

# FCC REPORT

**Applicant:** Red Bear Company Limited

**Address of Applicant:** 1711 Block B, Wah Luen Industrial Centre, 15-21 Wong Chuk Yeung Street, Fo Tan, Hong Kong

**Equipment Under Test (EUT)**

Product Name: Bluetooth BLE Beacon

Model No.: B1

**FCC ID:** 2ABXJ-B-B1

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.247:2013

**Date of sample receipt:** February 26, 2014

**Date of Test:** February 26-March 04, 2014

**Date of report issued:** March 05, 2014

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

A circular blue stamp for GTS Global Testing is visible. The text around the stamp reads "GLOBAL UNITED TECHNOLOGY SERVICES CO." and "GLOBAL TESTING". The stamp also includes the year "1994". A handwritten signature in black ink is written over the stamp.

**Robinson Lo**

**Laboratory Manager**

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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## 2 Version

| Version No. | Date           | Description |
|-------------|----------------|-------------|
| 00          | March 05, 2014 | Original    |
|             |                |             |
|             |                |             |
|             |                |             |
|             |                |             |

Prepared By:

*Sam. Gao*

Date:

March 05, 2014

**Project Engineer**

Check By:

*Hans. Hu*

Date:

March 05, 2014

**Reviewer**

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## 4 Test Summary

| Test Item                        | Section in CFR 47 | Result |
|----------------------------------|-------------------|--------|
| Antenna requirement              | 15.203/15.247 (c) | Pass   |
| AC Power Line Conducted Emission | 15.207            | N/A    |
| Conducted Peak Output Power      | 15.247 (b)(3)     | Pass   |
| Channel Bandwidth                | 15.247 (a)(2)     | Pass   |
| Power Spectral Density           | 15.247 (e)        | Pass   |
| Band Edge                        | 15.247(d)         | Pass   |
| Spurious Emission                | 15.205/15.209     | Pass   |

*Pass: The EUT complies with the essential requirements in the standard.*

*N/A: Not applicable.*

## 5 General Information

### 5.1 Client Information

|                          |   |
|--------------------------|---|
| Applicant:               | Red Bear Company Limited  |
| Address of Applicant:    | 1711 Block B, Wah Luen Industrial Centre, 15-21 Wong Chuk Yeung Street, Fo Tan, Hong Kong |
| Manufacturer:            | Alutech International Limited   |
| Address of Manufacturer: | Room 719 International Trade Centre 11-19 Sha Tsui Road Tsuen Wan NT, Hong Kong           |

### 5.2 General Description of EUT

|                      |                               |
|----------------------|-------------------------------|
| Product Name:        | Bluetooth BLE Beacon          |
| Model No.:           | B1                            |
| Operation Frequency: | 2402MHz~2480MHz               |
| Channel Numbers:     | 40                            |
| Channel Separation:  | 2MHz                          |
| Modulation Type:     | GFSK                          |
| Antenna Type:        | Multilayer Chip Antenna       |
| Antenna Gain:        | 1.0dBi (declare by Applicant) |
| Power Supply:        | DC 3.0V(SIZE:AAA 1.5V*2)      |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1                                   | 2402MHz   | 11      | 2422MHz   | 21      | 2442MHz   | 31      | 2462MHz   |
| 2                                   | 2404MHz   | 12      | 2424MHz   | 22      | 2444MHz   | 32      | 2464MHz   |
| ⋮                                   | ⋮         | ⋮       | ⋮         | ⋮       | ⋮         | ⋮       | ⋮         |
| 9                                   | 2418MHz   | 19      | 2438MHz   | 29      | 2458MHz   | 39      | 2478MHz   |
| 10                                  | 2420MHz   | 20      | 2440MHz   | 30      | 2460MHz   | 40      | 2480MHz   |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel             | Frequency |
|---------------------|-----------|
| The lowest channel  | 2402MHz   |
| The middle channel  | 2442MHz   |
| The Highest channel | 2480MHz   |

## 5.3 Test mode

|  |  |
|--|--|
| Transmitting mode  | Keep the EUT in continuously transmitting mode |
| <i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i> |  |

## 5.4 Description of Support Units

|       |
|-------|
| None. |
|-------|

## 5.5 Test Facility

|   |
|---|
| <p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> <li>• <b>CNAS —Registration No.: CNAS L5775</b><br/>CNAS has accredited Global United Technology Services Co., Ltd. To ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.</li> <li>• <b>FCC —Registration No.: 600491</b><br/>Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 28, 2013.</li> <li>• <b>Industry Canada (IC) —Registration No.: 9079A-2</b><br/>The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, June 26, 2013.</li> </ul> |
|---|

## 5.6 Test Location

|  |
|--|
| All tests were performed at:   |
| <p>Global United Technology Services Co., Ltd.<br/>Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China<br/>Tel: 0755-27798480<br/>Fax: 0755-27798960</p> |

## 6 Test Instruments list

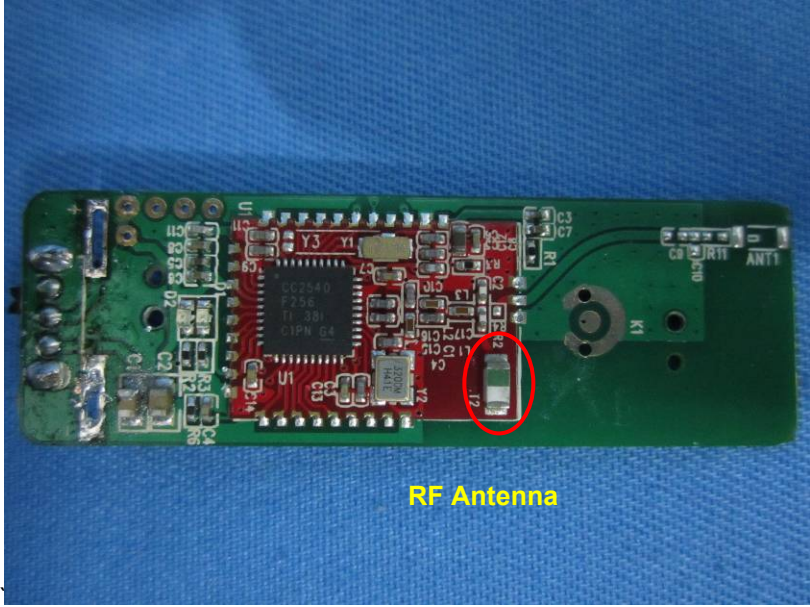
| Radiated Emission: |                               |                                |                             |               |                     |                         |
|--------------------|-------------------------------|--------------------------------|-----------------------------|---------------|---------------------|-------------------------|
| Item               | Test Equipment                | Manufacturer                   | Model No.                   | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | 3m Semi- Anechoic Chamber     | ZhongYu Electron               | 9.2(L)*6.2(W)* 6.4(H)       | GTS250        | Mar. 29 2013        | Mar. 28 2014            |
| 2                  | Control Room                  | ZhongYu Electron               | 6.2(L)*2.5(W)* 2.4(H)       | GTS251        | N/A                 | N/A                     |
| 3                  | Spectrum Analyzer             | Agilent                        | E4440A                      | GTS533        | Dec. 5, 2013        | Dec. 4 2014             |
| 4                  | EMI Test Receiver             | Rohde & Schwarz                | ESU26                       | GTS203        | Jul. 02 2013        | Jul. 01 2014            |
| 5                  | BiConiLog Antenna             | SCHWARZBECK<br>MESS-ELEKTRONIK | VULB9163                    | GTS214        | Feb. 23 2014        | Feb. 22 2015            |
| 6                  | Double -ridged waveguide horn | SCHWARZBECK<br>MESS-ELEKTRONIK | 9120D-829                   | GTS208        | June 28 2013        | June 27 2014            |
| 7                  | Horn Antenna                  | ETS-LINDGREN                   | 3160                        | GTS217        | Mar. 29 2013        | Mar. 28 2014            |
| 8                  | EMI Test Software             | AUDIX                          | E3                          | N/A           | N/A                 | N/A                     |
| 9                  | Coaxial Cable                 | GTS                            | N/A                         | GTS213        | Mar. 30 2013        | Mar. 29 2014            |
| 10                 | Coaxial Cable                 | GTS                            | N/A                         | GTS211        | Mar. 30 2013        | Mar. 29 2014            |
| 11                 | Coaxial cable                 | GTS                            | N/A                         | GTS210        | Mar. 30 2013        | Mar. 29 2014            |
| 12                 | Coaxial Cable                 | GTS                            | N/A                         | GTS212        | Mar. 30 2013        | Mar. 29 2014            |
| 13                 | Amplifier(100kHz-3GHz)        | HP                             | 8347A                       | GTS204        | Jul. 02 2013        | Jul. 01 2014            |
| 14                 | Amplifier(2GHz-20GHz)         | HP                             | 8349B                       | GTS206        | Jul. 02 2013        | Jul. 01 2014            |
| 15                 | Amplifier (18-26GHz)          | Rohde & Schwarz                | AFS33-18002<br>650-30-8P-44 | GTS218        | June 28 2013        | June 27 2014            |
| 16                 | Band filter                   | Amindeon                       | 82346                       | GTS219        | Mar. 30 2013        | Mar. 29 2014            |

| General used equipment: |                |              |           |               |                     |                         |
|-------------------------|----------------|--------------|-----------|---------------|---------------------|-------------------------|
| Item                    | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                       | Barometer      | ChangChun    | DYM3      | GTS257        | July 09 2013        | July 08 2014            |

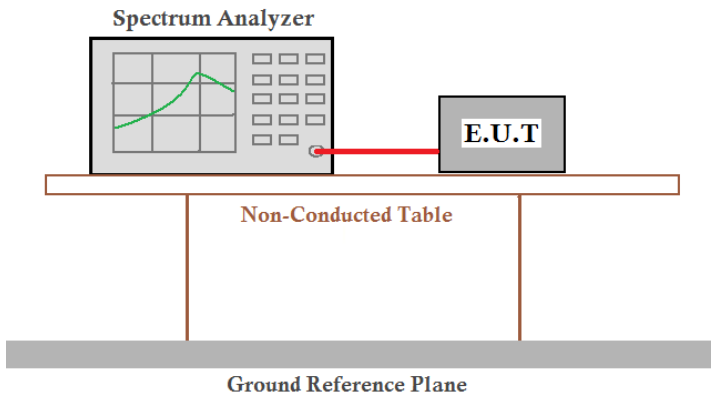


## 7 Test results and Measurement Data

### 7.1 Antenna requirement:

|  |                                     |
|--|-------------------------------------|
| <b>Standard requirement:</b>   | FCC Part15 C Section 15.203 /247(c) |
| <p><b>15.203 requirement:</b></p> <p>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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p><b>15.247(c) (1)(i) requirement:</b></p> <p>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p> |                                     |
| <b>E.U.T Antenna:</b>  |                                     |
| <p><i>The antenna is Integral antenna, the best case gain of the antenna is 1.0dBi</i></p>  <p style="text-align: center;"><b>RF Antenna</b></p>  |                                     |

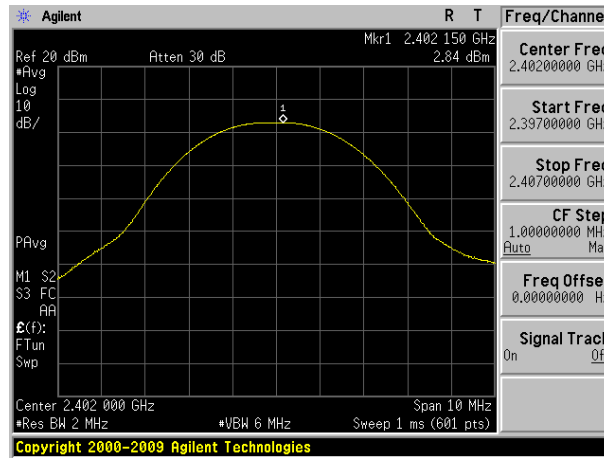
## 7.2 Conducted Peak Output Power

|                   |  |
|-------------------|--|
| Test Requirement: | FCC Part15 C Section 15.247 (b)(3)   |
| Test Method:      | ANSI C63.4:2003 and KDB558074 D01 DTS Meas Guidance V03  |
| Limit:            | 30dBm  |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by two vertical legs and sits on a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 6.0 for details   |
| Test mode:        | Refer to section 5.3 for details   |
| Test results:     | Pass   |

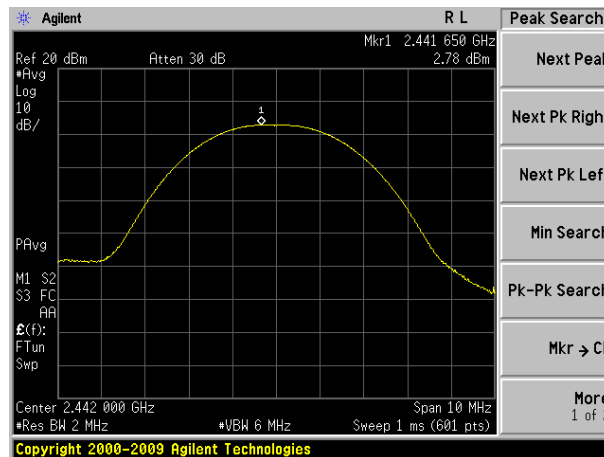
### Measurement Data

| Test channel | Peak Output Power (dBm) | Limit(dBm) | Result |
|--------------|-------------------------|------------|--------|
| Lowest       | 2.84                    | 30.00      | Pass   |
| Middle       | 2.78                    |            |        |
| Highest      | 2.75                    |            |        |

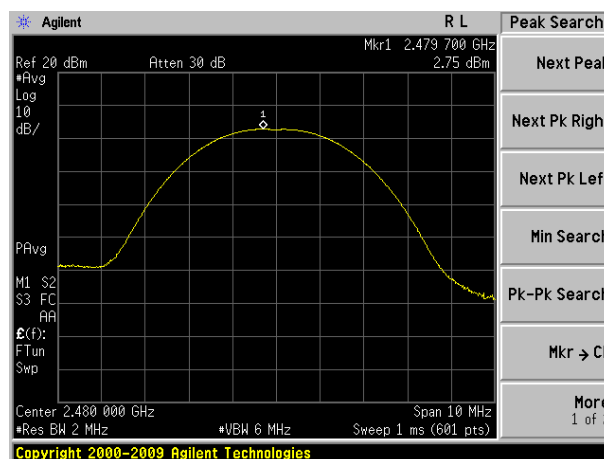
Test plot as follows:



Lowest channel

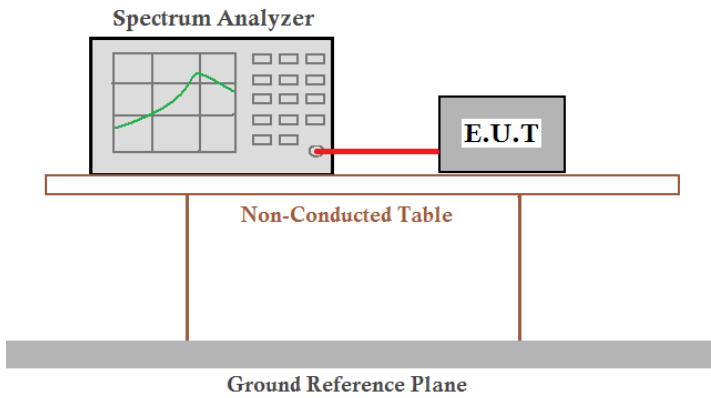


Middle channel



Highest channel

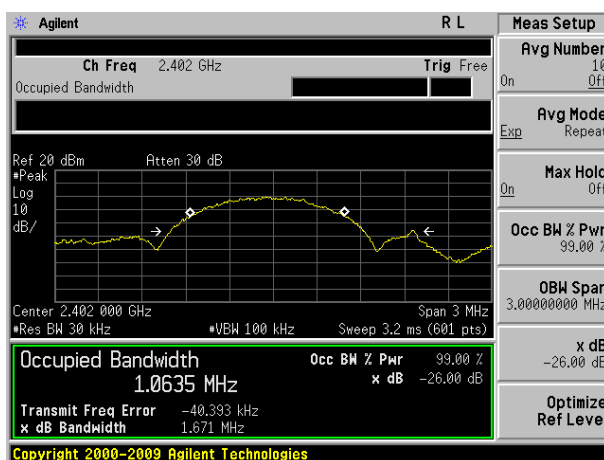
## 7.3 Channel Bandwidth

|                   |   |
|-------------------|---|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(2)  |
| Test Method:      | ANSI C63.4:2003 and KDB558074 D01 DTS Meas Guidance V03   |
| Limit:            | >500KHz   |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 6.0 for details  |
| Test mode:        | Refer to section 5.3 for details  |
| Test results:     | Pass  |

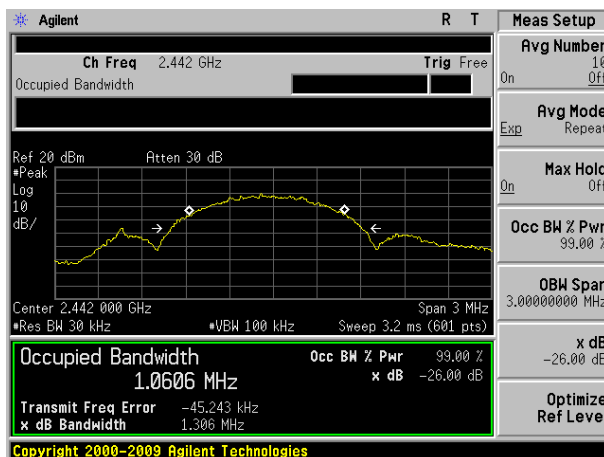
### Measurement Data

| Test channel | Channel Bandwidth (MHz) | Limit(KHz) | Result |
|--------------|-------------------------|------------|--------|
| Lowest       | 1.671                   | >500       | Pass   |
| Middle       | 1.306                   |            |        |
| Highest      | 1.673                   |            |        |

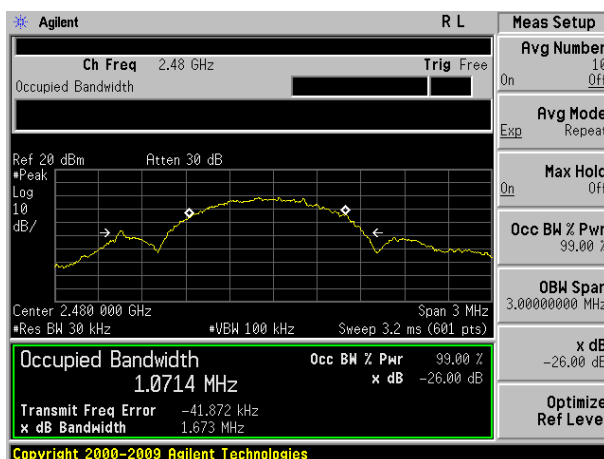
Test plot as follows:



Lowest channel

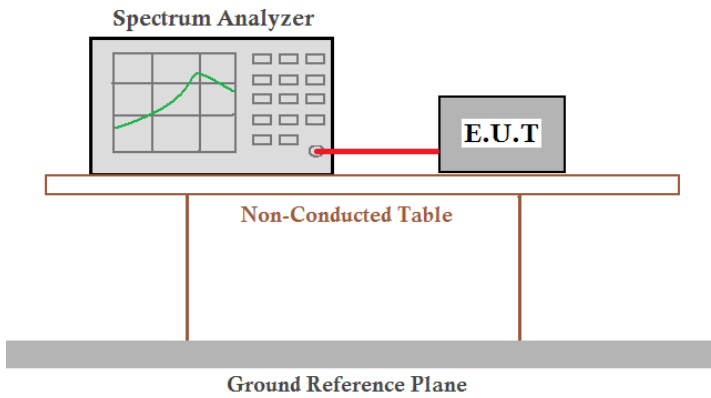


Middle channel



Highest channel

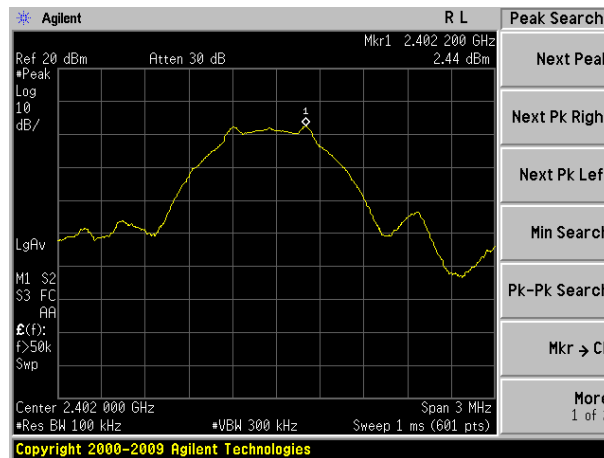
## 7.4 Power Spectral Density

|                   |   |
|-------------------|---|
| Test Requirement: | FCC Part15 C Section 15.247 (e)   |
| Test Method:      | ANSI C63.4:2003 and KDB558074 D01 DTS Meas Guidance V03   |
| Limit:            | 8dBm/3kHz   |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 6.0 for details  |
| Test mode:        | Refer to section 5.3 for details  |
| Test results:     | Pass  |

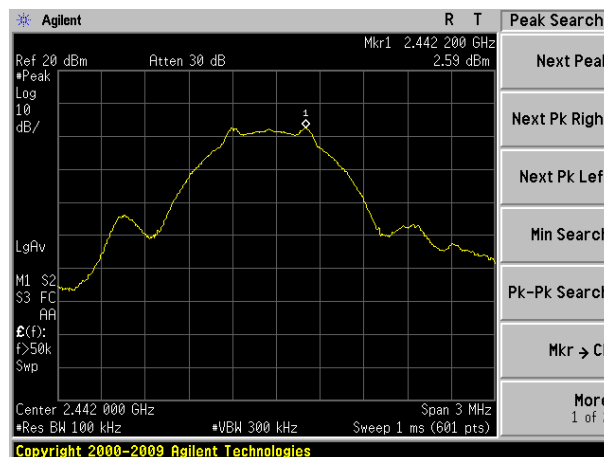
### Measurement Data

| Test channel | Power Spectral Density (dBm) | Limit(dBm/3kHz) | Result |
|--------------|------------------------------|-----------------|--------|
| Lowest       | 2.44                         | 8.00            | Pass   |
| Middle       | 2.59                         |                 |        |
| Highest      | 2.27                         |                 |        |

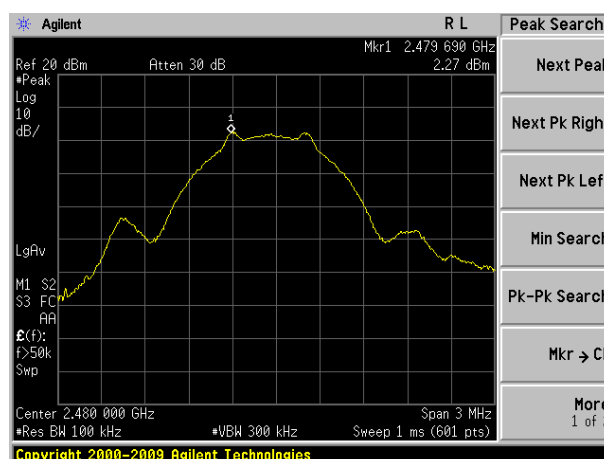
Test plot as follows:



Lowest channel



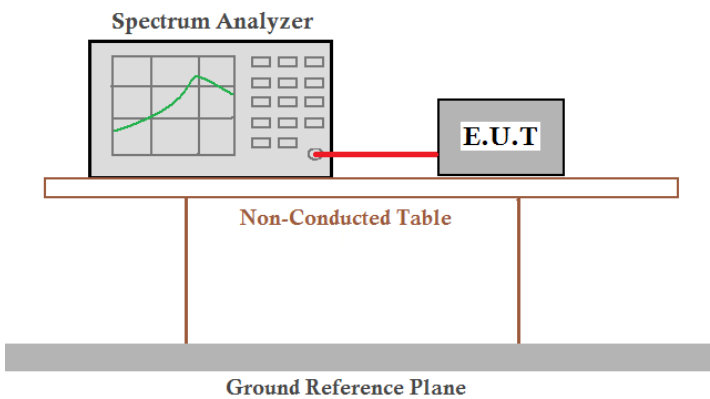
Middle channel



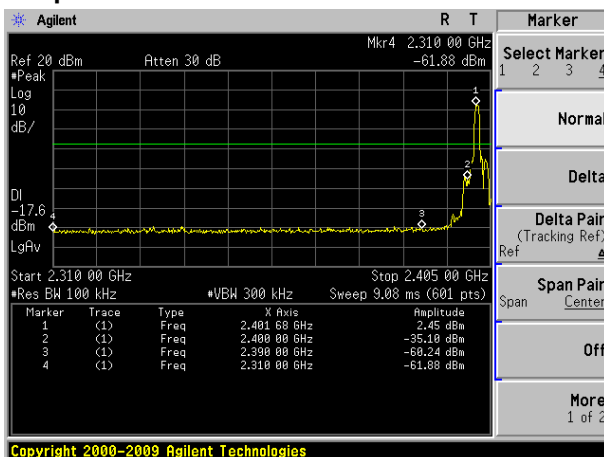
Highest channel

## 7.5 Band edges

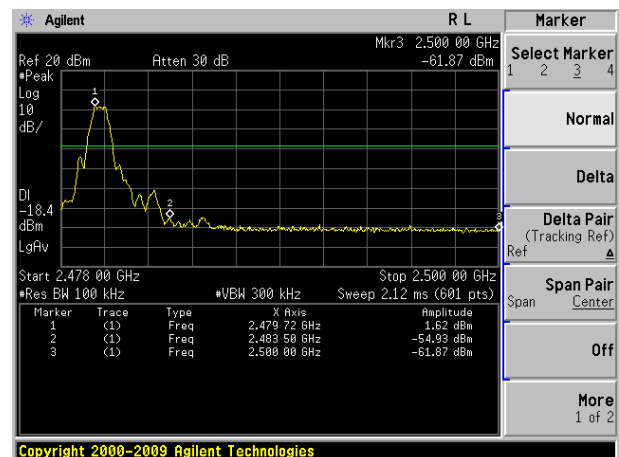
### 7.5.1 Conducted Emission Method

|                   |   |
|-------------------|---|
| Test Requirement: | FCC Part15 C Section 15.247 (d)   |
| Test Method:      | ANSI C63.4:2003 and KDB558074 D01 DTS Meas Guidance V03   |
| Limit:            | In any 100 kHz bandwidth outside the frequency band 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. |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>  |
| Test Instruments: | Refer to section 6.0 for details  |
| Test mode:        | Refer to section 5.3 for details  |
| Test results:     | Pass  |

### Test plot as follows:



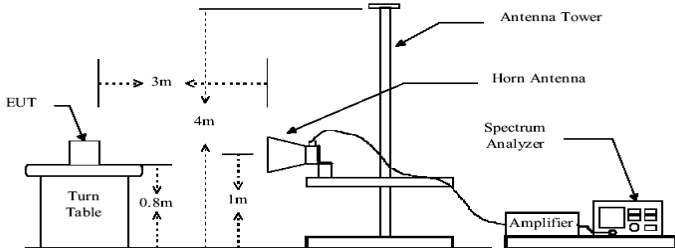
Lowest channel



Highest channel



## 7.5.2 Radiated Emission Method

|                       |   |          |                    |      |         |
|-----------------------|---|----------|--------------------|------|---------|
| Test Requirement:     | FCC Part15 C Section 15.209 and 15.205  |          |                    |      |         |
| Test Method:          | ANSI C63.4: 2003  |          |                    |      |         |
| Test Frequency Range: | All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.  |          |                    |      |         |
| Test site:            | Measurement Distance: 3m  |          |                    |      |         |
| Receiver setup:       | Frequency   | Detector | RBW                | VBW  | Value   |
|                       | Above 1GHz  | Peak     | 1MHz               | 3MHz | Peak    |
|                       |   | Peak     | 1MHz               | 10Hz | Average |
| Limit:                | Frequency   |          | Limit (dBuV/m @3m) |      | Value   |
|                       | Above 1GHz  |          | 54.00              |      | Average |
|                       |   |          | 74.00              |      | Peak    |
| Test setup:           |    |          |                    |      |         |
| Test Procedure:       | <ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li><li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li><li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li><li>7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.</li></ol> |          |                    |      |         |
| Test Instruments:     | Refer to section 6.0 for details  |          |                    |      |         |
| Test mode:            | Refer to section 5.3 for details  |          |                    |      |         |
| Test results:         | Pass  |          |                    |      |         |

Measurement data:

*Remark: The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*

|               |        |
|---------------|--------|
| Test channel: | Lowest |
|---------------|--------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2310.00         | 38.38             | 27.91                 | 5.30            | 34.11                    | 37.48          | 74.00               | -36.52          | Vertical     |
| 2390.00         | 36.56             | 27.59                 | 5.38            | 34.01                    | 35.52          | 74.00               | -38.48          | Vertical     |
| 2400.00         | 58.40             | 27.58                 | 5.39            | 34.01                    | 57.36          | 74.00               | -16.64          | Vertical     |
| 2310.00         | 36.26             | 27.91                 | 5.30            | 34.11                    | 35.36          | 74.00               | -38.64          | Horizontal   |
| 2390.00         | 37.73             | 27.59                 | 5.38            | 34.01                    | 36.69          | 74.00               | -37.31          | Horizontal   |
| 2400.00         | 59.71             | 27.58                 | 5.39            | 34.01                    | 58.67          | 74.00               | -15.33          | Horizontal   |

**Average value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2310.00         | 21.33             | 27.91                 | 5.30            | 34.11                    | 20.43          | 54.00               | -33.57          | Vertical     |
| 2390.00         | 20.54             | 27.59                 | 5.38            | 34.01                    | 19.50          | 54.00               | -34.50          | Vertical     |
| 2400.00         | 42.69             | 27.58                 | 5.39            | 34.01                    | 41.65          | 54.00               | -12.35          | Vertical     |
| 2310.00         | 20.35             | 27.91                 | 5.30            | 34.11                    | 19.45          | 54.00               | -34.55          | Horizontal   |
| 2390.00         | 20.14             | 27.59                 | 5.38            | 34.01                    | 19.10          | 54.00               | -34.90          | Horizontal   |
| 2400.00         | 43.62             | 27.58                 | 5.39            | 34.01                    | 42.58          | 54.00               | -11.42          | Horizontal   |

|               |         |
|---------------|---------|
| Test channel: | Highest |
|---------------|---------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 40.04             | 27.53                 | 5.47            | 33.92                    | 39.12          | 74.00               | -34.88          | Vertical     |
| 2500.00         | 39.20             | 27.55                 | 5.49            | 33.90                    | 38.34          | 74.00               | -35.66          | Vertical     |
| 2483.50         | 43.37             | 27.53                 | 5.47            | 33.92                    | 42.45          | 74.00               | -31.55          | Horizontal   |
| 2500.00         | 39.18             | 27.55                 | 5.49            | 33.90                    | 38.32          | 74.00               | -35.68          | Horizontal   |

**Average value:**

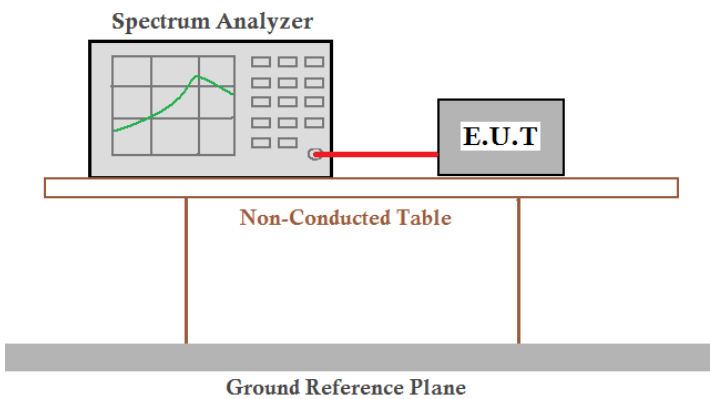
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 24.47             | 27.53                 | 5.47            | 33.92                    | 23.55          | 54.00               | -30.45          | Vertical     |
| 2500.00         | 23.13             | 27.55                 | 5.49            | 33.90                    | 22.27          | 54.00               | -31.73          | Vertical     |
| 2483.50         | 26.66             | 27.53                 | 5.47            | 33.92                    | 25.74          | 54.00               | -28.26          | Horizontal   |
| 2500.00         | 24.65             | 27.55                 | 5.49            | 33.90                    | 23.79          | 54.00               | -30.21          | Horizontal   |

**Remark:**

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

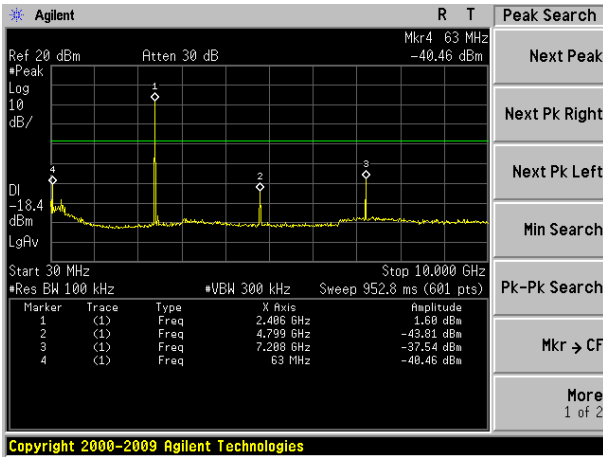
## 7.6 Spurious Emission

### 7.6.1 Conducted Emission Method

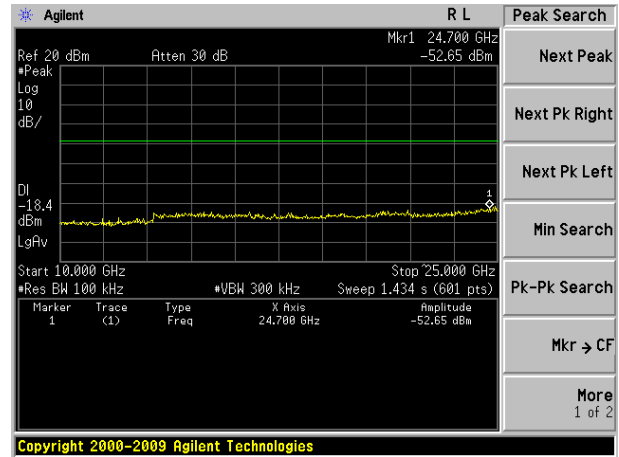
|                   |   |
|-------------------|---|
| Test Requirement: | FCC Part15 C Section 15.247 (d)   |
| Test Method:      | ANSI C63.4:2003 and KDB558074 D01 DTS Meas Guidance V03   |
| Limit:            | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional 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. |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>                             |
| Test Instruments: | Refer to section 6.0 for details  |
| Test mode:        | Refer to section 5.3 for details  |
| Test results:     | Pass  |

## Test plot as follows:

### Lowest channel

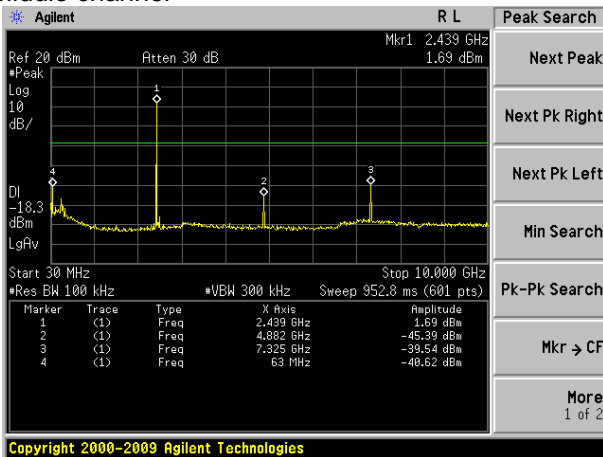


30MHz~10GHz

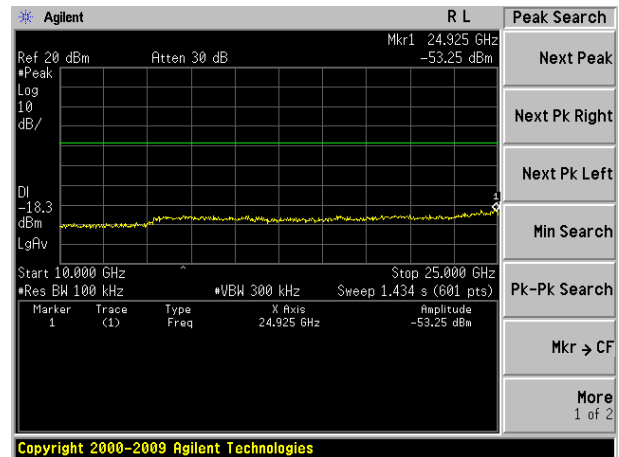


10GHz~25GHz

### Middle channel

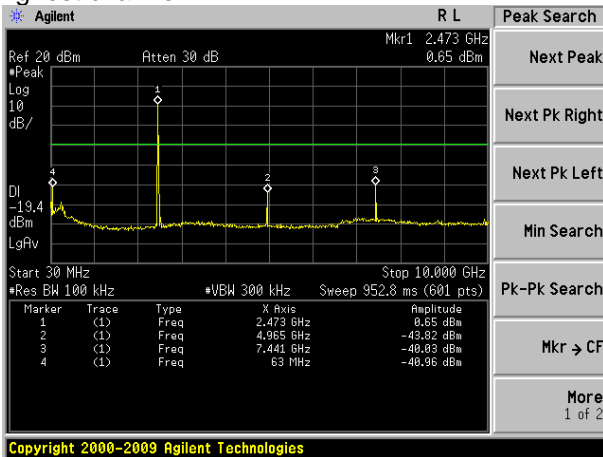


30MHz~10GHz

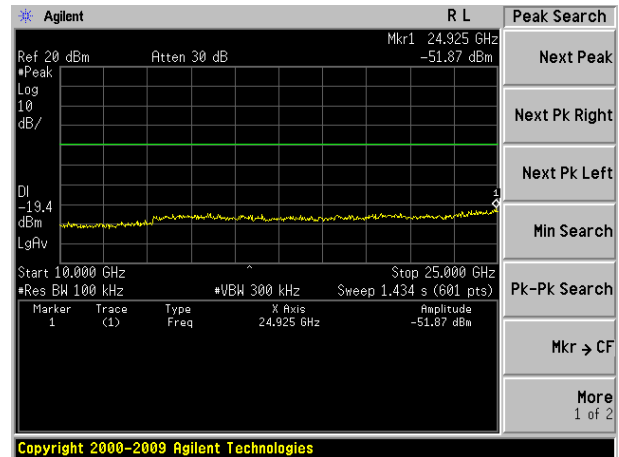


10GHz~25GHz

### Highest channel

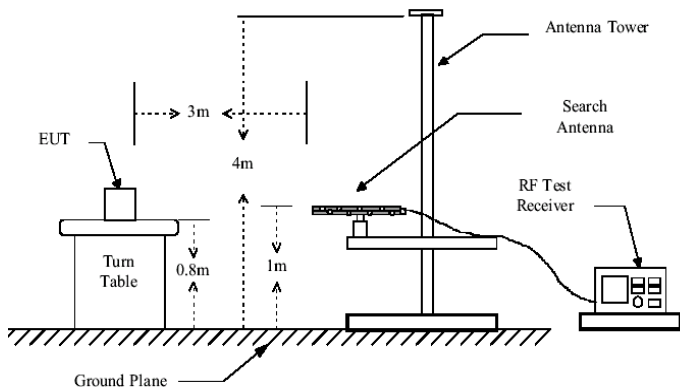
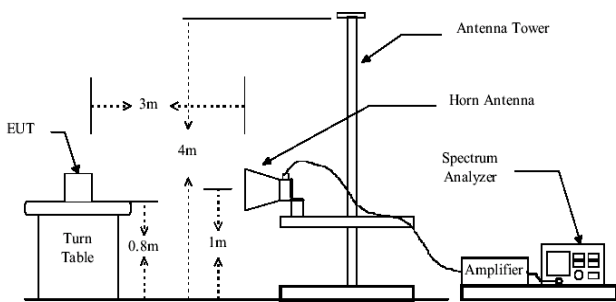


30MHz~10GHz



10GHz~25GHz

## 7.6.2 Radiated Emission Method

|                       |  |            |                    |        |            |
|-----------------------|--|------------|--------------------|--------|------------|
| Test Requirement:     | FCC Part15 C Section 15.209  |            |                    |        |            |
| Test Method:          | ANSI C63.4: 2003   |            |                    |        |            |
| Test Frequency Range: | 30MHz to 25GHz   |            |                    |        |            |
| Test site:            | Measurement Distance: 3m   |            |                    |        |            |
| Receiver setup:       | Frequency  | Detector   | RBW                | VBW    | Value      |
|                       | 30MHz-1GHz   | Quasi-peak | 120KHz             | 300KHz | Quasi-peak |
|                       | Above 1GHz   | Peak       | 1MHz               | 3MHz   | Peak       |
|                       |  | Peak       | 1MHz               | 10Hz   | Average    |
| Limit:                | Frequency  |            | Limit (dBuV/m @3m) |        | Value      |
|                       | 30MHz-88MHz  |            | 40.00              |        | Quasi-peak |
|                       | 88MHz-216MHz   |            | 43.50              |        | Quasi-peak |
|                       | 216MHz-960MHz  |            | 46.00              |        | Quasi-peak |
|                       | 960MHz-1GHz  |            | 54.00              |        | Quasi-peak |
|                       | Above 1GHz   |            | 54.00              |        | Average    |
|                       |  |            | 74.00              |        | Peak       |
| Test setup:           | Below 1GHz   |            |                    |        |            |
|                       |  |            |                    |        |            |
| Test setup:           | Above 1GHz   |            |                    |        |            |
|                       |  |            |                    |        |            |
| Test Procedure:       | 1. The EUT was placed on the top of a rotating table 0.8 meters above                |            |                    |        |            |

|                   |   |
|-------------------|---|
|                   | <p>the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</p> <ol style="list-style-type: none"> <li>The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> <li>The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.</li> </ol> |
| Test Instruments: | Refer to section 6.0 for details  |
| Test mode:        | Refer to section 5.3 for details  |
| Test results:     | Pass  |

*Remark:*

*Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis which it is worse case.*

## Measurement Data

### ■ Below 1GHz

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 39.16           | 37.02             | 15.34                 | 0.65            | 32.06              | 20.95          | 40.00               | -19.05          | Vertical     |
| 68.87           | 41.79             | 11.06                 | 0.93            | 31.89              | 21.89          | 40.00               | -18.11          | Vertical     |
| 95.76           | 38.25             | 14.90                 | 1.16            | 31.74              | 22.57          | 43.50               | -20.93          | Vertical     |
| 155.91          | 42.06             | 10.51                 | 1.60            | 32.00              | 22.17          | 43.50               | -21.33          | Vertical     |
| 389.36          | 36.92             | 16.83                 | 2.80            | 31.92              | 24.63          | 46.00               | -21.37          | Vertical     |
| 785.09          | 36.51             | 21.87                 | 4.40            | 31.30              | 31.48          | 46.00               | -14.52          | Vertical     |
| 40.14           | 36.92             | 15.58                 | 0.66            | 32.06              | 21.10          | 40.00               | -18.90          | Horizontal   |
| 99.18           | 35.52             | 15.13                 | 1.18            | 31.76              | 20.07          | 43.50               | -23.43          | Horizontal   |
| 110.57          | 36.21             | 14.15                 | 1.28            | 31.81              | 19.83          | 43.50               | -23.67          | Horizontal   |
| 296.18          | 36.62             | 14.98                 | 2.34            | 32.18              | 21.76          | 46.00               | -24.24          | Horizontal   |
| 467.24          | 37.09             | 17.77                 | 3.17            | 31.66              | 26.37          | 46.00               | -19.63          | Horizontal   |
| 661.15          | 36.45             | 20.67                 | 3.95            | 31.13              | 29.94          | 46.00               | -16.06          | Horizontal   |



## ■ Above 1GHz

|               |        |
|---------------|--------|
| Test channel: | Lowest |
|---------------|--------|

### Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4804.00         | 37.26             | 31.78                 | 8.60            | 32.09              | 45.55          | 74.00               | -28.45          | Vertical     |
| 7206.00         | 35.65             | 36.15                 | 11.65           | 32.00              | 51.45          | 74.00               | -22.55          | Vertical     |
| 9608.00         | 26.81             | 37.95                 | 14.14           | 31.62              | 47.28          | 74.00               | -26.72          | Vertical     |
| 12010.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 14412.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 4804.00         | 37.98             | 31.78                 | 8.60            | 32.09              | 46.27          | 74.00               | -27.73          | Horizontal   |
| 7206.00         | 35.17             | 36.15                 | 11.65           | 32.00              | 50.97          | 74.00               | -23.03          | Horizontal   |
| 9608.00         | 23.63             | 37.95                 | 14.14           | 31.62              | 44.10          | 74.00               | -29.90          | Horizontal   |
| 12010.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |
| 14412.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |

### Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4804.00         | 24.73             | 31.78                 | 8.60            | 32.09              | 33.02          | 54.00               | -20.98          | Vertical     |
| 7206.00         | 22.98             | 36.15                 | 11.65           | 32.00              | 38.78          | 54.00               | -15.22          | Vertical     |
| 9608.00         | 16.70             | 37.95                 | 14.14           | 31.62              | 37.17          | 54.00               | -16.83          | Vertical     |
| 12010.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 14412.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 4804.00         | 24.78             | 31.78                 | 8.60            | 32.09              | 33.07          | 54.00               | -20.93          | Horizontal   |
| 7206.00         | 22.65             | 36.15                 | 11.65           | 32.00              | 38.45          | 54.00               | -15.55          | Horizontal   |
| 9608.00         | 12.10             | 37.95                 | 14.14           | 31.62              | 32.57          | 54.00               | -21.43          | Horizontal   |
| 12010.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |
| 14412.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |

### Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.

|               |        |
|---------------|--------|
| Test channel: | Middle |
|---------------|--------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4884.00         | 38.76             | 31.86                 | 8.67            | 32.12              | 47.17          | 74.00               | -26.83          | Vertical     |
| 7326.00         | 33.67             | 36.41                 | 11.72           | 31.89              | 49.91          | 74.00               | -24.09          | Vertical     |
| 9768.00         | 25.31             | 38.35                 | 14.27           | 31.62              | 46.31          | 74.00               | -27.69          | Vertical     |
| 12210.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 14652.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 4884.00         | 37.50             | 31.86                 | 8.67            | 32.12              | 45.91          | 74.00               | -28.09          | Horizontal   |
| 7326.00         | 32.50             | 36.41                 | 11.72           | 31.89              | 48.74          | 74.00               | -25.26          | Horizontal   |
| 9768.00         | 23.95             | 38.35                 | 14.27           | 31.62              | 44.95          | 74.00               | -29.05          | Horizontal   |
| 12210.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |
| 14652.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |

**Average value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4884.00         | 25.64             | 31.86                 | 8.67            | 32.12              | 34.05          | 54.00               | -19.95          | Vertical     |
| 7326.00         | 20.32             | 36.41                 | 11.72           | 31.89              | 36.56          | 54.00               | -17.44          | Vertical     |
| 9768.00         | 12.78             | 38.35                 | 14.27           | 31.62              | 33.78          | 54.00               | -20.22          | Vertical     |
| 12210.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 14652.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 4884.00         | 24.98             | 31.86                 | 8.67            | 32.12              | 33.39          | 54.00               | -20.61          | Horizontal   |
| 7326.00         | 19.60             | 36.41                 | 11.72           | 31.89              | 35.84          | 54.00               | -18.16          | Horizontal   |
| 9768.00         | 10.46             | 38.35                 | 14.27           | 31.62              | 31.46          | 54.00               | -22.54          | Horizontal   |
| 12210.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |
| 14652.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |

**Remark:**

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.

|               |         |
|---------------|---------|
| Test channel: | Highest |
|---------------|---------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4960.00         | 39.35             | 31.93                 | 8.73            | 32.16              | 47.85          | 74.00               | -26.15          | Vertical     |
| 7440.00         | 32.23             | 36.59                 | 11.79           | 31.78              | 48.83          | 74.00               | -25.17          | Vertical     |
| 9920.00         | 25.53             | 38.81                 | 14.38           | 31.88              | 46.84          | 74.00               | -27.16          | Vertical     |
| 12400.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 14880.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 4960.00         | 36.12             | 31.93                 | 8.73            | 32.16              | 44.62          | 74.00               | -29.38          | Horizontal   |
| 7440.00         | 33.98             | 36.59                 | 11.79           | 31.78              | 50.58          | 74.00               | -23.42          | Horizontal   |
| 9920.00         | 26.30             | 38.81                 | 14.38           | 31.88              | 47.61          | 74.00               | -26.39          | Horizontal   |
| 12400.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |
| 14880.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |

**Average value:**

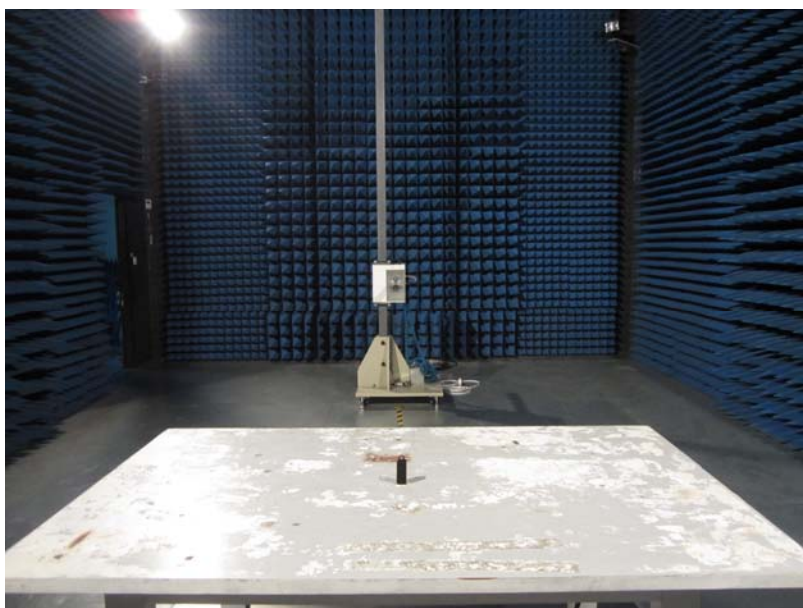
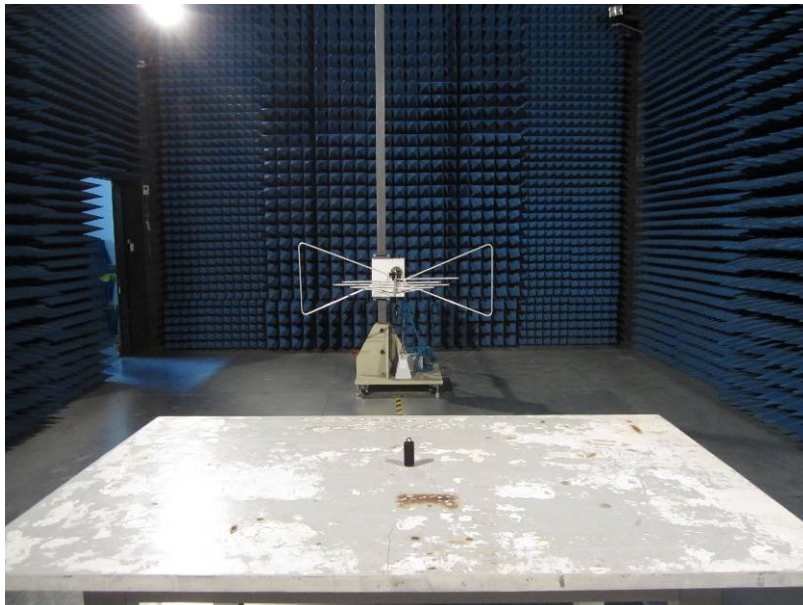
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4960.00         | 26.13             | 31.93                 | 8.73            | 32.16              | 34.63          | 54.00               | -19.37          | Vertical     |
| 7440.00         | 19.32             | 36.59                 | 11.79           | 31.78              | 35.92          | 54.00               | -18.08          | Vertical     |
| 9920.00         | 12.64             | 38.81                 | 14.38           | 31.88              | 33.95          | 54.00               | -20.05          | Vertical     |
| 12400.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 14880.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 4960.00         | 23.45             | 31.93                 | 8.73            | 32.16              | 31.95          | 54.00               | -22.05          | Horizontal   |
| 7440.00         | 20.65             | 36.59                 | 11.79           | 31.78              | 37.25          | 54.00               | -16.75          | Horizontal   |
| 9920.00         | 13.06             | 38.81                 | 14.38           | 31.88              | 34.37          | 54.00               | -19.63          | Horizontal   |
| 12400.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |
| 14880.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |

**Remark:**

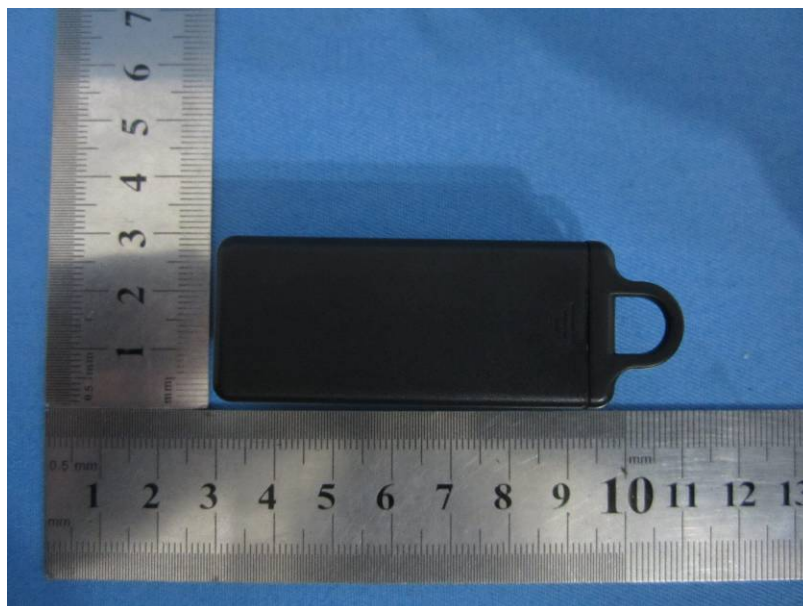
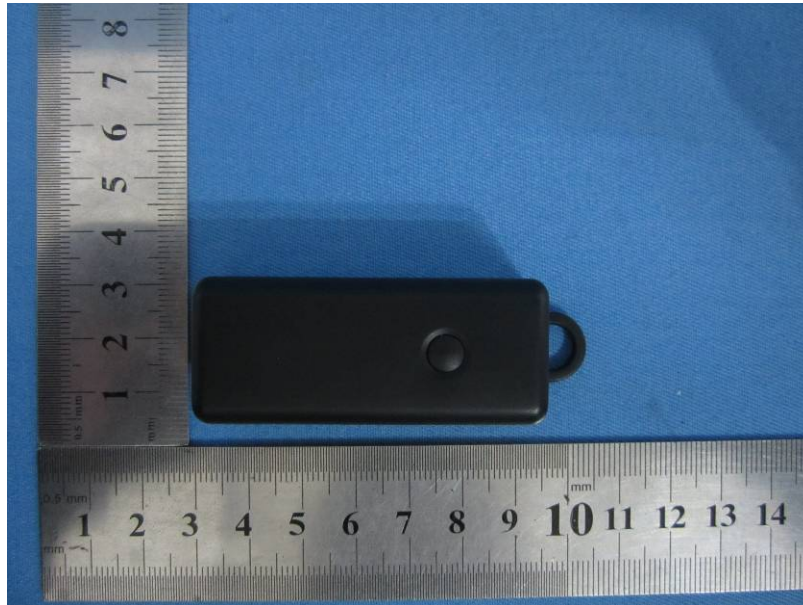
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.

## 8 Test Setup Photo

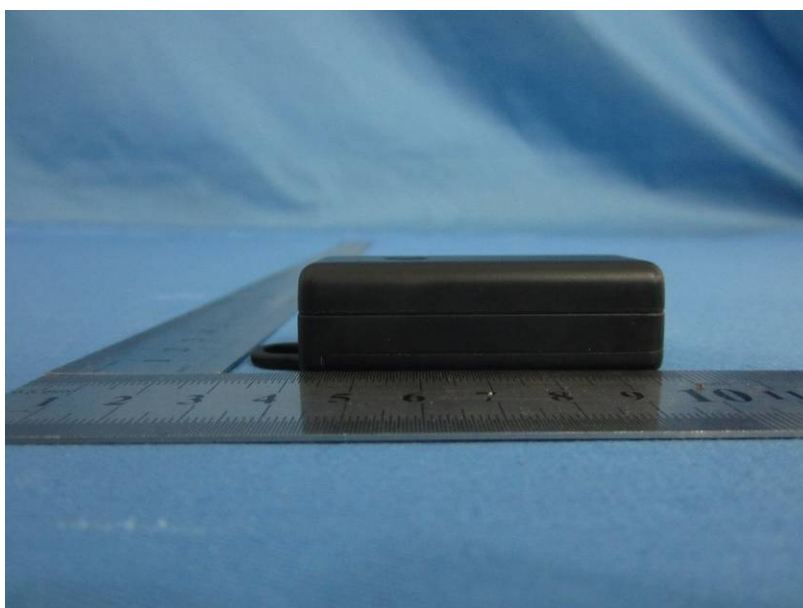
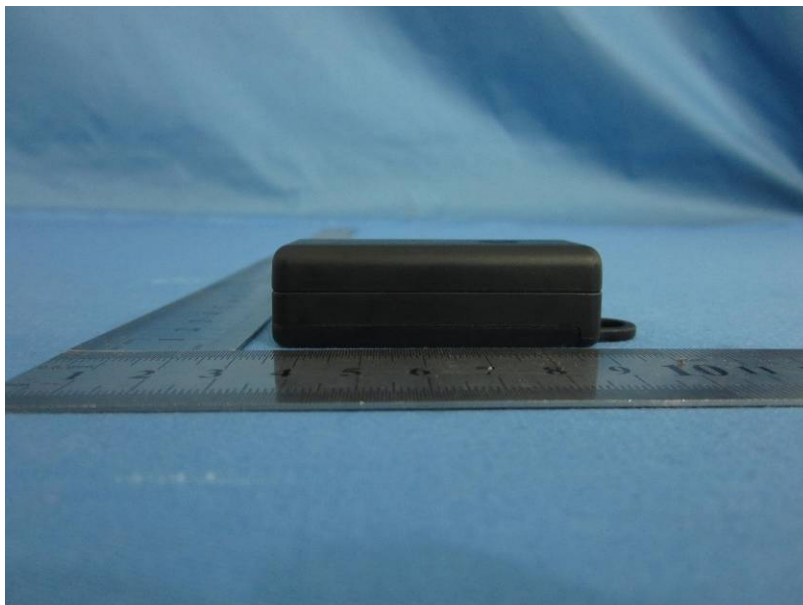
Radiated Emission

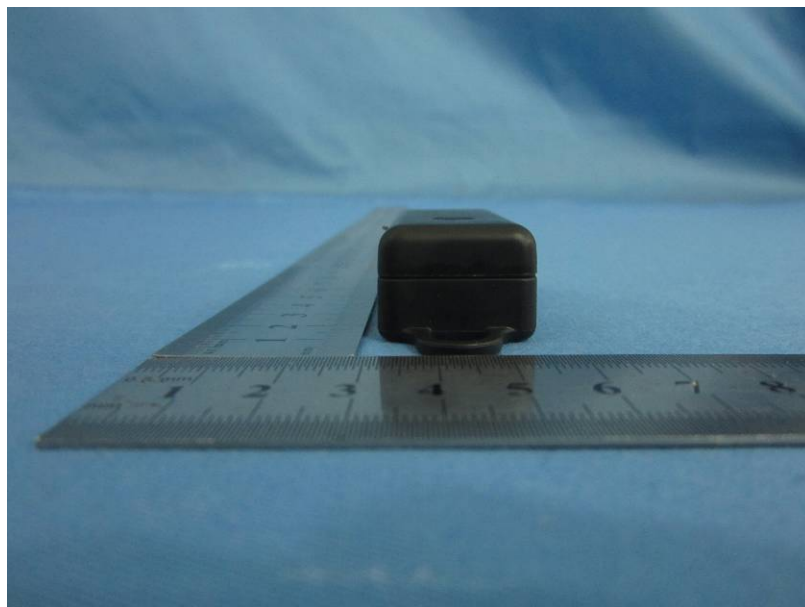
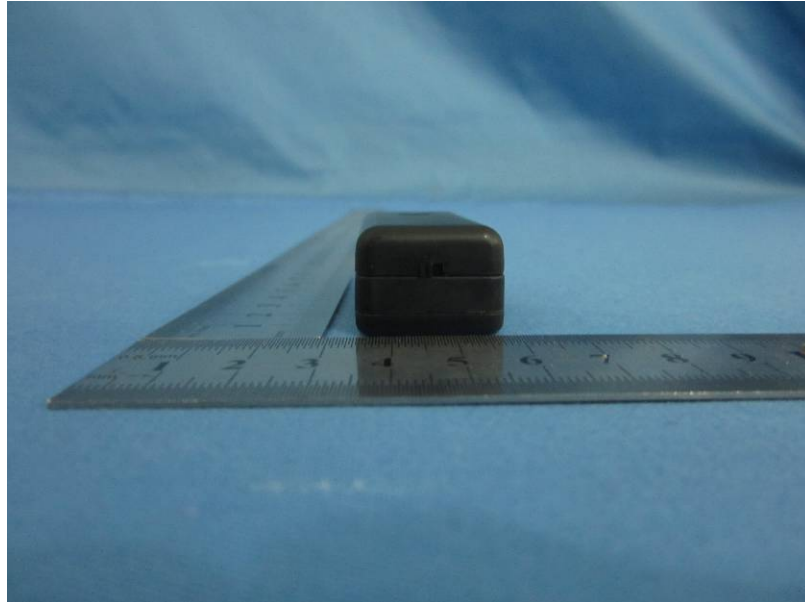


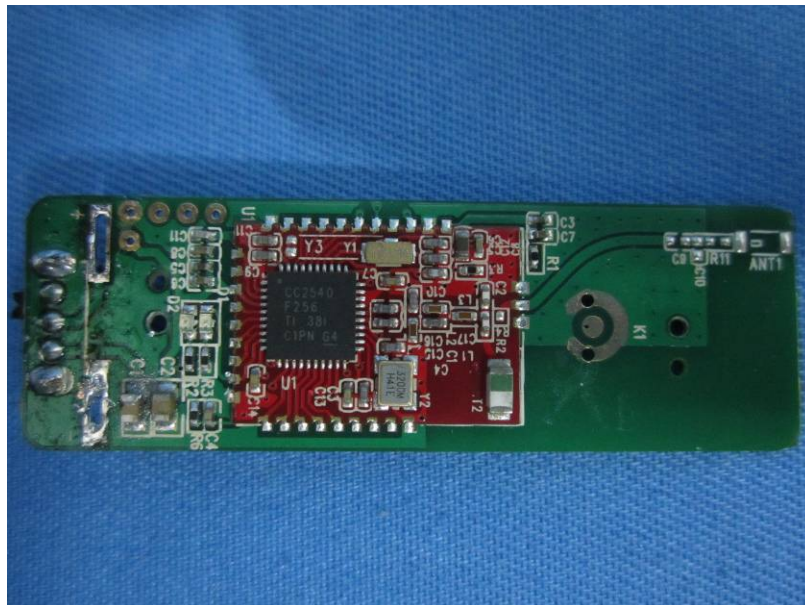
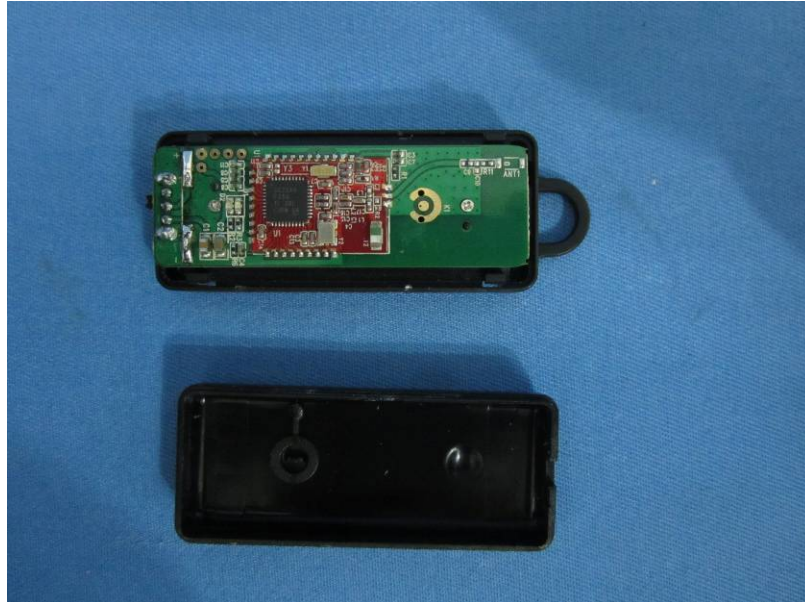
## 9 EUT Constructional Details



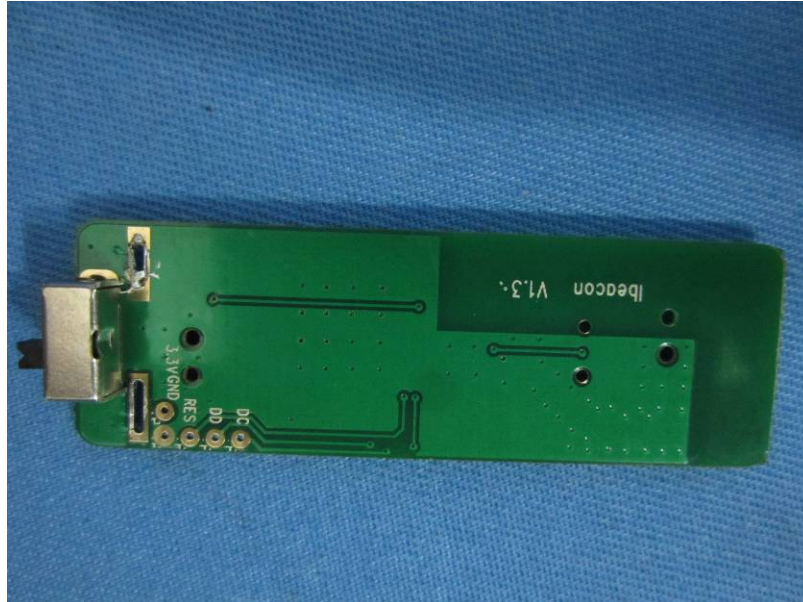












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