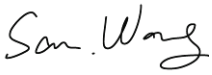
**Shenzhen GUOREN Certification Technology Service Co., Ltd.**

101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

# FCC PART 15 SUBPART C TEST REPORT

## FCC PART 15.249

| | | |
|---|---|---|
| **Report Reference No.**.....: | **GRCTR211002001-02** | |
| **FCC ID**..... **:** | **HLEMS836BG** | |
| Compiled by<br>( position+printed name+signature)..: | File administrators Jimmy Wang |  |
| Supervised by<br>( position+printed name+signature)..: | Test Engineer Kelley Zhang |  |
| Approved by<br>( position+printed name+signature)..: | Manager Sam Wang |  |
| Date of issue.....: | Oct. 29, 2021 | |
| **Testing Laboratory Name** .....: | **Shenzhen GUOREN Certification Technology Service Co., Ltd.** | |
| Address .....: | 101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China | |
| **Applicant's name**.....: | **unitech electronics co., ltd.** | |
| Address .....: | 5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist., New Taipei City, Taiwan | |
| **Test specification** .....**:** | | |
| Standard .....: | **FCC Part 15.249: Operation within the bands 902-928 MHz, 2400-2483.5 MHz ,5725-5850 MHz,and 24.0-24.25 GHz** | |



| | |
|---|---|
| **Test item description .....:** | **2.4G Wireless Laser Barcode Scanner** |
| Trade Mark .....: | unitech |
| Manufacturer .....: | unitech electronics co., ltd. |
| Model/Type reference.....: | MS836B |
| Listed Models .....: | N/A |
| Modulation Type .....: | GFSK |
| Operation Frequency.....: | 2478MHz |
| EUT Type .....: | Production Unit |
| Rating .....: | DC 3.70V from battery and DC 5V from external circuit |
| Result.....: | **PASS** |

# TEST REPORT

| | | |
|---|---|---|
| Equipment under Test | : | 2.4G Wireless Laser Barcode Scanner |
| Model /Type | : | MS836B |
| Listed Models | : | N/A |
| **Applicant** | : | **unitech electronics co., ltd.** |
| Address | : | 5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist., New Taipei City, Taiwan |
| **Manufacturer** | : | **unitech electronics co., ltd.** |
| Address | : | 5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist., New Taipei City, Taiwan |

| | |
|---|---|
| **Test Result**: | **PASS** |

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# Contents

# 1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.249: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

# 2. SUMMARY

## 2.1. General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | Oct. 11, 2021 |
| | | |
| | | |
| Testing commenced on | : | Oct. 11, 2021 |
| | | |
| | | |
| Testing concluded on | : | Oct. 29, 2021 |

## 2.2. Product Description

| | |
|---|---|
| Product Description: | 2.4G Wireless Laser Barcode Scanner |
| Model/Type reference: | MS836B |
| Listed Models: | N/A |
| Power supply: | DC 3.70V from battery and DC 5V from external circuit |
| Adapter: | Model: EP-TA20CBC<br>Input:AC 100-240V 50/60Hz<br>Output:DC 5V 2A |
| Testing sample ID: | GRCTR211002001-1# (Engineer sample),<br>GRCTR211002001-2# (Normal sample) |
| Firmware Version: | V1.0 |
| Hardware Version: | V1.0 |
| Modulation: | GFSK |
| Operation frequency: | 2478MHz |
| Channel number: | 1 |
| Antenna type: | Internal antenna |
| Antenna gain: | 0.00 dBi |

## 2.3. Short description of the Equipment under Test (EUT)

This is a 2.4G Wireless Laser Barcode Scanner.

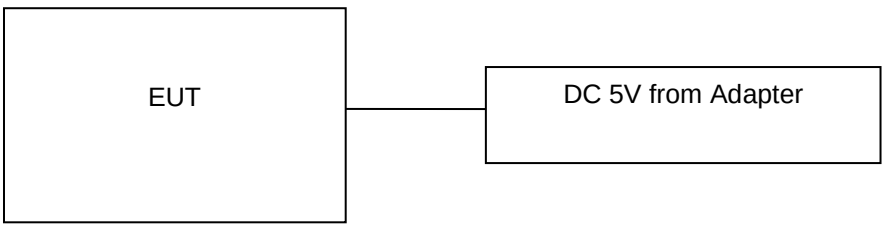
For more details, refer to the user's manual of the EUT.

## 2.4. EUT operation mode

There are 1 channels provided to the EUT. Channel 1 was selected to test.

| Channel | Frequency(MHz) |
|---|---|
| **1** | **2478** |

## 2.5. Block Diagram of Test Setup



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

This submittal(s) (test report) is intended for the device filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 2.7. EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer

○ - Supplied by the lab

| | | | |
|---|---|---|---|
| ○ | / | M/N: | / |
| | | Manufacturer: | / |

## 2.8. Modifications

No modifications were implemented to meet testing criteria.

# 3. TEST ENVIRONMENT

## 3.1. Address of the test laboratory

**Shenzhen GUOREN Certification Technology Service Co., Ltd.**
101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

## 3.2. Test Facility

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

**FCC-Registration No.: 920798 Designation Number: CN1304**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**A2LA-Lab Cert. No.: 6202.01**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

**ISED#: 27264 CAB identifier: CN0115**
Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

## 3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

During the measurement the environmental conditions were within the listed ranges:
Radiated Emission:

| | |
|---|---|
| Temperature: | 23 ° C |
| | |
| Humidity: | 47 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

AC Main Conducted testing：

| | |
|---|---|
| Temperature: | 24 ° C |
| | |
| Humidity: | 49% |
| | |
| Atmospheric pressure: | 950-1050mbar |

Conducted testing：

| | |
|---|---|
| Temperature: | 24 ° C |
| | |
| Humidity: | 48 % |
| | |
| Atmospheric pressure: | 950-1050mbar |

## 3.4. Test Description

| FCC PART 15.249 | | |
|---|---|---|
| FCC Part 15.249(a) | Field Strength of Fundamental | PASS |
| FCC Part 15.249 (a) (d)/15.209 | Spurious Emission | PASS |
| FCC Part 15.249 (d)/15.205 | Band edge | PASS |
| FCC Part 15.215(c) | Occupied bandwidth | PASS |
| FCC Part 15.207 | Conducted Emission | PASS |
| FCC Part 15.203 | Antenna Requirement | PASS |

Remark:
1. The measurement uncertainty is not included in the test result.
2. N/A = Not Applicable; N/P = Not Performed

## 3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen GUOREN Certification Technology Service Co., Ltd.quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GUOREN Certification Technology Service Co., Ltd.:

| Test | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30~1000MHz | 4.06 dB | (1) |
| Radiated Emission | 1~18GHz | 5.14 dB | (1) |
| Radiated Emission | 18-40GHz | 5.38 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 2.14 dB | (1) |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 3.6. Equipments Used during the Test

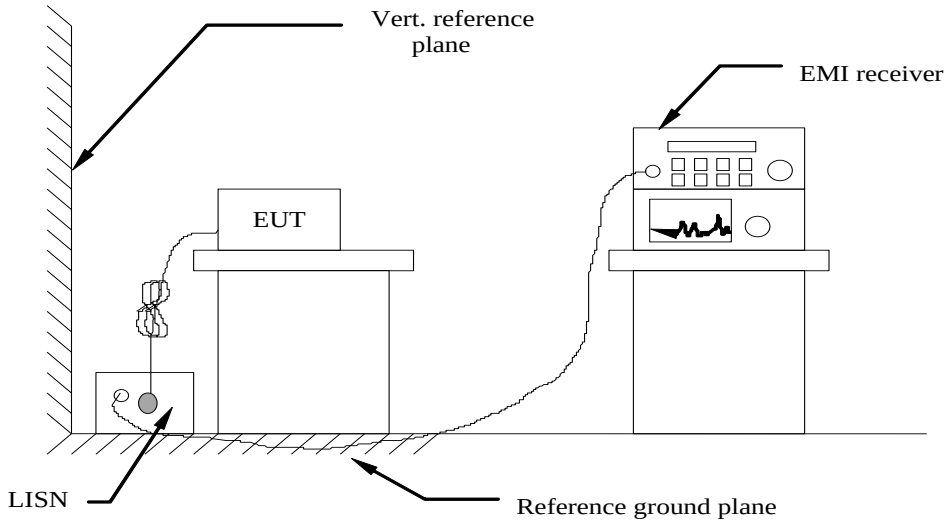
| Test Equipment | Manufacturer | Model No. | Equipment No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| LISN | R&S | ENV216 | GRCTEE009 | 2020/11/3 | 2021/11/2 |
| LISN | R&S | ENV216 | GRCTEE010 | 2020/11/3 | 2021/11/2 |
| EMI Test Receiver | R&S | ESPI | GRCTEE017 | 2020/11/3 | 2021/11/2 |
| EMI Test Receiver | R&S | ESCI | GRCTEE008 | 2020/11/3 | 2021/11/2 |
| Spectrum Analyzer | Agilent | N9020A | GRCTEE002 | 2020/11/3 | 2021/11/2 |
| Spectrum Analyzer | R&S | FSP | GRCTEE003 | 2020/11/19 | 2021/11/18 |
| Vector Signal generator | Agilent | N5181A | GRCTEE007 | 2020/11/3 | 2021/11/2 |
| Analog Signal Generator | R&S | SML03 | GRCTEE006 | 2020/11/3 | 2021/11/2 |
| Universal Radio Communication | CMW500 | R&S | GRCTEE001 | 2020/11/3 | 2021/11/2 |
| Climate Chamber | QIYA | LCD-9530 | GRCTES016 | 2020/11/1 | 2021/10/31 |
| Ultra-Broadband Antenna | Schwarzbeck | VULB9163 | GRCTEE018 | 2020/10/25 | 2023/10/24 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | GRCTEE019 | 2020/10/25 | 2023/10/24 |
| Loop Antenna | Zhinan | ZN30900C | GRCTEE020 | 2020/10/25 | 2023/10/24 |
| Horn Antenna | Beijing Hangwei Dayang | OBH100400 | GRCTEE049 | 2021/1/18 | 2024/1/17 |
| Amplifier | Schwarzbeck | BBV 9745 | GRCTEE021 | 2021/1/18 | 2022/1/17 |
| Amplifier | Taiwan chengyi | EMC051845B | GRCTEE022 | 2020/11/19 | 2021/11/18 |
| Temperature/Humidity Meter | Huaguan | HG-308 | GRCTES037 | 2020/11/1 | 2021/10/31 |
| Directional coupler | NARDA | 4226-10 | GRCTEE004 | 2020/11/3 | 2021/11/2 |
| High-Pass Filter | XingBo | XBLBQ-GTA18 | GRCTEE053 | 2020/11/3 | 2021/11/2 |
| High-Pass Filter | XingBo | XBLBQ-GTA27 | GRCTEE054 | 2020/11/3 | 2021/11/2 |
| Automated filter bank | Tonscend | JS0806-F | GRCTEE055 | 2020/11/3 | 2021/11/2 |
| EMI Test Software | ROHDE & SCHWARZ | ESK1-V1.71 | GRCTEE060 | N/A | N/A |
| EMI Test Software | Fera | EZ-EMC | GRCTEE061 | N/A | N/A |
| Power Sensor | Agilent | U2021XA | GRCTEE070 | 2020/11/3 | 2021/11/2 |

Note: The Cal.Interval was one year.

# 4. TEST CONDITIONS AND RESULTS

## 4.1. AC Power Conducted Emission

**TEST CONFIGURATION**




**TEST PROCEDURE**

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013.
4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

**AC Power Conducted Emission Limit**

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

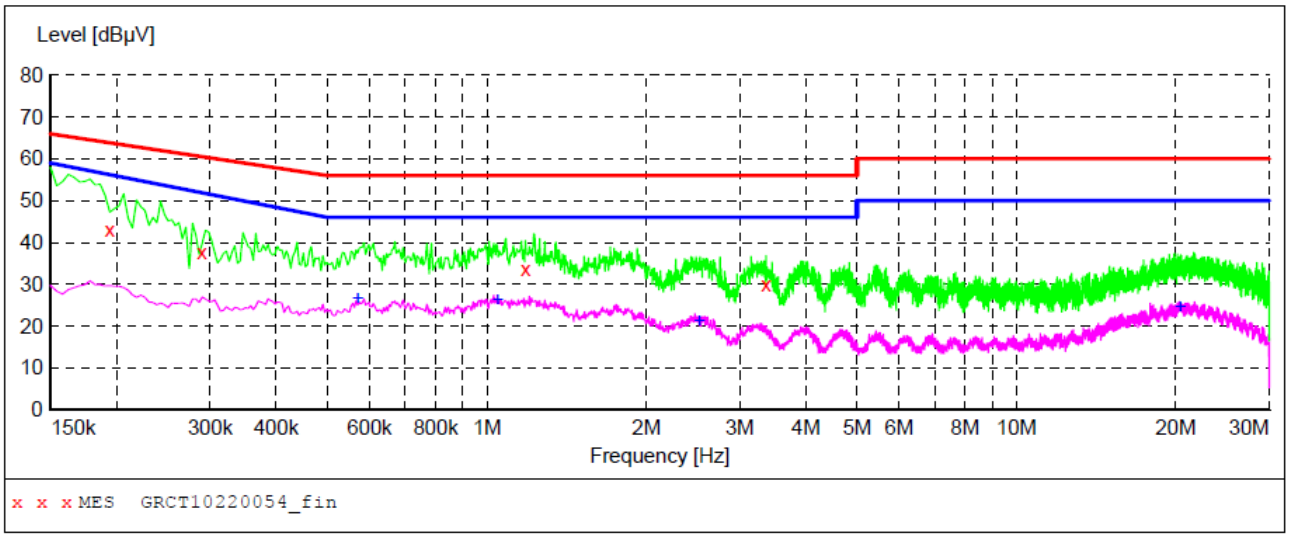
| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | |

**TEST RESULTS**

Remark:

1. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:

| Power supply: | DC 5V from Adapter AC 120V/60Hz | Polarization | L |
|---|---|---|---|




***MEASUREMENT RESULT: "GRCT10220054_fin"***

10/22/2021 7:03PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.194000 | 43.20 | 10.3 | 64 | 20.7 | QP | L1 | GND |
| 0.290000 | 37.50 | 10.3 | 61 | 23.0 | QP | L1 | GND |
| 1.182000 | 33.80 | 10.4 | 56 | 22.2 | QP | L1 | GND |
| 3.370000 | 29.90 | 10.5 | 56 | 26.1 | QP | L1 | GND |

***MEASUREMENT RESULT: "GRCT10220054_fin2"***

10/22/2021 7:03PM

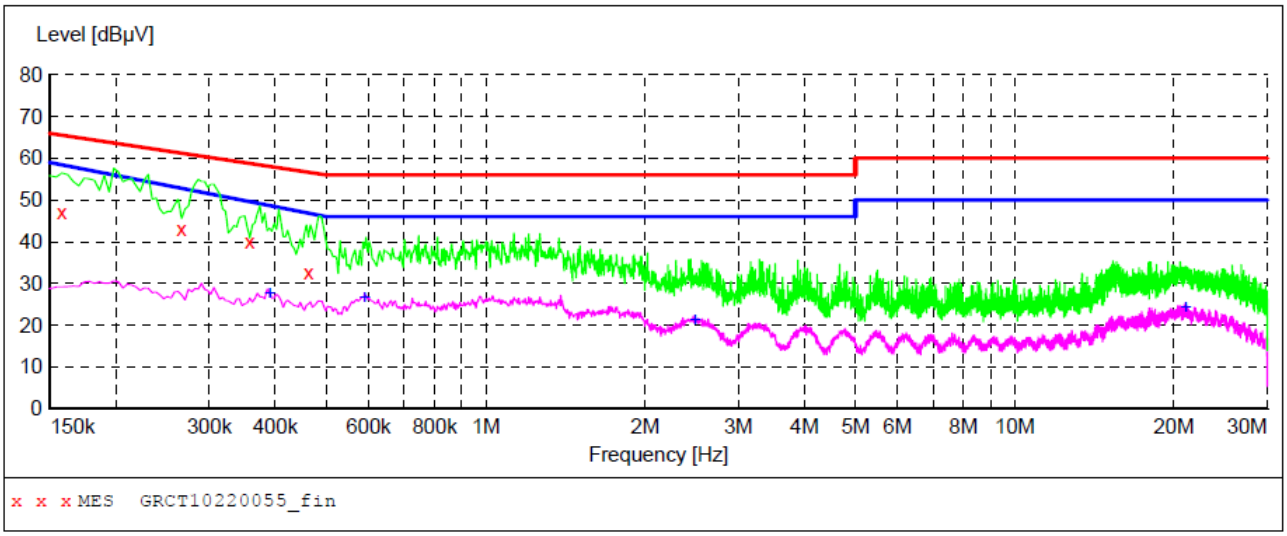
| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.570000 | 26.50 | 10.3 | 46 | 19.5 | AV | L1 | GND |
| 1.046000 | 26.30 | 10.4 | 46 | 19.7 | AV | L1 | GND |
| 2.514000 | 21.40 | 10.5 | 46 | 24.6 | AV | L1 | GND |
| 20.350000 | 24.60 | 11.0 | 50 | 25.4 | AV | L1 | GND |

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

| Power supply: | DC 5V from Adapter AC 120V/60Hz | Polarization | N |
|---|---|---|---|




***MEASUREMENT RESULT: "GRCT10220055_fin"***

10/22/2021 7:06PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.158000 | 47.00 | 10.3 | 66 | 18.6 | QP | N | GND |
| 0.266000 | 42.90 | 10.3 | 61 | 18.3 | QP | N | GND |
| 0.358000 | 40.10 | 10.3 | 59 | 18.7 | QP | N | GND |
| 0.462000 | 32.60 | 10.3 | 57 | 24.1 | QP | N | GND |

***MEASUREMENT RESULT: "GRCT10220055_fin2"***

10/22/2021 7:06PM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.390000 | 27.70 | 10.3 | 49 | 21.0 | AV | N | GND |
| 0.590000 | 26.70 | 10.3 | 46 | 19.3 | AV | N | GND |
| 2.486000 | 21.20 | 10.5 | 46 | 24.8 | AV | N | GND |
| 21.030000 | 24.30 | 11.0 | 50 | 25.7 | AV | N | GND |

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

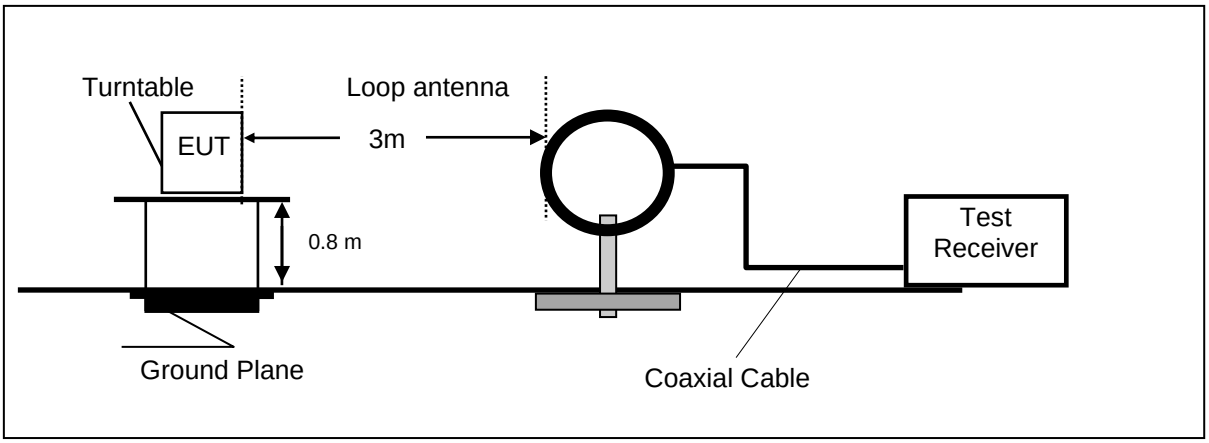
2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

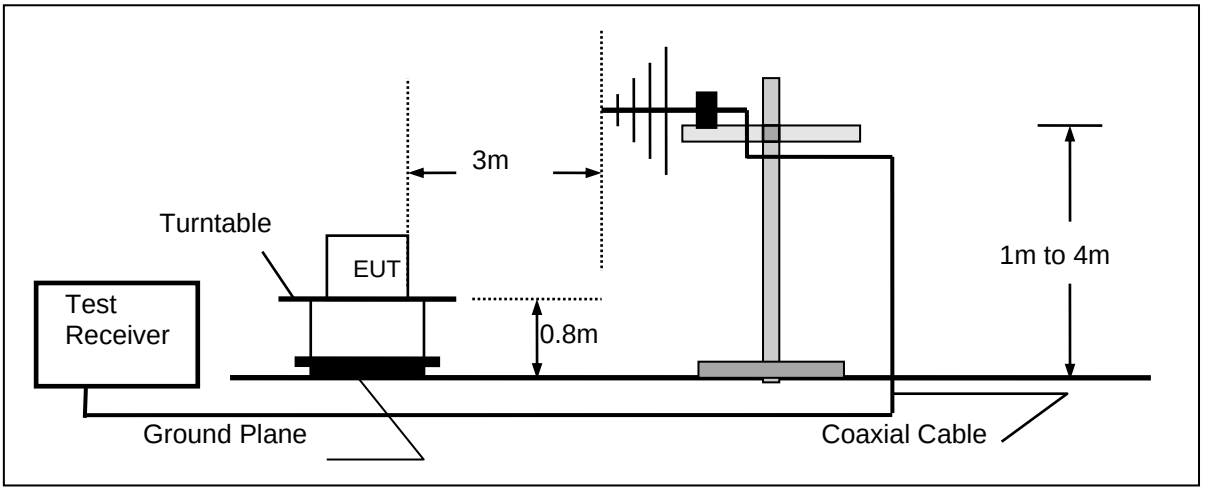
## 4.2. Radiated Emissions and Band Edge

**TEST CONFIGURATION**

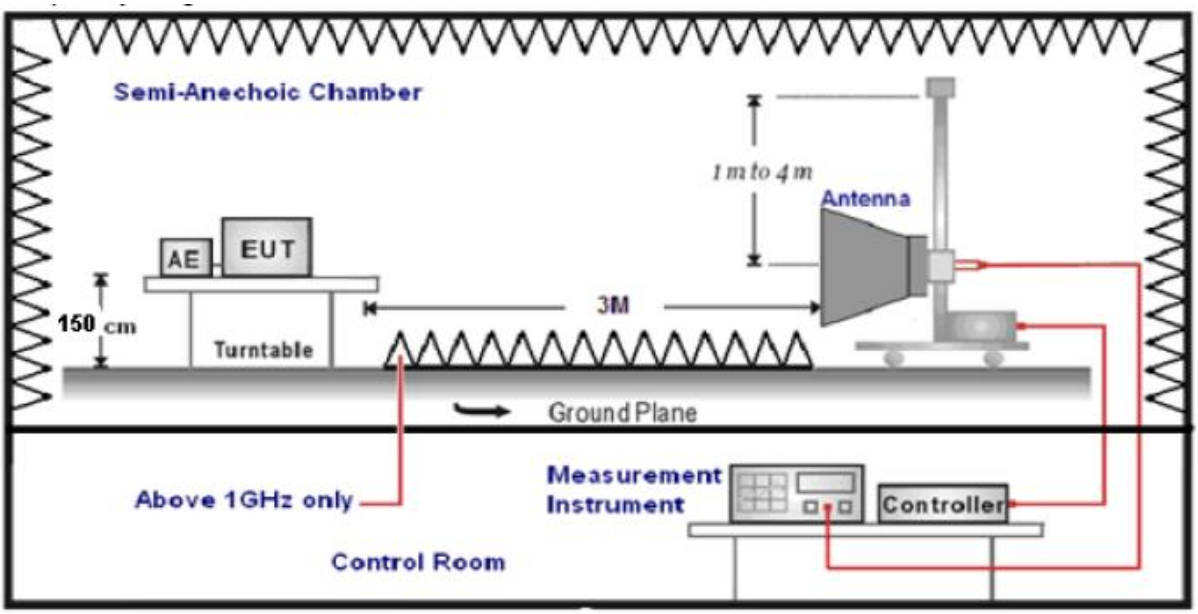
Frequency range 9 KHz – 30MHz




Frequency range 30MHz – 1000MHz




Frequency range above 1GHz-25GHz



## TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz; the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|---|---|---|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Ultra-Broadband Antenna | 3 |
| 1GHz-18GHz | Double Ridged Horn Antenna | 3 |
| 18GHz-25GHz | Horn Anternna | 1 |

6. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto<br>Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

## Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

**FS = RA + AF + CL - AG**

| | |
|---|---|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

Transd=AF +CL-AG

## LIMIT

According 15.249, the field strength of emissions from intentional radiators operated within 2400MHz-2483.5 MHz shall not exceed 94dBμV/m (50mV/m):

FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

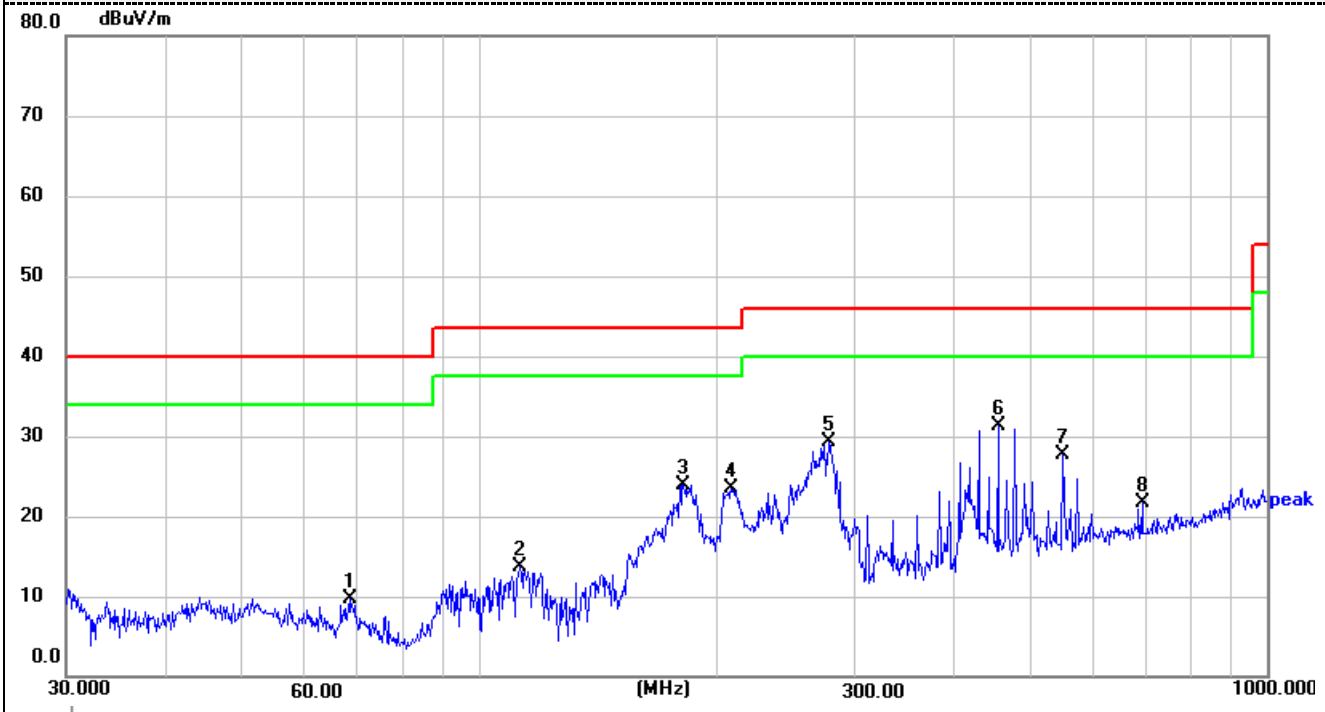
**TEST RESULTS**

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. EUT was tested at Low, Middle, and High channel, only the worst result of Middle Channel was reported for below 1GHz.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

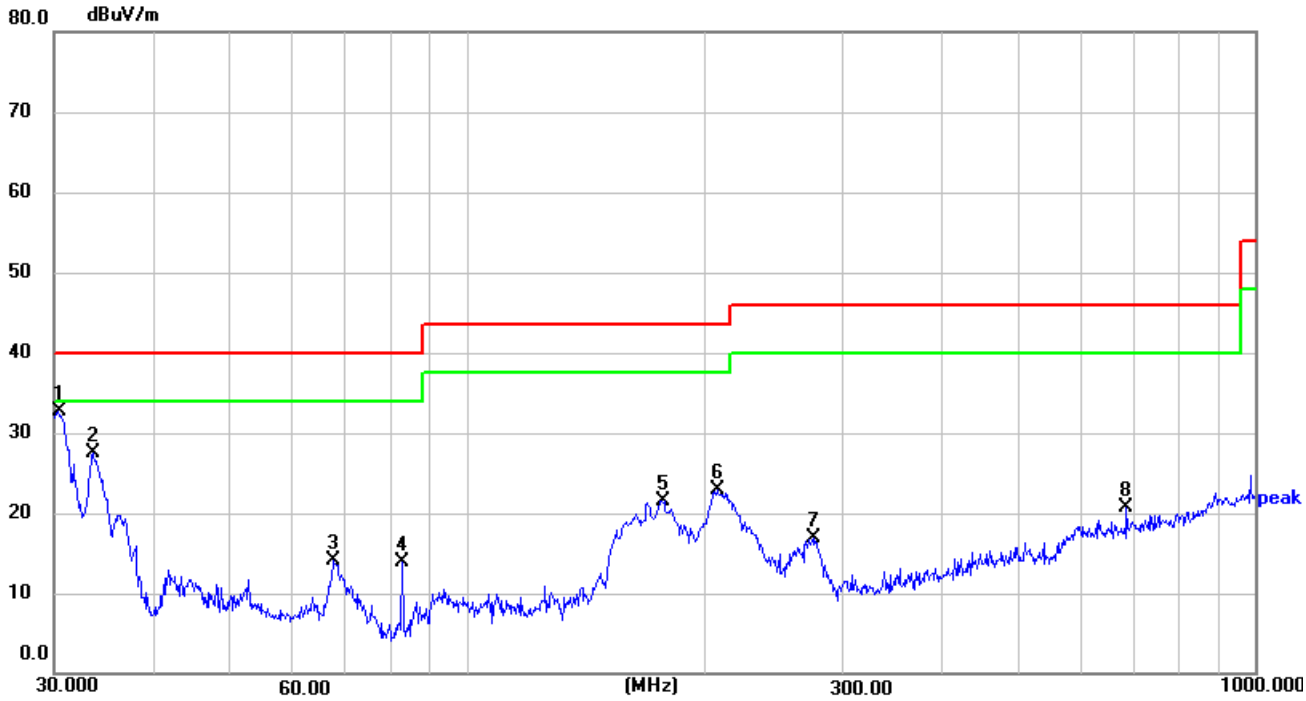
**For 30MHz to 1000MHz**

Horizontal




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 | 68.6310 | 30.45 | -20.72 | 9.73 | 40.00 | -30.27 | peak |
| 2 | 112.9196 | 33.30 | -19.53 | 13.77 | 43.50 | -29.73 | peak |
| 3 | 181.9200 | 44.42 | -20.54 | 23.88 | 43.50 | -19.62 | peak |
| 4 | 209.3129 | 42.24 | -18.83 | 23.41 | 43.50 | -20.09 | peak |
| 5 | 278.0668 | 46.80 | -17.55 | 29.25 | 46.00 | -16.75 | peak |
| 6 * | 455.9057 | 45.89 | -14.53 | 31.36 | 46.00 | -14.64 | peak |
| 7 | 550.9479 | 41.18 | -13.49 | 27.69 | 46.00 | -18.31 | peak |
| 8 | 694.4174 | 32.11 | -10.41 | 21.70 | 46.00 | -24.30 | peak |

Vertical




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 * | 30.3171 | 52.83 | -20.08 | 32.75 | 40.00 | -7.25 | peak |
| 2 | 33.5623 | 47.41 | -19.94 | 27.47 | 40.00 | -12.53 | peak |
| 3 | 67.9128 | 34.74 | -20.63 | 14.11 | 40.00 | -25.89 | peak |
| 4 | 82.9384 | 36.14 | -22.20 | 13.94 | 40.00 | -26.06 | peak |
| 5 | 176.8877 | 42.37 | -20.85 | 21.52 | 43.50 | -21.98 | peak |
| 6 | 207.8500 | 41.68 | -18.86 | 22.82 | 43.50 | -20.68 | peak |
| 7 | 276.1234 | 34.45 | -17.60 | 16.85 | 46.00 | -29.15 | peak |
| 8 | 687.1506 | 31.04 | -10.41 | 20.63 | 46.00 | -25.37 | peak |

**For 1GHz to 25GHz**

| Frequency(MHz): | | | 2478 | | Polarity: | | HORIZONTAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2478.00 | 96.02 | PK | 114 | 17.98 | 120.58 | 25.8 | 4.49 | 54.85 | -24.56 |
| 2478.00 | 81.17 | AV | 94 | 12.83 | 105.73 | 25.8 | 4.49 | 54.85 | -24.56 |
| 4956.00 | 60.81 | PK | 74 | 13.19 | 80.32 | 29.53 | 5.65 | 54.69 | -19.51 |
| 4956.00 | 45.17 | AV | 54 | 8.83 | 64.68 | 29.53 | 5.65 | 54.69 | -19.51 |
| 7434.00 | 53.64 | PK | 74 | 20.36 | 66.85 | 34.48 | 7.24 | 54.93 | -13.21 |
| 7434.00 | 39.26 | AV | 54 | 14.74 | 52.47 | 34.48 | 7.24 | 54.93 | -13.21 |

| Frequency(MHz): | | | 2478 | | Polarity: | | VERTICAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2478.00 | 101.33 | PK | 114 | 12.67 | 125.89 | 25.8 | 4.49 | 54.85 | -24.56 |
| 2478.00 | 85.79 | AV | 94 | 8.21 | 110.35 | 25.8 | 4.49 | 54.85 | -24.56 |
| 4956.00 | 62.96 | PK | 74 | 11.04 | 82.47 | 29.53 | 5.65 | 54.69 | -19.51 |
| 4956.00 | 46.08 | AV | 54 | 7.92 | 65.59 | 29.53 | 5.65 | 54.69 | -19.51 |
| 7434.00 | 53.50 | PK | 74 | 20.50 | 66.71 | 34.48 | 7.24 | 54.93 | -13.21 |
| 7434.00 | 39.34 | AV | 54 | 14.66 | 52.55 | 34.48 | 7.24 | 54.93 | -13.21 |

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

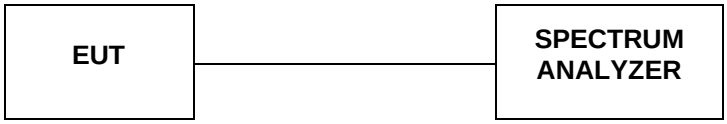
***Results of Band Edges Test (Radiated)***

| Frequency(MHz): | | | 2478 | | Polarity: | | HORIZONTAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2390.00 | 59.40 | PK | 74 | 14.60 | 84.12 | 25.72 | 4.32 | 54.76 | -24.72 |
| 2390.00 | 41.03 | AV | 54 | 12.97 | 65.75 | 25.72 | 4.32 | 54.76 | -24.72 |
| **Frequency(MHz):** | | | **2478** | | **Polarity:** | | **VERTICAL** | | |
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2390.00 | 59.14 | PK | 74 | 14.86 | 83.86 | 25.72 | 4.32 | 54.76 | -24.72 |
| 2390.00 | 41.47 | AV | 54 | 12.53 | 66.19 | 25.72 | 4.32 | 54.76 | -24.72 |
| **Frequency(MHz):** | | | **2478** | | **Polarity:** | | **HORIZONTAL** | | |
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2483.50 | 58.32 | PK | 74 | 15.68 | 82.89 | 25.78 | 4.48 | 54.83 | -24.57 |
| 2483.50 | 40.55 | AV | 54 | 13.45 | 65.12 | 25.78 | 4.48 | 54.83 | -24.57 |
| **Frequency(MHz):** | | | **2478** | | **Polarity:** | | **VERTICAL** | | |
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2483.50 | 58.71 | PK | 74 | 15.29 | 83.28 | 25.78 | 4.48 | 54.83 | -24.57 |
| 2483.50 | 40.88 | AV | 54 | 13.12 | 65.45 | 25.78 | 4.48 | 54.83 | -24.57 |

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

## 4.3. Occupied Bandwidth Measurement

**TEST CONFIGURATION**




**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW.

**TEST RESULTS**

| Type | Channel | 99% OBW (MHz) | 20dB bandwidth (MHz) | Result |
|---|---|---|---|---|
| GFSK | 1 | 1.0791 | 1.189 | Pass |

Note: 1.The test results including the cable lose.


*2478MHz*

## 4.4. Antenna Requirement

**Standard Applicable**

**For intentional device, according to FCC 47 CFR Section 15.203:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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

**FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):**

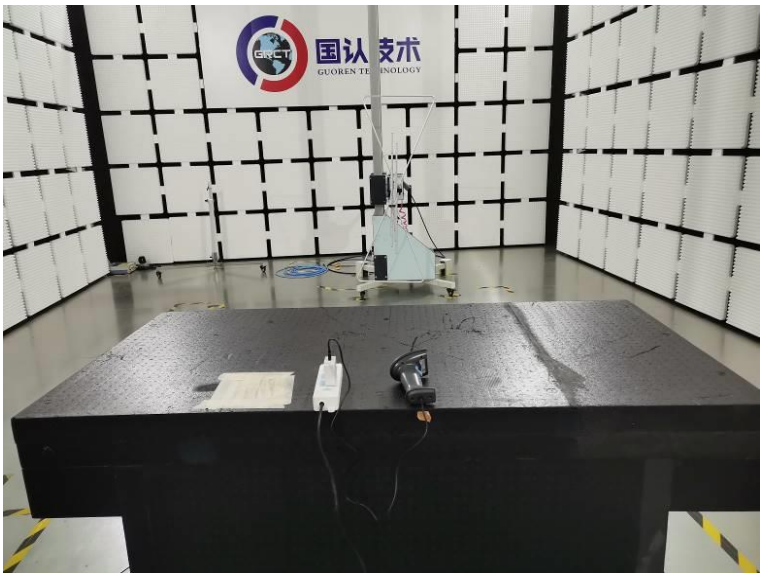
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

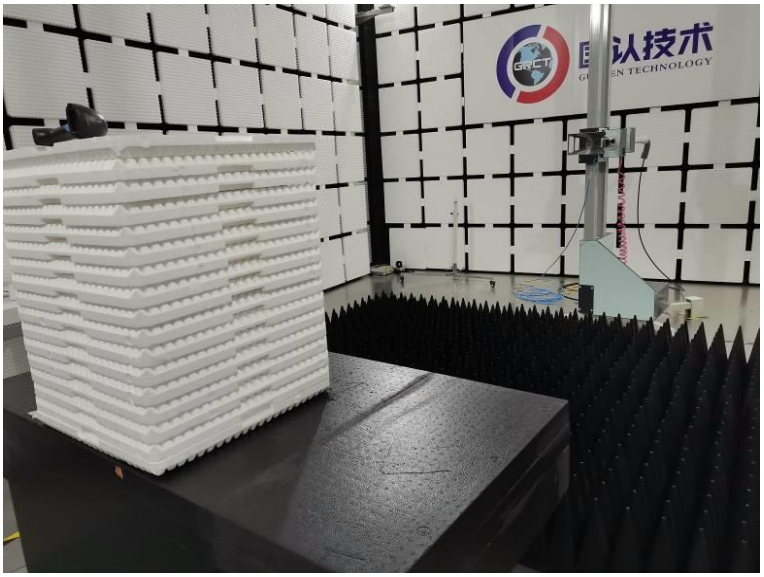
**Antenna Connected Construction**

The maximum gain of antenna was 0.00 dBi.

Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen GUOREN Certification Technology Service Co., Ltd. does not assume any responsibility.

# 5. Test Setup Photos of the EUT

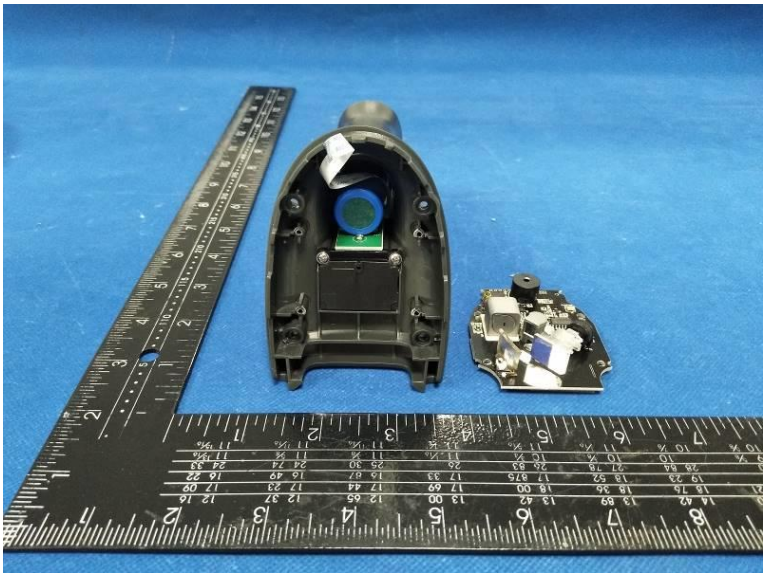


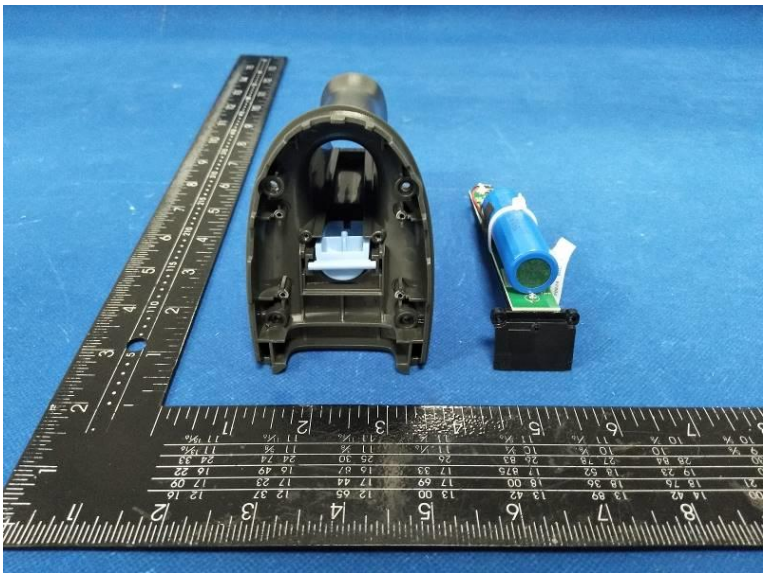


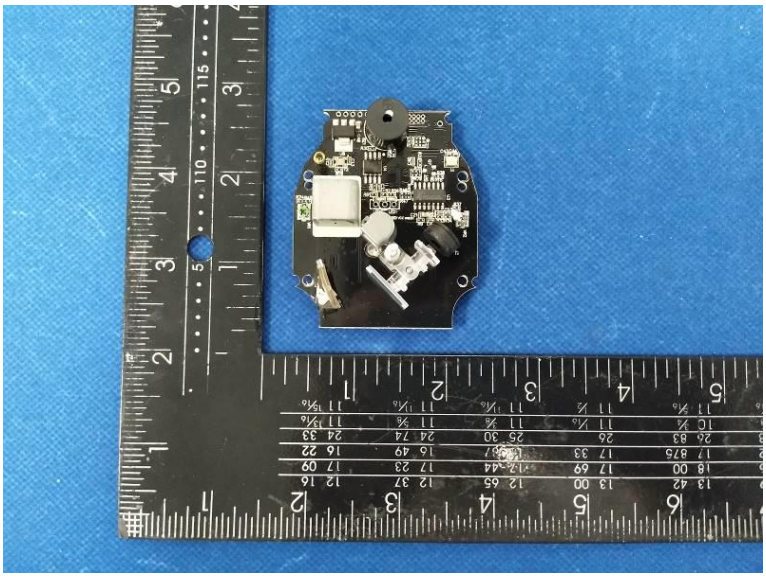
# 6. Photos of the EUT

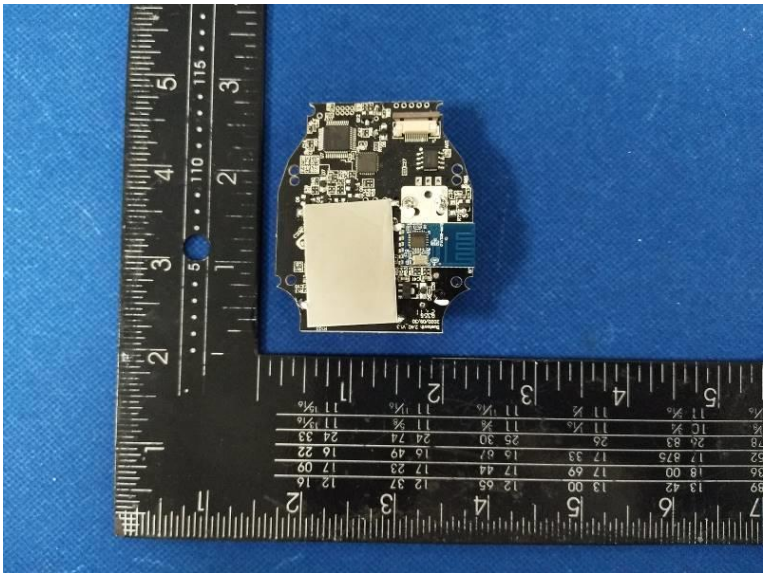

unitech

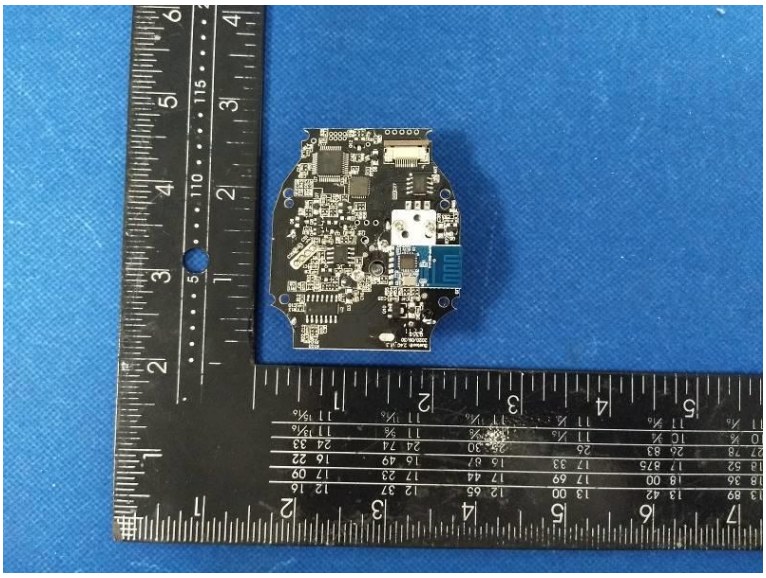

unitech

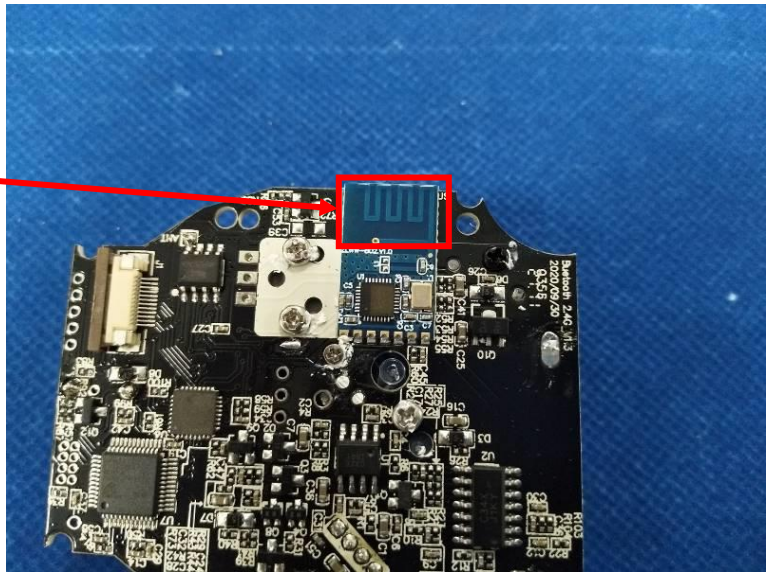


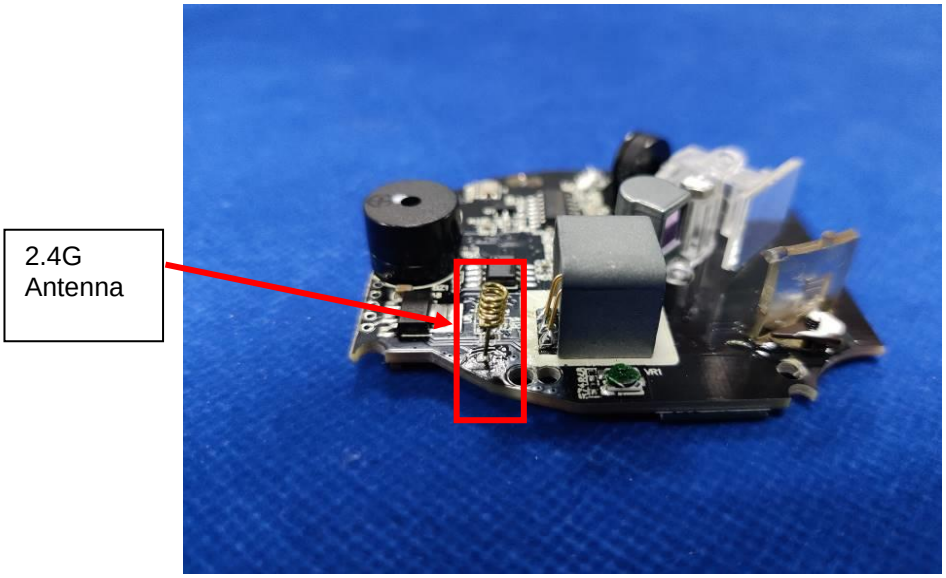


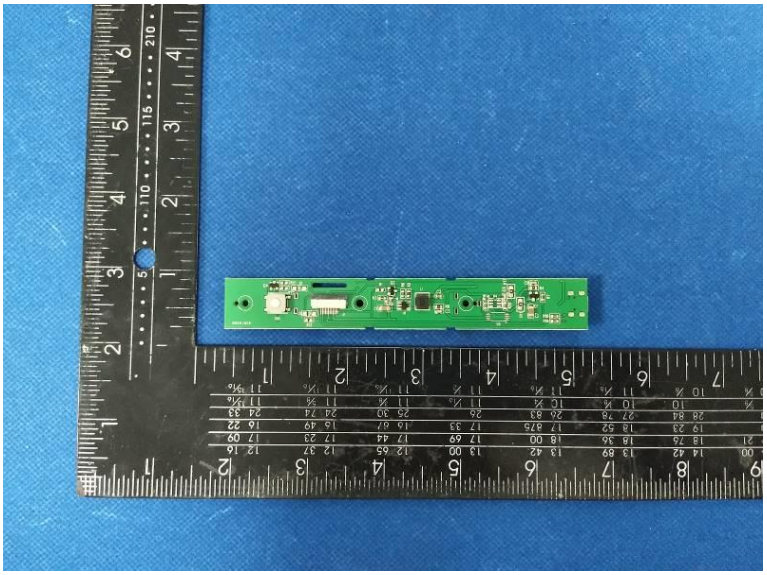


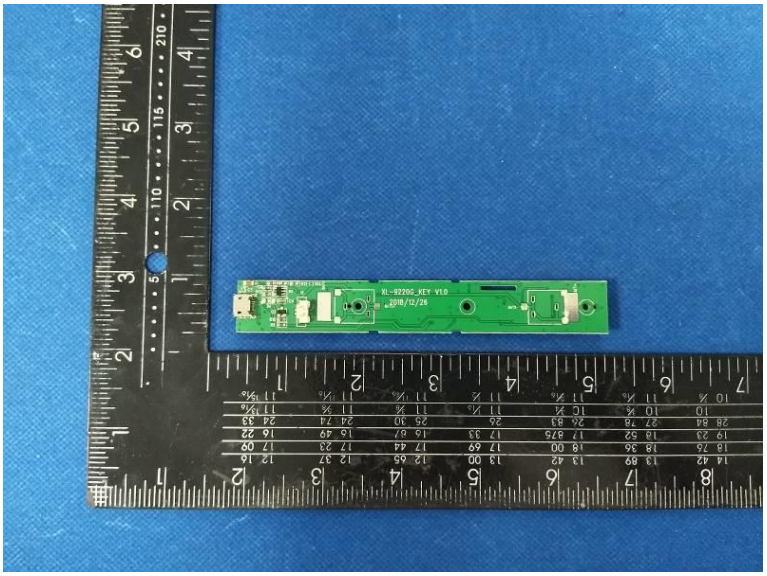





Bluetooth
Antenna


2.4G
Antenna






**.....End of Report.....**