

EMC Test Report

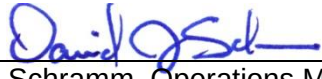
Project Number: 4219718**Report Number: 4219718EMC01****Revision Level: 0****Client: Johnson Controls Inc****Equipment Under Test: Wireless Thermostat****Model: SiO2****FCC ID: OEJGLASWIFI****IC ID: 279A-GLASWIFI****Applicable Standards: FCC Part 15 Subpart C, § 15.247****RSS-247, Issue 2****ANSI C63.10: 2013****Report issued on: 31 October 2017****Test Result: Compliant**

Tested by:



Jeremy Pickens, Senior EMC Engineer

Reviewed by:



David Schramm, Operations Manager**Remarks:**

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or Testing done by SGS International Electrical Approvals in connection with distribution or use of the product described in this report must be approved by SGS international Electrical Approvals in writing.

Table of Contents

1	SUMMARY OF TEST RESULTS	4
1.1	MODIFICATIONS REQUIRED FOR COMPLIANCE	4
2	GENERAL INFORMATION.....	5
2.1	CLIENT INFORMATION	5
2.2	TEST LABORATORY	5
2.3	GENERAL INFORMATION OF EUT	5
2.4	OPERATING MODES AND CONDITIONS	5
2.5	EUT CONNECTION BLOCK DIAGRAM – CONDUCTED MEASUREMENTS.....	6
2.6	EUT CONNECTION BLOCK DIAGRAM – RADIATED MEASUREMENTS	6
2.7	SYSTEM CONFIGURATIONS	7
3	BANDWIDTH	8
3.1	TEST RESULT.....	8
3.2	TEST METHOD.....	8
3.3	TEST SITE	8
3.4	TEST EQUIPMENT	8
3.5	TEST DATA.....	8
4	OUTPUT POWER	10
4.1	TEST RESULT.....	10
4.2	TEST METHOD.....	10
4.3	TEST SITE	10
4.4	TEST EQUIPMENT	10
4.5	TEST DATA.....	11
5	POWER SPECTRAL DENSITY	12
5.1	TEST RESULT.....	12
5.2	TEST METHOD.....	12
5.3	TEST SITE	12
5.4	TEST EQUIPMENT	12
5.5	TEST DATA.....	12
6	CONDUCTED SPURIOUS EMISSIONS	14
6.1	TEST RESULT.....	14
6.2	TEST METHOD.....	14
6.3	TEST SITE	14
6.4	TEST EQUIPMENT	14
6.5	TEST DATA – DTS BANDEDGE	15
6.6	TEST DATA – CONDUCTED SPURIOUS EMISSIONS	17
7	FIELD STRENGTH OF SPURIOUS RADIATION.....	19
7.1	TEST RESULT.....	19
7.2	TEST METHOD.....	19
7.3	TEST SITE	19
7.4	TEST EQUIPMENT	20
7.5	PEAK PLOTS	21
7.6	TABULAR DATA	28
8	RADIATED EMISSIONS AT BAND EDGE / RESTRICTED BAND	29
8.1	TEST RESULT.....	29
8.2	TEST METHOD.....	29
8.3	TEST SITE	29
8.4	TEST EQUIPMENT	29



8.5	TEST DATA – BAND EDGE	30
8.6	TEST DATA – RESTRICTED BANDS	33
9	CONDUCTED EMISSIONS	35
9.1	TEST RESULT.....	35
9.2	TEST METHOD.....	35
9.3	TEST SITE	35
9.4	TEST EQUIPMENT	35
9.5	TEST DATA.....	36
10	REVISION HISTORY	38

1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.6	Compliant
Transmitter Output Power	15.247(b)(3)	RSS-247 S5.4 (4)	Compliant
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	Compliant
Conducted Spurious Emissions / Band edge	15.247(d)	RSS-247 S5.5	Compliant
Radiated Spurious Emissions / Restricted Bands	15.35(b),15.209	RSS-GEN S6.13 RSS-GEN S8.10	Compliant
Antenna Requirement	15.203	RSS-GEN S8.3	Compliant (1)
AC Powerline Conducted Emission	15.107, 15.207	RSS-GEN S8.8	Compliant

1) Internal PCB trace antenna

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: Johnson Controls Inc
Address: 507 East Michigan Street
City, State, Zip, Country: Milwaukee, WI 53202, USA

2.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA
Type of lab: Testing Laboratory
Certificate Number: 3212.01

2.3 General Information of EUT

Type of Product: Wireless Thermostat
Model Number: SiO2
Serial Number: 173800048

Frequency Range: 2412 - 2462MHz (Channels 1 to 11)
Data Modes: 802.11b, 802.11g, 802.11n (HT20)
Antenna: Internal, 3.34 dBi Max Gain

Rated Voltage: 24Vac, 60Hz
Test Voltage: 24Vac, 60Hz

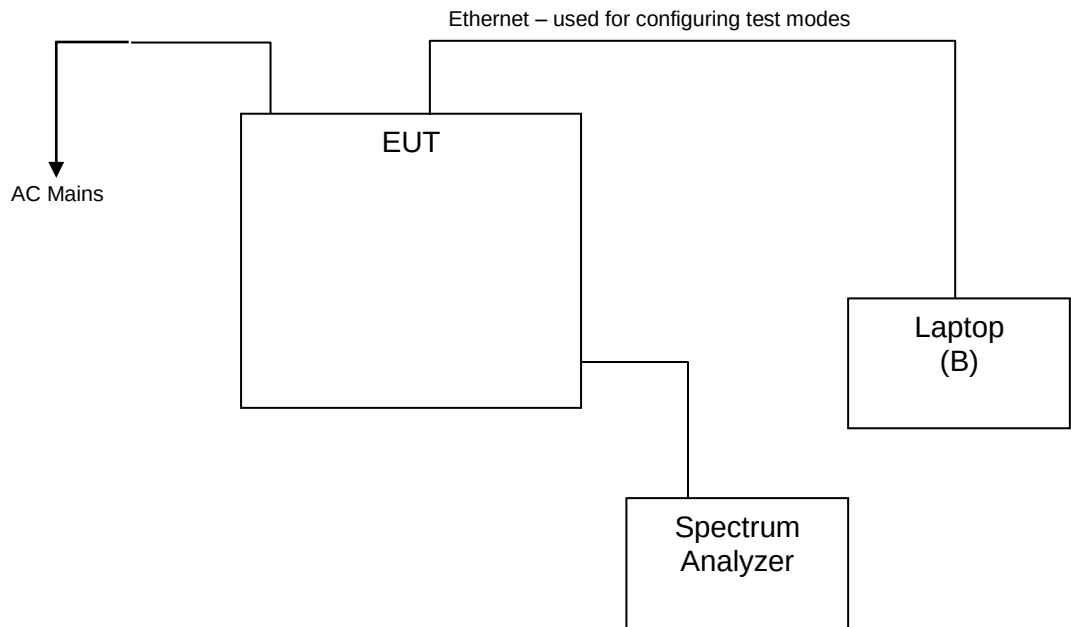
Sample Received Date: 18 October 2017
Dates of testing: 18 - 31 October 2017

2.4 Operating Modes and Conditions

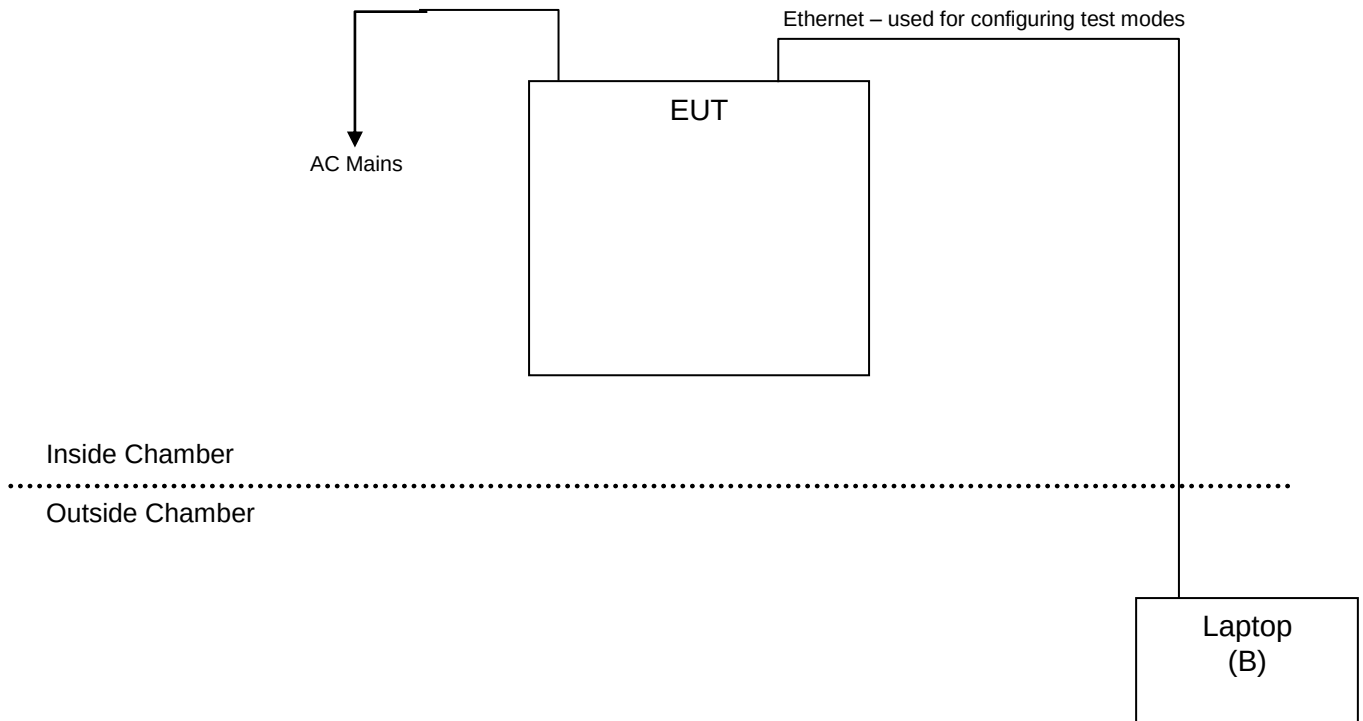
For spurious emissions measurements, only the worst-case mode with respect to peak power was investigated: 802.11b, 1Mbps. Investigations covered the low, middle, and high channels in the 2400-2483.5MHz band.

Continuous traffic was generated using test commands. Where the duty cycle measured below 99% and an RMS detector was employed, corrections of $10 \cdot \log(1/D)$ were applied according to KDB publication 558074 D01 DTS Meas Guidance v04.

2.5 EUT Connection Block Diagram – Conducted Measurements



2.6 EUT Connection Block Diagram – Radiated Measurements



2.7 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Johnson Controls Inc	Wireless Thermostat	SiO2	173800048
B	Dell	Laptop	Latitude ES420	11033846857

3 Bandwidth

3.1 Test Result

Test Description	Test Specification		Test Result
6 dB bandwidth / 99% OBW	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.6	Compliant

3.2 Test Method

The procedures from ANSI C63.10: 2013 clause 11.8 and 558074 D01 DTS Meas Guidance v04 were used to determine the 6 dB bandwidth and 99% OBW.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.5 °C

Relative Humidity: 40.3 %

3.4 Test Equipment

Test End Date: 18-Oct-2017

Tester: JOP

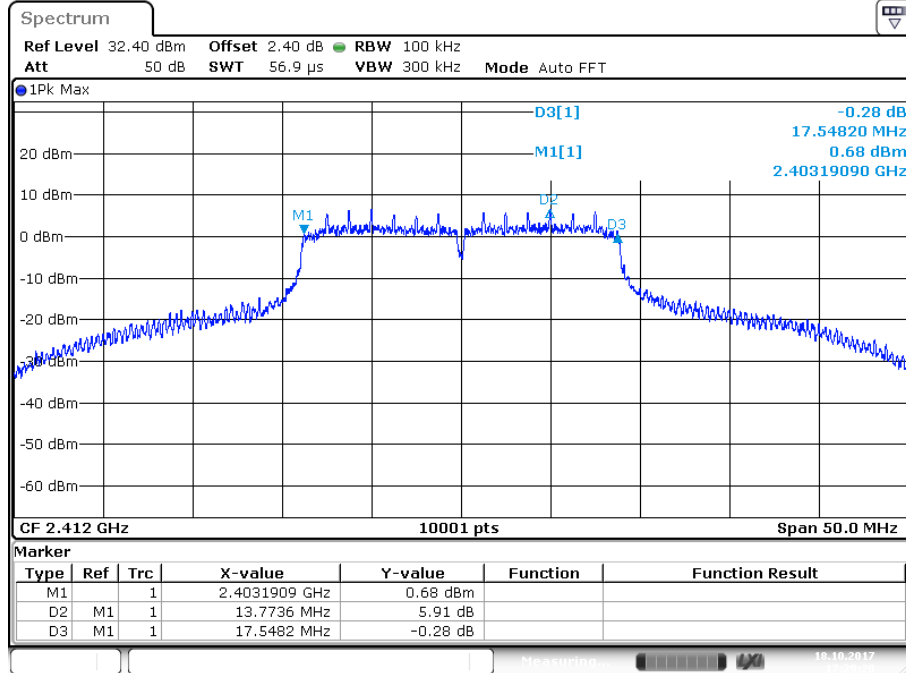
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018

Note: The equipment calibration period is 1 year.

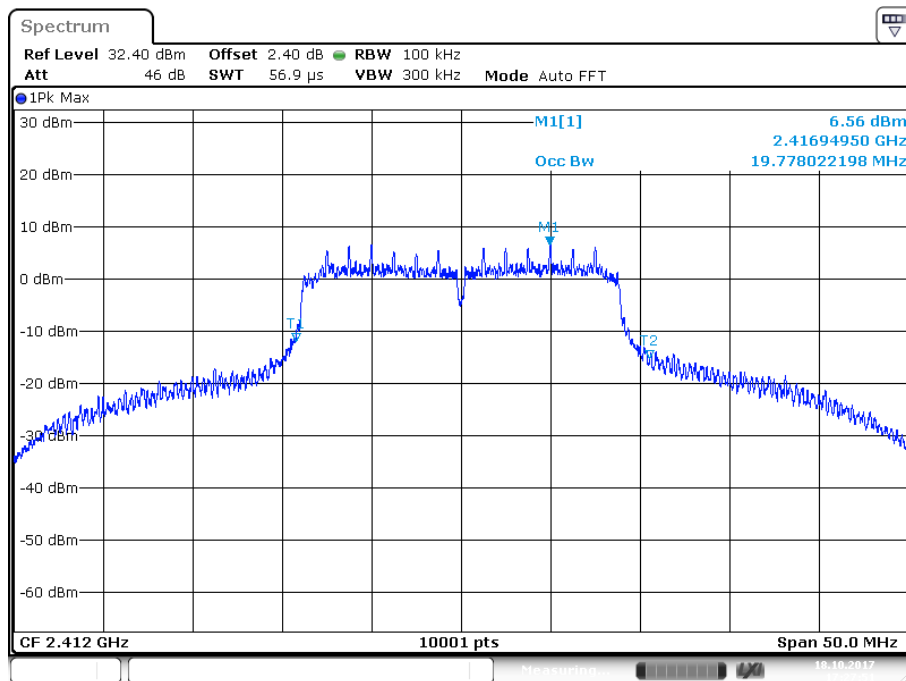
3.5 Test Data

Channel	Data Rate	6dB Bandwidth (MHz)	Occupied Bandwidth (99%) (MHz)
1	11 Mbps	8.029	13.294
6	11 Mbps	8.032	13.719
11	11 Mbps	7.196	13.043
1	54 Mbps	16.318	19.283
6	54 Mbps	16.403	18.303
11	54 Mbps	16.417	19.190
1	MCS7	17.548	19.778
6	MCS7	17.723	19.440
11	MCS7	17.666	20.490

Sample Plots



Date: 18 OCT 2017 17:29:21



Date: 18 OCT 2017 17:27:51

4 Output Power

4.1 Test Result

Test Description	Test Specification		Test Result
Peak Output Power	15.247(b) (3)	RSS-247 S5.4 (4)	Compliant

4.2 Test Method

Fundamental power measurements were recorded using the peak power procedures from ANSI C63.10: 2013 clause 11.9 and KDB 558074 D01 Measurement Guidance v04. The lowest data rate for each modulation was found to be the worst-case.

Limit

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. For using antennas with greater than 6dBi of gain, the limit is reduced in dB by the amount the gain exceeds 6dBi (e.g. for a 7.4dBi antenna, the limit is reduced from 30dBm to 28.6dBm)

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.5 °C

Relative Humidity: 40.3 %

4.4 Test Equipment

Test End Date: 18-Oct-2017

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018

Note: The equipment calibration period is 1 year.

4.5 Test Data

Mode	RateMbps	Channel	Peak Power dBm	Limit dBm	Margin dB
802.11b	1	1	21.3	30	-8.7
		6	21.7	30	-8.3
		11	22.1	30	-7.9
802.11g	6	1	23	30	-7
		6	23	30	-7
		11	23.3	30	-6.7
802.11n (HT20)	MCS0	1	22.4	30	-7.6
		6	22.6	30	-7.4
		11	23	30	-7

5 Power Spectral Density

5.1 Test Result

Test Description	Test Specification		Test Result
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	Compliant

5.2 Test Method

Fundamental power measurements were recorded using the peak PSD procedures from ANSI C63.10: 2013 clause 11.10 and KDB 558074 D01 Measurement Guidance v04. The lowest data rate for each modulation was determined to be the worst-case.

Limit

The limit is 8 dBm.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.5 °C
Relative Humidity: 40.3 %

5.4 Test Equipment

Test End Date: 18-Oct-2017

Tester: JOP

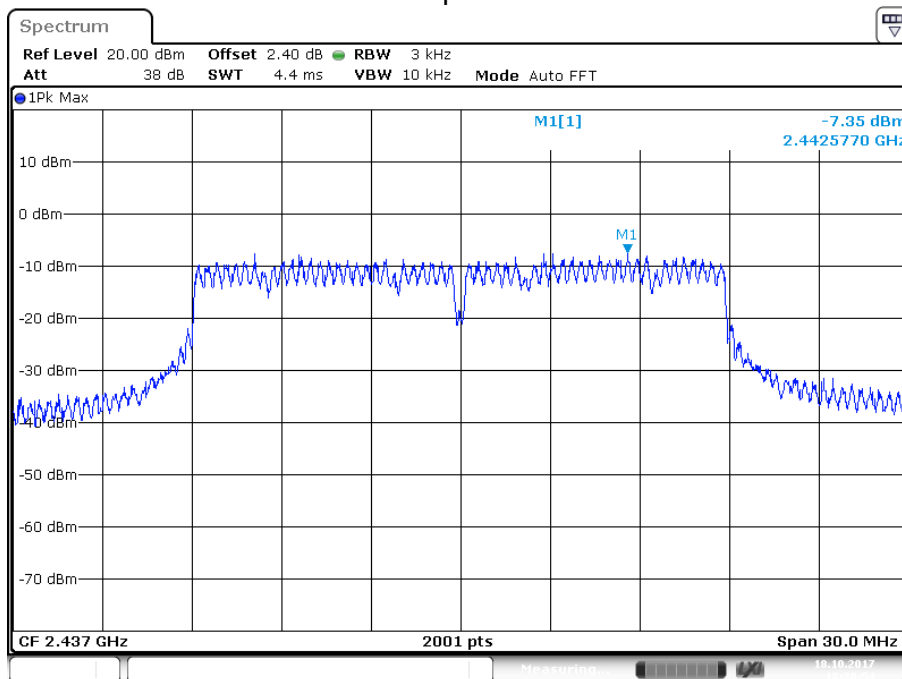
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018

Note: The equipment calibration period is 1 year.

5.5 Test Data

Mode	RateMbps	Channel	Peak PSD dBm/3kHz	Limit dBm	Margin dB
802.11b	1	1	-2.31	8	-10.31
		6	-2.2	8	-10.2
		11	-1.28	8	-9.28
802.11g	6	1	-5.63	8	-13.63
		6	-4.52	8	-12.52
		11	-5.68	8	-13.68
802.11n (HT20)	MCS0	1	-8.8	8	-16.8
		6	-7.35	8	-15.35
		11	-7.92	8	-15.92

Sample Plot



Date: 18 OCT 2017 18:20:55

6 Conducted Spurious Emissions

6.1 Test Result

Test Description	Test Specification		Test Result
Conducted Spurious Emissions	15.247(d)	RSS-247 S5.5	Compliant

6.2 Test Method

Spurious emissions in non-restricted frequency bands were recorded using the methods defined in ANSI C63.10: 2013 clause 11.11 and KDB 558074 D01 Measurement Guidance v04.

Lowest, middle, and highest channels were investigated. Only the worst-case (lowest data rate) for each modulation was reported.

Because the peak conducted output power was used to determine compliance with the output power limits, the limit is 20 dB below the maximum in-band peak PSD level in 100 kHz.

6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.5 °C

Relative Humidity: 40.3 %

6.4 Test Equipment

Test End Date: 18-Oct-2017

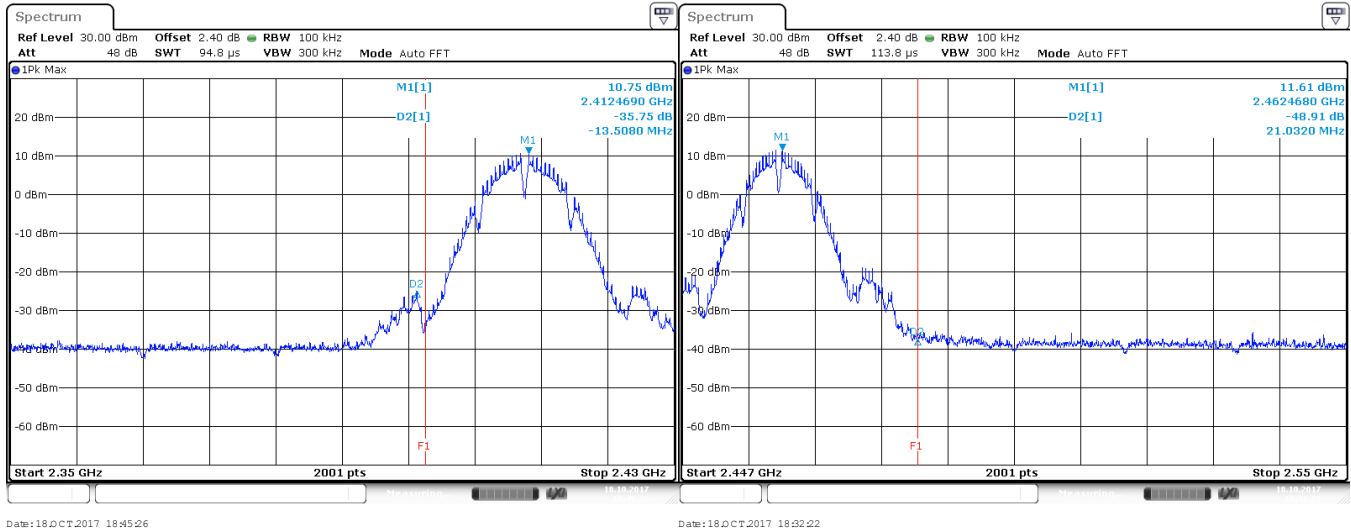
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018

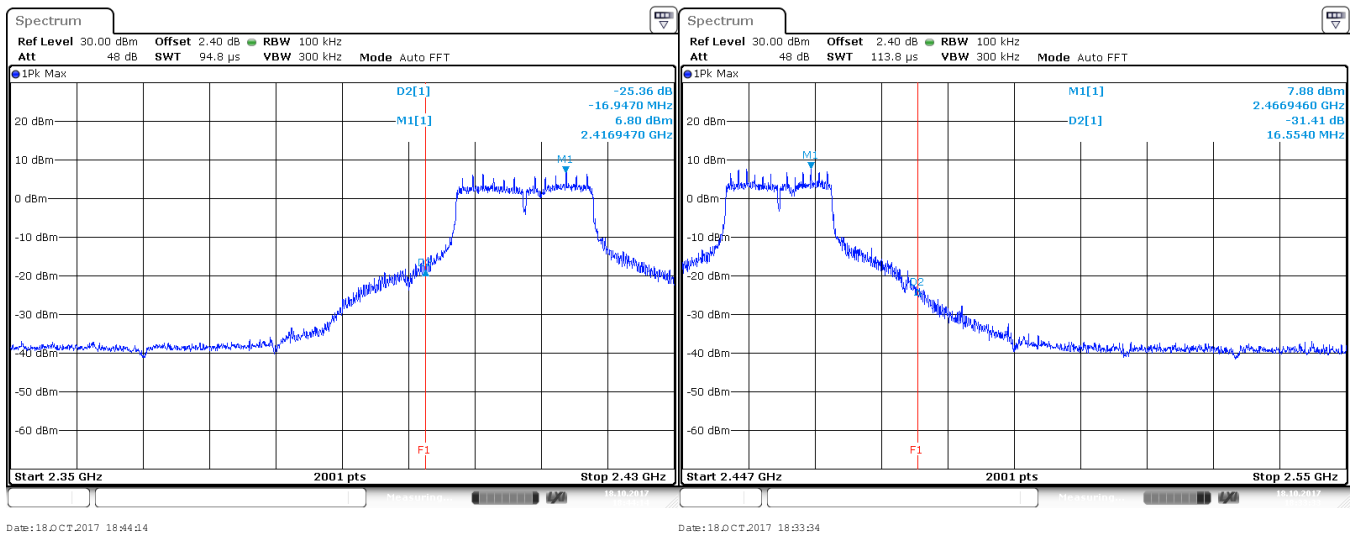
Note: The equipment calibration period is 1 year.

6.5 Test Data – DTS Bandedge

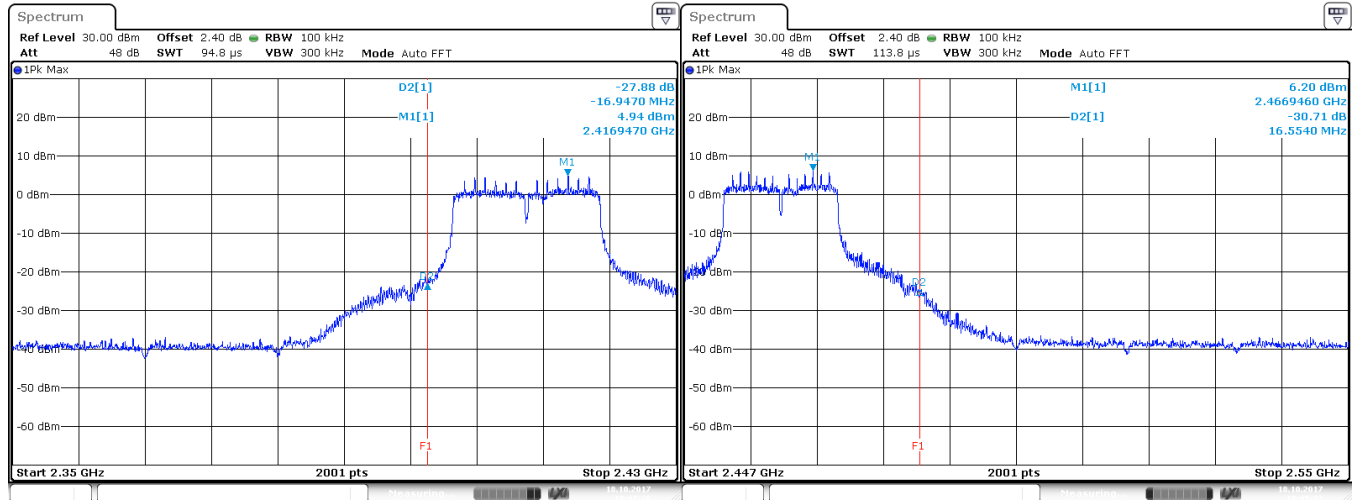
802.11b / 1Mbps
Lower band edge / Upper band edge
Channel 1 / Channel 11



802.11g / 6Mbps
Lower band edge / Upper band edge
Channel 1 / Channel 11



802.11n (HT20) / MCS0
Lower band edge / Upper band edge
Channel 1 / Channel 11

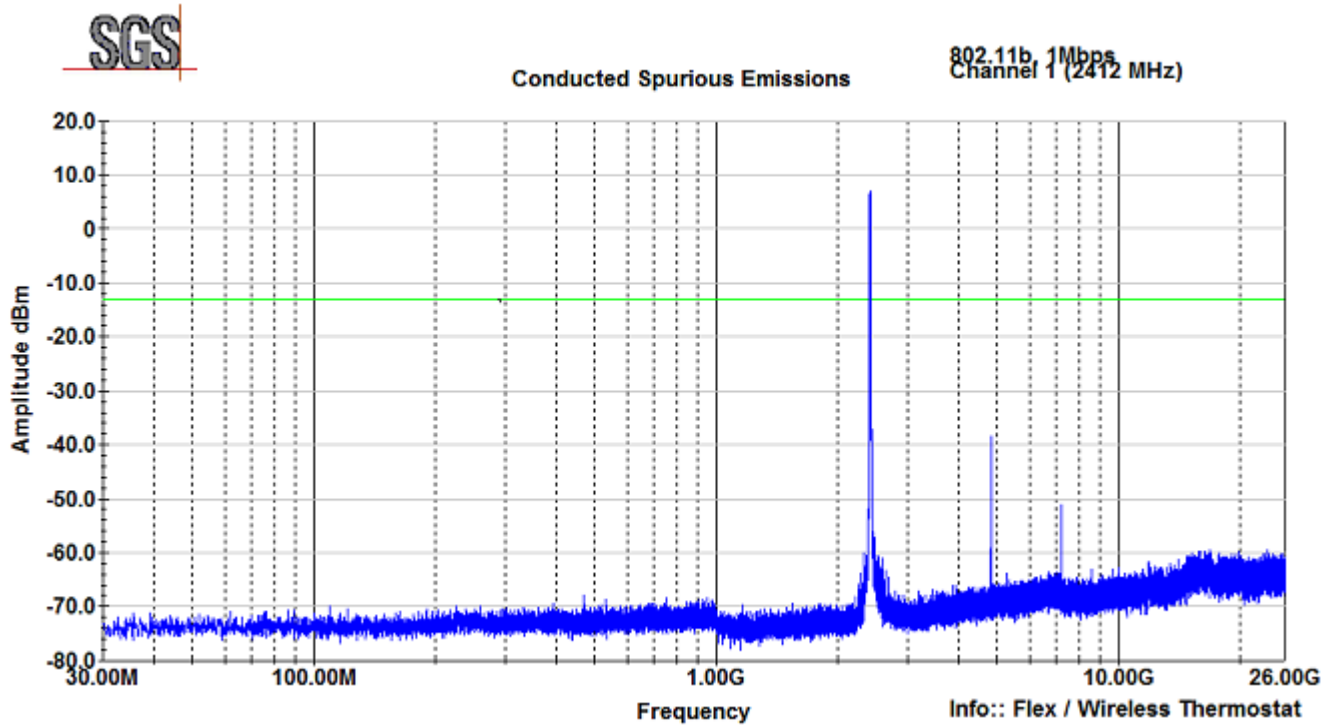


Date: 18 OCT 2017 18:37:27

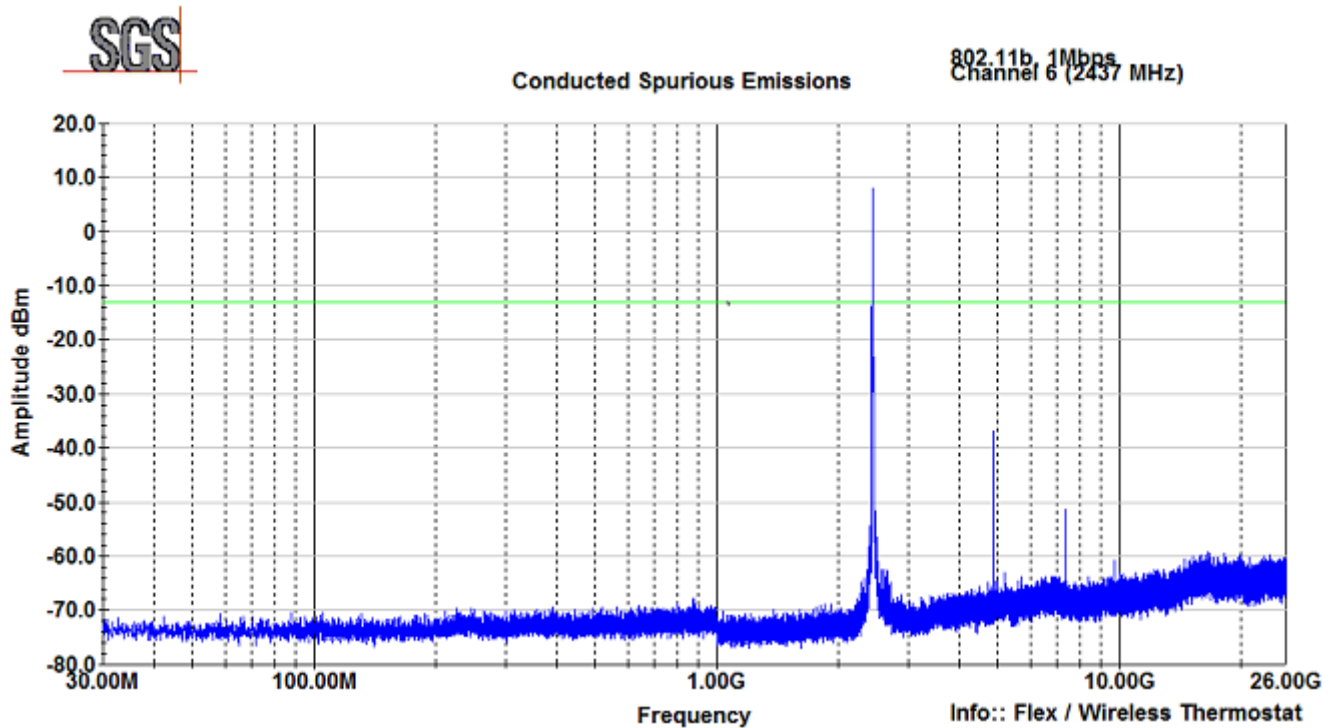
Date: 18 OCT 2017 18:35:27

6.6 Test Data – Conducted Spurious Emissions

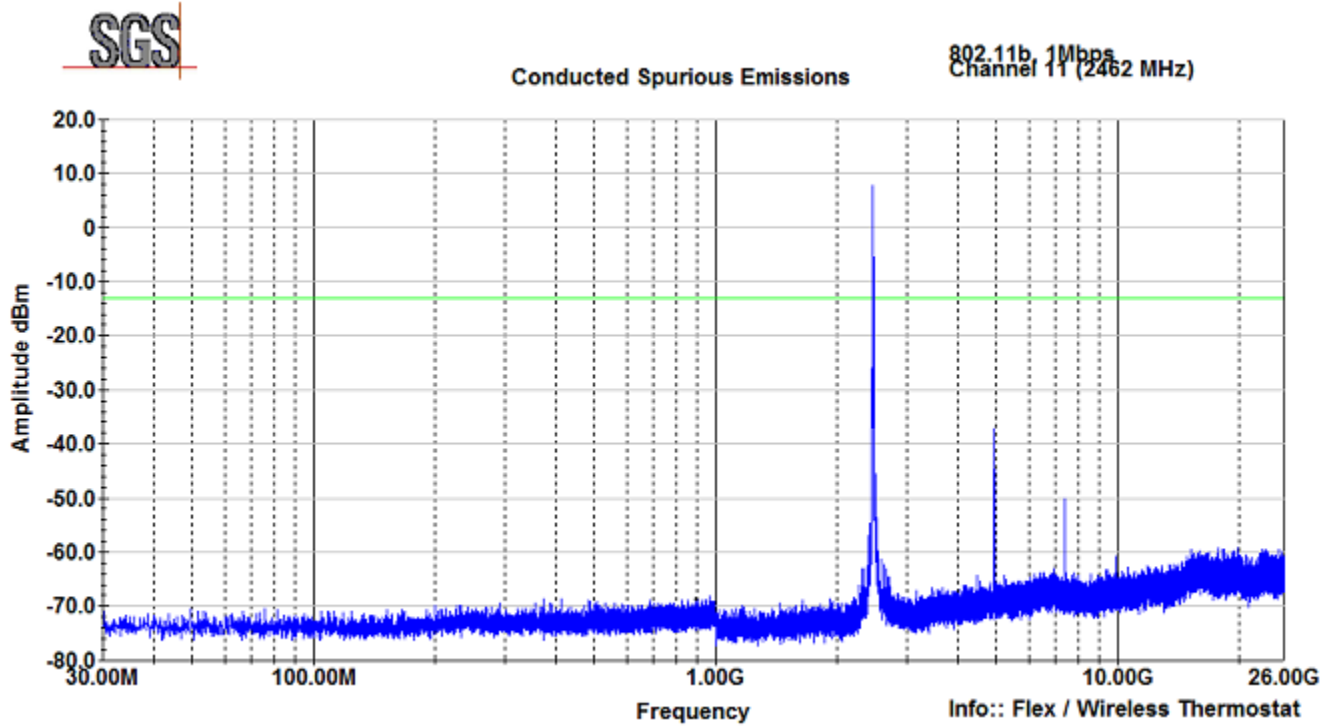
Conducted Spurs –Channel 1



Conducted Spurs –Channel 6



Conducted Spurs –Channel 11



7 Field Strength of Spurious Radiation

7.1 Test Result

Test Description	Test Specification		Test Result
Spurious Emissions	15.247 (d) and 15.209	RSS-247 S5.5	Compliant

7.2 Test Method

Radiated spurious emissions measurements were recorded with the device configured to transmit at the lowest, middle, and highest channels. The frequency range investigated was up through the 10th harmonic of the fundamental transmit frequency. The methods defined in ANSI C63.10: 2013 were used.

Lowest, middle, and highest channels were investigated. Only the worst-case (802.11b, 1Mbps) was reported except at the restricted band edges where all three modulations were measured.

Test distance:

- 9k to 30 MHz – Near field prescan to determine if there were any emissions.
- 30 to 1000 MHz - The EUT to measurement antenna distance was 3 meters
- 1 to 18 GHz - The EUT to measurement antenna distance was 3 meters
- 18 to 26 GHz - The EUT to measurement antenna distance was 1 meter

Limits within restricted bands of operation:

Frequency	Limits ⁽¹⁾		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
30 - 88 MHz	100	40 ⁽²⁾	--
88 - 216 MHz	150	43.5 ⁽²⁾	--
216 - 960 MHz	200	46 ⁽²⁾	--
960 - 1000 MHz	500	54 ⁽²⁾	--
1 - 40 GHz	500	54 ⁽³⁾	74

(1) These limits are applicable to emissions outside of the intentional transmit frequency band.

(2) Quasi-peak limit

(3) Average limit

7.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.5 °C

Relative Humidity: 44.2 %

7.4 Test Equipment

Test End Date: 31-Oct-2017

Tester: JOP

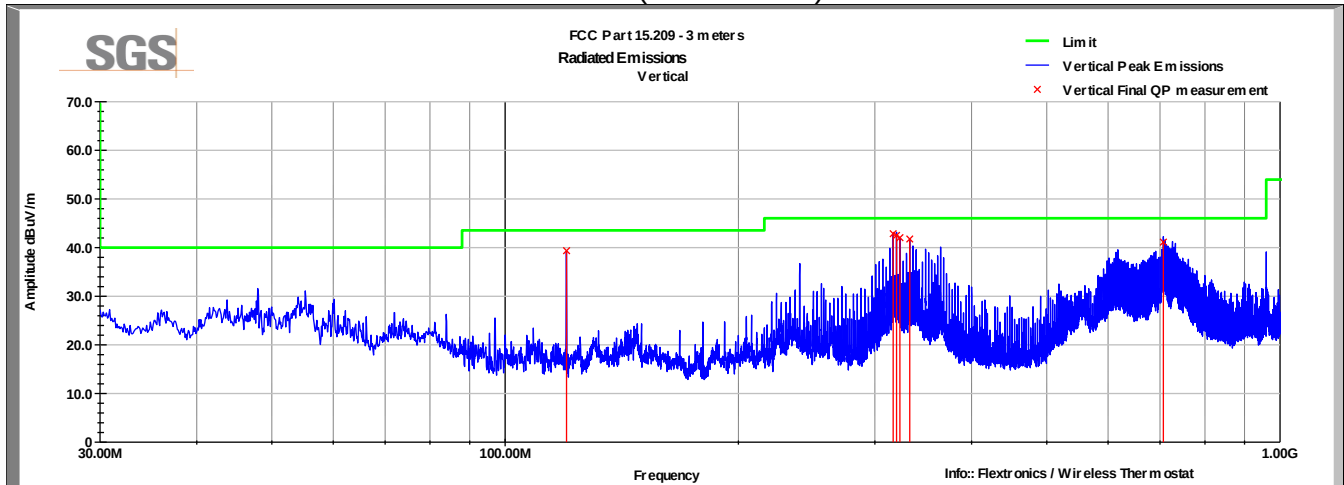
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	25-Jul-2018
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	25-Apr-2018
ANTENNA, BILOG	CBL 6143A	TESEQ	B085931	6-Dec-2017
RF CABLE	SF106	HUBER & SUHNER	B079661	25-Jul-2018
RF CABLE	SF106	HUBER & SUHNER	B079713	24-Jul-2018
RF CABLE	SF106	HUBER & SUHNER	B079659	25-Jul-2018
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2018
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	22-Feb-2018
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2018
HORN(SMALL)	LB-180400-20-C-KF	A-INFO	15007	21-Mar-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079824	26-Jul-2018
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	28-Jul-2018

Note: The equipment calibration period is 1 year.

7.5 Peak Plots

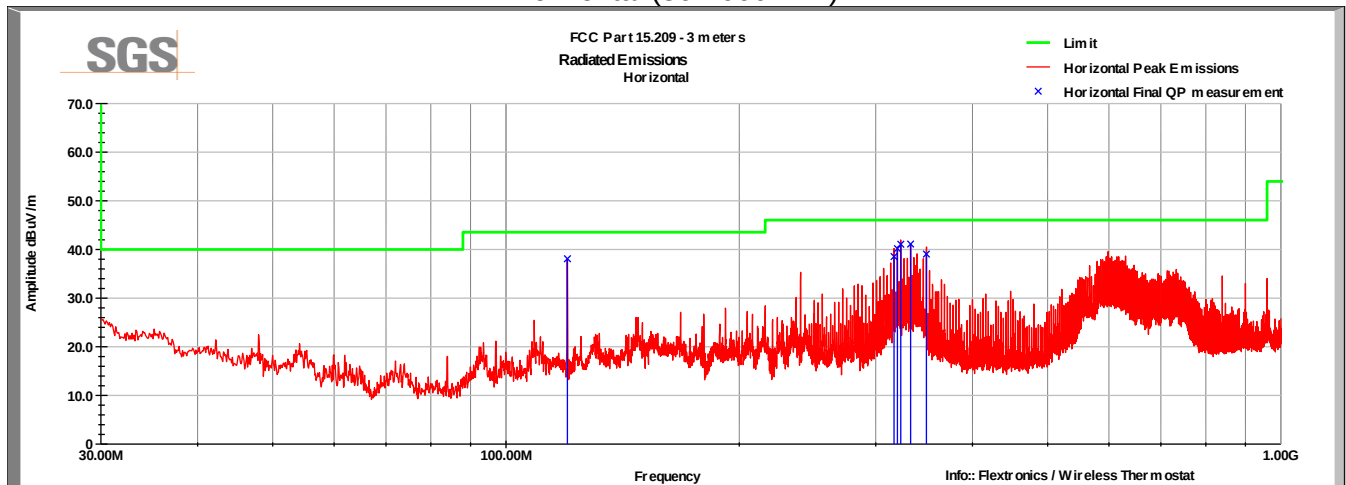
No emissions were detected in the range 9kHz to 30MHz.

Channel 1
Vertical (30-1000MHz)



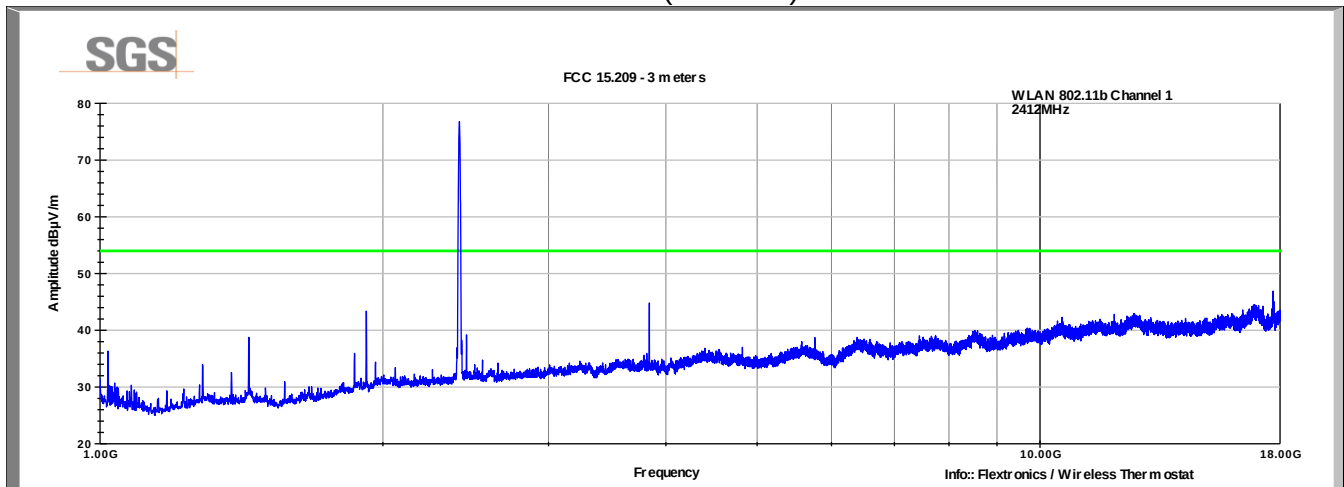
Below 1GHz, there was no discernible difference among the different transmit channels.

Horizontal (30-1000MHz)



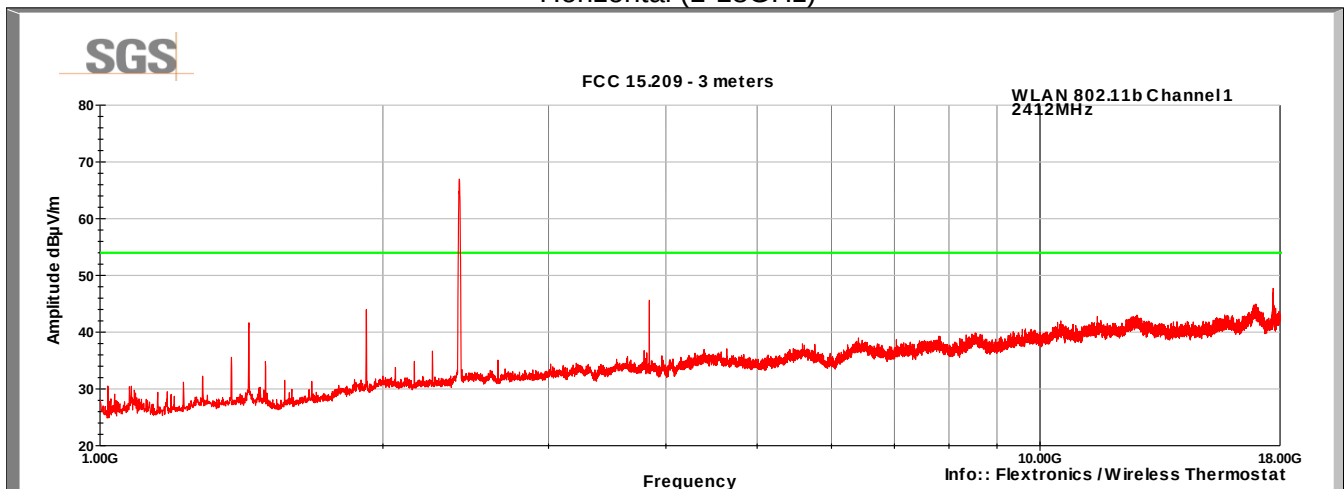
Below 1GHz, there was no discernible difference among the different transmit channels.

Channel 1 Vertical (1-18GHz)



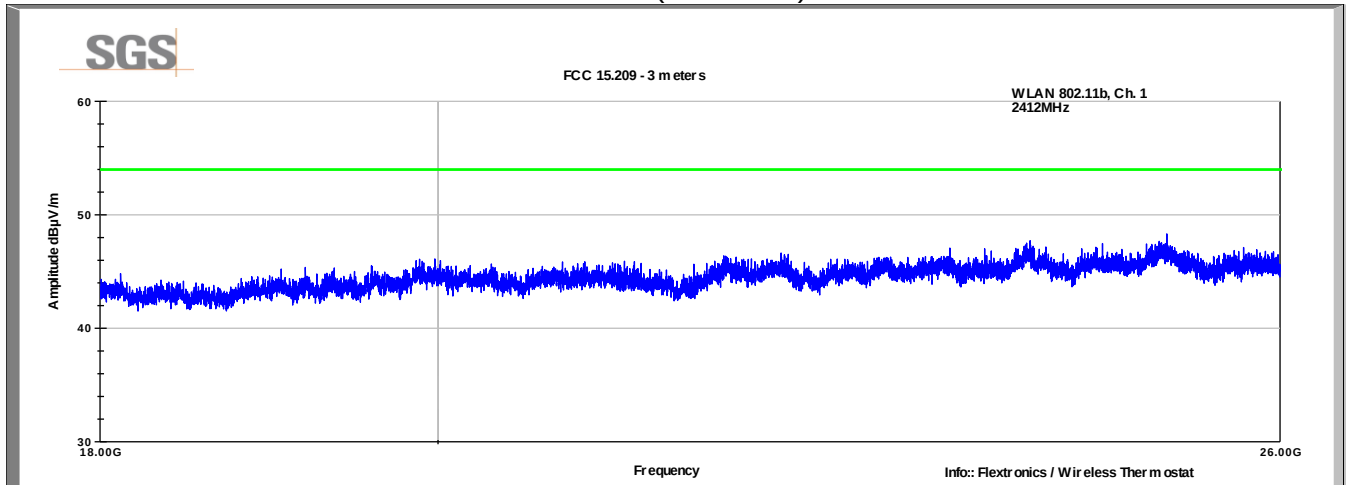
Antenna port was terminated into 50-Ohms

Horizontal (1-18GHz)

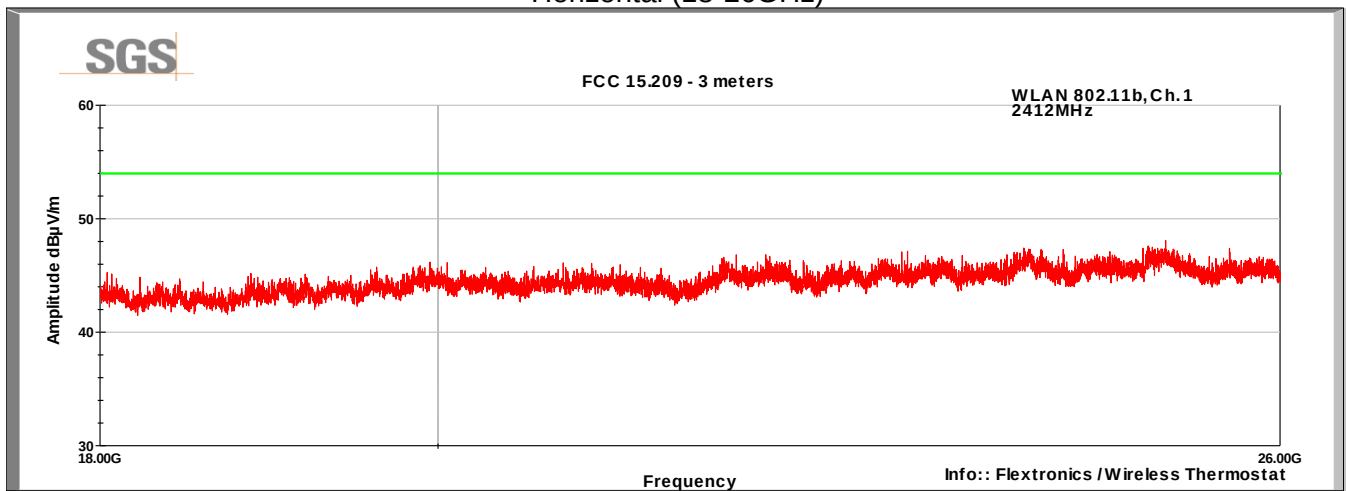


Antenna port was terminated into 50-Ohms

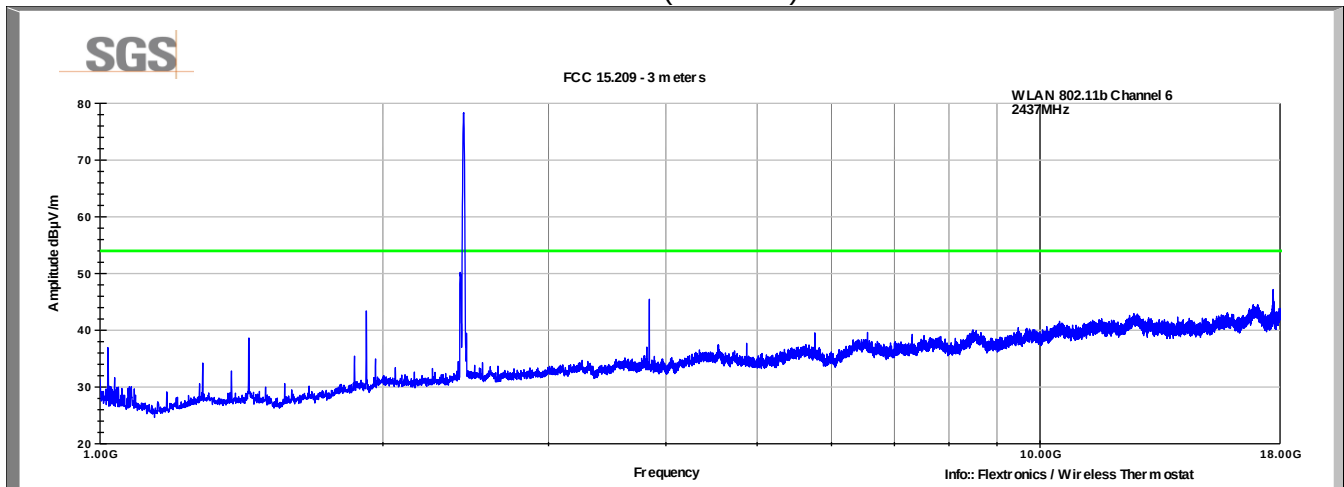
Channel 1
Vertical (18-26GHz)



Horizontal (18-26GHz)

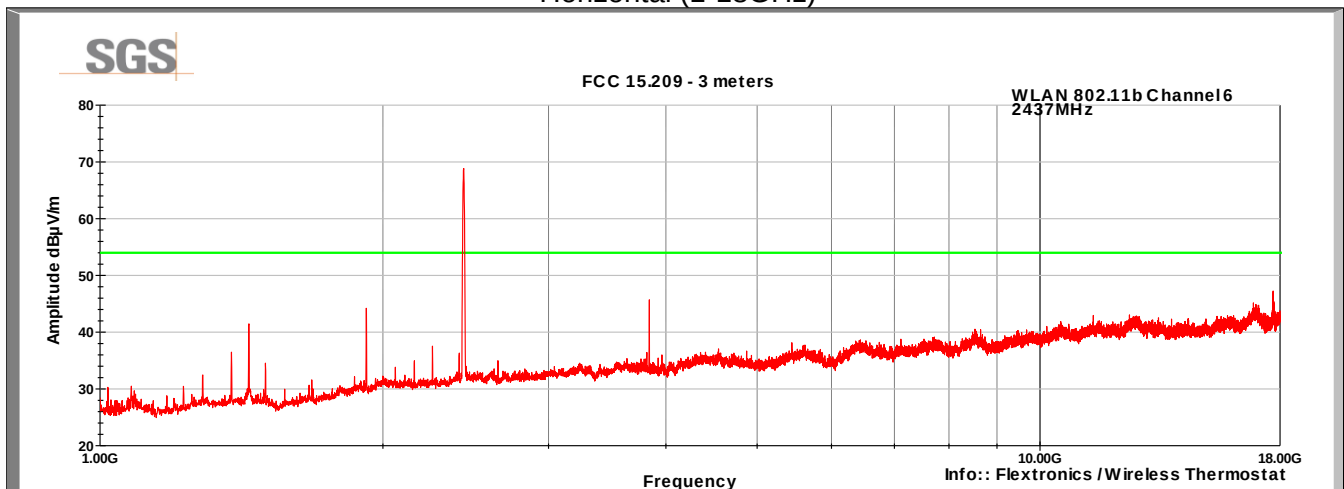


Channel 6 Vertical (1-18GHz)



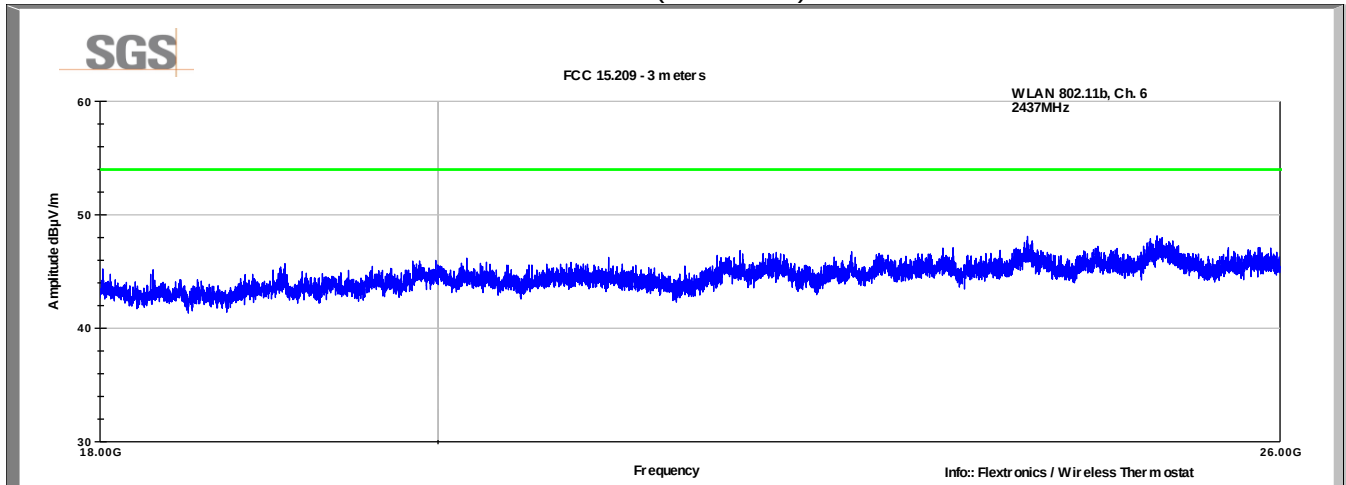
Antenna port was terminated into 50-Ohms

Horizontal (1-18GHz)

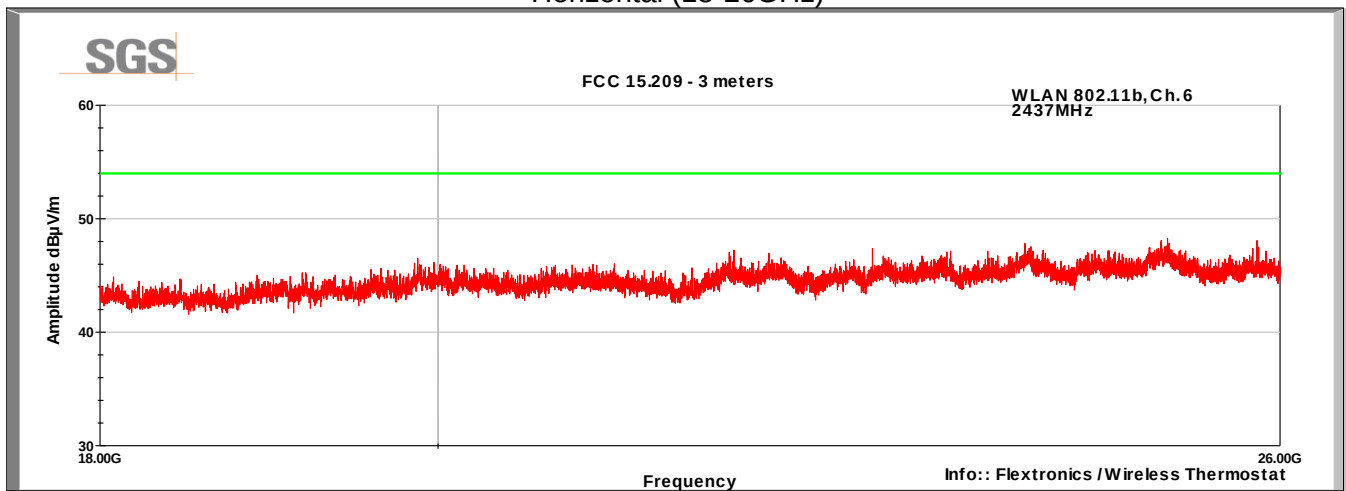


Antenna port was terminated into 50-Ohms

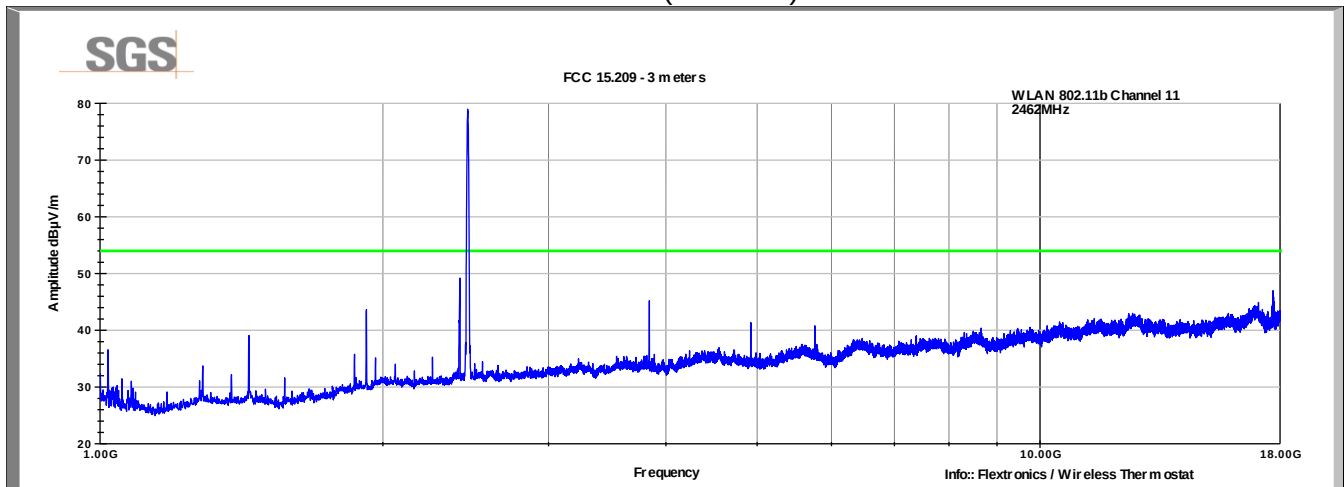
Channel 6
Vertical (18-26GHz)



Horizontal (18-26GHz)

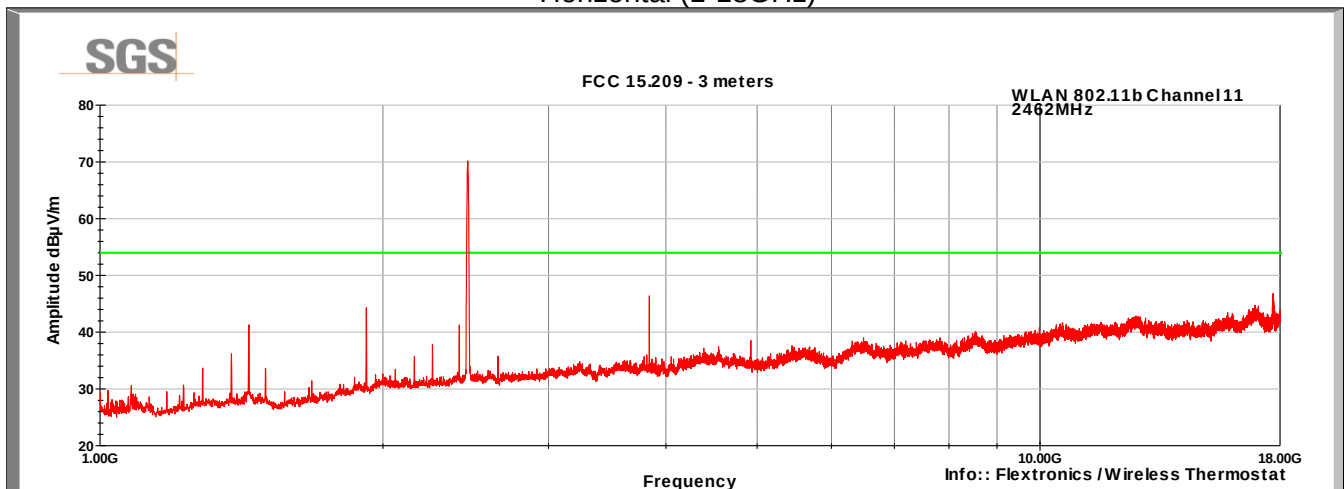


Channel 11 Vertical (1-18GHz)



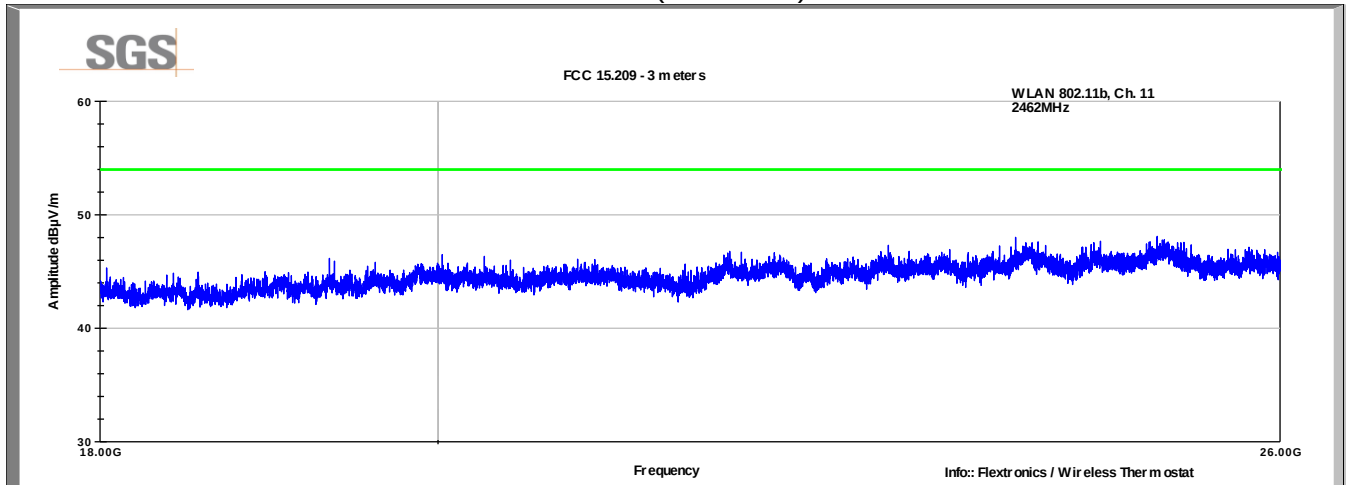
Antenna port was terminated into 50-Ohms

Horizontal (1-18GHz)

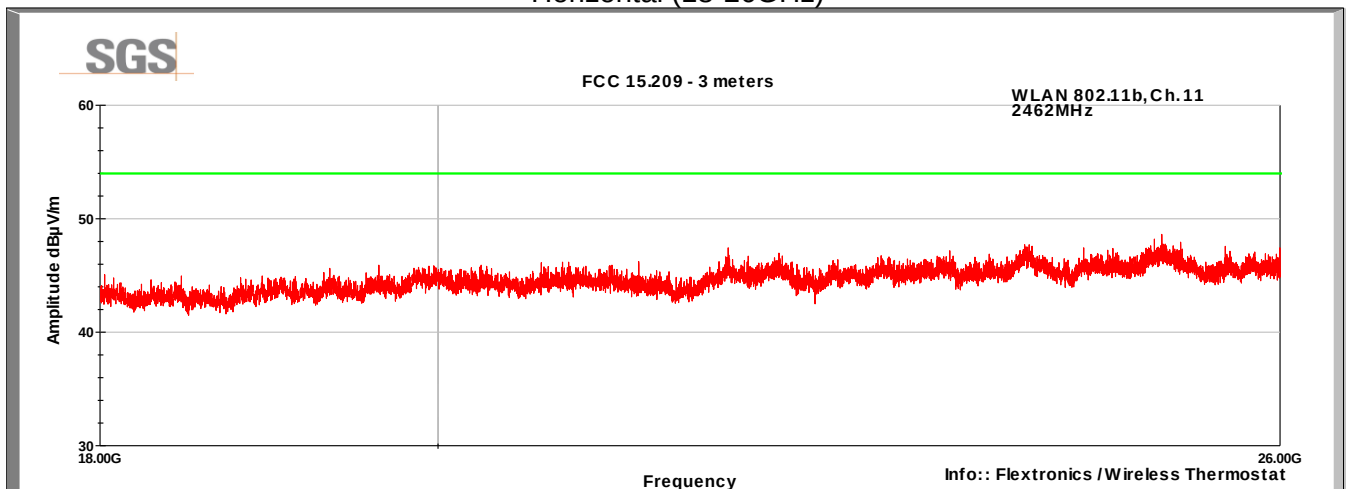


Antenna port was terminated into 50-Ohms

Channel 11
Vertical (18-26GHz)



Horizontal (18-26GHz)



7.6 Tabular Data

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.02	58.6	V	82.0	100.0	13.4	1.0	33.7	39.4	43.5	-4.2
316.80	60.0	V	266.0	178.0	14.6	1.7	33.5	42.9	46.0	-3.2
320.00	59.5	V	271.0	193.0	14.7	1.7	33.5	42.5	46.0	-3.5
323.19	58.9	V	259.0	205.0	14.8	1.7	33.5	42.0	46.0	-4.0
332.80	58.8	V	0.0	119.0	14.6	1.8	33.5	41.8	46.0	-4.3
707.19	51.5	V	254.0	157.0	20.2	2.6	33.2	41.1	46.0	-4.9
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
120.02	57.3	H	281.0	250.0	13.4	1.0	33.7	38.1	43.5	-5.4
316.79	55.7	H	220.0	100.0	14.6	1.7	33.5	38.5	46.0	-7.5
320.00	57.2	H	230.0	100.0	14.7	1.7	33.5	40.2	46.0	-5.9
323.19	58.0	H	151.0	299.0	14.8	1.7	33.5	41.1	46.0	-5.0
332.80	58.2	H	157.0	296.0	14.6	1.8	33.5	41.1	46.0	-4.9
348.80	55.6	H	336.0	305.0	15.2	1.8	33.5	39.0	46.0	-7.0
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Note: There was no discernible difference in the measurement data below 1GHz when transmitting at different channels. QP measurements were only recorded with the device transmitting on Channel 1.

8 Radiated Emissions at Band Edge / Restricted Band

8.1 Test Result

Test Description	Test Specification	Test Result
Field strength of spurious radiation	15.247 (d) and 15.209	Compliant

8.2 Test Method

Field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz for each modulation. Measurements were made using the conducted methods defined in Section 12 of FCC publication D01 DTS Meas Guidance v04. Conducted measurements across the entire band were used for showing compliance in all other restricted bands applying the same methods. These measurements were only recorded for the worst-case power: 802.11b, 1Mbps.

Offset Calculations (at restricted band edges):

Offset calculations so that conducted measurements on the spectrum analyzer in dBμV represent field strength measurements in dBμV/m.

$$\text{Offset} = -20\log(D) + 104.8 - 107 + \text{CL} + \text{DC} + \text{AG}$$

$$\text{Offset}_{3m} = -11.7 + \text{CL} + \text{DC} + \text{AG}$$

D = 3m Distance
CL = 1.1 dB Cable Loss
DC (802.11b) = 0 dB (98%) Duty Cycle Correction Factor
DC (802.11g) = 0.6 dB (88%) Duty Cycle Correction Factor
DC (802.11n) = 0.6 dB (87%) Duty Cycle Correction Factor
AG = 3.34 dB Antenna Gain

$$\text{Offset (802.11b)} = -7.3 \text{ dB}$$

$$\text{Offset (802.11g/n)} = -6.7 \text{ dB}$$

8.3 Test Site

3m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions

Temperature: 22.5°C

Relative Humidity: 41.6 %

8.4 Test Equipment

Test End Date: 19-Oct-2017

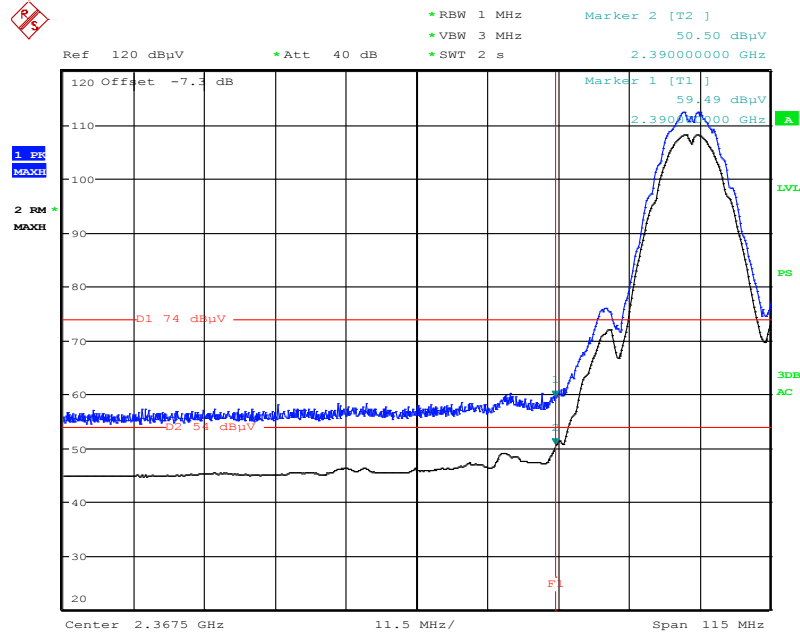
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	25-Apr-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	26-Jul-2018
FILTER, BAND REJECT (2450MHZ)	BRM50709	MICRO-TRONICS	B079790	27-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018

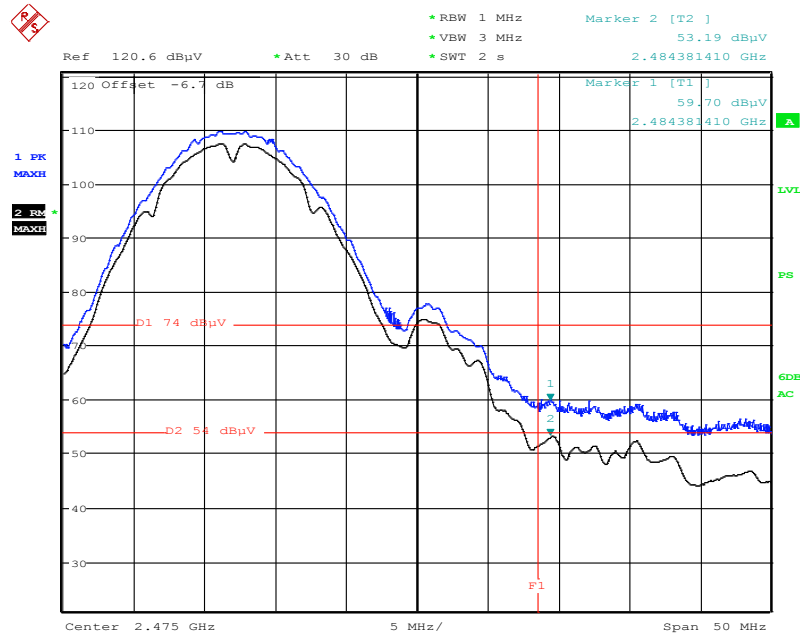
Note: The equipment calibration period is 1 year.

8.5 Test Data – Band Edge

802.11b

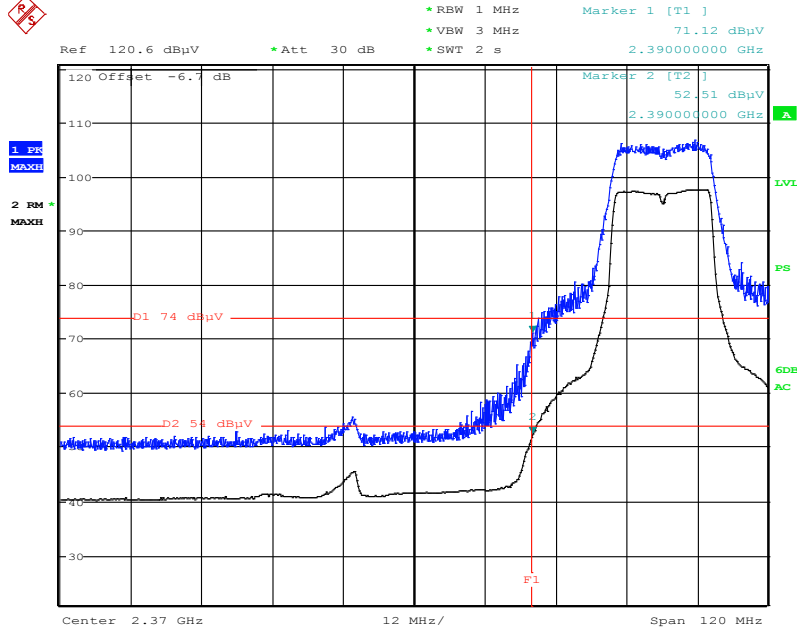


Date: 19.OCT.2017 08:07:56

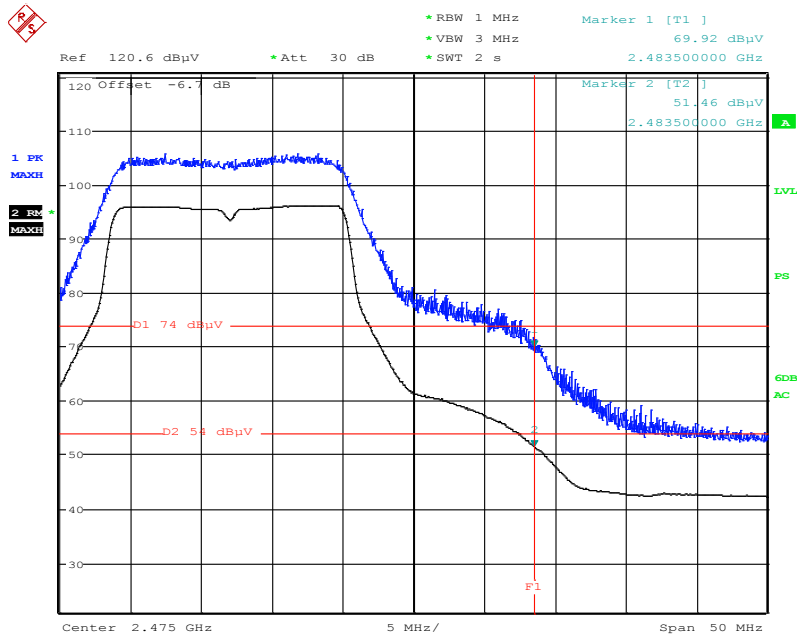


Date: 19.OCT.2017 08:57:39

802.11g

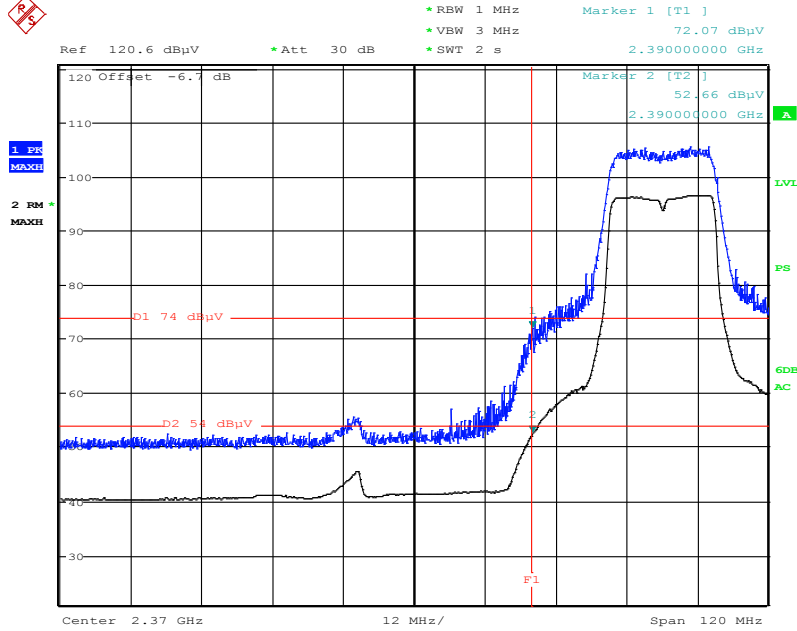


Date: 19.OCT.2017 08:38:11

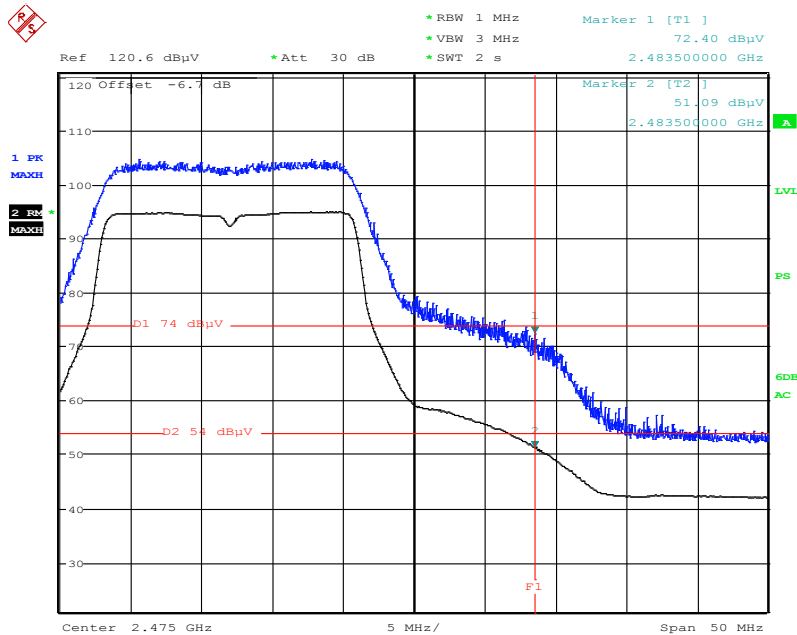


Date: 19.OCT.2017 08:55:04

802.11n (HT20)



Date: 19.OCT.2017 08:40:20

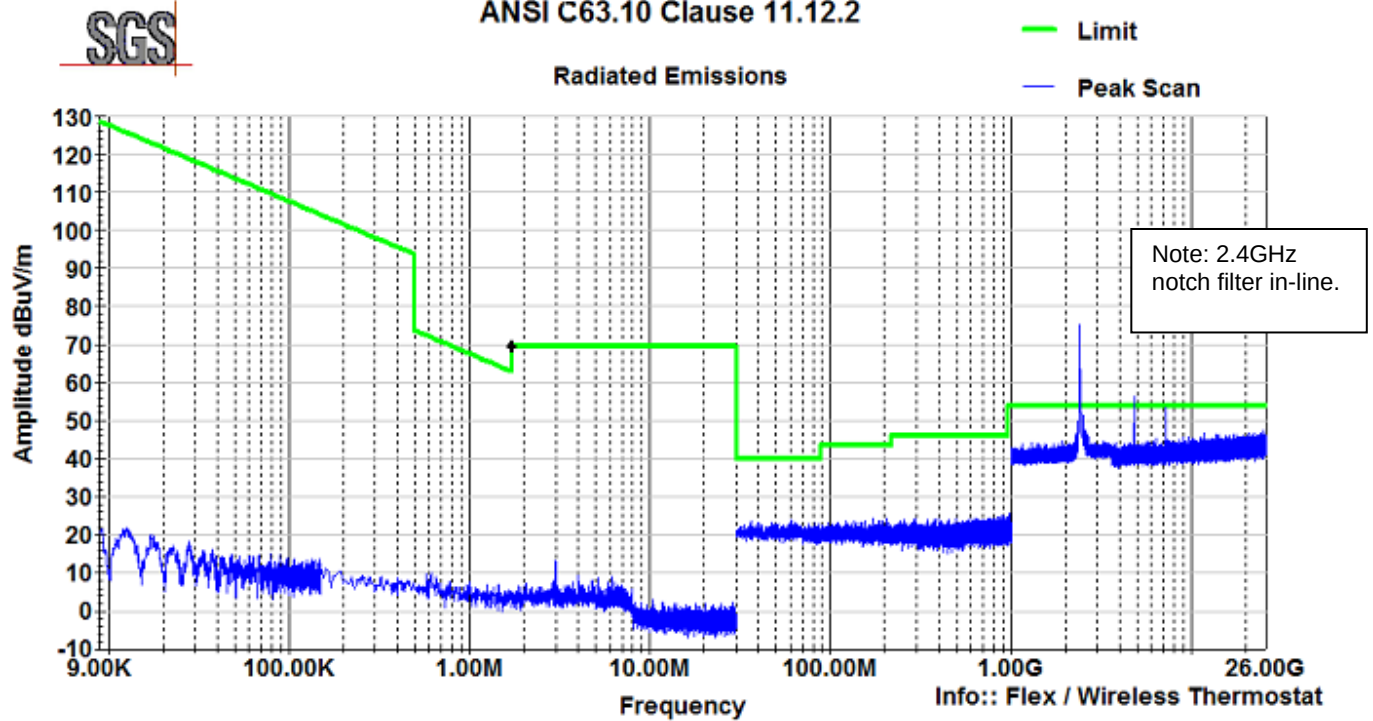


Date: 19.OCT.2017 08:49:23

8.6 Test Data – Restricted Bands

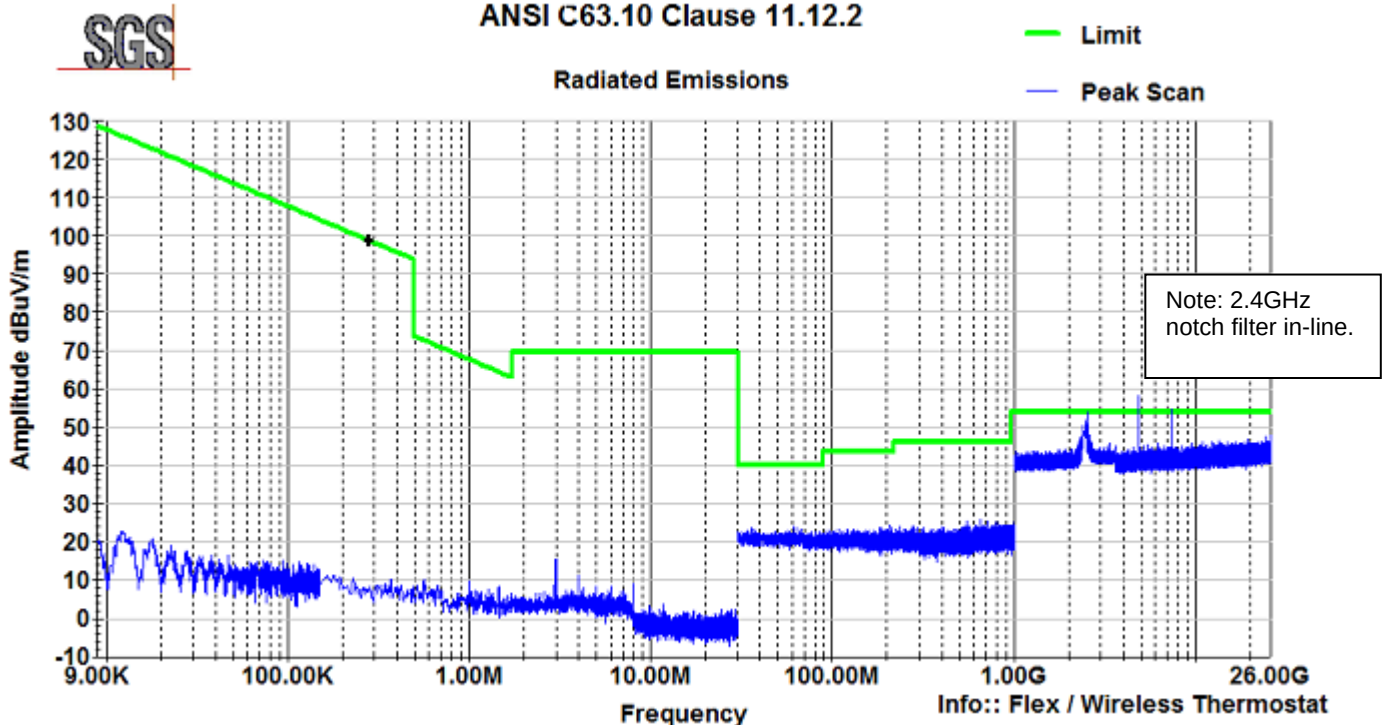
Channel 1 (802.11b, 1Mbps)

ANSI C63.10 Clause 11.12.2



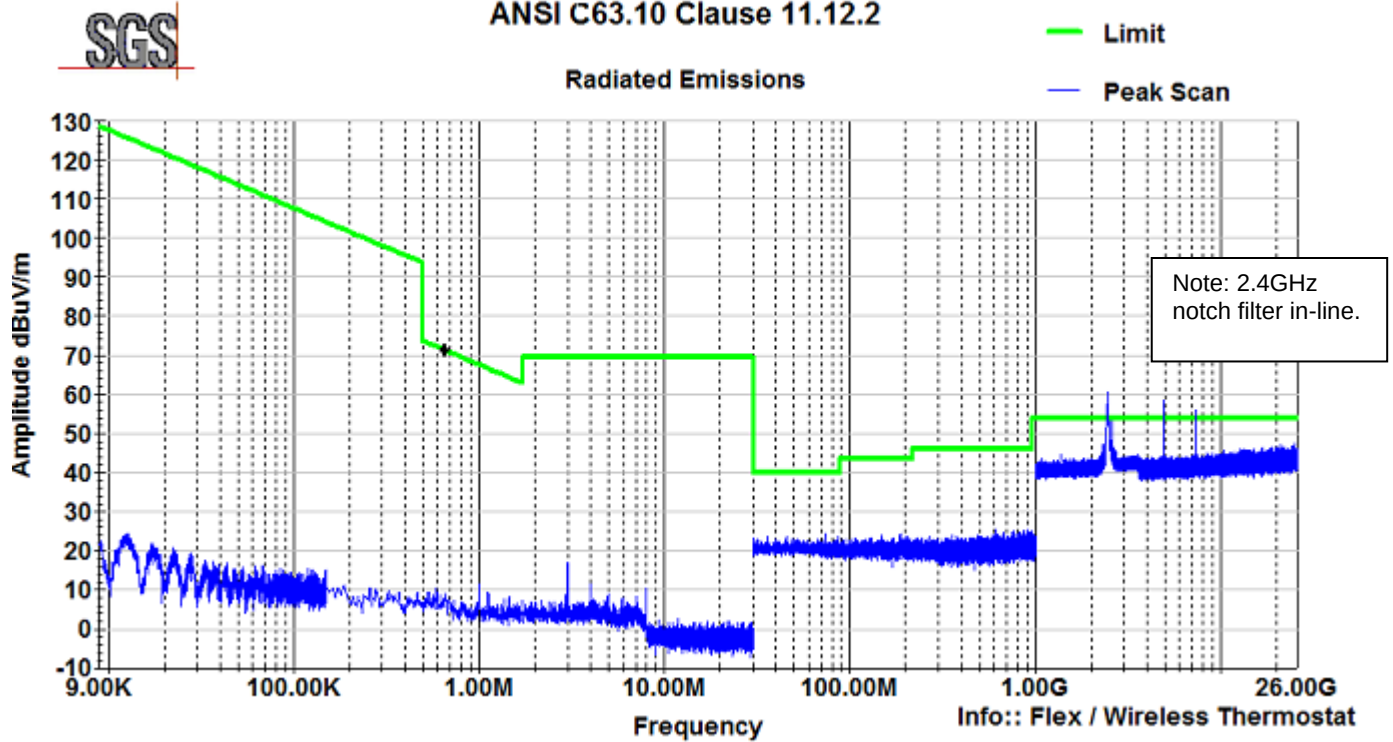
Channel 6 (802.11b, 1Mbps)

ANSI C63.10 Clause 11.12.2



Channel 11 (802.11b, 1Mbps)

ANSI C63.10 Clause 11.12.2



Frequency MHz	Raw Meas (dBuV)	Correction (dB/m)	Corr Value dBuV/m	Limit (dBuV/m)	Margin (dB)	Detector
Channel 1 (2412 MHz)						
4824.00	57.5	-1.0	56.5	74.0	-17.5	Peak
4824.00	51.8	-1.0	50.8	54.0	-3.2	Average
7236.00	54.0	-0.6	53.4	74.0	-20.6	Peak
7236.00	48.5	-0.6	47.9	54.0	-6.1	Average
Channel 6 (2437 MHz)						
4874.00	59.1	-1.0	58.1	74.0	-15.9	Peak
4874.00	53.7	-1.0	52.7	54.0	-1.3	Average
7311.00	54.9	-0.5	54.4	74.0	-19.6	Peak
7311.00	49.5	-0.5	49.0	54.0	-5.0	Average
Channel 11 (2462 MHz)						
4924.00	59.5	-1.0	58.5	74.0	-15.5	Peak
4924.00	54.0	-1.0	53.0	54.0	-1.0	Average
7386.00	56.5	-0.5	56.0	74.0	-18.0	Peak
7386.00	50.6	-0.5	50.1	54.0	-3.9	Average

9 Conducted Emissions

9.1 Test Result

Test Description	Basic Standards	Test Result
Conducted Emissions, Class B	RSS-GEN, Issue 4 ANSI C63.4:2014	Compliant

9.2 Test Method

With the receiver's resolution bandwidth was set to 9 kHz the exploratory scans were performed over the measuring frequency range (0.15MHz to 30MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)	Class B Limits (dBuV) CISPR
0.15 to 0.5 MHz	Avg 66 QP 79	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 60 QP 73	Avg 46 Pk 56
5 to 30 MHz	Avg 60 QP 73	Avg 50 Pk 60

9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.5°C

Relative Humidity: 42.8%

9.4 Test Equipment

Test End Date: 17-Oct-2017

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	25-Apr-2018
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B087573	16-Nov-2017
RF CABLE	CBL-25FT-NMNM	MINI-CIRCUITS	B094941	25-Jul-2018

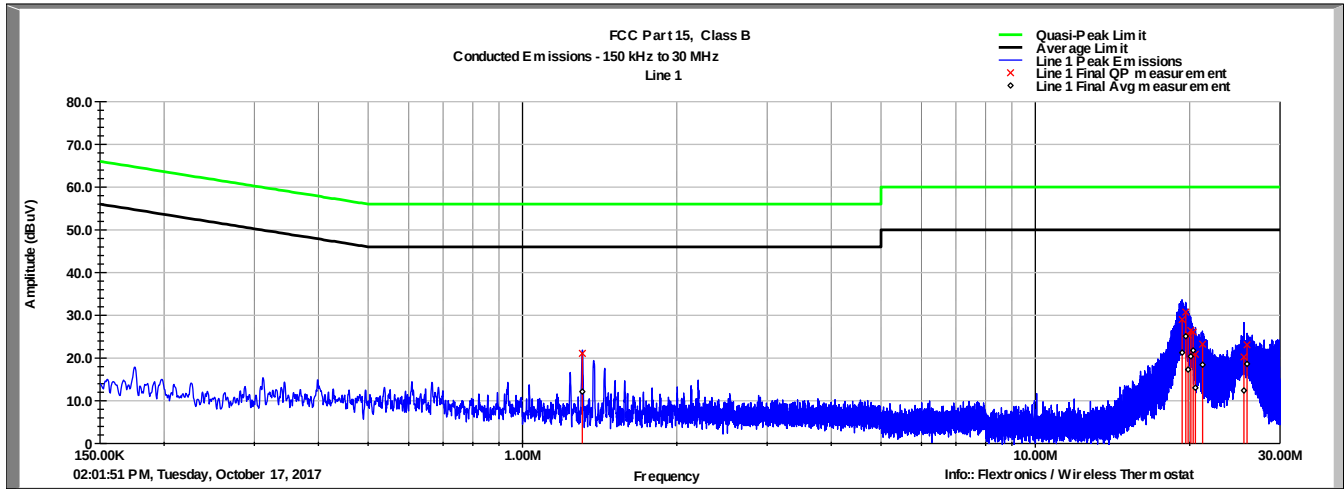
Note: The equipment calibration period is 1 year.

Software:

"Conducted Emissions" TILE! profile dated Dec 2015

9.5 Test Data

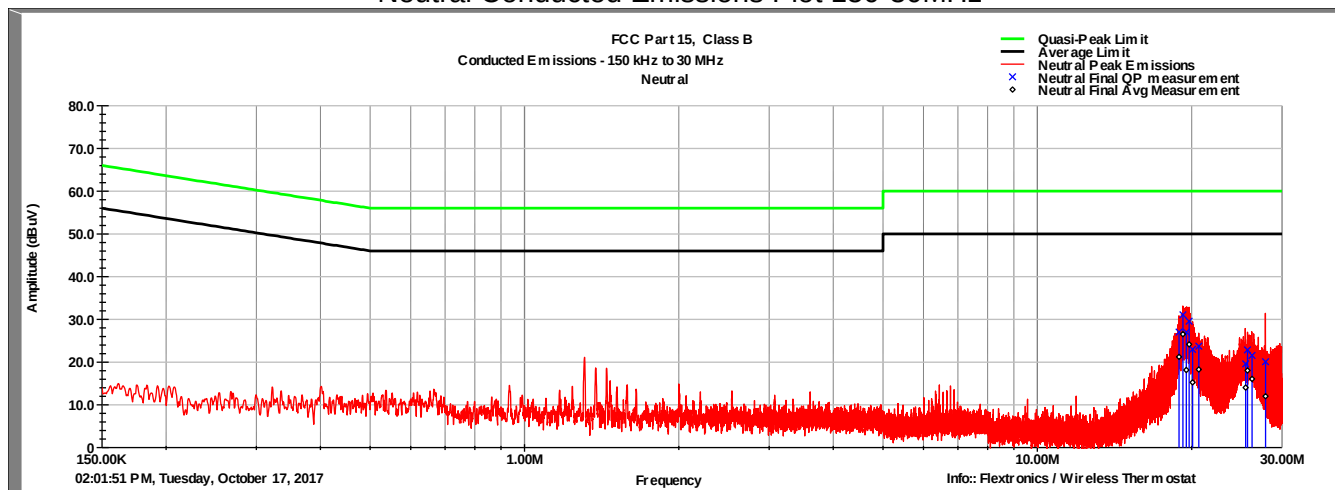
Line 1 Conducted Emissions Plot 150-30MHz



Line 1 Conducted Emissions Data 150-30MHz

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
1.308	21.1	56.0	-34.9	12.1	46.0	-33.9
19.335	29.0	60.0	-31.0	21.3	50.0	-28.7
19.655	30.7	60.0	-29.3	25.1	50.0	-24.9
19.860	25.4	60.0	-34.6	17.3	50.0	-32.7
20.098	26.4	60.0	-33.6	20.4	50.0	-29.6
20.313	26.1	60.0	-33.9	21.8	50.0	-28.2
20.520	20.9	60.0	-39.1	13.0	50.0	-37.0
21.189	23.2	60.0	-36.8	18.4	50.0	-31.6
25.520	20.2	60.0	-39.8	12.4	50.0	-37.6
25.878	23.1	60.0	-36.9	18.6	50.0	-31.4

Neutral Conducted Emissions Plot 150-30MHz



Neutral Conducted Emissions Data 150-30MHz

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
18.893	27.0	60.0	-33.0	21.2	50.0	-28.8
19.225	31.0	60.0	-29.0	26.5	50.0	-23.5
19.528	27.0	60.0	-33.0	18.1	50.0	-31.9
19.771	29.6	60.0	-30.4	24.1	50.0	-25.9
20.084	23.0	60.0	-37.0	15.2	50.0	-34.8
20.646	23.7	60.0	-36.3	18.3	50.0	-31.7
25.482	19.6	60.0	-40.4	14.0	50.0	-36.0
25.695	22.8	60.0	-37.2	18.0	50.0	-32.0
26.224	21.6	60.0	-38.4	16.0	50.0	-34.0
27.865	20.1	60.0	-39.9	12.0	50.0	-38.0

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	31 October 2017