# FCC TEST REPORT

For

Shenzhen Hejiaxing Electronics Co., Ltd.

Wireless Wristband

Model No.: U8

| | | |
|---|---|---|
| Prepared For | : | Shenzhen Hejiaxing Electronics Co., Ltd. |
| Address | : | Floor 2, Building 1, Dongzhijia Industry Park, Lezhujiao Village, Xixiang Town, Baoan District, Shenzhen |
| Prepared By | : | Shenzhen Anbotek Compliance Laboratory Limited |
| Address | : | 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China<br>Tel: (86) 755-26066544 Fax: (86) 755-26014772 |
| Report Number | : | R0217060244W |
| Date of Test | : | Jun. 20~Jul. 10, 2017 |
| Date of Report | : | Jul. 11, 2017 |

# Contents

1. General Information....5
1.1. Client Information....5
1.2. Description of Device (EUT)....5
1.3. Auxiliary Equipment Used During Test....5
1.4. Description of Test Modes....6
1.5. List of channels....6
1.6. Description Of Test Setup....7
1.7. Test Equipment List....8
1.8. Measurement Uncertainty....8
1.9. Description of Test Facility....9
2. Summary of Test Results....10
3. Conducted Emission Test....11
3.1. Test Standard and Limit....11
3.2. Test Setup....11
3.3. Test Procedure....11
3.4. Test Data....11
4. Radiation Spurious Emission and Band Edge....16
4.1. Test Standard and Limit....16
4.2. Test Setup....16
4.3. Test Procedure....17
4.4. Test Data....18
5. Maximum Peak Output Power Test....25
5.1. Test Standard and Limit....25
5.2. Test Setup....25
5.3. Test Procedure....25
5.4. Test Data....25
6. 6DB Occupy Bandwidth Test....28
6.1. Test Standard and Limit....28
6.2. Test Setup....28
6.3. Test Procedure....28
6.4. Test Data....28
7. Power Spectral Density Test....31
7.1. Test Standard and Limit....31
7.2. Test Setup....31
7.3. Test Procedure....31
7.4. Test Data....31
8. 100kHz Bandwidth of Frequency Band Edge Requirement....34
8.1. Test Standard and Limit....34
8.2. Test Setup....34
8.3. Test Procedure....34
8.4. Test Data....34
9. Antenna Requirement....36

9.1. Test Standard and Requirement.....36
9.2. Antenna Connected Construction.....36
APPENDIX I -- TEST SETUP PHOTOGRAPH.....37
APPENDIX II -- EXTERNAL PHOTOGRAPH.....39
APPENDIX III -- INTERNAL PHOTOGRAPH.....43

# TEST REPORT

| | | |
|---|---|---|
| Applicant | : | Shenzhen Hejiaxing Electronics Co., Ltd. |
| Manufacturer | : | Shenzhen Hejiaxing Electronics Co., Ltd. |
| Product Name | : | Wireless Wristband |
| Model No. | : | U8 |
| Trade Mark | : | N.A. |
| Rating(s) | : | Input DC 5V, 500mA(DC 3.7V, 75mAh Battery inside) |
| **Test Standard(s)** | **:** | **FCC Part15 Subpart C 2016, Section 15.247** |
| **Test Method(s)** | **:** | **ANSI C63.10: 2013, KDB558074 D01 DTS Meas Guidance v04** |

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : : Jun. 20~Jul. 10, 2017

Prepared by : : Winkey Wang

(Tested Engineer / Winkey Wang)

Reviewer : : Tangcy. T.

(Project Manager / Tangcy. T)

Approved & Authorized Signer : : Tom Chen

(Manager / Tom Chen)

# 1. General Information

## 1.1. Client Information

| | | |
|---|---|---|
| Applicant | : | Shenzhen Hejiaxing Electronics Co., Ltd. |
| Address | : | Floor 2, Building 1, Dongzhijia Industry Park, Lezhujiao Village, Xixiang Town, Baoan District, Shenzhen |
| Manufacturer | : | Shenzhen Hejiaxing Electronics Co., Ltd. |
| Address | : | Floor 2, Building 1, Dongzhijia Industry Park, Lezhujiao Village, Xixiang Town, Baoan District, Shenzhen |

## 1.2. Description of Device (EUT)

| | | | |
|---|---|---|---|
| Product Name | : | Wireless Wristband | |
| Model No. | : | U8 | |
| Trade Mark | : | N.A. | |
| Test Power Supply | : | AC 120V, 60Hz for adapter/AC 240V, 60Hz for adapter<br>DC 3.7V Battery inside | |
| Product Description | : | Operation Frequency: | 2402MHz~2480MHz |
| | | Transfer Rate: | 1 Mbits/s |
| | | Number of Channel: | 40 Channels |
| | | Modulation Type: | GFSK |
| | | Antenna Type: | PCB Antenna |
| | | Antenna Gain(Peak): | 0 dbi |
| **Remark:** 1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. | | | |

## 1.3. Auxiliary Equipment Used During Test

| | | |
|---|---|---|
| Adapter | : | Manufacturer: ZTE<br>M/N: STC-A2050I1000USBA-C<br>S/N: 201202102100876<br>Input: 100-240V~50/60Hz 0.3A<br>Output: DC 5V, 1000mA |

## 1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode | Description |
|---|---|
| Mode 1 | CH00 |
| Mode 2 | CH19 |
| Mode 3 | CH39 |
| Mode 4 | Keeping TX mode |

| For Conducted Emission | |
|---|---|
| Final Test Mode | Description |
| Mode 4 | Keeping TX mode |

| For Radiated Emission | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | CH00 |
| Mode 2 | CH19 |
| Mode 3 | CH39 |

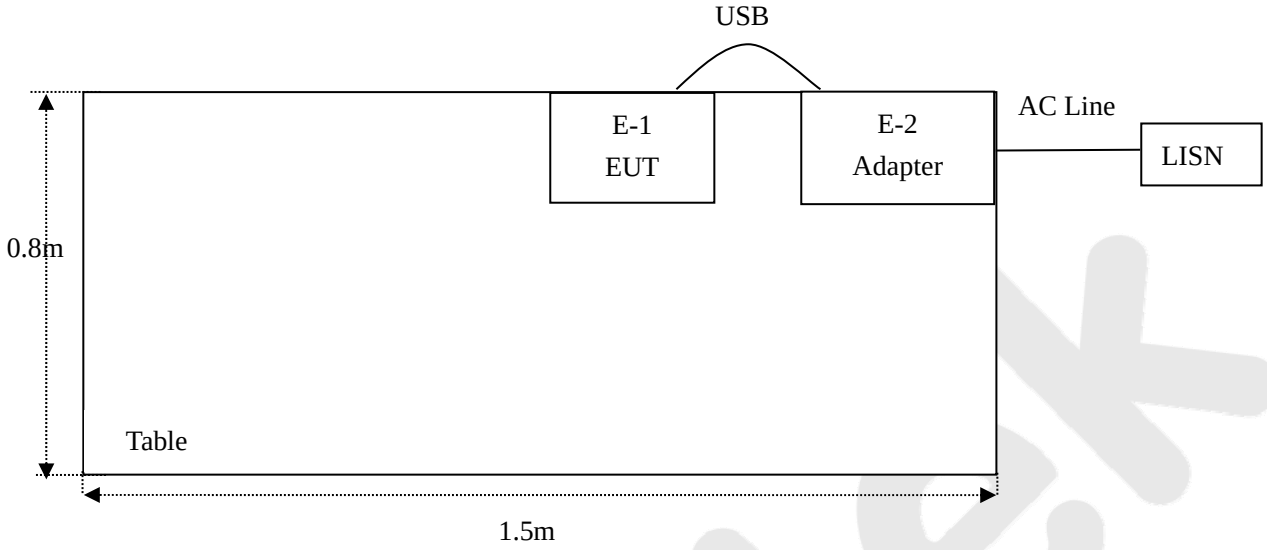
Note:
(1) The measurements are performed at the highest, middle, lowest available channels.
(2)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

## 1.5. List of channels

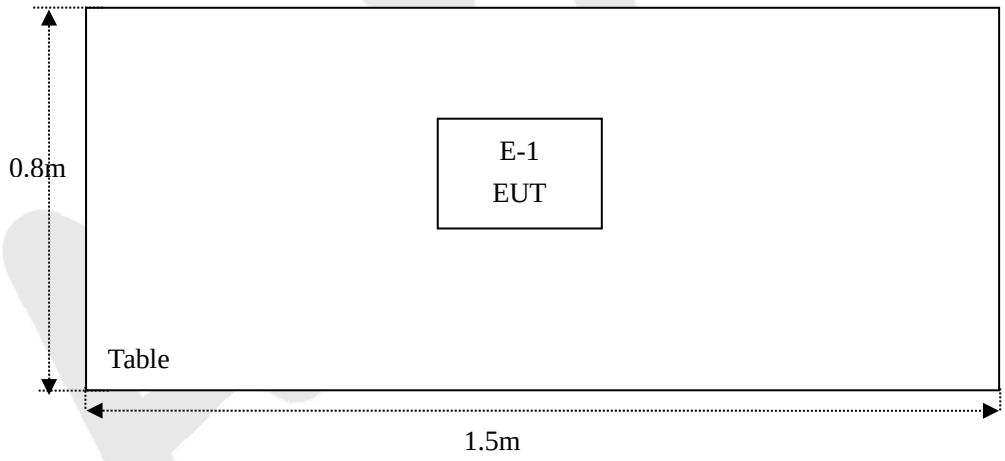
| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---|---|---|---|---|---|---|---|---|---|
| 00 | 2402 | 09 | 2420 | 18 | 2438 | 27 | 2456 | 36 | 2474 |
| 01 | 2404 | 10 | 2422 | 19 | 2440 | 28 | 2458 | 37 | 2476 |
| 02 | 2406 | 11 | 2424 | 20 | 2442 | 29 | 2460 | 38 | 2478 |
| 03 | 2408 | 12 | 2426 | 21 | 2444 | 30 | 2462 | 39 | 2480 |
| 04 | 2410 | 13 | 2428 | 22 | 2446 | 31 | 2464 | | |
| 05 | 2412 | 14 | 2430 | 23 | 2448 | 32 | 2466 | | |
| 06 | 2414 | 15 | 2432 | 24 | 2450 | 33 | 2468 | | |
| 07 | 2416 | 16 | 2434 | 25 | 2452 | 34 | 2470 | | |
| 08 | 2418 | 17 | 2436 | 26 | 2454 | 35 | 2472 | | |

## 1.6. Description Of Test Setup

CE




RE



## 1.7. Test Equipment List

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | L.I.S.N. Artificial Mains Network | Rohde & Schwarz | ENV216 | 100055 | May 27, 2017 | 1 Year |
| 2. | EMI Test Receiver | Rohde & Schwarz | ESCI | 100627 | May 27, 2017 | 1 Year |
| 3. | RF Switching Unit | Compliance Direction | RSU-M2 | 38303 | May 27, 2017 | 1 Year |
| 4. | Spectrum Analysis | Agilent | E4407B | US39390582 | May 27, 2017 | 1 Year |
| 5. | Preamplifier | SKET Electronic | BK1G18G30D | KD17503 | May 27, 2017 | 1 Year |
| 6. | EMI Test Receiver | Rohde & Schwarz | ESPI | 101604 | May 27, 2017 | 1 Year |
| 7. | Double Ridged Horn Antenna | Instruments corporation | GTH-0118 | 351600 | May 31, 2017 | 1 Year |
| 8. | Bilog Broadband Antenna | Schwarzbeck | VULB9163 | VULB 9163-289 | May 31, 2017 | 1 Year |
| 9. | Loop Antenna | Schwarzbeck | HFH2-Z2 | 100047 | Apr. 03, 2017 | 1 Year |
| 10. | Pre-amplifier | SONOMA | 310N | 186860 | May 27, 2017 | 1 Year |
| 11. | EMI Test Software EZ-EMC | SHURPLE | N/A | N/A | N/A | N/A |
| 12. | Power Sensor | DAER | RPR3006W | 15I00041SN045 | May 27, 2017 | 1 Year |
| 13. | Power Sensor | DAER | RPR3006W | 15I00041SN046 | May 27, 2017 | 1 Year |
| 14. | MXA Spectrum Analysis | Agilent | N9020A | MY51170037 | May 27, 2017 | 1 Year |
| 15. | MXG RF Vector Signal Generator | Agilent | N5182A | MY48180656 | May 27, 2017 | 1 Year |
| 16. | Signal Generator | Agilent | E4421B | MY41000743 | May 27, 2017 | 1 Year |
| 17. | DC Power supply | IVYTECH | IV6003 | 1601D6030007 | May 26, 2017 | 1 Year |
| 18. | TEMP&HUMI PROGRAMMABLE CHAMBER | Sertep | ZJ-HWHS80B | ZJ-17042804 | Mar. 03, 2017 | 1 Year |

## 1.8. Measurement Uncertainty

| | | |
|---|---|---|
| Radiation Uncertainty | : | Ur = 4.1 dB (Horizontal) |
| | | Ur = 4.3 dB (Vertical) |
| | | |
| Conduction Uncertainty | : | Uc = 3.4dB |

## 1.9. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**FCC-Registration No.: 752021**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 752021, July 06, 2016.

**ISED-Registration No.: 8058A-1**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

**Test Location**

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong, China

# 2. Summary of Test Results

| Standard Section | Test Item | Result |
|---|---|---|
| 15.203/15.247(c) | Antenna Requirement | PASS |
| 15.207 | Conducted Emission | PASS |
| 15.205/15.209 | Spurious Emission | PASS |
| 15.247(b)(3) | Conducted Peak Output Power | PASS |
| 15.247(a)(2) | 6dB Occupied Bandwidth | PASS |
| 15.247(e) | Power Spectral Density | PASS |
| 15.247(d) | Band Edge | PASS |
| **Remark:** "N/A" is an abbreviation for Not Applicable. | | |

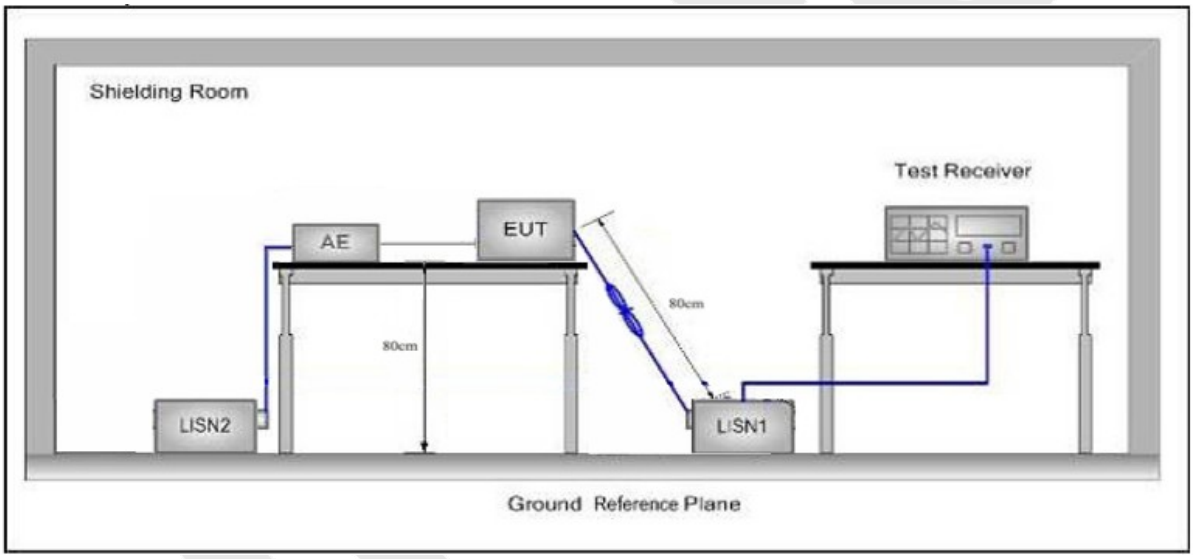
# 3. Conducted Emission Test

## 3.1. Test Standard and Limit

| Test Standard | FCC Part15 Section 15.207 | | |
|---|---|---|---|
| Test Limit | Frequency | Maximum RF Line Voltage (dBuV) | |
| | | Quasi-peak Level | Average Level |
| | 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| | 500kHz~5MHz | 56 | 46 |
| | 5MHz~30MHz | 60 | 50 |

**Remark:** (1) *Decreasing linearly with logarithm of the frequency.
(2) The lower limit shall apply at the transition frequency.

## 3.2. Test Setup




## 3.3. Test Procedure

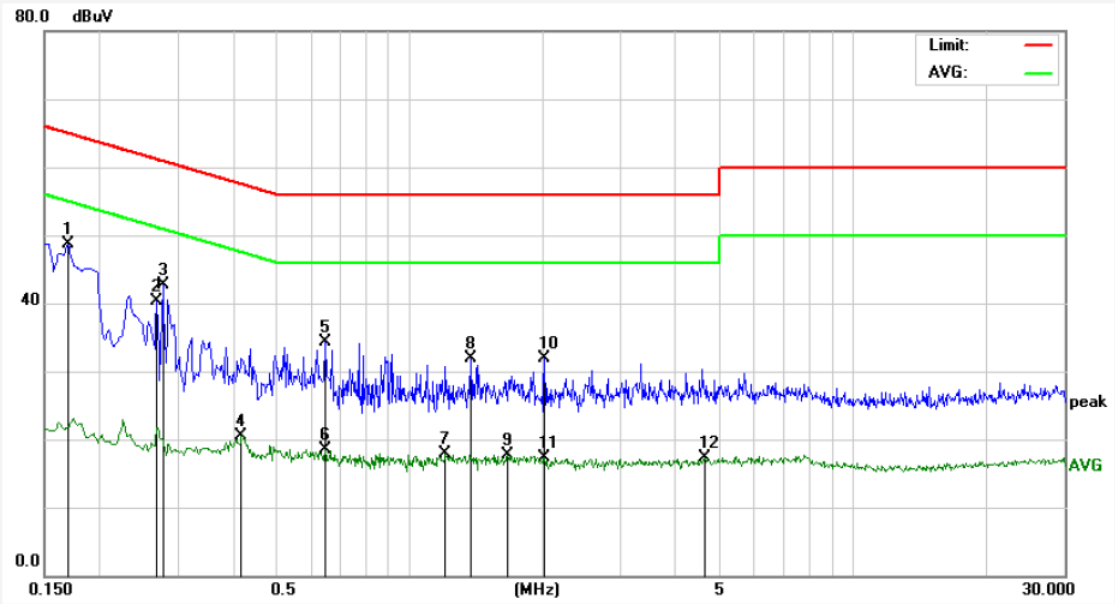
The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.
The bandwidth of test receiver (ESCI) set at 9kHz.
The frequency range from 150kHz to 30MHz is checked.

## 3.4. Test Data

Please to see the following pages

**Conducted Emission Test Data**

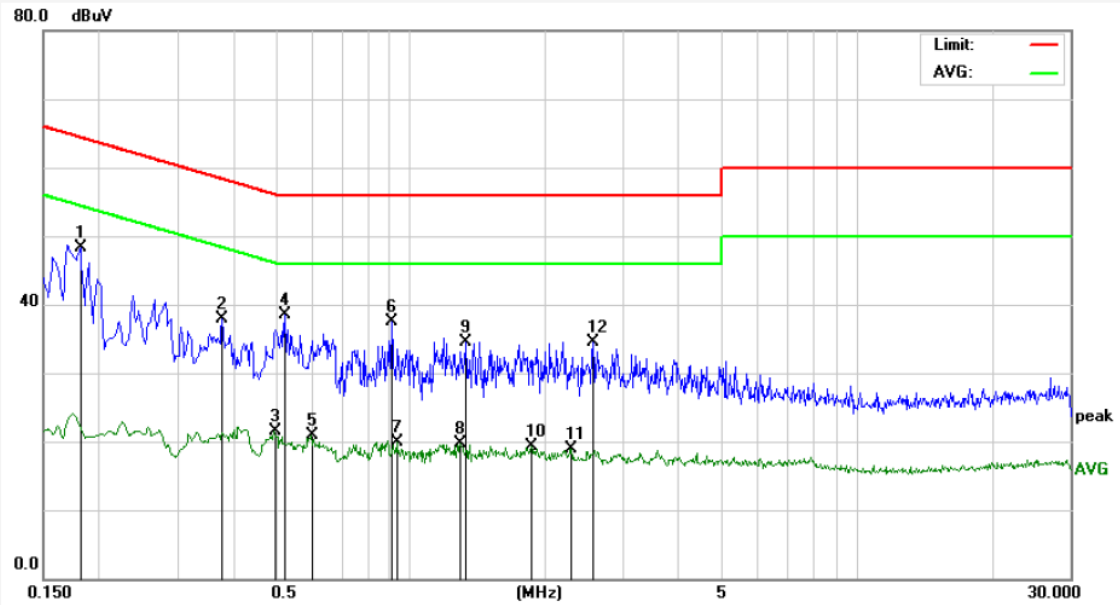
| | |
|---|---|
| Test Site: | 1# Shielded Room |
| Operating Condition: | Keeping TX mode |
| Test Specification: | AC 120V, 60Hz for adapter |
| Comment: | Live Line |
| | Tem.:25℃ Hum.:50% |




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1700 | 28.77 | 19.90 | 48.67 | 64.96 | -16.29 | QP | |
| 2 | 0.2700 | 20.38 | 19.89 | 40.27 | 61.12 | -20.85 | QP | |
| 3 | 0.2779 | 22.85 | 19.89 | 42.74 | 60.88 | -18.14 | QP | |
| 4 | 0.4180 | 0.59 | 19.94 | 20.53 | 47.49 | -26.96 | AVG | |
| 5 | 0.6460 | 14.27 | 20.02 | 34.29 | 56.00 | -21.71 | QP | |
| 6 | 0.6460 | -1.50 | 20.02 | 18.52 | 46.00 | -27.48 | AVG | |
| 7 | 1.2059 | -2.18 | 20.12 | 17.94 | 46.00 | -28.06 | AVG | |
| 8 | 1.3740 | 11.81 | 20.13 | 31.94 | 56.00 | -24.06 | QP | |
| 9 | 1.6700 | -2.43 | 20.13 | 17.70 | 46.00 | -28.30 | AVG | |
| 10 | 2.0140 | 11.67 | 20.14 | 31.81 | 56.00 | -24.19 | QP | |
| 11 | 2.0140 | -2.75 | 20.14 | 17.39 | 46.00 | -28.61 | AVG | |
| 12 | 4.6340 | -2.85 | 20.20 | 17.35 | 46.00 | -28.65 | AVG | |

**Conducted Emission Test Data**

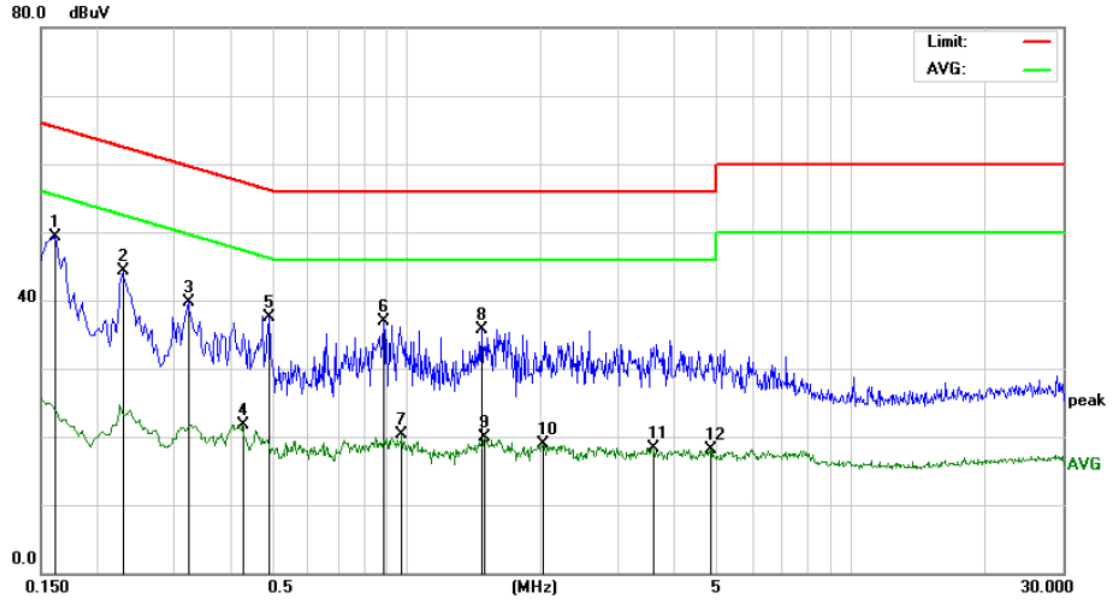
Test Site: 1# Shielded Room
Operating Condition: Keeping TX mode
Test Specification: AC 120V, 60Hz for adapter
Comment: Neutral Line
Tem.:25℃ Hum.:50%




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1819 | 28.37 | 19.90 | 48.27 | 64.39 | -16.12 | QP | |
| 2 | 0.3780 | 17.92 | 19.93 | 37.85 | 58.32 | -20.47 | QP | |
| 3 | 0.4940 | 1.43 | 19.98 | 21.41 | 46.10 | -24.69 | AVG | |
| 4 | 0.5220 | 18.59 | 19.99 | 38.58 | 56.00 | -17.42 | QP | |
| 5 | 0.5980 | 0.91 | 20.01 | 20.92 | 46.00 | -25.08 | AVG | |
| 6 | 0.9060 | 17.34 | 20.09 | 37.43 | 56.00 | -18.57 | QP | |
| 7 | 0.9300 | -0.24 | 20.10 | 19.86 | 46.00 | -26.14 | AVG | |
| 8 | 1.2940 | -0.45 | 20.13 | 19.68 | 46.00 | -26.32 | AVG | |
| 9 | 1.3300 | 14.37 | 20.13 | 34.50 | 56.00 | -21.50 | QP | |
| 10 | 1.8620 | -0.79 | 20.14 | 19.35 | 46.00 | -26.65 | AVG | |
| 11 | 2.2900 | -1.33 | 20.15 | 18.82 | 46.00 | -27.18 | AVG | |
| 12 | 2.5660 | 14.35 | 20.15 | 34.50 | 56.00 | -21.50 | QP | |

**Conducted Emission Test Data**

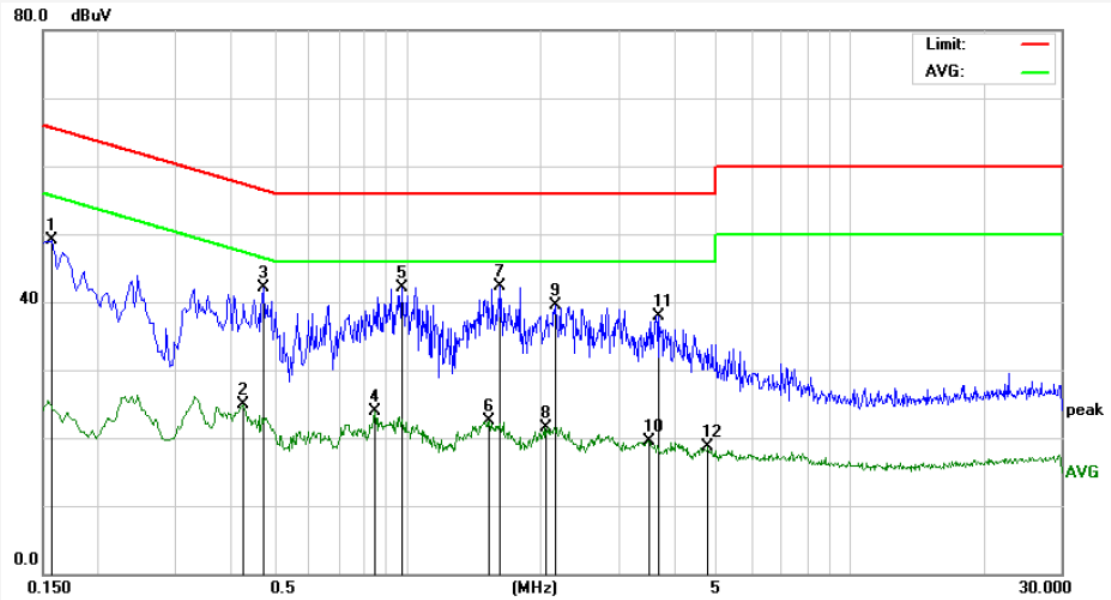
Test Site: 1# Shielded Room
Operating Condition: Keeping TX mode
Test Specification: AC 240V, 60Hz for adapter
Comment: Live Line
Tem.:25℃ Hum.:50%




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1620 | 29.36 | 19.90 | 49.26 | 65.36 | -16.10 | QP | |
| 2 | 0.2300 | 24.33 | 19.89 | 44.22 | 62.45 | -18.23 | QP | |
| 3 | 0.3220 | 19.72 | 19.90 | 39.62 | 59.65 | -20.03 | QP | |
| 4 | 0.4260 | 1.67 | 19.95 | 21.62 | 47.33 | -25.71 | AVG | |
| 5 | 0.4900 | 17.51 | 19.98 | 37.49 | 56.17 | -18.68 | QP | |
| 6 | 0.8860 | 16.86 | 20.09 | 36.95 | 56.00 | -19.05 | QP | |
| 7 | 0.9740 | 0.15 | 20.11 | 20.26 | 46.00 | -25.74 | AVG | |
| 8 | 1.4780 | 15.49 | 20.13 | 35.62 | 56.00 | -20.38 | QP | |
| 9 | 1.4980 | -0.13 | 20.13 | 20.00 | 46.00 | -26.00 | AVG | |
| 10 | 2.0260 | -1.20 | 20.14 | 18.94 | 46.00 | -27.06 | AVG | |
| 11 | 3.5820 | -1.77 | 20.17 | 18.40 | 46.00 | -27.60 | AVG | |
| 12 | 4.8260 | -2.14 | 20.20 | 18.06 | 46.00 | -27.94 | AVG | |

**Conducted Emission Test Data**

Test Site: 1# Shielded Room
Operating Condition: Keeping TX mode
Test Specification: AC 240V, 60Hz for adapter
Comment: Neutral Line
Tem.:25℃ Hum.:50%




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit dBuV | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1580 | 29.14 | 19.90 | 49.04 | 65.56 | -16.52 | QP | |
| 2 | 0.4260 | 4.98 | 19.95 | 24.93 | 47.33 | -22.40 | AVG | |
| 3 | 0.4740 | 22.06 | 19.97 | 42.03 | 56.44 | -14.41 | QP | |
| 4 | 0.8460 | 3.77 | 20.08 | 23.85 | 46.00 | -22.15 | AVG | |
| 5 | 0.9700 | 22.07 | 20.11 | 42.18 | 56.00 | -13.82 | QP | |
| 6 | 1.5339 | 2.30 | 20.13 | 22.43 | 46.00 | -23.57 | AVG | |
| 7 | 1.6260 | 22.08 | 20.13 | 42.21 | 56.00 | -13.79 | QP | |
| 8 | 2.0460 | 1.43 | 20.14 | 21.57 | 46.00 | -24.43 | AVG | |
| 9 | 2.1580 | 19.43 | 20.14 | 39.57 | 56.00 | -16.43 | QP | |
| 10 | 3.5260 | -0.61 | 20.17 | 19.56 | 46.00 | -26.44 | AVG | |
| 11 | 3.7180 | 17.78 | 20.17 | 37.95 | 56.00 | -18.05 | QP | |
| 12 | 4.7780 | -1.49 | 20.20 | 18.71 | 46.00 | -27.29 | AVG | |

# 4. Radiation Spurious Emission and Band Edge

## 4.1. Test Standard and Limit

| Test Standard | FCC Part15 C Section 15.209 and 15.205 | | | | |
|---|---|---|---|---|---|
| Test Limit | Frequency (MHz) | Field strength (microvolt/meter) | Limit (dBuV/m) | Remark | Measurement distance (m) |
| | 0.009MHz~0.490MHz | 2400/F(kHz) | - | - | 300 |
| | 0.490MHz-1.705MHz | 24000/F(kHz) | - | - | 30 |
| | 1.705MHz-30MHz | 30 | - | - | 30 |
| | 30MHz~88MHz | 100 | 40.0 | Quasi-peak | 3 |
| | 88MHz~216MHz | 150 | 43.5 | Quasi-peak | 3 |
| | 216MHz~960MHz | 200 | 46.0 | Quasi-peak | 3 |
| | 960MHz~1000MHz | 500 | 54.0 | Quasi-peak | 3 |
| | Above 1000MHz | 500 | 54.0 | Average | 3 |
| | | - | 74.0 | Peak | 3 |

**Remark:**

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

## 4.2. Test Setup

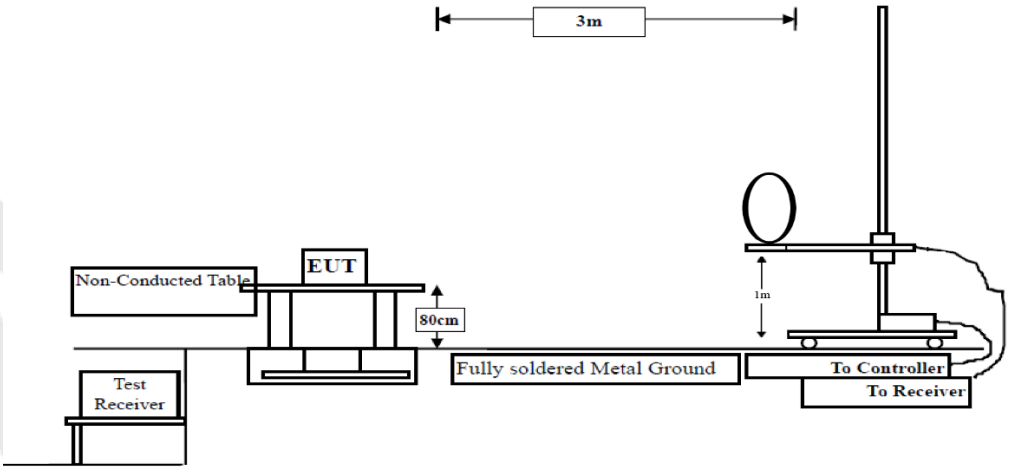



Figure 1. Below 30MHz

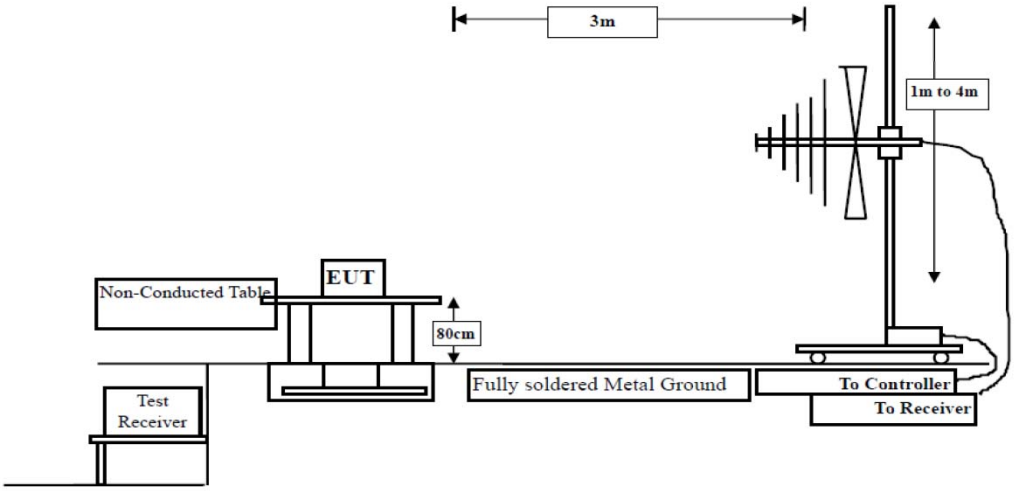



Figure 2. 30MHz to 1GHz

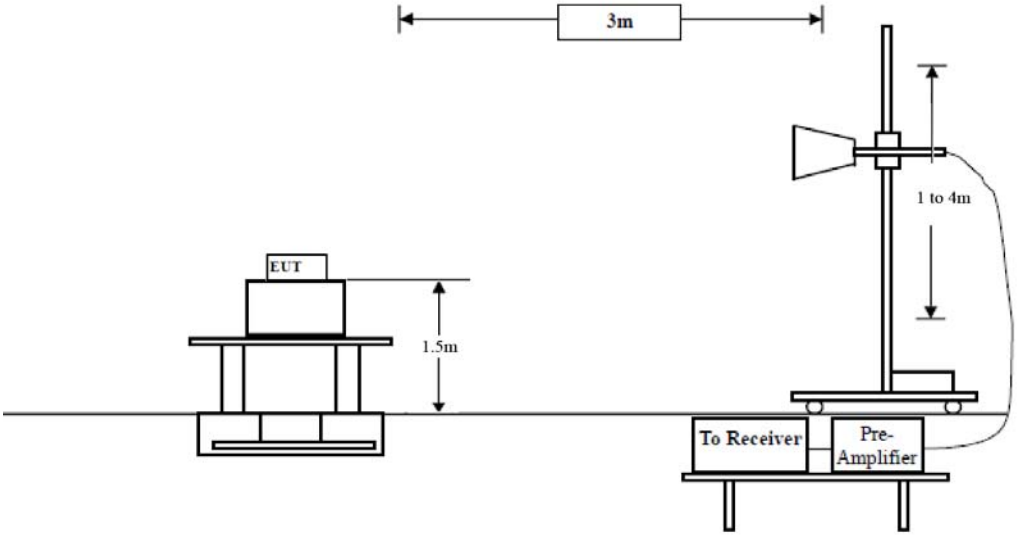



Figure 3. Above 1 GHz

## 4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz,Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz,Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

## 4.4. Test Data

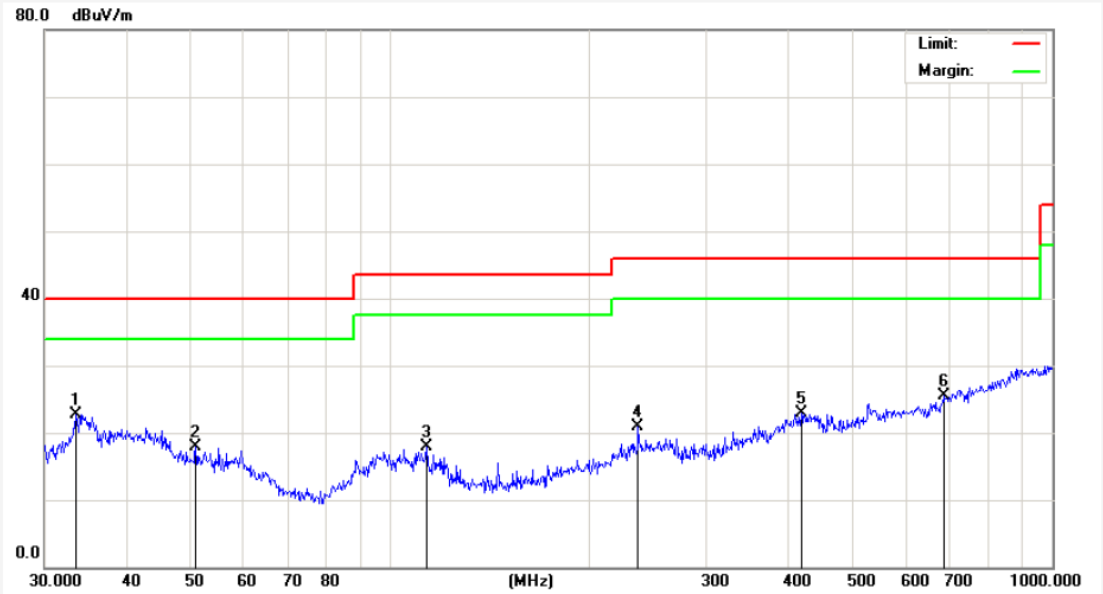
**PASS**

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz and above 18000MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

**Test Results (30~1000MHz)**

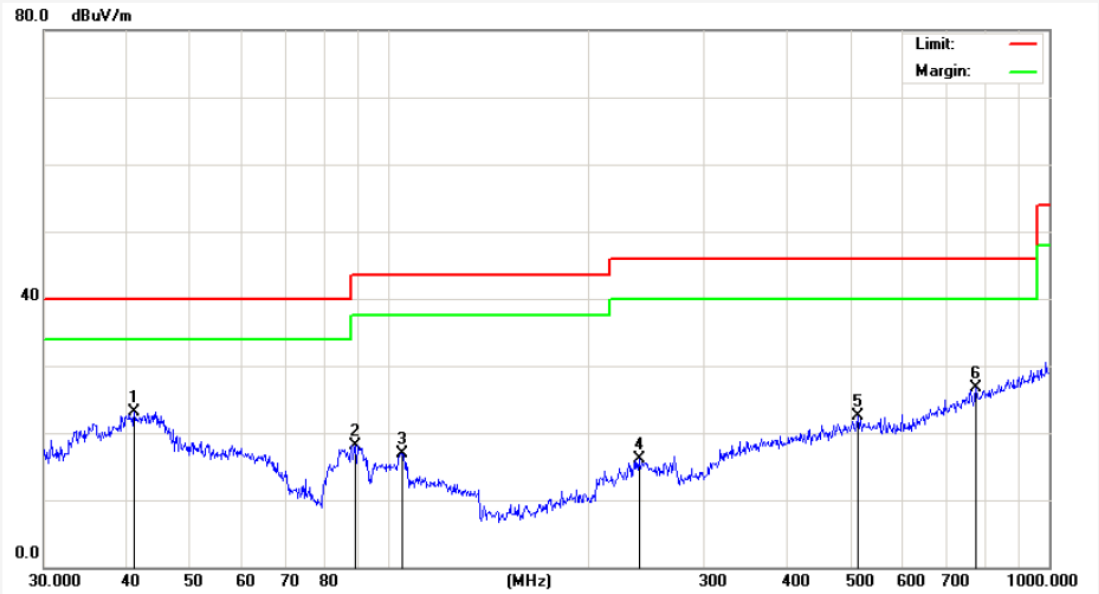
| | | | |
|---|---|---|---|
| Job No.: | 0217060244W | Temp.(℃)/Hum.(%RH): | 24.3℃/55%RH |
| Standard: | FCC PART 15C | Power Source: | DC 3.7V Battery inside |
| Test Mode: | TX Mode | Polarization: | Horizontal |




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/ | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 33.4449 | 37.88 | -15.12 | 22.76 | 40.00 | -17.24 | peak | | | |
| 2 | 50.7637 | 32.50 | -14.63 | 17.87 | 40.00 | -22.13 | peak | | | |
| 3 | 113.3163 | 38.71 | -20.86 | 17.85 | 43.50 | -25.65 | peak | | | |
| 4 | 236.6447 | 39.36 | -18.43 | 20.93 | 46.00 | -25.07 | peak | | | |
| 5 | 417.6411 | 35.33 | -12.44 | 22.89 | 46.00 | -23.11 | peak | | | |
| 6 | 684.7454 | 34.49 | -8.90 | 25.59 | 46.00 | -20.41 | peak | | | |

**Test Results (30~1000MHz)**

| | | | |
|---|---|---|---|
| Job No.: | 0217060244W | Temp.(℃)/Hum.(%RH): | 24.3℃/55%RH |
| Standard: | FCC PART 15C | Power Source: | DC 3.7V Battery inside |
| Test Mode: | TX Mode | Polarization: | Vertical |




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/ | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 41.1320 | 33.90 | -10.81 | 23.09 | 40.00 | -16.91 | peak | | | |
| 2 | 88.9639 | 36.08 | -17.98 | 18.10 | 43.50 | -25.40 | peak | | | |
| 3 | 104.9033 | 32.65 | -15.71 | 16.94 | 43.50 | -26.56 | peak | | | |
| 4 | 239.1473 | 30.15 | -14.13 | 16.02 | 46.00 | -29.98 | peak | | | |
| 5 | 513.6331 | 33.13 | -10.72 | 22.41 | 46.00 | -23.59 | peak | | | |
| 6 | 774.1584 | 32.95 | -6.31 | 26.64 | 46.00 | -19.36 | peak | | | |

**Test Results (Above 1000MHz)**

| Test Mode: TX Mode | | | | | Test channel: Lowest | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4804.00 | 38.29 | 34.04 | 6.58 | 34.09 | 44.82 | 74.00 | -29.18 | V |
| 7206.00 | 32.48 | 37.11 | 7.73 | 34.50 | 42.82 | 74.00 | -31.18 | V |
| 9608.00 | 32.05 | 39.31 | 9.23 | 34.79 | 45.80 | 74.00 | -28.20 | V |
| 12010.00 | * | | | | | 74.00 | | V |
| 14412.00 | * | | | | | 74.00 | | V |
| 4804.00 | 42.78 | 34.04 | 6.58 | 34.09 | 49.31 | 74.00 | -24.69 | H |
| 7206.00 | 34.33 | 37.11 | 7.73 | 34.50 | 44.67 | 74.00 | -29.33 | H |
| 9608.00 | 31.57 | 39.31 | 9.23 | 34.79 | 45.32 | 74.00 | -28.68 | H |
| 12010.00 | * | | | | | 74.00 | | H |
| 14412.00 | * | | | | | 74.00 | | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4804.00 | 26.92 | 34.04 | 6.58 | 34.09 | 33.45 | 54.00 | -20.55 | V |
| 7206.00 | 21.06 | 37.11 | 7.73 | 34.50 | 31.40 | 54.00 | -22.60 | V |
| 9608.00 | 20.08 | 39.31 | 9.23 | 34.79 | 33.83 | 54.00 | -20.17 | V |
| 12010.00 | * | | | | | 54.00 | | V |
| 14412.00 | * | | | | | 54.00 | | V |
| 4804.00 | 31.26 | 34.04 | 6.58 | 34.09 | 37.79 | 54.00 | -16.21 | H |
| 7206.00 | 23.30 | 37.11 | 7.73 | 34.50 | 33.64 | 54.00 | -20.36 | H |
| 9608.00 | 19.89 | 39.31 | 9.23 | 34.79 | 33.64 | 54.00 | -20.36 | H |
| 12010.00 | * | | | | | 54.00 | | H |
| 14412.00 | * | | | | | 54.00 | | H |

**Test Results (Above 1000MHz)**

| Test Mode: TX Mode | | | | | Test channel: Middle | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4880.00 | 36.90 | 34.38 | 6.69 | 34.09 | 43.88 | 74.00 | -30.12 | V |
| 7320.00 | 31.56 | 37.22 | 7.78 | 34.53 | 42.03 | 74.00 | -31.97 | V |
| 9760.00 | 31.23 | 39.46 | 9.35 | 34.80 | 45.24 | 74.00 | -28.76 | V |
| 12200.00 | * | | | | | 74.00 | | V |
| 14640.00 | * | | | | | 74.00 | | V |
| 4880.00 | 41.11 | 34.38 | 6.69 | 34.09 | 48.09 | 74.00 | -25.91 | H |
| 7320.00 | 33.28 | 37.22 | 7.78 | 34.53 | 43.75 | 74.00 | -30.25 | H |
| 9760.00 | 30.62 | 39.46 | 9.35 | 34.80 | 44.63 | 74.00 | -29.37 | H |
| 12200.00 | * | | | | | 74.00 | | H |
| 14640.00 | * | | | | | 74.00 | | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4880.00 | 25.81 | 34.38 | 6.69 | 34.09 | 32.79 | 54.00 | -21.21 | V |
| 7320.00 | 20.30 | 37.22 | 7.78 | 34.53 | 30.77 | 54.00 | -23.23 | V |
| 9760.00 | 19.41 | 39.46 | 9.35 | 34.80 | 33.42 | 54.00 | -20.58 | V |
| 12200.00 | * | | | | | 54.00 | | V |
| 14640.00 | * | | | | | 54.00 | | V |
| 4880.00 | 29.99 | 34.38 | 6.69 | 34.09 | 36.97 | 54.00 | -17.03 | H |
| 7320.00 | 22.45 | 37.22 | 7.78 | 34.53 | 32.92 | 54.00 | -21.08 | H |
| 9760.00 | 19.10 | 39.46 | 9.35 | 34.80 | 33.11 | 54.00 | -20.89 | H |
| 12200.00 | * | | | | | 54.00 | | H |
| 14640.00 | * | | | | | 54.00 | | H |

**Test Results (Above 1000MHz)**

| Test Mode: TX Mode | | | | | Test channel: Highest | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4960.00 | 36.51 | 34.72 | 6.79 | 34.09 | 43.93 | 74.00 | -30.07 | V |
| 7440.00 | 31.31 | 37.34 | 7.82 | 34.57 | 41.90 | 74.00 | -32.10 | V |
| 9920.00 | 31.00 | 39.62 | 9.46 | 34.81 | 45.27 | 74.00 | -28.73 | V |
| 12400.00 | * | | | | | 74.00 | | V |
| 14880.00 | * | | | | | 74.00 | | V |
| 4960.00 | 40.64 | 34.72 | 6.79 | 34.09 | 48.06 | 74.00 | -25.94 | H |
| 7440.00 | 32.99 | 37.34 | 7.82 | 34.57 | 43.58 | 74.00 | -30.42 | H |
| 9920.00 | 30.35 | 39.62 | 9.46 | 34.81 | 44.62 | 74.00 | -29.38 | H |
| 12400.00 | * | | | | | 74.00 | | H |
| 14880.00 | * | | | | | 74.00 | | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4960.00 | 25.54 | 34.72 | 6.79 | 34.09 | 32.96 | 54.00 | -21.04 | V |
| 7440.00 | 20.12 | 37.34 | 7.82 | 34.57 | 30.71 | 54.00 | -23.29 | V |
| 9920.00 | 19.25 | 39.62 | 9.46 | 34.81 | 33.52 | 54.00 | -20.48 | V |
| 12400.00 | * | | | | | 54.00 | | V |
| 14880.00 | * | | | | | 54.00 | | V |
| 4960.00 | 29.69 | 34.72 | 6.79 | 34.09 | 37.11 | 54.00 | -16.89 | H |
| 7440.00 | 22.25 | 37.34 | 7.82 | 34.57 | 32.84 | 54.00 | -21.16 | H |
| 9920.00 | 18.92 | 39.62 | 9.46 | 34.81 | 33.19 | 54.00 | -20.81 | H |
| 12400.00 | * | | | | | 54.00 | | H |
| 14880.00 | * | | | | | 54.00 | | H |

Remark:

1. 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.

**Radiated Band Edge:**

| Test Mode: GFSK | | | | | Test channel: Lowest | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00 | 46.70 | 29.15 | 3.41 | 34.01 | 45.25 | 74.00 | -28.75 | H |
| 2400.00 | 64.03 | 29.16 | 3.43 | 34.01 | 62.61 | 74.00 | -11.39 | H |
| 2390.00 | 47.61 | 29.15 | 3.41 | 34.01 | 46.16 | 74.00 | -27.84 | V |
| 2400.00 | 66.47 | 29.16 | 3.43 | 34.01 | 65.05 | 74.00 | -8.95 | V |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2390.00 | 36.38 | 29.15 | 3.41 | 34.01 | 34.93 | 54.00 | -19.07 | H |
| 2400.00 | 47.85 | 29.16 | 3.43 | 34.01 | 46.43 | 54.00 | -7.57 | H |
| 2390.00 | 36.60 | 29.15 | 3.41 | 34.01 | 35.15 | 54.00 | -18.85 | V |
| 2400.00 | 44.86 | 29.16 | 3.43 | 34.01 | 43.44 | 54.00 | -10.56 | V |

| Test Mode: GFSK | | | | | Test channel: Highest | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50 | 49.25 | 29.28 | 3.53 | 34.03 | 48.03 | 74.00 | -25.97 | H |
| 2500.00 | 47.70 | 29.30 | 3.56 | 34.03 | 46.53 | 74.00 | -27.47 | H |
| 2483.50 | 50.73 | 29.28 | 3.53 | 34.03 | 49.51 | 74.00 | -24.49 | V |
| 2500.00 | 49.06 | 29.30 | 3.56 | 34.03 | 47.89 | 74.00 | -26.11 | V |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 2483.50 | 39.25 | 29.28 | 3.53 | 34.03 | 38.03 | 54.00 | -15.97 | H |
| 2500.00 | 36.71 | 29.30 | 3.56 | 34.03 | 35.54 | 54.00 | -18.46 | H |
| 2483.50 | 40.78 | 29.28 | 3.53 | 34.03 | 39.56 | 54.00 | -14.44 | V |
| 2500.00 | 36.95 | 29.30 | 3.56 | 34.03 | 35.78 | 54.00 | -18.22 | V |

Remark:

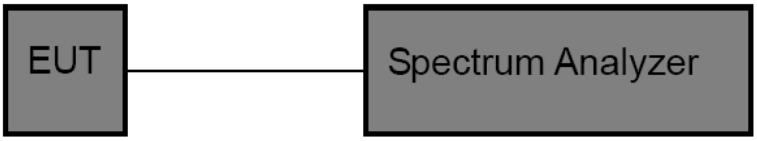
1. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

# 5. Maximum Peak Output Power Test

## 5.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section 15.247 (b)(3) |
| Test Limit | 30dBm |

## 5.2. Test Setup




## 5.3. Test Procedure

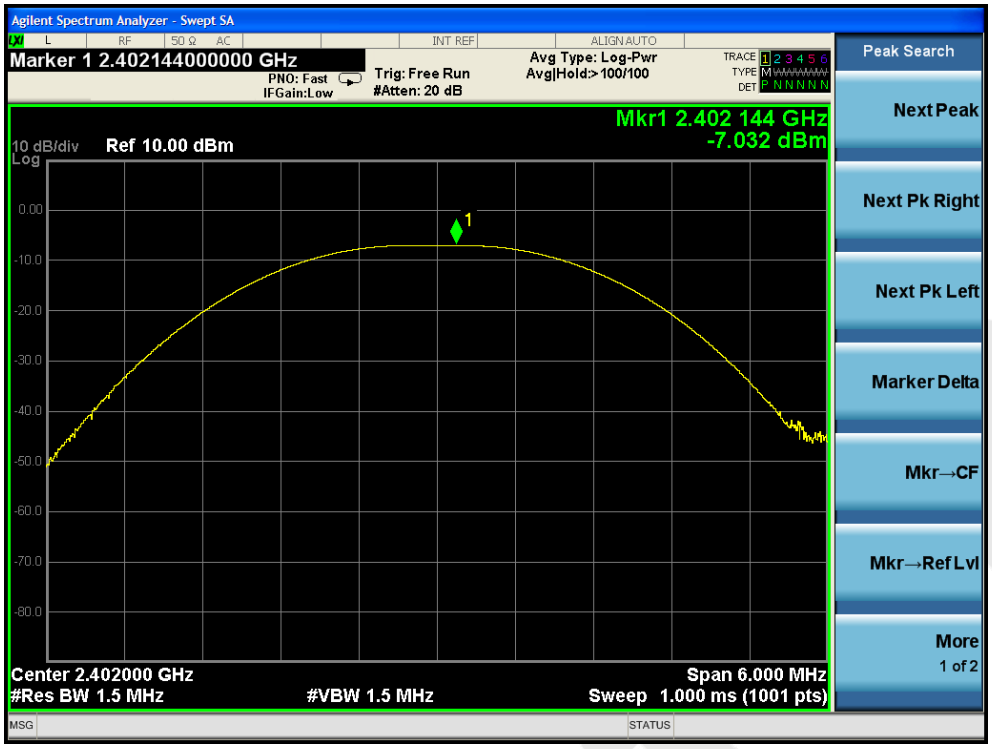
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

1. Set the RBW ≥DTS bandwidth.
2. Set the VBW≥3*RBW.
3. Set the span≥ 3*RBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

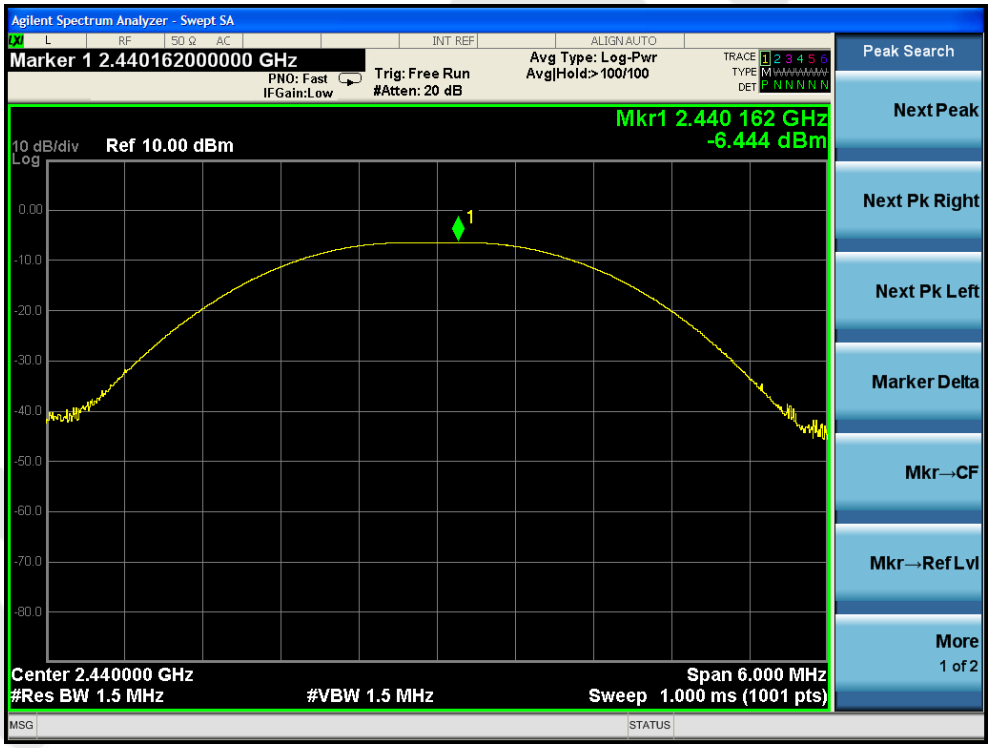
## 5.4. Test Data

| | | | | | |
|---|---|---|---|---|---|
| Test Item | : | Max. peak output power | Test Mode | : | CH Low ~ CH High |
| Test Voltage | : | DC 3.7V Battery inside | Temperature | : | 24℃ |
| Test Result | : | PASS | Humidity | : | 55%RH |

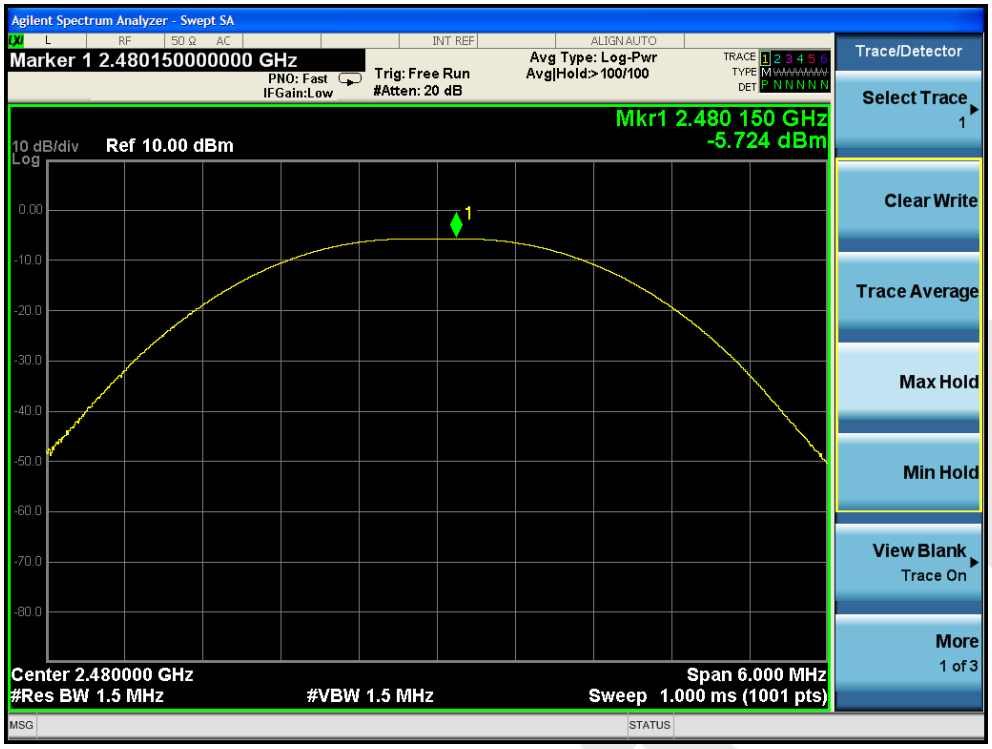
| Channel Frequency (MHz) | Peak Power output (dBm) | Limit (dBm) | Results |
|---|---|---|---|
| 2402 | -7.032 | 30 | PASS |
| 2440 | -6.444 | 30 | PASS |
| 2480 | **-5.724** | 30 | PASS |




CH: Low




CH: Middle


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.480150000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.480 150 GHz
-5.724 dBm
10 dB/div
Log
Ref 10.00 dBm
Center 2.480000 GHz
#Res BW 1.5 MHz
#VBW 1.5 MHz
Span 6.000 MHz
Sweep 1.000 ms (1001 pts)
Trace/Detector
Select Trace
Clear Write
Trace Average
Max Hold
Min Hold
View Blank
Trace On
More
1 of 3

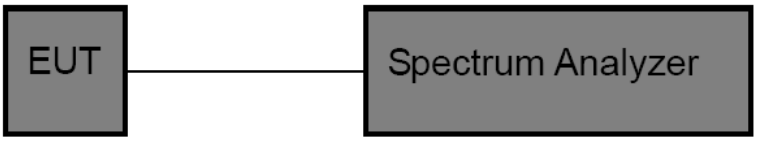
CH: High

# 6. 6DB Occupy Bandwidth Test

## 6.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section 15.247 (a)(2) |
| Test Limit | >500kHz |

## 6.2. Test Setup




## 6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:

RBW = 100kHz, VBW⩾3*RBW =300kHz,

Detector= Peak

Trace mode= Max hold.

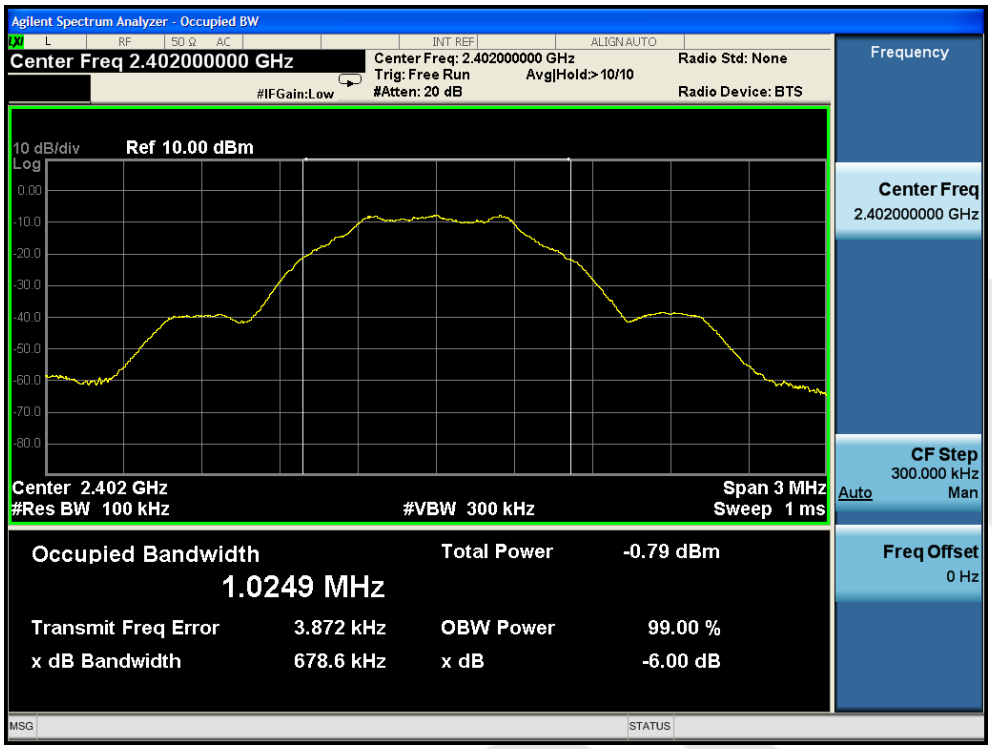
Sweep- auto couple.

4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

## 6.4. Test Data

| | | | | | |
|---|---|---|---|---|---|
| Test Item | : | 6dB Bandwidth | Test Mode | : | CH Low ~ CH High |
| Test Voltage | : | DC 3.7V Battery inside | Temperature | : | 24℃ |
| Test Result | : | PASS | Humidity | : | 55%RH |

| Channel | Frequency(MHz) | Bandwidth (kHz) | Limit (kHz) | Results |
|---|---|---|---|---|
| Low | 2402 | 678.6 | >500 | PASS |
| Middle | 2440 | 690.0 | | PASS |
| High | 2480 | 687.7 | | PASS |




CH: Low

CH: Middle

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
Frequency
10 dB/div
Ref 10.00 dBm
Log
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.0283 MHz
Total Power
0.33 dBm
Freq Offset
0 Hz
Transmit Freq Error
3.812 kHz
OBW Power
99.00 %
x dB Bandwidth
687.7 kHz
x dB
-6.00 dB
MSG
STATUS

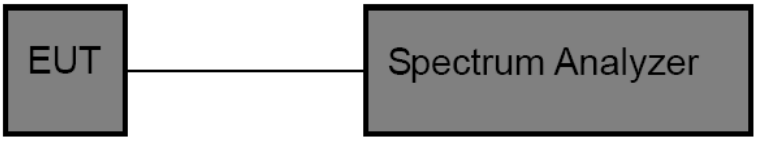
CH: High

# 7. Power Spectral Density Test

## 7.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section 15.247 (e) |
| Test Limit | 8dBm |

## 7.2. Test Setup



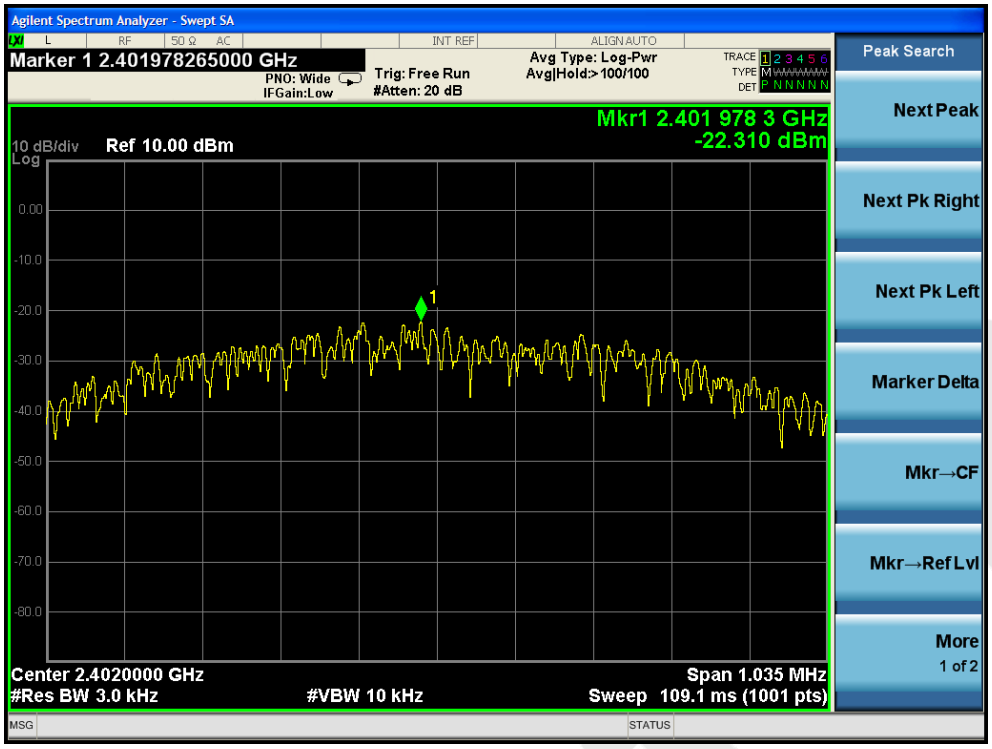

## 7.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

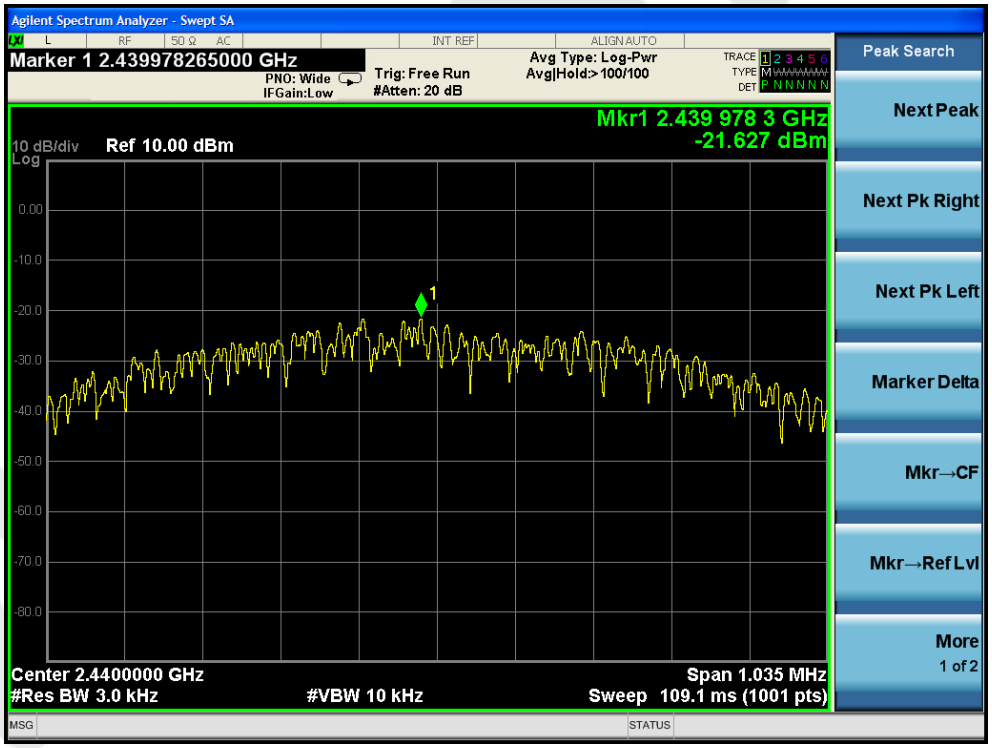
## 7.4. Test Data

| | | | | | |
|---|---|---|---|---|---|
| Test Item | : | Power Spectral Density | Test Mode | : | CH Low ~ CH High |
| Test Voltage | : | DC 3.7V Battery inside | Temperature | : | 24℃ |
| Test Result | : | PASS | Humidity | : | 55%RH |

| Channel | Frequency (MHz) | PPSD (dBm/3KHz) | Limit (dBm/3KHz) | Results |
|---|---|---|---|---|
| Low | 2402 | -22.310 | 8.00 | PASS |
| Middle | 2440 | -21.627 | 8.00 | PASS |
| High | 2480 | -20.519 | 8.00 | PASS |




CH: Low




CH: Middle

Agilent Spectrum Analyzer - Swept SA
Marker 1 2.479977575000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 78/100
Mkr1 2.479 977 6 GHz
-20.519 dBm
10 dB/div
Log
Ref 10.00 dBm
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.035 MHz
Sweep 109.2 ms (601 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

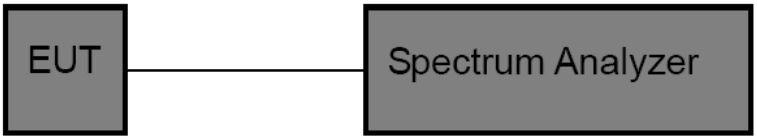
CH: High

# 8. 100kHz Bandwidth of Frequency Band Edge Requirement

## 8.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section 15.247 (d) |
| Test Limit | in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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 in15.209(a). |

## 8.2. Test Setup




## 8.3. Test Procedure

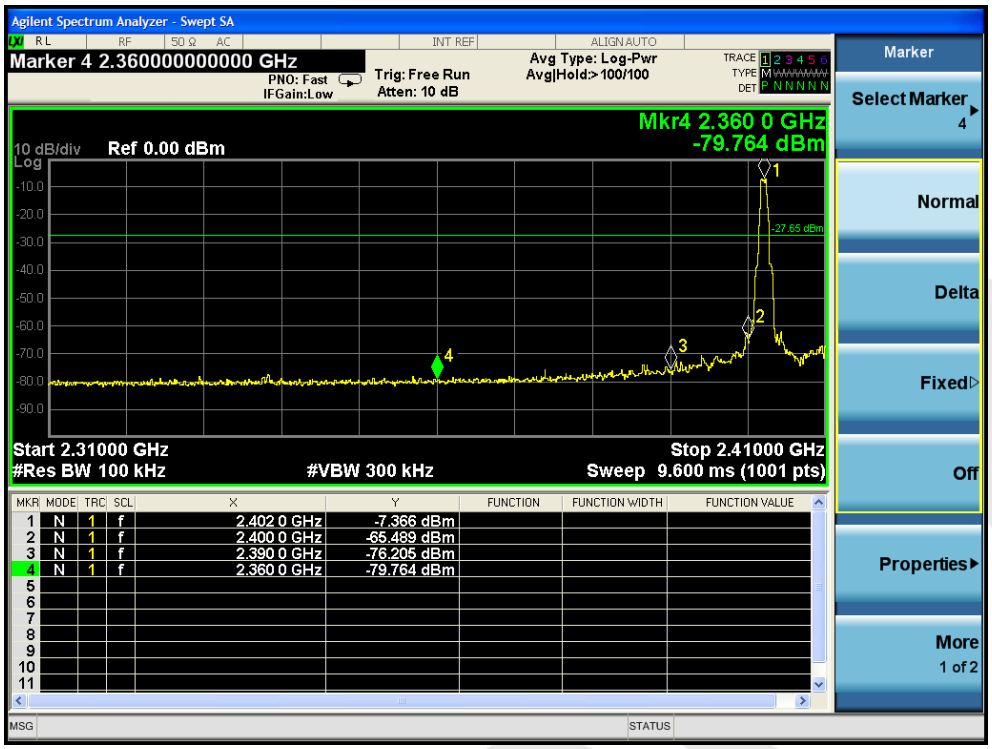
Using the following spectrum analyzer setting:

1. Set the RBW = 100KHz.
2. Set the VBW = 300KHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

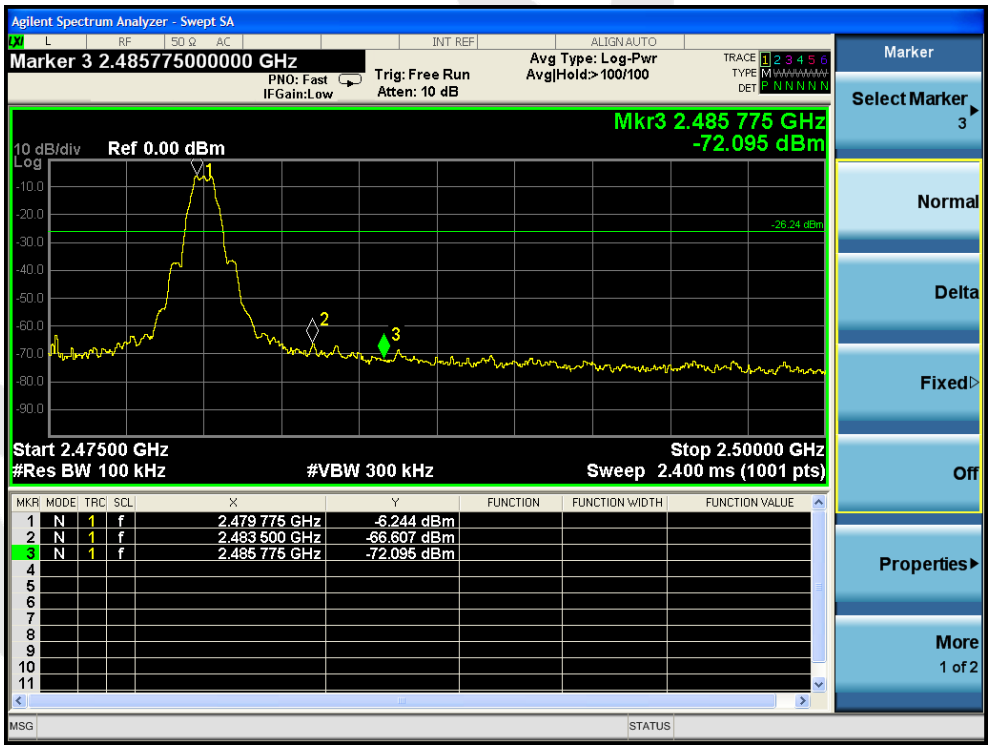
## 8.4. Test Data

| | | | | | |
|---|---|---|---|---|---|
| Test Item | : | Band edge | Test Mode | : | CH Low ~ CH High |
| Test Voltage | : | DC 3.7V Battery inside | Temperature | : | 24℃ |
| Test Result | : | PASS | Humidity | : | 55%RH |

| Frequency Band (MHz) | Delta Peak toBand Emission (dBc) | Limit (dBc) | Results |
|---|---|---|---|
| 2400 | 58.123 | >20 | PASS |
| 2483.5 | 60.363 | >20 | PASS |




CH: Low




CH: High

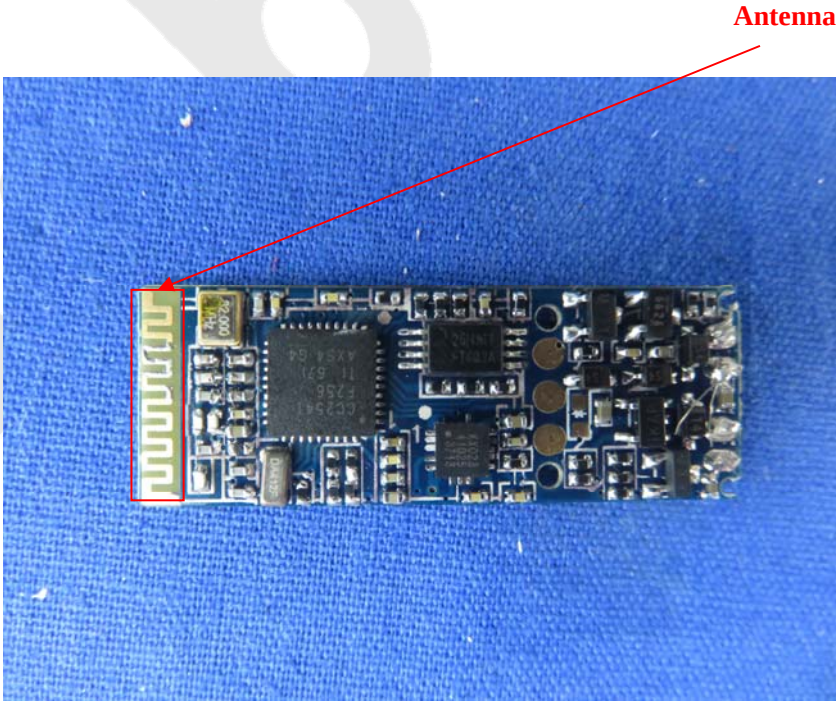
# 9. Antenna Requirement

## 9.1. Test Standard and Requirement

| | |
|---|---|
| Test Standard | FCC Part15 Section 15.203 /247(c) |
| Requirement | 1) 15.203 requirement:<br>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.<br>2) 15.247(c) (1)(i) requirement:<br>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 6 dBi. |

## 9.2. Antenna Connected Construction

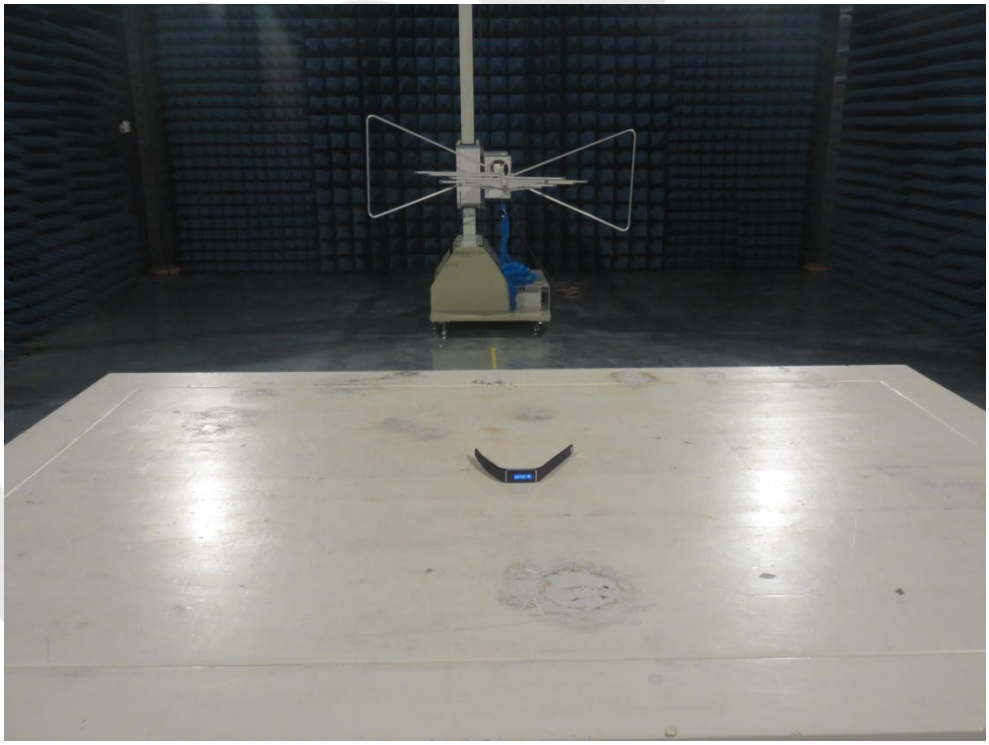
The antenna is a PCB Antenna which permanently attached, and the best case gain of the antenna is 0dBi. It complies with the standard requirement.

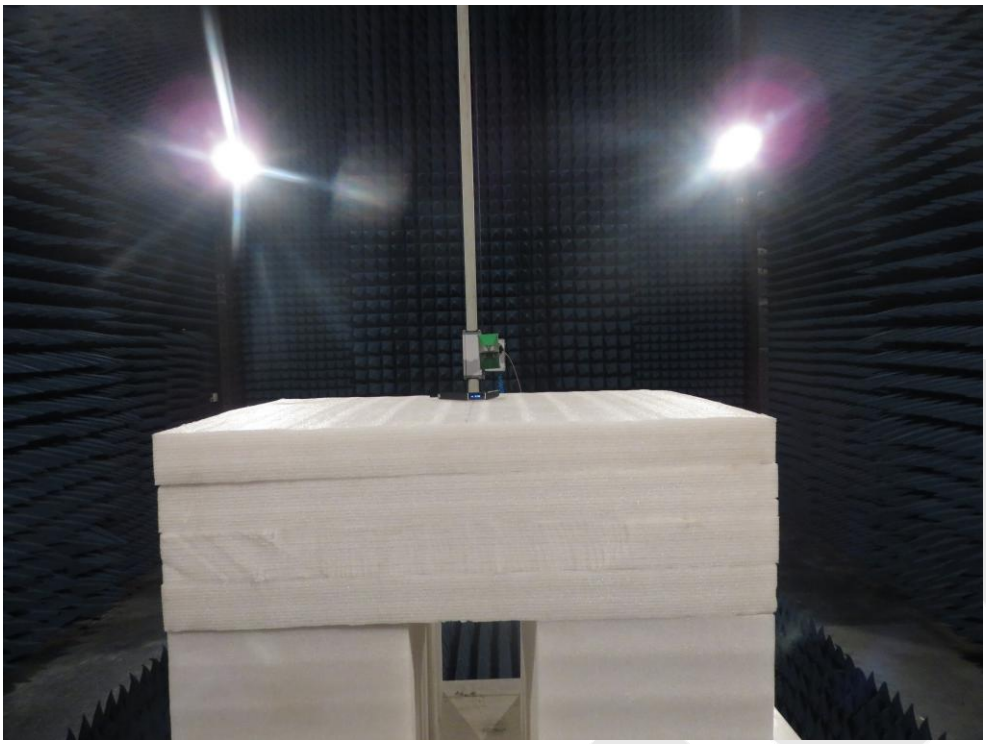


# APPENDIX I -- TEST SETUP PHOTOGRAPH

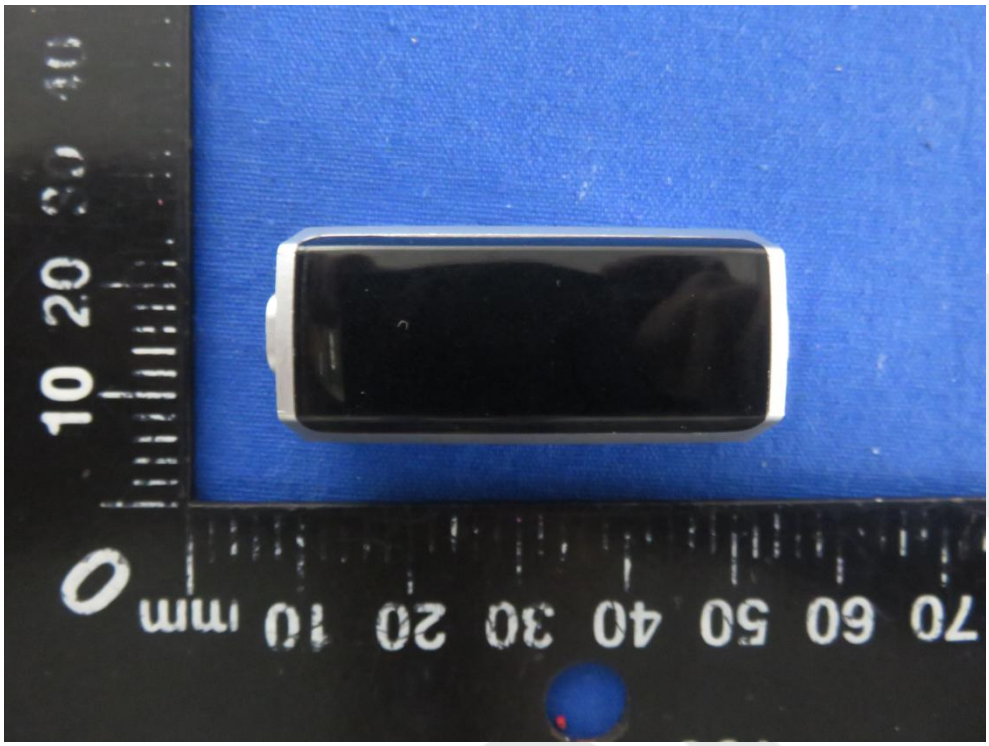
Photo of Conducted Emission Measurement

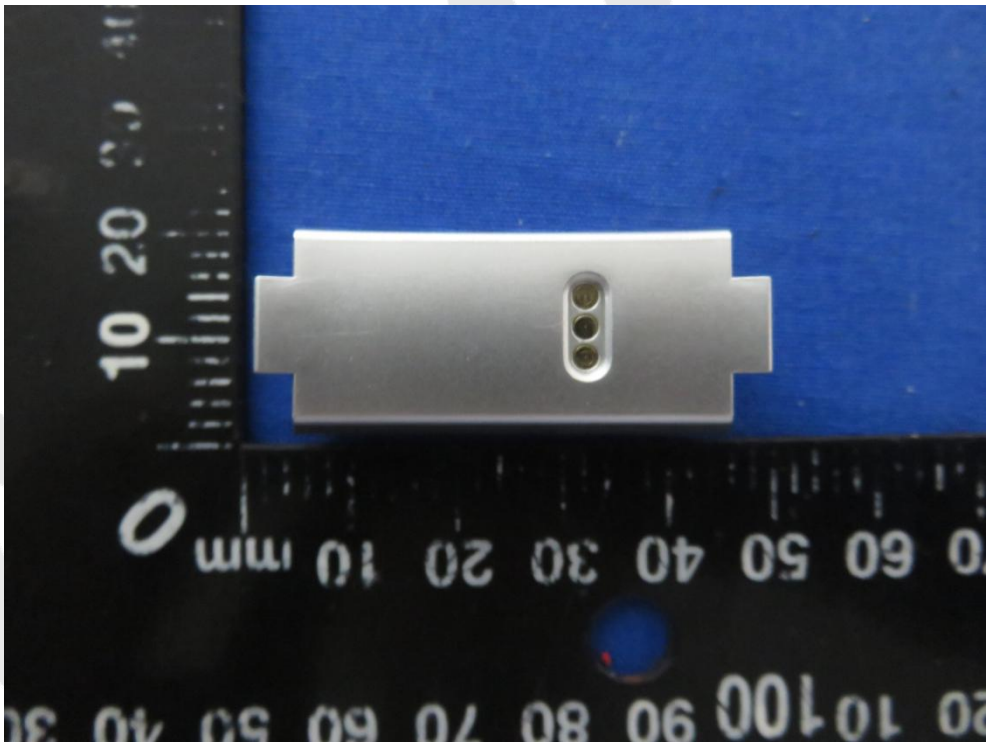
Photo of Radiation Emission Test

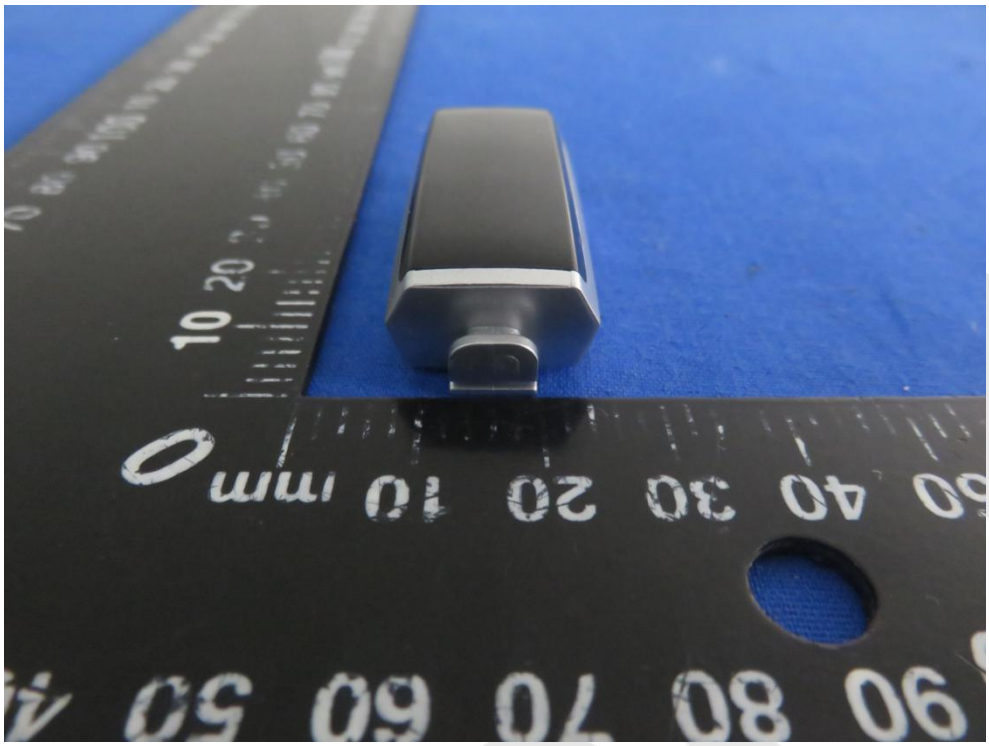


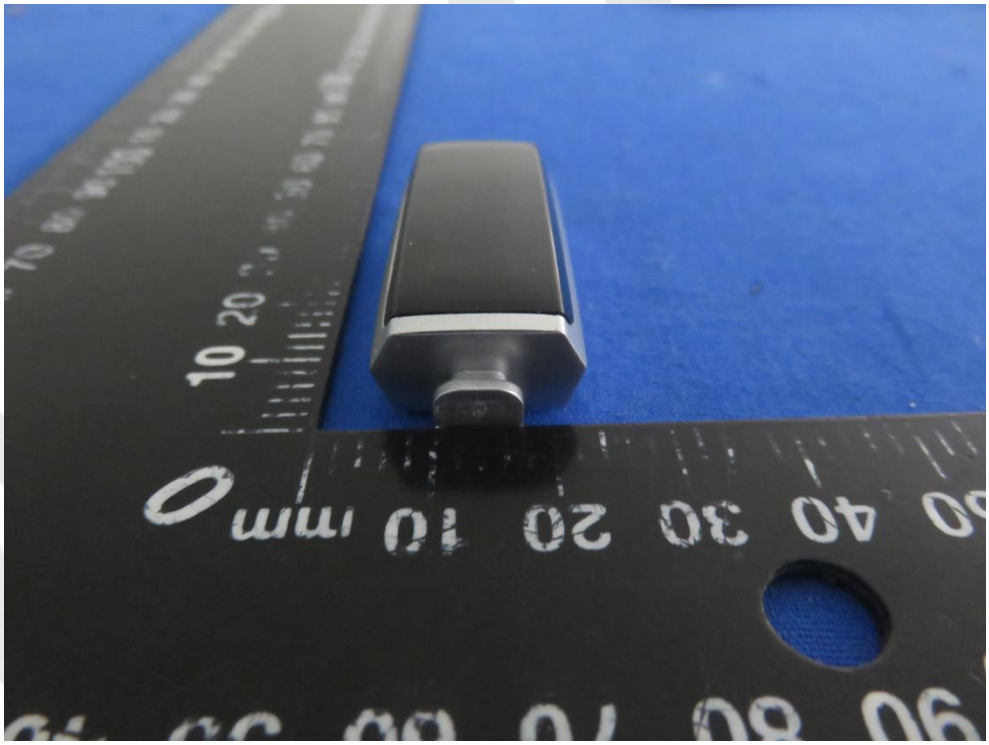


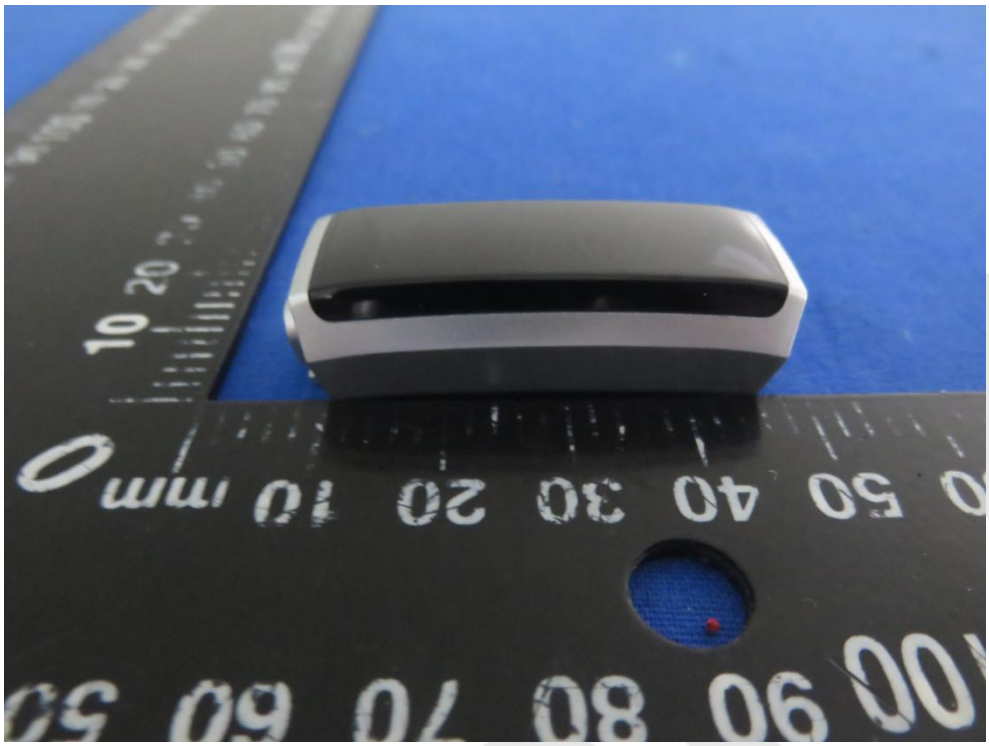
# APPENDIX II -- EXTERNAL PHOTOGRAPH

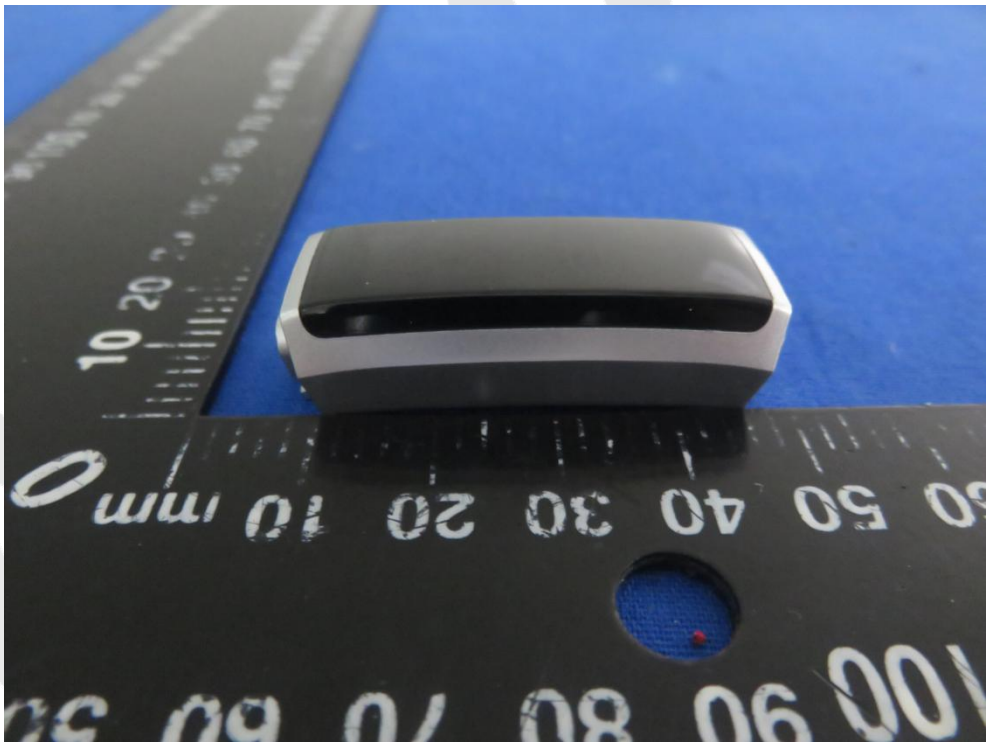




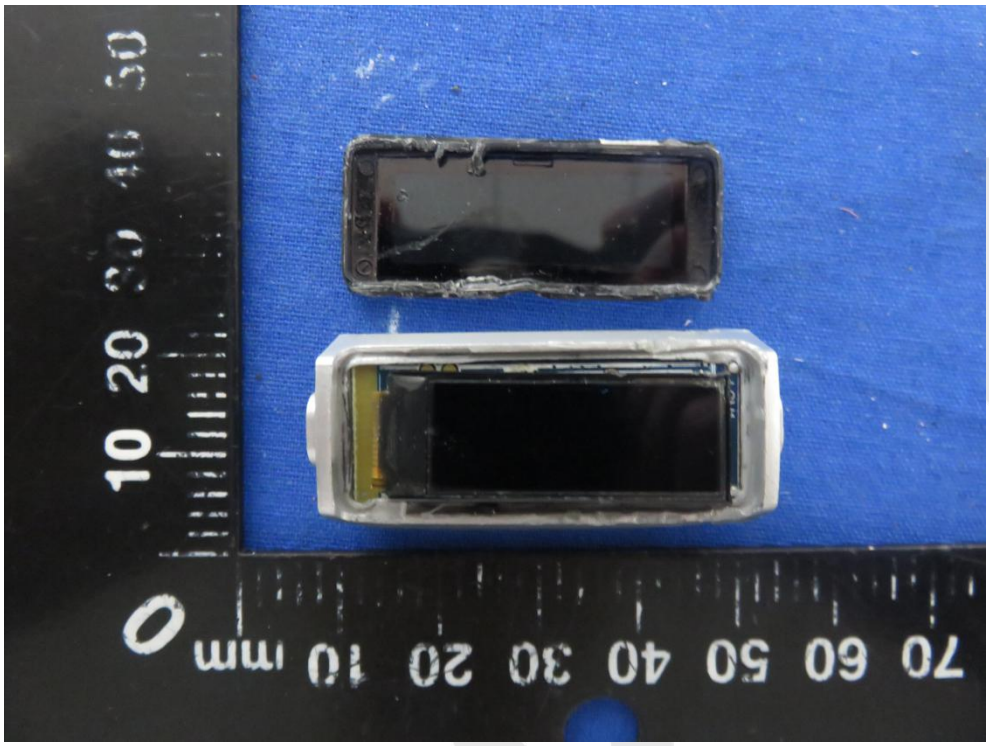


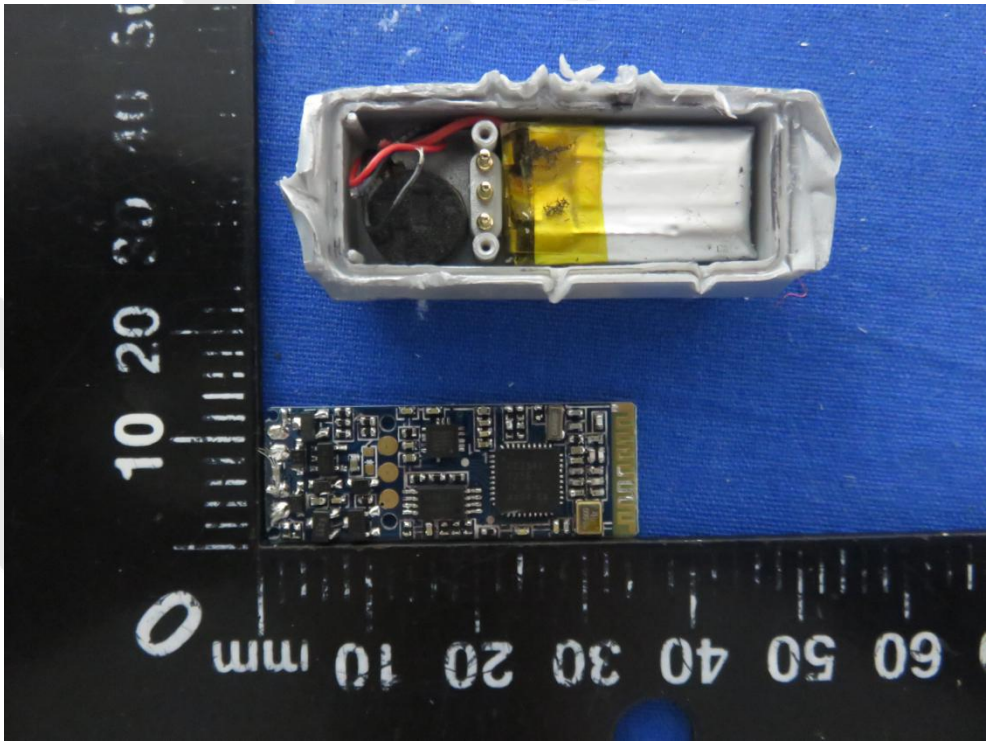


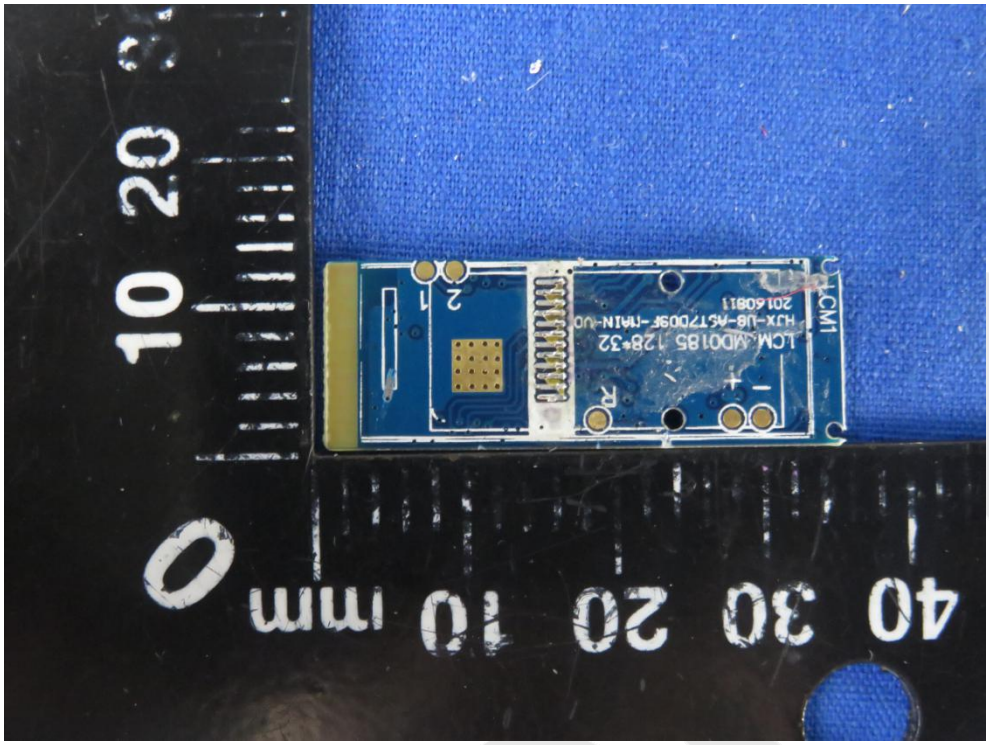


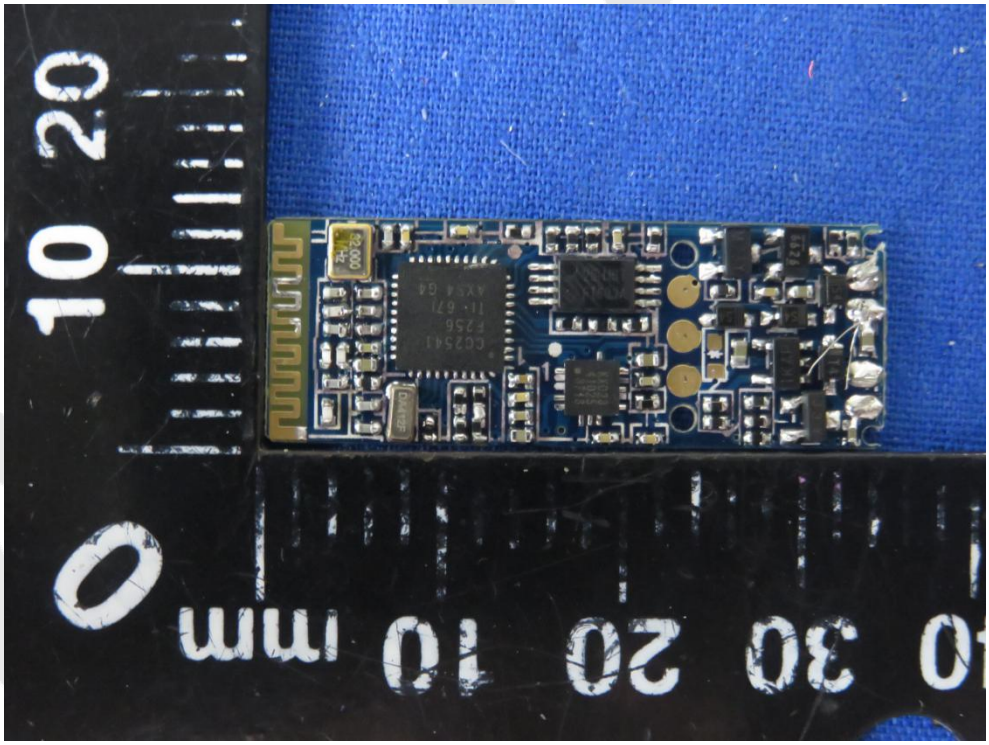
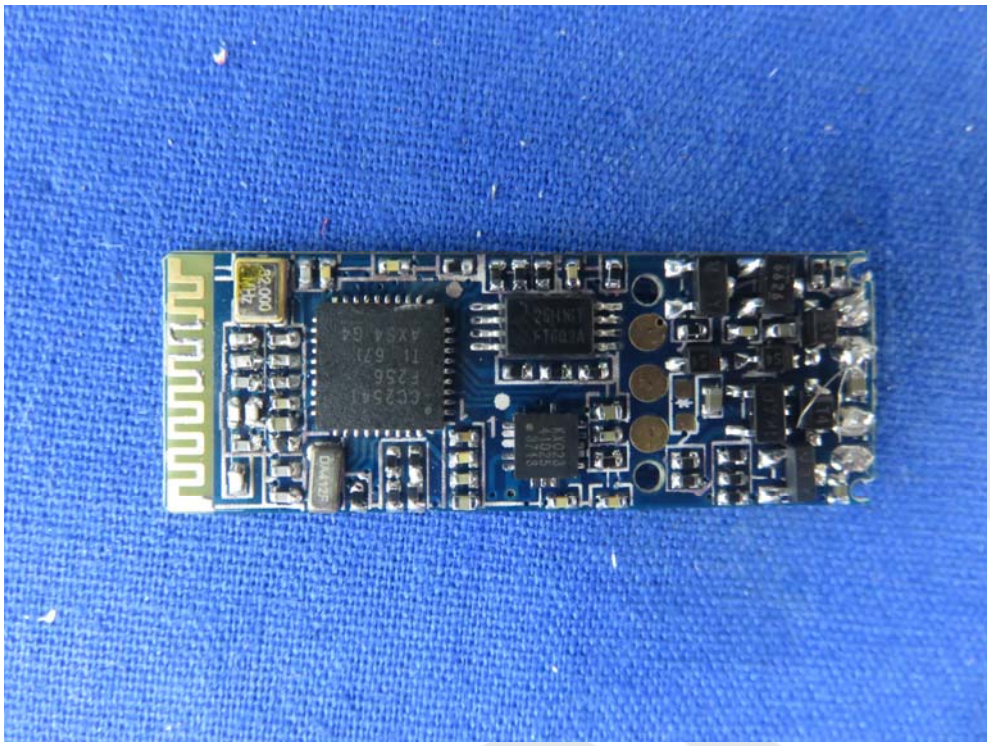
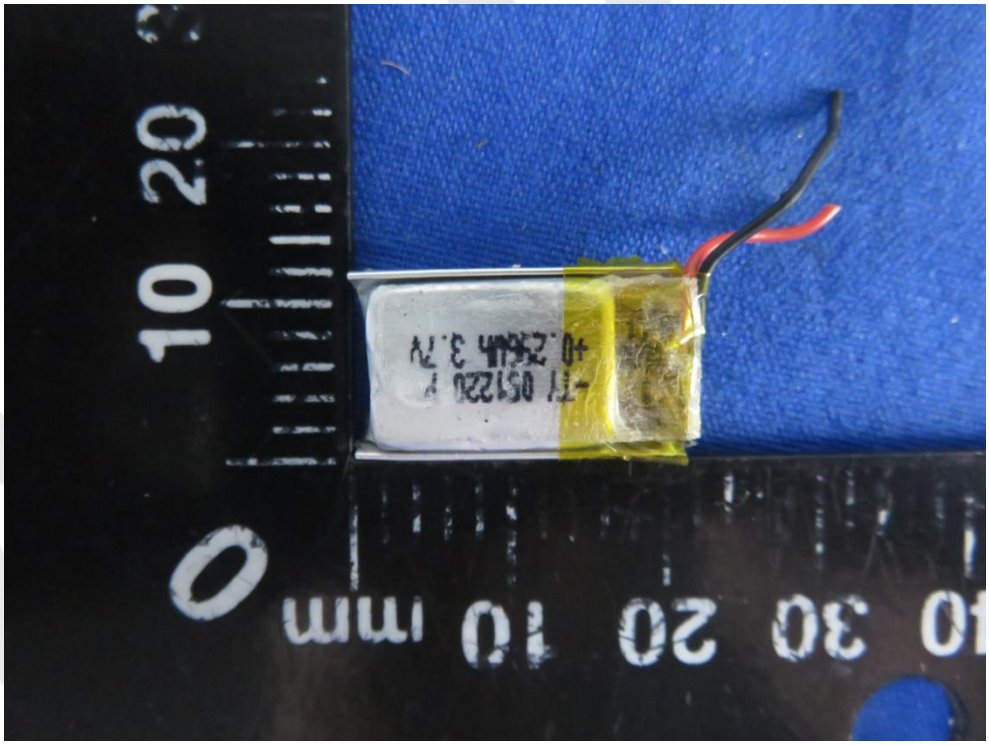


# APPENDIX III -- INTERNAL PHOTOGRAPH






LCM1
LCM-MD0185 128*32
HJX-U8-MS72009F-MAIN-V0
20160811
2
1
R
+
-
40 30 20 10 mm 0
10 20


40 30 20 10 mm 0
10 20