

## FCC PART 15.247

## TEST REPORT

For

### Fuzhou Emax Electronic Co., Ltd.

Building #12-#16, CangShan Industrial Area, JuYuanZhou JinShan District, FuZhou, China.

**FCC ID: WEC-1601**

|  |   |
|--|---|
| <b>Report Type:</b><br>Original Report | <b>Product Type:</b><br>Bluetooth Smart Thermometer   |
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| <b>Report Number:</b>                  | RXM160520062-00   |
| <b>Report Date:</b>                    | 2016-07-08  |
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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. (Dongguan).

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *Fuzhou Emax Electronic Co., Ltd.*'s product, model number: *EM2241-T1 (FCC ID: WEC-1601)* (the "EUT") in this report was a *Bluetooth Smart Thermometer*, which was measured approximately: 5.8 cm (L) x 2.8 cm (W) x 8.3cm (H), rated input voltage: DC3V from battery.

*All measurement and test data in this report was gathered from production sample serial number: 160520062 (Assigned byBACL, Dongguan). The EUT was received on 2016-06-24.*

### Objective

This report is prepared on behalf of *Fuzhou Emax Electronic Co., Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communications Commission's rules

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.209 and 15.247 rules.

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

No related Grant(s).

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

### Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer.

For Bluetooth LE mode, 40 channels are provided for testing:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 0       | 2402            | 20      | 2442            |
| 1       | 2404            | ...     | ...             |
| ...     | ...             | ...     | ...             |
| ...     | ...             | ...     | ...             |
| ..      | ...             | 38      | 2478            |
| 19      | 2440            | 39      | 2480            |

EUT was tested with channel 0, 19 and 39.

### Equipment Modifications

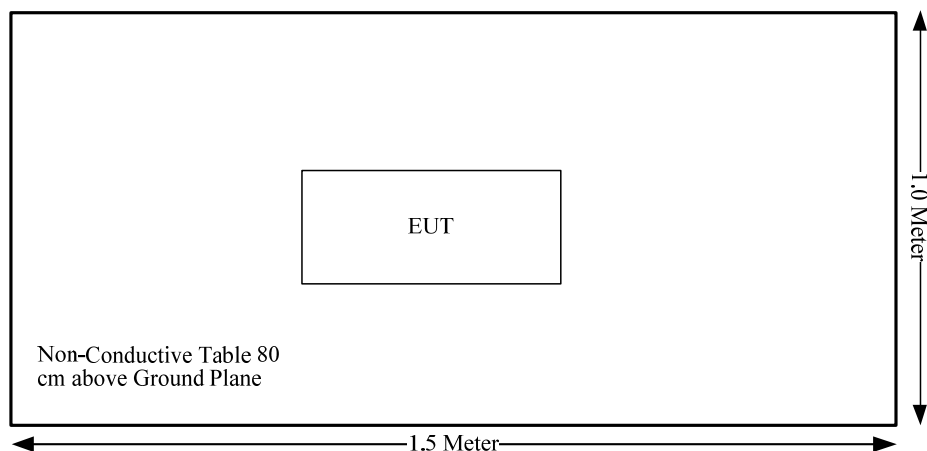
No modification was made to the EUT tested.

### EUT Exercise Software

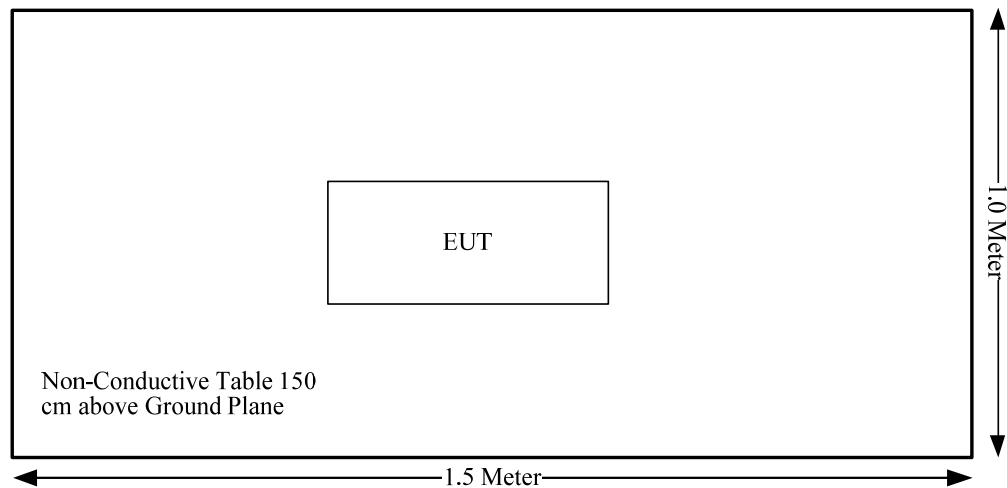
No software was used in test, the engineering mode configured the maximum power as default setting.

### Block Diagram of Test Setup

Below 1 G



Above 1 G



**SUMMARY OF TEST RESULTS**

| FCC Rules                           | Description of Test                      | Result         |
|-------------------------------------|--|----------------|
| FCC §15.247 (i) & §1.1310 & §2.1093 | RF Exposure                              | Compliance     |
| §15.203                             | Antenna Requirement                      | Compliance     |
| §15.207 (a)                         | AC Line Conducted Emissions              | Not Applicable |
| §15.247(d)                          | Spurious Emissions at Antenna Port       | Compliance     |
| §15.205, §15.209, §15.247(d)        | Spurious Emissions                       | Compliance     |
| §15.247 (a)(2)                      | 6 dB Emission Bandwidth                  | Compliance     |
| §15.247(b)(3)                       | Maximum conducted output power           | Compliance     |
| §15.247(d)                          | 100 kHz Bandwidth of Frequency Band Edge | Compliance     |
| §15.247(e)                          | Power Spectral Density                   | Compliance     |

Not Applicable: the device power by battery.

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**FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE**

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**Applicable Standard**

According to §15.247(i) and §1.1310, 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 KDB447498 D01 General RF Exposure Guidance v06:

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

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

**Measurement Result**

The tune-up power is -5.0dBm (0.32mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$   
 $= 0.32/5 \cdot (\sqrt{2.48}) = 0.1 \leq 3.0$

**So the stand-alone SAR evaluation is not necessary.**



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## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **Applicable Standard**

According to § 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

### **Antenna Connector Construction**

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

### Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If  $U_{lab}$  is less than or equal to  $U_{cispr}$  of Table 2, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If  $U_{lab}$  is greater than  $U_{cispr}$  of Table 2, then:

- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.

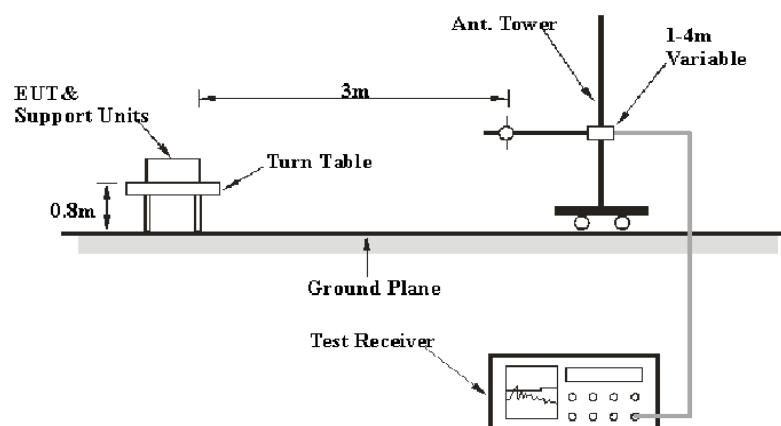
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 10m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.55 dB for Horizontal, 4.57 dB for Vertical; 200M~1GHz: 4.66 dB for Horizontal, 4.56 dB for Vertical; measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB

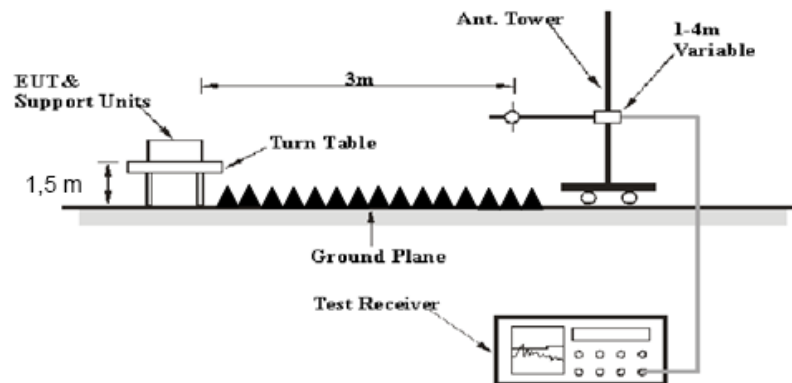
Table 2 – Values of  $U_{cispr}$

| Measurement  | $U_{cispr}$ |
|--|-------------|
| Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz) | 6.3 dB      |
| Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)                   | 5.2 dB      |
| Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)                  | 5.5 dB      |

### EUT Setup

Below 1GHz:



**Above 1GHz:**

The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits. The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range   | RBW     | Video B/W | IF B/W  | Detector |
|-------------------|---------|-----------|---------|----------|
| 30 MHz – 1000 MHz | 120 kHz | 300 kHz   | 120 kHz | QP       |
| Above 1 GHz       | 1MHz    | 3 MHz     | /       | PK       |
|                   | 1MHz    | 10 Hz     | /       | AV       |

**Test Procedure**

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

**Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

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

### Test Equipment List and Details

| Manufacturer          | Description       | Model               | Serial Number      | Calibration Date | Calibration Due Date |
|-----------------------|-------------------|---------------------|--------------------|------------------|----------------------|
| R&S                   | EMI Test Receiver | ESCI                | 100224             | 2015-08-03       | 2016-08-02           |
| Sunol Sciences        | Antenna           | JB3                 | A060611-3          | 2014-11-06       | 2017-11-05           |
| HP                    | Amplifier         | 8447E               | 2434A02181         | 2015-09-01       | 2016-09-01           |
| Agilent               | Spectrum Analyzer | E4440A              | SG43360054         | 2015-11-23       | 2016-11-22           |
| ETS-Lindgren          | Horn Antenna      | 3115                | 9808-5557          | 2015-09-06       | 2018-09-06           |
| Mini-Circuit          | Amplifier         | ZVA-213-S+          | 054201245          | 2016-02-19       | 2017-02-19           |
| R&S                   | Spectrum Analyzer | FSEM                | DE23437            | 2015-11-23       | 2016-11-22           |
| Ducommun Technologies | Horn Antenna      | ARH-4223-02         | 1007726-01<br>1304 | 2014-06-16       | 2017-06-15           |
| N/A                   | Coaxial Cable     | 14m                 | N/A                | 2016-05-06       | 2017-05-06           |
| N/A                   | Coaxial Cable     | 8m                  | N/A                | 2016-05-06       | 2017-05-06           |
| Quinstar              | Amplifier         | QLW-<br>18405536-JO | 15964001001        | 2015-09-06       | 2016-09-06           |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

**7.20 dB at 2390 MHz in the Horizontal polarization**

### Test Data

#### Environmental Conditions

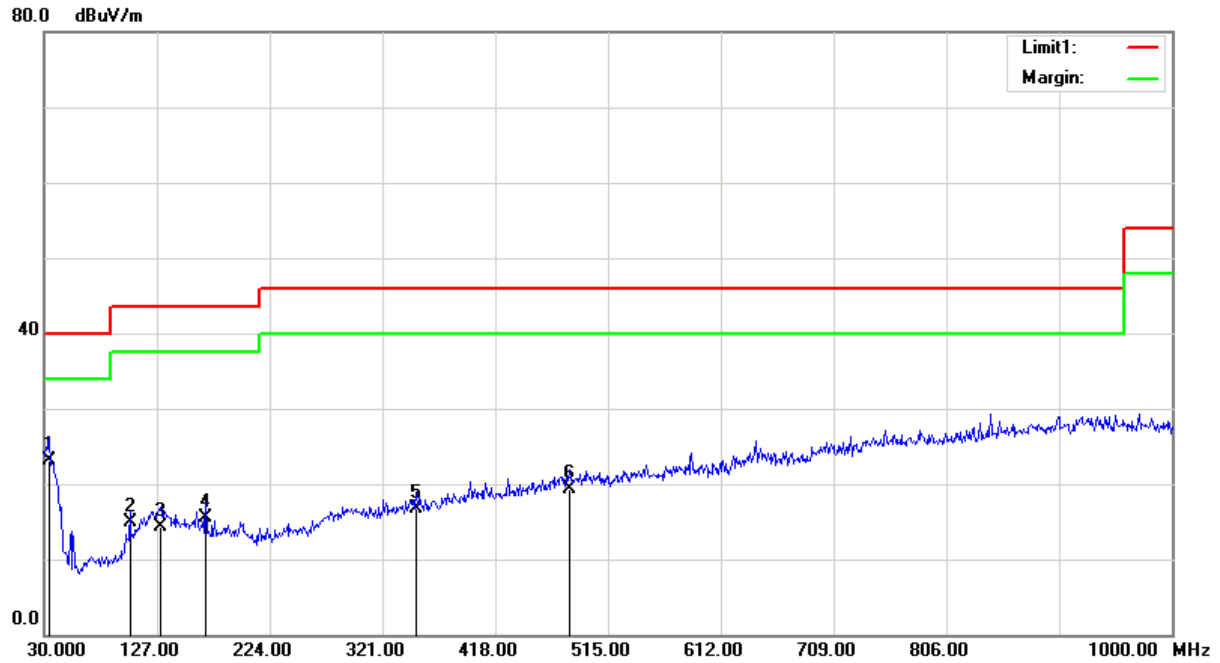
|                           |         |
|---------------------------|---------|
| <b>Temperature:</b>       | 27.9 °C |
| <b>Relative Humidity:</b> | 50%     |
| <b>ATM Pressure:</b>      | 99.9kPa |

*The testing was performed by Lion Xiao on 2016-07-04.*

*Test Mode: Transmitting*

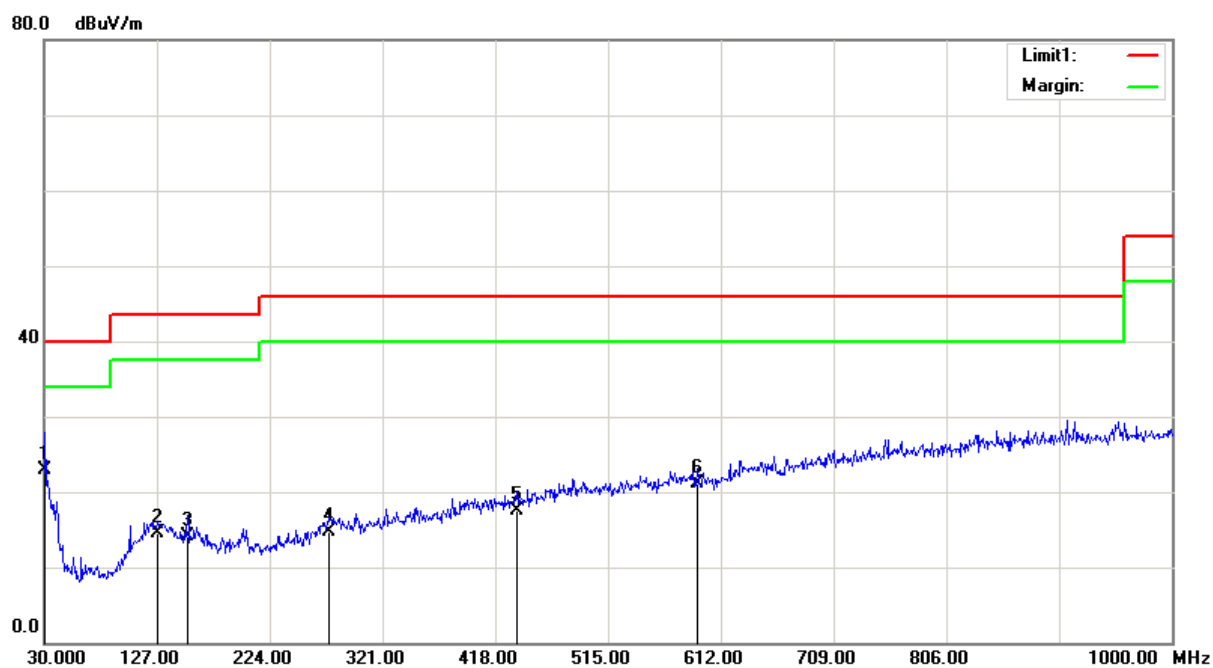
## 1) Below 1GHz:

## Horizontal



| Frequency (MHz) | Receiver Reading (dB $\mu$ V) | Detector | Correction Factor (dB/m) | Cord. Amp. (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
|-----------------|-------------------------------|----------|--------------------------|---------------------------|----------------------|-------------|
| 33.8800         | 25.17                         | QP       | -1.97                    | 23.20                     | 40.00                | 16.80       |
| 103.7200        | 23.50                         | QP       | -8.60                    | 14.90                     | 43.50                | 28.60       |
| 129.9100        | 20.00                         | QP       | -5.70                    | 14.30                     | 43.50                | 29.20       |
| 168.7100        | 23.31                         | QP       | -7.81                    | 15.50                     | 43.50                | 28.00       |
| 350.1000        | 21.48                         | QP       | -4.68                    | 16.80                     | 46.00                | 29.20       |
| 482.0200        | 21.12                         | QP       | -1.72                    | 19.40                     | 46.00                | 26.60       |

## Vertical



| Frequency (MHz) | Receiver Reading (dB $\mu$ V) | Detector | Correction Factor (dB/m) | Cord. Amp. (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
|-----------------|-------------------------------|----------|--------------------------|---------------------------|----------------------|-------------|
| 30.9700         | 22.68                         | QP       | 0.22                     | 22.90                     | 40.00                | 17.10       |
| 127.9700        | 20.12                         | QP       | -5.62                    | 14.50                     | 43.50                | 29.00       |
| 153.1900        | 21.23                         | QP       | -7.13                    | 14.10                     | 43.50                | 29.40       |
| 275.4100        | 20.81                         | QP       | -6.01                    | 14.80                     | 46.00                | 31.20       |
| 436.4300        | 20.46                         | QP       | -2.86                    | 17.60                     | 46.00                | 28.40       |
| 591.6300        | 21.94                         | QP       | -0.74                    | 21.20                     | 46.00                | 24.80       |

## 2) 1G-25GHz

| Frequency<br>(MHz)       | Receiver          |                        | Rx Antenna     |                | Cable<br>loss<br>(dB) | Amplifier<br>Gain<br>(dB) | Corrected<br>Amplitude<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) |
|--------------------------|-------------------|------------------------|----------------|----------------|-----------------------|---------------------------|------------------------------------|-------------------|----------------|
|                          | Reading<br>(dBμV) | Detector<br>(PK/QP/AV) | Polar<br>(H/V) | Factor<br>(dB) |                       |                           |                                    |                   |                |
| Low Channel: 2402 MHz    |                   |                        |                |                |                       |                           |                                    |                   |                |
| 2402                     | 60.88             | PK                     | H              | 24.82          | 3.66                  | 0.00                      | 89.36                              | N/A               | N/A            |
| 2402                     | 54.73             | AV                     | H              | 24.82          | 3.66                  | 0.00                      | 83.21                              | N/A               | N/A            |
| 2402                     | 59.95             | PK                     | V              | 24.82          | 3.66                  | 0.00                      | 88.43                              | N/A               | N/A            |
| 2402                     | 53.81             | AV                     | V              | 24.82          | 3.66                  | 0.00                      | 82.29                              | N/A               | N/A            |
| 2390                     | 32.03             | PK                     | H              | 24.80          | 3.63                  | 0.00                      | 60.46                              | 74.00             | 13.54          |
| 2390                     | 18.37             | AV                     | H              | 24.80          | 3.63                  | 0.00                      | 46.80                              | 54.00             | 7.20           |
| 4804                     | 46.95             | PK                     | H              | 29.71          | 5.06                  | 27.41                     | 54.31                              | 74.00             | 19.69          |
| 4804                     | 39.32             | AV                     | H              | 29.71          | 5.06                  | 27.41                     | 46.68                              | 54.00             | 7.32           |
| 7206                     | 38.32             | PK                     | H              | 33.93          | 6.61                  | 25.91                     | 52.95                              | 74.00             | 21.05          |
| 7206                     | 26.95             | AV                     | H              | 33.93          | 6.61                  | 25.91                     | 41.58                              | 54.00             | 12.42          |
| 9608                     | 30.91             | PK                     | H              | 36.36          | 8.53                  | 27.55                     | 48.25                              | 74.00             | 25.75          |
| 9608                     | 18.56             | AV                     | H              | 36.36          | 8.53                  | 27.55                     | 35.90                              | 54.00             | 18.10          |
| 1971.5                   | 37.67             | PK                     | H              | 24.10          | 3.04                  | 27.49                     | 37.32                              | 74.00             | 36.68          |
| 1971.5                   | 25.13             | AV                     | H              | 24.10          | 3.04                  | 27.49                     | 24.78                              | 54.00             | 29.22          |
| Middle Channel: 2440 MHz |                   |                        |                |                |                       |                           |                                    |                   |                |
| 2440                     | 60.39             | PK                     | H              | 24.89          | 3.76                  | 0.00                      | 89.04                              | N/A               | N/A            |
| 2440                     | 54.22             | AV                     | H              | 24.89          | 3.76                  | 0.00                      | 82.87                              | N/A               | N/A            |
| 2440                     | 59.46             | PK                     | V              | 24.89          | 3.76                  | 0.00                      | 88.11                              | N/A               | N/A            |
| 2440                     | 53.30             | AV                     | V              | 24.89          | 3.76                  | 0.00                      | 81.95                              | N/A               | N/A            |
| 4880                     | 45.56             | PK                     | H              | 29.86          | 5.18                  | 27.42                     | 53.18                              | 74.00             | 20.82          |
| 4880                     | 38.29             | AV                     | H              | 29.86          | 5.18                  | 27.42                     | 45.91                              | 54.00             | 8.09           |
| 7320                     | 37.53             | PK                     | H              | 34.11          | 6.75                  | 25.88                     | 52.51                              | 74.00             | 21.49          |
| 7320                     | 25.77             | AV                     | H              | 34.11          | 6.75                  | 25.88                     | 40.75                              | 54.00             | 13.25          |
| 9760                     | 30.80             | PK                     | H              | 36.46          | 8.62                  | 27.21                     | 48.67                              | 74.00             | 25.33          |
| 9760                     | 18.67             | AV                     | H              | 36.46          | 8.62                  | 27.21                     | 36.54                              | 54.00             | 17.46          |
| 1971.5                   | 37.59             | PK                     | H              | 24.10          | 3.04                  | 27.49                     | 37.24                              | 74.00             | 36.76          |
| 1971.5                   | 25.73             | AV                     | H              | 24.10          | 3.04                  | 27.49                     | 25.38                              | 54.00             | 28.62          |
| 3219                     | 36.40             | PK                     | H              | 26.36          | 6.17                  | 27.35                     | 41.58                              | 74.00             | 32.42          |
| 3219                     | 24.82             | AV                     | H              | 26.36          | 6.17                  | 27.35                     | 30.00                              | 54.00             | 24.00          |
| High Channel: 2480 MHz   |                   |                        |                |                |                       |                           |                                    |                   |                |
| 2480                     | 59.49             | PK                     | H              | 24.96          | 3.68                  | 0.00                      | 88.13                              | N/A               | N/A            |
| 2480                     | 53.65             | AV                     | H              | 24.96          | 3.68                  | 0.00                      | 82.29                              | N/A               | N/A            |
| 2480                     | 58.91             | PK                     | V              | 24.96          | 3.68                  | 0.00                      | 87.55                              | N/A               | N/A            |
| 2480                     | 52.88             | AV                     | V              | 24.96          | 3.68                  | 0.00                      | 81.52                              | N/A               | N/A            |
| 2483.5                   | 28.41             | PK                     | H              | 24.97          | 3.67                  | 0.00                      | 57.05                              | 74.00             | 16.95          |
| 2483.5                   | 15.83             | AV                     | H              | 24.97          | 3.67                  | 0.00                      | 44.47                              | 54.00             | 9.53           |
| 4960                     | 44.06             | PK                     | H              | 30.02          | 5.34                  | 27.43                     | 51.99                              | 74.00             | 22.01          |
| 4960                     | 37.30             | AV                     | H              | 30.02          | 5.34                  | 27.43                     | 45.23                              | 54.00             | 8.77           |
| 7440                     | 37.67             | PK                     | H              | 34.30          | 6.89                  | 25.97                     | 52.89                              | 74.00             | 21.11          |
| 7440                     | 25.12             | AV                     | H              | 34.30          | 6.89                  | 25.97                     | 40.34                              | 54.00             | 13.66          |
| 9920                     | 30.15             | PK                     | H              | 36.55          | 8.71                  | 26.66                     | 48.75                              | 74.00             | 25.25          |
| 9920                     | 18.57             | AV                     | H              | 36.55          | 8.71                  | 26.66                     | 37.17                              | 54.00             | 16.83          |
| 1971.5                   | 37.96             | PK                     | H              | 24.10          | 3.04                  | 27.49                     | 37.61                              | 74.00             | 36.39          |
| 1971.5                   | 25.59             | AV                     | H              | 24.10          | 3.04                  | 27.49                     | 25.24                              | 54.00             | 28.76          |

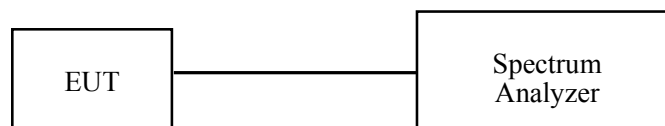
## FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

### Applicable Standard

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.

### Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



### Test Equipment List and Details

| Manufacturer | Description       | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|-------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSP 38      | 100478        | 2015-11-23       | 2016-11-22           |
| N/A          | Coaxial Cable     | 0.1m        | N/A           | 2016-05-06       | 2017-05-06           |
| E-Microwave  | DC Blocking       | EMDCB-00036 | 0E01201047    | 2016-05-06       | 2017-05-06           |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 29.6°C   |
| Relative Humidity: | 60 %     |
| ATM Pressure:      | 99.9 kPa |

\* The testing was performed by Lion Xiao on 2016-07-04.

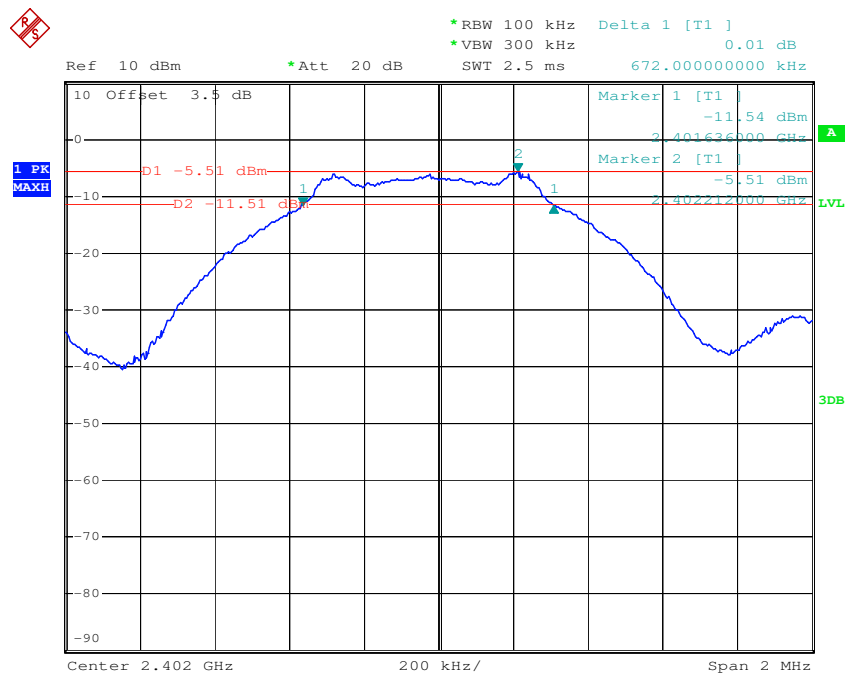


Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

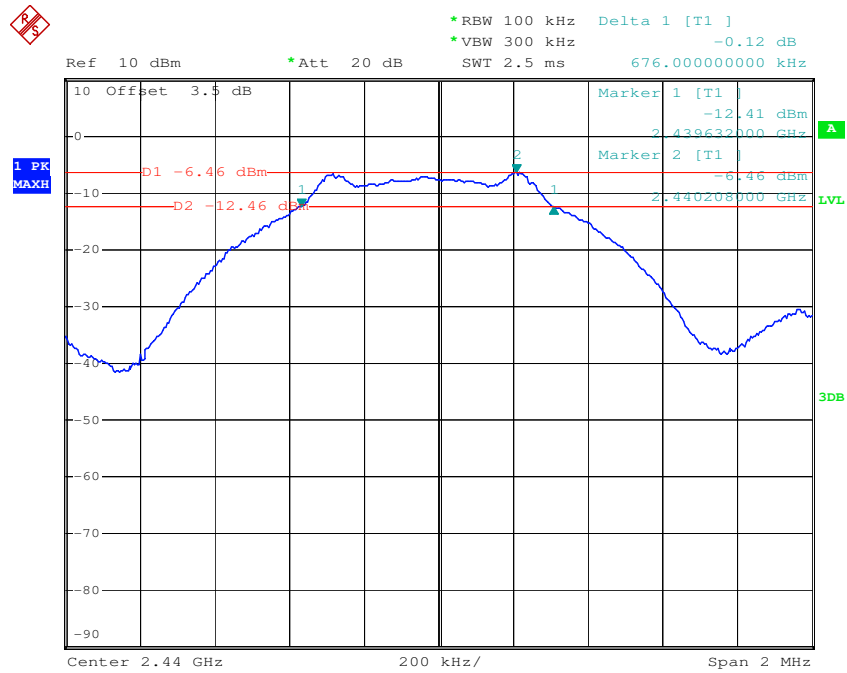
| Test mode | Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Limit (MHz) |
|-----------|---------|-----------------|----------------------|-------------|
| BLE       | Low     | 2402            | 0.67                 | $\geq 0.5$  |
|           | Middle  | 2440            | 0.68                 | $\geq 0.5$  |
|           | High    | 2480            | 0.67                 | $\geq 0.5$  |

### BLE Low Channel



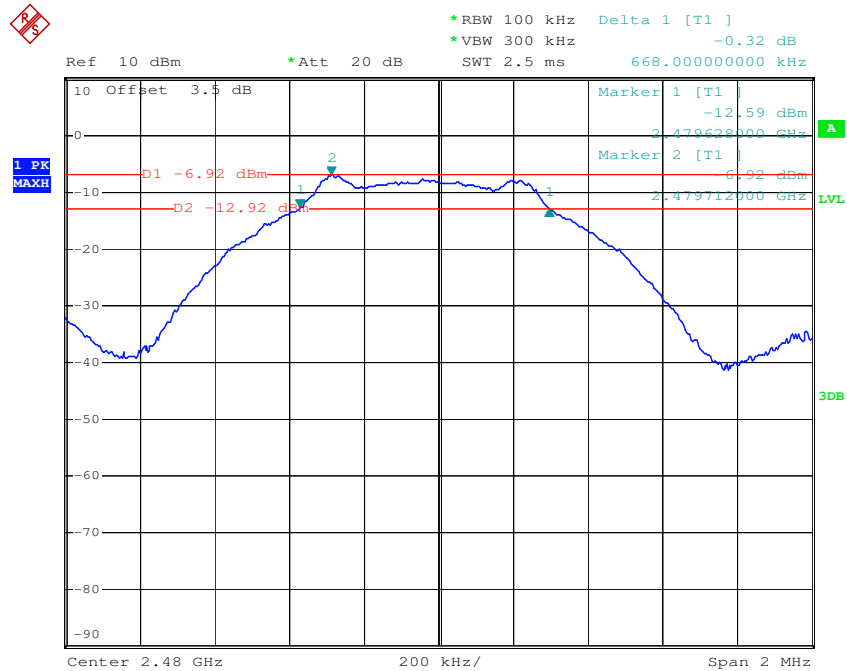
Date: 4.JUL.2016 20:45:33

### BLE Middle Channel



Date: 4.JUL.2016 20:43:58

### BLE High Channel



Date: 4.JUL.2016 20:40:16

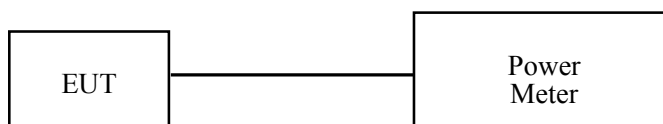
## FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

### Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

### Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.



### Test Equipment List and Details

| Manufacturer | Description           | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-----------------------|-------------|---------------|------------------|----------------------|
| Agilent      | Wideband Power Sensor | N1921A      | MY54210016    | 2015-11-03       | 2016-11-03           |
| Agilent      | Wideband Power Sensor | N1921A      | MY54170013    | 2015-11-03       | 2016-11-03           |
| Agilent      | P-Series Power Meter  | N1912A      | MY5000448     | 2015-11-03       | 2016-11-03           |
| N/A          | Coaxial Cable         | 0.1m        | N/A           | 2016-05-06       | 2017-05-06           |
| E-Microwave  | DC Blocking           | EMDCB-00036 | 0E01201047    | 2016-05-06       | 2017-05-06           |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 29.6°C   |
| Relative Humidity: | 60 %     |
| ATM Pressure:      | 99.9 kPa |

\* The testing was performed by Lion Xiao on 2016-07-04.

*Test Mode: Transmitting*

*Test Result: Compliant. Please refer to the following table.*

| Channel | Frequency | Max Peak<br>Conducted Output<br>Power | Limit |
|---------|-----------|---------------------------------------|-------|
|         | (MHz)     | (dBm)                                 | (dBm) |
| Low     | 2402      | -5.29                                 | 30    |
| Middle  | 2440      | -6.05                                 | 30    |
| High    | 2480      | -6.73                                 | 30    |

## **FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE**

### **Applicable Standard**

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)).

### **Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### **Test Equipment List and Details**

| Manufacturer | Description       | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|-------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSP 38      | 100478        | 2015-11-23       | 2016-11-22           |
| N/A          | Coaxial Cable     | 0.1m        | N/A           | 2016-05-06       | 2017-05-06           |
| E-Microwave  | DC Blocking       | EMDCB-00036 | 0E01201047    | 2016-05-06       | 2017-05-06           |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### **Test Data**

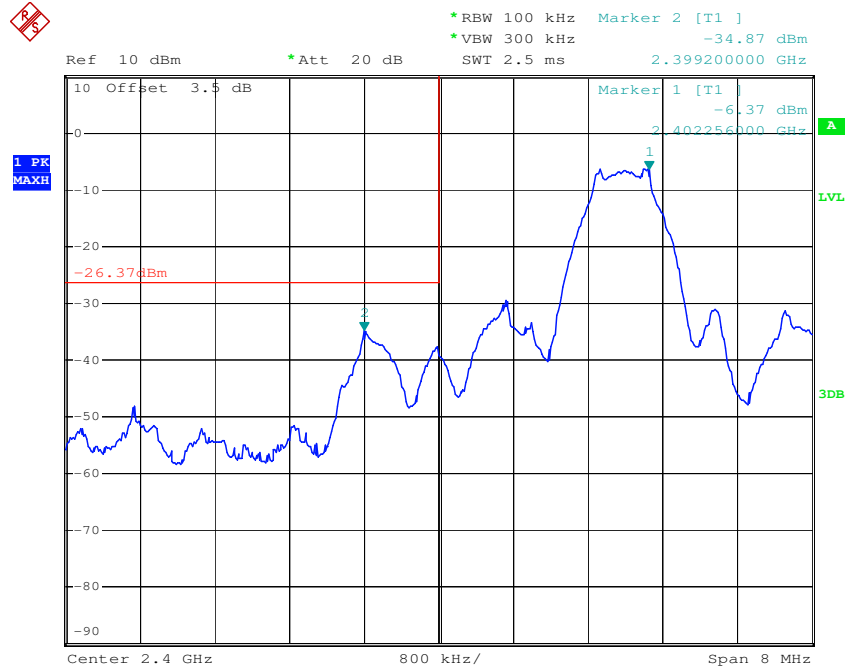
#### **Environmental Conditions**

|                           |          |
|---------------------------|----------|
| <b>Temperature:</b>       | 29.6°C   |
| <b>Relative Humidity:</b> | 60%      |
| <b>ATM Pressure:</b>      | 99.9 kPa |

\* The testing was performed by Lion Xiao on 2016-07-04.  
Test mode: Transmitting

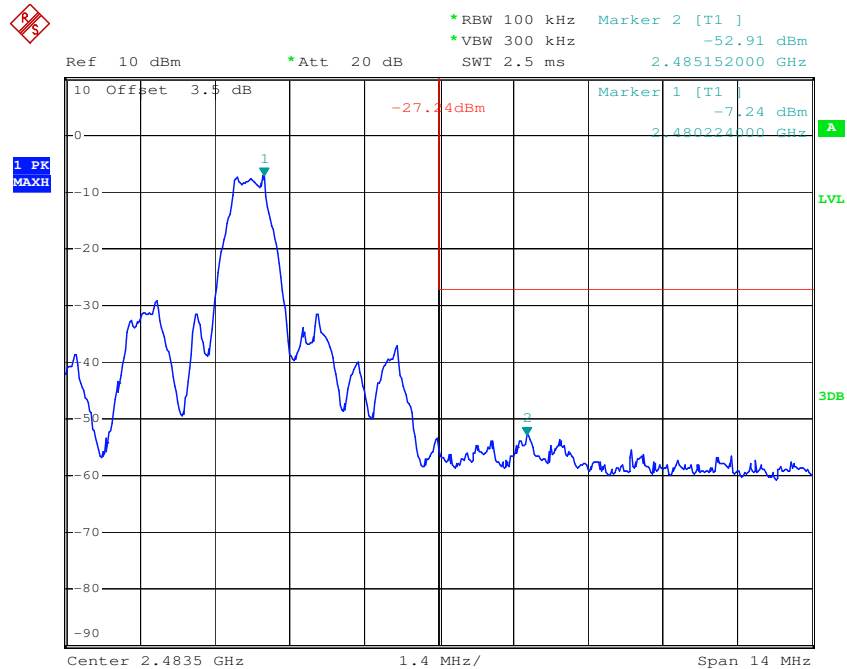
Test Result: Compliant. Please refer to following plots.

### BLE Band Edge, Left Side



Date: 4.JUL.2016 20:47:43

### BLE Band Edge, Right Side



Date: 4.JUL.2016 20:39:37

## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- Set the VBW  $\geq 3 \times \text{RBW}$ .
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### Test Equipment List and Details

| Manufacturer | Description       | Model       | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|-------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSP 38      | 100478        | 2015-11-23       | 2016-11-22           |
| N/A          | Coaxial Cable     | 0.1m        | N/A           | 2016-05-06       | 2017-05-06           |
| E-Microwave  | DC Blocking       | EMDCB-00036 | 0E01201047    | 2016-05-06       | 2017-05-06           |

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

|                    |          |
|--------------------|----------|
| Temperature:       | 29.6°C   |
| Relative Humidity: | 60 %     |
| ATM Pressure:      | 99.9 kPa |

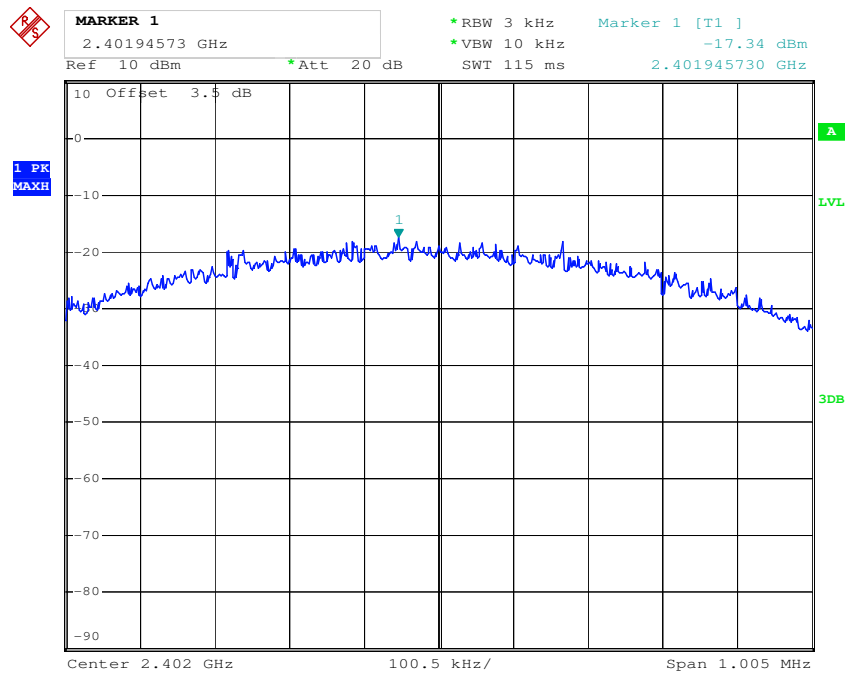
\* The testing was performed by Lion Xiao on 2016-07-04.

*Test Mode: Transmitting*

*Test Result: Compliant. Please refer to the following table and plots*

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) |
|---------|-----------------|----------------|------------------|
| Low     | 2402            | -17.34         | $\leq 8$         |
| Middle  | 2440            | -18.28         | $\leq 8$         |
| High    | 2480            | -18.96         | $\leq 8$         |

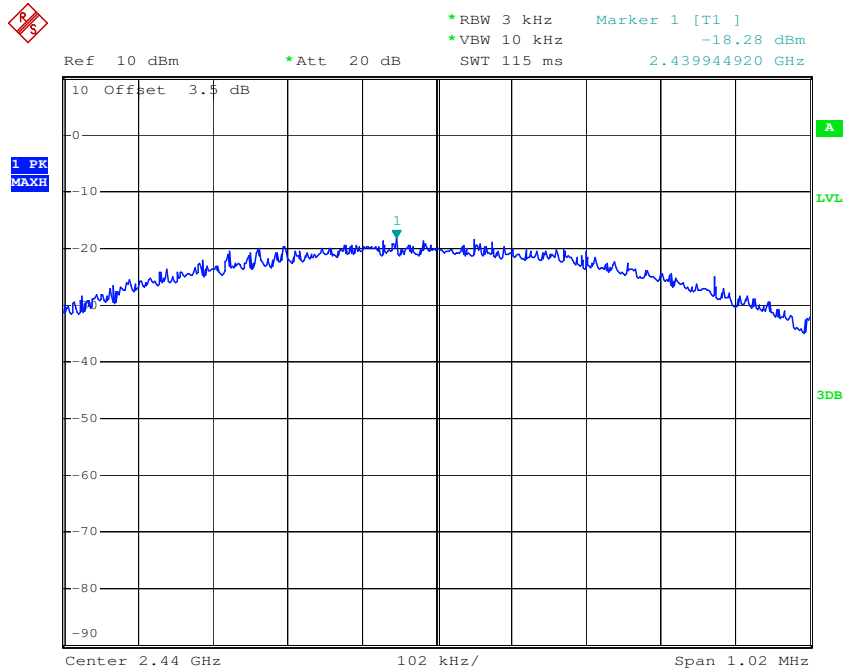
### Power Spectral Density, BLE Low Channel



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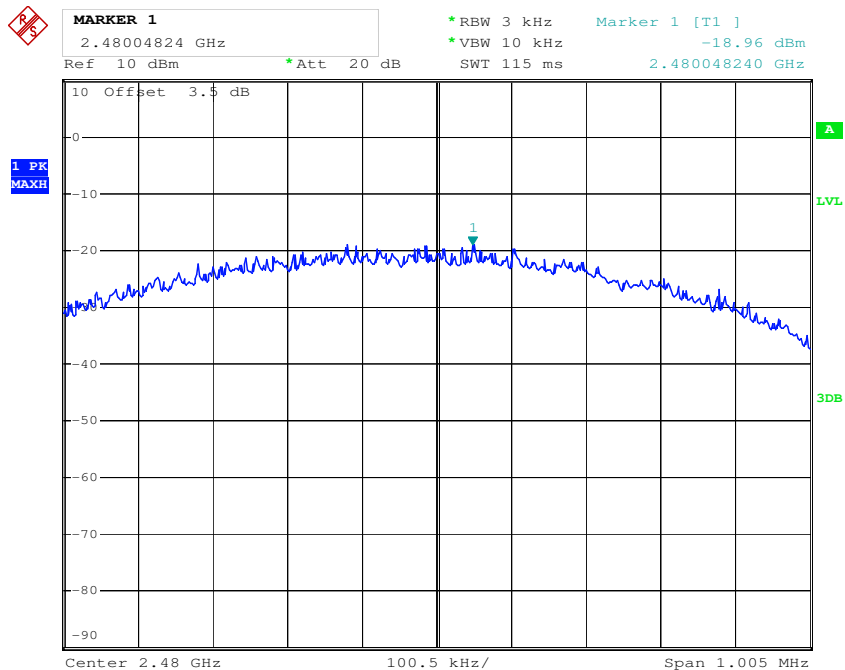


### Power Spectral Density, BLE Middle Channel



Date: 4.JUL.2016 20:44:43

### Power Spectral Density, BLE High Channel



Date: 4.JUL.2016 20:51:44

\*\*\*\*\* END OF REPORT \*\*\*\*\*