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Spectrum Brands
TEST REPORT

SCOPE OF WORK
FCC 15.247 AND ISED RSS-247 TESTING – 9389-GED24500-GIG

REPORT NUMBER
104044098LAX-001

ISSUE DATE
August 15, 2019

REVISED DATE:
December 10, 2019

PAGES
47

DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. December 2017

EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 104044098LAX-001
Project Number: G104044098

Report Issued Date: August 15, 2019
Report Revised Date: December 10, 2019

Model(s) Tested: 9389-GED24500-GIG (Kwikset 939 / Weiser GED2500)
Models Partially Tested: 9389-GED24500-GIG (Kwikset 938 / Weiser GED2400)

Standards: **FCC CFR47 Part 15 Subpart C, August 2019**
Intentional Radiator
§15.247, Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ISED RSS-247 Issue 2, February 2017
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

ISED RSS-Gen Issue 5, April 2018
General Requirements for Compliance of Radio Apparatus

Tested by:
Intertek
25791 Commercentre Drive
Lake Forest, CA 92630
USA

Client:
Spectrum Brands
19701 DaVinci
Foothill Ranch, CA 92610
USA

Report prepared by

Grace Lin
EMC Staff Engineer

Report reviewed by

Suresh Kondapalli
Sr. Staff Engineer

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. 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 **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	-
4	Description of Equipment Under Test and Variant Models	-
5	System Setup and Method	-
6	6 dB Bandwidth and 99% Bandwidth (FCC §15.247(a)(2), ISED RSS-247 §5.2a; ISED RSS-Gen §6.7)	Compliant
7	Maximum Peak Conducted Output Power at Antenna Terminals (FCC §15.247(b)(3), ISED RSS-247 §5.4d)	Compliant
8	Maximum Power Spectral Density (FCC §15.247(e), ISED RSS-247 §5.2b)	Compliant
9	Conducted Spurious Emissions (FCC §15.247(d), ISED RSS-247 §5.5)	Compliant
10	Radiated Spurious Emissions (FCC §15.247(d), §15.209, §15.205, ISED RSS-247 §5.5, ISED RSS-Gen §8.9)	Compliant
11	AC Mains Conducted Emissions (FCC §15.207, ISED RSS-Gen §8.8)	Not Applicable*
12	Revision History	-

*: The EUT is battery powered

3 Client Information

This EUT was tested at the request of:

Client: Spectrum Brands (formerly Kwikset Corp.)
19701 DaVinci
Foothill Ranch, CA 92610
USA

Contact: Thuan Nguyen
Telephone: 949 672-4452
Email: thuan.nguyen@spectrumbrands.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Spectrum Brands (formerly Kwikset Corp.)
19701 DaVinci
Foothill Ranch, CA 92610
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Wireless Deadbolt	Spectrum Brands	9389-GED24500-GIG (Kwikset 939 / Weiser GED2500)	TCH1
Wireless Deadbolt	Spectrum Brands	9389-GED24500-GIG (Kwikset 938 / Weiser GED2400), for RSE only	KPD1

Receive Date:	8/7/2019	Test Started	8/7/2019
Received Condition:	Good	Test Ended	8/12/2019
Type:	Production		

Receive Date:	12/2/2019 (938)	Test Started	12/9/2019 (938, RSE only)
Received Condition:	Good	Test Ended	12/10/2019 (938, RSE only)
Type:	Production		

Description of Equipment Under Test (provided by client)

The equipment under test is a wireless deadbolt with integrated Bluetooth Low Energy (BLE) transceiver and containing a certified Wi-Fi transmitter module. This test report covers for the BLE transmitter.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
6 Vdc	-	-	-

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Test Mode – Continuously Transmitting normal modulated signal

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	Under test mode, the EUT was programmed to run Bluetooth DTM Mode – Modulated with continuous packet transmit.

Radio/Receiver Characteristics	
Frequency Band(s)	2402 MHz – 2480 MHz
Modulation Type(s)	GFSK
Maximum Output Power	11.62 dBm (14.52 mW)
Test Channels	2402 MHz, 2440 MHz, 2480 MHz
Occupied Bandwidth	744.3 kHz (6 dB), 1034 kHz (99%)
Frequency Hopper: Number of Hopping Channels	Not Applicable
Frequency Hopper: Channel Dwell Time	Not Applicable
Frequency Hopper: Max interval between two instances of use of the same channel	Not Applicable
MIMO Information (# of Transmit and Receive antenna ports)	Not Applicable
Equipment Type	Standalone
Antenna Type and Gain	Permanent attached SMD antenna. Antenna Gain: 2.0 dBi*

*: Antenna gain was provided by Spectrum Brands. Intertek takes no responsibility for the accuracy of the antenna gain.

Variant Models:

The following variant models were not tested as part of this evaluation but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

- The model name of "9389-GED24500-GIG" represents four models: Kwikset 938, Weiser GED2400, Kwikset 939, and Weiser GED2500.
- Kwikset 938 is identical to Weiser GED2400. Kwikset 939 is identical to Weiser GED2500. Different model names are for different markets.
- The difference between Kwikset 938 / Weiser GED2400 and Kwikset 939 / Weiser GED2500 is that Kwikset 938 / Weiser GED2400 uses a keypad and Kwikset 939 / Weiser GED2500 uses a touchscreen. Both Kwikset 938 / Weiser GED2400 and Kwikset 939 / Weiser GED2500 use the same interior PCB bare board where the radios reside. The exact differences between Kwikset 938 / Weiser GED2400 and Kwikset 939 / Weiser GED2500 can be found in the operational description.

5 System Setup and Method

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	None	-	-	-	-

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None	-	-	-

5.1 Method:

Configuration as required by ANSI C63.10-2013.

5.2 Test Setup Block Diagram:

6 DTS (6 dB) Bandwidth and 99% Bandwidth

6.1 Requirement(s)

The minimum DTS (6 dB) bandwidth shall be at least 500 kHz.

6.2 Method

A. The procedure described in Subclause 11.8 of ANSI C63.10-2013 was utilized to determine the DTS (6 dB) bandwidth.

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 x RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

B. The following procedure was used for measuring 99% power bandwidth.

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.
d) Step a) through step c) might require iteration to adjust within the specified range.
e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f) Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

TEST SITE:

The test is performed in the EMC laboratory located at 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility meets the requirements of CISPR 16-1-4 and has been accredited by A2LA. ISED test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

The expanded uncertainty (k=2) is 1.3 dB.

6.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1016	Barometer Temp/Humidity	Omega	IBTHX-W	18300406	08/18/2018	08/18/2019

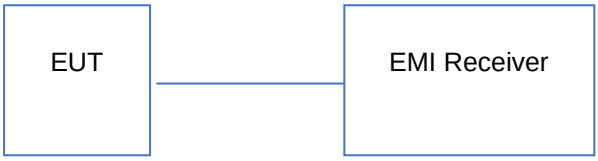
Software Utilized:

Name	Manufacturer	Version	Profile
N/A	N/A	N/A	N/A

6.4 Results:

The sample tested was found to Comply.

6.5 Setup Diagram:

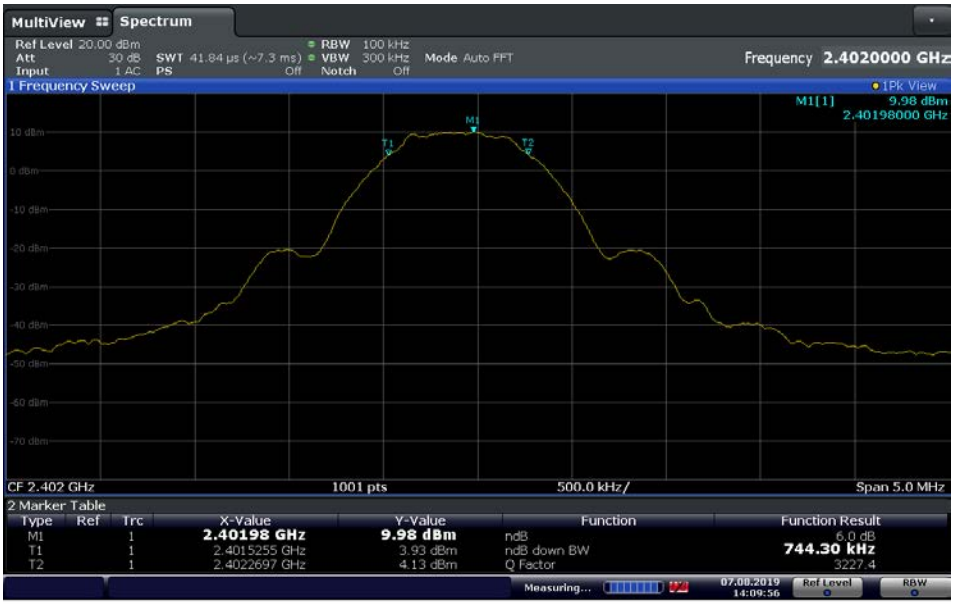


6.6 Plots/Data:

Frequency (MHz)	6 dB Bandwidth (kHz)	99% Bandwidth (kHz)
2402	744.3	1034
2440	729.3	1034
2480	729.3	1030

Note: The antenna port of the EUT was connected directly to the input of the measuring EMI receiver. The RF level in the plots is relative and is not the indication of RF output power.

6 dB Bandwidth, 2402 MHz:

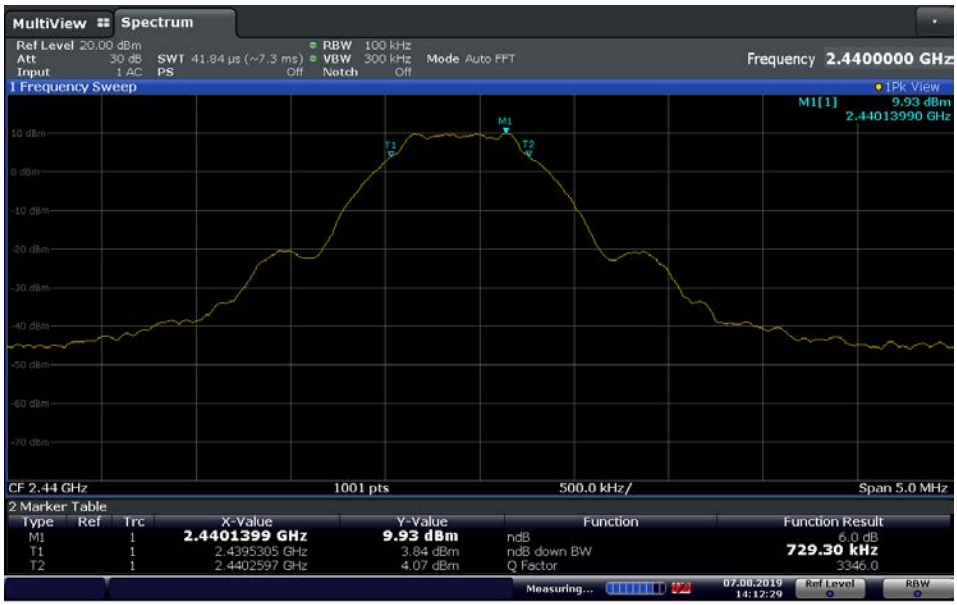


14:09:57 07.08.2019

99% Bandwidth, 2402 MHz:

14:21:44 07.08.2019

6 dB Bandwidth, 2440 MHz:



14:12:30 07.08.2019

99% Bandwidth, 2440 MHz:

14:23:24 07.08.2019

6 dB Bandwidth, 2480 MHz:

14:14:30 07.08.2019

99% Bandwidth, 2480 MHz:

14:25:24 07.08.2019

Test Personnel:	Grace Lin	Test Date:	08/07/2019
Product Standard:	FCC §15.247, ISED RSS-247	Limit Applied:	FCC §15.247, ISED RSS-247
Input Voltage:	6 Vdc Battery (4xAA)	Ambient Temperature:	24.6 °C
Pretest Verification w/ BB Source:	N/A	Relative Humidity:	51.5 %
		Atmospheric Pressure:	988.6 mBars

Deviations, Additions, or Exclusions: None

7 Maximum Peak Conducted Output Power at Antenna Terminals

7.1 Requirement(s)

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt or 30 dBm. For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.2 Method

The procedure described in Subclause 11.9.1.1 of ANSI C63.10-2013 was utilized as the spectrum analyzer's resolution bandwidth was greater than the DTS bandwidth.

a) Set the RBW ≥ DTS Bandwidth
b) Set the VBW ≥ 3 x RBW
c) Set the span ≥ 3 x RBW
d) Sweep time = Auto couple
e) Detector = Peak
f) Trace mode = Max Hold
g) Allow trace to fully stabilize
h) Use peak marker function to determine the peak amplitude level.

TEST SITE:

The test is performed in the EMC laboratory located at 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility meets the requirements of CISPR 16-1-4 and has been accredited by A2LA. ISED test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

The expanded uncertainty (k=2) is 1.3 dB.

7.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1016	Barometer Temp/Humidity	Omega	IBTHX-W	18300406	08/18/2018	08/18/2019

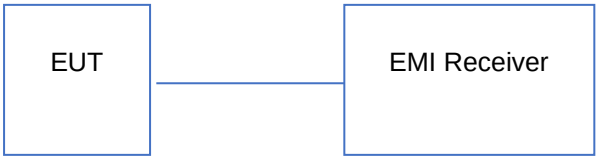
Software Utilized:

Name	Manufacturer	Version	Profile
N/A	N/A	N/A	N/A

7.4 Results:

The sample tested was found to Comply.

7.5 Setup Diagram:

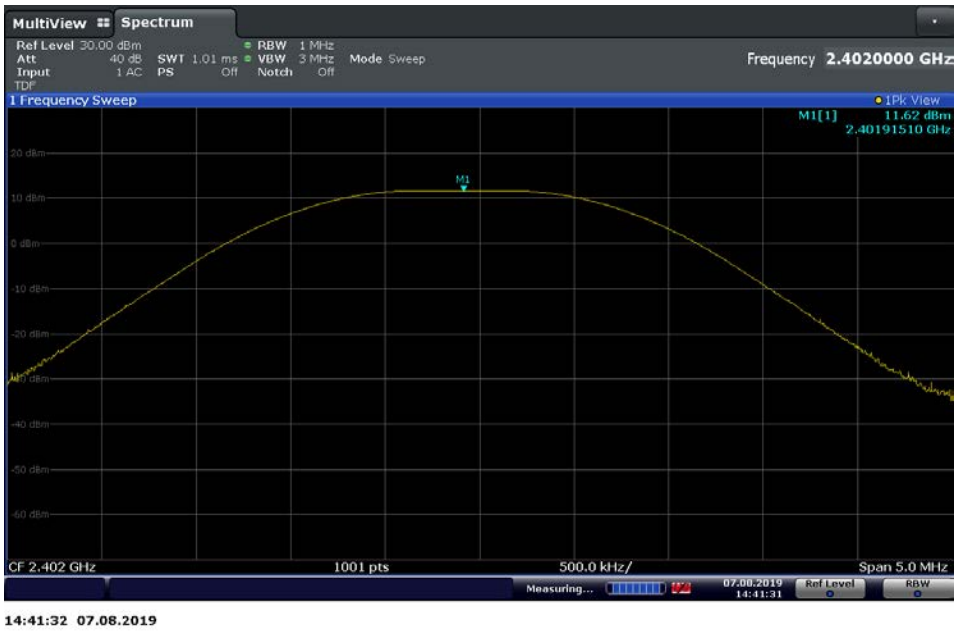


7.6 Plots/Data:

Frequency (MHz)	Peak Conducted Output Power	
	dBm	mW
2402	11.62	14.52
2440	11.29	13.46
2480	10.97	12.50

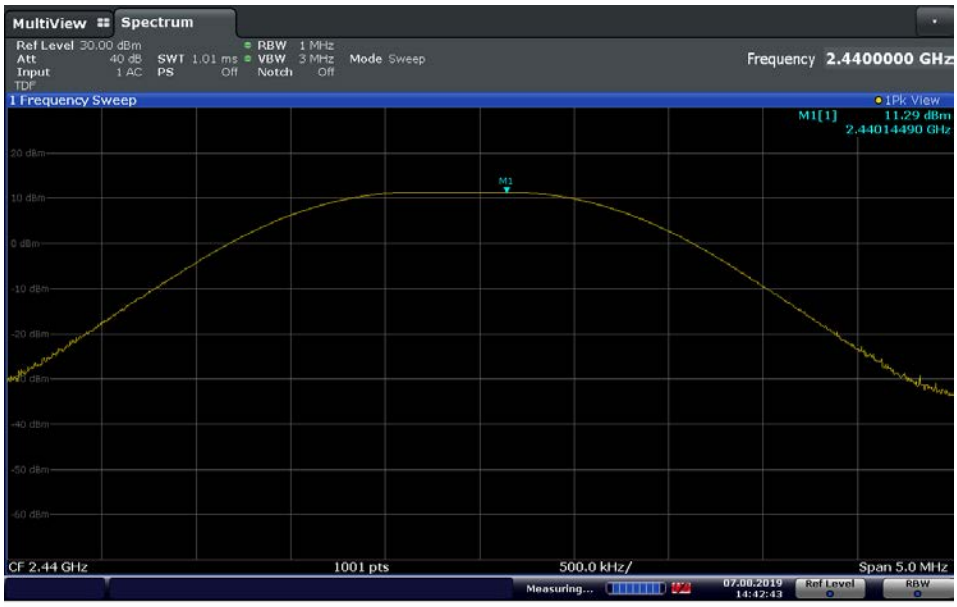
Note: The antenna port of the EUT was connected directly to the input of the measuring EMI receiver. The insertion loss was compensated for in the receiver

Output Power, 2402 MHz:



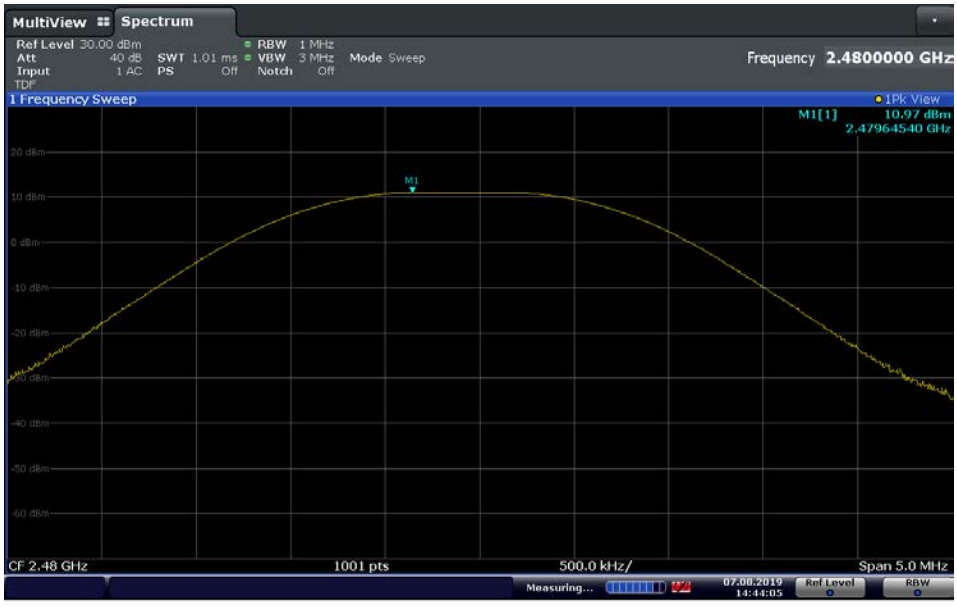
14:41:32 07.08.2019

Output Power, 2440 MHz:



14:42:44 07.08.2019

Output Power, 2480 MHz:



14:44:05 07.08.2019

Test Personnel:	Grace Lin	Test Date:	08/07/2019
Product Standard:	FCC §15.247, ISED RSS-247	Limit Applied:	FCC §15.247, ISED RSS-247
Input Voltage:	6 Vdc Battery	Ambient Temperature:	24.6 °C
Pretest Verification w/ BB Source:	N/A	Relative Humidity:	51.5 %
		Atmospheric Pressure:	988.6 mBars

Deviations, Additions, or Exclusions: None

8 Maximum Power Spectral Density

8.1 Requirement(s)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna should not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.2 Method

The procedure described in Subclause 11.10 of ANSI C63.10-2013, specifically Subclause 11.10.2 *Method PKPSD*, was utilized.

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the *DTS bandwidth*.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SITE:

The test is performed in the EMC laboratory located at 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility meets the requirements of CISPR 16-1-4 and has been accredited by A2LA. ISED test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

The expanded uncertainty (k=2) is 1.3 dB.

8.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1016	Barometer Temp/Humidity	Omega	IBTHX-W	18300406	08/18/2018	08/18/2019

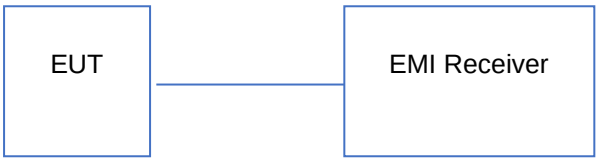
Software Utilized:

Name	Manufacturer	Version	Profile
N/A	N/A	N/A	N/A

8.4 Results:

The sample tested was found to Comply.

8.5 Setup Diagram:

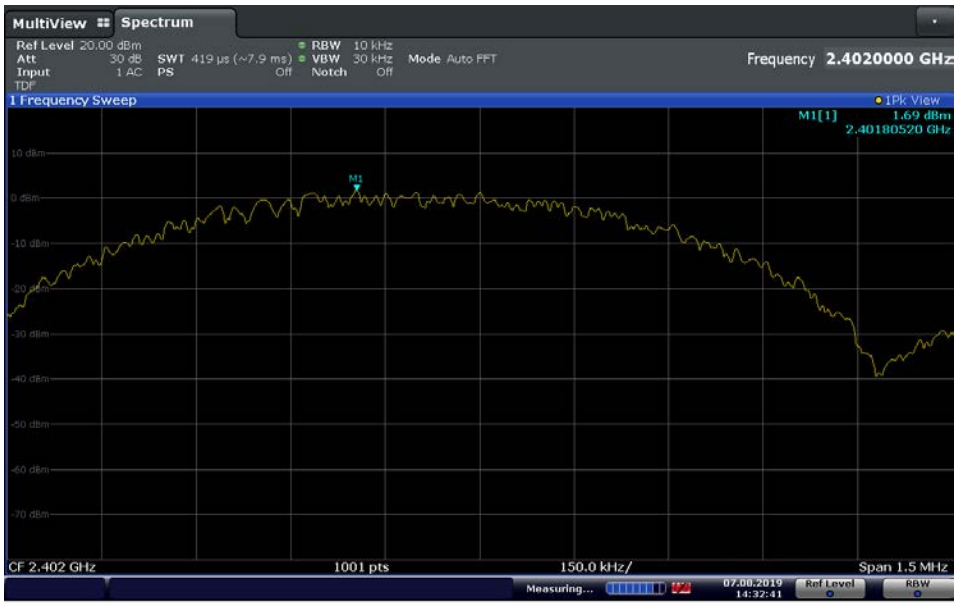


8.6 Plots/Data:

Frequency (MHz)	Maximum Power Spectral Density (dBm)
2402	1.69
2440	1.45
2480	0.97

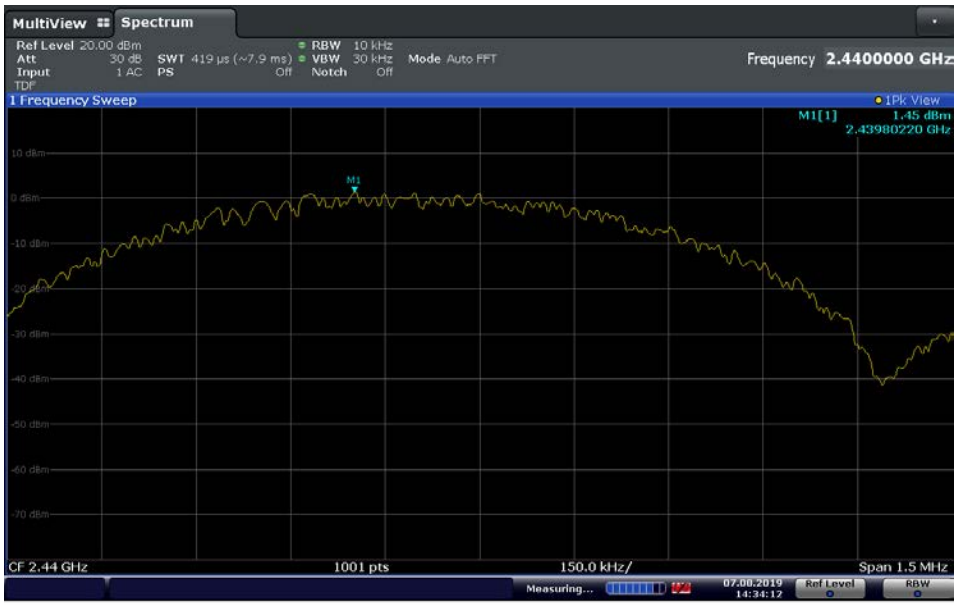
Note: The antenna port of the EUT was connected directly to the input of the measuring EMI receiver. The insertion loss was compensated for in the receiver

PSD, 2402 MHz:



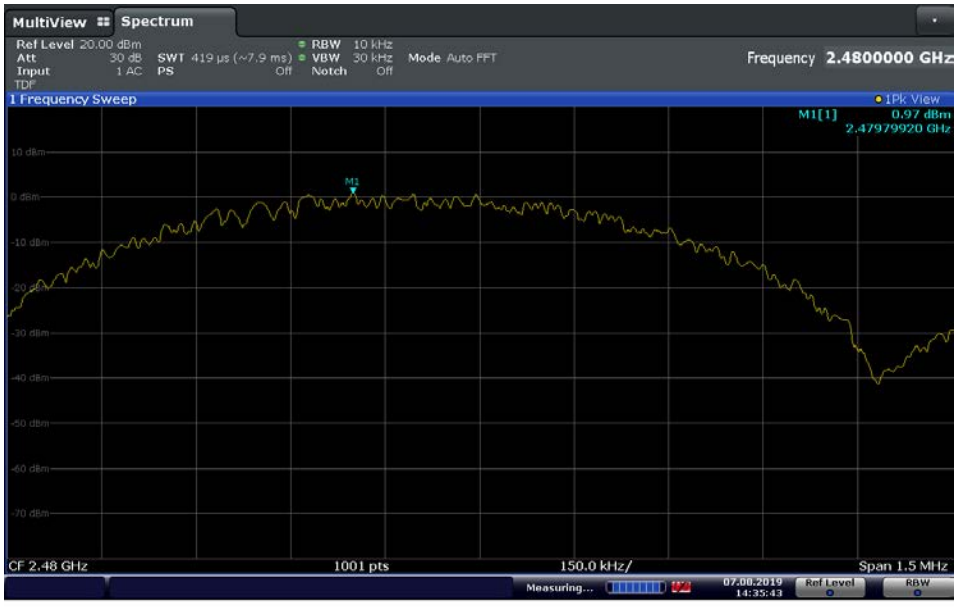
14:32:41 07.08.2019

PSD, 2440 MHz:



14:34:13 07.08.2019

PSD, 2480 MHz:



14:35:43 07.08.2019

Test Personnel:	Grace Lin	Test Date:	08/07/2019
Product Standard:	FCC §15.247, ISED RSS-247	Limit Applied:	FCC §15.247, ISED RSS-247
Input Voltage:	6 Vdc Battery	Ambient Temperature:	24.6 °C
Pretest Verification w/ BB Source:	N/A	Relative Humidity:	51.5 %
		Atmospheric Pressure:	988.6 mBars

Deviations, Additions, or Exclusions: None

9 Conducted Spurious Emissions

9.1 Requirement(s)

In any 100 kHz bandwidth outside the frequency band, the radio frequency power 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, 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 the RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), shall comply with the radiated emission limits specified in § 15.209(a)

9.2 Method

The procedure described in Subclause 11.11 of ANSI C63.10-2013, specifically Subclause 11.11.2 *Relative level measurement*, was utilized.

A spectrum analyzer was connected to the antenna port of the transmitter.

a) Set the RBW = 100 kHz.
b) Set the VBW ≥ 3 x RBW.
c) Detector = peak.
d) Sweep time = auto couple.
e) Trace mode = max hold.
f) Allow trace to fully stabilize.
g) Use the peak marker function to determine the maximum PSD level.

The unwanted emissions were measured from 30 MHz to 25 GHz. Plots below are corrected for cable loss and then compared to the limits. The RF level in the plots is relative and is not the indication of RF output power.

TEST SITE:

The test is performed in the EMC laboratory located at 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility meets the requirements of CISPR 16-1-4 and has been accredited by A2LA. ISED test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

The expanded uncertainty (k=2) is 1.3 dB.

9.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1016	Barometer Temp/Humidity	Omega	IBTHX-W	18300406	08/18/2018	08/18/2019

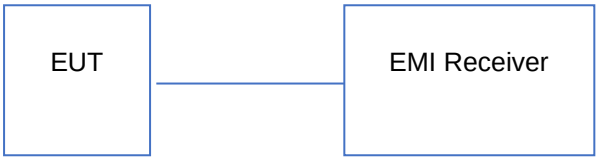
Software Utilized:

Name	Manufacturer	Version	Profile
N/A	N/A	N/A	N/A

9.4 Results:

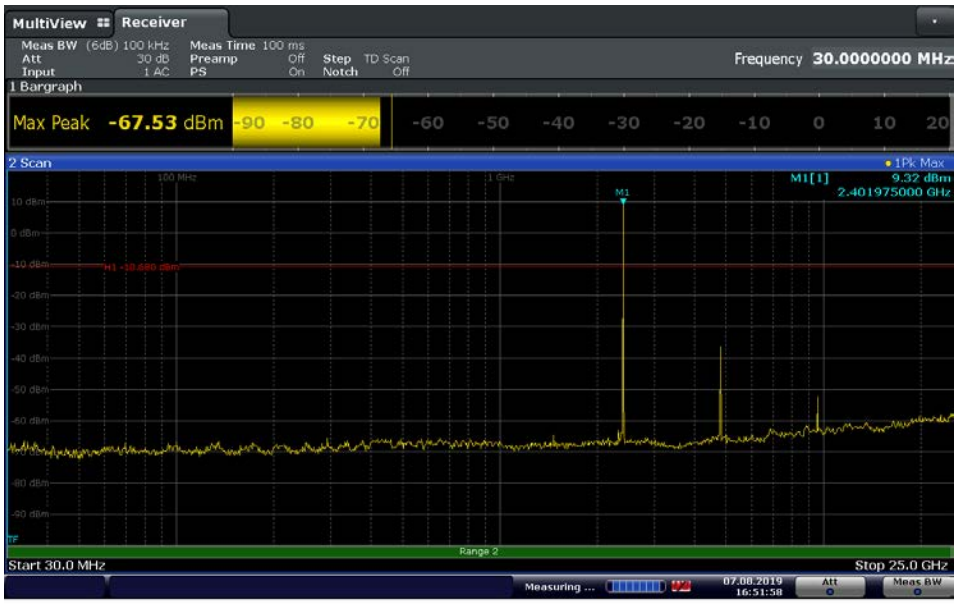
The sample tested was found to Comply. All the emissions outside of the frequency band were at least 20 dB below the carrier power level.

9.5 Setup Diagram:



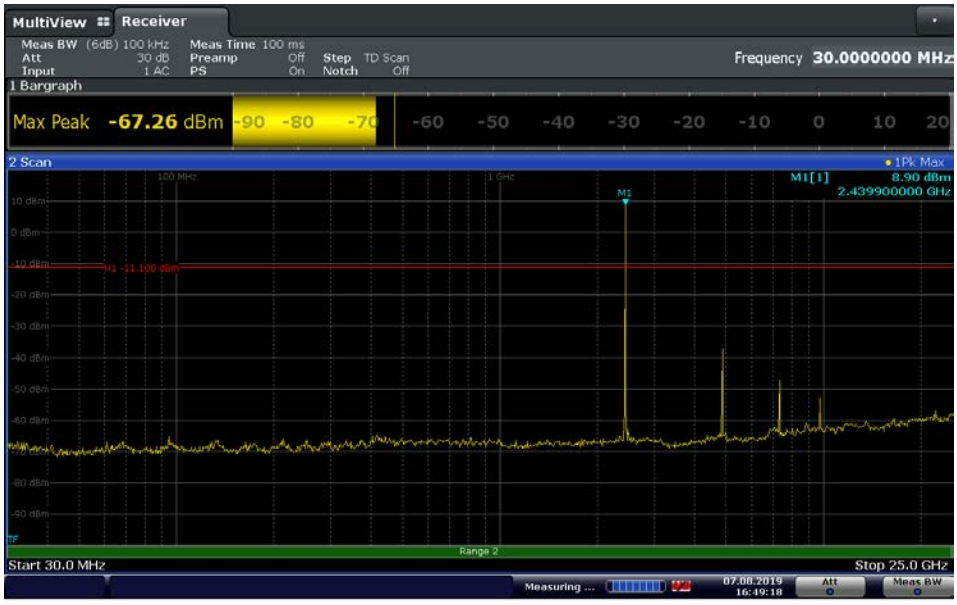
9.6 Plots/Data:

Conducted Spurious Emissions, 2402 MHz:



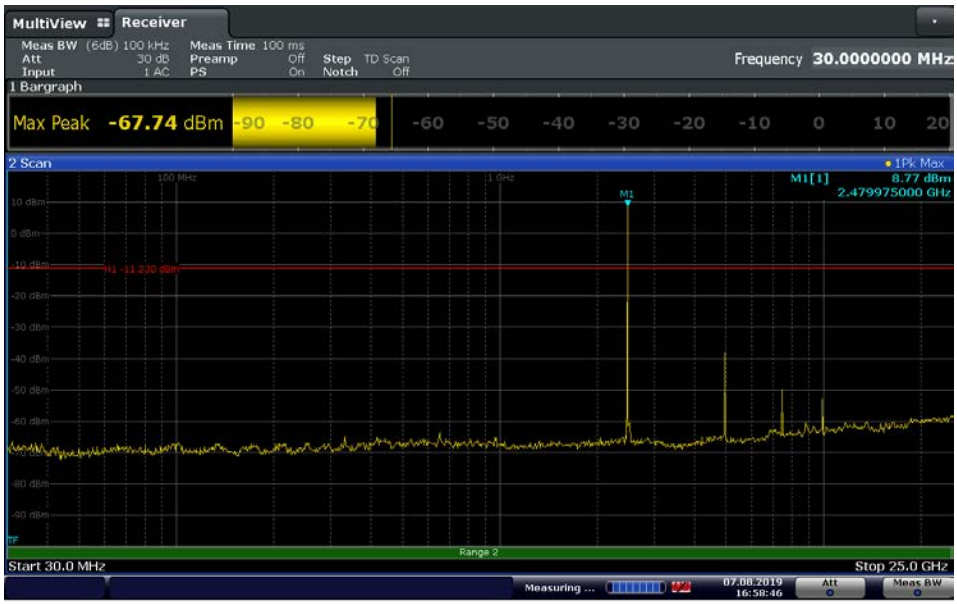
16:51:58 07.08.2019

Conducted Spurious Emissions, 2440 MHz:



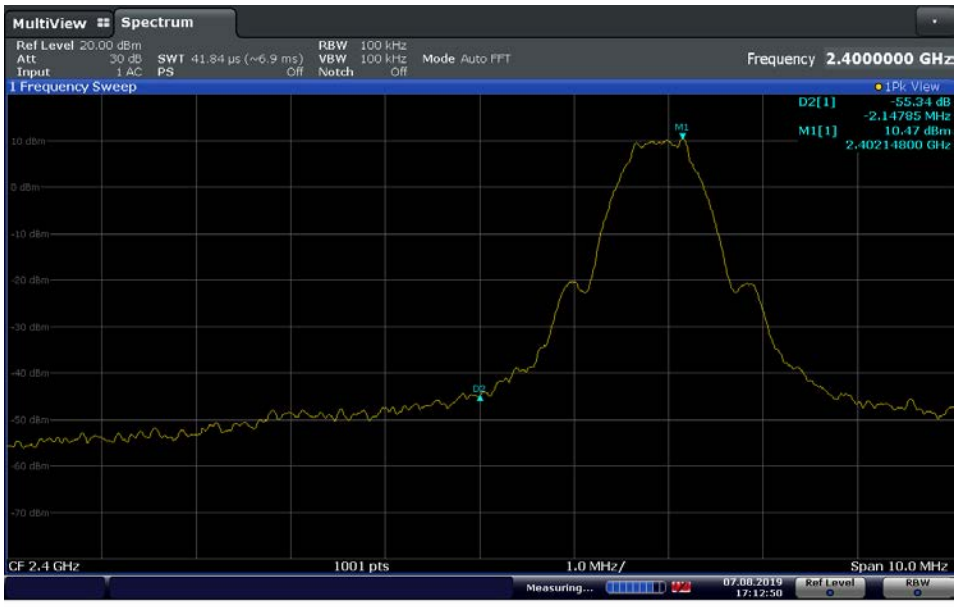
16:49:19 07.08.2019

Conducted Spurious Emissions, 2480 MHz:



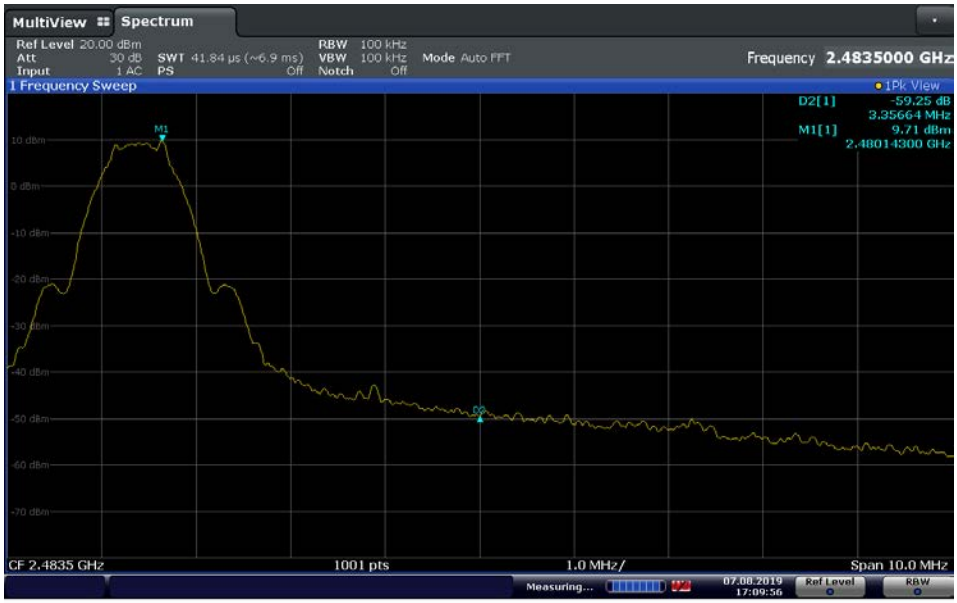
16:58:47 07.08.2019

Bandedge, Low Channel:



17:12:50 07.08.2019

Bandedge, High Channel:



17:09:57 07.08.2019

Test Personnel:	Grace Lin	Test Date:	08/07/2018
Product Standard:	FCC §15.247, ISED RSS-247	Limit Applied:	FCC §15.247, ISED RSS-247
Input Voltage:	6 Vdc Battery	Ambient Temperature:	24.6 °C
Pretest Verification w/ BB Source:	N/A	Relative Humidity:	51.5 %
		Atmospheric Pressure:	988.6 mBars

Deviations, Additions, or Exclusions: None

10 Radiated Spurious Emissions

10.1 Requirement(s)

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), shall comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

In any 100 kHz bandwidth outside the frequency band, the radio frequency power 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, 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 the RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

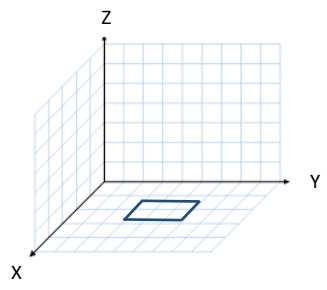
10.2 Method

EUT was configured to transmit continuously. Radiated emission measurements were performed from 30 MHz to 10 GHz according to the procedure described in ANSI C64.10. Spectrum analyzer resolution bandwidth is 120 kHz for frequencies 30 MHz to 1 GHz. Above 1 GHz, both Peak and Average measurements were performed. The peak level of radiated emissions was measured with a resolution bandwidth (RBW) of 1 MHz, a video bandwidth (VBW) of 3 MHz, and a peak detector. The average level of radiated emissions was measured with a resolution bandwidth (RBW) of 1 MHz, a video bandwidth (VBW) of 3 MHz, and a RMS detector with trace averaging.

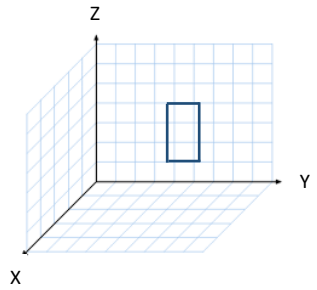
The EUT is placed on a plastic turntable that is 80 cm in height for frequencies 30 MHz to 1 GHz, 1.5 meters for frequency above 1 GHz. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 3 meters for frequencies below 18 GHz and 1 meter for frequencies above 18 GHz.

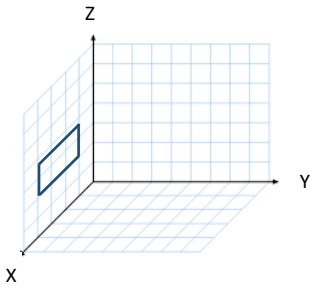
EUT was tested as the customers would normally use (YZ plane). Data included is representative of the worst-case configuration (the configuration which resulted in the highest emission levels). Plots below are corrected for distance, cables, preamp, filters and antenna factors then compared to the limits.



EUT = XY



EUT = YZ



EUT = ZX

TEST SITE:

The test is performed in the 3-meter semi-anechoic chamber located at 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility meets the requirements of CISPR 16-1-4 and has been accredited by A2LA. ISED test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 3m	30-1000 MHz	4.2 dB	6.3 dB (SAC)
Radiated Emissions, 3m	1-6 GHz	5.1 dB	5.2 dB (FAR)
Radiated Emissions, 3m	6-18 GHz	5.5 dB	5.5 dB (FAR)
Radiated Emissions, 3m	18-26.5 GHz	5.5 dB	-

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

10.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
637	3m Semi-anechoic Chamber	Panashield	3 meter	25 331-D-Z	December 2018	December 2021
1669	EMI Test Receiver	R&S	ESW44	101636	09/03/2019	09/03/2020
1707	Bilog Antenna	sunAR	JB6	A110618	09/26/2019	09/26/2020
1568	Pre-amp	R&S	TS-PR1	102068	02/01/2019	02/01/2020
1515	Horn Antenna	ETS-Lindgren	3115	00161631	04/17/2019	04/17/2020
4243	Pre-amp	Miteq	AMF-50-00501B00-24-10P	-	01/20/2019	01/20/2020
880	Horn Antenna	ETS-Lindgren	3116	00153521	04/18/2018	04/18/2020
1770	Cable	R&S	TSPR-B7	101546	08/10/2018	08/10/2019
1771	Cable	R&S	TSPR-B7	101547	08/10/2018	08/10/2019
1565	Cable	R&S	TSPR-B8	268578-004	02/13/2019	02/13/2020
1015	Barometer Temp/Humidity	Omega	IBTHX-W	0480396	02/12/2019	02/12/2020
1556	Pre-amp	R&S	TS-PR18	102144	08/28/2019	08/28/2020
1517	Cable	R&S	TSPR-B7	101528	08/28/2019	08/28/2020
1518	Cable	R&S	TSPR-B7	101529	08/28/2019	08/28/2020

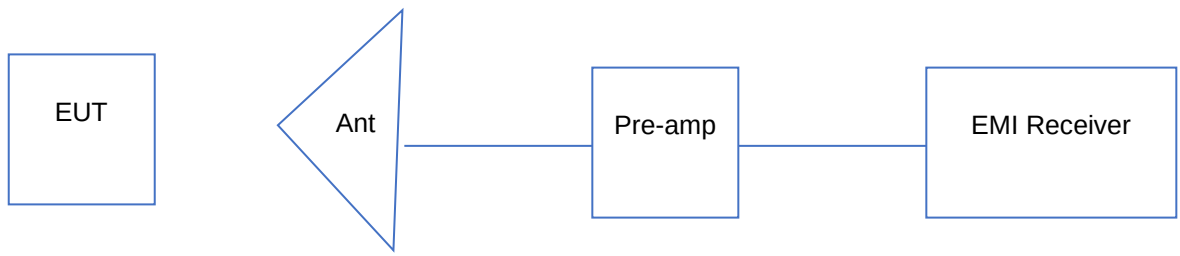
Software Utilized:

Name	Manufacturer	Version	Profile
BAT-EMC	Nexio	3.18.0.16	LAX Intertek Emissions Template 03-30-2018

10.4 Results:

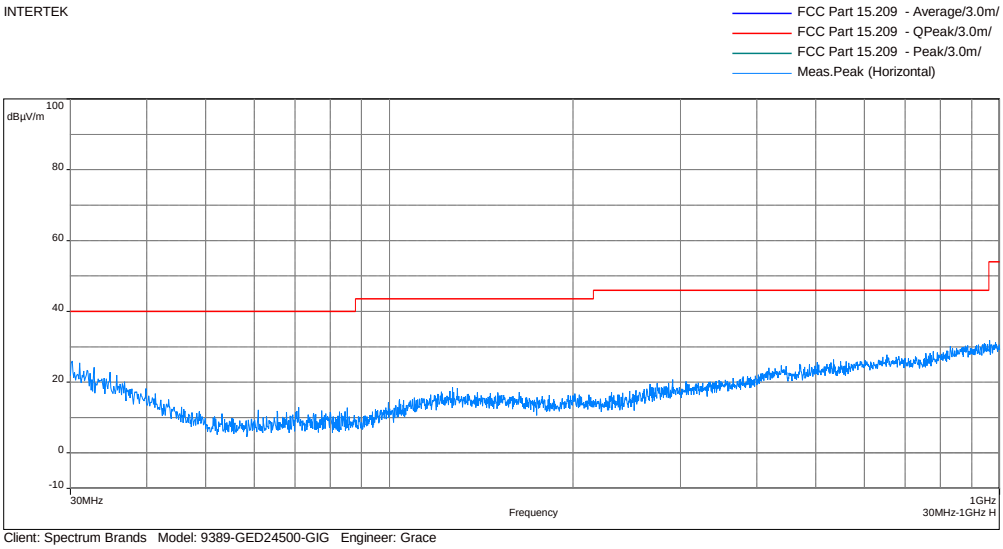
The sample tested was found to Comply.

10.5 Setup Diagram:



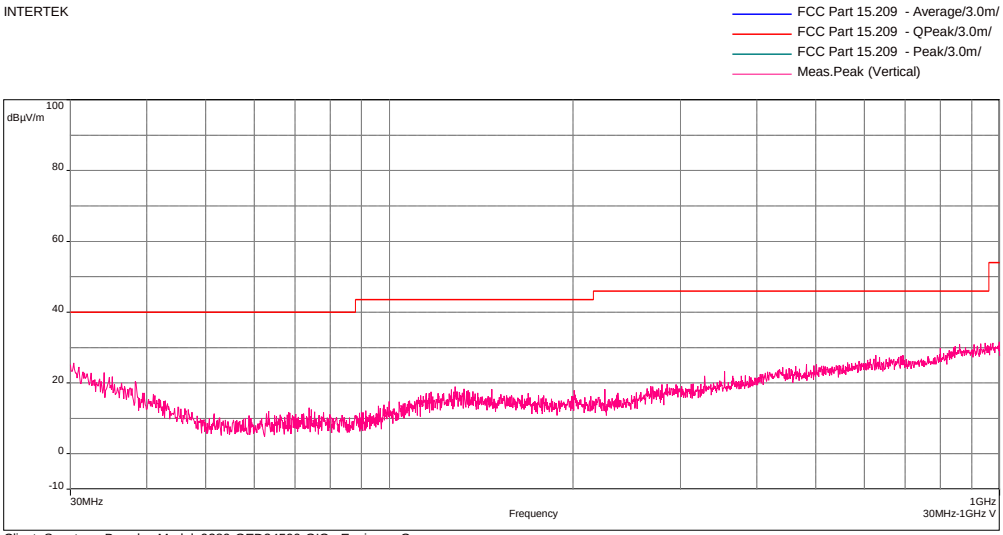
10.6 Plots/Data (939):

Radiated Spurious Emissions, 30 MHz – 1 GHz, Low Channel, Horizontal



Client: Spectrum Brands Model: 9389-GED24500-GIG Engineer: Grace

Radiated Spurious Emissions, 30 MHz – 1 GHz, Low Channel, Vertical



Client: Spectrum Brands Model: 9389-GED24500-GIG Engineer: Grace

10.6 Plots/Data (939): *(Continued)*

Radiated Spurious Emissions, 1-18 GHz, Low Channel, Horizontal

21:49:23 10.08.2019

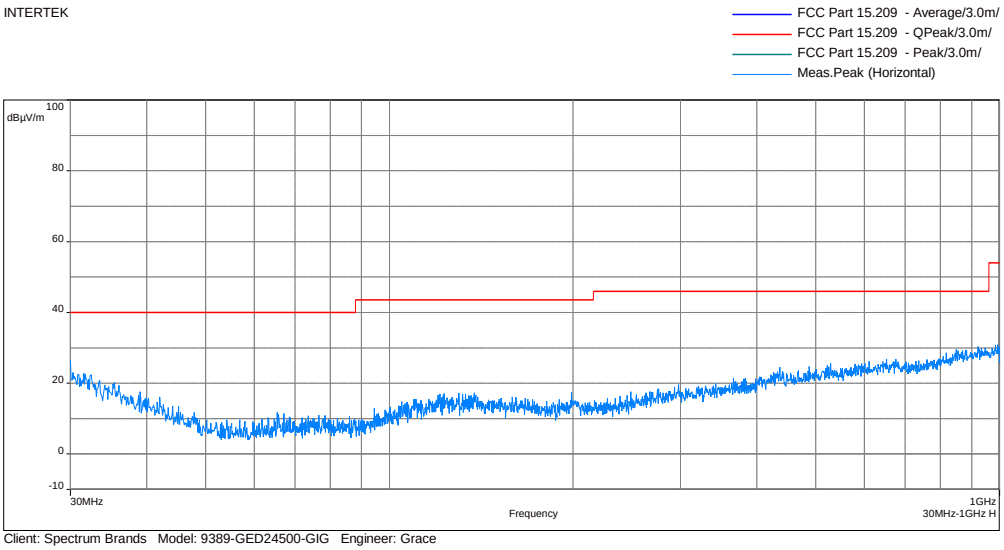
Radiated Spurious Emissions, 1-18 GHz, Low Channel, Vertical

21:57:20 10.08.2019

Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.

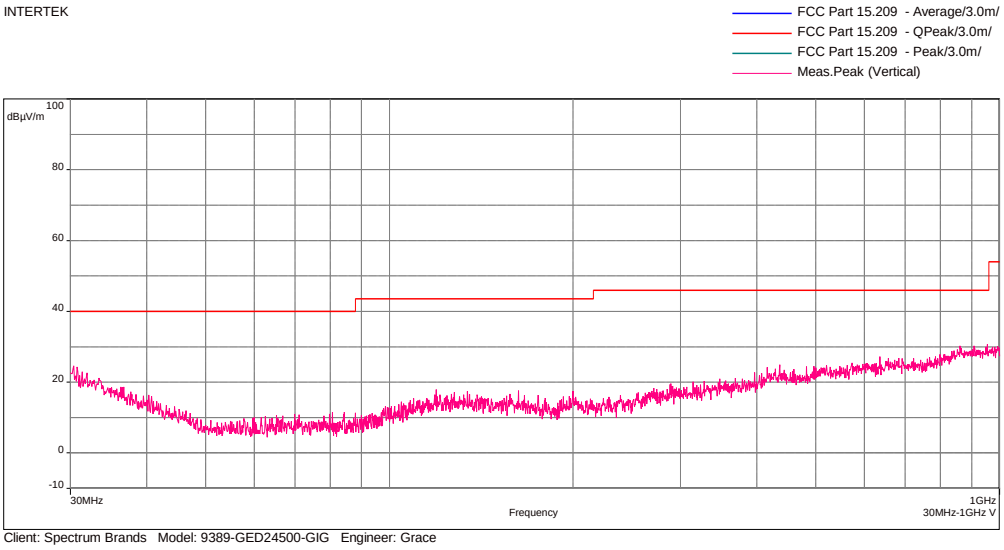
10.6 Plots/Data (939): *(Continued)*

Radiated Spurious Emissions, 30 MHz – 1 GHz, Middle Channel, Horizontal



Client: Spectrum Brands Model: 9389-GED24500-GIG Engineer: Grace

Radiated Spurious Emissions, 30 MHz – 1 GHz, Middle Channel, Vertical



Client: Spectrum Brands Model: 9389-GED24500-GIG Engineer: Grace

10.6 Plots/Data (939): *(Continued)*

Radiated Spurious Emissions, 1-18 GHz, Middle Channel, Horizontal

22:15:11 10.08.2019

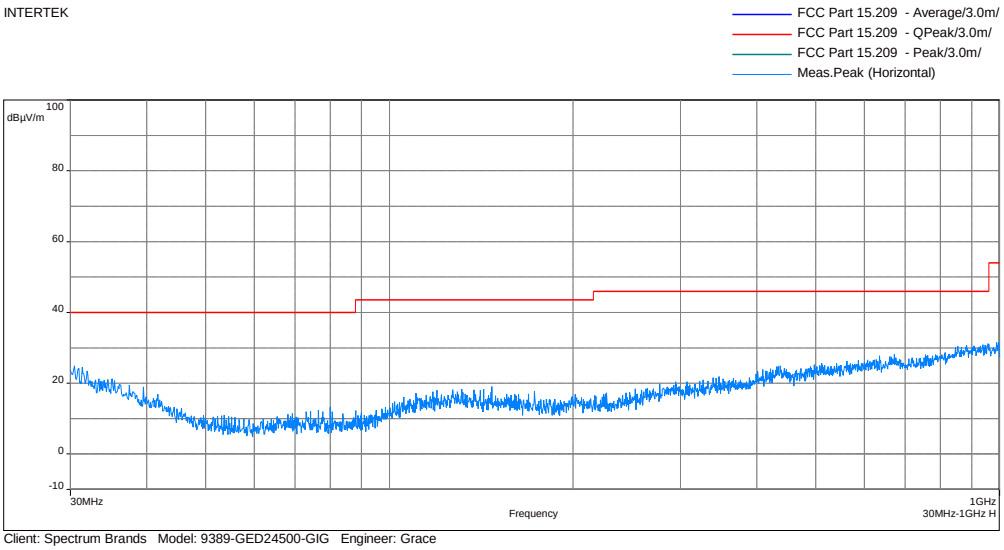
Radiated Spurious Emissions, 1-18 GHz, Middle Channel, Vertical

22:06:22 10.08.2019

Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.

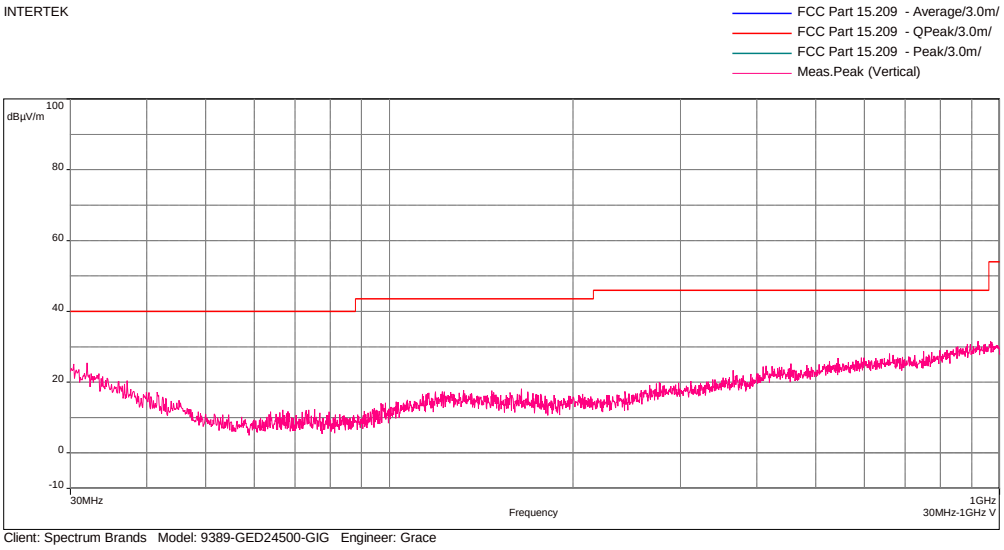
10.6 Plots/Data (939): *(Continued)*

Radiated Spurious Emissions, 30 MHz – 1 GHz, High Channel, Horizontal



Client: Spectrum Brands Model: 9389-GED24500-GIG Engineer: Grace

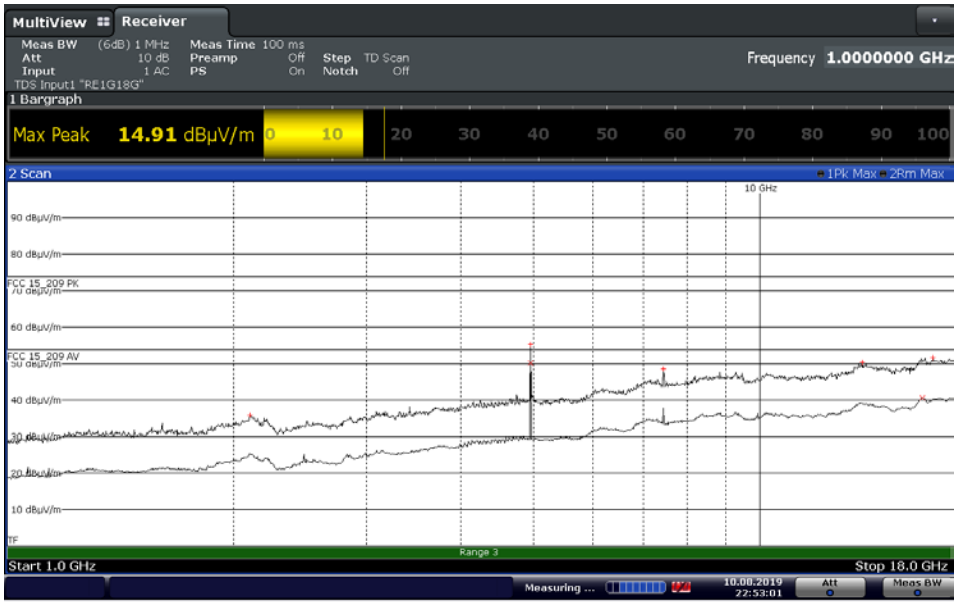
Radiated Spurious Emissions, 30 MHz – 1 GHz, High Channel, Vertical



Client: Spectrum Brands Model: 9389-GED24500-GIG Engineer: Grace

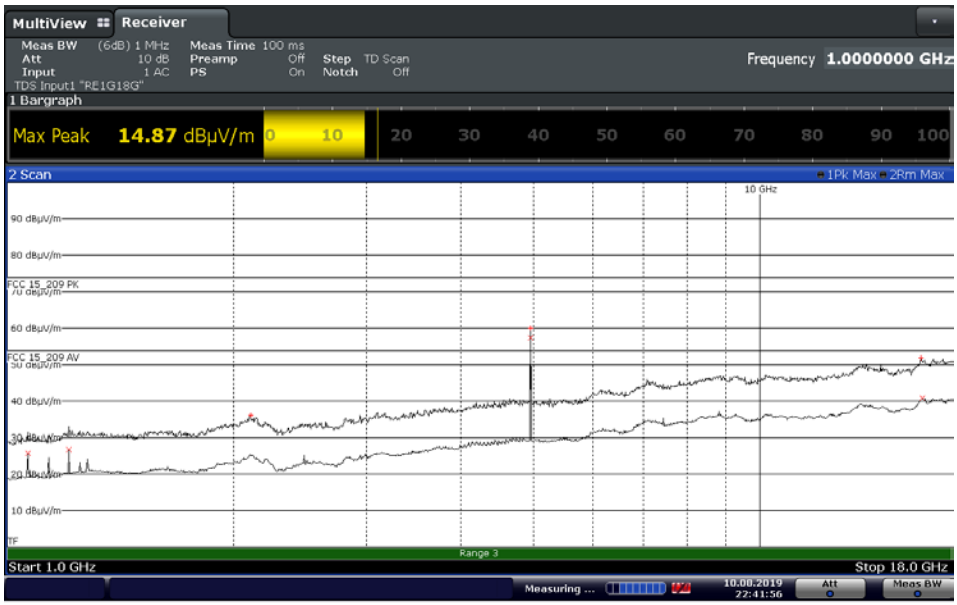
10.6 Plots/Data (939): *(Continued)*

Radiated Spurious Emissions, 1-18 GHz, High Channel, Horizontal



22:53:02 10.08.2019

Radiated Spurious Emissions, 1-18 GHz, High Channel, Vertical



22:41:57 10.08.2019

Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.

10.6 Plots/Data (939): *(Continued)*

Antenna Polarization	Frequency (MHz)	Channel Freq. (MHz)	EUT Power Setting (dBm)	Field Strength (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Turntable Degree	Antenna Height (cm)	Detector
V	2390	2402	10	33.07	74	-40.93	3.0	388.0	PK
V	2390	2402	10	22.24	54	-31.76	3.0	388.0	RMS
V	4804	2402	10	64.69	74	-9.31	176.3	293.0	PK
V	4804	2402	10	52.86	54	-1.14	176.3	293.0	RMS
V	4880	2440	10	61.23	74	-12.77	187.3	107.0	PK
V	4880	2440	10	49.11	54	-4.89	187.3	107.0	RMS
V	7320	2440	10	52.50	74	-21.50	128.5	100.0	PK
V	7320	2440	10	35.94	54	-18.06	128.5	100.0	RMS
V	2483.5	2480	10	39.56	74	-34.44	0.0	400.0	PK
V	2483.5	2480	10	23.61	54	-30.39	0.0	400.0	RMS
V	4960	2480	10	62.11	74	-11.89	166.5	234.0	PK
V	4960	2480	10	50.20	54	-3.80	166.5	234.0	RMS
V	7440	2480	10	51.81	74	-22.19	137.5	100.0	PK
V	7440	2480	10	35.36	54	-18.64	137.5	100.0	RMS

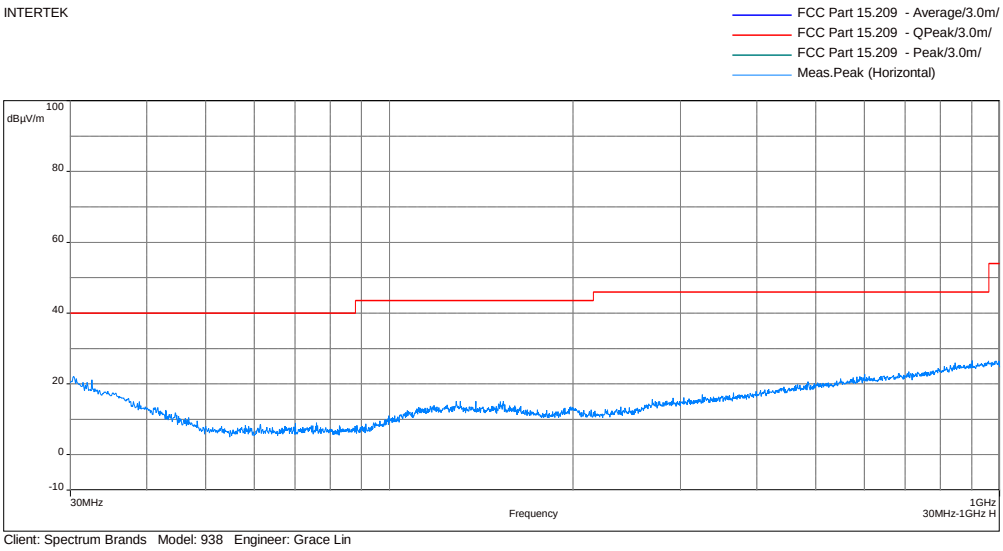
Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.
Restricted Band edge Measurements are highlighted in Grey

Test Personnel:	Grace Lin	Test Date:	08/08/2019 - 08/12/2019
Product Standard:	FCC §15.247, ISED RSS-247	Limit Applied:	FCC §15.209, RSS-Gen §8.9
Input Voltage:	6 Vdc (4xAA Batteries)	Ambient Temperature:	24.2 °C
Pretest Verification w/ BB Source:	Yes	Relative Humidity:	58.6 %
		Atmospheric Pressure:	991 mbars

Deviations, Additions, or Exclusions: None

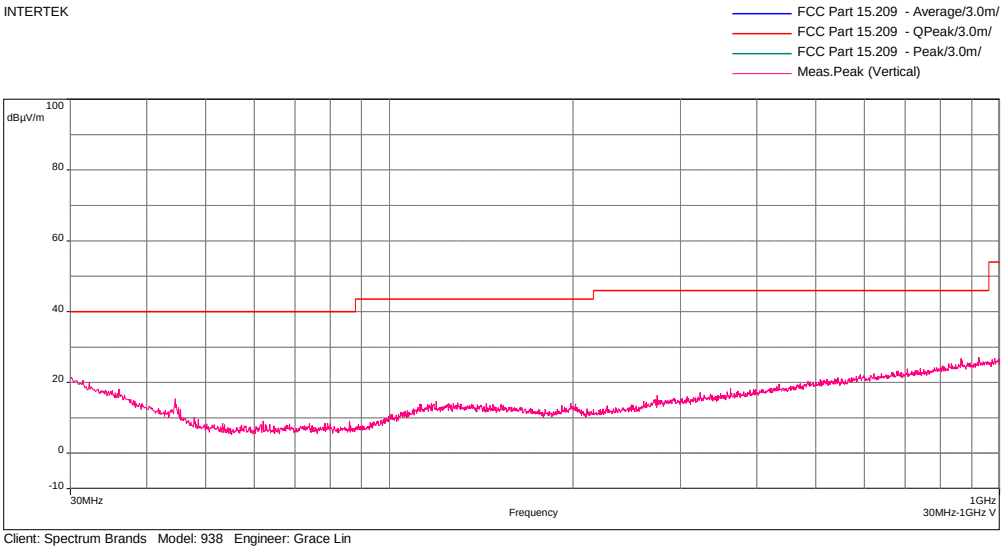
10.6 Plots/Data (938): *(Continued)*

Radiated Spurious Emissions, 30 MHz – 1 GHz, Low Channel, Horizontal



Client: Spectrum Brands Model: 938 Engineer: Grace Lin

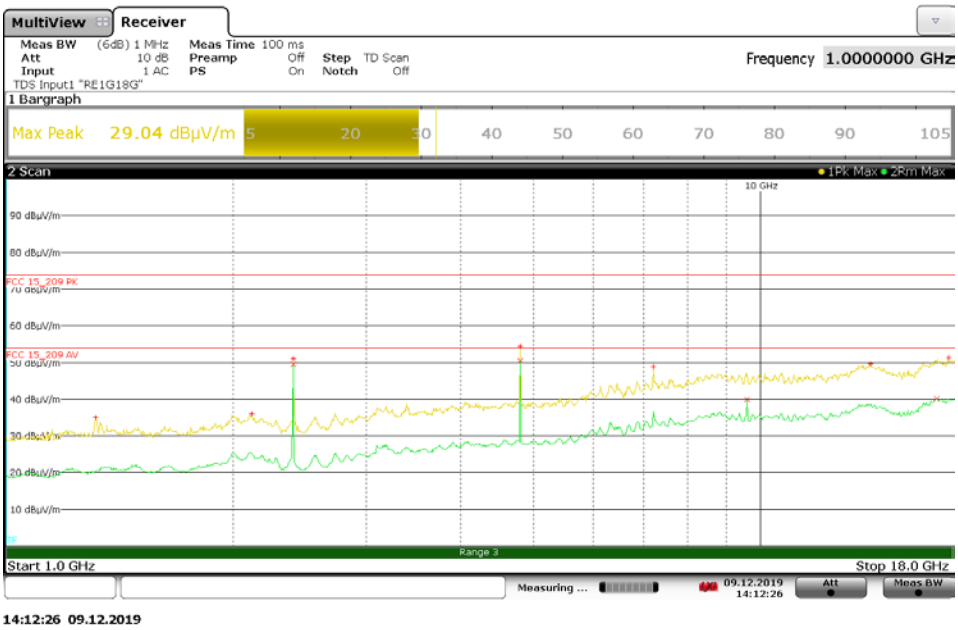
Radiated Spurious Emissions, 30 MHz – 1 GHz, Low Channel, Vertical



Client: Spectrum Brands Model: 938 Engineer: Grace Lin

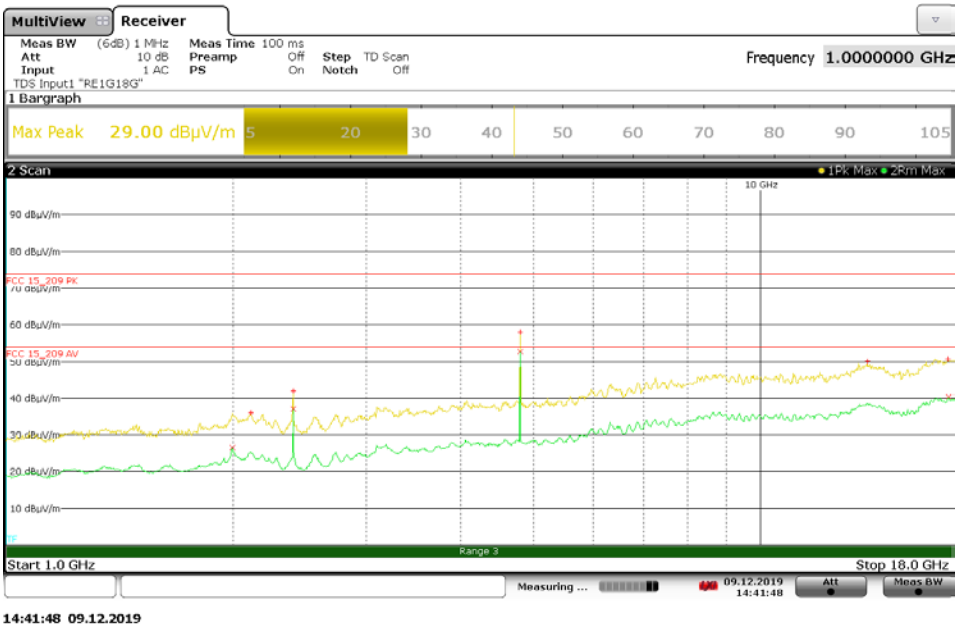
10.6 Plots/Data (938): *(Continued)*

Radiated Spurious Emissions, 1-18 GHz, Low Channel, Horizontal



14:12:26 09.12.2019

Radiated Spurious Emissions, 1-18 GHz, Low Channel, Vertical

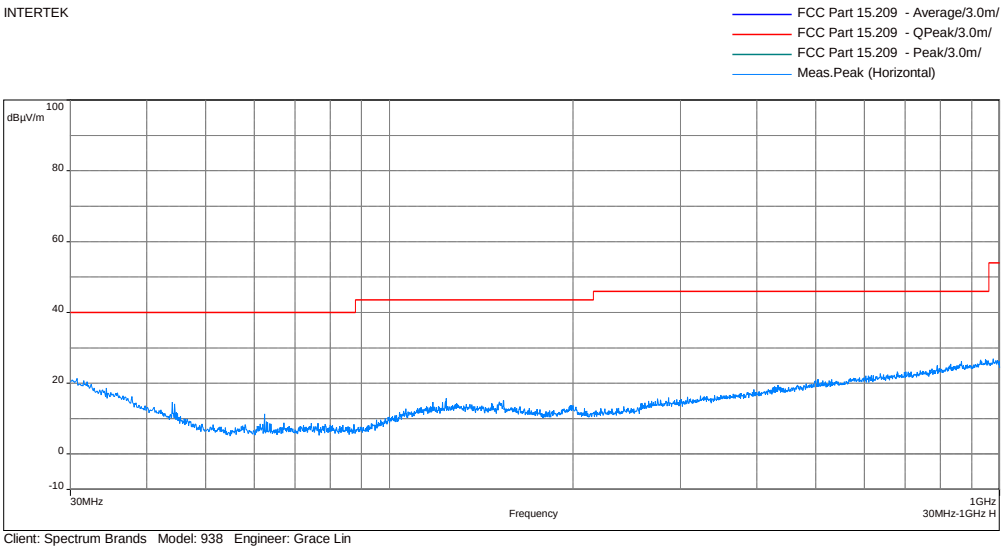


14:41:48 09.12.2019

Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.

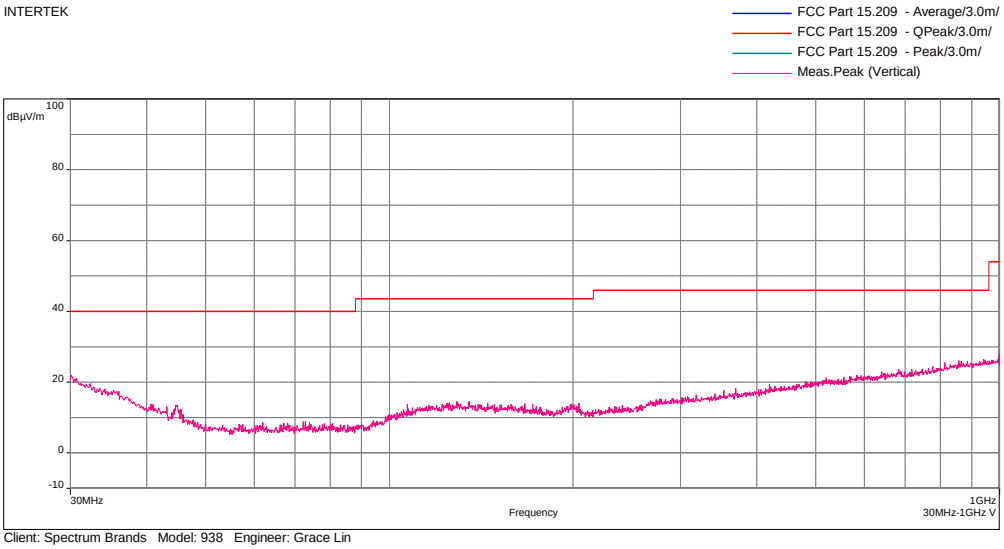
10.6 Plots/Data (938): *(Continued)*

Radiated Spurious Emissions, 30 MHz – 1 GHz, Middle Channel, Horizontal



Client: Spectrum Brands Model: 938 Engineer: Grace Lin

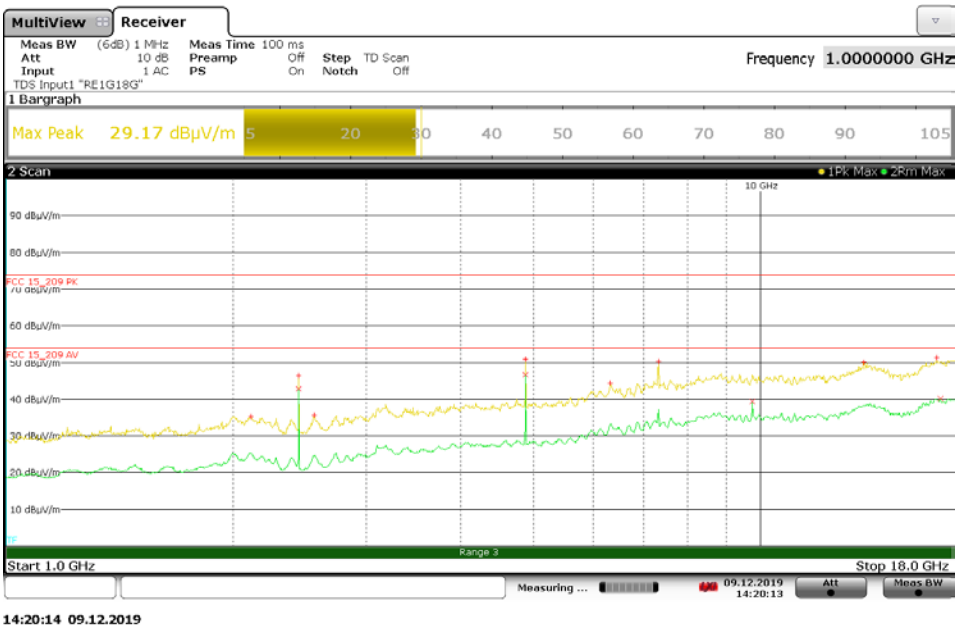
Radiated Spurious Emissions, 30 MHz – 1 GHz, Middle Channel, Vertical



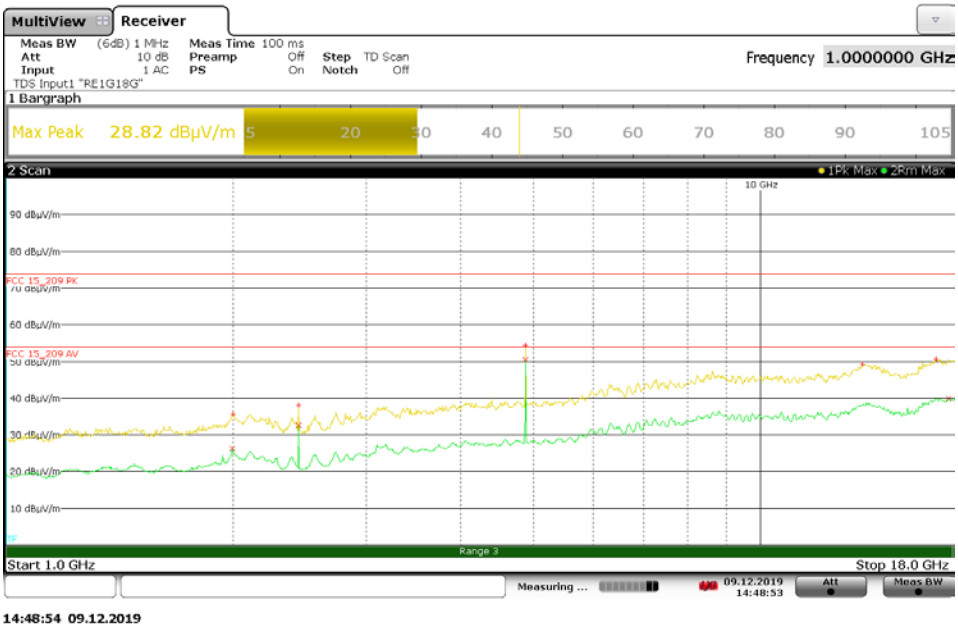
Client: Spectrum Brands Model: 938 Engineer: Grace Lin

10.6 Plots/Data (938): *(Continued)*

Radiated Spurious Emissions, 1-18 GHz, Middle Channel, Horizontal



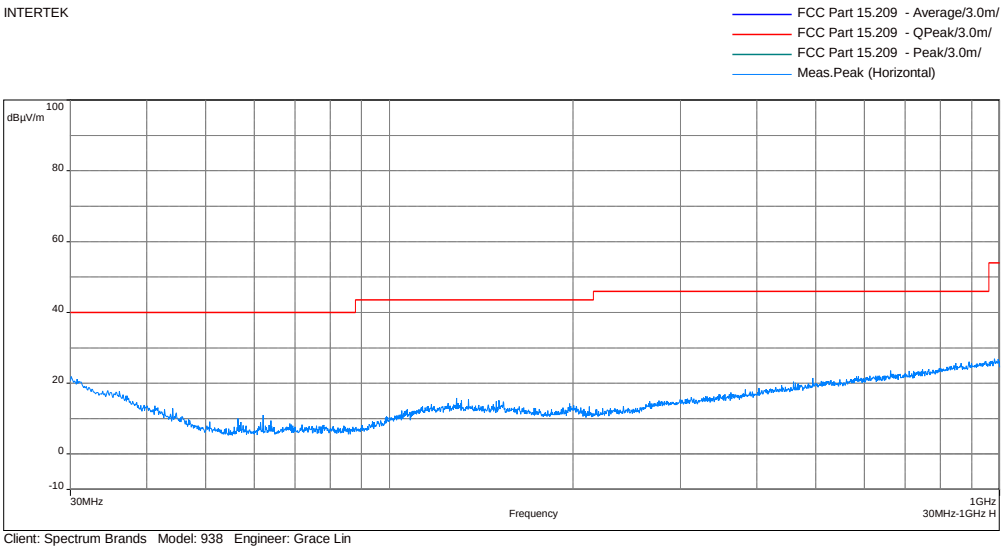
Radiated Spurious Emissions, 1-18 GHz, Middle Channel, Vertical



Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.

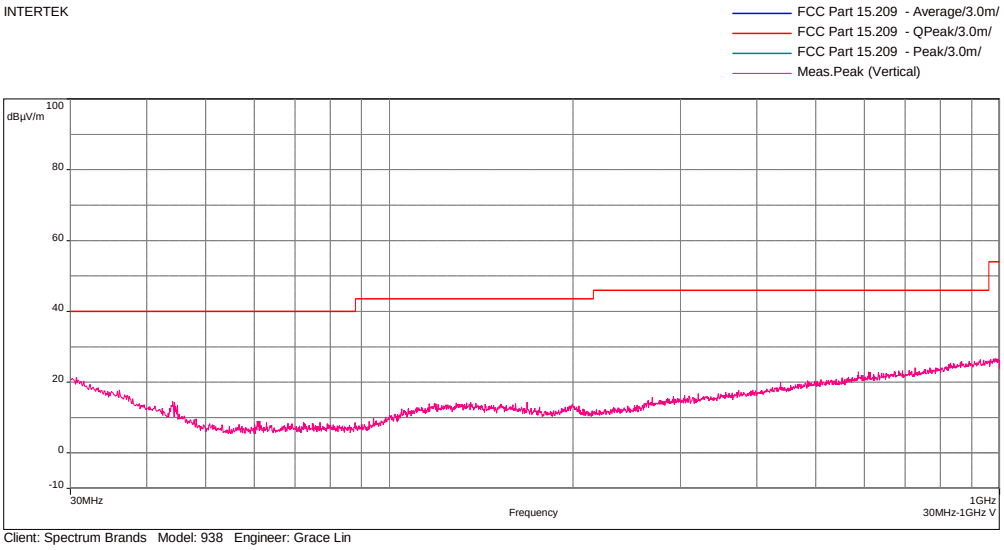
10.6 Plots/Data (938): *(Continued)*

Radiated Spurious Emissions, 30 MHz – 1 GHz, High Channel, Horizontal



Client: Spectrum Brands Model: 938 Engineer: Grace Lin

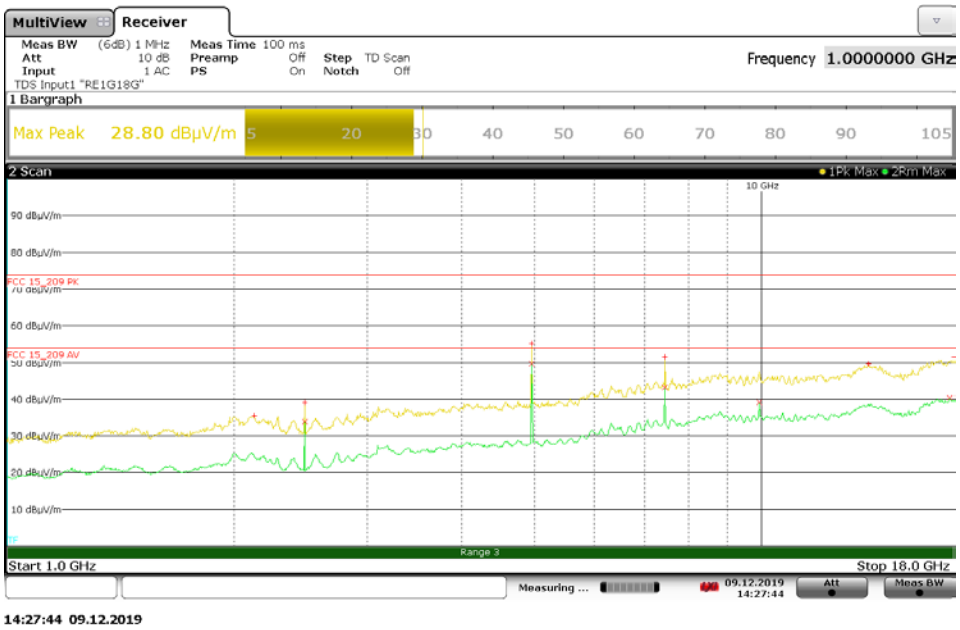
Radiated Spurious Emissions, 30 MHz – 1 GHz, High Channel, Vertical



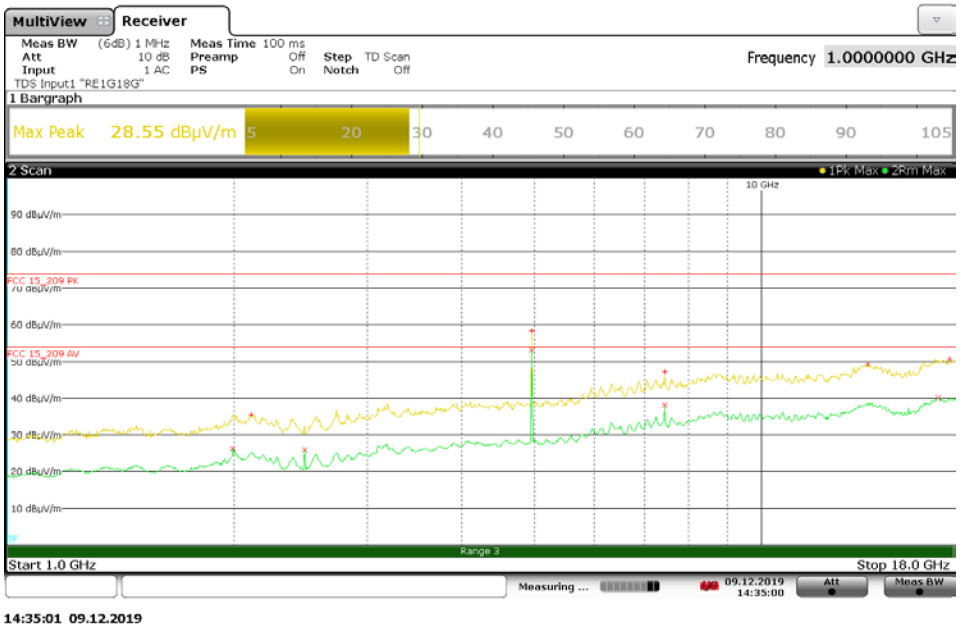
Client: Spectrum Brands Model: 938 Engineer: Grace Lin

10.6 Plots/Data (938): *(Continued)*

Radiated Spurious Emissions, 1-18 GHz, High Channel, Horizontal



Radiated Spurious Emissions, 1-18 GHz, High Channel, Vertical



Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.

10.6 Plots/Data (938): *(Continued)*

Antenna Polarization	Frequency (MHz)	Channel Freq. (MHz)	EUT Power Setting (dBm)	Field Strength (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Turntable Degree	Antenna Height (cm)	Detector
V	2390	2402	10	32.89	74	-41.11	138.0	180.0	PK
V	2390	2402	10	21.56	54	-32.44	138.0	180.0	RMS
V	4804	2402	10	60.50	74	-13.50	163.0	159.0	PK
V	4804	2402	10	46.12	54	-7.88	163.0	159.0	RMS
V	4880	2440	10	56.87	74	-17.13	169.0	166.0	PK
V	4880	2440	10	42.11	54	-11.89	169.0	166.0	RMS
V	7320	2440	10	44.47	74	-29.53	180.0	151.0	PK
V	7320	2440	10	31.67	54	-22.33	180.0	151.0	RMS
V	2483.5	2480	10	43.92	74	-30.08	138.0	202.0	PK
V	2483.5	2480	10	25.62	54	-28.38	138.0	202.0	RMS
V	4960	2480	10	59.30	74	-14.70	160.0	161.0	PK
V	4960	2480	10	44.91	54	-9.09	160.0	161.0	RMS
V	7440	2480	10	49.43	74	-24.57	184.0	126.0	PK
V	7440	2480	10	34.62	54	-19.38	184.0	126.0	RMS

Note: Radiated spurious emissions measurements were performed from 30 MHz to 25 GHz.
Restricted Band edge Measurements are highlighted in Grey

Test Personnel:	Grace Lin	Test Date:	12/09/2019 - 12/10/2019
Product Standard:	FCC §15.247, ISED RSS-247	Limit Applied:	FCC §15.209, RSS-Gen §8.9
Input Voltage:	6 Vdc (4xAA Batteries)	Ambient Temperature:	18.7 °C
Pretest Verification w/ BB Source:	Yes	Relative Humidity:	59.8 %
		Atmospheric Pressure:	995.4 mbars

Deviations, Additions, or Exclusions: None

11 AC Mains Conducted Emissions

11.1 Performance Criterion

Frequency Band MHz	Conducted Limit dB(µV)	
	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *
0.50-5.00	56	46
5.00-30.00	60	50

*Note: *Decreases linearly with the logarithm of the frequency*
At the transition frequency the lower limit applies.

11.2 Method

Tests are performed in accordance with ANSI C63.4-2014.

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

TEST SITE:

The test is performed in the 3 meter semi-anechoic chamber located at 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility meets the requirements of CISPR 16-1-4 and has been accredited by A2LA. IC test site registration number is 2042T.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
AC Line Conducted Emissions	150 kHz - 30 MHz	2.5 dB	3.4dB

As shown in the table above our conducted emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculations

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN or ISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(49.1\ dB\mu V / 20)}$ = 285.1 μV/m

11.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
-	-	-	-	-	-	-

Software Utilized:

Name	Manufacturer	Version	Profile
N/A	N/A	N/A	N/A

11.4 Results:

This test is not applicable as the equipment under test is battery powered.

12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	08/15/2019	104044098LAX-001	GL	SK	Initial Issue
1	12/10/2019	104044098LAX-001	GL	SK	Added RSE data to §6.10 for 938.