



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

TEST AND MEASUREMENT REPORT

For

**Enflux Inc.**

3831 Sepulveda Blvd.,  
Sherman Oaks, CA 91403, USA

**FCC ID: 2AL7O44X101**  
**IC: 22757-44X101**

|                                                                                                                                            |                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report                                                                                                     | <b>Product Type:</b><br>Wearable BLE motion Tracking Clothing                        |
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| <b>Report Number:</b> R1705181-247                                                                                                         |                                                                                      |
| <b>Report Date:</b> 2017-06-14                                                                                                             |                                                                                      |
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\* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “\*” Rev. 01

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**DOCUMENT REVISION HISTORY**

| <b>Revision Number</b> | <b>Report Number</b> | <b>Description of Revision</b> | <b>Date of Revision</b> |
|------------------------|----------------------|--------------------------------|-------------------------|
| 0                      | R1705181-247         | Original Report                | 2017-06-14              |

# 1 General Description

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

This test and measurement report was prepared on behalf of *Enflux Inc.*, and their product model: 44X101, FCC ID: 2AL7O44X101; IC: 22757-44X101 or the “EUT” as referred to in this report. It is a Wearable BLE motion tracking clothing with BLE function. It operates in the 2.4 GHz band.

## 1.2 Objective

This report is prepared on behalf of *Enflux Inc.*, in accordance with Part 2, Subpart J, and Part 15, Subparts A and C of the Federal Communication Commission’s rules and ISEDC RSS-247 Issue 2, FEBRUARY 2017.

The objective is to determine compliance with FCC Part 15.247 and ISEDC RSS-247 rules for Output Power, Antenna Requirements, 6 dB and 99% Emission Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Radiated Spurious Emissions.

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

There are no additional submittals or grants with this application.

## 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        | ±5 %                    |
| RF output power, conducted        | ±0.57 dB                |
| Power Spectral Density, conducted | ±1.48dB                 |
| Unwanted Emissions, conducted     | ±1.57dB                 |
| All emissions, radiated           | ±4.0 dB                 |
| AC power line Conducted Emission  | ±2.0 dB                 |
| Temperature                       | ±2 ° C                  |
| Humidity                          | ±5 %                    |
| DC and low frequency voltages     | ±1.0 %                  |
| Time                              | ±2 %                    |
| Duty Cycle                        | ±3 %                    |

## 1.6 Test Facility Registrations

BACLs 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: (Industry Canada - IC) 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 2004/108/EC US-EU EMC & Telecom MRA CAB
  - o Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC  
US -EU EMC & Telecom MRA CAB
- 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 Development Authority - IDA) 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;
- 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 software used was Tera Term VT; the software complies with the standard requirements being tested against.

### 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).

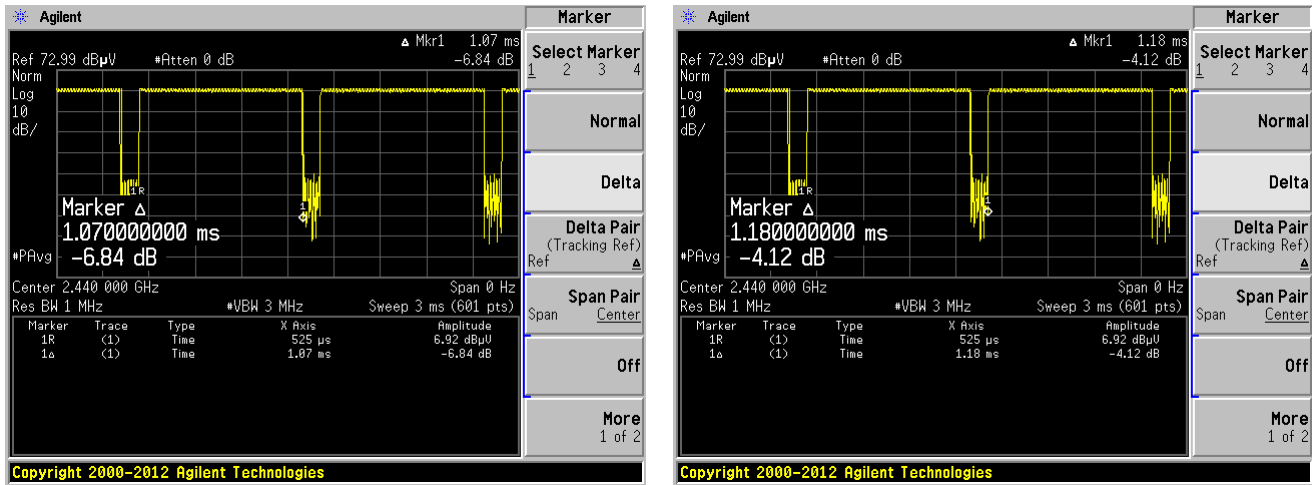
| Radio Mode | On Time (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) |
|------------|--------------|-------------|----------------|-----------------------------------|
| BLE        | 1.07         | 1.18        | 90.68          | 0.42                              |

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.

BLE



2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

| Manufacturer | Description | Model |
|--------------|-------------|-------|
| Apple        | Adapter     | A1385 |

2.6 Support Equipment

There was no support equipment included, or intended for use with EUT during these tests.

2.7 Interface Ports and Cabling

| Cable Description | Length | To      | From |
|-------------------|--------|---------|------|
| USB Cable         | < 1 m  | Adapter | EUT  |

### 3 Summary of Test Results

Results reported relate only to the product tested.

| FCC/ISED Rules                                                                                  | Description of Test                      | Results         |
|-------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|
| FCC §15.203<br>ISED RSS-Gen §8.3                                                                | Antenna Requirement                      | Compliant       |
| FCC §2.1093, §15.247(i)<br>ISED RSS-102                                                         | RF Exposure                              | Compliant       |
| FCC §15.207<br>ISED RSS-Gen §8.8                                                                | AC Line Conducted Emissions              | Compliant       |
| FCC §2.1051, §15.247 (d)<br>ISED RSS-247 §5.5                                                   | Spurious Emissions at Antenna Port       | Not Applicable* |
| FCC §2.1053, §15.205,<br>§15.209, & §15.247 (d)<br>ISED RSS-247 §5.5 & RSS-<br>Gen §8.9 & §8.10 | Radiated Spurious Emissions              | Compliant       |
| FCC §15.247(a)(2)<br>ISED RSS-247 §5.2 (a)                                                      | 6 dB & 99% Emission Bandwidth            | Compliant       |
| FCC §15.247(b)(3)<br>ISED RSS-247 §5.4 (d)                                                      | Maximum Peak Output Power                | Compliant       |
| FCC §15.247(d)<br>ISED RSS-247 §5.5                                                             | 100 kHz Bandwidth of Frequency Band Edge | Compliant       |
| FCC §15.247(e)<br>ISED RSS-247 §5.2 (b)                                                         | Power Spectral Density                   | Compliant       |

Note\*: SMD antenna soldered on the PCB board.

## 4 FCC §15.203 & ISEDC RSS-Gen §8.3 - Antenna Requirements

### 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 §8.3: Transmitter Antenna

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the license-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

License-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the license-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of license-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.<sup>9</sup> When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

### 4.2 Antenna Description

The antenna used by the EUT is permanent attached antenna.

| Antenna usage | Frequency Range (MHz) | Maximum Antenna Gain (dBi) |
|---------------|-----------------------|----------------------------|
| BLE           | 2400-2500             | 1.0                        |

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

### 5.1 Applicable Standard

According to FCC §2.1093 and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot$

$[\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

1.  $f(\text{GHz})$  is the RF channel transmit frequency in GHz.

2. Power and distance are rounded to the nearest mW and mm before calculation.

3. The result is rounded to one decimal place for comparison.

4. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test Exclusion.

**For worst case:**

| Frequency (MHz) | Maximum conducted Tune-up power |            | Calculated Distance (mm) | Calculated value | Threshold (1-g SAR) | SAR Test Exclusion |
|-----------------|---------------------------------|------------|--------------------------|------------------|---------------------|--------------------|
|                 | Power (dBm)                     | Power (mW) |                          |                  |                     |                    |
| 2480            | 4.0                             | 2.51       | 5.0                      | 0.8              | 3.0                 | Yes                |

**Result: No SAR test is required**

According to RSS-102 Issue 5§ (2.5.1), SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance<sup>4,5</sup>

| Frequency (MHz) | Exemption Limits (mW)                 |                                 |                                 |                                 |                                 |
|-----------------|---------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                 | At separation distance of $\leq 5$ mm | At separation distance of 10 mm | At separation distance of 15 mm | At separation distance of 20 mm | At separation distance of 25 mm |
| $\leq 300$      | 71 mW                                 | 101 mW                          | 132 mW                          | 162 mW                          | 193 mW                          |
| 450             | 52 mW                                 | 70 mW                           | 88 mW                           | 106 mW                          | 123 mW                          |
| 835             | 17 mW                                 | 30 mW                           | 42 mW                           | 55 mW                           | 67 mW                           |
| 1900            | 7 mW                                  | 10 mW                           | 18 mW                           | 34 mW                           | 60 mW                           |
| 2450            | 4 mW                                  | 7 mW                            | 15 mW                           | 30 mW                           | 52 mW                           |
| 3500            | 2 mW                                  | 6 mW                            | 16 mW                           | 32 mW                           | 55 mW                           |
| 5800            | 1 mW                                  | 6 mW                            | 15 mW                           | 27 mW                           | 41 mW                           |

| Frequency (MHz) | Exemption Limits (mW)           |                                 |                                 |                                 |                                        |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------------|
|                 | At separation distance of 30 mm | At separation distance of 35 mm | At separation distance of 40 mm | At separation distance of 45 mm | At separation distance of $\geq 50$ mm |
| $\leq 300$      | 223 mW                          | 254 mW                          | 284 mW                          | 315 mW                          | 345 mW                                 |
| 450             | 141 mW                          | 159 mW                          | 177 mW                          | 195 mW                          | 213 mW                                 |
| 835             | 80 mW                           | 92 mW                           | 105 mW                          | 117 mW                          | 130 mW                                 |
| 1900            | 99 mW                           | 153 mW                          | 225 mW                          | 316 mW                          | 431 mW                                 |
| 2450            | 83 mW                           | 123 mW                          | 173 mW                          | 235 mW                          | 309 mW                                 |
| 3500            | 86 mW                           | 124 mW                          | 170 mW                          | 225 mW                          | 290 mW                                 |
| 5800            | 56 mW                           | 71 mW                           | 85 mW                           | 97 mW                           | 106 mW                                 |

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

#### Test Result:

The higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power:

$$(2480-2450)/(3500-2450) = (4-P)/(4-2)$$

The exemption limit of 2480MHz is  $P = 3.94\text{mW}$

Ant gain: 1.0 dBi

Tune up conducted power = 4.0 dBm

2480 MHz e.i.r.p.:  $(1.0 + 4.0) \text{ dBm} = 5.0 \text{ dBm} = 3.2 \text{ mW} < 3.94 \text{ mW}$

**So the stand-alone SAR evaluation can be exempted.**

## 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<br>(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 & 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:

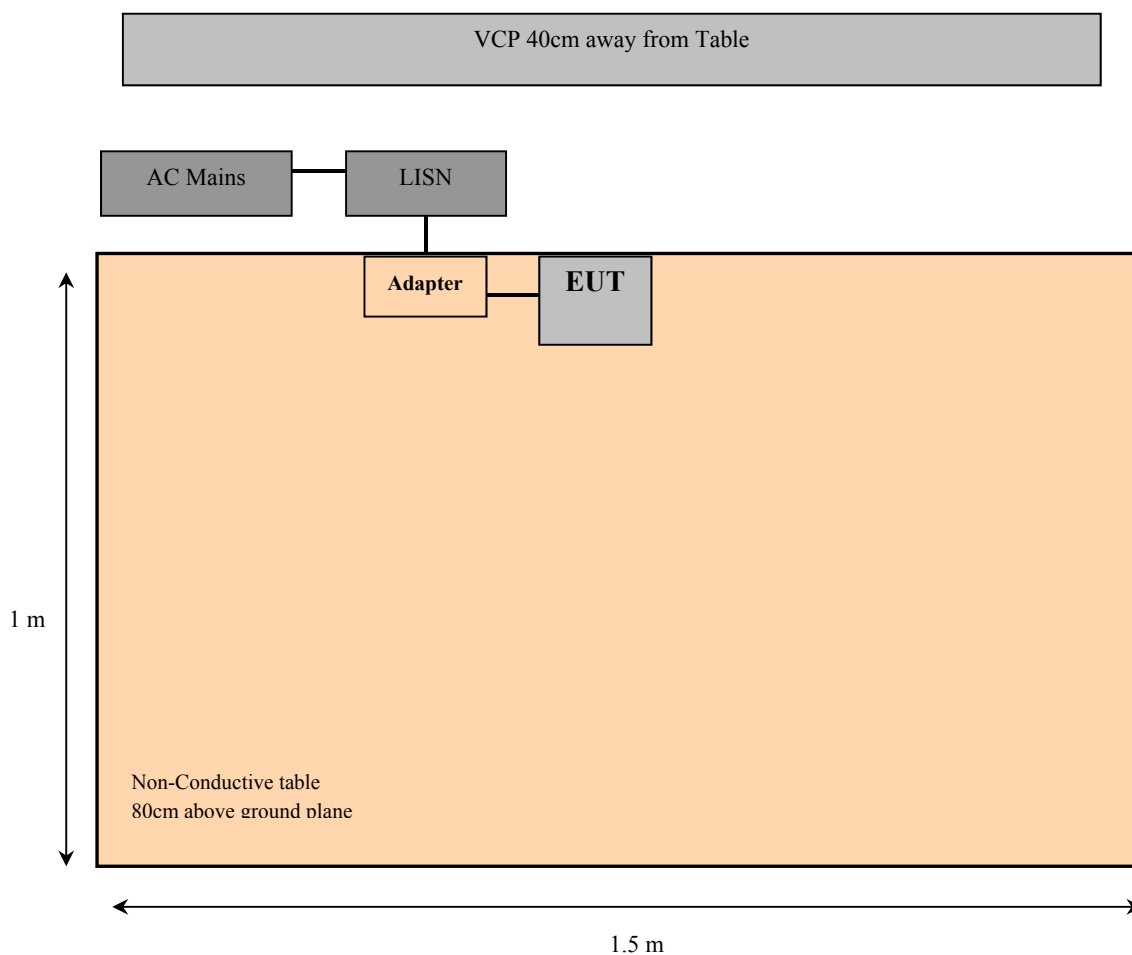
$$CA = Ai + CL + Atten$$

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 Setup Block Diagram



## 6.6 Test Equipment List and Details

| Manufacturer              | Description                     | Model No.            | Serial No. | Calibration Date | Calibration Interval |
|---------------------------|---------------------------------|----------------------|------------|------------------|----------------------|
| Rohde & Schwarz           | Receiver, EMI Test              | ESCI<br>1166.5950K03 | 100338     | 2016-02-04       | 2 year               |
| Rohde & Schwarz           | Impulse Limiter                 | ESH3-Z2              | 101964     | 2016-07-22       | 1 year               |
| Keysight Technologies     | RF Limiter                      | 11867A               | MY42242932 | 2016-12-15       | 1 year               |
| Solar Electronics Company | High Pass Filter                | Type 7930-100        | 7930150204 | 2017-03-09       | 1 Year               |
| Suirong                   | 30 ft conductive emission cable | LMR 400              | -          | 2017-03-05       | 1 year               |
| Vasona                    | Test software                   | V6.0 build 11        | 10400213   | N/R              | N/R                  |

**Statement of Traceability:** *BACL Corp.* attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

## 6.7 Test Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 24 °C    |
| Relative Humidity: | 48 %     |
| ATM Pressure:      | 101.2kPa |

The testing was performed by Candy Li on 2017-06-06 in the outside emissions test site.

## 6.8 Summary of Test Results

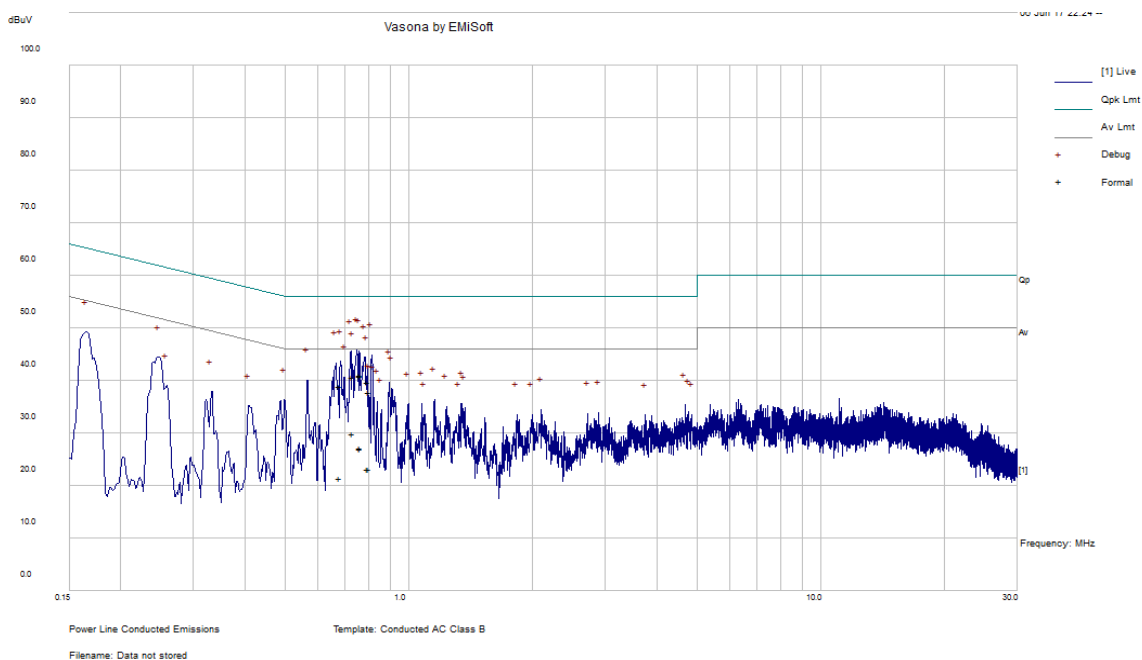
According to the recorded data in following table, the EUT complied with the FCC 15C and ISEDC RSS-Gen standard's conducted emissions limits, with the margin reading of:

**BLE**

| Connection: AC/DC adapter connected to 120 V/60 Hz, AC |                 |                               |             |
|--------------------------------------------------------|-----------------|-------------------------------|-------------|
| Margin (dB)                                            | Frequency (MHz) | Conductor Mode (Live/Neutral) | Range (MHz) |
| -12.71                                                 | 0.727799        | Neutral                       | 0.15-30     |

## 6.9 Conducted Emissions Test Plots and Data

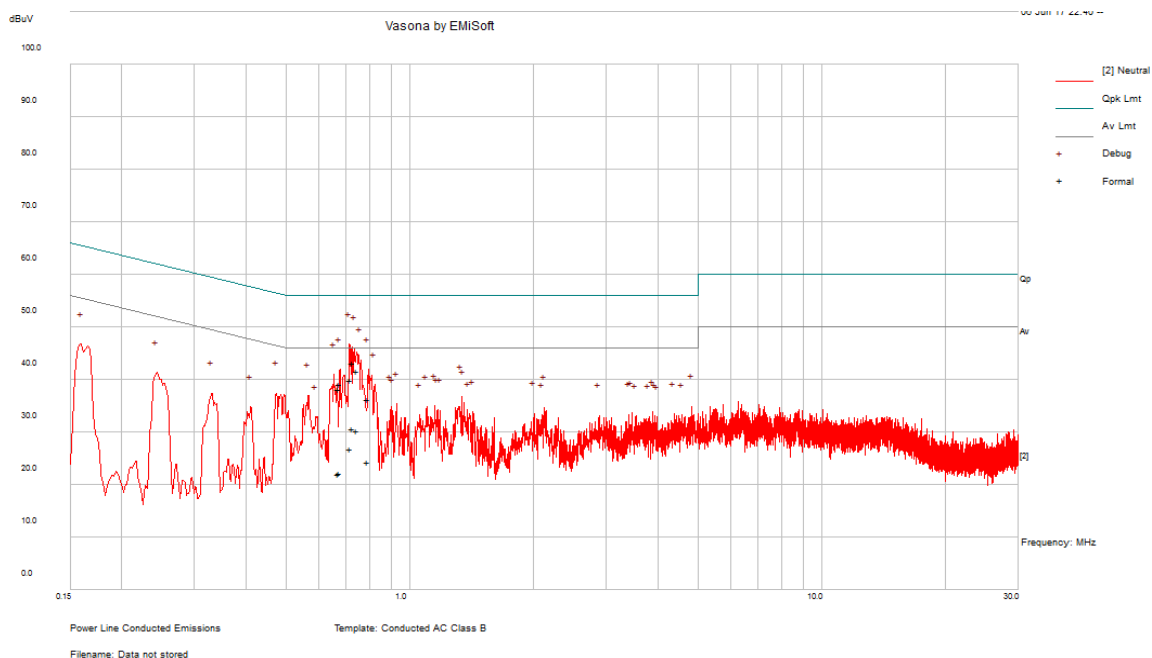
### 120 V, 60 Hz – Line



| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.764510        | 40.86                      | Line                     | 56           | -15.14      | QP                 |
| 0.762041        | 41.16                      | Line                     | 56           | -14.84      | QP                 |
| 0.731061        | 40.76                      | Line                     | 56           | -15.24      | QP                 |
| 0.798753        | 37.76                      | Line                     | 56           | -18.24      | QP                 |
| 0.793637        | 39.84                      | Line                     | 56           | -16.16      | QP                 |
| 0.678511        | 38.89                      | Line                     | 56           | -17.11      | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.764510        | 27.17                      | Line                     | 46           | -18.83      | Ave.               |
| 0.762041        | 27.05                      | Line                     | 46           | -18.95      | Ave.               |
| 0.731061        | 29.88                      | Line                     | 46           | -16.12      | Ave.               |
| 0.798753        | 23.19                      | Line                     | 46           | -22.81      | Ave.               |
| 0.793637        | 23.16                      | Line                     | 46           | -22.84      | Ave.               |
| 0.678511        | 21.50                      | Line                     | 46           | -24.50      | Ave.               |

## 120 V, 60 Hz – Neutral



| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.727799        | 43.29                      | Neutral                  | 56           | -12.71      | QP                 |
| 0.717468        | 39.94                      | Neutral                  | 56           | -16.06      | QP                 |
| 0.743819        | 41.59                      | Neutral                  | 56           | -14.41      | QP                 |
| 0.789320        | 36.24                      | Neutral                  | 56           | -19.76      | QP                 |
| 0.676143        | 39.21                      | Neutral                  | 56           | -16.79      | QP                 |
| 0.670731        | 38.15                      | Neutral                  | 56           | -17.85      | QP                 |

| Frequency (MHz) | Corrected Amplitude (dBuV) | Conductor (Line/Neutral) | Limit (dBuV) | Margin (dB) | Detector (QP/Ave.) |
|-----------------|----------------------------|--------------------------|--------------|-------------|--------------------|
| 0.727799        | 30.79                      | Neutral                  | 46           | -15.21      | Ave.               |
| 0.717468        | 26.95                      | Neutral                  | 46           | -19.05      | Ave.               |
| 0.743819        | 30.33                      | Neutral                  | 46           | -15.67      | Ave.               |
| 0.789320        | 24.37                      | Neutral                  | 46           | -21.63      | Ave.               |
| 0.676143        | 22.34                      | Neutral                  | 46           | -23.66      | Ave.               |
| 0.670731        | 22.09                      | Neutral                  | 46           | -23.91      | 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**

| Frequency<br>(MHz) | Field Strength<br>( $\mu\text{V/m}$ at 3 metres) |
|--------------------|--------------------------------------------------|
| 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 specified 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 ISERC 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

For the radiated emissions test, 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.

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:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto

(2) Average: RBW = 1MHz / VBW > 1/T Hz / Sweep = Auto

Where  $T$  is the period of the transmitting signal

## 7.4 Corrected Amplitude & 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:

$$CA = Ai + AF + CL + Atten - Ga$$

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 & Schwarz    | Receiver, EMI Test  | ESCI<br>1166.5950K03 | 100338     | 2016-02-04             | 2 year               |
| Agilent            | Analyzer, Spectrum  | E4446A               | US44300386 | 2016-06-10             | 1 year               |
| Sunol Science Corp | System Controller   | SC99V                | 011003-1   | N/R                    | N/R                  |
| Sunol Sciences     | Antenna, Biconi-Log | JB3                  | A020106-2  | 2015-07-11             | 2 Years              |
| EMCO               | Antenna, Horn       | 3115                 | 9511-4627  | 2016-01-28             | 2 years              |
| Agilent            | Amplifier, Pre      | 8447D                | 2944A10187 | 2016-06-28             | 1 year               |
| -                  | N-Type Cable        | -                    | C00013     | 2017-04-20             | 1 year               |
| -                  | N-Type Cable        | -                    | C00014     | 2017-04-28             | 1 year               |
| -                  | SMA cable           | -                    | C0002      | Each time <sup>1</sup> | N/A                  |
| -                  | High Freq Cable     | -                    | 5M-3       | 2017-05-20             | 1 year               |
| Agilent            | Pre-Amplifier       | 8449B                | 3008A01978 | 2016-10-06             | 1year                |
| Vasona             | Test software       | V6.0 build 11        | 10400213   | N/R                    | N/R                  |

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

**Statement of Traceability:** *BACL attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

## 7.6 Test Environmental Conditions

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 23-25°C  |
| <b>Relative Humidity:</b> | 46-49 %  |
| <b>ATM Pressure:</b>      | 101.2kPa |

The testing was performed by Candy Li from 2017-05-29 to 2017-06-06 in 5m chamber 3.

## 7.7 Summary of Test Results

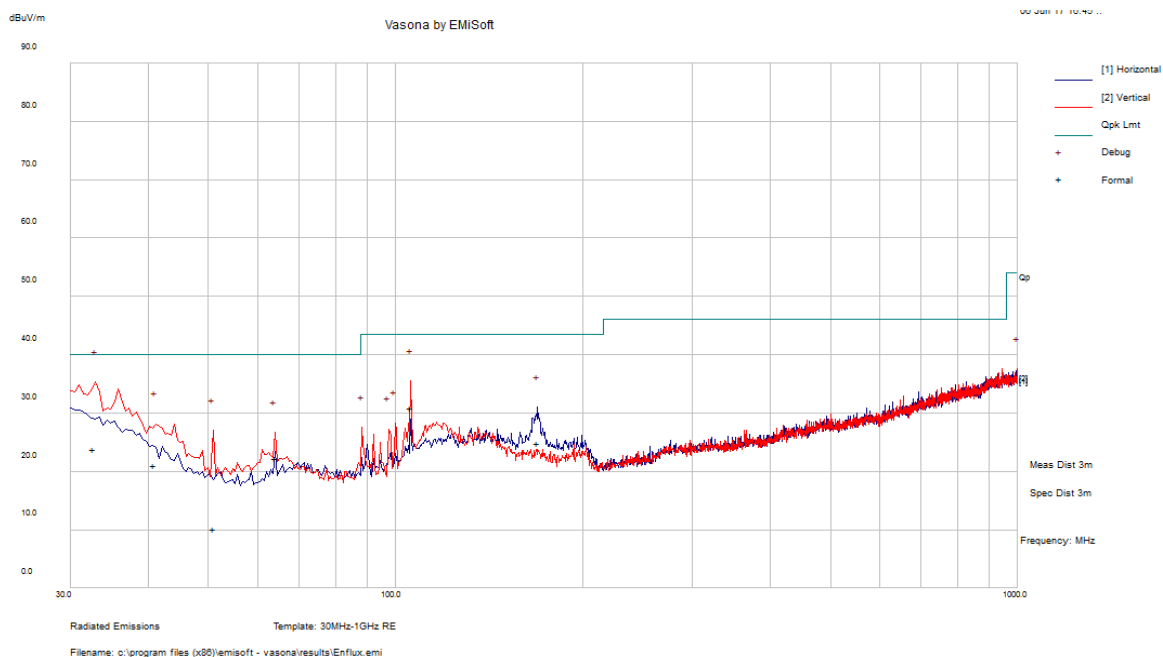
According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C and ISEDC RSS-247 standard's radiated emissions limits, and had the worst margin of:

| Mode: Transmitting |                 |                                    |              |
|--------------------|-----------------|------------------------------------|--------------|
| Margin (dB)        | Frequency (MHz) | Polarization (Horizontal/Vertical) | channel      |
| -2.477             | 2483.5          | Horizontal                         | High Channel |

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

## 7.8 Radiated Emissions Test Results

### 1) 30 MHz– 1 GHz, Measured at 3 meters



| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna Height (cm) | Antenna Polarity (H/V) | Turntable Azimuth (degrees) | Limit (dBμV/m) | Margin (dB) | Comment |
|-----------------|------------------------------|---------------------|------------------------|-----------------------------|----------------|-------------|---------|
| 105.6633        | 30.93                        | 158                 | V                      | 230                         | 43.5           | -12.57      | QP      |
| 32.6815         | 23.80                        | 106                 | V                      | 326                         | 40             | -16.20      | QP      |
| 63.9938         | 22.35                        | 141                 | V                      | 165                         | 40             | -17.65      | QP      |
| 40.969          | 21.08                        | 126                 | V                      | 303                         | 40             | -18.92      | QP      |
| 169.19          | 24.78                        | 114                 | H                      | 0                           | 43.5           | -18.72      | QP      |
| 50.9735         | 10.14                        | 210                 | V                      | 228                         | 40             | -29.86      | QP      |

## 2) 1–25 GHz Measured at 3 meters

| Frequency<br>(MHz)      | S.A.<br>Reading<br>(dBμV) | Turntable<br>Azimuth<br>(degrees) | Test Antenna   |                   |                  | Cable<br>Loss<br>(dB) | Pre-<br>Amp.<br>(dB) | Cord.<br>Reading<br>(dBμV/m) | FCC/ISED          |                | Comments |
|-------------------------|---------------------------|-----------------------------------|----------------|-------------------|------------------|-----------------------|----------------------|------------------------------|-------------------|----------------|----------|
|                         |                           |                                   | Height<br>(cm) | Polarity<br>(H/V) | Factor<br>(dB/m) |                       |                      |                              | Limit<br>(dBμV/m) | Margin<br>(dB) |          |
| Low Channel 2402 MHz    |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2402                    | 60.14                     | 115                               | 124            | H                 | 29.042           | 6.25                  | 0.00                 | 95.432                       | -                 | -              | PK       |
| 2402                    | 59.37                     | 115                               | 124            | H                 | 29.042           | 6.25                  | 0.00                 | 94.662                       | -                 | -              | Ave.     |
| 2402                    | 57.09                     | 180                               | 163            | V                 | 29.042           | 6.25                  | 0.00                 | 92.382                       | -                 | -              | PK       |
| 2402                    | 56.28                     | 180                               | 163            | V                 | 29.042           | 6.25                  | 0.00                 | 91.572                       | -                 | -              | Ave.     |
| 2390                    | 26.68                     | 0                                 | 154            | H                 | 29.042           | 6.24                  | 0.00                 | 61.962                       | 74                | -12.038        | PK       |
| 2390                    | 15.35                     | 0                                 | 154            | H                 | 29.042           | 6.24                  | 0.00                 | 50.632                       | 54                | -3.368         | Ave.     |
| 2390                    | 26.17                     | 160                               | 100            | V                 | 29.042           | 6.24                  | 0.00                 | 61.452                       | 74                | -12.548        | PK       |
| 2390                    | 15.19                     | 160                               | 100            | V                 | 29.042           | 6.24                  | 0.00                 | 50.472                       | 54                | -3.528         | Ave.     |
| 4804                    | 53.17                     | 32                                | 120            | H                 | 32.472           | 8.42                  | 38.564               | 55.498                       | 74                | -18.502        | PK       |
| 4804                    | 45.67                     | 32                                | 120            | H                 | 32.472           | 8.42                  | 38.564               | 47.998                       | 54                | -6.002         | Ave.     |
| 7206                    | 49.05                     | 247                               | 155            | H                 | 36.692           | 10.21                 | 37.907               | 58.045                       | 74                | -15.955        | PK       |
| 7206                    | 41.25                     | 247                               | 155            | H                 | 36.692           | 10.21                 | 37.907               | 50.245                       | 54                | -3.755         | Ave.     |
| 9608                    | 45.95                     | 320                               | 166            | H                 | 37.771           | 11.62                 | 38.292               | 57.049                       | 74                | -16.951        | PK       |
| 9608                    | 34.20                     | 320                               | 166            | H                 | 37.771           | 11.62                 | 38.292               | 45.299                       | 54                | -8.701         | Ave.     |
| Middle Channel 2440 MHz |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2440                    | 61.34                     | 144                               | 163            | H                 | 29.347           | 6.29                  | 0                    | 96.977                       | -                 | -              | PK       |
| 2440                    | 60.52                     | 144                               | 163            | H                 | 29.347           | 6.29                  | 0                    | 96.157                       | -                 | -              | Ave.     |
| 2440                    | 58.36                     | 186                               | 242            | V                 | 29.347           | 6.29                  | 0                    | 93.997                       | -                 | -              | PK       |
| 2440                    | 57.49                     | 186                               | 242            | V                 | 29.347           | 6.29                  | 0                    | 93.127                       | -                 | -              | Ave.     |
| 4880                    | 51.87                     | 258                               | 180            | H                 | 32.638           | 8.39                  | 38.564               | 54.334                       | 74                | -19.666        | PK       |
| 4880                    | 44.48                     | 258                               | 180            | H                 | 32.638           | 8.39                  | 38.564               | 46.944                       | 54                | -7.056         | Ave.     |
| 7320                    | 47.99                     | 144                               | 153            | H                 | 37.148           | 10.35                 | 37.907               | 57.581                       | 74                | -16.419        | PK       |
| 7320                    | 36.77                     | 144                               | 153            | H                 | 37.148           | 10.35                 | 37.907               | 46.361                       | 54                | -7.639         | Ave.     |
| 9760                    | 46.28                     | 103                               | 252            | H                 | 37.865           | 11.52                 | 38.292               | 57.373                       | 74                | -16.627        | PK       |
| 9760                    | 34.97                     | 103                               | 252            | H                 | 37.865           | 11.52                 | 38.292               | 46.063                       | 54                | -7.937         | Ave.     |
| High Channel 2480 MHz   |                           |                                   |                |                   |                  |                       |                      |                              |                   |                |          |
| 2480                    | 63.78                     | 167                               | 194            | H                 | 29.413           | 6.35                  | 0                    | 99.543                       | -                 | -              | PK       |
| 2480                    | 63.01                     | 167                               | 194            | H                 | 29.413           | 6.35                  | 0                    | 98.773                       | -                 | -              | Ave.     |
| 2480                    | 60.34                     | 197                               | 100            | V                 | 29.413           | 6.35                  | 0                    | 96.103                       | -                 | -              | PK       |
| 2480                    | 59.55                     | 197                               | 100            | V                 | 29.413           | 6.35                  | 0                    | 95.313                       | -                 | -              | Ave.     |
| 2483.5                  | 26.13                     | 154                               | 177            | H                 | 29.413           | 6.24                  | 0                    | 61.783                       | 74                | -12.217        | PK       |
| 2483.5                  | 15.87                     | 154                               | 177            | H                 | 29.413           | 6.24                  | 0                    | 51.523                       | 54                | -2.477         | Ave.     |
| 2483.5                  | 25.85                     | 109                               | 181            | V                 | 29.413           | 6.24                  | 0                    | 61.503                       | 74                | -12.497        | PK       |
| 2483.5                  | 15.49                     | 109                               | 181            | V                 | 29.413           | 6.24                  | 0                    | 51.143                       | 54                | -2.857         | Ave.     |
| 4960                    | 51.27                     | 181                               | 168            | H                 | 32.738           | 8.31                  | 38.535               | 53.783                       | 74                | -20.217        | PK       |
| 4960                    | 42.93                     | 181                               | 168            | H                 | 32.738           | 8.31                  | 38.535               | 45.443                       | 54                | -8.557         | Ave.     |
| 7440                    | 47.2                      | 335                               | 110            | H                 | 37.034           | 10.38                 | 37.89                | 56.724                       | 74                | -17.276        | PK       |
| 7440                    | 36.21                     | 335                               | 110            | H                 | 37.034           | 10.38                 | 37.89                | 45.734                       | 54                | -8.266         | Ave.     |
| 9920                    | 46.14                     | 47                                | 75             | H                 | 37.985           | 11.45                 | 38.326               | 57.249                       | 74                | -16.751        | PK       |
| 9920                    | 34.85                     | 47                                | 75             | H                 | 37.985           | 11.45                 | 38.326               | 45.959                       | 54                | -8.041         | Ave.     |

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

### 8.1 Applicable Standards

According to FCC §15.247(a) (2) and ISEDC RSS-247 §5.2(a), 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    | US44300386 | 2016-06-10       | 1 year               |
| Sunol Science Corp | System Controller  | SC99V     | 011003-1   | N/R              | N/R                  |
| EMCO               | Antenna, Horn      | 3115      | 9511-4627  | 2016-01-28       | 2 years              |
| -                  | High Freq Cable    | -         | 5M-3       | 2017-05-20       | 1 year               |

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 calibrations have been performed per the A2LA requirements, traceable to the NIST.

### 8.4 Test Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 23°C     |
| Relative Humidity: | 46 %     |
| ATM Pressure:      | 101.2kPa |

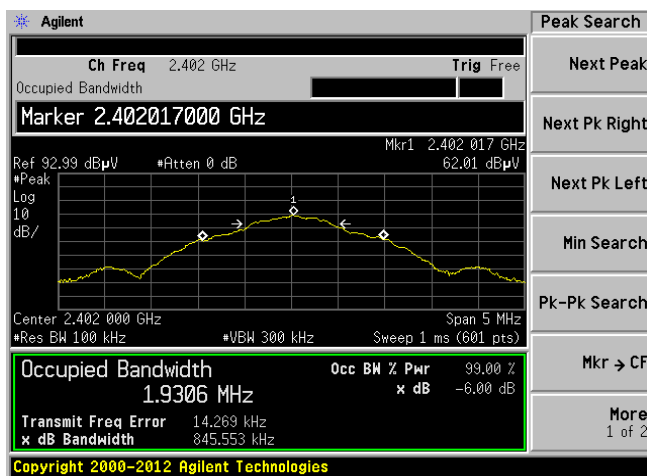
The testing was performed by Candy Lion 2017-05-29 in 5m chamber 3.

## 8.5 Test Results

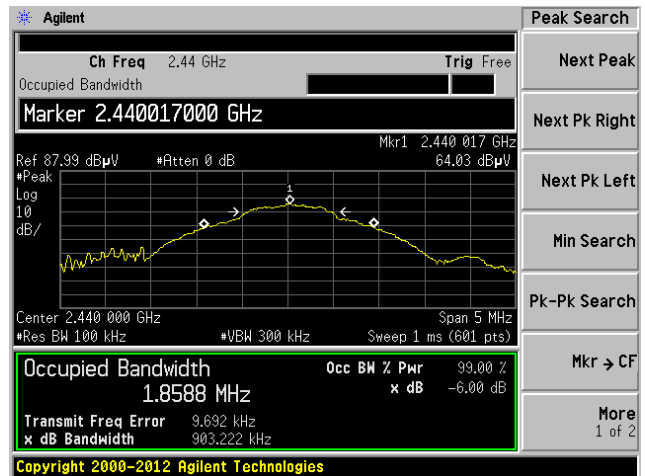
| Channel | Frequency (MHz) | 99% OBW (kHz) | 6 dB OBW (kHz) | 6 dB OBW Limit (kHz) |
|---------|-----------------|---------------|----------------|----------------------|
| Low     | 2402            | 1930.6        | 845.553        | 500                  |
| Middle  | 2440            | 1858.8        | 903.222        | 500                  |
| High    | 2480            | 1877.8        | 845.637        | 500                  |

Please refer to the following plots for detailed test results.

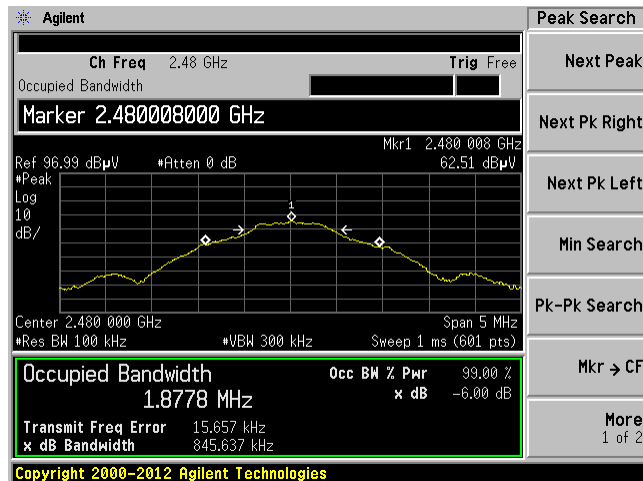
Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz



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

### 9.1 Applicable Standards

According to FCC §15.247(b) (3) and ISEDC RSS-247 §5.4 (d) 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 |
|--------------------|--------------------|-----------|------------|------------------|----------------------|
| Agilent            | Analyzer, Spectrum | E4446A    | US44300386 | 6/10/2016        | 1 year               |
| Sunol Science Corp | System Controller  | SC99V     | 011003-1   | N/R              | N/R                  |
| EMCO               | Antenna, Horn      | 3115      | 9511-4627  | 1/28/2016        | 2 years              |
| -                  | High Freq Cable    | -         | 5M-3       | 5/20/2017        | 1 year               |

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 calibrations have been performed per the A2LA requirements, traceable to the NIST.

### 9.4 Test Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 46 %      |
| ATM Pressure:      | 101.2 kPa |

The testing was performed by Candy Li on 2017-05-29 in 5m chamber 3.

## 9.5 Test Results

| Channel | Frequency (MHz) | Measured (dB $\mu$ V/m) | EIRP (dBm) | Ant Gain (dBi) | Conducted Output Power (dBm) | Limit (dBm) |
|---------|-----------------|-------------------------|------------|----------------|------------------------------|-------------|
| Low     | 2402            | 95.972                  | 0.742      | 1.0            | -0.258                       | 30          |
| Middle  | 2440            | 97.407                  | 2.177      | 1.0            | 1.177                        | 30          |
| High    | 2480            | 100.053                 | 4.823      | 1.0            | 3.823                        | 30          |

Note:  $EIRP[dBm] = E[dB\mu V/m] - 95.3$  when distance is 3 meter

$EIRP[dBm] = \text{Conducted Output Power}[dBm] + \text{Antenna Gain} [dBi]$

Where: E is the field strength in dB $\mu$ V/m

EIRP is the equivalent isotropically radiated power in dBm

## 10 FCC §15.247(d) & 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    | US44300386 | 6/10/2016        | 1 year               |
| Sunol Science Corp | System Controller  | SC99V     | 011003-1   | N/R              | N/R                  |
| EMCO               | Antenna, Horn      | 3115      | 9511-4627  | 1/28/2016        | 2 years              |
| -                  | High Freq Cable    | -         | 5M-3       | 5/20/2017        | 1 year               |

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 calibrations have been performed per the A2LA requirements, traceable to the NIST.

10.4 Test Environmental Conditions

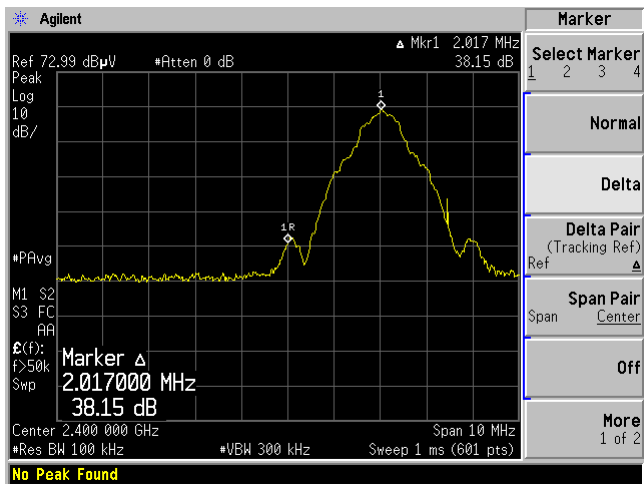
|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 46 %      |
| ATM Pressure:      | 101.2 kPa |

The testing was performed by Candy Lion 2017-05-29 in 5m chamber 3.

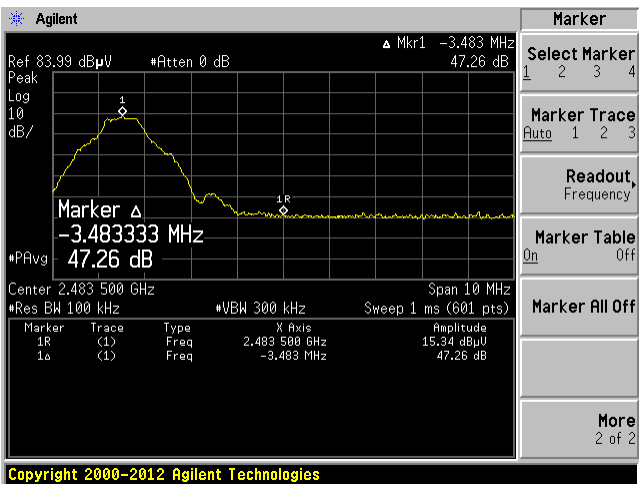
10.5 Test Results

Please refer to the following plots:

Low Channel 2402 MHz



High Channel 2480 MHz



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

### 11.1 Applicable Standards

According to FCC §15.247(e) and RSS-247 §5.2 (b) , 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.

### 11.3 Test Equipment List and Details

| Manufacturer       | Description        | Model No. | Serial No. | Calibration Date | Calibration Interval |
|--------------------|--------------------|-----------|------------|------------------|----------------------|
| Agilent            | Analyzer, Spectrum | E4446A    | US44300386 | 6/10/2016        | 1 year               |
| Sunol Science Corp | System Controller  | SC99V     | 011003-1   | N/R              | N/R                  |
| EMCO               | Antenna, Horn      | 3115      | 9511-4627  | 1/28/2016        | 2 years              |
| -                  | High Freq Cable    | -         | 5M-3       | 5/20/2017        | 1 year               |

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 calibrations have been performed per the A2LA requirements, traceable to the NIST.

### 11.4 Test Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 23° C     |
| Relative Humidity: | 46 %      |
| ATM Pressure:      | 101.2 kPa |

The testing was performed by Candy Lion 2017-05-29 in 5m chamber 3.

## 11.5 Test Results

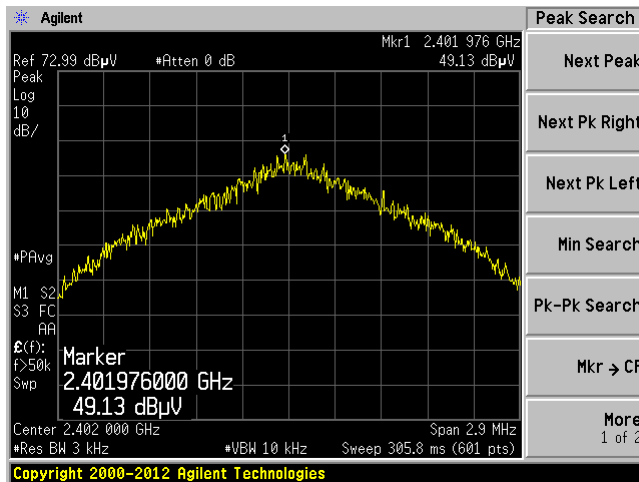
| Channel | Frequency (MHz) | Measured (dBμV/m) | EIRP (dBm) | Ant Gain (dBi) | PSD (dBm/3kHz) | Limit (dBm/3kHz) |
|---------|-----------------|-------------------|------------|----------------|----------------|------------------|
| Low     | 2402            | 84.462            | -10.768    | 1              | -11.768        | 8                |
| Middle  | 2440            | 85.467            | -9.763     | 1              | -10.763        | 8                |
| High    | 2480            | 85.053            | -10.177    | 1              | -11.177        | 8                |

Note:  $EIRP[dBm] = E[dB\mu V/m] - 95.3$  when the distance is 3 meter  
 $EIRP[dBm] = \text{Conducted Output Power}[dBm] + \text{Antenna Gain}[dBi]$

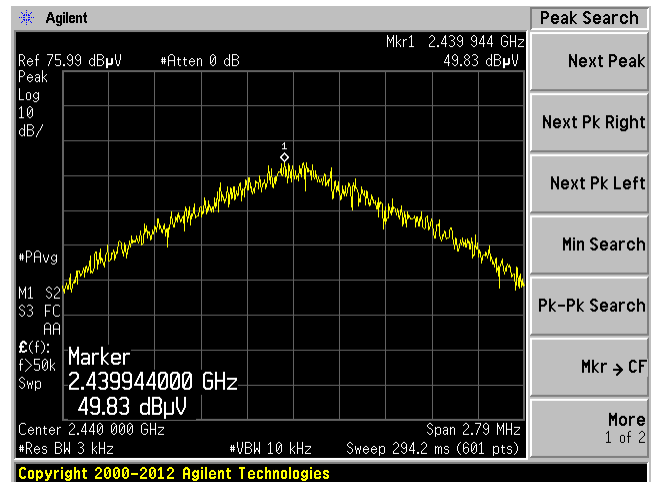
Where: E is the field strength in dBμV/m  
 EIRP is the equivalent isotropically radiated power in dBm

Please refer to the following plots for detailed test results.

Low Channel 2402 MHz



Middle Channel 2440 MHz



High Channel 2480 MHz

