

# Radio Test Report

## FCC ID:2AZI3F55

**Report No.** : TBR-C-202403-0223-21  
**Applicant** : SHENZHEN KERUI SMART TECHNOLOGY CO., LTD  
**Equipment Under Test (EUT)**  
**EUT Name** : Wireless Doorbell Transmitter  
**Model No.** : F55  
**Series Model No.** : Please Refer To Page 5  
**Brand Name** : SECRUI  
**Sample ID** : HC-C-202403-0223-02-01  
**Receipt Date** : 2024-03-29  
**Test Date** : 2024-03-29 to 2024-04-11  
**Issue Date** : 2024-04-11  
**Standards** : FCC Part 15, Subpart C (15.231(a))  
**Test Method** : ANSI C63.10:2013  
**Conclusions** : **PASS**

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

**Tested By** : Zkn Zhou  
**Reviewed By** : Camille Li  
**Approved By** : IVAN SU



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

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# 1. General Information about EUT

## 1.1 Client Information

|                     |   |  |
|---------------------|---|--|
| <b>Applicant</b>    | : | SHENZHEN KERUI SMART TECHNOLOGY CO., LTD   |
| <b>Address</b>      | : | Room 1501, T2, Jinlitong Building, No. 1100, Xingye Road, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China |
| <b>Manufacturer</b> | : | SHENZHEN KERUI SMART TECHNOLOGY CO., LTD   |
| <b>Address</b>      | : | Room 1501, T2, Jinlitong Building, No. 1100, Xingye Road, Xin'an Street, Bao'an District, Shenzhen, Guangdong, China |

## 1.2 General Description of EUT (Equipment Under Test)

|                            |   |   |  |
|----------------------------|---|---|--|
| <b>EUT Name</b>            | : | Wireless Doorbell Transmitter   |  |
| <b>Models No.</b>          | : | F55, M520+F55, M520+F55X2, M520X2+F55, M520X2+F55X2, M520X3+F55X2, M508+F55, M508+F55X2, M508X2+F55, M508X2+F55X2, M508X3+F55X2, M523+F55, M523+F55X2, M523X2+F55, M523X2+F55X2, M523X3+F55X2 |  |
| <b>Model Different</b>     | : | All PCB boards and circuit diagrams are the same, the only difference is that appearance color.   |  |
| <b>Product Description</b> | : | Operation Frequency:  | 433.92 MHz                                       |
|                            | : | Max Out Power:  | 67.11 dBuV/m (PK Max.)<br>58.61 dBuV/m (AV Max.) |
|                            | : | Antenna Gain:   | -6.3dBi PCB Antenna                              |
|                            | : | Modulation Type:  | OOK  |
| <b>Power Rating</b>        | : | DC 3.0V by button cell  |  |
| <b>Software Version</b>    | : | -----   |  |
| <b>Hardware Version</b>    | : | KR-F55-CE-V1.1-2434   |  |

**Note:**

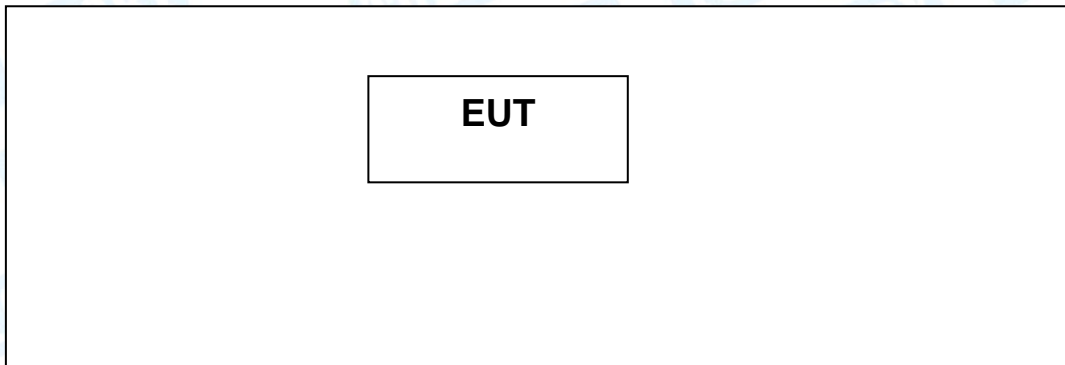
- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

## (2) Antenna description

| Antenna | Brand | Model Name | Type     | Antenna Gain(dBi) |
|---------|-------|------------|----------|-------------------|
| 1       | N/A   | N/A        | PCB Ant. | -6.3              |

### 1.3 Block Diagram Showing the Configuration of System Tested

TX Mode



### 1.4 Description of Support Units

The EUT has been test as an independent unit.

### 1.5 Description of Test Mode

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 follow was evaluated respectively.

| Test Items         | Note                      |
|--------------------|---------------------------|
| Conducted Emission | Charging Mode             |
| Radiated Emission  | Continuously transmitting |
| Bandwidth          | Continuously transmitting |
| Duty Cycle         | Continuously transmitting |
| Release Time       | Normal Mode               |

**Note:**

- (1) During the testing procedure, the continuously transmitting mode was programmed by the customer.
- (2) The EUT is considered a fixed unit, and it was pre-tested on the positioned of each 3 axis: X axis, Y axis and Z axis. The worst case was found positioned on Z-plane. There for only the test data of this Z-plane were used for radiated emission measurement test.



## 1.6 Description of Test Software Setting

During testing channel & Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of transmitting mode.

|                                     |     |
|-------------------------------------|-----|
| <b>RF Power Setting in Test SW:</b> | DEF |
|-------------------------------------|-----|

## 1.7 Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| Test Item          | Parameters  | Expanded Uncertainty ( $U_{Lab}$ ) |
|--------------------|---|------------------------------------|
| Conducted Emission | Level Accuracy:<br>9kHz~150kHz<br>150kHz to 30MHz | $\pm 3.50$ dB<br>$\pm 3.10$ dB     |
| Radiated Emission  | Level Accuracy:<br>9kHz to 30 MHz                 | $\pm 4.60$ dB                      |
| Radiated Emission  | Level Accuracy:<br>30MHz to 1000 MHz              | $\pm 4.50$ dB                      |
| Radiated Emission  | Level Accuracy:<br>Above 1000MHz                  | $\pm 4.20$ dB                      |

## 1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F., Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

### **CNAS (L5813)**

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

### **A2LA Certificate No.: 4750.01**

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

### **IC Registration No.: (11950A)**

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.

## 2. Test Summary

| FCC Part 15 Subpart (15.231(a))                         |                     |                        |          |        |
|---|---------------------|------------------------|----------|--------|
| Standard Section  | Test Item           | Test Sample(s)         | Judgment | Remark |
| FCC   |                     |                        |          |        |
| 15.203  | Antenna Requirement | HC-C-202403-0223-02-01 | PASS     | N/A    |
| 15.207  | Conducted Emission  | /                      | /        | N/A    |
| 15.231  | Release Time        | HC-C-202403-0223-02-01 | PASS     | N/A    |
|   | Radiation Emission  | HC-C-202403-0223-02-01 | PASS     | N/A    |
|   | 20 dB Bandwidth     | HC-C-202403-0223-02-01 | PASS     | N/A    |
|   | Duty Cycle          | HC-C-202403-0223-02-01 | PASS     | N/A    |
| <b>Note:</b> N/A is an abbreviation for Not Applicable. |                     |                        |          |        |

## 3. Test Software

| Test Item                | Test Software | Manufacturer | Version No.  |
|--------------------------|---------------|--------------|--------------|
| Conducted Emission       | EZ-EMC        | EZ           | CDI-03A2     |
| Radiation Emission       | EZ-EMC        | EZ           | FA-03A2RE    |
| RF Conducted Measurement | MTS-8310      | MWRFtest     | V2.0.0.0     |
| RF Test System           | JS1120        | Tonscend     | V2.6.88.0336 |

## 4. Test Equipment and Test Site

| Test Site   |                        |              |                   |      |
|-------------|------------------------|--------------|-------------------|------|
| No.         | Test Site              | Manufacturer | Specification     | Used |
| TB-EMCSR001 | Shielding Chamber #1   | YIHENG       | 7.5*4.0*3.0 ( m ) | √    |
| TB-EMCSR002 | Shielding Chamber #2   | YIHENG       | 8.0*4.0*3.0 ( m ) | √    |
| TB-EMCCA001 | 3m Anechoic Chamber #A | ETS          | 9.0*6.0*6.0 ( m ) | X    |
| TB-EMCCB002 | 3m Anechoic Chamber #B | YIHENG       | 9.0*6.0*6.0 ( m ) | √    |

| Conducted Emission Test          |  |                    |                |               |               |
|----------------------------------|--|--------------------|----------------|---------------|---------------|
| Equipment                        | Manufacturer                           | Model No.          | Serial No.     | Last Cal.     | Cal. Due Date |
| EMI Test Receiver                | Rohde & Schwarz                        | ESCI               | 100321         | Jun. 20, 2023 | Jun. 19, 2024 |
| RF Switching Unit                | Compliance<br>Direction Systems<br>Inc | RSU-A4             | 34403          | Jun. 20, 2023 | Jun. 19, 2024 |
| AMN                              | SCHWARZBECK                            | NNBL 8226-2        | 8226-2/164     | Jun. 20, 2023 | Jun. 19, 2024 |
| LISN                             | Rohde & Schwarz                        | ENV216             | 101131         | Jun. 20, 2023 | Jun. 19, 2024 |
| ISN                              | SCHWARZBECK                            | NTFM 8131          | 8131-193       | Jun. 20, 2023 | Jun. 19, 2024 |
| ISN                              | SCHWARZBECK                            | CAT3 8158          | cat3 5158-0094 | Jun. 20, 2023 | Jun. 19, 2024 |
| ISN                              | SCHWARZBECK                            | NTFM5158           | NTFM5158 0145  | Jun. 20, 2023 | Jun. 19, 2024 |
| ISN                              | SCHWARZBECK                            | CAT 8158           | cat5 8158-179  | Jun. 20, 2023 | Jun. 19, 2024 |
| Radiation Emission Test (B Site) |  |                    |                |               |               |
| Equipment                        | Manufacturer                           | Model No.          | Serial No.     | Last Cal.     | Cal. Due Date |
| Spectrum Analyzer                | Agilent                                | N9020A             | MY49100060     | Aug. 30, 2023 | Aug. 29, 2024 |
| Spectrum Analyzer                | Rohde & Schwarz                        | FSV40-N            | 102197         | Jun. 20, 2023 | Jun. 19, 2024 |
| EMI Test Receiver                | Rohde & Schwarz                        | ESU-8              | 100472/008     | Feb. 23, 2024 | Feb.22, 2025  |
| Bilog Antenna                    | SCHWARZBECK                            | VULB 9168          | 1225           | Nov. 13, 2023 | Nov. 12, 2025 |
| Horn Antenna                     | SCHWARZBECK                            | BBHA 9120 D        | 2463           | Jun. 26, 2022 | Jun.25, 2024  |
| Horn Antenna                     | SCHWARZBECK                            | BBHA 9170          | 1118           | Feb. 27, 2024 | Feb.26, 2026  |
| Loop Antenna                     | SCHWARZBECK                            | FMZB 1519 B        | 1519B-059      | Jun. 26, 2022 | Jun.25, 2024  |
| HF Amplifier                     | Tonscend                               | TAP9E6343          | AP21C806117    | Aug. 30, 2023 | Aug. 29, 2024 |
| HF Amplifier                     | Tonscend                               | TAP051845          | AP21C806141    | Aug. 30, 2023 | Aug. 29, 2024 |
| HF Amplifier                     | Tonscend                               | TAP0184050         | AP21C806129    | Aug. 30, 2023 | Aug. 29, 2024 |
| Highpass Filter                  | CD                                     | HPM-6.4/18G        | ---            | N/A           | N/A           |
| Highpass Filter                  | CD                                     | HPM-2.8/18G        | ---            | N/A           | N/A           |
| Highpass Filter                  | XINBO                                  | XBLBQ-HTA67(8-25G) | 22052702-1     | N/A           | N/A           |

| Antenna Conducted Emission              |                    |                   |               |               |               |
|---|--------------------|-------------------|---------------|---------------|---------------|
| Equipment                               | Manufacturer       | Model No.         | Serial No.    | Last Cal.     | Cal. Due Date |
| Spectrum Analyzer                       | Agilent            | E4407B            | MY45106456    | Jun. 20, 2023 | Jun. 19, 2024 |
| Spectrum Analyzer                       | Rohde & Schwarz    | FSV40-N           | 102197        | Jun. 20, 2023 | Jun. 19, 2024 |
| MXA Signal Analyzer                     | KEYSIGHT           | N9020B            | MY60110172    | Aug. 30, 2023 | Aug. 29, 2024 |
| MXA Signal Analyzer                     | Agilent            | N9020A            | MY47380425    | Aug. 30, 2023 | Aug. 29, 2024 |
| Vector Signal Generator                 | Agilent            | N5182A            | MY50141294    | Aug. 30, 2023 | Aug. 29, 2024 |
| Analog Signal Generator                 | Agilent            | N5181A            | MY48180463    | Aug. 30, 2023 | Aug. 29, 2024 |
| Vector Signal Generator                 | KEYSIGHT           | N5182B            | MY59101429    | Aug. 30, 2023 | Aug. 29, 2024 |
| Analog Signal Generator                 | KEYSIGHT           | N5173B            | MY61252685    | Aug. 30, 2023 | Aug. 29, 2024 |
| RF Power Sensor                         | DARE!! Instruments | RadiPowerRPR3006W | 17100015SNO26 | Aug. 30, 2023 | Aug. 29, 2024 |
|   | DARE!! Instruments | RadiPowerRPR3006W | 17100015SNO29 | Aug. 30, 2023 | Aug. 29, 2024 |
|   | DARE!! Instruments | RadiPowerRPR3006W | 17100015SNO31 | Aug. 30, 2023 | Aug. 29, 2024 |
|   | DARE!! Instruments | RadiPowerRPR3006W | 17100015SNO33 | Aug. 30, 2023 | Aug. 29, 2024 |
| RF Control Unit                         | Tonsced            | JS0806-1          | 21C8060380    | N/A           | N/A           |
| RF Control Unit                         | Tonsced            | JS0806-2          | 21F8060439    | Aug. 30, 2023 | Aug. 29, 2024 |
| Power Control Box                       | Tonsced            | JS0806-4ADC       | 21C8060387    | N/A           | N/A           |
| Wideband Radio<br>Communication Tester  | Rohde & Schwarz    | CMW500            | 144382        | Aug. 30, 2023 | Aug. 29, 2024 |
| Universal Radio<br>Communication Tester | Rohde&Schwarz      | CMW500            | 168796        | Feb. 23, 2024 | Feb. 22, 2025 |
| Temperature and<br>Humidity Chamber     | ZhengHang          | ZH-QTH-1500       | ZH2107264     | Jun. 20, 2023 | Jun. 19, 2024 |

## 5. Conducted Emission

### 5.1 Test Standard and Limit

#### 5.1.1 Test Standard

#### FCC Part 15.207

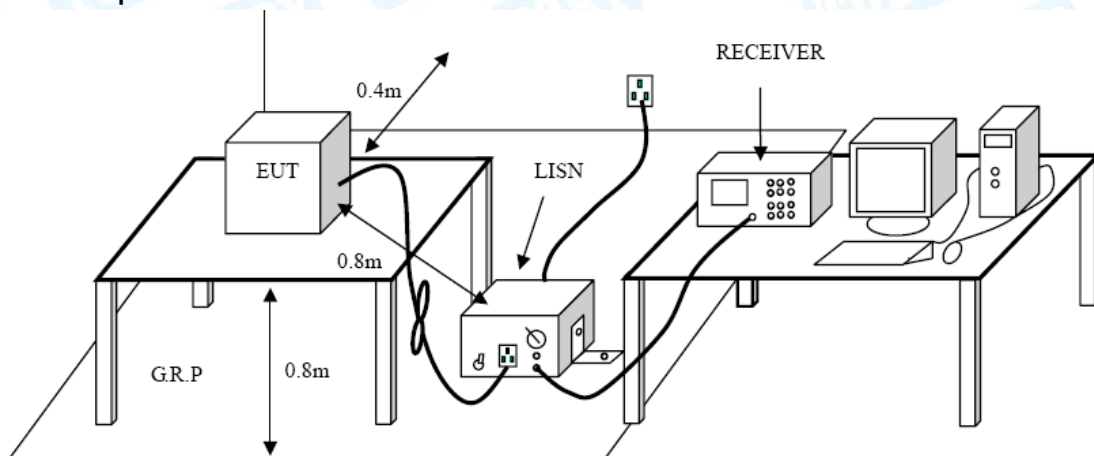
#### 5.1.2 Test Limit

| Frequency     | Maximum RF Line Voltage (dB $\mu$ V) |               |
|---------------|--------------------------------------|---------------|
|               | Quasi-peak Level                     | Average Level |
| 150kHz~500kHz | 66 ~ 56 *                            | 56 ~ 46 *     |
| 500kHz~5MHz   | 56                                   | 46            |
| 5MHz~30MHz    | 60                                   | 50            |

#### Notes:

- (1) \*Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 5.2 Test Setup



### 5.3 Test Procedure

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.

- The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.

#### 5.4 Deviation From Test Standard

No deviation

#### 5.5 EUT Operating Mode

Please refer to the description of test mode.

#### 5.6 Test Data

The EUT is powered by DC battery, no requirement for this test item.

## 6. Radiated Emission Test

### 6.1 Test Standard and Limit

#### 6.1.1 Test Standard

##### FCC 15.231e

#### 6.1.2 Test Limit

According to FCC 15.231(e) requirement:

In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (microvolt/meter) at 3m | Field Strength of Spurious Emissions (microvolt/meter) at 3m |
|-----------------------------|---|--|
| 40.66~40.70                 | 1000  | 100  |
| 70~130                      | 500   | 50   |
| 130~174                     | 500 to 1500(**)                                       | 50 to 150(**)  |
| 174~260                     | 1500  | 150  |
| 260~470                     | 1500 to 5000(**)                                      | 150 to 500(**)   |
| Above 470                   | 5000  | 500  |

\*\* Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

- (1) for the band 130~174 MHz,  $\mu\text{V/m}$  at 3 meters =  $22.7273(F) - 2454.5455$ ;
- (2) for the band 260~470 MHz,  $\mu\text{V/m}$  at 3 meter =  $16.6667(F) - 2833.3333$ .
- (3) The maximum permitted unwanted emissions level is 20 dB below the maximum permitted fundamental level. In addition field strength of any emissions which appear inside of the restriction band shall not exceed the general radiated emissions limits in FCC Part 15.209.

| Frequency (MHz) | Field Strength (microvolt/meter) | Measurement Distance (meters) |
|-----------------|----------------------------------|-------------------------------|
| 0.009~0.490     | 2400/F(KHz)                      | 300                           |
| 0.490~1.705     | 24000/F(KHz)                     | 30                            |
| 1.705~30.0      | 30                               | 30                            |
| 30~88           | 100                              | 3                             |
| 88~216          | 150                              | 3                             |



|           |     |   |
|-----------|-----|---|
| 216~960   | 200 | 3 |
| Above 960 | 500 | 3 |

Note:

(1) The tighter limit applies at the band edges.

(2) For above 30MHz:

$$\text{Emission Level(dBuV/m)} = 20\log \text{Emission Level(uV/m)}$$

For 0.009~0.490MHz:

$$\text{Emission Level(dBuV/m)} = 20\log \text{Emission Level(uV/m)} + 40\log(300/3)$$

For 0.049~30MHz:

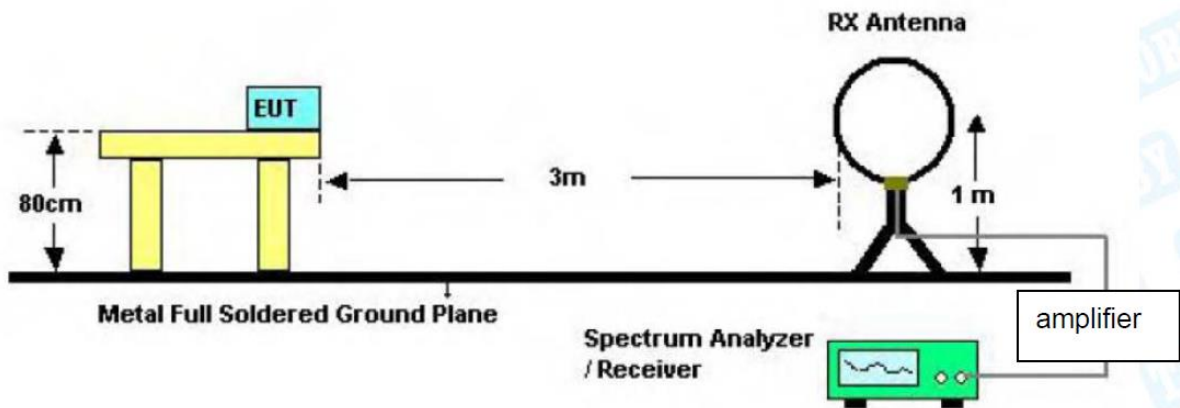
$$\text{Emission Level(dBuV/m)} = 20\log \text{Emission Level(uV/m)} + 40\log(30/3)$$

So the field strength of emission limits have been calculated in below table.

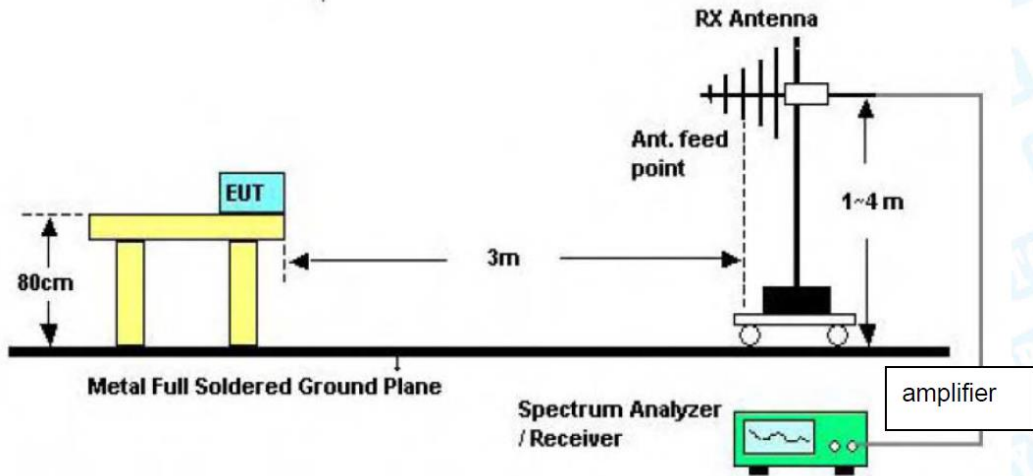
| Fundamental Frequency (MHz) | Field Strength of Fundamental (microvolt/meter) at 3m |
|-----------------------------|---|
| 433.92 MHz                  | 80.82 (Average)                                       |
| 433.92 MHz                  | 100.82 (Peak)   |

## 6.2 Test Setup

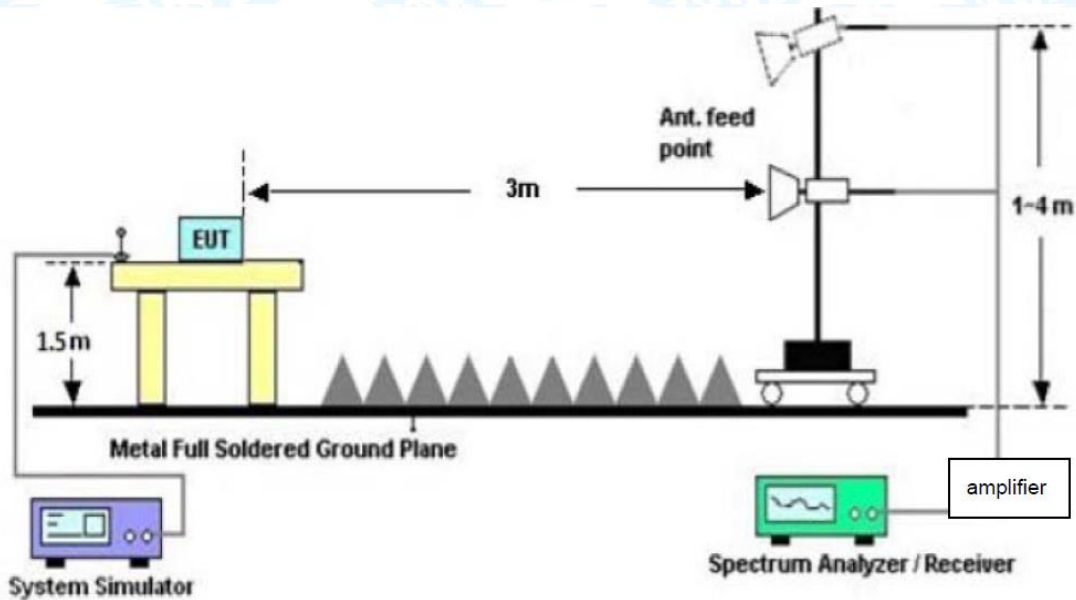
### Radiated measurement



### Below 30MHz Test Setup



**Below 1000MHz Test Setup**



**Above 1GHz Test Setup**

### 6.3 Test Procedure

#### ---Radiated measurement

- The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.

- The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Below 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- Testing frequency range 30MHz-1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection. Testing frequency range 9KHz-150Hz the measuring instrument use VBW=200Hz with Quasi-peak detection. Testing frequency range 9KHz-30MHz the measuring instrument use VBW=9kHz with Quasi-peak detection.
- Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- For the actual test configuration, please see the test setup photo.

#### 6.4 Deviation From Test Standard

No deviation

#### 6.5 EUT Operating Mode

Please refer to the description of test mode.

#### 6.6 Test Data

Radiated measurement please refer to the Attachment A inside test report.

## 7. Bandwidth

### 7.1 Test Standard and Limit

#### 7.1.1 Test Standard

##### **FCC 15.231**

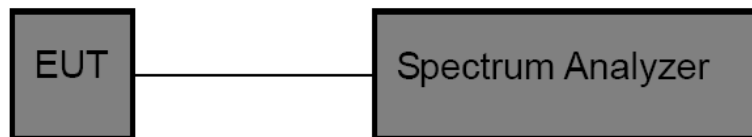
#### 7.1.2 Test Limit

The 99%bandwidth of the emissions shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. So the emission bandwidth limits have been calculated in below table.

| Fundamental Frequency | 20 dB Bandwidth Limits (MHz) |
|-----------------------|------------------------------|
| 433.92MHz             | 1.0848                       |

### 7.2 Test Setup

#### Conducted measurement



### 7.3 Test Procedure

- (1) Set Spectrum Analyzer Center Frequency= Fundamental Frequency, RBW=10 kHz, VBW= 30 kHz, Span= 1 MHz.
- (2) Measured the spectrum width with power higher than 20 dB below carrier.

### 7.4 Deviation From Test Standard

No deviation

### 7.5 EUT Operating Mode

Please refer to the description of test mode.

### 7.6 Test Data

Please refer to the Attachment B.

## 8. Release Time Measurement

### 8.1 Test Standard and Limit

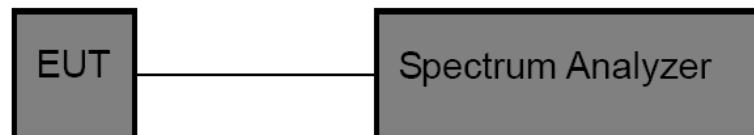
#### 8.1.1 Test Standard

##### **FCC 15.231**

#### 8.1.2 Test Limit

According to FCC 15.231a, A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### 8.2 Test Setup



### 8.3 Test Procedure

- (1) Setup the EUT as show in the block diagram above.
- (2) Set Spectrum Analyzer Centre Frequency= Fundamental Frequency, RBW=100 kHz, VBW= 300 kHz, Span= 0 Hz. Sweep Time= 5 Seconds.
- (3) Setup the EUT as normal operation and press Transmitter button.
- (4) Set Spectrum Analyzer View, Delta Mark time.

### 8.4 Deviation From Test Standard

No deviation

### 8.5 EUT Operating Mode

Please refer to the description of test mode.

### 8.6 Test Data

Please refer to the Appendix C.

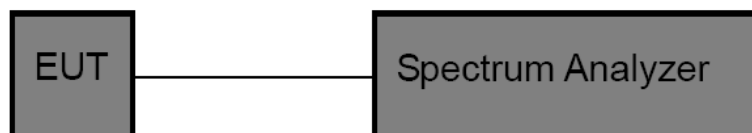
## 9. Duty Cycle

### 9.1 Test Standard and Limit

#### 9.1.1 Test Standard

**FCC 15.231**

### 9.2 Test Setup



### 9.3 Test Procedure

- (1) The EUT was placed on a turntable which is 0.8m above ground plane.
- (2) Set EUT operating in continuous transmitting mode.
- (3) Set the Spectrum Analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth (RBW) to 100 kHz and video bandwidth (VBW) to 300 kHz, Span was set to 0 Hz.
- (4) The Duty Cycle was measured and recorded.

### 9.4 Deviation From Test Standard

No deviation

### 9.5 EUT Operating Mode

Please refer to the description of test mode.

### 9.6 Test Data

Please refer to the Appendix D.

## 10. Antenna Requirement

### 11.1 Test Standard and Limit

#### 11.1.1 Test Standard

##### **FCC Part 15.203**

#### 11.1.2 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 shall be considered sufficient to comply with the provisions of this Section. 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.

### 11.2 Deviation From Test Standard

No deviation

### 11.3 Antenna Connected Construction

The gains of the antenna used for transmitting is -6.3dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

### 11.4 Test Data

The EUT antenna is a PCB Antenna. It complies with the standard requirement.

| Antenna Type   |
|--|
| <input checked="" type="checkbox"/> Permanent attached antenna |
| <input type="checkbox"/> Unique connector antenna              |
| <input type="checkbox"/> Professional installation antenna     |

## Attachment A--Unwanted Emissions Data

### ---Radiated Unwanted Emissions

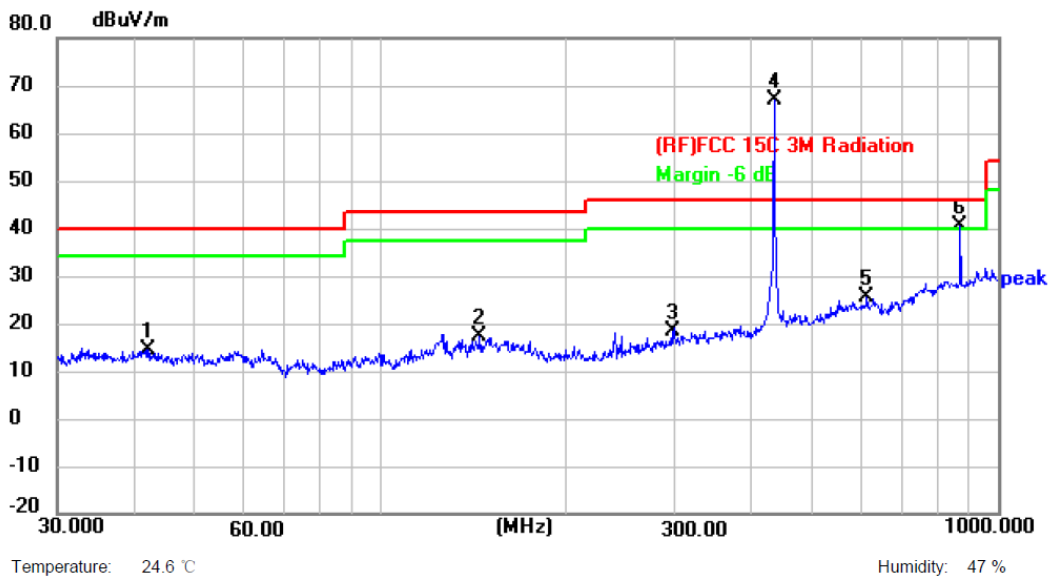
#### 9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB Below the permissible value has no need to be reported.

#### 30MHz~1GHz

|                      |  |
|----------------------|--|
| <b>Test Voltage:</b> | DC 3V  |
| <b>Ant. Pol.</b>     | Horizontal   |
| <b>Test Mode:</b>    | Mode 1   |
| <b>Remark:</b>       | No report for the emission which more than 10 dB below the prescribed limit. |



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 42.0065         | 38.21          | -23.73        | 14.48          | 40.00          | -25.52      | peak     |
| 2   | 144.8417        | 39.70          | -22.28        | 17.42          | 43.50          | -26.08      | peak     |
| 3   | 297.2240        | 39.74          | -21.31        | 18.43          | 46.00          | -27.57      | peak     |
| 4 * | 434.0651        | 84.41          | -17.38        | 67.03          | 46.00          | 21.03       | peak     |
| 5   | 614.2142        | 39.09          | -13.69        | 25.40          | 46.00          | -20.60      | peak     |
| 6 ! | 869.1302        | 49.91          | -9.34         | 40.57          | 46.00          | -5.43       | peak     |

\*:Maximum data    x:Over limit    !:over margin

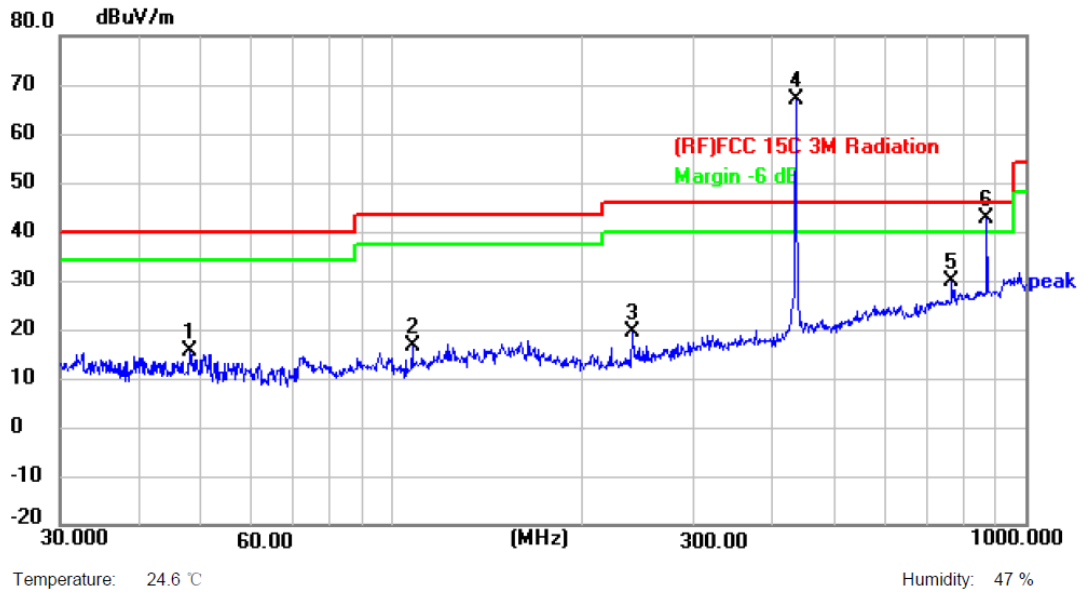
**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak (dBμV/m)-Limit QPK(dBμV/m)



| Fundamental and Harmonics Result |                              |   |                                 |                                  |                               |            |
|----------------------------------|------------------------------|---|---------------------------------|----------------------------------|-------------------------------|------------|
| Freq(MHz)                        | Peak Level<br>(dB $\mu$ V/m) | AV Factor(dB $\mu$ V/m)<br>(see Attachment D) | Average Level<br>(dB $\mu$ V/m) | Limit(dB $\mu$ V/m)<br>(average) | Limit(dB $\mu$ V/m)<br>(Peak) | Conclusion |
| 434.0651                         | 67.03                        | -8.5  | 58.53                           | 80.80                            | 100.80                        | PASS       |
| 869.1302                         | 40.57                        | -8.5  | 32.07                           | 60.80                            | 80.80                         | PASS       |

|                      |  |
|----------------------|--|
| <b>Test Voltage:</b> | DC 3V  |
| <b>Ant. Pol.</b>     | Vertical   |
| <b>Test Mode:</b>    | Mode 1   |
| <b>Remark:</b>       | No report for the emission which more than 10 dB below the prescribed limit. |



| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 47.9940         | 39.87          | -24.23        | 15.64          | 40.00          | -24.36      | peak     |
| 2   | 107.8876        | 41.18          | -24.55        | 16.63          | 43.50          | -26.87      | peak     |
| 3   | 239.9873        | 43.40          | -23.92        | 19.48          | 46.00          | -26.52      | peak     |
| 4 * | 434.0651        | 84.49          | -17.38        | 67.11          | 46.00          | 21.11       | peak     |
| 5   | 766.0570        | 41.36          | -11.47        | 29.89          | 46.00          | -16.11      | peak     |
| 6 ! | 869.1302        | 52.10          | -9.34         | 42.76          | 46.00          | -3.24       | peak     |

\*:Maximum data    x:Over limit    !:over margin

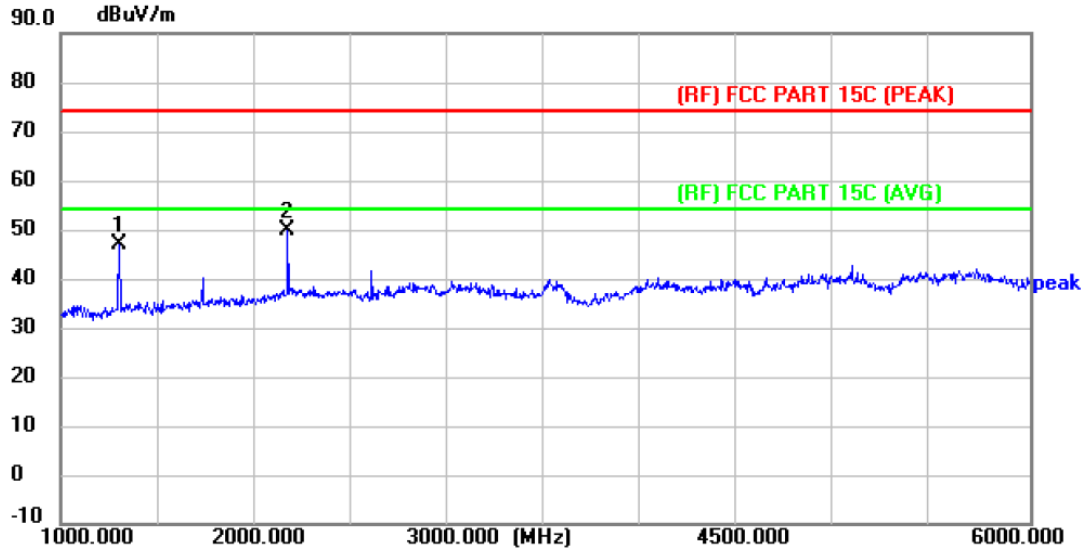
**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = QuasiPeak (dBμV/m)-Limit QPK(dBμV/m)

| Fundamental and Harmonics Result |                              |   |                                 |                                  |                               |            |
|----------------------------------|------------------------------|---|---------------------------------|----------------------------------|-------------------------------|------------|
| Freq(MHz)                        | Peak Level<br>(dB $\mu$ V/m) | AV Factor(dB $\mu$ V/m)<br>(see Attachment D) | Average Level<br>(dB $\mu$ V/m) | Limit(dB $\mu$ V/m)<br>(average) | Limit(dB $\mu$ V/m)<br>(Peak) | Conclusion |
| 434.0651                         | 67.11                        | -8.5  | 58.61                           | 80.80                            | 100.80                        | PASS       |
| 869.1302                         | 42.76                        | -8.5  | 34.26                           | 60.80                            | 80.80                         | PASS       |

**Above 1GHz**

|                      |            |
|----------------------|------------|
| <b>Test Voltage:</b> | DC 3V      |
| <b>Ant. Pol.</b>     | Horizontal |
| <b>Test Mode:</b>    | TX Mode    |



Temperature: 24.6 °C

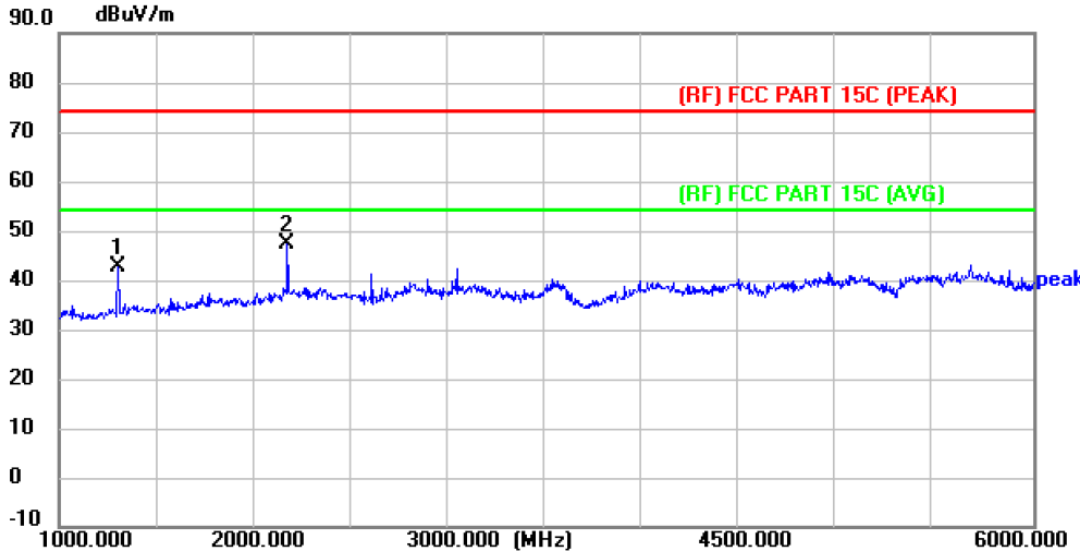
Humidity: 47 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 1300.000        | 66.57          | -19.45        | 47.12          | 74.00          | -26.88      | peak     |
| 2 * | 2170.000        | 64.84          | -15.11        | 49.73          | 74.00          | -24.27      | peak     |

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. Peak/AVG (dBμV/m) = Corr. (dB/m) + Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m) - Limit PK/AVG (dBμV/m)
4. The tests evaluated 1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
5. No report for the emission which more than 20dB below the prescribed limit.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

|               |          |
|---------------|----------|
| Test Voltage: | DC 3V    |
| Ant. Pol.     | Vertical |
| Test Mode:    | TX Mode  |



Temperature: 24.6 °C

Humidity: 47 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------|----------------|----------------|-------------|----------|
| 1   | 1300.000        | 61.99          | -19.45        | 42.54          | 74.00          | -31.46      | peak     |
| 2 * | 2170.000        | 62.52          | -15.11        | 47.41          | 74.00          | -26.59      | peak     |

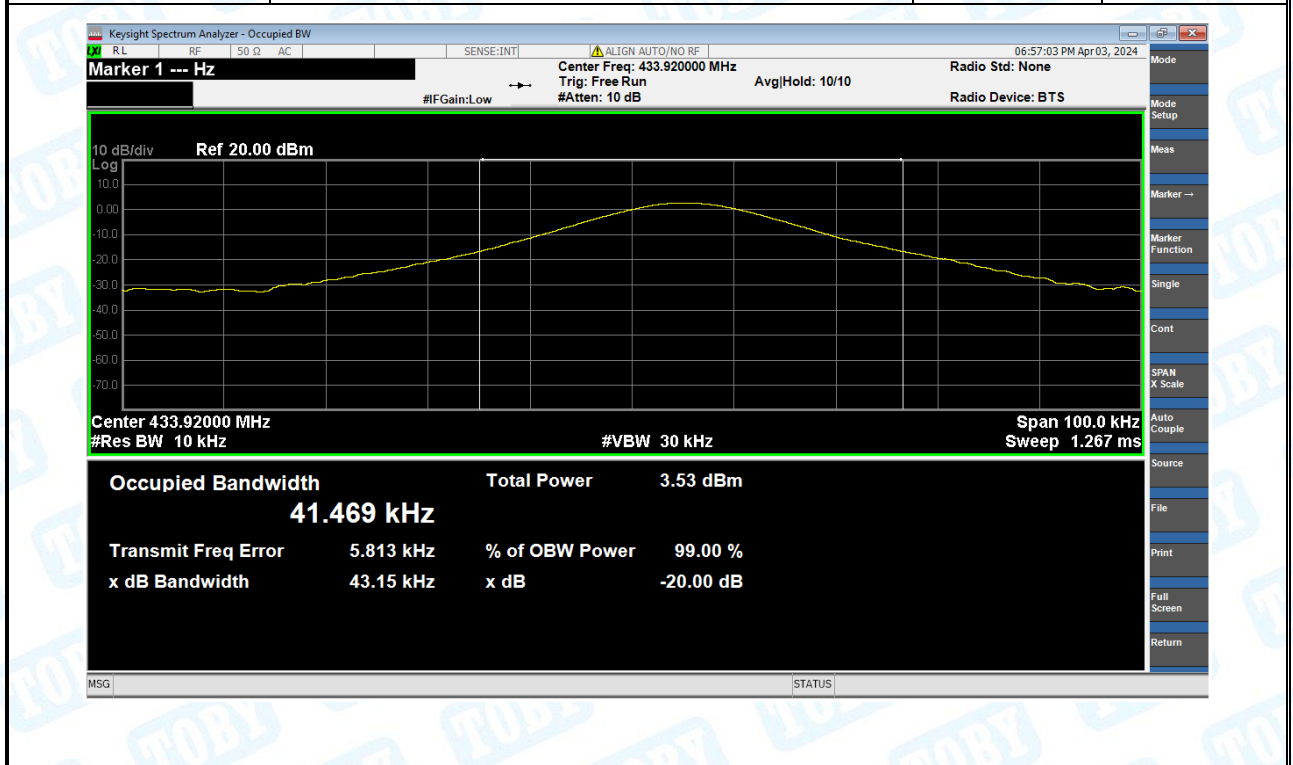
**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. Peak/AVG (dBμV/m) = Corr. (dB/m) + Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m) - Limit PK/AVG (dBμV/m)
4. The tests evaluated 1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
5. No report for the emission which more than 20dB below the prescribed limit.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

## Attachment B--Bandwidth Data

|                   |   |          |
|-------------------|---|----------|
| Temperature       | : | 25°C     |
| Relative Humidity | : | 65 %     |
| Pressure          | : | 1010 hPa |
| Test Power        | : | DC 3V    |

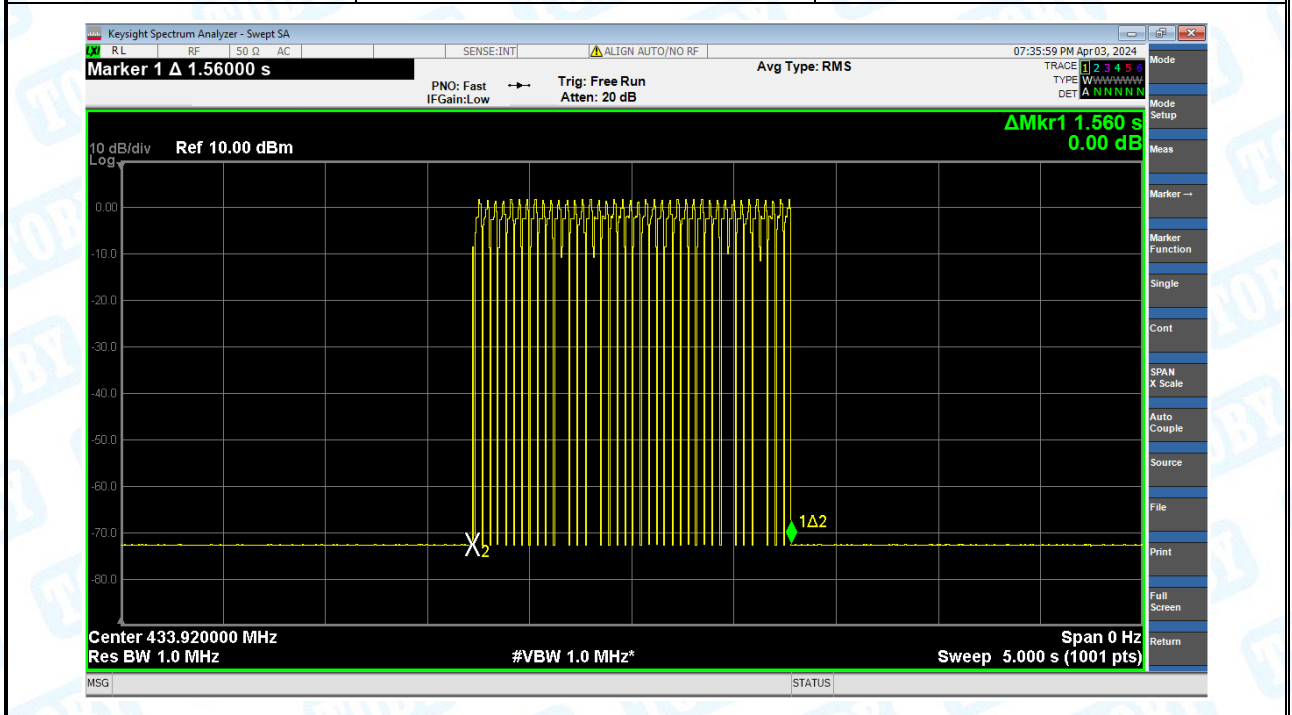
| Frequency (MHz) | 20 dBc Bandwidth (kHz) | Limit (kHz) | Result |
|-----------------|------------------------|-------------|--------|
| 433.92          | 43.15                  | 1084.8      | PASS   |



## Attachment C-- Release Time Measurement Data

|                   |   |          |
|-------------------|---|----------|
| Temperature       | : | 25 °C    |
| Relative Humidity | : | 65 %     |
| Pressure          | : | 1010 hPa |
| Test Power        | : | DC 3V    |

| Release Time(s) | Limit (s) | Result |
|-----------------|-----------|--------|
| 1.56            | 5         | PASS   |



## Attachment D--Duty Cycle Data

Please refer the following pages:

**Plot 1:** transmit once in 100ms, and each cycle is 38.88ms there are two kinds of pulse in each cycle, the large pulses total 6, the small pulses total 19.

**Plot 2:** one large pulse in a time period of 1.04 ms

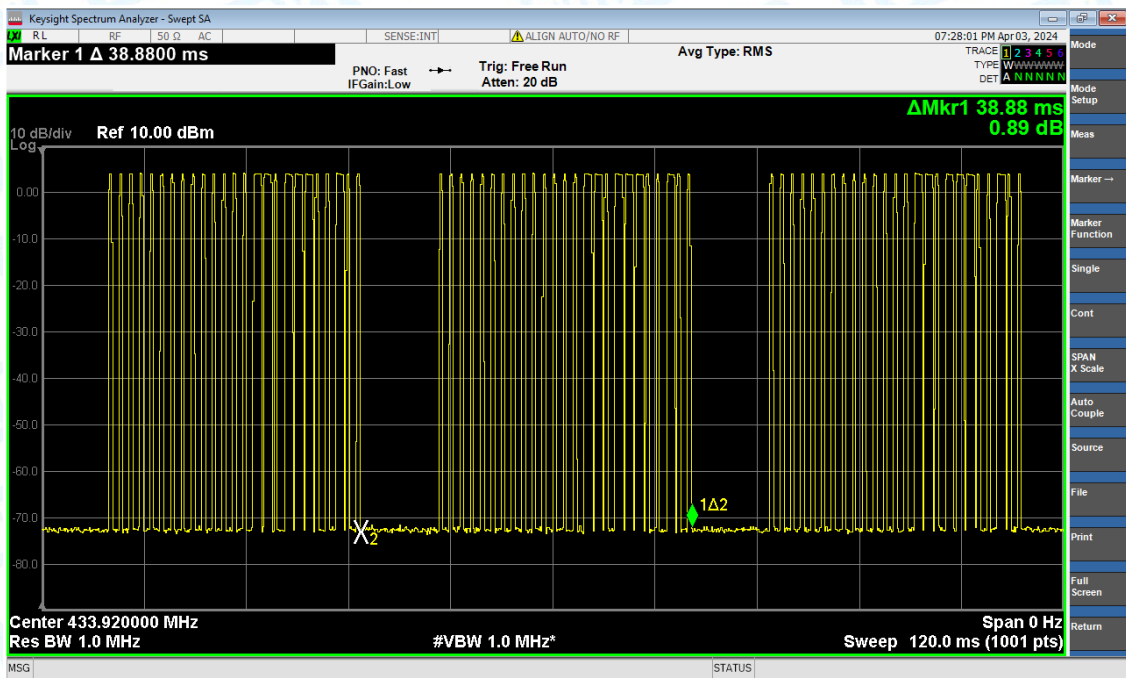
**Plot 3:** one small pulse in a time period of 0.44 ms

**Duty Cycle=ON/Total=  $(1.04*6+0.44*19)/38.88=37.55\%$**

**20log (Duty Cycle) =-8.5**

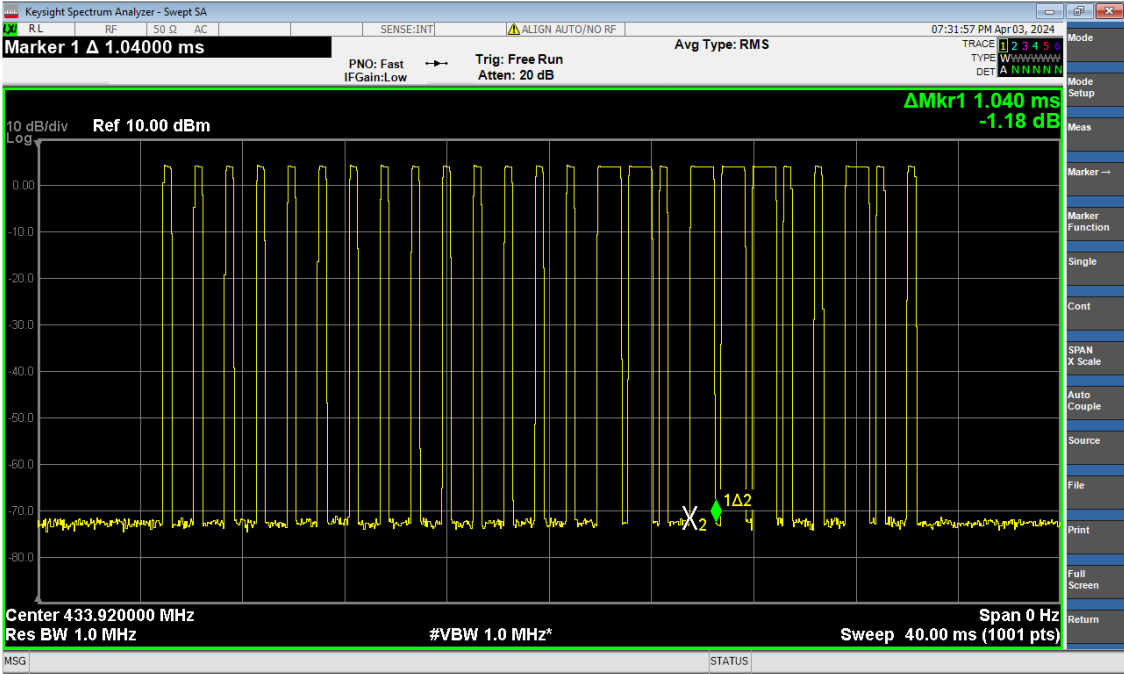
**Average=Peak Value+ 20log (Duty Cycle), AV=PK-8.5**

**Plot 1**

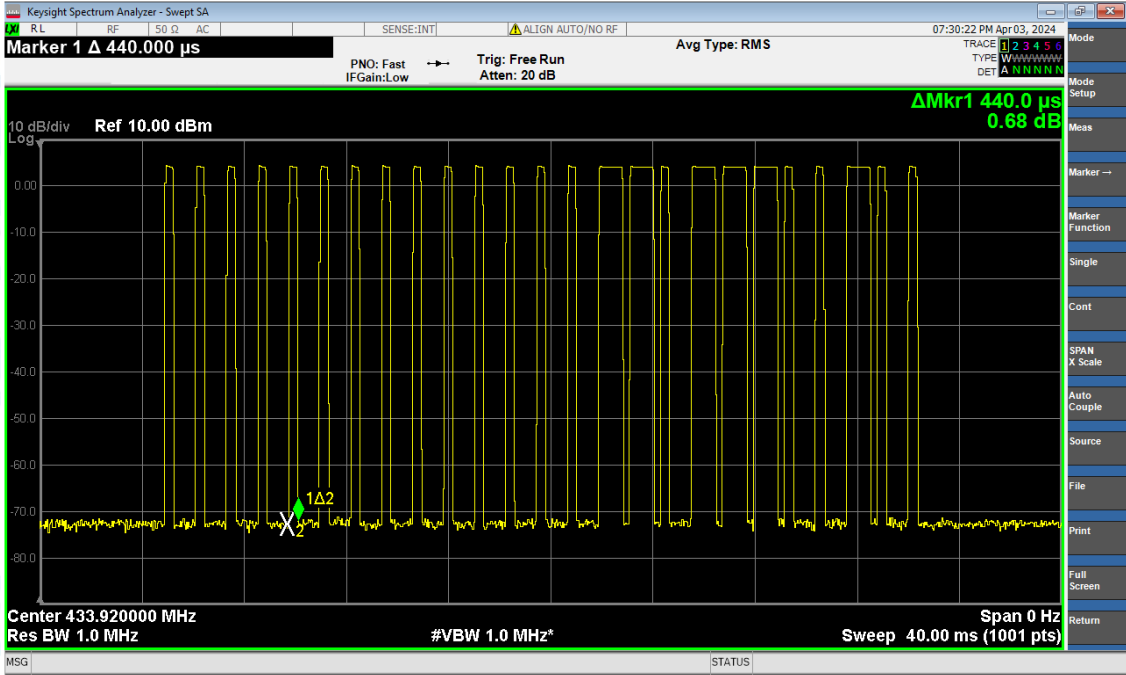




Plot 2



Plot 3



-----END OF REPORT-----