	341.0	H	326.0	5.0
3202.700000	---	43.85	74.00	30.15	1000.000	342.0	H	330.0	5.0
3202.700000	36.92	---	54.00	17.08	1000.000	342.0	H	330.0	5.0
4803.900000	---	48.33	74.00	25.67	1000.000	404.0	V	329.0	7.5
4803.900000	40.10	---	54.00	13.90	1000.000	404.0	V	329.0	7.5
7205.900000	---	60.73	74.00	13.27	1000.000	331.0	V	335.0	10.4
7205.900000	(12.36)	---	54.00	41.36	1000.000	331.0	V	335.0	10.4
9607.600000	---	57.95	74.00	16.05	1000.000	109.0	H	248.0	13.6
9607.600000	48.68	---	54.00	5.32	1000.000	109.0	H	248.0	13.6
9608.300000	---	50.82	74.00	23.18	1000.000	217.0	H	276.0	13.6
9608.300000	40.89	---	54.00	13.11	1000.000	217.0	H	276.0	13.6
12010.500000	---	50.26	74.00	23.74	1000.000	98.0	H	138.0	17.4
12010.500000	39.91	---	54.00	14.09	1000.000	98.0	H	138.0	17.4
14412.500000	---	47.05	74.00	26.95	1000.000	408.0	H	254.0	17.0
14412.500000	36.24	---	54.00	17.76	1000.000	408.0	H	254.0	17.0
16813.500000	---	51.40	74.00	22.60	1000.000	98.0	H	129.0	21.5
16813.500000	40.93	---	54.00	13.07	1000.000	98.0	H	129.0	21.5

Bluetooth, Channel 2402, EDR2

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2390.000000	---	52.51	74.00	21.49	1000.000	290.0	H	338.0	37.7
2390.000000	41.90	---	54.00	12.10	1000.000	290.0	H	338.0	37.7

Bluetooth, Channel 2402, EDR2, Band Edge

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3202.800000	---	50.95	74.00	23.05	1000.000	367.0	V	267.0	5.0
3202.800000	46.78	---	54.00	7.22	1000.000	367.0	V	267.0	5.0
4804.200000	42.27	---	54.00	11.73	1000.000	404.0	V	324.0	7.5
4804.200000	---	49.94	74.00	24.06	1000.000	404.0	V	324.0	7.5
7206.200000	(44.32)	---	54.00	9.68	1000.000	332.0	V	338.0	10.4
7206.200000	---	61.38	74.00	12.62	1000.000	332.0	V	338.0	10.4
9608.200000	40.93	---	54.00	13.07	1000.000	215.0	H	278.0	13.6
9608.200000	---	50.76	74.00	23.24	1000.000	215.0	H	278.0	13.6
12009.400000	37.90	---	54.00	16.10	1000.000	410.0	H	134.0	17.5
12009.400000	---	49.44	74.00	24.56	1000.000	410.0	H	134.0	17.5
14412.200000	---	50.93	74.00	23.07	1000.000	223.0	H	256.0	17.0
14412.200000	39.37	---	54.00	14.63	1000.000	223.0	H	256.0	17.0
16813.000000	---	50.79	74.00	23.21	1000.000	253.0	H	132.0	21.5
16813.000000	40.81	---	54.00	13.19	1000.000	253.0	H	132.0	21.5

Bluetooth, Channel 2402, EDR3

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2390.000000	---	52.68	74.00	21.32	1000.000	284.0	H	330.0	37.7
2390.000000	41.75	---	54.00	12.25	1000.000	284.0	H	330.0	37.7

Bluetooth, Channel 2402, EDR3, Band Edge

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4879.800000	---	57.06	74.00	16.94	1000.000	241.0	V	336.0	7.4
4879.800000	(10.41)	---	54.00	43.59	1000.000	241.0	V	336.0	7.4
7319.800000	53.68	---	54.00	0.32	1000.000	233.0	V	340.0	10.5
7319.800000	---	57.38	74.00	16.62	1000.000	233.0	V	340.0	10.5
9760.200000	38.49	---	54.00	15.51	1000.000	406.0	H	279.0	13.7
9760.200000	---	48.22	74.00	25.78	1000.000	406.0	H	279.0	13.7
12200.600000	---	53.16	74.00	20.84	1000.000	296.0	V	190.0	17.2
12200.600000	43.42	---	54.00	10.58	1000.000	296.0	V	190.0	17.2
14640.600000	39.61	---	54.00	14.39	1000.000	222.0	H	258.0	17.3
14640.600000	---	50.13	74.00	23.87	1000.000	222.0	H	258.0	17.3
17079.000000	40.07	---	54.00	13.93	1000.000	267.0	H	122.0	21.3
17079.000000	---	51.32	74.00	22.68	1000.000	267.0	H	122.0	21.3

Bluetooth, Channel 2440, GFSK

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4879.800000	50.50	---	54.00	3.50	1000.000	250.0	V	312.0	7.4
4879.800000	---	55.94	74.00	18.06	1000.000	250.0	V	312.0	7.4
7319.800000	49.69	---	54.00	4.31	1000.000	308.0	V	336.0	10.5
7319.800000	---	55.11	74.00	18.89	1000.000	308.0	V	336.0	10.5
9759.400000	37.43	---	54.00	16.57	1000.000	216.0	H	278.0	13.7
9759.400000	---	47.94	74.00	26.06	1000.000	216.0	H	278.0	13.7
12199.400000	40.91	---	54.00	13.09	1000.000	232.0	V	191.0	17.2
12199.400000	---	51.14	74.00	22.86	1000.000	232.0	V	191.0	17.2
14641.000000	---	48.72	74.00	25.28	1000.000	212.0	H	285.0	17.3
14641.000000	38.28	---	54.00	15.72	1000.000	212.0	H	285.0	17.3
17079.400000	---	51.92	74.00	22.08	1000.000	289.0	V	257.0	21.3
17079.400000	40.01	---	54.00	13.99	1000.000	289.0	V	257.0	21.3

Bluetooth, Channel 2440, EDR2

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4879.800000	---	58.69	74.00	15.31	1000.000	239.0	V	320.0	7.4
4879.800000	(9.73)	---	54.00	44.27	1000.000	239.0	V	320.0	7.4
7319.800000	51.42	---	54.00	2.58	1000.000	235.0	V	336.0	10.5
7319.800000	---	57.37	74.00	16.63	1000.000	235.0	V	336.0	10.5
9759.800000	36.41	---	54.00	17.59	1000.000	405.0	H	277.0	13.7
9759.800000	---	47.53	74.00	26.47	1000.000	405.0	H	277.0	13.7
12199.800000	---	51.77	74.00	22.23	1000.000	378.0	V	184.0	17.2
12199.800000	41.22	---	54.00	12.78	1000.000	378.0	V	184.0	17.2
14639.800000	37.67	---	54.00	16.33	1000.000	294.0	H	128.0	17.3
14639.800000	---	48.98	74.00	25.02	1000.000	294.0	H	128.0	17.3
17080.200000	40.03	---	54.00	13.97	1000.000	223.0	H	131.0	21.3
17080.200000	---	50.58	74.00	23.42	1000.000	223.0	H	131.0	21.3

Bluetooth, Channel 2440, EDR3

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3306.800000	---	47.66	74.00	26.34	1000.000	323.0	H	331.0	5.1
3306.800000	44.00	---	54.00	10.00	1000.000	323.0	H	331.0	5.1
4959.800000	(14.64)	---	54.00	39.36	1000.000	231.0	V	326.0	7.2
4959.800000	---	61.04	74.00	12.96	1000.000	231.0	V	326.0	7.2
7439.800000	(11.0)	---	54.00	43.00	1000.000	249.0	V	343.0	10.9
7439.800000	---	58.95	74.00	15.05	1000.000	249.0	V	343.0	10.9
9920.200000	---	50.15	74.00	23.85	1000.000	406.0	H	277.0	14.0
9920.200000	42.41	---	54.00	11.59	1000.000	406.0	H	277.0	14.0
12399.400000	---	51.49	74.00	22.51	1000.000	244.0	V	184.0	16.9
12399.400000	42.81	---	54.00	11.19	1000.000	244.0	V	184.0	16.9
14879.000000	39.22	---	54.00	14.78	1000.000	209.0	H	284.0	18.2
14879.000000	---	49.65	74.00	24.35	1000.000	209.0	H	284.0	18.2
17359.000000	39.57	---	54.00	14.43	1000.000	241.0	H	116.0	20.6
17359.000000	---	49.80	74.00	24.20	1000.000	241.0	H	116.0	20.6

Bluetooth, Channel 2480, GFSK

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2483.500000	42.49	---	54.00	11.51	1000.000	100.0	H	0.0	37.8
2483.500000	---	53.70	74.00	20.30	1000.000	100.0	H	0.0	37.8

Bluetooth, Channel 2480, GFSK, Band Edge

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3306.800000	---	49.72	74.00	24.28	1000.000	327.0	H	334.0	5.1
3306.800000	44.73	---	54.00	9.27	1000.000	327.0	H	334.0	5.1
4959.800000	(10.17)	---	54.00	43.83	1000.000	234.0	V	324.0	7.2
4959.800000	---	59.30	74.00	14.70	1000.000	234.0	V	324.0	7.2
7439.800000	49.81	---	54.00	4.19	1000.000	241.0	V	342.0	10.9
7439.800000	---	54.89	74.00	19.11	1000.000	241.0	V	342.0	10.9
9919.400000	---	53.84	74.00	20.16	1000.000	337.0	H	276.0	14.0
9919.400000	44.60	---	54.00	9.40	1000.000	337.0	H	276.0	14.0
12400.600000	---	50.16	74.00	23.84	1000.000	325.0	V	196.0	16.9
12400.600000	40.25	---	54.00	13.75	1000.000	325.0	V	196.0	16.9
14880.600000	39.24	---	54.00	14.76	1000.000	396.0	H	129.0	18.2
14880.600000	---	49.79	74.00	24.21	1000.000	396.0	H	129.0	18.2
17361.000000	40.21	---	54.00	13.79	1000.000	98.0	H	335.0	20.6
17361.000000	---	52.15	74.00	21.85	1000.000	98.0	H	335.0	20.6

Bluetooth, Channel 2480, EDR2

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2483.500000	---	52.67	74.00	21.33	1000.000	301.0	H	345.0	37.8
2483.500000	42.30	---	54.00	11.70	1000.000	301.0	H	345.0	37.8

Bluetooth, Channel 2480, EDR2, Bandedge

Frequency (MHz)	Average (dBμV/m)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4959.800000	---	58.48	74.00	15.52	1000.000	234.0	V	326.0	7.2
4959.800000	53.52	---	54.00	0.48	1000.000	234.0	V	326.0	7.2
7439.800000	49.04	---	54.00	4.96	1000.000	224.0	V	345.0	10.9
7439.800000	---	55.91	74.00	18.09	1000.000	224.0	V	345.0	10.9
9919.800000	40.58	---	54.00	13.42	1000.000	402.0	H	276.0	14.0
9919.800000	---	50.24	74.00	23.76	1000.000	402.0	H	276.0	14.0
12399.800000	---	51.35	74.00	22.65	1000.000	400.0	V	180.0	16.9
12399.800000	41.46	---	54.00	12.54	1000.000	400.0	V	180.0	16.9
14879.800000	39.03	---	54.00	14.97	1000.000	397.0	H	129.0	18.2
14879.800000	---	49.59	74.00	24.41	1000.000	397.0	H	129.0	18.2
17360.600000	39.79	---	54.00	14.21	1000.000	98.0	H	336.0	20.6
17360.600000	---	50.24	74.00	23.76	1000.000	98.0	H	336.0	20.6

Bluetooth, Channel 2480, EDR3

Frequency (MHz)	Average (dBμV/m)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2483.500000	---	52.71	74.00	21.29	1000.000	410.0	H	345.0	37.8
2483.500000	42.28	---	54.00	11.72	1000.000	410.0	H	345.0	37.8

Bluetooth, Channel 2480, EDR3, Bandedge

11 AC Powerline Conducted Emissions

11.1 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 μ H/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 (dB μ V)	
	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.

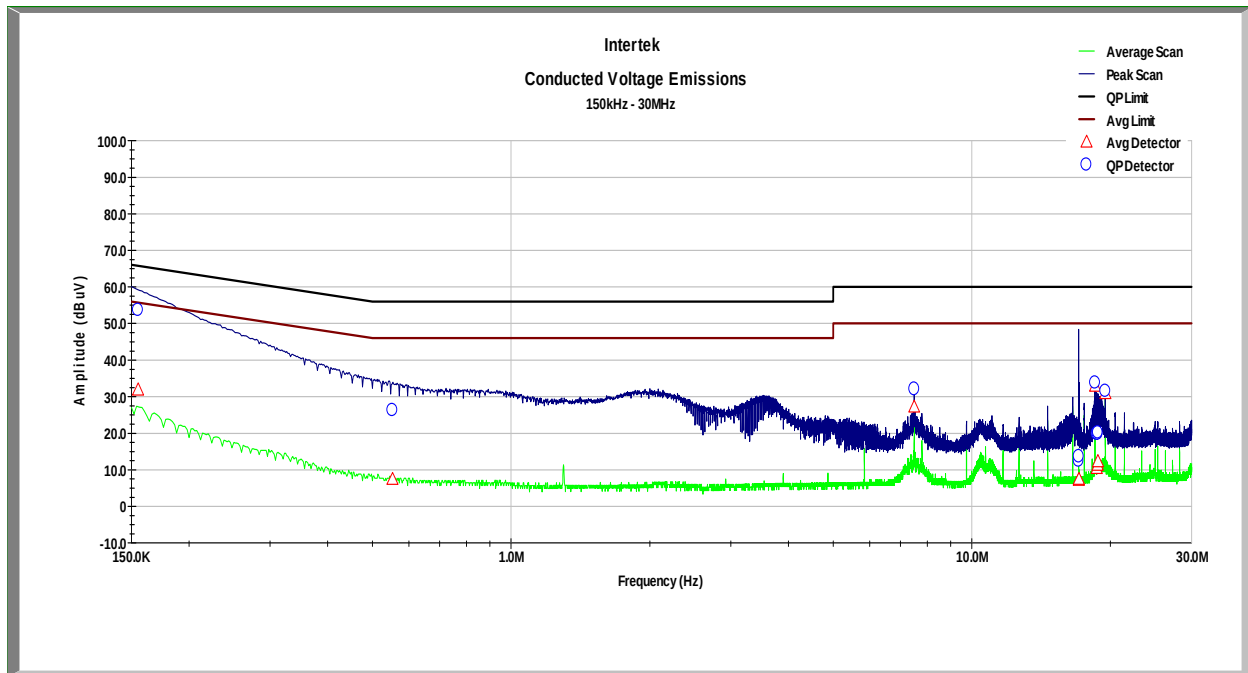
11.2 Test Procedure

ANSI C63.4: 2014

11.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	8/22/2014	8/22/2015
LISN	3333	Teseq	NNB52	3/12/2014	3/12/2015

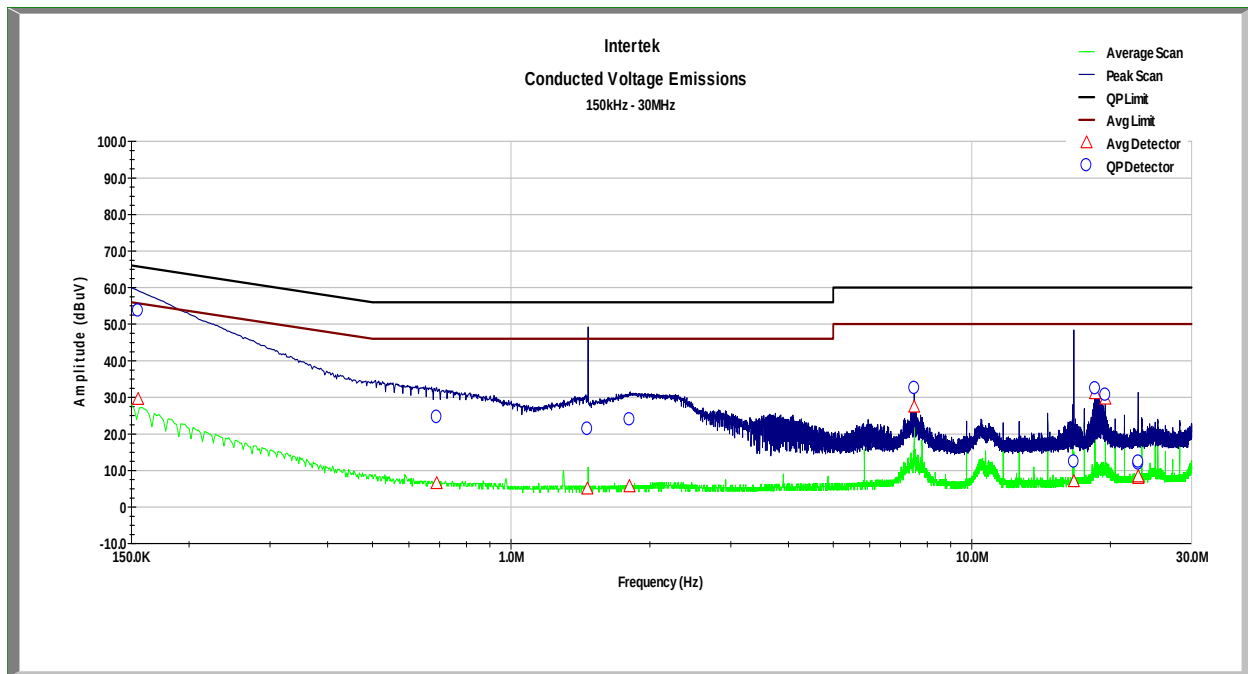
11.4 Results:



Neutral

Conducted Voltage Emissions on Power Lines								
Test Engineer:	Carmen Davis	Start Date:		1/30/2015	End Date:		1/30/2015	
Temperature:	22.1C	Humidity:		34.20%	Pressure:		988.6mBar	
Specification:	FCC Part 15	Test Limit:		Class B	RBW:		9kHz	
Notes:	Transmitting							
	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
Neutral	155.000 KHz	53.666	65.857	-12.192	31.845	55.857	-24.012	Compliant
Neutral	552.800 KHz	26.284	56	-29.716	7.38	46	-38.62	Compliant
Neutral	7.500 MHz	32.018	60	-27.982	27.133	50	-22.867	Compliant
Neutral	17.064 MHz	12.443	60	-47.557	7.184	50	-42.816	Compliant
Neutral	17.079 MHz	13.658	60	-46.342	7.382	50	-42.618	Compliant
Neutral	18.513 MHz	33.766	60	-26.234	32.836	50	-17.164	Compliant
Neutral	18.667 MHz	19.799	60	-40.201	10.351	50	-39.649	Compliant
Neutral	18.754 MHz	19.807	60	-40.193	11.288	50	-38.712	Compliant
Neutral	18.782 MHz	20.179	60	-39.821	12.205	50	-37.795	Compliant
Neutral	19.488 MHz	31.544	60	-28.456	30.832	50	-19.168	Compliant

Neutral



Line 1

Conducted Voltage Emissions on Power Lines								
Test Engineer:	Carmen Davis		Start Date:	1/30/2015		End Date:	1/30/2015	
Temperature:	22.1C		Humidity:	34.20%		Pressure:	988.6mBar	
Specification:	FCC Part 15		Test Limit:	Class B		RBW:	9kHz	
Notes:	Transmitting							
Line	Frequency	Quasi-	Quasi-Peak	Quasi-	Average	Average	Average	Results
Line 1	155.000 KHz	53.684	65.857	-12.173	29.434	55.857	-26.423	Compliant
Line 1	689.300 KHz	24.563	56	-31.437	6.411	46	-39.589	Compliant
Line 1	1.464 MHz	21.324	56	-34.676	4.933	46	-41.067	Compliant
Line 1	1.807 MHz	23.895	56	-32.105	5.566	46	-40.434	Compliant
Line 1	7.500 MHz	32.477	60	-27.523	27.318	50	-22.682	Compliant
Line 1	16.654 MHz	12.411	60	-47.589	6.951	50	-43.049	Compliant
Line 1	18.515 MHz	32.376	60	-27.624	31.042	50	-18.958	Compliant
Line 1	19.489 MHz	30.612	60	-29.388	29.512	50	-20.488	Compliant
Line 1	22.982 MHz	11.879	60	-48.121	7.861	50	-42.139	Compliant
Line 1	22.989 MHz	12.349	60	-47.651	8.297	50	-41.703	Compliant

Line 1

12 Antenna Requirement per FCC Part 15.203

12.1 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.

12.2 Results:

The sample tested met the antenna requirement. The antenna was a PCB circuit board that was permanently soldered to the main board.

13 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	

14 Revision History

Revision Level	Date	Report Number	Notes
0	3/9/2015	102048164LEX-004	Original Issue