

# FCC TEST REPORT

Under  
FCC 15 Subpart C, Paragraph 15.247  
&

Prepared For :

**Calibeur Measurements (Hong Kong) Co., Limited**

B46 Bldg., 2nd Ind . Zone, TangLang, XiLi ,Shenzhen, China.

|                                                                |
|----------------------------------------------------------------|
| <b>FCC ID: SWTTG-510</b>                                       |
| <b>EUT: Tire Pressure/Tread Depth Gauge<br/>with Bluetooth</b> |
| <b>Model: TG-510</b>                                           |

|                                        |
|----------------------------------------|
| August 31, 2015                        |
| <b>Issue Date:</b>                     |
| Original Report                        |
| <b>Report Type:</b>                    |
| <i>Eric Guo</i>                        |
| <b>Test Engineer: Eric Guo</b>         |
| <i>Apollo Liu</i>                      |
| <b>Review By: Apollo Liu / Manager</b> |

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## 1. General Information

### 1.1 Notes

The test results of this report relate exclusively to the test item specified in 1.5. The KMO Lab does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the KMO Lab.

### 1.2 Testing Laboratory

#### Ke Mei Ou Laboratory Co., Ltd.

ANSI-ASQ National Accreditation Board/ACLASS ISO/IEC 17025 Accredited Lab for telecommunication standards. The Registration Number is AT-1532. The testing quality system meets with ISO/IEC-17025 requirements, This approval results is accepted by MRA of ILAC.

FCC Test Site Registration Number: 962205

IC Test Site Registration Number: 4986A-2

Internet: [www.kmolab.com](http://www.kmolab.com)

### 1.3 Details of Applicant

**Name** : Calibeur Measurements (Hong Kong) Co., Limited  
**Address** : B46 Bldg., 2nd Ind. Zone, TangLang, XiLi, Shenzhen, China.

### 1.4 Application Details

Date of Receipt of Application : May 12, 2015  
 Date of Receipt of Test Item : May 12, 2015  
 Date of Test : August 6~ August 31, 2015

### 1.5 Test Item

Manufacturer : Same as applicant  
 Address : Same as applicant  
 Trade Name : N/A  
 Model No.(Base) : TG-510  
 Model No.(Extension) : N/A  
 Description : Tire Pressure/Tread Depth Gauge with Bluetooth

#### Additional Information

Product Type : Bluetooth 4.0 LE (1TX, 1RX)  
 Radio Type : Intentional Transceiver  
 Power Type : DC 6V(CR2032\*2)  
 Modulation : see the below tables  
 Data Modulation : Bluetooth: GFSK (1Mbps)  
 Data Rate (Mbps) : see the below table  
 Frequency Range : 2402~2480MHz  
 Channel Number : 40  
 Antenna : Internal, 1.01dBi

Bluetooth

| Type of Modulation | Data Rate |
|--------------------|-----------|
| GFSK               | 1Mbps     |

### 1.6 Test Standards

FCC 15 Subpart C, Paragraph 15.247

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

## 2. Technical Test

### 2.1 Summary of Test Results

The EUT has been tested according to the following specifications:

| FCC Rule               | Test Type                                  | Limit                     | Result | Notes     |
|------------------------|--------------------------------------------|---------------------------|--------|-----------|
| FCC 15.247(a)(2)       | 6dB Bandwidth                              | $\geq 0.5\text{MHz}$      | PASS   | Complies  |
| FCC 15.247(b)(1)       | Peak Output Power                          | $\leq 30\text{dBm}$       | PASS   | Complies  |
| FCC 15.247(e)          | Power Spectral Density                     | $\leq 8\text{dBm}$        | PASS   | Complies  |
| FCC 15.247(d)          | Conducted Band Edges and Spurious Emission | $\leq 20\text{dBc}$       | PASS   | Complies. |
| FCC 15.247(d)          | Radiated Band Edges and Spurious Emission  | FCC 15.209(a) & 15.247(d) | PASS   | Complies. |
| FCC 15.207             | AC Conducted Emission                      | FCC 15.207(a)             | N/A    | Complies. |
| FCC 15.203 & 15.247(b) | Antenna Requirement                        | N/A                       | PASS   | Complies  |

\* The digital circuit porting of the EUT has been tested and verified to comply with FCC Part 15, Subpart B., Class B Digital Devices and the associated Radio Receiver has also been tested and found to comply with FCC Part 15, Subpart B – Radio Receivers.

### 2.2 Antenna Requirement

#### A. Regulation

FCC section 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 Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

#### B. Result

The antenna type used in this product is internal Antenna and fixed in the EUT and without connector. That no antenna other than furnished by the responsible party shall be used with the device. The EUT as tested meets the criteria of this rule by being antenna being permanently attached and professionally installed. The EUT is compliant with Section 15.203.

## 3. EUT Modifications

No modification by test lab.

## 4. Conducted Power Line Test

### 4.1 Test Equipment

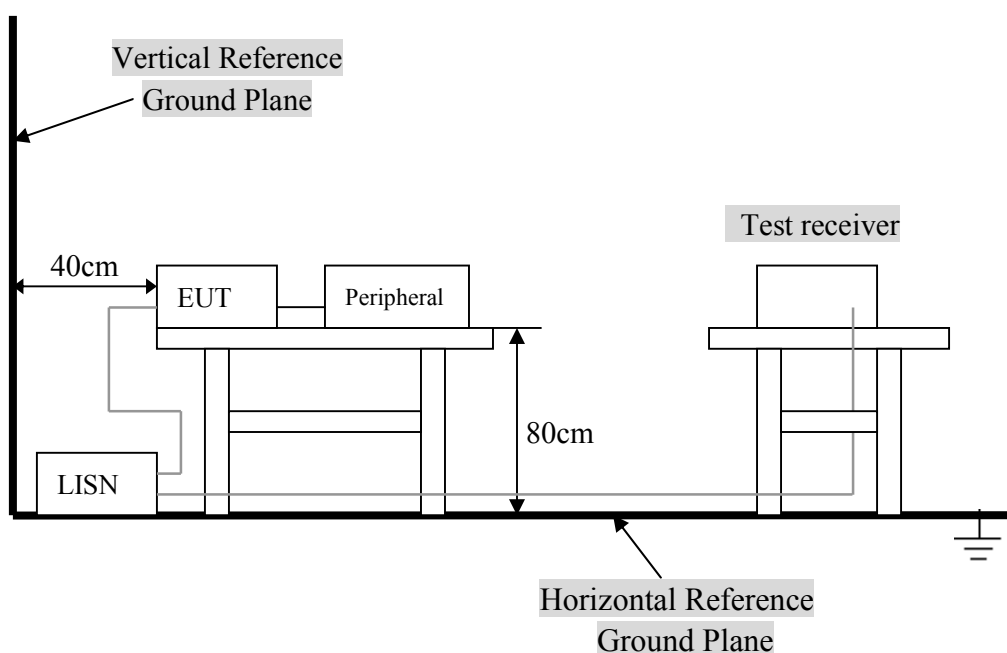
Please refer to Section 10 this report.

### 4.2 Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission., the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement. Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

### 4.3 Test Setup



For the actual test configuration, Please refer to the related items – Photos of Testing.

#### 4.4 Configuration of the EUT

The EUT was configured according to ANSI C63.10:2013. EUT was used DC6V. The operation frequency is from 2402MHz~2480MHz. Enable the signal transmitted from the EUT to Notebook PC. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

Note:

- 1) Operating Modes: Each of lowest, middle and highest channel frequencies transmits continuously for emissions measurements. The EUT operates in normal Bluetooth 4.0 for occupancy duration and frequency separation.
- 2) Special Test Software & Hardware: Special firmware and hardware provided by the Applicant are installed to allow the EUT to operate in Bluetooth 4.0 or at each channel frequency continuously. For example, the transmitter will be operated at each of lowest, middle and highest frequencies individually continuously during testing.
- 3) Transmitter Test Antenna: The EUT is tested with the antenna fitted in a manner typical of normal intended use as an integral / non-integral antenna equipment as describe with the test results.
- 4) Frequency(ies) Tested: 2402MHz, 2440MHz and 2480MHz were pre-tested, The worst case one, was chosen for conducted emission test.
- 5) Above 1GHz, the 2402MHz, 2440MHz and 2480MHz were tested individually.
- 6) Normal Test Modulation: Bluetooth 4.0
- 7) Modulating Signal Source: Internal

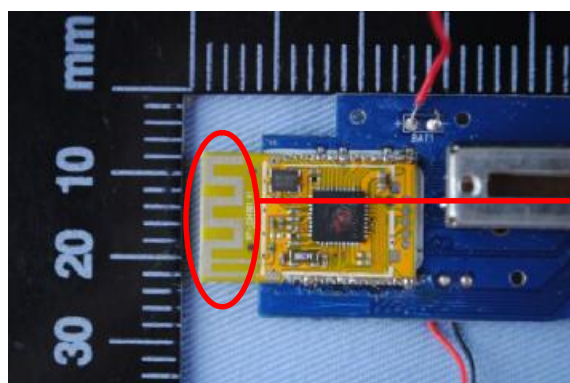
\* Associated Antenna Descriptions: The antenna used in this product is embedded antenna.

#### A. EUT

| Device                                         | Manufacturer      | Model # | FCC ID    |
|------------------------------------------------|-------------------|---------|-----------|
| Tire Pressure/Tread Depth Gauge with Bluetooth | Same as applicant | TG-510  | SWTTG-510 |

#### Field Antenna For 2.4GHz Band

| Ant. | Brand | Model Name            | Antenna Type | Connector | Gain (dBi) | Remark |
|------|-------|-----------------------|--------------|-----------|------------|--------|
| 0    | N/A   | PCB Bluetooth Antenna | Internal     | N/A       | 1.01       | TX/RX  |



ANT0  
TX0/RX0

#### Bluetooth Test Modes For 2.4GHz Band

| Worst Modulation Mode | Number of Transmit (Ntx) | Frequency (MHz) | Power Setting | Data Rate |
|-----------------------|--------------------------|-----------------|---------------|-----------|
| BT-1M                 | 1                        | 2402            | 63            | 1 Mbps    |
| BT-1M                 | 1                        | 2440            | 63            | 1 Mbps    |
| BT-1M                 | 1                        | 2480            | 63            | 1 Mbps    |

**B. Internal Devices**

| Device | Manufacturer | Model # | FCC ID |
|--------|--------------|---------|--------|
| N/A    |              |         |        |
|        |              |         |        |
|        |              |         |        |
|        |              |         |        |
|        |              |         |        |
|        |              |         |        |

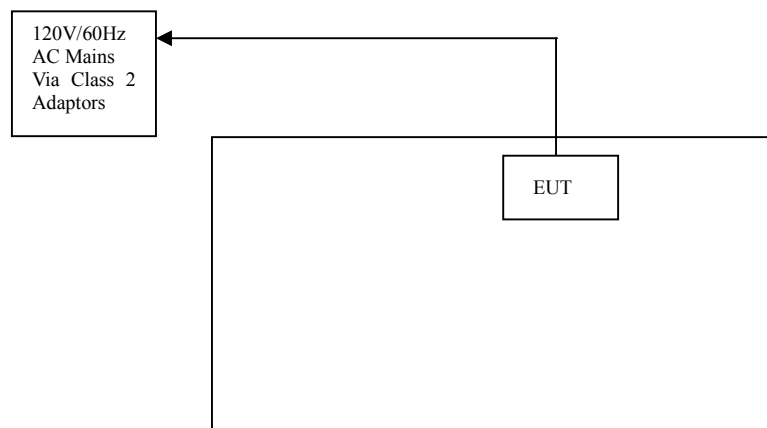
**C. Peripherals**

| Device   | Manufacturer | Model #<br>Serial # | FCC ID/<br>DoC | Cable                                                     |
|----------|--------------|---------------------|----------------|-----------------------------------------------------------|
| Printer  | HP           | HP930C              | DoC            | 1.5m unshielded power cord<br>1.2m unshielded data cable. |
| Modem    | GVC          | N/A                 | DoC            | 1.5m unshielded power cord<br>1.2m unshielded data cable. |
| Notebook | DELL         | PP10L               | DoC            | 1.5m unshielded power cord                                |
| PC       | Dell         | 2400n               | DoC            | 1.5m unshielded power cord                                |

## 4. 5 EUT Operating Condition

Operating condition is according to ANSI C63.10:2013.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



## 4. 6 Conducted Power Line Emission Limits

| FCC Part 15 Paragraph 15.207 (dBuV) |               |               |
|-------------------------------------|---------------|---------------|
| Frequency Range (MHz)               | Class A QP/AV | Class B QP/AV |
| 0.15 – 0.5                          | 79/66         | 66-56/56-46   |
| 0.5 – 5.0                           | 73/60         | 56/46         |
| 5.0 – 30                            | 73/60         | 60/50         |

**NOTE** : In the above table, the tighter limit applies at the band edges.

## 4. 7 Conducted Power Line Test Result

|              |                                                  |               |                      |
|--------------|--------------------------------------------------|---------------|----------------------|
| Product      | : Tire Pressure/Tread Depth Gauge with Bluetooth | Test Mode     | : Normal Link / Auto |
| Test Item    | : Conducted Emission Data                        | Temperature   | : 25 °C              |
| Test Voltage | : DC 6V (By battery)                             | Humidity      | : 56%RH              |
| Test Result  | : <b>N/A</b>                                     | Adapter Model | :                    |

The frequency spectrum from 0.15 MHz to 30 MHz was investigated. All readings are quasi -peak values with a resolution bandwidth of 9 KHz.

- Temperature : 26 °C
- Humidity : 53 % RH

| FCC Part 15 Paragraph 15.207 |                 |    |              |              |    |             |    |
|------------------------------|-----------------|----|--------------|--------------|----|-------------|----|
| Frequency (MHz)              | Emission (dBuV) |    | LINE/NEUTRAL | Limit (dBuV) |    | Margin (dB) |    |
|                              | QP              | AV |              | QP           | AV | QP          | AV |
| N/A                          |                 |    | Line         |              |    |             |    |
|                              |                 |    | Neutral      |              |    |             |    |
|                              |                 |    | Line         |              |    |             |    |
|                              |                 |    | Neutral      |              |    |             |    |
|                              |                 |    | Line         |              |    |             |    |
|                              |                 |    | Neutral      |              |    |             |    |

**Note:** NF = No Significant Peak was Found.

**Note:**

- 1.Uncertainty in conducted emission measured is <+/-2dB.
- 2.The emission levels of other frequencies were very low against the limit.
- 3.All Reading Levels are Quasi-Peak and Average value.
- 4.Emission = Meter Reading + Factor; Factor = Insertion Loss + Cable Loss.
- 5.Margin Value = Emission Level - Limit Value.

## 5. FCC Part 15.247 Requirements for DTS Systems

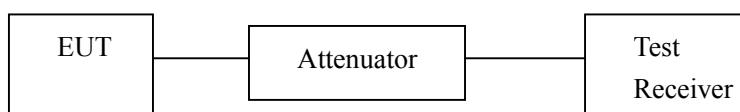
### 5.1 Test Equipment

Please refer to Section 10 this report.

### 5.2 Test Procedure

|                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6 dB &amp; 99% Bandwidth</b>                                                                                                                                                                                                                                                                 | Refer to FCC 15.247(a)(2), ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                         |
| Test Method:                                                                                                                                                                                                                                                                                    | FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r03. - 8.1 Option 1                                                                                                                                                                                                                                                                                                                                         |
| a) Set RBW = 100 kHz.<br>b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.<br>c) Detector = Peak.<br>d) Trace mode = max hold.<br>e) Sweep = auto couple.<br>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.<br>*For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30kHz and set the Video bandwidth (VBW) = 100kHz. |
| <b>Peak Power:</b>                                                                                                                                                                                                                                                                              | Refer to FCC 15.247(b)(3), ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                         |
| Test Method:                                                                                                                                                                                                                                                                                    | FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r03. - 9.1.2 PKPM1 Peak power meter method                                                                                                                                                                                                                                                                                                                  |
| The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.                                              |                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Peak Power Spectral Density:</b>                                                                                                                                                                                                                                                             | Refer to FCC 15.247(e), ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                            |
| Test Method:                                                                                                                                                                                                                                                                                    | FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r03. - 10.2 Method PKPSD                                                                                                                                                                                                                                                                                                                                    |
| a) Set analyzer center frequency to DTS channel center frequency.<br>b) Set the span to 1.5 times the DTS bandwidth.<br>c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .<br>d) Set the VBW $\geq 3 \times$ RBW.<br>e) Detector = peak.<br>f) Sweep time = auto couple. | g) Trace mode = max hold.<br>h) Allow trace to fully stabilize.<br>i) Use the peak marker function to determine the maximum amplitude level within the RBW.<br>j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.                                                                                                                                                                      |
| <b>Band Edges Measurement:</b>                                                                                                                                                                                                                                                                  | Refer to FCC 15.247(d), ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                            |
| Test Method:                                                                                                                                                                                                                                                                                    | FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r03.& 15.247                                                                                                                                                                                                                                                                                                                                                |
| a. The transmitter output was connected to the spectrum analyzer via a low lose cable.<br>b. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100kHz bandwidth from band edge.<br>c. The band edges was measured and recorded.                        |                                                                                                                                                                                                                                                                                                                                                                                                                     |

### 5.3 Test Setup



### 5.4 Configuration of the EUT

Same as section 4.4 of this report

### 5.5 EUT Operating Condition

Same as section 4.5 of this report.

## 5.6 Limit

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

According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.

According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be

reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to §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, provided the transmitter demonstrates compliance with the peak conducted power

limits. 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 Section 15.205(c)).

According to §15.247(e), 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.

According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

## 5.7 Test Result

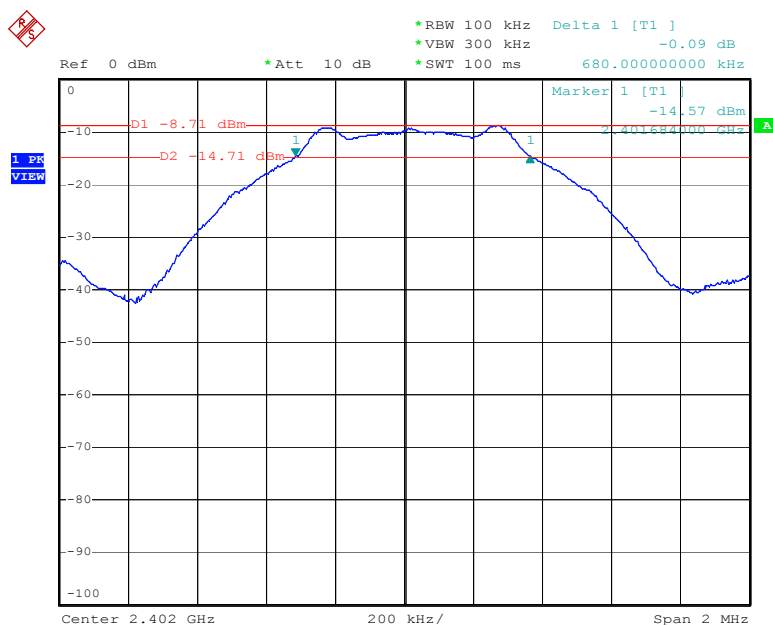
### A. 6 dB & 99% Occupied Bandwidth

Product : Tire Pressure/Tread Depth Gauge with Bluetooth      Test Mode : Bluetooth 4.0 LE  
 Test Item : 6 dB BW      Temperature : 25 °C  
 Test Voltage : DC 6V      Humidity : 56%RH  
 Test Result : **PASS**

#### Bluetooth 4.0 LE

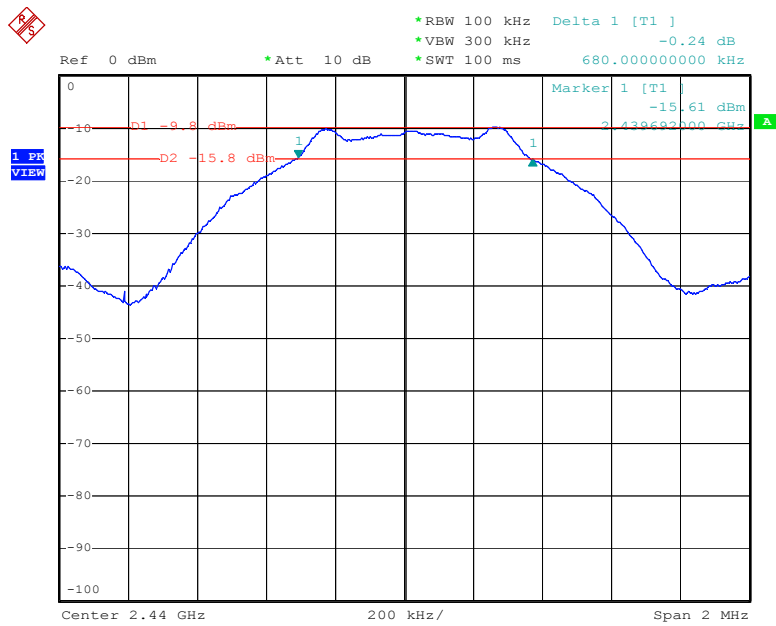
| Channel | Frequency (MHz) | Bandwidth (MHz) | FCC Limit (kHz) | Result      |
|---------|-----------------|-----------------|-----------------|-------------|
| Low     | 2402            | 0.680           | >500 kHz        | <b>PASS</b> |
| Mid     | 2440            | 0.680           |                 | <b>PASS</b> |
| High    | 2480            | 0.680           |                 | <b>PASS</b> |

#### CH Low



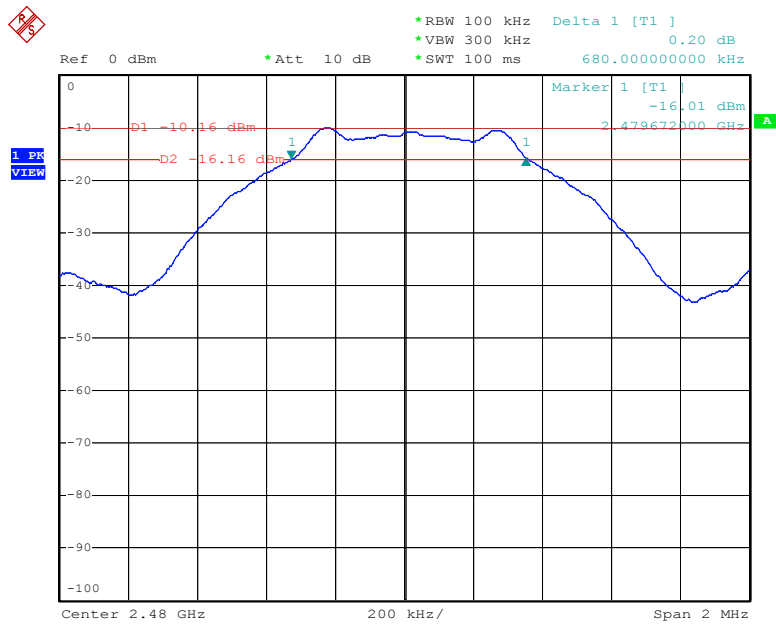
Date: 7.AUG.2015 10:46:49

CH Mid



Date: 7.AUG.2015 10:48:34

CH High

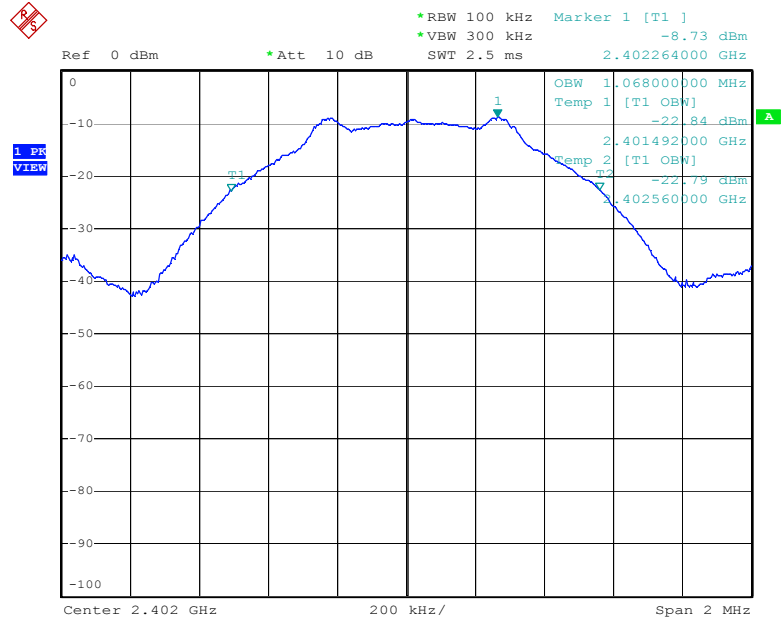


Date: 7.AUG.2015 10:55:53

99% Bandwidth

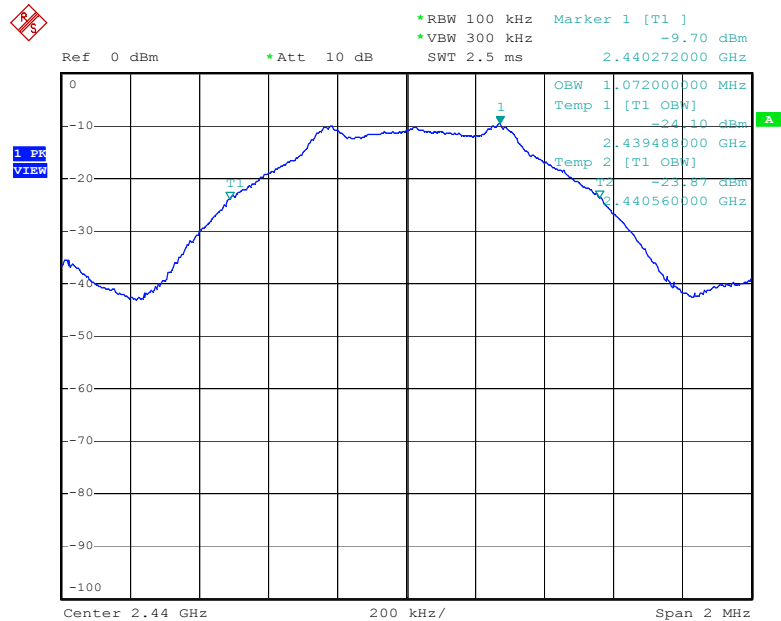
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) |
|---------|-----------------|------------------------------|
| Low     | 2402            | 1.068                        |
| Mid     | 2440            | 1.072                        |
| High    | 2480            | 1.072                        |

CH Low

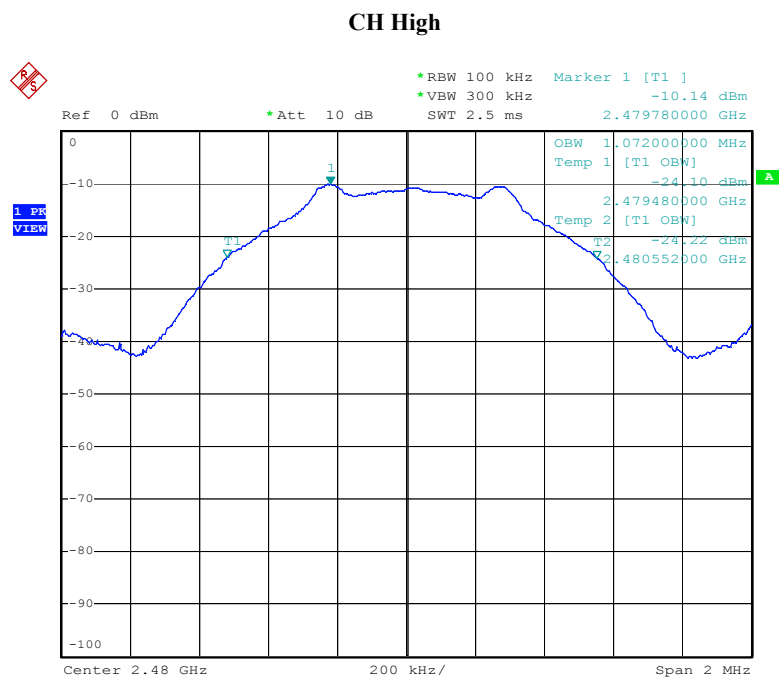


Date: 7.AUG.2015 11:34:12

CH Mid



Date: 7.AUG.2015 11:36:05



Date: 7.AUG.2015 11:38:23

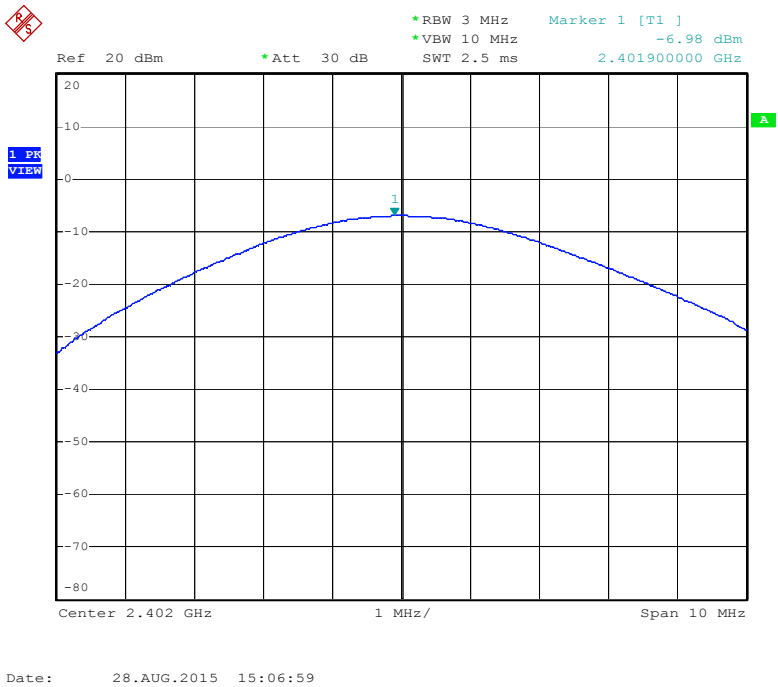
B. Peak Power

|              |                                                  |             |                    |
|--------------|--------------------------------------------------|-------------|--------------------|
| Product      | : Tire Pressure/Tread Depth Gauge with Bluetooth | Test Mode   | : Bluetooth 4.0 LE |
| Test Item    | : Peak Power                                     | Temperature | : 25 °C            |
| Test Voltage | : DC 6V                                          | Humidity    | : 56%RH            |
| Test Result  | : PASS                                           |             |                    |

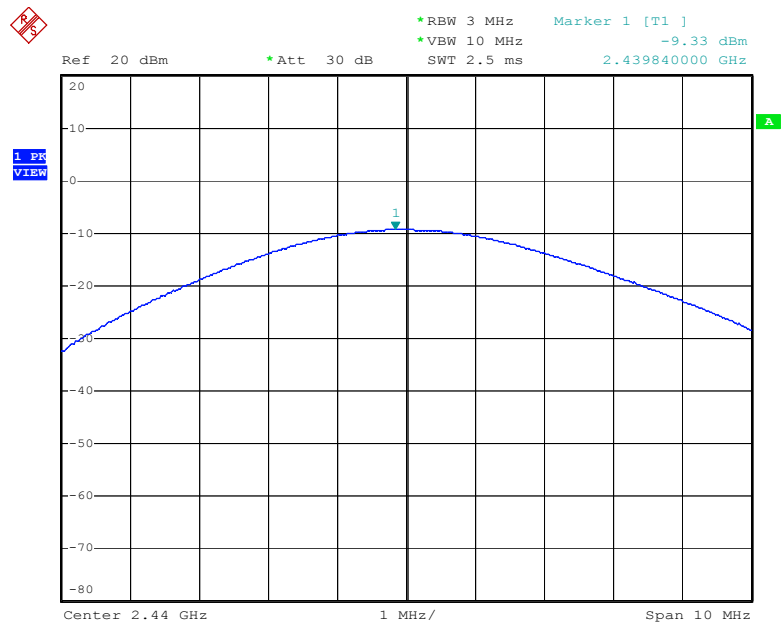
Bluetooth 4.0 LE

| Channel | Frequency (MHz) | Output Power (dBm) | FCC Limit (W/dBm) | Result |
|---------|-----------------|--------------------|-------------------|--------|
| Low     | 2402            | -6.98              | 1.00/30.00        | PASS   |
| Mid     | 2440            | -9.33              |                   | PASS   |
| High    | 2480            | -9.82              |                   | PASS   |

CH Low

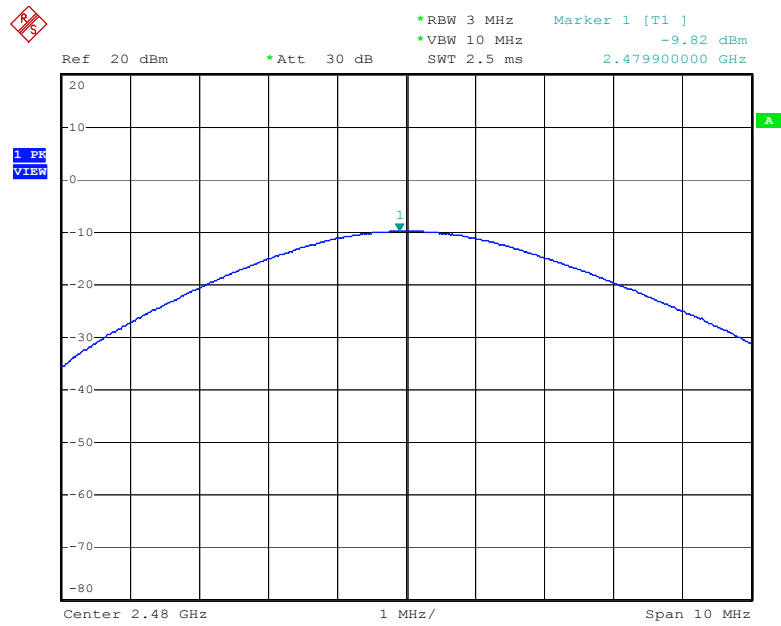


CH Mid



Date: 28.AUG.2015 15:12:07

CH High

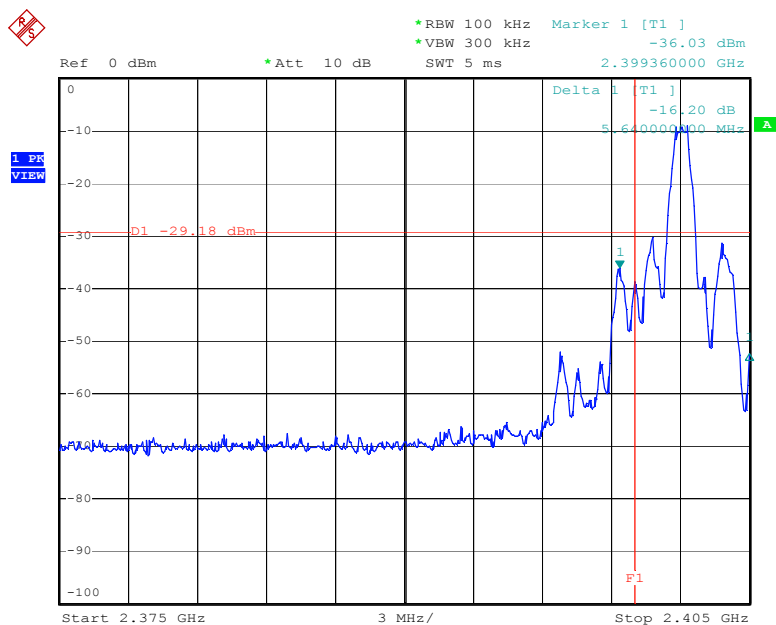


Date: 28.AUG.2015 15:10:23

### C. Band Edges Measurement

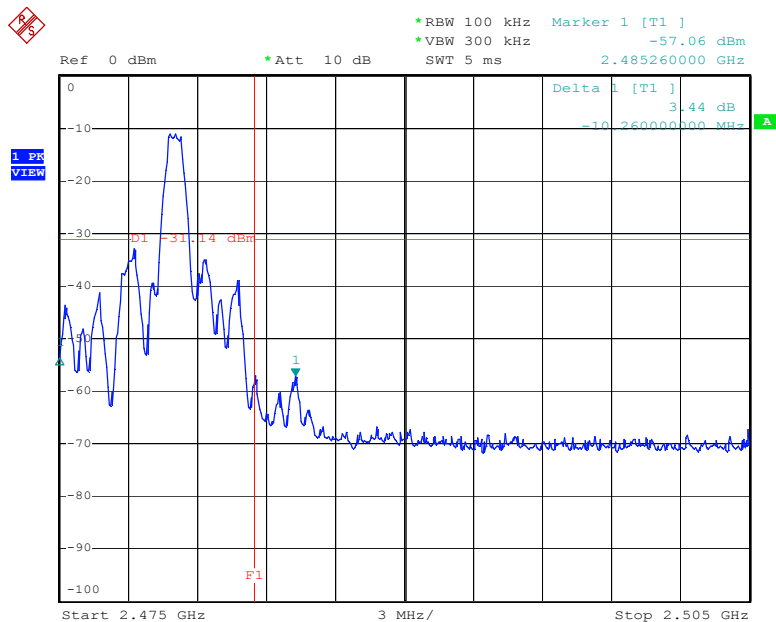
|              |                                                  |             |                    |
|--------------|--------------------------------------------------|-------------|--------------------|
| Product      | : Tire Pressure/Tread Depth Gauge with Bluetooth | Test Mode   | : Bluetooth 4.0 LE |
| Test Item    | : Band Edges Measurement                         | Temperature | : 25 ℃             |
| Test Voltage | : DC 6V                                          | Humidity    | : 56%RH            |
| Test Result  | : <b>PASS</b>                                    |             |                    |

### Bluetooth 4.0 LE Channel: Low



Date: 7.AUG.2015 10:58:46

### Bluetooth 4.0 LE Channel: High



Date: 7.AUG.2015 11:00:12

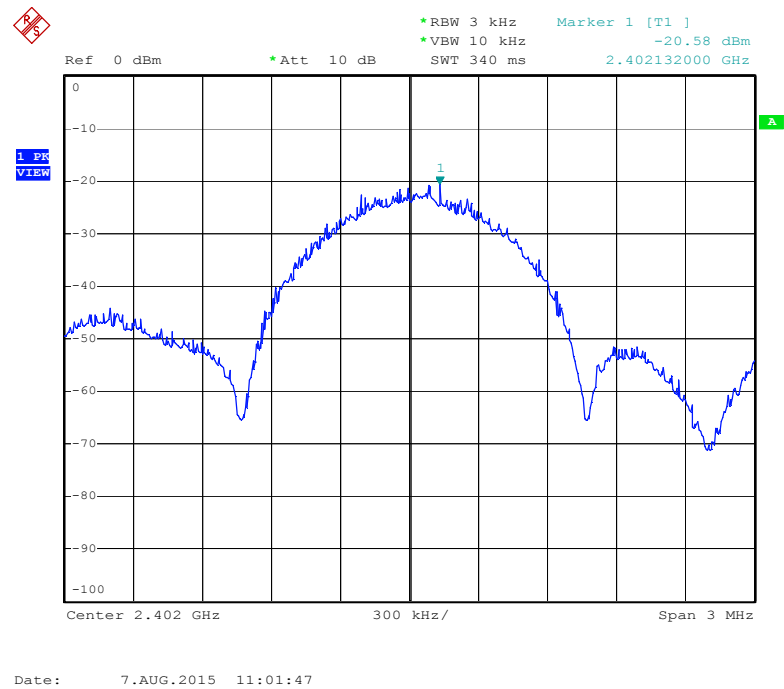
D. Peak Power Spectral Density

|              |                                                  |             |                    |
|--------------|--------------------------------------------------|-------------|--------------------|
| Product      | : Tire Pressure/Tread Depth Gauge with Bluetooth | Test Mode   | : Bluetooth 4.0 LE |
| Test Item    | : Peak Power Spectral Density                    | Temperature | : 25 °C            |
| Test Voltage | : DC 6V                                          | Humidity    | : 56%RH            |
| Test Result  | : <b>PASS</b>                                    |             |                    |

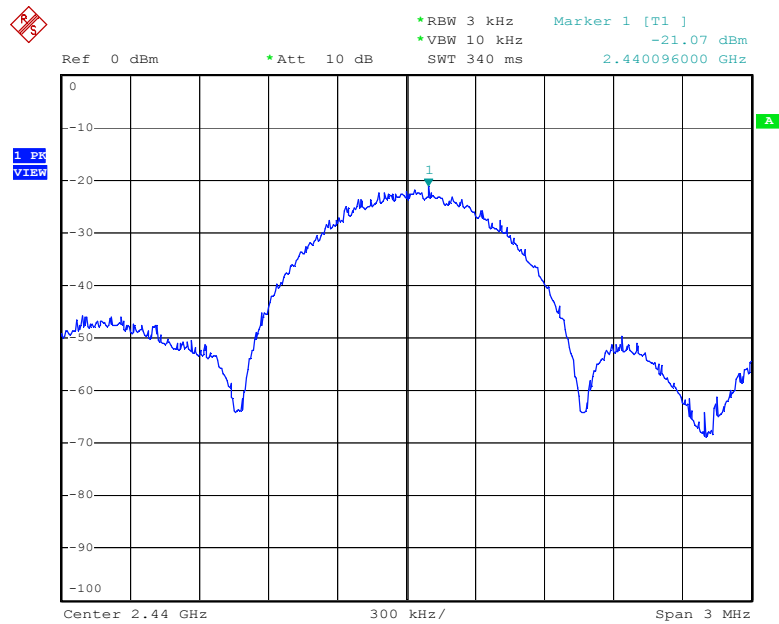
Bluetooth 4.0 LE

| Channel | Frequency (MHz) | 3kHz PPSD (dBm) | FCC Limit (dBm) | Result      |
|---------|-----------------|-----------------|-----------------|-------------|
| Low     | 2402            | -20.58          | 8.00            | <b>PASS</b> |
| Mid     | 2440            | -21.07          |                 | <b>PASS</b> |
| High    | 2480            | -22.14          |                 | <b>PASS</b> |

Channel: Low

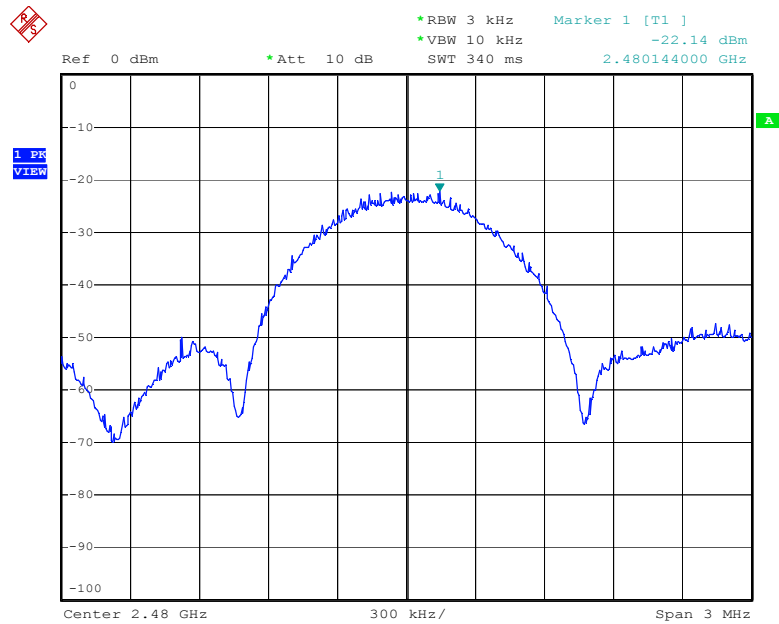


Channel: Mid



Date: 7.AUG.2015 11:05:29

Channel: High



Date: 7.AUG.2015 11:07:35

## 6. Transmitter Spurious Radiated Emission at 3 Meters

### 6.1 Test Equipment

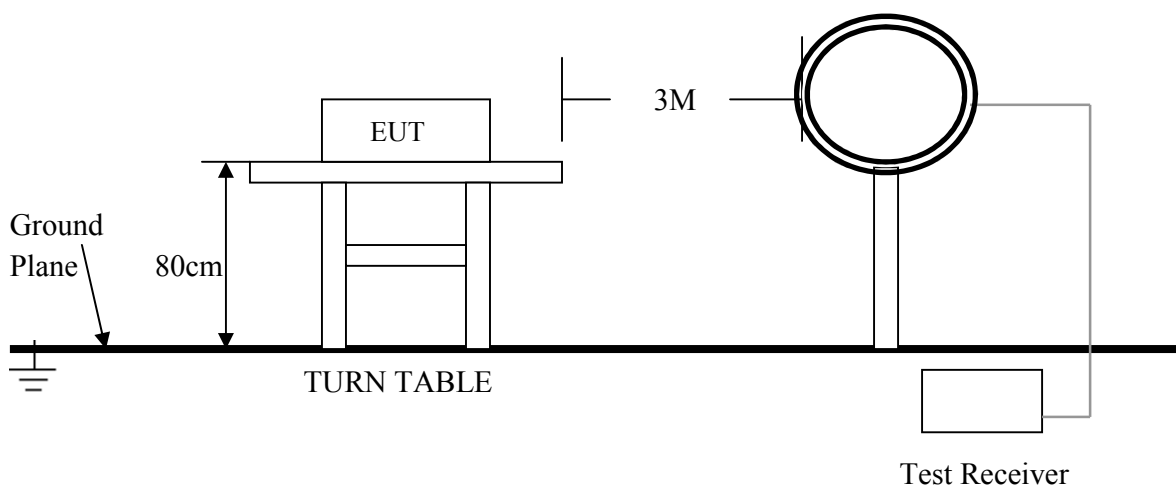
Please refer to Section 10 this report.

### 6.2 Test Procedure

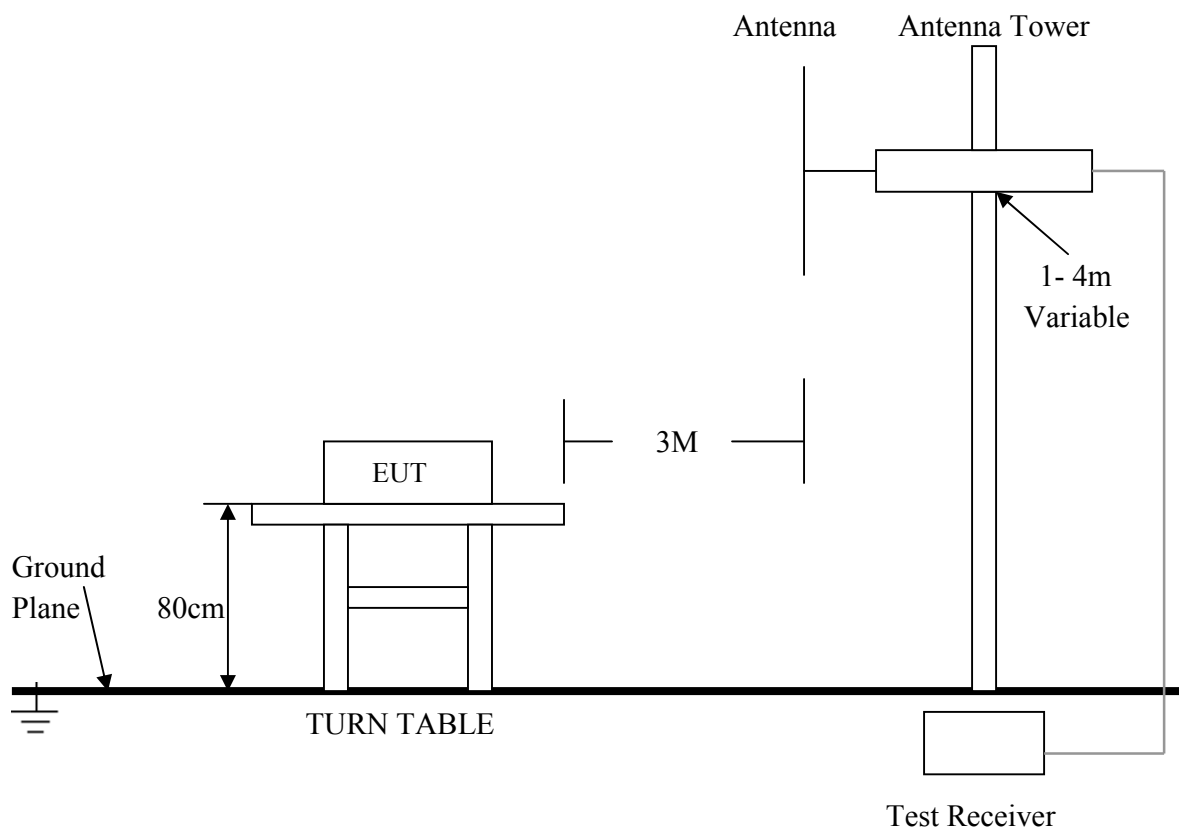
1. The EUT was tested according to ANSI C63.10:2013.
2. The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m, and which is 1.5 m high for above 1 GHz. All set up is according to ANSI C63.10:2013 .
3. The frequency spectrum from 9 kHz to 25 GHz was investigated. All readings from 9 kHz to 150 kHz are quasi-peak values with a resolution bandwidth of 200 Hz. All readings from 150 kHz to 30 MHz are quasi-peak values with a resolution bandwidth of 9 KHz. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 KHz. All readings are above 1 GHz , peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
4. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. The Receiving antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency. Emissions below 30MHz were measured with a loop antenna while emission above 30MHz were measured using a broadband E-field antenna.
5. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.10:2013

### 6.3 Test Setup

For Frequencies below 30 MHz



For the actual test configuration , please refer to the related items – Photos of Testing

**For Frequencies above 30 MHz**

For the actual test configuration , please refer to the related items – **Photos of Testing**

**6. 4 Configuration of the EUT**

Same as section 4.4 of this report

**6. 5 EUT Operating Condition**

Same as section 4.5 of this report.

## 6.6 Limit

In any 100 KHz bandwidth outside the operating frequency band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 KHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in section 15.209(a), which lesser attenuation.

All other emissions inside restricted bands specified in section 15.205(a) shall not exceed the general radiated emission limits specified in section 15.209(a)

### Note:

Applies to harmonics/spurious emissions that fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

47 CFR § 15.237(c): The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.

FCC CFR 47, Part 15, Subpart C, Para. 15.205(a) – Restricted Frequency Bands

| MHz                            | MHz                 | MHz           | GHz              |
|--------------------------------|---------------------|---------------|------------------|
| 0.090–0.110 .....              | 16.42–16.423        | 399.9–410     | 4.5–5.15         |
| <sup>1</sup> 0.495–0.505 ..... | 16.69475–16.69525   | 608–614       | 5.35–5.46        |
| 2.1735–2.1905 .....            | 16.80425–16.80475   | 960–1240      | 7.25–7.75        |
| 4.125–4.128 .....              | 25.5–25.67          | 1300–1427     | 8.025–8.5        |
| 4.17725–4.17775 .....          | 37.5–38.25          | 1435–1626.5   | 9.0–9.2          |
| 4.20725–4.20775 .....          | 73–74.6             | 1645.5–1646.5 | 9.3–9.5          |
| 6.215–6.218 .....              | 74.8–75.2           | 1660–1710     | 10.6–12.7        |
| 6.26775–6.26825 .....          | 108–121.94          | 1718.8–1722.2 | 13.25–13.4       |
| 6.31175–6.31225 .....          | 123–138             | 2200–2300     | 14.47–14.5       |
| 8.291–8.294 .....              | 149.9–150.05        | 2310–2390     | 15.35–16.2       |
| 8.362–8.366 .....              | 156.52475–156.52525 | 2483.5–2500   | 17.7–21.4        |
| 8.37625–8.38675 .....          | 156.7–156.9         | 2655–2900     | 22.01–23.12      |
| 8.41425–8.41475 .....          | 162.0125–167.17     | 3260–3267     | 23.6–24.0        |
| 12.29–12.293 .....             | 167.72–173.2        | 3332–3339     | 31.2–31.8        |
| 12.51975–12.52025 .....        | 240–285             | 3345.8–3358   | 36.43–36.5       |
| 12.57675–12.57725 .....        | 322–335.4           | 3600–4400     | ( <sup>2</sup> ) |
| 13.36–13.41 .....              |                     |               |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

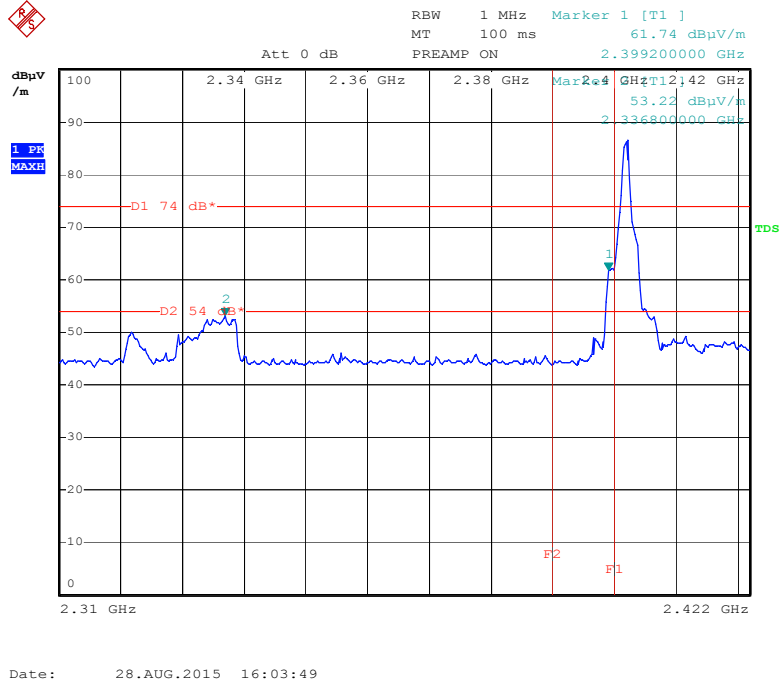
<sup>2</sup> Above 38.6

FCC 47 CFR, Part 15.209(a) – Field Strength Limits within Restricted Frequency Bands

| Frequency (MHz)   | Field strength (microvolts/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                             |

6.7 Test Result

Transmitter Radiated Bandedge Emissions  
Bluetooth 4.0 LE CH Low



| Transmitter Radiated Bandedge Emissions Result |               |                               |                               |                                |                |            |            |             |
|------------------------------------------------|---------------|-------------------------------|-------------------------------|--------------------------------|----------------|------------|------------|-------------|
| Modulation                                     | LE-1Mbps      |                               | Non-restricted Band Emissions |                                |                |            |            |             |
| Non-restricted Band (MHz)                      | Channel (MHz) | In-band PSD [a] (dBuV/100kHz) | Freq. (MHz)                   | Out-band PSD [b] (dBuV/100kHz) | [a] – [b] (dB) | Limit (dB) | Level Type | Pol. note 1 |
| 2390-2400                                      | 2402          | 86.37                         | 2400.00                       | 61.83                          | 24.54          | 20         | PK         | H           |

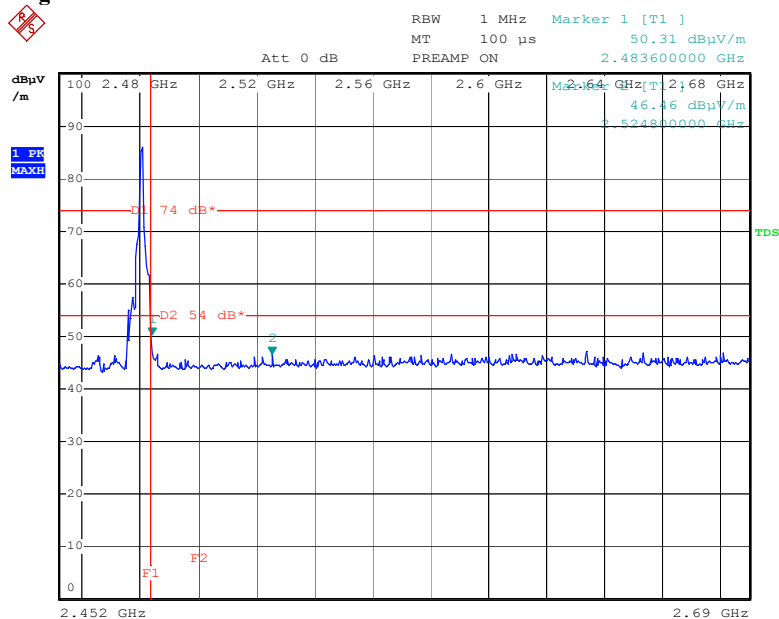
Note 1: Measurement at the “worst case” settings emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

| Modulation            | LE-1Mbps      |                           | Restricted Band Emissions |                      |                         |            |            |             |
|-----------------------|---------------|---------------------------|---------------------------|----------------------|-------------------------|------------|------------|-------------|
| Restricted Band (MHz) | Channel (MHz) | In-band PSD (dBuV/100kHz) | Freq. (MHz)               | Measure Distance (m) | Out-Band Level (dBuV/m) | Limit (dB) | Level Type | Pol. note 1 |
| 2310-2390             | 2402          | 86.33                     | 2336.800                  | 3                    | 53.22                   | 74         | PK         | H           |
| 2310-2390             | 2402          | /                         | 2336.800                  | 3                    | /                       | 54         | AV         | H           |

Note 1: Measurement at the “worst case” settings emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Note 2: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is “Pulse On Time” , e.g., LE VBW≥1/625us, VBW=3kHz.

## Bluetooth 4.0 LE CH High



Date: 28.AUG.2015 16:20:46

| Transmitter Radiated Bandedge Emissions Result |               |                               |                               |                                |                |            |            |             |
|------------------------------------------------|---------------|-------------------------------|-------------------------------|--------------------------------|----------------|------------|------------|-------------|
| Modulation                                     | LE-1Mbps      |                               | Non-restricted Band Emissions |                                |                |            |            |             |
| Non-restricted Band (MHz)                      | Channel (MHz) | In-band PSD [a] (dBuV/100kHz) | Freq. (MHz)                   | Out-band PSD [b] (dBuV/100kHz) | [a] – [b] (dB) | Limit (dB) | Level Type | Pol. note 1 |
| 2500-2690                                      | 2480          | 87.08                         | 2524.800                      | 46.46                          | 40.62          | 20         | PK         | H           |

Note 1: Measurement at the “worst case” settings emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

| Modulation            | LE-1Mbps      |                           | Restricted Band Emissions |                      |                         |            |            |             |
|-----------------------|---------------|---------------------------|---------------------------|----------------------|-------------------------|------------|------------|-------------|
| Restricted Band (MHz) | Channel (MHz) | In-band PSD (dBuV/100kHz) | Freq. (MHz)               | Measure Distance (m) | Out-Band Level (dBuV/m) | Limit (dB) | Level Type | Pol. note 1 |
| 2483.5-2500           | 2480          | 87.11                     | 2483.600                  | 3                    | 50.31                   | 74         | PK         | H           |
| 2483.5-2500           | 2480          | /                         | 2483.600                  | 3                    | /                       | 54         | AV         | H           |

Note 1: Measurement at the “worst case” settings emissions of receive antenna polarization: H (Horizontal) or V (Vertical)

Note 2: Average emission setting: RBW=1MHz; VBW  $\geq 1/T$ , where T is “Pulse On Time”, e.g., LE VBW  $\geq 1/625\mu s$ , VBW=3kHz.

**Harmonics Radiated Emission Data****CH Low**

| Freq. (MHz) | Emission (dBuV/m)<br>Peak Detector | HORIZ /<br>VERT | Limits (dBuV/m)<br>Peak / Average | Margin (dB) |
|-------------|------------------------------------|-----------------|-----------------------------------|-------------|
| 4804.00     | 52.78                              | HORZ            | 74.0 / 54.0                       | -21.22      |
| 4804.00     | 51.56                              | VERT            | 74.0 / 54.0                       | -22.44      |
| 7206.00     | 49.76                              | HORZ            | 74.0 / 54.0                       | -24.24      |
| 7206.00     | 49.43                              | VERT            | 74.0 / 54.0                       | -24.57      |
| 24020.00    | -                                  | HORZ            | 74.0 / 54.0                       | -           |
| 24020.00    | -                                  | VERT            | 74.0 / 54.0                       | -           |

**CH Mid**

| Freq. (MHz) | Emission (dBuV/m)<br>Peak Detector | HORIZ /<br>VERT | Limits (dBuV/m)<br>Peak / Average | Margin (dB) |
|-------------|------------------------------------|-----------------|-----------------------------------|-------------|
| 4884.00     | 51.95                              | HORZ            | 74.0 / 54.0                       | -22.05      |
| 4884.00     | 50.76                              | VERT            | 74.0 / 54.0                       | -23.24      |
| 7326.00     | 49.88                              | HORZ            | 74.0 / 54.0                       | -24.12      |
| 7326.00     | 49.62                              | VERT            | 74.0 / 54.0                       | -24.38      |
| 24410.00    | -                                  | HORZ            | 74.0 / 54.0                       | -           |
| 24410.00    | -                                  | VERT            | 74.0 / 54.0                       | -           |

**CH High**

| Freq. (MHz) | Emission (dBuV/m)<br>Peak Detector | HORIZ /<br>VERT | Limits (dBuV/m)<br>Peak / Average | Margin (dB) |
|-------------|------------------------------------|-----------------|-----------------------------------|-------------|
| 4960.00     | 50.25                              | HORZ            | 74.0 / 54.0                       | -23.75      |
| 4960.00     | 49.16                              | VERT            | 74.0 / 54.0                       | -24.84      |
| 7440.00     | 49.43                              | HORZ            | 74.0 / 54.0                       | -24.57      |
| 7440.00     | 48.98                              | VERT            | 74.0 / 54.0                       | -25.02      |
| 24800.00    | -                                  | HORZ            | 74.0 / 54.0                       | -           |
| 24800.00    | -                                  | VERT            | 74.0 / 54.0                       | -           |

- Note:**
- (1) All Reading Levels below 1GHz are Quasi-Peak, above are peak and average value.
  - (2) Emission Level = Reading Level + Probe Factor + Cable Loss.
  - (3) Receiver setting (Peak Detector) : RBW=1MHz; VBW=1MHz; Span=100MHz
  - (4) Receiver setting (AVG Detector): RBW=1MHz; VBW=30Hz; Span=20MHz
  - (5) The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
  - (6) Where an emission level is indicated by a -, levels had a margin greater than 20 dB when compared to the limit.

**General Radiated Emission Data**

|              |                                                  |             |                    |
|--------------|--------------------------------------------------|-------------|--------------------|
| Product      | : Tire Pressure/Tread Depth Gauge with Bluetooth | Test Mode   | : Bluetooth 4.0 LE |
| Test Item    | : Fundamental Radiated Emission Data             | Temperature | : 25 °C            |
| Test Voltage | : DC 6V                                          | Humidity    | : 56%RH            |
| Test Result  | : <b>PASS</b>                                    | Model       | :                  |

**For Frequency below 30MHz**

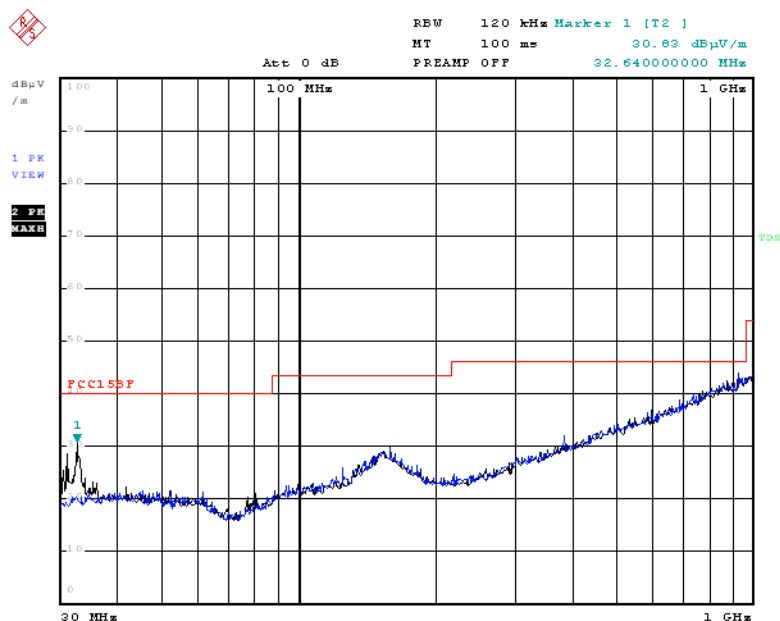
| Freq. (MHz) | Emission (dBuV/m)<br>QP Detector | HORIZ /<br>VERT | Limits (dBuV/m) | Margin (dB) |
|-------------|----------------------------------|-----------------|-----------------|-------------|
| N/A         |                                  |                 |                 |             |
| N/A         |                                  |                 |                 |             |
| N/A         |                                  |                 |                 |             |
| N/A         |                                  |                 |                 |             |
| N/A         |                                  |                 |                 |             |
| N/A         |                                  |                 |                 |             |

- Note:**
- (1) All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
  - (2) "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
  - (3) Emission Level = Reading Level + Probe Factor + Cable Loss.

**For Frequency from 30MHz to 1GHz**

| Freq. (MHz) | Emission (dBuV/m)<br>QP Detector | HORIZ /<br>VERT | Limits (dBuV/m) | Margin (dB) |
|-------------|----------------------------------|-----------------|-----------------|-------------|
| 159.040     | 24.11                            | HORZ            | 43.5            | -19.39      |
| 32.640      | 24.26                            | VERT            | 40.0            | -15.74      |
| 586.120     | 30.39                            | HORZ            | 46.0            | -15.61      |
| 550.480     | 29.56                            | VERT            | 46.0            | -16.44      |
| 738.680     | 33.65                            | HORZ            | 46.0            | -12.35      |
| 874.800     | 36.12                            | VERT            | 46.0            | -9.88       |

- Note:**
- (1) All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
  - (2) Emission Level = Reading Level + Probe Factor + Cable Loss.

**Radiated Emission****FCC 15.209**

Date: 10.AUG.2015 14:01:51

## 7. RF Exposure Requirements

### 7.1 Test Equipment

Please refer to Section 10 this report.

### 7.2 Limit

According to FCC 15.247(e)(i) and FCC 1.1307(b)(1), Systems operating under provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commissions guidelines.

According to KDB 447498 D01 General RF Exposure v05, section 4.3.1

SAR Test Exclusion Thresholds for 100 MHz-6GHz and  $\leq 5\text{mm}$

| Frequency Range    |                     | Maximum measured transmitter power frequency(MHz) | SAR Limitation (mW) |
|--------------------|---------------------|---------------------------------------------------|---------------------|
| Low Frequency(MHz) | High Frequency(MHz) |                                                   |                     |
| 2402               | 2480                | 2480                                              | 10                  |

### 7.3 Test Result

|              |                                                  |             |                    |
|--------------|--------------------------------------------------|-------------|--------------------|
| Product      | : Tire Pressure/Tread Depth Gauge with Bluetooth | Test Mode   | : Bluetooth 4.0 LE |
| Test Item    | : RF Exposure                                    | Temperature | : 25 °C            |
| Test Voltage | : DC 6V                                          | Humidity    | : 56%RH            |
| Test Result  | : <b>PASS</b>                                    |             |                    |

| RF Exposure Requirements                                                                                                                  | Compliance with FCC Rules                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>EIRP=P<sub>x</sub>G</p> <p>Where:<br/> P=Power input to antenna<br/> G=Power gain of the antenna relative to an isotropic radiator</p> | <p>Maximum output power at antenna input terminal:<br/> -6.98 dBm = 0.20 mW (Bluetooth 4.0 LE, 2402MHz)<br/> Prediction distance: <math>\leq 5\text{mm}</math><br/> Antenna gain : 1.01dBi<br/> SAR Test Exclusion Threshold is 10mW</p> <p>Bluetooth 4.0 LE : 0.25 mW<br/> The max. output power E.I.R.P &lt; 10mW<br/> Conclusion: No SAR is required.</p> |

## 8. Photos of Testing

### 8.1 EUT Test Photographs

Radiated Emission test view(Frequency from 30MHz to 1GHz)



Radiated Emission test view(Frequency above 1GHz)



## 8. 2 EUT Detailed Photographs

EUT top view



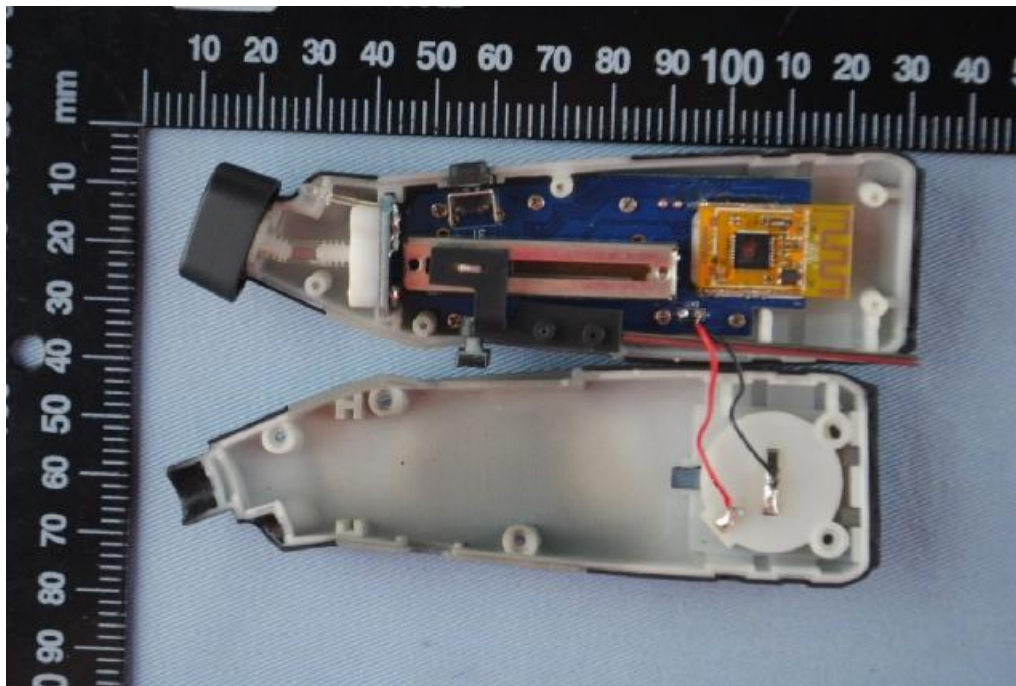


EUT bottom view

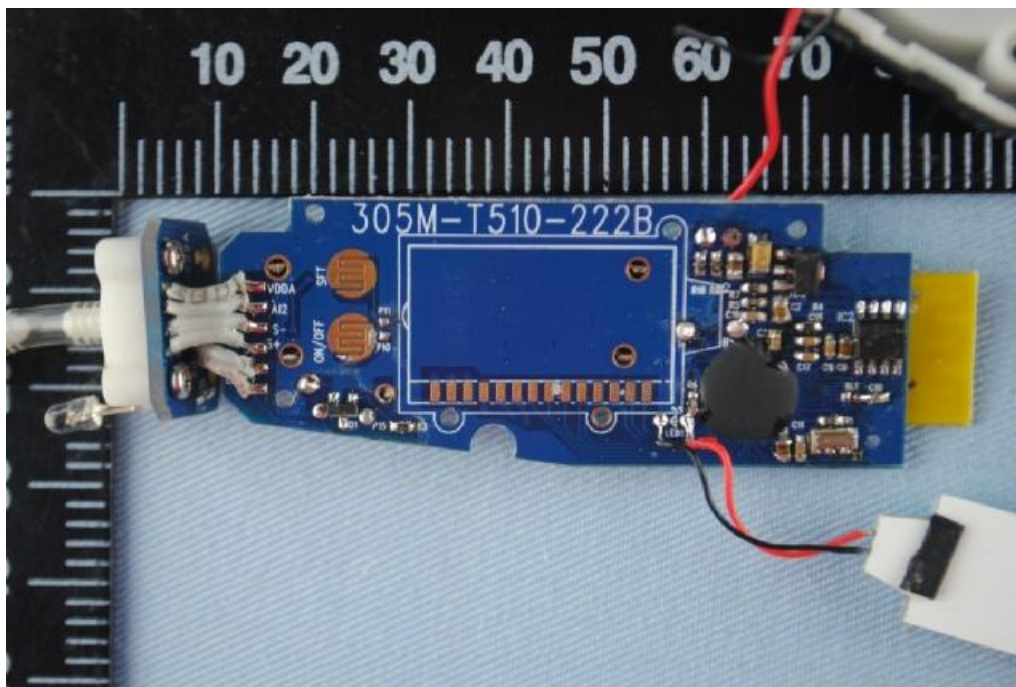




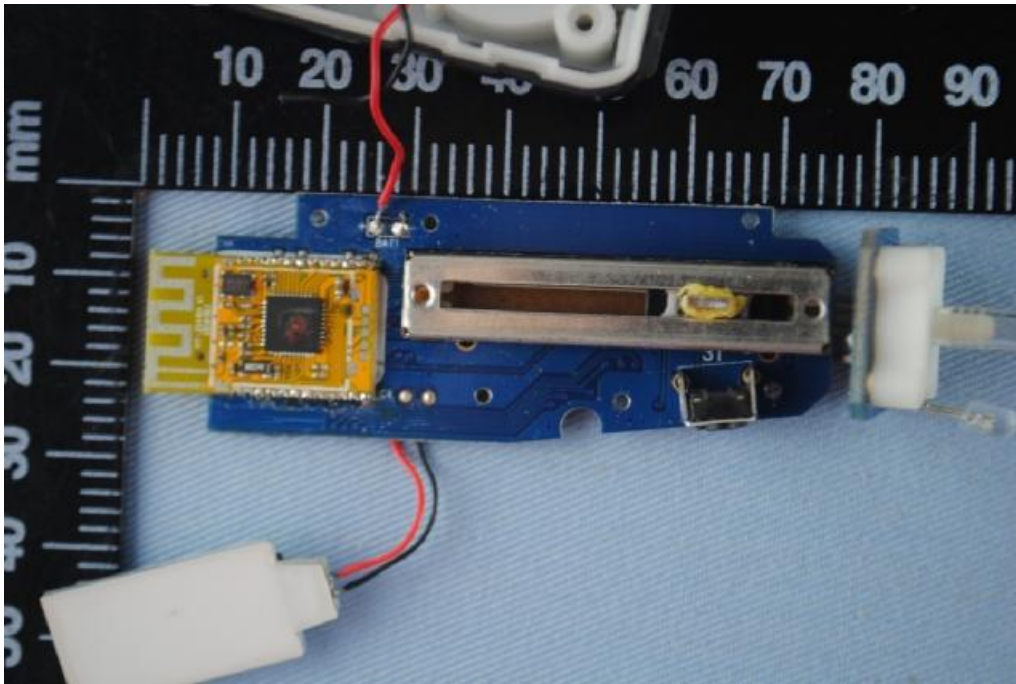
EUT inside whole view



Main board component side



Main board solder side



## 9. FCC ID Label

**FCC ID: SWTTG-510**

The following note shall be conspicuously placed in the users manual: “**Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.**”

The Label must not be a stick-on paper label. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

### Proposed Label Location on EUT



## 10. Test Equipment

The following test equipments were used during the radiated & conducted emission test:

| Equipment/<br>Facilities                | Manufacturer       | Model #        | Serial No. | Due Date       |
|-----------------------------------------|--------------------|----------------|------------|----------------|
| Turntable                               | Innco systems GmbH | CT-0801        | KMO-SZ114  | NCR            |
| Antenna Tower                           | Innco systems GmbH | MM4000-PP      | KMO-SZ115  | NCR            |
| Controller                              | Innco systems GmbH | CO2000         | KMO-SZ116  | NCR            |
| Pre-Amplifier                           | Agilent            | 87405C         | KMO-SZ155  | Dec.6, 2015    |
| Pre-Amplifier                           | Com-Power          | PAM-840        | KMO-SZ156  | Dec.6, 2015    |
| Horn Antenna                            | Com-Power          | AH-840         | KMO-SZ157  | Dec.6, 2015    |
| EMI Test Receiver                       | Rohde & Schwarz    | ESPI7          | KMO-SZ002  | June 27, 2016  |
| Spectrum Analyzer                       | Rohde & Schwarz    | FSP40          | KMO-SZ003  | June 27, 2016  |
| Signal Generator                        | FLUKE              | PM5418+Y/C     | KMO-SZ020  | May 27, 2016   |
| Loop Antenna                            | Rohde & Schwarz    | HFH2-Z2        | KMO-SZ004  | Jan. 30, 2016  |
| Trilog-Super Broadband Antenna          | SCHWARZBECK        | VULB9161       | KMO-SZ005  | Sep.18, 2015   |
| Trilog-Super Broadband Antenna          | SCHWARZBECK        | VULB9161       | KMO-SZ006  | Sep.18, 2015   |
| Broad-Band Horn Antenna                 | SCHWARZBECK        | BBHA 9120D     | KMO-SZ007  | Sep.18, 2015   |
| Broad-Band Horn Antenna                 | SCHWARZBECK        | BBHA 9120D     | KMO-SZ008  | Sep.18, 2015   |
| AMN                                     | Rohde & Schwarz    | ESH3-Z5        | KMO-SZ009  | June 27, 2016  |
| Pulse Limiter                           | SCHWARZBECK        | VTSD 9561-F    | KMO-SZ077  | Nov.29, 2015   |
| ISN                                     | SCHWARZBECK        | NTFM 8158 CAT3 | KMO-SZ070  | Nov.19, 2015   |
| ISN                                     | SCHWARZBECK        | NTFM 8158 CAT5 | KMO-SZ071  | Nov.19, 2015   |
| ISN                                     | SCHWARZBECK        | NTFM 8158 CAT6 | KMO-SZ072  | Nov.19, 2015   |
| KMO Shielded Room                       | KMO                | KMO-001        | KMO-SZ036  | NCR            |
| Coaxial Cable with N-Connectors         | SCHWARZBECK        | AK9515H        | KMO-SZ037  | Sep.18, 2015   |
| AC Power Source / Analyzer              | Agilent            | 6813B          | KMO-SZ166  | July 22, 2016  |
| Digital Radio Communication Tester      | Rohde & Schwarz    | CMD60          | KMO-SZ169  | April 10, 2016 |
| Universal Radio Communication Tester    | Rohde & Schwarz    | CMU200         | KMO-SZ170  | April 10, 2016 |
| Regulatory Test System 30 MHz to 40 GHz | Rohde & Schwarz    | TS8997         | KMO-HK015  | Nov.6, 2015    |
| Program Control Telephone Exchanger     | Excelltel          | CDX8000-M      | KMO-SZ221  | NCR            |
| 3m Anechoic Chamber                     | KMO                | KMO-3AC        | KMO-3AC-1  | Nov.12, 2016   |
| Temperature Chamber                     | TABAI              | PSL-4GTW       | N/A        | Feb.10, 2016   |