# TEST REPORT

| | |
|---|---|
| Product Name: | Outdoor Energy Plug |
| FCC ID: | 2ATM76803 |
| Trademark: | YoLink |
| Model Number: | YS6803-UC, YS6803-UA |
| Prepared For: | YoSmart Inc. |
| Address: | 15375 Barranca Parkway, Ste G-105 Irvine, CA 92618, USA |
| Manufacturer: | YoSmart Inc. |
| Address: | 15375 Barranca Parkway, Ste G-105 Irvine, CA 92618, USA |
| Prepared By: | Shenzhen CTB Testing Technology Co., Ltd. |
| Address: | 1&2/F., Building A, No.26, Xinhe Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China |
| Sample Received Date: | Apr. 02, 2024 |
| Sample tested Date: | Apr. 02, 2024 to Apr. 22, 2024 |
| Issue Date: | Apr. 22, 2024 |
| Report No.: | CTB240422028RF |
| Test Standards | FCC Part15.249<br>ANSI C63.10:2013 |
| Test Results | PASS |
| Remark: | This is LoRa radio test report. |

| Compiled by: | Reviewed by: | Approved by: |
|---|---|---|
| Zhou Kui | Arron Liu | Bin Mei / Director |

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "★" indicates the testing items were fulfilled by subcontracted lab. "※" indicates the items are not in CNAS accreditation scope.

**TABLE OF CONTENT**



*(Note: N/A means not applicable)*

## 1. VERSION

| Report No. | Issue Date | Description | Approved |
|---|---|---|---|
| CTB240422028RF | Apr. 22, 2024 | Original | Valid |

## 2. TEST SUMMARY

3. The Product has been tested according to the following specifications:

| Standard Section | Test Item | Judgment | Remark |
|---|---|---|---|
| 15.207 | Conducted Emission | PASS | |
| 15.215 | 20dB Bandwidth | PASS | |
| 15.249 | Fundamental &Radiated Spurious Emission Measurement | PASS | |
| 15.205 | Band Edge Emission | PASS | |
| 15.203 | Antenna Requirement | PASS | |

Remark:
Test according to ANSI C63.10-2013.

## 4. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Item | Uncertainty |
|---|---|
| Occupancy bandwidth | 54.3kHz |
| Conducted output power Above 1G | 0.9dB |
| Conducted output power below 1G | 0.9dB |
| Power Spectral Density , Conduction | 0.9dB |
| Conduction spurious emissions | 2.0dB |
| Out of band emission | 2.0dB |
| 3m camber Radiated spurious emission(9KHz-30MHz) | 4.8dB |
| 3m camber Radiated spurious emission(30MHz-1GHz) | 4.6dB |
| 3m chamber Radiated spurious emission(1GHz-18GHz) | 5.1dB |
| 3m chamber Radiated spurious emission(18GHz-40GHz) | 3.4dB |
| humidity uncertainty | 5.5% |
| Temperature uncertainty | 0.63℃ |
| frequency | 1×10-7 |
| Conducted Emission (150KHz-30MHz) | 3.2 dB |
| Radiated Emission(30MHz ~ 1000MHz) | 4.8 dB |
| Radiated Emission(1GHz ~6GHz) | 4.9 dB |

## 5. PRODUCT INFORMATION AND TEST SETUP

### 4.1 Product Information

| | |
|---|---|
| Model(s): | YS6803-UC, YS6803-UA |
| Model Description: | All the model are the same circuit and RF module, only for model name. Test sample model: YS6803-UC |
| Hardware Version: | V1.0 |
| Software Version: | V0304 |
| Operation Frequency: | 910.3 MHz |
| Type of Modulation: | LoRa |
| Antenna installation: | Spring Antenna |
| Antenna Gain: | -1.71dBi |
| Ratings: | Input: AC 120V/60Hz |

### 4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

### 4.3 Support Equipment

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Note |
|---|---|---|---|---|---|
| | | | | | |

***Notes:***

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

| CH | Frequency (MHz) |
|---|---|
| 1 | 910.3 |

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

| Test mode | Test mode |
|---|---|
| 1 | 910.3MHz |

4.6 Test Environment

| | |
|---|---|
| Humidity(%): | 54 |
| Atmospheric Pressure(kPa): | 101 |
| Normal Voltage(AC): | 120V |
| Normal Temperature(℃) | 23 |
| Low Temperature(℃) | -20 |
| High Temperature(℃) | 54 |

## 6. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

FCC Test Firm Registration Number: 292923

IC Registered No.:25587

CAB identifier: CN0098

5.2 Test Instrument Used

| No. | Equipment | Manufacturer | Type No. | Serial No. | Firmware Version | Calibrated until |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | Agilent | N9020A | MY52090073 | A.14.16 | 2024.07.05 |
| 2 | Power Sensor | Agilent | U2021XA | MY56120032 | / | 2024.07.05 |
| 3 | Power Sensor | Agilent | U2021XA | MY56120034 | / | 2024.07.05 |
| 4 | Communication test set | R&S | CMW500 | 108058 | V3.5.80 | 2024.07.05 |
| 5 | Spectrum Analyzer | KEYSIGHT | N9020A | MY51289897 | A.14.16 | 2024.07.05 |
| 6 | Signal Generator | Agilent | N5181A | MY50140365 | A.01.60 | 2024.07.05 |
| 7 | Vector signal generator | Agilent | N5182A | MY47420195 | A.01.87 | 2024.07.05 |
| 8 | Communication test set | Agilent | E5515C | MY50102567 | B.19.07 （E1962B ） | 2024.07.06 |
| 9 | 2.4 GHz Filter | Shenxiang | MSF2400-2483.5MS-1154 | 20181015001 | / | 2024.07.05 |
| 10 | 5 GHz Filter | Shenxiang | MSF5150-5850MS-1155 | 20181015001 | / | 2024.07.06 |
| 11 | Filter | Xingbo | XBLBQ-DZA120 | 190821-1-1 | / | 2024.07.06 |
| 12 | BT&WI-FI Automatic test software | Micowave | MTS8000 | Ver. 2.0.0.0 | / | / |
| 13 | Rohde & Schwarz SFU Broadcast Test System | R&S | SFU | 101017 | / | 2024.10.30 |
| 14 | Temperature humidity chamber | Hongjing | TH-80CH | DG-15174 | / | 2024.07.05 |
| 15 | 234G Automatic test software | Micowave | MTS8200 | Ver. 2.0.0.0 | / | / |
| 16 | 966 chamber | C.R.T. | 966 | / | / | 2024.08.11 |
| 17 | Receiver | R&S | ESPI | 100362 | RF_ATTEN_7（104489/003） | 2024.07.05 |
| 18 | Amplifier | HP | 8447E | 2945A02747 | / | 2024.07.05 |
| 19 | Amplifier | Agilent | 8449B | 3008A01838 | / | 2024.07.05 |
| 20 | TRILOG Broadband Antenna | Schwarzbeck | VULB 9168 | 00869 | / | 2024.07.08 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 21 | Double Ridged Broadband Horn Antenna | Schwarzbeck | BBHA9120D | 01911 | / | 2024.07.08 |
| 22 | EMI test software | Fala | EZ-EMC | FA-03A2 RE | / | / |
| 23 | Loop Antenna | Schwarzbeck | FMZB 1519B | 1519B-224 | / | 2024.07.08 |
| 24 | loop antenna | ZHINAN | ZN30900A | GTS534 | / | / |
| 25 | 40G Horn antenna | A/H/System | SAS-574 | 588 | / | 2024.10.30 |
| 26 | Amplifier | AEROFLEX | Aeroflex | 097 | / | 2024.07.05 |

**Continuous disturbance**

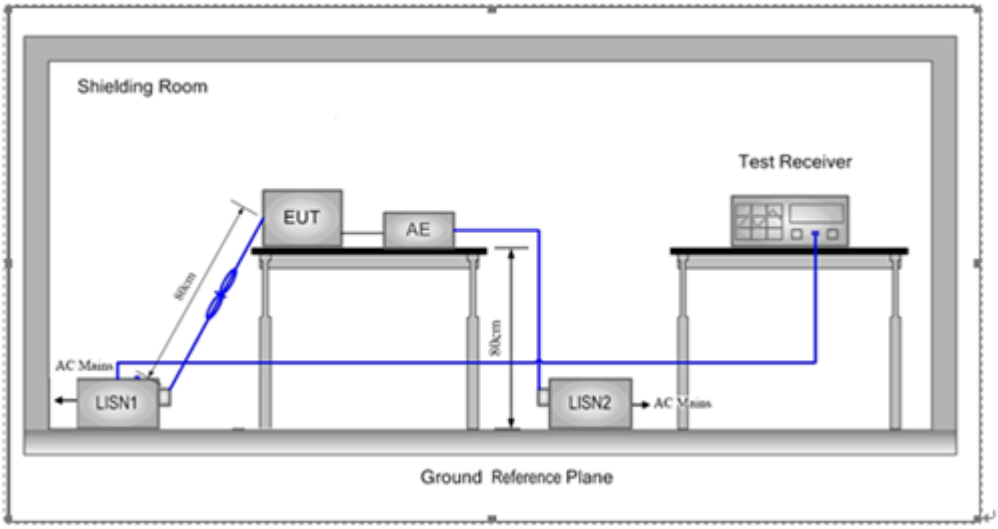
| No. | Equipment | Manufacturer | Model No. | Serial No. | Firmware Version | Calibrated until |
|---|---|---|---|---|---|---|
| 1 | LISN | ROHDE&SCHWARZ | ESH3-Z5 | 100318 | / | 2024.07.05 |
| 2 | Pulse limiter | ROHDE&SCHWARZ | ESH3Z2 | 357881052 | / | 2024.07.05 |
| 3 | EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI | 100428/003 | V4.42.SP3 | 2024.07.05 |
| 4 | Coaxial cable | ZDECL | Z302S-NJ-SM AJ-12M | 18091905 | / | 2024.07.05 |
| 5 | ISN | Schwarzbeck | NTFM8158 | 183 | / | 2024.07.05 |
| 6 | Communication test set | Agilent | E5515C | MY50102567 | B.19.07 （E1962B ） | 2024.07.05 |
| 7 | Communication test set | R&S | CMW500 | 108058 | V3.5.80 | 2024.07.05 |
| 8 | EZ-EMC | Frad | EMC-con3A1.1 | / | / | / |

**Radiated emission**

| No. | Equipment | Manufacturer | Model No. | Serial No. | Firmware Version | Calibrated until |
|---|---|---|---|---|---|---|
| 1 | Double Ridged Broadband Horn Antenna | Schwarzbeck | BBHA 9120 D | 01911 | / | 2024.07.08 |
| 2 | TRILOG Broadband Antenna | Schwarzbeck | VULB 9168 | 00869 | / | 2024.07.08 |
| 3 | Amplifier | Agilent | 8449B | 3008A01838 | / | 2024.07.05 |
| 4 | Amplifier | HP | 8447E | 2945A02747 | / | 2024.07.05 |
| 5 | EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI | 100428/003 | V4.42.SP3 | 2024.07.05 |
| 6 | Coaxial cable | ETS | RFC-SNS-100-N MS-80 NI | / | / | 2024.07.05 |
| 7 | Coaxial cable | ETS | RFC-SNS-100-N MS-20 NI | / | / | 2024.07.05 |
| 8 | Coaxial cable | ETS | RFC-SNS-100-S MS-20 NI | / | / | 2024.07.05 |
| 9 | Coaxial cable | ETS | RFC-NNS-100-NMS-300 NI | / | / | 2024.07.05 |
| 10 | Communication test set | Agilent | E5515C | MY50102567 | B.19.07 （E1962B ） | 2024.07.05 |
| 11 | Communication test set | R&S | CMW500 | 108058 | V3.5.80 | 2024.07.05 |
| 12 | EZ-EMC | Frad | EMC-con3A1.1 | / | / | / |

## 6. AC POWER LINE CONDUCTED EMISSION

### 6.1 Block Diagram Of Test Setup




### 6.2 Limit

**Table 4 – AC power-line conducted emissions limits**

| Frequency (MHz) | Conducted limit (dBµV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 to 56[Note 1] | 56 to 46[Note 1] |
| 0.5 – 5 | 56 | 46 |
| 5 – 30 | 60 | 50 |

**Note 1:** The level decreases linearly with the logarithm of the frequency.

* Decreasing linearly with the logarithm of the frequency

### 6.3 Test procedure

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50µH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane.

This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

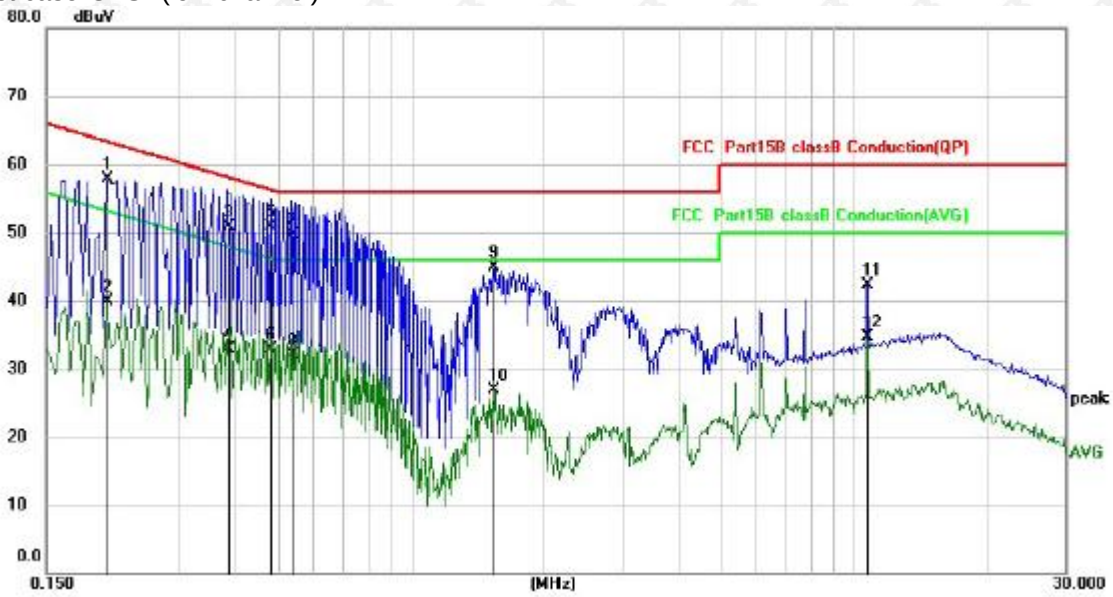
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement**.**

6) All modes were tested at AC 120V and 240V, only the worst result of AC 120V 60Hz was reported.

7) If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

6.4 Test Result

**L:** Worst case-GFSK(low channel)



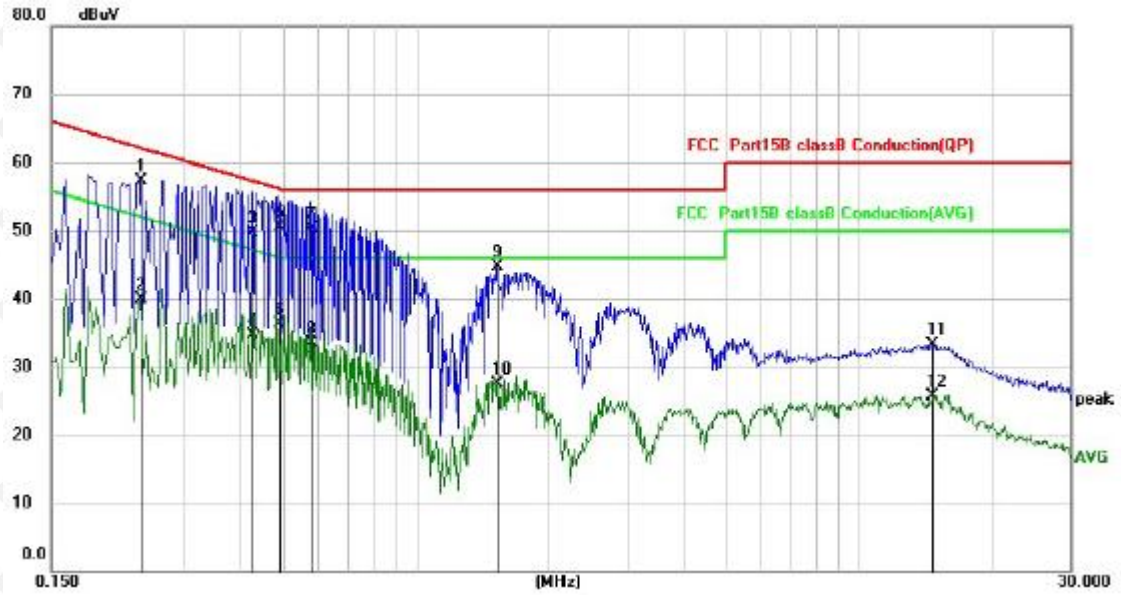

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.2060 | 47.99 | 9.95 | 57.94 | 63.37 | -5.43 | QP |
| 2 | | 0.2060 | 29.93 | 9.95 | 39.88 | 53.37 | -13.49 | AVG |
| 3 | | 0.3860 | 40.92 | 9.97 | 50.89 | 58.15 | -7.26 | QP |
| 4 | | 0.3860 | 22.96 | 9.97 | 32.93 | 48.15 | -15.22 | AVG |
| 5 | * | 0.4820 | 41.00 | 9.99 | 50.99 | 56.30 | -5.31 | QP |
| 6 | | 0.4820 | 22.94 | 9.99 | 32.93 | 46.30 | -13.37 | AVG |
| 7 | | 0.5380 | 39.62 | 10.00 | 49.62 | 56.00 | -6.38 | QP |
| 8 | | 0.5380 | 22.08 | 10.00 | 32.08 | 46.00 | -13.92 | AVG |
| 9 | | 1.5339 | 34.81 | 10.05 | 44.86 | 56.00 | -11.14 | QP |
| 10 | | 1.5339 | 16.76 | 10.05 | 26.81 | 46.00 | -19.19 | AVG |
| 11 | | 10.7299 | 31.75 | 10.60 | 42.35 | 60.00 | -17.65 | QP |
| 12 | | 10.7299 | 24.05 | 10.60 | 34.65 | 50.00 | -15.35 | AVG |

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

Measurement=Reading level+correct facto

**N:** Worst case-GFSK(low channel)




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | * | 0.2379 | 47.41 | 9.95 | 57.36 | 62.17 | -4.81 | QP |
| 2 | | 0.2379 | 30.03 | 9.95 | 39.98 | 52.17 | -12.19 | AVG |
| 3 | | 0.4260 | 39.66 | 9.98 | 49.64 | 57.33 | -7.69 | QP |
| 4 | | 0.4260 | 24.63 | 9.98 | 34.61 | 47.33 | -12.72 | AVG |
| 5 | | 0.4900 | 40.49 | 9.99 | 50.48 | 56.17 | -5.69 | QP |
| 6 | | 0.4900 | 26.26 | 9.99 | 36.25 | 46.17 | -9.92 | AVG |
| 7 | | 0.5780 | 40.33 | 10.00 | 50.33 | 56.00 | -5.67 | QP |
| 8 | | 0.5780 | 23.51 | 10.00 | 33.51 | 46.00 | -12.49 | AVG |
| 9 | | 1.5260 | 34.57 | 10.05 | 44.62 | 56.00 | -11.38 | QP |
| 10 | | 1.5260 | 17.38 | 10.05 | 27.43 | 46.00 | -18.57 | AVG |
| 11 | | 14.6500 | 22.56 | 10.72 | 33.28 | 60.00 | -26.72 | QP |
| 12 | | 14.6500 | 14.98 | 10.72 | 25.70 | 50.00 | -24.30 | AVG |

Factor = Cable loss + LISN factor, Margin = Measurement – Limit
Measurement=Reading level+correct facto

## 7. RADIATED SPURIOUS EMISSION

### 7.1 Block Diagram Of Test Setup

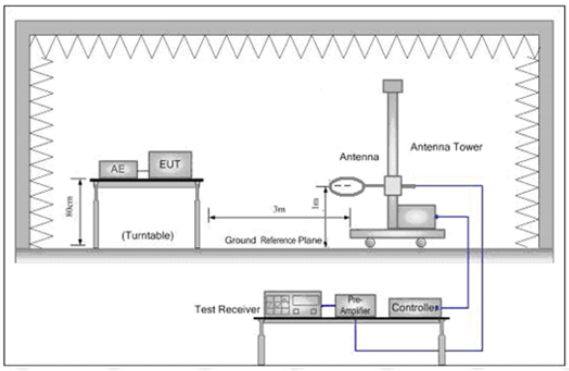



Figure 1. Below 30MHz

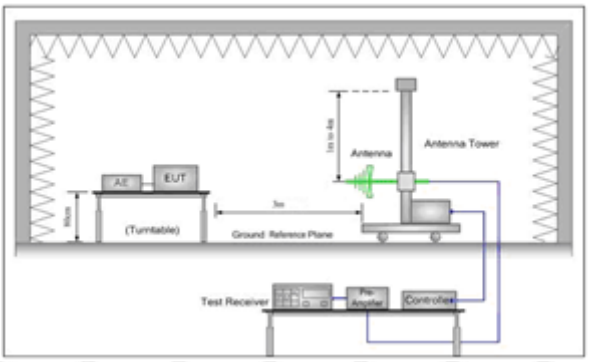
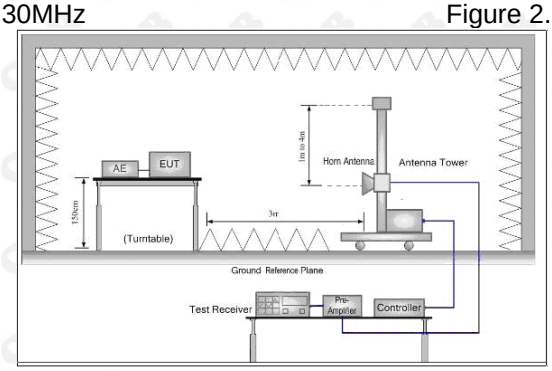



Figure 2. 30MHz to 1GHz




### 7.2 Limit

Spurious Emissions:

| Frequency | Field strength (microvolt/meter) | Limit (dBμV/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-1GHz | 500 | 54.0 | Quasi-peak | 3 |
| Above 1GHz | 500 | 54.0 | Average | 3 |

Note: 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.

7.3 Test procedure

**Below 1GHz test procedure as below:**

a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.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.

d.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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f.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.

**Above 1GHz test procedure as below:**

g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).

h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel

j.Repeat above procedures until all frequencies measured was complete.

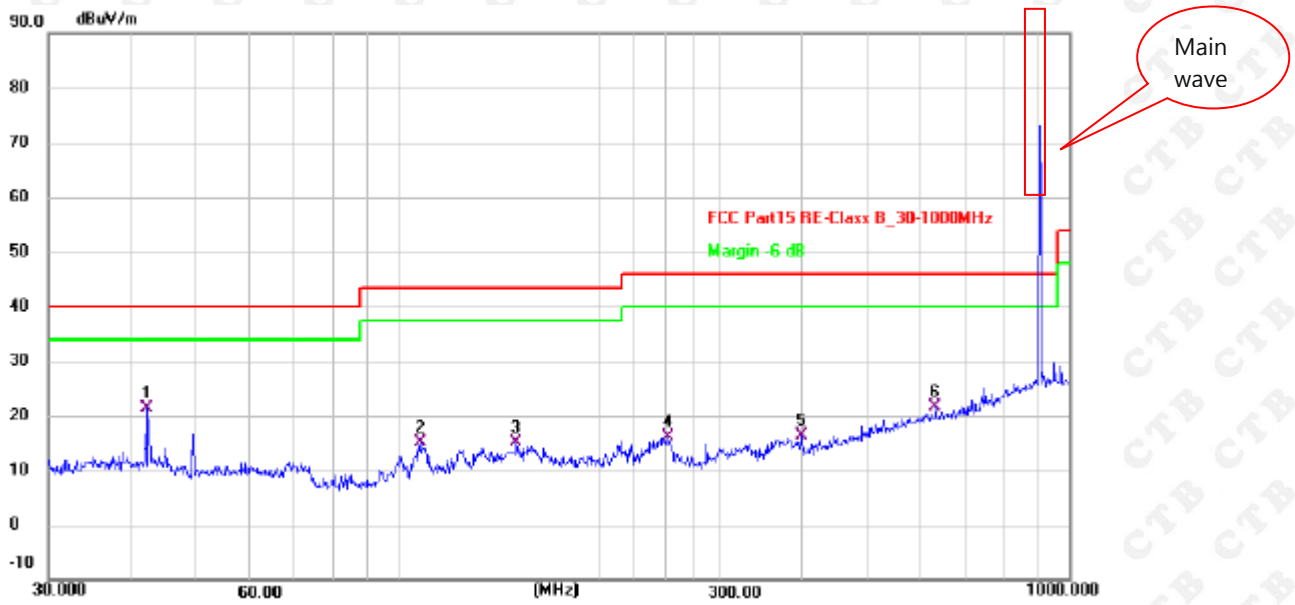
j. Full battery is usedduring test

Receiver set:

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 0.009MHz-0.090MHz | Peak | 10kHz | 30KHz | Peak |
| 0.009MHz-0.090MHz | Average | 10kHz | 30KHz | Average |
| 0.090MHz-0.110MHz | Quasi-peak | 10kHz | 30KHz | Quasi-peak |
| 0.110MHz-0.490MHz | Peak | 10kHz | 30KHz | Peak |
| 0.110MHz-0.490MHz | Average | 10kHz | 30KHz | Average |
| 0.490MHz -30MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| 30MHz-1GHz | Quasi-peak | 120 kHz | 300KHz | Quasi-peak |
| Above 1GHz | Peak | 1MHz | 3MHz | Peak |
| | Peak | 1MHz | 10Hz | Average |

7.4 Test Result

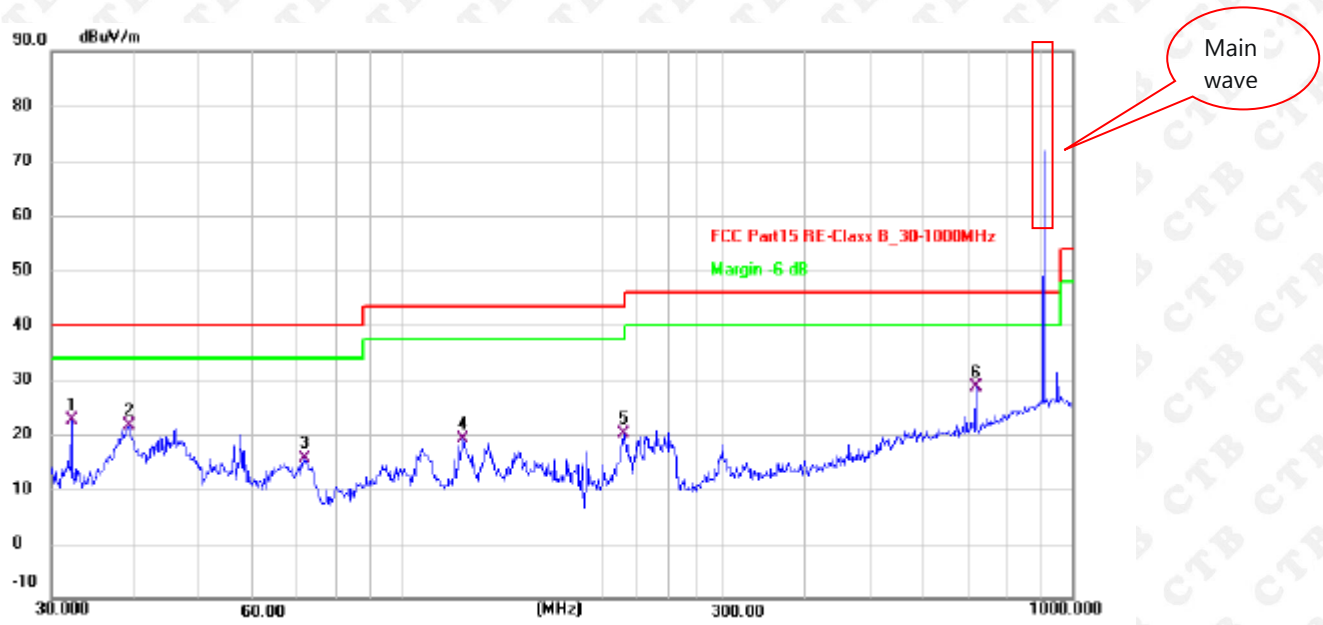
Below 1GHz Test Results:
Antenna polarity: H




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 * | 42.1541 | 35.23 | -13.95 | 21.28 | 40.00 | -18.72 | QP |
| 2 | 107.5100 | 31.80 | -16.79 | 15.01 | 43.50 | -28.49 | QP |
| 3 | 149.4857 | 27.63 | -12.60 | 15.03 | 43.50 | -28.47 | QP |
| 4 | 252.0627 | 31.70 | -15.54 | 16.16 | 46.00 | -29.84 | QP |
| 5 | 399.0302 | 27.80 | -11.53 | 16.27 | 46.00 | -29.73 | QP |
| 6 | 631.6883 | 26.71 | -4.96 | 21.75 | 46.00 | -24.25 | QP |

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Antenna polarity: V




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---|---|---|---|---|---|---|---|
| 1 * | 32.1794 | 36.82 | -14.10 | 22.72 | 40.00 | -17.28 | QP |
| 2 | 39.1615 | 35.37 | -13.66 | 21.71 | 40.00 | -18.29 | QP |
| 3 | 71.8320 | 33.81 | -18.27 | 15.54 | 40.00 | -24.46 | QP |
| 4 | 123.2654 | 34.24 | -15.11 | 19.13 | 43.50 | -24.37 | QP |
| 5 | 213.7634 | 36.15 | -16.14 | 20.01 | 43.50 | -23.49 | QP |
| 6 | 719.1995 | 32.09 | -3.57 | 28.52 | 46.00 | -17.48 | QP |

Remark: 1. Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

2. The margin of 9K-30MH measurement exceeds 20dB, so the test chart is not included.

Above 1 GHz Test Results:

910.3MHz

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Factor (dB) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| V | 1820.6 | 59.86 | -3.57 | 56.29 | 74 | -17.71 | Pk |
| V | 1820.6 | 48.40 | -3.57 | 44.83 | 54 | -9.17 | AV |
| V | 2730.9 | 58.46 | -3.84 | 54.62 | 74 | -19.38 | Pk |
| V | 2730.9 | 48.25 | -3.84 | 44.41 | 54 | -9.59 | AV |
| V | 3641.2 | 58.09 | -4.59 | 53.50 | 74 | -20.50 | Pk |
| V | 3641.2 | 48.61 | -4.59 | 44.02 | 54 | -9.98 | AV |
| H | 1820.6 | 61.74 | -3.62 | 58.12 | 74 | -15.88 | Pk |
| H | 1820.6 | 49.28 | -3.62 | 45.66 | 54 | -8.34 | AV |
| H | 2730.9 | 61.75 | -3.93 | 57.82 | 74 | -16.18 | Pk |
| H | 2730.9 | 50.57 | -3.93 | 46.64 | 54 | -7.36 | AV |
| H | 3641.2 | 60.23 | -3.57 | 56.66 | 74 | -17.34 | Pk |
| H | 3641.2 | 48.22 | -3.57 | 44.65 | 54 | -9.35 | AV |

Remark:
Absolute Level= ReadingLevel+ Factor, Margin= Limit- Absolute Level
Other harmonics emissions are lower than 20dB below the allowable limit.

## 8. BAND EDGE EMISSION

### 8.1 Block Diagram Of Test Setup

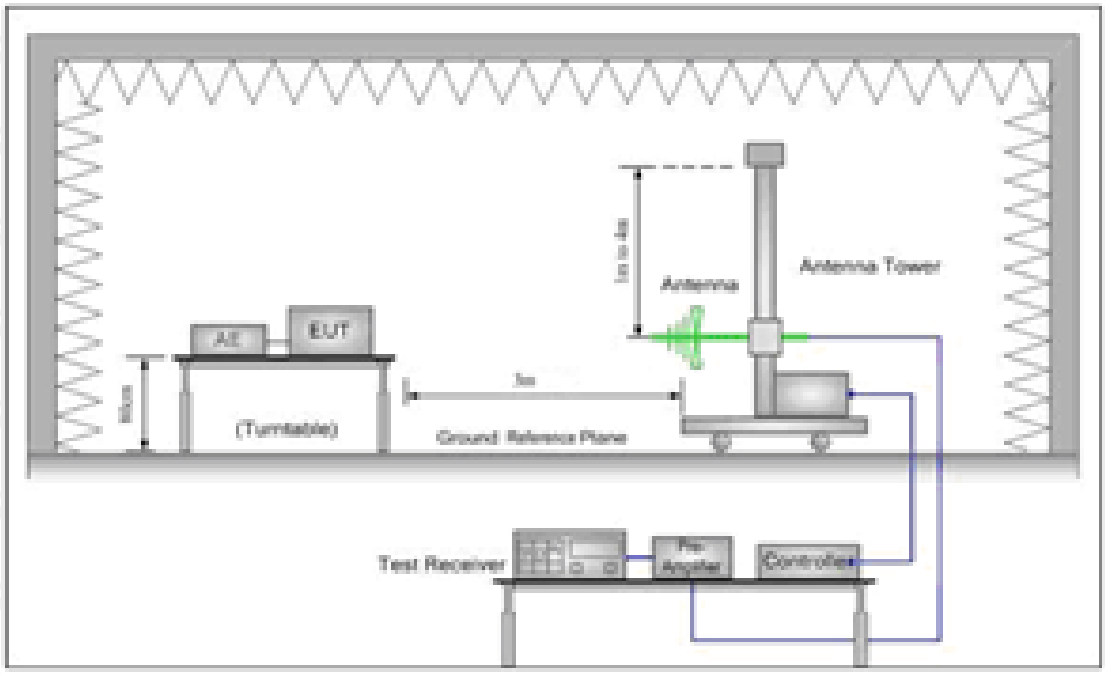



Figure 2. 30MHz to 1GHz

### 8.2 Limit

Spurious Emissions:

| Frequency | Field strength (microvolt/meter) | Limit (dBμV/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-1GHz | 500 | 54.0 | Quasi-peak | 3 |
| Above 1GHz | 500 | 54.0 | Average | 3 |

Note: 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.

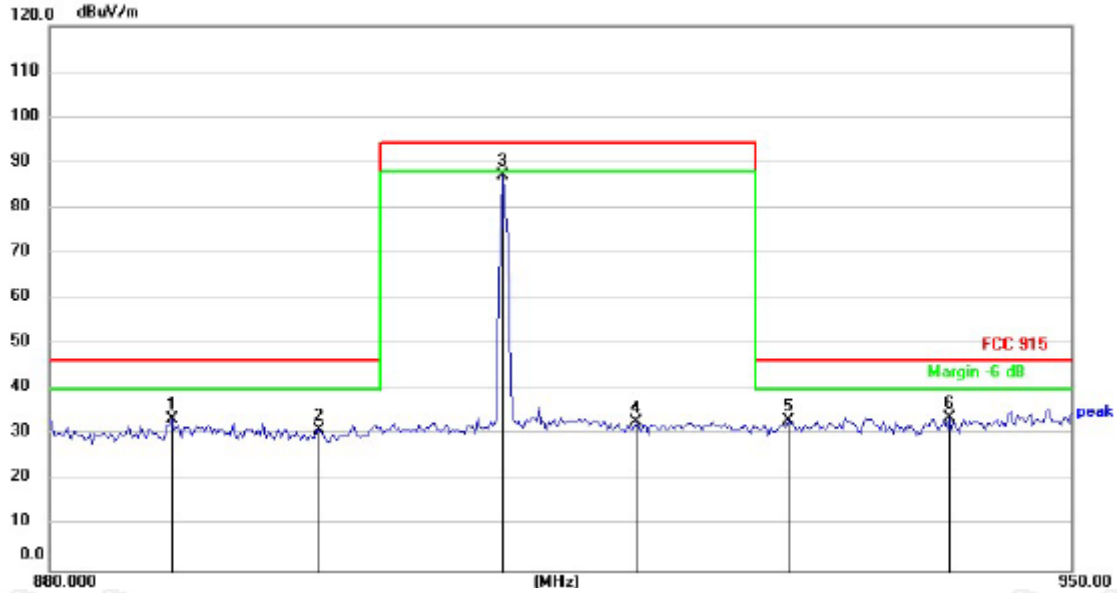
8.3 Test procedure

a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c.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.
d.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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f.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.

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 880MHz-950MHz | Quasi-peak | 120 kHz | 300KHz | Quasi-peak |

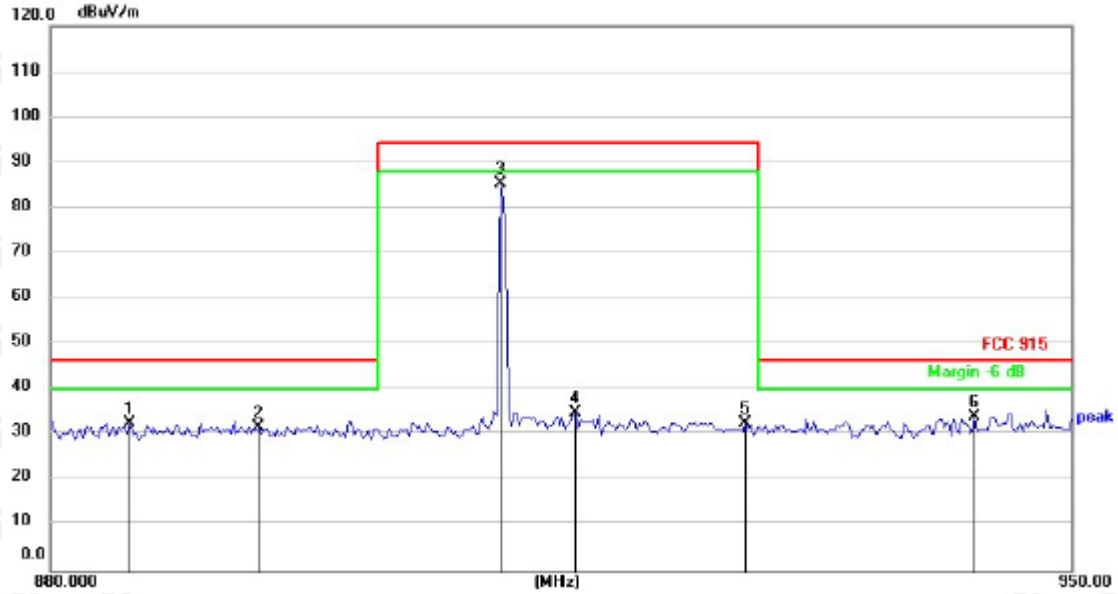
8.4 Test Result

**910.3MHz Horizontal**




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dB/m | dB | Detector |
| 1 | | 888.1198 | 26.47 | 6.91 | 33.38 | 46.00 | -12.62 | QP |
| 2 | | 898.0312 | 23.88 | 7.03 | 30.91 | 46.00 | -15.09 | QP |
| 3 | * | 910.4891 | 80.04 | 7.18 | 87.22 | 94.00 | -6.78 | QP |
| 4 | | 919.5941 | 25.48 | 7.29 | 32.77 | 94.00 | -61.23 | QP |
| 5 | | 930.2128 | 25.69 | 7.41 | 33.10 | 46.00 | -12.90 | QP |
| 6 | | 941.3143 | 26.15 | 7.54 | 33.69 | 46.00 | -12.31 | QP |

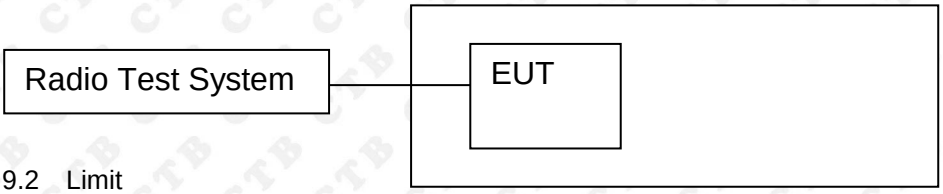
## 910.3MHz Vertical




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dB/m | dB | Detector |
| 1 | | 885.2355 | 25.82 | 6.87 | 32.69 | 46.00 | -13.31 | QP |
| 2 | | 893.9166 | 24.82 | 6.98 | 31.80 | 46.00 | -14.20 | QP |
| 3 | * | 910.3151 | 78.25 | 7.18 | 85.43 | 94.00 | -8.57 | QP |
| 4 | | 915.3807 | 27.70 | 7.24 | 34.94 | 94.00 | -59.06 | QP |
| 5 | | 927.1915 | 25.16 | 7.38 | 32.54 | 94.00 | -61.46 | QP |
| 6 | | 943.1173 | 26.36 | 7.56 | 33.92 | 46.00 | -12.08 | QP |

## 9. BANDWIDTH TEST

9.1 Block Diagram Of Test Setup




9.2 Limit

| FCC Part15 (15.249) , Subpart C | | | |
|---|---|---|---|
| Section | Test Item | Frequency Range (MHz) | Result |
| 15.249 | Bandwidth | 902~928 | PASS |

9.3 Test procedure

1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

9.4 Test Result

| Test Mode | Frequency (MHz) | 20dB Bandwidth (MHz) | Result |
|---|---|---|---|
| LoRa | 910.3 | 0.1396 | PASS |

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

Test Graph:

| | |
|---|---|
| LoRa |  |

## 10. ANTENNA REQUIREMENT

15.203 requirement:
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.
15.247(b) (4) requirement:
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

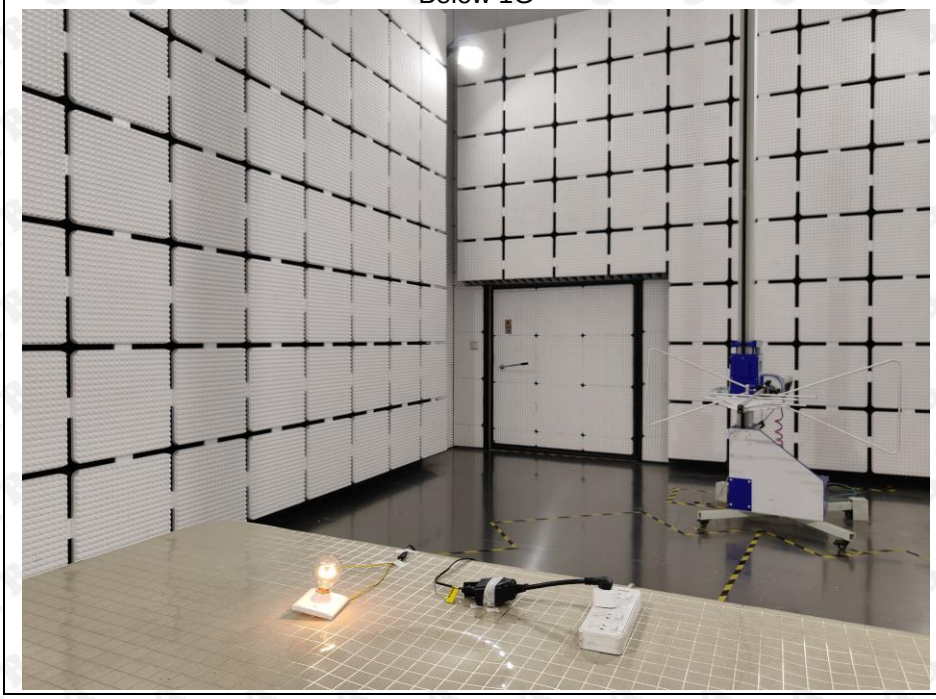
**EUT Antenna:**

The antenna is Spring Antenna. The best case gain of the antenna is -1.71dBi.

## 11. EUT TEST SETUP PHOTOGRAPHS

Radiated Emissions

Below 1G



Above 1G

Conducted emission

※※※※※ **END OF REPORT** ※※※※※