

TEST REPORT

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Model Number: XT6350

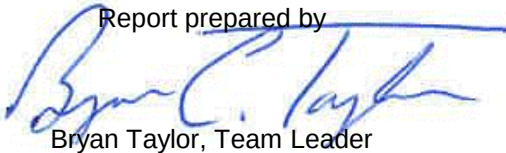
Standards: Title 47 CFR Part 15 Subpart C,
RSS-210 Issue 8

Radios Under Test: Low Energy Bluetooth (BTLE)

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

Client:
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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 Conducted Power	§ 15.247(b)(3)(4)	RSS-210 (A8.4)	Pass
9	Occupied Bandwidth	§ 15.247(a)(2)	RSS-210 (A8.2), RSS-GEN (4.6.1)	Pass
12	Conducted Spurious Emissions	§ 15.247(d)	RSS-210 (A8.5)	Pass
14	Power Spectral Density	§ 15.247(e)	RSS-210 (A8.2b)	Pass
17	Radiated Spurious Emissions (Transmitter)	§ 15.247(d), § 15.209, and § 15.205	RSS-210 (2.2) (A8.5)	Pass
22	Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (6.1)	Pass
26	Conducted Voltage Emissions on the AC Mains Terminals	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Pass
29	Antenna Requirement per FCC Part 15.203	§ 15.203	RSS-Gen (7.1.2)	Pass

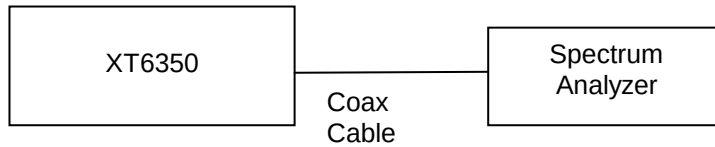
3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Xirgo Technologies
Model Number	XT6350
Serial Number	1 and 2
Receive Date	1/19/2015
Test Start Date	1/19/2015
Test End Date	3/3/2015
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	2402MHz – 2480MHz
Mode(s) of Operation	BTLE
Modulation Type	GFSK
Number of Hopping Channels	40
Transmission Control	Test Commands
Test Channels	0, 19, 39 (2402, 2440, 2480 MHz)
Antenna Type (15.203)	Internal
Power Supply	12VDC

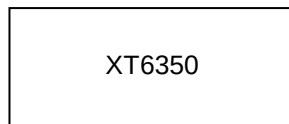
Description of Equipment Under Test
The XT6350 is a Vehicle GPS/Cellular Tracking Device with BT

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting BTLE 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 Conducted Power

4.1 Test Limits

§ 15.247(b)(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.

§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2 Test Procedure

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247). The peak output power was measured using the channel power function of the spectrum analyzer.

4.3 Test Equipment Used:

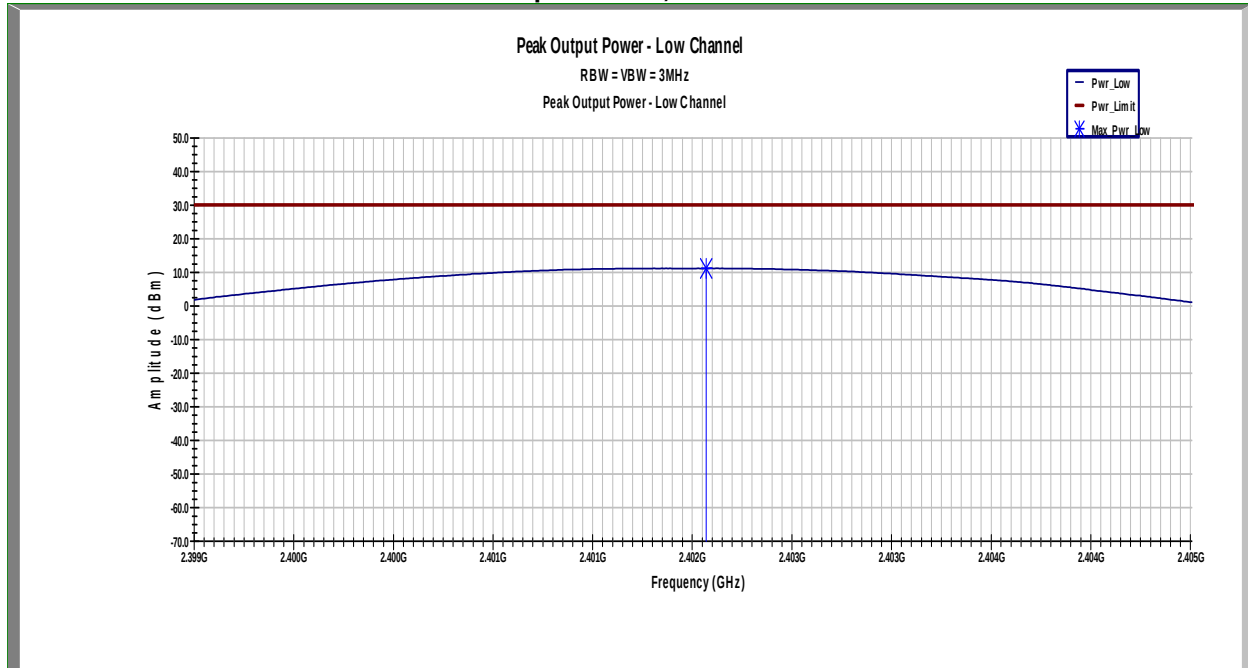
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

4.4 Results:

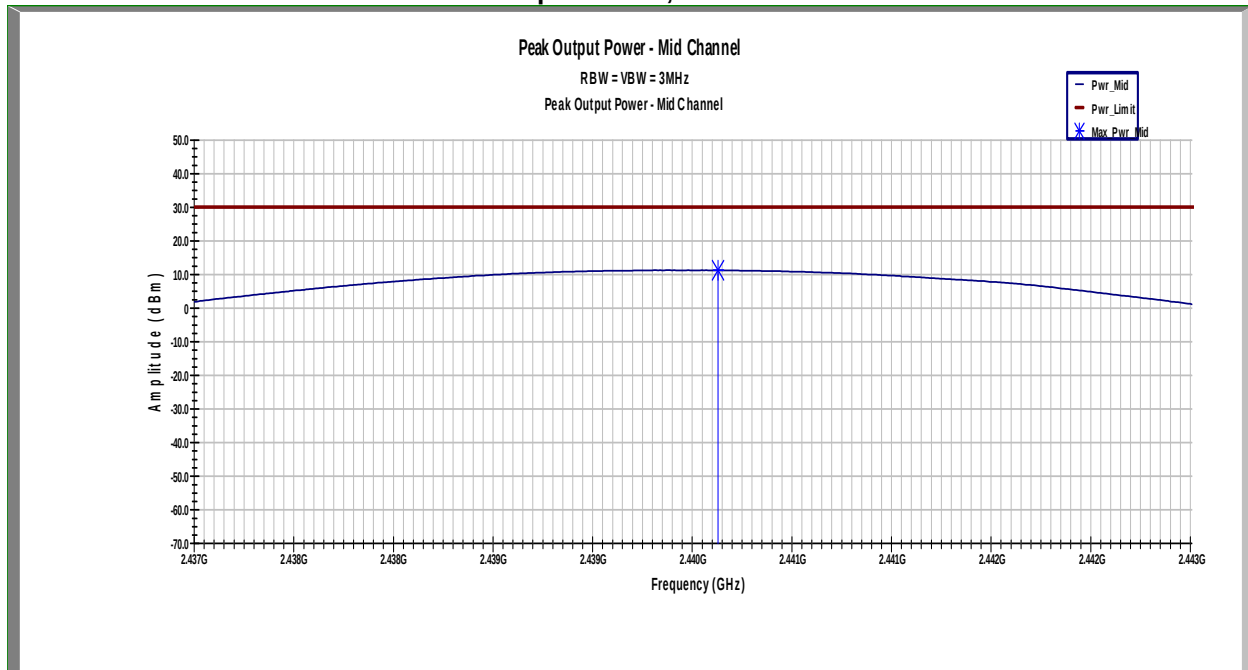
The peak output power measurements were all below the 30dBm limit.

Mode	Channel Number	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Result
BTLE	0	2402	11.157	30	Pass
BTLE	19	2440	11.219	30	Pass
BTLE	39	2480	11.159	30	Pass

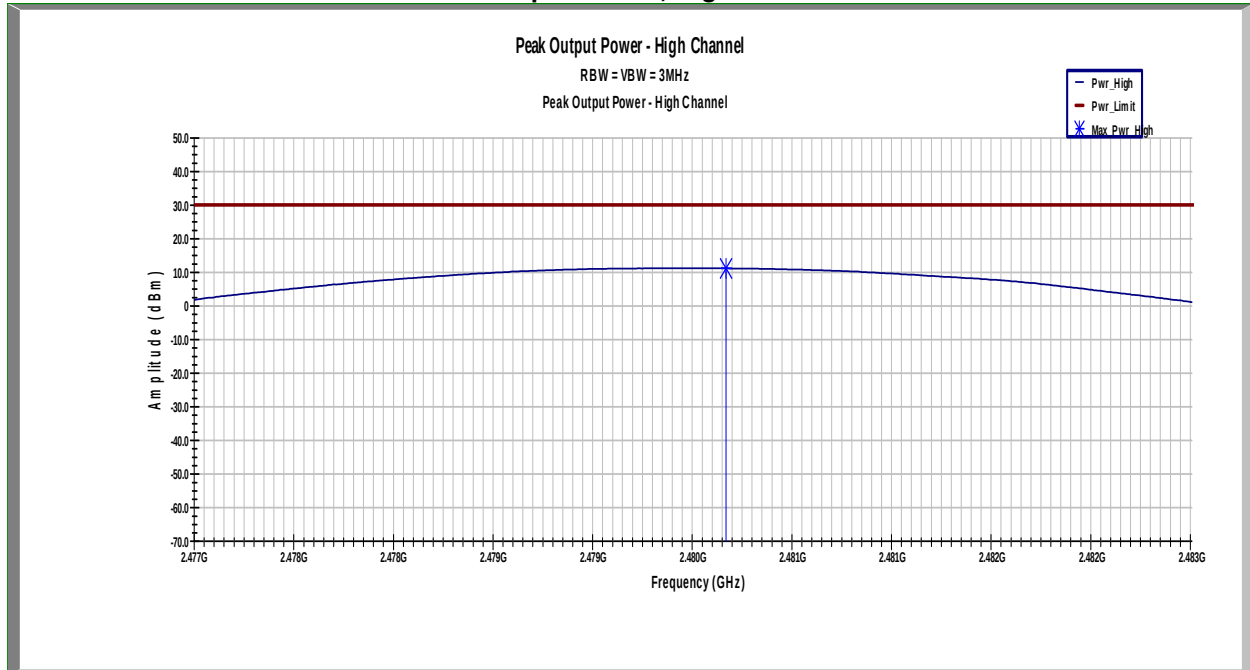
Peak Output Power, Low Channel



Peak Output Power, Mid Channel



Peak Output Power, High Channel



5 Occupied Bandwidth

5.1 Test Limits

§ 15.247(a)(2): For digital modulation systems, the minimum 6dB bandwidth shall be at least 500kHz.

5.2 Test Procedure

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

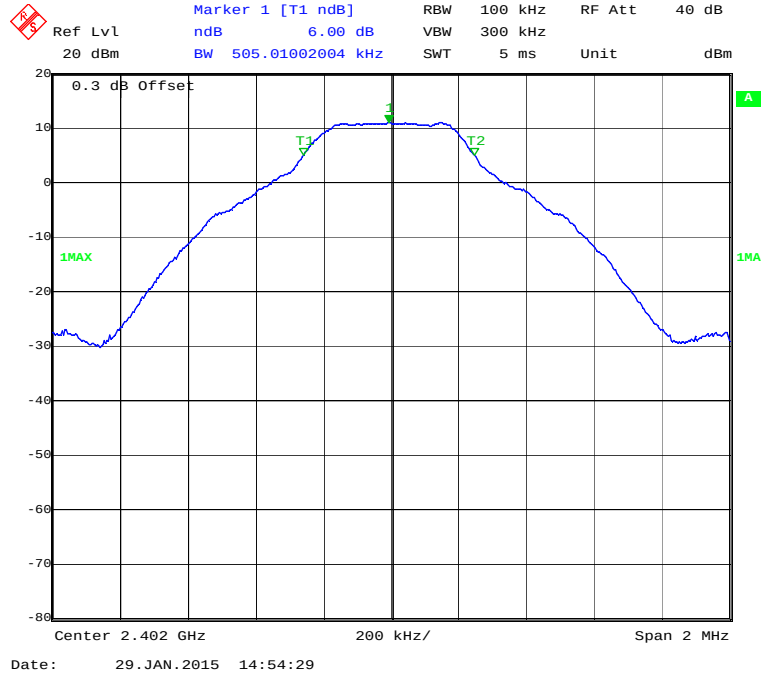
5.3 Test Equipment Used:

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

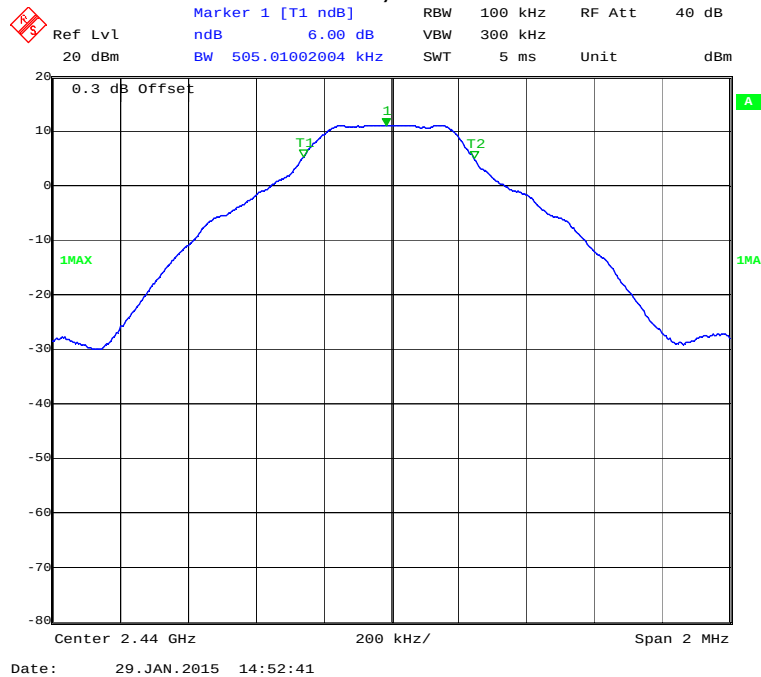
5.4 Results:

Mode	Channel Number	Frequency (MHz)	6dB Bandwidth	99% Power Bandwidth	Result
BTLE	0	2402	505kHz	---	Pass
BTLE	19	2440	505kHz	937kHz	Pass
BTLE	39	2480	513kHz	---	Pass

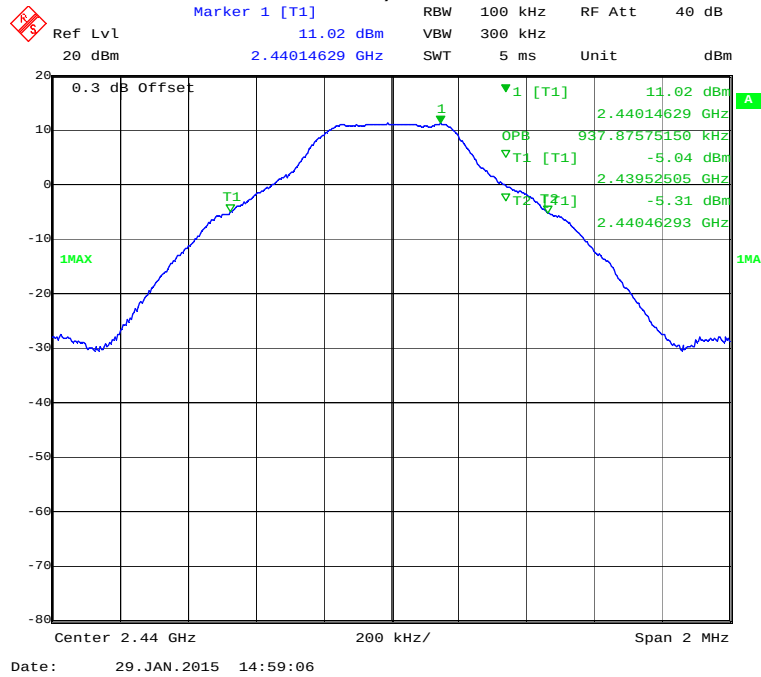
6dB Bandwidth, Low Channel



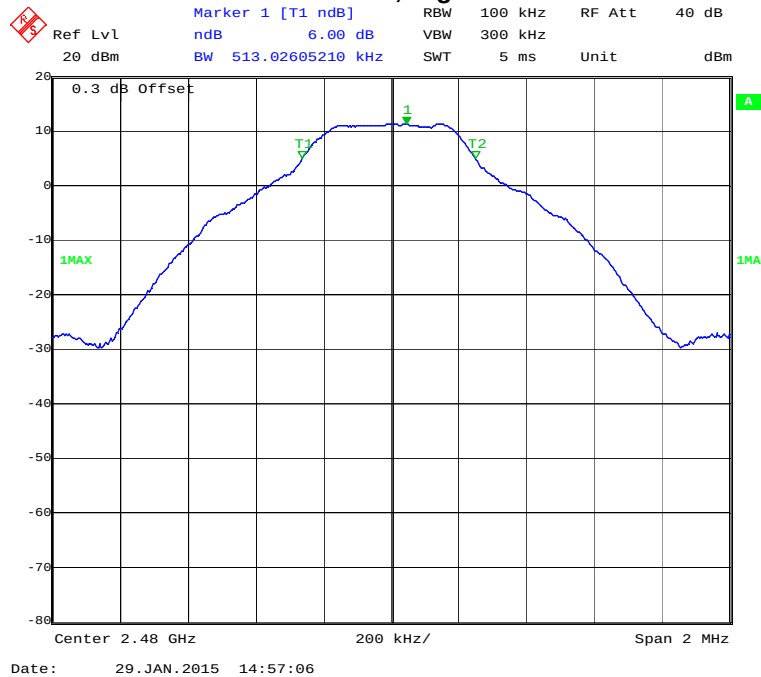
6dB Bandwidth, Middle Channel



99% Bandwidth, Middle Channel



6dB Bandwidth, High Channel



6 Conducted Spurious Emissions

6.1 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.

6.2 Test Procedure

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

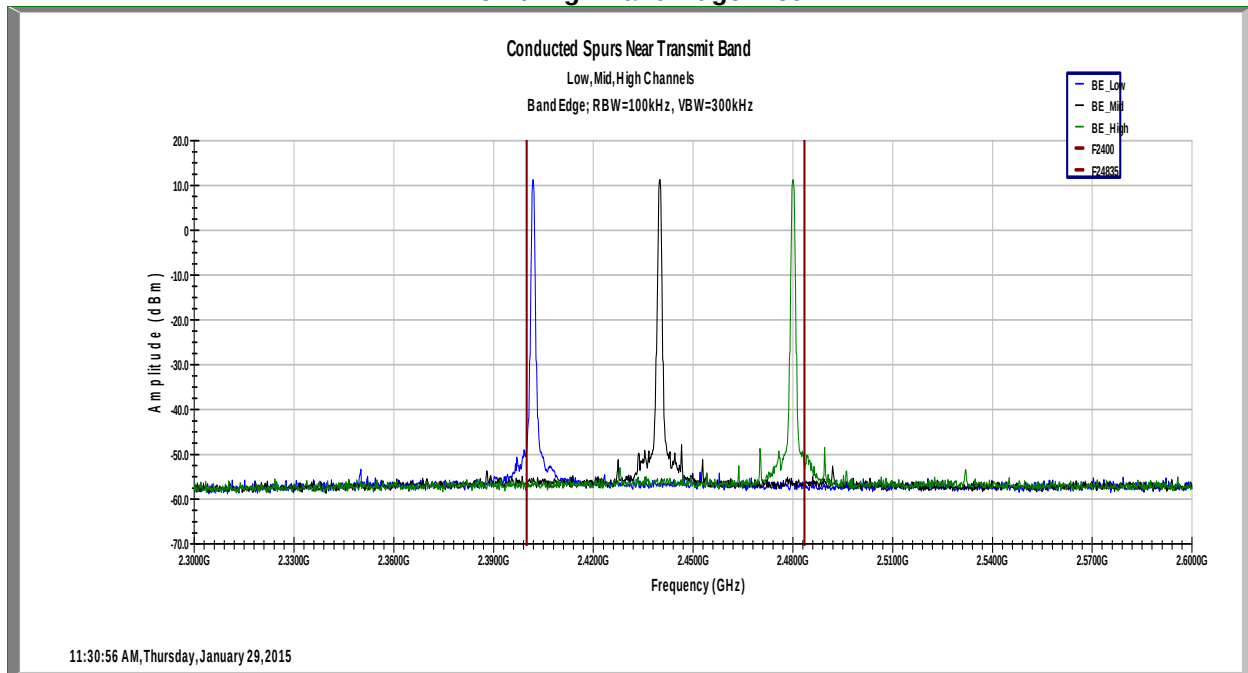
6.3 Test Equipment Used:

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

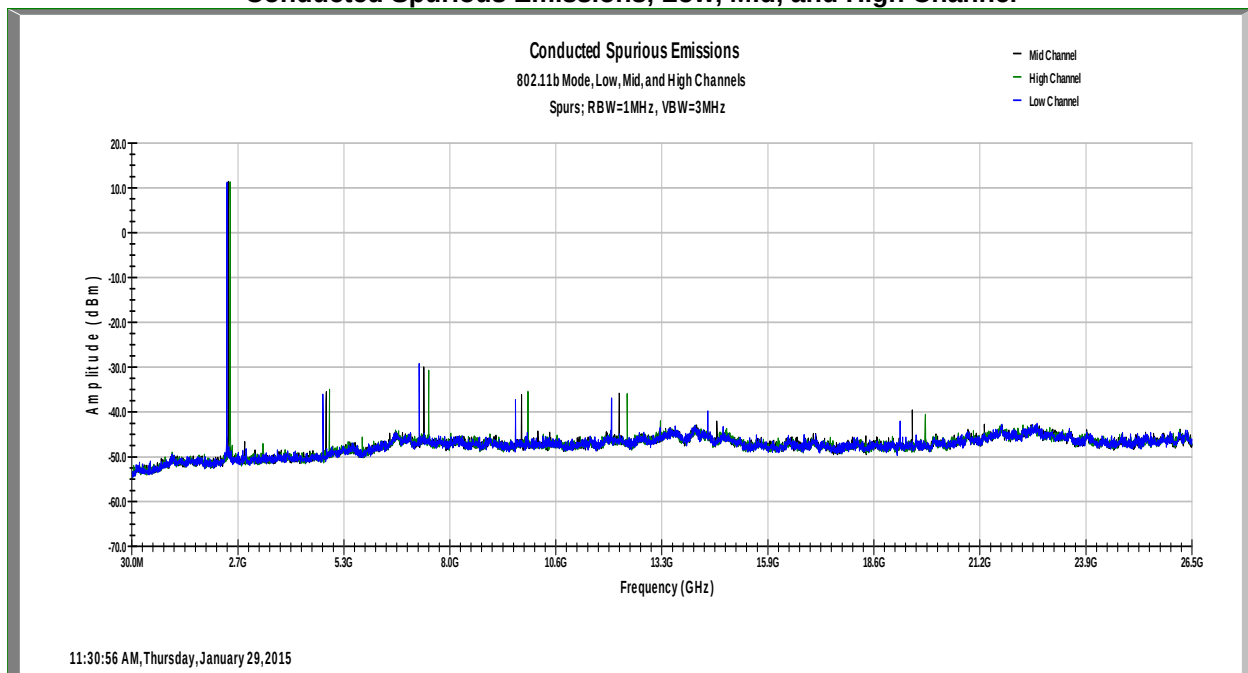
6.4 Results:

The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria.

Low / High Band Edge Plot



Conducted Spurious Emissions, Low, Mid, and High Channel



7 Power Spectral Density

7.1 Test Limits

§ 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

7.2 Test Procedure

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

7.3 Test Equipment Used:

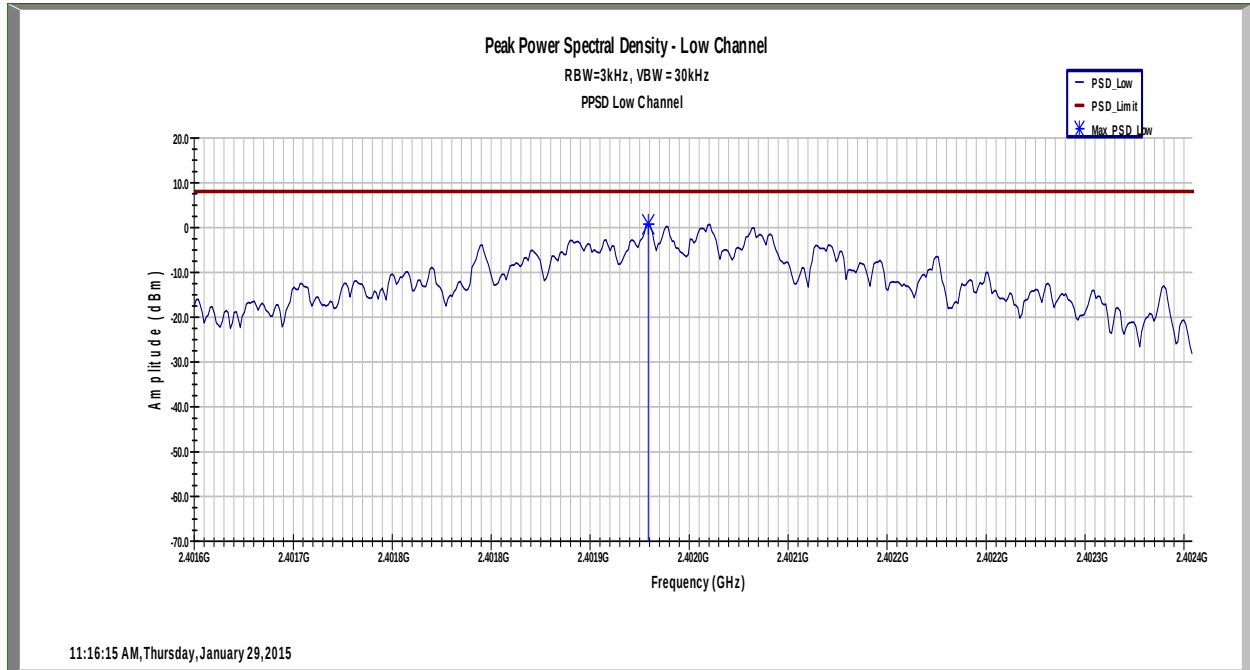
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3720	Rohde&Schwarz	FSEK30	9/15/2014	9/15/2015

7.4 Results:

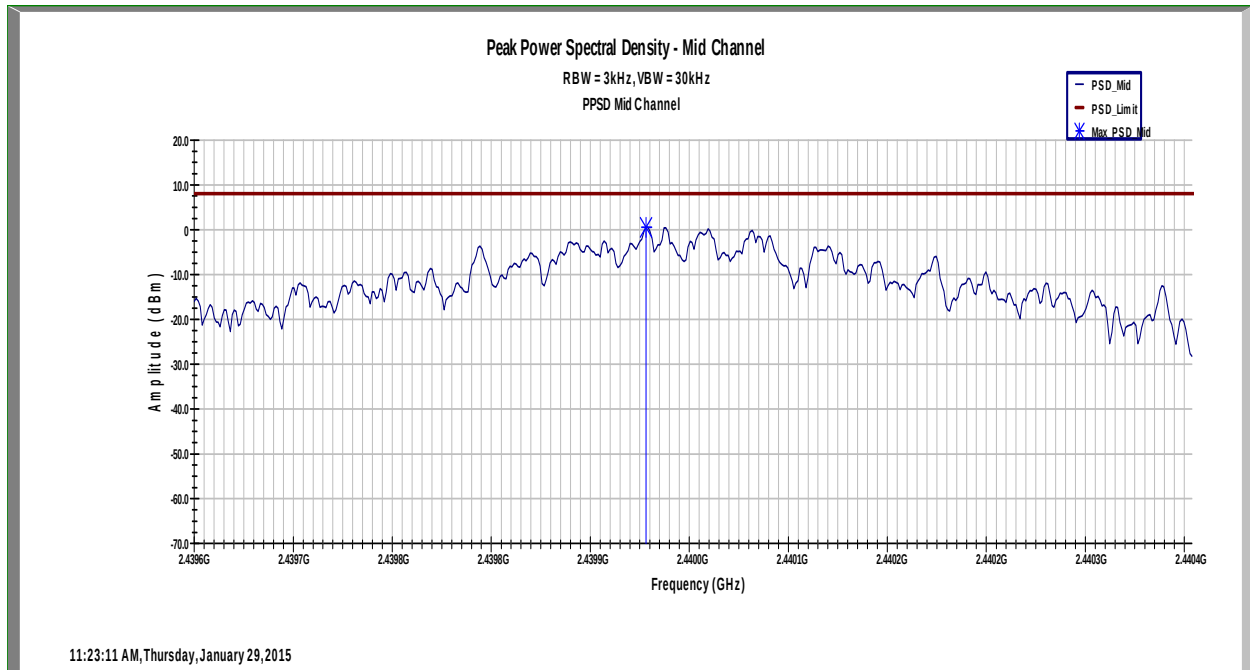
*PSD Option 1 Method

Mode	Channel Number	Frequency (MHz)	PSD in 3kHz BW (dBm)	Limit (dBm)	Result
BTLE	0	2402	0.708	8.0	Pass
BTLE	19	2440	0.485	8.0	Pass
BTLE	39	2480	0.476	8.0	Pass

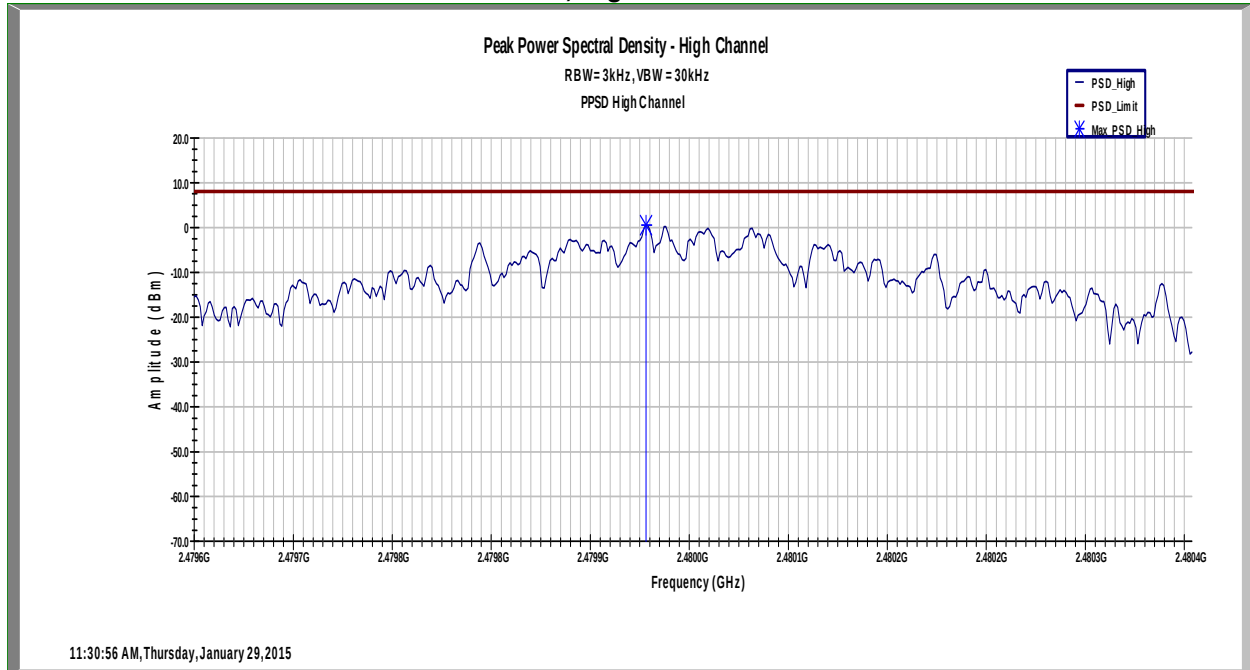
PSD Low Channel



PSD Middle Channel



PSD, High Channel



8 Radiated Spurious Emissions (Transmitter)

8.1 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

8.2 Test Procedure

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

8.3 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

$FS = 19.48 + 18.52 + 0.78 = 38.78$ dB μ V/m

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

8.4 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
High Pass Filter	1	Wainwright	WHKX12- 2533.85-2710- 18000-40SS	Time of Use	Time of Use
EMC Software	Version 9.15.02	Rohde&Schwarz	EMC32	Time of Use	Time of Use

8.5 Results:

The radiated spurious testing was conducted up to 10 times the fundamental frequency. 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 could be used in any orientation.

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).

Worst Case Spurious Emissions (BTLE, Low Channel)

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

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

Channel 2402, GFSK, Band Edge

Worst Case Spurious Emissions (BTLE, Middle Channel)

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

Channel 2440, GFSK

Worst Case Spurious Emissions (BTLE, High Channel)

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

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

Channel 2480, GFSK, Band Edge

9 Radiated Spurious Emissions (Receiver)

9.1 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

9.2 Test Procedure

ANSI C63.4: 2014

9.3 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

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

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

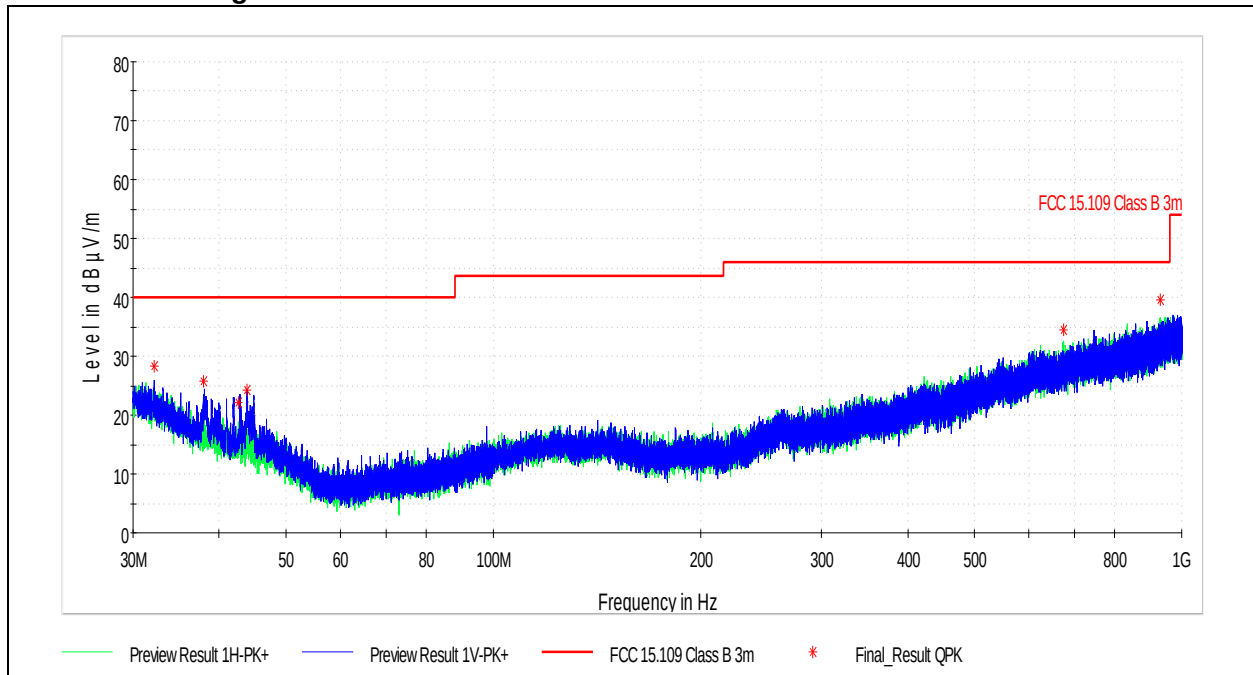
9.4 Test Equipment Used:

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

9.5 Results:

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

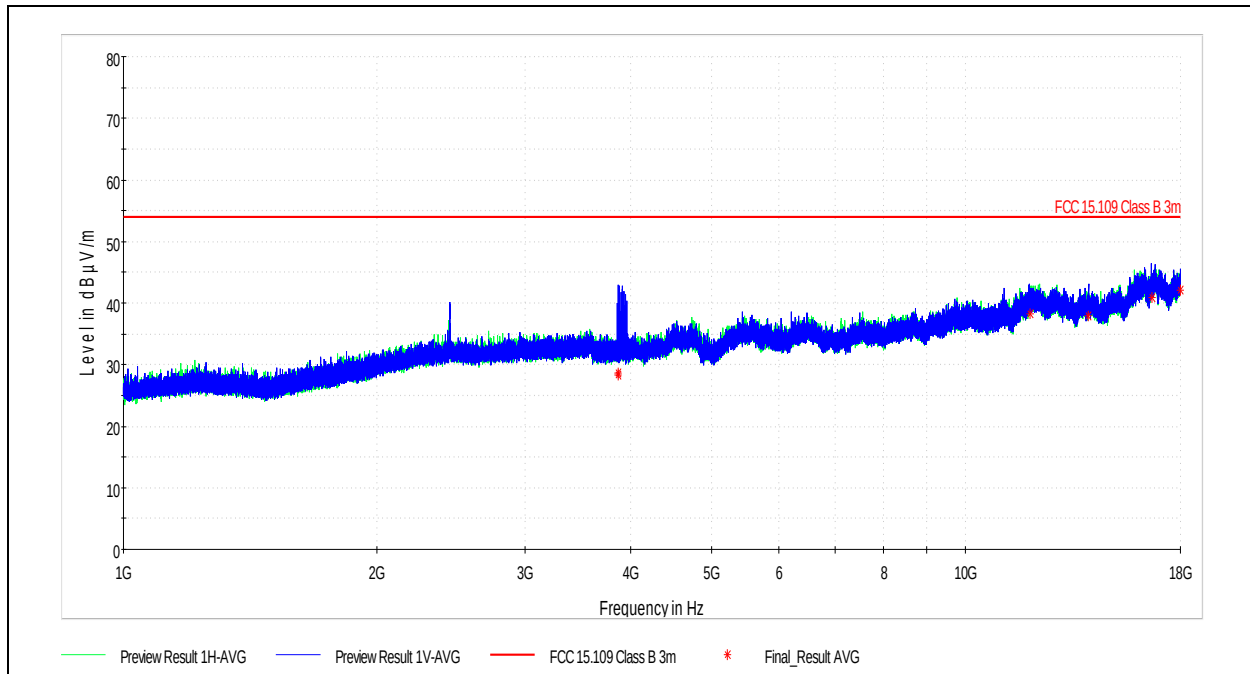
9.1 Plot: Bilog



9.2 Test Data: Bilog

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.179000	28.21	40.00	11.79	120.000	113.9	V	24.0	21.1
38.005000	25.74	40.00	14.26	120.000	112.3	V	26.0	16.4
42.704000	22.20	40.00	17.80	120.000	105.5	V	5.0	14.9
43.884000	24.17	40.00	15.83	120.000	110.8	V	19.0	14.6
673.470000	34.49	46.02	11.53	120.000	108.6	H	23.0	26.4
931.260000	39.58	46.02	6.44	120.000	400.0	H	74.0	30.6

9.1 Plot: Horn



9.2 Test Data: Horn

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3864.400000	---	38.26	---	---	1000.000	391.0	V	339.0	6.1
3864.400000	28.36	---	54.00	25.64	1000.000	391.0	V	339.0	6.1
3869.000000	---	37.69	---	---	1000.000	319.0	V	142.0	6.1
3869.000000	28.62	---	54.00	25.38	1000.000	319.0	V	142.0	6.1
11928.200000	38.17	---	54.00	15.83	1000.000	275.0	V	338.0	17.4
11928.200000	---	47.58	---	---	1000.000	275.0	V	338.0	17.4
14001.000000	---	47.39	---	---	1000.000	403.0	V	217.0	17.4
14001.000000	37.88	---	54.00	16.12	1000.000	403.0	V	217.0	17.4
16649.000000	---	50.34	---	---	1000.000	316.0	V	134.0	21.6
16649.000000	40.81	---	54.00	13.19	1000.000	316.0	V	134.0	21.6
17999.400000	42.02	---	54.00	11.98	1000.000	246.0	V	119.0	23.0
17999.400000	---	50.44	---	---	1000.000	246.0	V	119.0	23.0

10 AC Powerline Conducted Emissions

10.1 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.

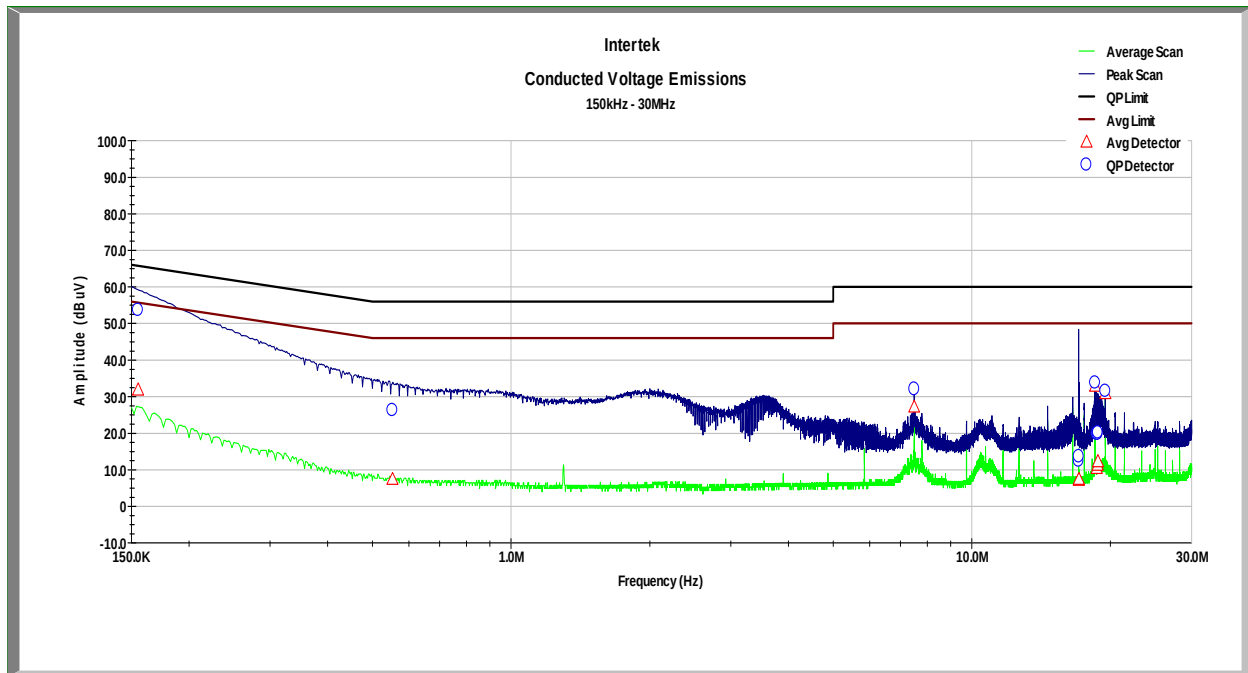
10.2 Test Procedure

ANSI C63.4: 2014

10.3 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

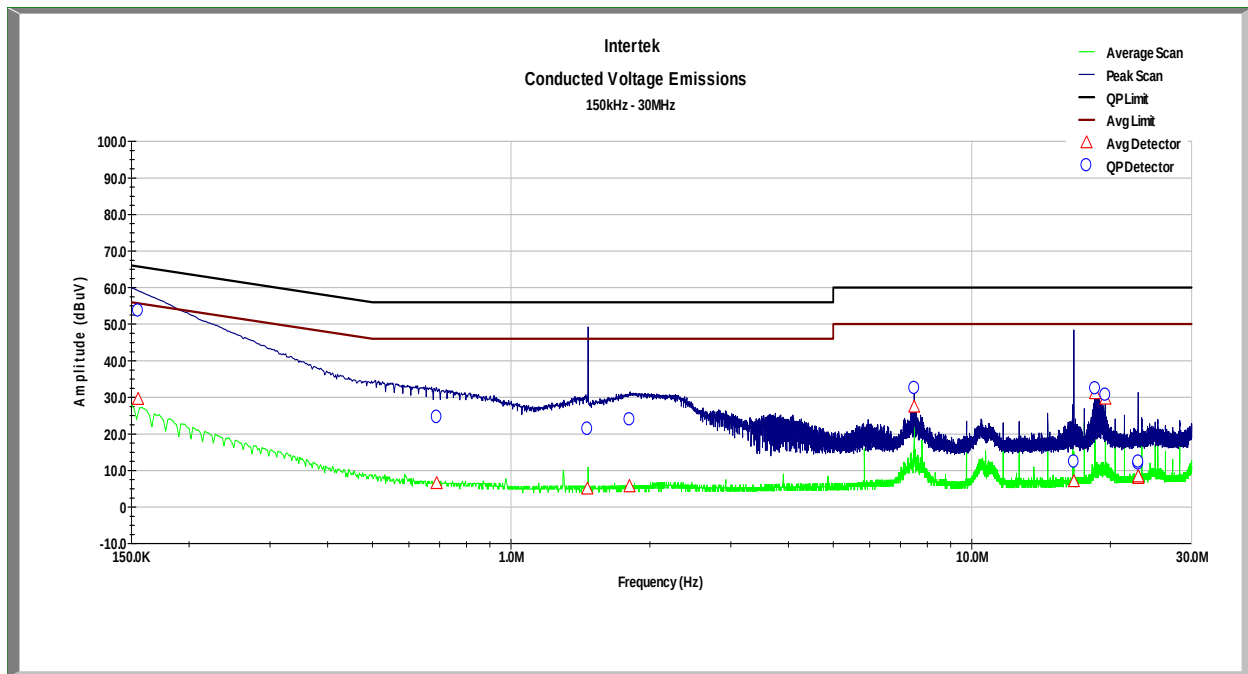
10.4 Results:



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							
Line	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

11 Antenna Requirement per FCC Part 15.203

11.1 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.

11.2 Results:

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

12 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	

13 Revision History

Revision Level	Date	Report Number	Notes
0	3/9/2015	101978620LEX-002	Original Issue