



FCC PART 15, SUBPART C  
ISED C RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

**Brava Home Inc.**

312 Chestnut Street,  
Redwood City, CA 94063, USA

**FCC ID: 2AOGABRAVAONE**  
**IC: 24108-BRAVAONE**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Convection Oven
Vincent Licata	
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by A2LA\*, NIST, or any agency of the Federal Government.

\* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “\*”

## TABLE OF CONTENTS

<b>1 General Description.....</b>	<b>5</b>
1.1 Product Description for Equipment Under Test (EUT) .....	5
1.2 Objective.....	5
1.3 Related Submittal(s)/Grant(s) .....	5
1.4 Test Methodology .....	5
1.5 Measurement Uncertainty .....	6
1.6 Test Facility Registrations .....	6
1.7 Test Facility Accreditations .....	6
<b>2 System Test Configuration.....</b>	<b>9</b>
2.1 Justification .....	9
2.2 EUT Exercise Software.....	9
2.3 Duty Cycle Correction Factor .....	10
2.4 Equipment Modifications.....	12
2.5 Local Support Equipment .....	12
2.6 Support Equipment .....	12
2.7 Power Supply/Adapter .....	12
2.8 Interface Ports and Cabling.....	13
<b>3 Summary of Test Results .....</b>	<b>14</b>
<b>4 FCC §15.203 &amp; ISEDC RSS-Gen §6.8 - Antenna Requirements .....</b>	<b>15</b>
4.1 Applicable Standards .....	15
4.2 Antenna Description .....	16
<b>5 FCC §2.1091, §15.247(i) &amp; ISEDC RSS-102 - RF Exposure.....</b>	<b>17</b>
5.1 Applicable Standards .....	17
5.2 MPE Prediction.....	18
5.3 MPE Results .....	18
5.4 RF exposure evaluation exemption for IC .....	18
<b>6 FCC §15.207 &amp; ISEDC RSS-Gen §8.8 - AC Line Conducted Emissions.....</b>	<b>19</b>
6.1 Applicable Standards .....	19
6.2 Test Setup .....	19
6.3 Test Procedure .....	19
6.4 Corrected Amplitude and Margin Calculation .....	20
6.5 Test Equipment List and Details.....	20
6.6 Test Environmental Conditions .....	20
6.7 Summary of Test Results .....	21
6.8 Conducted Emissions Test Plots and Data.....	22
<b>7 FCC §15.209, §15.247(d) &amp; ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions.....</b>	<b>24</b>
7.1 Applicable Standards .....	24
7.2 Test Setup .....	26
7.3 Test Procedure .....	26
7.4 Corrected Amplitude and Margin Calculation .....	26
7.5 Test Equipment List and Details.....	27
7.6 Test Environmental Conditions .....	27
7.7 Summary of Test Results .....	28
7.8 Spurious Emissions Test Results .....	29
<b>8 FCC §15.247(a) (2) &amp; ISEDC RSS-247 §5.2 -Emission Bandwidth .....</b>	<b>34</b>
8.1 Applicable Standards .....	34
8.2 Measurement Procedure.....	34
8.3 Test Equipment List and Details.....	34
8.4 Test Environmental Conditions .....	34

8.5	Test Results.....	35
<b>9</b>	<b>FCC §15.247(b) (3) &amp; ISEDC RSS-247 §5.4 (4) - Output Power Measurement .....</b>	<b>36</b>
9.1	Applicable Standards .....	36
9.2	Measurement Procedure.....	36
9.3	Test Equipment List and Details.....	36
9.4	Test Environmental Conditions .....	36
9.5	Test Results.....	37
<b>10</b>	<b>FCC §15.247(d) and ISEDC RSS-247 §5.5 - 100 kHz Bandwidth of Band Edges.....</b>	<b>38</b>
10.1	Applicable Standards .....	38
10.2	Measurement Procedure.....	38
10.3	Test Equipment List and Details.....	38
10.4	Test Environmental Conditions .....	39
10.5	Test Results.....	39
<b>11</b>	<b>FCC §15.247(e) &amp; ISEDC RSS-247 §5.2(2) - Power Spectral Density .....</b>	<b>40</b>
11.1	Applicable Standards .....	40
11.2	Measurement Procedure.....	40
10.3	Test Equipment List and Details.....	40
11.4	Test Environmental Conditions .....	40
11.3	Test Results.....	41
<b>12</b>	<b>FCC §15.247(d) &amp; ISEDC RSS-247 §5.5, RSS-GEN §8.9 - Spurious Emissions at Antenna Terminals .....</b>	<b>42</b>
12.1	Applicable Standards .....	42
12.2	Test Procedure .....	42
12.3	Test Equipment List and Details.....	42
12.4	Test Environmental Conditions .....	43
12.5	Test Results.....	43
<b>13</b>	<b>Exhibit A - FCC &amp; ISED Equipment Labeling Requirements.....</b>	<b>44</b>
13.1	FCC ID Label Requirements .....	44
13.2	IC Label Requirements .....	44
12.3	Recommended Label Contents and Location.....	45
<b>14</b>	<b>Appendix .....</b>	<b>46</b>
<b>15</b>	<b>Annex A (Informative) - A2LA Electrical Testing Certificate.....</b>	<b>47</b>

**DOCUMENT REVISION HISTORY**

Revision Number	Report Number	Description of Revision	Date of Revision
0	R18062910-247 DTS	Original Report	2018-08-21

## **1 General Description**

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### **1.1 Product Description for Equipment Under Test (EUT)**

This test and measurement report was prepared on behalf of *Brava Home Inc.*, and their product model; Brava one, FCC ID: 2AOGABRAVAONE, IC: 24108-BRAVAONE or the “EUT” as referred to in this report. The EUT is a countertop smart convection oven with Wi-Fi for household use.

### **1.2 Objective**

This report is prepared on behalf of *Brava Home Inc.*, in accordance with Part 2, Subpart J, and Part 15, Subpart and C of the Federal Communication Commission’s rules and ISED RSS-247 Issue 2, February 2017.

The objective is to determine compliance with FCC Part 15.247 and ISED RSS-247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

### **1.3 Related Submittal(s)/Grant(s)**

FCC 15.407 Report: R18062910-407

FCC 15.407 Report: R18062910-DFS

### **1.4 Test Methodology**

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v04: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

## 1.5 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 0.57 \text{ dB}$
Power Spectral Density, conducted	$\pm 1.48 \text{ dB}$
Unwanted Emissions, conducted	$\pm 1.57 \text{ dB}$
All emissions, radiated	$\pm 4.0 \text{ dB}$
AC power line Conducted Emission	$\pm 2.0 \text{ dB}$
Temperature	$\pm 2 \text{ }^{\circ} \text{C}$
Humidity	$\pm 5 \%$
DC and low frequency voltages	$\pm 1.0 \%$
Time	$\pm 2 \%$
Duty Cycle	$\pm 3 \%$

## 1.6 Test Facility Registrations

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

## 1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

**A- An independent, 3<sup>rd</sup>-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02),** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (\*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment

[including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices, Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

**B- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.03) to certify**

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2 All Scope 2-Licensed Personal Mobile Radio Services;
  - 3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime & Aviation Radio Services;
  - 5 All Scope 5-Licensed Fixed Microwave Radio Services
  - 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  - 2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1 All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

**C- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.01) to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:**

- 1 Electronics and Office Equipment:
  - for Telephony (ver. 3.0)
  - for Audio/Video (ver. 3.0)
  - for Battery Charging Systems (ver. 1.1)
  - for Set-top Boxes & Cable Boxes (ver. 4.1)
  - for Televisions (ver. 6.1)
  - for Computers (ver. 6.0)
  - for Displays (ver. 6.0)

- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)
- 2 Commercial Food Service Equipment
  - for Commercial Dishwashers (ver. 2.0)
  - for Commercial Ice Machines (ver. 2.0)
  - for Commercial Ovens (ver. 2.1)
  - for Commercial Refrigerators and Freezers
- 3 Lighting Products
  - For Decorative Light Strings (ver. 1.5)
  - For Luminaires (including sub-components) and Lamps (ver. 1.2)
  - For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
  - For Integral LED Lamps (ver. 1.4)
- 4 Heating, Ventilation, and AC Products
  - for Residential Ceiling Fans (ver. 3.0)
  - for Residential Ventilating Fans (ver. 3.2)
- 5 Other
  - For Water Coolers (ver. 3.0)

**D- A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:**

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic development Canada - ISED) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - o EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - o Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - o Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - o ENERGY STAR Recognized Test Laboratory – US EPA
  - o Telecommunications Certification Body (TCB) – US FCC;
  - o Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;



## 2 System Test Configuration

### 2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v04.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the average power, peak power and PPSD across all data rates bandwidths, and modulations.

### 2.2 EUT Exercise Software

The test firmware used was Tera Term, provided by *Brava Home Inc.*, the software is compliant with the standard requirements being tested against.

Modulation	Frequency (MHz)	Power Setting
802.11b	2412	14
	2442	14
	2472	14
802.11g	2412	13
	2442	13
	2472	13
802.11n20	2412	13
	2442	13
	2472	13

Data Rates Tested:

802.11b mode: 1Mbps

802.11g mode: 6Mbps

802.11n HT20 mode: MCS0

## 2.3 Duty Cycle Correction Factor

According to KDB 558074 D01 DTS Meas Guidance v04 section 6.0:

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data is being acquired (i.e., no transmitter off-time is to be considered).

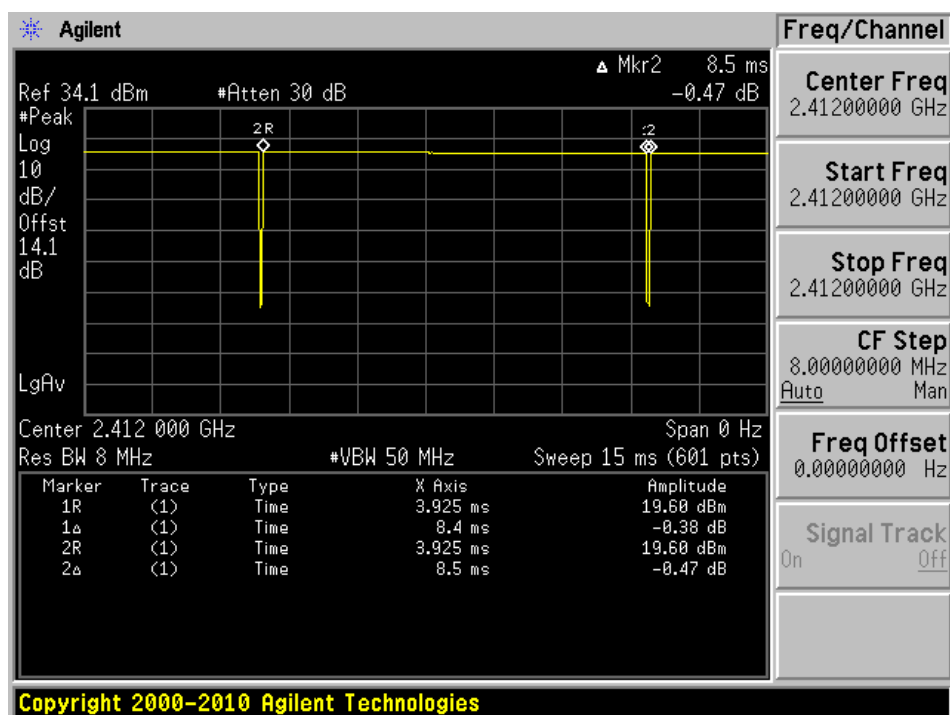
Radio Mode	Total On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	8.400	8.500	98.82	0.000
802.11g	1.400	1.500	93.33	0.300
802.11n20	1.300	1.408	92.33	0.347

Duty Cycle = On Time (ms)/ Period (ms)

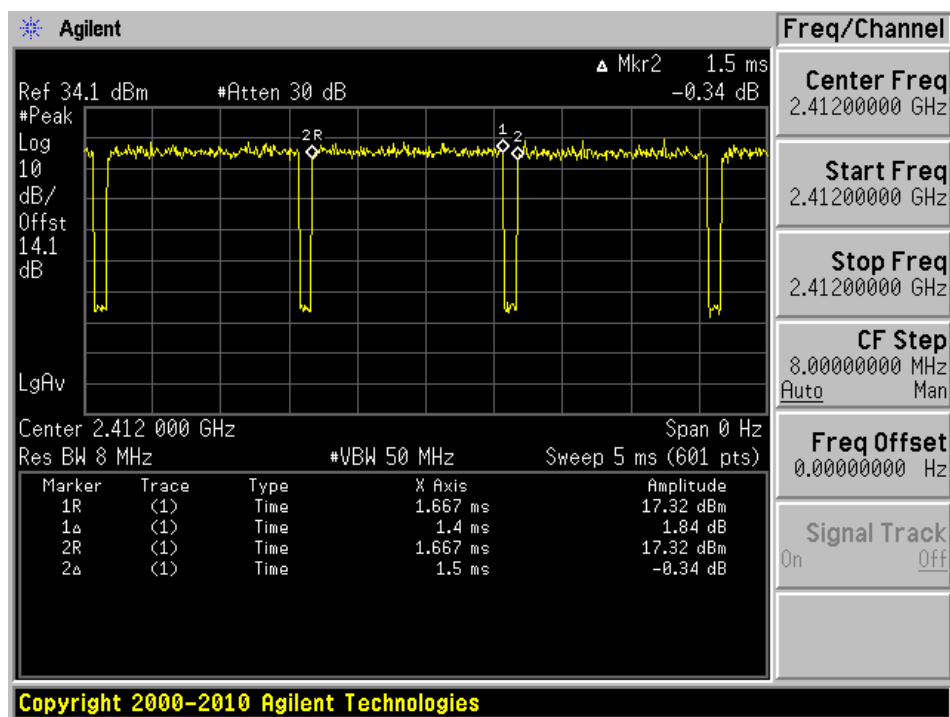
Duty Cycle Correction Factor (dB) =  $10 \cdot \log(1/\text{Duty Cycle})$

Please refer to the following plots.

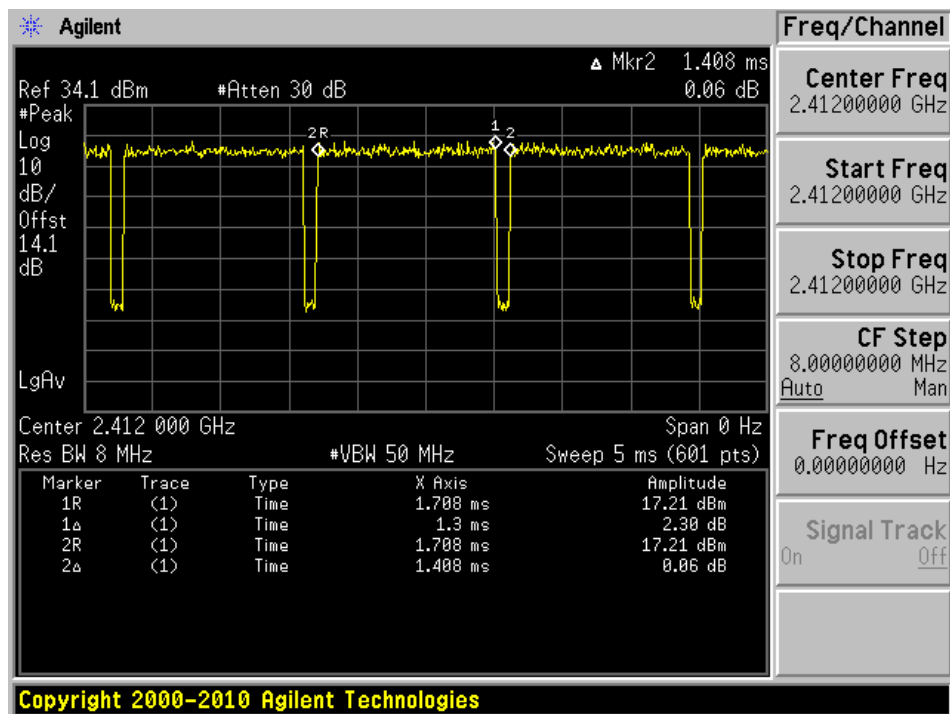
## 802.11b mode



## 802.11g mode



## 802.11n20 mode



## 2.4 Equipment Modifications

N/A

## 2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E6410	3CKRAQ1

## 2.6 Support Equipment

Manufacturer	Description	Model
FTDI Ltd.	Debug Board	FT4232H Mini Module

## 2.7 Power Supply/Adapter

N/A

## 2.8 Interface Ports and Cabling

Description	Length (m)	To	From
RF Cable	< 1 m	PSA	EUT
Serial Cables	< 1 m	Debug Board	EUT
USB A-Male to Mini-B	< 1 m	Laptop	Debug Board

### 3 Summary of Test Results

Results reported relate only to the product tested.

FCC & ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirement	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §2.1091, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant
FCC §2.1051, §15.247 (d) ISEDC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §2.1053, §15.209, §15.247(d) ISEDC RSS-247 §5.5 RSS-Gen §8.9 & §8.10	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) ISEDC RSS-247 §5.2 (1)	6 dB and 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) ISEDC RSS-247 §5.4 (4)	Output Power	Compliant
FCC §15.247(d) ISEDC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) ISEDC RSS-247 §5.2 (2)	Power Spectral Density	Compliant

## 4 FCC §15.203 & ISEDC RSS-Gen §6.8 - Antenna Requirements

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### 4.1 Applicable Standards

According to FCC §15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to ISEDC RSS-Gen §6.8: Transmitter Antenna

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

## 4.2 Antenna Description

The antennas used by the EUT have nonstandard U.FL Connectors.

Antenna usage	Band of Operation (MHz)	Maximum Antenna Gain (dBi)
Wi-Fi	2400-2500	3.0
Wi-Fi	4900-6000	5.5



## 5 FCC §2.1091, §15.247(i) & ISED RSS-102 - RF Exposure

### 5.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

#### Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* (180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

According to ISED RSS-102 Issue 5:

#### 2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz<sup>6</sup> and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

## 5.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

## 5.3 MPE Results

### 2.4 GHz Wi-Fi

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>16.07</u>
<u>Maximum output power at antenna input terminal (mW):</u>	<u>40.458</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2442</u>
<u>Maximum Antenna Gain, typical (dBi):</u>	<u>3.0</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>1.995</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>	<u>0.016059</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.016059 mW/cm<sup>2</sup>. Limit is 1.0 mW/cm<sup>2</sup>.

Note: Wi-Fi radio is non-simultaneous dual-band operation.

## 5.4 RF exposure evaluation exemption for IC

### 2.4 GHz Wi-Fi

$$16.07 + 3.0 \text{ dBi} = 19.07 \text{ dBm} < 1.31 \times 10^{-2} f^{0.6834} = 2.7068 \text{ W} = 34.32 \text{ dBm}$$

Therefore the RF exposure is not required.

## 6 FCC §15.207 & ISEDC RSS-Gen §8.8 - AC Line Conducted Emissions

### 6.1 Applicable Standards

As per FCC §15.207 and ISEDC RSS-Gen §8.8 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 <sup>Note1</sup>	56 to 46 <sup>Note2</sup>
0.5-5	56	46
5-30	60	50

*Note1: Decreases with the logarithm of the frequency.*

*Note2: A linear average detector is required*

### 6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used were FCC §15.207 and ISEDC RSS-Gen §8.8 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

### 6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cords of support equipment were connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data were recorded in the peak, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with a "QP." Average readings are distinguished with an "Ave".

## 6.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$CA = Ai + CL + Atten$$

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

## 6.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2018-07-05	2 years
Rohde & Schwarz	Impulse Limiter	ESH3-Z2	101964	2017-07-24	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150203	2018-02-28	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160129	2018-04-04	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R
Rohde & Schwarz	Receiver, EMI Test	ESCI 1166.5950.03	100338	2018-07-05	2 years

**Statement of Traceability:** *BACL Corp.* attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) “A2LA Policy on Metrological Traceability”.

## 6.6 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	42 %
ATM Pressure:	101.31 kPa

The testing was performed by Vincent Licata on 2018-07-16 at Conducted Test Site.

## 6.7 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC 15C and ISED RSS-Gen standard's conducted emissions limits, with the margin reading of:

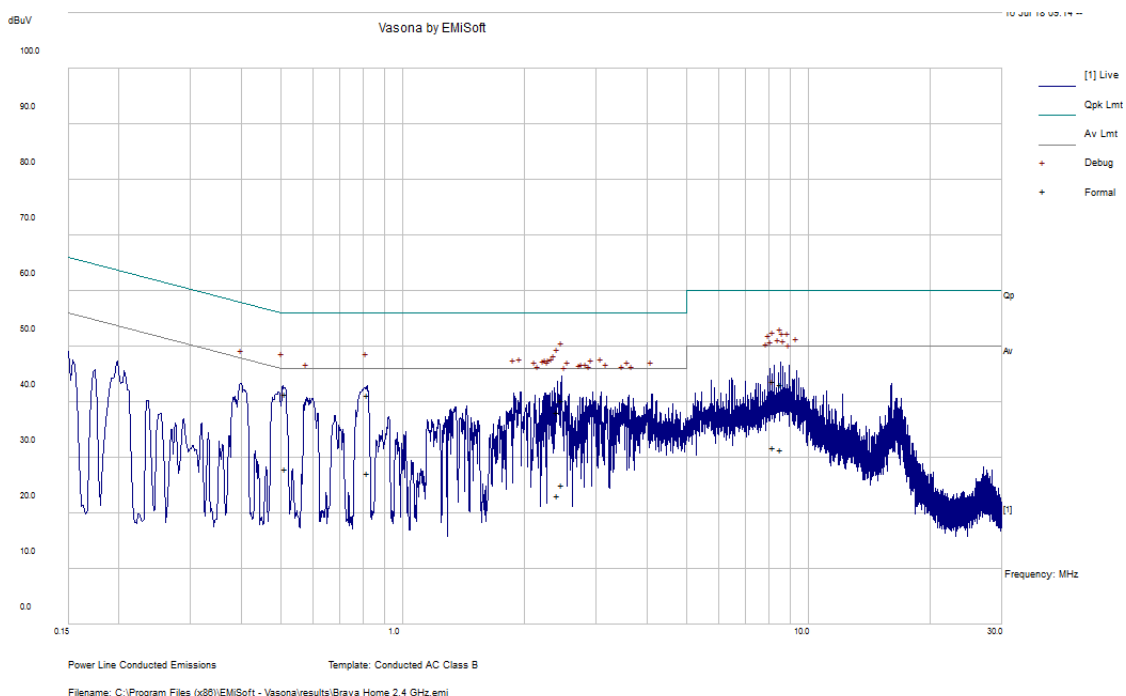
### 2.4 GHz Wi-Fi

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	Frequency (MHz)	Conductor Mode (Line/Neutral)	Range (MHz)
-13.30	8.736223	Neutral	0.15-30

## 6.8 Conducted Emissions Test Plots and Data

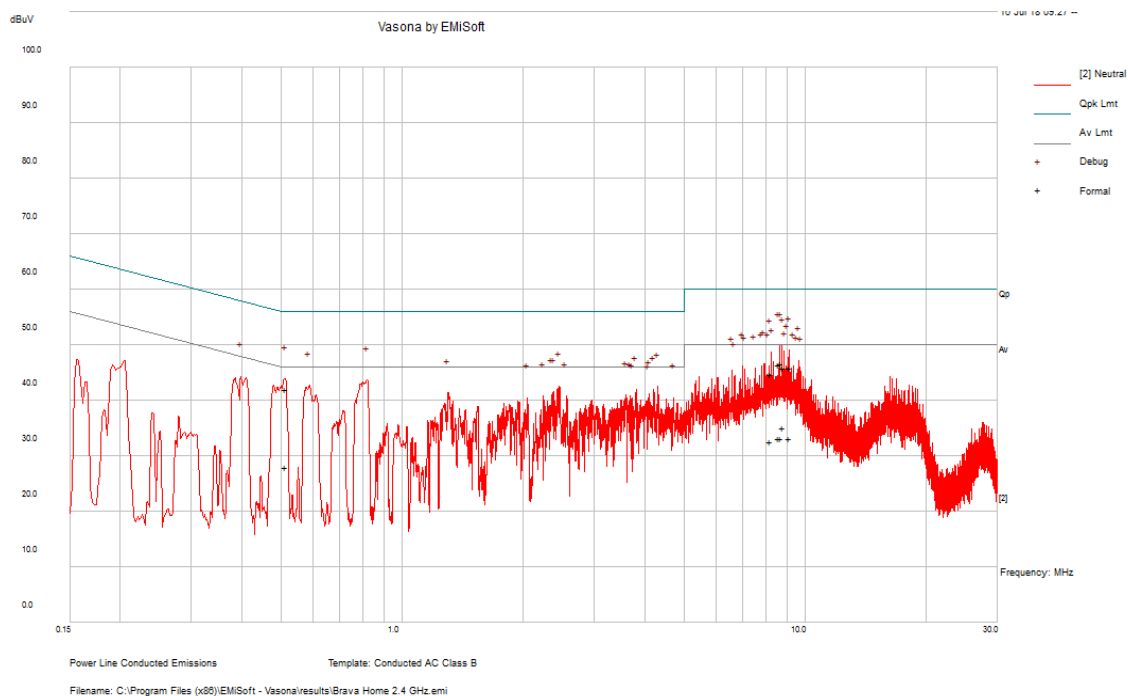
### 2.4 GHz Wi-Fi, worst case b mode (2442 MHz)

#### 120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
2.463945	40.41	Line	56	-15.59	QP
2.405527	38.2	Line	56	-17.8	QP
8.534215	43.17	Line	60	-16.83	QP
0.513925	41.45	Line	56	-14.55	QP
0.820232	41.21	Line	56	-14.79	QP
8.22114	43.81	Line	60	-16.19	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
2.463945	25.17	Line	46	-20.83	Ave.
2.405527	23.21	Line	46	-22.79	Ave.
8.534215	31.45	Line	50	-18.55	Ave.
0.513925	28.06	Line	46	-17.94	Ave.
0.820232	27.2	Line	46	-18.8	Ave.
8.22114	31.78	Line	50	-18.22	Ave.

**120 V, 60 Hz – Neutral**

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
8.736223	46.7	Neutral	60	-13.3	QP
8.632799	46.55	Neutral	60	-13.45	QP
9.14812	45.88	Neutral	60	-14.12	QP
8.83876	45.9	Neutral	60	-14.1	QP
8.224753	44.73	Neutral	60	-15.27	QP
0.514493	42.1	Neutral	56	-13.9	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
8.736223	33.22	Neutral	50	-16.78	Ave.
8.632799	33.23	Neutral	50	-16.77	Ave.
9.14812	33.2	Neutral	50	-16.8	Ave.
8.83876	35.05	Neutral	50	-14.95	Ave.
8.224753	32.63	Neutral	50	-17.37	Ave.
0.514493	28.06	Neutral	46	-17.94	Ave.

## 7 FCC §15.209, §15.247(d) & ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

### 7.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.



However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement, 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 RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

As per ISED RSS-Gen 8.9,

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 or Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

**Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz**

<b>Frequency (MHz)</b>	<b>Field Strength (<math>\mu\text{V/m}</math> at 3 metres)</b>
30-88	100
88-216	150
216-960	200
Above 960*	500

\* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for license-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per ISED RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

## 7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart C and ISEDC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

## 7.3 Test Procedure

The EUT host, and all support equipment power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

For radiated testing the EUT was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was set as:

Below 1000 MHz:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

Above 1000 MHz:

(1) Peak:  $\text{RBW} = 1\text{MHz} / \text{VBW} = 3\text{MHz} / \text{Sweep} = 100 \text{ ms}$

(2) Average:  $\text{RBW} = 1\text{MHz} / \text{VBW} = 1 / \text{T} / \text{Sweep} = \text{Auto}$

## 7.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$\text{CA} = \text{Ai} + \text{AF} + \text{CL} + \text{Atten} - \text{Ga}$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

## 7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100337	2017-07-15	2 years
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB3	A020106-3	2017-11-02	2 years
Wisewave	Antenna, Horn	ARH-4223-02	10555-02	2017-12-15	2 years
IW	AOBOR Hi frequency Co AX Cable	DC 1531	KPS- 1501A3960K PS	2017-08-05	1 year
-	SMA cable	-	C00011	Each time <sup>1</sup>	N/A
-	N-Type Cable	-	C00012	Each time <sup>1</sup>	N/A
-	N-Type Cable	-	C00014	Each time <sup>1</sup>	N/A
HP	Pre-Amplifier	8449B	3147A00400	2018-02-02	1 year
SONOMA INSTRUMENT	Pre-Amplifier	315	303125	2017-08-01	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2017-03-27	2 years
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note<sup>1</sup>: cables included in the test set-up will be checked each time before testing.

**Statement of Traceability:** *BACL Corp.* attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

## 7.6 Test Environmental Conditions

<b>Temperature:</b>	20-22 °C
<b>Relative Humidity:</b>	42-50 %
<b>ATM Pressure:</b>	102.7 kPa

The testing was performed by Vincent Licata from 2018-07-03 to 2018-07-16 in 5m chamber 3 and 10m chamber 1.

## 7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C and ISERC RSS-247 standard's radiated emissions limits, and had the worst margin of:

### 2.4 GHz Wi-Fi

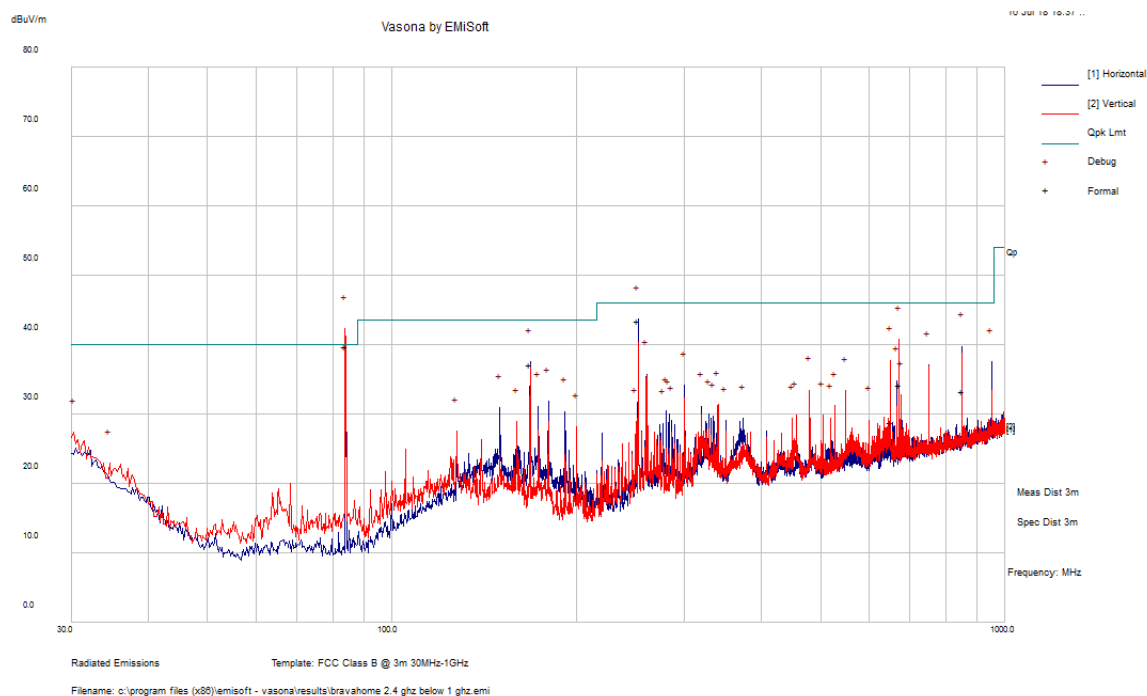
Mode: Transmitting		
Margin (dB)	Frequency (MHz)	Mode, channel
-0.18	83.994	b mode, Middle channel

Please refer to the following table and plots for specific test result details

## 7.8 Spurious Emissions Test Results

### 1) 30 MHz – 1 GHz

#### 2.4 GHz Wi-Fi, worst case b mode (2442 MHz)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)	Comment
83.994	39.82	120	V	217	40	-0.18	QP
251.9985	43.4	117	H	272	46	-2.6	QP
671.9555	34.22	129	V	0	46	-11.78	QP
167.9898	37.21	157	H	89	43.5	-6.29	QP
850.0585	33.41	189	H	328	46	-12.59	QP
650.04	28.89	220	V	141	46	-17.11	QP

## 2) 1–26.5 GHz Measured at 3 meters

## 802.11b mode

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	59.79	221	229	H	28.93	5.76	0	94.48	-	-	PK
2412	57.21	221	229	H	28.93	5.76	0	91.90	-	-	AV
2412	62.19	230	225	V	28.93	5.76	0	96.88	-	-	PK
2412	59.46	230	225	V	28.93	5.76	0	94.15	-	-	AV
2390	49.44	221	229	H	28.93	6.489	32.207	52.66	74.00	-21.35	PK
2390	39.40	221	229	H	28.93	6.489	32.207	42.62	54.00	-11.39	AV
2390	50.97	230	225	V	28.93	6.489	32.207	54.19	74.00	-19.82	PK
2390	40.64	230	225	V	28.93	6.489	32.207	43.86	54.00	-10.15	AV
4824	46.64	181	300	V	32.56	9.36	32.993	55.57	74.00	-18.43	PK
4824	36.95	181	300	V	32.56	9.36	32.993	45.88	54.00	-8.12	AV
7236	44.86	0	100	V	36.88	12.01	33.248	60.50	74.00	-13.50	PK
7236	34.09	0	100	V	36.88	12.01	33.248	49.73	54.00	-4.27	AV
Middle Channel 2442 MHz											
2442	60.06	219	237	H	28.93	5.76	0	94.75	-	-	PK
2442	57.53	219	237	H	28.93	5.76	0	92.22	-	-	AV
2442	63.91	221	230	V	28.93	5.76	0	98.60	-	-	PK
2442	61.01	221	230	V	28.93	5.76	0	95.70	-	-	AV
4884	46.81	86	252	V	32.53	9.46	32.993	55.80	74.00	-18.20	PK
4884	37.14	86	252	V	32.53	9.46	32.993	46.13	54.00	-7.87	AV
7326	44.91	0	100	V	36.99	11.97	33.248	60.62	74.00	-13.38	PK
7326	34.16	0	100	V	36.99	11.97	33.248	49.87	54.00	-4.13	AV
High Channel 2472 MHz											
2472	59.26	217	297	H	29.19	5.86	0	94.31	-	-	PK
2472	56.32	217	297	H	29.19	5.86	0	91.37	-	-	AV
2472	61.04	314	240	V	29.19	5.86	0	96.09	-	-	PK
2472	58.20	314	240	V	29.19	5.86	0	93.25	-	-	AV
2483.5	54.25	217	297	H	29.18	6.61	32.207	57.83	74.00	-16.17	PK
2483.5	46.14	217	297	H	29.18	6.61	32.207	49.72	54.00	-4.28	AV
2483.5	55.49	314	240	V	29.18	6.61	32.207	59.07	74.00	-14.93	PK
2483.5	47.32	314	240	V	29.18	6.61	32.207	50.90	54.00	-3.10	AV
4944	46.50	177	300	V	32.70	9.42	32.993	55.62	74.00	-18.38	PK
4944	36.89	177	300	V	32.70	9.42	32.993	46.01	54.00	-7.99	AV
7416	44.38	0	100	V	37.10	12.01	33.248	60.24	74.00	-13.76	PK
7416	33.51	0	100	V	37.10	12.01	33.248	49.37	54.00	-4.63	AV

**802.11g mode**

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	63.62	220	300	H	28.93	5.76	0	98.31	-	-	PK
2412	53.87	220	300	H	28.93	5.76	0	88.56	-	-	AV
2412	65.85	231	231	V	28.93	5.76	0	100.54	-	-	PK
2412	56.15	231	231	V	28.93	5.76	0	90.84	-	-	AV
2390	57.28	220	300	H	28.93	6.489	32.207	60.50	74.00	-13.51	PK
2390	43.28	220	300	H	28.93	6.489	32.207	46.50	54.00	-7.51	AV
2390	63.07	231	231	V	28.93	6.489	32.207	66.29	74.00	-7.72	PK
2390	47.01	231	231	V	28.93	6.489	32.207	50.23	54.00	-3.78	AV
4824	46.02	158	300	V	32.56	9.36	32.993	54.95	74.00	-19.05	PK
4824	35.29	158	300	V	32.56	9.36	32.993	44.22	54.00	-9.78	AV
7236	44.97	0	100	V	36.88	12.01	33.248	60.61	74.00	-13.39	PK
7236	34.21	0	100	V	36.88	12.01	33.248	49.85	54.00	-4.15	AV
Middle Channel 2442 MHz											
2442	63.22	216	300	H	28.93	5.76	0	97.91	-	-	PK
2442	53.14	216	300	H	28.93	5.76	0	87.83	-	-	AV
2442	67.00	220	268	V	28.93	5.76	0	101.69	-	-	PK
2442	57.12	220	268	V	28.93	5.76	0	91.81	-	-	AV
4884	46.23	166	300	V	32.53	9.46	32.993	55.22	74.00	-18.78	PK
4884	35.77	166	300	V	32.53	9.46	32.993	44.76	54.00	-9.24	AV
7326	45.25	0	100	V	36.99	11.97	33.248	60.96	74.00	-13.04	PK
7326	34.50	0	100	V	36.99	11.97	33.248	50.21	54.00	-3.79	AV
High Channel 2472 MHz											
2472	61.60	216	300	H	29.19	5.86	0	96.65	-	-	PK
2472	52.42	216	300	H	29.19	5.86	0	87.47	-	-	AV
2472	65.09	321	300	V	29.19	5.86	0	100.14	-	-	PK
2472	55.18	321	300	V	29.19	5.86	0	90.23	-	-	AV
2483.5	65.31	216	300	H	29.18	6.61	32.207	68.89	74.00	-5.11	PK
2483.5	45.76	216	300	H	29.18	6.61	32.207	49.34	54.00	-4.66	AV
2483.5	68.22	321	300	V	29.18	6.61	32.207	71.80	74.00	-2.20	PK
2483.5	48.41	321	300	V	29.18	6.61	32.207	51.99	54.00	-2.01	AV
4944	45.74	173	300	V	32.70	9.42	32.993	54.86	74.00	-19.14	PK
4944	35.85	173	300	V	32.70	9.42	32.993	44.97	54.00	-9.03	AV
7416	44.59	0	100	V	37.10	12.01	33.248	60.45	74.00	-13.55	PK
7416	34.77	0	100	V	37.10	12.01	33.248	50.63	54.00	-3.37	AV

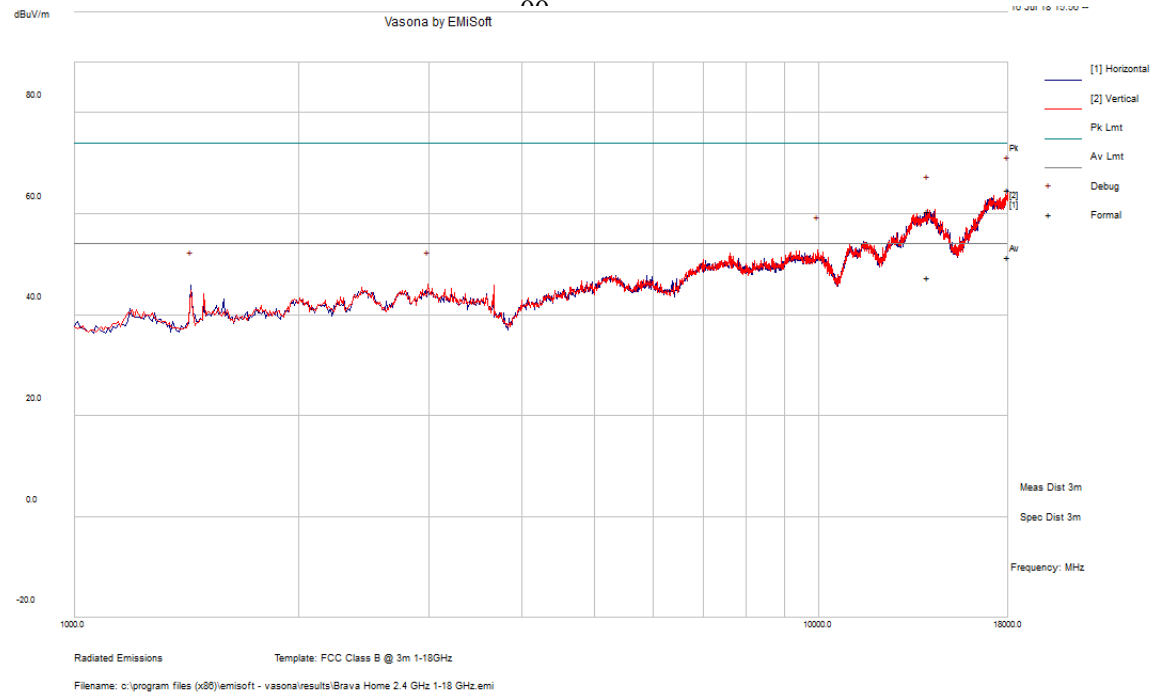
**802.11n20 mode**

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	61.65	214	300	H	28.93	5.76	0	96.34	-	-	PK
2412	53.04	214	300	H	28.93	5.76	0	87.73	-	-	AV
2412	65.68	226	232	V	28.93	5.76	0	100.37	-	-	PK
2412	56.83	226	232	V	28.93	5.76	0	91.52	-	-	AV
2390	61.23	214	300	H	28.93	6.489	32.207	64.45	74.00	-9.56	PK
2390	45.03	214	300	H	28.93	6.489	32.207	48.25	54.00	-5.76	AV
2390	64.62	226	232	V	28.93	6.489	32.207	67.84	74.00	-6.16	PK
2390	48.47	226	232	V	28.93	6.489	32.207	51.69	54.00	-2.32	AV
4824	45.72	0	100	V	32.56	9.36	32.993	54.65	74.00	-19.35	PK
4824	34.71	0	100	V	32.56	9.36	32.993	43.64	54.00	-10.36	AV
7236	45.15	0	100	V	36.88	12.01	33.248	60.79	74.00	-13.21	PK
7236	34.17	0	100	V	36.88	12.01	33.248	49.81	54.00	-4.19	AV
Middle Channel 2442 MHz											
2442	63.48	216	300	H	28.93	5.76	0	98.17	-	-	PK
2442	54.79	216	300	H	28.93	5.76	0	89.48	-	-	AV
2442	65.42	223	253	V	28.93	5.76	0	100.11	-	-	PK
2442	56.31	223	253	V	28.93	5.76	0	91.00	-	-	AV
4884	45.69	0	100	V	32.53	9.46	32.993	54.68	74.00	-19.32	PK
4884	34.64	0	100	V	32.53	9.46	32.993	43.63	54.00	-10.37	AV
7326	45.02	0	100	V	36.99	11.97	33.248	60.73	74.00	-13.27	PK
7326	34.09	0	100	V	36.99	11.97	33.248	49.80	54.00	-4.20	AV
High Channel 2472 MHz											
2472	61.97	210	300	H	29.19	5.86	0	97.02	-	-	PK
2472	53.22	210	300	H	29.19	5.86	0	88.27	-	-	AV
2472	64.15	221	236	V	29.19	5.86	0	99.20	-	-	PK
2472	55.05	221	236	V	29.19	5.86	0	90.10	-	-	AV
2483.5	64.93	210	300	H	29.18	6.61	32.207	68.51	74.00	-5.49	PK
2483.5	46.68	210	300	H	29.18	6.61	32.207	50.26	54.00	-3.74	AV
2483.5	66.42	221	236	V	29.18	6.61	32.207	70.00	74.00	-4.00	PK
2483.5	49.01	221	236	V	29.18	6.61	32.207	52.59	54.00	-1.41	AV
4944	44.62	0	100	V	32.70	9.42	32.993	53.74	74.00	-20.26	PK
4944	33.89	0	100	V	32.70	9.42	32.993	43.01	54.00	-10.99	AV
7416	44.91	0	100	V	37.10	12.01	33.248	60.77	74.00	-13.23	PK
7416	33.94	0	100	V	37.10	12.01	33.248	49.80	54.00	-4.20	AV



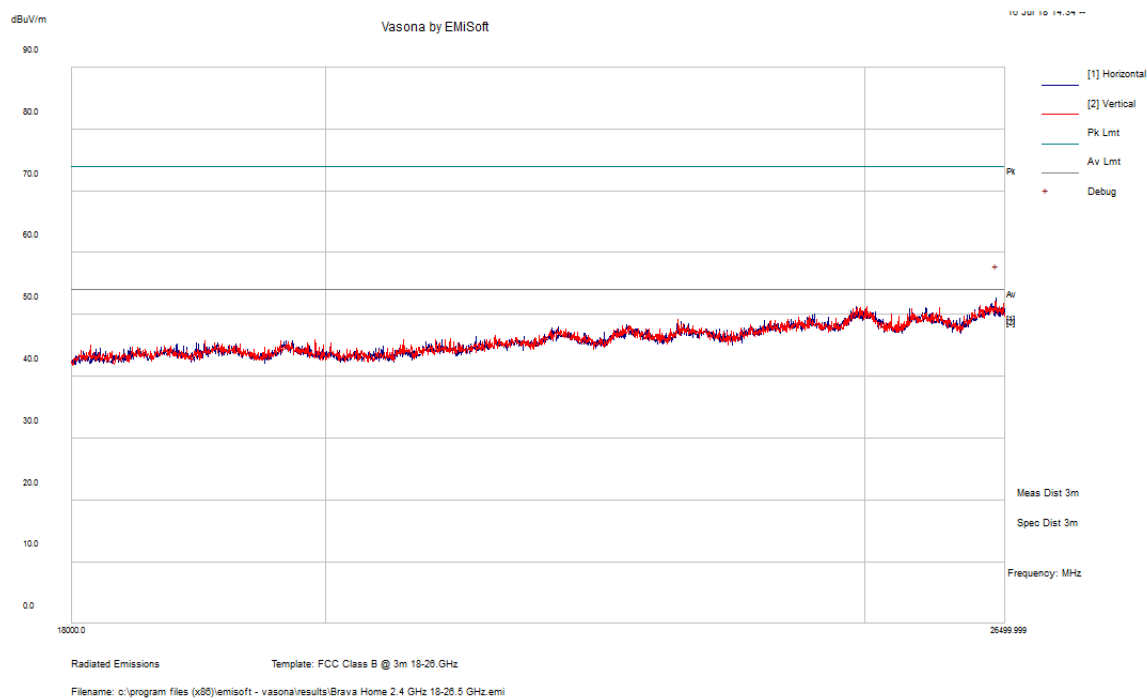
1-18 GHz

2.4 GHz Wi-Fi, worst case b mode (2442 MHz)



18-26.5 GHz

2.4 GHz Wi-Fi, worst case b mode (2442 MHz)



## 8 FCC §15.247(a) (2) & ISEDC RSS-247 §5.2 -Emission Bandwidth

### 8.1 Applicable Standards

According to ECFR §15.247(a) (2) and ISEDC RSS-247 §5.2, systems using digital modulation techniques may operate in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

### 8.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v04: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

### 8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
-	RF cable	-	-	Each time <sup>1</sup>	N/A
-	10dB attenuator	-	-	Each time <sup>1</sup>	N/A

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

**Statement of Traceability:** *BACL Corp.* attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

### 8.4 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

The testing was performed by Vincent Licata on 2018-07-06 to 2018-07-11 in RF site.

## 8.5 Test Results

### 99% and 6 dB Emission Bandwidth

Channel	Frequency (MHz)	99% OBW (MHz)	6 dB OBW (MHz)	6 dB OBW Limit (MHz)
802.11b mode				
Low	2412	12.00	6.55	0.5
Middle	2442	11.86	7.54	0.5
High	2472	11.97	7.11	0.5
802.11g mode				
Low	2412	16.34	15.15	0.5
Middle	2442	16.37	15.12	0.5
High	2472	16.36	15.14	0.5
802.11n20 mode				
Low	2412	17.41	15.96	0.5
Middle	2442	17.42	15.15	0.5
High	2472	17.42	15.14	0.5

Please refer to Annex E for plots.

## 9 FCC §15.247(b) (3) & ISEDC RSS-247 §5.4 (4) - Output Power Measurement

### 9.1 Applicable Standards

According to ECFR §15.247(b) (3) and ISEDC RSS-247 §5.4 (4) for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

### 9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v04: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power.

### 9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
ETS- Lindgren	Power Sensor	7002-006	160097	2016-12-05	2 years
-	RF cable	-	-	Each time <sup>1</sup>	N/A
-	10dB attenuator	-	-	Each time <sup>1</sup>	N/A

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

**Statement of Traceability:** *BACL Corp.* attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

### 9.4 Test Environmental Conditions

<b>Temperature:</b>	23° C
<b>Relative Humidity:</b>	42 %
<b>ATM Pressure:</b>	102.7 KPa

The testing was performed by Vincent Licata on 2018-07-06 to 2018-07-11 in RF site.

## 9.5 Test Results

### Output Power 2.4 GHz Wi-Fi

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
802.11b mode			
Low	2412	15.99	30
Middle	2442	16.07	30
High	2472	15.93	30
802.11g mode			
Low	2412	15.10	30
Middle	2442	15.05	30
High	2472	15.24	30
802.11n20 mode			
Low	2412	14.31	30
Middle	2442	14.35	30
High	2472	14.44	30

## 10 FCC §15.247(d) and ISEDC RSS-247 §5.5 - 100 kHz Bandwidth of Band Edges

### 10.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

According to ISEDC RSS-247 §5.5. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### 10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v04: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

### 10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
-	RF cable	-	-	Each time <sup>1</sup>	N/A
-	10dB attenuator	-	-	Each time <sup>1</sup>	N/A

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

**Statement of Traceability:** *BACL Corp.* attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

## 10.4 Test Environmental Conditions

<b>Temperature:</b>	23° C
<b>Relative Humidity:</b>	42 %
<b>ATM Pressure:</b>	102.7 KPa

*The testing was performed by Vincent Licata on 2018-07-06 to 2018-07-11 in RF site.*

## 10.5 Test Results

Compliant

**Please refer to Annex H for plots of results.**

## 11 FCC §15.247(e) & ISEDC RSS-247 §5.2(2) - Power Spectral Density

### 11.1 Applicable Standards

According to ECFR §15.247(e) and RSS-247 §5.2 ( 2 ) , for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 11.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v04: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission.

### 10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
-	RF cable	-	-	Each time <sup>1</sup>	N/A
-	10dB attenuator	-	-	Each time <sup>1</sup>	N/A

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

**Statement of Traceability:** *BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

### 11.4 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

*The testing was performed by Vincent Licata on 2018-07-06 to 2018-07-11 in RF site.*



## 11.3 Test Results

### PSD 2.4 GHz Wi-Fi

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-5.64	8
Middle	2442	-6.79	8
High	2472	-6.54	8
802.11g mode			
Low	2412	-9.65	8
Middle	2442	-10.51	8
High	2472	-10.52	8
802.11n20 mode			
Low	2412	-10.96	8
Middle	2442	-9.60	8
High	2472	-9.77	8

Please refer to Annex G for plots.

## 12 FCC §15.247(d) & ISEDC RSS-247 §5.5, RSS-GEN §8.9 - Spurious Emissions at Antenna Terminals

### 12.1 Applicable Standards

For ECFR §15.247(d) in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement, 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 RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

As per ISEDC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### 12.2 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

### 12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	MY48250238	2018-05-08	1 year
-	RF cable	-	-	Each time <sup>1</sup>	N/A
-	10dB attenuator	-	-	Each time <sup>1</sup>	N/A

Note<sup>1</sup>: cable and attenuator included in the test set-up will be checked each time before testing.

**Statement of Traceability:** *BACL Corp.* attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

## 12.4 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	42 %
ATM Pressure:	102.7 KPa

*The testing was performed by Vincent Licata on 2018-07-06 to 2018-07-11 in RF site.*

## 12.5 Test Results

Compliant

**Please refer to Annex F for plots.**

## 13 Exhibit A - FCC & ISED Equipment Labeling Requirements

### 13.1 FCC ID Label Requirements

#### As per FCC §2.925,

(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

Example: FCC ID: XXX123

Where: XXX—Grantee Code, 123—Equipment Product Code

#### As per FCC §15.19,

(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or verification shall be labeled as follows:

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified above is required to be affixed only to the main control unit. If the EUT is integrated within another device then a label affixed to the host shall also state, "Contains FCC ID: XXXXXX"

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

### 13.2 IC Label Requirements

As per IC RSP-100 Section 3.1, the certification number shall appear as follows:

IC: XXXXXX-YYYYYYYY

Where:

- The letters "IC:" indicate that this is an Innovation, Science and Economic Development Canada's certification number, but they are not part of the certification number. XXXXXXYYYYYYYYYYY is the ISED certification number.
- XXXXXX is the CN assigned by Innovation, Science and Economic Development Canada. Newly assigned CNs will be made up of five numeric characters (e.g. "20001") whereas existing CNs may consist of up to five numeric characters followed by an alphabetic character (e.g. "21A" or "15589J").
- YYYYYYYYYYYY is the Unique Product Number (UPN) assigned by the applicant, made up of a maximum of 11 alphanumeric characters.
- The CN and UPN are limited to capital alphabetic characters (A-Z) and numerals (0-9) only. The use of punctuation marks or other symbols, including "wildcard" characters, is not permitted.

- The HVIN may contain punctuation marks or symbols but they shall not represent any indeterminate (“wildcard”) characters.

As per RSS-Gen §4.2 Equipment Labeling:

The application for equipment certification shall be submitted in accordance with Industry Canada’s Radio Standards Procedure RSP-100, Radio Equipment Certification Procedure which sets out the requirements for certification and labelling of radio apparatus. RSP-100 shall be used in conjunction with RSS-Gen and other Radio Standards Specifications (RSSs) specifically applicable to the type of radio apparatus for which certification is sought.

### 12.3 Recommended Label Contents and Location

**brava**

Model: BRAVA ONE

**120 VAC | 1800 W | 60Hz**

The device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

**HOUSEHOLD USE ONLY**

FCC ID: 2AOGABRAVAONE  
IC: 24108-BRAVAONE



Designed in California  
Assembled in China



## **14 Appendix**

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Please see attachments:

- Annex B – EUT Test Setup Photographs
- Annex C – EUT External Photographs
- Annex D – EUT Internal Photographs
- Annex E – Occupied Bandwidth
- Annex F – Spurious Emissions at Antenna Port
- Annex G – Power Spectral Density
- Annex H – Band Edge

## 15 Annex A (Informative) - A2LA Electrical Testing Certificate



### Accredited Laboratory

A2LA has accredited

### BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA


for technical competence in the field of

### Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of any additional program requirements in the Electrical field. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).



Presented this 30<sup>th</sup> day of August 2016.

  
President and CEO  
For the Accreditation Council  
Certificate Number 3297.02  
Valid to September 30, 2018  
Revised November 14, 2016

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

----- END OF REPORT -----