

## FCC CERTIFICATION TEST REPORT

### FOR

|                             |   |                                                                                      |
|-----------------------------|---|--------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Giant Telecom Limited                                                                |
| <b>Address</b>              | : | 33/F, AIA Kowloon Tower, Landmark East, 100 How Ming Street, Kwun Tong , Kowloon     |
| <b>Equipment under Test</b> | : | Two-way radio                                                                        |
| <b>Model No</b>             | : | R500                                                                                 |
| <b>Trade Mark</b>           | : | OLYMPIA                                                                              |
| <b>FCC ID</b>               | : | RAQLYAE                                                                              |
| <b>Manufacturer</b>         | : | DONGGUAN WISETRONICS TELECOM EQUIPMENT CO. LTD                                       |
| <b>Address</b>              | : | Elite Industrial City, Melin District, Dailing Mount Town, Dongguan Guangdong, China |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

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Guangdong Province, China, 523808

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# REPORT

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## TEST REPORT DECLARE

|                             |   |                                                                                         |
|-----------------------------|---|-----------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Giant Telecom Limited                                                                   |
| <b>Address</b>              | : | 33/F, AIA Kowloon Tower, Landmark East, 100 How Ming Street,<br>Kwun Tong , Kowloon     |
| <b>Equipment under Test</b> | : | Two-way radio                                                                           |
| <b>Model No</b>             | : | R500                                                                                    |
| <b>Trade Mark</b>           | : | OLYMPIA                                                                                 |
| <b>FCC ID</b>               | : | RAQLYAE                                                                                 |
| <b>Manufacturer</b>         | : | DONGGUAN WISETRONICS TELECOM EQUIPMENT CO.<br>LTD                                       |
| <b>Address</b>              | : | Elite Industrial City, Melin District, Dailing Mount Town,<br>Dongguan Guangdong, China |

**Test Standard Used:** FCC Rules and Regulations Part 95; FCC Rules and Regulations Part 2; FCC Rules and Regulations Part 15B;

**Test procedure used:** TIA-603-D:2010; ANSI C63.4:2009

**We Declare:**

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

|                      |                       |                        |            |
|----------------------|-----------------------|------------------------|------------|
| <b>Report No:</b>    | DDT-RE140472          |                        |            |
| <b>Date of Test:</b> | 2014/05/19~2014/05/22 | <b>Date of Report:</b> | 2014/06/13 |

**Prepared By:**

  
Leo Liu/Engineer

**Approved By:**

  
Jamy Yu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

## 1. Summary of test results

| Description of Test Item             | Standard                                                | Results |
|--------------------------------------|---------------------------------------------------------|---------|
| Maximum Transmitter Power            | FCC Part 95.639                                         | PASS    |
| Modulation Characteristics           | FCC Part 2.1047,<br>FCC Part 95.637                     | PASS    |
| Occupied Bandwidth and Emission Mask | FCC Part 2.1049,<br>FCC Part 95.633,<br>FCC Part 95.635 | PASS    |
| Radiated Spurious Emission           | FCC Part 95.635                                         | PASS    |
| Frequency Stability                  | FCC Part 2.1055,<br>FCC Part 95.621<br>FCC Part 95.626  | PASS    |
| Power line conducted emissions       | FCC Part 15: 2012                                       | PASS    |

## 2. General test information

### 2.1. Description of EUT

|                           |   |                                                                                     |
|---------------------------|---|-------------------------------------------------------------------------------------|
| EUT* Name                 | : | Two-way radio                                                                       |
| Model Number              | : | R500                                                                                |
| Trade Mark                | : | OLYMPIA                                                                             |
| EUT function description  | : | Please reference user manual of this device                                         |
| Power supply              | : | DC 4.5V from battery or DC 5V from power adapter                                    |
| Operation frequency range | : | GMRS:462.55MHz-462.7250MHz; 467.5500MHz-467.7250MHz<br>FRS: 467.5625MHz-467.7125MHz |
| Modulation type           | : | FM                                                                                  |
| Max Tx deviation          | : | 2.5KHz                                                                              |
| Emission type             | : | F3E                                                                                 |
| Antenna Type              | : | Integral                                                                            |
| Date of Receipt           | : | 2014/05/06                                                                          |
| Sample Type               | : | Series production                                                                   |

Note1: EUT is the ab. of equipment under test.

### 2.2. Accessories of EUT

| Description of Accessories | Manufacturer                       | Model number or Type | Other |
|----------------------------|------------------------------------|----------------------|-------|
| Power adapter              | HSK Electronics Technology Co.,Ltd | HSK-SAD0900200       | /     |
| Earphone                   | /                                  | /                    | 1.2m  |

### 2.3. Channel Information

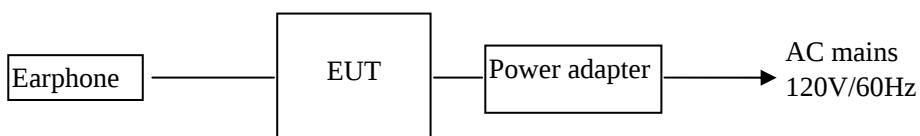
| CH # | FREQ (MHz) | CODE | TYPE | CH # | FREQ (MHz) | CODE | TYPE |
|------|------------|------|------|------|------------|------|------|
| 1    | 462.5625   | ANY  | GMRS | 26   | 462.7125   | 29   | GMRS |
| 2    | 462.5875   | ANY  | GMRS | 27   | 462.55     | 26   | GMRS |
| 3    | 462.6125   | ANY  | GMRS | 28   | 462.6      | 23   | GMRS |
| 4    | 462.6375   | ANY  | GMRS | 29   | 462.65     | 20   | GMRS |
| 5    | 462.6625   | ANY  | GMRS | 30   | 462.7      | 17   | GMRS |
| 6    | 462.6875   | ANY  | GMRS | 31   | 462.5875   | 39   | GMRS |
| 7    | 462.7125   | ANY  | GMRS | 32   | 462.6375   | 42   | GMRS |
| 8    | 467.5625   | ANY  | FRS  | 33   | 462.6875   | 45   | GMRS |
| 9    | 467.5875   | ANY  | FRS  | 34   | 467.5625   | 48   | FRS  |
| 10   | 467.6125   | ANY  | FRS  | 35   | 467.6125   | 51   | FRS  |
| 11   | 467.6375   | ANY  | FRS  | 36   | 467.6625   | 54   | FRS  |
| 12   | 467.6625   | ANY  | FRS  | 37   | 467.7125   | 57   | FRS  |
| 13   | 467.6875   | ANY  | FRS  | 38   | 462.575    | 60   | GMRS |
| 14   | 467.7125   | ANY  | FRS  | 39   | 462.625    | 63   | GMRS |

| CH # | FREQ (MHz) | CODE | TYPE    | CH # | FREQ (MHz) | CODE | TYPE    |
|------|------------|------|---------|------|------------|------|---------|
| 15   | 462.55     | ANY  | GMRS    | 40   | 462.675    | 66   | GMRS    |
| 16   | 462.575    | ANY  | GMRS    | 41   | 462.725    | 69   | GMRS    |
| 17   | 462.6      | ANY  | GMRS    | 42   | 462.5625   | 14   | GMRS    |
| 18   | 462.625    | ANY  | GMRS    | 43   | 462.6125   | 11   | GMRS    |
| 19   | 462.65     | ANY  | GMRS    | 44   | 462.6625   | 8    | GMRS    |
| 20   | 462.675    | ANY  | GMRS    | 45   | 462.7125   | 5    | GMRS    |
| 21   | 462.7      | ANY  | GMRS    | 46   | 462.55     | 2    | GMRS    |
| 22   | 462.725    | ANY  | GMRS    | 47   | 462.6      | 37   | GMRS    |
| 23   | 462.5625   | 38   | GMRS    | 48   | 462.65     | 34   | GMRS    |
| 24   | 462.6125   | 35   | GMRS    | 49   | 462.7      | 31   | GMRS    |
| 25   | 462.6625   | 32   | GMRS    | 50   | 462.5875   | 40   | GMRS    |
| 15R  | 462.5500   | ANY  | RX GMRS | 16R  | 462.5750   | ANY  | RX GMRS |
|      | 467.550    | ANY  | TX GMRS |      | 467.5750   | ANY  | TX GMRS |
| 17R  | 462.6000   | ANY  | RX GMRS | 18R  | 462.6250   | ANY  | RX GMRS |
|      | 467.6000   | ANY  | TX GMRS |      | 467.6250   | ANY  | TX GMRS |
| 19R  | 462.6500   | ANY  | RX GMRS | 20R  | 462.6750   | ANY  | RX GMRS |
|      | 467.6500   | ANY  | TX GMRS |      | 467.7000   | ANY  | TX GMRS |
| 21R  | 462.7000   | ANY  | RX GMRS | 22R  | 462.7250   | ANY  | RX GMRS |
|      | 467.7000   | ANY  | TX GMRS |      | 467.7250   | ANY  | TX GMRS |

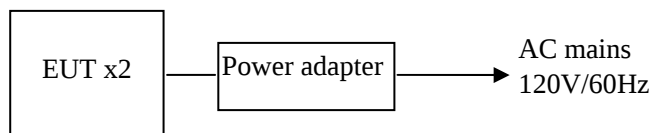
Note: From channel 23 to channel 50 have repeated frequency with channel 1 to channel 22, and only have different code. Channel 4, channel 11 and channel 17R were chosen for test. 15R to 22R are repeater mode channel, only have difference Rx channel and Tx channel, all other parameters as power, modulation type are same with normal mode.

## 2.4. Block diagram of EUT configuration for test

For Radiated emissions test, the block diagram of EUT configuration as below:



For power line conducted emissions test, the block diagram of EUT configuration as below:



## 2.5. Test environment conditions

Unless otherwise specified, measurements were performed within below environmental conditions

|                    |           |
|--------------------|-----------|
| Temperature range: | 21-25℃    |
| Humidity range:    | 40-75%    |
| Pressure range:    | 86-106kPa |

## 2.6. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong

Province, China, 523808 Tel: +86-0769-22891499 <http://www.dgddt.com>

FCC Registration Number: 270092 Industry Canada site registration number: 10288A

## 2.7. Measurement uncertainty

| Test Item                                                  | Uncertainty           |
|------------------------------------------------------------|-----------------------|
| Maximum RF output power (Radiated)                         | ±1.5dB                |
| Frequency Deviation                                        | ±0.05KHz              |
| Uncertainty for radio frequency                            | $1 \times 10^{-9}$    |
| Frequency stability                                        | 140Hz                 |
| Temperature                                                | ±0.2℃                 |
| Humidity                                                   | ±1%                   |
| DC and Low frequency voltage                               | ±0.5%                 |
| Uncertainty for radiation emission test<br>(30MHz-1GHz)    | 3.14 dB (Polarize: V) |
|                                                            | 3.16 dB (Polarize: H) |
| Uncertainty for radiation emission test<br>(1GHz to 25GHz) | 2.08dB(Polarize: V)   |
|                                                            | 2.56dB (Polarize: H)  |
| Uncertainty for radiation emission test (150KHz-30MHz)     | 3.21dB                |
| Uncertainty for Power line conduction emission test        | 2.44dB                |

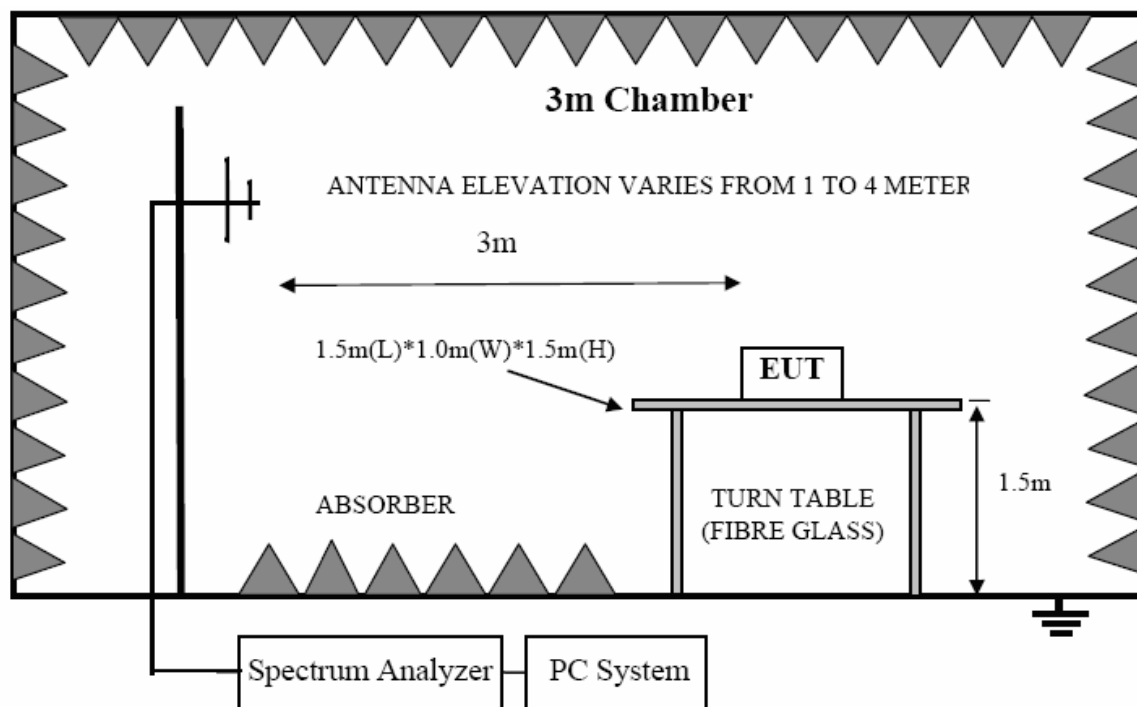
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. Maximum Transmitter Power

#### 3.1. Test equipment

| Item | Equipment                | Manufacturer | Model No. | Serial No.   | Last Cal.  | Cal. Interval |
|------|--------------------------|--------------|-----------|--------------|------------|---------------|
| 1    | Spectrum analyzer        | R&S          | FSU26     | 1166.1660.26 | 2013/11/26 | 1Y            |
| 2    | Trilog Broadband Antenna | Schwarzbeck  | VULB9163  | 9163-462     | 2013/11/26 | 1Y            |
| 3    | Dipole antenna           | Schwarzbeck  | UHAP      | 1101         | 2013/11/26 | 1Y            |
| 4    | Dipole antenna           | Schwarzbeck  | VHAP      | 1118         | 2013/11/26 | 1Y            |
| 5    | RF Cable                 | R&S          | R01       | 10403        | 2013/11/26 | 1Y            |
| 6    | RF Cable                 | R&S          | R02       | 10512        | 2013/11/26 | 1Y            |
| 7    | RF Cable                 | R&S          | R01       | 10454        | 2013/11/26 | 1Y            |
| 8    | RF Cable                 | R&S          | R02       | 10343        | 2013/11/26 | 1Y            |
| 9    | Signal Generator         | R&S          | SMBV100A  | 1407.6004K02 | 2013/11/26 | 1Y            |

#### 3.2. Block diagram of test setup



#### 3.3. Limits

##### According to FCC Part 95.639:

Power output shall not exceed 0.50 Watts effective radiated power for the FRS channels. There can be no provisions for increasing the power or varying the power.

No GMRS channel, under any condition of modulation, shall exceed:

- (1) 50W Carrier power (average TP during one modulated RF cycle) when transmitting emissions type A1D, F1D, G1D, A3E, F3E, or G3E.
- (2) 50W peak envelope TP when transmitting emission type H1D, J1D, R1D, H3E, J3E or R3E.

### **3.4. Test Procedure**

- (1) On a test site, the EUT shall be placed at 1.5m height on a wooden turntable, and in the position closest to normal use as declared by the applicant.
- (2) The test antenna shall be oriented initially for vertical polarization located 3m from EUT to correspond to the frequency of the transmitter.
- (3) The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
- (4) The transmitter shall be switched on , if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- (5) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- (6) The transmitter shall then be rotated through 360° in the horizontal plane, until a maximum signal level is detected by the measuring receiver.
- (7) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- (8) The maximum signal level detected by the measuring receiver shall be noted.
- (9) The transmitter shall be replaced by a tuned dipole (substitution antenna).
- (10) The substitution antenna shall be oriented for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- (11) The substitution antenna shall be connected to a calibrated signal generator.
- (12) If necessary , the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- (13) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver
- (14) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- (15) The input signal to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- (16) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- (17) The measure of the ERP is the larger of the two levels recorded, at the input to the substitution antenna, corrected the gain of the substitution antenna if necessary.

### 3.5. Test Result

| CH # | Frequency | Type | Result |       | FCC Limit | FCC Margin |
|------|-----------|------|--------|-------|-----------|------------|
|      | (MHz)     |      | dBm    | (W)   | (W)       | (W)        |
| 1    | 462.5625  | GMRS | 29.70  | 0.933 | 5         | 4.067      |
| 2    | 462.5875  | GMRS | 29.68  | 0.929 | 5         | 4.071      |
| 3    | 462.6125  | GMRS | 29.81  | 0.957 | 5         | 4.043      |
| 4    | 462.6375  | GMRS | 29.88  | 0.973 | 5         | 4.027      |
| 5    | 462.6625  | GMRS | 29.43  | 0.877 | 5         | 4.123      |
| 6    | 462.6875  | GMRS | 29.67  | 0.927 | 5         | 4.073      |
| 7    | 462.7125  | GMRS | 29.60  | 0.912 | 5         | 4.088      |
| 8    | 467.5625  | FRS  | 23.12  | 0.205 | 0.5       | 0.295      |
| 9    | 467.5875  | FRS  | 23.45  | 0.221 | 0.5       | 0.279      |
| 10   | 467.6125  | FRS  | 23.50  | 0.224 | 0.5       | 0.276      |
| 11   | 467.6375  | FRS  | 23.66  | 0.232 | 0.5       | 0.268      |
| 12   | 467.6625  | FRS  | 23.41  | 0.219 | 0.5       | 0.281      |
| 13   | 467.6875  | FRS  | 23.52  | 0.225 | 0.5       | 0.275      |
| 14   | 467.7125  | FRS  | 23.31  | 0.214 | 0.5       | 0.286      |
| 15   | 462.55    | GMRS | 29.75  | 0.944 | 5         | 4.056      |
| 16   | 462.575   | GMRS | 29.80  | 0.955 | 5         | 4.045      |
| 17   | 462.6     | GMRS | 29.54  | 0.899 | 5         | 4.101      |
| 18   | 462.625   | GMRS | 29.67  | 0.927 | 5         | 4.073      |
| 19   | 462.65    | GMRS | 29.80  | 0.955 | 5         | 4.045      |
| 20   | 462.675   | GMRS | 29.76  | 0.946 | 5         | 4.054      |
| 21   | 462.7     | GMRS | 29.75  | 0.944 | 5         | 4.056      |
| 22   | 462.725   | GMRS | 29.41  | 0.873 | 5         | 4.127      |
| 23   | 462.5625  | GMRS | 29.54  | 0.899 | 5         | 4.101      |
| 24   | 462.6125  | GMRS | 29.73  | 0.940 | 5         | 4.060      |
| 25   | 462.6625  | GMRS | 29.70  | 0.933 | 5         | 4.067      |
| 26   | 462.7125  | GMRS | 29.41  | 0.873 | 5         | 4.127      |
| 27   | 462.55    | GMRS | 29.65  | 0.923 | 5         | 4.077      |
| 28   | 462.6     | GMRS | 29.67  | 0.927 | 5         | 4.073      |
| 29   | 462.65    | GMRS | 29.79  | 0.953 | 5         | 4.047      |
| 30   | 462.7     | GMRS | 29.61  | 0.914 | 5         | 4.086      |
| 31   | 462.5875  | GMRS | 29.67  | 0.927 | 5         | 4.073      |
| 32   | 462.6375  | GMRS | 29.51  | 0.893 | 5         | 4.107      |
| 33   | 462.6875  | GMRS | 29.45  | 0.881 | 5         | 4.119      |
| 34   | 467.5625  | FRS  | 23.60  | 0.229 | 0.5       | 0.271      |
| 35   | 467.6125  | FRS  | 23.57  | 0.228 | 0.5       | 0.272      |
| 36   | 467.6625  | FRS  | 23.61  | 0.230 | 0.5       | 0.270      |
| 37   | 467.7125  | FRS  | 23.61  | 0.230 | 0.5       | 0.270      |
| 38   | 462.575   | GMRS | 29.63  | 0.918 | 5         | 4.082      |
| 39   | 462.625   | GMRS | 29.54  | 0.899 | 5         | 4.101      |

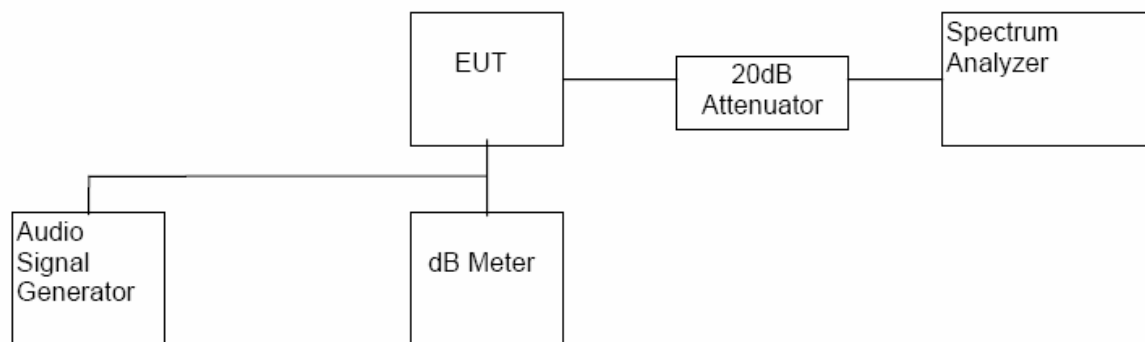
|                        |          |      |       |                         |   |       |
|------------------------|----------|------|-------|-------------------------|---|-------|
| 40                     | 462.675  | GMRS | 29.52 | 0.895                   | 5 | 4.105 |
| 41                     | 462.725  | GMRS | 29.40 | 0.871                   | 5 | 4.129 |
| 42                     | 462.5625 | GMRS | 29.61 | 0.914                   | 5 | 4.086 |
| 43                     | 462.6125 | GMRS | 29.65 | 0.923                   | 5 | 4.077 |
| 44                     | 462.6625 | GMRS | 29.54 | 0.899                   | 5 | 4.101 |
| 45                     | 462.7125 | GMRS | 29.60 | 0.912                   | 5 | 4.088 |
| 46                     | 462.55   | GMRS | 29.54 | 0.899                   | 5 | 4.101 |
| 47                     | 462.6    | GMRS | 29.64 | 0.920                   | 5 | 4.080 |
| 48                     | 462.65   | GMRS | 29.60 | 0.912                   | 5 | 4.088 |
| 49                     | 462.7    | GMRS | 29.51 | 0.893                   | 5 | 4.107 |
| 50                     | 462.5875 | GMRS | 29.69 | 0.931                   | 5 | 4.069 |
| 15R                    | 467.5500 | GMRS | 29.51 | 0.893                   | 5 | 4.107 |
| 16R                    | 467.5750 | GMRS | 29.40 | 0.871                   | 5 | 4.129 |
| 17R                    | 467.6000 | GMRS | 29.68 | 0.929                   | 5 | 4.071 |
| 18R                    | 467.6250 | GMRS | 29.52 | 0.895                   | 5 | 4.105 |
| 19R                    | 467.6500 | GMRS | 29.43 | 0.877                   | 5 | 4.123 |
| 21R                    | 467.7000 | GMRS | 29.50 | 0.891                   | 5 | 4.109 |
| 22R                    | 467.7250 | GMRS | 29.60 | 0.912                   | 5 | 4.088 |
| <b>Conclusion:PASS</b> |          |      |       |                         |   |       |
| Test Date : 2014/05/19 |          |      |       | Test Engineer : Leo Liu |   |       |

## 4. Occupied bandwidth and emission mask

### 4.1. Test equipment

| Item | Equipment         | Manufacturer         | Model No.   | Serial No.   | Last Cal.  | Cal. Interval |
|------|-------------------|----------------------|-------------|--------------|------------|---------------|
| 1    | Spectrum analyzer | R&S                  | FSU         | 1166.1660.26 | 2013/11/13 | 1 Year        |
| 2    | Attenuator        | Mini-Circuits        | BW-S20W2    | 101109       | 2013/11/13 | 1 Year        |
| 3    | RF Cable          | Micable              | C10-01-01-1 | 100309       | 2013/11/13 | 1 Year        |
| 4    | Audio Generator   | Good Will Instrument | GAG-810     | EM862120     | 2013/11/13 | 1 Year        |
| 5    | Digit Multimeter  | Agilent              | 34401A      | MY47053313   | 2014/03/28 | 1 Year        |

### 4.2. Block diagram of test setup



### 4.3. Limits

#### According to FCC 95.633:

For GMRS: the authorized bandwidth for emission type A1D or A3E is 8 KHz ,The authorized bandwidth for emission type F1D, G1D, F3E or G3E is 20 KHz.

For FRS: the authorized bandwidth for emission type F3E or F2D is 12.5 KHz

#### According to FCC 95.635:

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 %.

### 4.4. Test Procedure

(1). Configure EUT and assistant system according clause 4.2

- (2). 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).
- (3). Set SPA Center Frequency = fundamental frequency, RBW=VBW= 300 Hz, Span =20 KHz.
- (4). Measure the -20 dB bandwidth of modulated signal.

#### 4.5. Test Result

##### Occupied Bandwidth:

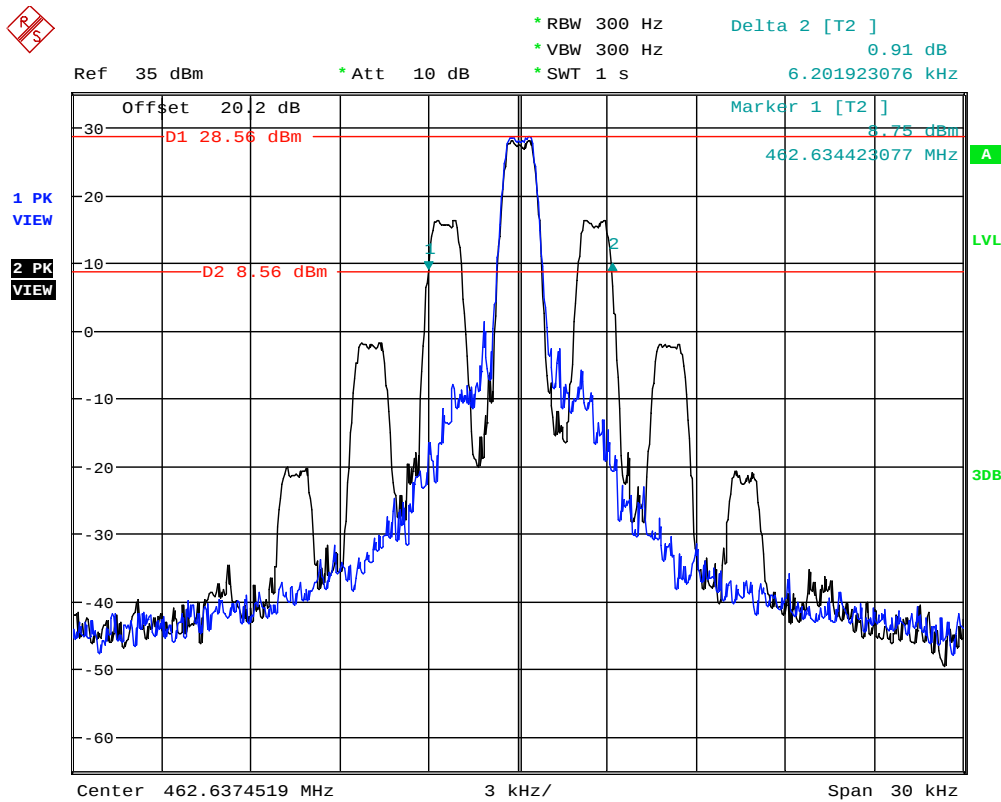
| CH                     | Freq (MHz) | Type | Occupied Bandwidth      | Limit   |
|------------------------|------------|------|-------------------------|---------|
| CH4                    | 462.6375   | GMRS | 6.20KHz                 | 20KHz   |
| CH11                   | 467.6375   | FRS  | 6.25KHz                 | 12.5KHz |
| 17R                    | 467.6000   | GMRS | 5.577KHz                | 20KHz   |
| Conclusion:PASS        |            |      |                         |         |
| Test Date : 2014/05/19 |            |      | Test Engineer : Leo Liu |         |

##### Emission mask:

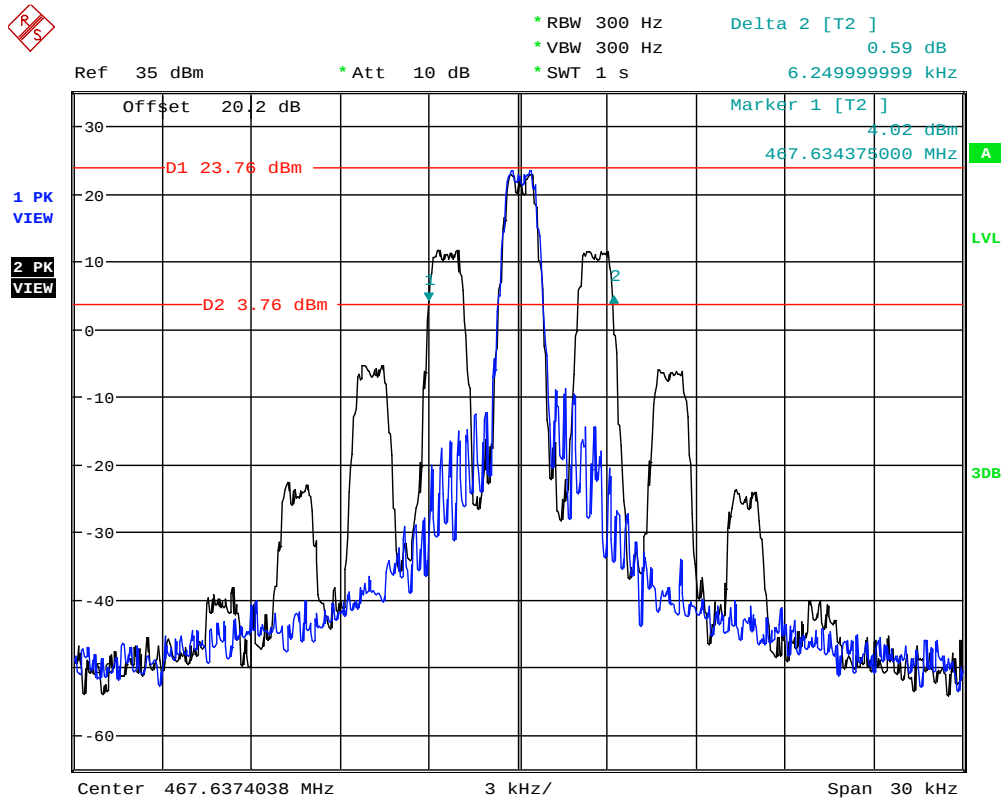
| CH                     | Freq (MHz) | Type | Emission mask result    |
|------------------------|------------|------|-------------------------|
| CH4                    | 462.6375   | GMRS | PASS                    |
| CH11                   | 467.6375   | FRS  | PASS                    |
| 17R                    | 467.6000   | GMRS | PASS                    |
| Test Date : 2014/05/19 |            |      | Test Engineer : Leo Liu |

4.6. Original test data

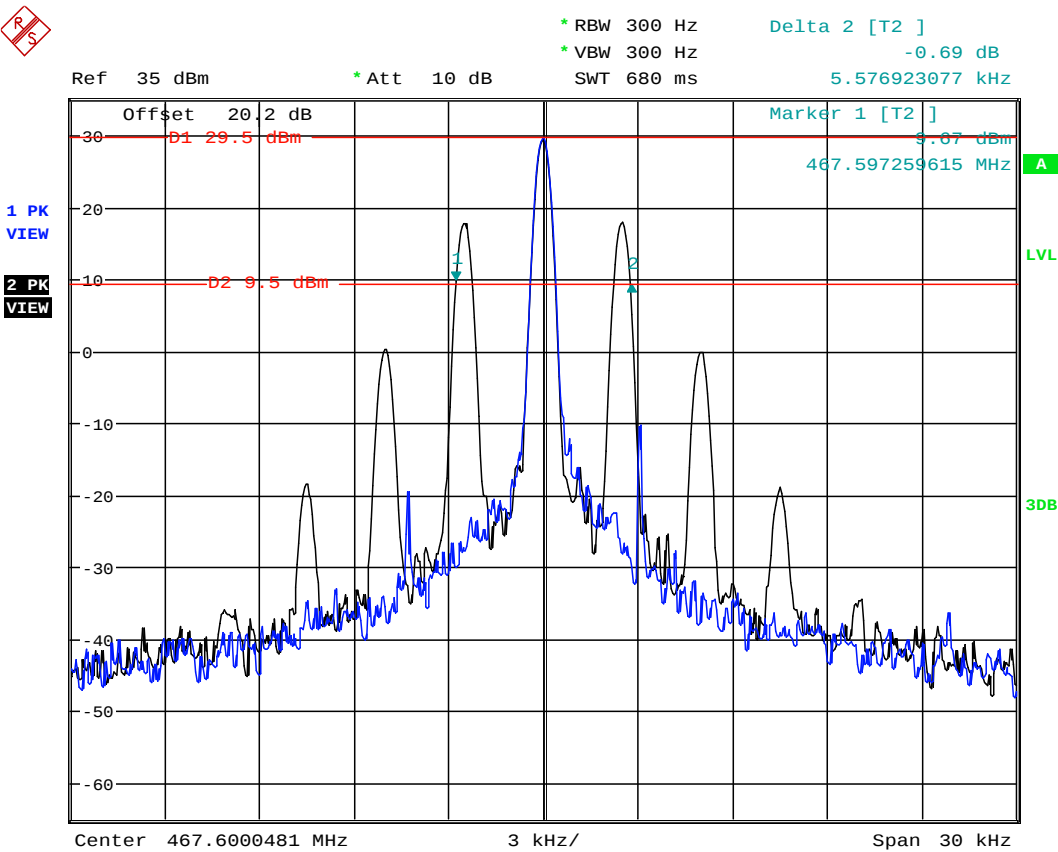
Occupied Bandwidth CH4:



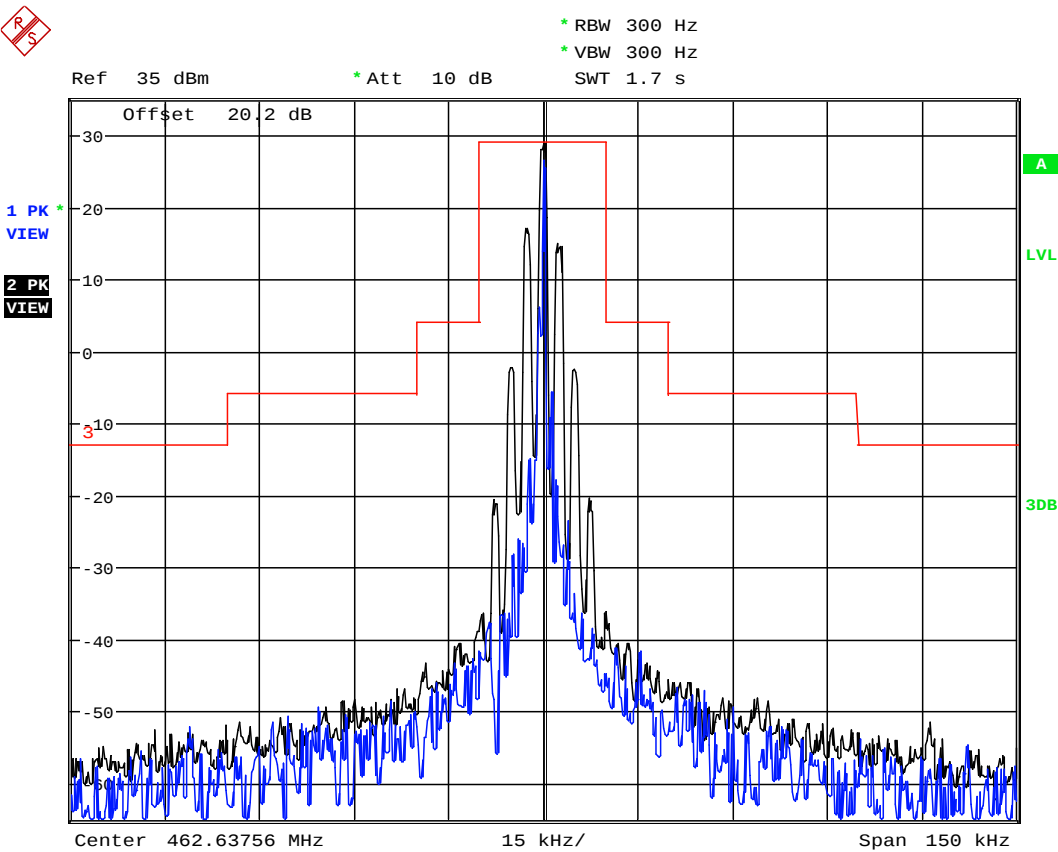
Occupied Bandwidth CH11:



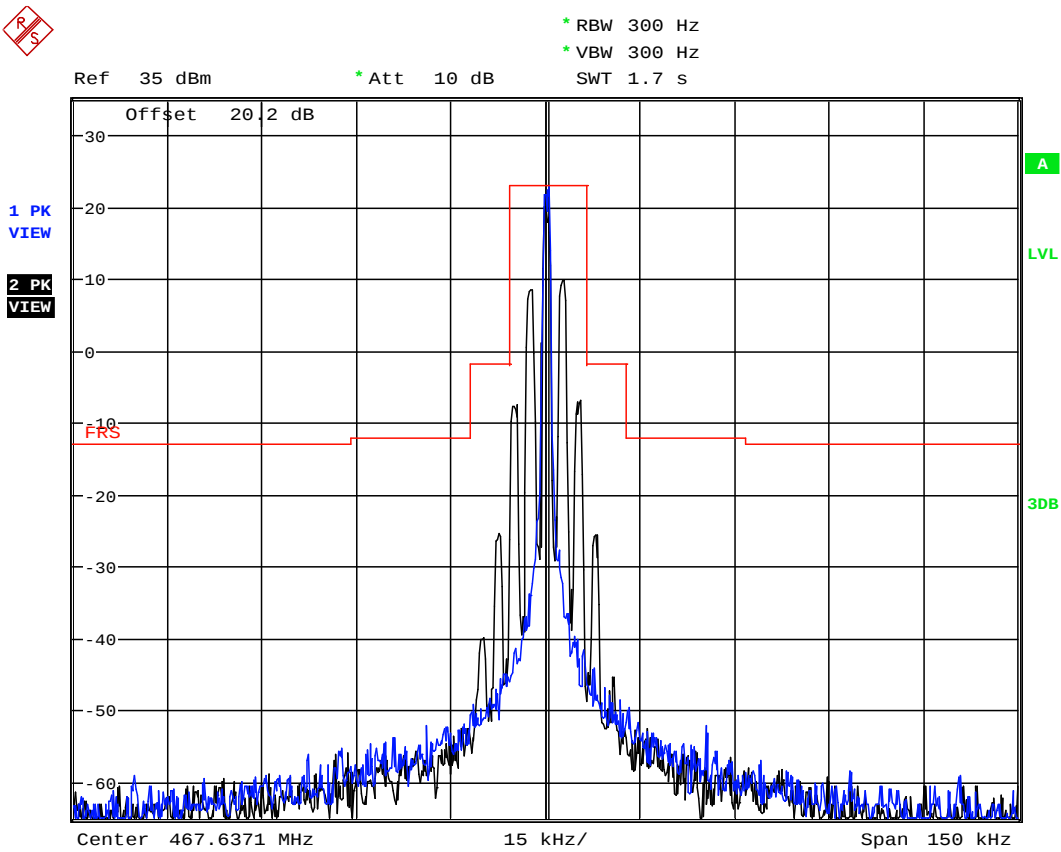
Occupied Bandwidth CH 17R:



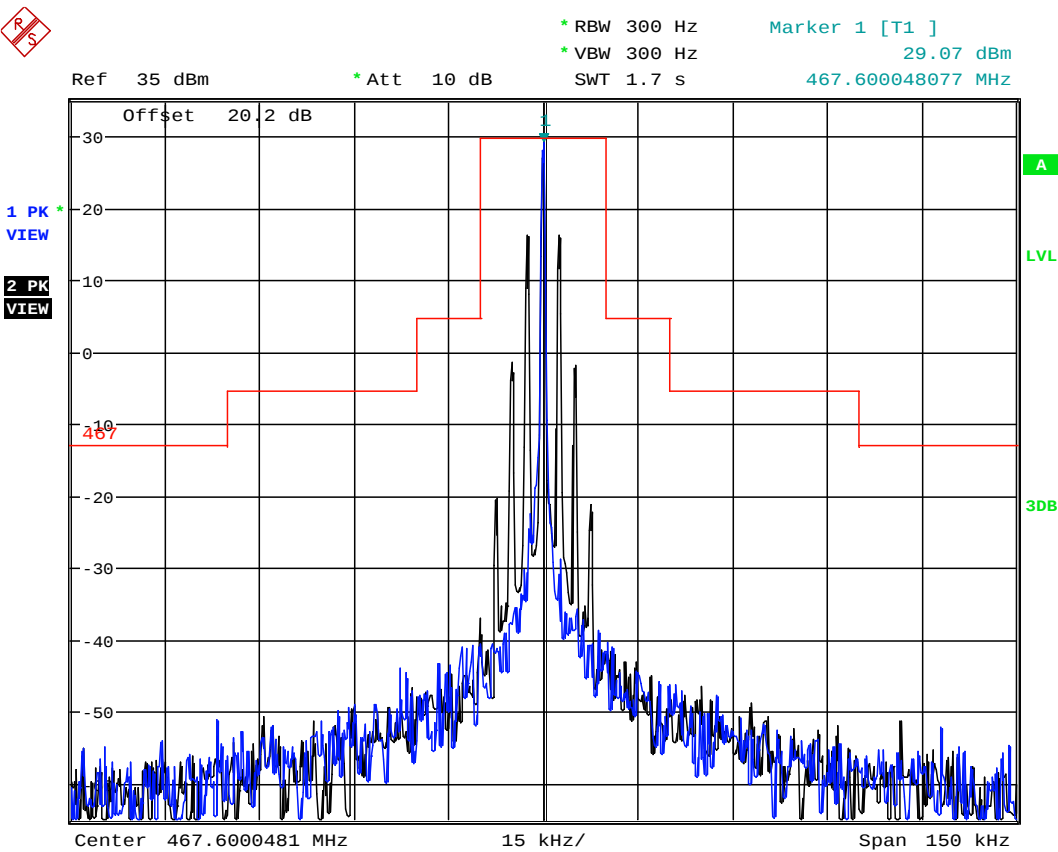
Emission mask CH 4



Emission mask CH11



Emission mask CH 17R



## 5. Modulation Characteristics

### 5.1. Test equipment

| Item | Equipment                 | Manufacturer         | Model No.   | Serial No.   | Last Cal.  | Cal. Interval |
|------|---------------------------|----------------------|-------------|--------------|------------|---------------|
| 1    | Spectrum analyzer         | R&S                  | FSU         | 1166.1660.26 | 2013/11/13 | 1 Year        |
| 2    | Attenuator                | Mini-Circuits        | BW-S20W2    | 101109       | 2013/11/13 | 1 Year        |
| 3    | RF Cable                  | Micable              | C10-01-01-1 | 100309       | 2013/11/13 | 1 Year        |
| 4    | Audio Generator           | Good Will Instrument | GAG-810     | EM862120     | 2013/11/13 | 1 Year        |
| 5    | Digit Multimeter          | Agilent              | 34401A      | MY47053313   | 2014/03/28 | 1 Year        |
| 6    | RF COMMUNICATION TEST SET | HP                   | 8920A       | 3813A1016    | 2014/03/28 | 1 Year        |

### 5.2. Block diagram of test setup

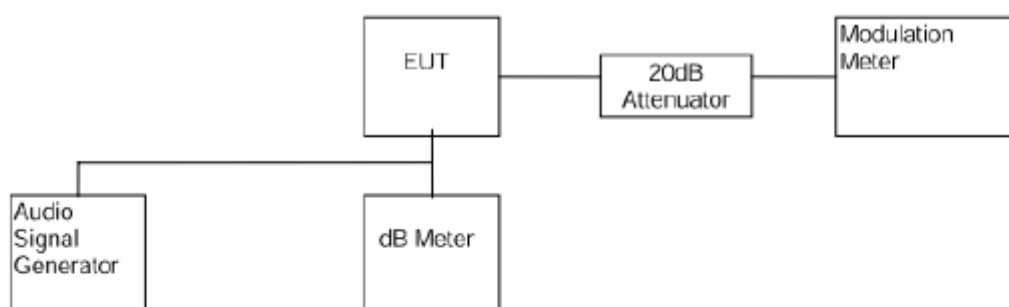


Figure 1

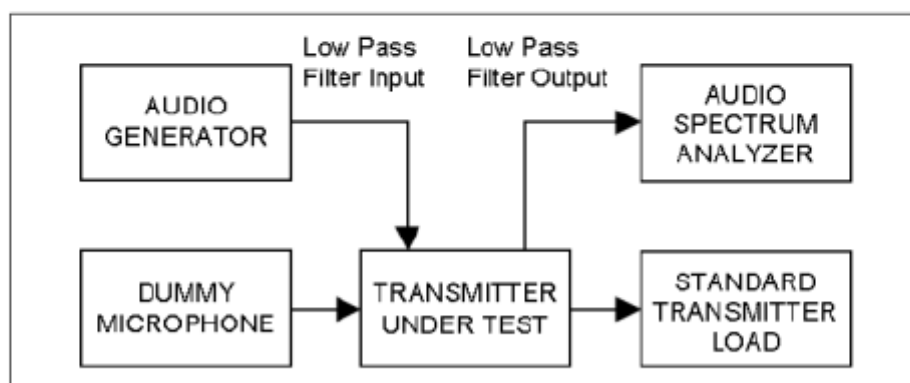


Figure 2

### 5.3. Limits

#### According to FCC 95.637:

(a) A GMRS transmitter that transmits emission types F1D, G1D, or G3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A GMRS transmitter that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5 kHz, and the audio frequency response must not exceed 3.125 kHz .

(b) Each GMRS transmitter, except a mobile station transmitter with a power output of 2.5 W or less, must automatically prevent a greater than normal audio level from causing overmodulation. The transmitter also must include audio frequency low pass filtering, unless it complies with the applicable paragraphs of §95.631 (without filtering.) The filter must be between the modulation limiter and the modulated stage of the transmitter. At any frequency ( $f$  in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least  $60 \log_{10}(f/3)$  dB greater than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB greater than the attenuation at 1 kHz.

#### According to FCC 2.1047:

(a) 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.

For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

### 5.4. Test Procedure

#### Frequency deviation:

(1). Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1 KHz using this level as a reference (0dB) and vary the input level from -20 to +20dB.

Record the frequency deviation obtained as a function of the input level.

(2). Repeat step (1) with input frequency changing to 300Hz, 500Hz, 1Kz, 1.5KHz, 2KHz and 3KHz in sequence.

#### Audio Frequency Response:

(1). Configure the EUT as shown in figure 1.

(2). Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.

(3). Vary the Audio frequency from 100 Hz to 5 KHz and record the frequency deviation.

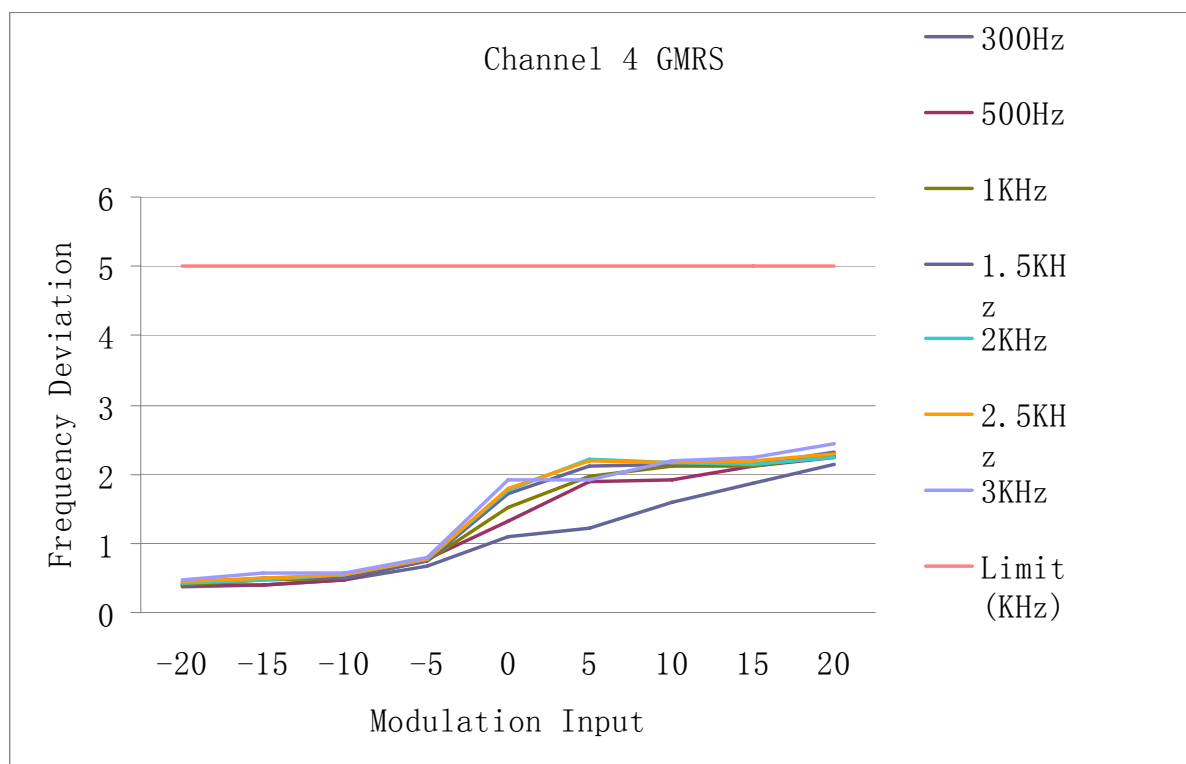
(4). The peak frequency deviation must not exceed  $\pm 2.5$ KHz.

**Audio Low Pass Filter Response:**

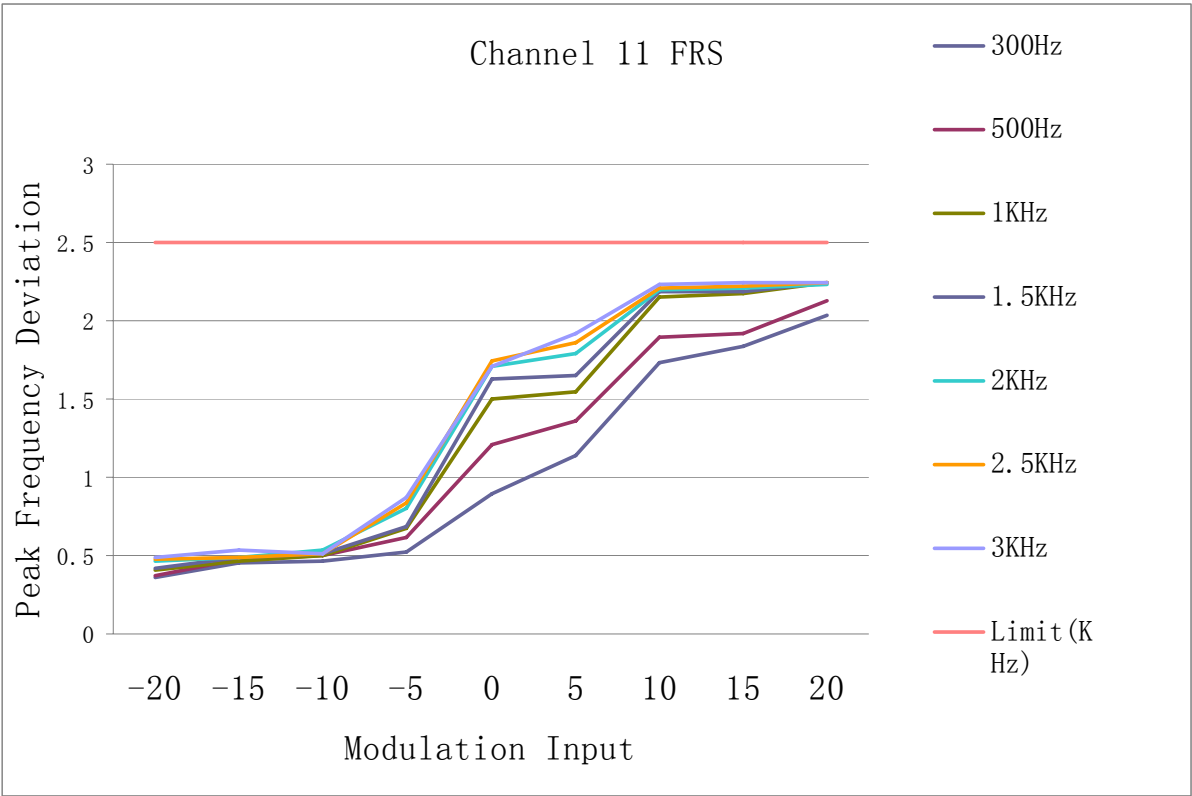
- (1) Connect the equipment in figure 2.
- (2) Connect the audio frequency generator as close as possible the input of the post limiter low pass filter within the transmitter under test.
- (3) Connect the audio spectrum analyzer to the output of the post limiter low pass filter within the transmitter under test.
- (4) Apply a 1000 Hz tone from the audio frequency generator and adjust the level per manufacturer's specifications.
- (5) Record the dB level of the 1000 Hz spectral line on the audio spectrum analyzer as LEV1 .
- (6) Set the audio frequency generator to the desired test frequency between 3000 Hz and the upper low pass filter limit.
- (7) Record audio spectrum analyzer levels, at the test frequency in step (6).
- (8) Record the dB level on the audio spectrum analyzer as LEV2 . Method of Measurement for Transmitters .

**5.5. Test Result****Frequency deviation:**

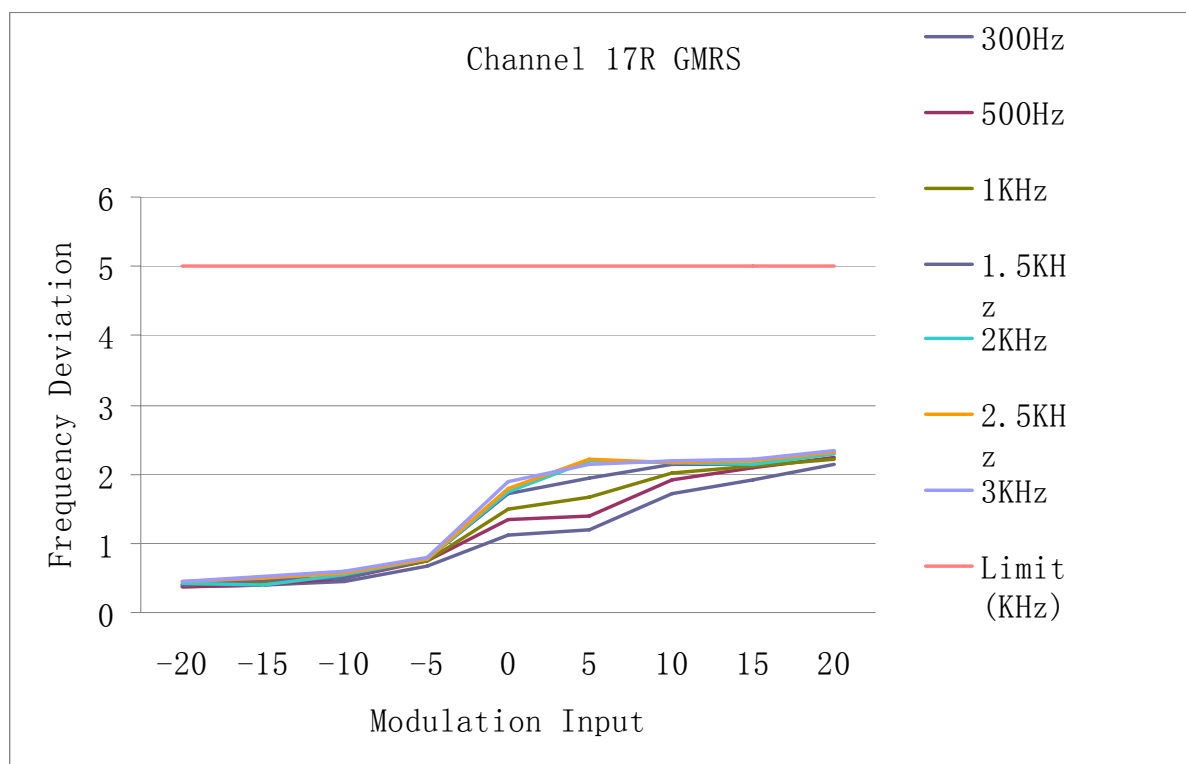
| Channel 4: 462.6375MHz, GMRS |                                |       |      |        |                         |        |      |                |
|------------------------------|--------------------------------|-------|------|--------|-------------------------|--------|------|----------------|
| Modulation<br>Input(dB)      | Peak Frequency Deviation (KHz) |       |      |        |                         |        |      | Limit<br>(KHz) |
|                              | 300Hz                          | 500Hz | 1KHz | 1.5KHz | 2KHz                    | 2.5KHz | 3KHz |                |
| -20.0                        | 0.38                           | 0.39  | 0.41 | 0.42   | 0.43                    | 0.46   | 0.47 | 5              |
| -15.0                        | 0.40                           | 0.41  | 0.48 | 0.51   | 0.47                    | 0.50   | 0.57 | 5              |
| -10.0                        | 0.47                           | 0.48  | 0.51 | 0.50   | 0.55                    | 0.56   | 0.58 | 5              |
| -5.0                         | 0.67                           | 0.76  | 0.74 | 0.75   | 0.78                    | 0.76   | 0.80 | 5              |
| 0.0                          | 1.10                           | 1.32  | 1.50 | 1.71   | 1.76                    | 1.80   | 1.91 | 5              |
| 5.0                          | 1.21                           | 1.90  | 1.96 | 2.12   | 2.21                    | 2.20   | 1.92 | 5              |
| 10.0                         | 1.59                           | 1.91  | 2.12 | 2.14   | 2.16                    | 2.16   | 2.20 | 5              |
| 15.0                         | 1.86                           | 2.12  | 2.11 | 2.15   | 2.15                    | 2.19   | 2.25 | 5              |
| 20.0                         | 2.13                           | 2.25  | 2.26 | 2.32   | 2.23                    | 2.30   | 2.45 | 5              |
| Conclusion: PASS             |                                |       |      |        |                         |        |      |                |
| Test Date : 2014/05/20       |                                |       |      |        | Test Engineer : Leo Liu |        |      |                |



| Channel 11: 467.6375MHz, FRS |                                |       |      |                         |      |        |      |             |
|------------------------------|--------------------------------|-------|------|-------------------------|------|--------|------|-------------|
| Modulation Input(dB)         | Peak Frequency Deviation (KHz) |       |      |                         |      |        |      | Limit (KHz) |
|                              | 300Hz                          | 500Hz | 1KHz | 1.5KHz                  | 2KHz | 2.5KHz | 3KHz |             |
| -20.0                        | 0.36                           | 0.37  | 0.41 | 0.42                    | 0.47 | 0.48   | 0.49 | 2.5         |
| -15.0                        | 0.45                           | 0.48  | 0.46 | 0.49                    | 0.49 | 0.49   | 0.54 | 2.5         |
| -10.0                        | 0.47                           | 0.50  | 0.50 | 0.51                    | 0.54 | 0.51   | 0.51 | 2.5         |
| -5.0                         | 0.52                           | 0.62  | 0.68 | 0.69                    | 0.80 | 0.84   | 0.87 | 2.5         |
| 0.0                          | 0.90                           | 1.21  | 1.50 | 1.63                    | 1.71 | 1.74   | 1.71 | 2.5         |
| 5.0                          | 1.14                           | 1.36  | 1.55 | 1.65                    | 1.79 | 1.86   | 1.92 | 2.5         |
| 10.0                         | 1.73                           | 1.90  | 2.15 | 2.19                    | 2.20 | 2.21   | 2.23 | 2.5         |
| 15.0                         | 1.84                           | 1.92  | 2.18 | 2.19                    | 2.21 | 2.22   | 2.24 | 2.5         |
| 20.0                         | 2.04                           | 2.13  | 2.25 | 2.24                    | 2.23 | 2.24   | 2.25 | 2.5         |
| Conclusion: PASS             |                                |       |      |                         |      |        |      |             |
| Test Date : 2014/05/20       |                                |       |      | Test Engineer : Leo Liu |      |        |      |             |



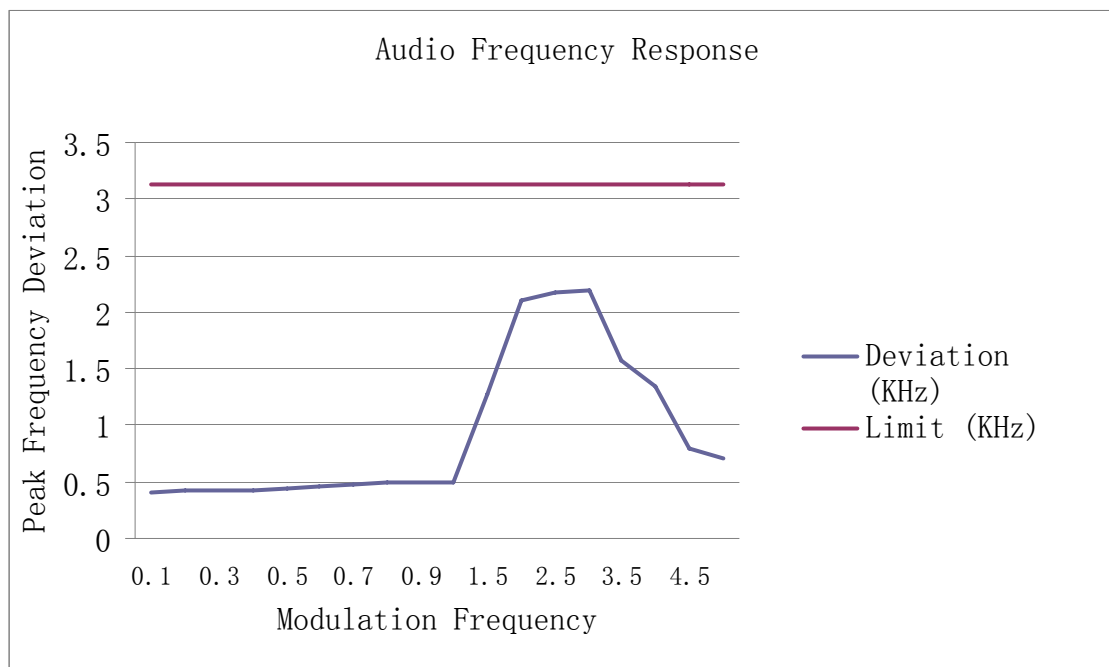
| Channel 17R: 467.600MHz, GMRS |                                |       |      |                         |      |        |      |                |
|-------------------------------|--------------------------------|-------|------|-------------------------|------|--------|------|----------------|
| Modulation<br>Input(dB)       | Peak Frequency Deviation (KHz) |       |      |                         |      |        |      | Limit<br>(KHz) |
|                               | 300Hz                          | 500Hz | 1KHz | 1.5KHz                  | 2KHz | 2.5KHz | 3KHz |                |
| -20.0                         | 0.37                           | 0.38  | 0.4  | 0.41                    | 0.42 | 0.45   | 0.46 | 5              |
| -15.0                         | 0.39                           | 0.41  | 0.46 | 0.48                    | 0.4  | 0.5    | 0.53 | 5              |
| -10.0                         | 0.46                           | 0.49  | 0.52 | 0.51                    | 0.54 | 0.57   | 0.59 | 5              |
| -5.0                          | 0.66                           | 0.75  | 0.75 | 0.77                    | 0.78 | 0.78   | 0.79 | 5              |
| 0.0                           | 1.13                           | 1.35  | 1.5  | 1.72                    | 1.75 | 1.79   | 1.9  | 5              |
| 5.0                           | 1.2                            | 1.4   | 1.67 | 1.93                    | 2.2  | 2.21   | 2.13 | 5              |
| 10.0                          | 1.73                           | 1.92  | 2.02 | 2.15                    | 2.16 | 2.17   | 2.2  | 5              |
| 15.0                          | 1.91                           | 2.1   | 2.12 | 2.13                    | 2.14 | 2.2    | 2.21 | 5              |
| 20.0                          | 2.14                           | 2.23  | 2.22 | 2.31                    | 2.3  | 2.31   | 2.35 | 5              |
| Conclusion: PASS              |                                |       |      |                         |      |        |      |                |
| Test Date : 2014/05/20        |                                |       |      | Test Engineer : Leo Liu |      |        |      |                |



### Audio Frequency Response

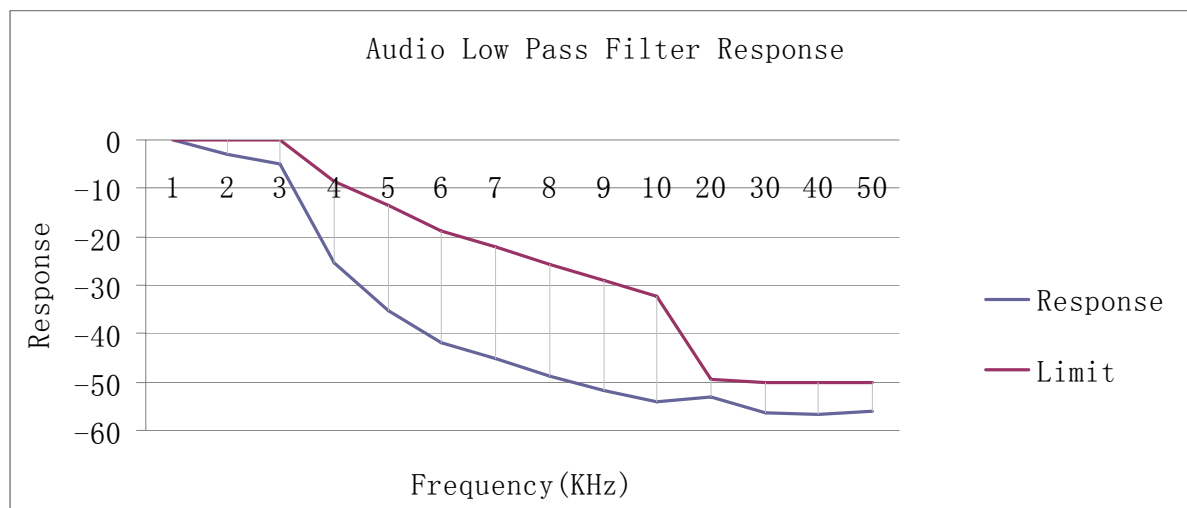
| Channel 11: 467.6375MHz, FRS |                 |             |
|------------------------------|-----------------|-------------|
| Modulation Frequency(Hz)     | Deviation (KHz) | Limit (KHz) |
| 100                          | 0.41            | 3.125       |
| 200                          | 0.42            | 3.125       |
| 300                          | 0.42            | 3.125       |
| 400                          | 0.43            | 3.125       |
| 500                          | 0.44            | 3.125       |
| 600                          | 0.46            | 3.125       |
| 700                          | 0.47            | 3.125       |
| 800                          | 0.49            | 3.125       |
| 900                          | 0.49            | 3.125       |
| 1000                         | 0.50            | 3.125       |
| 1500                         | 1.28            | 3.125       |
| 2000                         | 2.10            | 3.125       |
| 2500                         | 2.18            | 3.125       |
| 3000                         | 2.19            | 3.125       |
| 3500                         | 1.57            | 3.125       |
| 4000                         | 1.34            | 3.125       |
| 4500                         | 0.80            | 3.125       |

|                        |      |                         |
|------------------------|------|-------------------------|
| 5000                   | 0.71 | 3.125                   |
| Conclusion:PASS        |      |                         |
| Test Date : 2014/05/20 |      | Test Engineer : Leo Liu |



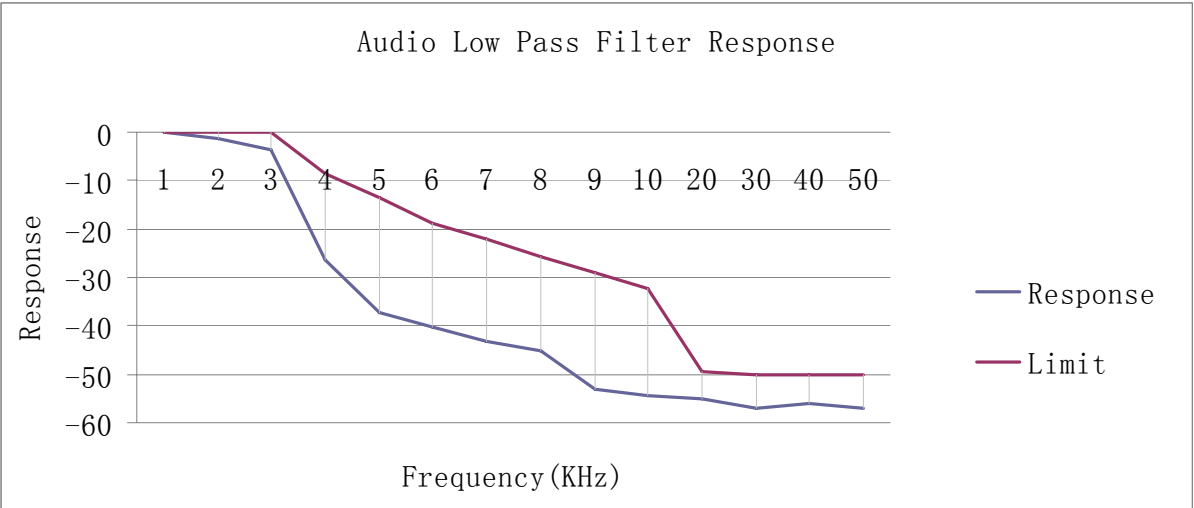
#### Audio Low Pass Filter Response

| Channel 4: 462.6375MHz, GMRS |          |                         |
|------------------------------|----------|-------------------------|
| Frequency(KHz)               | Response | Limit                   |
| 1                            | 0        | 0.00                    |
| 2                            | -2.89    | 0.00                    |
| 3                            | -5.10    | 0.00                    |
| 4                            | -25.23   | -8.62                   |
| 5                            | -35.15   | -13.64                  |
| 6                            | -41.78   | -18.75                  |
| 7                            | -45.31   | -22.16                  |
| 8                            | -48.90   | -25.57                  |
| 9                            | -51.89   | -28.98                  |
| 10                           | -53.91   | -32.39                  |
| 20                           | -53.23   | -49.43                  |
| 30                           | -56.32   | -50.00                  |
| 40                           | -56.65   | -50.00                  |
| 50                           | -55.89   | -50.00                  |
| Conclusion: PASS             |          |                         |
| Test Date : 2014/05/20       |          | Test Engineer : Leo Liu |



### Audio Low Pass Filter Response

| Channel 17R: 467.600MHz, GMRS |          |                         |
|-------------------------------|----------|-------------------------|
| Frequency(KHz)                | Response | Limit                   |
| 1                             | 0        | 0.00                    |
| 2                             | -1.21    | 0.00                    |
| 3                             | -3.5     | 0.00                    |
| 4                             | -26.24   | -8.62                   |
| 5                             | -37.32   | -13.64                  |
| 6                             | -40.12   | -18.75                  |
| 7                             | -43.23   | -22.16                  |
| 8                             | -45.12   | -25.57                  |
| 9                             | -53.12   | -28.98                  |
| 10                            | -54.56   | -32.39                  |
| 20                            | -55.12   | -49.43                  |
| 30                            | -56.89   | -50.00                  |
| 40                            | -56.12   | -50.00                  |
| 50                            | -57.1    | -50.00                  |
| Conclusion: PASS              |          |                         |
| Test Date : 2014/05/20        |          | Test Engineer : Leo Liu |

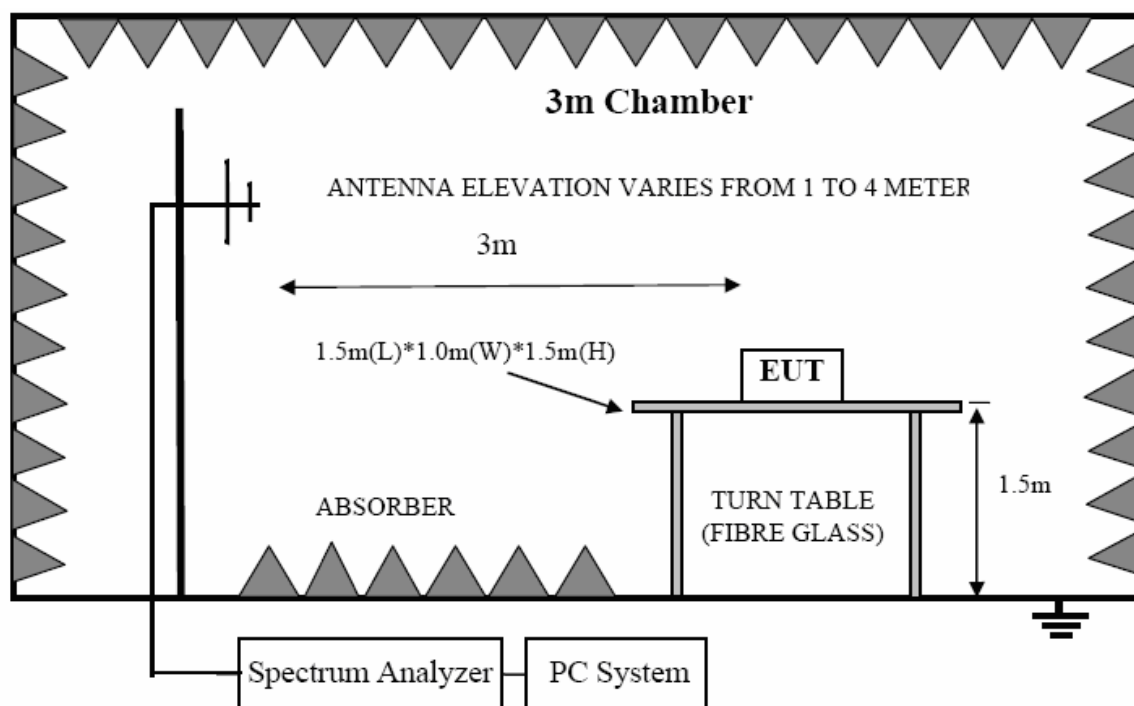


## 6. Radiated Spurious Emission

### 6.1. Test equipment

| Item | Equipment                  | Manufacturer | Model No. | Serial No.   | Last Cal.  | Cal. Interval |
|------|----------------------------|--------------|-----------|--------------|------------|---------------|
| 1    | Spectrum analyzer          | R&S          | FSU26     | 1166.1660.26 | 2013/11/26 | 1Y            |
| 2    | EMI Test Receiver          | R&S          | ESU8      | 100316       | 2013/11/13 | 1 Y           |
| 3    | Loop antenna               | TESEQ        | HLA6120   | 20129        | 2013/11/16 | 1 Y           |
| 4    | Trilog Broadband Antenna   | Schwarzbeck  | VULB9163  | 9163-462     | 2013/11/26 | 1Y            |
| 5    | Double Ridged Horn Antenna | R&S          | HF907     | 100276       | 2013/11/16 | 1Y            |
| 6    | Double Ridged Horn Antenna | R&S          | HF907     | 100265       | 2013/11/16 | 1Y            |
| 7    | Dipole antenna             | Schwarzbeck  | UHAP      | 1101         | 2013/11/26 | 1Y            |
| 8    | Dipole antenna             | Schwarzbeck  | VHAP      | 1118         | 2013/11/26 | 1Y            |
| 9    | RF Cable                   | R&S          | R01       | 10403        | 2013/11/26 | 1Y            |
| 10   | RF Cable                   | R&S          | R02       | 10512        | 2013/11/26 | 1Y            |
| 11   | RF Cable                   | R&S          | R01       | 10454        | 2013/11/26 | 1Y            |
| 12   | RF Cable                   | R&S          | R02       | 10343        | 2013/11/26 | 1Y            |
| 13   | Signal Generator           | R&S          | SMBV100A  | 1407.6004K02 | 2013/11/26 | 1Y            |

### 6.2. Block diagram of test setup



### 6.3. Limit

The unwanted emission should be attenuated below TP by at least  $43+10\log(\text{Transmit Power})$  dB

### 6.4. Test Procedure

- (1) On a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- (2) The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- (3) The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- (4) The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- (5) The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- (6) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- (7) The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- (8) The maximum signal level detected by the measuring receiver shall be noted.
- (9) The measurement shall be repeated with the test antenna set to horizontal polarization.
- (10) Replace the antenna with a proper Antenna (substitution antenna).
- (11) The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- (12) The substitution antenna shall be connected to a calibrated signal generator.
- (13) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- (14) The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- (15) The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- (16) The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- (17) The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

## 6.5. Test result

| Test Mode: GMRS mode continue transmitting Channel 4, Frequency= 462.6375MHz, with earphone and power adapter 2.(Note 1) |                      |              |                         |             |             |
|--------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|-------------------------|-------------|-------------|
| Channle Maximum Power: 29.88dBm(0.973W)                                                                                  |                      |              |                         |             |             |
| Frequency (MHz)                                                                                                          | Antenna polarization | Result (dBm) | Limit(Note 2) (dBm)     | Margin (dB) | Conclusion  |
| 321                                                                                                                      | H                    | -50.23       | -13                     | 37.23       | <b>PASS</b> |
| 925.27                                                                                                                   | H                    | -30.89       | -13                     | 17.89       | <b>PASS</b> |
| 1387.9                                                                                                                   | H                    | -29.81       | -13                     | 16.81       | <b>PASS</b> |
| 234                                                                                                                      | V                    | -49.50       | -13                     | 36.50       | <b>PASS</b> |
| 925.27                                                                                                                   | V                    | -24.12       | -13                     | 11.12       | <b>PASS</b> |
| 1387.9                                                                                                                   | V                    | -26.90       | -13                     | 13.90       | <b>PASS</b> |
| Note 1: According explorer test, this configuration have worst emission.                                                 |                      |              |                         |             |             |
| Note 2:Limit= 29.88 dBm- (43+10log(Transmit Power)) = -13dBm                                                             |                      |              |                         |             |             |
| Test Date : 2014/05/20                                                                                                   |                      |              | Test Engineer : Leo Liu |             |             |

| Test Mode: FRS mode continue transmitting Channel 11, Frequency= 467.6375MHz, with earphone and power adapter 2.(Note 1) |                      |              |                         |             |             |
|--------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|-------------------------|-------------|-------------|
| Channle Maximum Power: 23.66dBm (0.232W)                                                                                 |                      |              |                         |             |             |
| Frequency (MHz)                                                                                                          | Antenna polarization | Result (dBm) | Limit(Note 2) (dBm)     | Margin (dB) | Conclusion  |
| 321                                                                                                                      | H                    | -49.78       | -13                     | 36.78       | <b>PASS</b> |
| 935.27                                                                                                                   | H                    | -36.12       | -13                     | 23.12       | <b>PASS</b> |
| 1402.9                                                                                                                   | H                    | -34.45       | -13                     | 21.45       | <b>PASS</b> |
| 254                                                                                                                      | V                    | -50.32       | -13                     | 37.32       | <b>PASS</b> |
| 935.27                                                                                                                   | V                    | -33.45       | -13                     | 20.45       | <b>PASS</b> |
| 1402.9                                                                                                                   | V                    | -32.98       | -13                     | 19.98       | <b>PASS</b> |
| Note 1: According explorer test, this configuration have worst emission.                                                 |                      |              |                         |             |             |
| Note 2:Limit= 23.66 dBm- (43+10log(Transmit Power)) = -13dBm                                                             |                      |              |                         |             |             |
| Test Date : 2014/05/20                                                                                                   |                      |              | Test Engineer : Leo Liu |             |             |

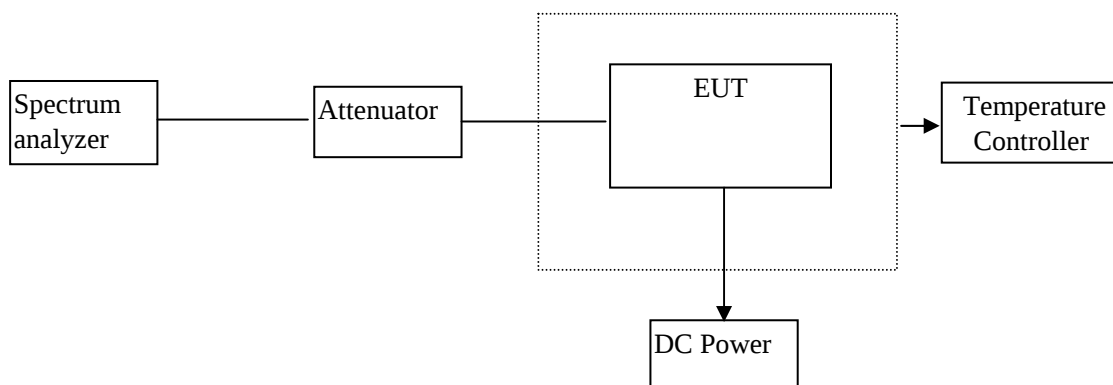
| Test Mode: GMRS mode continue transmitting Channel 17R, Frequency= 467.600MHz, with earphone and power adapter 2.(Note 1) |                      |              |                         |             |             |
|---------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|-------------------------|-------------|-------------|
| Channle Maximum Power: 29.68dBm(0.929W)                                                                                   |                      |              |                         |             |             |
| Frequency (MHz)                                                                                                           | Antenna polarization | Result (dBm) | Limit(Note 2) (dBm)     | Margin (dB) | Conclusion  |
| 320                                                                                                                       | H                    | -51.45       | -13                     | 38.45       | <b>PASS</b> |
| 935.2                                                                                                                     | H                    | -32.13       | -13                     | 19.13       | <b>PASS</b> |
| 1402.8                                                                                                                    | H                    | -30.23       | -13                     | 17.23       | <b>PASS</b> |
| 241                                                                                                                       | V                    | -51.21       | -13                     | 38.21       | <b>PASS</b> |
| 935.2                                                                                                                     | V                    | -26.31       | -13                     | 13.31       | <b>PASS</b> |
| 1402.8                                                                                                                    | V                    | -28.12       | -13                     | 15.12       | <b>PASS</b> |
| Note 1: According explorer test, this configuration have worst emission.                                                  |                      |              |                         |             |             |
| Note 2:Limit= 29.68 dBm- (43+10log(Transmit Power)) = -13dBm                                                              |                      |              |                         |             |             |
| Test Date : 2014/05/20                                                                                                    |                      |              | Test Engineer : Leo Liu |             |             |

## 7. Frequency Stability

### 7.1. Test equipment

| Item | Equipment              | Manufacturer  | Model No.   | Serial No.   | Last Cal.  | Cal. Interval |
|------|------------------------|---------------|-------------|--------------|------------|---------------|
| 1    | Spectrum analyzer      | R&S           | FSU         | 1166.1660.26 | 2013/11/26 | 1 Y           |
| 2    | Attenuator             | Mini-Circuits | BW-S10W2    | 101109       | 2013/11/13 | 1 Y           |
| 3    | RF Cable               | Micable       | C10-01-01-1 | 100309       | 2013/11/26 | 1 Y           |
| 4    | Temperature controller | Dongguan Bell | BE-TH-150M3 | 201208153364 | 2013/11/13 | 1 Y           |
| 5    | DC Power Source        | ALLPower      | ADC50-20    | 990406       | 2013/11/26 | 1 Y           |

### 7.2. Block diagram of test setup



### 7.3. Limits

#### According to FCC 95.621

- (b) Each GMRS transmitter for mobile station, small base station and control station operation must be maintained within a frequency tolerance of 0.0005%. Each GMRS transmitter for base station (except small base), mobile relay station or fixed station operation must be maintained within a frequency tolerance of 0.00025%.

#### According to FCC 95.627

- (b) Each FRS unit must be maintained within a frequency tolerance of 0.000 25%.

### 7.4. Test Procedure

#### Frequency stability versus environmental temperature:

- Setup the configuration per figure 1 for frequencies measurement inside an environment chamber, Install new battery in the EUT.
- Turn on EUT and set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1KHz and Video Resolution Bandwidth to 1KHz and Frequency Span to 50KHz. Record this frequency as reference frequency.

- (3). Set the temperature of chamber to 50°C. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
- (4). Repeat step 2 with a 10°C decreased per stage until the lowest temperature -30°C is measured, record all measured frequencies on each temperature step.

#### Frequency stability versus input voltage:

- (1). Setup the configuration per figure 1 for frequencies measured at temperature if it is within 15°C to 25°C. Otherwise, an environment chamber set for a temperature of 20°C shall be used. The EUT shall be powered by DC 4.5 V
- (2). Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1 KHz and Video Resolution Bandwidth to 1KHz. Record this frequency as reference frequency.
- (3). Supply the EUT primary voltage at the operating end point which is specified by manufacturer and record the frequency.

### 7.5. Test result

| Frequency Tolerance |                 |      |                |               |                 |           |     |
|---------------------|-----------------|------|----------------|---------------|-----------------|-----------|-----|
| CH #                | Frequency (MHz) | TYPE | Result         |               |                 | FCC limit |     |
|                     |                 |      | Measured (MHz) | Tolerance (%) | Tolerance (ppm) | %         | ppm |
| 1                   | 462.5625        | GMRS | 462.5624       | -0.000022     | -0.22           | 0.0005%   | ±5  |
| 2                   | 462.5875        | GMRS | 462.5874       | -0.000022     | -0.22           | 0.0005%   | ±5  |
| 3                   | 462.6125        | GMRS | 462.6125       | 0             | 0               | 0.0005%   | ±5  |
| 4                   | 462.6375        | GMRS | 462.6375       | 0             | 0               | 0.0005%   | ±5  |
| 5                   | 462.6625        | GMRS | 462.6624       | -0.000022     | -0.22           | 0.0005%   | ±5  |
| 6                   | 462.6875        | GMRS | 462.6875       | 0             | 0               | 0.0005%   | ±5  |
| 7                   | 462.7125        | GMRS | 462.7125       | 0             | 0               | 0.0005%   | ±5  |
| 8                   | 467.5625        | FRS  | 467.5625       | 0             | 0               | 0.00025%  | ±5  |
| 9                   | 467.5875        | FRS  | 467.5876       | 0.000021      | 0.21            | 0.00025%  | ±5  |
| 10                  | 467.6125        | FRS  | 467.6126       | 0.000021      | 0.21            | 0.00025%  | ±5  |
| 11                  | 467.6375        | FRS  | 467.6374       | -0.000021     | 0.21            | 0.00025%  | ±5  |
| 12                  | 467.6625        | FRS  | 467.6625       | 0             | 0               | 0.00025%  | ±5  |
| 13                  | 467.6875        | FRS  | 467.6875       | 0             | 0               | 0.00025%  | ±5  |
| 14                  | 467.7125        | FRS  | 467.7125       | 0             | 0               | 0.00025%  | ±5  |
| 15                  | 462.55          | GMRS | 462.550        | 0             | 0               | 0.0005%   | ±5  |
| 16                  | 462.575         | GMRS | 462.575        | 0             | 0               | 0.0005%   | ±5  |
| 17                  | 462.6           | GMRS | 462.60         | 0             | 0               | 0.0005%   | ±5  |
| 18                  | 462.625         | GMRS | 462.625        | 0             | 0               | 0.0005%   | ±5  |
| 19                  | 462.65          | GMRS | 462.650        | 0             | 0               | 0.0005%   | ±5  |
| 20                  | 462.675         | GMRS | 462.675        | 0             | 0               | 0.0005%   | ±5  |
| 21                  | 462.7           | GMRS | 462.70         | 0             | 0               | 0.0005%   | ±5  |
| 22                  | 462.725         | GMRS | 462.725        | 0             | 0               | 0.0005%   | ±5  |

| Frequency Tolerance    |                 |      |                |                         |                 |           |     |
|------------------------|-----------------|------|----------------|-------------------------|-----------------|-----------|-----|
| CH #                   | Frequency (MHz) | TYPE | Result         |                         |                 | FCC limit |     |
|                        |                 |      | Measured (MHz) | Tolerance (%)           | Tolerance (ppm) | %         | ppm |
| 15R                    | 467.5500        | GMRS | 467.5501       | 0.000021                | 0.21            | 0.0005%   | ±5  |
| 16R                    | 467.5750        | GMRS | 467.5750       | 0                       | 0               | 0.0005%   | ±5  |
| 17R                    | 467.6000        | GMRS | 467.6000       | 0                       | 0               | 0.0005%   | ±5  |
| 18R                    | 467.6250        | GMRS | 467.6251       | 0.000021                | 0.21            | 0.0005%   | ±5  |
| 19R                    | 467.6500        | GMRS | 467.6500       | 0                       | 0               | 0.0005%   | ±5  |
| 21R                    | 467.7000        | GMRS | 467.7000       | 0                       | 0               | 0.0005%   | ±5  |
| 22R                    | 467.7250        | GMRS | 467.7249       | -0.000021               | 0.21            | 0.0005%   | ±5  |
| 15R                    | 467.5500        | GMRS | 467.5500       | 0                       | 0               | 0.0005%   | ±5  |
| <b>Conclusion:PASS</b> |                 |      |                |                         |                 |           |     |
| Test Date : 2014/05/20 |                 |      |                | Test Engineer : Leo Liu |                 |           |     |

| Frequency Deviation With Temperature Variation |                 |                |               |                 |           |     |
|------------------------------------------------|-----------------|----------------|---------------|-----------------|-----------|-----|
| GMRS Channel 4                                 |                 |                |               |                 |           |     |
| Temperature (°C)                               | Frequency (MHz) | Result         |               |                 | FCC limit |     |
|                                                |                 | Measured (MHz) | Tolerance (%) | Tolerance (ppm) | %         | ppm |
| -30                                            | 462.6375        | 462.6375       | 0             | 0               | 0.0005%   | ±5  |
| -20                                            | 462.6375        | 462.6374       | -0.000022     | -0.22           | 0.0005%   | ±5  |
| -10                                            | 462.6375        | 462.6374       | -0.000022     | -0.22           | 0.0005%   | ±5  |
| 0                                              | 462.6375        | 462.6376       | 0.000022      | 0.22            | 0.0005%   | ±5  |
| 10                                             | 462.6375        | 462.6375       | 0             | 0               | 0.0005%   | ±5  |
| 20                                             | 462.6375        | 462.6375       | 0             | 0               | 0.0005%   | ±5  |
| 30                                             | 462.6375        | 462.6374       | -0.000022     | -0.22           | 0.0005%   | ±5  |
| 40                                             | 462.6375        | 462.6376       | 0.000022      | 0.22            | 0.0005%   | ±5  |
| 50                                             | 462.6375        | 462.6375       | 0             | 0               | 0.0005%   | ±5  |
| FRS Channel 11                                 |                 |                |               |                 |           |     |
| -30                                            | 467.6375        | 467.6375       | 0             | 0               | 0.00025%  | ±5  |
| -20                                            | 467.6375        | 467.6374       | -0.000021     | -0.21           | 0.00025%  | ±5  |
| -10                                            | 467.6375        | 467.6375       | 0             | 0               | 0.00025%  | ±5  |
| 0                                              | 467.6375        | 467.6374       | -0.000021     | -0.21           | 0.00025%  | ±5  |
| 10                                             | 467.6375        | 467.6376       | 0.000021      | 0.21            | 0.00025%  | ±5  |
| 20                                             | 467.6375        | 467.6375       | 0             | 0               | 0.00025%  | ±5  |
| 30                                             | 467.6375        | 467.6375       | 0             | 0               | 0.00025%  | ±5  |
| 40                                             | 467.6375        | 467.6374       | -0.000021     | -0.21           | 0.00025%  | ±5  |
| 50                                             | 467.6375        | 467.6375       | 0             | 0               | 0.00025%  | ±5  |
| GMRS Channel 17R                               |                 |                |               |                 |           |     |
| -30                                            | 467.6000        | 467.6001       | 0.000021      | 0.21            | 0.0005%   | ±5  |
| -20                                            | 467.6000        | 467.6001       | 0.000021      | 0.21            | 0.0005%   | ±5  |
| -10                                            | 467.6000        | 467.5999       | 0             | 0               | 0.0005%   | ±5  |
| 0                                              | 467.6000        | 467.6001       | 0.000021      | 0.21            | 0.0005%   | ±5  |
| 10                                             | 467.6000        | 467.6000       | 0             | 0               | 0.0005%   | ±5  |

| Frequency Deviation With Temperature Variation |                 |                |               |                         |           |     |
|------------------------------------------------|-----------------|----------------|---------------|-------------------------|-----------|-----|
| GMRS Channel 4                                 |                 |                |               |                         |           |     |
| Temperature (°C)                               | Frequency (MHz) | Result         |               |                         | FCC limit |     |
|                                                |                 | Measured (MHz) | Tolerance (%) | Tolerance (ppm)         | %         | ppm |
| 20                                             | 467.6000        | 467.6000       | 0             | 0                       | 0.0005%   | ±5  |
| 30                                             | 467.6000        | 467.5999       | -0.000021     | -0.21                   | 0.0005%   | ±5  |
| 40                                             | 467.6000        | 467.5999       | -0.000021     | -0.21                   | 0.0005%   | ±5  |
| 50                                             | 467.6000        | 467.6000       | 0             | 0                       | 0.0005%   | ±5  |
| <b>Conclusion:PASS</b>                         |                 |                |               |                         |           |     |
| Test Date : 2014/05/19                         |                 |                |               | Test Engineer : Leo Liu |           |     |

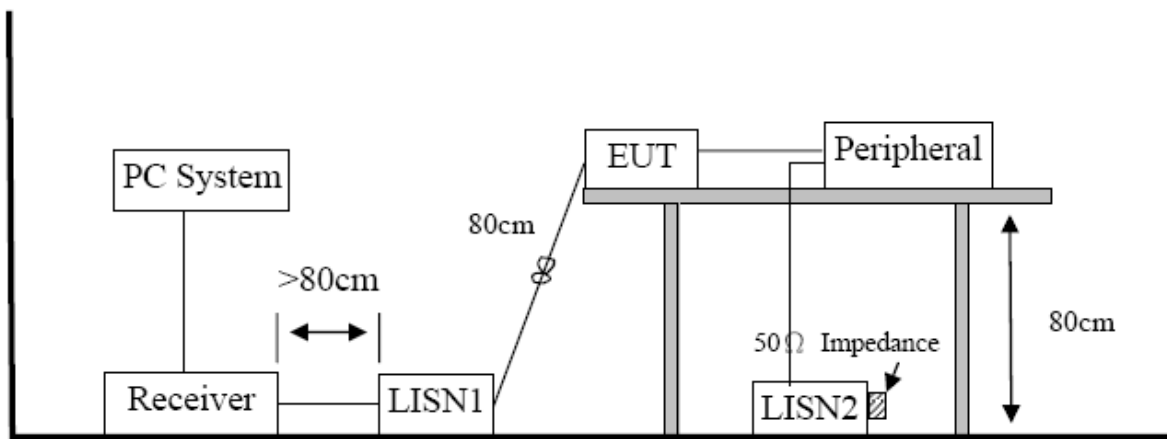
| Frequency Deviation With Voltage Variation |                 |                |               |                         |           |     |
|--------------------------------------------|-----------------|----------------|---------------|-------------------------|-----------|-----|
| GMRS Channel 4                             |                 |                |               |                         |           |     |
| Voltage(V)                                 | Frequency (MHz) | Result         |               |                         | FCC limit |     |
|                                            |                 | Measured (MHz) | Tolerance (%) | Tolerance (ppm)         | %         | ppm |
| 4.5                                        | 462.6375        | 462.6375       | 0             | 0                       | 0.0005%   | ±5  |
| 4.2                                        | 462.6375        | 462.6374       | -0.000022     | -0.22                   | 0.0005%   | ±5  |
| 4.0                                        | 462.6375        | 462.6376       | 0.000022      | 0.22                    | 0.0005%   | ±5  |
| 3.8                                        | 462.6375        | 462.6375       | 0             | 0                       | 0.0005%   | ±5  |
| 3.6                                        | 462.6375        | 462.6374       | -0.000022     | -0.22                   | 0.0005%   | ±5  |
| 3.4                                        | 462.6375        | 462.6375       | 0             | 0                       | 0.0005%   | ±5  |
| 3.3                                        | 462.6375        | 462.6376       | 0.000022      | 0.22                    | 0.0005%   | ±5  |
| FRS Channel 11                             |                 |                |               |                         |           |     |
| 4.5                                        | 467.6375        | 467.6375       | 0             | 0                       | 0.00025%  | ±5  |
| 4.2                                        | 467.6375        | 467.6375       | 0             | 0                       | 0.00025%  | ±5  |
| 4.0                                        | 467.6375        | 467.6374       | -0.000021     | -0.21                   | 0.00025%  | ±5  |
| 3.8                                        | 467.6375        | 467.6375       | 0             | 0                       | 0.00025%  | ±5  |
| 3.6                                        | 467.6375        | 467.6376       | 0.000021      | 0.21                    | 0.00025%  | ±5  |
| 3.4                                        | 467.6375        | 467.6374       | -0.000021     | -0.21                   | 0.00025%  | ±5  |
| 3.3                                        | 467.6375        | 467.6374       | -0.000021     | -0.21                   | 0.00025%  | ±5  |
| GMRS Channel 17R                           |                 |                |               |                         |           |     |
| 4.5                                        | 467.6000        | 467.6000       | 0             | 0                       | 0.00025%  | ±5  |
| 4.2                                        | 467.6000        | 467.5999       | -0.000021     | -0.21                   | 0.0005%   | ±5  |
| 4.0                                        | 467.6000        | 467.6000       | 0             | 0                       | 0.00025%  | ±5  |
| 3.8                                        | 467.6000        | 467.6001       | 0.000021      | 0.21                    | 0.0005%   | ±5  |
| 3.6                                        | 467.6000        | 467.5999       | -0.000021     | -0.21                   | 0.0005%   | ±5  |
| 3.4                                        | 467.6000        | 467.6000       | 0             | 0                       | 0.00025%  | ±5  |
| 3.3                                        | 467.6000        | 467.6001       | 0.000021      | 0.21                    | 0.0005%   | ±5  |
| <b>Conclusion:PASS</b>                     |                 |                |               |                         |           |     |
| Test Date : 2014/05/19                     |                 |                |               | Test Engineer : Leo Liu |           |     |

## 8. Power Line Conducted Emission

### 8.1. Test equipment

| Item | Equipment     | Manufacturer | Model No. | Serial No. | Last Cal.  | Cal. Interval |
|------|---------------|--------------|-----------|------------|------------|---------------|
| 1    | Test Receiver | R&S          | ESU8      | 100316     | 2013/11/13 | 1 Year        |
| 2    | LISN 1        | R&S          | ENV216    | 101109     | 2013/11/13 | 1 Year        |
| 3    | LISN 2        | R&S          | ESH2-Z5   | 100309     | 2013/11/13 | 1 Year        |
| 4    | Pulse Limiter | R&S          | ESH3-Z2   | 101242     | 2013/11/13 | 1 Year        |

### 8.2. Block diagram of test setup



### 8.3. Power Line Conducted Emission Limits(Class B)

| Frequency       | Quasi-Peak Level<br>dB(μV) | Average Level<br>dB(μV) |
|-----------------|----------------------------|-------------------------|
| 150kHz ~ 500kHz | 66 ~ 56*                   | 56 ~ 46*                |
| 500kHz ~ 5MHz   | 56                         | 46                      |
| 5MHz ~ 30MHz    | 60                         | 50                      |

Note 1: \* Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

### 8.4. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

## **8.5. Test Result**

**PASS. (See below detailed test result)**

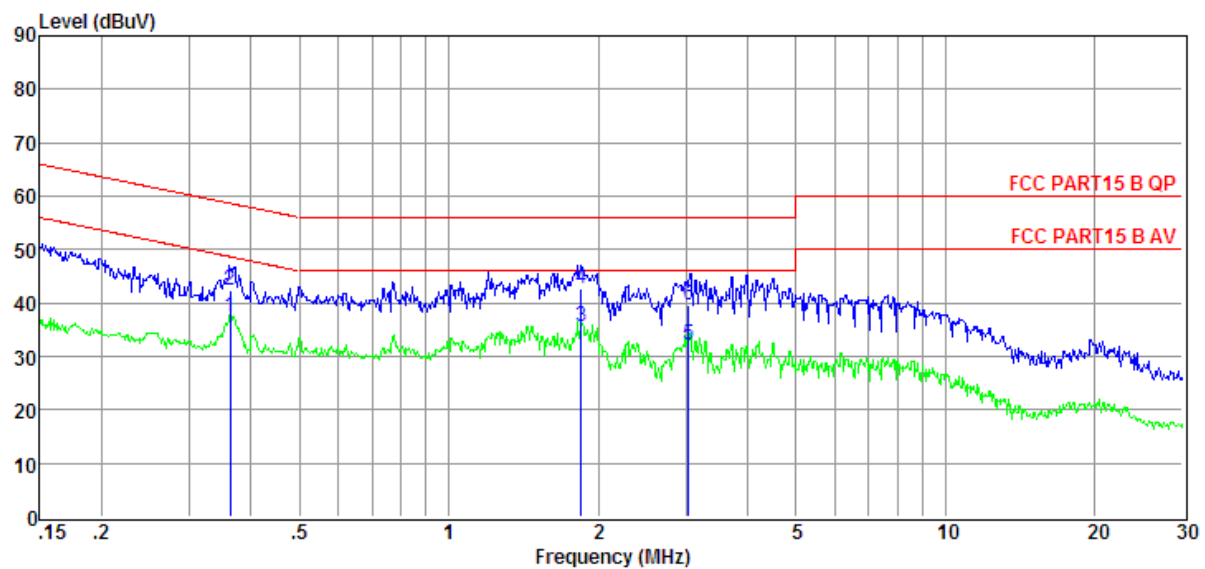
Note1: All emissions not reported below are too low against the prescribed limits.

Note2: “-----” means average detection; “-----” mans peak detection

## TR-4-E-010 Conducted Emission Test Result

**Test Site** : DDT 1# Shield Room **E:\2014 test data\ R500.EM6**  
**Test Date** : 2014-05-22 **Tested By** : Jerry  
**EUT** : Two-way radio **Model Number** : R500  
**Power Supply** : AC 120V/60Hz **Test Mode** : Charging mode  
**Condition** : Temp:24.5'C,Humi:55%,  
 : Press:100.1kPa **LISN** : 2013 ENV216/LINE  
**Memo** :

Data : 14



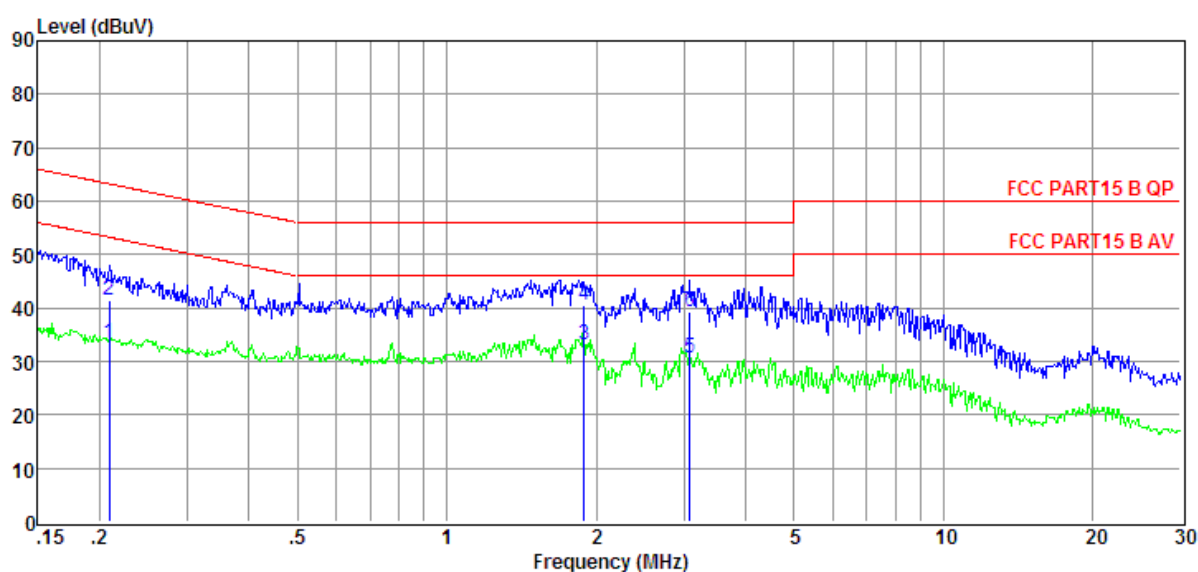
| Item   | Freq  | Read Level | LISN Factor | Cable Loss | Pulse Limiter Factor | Result Level | Limit Line | Over Limit | Detector | Phase |
|--------|-------|------------|-------------|------------|----------------------|--------------|------------|------------|----------|-------|
| (Mark) | (MHz) | (dBμV)     | (dB)        | (dB)       | (dB)                 | (dBμV)       | (dBμV)     | (dB)       |          |       |
| 1      | 0.36  | 17.94      | 9.63        | 0.02       | 9.86                 | 37.45        | 48.65      | -11.20     | Average  | LINE  |
| 2      | 0.36  | 22.82      | 9.63        | 0.02       | 9.86                 | 42.33        | 58.65      | -16.32     | QP       | LINE  |
| 3      | 1.85  | 16.12      | 9.63        | 0.07       | 9.86                 | 35.68        | 46.00      | -10.32     | Average  | LINE  |
| 4      | 1.85  | 23.05      | 9.63        | 0.07       | 9.86                 | 42.61        | 56.00      | -13.39     | QP       | LINE  |
| 5      | 3.04  | 12.42      | 9.65        | 0.09       | 9.86                 | 32.02        | 46.00      | -13.98     | Average  | LINE  |
| 6      | 3.04  | 20.13      | 9.65        | 0.09       | 9.86                 | 39.73        | 56.00      | -16.27     | QP       | LINE  |

Note: 1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss  
 2. If QP Result comply with AV limit, AV Result is deemed to comply with AV limit  
 3. Test setup: RBW: 200Hz(9kHz—150kHz) , 9kHz(150kHz—30MHz), Step size:4kHz, Scan time: auto

## TR-4-E-010 Conducted Emission Test Result

**Test Site** : DDT 1# Shield Room **E:\2014 test data\ 5300.EM6**  
**Test Date** : 2014-05-22 **Tested By** : Jerry  
**EUT** : Two-way radio **Model Number** : R500  
**Power Supply** : AC 120V/60Hz **Test Mode** : Charging mode  
**Condition** : Temp:24.5'C,Humi:55%,  
 : Press:100.1kPa **LISN** : 2013 ENV216/NEUTRAL  
**Memo** :

Data : 16



| Item<br>(Mark) | Freq<br>(MHz) | Read<br>Level<br>(dBμV) | LISN<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Pulse<br>Limiter<br>Factor<br>(dB) | Result<br>Level<br>(dBμV) | Limit<br>Line<br>(dBμV) | Over<br>Limit<br>(dB) | Detector | Phase   |
|----------------|---------------|-------------------------|------------------------|-----------------------|------------------------------------|---------------------------|-------------------------|-----------------------|----------|---------|
| 1              | 0.21          | 13.99                   | 9.59                   | 0.02                  | 9.85                               | 33.45                     | 53.23                   | -19.78                | Average  | NEUTRAL |
| 2              | 0.21          | 21.89                   | 9.59                   | 0.02                  | 9.85                               | 41.35                     | 63.23                   | -21.88                | QP       | NEUTRAL |
| 3              | 1.89          | 13.59                   | 9.61                   | 0.07                  | 9.86                               | 33.13                     | 46.00                   | -12.87                | Average  | NEUTRAL |
| 4              | 1.89          | 20.85                   | 9.61                   | 0.07                  | 9.86                               | 40.39                     | 56.00                   | -15.61                | QP       | NEUTRAL |
| 5              | 3.09          | 10.92                   | 9.61                   | 0.09                  | 9.86                               | 30.48                     | 46.00                   | -15.52                | Average  | NEUTRAL |
| 6              | 3.09          | 19.68                   | 9.61                   | 0.09                  | 9.86                               | 39.24                     | 56.00                   | -16.76                | QP       | NEUTRAL |

Note: 1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss

2. If QP Result comply with AV limit, AV Result is deemed to comply with AV limit

3. Test setup: RBW: 200Hz(9kHz—150kHz) , 9kHz(150kHz—30MHz), Step size:4kHz, Scan time: auto