



**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104,Building 7 and 8,DCC Cultural and Creative Garden No.98,Pingxin North Road,Shangmugu,Pinghu Street, Longgang District,Shenzhen,Guangdong,China

# TEST REPORT

## FCC Part 95

**Report Reference No.**.....: **GTS20210317002-1-1**

**FCC ID**.....: **2AZAS-M388**

Compiled by

( position+printed name+signature) .: File administrators Jimmy Wang

Supervised by

( position+printed name+signature) .: Test Engineer Aaron Tan

Approved by

( position+printed name+signature) .: Manager Jason Hu

Date of issue.....: Mar. 17, 2021

**Testing Laboratory Name** .....: **Shenzhen Global Test Service Co.,Ltd.**

Address .....: No.7-101 and 8A-104,Building 7 and 8,DCC Cultural and Creative Garden No.98,Pingxin North Road,Shangmugu,Pinghu Street, Longgang District,Shenzhen,Guangdong,China

**Applicant's name** .....: **Shenzhen Karni Technology Co., Ltd**

Address .....: Room 102, No. 7, Lane 3, Fenghuangang Community (North), Xixiang Subdistrict, Bao'an District, Shenzhen

**Test specification** .....

Standard .....: **FCC Part 95**

**Shenzhen Global Test Service Co.,Ltd. All rights reserved.**

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Global Test Service Co.,Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Global Test Service Co.,Ltd.takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

**Test item description**.....: T388 walkie talkie

Trade Mark .....: OEM

**Manufacturer**.....: **Shenzhen Karni Technology Co., Ltd**

Model/Type reference.....: T388

Listed Models .....: T50

Ratings .....: DC 6.0V

Modulation .....: FM

Hardware version .....: V1.0

Software version .....: V1.0

Frequency.....: FRS :462.5500MHz~462.7250MHz;  
FRS :462.5625MHz~462.7125MHz;  
FRS :467.5625MHz~467.7125MHz

Result.....: **PASS**

*Jimmy Wang*



*Jason Hu*

# TEST REPORT

Equipment under Test : T388 walkie talkie

Model /Type : T388

Listed Models : T50

**Applicant** : **Shenzhen Karni Technology Co., Ltd**

Address : Room 102, No. 7, Lane 3, Fenghuangang Community  
(North), Xixiang Subdistrict, Bao'an District, Shenzhen

**Manufacturer** : **Shenzhen Karni Technology Co., Ltd**

Address : Room 102, No. 7, Lane 3, Fenghuangang Community  
(North), Xixiang Subdistrict, Bao'an District, Shenzhen

|                    |               |
|--------------------|---------------|
| <b>Test result</b> | <b>Pass *</b> |
|--------------------|---------------|

# Contents

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>SUMMARY .....</b>                                 | <b>4</b>  |
| 1.1      | TEST STANDARDS .....                                 | 4         |
| 1.2      | TEST DESCRIPTION .....                               | 4         |
| 1.3      | ADDRESS OF THE TEST LABORATORY .....                 | 4         |
| 1.4      | TEST FACILITY .....                                  | 4         |
| 1.5      | STATEMENT OF THE MEASUREMENT UNCERTAINTY .....       | 4         |
| <b>2</b> | <b>GENERAL INFORMATION .....</b>                     | <b>6</b>  |
| 2.1      | GENERAL REMARKS .....                                | 6         |
| 2.2      | ENVIRONMENTAL CONDITIONS .....                       | 6         |
| 2.3      | GENERAL DESCRIPTION OF EUT .....                     | 6         |
| 2.4      | DESCRIPTION OF TEST MODES AND TEST FREQUENCY .....   | 6         |
| 2.5      | EQUIPMENTS USED DURING THE TEST .....                | 8         |
| 2.6      | RELATED SUBMITTAL(S) / GRANT (S) .....               | 8         |
| 2.7      | MODIFICATIONS .....                                  | 8         |
| <b>3</b> | <b>TEST CONDITIONS AND RESULTS .....</b>             | <b>9</b>  |
| 3.1      | MAXIMUM TRANSMITTER POWER .....                      | 9         |
| 3.2      | OCCUPIED BANDWIDTH AND EMISSION MASK .....           | 12        |
| 3.3      | MODULATION LIMIT .....                               | 16        |
| 3.4      | AUDIO FREQUENCY RESPONSE .....                       | 18        |
| 3.5      | FREQUENCY STABILITY .....                            | 20        |
| 3.6      | TRANSMITTER RADIATED SPURIOUS EMISSION .....         | 22        |
| <b>4</b> | <b>TEST SETUP PHOTOS OF THE EUT .....</b>            | <b>25</b> |
| <b>5</b> | <b>EXTERNAL AND INTERNAL PHOTOS OF THE EUT .....</b> | <b>26</b> |

# 1 SUMMARY

## 1.1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 95](#) : PERSONAL RADIO SERVICES

[ANSI/TIA-603-E-2016](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[FCC Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

[ANSI C63.26-2015](#) : IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

## 1.2 Test Description

| Description of Test Item             | Standard clause                                       | Verdict |
|--------------------------------------|---|---------|
| Maximum Transmitter Power            | FCC Part 95.567                                       | PASS    |
| Modulation Characteristic            | FCC Part 2.1047<br>FCC Part 95.575                    | PASS    |
| Occupied Bandwidth and Emission Mask | FCC Part 2.1049<br>FCC Part 95.573<br>FCC Part 95.579 | PASS    |
| Radiated Spurious Emission           | FCC Part 95.579                                       | PASS    |
| Frequency Stability                  | FCC Part 2.1055<br>FCC Part 95.565                    | PASS    |

## 1.3 Address of the test laboratory

**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

## 1.4 Test Facility

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

### **FCC-Registration No.: 165725**

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

### **A2LA-Lab Cert. No.: 4758.01**

Shenzhen Global Test Service Co.,Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

### **CNAS-Lab Code: L8169**

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2024.

## 1.5 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 Global Test 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 Global Test Service Co., Ltd. is reported:

| Test                                | Range      | Measurement Uncertainty | Notes |
|-------------------------------------|------------|-------------------------|-------|
| Radiated Emission                   | 30~1000MHz | 4.10 dB                 | (1)   |
| Radiated Emission                   | 1~18GHz    | 4.32 dB                 | (1)   |
| Radiated Emission                   | 18-40GHz   | 5.54 dB                 | (1)   |
| Conducted Disturbance               | 0.15~30MHz | 3.12 dB                 | (1)   |
| Conducted Power                     | 9KHz~18GHz | 0.61 dB                 | (1)   |
| Spurious RF Conducted Emission      | 9KHz~40GHz | 1.22 dB                 | (1)   |
| Band Edge Compliance of RF Emission | 9KHz~40GHz | 1.22 dB                 | (1)   |
| Occupied Bandwidth                  | 9KHz~40GHz | -                       | (1)   |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=1.96$ .

## 2 GENERAL INFORMATION

### 2.1 General Remarks

|                                |   |               |
|--------------------------------|---|---------------|
| Date of receipt of test sample | : | Feb. 18, 2021 |
| Testing commenced on           | : | Feb. 18, 2021 |
| Testing concluded on           | : | Mar. 17, 2021 |

### 2.2 Environmental conditions

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

|                     |         |
|---------------------|---------|
| Normal Temperature: | 25°C    |
| Relative Humidity:  | 55 %    |
| Air Pressure:       | 101 kPa |

### 2.3 General Description of EUT

|                    |   |
|--------------------|---|
| Name of EUT        | T388 walkie talkie  |
| Model Number       | T388  |
| Power Supply       | DC 6.0V from battery  |
| Frequency Range    | FRS:462.5500MHz~462.7250MHz;<br>FRS:462.5625MHz~462.7125MHz;<br>FRS:467.5625MHz~467.7125MHz |
| Rate Power         | 0.5W  |
| Modulation Type    | FM  |
| Channel Separation | 12.5KHz   |
| Antenna Type       | Integral antenna  |
| Antennal Gain      | 4.50 dBi  |
| Sample ID:         | GTS20210317002-1-1-1#(Engineer sample)<br>GTS20210317002-1-1-2#(Normal sample)              |

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

### 2.4 Description of Test Modes and Test Frequency

The EUT has been tested under typical operating condition. As, test modes selected as below by the technical parameters of the EUT:

| Operation Mode No. | Modulation                          | Channel Separation                  | Condition                           |                                     |
|--------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                    | FM                                  | 12.5KHz                             | TX                                  | RX                                  |
| 1                  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                                     |
| 2                  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                                     | <input checked="" type="checkbox"/> |

**Frequency list**

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 1       | 462.5625       | 12      | 467.6625       |
| 2       | 462.5875       | 13      | 467.6875       |
| 3       | 462.6125       | 14      | 467.7125       |
| 4       | 462.6375       | 15      | 462.5500       |
| 5       | 462.6625       | 16      | 462.5750       |
| 6       | 462.6875       | 17      | 462.6000       |
| 7       | 462.7125       | 18      | 462.6250       |
| 8       | 467.5625       | 19      | 462.6500       |
| 9       | 467.5875       | 20      | 462.6750       |
| 10      | 467.6125       | 21      | 462.7000       |
| 11      | 467.6375       | 22      | 462.7250       |

Note1: In section 15.31(m), regards to the operating frequency range less than 1MHz, only one point centered in the frequency range of operation selected to measure.

Note2: The line display in grey was the channel selected for test.

## 2.5 Equipments Used during the Test

| Test Equipment             | Manufacturer                      | Model No.             | Serial No.      | Calibration Date | Calibration Due Date |
|----------------------------|-----------------------------------|-----------------------|-----------------|------------------|----------------------|
| LISN                       | R&S                               | ENV216                | 3560.6550.08    | 2020/09/19       | 2021/09/18           |
| LISN                       | R&S                               | ESH2-Z5               | 893606/008      | 2020/09/19       | 2021/09/18           |
| EMI Test Receiver          | R&S                               | ESPI3                 | 101841-cd       | 2020/09/19       | 2021/09/18           |
| EMI Test Receiver          | R&S                               | ESCI7                 | 101102          | 2020/09/19       | 2021/09/18           |
| Spectrum Analyzer          | Agilent                           | N9020A                | MY48010425      | 2020/09/19       | 2021/09/18           |
| Spectrum Analyzer          | R&S                               | FSV40                 | 100019          | 2020/09/19       | 2021/09/18           |
| Vector Signal generator    | Agilent                           | N5181A                | MY49060502      | 2020/09/19       | 2021/09/18           |
| Signal generator           | Agilent                           | E4421B                | 3610AO1069      | 2020/09/19       | 2021/09/18           |
| Climate Chamber            | ESPEC                             | EL-10KA               | A20120523       | 2020/09/19       | 2021/09/18           |
| Controller                 | EM Electronics                    | Controller EM 1000    | N/A             | N/A              | N/A                  |
| Horn Antenna               | Schwarzbeck                       | BBHA 9120D            | 01622           | 2020/09/19       | 2021/09/18           |
| Active Loop Antenna        | Beijing Da Ze Technology Co.,Ltd. | ZN30900C              | 15006           | 2020/10/11       | 2021/10/10           |
| Bilog Antenna              | Schwarzbeck                       | VULB9163              | 000976          | 2020/05/26       | 2021/05/25           |
| Broadband Horn Antenna     | SCHWARZBECK                       | BBHA 9170             | 791             | 2020/09/19       | 2021/09/18           |
| Amplifier                  | Schwarzbeck                       | BBV 9743              | #202            | 2020/09/19       | 2021/09/18           |
| Amplifier                  | Schwarzbeck                       | BBV9179               | 9719-025        | 2020/09/19       | 2021/09/18           |
| Amplifier                  | EMCI                              | EMC051845B            | 980355          | 2020/09/19       | 2021/09/18           |
| Temperature/Humidity Meter | Gangxing                          | CTH-608               | 02              | 2020/09/19       | 2021/09/18           |
| High-Pass Filter           | K&L                               | 9SH10-2700/X12750-O/O | KL142031        | 2020/09/19       | 2021/09/18           |
| High-Pass Filter           | K&L                               | 41H10-1375/U12750-O/O | KL142032        | 2020/09/19       | 2021/09/18           |
| RF Cable(below 1GHz)       | HUBER+SUHNER                      | RG214                 | RE01            | 2020/09/19       | 2021/09/18           |
| RF Cable(above 1GHz)       | HUBER+SUHNER                      | RG214                 | RE02            | 2020/09/19       | 2021/09/18           |
| Data acquisition card      | Agilent                           | U2531A                | TW53323507      | 2020/09/19       | 2021/09/18           |
| Power Sensor               | Agilent                           | U2021XA               | MY5365004       | 2020/09/19       | 2021/09/18           |
| Test Control Unit          | Tonscend                          | JS0806-1              | 178060067       | 2020/06/19       | 2021/06/18           |
| Automated filter bank      | Tonscend                          | JS0806-F              | 19F8060177      | 2020/06/19       | 2021/06/18           |
| Radio Communication Tester | HP                                | 8920A                 | 116250          | 2020-09-20       | 2021-09-19           |
| EMI Test Software          | Tonscend                          | JS1120-1              | Ver 2.6.8.0518  | /                | /                    |
| EMI Test Software          | Tonscend                          | JS1120-3              | Ver 2.5.77.0418 | /                | /                    |
| EMI Test Software          | Tonscend                          | JS32-CE               | Ver 2.5         | /                | /                    |
| EMI Test Software          | Tonscend                          | JS32-RE               | Ver 2.5.1.8     | /                | /                    |

Note: The Cal.Interval was one year.

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

This submittal(s) (test report) is intended to comply with FCC Part 95 Rules.

## 2.7 Modifications

No modifications were implemented to meet testing criteria.



### 3 TEST CONDITIONS AND RESULTS

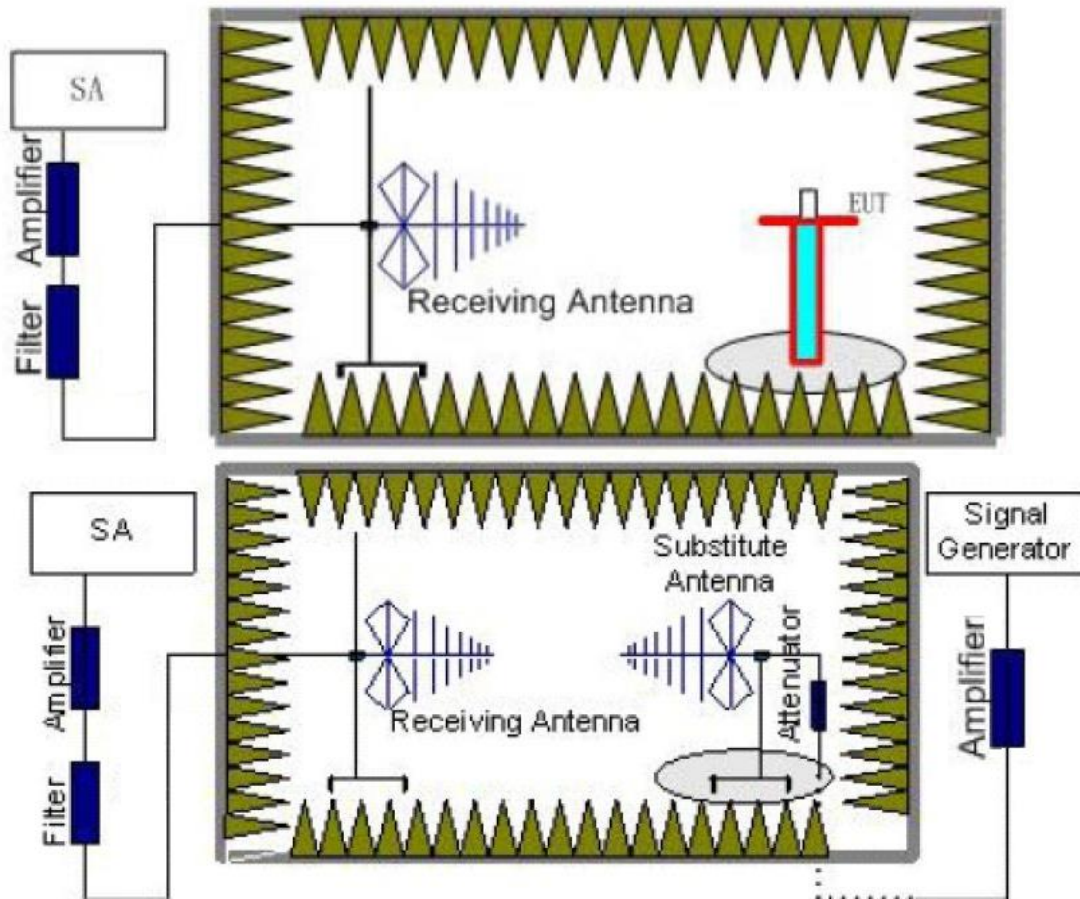
#### 3.1 Maximum Transmitter Power

##### LIMITS

##### **According to FCC Part 95.567:**

Each FRS transmitter type must be designed such that the effective radiated power (ERP) on channels 8 through 14 does not exceed 0.5 Watts and the ERP on channels 1 through 7 and 15 through 22 does not exceed 2.0 Watts.

##### TEST CONFIGURATION



##### Measurement Procedure

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.0m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all test transmit frequencies were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as ( $P_r$ ).

4. The EUT shall be replaced by a substitution antenna. In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier may be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test. The measurement results are obtained as described below:  
$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

**TEST RESULTS**

Remark;

The field strength of radiation emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The data show in this report only with the worst case setup. After exploratory measurement the worst case of Z axis and receiver antenna at vertical polarization was reported.

| Test Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | G <sub>a</sub> Antenna Gain(dBi) | Correction (dB) | P <sub>Ag</sub> (dB) | ERP (dBm) | ERP (W) | Limit (W) | Polarization |
|----------------------|------------------------|----------------------|----------------------------------|-----------------|----------------------|-----------|---------|-----------|--------------|
| 462.6375             | -11.40                 | 2.08                 | 7.69                             | 2.15            | 34.59                | 26.65     | 0.462   | 2.0       | V            |
| 467.6375             | -11.35                 | 2.13                 | 7.75                             | 2.15            | 34.62                | 26.74     | 0.472   | 0.5       | V            |
| 462.6500             | -11.48                 | 2.08                 | 7.69                             | 2.15            | 34.59                | 26.57     | 0.454   | 2.0       | V            |

Remark:

1.  $EIRP = P_{Mea}(dBm) + P_{Ag}(dB) - P_{cl}(dB) + G_a(dBi)$
2.  $ERP = EIRP - 2.15dBi$  as EIRP by subtracting the gain of the dipole.

### 3.2 Occupied Bandwidth and Emission Mask

#### LIMITS

##### **According to FCC 95.573:**

Each FRS transmitter type must be designed such that the occupied bandwidth does not exceed 12.5 kHz.

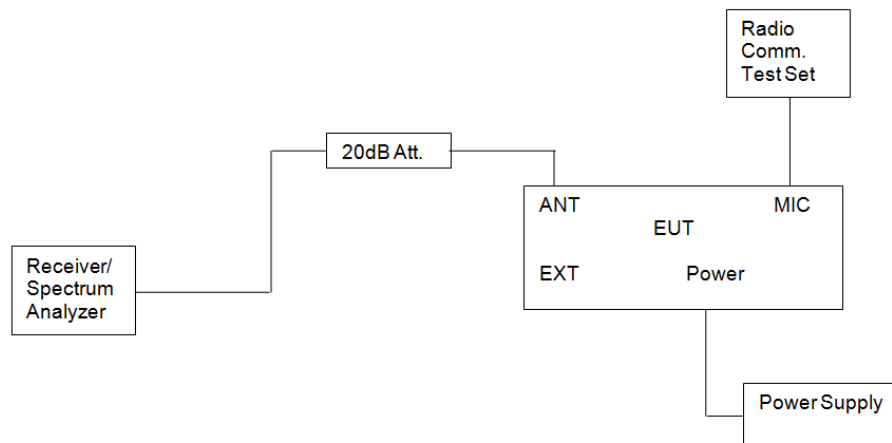
##### **According to FCC 95.579:**

At least 25dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50 % up to and including 100 % of the authorized bandwidth.

At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100 % up to and including 250 % of the authorized bandwidth.

At least  $43 + 10 \log_{10}(T)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250 %.

#### TEST CONFIGURATION

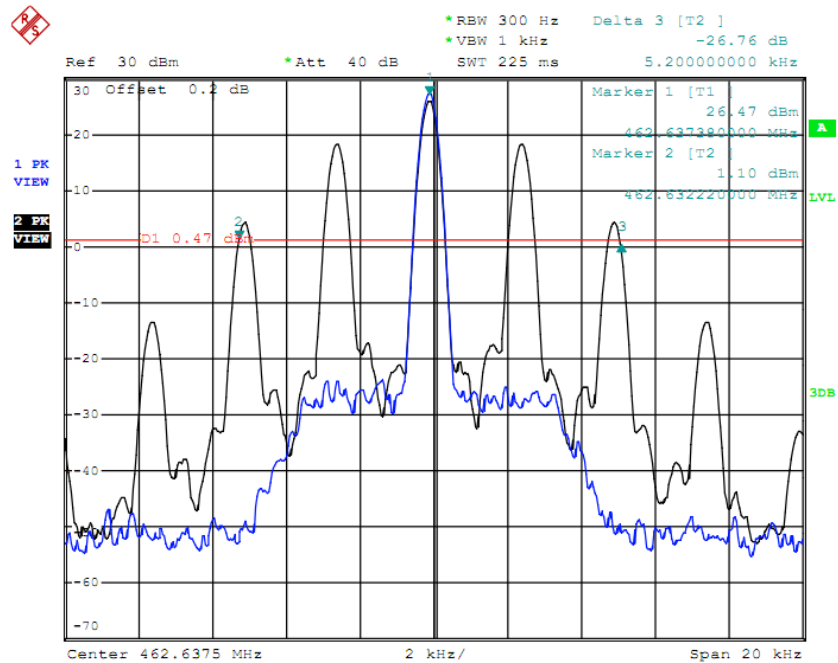
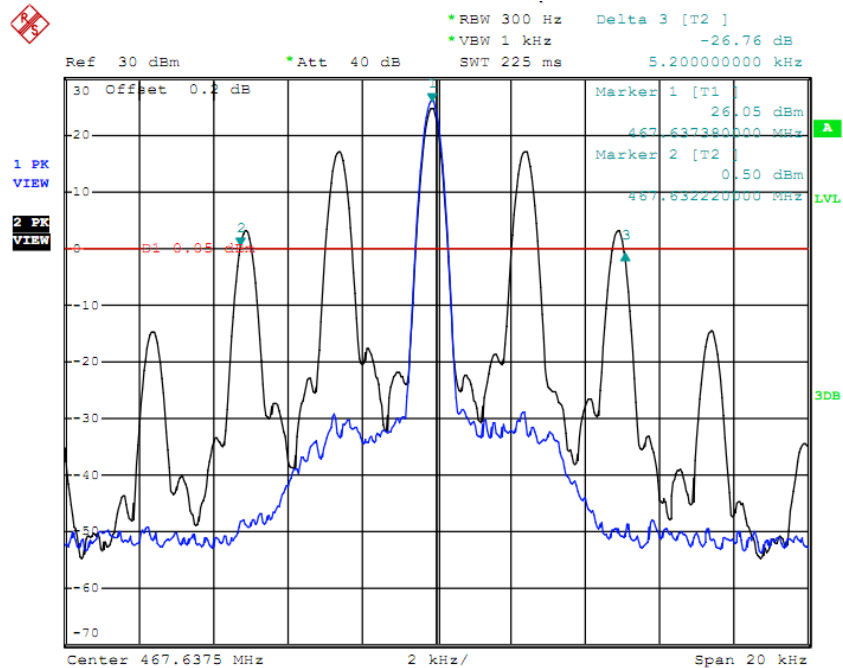


#### TEST PROCEDURE

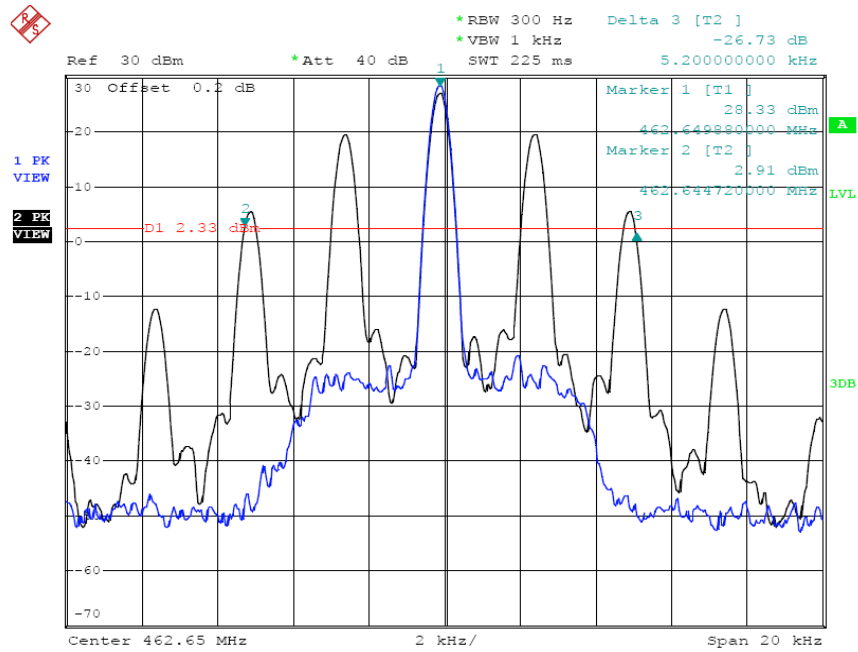
- 1 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing) and 5 kHz (25 kHz channel spacing).
- 2 Set SPA Center Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.
- 3 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.

**TEST RESULTS****Occupied Bandwidth:**

| Modulation | Channel | 26dB bandwidth (kHz) | Limit (KHz) | Result |
|------------|---------|----------------------|-------------|--------|
| FM         | CH4     | 5.20                 | 12.5        | Pass   |
|            | CH11    | 5.20                 | 12.5        | Pass   |
|            | CH19    | 5.20                 | 12.5        | Pass   |

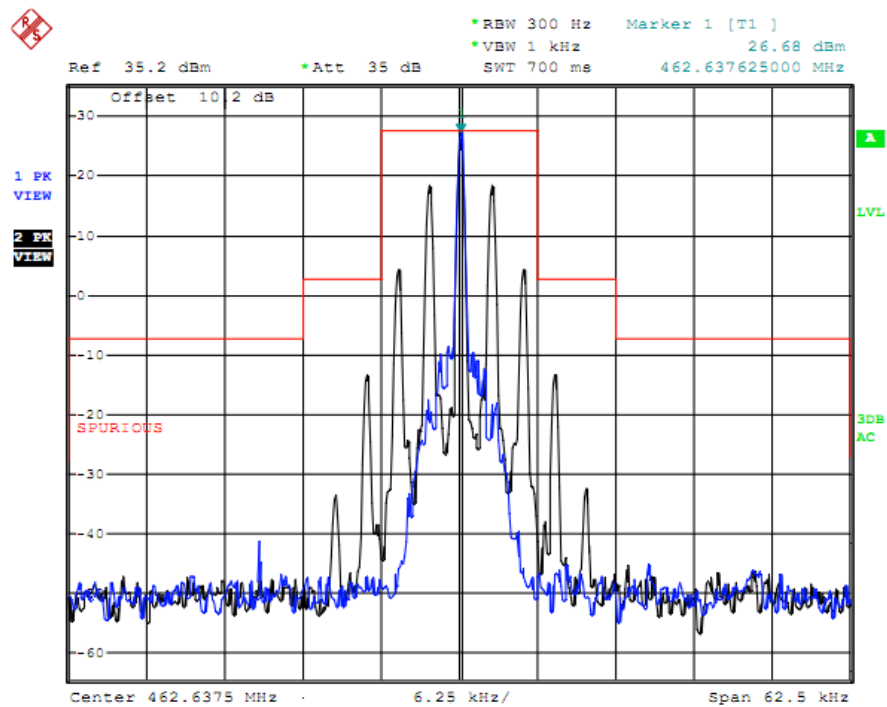
**CH4****CH11**

## CH19

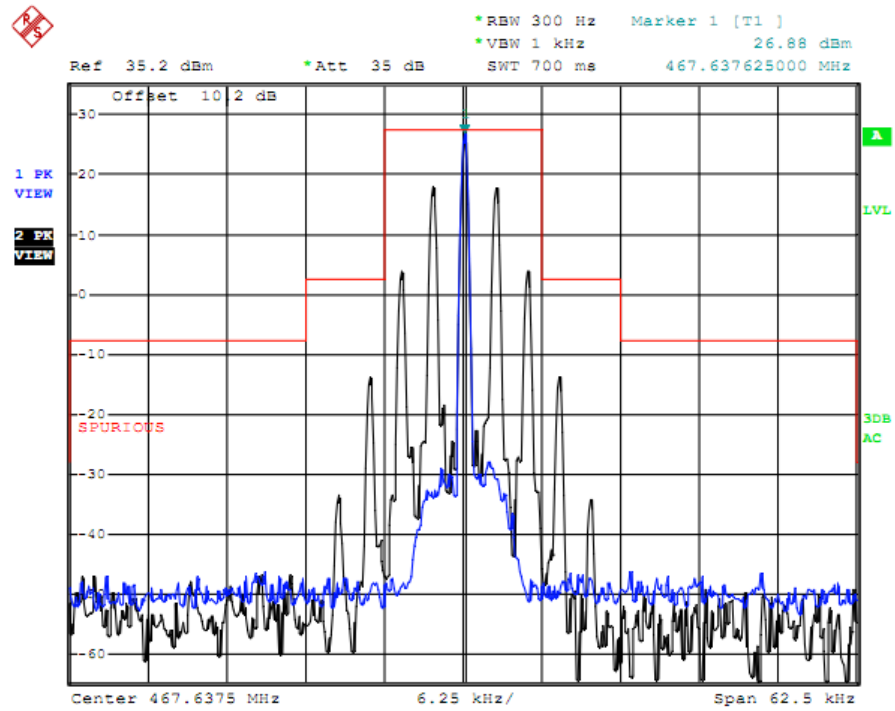


## Emission Mask:

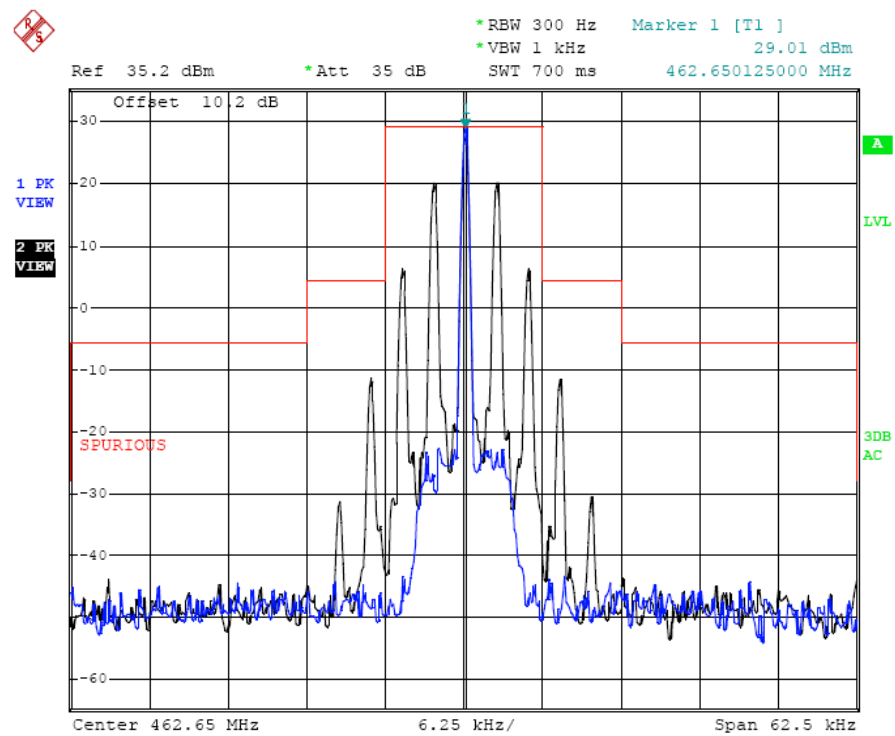
## CH4



## CH11



## CH19



### 3.3 Modulation Limit

#### LIMITS

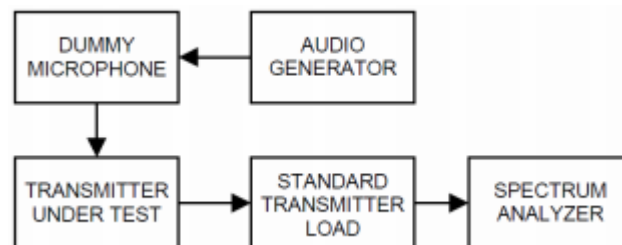
FCC Part 95.575, FCC Part 2.1047(b) Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

#### TEST PROCEDURE

##### **Modulation Limit**

- 1) Connect the equipment as illustrated.
- 2) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- 3) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for  $\leq 0.25$  Hz to  $\geq 15,000$  Hz. Turn the de-emphasis function off.
- 4) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation.
- 5) Apply Input Modulation Signal to EUT according to Section 3.4 and vary the input level from  $-20$  to  $+20$  dB.
- 6) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level
- 7) With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 300 Hz to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.
- 8) Set the test receiver to measure peak negative deviation and repeat steps d) through g).
- 9) The values recorded in steps g) and h) are the modulation limiting.

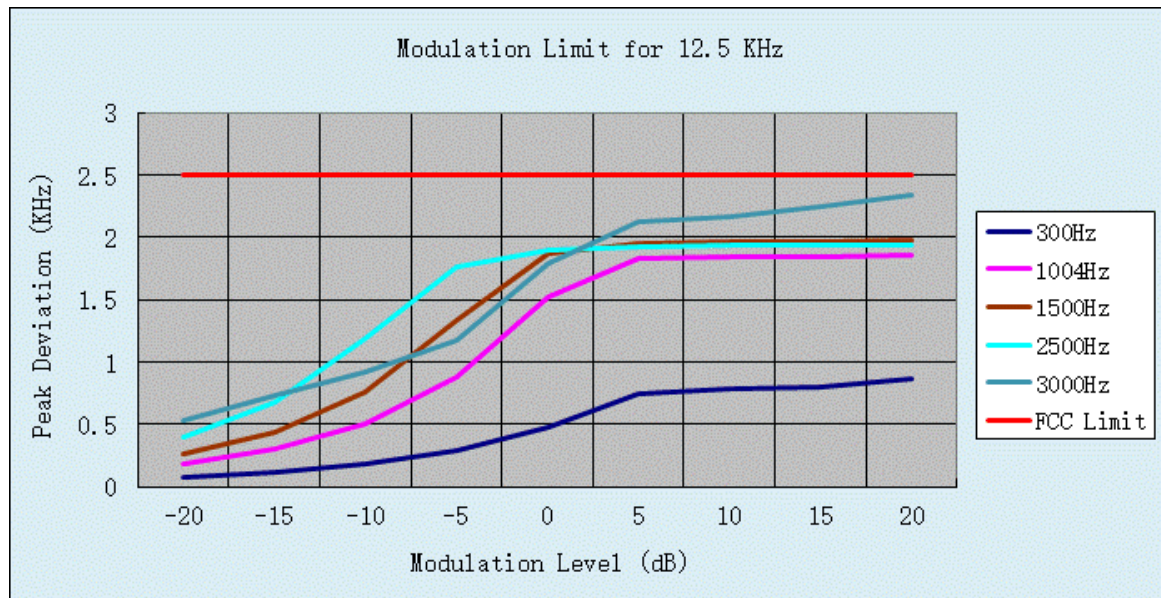
#### TEST CONFIGURATION



#### TEST RESULTS

| Modulation Level(dB) | Peak Freq. Deviation At 300 Hz(KHz) | Peak Freq. Deviation At 1004 Hz(KHz) | Peak Freq. Deviation At 1500 Hz(KHz) | Peak Freq. Deviation At 2500 Hz(KHz) | Peak Freq. Deviation At 3000 Hz(KHz) |
|----------------------|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| -20                  | 0.08                                | 0.19                                 | 0.26                                 | 0.40                                 | 0.53                                 |
| -15                  | 0.11                                | 0.30                                 | 0.44                                 | 0.68                                 | 0.73                                 |
| -10                  | 0.18                                | 0.51                                 | 0.76                                 | 1.19                                 | 0.92                                 |
| -5                   | 0.29                                | 0.88                                 | 1.33                                 | 1.77                                 | 1.18                                 |
| 0                    | 0.48                                | 1.52                                 | 1.87                                 | 1.90                                 | 1.79                                 |
| +5                   | 0.74                                | 1.83                                 | 1.95                                 | 1.92                                 | 2.13                                 |
| +10                  | 0.79                                | 1.85                                 | 1.96                                 | 1.94                                 | 2.17                                 |
| +15                  | 0.80                                | 1.85                                 | 1.97                                 | 1.94                                 | 2.24                                 |
| +20                  | 0.87                                | 1.86                                 | 1.98                                 | 1.94                                 | 2.34                                 |

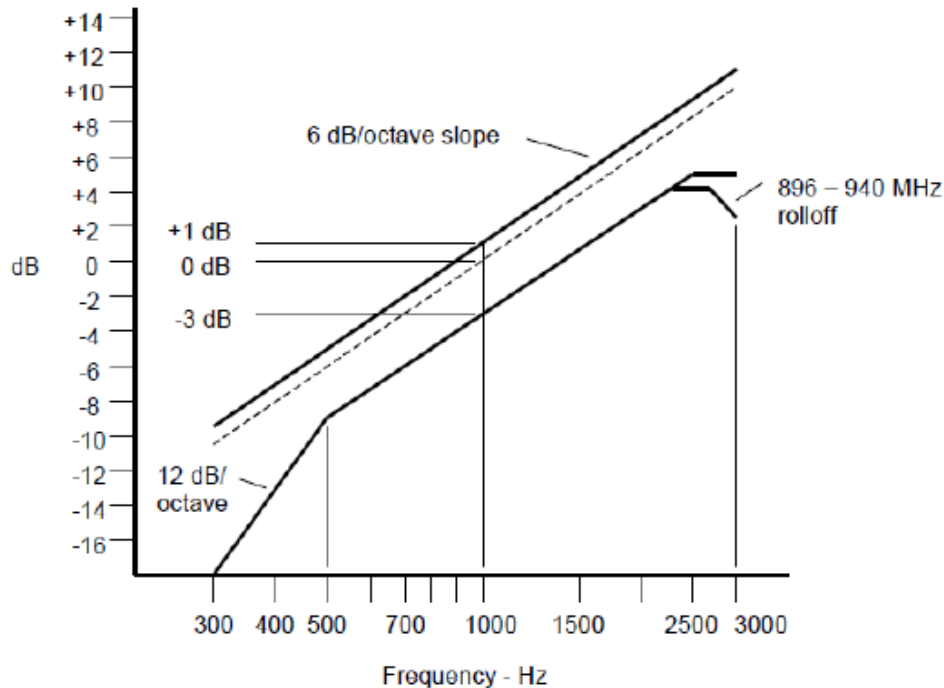




### 3.4 Audio Frequency Response

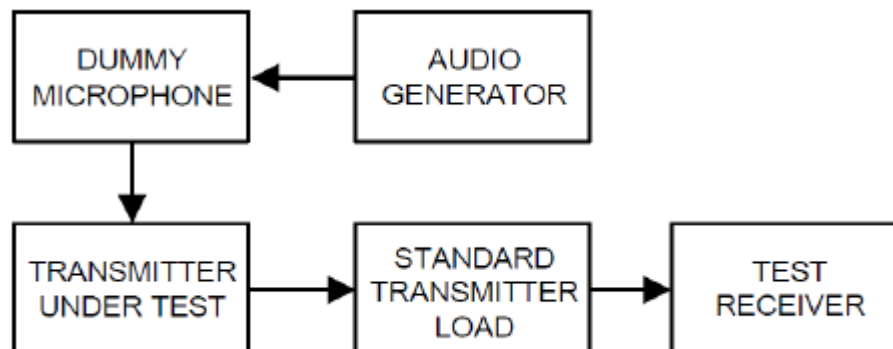
#### LIMIT

FCC Part 95.575), FCC Part 2.1047(a): Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz. Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted.



An additional 6 dB per octave attenuation is allowed from 2500 Hz to 3000 Hz in equipment operating in the 25 MHz to 869 MHz range.

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1) Connect the equipment as illustrated.
- 2) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for 50 Hz to 15,000 Hz. Turn the de-emphasis function off.
- 3) Set the DMM to measure rms voltage.
- 4) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- 5) Apply Input Modulation Signal to EUT.
- 6) Set the test receiver to measure rms deviation and record the deviation reading.
- 7) Record the DMM reading as  $V_{REF}$ .
- 8) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.
- 9) Vary the audio frequency generator output level until the deviation reading that was recorded in

step 6) is obtained.

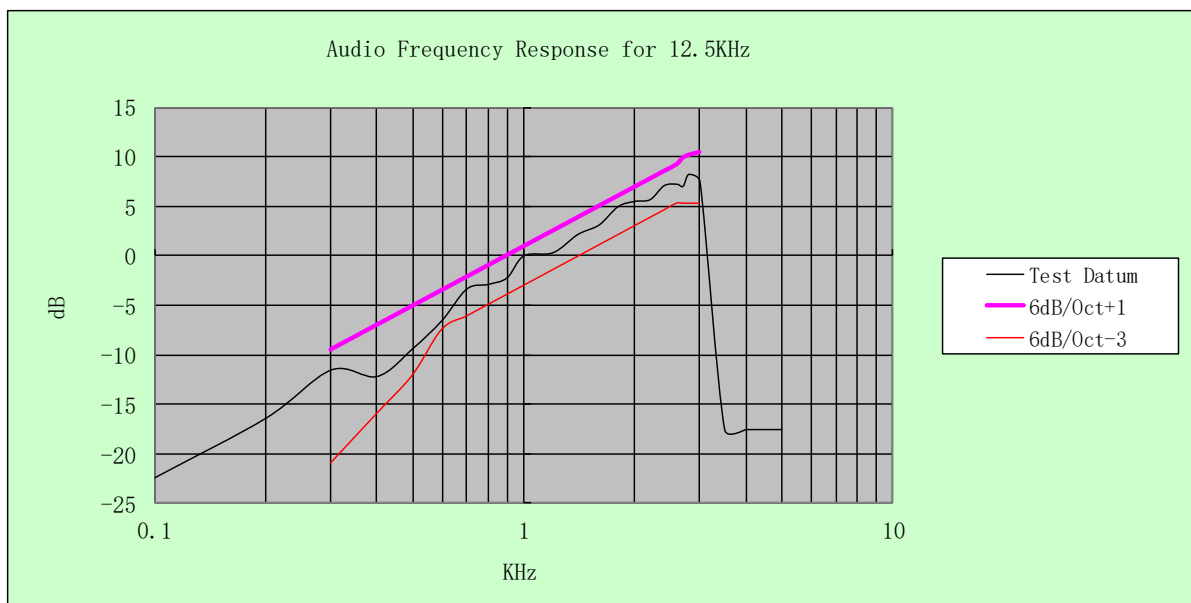
10) Record the DMM reading as  $V_{FREQ}$

11) Calculate the audio frequency response at the present frequency as: audio frequency response =  $20\log_{10} (V_{FREQ}/V_{REF})$ .

12) Repeat steps 8) through 11) for all the desired test frequencies

## TEST RESULTS

| Frequency (KHz ) | Frequency Deviation (KHz) | 1KHz Reference Deviation (KHz) | Audio Frequency Response (dB) |
|------------------|---------------------------|--------------------------------|-------------------------------|
| 0.1              | 0.04                      | 0.53                           | -22.44                        |
| 0.2              | 0.08                      | 0.53                           | -16.42                        |
| 0.3              | 0.14                      | 0.53                           | -11.56                        |
| 0.4              | 0.13                      | 0.53                           | -12.21                        |
| 0.5              | 0.18                      | 0.53                           | -9.38                         |
| 0.6              | 0.25                      | 0.53                           | -6.53                         |
| 0.7              | 0.36                      | 0.53                           | -3.36                         |
| 0.8              | 0.38                      | 0.53                           | -2.89                         |
| 0.9              | 0.41                      | 0.53                           | -2.23                         |
| 1.0              | 0.53                      | 0.53                           | 0.00                          |
| 1.2              | 0.55                      | 0.53                           | 0.32                          |
| 1.4              | 0.68                      | 0.53                           | 2.16                          |
| 1.6              | 0.76                      | 0.53                           | 3.13                          |
| 1.8              | 0.94                      | 0.53                           | 4.98                          |
| 2.0              | 1.00                      | 0.53                           | 5.51                          |
| 2.2              | 1.02                      | 0.53                           | 5.69                          |
| 2.4              | 1.20                      | 0.53                           | 7.10                          |
| 2.6              | 1.22                      | 0.53                           | 7.24                          |
| 2.7              | 1.19                      | 0.53                           | 7.03                          |
| 2.8              | 1.37                      | 0.53                           | 8.25                          |
| 3.0              | 1.26                      | 0.53                           | 7.52                          |
| 3.5              | 0.07                      | 0.53                           | -17.58                        |
| 4.0              | 0.07                      | 0.53                           | -17.58                        |
| 4.5              | 0.07                      | 0.53                           | -17.58                        |
| 5.0              | 0.07                      | 0.53                           | -17.58                        |



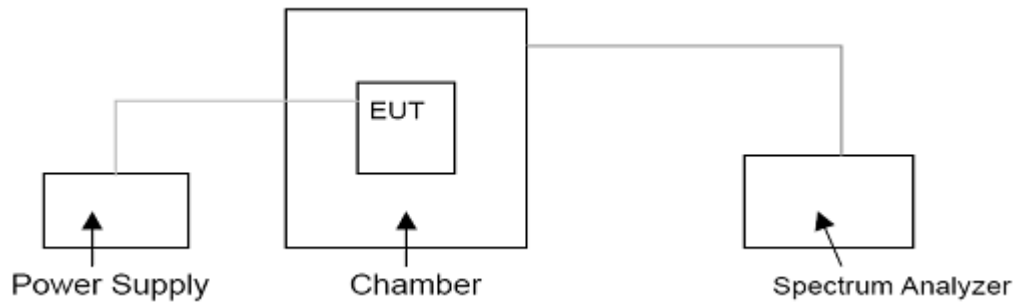
### 3.5 Frequency Stability

#### LIMITS

##### **According to FCC 95.565**

Each FRS transmitter type must be designed such that the carrier frequencies remain within  $\pm 2.5$  parts-per-million of the channel center frequencies specified in §95.563 during normal operating conditions.

#### TEST CONFIGURATION



#### TEST PROCEDURE

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

**TEST RESULTS**

| Reference Frequency: 462.6375MHz |                  |                      |                           |             |        |
|----------------------------------|------------------|----------------------|---------------------------|-------------|--------|
| Voltage ( V )                    | Temperature (°C) | Frequency error (Hz) | Frequency Tolerance (ppm) | Limit (ppm) | Result |
| 6.00                             | -30              | -27.51               | -0.059                    | ±2.5        | Pass   |
|                                  | -20              | 38.02                | 0.082                     |             |        |
|                                  | -10              | 31.79                | 0.069                     |             |        |
|                                  | 0                | -71.25               | -0.154                    |             |        |
|                                  | 10               | -63.90               | -0.138                    |             |        |
|                                  | 20               | 28.34                | 0.061                     |             |        |
|                                  | 30               | -36.54               | -0.079                    |             |        |
|                                  | 40               | -8.60                | -0.019                    |             |        |
|                                  | 50               | 22.56                | 0.049                     |             |        |
| 6.90                             | 25               | -61.90               | -0.134                    | ±2.5        | Pass   |
| 5.10                             | 25               | 67.77                | 0.146                     |             |        |

| Reference Frequency: 467.6375MHz |                  |                      |                           |             |        |
|----------------------------------|------------------|----------------------|---------------------------|-------------|--------|
| Voltage ( V )                    | Temperature (°C) | Frequency error (Hz) | Frequency Tolerance (ppm) | Limit (ppm) | Result |
| 6.00                             | -30              | -98.24               | -0.210                    | ±2.5        | Pass   |
|                                  | -20              | -11.54               | -0.025                    |             |        |
|                                  | -10              | -10.41               | -0.022                    |             |        |
|                                  | 0                | 67.09                | 0.143                     |             |        |
|                                  | 10               | -23.79               | -0.051                    |             |        |
|                                  | 20               | 54.62                | 0.117                     |             |        |
|                                  | 30               | 11.09                | 0.024                     |             |        |
|                                  | 40               | 82.40                | 0.176                     |             |        |
|                                  | 50               | 57.83                | 0.124                     |             |        |
| 6.90                             | 25               | -94.89               | -0.203                    | ±2.5        | Pass   |
| 5.10                             | 25               | 88.63                | 0.190                     |             |        |

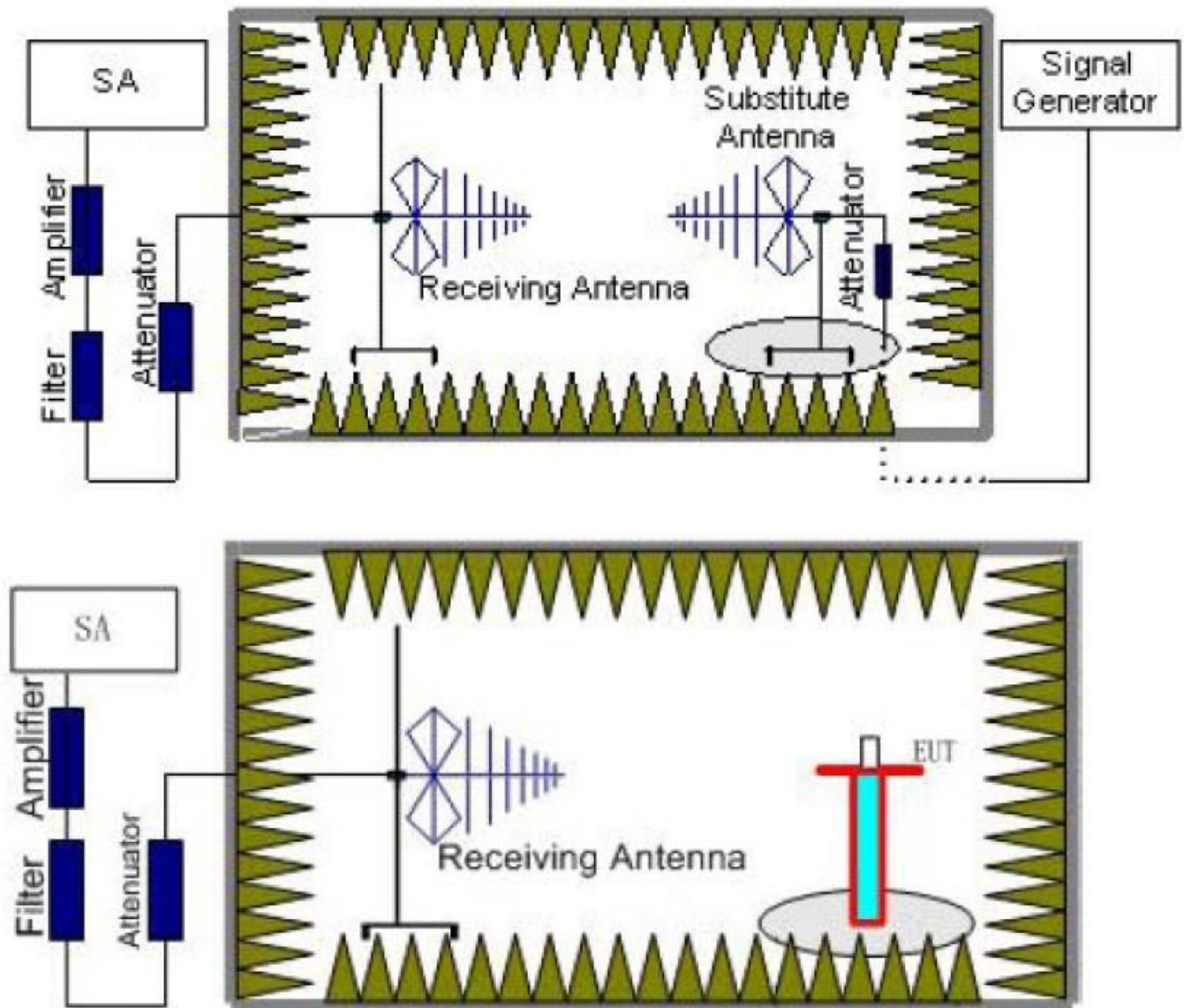
| Reference Frequency: 462.6500MHz |                  |                      |                           |             |        |
|----------------------------------|------------------|----------------------|---------------------------|-------------|--------|
| Voltage ( V )                    | Temperature (°C) | Frequency error (Hz) | Frequency Tolerance (ppm) | Limit (ppm) | Result |
| 6.00                             | -30              | -26.02               | -0.056                    | ±2.5        | Pass   |
|                                  | -20              | 23.42                | 0.051                     |             |        |
|                                  | -10              | 57.55                | 0.124                     |             |        |
|                                  | 0                | 79.09                | 0.171                     |             |        |
|                                  | 10               | 42.77                | 0.092                     |             |        |
|                                  | 20               | 42.30                | 0.091                     |             |        |
|                                  | 30               | 42.99                | 0.093                     |             |        |
|                                  | 40               | -39.05               | -0.084                    |             |        |
|                                  | 50               | 13.93                | 0.030                     |             |        |
| 6.90                             | 25               | 43.90                | 0.095                     | ±2.5        | Pass   |
| 5.10                             | 25               | -8.94                | -0.019                    |             |        |

### 3.6 Transmitter Radiated Spurious Emission

#### Limit

The unwanted emission should be attenuated below TP by at least  $43+10\log(\text{Transmit Power})$  dB and unwanted emissions falling within the restricted bands of RSS-Gen shall be attenuated to the limits provided in this section or to the general field strength limits shown in RSS-Gen, whichever are less stringent.

#### TEST CONFIGURATION



**TEST PROCEDURE**

- a. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.0m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all test transmit frequencies were measured with peak detector.
- b. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- c. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum 100 kHz below 1GHz and 1MHz above 1GHz, Sweep from 30MHz to the 10th harmonic of the fundamental frequency; and recorded the level of the concerned spurious emission point as ( $P_r$ ).
- d. The EUT then replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

The measurement results are obtained as described below:

$$\text{Power}_{(EIRP)} = P_{Mea} - P_{cl} + G_a$$

Where;

$P_{Mea}$  is the recorded signal generator level

$P_{cl}$  is the cable loss connect between instruments

$G_a$  Substitution Antenna Gain

- e. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
- f. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .
- g. Test site anechoic chamber refer to ANSI C63.

**TEST RESULTS**

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency; and worst spurious emissions recorded as below:

| Test Frequency (MHz) | Frequency (MHz) | P <sub>Mea</sub> (dBm) | P <sub>cl</sub> (dB) | Distance (m) | G <sub>a</sub> Antenna Gain(dBi) | Peak EIRP (dBm) | Limit (dBm) | Margin (dB) | Pol. |
|----------------------|-----------------|------------------------|----------------------|--------------|----------------------------------|-----------------|-------------|-------------|------|
| 462.6375             | 925.25          | -31.29                 | 3.54                 | 3.00         | 12.87                            | -21.96          | -13.00      | 8.96        | V    |
|                      | 1387.75         | -35.52                 | 4.21                 | 3.00         | 15.48                            | -24.25          | -13.00      | 11.25       | V    |
|                      | 1850.50         | -36.45                 | 4.52                 | 3.00         | 17.32                            | -23.65          | -13.00      | 10.65       | V    |
|                      | 2313.25         | -36.39                 | 5.24                 | 3.00         | 18.76                            | -22.87          | -13.00      | 9.87        | V    |
|                      | --              | --                     | --                   | --           | --                               | --              | --          | --          | --   |
| 467.6375             | 935.28          | -30.02                 | 3.57                 | 3.00         | 12.90                            | -20.69          | -13.00      | 7.69        | V    |
|                      | 1042.91         | -33.53                 | 4.25                 | 3.00         | 15.53                            | -22.25          | -13.00      | 9.25        | V    |
|                      | 1870.55         | -36.24                 | 4.60                 | 3.00         | 17.46                            | -23.38          | -13.00      | 10.38       | V    |
|                      | 2338.20         | -36.06                 | 5.37                 | 3.00         | 18.92                            | -22.51          | -13.00      | 9.51        | V    |
|                      | --              | --                     | --                   | --           | --                               | --              | --          | --          | --   |
| 462.6500             | 925.10          | -31.58                 | 3.54                 | 3.00         | 12.87                            | -22.25          | -13.00      | 9.25        | V    |
|                      | 1387.70         | -36.01                 | 4.21                 | 3.00         | 15.48                            | -24.74          | -13.00      | 11.74       | V    |
|                      | 1850.25         | -35.68                 | 4.52                 | 3.00         | 17.32                            | -22.88          | -13.00      | 9.88        | V    |
|                      | 2313.50         | -35.04                 | 5.24                 | 3.00         | 18.76                            | -21.52          | -13.00      | 8.52        | V    |
|                      | --              | --                     | --                   | --           | --                               | --              | --          | --          | --   |

Remark:

1.  $EIRP = P_{Mea}(dBm) - P_{cl}(dB) + G_a(dBi)$
2. -- Means other points for values lower than limits and not recorded.
3.  $Margin = Limit - EIRP$



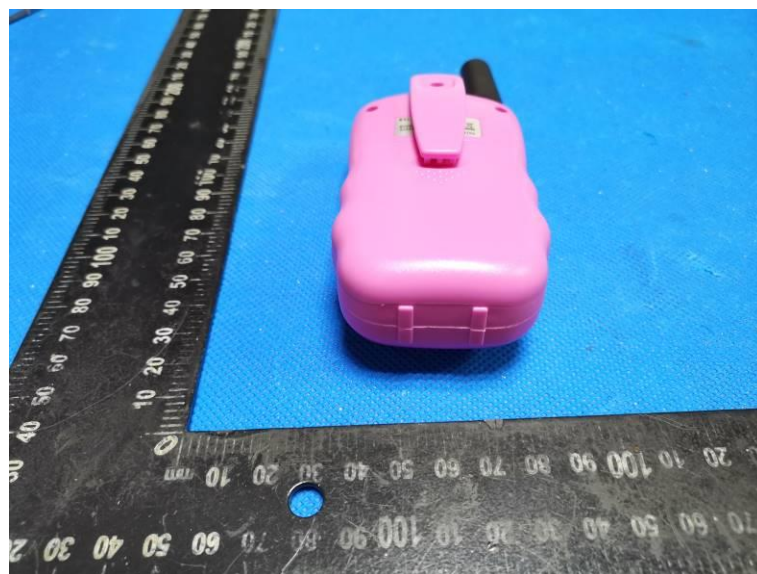
#### 4 Test Setup Photos of the EUT



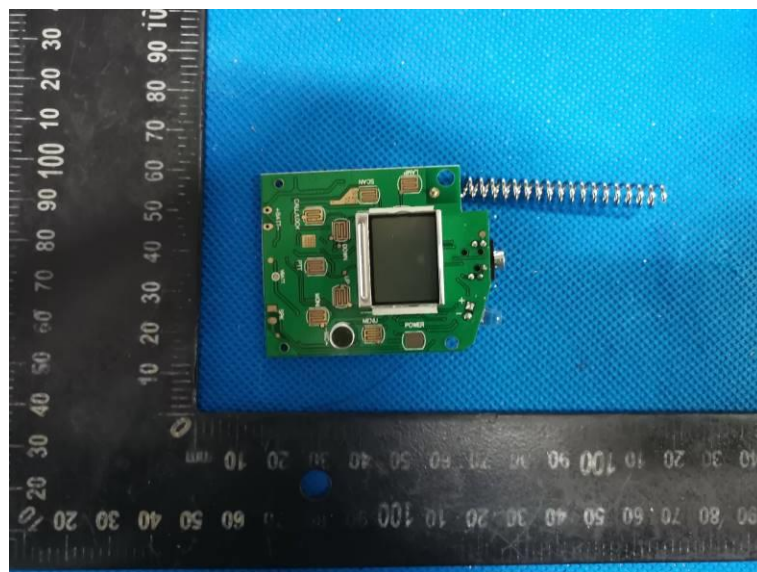
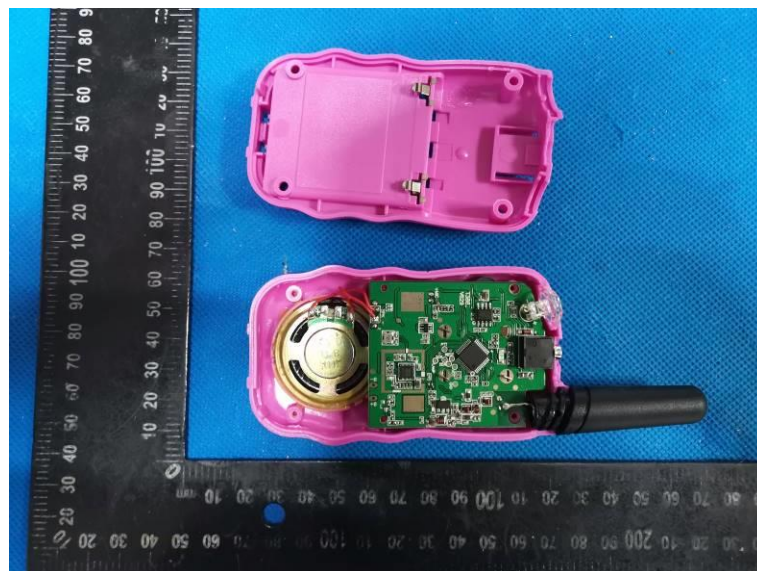
## 5 External and Internal Photos of the EUT

T388











T50

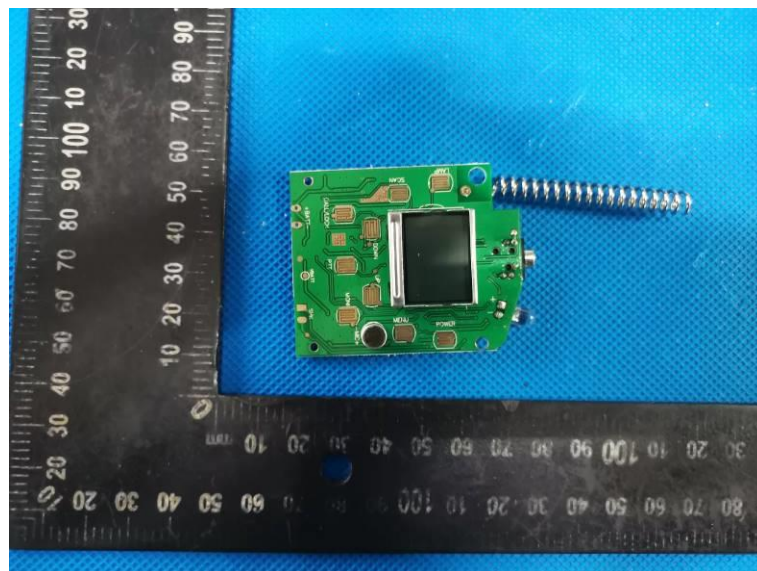
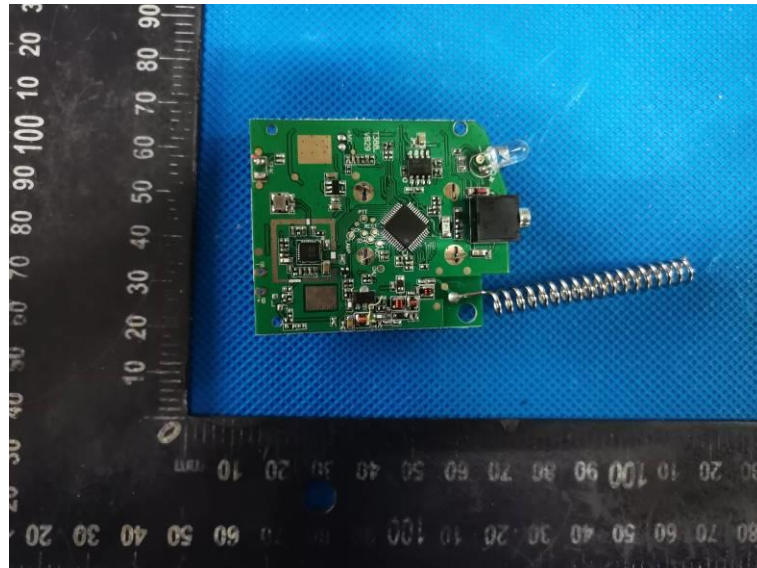












\*\*\*\*\* End of Report \*\*\*\*\*