

Spectrum Brands, Inc.

TEST REPORT

SCOPE OF WORK

FCC 15.249 AND ISED RSS-210 TESTING – 450126VHC

REPORT NUMBER

104271913LAX-001

ISSUE DATE

2-June-2020

REVISED DATE

18-September-2020

PAGES

31

DOCUMENT CONTROL NUMBER

Non-Specific Radio Report Shell Rev. December 2017
© 2017 INTERTEK



EMC TEST REPORT
(FULL COMPLIANCE)

Report Number: 104271913LAX-001

Project Number: G104271913

Report Issue Date: June 2, 2020

Report Revised Date: September 18, 2020

Model(s) Tested: 450126VHC

Standards: FCC CFR47 Part 15 Subpart C, January 2020

Intentional Radiator

§15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz

ISED RSS-210 Issue 10, December 2019

Licence-Exempt Radio Apparatus: Category I Equipment

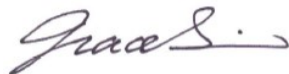
ISED RSS-Gen Issue 5, March 2019, Amendment 1

General Requirements for Compliance of Radio Apparatus

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

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

Report prepared by



Grace Lin
EMC Staff Engineer

Report reviewed by



Uri Spector
EMC Team Leader

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Table of Contents

Spectrum Brands, Inc. 1

1 Introduction and Conclusion..... 4

2 Test Summary 4

3 Client Information 5

4 Description of Equipment Under Test and Variant Models 5

5 System Setup and Method 7

6 Occupied Bandwidth 8

7 Fundamental Field Strength 13

8 Radiated Spurious Emissions 16

9 AC Mains Conducted Emissions 29

10 Revision History..... 31

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 radiated spurious emissions 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	Occupied Bandwidths (FCC §15.215(c); ISED RSS-Gen Issue 5 §6.7)	Compliant
7	Field Strength of Fundamental (FCC §15.249(a); ISED RSS-210 Issue 10 §B.10(a))	Compliant
8	Radiated Spurious Emissions (FCC §15.249(a); ISED RSS-210 Issue 10 §B.10(a))	Compliant
9	AC Mains Conducted Emissions (FCC §15.207, ISED RSS-Gen §8.8)	Not Applicable*
10	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, Inc. (formerly Kwikset Corp.)
19701 DaVinci
Foothill Ranch, CA 92610
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Z-Wave Plus Lock, Version II	Spectrum Brands, Inc.	450126VHC	Engineering Sample
Receive Date:	5/26/2020	Test Started	5/26/2020
Received Condition:	Good	Test Ended	5/28/2020
Type:	Production		

Description of Equipment Under Test (provided by client)

The equipment under test was a Z-Wave Plus Lock, Version II, operating at 908.4 MHz and 916 MHz. Please refer to the user’s manual for the details.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
6 Vdc (4 of AA batteries)	-	-	-

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 transmit continuously.

Radio/Receiver Characteristics	
Frequency Band(s)	908.4 MHz, 916 MHz
Modulation Type(s)	FSK; GFSK
Test Channels	908.4 MHz, 916 MHz
Occupied Bandwidth, 99%	92.61 kHz (908.4 MHz), 113.29 kHz (916 MHz)
Equipment Type	Standalone
Antenna Type and Gain*	Integral antenna

*: This information was provided by Spectrum Brands, Inc. Intertek takes no responsibility of the accuracy of the information.

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.

None

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 Occupied Bandwidth

6.1 Performance Requirement(s)

Intentional radiators must be designed to ensure that the 20dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. (FCC §15.215(c))

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs. (ISED RSS-Gen Issue 5 §6.7)

6.2 Method

Tests are performed in accordance with ANSI C63.10-2013.

TEST SITE:

The test is performed at Intertek Testing Services NA, Inc., 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility has been accredited by A2LA. FCC designation number is US1048. ISED Canada test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
Radiated Emissions, 3m	30-1000 MHz	4.2 dB	6.3 dB (SAC)

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.

6.3 Test Equipment Used:

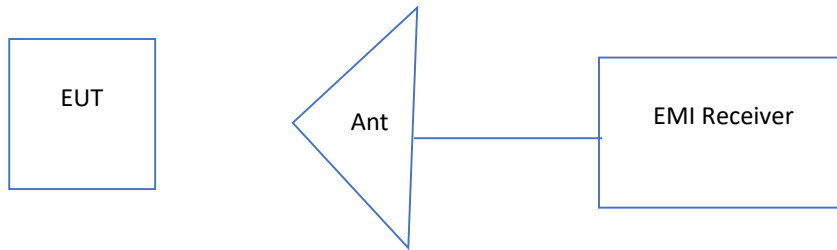
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
-	EMI Test Receiver	R&S	ESW44	101585	12/03/2019	12/03/2020
1707	Bilog Antenna	sunAR	JB6	A110618	09/26/2019	09/26/2020
1841	Cable	Fairview Microwave	FMC0101223-360	-	01/13/2020	01/13/2021
1412	Barometric Pressure/ Humidity/ Temperature Datalogger	EXTECH	SD700	Q769086	01/22/2020	01/22/2021

Software Utilized:

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

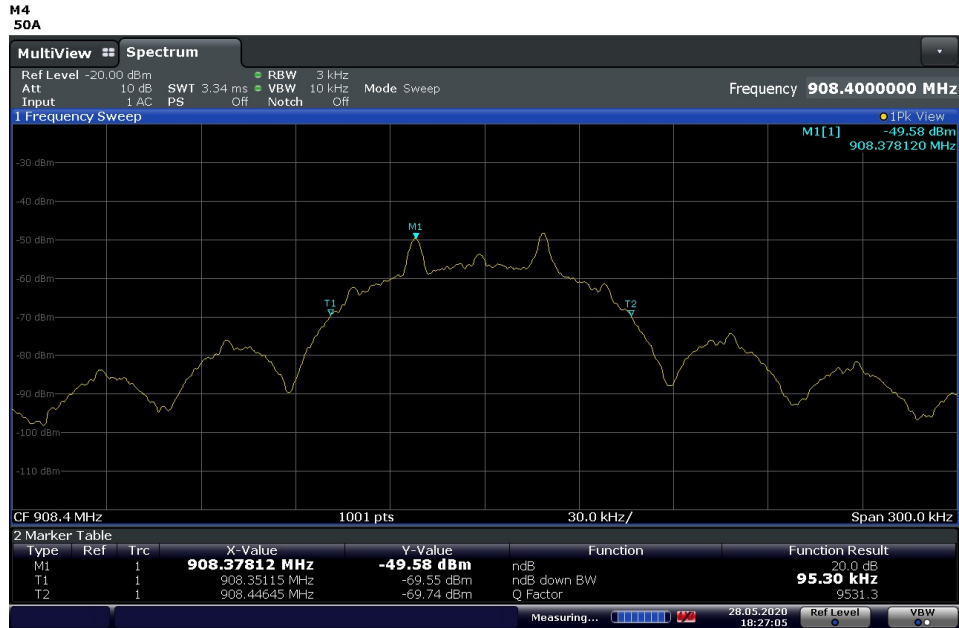
6.4 Results:

The sample tested was found to Comply. The 20 dB and 99% bandwidth of the fundamental frequency remain inside the band of operation.

6.5 Setup Diagram:**6.6 Plots/Data:**

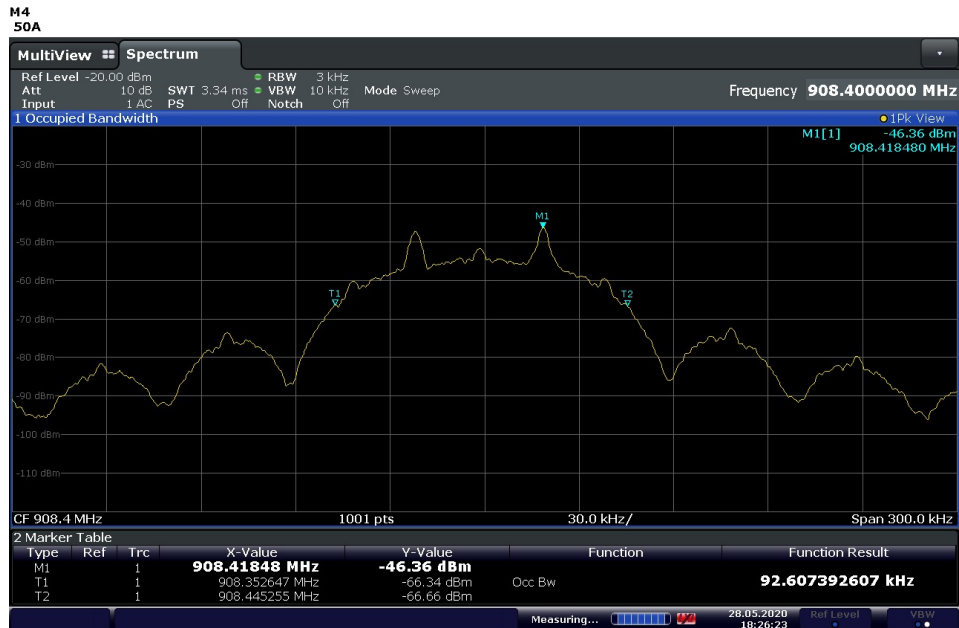
Frequency (MHz)	Occupied Bandwidth	
	20 dB	99 %
908.4	95.30 kHz	92.61 kHz
916	123.18 kHz	113.29 kHz

20 dB Bandwidth, 908.4 MHz:



18:27:06 28.05.2020

99 % Bandwidth, 908.4 MHz:



18:26:23 28.05.2020

20 dB Bandwidth, 916 MHz:



18:30:11 28.05.2020

99 % Bandwidth, 916 MHz:



18:30:55 28.05.2020

Test Personnel:	Grace Lin	Test Date:	05/28/2020
	FCC §15.249,		FCC §15.215(c),
Product Standard:	ISED RSS-210	Limit Applied:	ISED RSS-Gen
Input Voltage:	6 Vdc (4 of AA batteries)	Ambient Temperature:	23.4 °C
Pretest Verification w/ BB Source:	N/A	Relative Humidity:	59.1 %
		Atmospheric Pressure:	987.1 mBars

Deviations, Additions, or Exclusions: None

7 Fundamental Field Strength

7.1 Performance Requirement(s)

The field strength of emissions, measured at 3 meters, from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
908-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

7.2 Method

EUT was configured to transmit continuously. Spectrum analyzer resolution bandwidth is 120 kHz.

The EUT is placed on a plastic turntable that is 80 cm in height, 3 meters from the measuring antenna. During testing, 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.

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.

TEST SITE:

The test is performed at Intertek Testing Services NA, Inc., 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility has been accredited by A2LA. FCC designation number is US1048. ISED Canada test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
Radiated Emissions, 3m	30-1000 MHz	4.2 dB	6.3 dB (SAC)

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.

7.3 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
-	EMI Test Receiver	R&S	ESW44	101585	12/03/2019	12/03/2020
1707	Bilog Antenna	sunAR	JB6	A110618	09/26/2019	09/26/2020
1576	Preamplifier	R&S	TS-PR1	102068	01/13/2020	01/13/2021
1517	Cable	R&S	TSPR-B7	101528	01/13/2020	01/13/2021
1518	Cable	R&S	TSPR-B7	101529	01/13/2020	01/13/2021
1412	Barometric Pressure/ Humidity/ Temperature Datalogger	EXTECH	SD700	Q769086	01/22/2020	01/22/2021

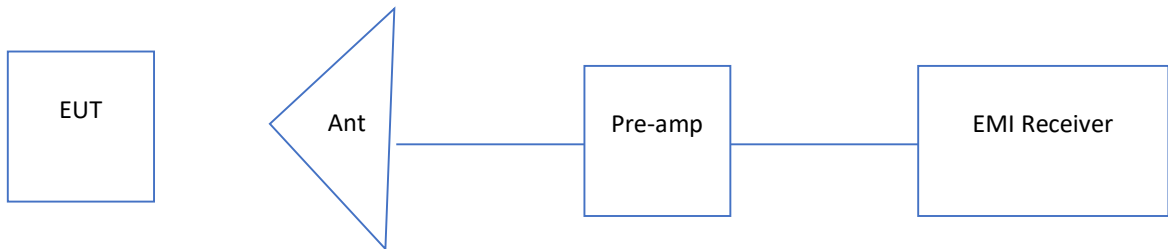
Software Utilized:

Name	Manufacturer	Version	Profile
BAT-EMC	Nexio	3.19.1.19	Project Template 03-05-2020

7.4 Results:

The sample tested was found to Comply.

7.5 Test Setup Diagram:



7.6 Plots/Data:

Ant. Pol.	Frequency (MHz)	Field Strength (dBuV/m)	Limit	Margin	TT	Ant. Ht.	Detector	EUT Power Level
V	908.4	91.85	94	-2.15	5.00	108	QP	43
H	908.4	85.88	94	-8.12	120.50	100	QP	43
V	916	92.76	94	-1.24	0.00	110	QP	43
H	916	83.33	94	-10.67	226.26	100	QP	43

Test Personnel: Grace Lin
 FCC §15.249,
 Product Standard: ISED RSS-210
 Input Voltage: 6 Vdc (4 of AA batteries)
 Pretest Verification w/
 BB Source: N/A

Test Date: 05/26/2020
 FCC §15.249(a),
 Limit Applied: ISED RSS-210 i10 §B.10(a)
 Ambient Temperature: 24.7 °C
 Relative Humidity: 49.9 %
 Atmospheric Pressure: 985.7 mBars

Deviations, Additions, or Exclusions: None

8 Radiated Spurious Emissions

8.1 Performance Requirement(s)

The field strength of emissions, measured at 3 meters, from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
908-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits listed in RSS-Gen, whichever is less stringent.

8.2 Method

EUT was configured to transmit continuously. Radiated emission measurements were performed from 9 kHz to the 10th harmonics according to the procedure described in ANSI C63.10. EMI receiver's resolution bandwidth (RBW) is 200 Hz for frequencies from 9 kHz to 150 kHz, 9 kHz for frequencies from 150 kHz to 30 MHz, 120 kHz for frequencies from, 30 MHz to 1 GHz, and 1 MHz for frequencies above 1 GHz. Video bandwidth (VBW) is at least 3 times RBW. Below 1 GHz, Quasi-Peak measurement was performed (unless specified otherwise). Above 1 GHz, both Peak and Average measurements were performed.

The EUT is placed on a plastic turntable that is 80 cm in height for frequencies below 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, unless specified otherwise.

For radiated emissions measurement below 30 MHz, initial measurement is performed at 3 meters distance in a semi-anechoic chamber (SAC). Any emissions detected at 3 meters distance are then performed at 10 meters distance at an open area test site (OATS) for the final data. The measurement antenna is positioned with its plane perpendicular to the ground. The lowest height of the antenna is 1 m above the ground and is positioned at the 3 meters distance from the EUT. Testing is performed with three measuring antenna orientations (parallel, perpendicular, and ground-parallel) and the EUT is rotated through 0° to 360° on a turntable.

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.

TEST SITE:

The test is performed at Intertek Testing Services NA, Inc., 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility has been accredited by A2LA. FCC designation number is US1048. ISED Canada 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	9 kHz-30 MHz	1.6 dB	3.3 dB (LLAS)
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)

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 dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where UF = Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

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

8.3 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
-	EMI Test Receiver	R&S	ESW44	101585	12/03/2019	12/03/2020
1707	Bilog Antenna	sunAR	JB6	A110618	09/26/2019	09/26/2020
1576	Preamplifier	R&S	TS-PR1	102068	01/13/2020	01/13/2021
692	Horn Antenna	ETS-Lindgren	3115	00031626	08/01/2019	08/01/2020
1556	Preamplifier	R&S	TS-PR18	102144	01/13/2020	01/13/2021
590	Loop Antenna	EMCO	6502	9807-3213	07/14/2020	07/14/2021
1517	Cable	R&S	TSPR-B7	101528	01/13/2020	01/13/2021
1518	Cable	R&S	TSPR-B7	101529	01/13/2020	01/13/2021
1412	Barometric Pressure/ Humidity/ Temperature Datalogger	EXTECH	SD700	Q769086	01/22/2020	01/22/2021

Software Utilized:

Name	Manufacturer	Version	Profile
BAT-EMC	Nexio	3.19.1.19	Project Template 03-05-2020

8.4 Results:

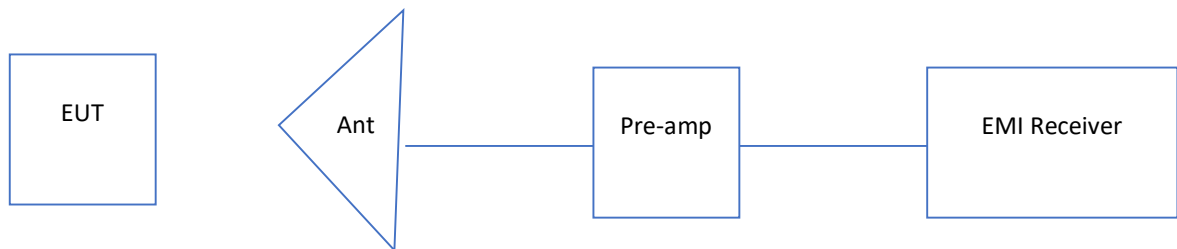
The sample tested was found to Comply.

8.5 Setup Diagram:

Radiated Spurious Emissions, below 30 MHz

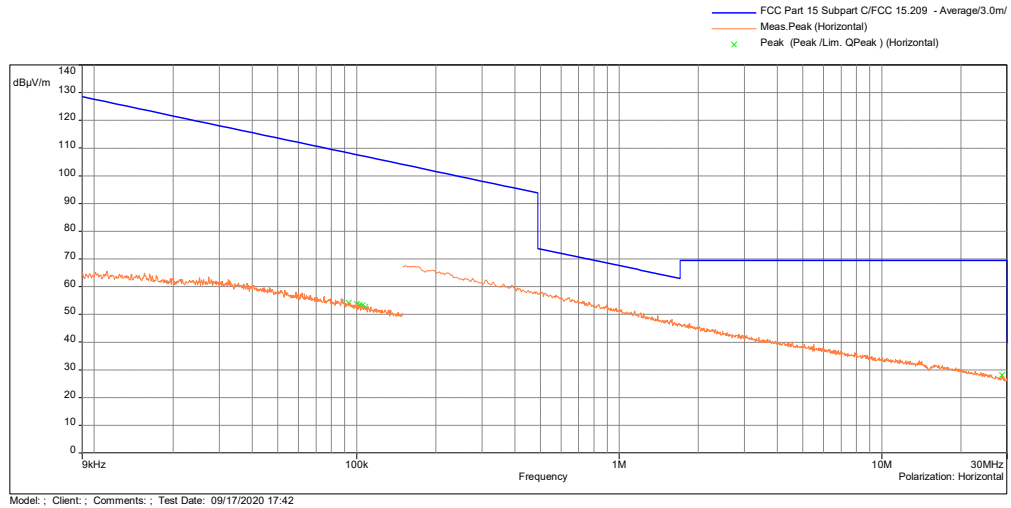


Radiated Spurious Emissions, 30 MHz and above

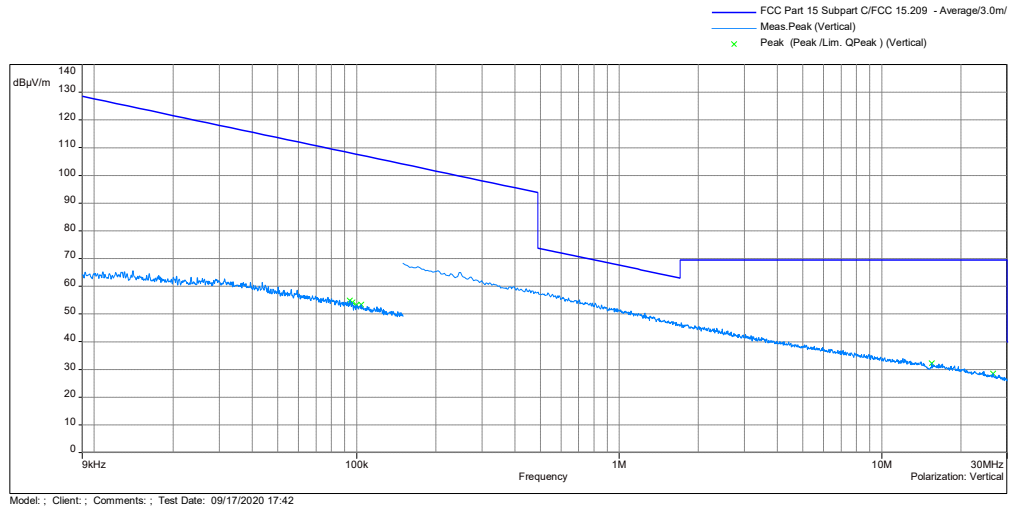


8.6 Plots/Data:

Radiated Spurious Emissions, 9 kHz – 30 MHz, 908.4 MHz



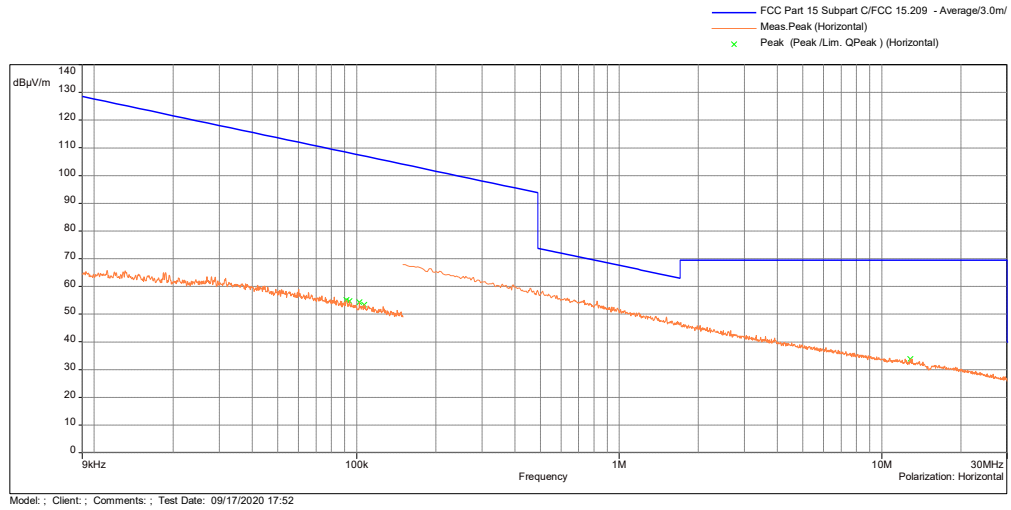
Antenna: Parallel



Antenna: Perpendicular

8.6 Plots/Data: (Continued)

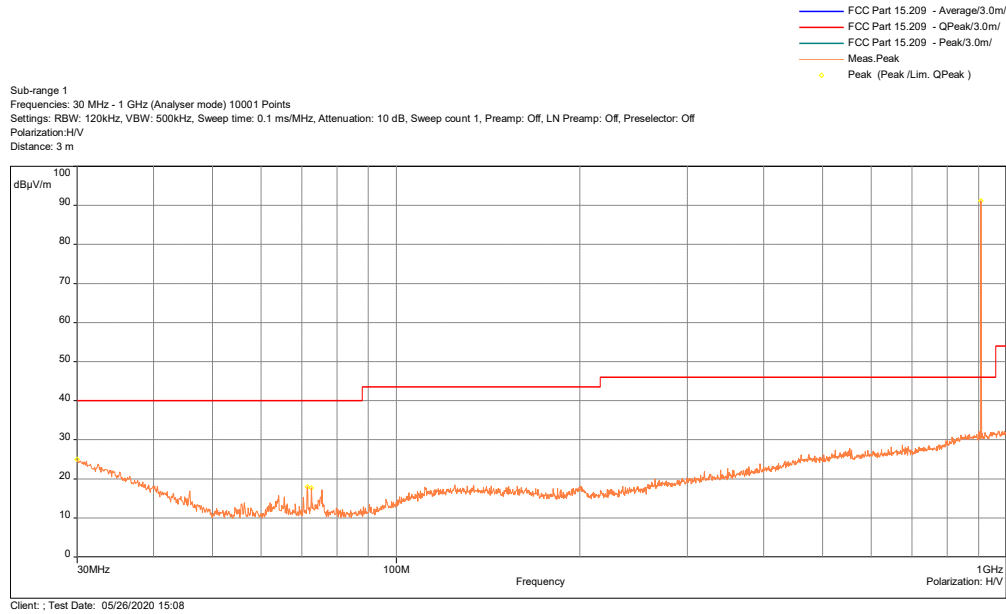
Radiated Spurious Emissions, 9 kHz – 30 MHz, 908.4 MHz



Antenna: Ground-Parallel

8.6 Plots/Data: (Continued)

Radiated Spurious Emissions, 30 MHz – 1 GHz, 908.4 MHz

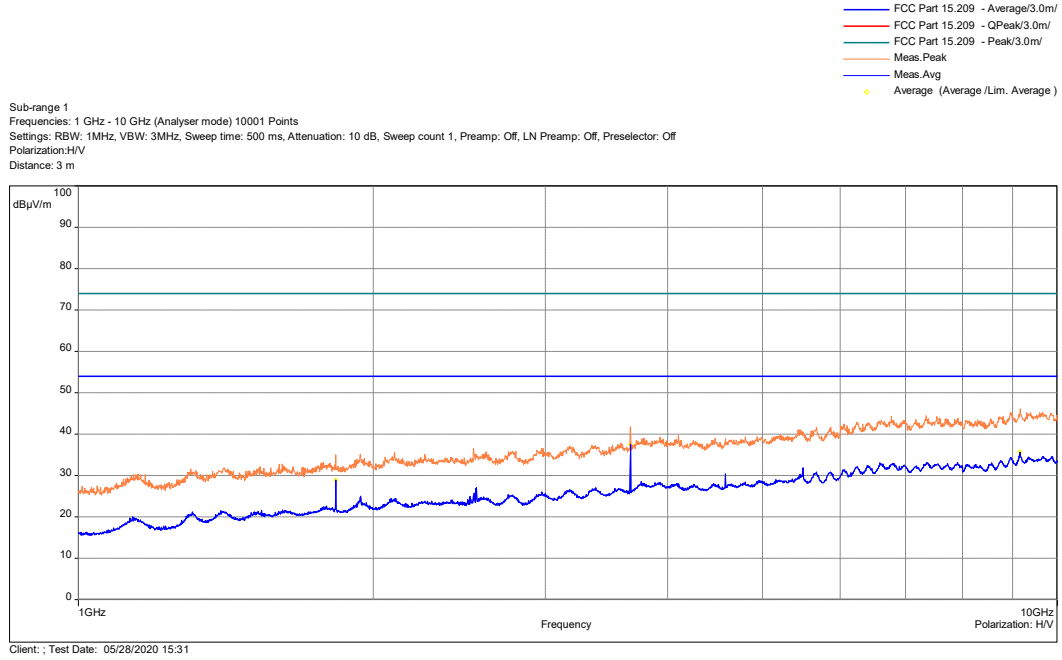


Note: Emission at 908.4 MHz was the carrier. Peak scan. QP Limit Line

Frequency (MHz)	Peak Field Strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)	Antenna Pol.	Correction (dB)
30.00	25.00	40	-15.00	3.98	138.50	Vertical	-4.16
71.52	17.95	40	-22.05	1.02	316.00	Vertical	-17.46
72.58	17.65	40	-22.35	1.02	351.25	Vertical	-17.43

8.6 Plots/Data: (Continued)

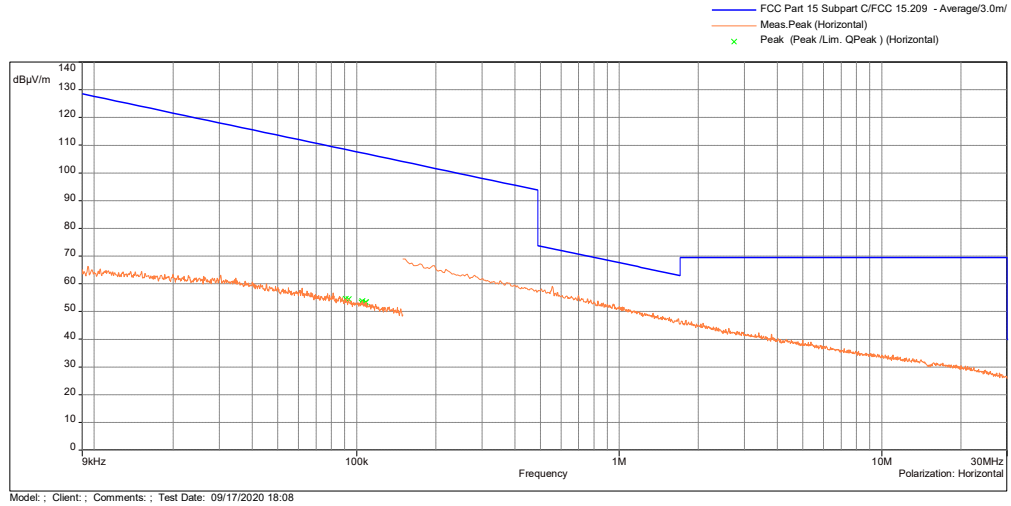
Radiated Spurious Emissions, 1-10 GHz, 908.4 MHz



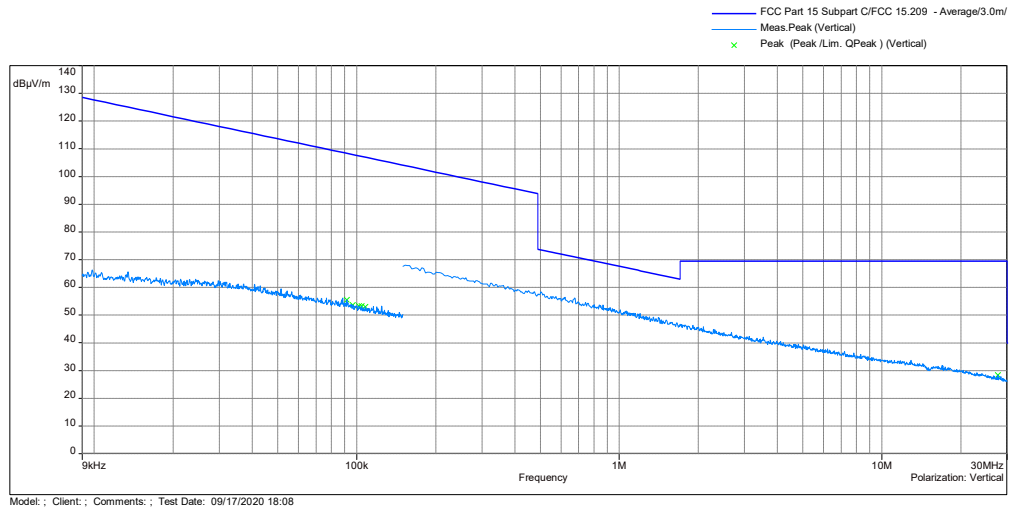
Frequency (MHz)	Field Strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Ant. Height (m)	Turntable Angle (°)	Ant. Pol.	Correction (dB)	Detector
1816.8	29.82	54	-24.18	331	167.0	Horizontal	-20.02	AV
1816.8	36.50	74	-37.50	331	167.0	Horizontal	-20.02	PK
3633.6	42.11	54	-11.89	149	141.0	Horizontal	-13.3	AV
3633.6	45.68	74	-28.32	149	141.0	Horizontal	-13.3	PK
9084.0	48.10	54	-5.90	249	344.5	Vertical	-3.45	AV
9084.0	53.58	74	-20.42	249	344.5	Vertical	-3.45	PK

8.6 Plots/Data: (Continued)

Radiated Spurious Emissions, 9 kHz – 30 MHz, 916 MHz



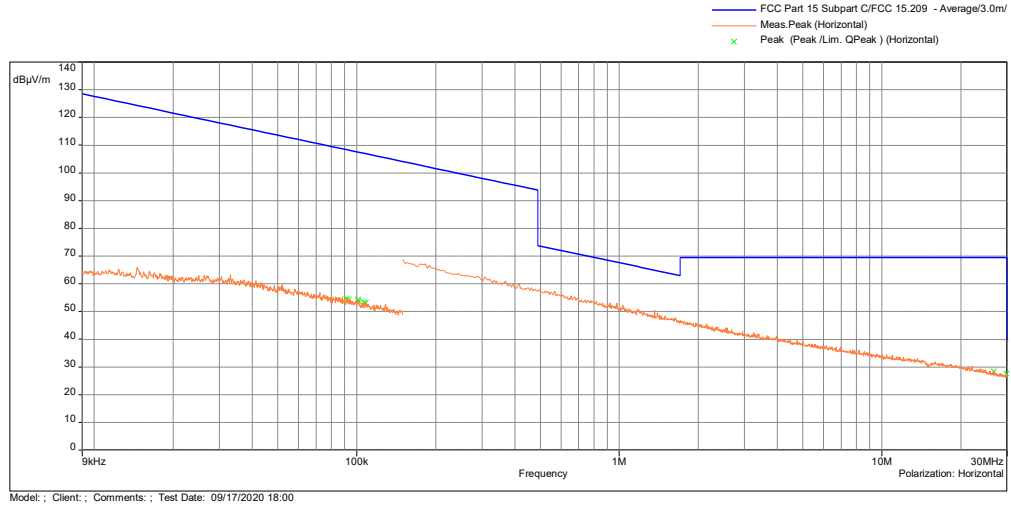
Antenna: Parallel



Antenna: Perpendicular

8.6 Plots/Data: (Continued)

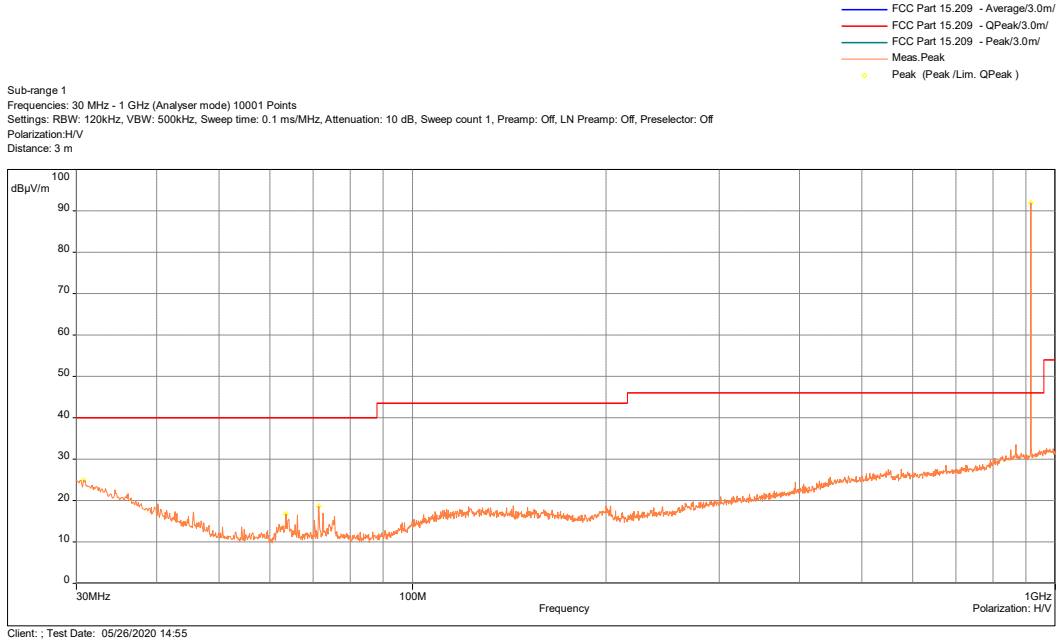
Radiated Spurious Emissions, 9 kHz – 30 MHz, 916 MHz



Antenna: Ground-Parallel

8.6 Plots/Data: (Continued)

Radiated Spurious Emissions, 30 MHz – 1 GHz, 916 MHz

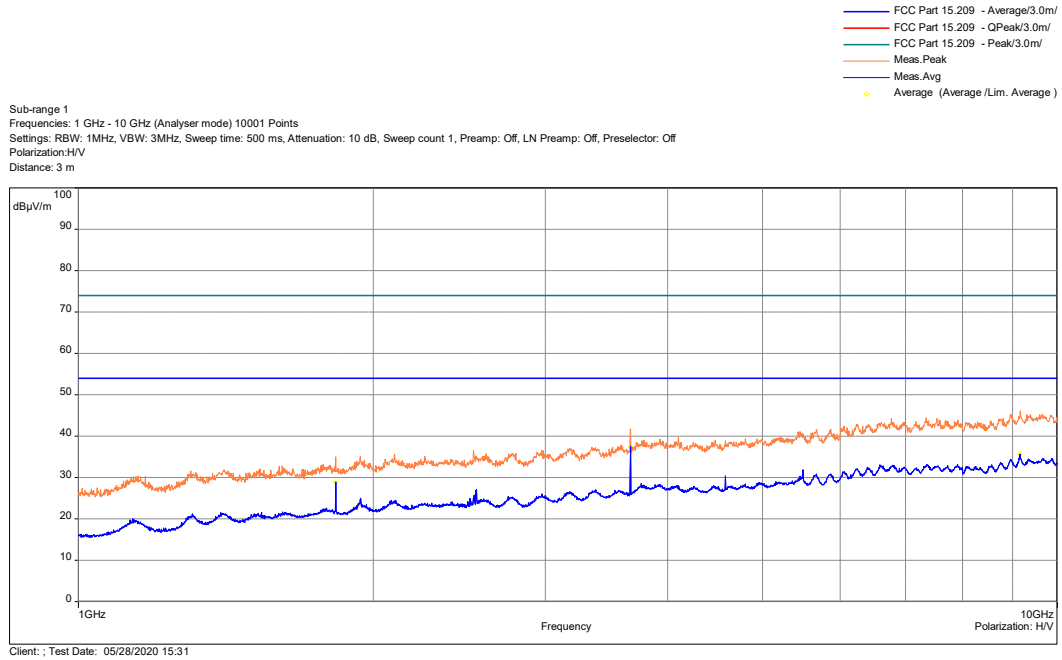


Note: Emission at 916 MHz was the carrier. Peak scan. QP Limit Line

Frequency (MHz)	Peak Field Strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)	Antenna Pol.	Correction (dB)
30.78	24.89	40	-15.11	1.98	47.75	Vertical	-4.69
63.56	16.78	40	-23.22	1.02	111.25	Vertical	-17.83
71.52	18.63	40	-21.37	1.02	220.00	Vertical	-17.46

8.6 Plots/Data: (Continued)

Radiated Spurious Emissions, 1-10 GHz, 916 MHz



Frequency (MHz)	Field Strength (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Ant. Height (m)	Turntable Angle (°)	Ant. Pol.	Correction (dB)	Detector
1832	29.88	54	-24.12	208	166.75	Horizontal	-19.98	AV
1832	36.14	74	-37.86	208	166.75	Horizontal	-19.98	PK
3664	39.11	54	-14.89	116	140.00	Horizontal	-13.05	AV
3664	43.42	74	-30.58	116	140.00	Horizontal	-13.05	PK
9160	33.87	54	-20.13	257	155.00	Vertical	-3.39	AV
9160	45.69	74	-28.31	257	155.00	Vertical	-3.39	PK

Note: Radiated spurious emissions measurements were performed from 9 kHz to 10 GHz.

Test Personnel:	Grace Lin	Test Date:	05/26/2020, 05/28/2020, 09/13/2020
	FCC §15.249,		FCC §15.249(a),
Product Standard:	ISED RSS-210	Limit Applied:	ISED RSS-210 i10 §B.10(a)
Input Voltage:	6 Vdc (4 of AA batteries)	Ambient Temperature:	23.4 °C
Pretest Verification w/ BB Source:	Yes	Relative Humidity:	59.1 %
		Atmospheric Pressure:	987.1 mBars

Deviations, Additions, or Exclusions: None

9 AC Mains Conducted Emissions

9.1 Performance Criterion

Frequency Band MHz	Conducted Limit dB(μ V)	
	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.*

9.2 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 at Intertek Testing Services NA, Inc., 25791 Commercentre Drive, Lake Forest, California 92630 USA. This test facility has been accredited by A2LA. FCC designation number is US1048. ISED Canada test site registration number is 2042T and wireless device testing laboratory CAB identifier is US0092.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
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:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 285.1 \mu\text{V/m}$$

9.3 Test Equipment Used:

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

Software Utilized:

Name	Manufacturer	Version	Profile
-	-	-	-

9.4 Results:

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

10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	06/02/2020	104271913LAX-001	GL	US	Initial Issue
1	09/18/2020	104271913LAX-001	GL	US	Added below 30 MHz measurement under Section 8.