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Spectrum Brands
TEST REPORT

SCOPE OF WORK
FCC 15.247 AND ISED RSS-247 TESTING – 959-3000-GIG

REPORT NUMBER
104193999LAX-001

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April 1, 2020

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May 20, 2020

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Non-Specific Radio Report Shell Rev. December 2017

EMC TEST REPORT

(PARTIAL COMPLIANCE)

Report Number: 104193999LAX-001
Project Number: G104193999

Report Issued Date: April 1, 2020
Report Revised Date: May 20, 2020

Model(s) Tested: 959-3000-GIG (Kwikset 959 / Weiser GED3000)

Standards: **FCC CFR47 Part 15 Subpart C, March 2020**
Intentional Radiator
§15.247, Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
(Output Power and Radiated Spurious Emissions Only)

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

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

This test report is to support a permissive change to FCC ID: NUL-WIFI-GIG and IC: 3022A-WIFIGIG. Radiated spurious emissions measurement was performed and record in this test report.

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	Maximum Peak Conducted Output Power at Antenna Terminals (FCC §15.247(b)(3), ISED RSS-247 §5.4d)	Compliant
7	Radiated Spurious Emissions (FCC §15.247(d), §15.209, §15.205, ISED RSS-247 §5.5, ISED RSS-Gen §8.9)	Compliant
8	AC Mains Conducted Emissions (FCC §15.207, ISED RSS-Gen §8.8)	Not Applicable*
9	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: Christopher Aiello
Telephone: 949 672-4372
Email: Christopher.Aiello@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	959-3000-GIG (Kwikset 959 / Weiser GED3000)	PROTO

Receive Date:	3/20/2020, 5/15/2020	Test Started	3/23/2020
Received Condition:	Good	Test Ended	5/20/2020
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 (FCC ID: Z64-CC3220MOD, IC: 451I-CC3220MOD). This test report covers the radiated spurious emissions of 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 (FW: HaloBleFCC4_App_BtLdr_v1_05) – Modulated with continuous packet transmit.

Radio/Receiver Characteristics	
Frequency Band(s)	2402 MHz – 2480 MHz
Modulation Type(s)	GFSK
Maximum Output Power	Refer to the original filing
Test Channels	2402 MHz, 2440 MHz, 2480 MHz
Occupied Bandwidth	Refer to the original filing
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 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 "959-3000-GIG" represents tow models: Kwikset 959 and Weiser GED3000
- Kwikset 959 is identical to Weiser GED3000. Different model names are for different markets.

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 Maximum Peak Conducted Output Power at Antenna Terminals

6.1 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.

6.2 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.

6.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1140	EMI Test Receiver	R&S	ESCI7	100825	05/15/2020	05/15/2021
1814	Barometric Pressure/ Humidity/ Temperature Datalogger	EXTECH	SD700	A.091747	10/18/2019	10/18/2020

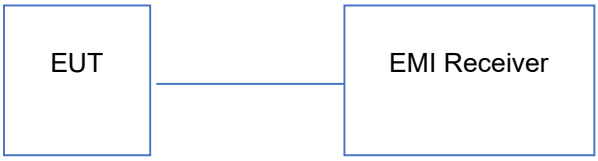
Software Utilized:

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:

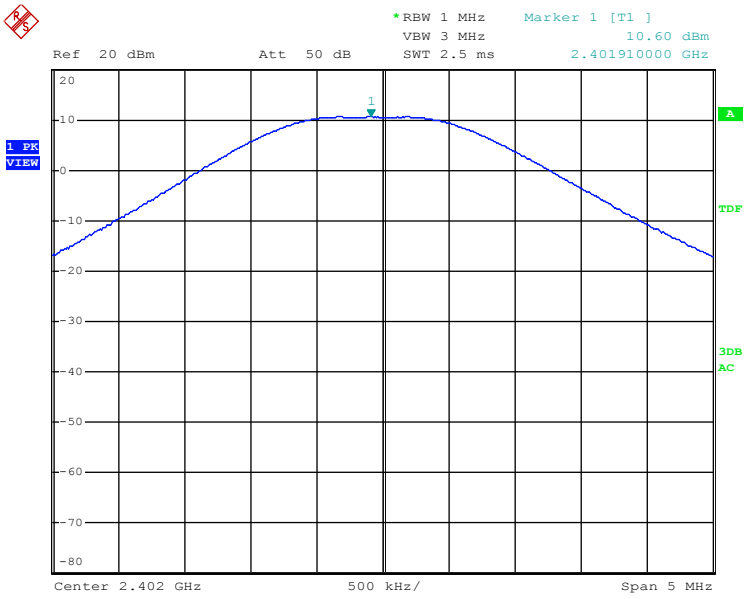


6.6 Plots/Data:

Frequency (MHz)	Peak Conducted Output Power	
	dBm	mW
2402	10.60	11.48
2440	10.26	10.62
2480	9.77	9.48

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:



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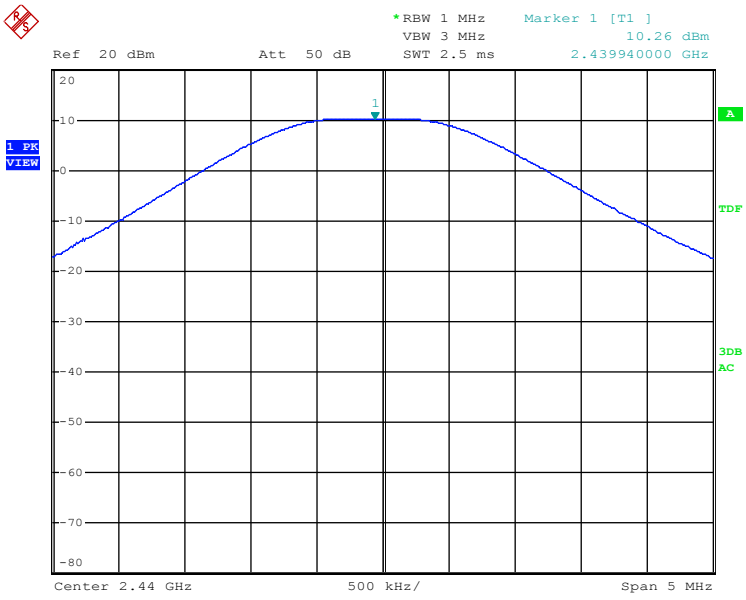
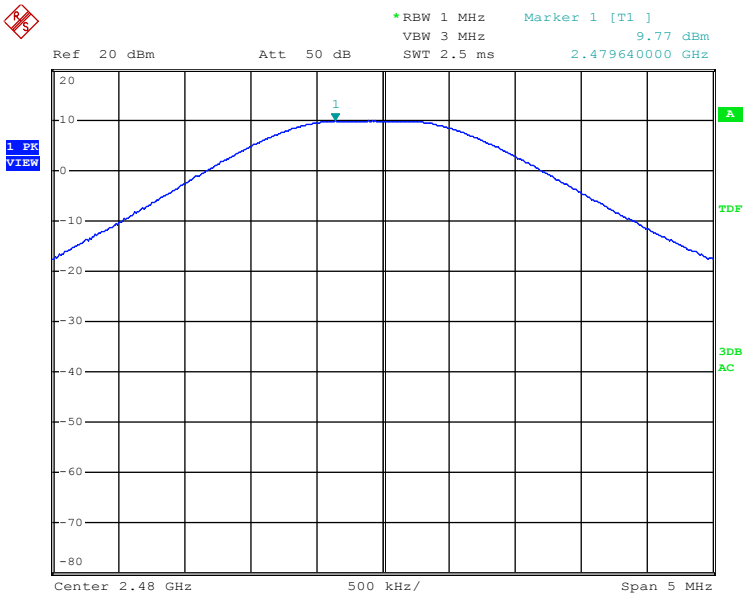
Output Power, 2440 MHz:



Date: 20.MAY.2020 17:12:58

Output Power, 2480 MHz:



Test Personnel:	Grace Lin	Test Date:	05/20/2020
Product Standard:	FCC §15.247, ISED RSS-247	Limit Applied:	FCC §15.247, ISED RSS-247
Input Voltage:	6 Vdc Battery (4 x AA)	Ambient Temperature:	21.1 °C
Pretest Verification w/ BB Source:	N/A	Relative Humidity:	50.8 %
		Atmospheric Pressure:	991.2 mBars

Deviations, Additions, or Exclusions: None

7 Radiated Spurious Emissions

7.1 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.

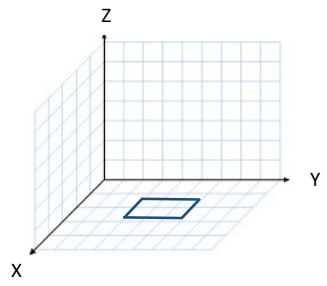
7.2 Method

EUT was configured to transmit continuously. Radiated emission measurements were performed from 30 MHz to 25 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. Duty cycle correction factor (DCCF) applied to the peak level for the average level of radiated emissions. Duty cycle of 0.196 was provided by Spectrum Brands. Refer to the operational description for the derivation of duty cycle.

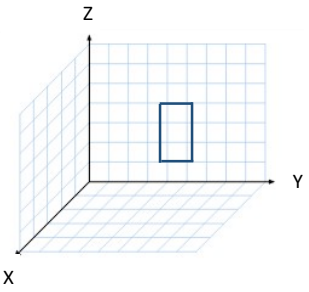
The EUT is placed on a plastic turntable that is 80 cm in height for frequencies 30 MHz to 1 GHz, 1.5 meters for frequency above 1 GHz. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. 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.

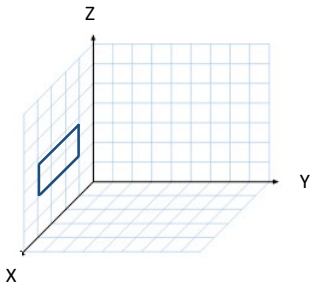
EUT was tested as the customers would normally use (YZ plane). Data included is representative of the worst-case configuration (the configuration which resulted in the highest emission levels). Plots below are corrected for distance, cables, preamp, filters and antenna factors then compared to the limits.



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

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
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
1576	Pre-amp	R&S	TS-PR1	102068	01/13/2020	01/13/2021
1515	Horn Antenna	ETS-Lindgren	3115	00161631	04/17/2019	04/17/2020
1556	Pre-amp	R&S	TS-PR18	102144	01/13/2020	01/13/2021
1418	High Pass Filter	Reactel, Inc.	7HSX-3G/18G-S11	14-2	01/13/2020	01/13/2021
880	Horn Antenna	ETS-Lindgren	3116C	00153521	04/19/2019	04/19/2021
1557	Pre-amp	R&S	TS-PR1840	100054	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
1564	Cable	Micro-coax	UFB142A	266585-001	01/13/2020	01/13/2021
1814	Barometric Pressure/ Humidity/ Temperature Datalogger	EXTECH	SD700	A.091747	10/18/2019	10/18/2020

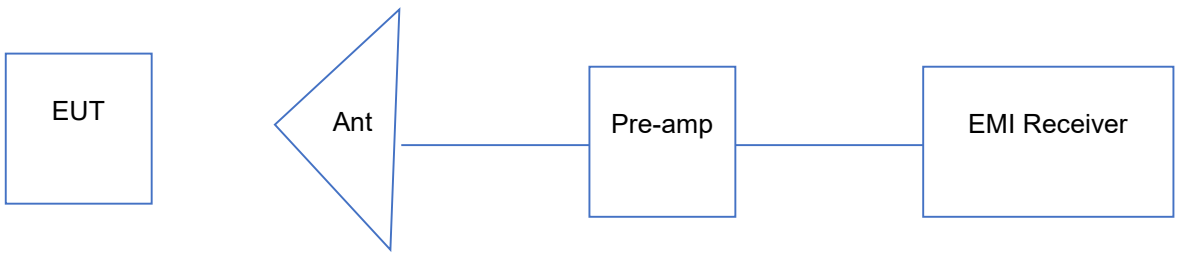
Software Utilized:

Name	Manufacturer	Version	Profile
BAT-EMC	Nexio	3.19.1.19	Template Project 20200305

7.4 Results:

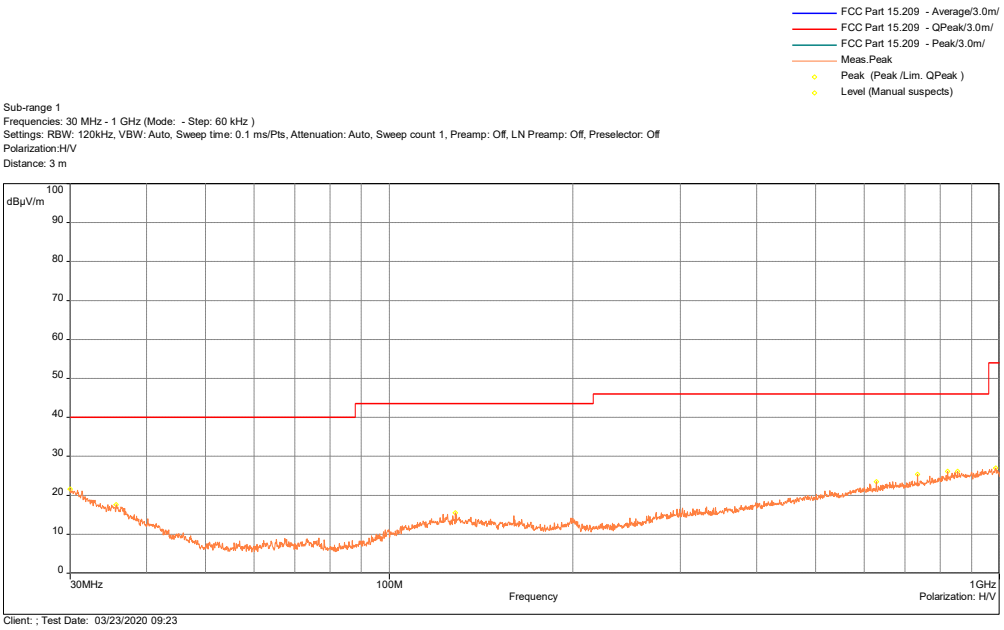
The sample tested was found to Comply.

7.5 Setup Diagram:



7.6 Plots/Data:

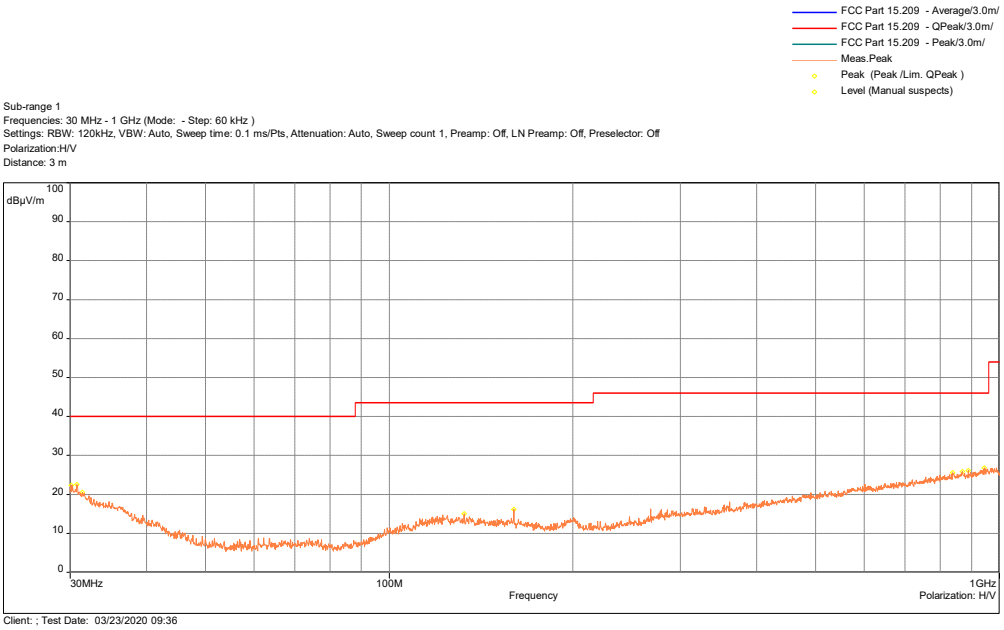
Radiated Spurious Emissions, 30 MHz – 1 GHz, Low Channel



Frequency (MHz)	Peak (dBµV/m)	Limit QP (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Ant. Pol.	Correction (dB)
30.00	21.58	40	-18.42	2.02	189.25	H	-4.16
628.20	23.51	46	-22.49	1.02	117.00	V	-3.99
734.34	25.42	46	-20.58	2.98	357.75	V	-2.71
822.78	26.15	46	-19.85	2.02	79.00	H	-0.81
853.80	26.15	46	-19.85	1.02	150.00	H	-0.03
985.44	26.97	54	-27.03	1.02	39.25	V	1.21

10.6 Plots/Data: *(Continued)*

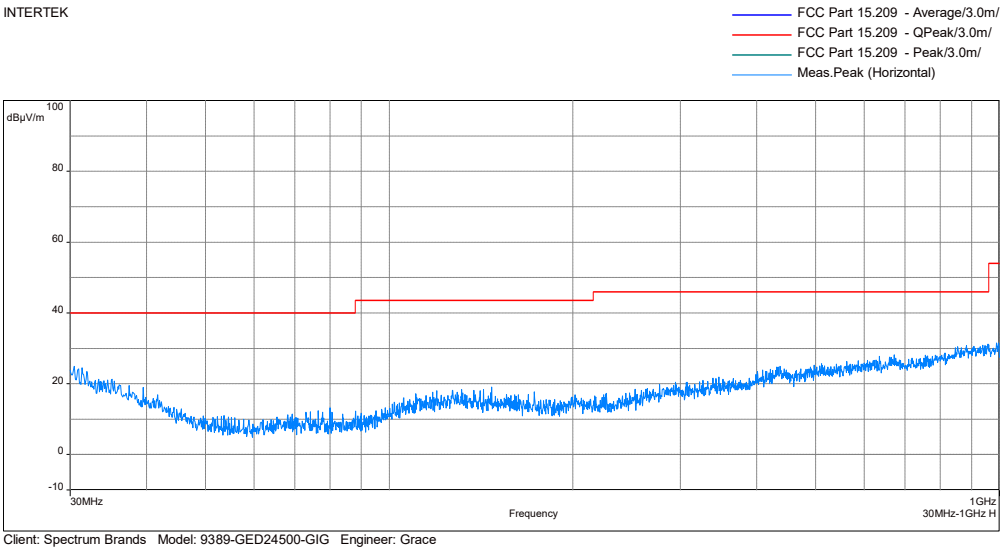
Radiated Spurious Emissions, 30 MHz – 1 GHz, Middle Channel



Frequency (MHz)	Peak (dBµV/m)	Limit QP (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Ant. Pol.	Correction (dB)
30.12	22.34	40	-17.66	2.02	354.00	H	-4.24
30.78	22.50	40	-17.50	1.98	10.25	V	-4.69
31.44	20.58	40	-19.42	1.98	47.25	V	-5.18
869.46	25.85	46	-20.15	3.02	210.50	H	0.27
889.56	26.16	46	-19.84	3.99	1.75	H	0.32
944.94	26.81	46	-19.19	3.98	175.75	V	0.83

10.6 Plots/Data: *(Continued)*

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



Frequency (MHz)	Peak (dBµV/m)	Limit QP (dBµV/m)	Margin (dB)	Height (m)	Angle (°)	Ant. Pol.	Correction (dB)
30.00	21.96	40	-18.04	3.98	219.50	V	-4.16
30.90	21.24	40	-18.76	3.99	190.25	H	-4.77
763.50	24.56	46	-21.44	3.02	10.00	H	-2.26
837.78	25.67	46	-20.33	2.02	54.00	H	-0.41
901.68	26.07	46	-19.93	2.02	199.75	H	0.31
974.64	27.02	54	-26.98	1.98	54.00	V	1.01

10.6 Plots/Data: *(Continued)*

Radiated Spurious Emissions, 1-25 GHz

Antenna Polarization	Frequency (MHz)	Channel Freq. (MHz)	Final Field Strength (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Turtable Degree	Antenna Height (cm)	Detector
H	2390	2402	33.66	74.00	-40.34	342.75	165.00	PK
H	2390	2402	19.52	54.00	-34.48	342.75	165.00	AV
V	2390	2402	34.31	74.00	-39.69	334.75	129.00	PK
V	2390	2402	20.17	54.00	-33.83	334.75	129.00	AV
V	4804	2402	62.96	74.00	-11.04	360.00	216.00	PK
V	4804	2402	48.82	54.00	-5.18	360.00	216.00	AV
H	7206	2402	56.87	74.00	-17.13	11.25	137.00	PK
H	7206	2402	42.73	54.00	-11.27	11.25	137.00	AV
V	4880	2440	61.92	74.00	-12.08	5.50	209.00	PK
V	4880	2440	47.78	54.00	-6.22	5.50	209.00	AV
H	7320	2440	55.34	74.00	-18.66	360.00	111.00	PK
H	7320	2440	41.19	54.00	-12.81	360.00	111.00	AV
H	2483.5	2480	48.12	74.00	-25.88	346.50	177.00	PK
H	2483.5	2480	33.98	54.00	-20.02	346.50	177.00	AV
V	2483.5	2480	40.79	74.00	-33.21	0.00	103.00	PK
V	2483.5	2480	26.65	54.00	-27.35	0.00	103.00	AV
H	4960	2480	57.94	74.00	-16.06	16.00	267.00	PK
H	4960	2480	43.80	54.00	-10.20	16.00	267.00	AV
V	4960	2480	63.09	74.00	-10.91	13.00	192.00	PK
V	4960	2480	48.95	54.00	-5.05	13.00	192.00	AV

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

Test Personnel:	Grace Lin	Test Date:	03/23/2020 - 03/25/2020
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:	18.3 °C
Pretest Verification w/ BB Source:	Yes	Relative Humidity:	50.5 %
		Atmospheric Pressure:	996.2 mbars

Deviations, Additions, or Exclusions: None

8 AC Mains Conducted Emissions

8.1 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.

8.2 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

8.3 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

8.4 Results:

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

9 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	04/01/2020	104044098LAX-001	GL	SK	Initial Issue
1	05/20/2020	104044098LAX-001	GL	SK	Power output measurement was added