

Water Pik, Inc.

TEST REPORT

SCOPE OF WORK

FCC 15.231 AND ISSED RSS-210 TESTING – WF-09

REPORT NUMBER

103835210LAX-001

ISSUE DATE

August 21, 2019

PAGES

26

DOCUMENT CONTROL NUMBER

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



EMC TEST REPORT (FULL COMPLIANCE)

Report Number: 103835210LAX-001

Project Number: G103835210

Report Issue Date: August 21, 2019

Model(s) Tested: WF-09W/C

Model(s) Not Tested: WF-09E, WF-09UK, WF-09EC

Standards: FCC CFR47 Part 15 Subpart C, August 2019

Intentional Radiator

§15.231, Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

ISED RSS-210 Issue 9, August 2016 (Amendment November 2017)

Licence-Exempt Radio Apparatus: Category I Equipment

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

General Requirements for Compliance of Radio Apparatus

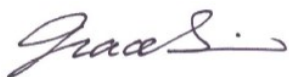
Tested by:
Intertek

25791 Commercentre Drive
Lake Forest, CA 92630
USA

Client:

Water Pik, Inc.
1730 E. Prospect Rd.
Fort Collins, CO 80553
USA

Report prepared by



Grace Lin
EMC Staff Engineer

Report reviewed by



Krishna Vemuri
Engineering Team Lead

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

Water Pik, 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 Transmitter Deactivation Time	8
7 Occupied Bandwidth	11
8 Fundamental Field Strength	14
9 Radiated Spurious Emissions	17
10 AC Mains Conducted Emissions	24
11 Revision History	26

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	Transmitter Deactivation Time (FCC §15.231(a)(1) and ISED RSS-210 Issue 9 §A.1.1(a))	Compliant
7	Occupied Bandwidths (FCC §15.215(c); ISED RSS-Gen Issue 4 §6.6)	Compliant
8	Field Strength of Fundamental (FCC §15.231(b); ISED RSS-210 Issue 9 §A.1.2(a))	Compliant
9	Radiated Spurious Emissions (FCC §15.231(b); ISED RSS-210 Issue 9 §A.1.2(a))	Compliant
10	AC Mains Conducted Emissions (FCC §15.207, ISED RSS-Gen §8.8)	Not Applicable*
11	Revision History	-

*: The EUT is battery powered

3 Client Information

This EUT was tested at the request of:

Client: Water Pik, Inc.
1730 E. Prospect Rd.
Fort Collins, CO 80553
USA

Contact: Tom Graves
Telephone: (970) 221-7072
Email: tgraves@waterpik.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Water Pik, Inc.
1730 E. Prospect Rd.
Fort Collins, CO 80553
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Waterflosser	Water Pik, Inc.	WF-09	1 (Occupied Bandwidth) 5 (Field Strength of Fundamental, Radiated Spurious Emissions) 21 (Deactivation Time)

Receive Date:	6/5/2019, 7/11/2019	Test Started	8/6/2019
Received Condition:	Good	Test Ended	8/14/2019
Type:	Production		

Description of Equipment Under Test (provided by client)

The equipment under test is an oral health home appliance operating at 433.94 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
3 Vdc (battery)	-	-	-

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)	433.94 MHz
Modulation Type(s)	ASK
Test Channels	433.94 MHz
Occupied Bandwidth	6.56 kHz (20 dB), 11.35 kHz (99%)
Equipment Type	Standalone
Antenna Type and Gain	Internal permanent attached antenna

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.

Per manufacturer, the following models are electrically identical models:

- US and Canada: WF-09W/C
- Europe: WF-09E
- UK: WF-09UK
- China: WF-09EC

5 System Setup and Method

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

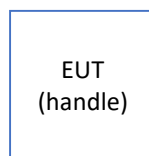
Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None	-	-	-

5.1 Method:

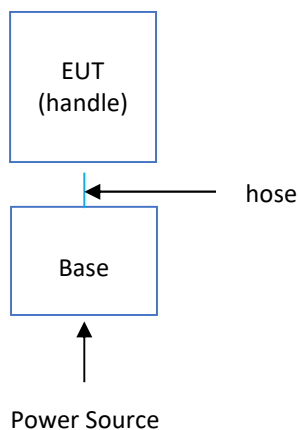
Configuration as required by ANSI C63.10-2013.

5.2 Test Setup Block Diagram:

Transmitting Mode:



Normal Operation Mode (for deactivation time measurement):



6 Transmitter Deactivation Time

6.1 Performance Requirement(s)

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

6.2 Method

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

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

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
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1707	Bilog Antenna	sunAR	JB6	A110618	11/20/2018	11/20/2019
1842	Cable	Fairview Microwave	FMC0101223-360	-	04/18/2019	04/18/2020
1016	Barometer Temp/Humidity	Omega	IBTHX-W	18300406	08/18/2018	08/18/2019

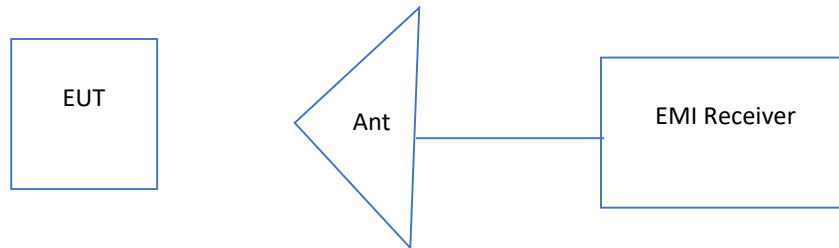
Software Utilized:

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

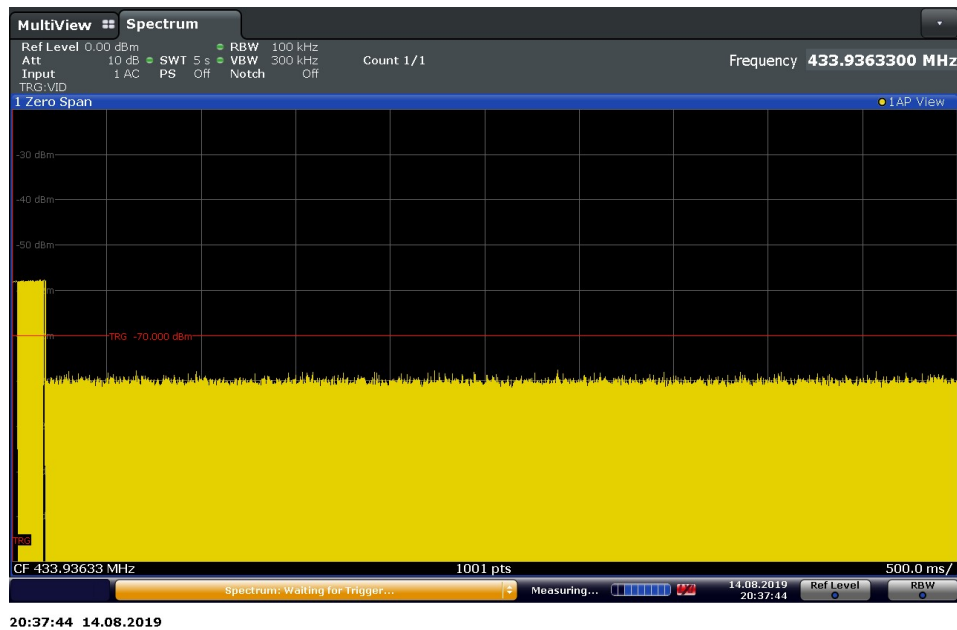
6.4 Results:

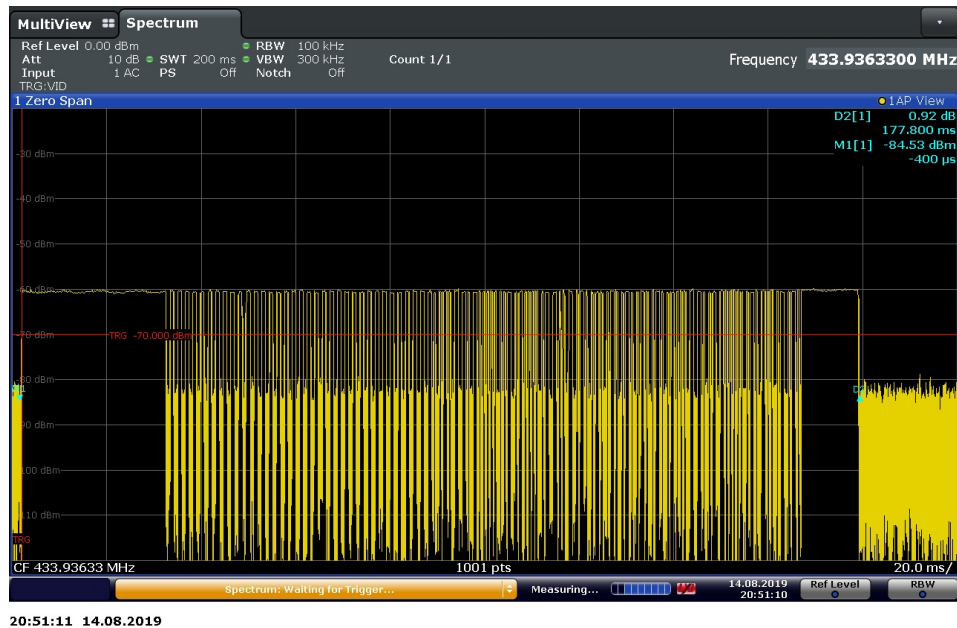
The sample tested was found to Comply. The transmitter ceases transmission within 200 ms after activation

6.5 Setup Diagram:



6.6 Plots/Data:





Deactivation Time	Limit	Result
177.8 ms	5 seconds	Compliant

Test Personnel: Grace Lin

Product Standard: FCC §15.231,
ISED RSS-210

Input Voltage: 3 Vdc (battery)

Pretest Verification w/
BB Source: N/A

Test Date: 08/14/2019

Limit Applied: FCC §15.231(a),
ISED RSS-210

Ambient Temperature: 22.8 °C

Relative Humidity: 50.3 %

Atmospheric Pressure: 989.7 mBars

Deviations, Additions, or Exclusions: None

7 Occupied Bandwidth

7.1 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 transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured. (ISED RSS-Gen Issue 4 §6.6)

7.2 Method

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

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.

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.

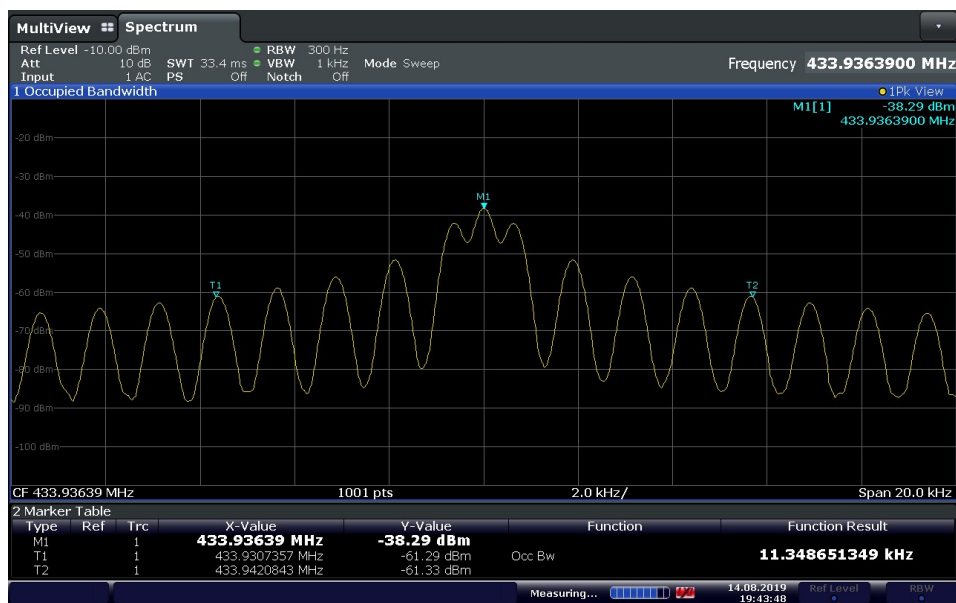
7.3 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1707	Bilog Antenna	sunAR	JB6	A110618	11/20/2018	11/20/2019
1842	Cable	Fairview Microwave	FMC0101223-360	-	04/18/2019	04/18/2020
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

99 % Bandwidth:



19:43:49 14.08.2019

Test Personnel: Grace Lin

Product Standard: FCC §15.231,
ISED RSS-210

Input Voltage: 3 Vdc (battery)

Pretest Verification w/
BB Source: N/A

Test Date: 08/14/2019

Limit Applied: FCC §15.215(c),
ISED RSS-Gen

Ambient Temperature: 22.8 °C

Relative Humidity: 50.3 %

Atmospheric Pressure: 989.7 mBars

Deviations, Additions, or Exclusions: None

8 Fundamental Field Strength

8.1 Performance Requirement(s)

The field strength of emissions, measured at 3 meters, from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

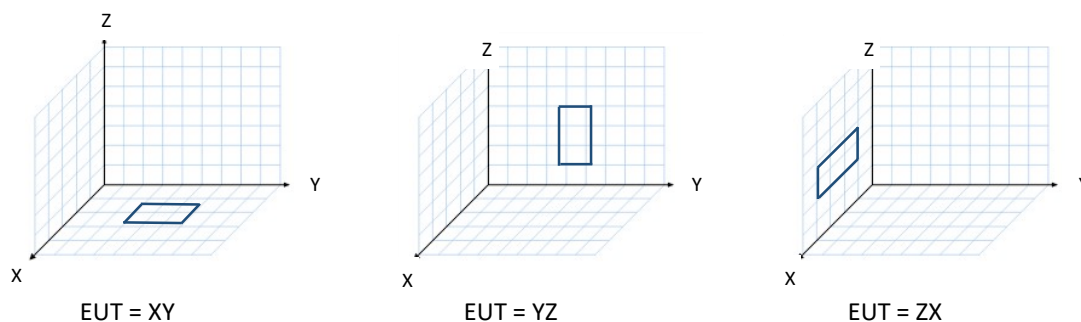
8.2 Method

EUT was configured to transmit continuously. 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 an Average detector.

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 in three orthogonal axes (XY, YZ, and ZX 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.



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)	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.

8.3 Test Equipment Used:

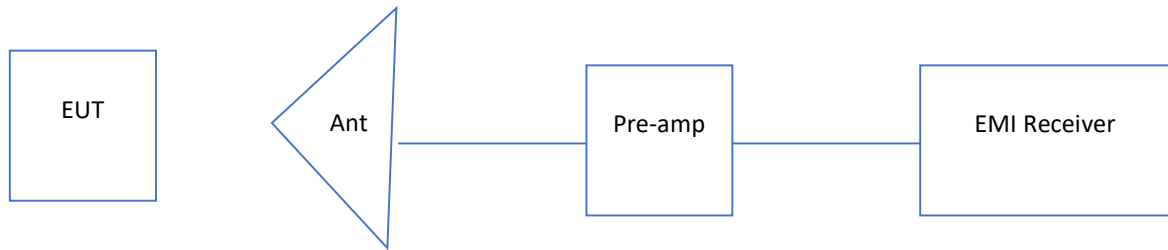
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1707	Bilog Antenna	sunAR	JB6	A110618	11/20/2018	11/20/2019
1842	Cable	Fairview Microwave	FMC0101223-360	-	04/18/2019	04/18/2020
1016	Barometer Temp/Humidity	Omega	IBTHX-W	18300406	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:**

Antenna Polarization	Frequency (MHz)	EUT Orientation	Field Strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Turntable Degree	Antenna Height (cm)	Detection
V	433.94	XY	67.44	80.83	-13.39	171.8	135.0	PK

Test Personnel: Grace Lin
Product Standard: FCC §15.231,
ISED RSS-210
Input Voltage: 3 Vdc (battery)
Pretest Verification w/
BB Source: N/A

Test Date: 08/14/2019
Limit Applied: FCC §15.231(b),
ISED RSS-210
Ambient Temperature: 22.8 °C
Relative Humidity: 50.3 %
Atmospheric Pressure: 989.7 mBars

Deviations, Additions, or Exclusions: None

9 Radiated Spurious Emissions

9.1 Performance Requirement(s)

The field strength of emissions, measured at 3 meters, from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

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

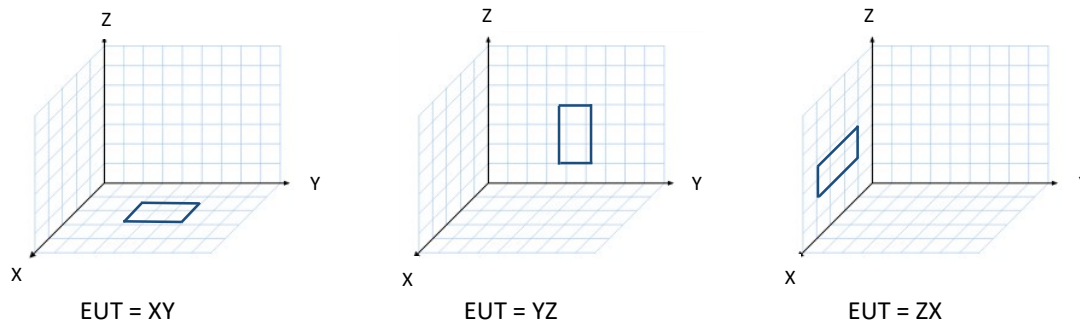
9.2 Method

EUT was configured to transmit continuously. Radiated emission measurements were performed from 30 MHz to the 10th harmonics 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 an Average detector.

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 in three orthogonal axes (XY, YZ, and ZX planes). 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 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)	Ucisp
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)

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:

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

Example:

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

9.3 Test Equipment Used:

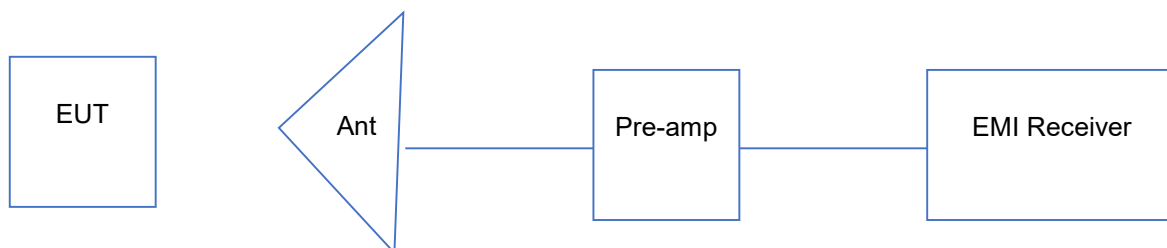
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
637	3m Semi-anechoic Chamber	Panashield	3 meter	25 331-D-Z	December 2018	December 2021
1669	EMI Test Receiver	R&S	ESW44	101636	08/15/2018	08/15/2019
1707	Bilog Antenna	sunAR	JB6	A110618	11/20/2018	11/20/2019
1568	Pre-amp	R&S	TS-PR1	102068	02/01/2019	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
1842	Cable	Fairview Microwave	FMC0101223-360	-	04/18/2019	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
1016	Barometer Temp/Humidity	Omega	IBTHX-W	18300406	08/18/2018	08/18/2019

Software Utilized:

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

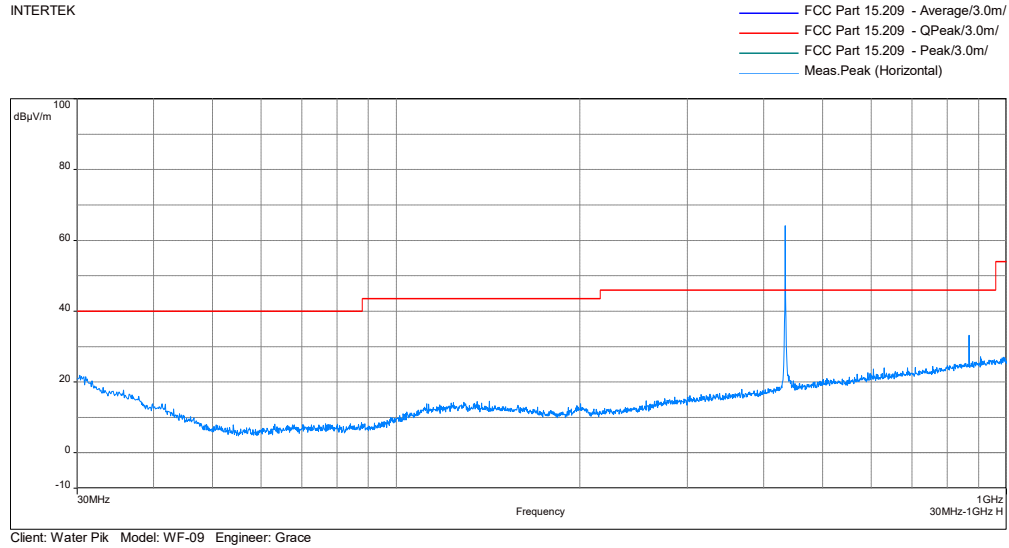
9.4 Results:

The sample tested was found to Comply.

9.5 Setup Diagram:

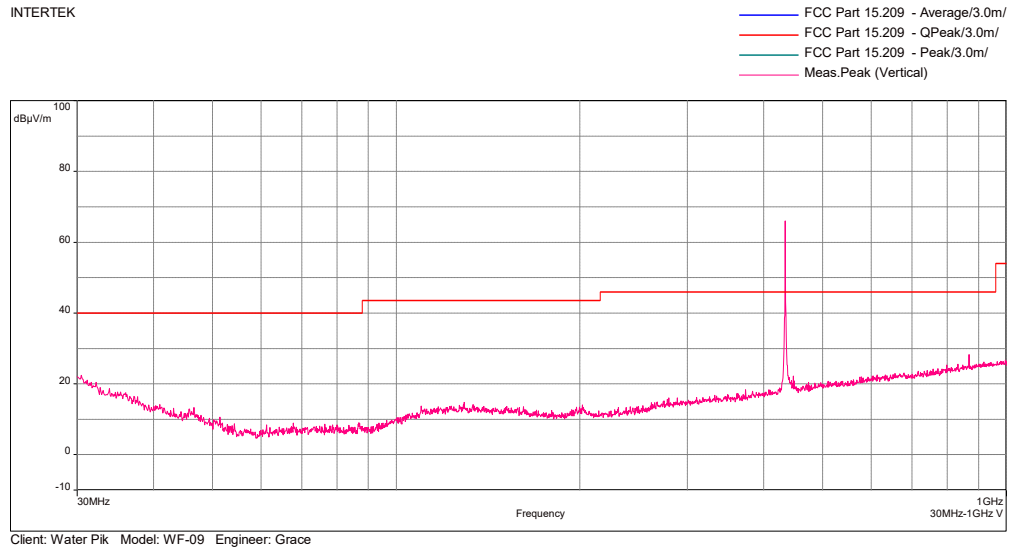
9.6 Plots/Data:

Radiated Spurious Emissions, 30 MHz – 1 GHz, Horizontal



Note: Emission at 433.94 MHz was the carrier. Emission at 867.9 MHz was an ambient noise.

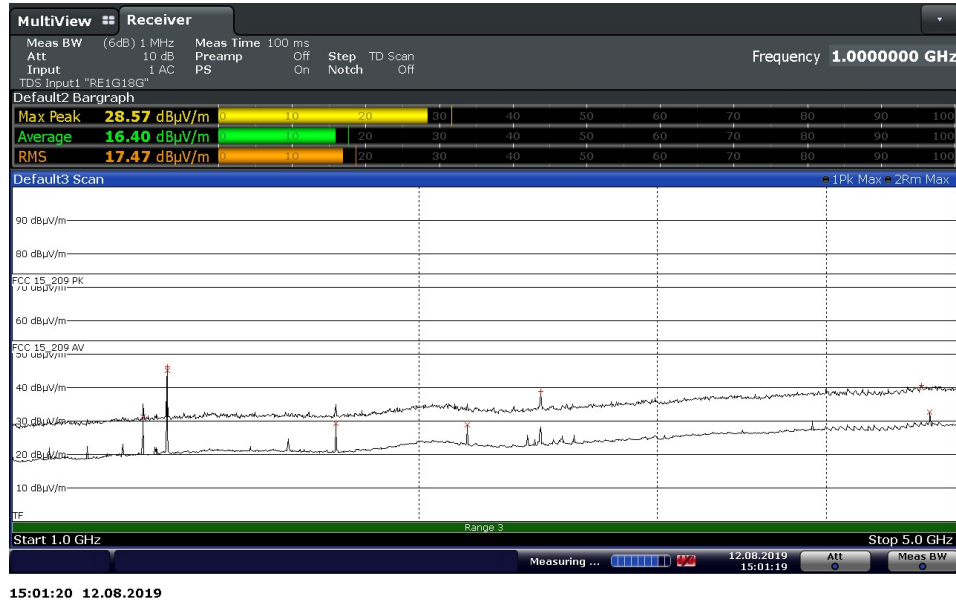
Radiated Spurious Emissions, 30 MHz – 1 GHz, Vertical



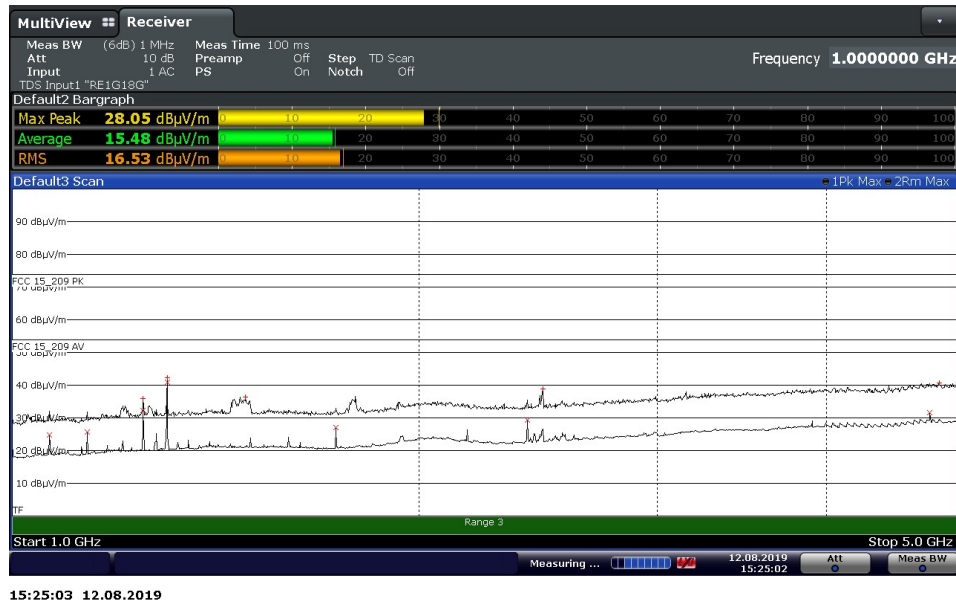
Note: Emission at 433.94 MHz was the carrier. Emission at 867.9 MHz was an ambient noise.

10.6 Plots/Data: (Continued)

Radiated Spurious Emissions, 1-18 GHz, Horizontal



Radiated Spurious Emissions, 1-18 GHz, Vertical



Note: Radiated spurious emissions measurements were performed from 30 MHz to 5 GHz.

10.6 Plots/Data: (Continued)

Antenna Polarization	Frequency (MHz)	EUT Orientation	Field Strength (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Turntable Degree	Antenna Height (cm)	Detection
V	1301.81	XY	44.33	74.00	-29.67	159.8	304.0	PK
V	1301.81	XY	40.24	54.00	-13.76	159.8	304.0	AV
V	1735.76	XY	35.60	80.83	-45.23	36.3	154.0	PK
V	1735.76	XY	24.71	60.83	-36.12	36.3	154.0	AV
V	2169.70	XY	36.05	80.83	-44.78	0.0	331.0	PK
V	2169.70	XY	24.93	60.83	-35.90	0.0	331.0	AV

Note: Radiated spurious emissions measurements were performed from 30 MHz to 5 GHz.

Test Personnel: Grace Lin
 Product Standard: FCC §15.231,
 ISED RSS-210
 Input Voltage: 3 Vdc (battery)
 Pretest Verification w/
 BB Source: Yes

Test Date: 08/08/2019 - 08/14/2019
 Limit Applied: FCC §15.231(b),
 ISED RSS-210
 Ambient Temperature: 24.2 °C
 Relative Humidity: 58.6 %
 Atmospheric Pressure: 991 mbars

Deviations, Additions, or Exclusions: None

10 AC Mains Conducted Emissions

10.1 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.*

10.2 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)	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 dB μ V

RF = Reading from receiver in dB μ V

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

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

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

NF = Net Reading in dB μ V

Example:

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

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

10.3 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

10.4 Results:

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

11 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	August 21, 2019	103835210LAX-001	GL	KV	Initial Issue