

# TEST REPORT

## Part 95(A/B)

**Equipment under test** GMRS / FRS 2-way Radio

**Model name** T55A

**FCC ID** MMAT55A

**Applicant** Midland Radio Corporation

**Manufacturer** Global Link Corporation Ltd.

**Date of test(s)** 2015.08.04~2015.08.25

**Date of issue** 2015.08.25

**Issued to**

**Midland Radio Corporation**

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**Issued by**

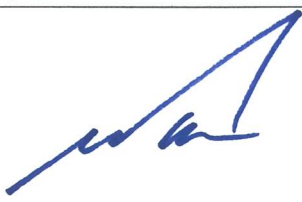
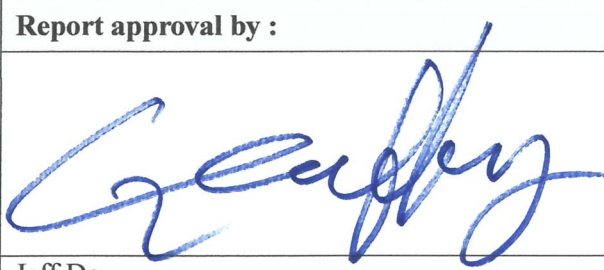
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The test results in the report only apply to the tested sample.



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### Revision history

| Revision | Date of issue | Test report No. | Description |
|----------|---------------|-----------------|-------------|
| -        | 2015.08.25    | KES-RF-15T0056  | Initial     |



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## 1. General information

Applicant: Midland Radio Corporation  
Applicant address: 5900 Parretta Drive, Kansas City, Missouri United States 64120  
Test site: KES Co., Ltd.  
Test site address: C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea  
473-29, Gayeo-ro, Yeosu-si, Gyeonggi-do, 126-58, Korea  
FCC rule part(s): FCC Part 95  
Model: T55A  
FCC ID: MMAT55A  
Test device serial No.: ☐ Production ☒ Pre-production ☐ Engineering

### 1.1. EUT description

Equipment under test FRS / GMRS  
Serial number N/A  
Frequency range 462.562 5 MHz ~ 462.712 5 MHz (GMRS Channels 1 ~ 7)  
467.562 5 MHz ~ 467.712 5 MHz (FRS Channels 8 ~ 14)  
462.550 0 MHz ~ 462.725 0 MHz (GMRS Channels 15 ~ 22)  
Type of Emission 11K0F3E  
E.R.P. GMRS: 0.247 W// FRS: 0.305 W  
Number of channels 22  
Power source Rechargeable Ni-MH battery pack(DC 3.6 V)

### 1.2. Test configuration

The GMRS / FRS 2-way Radio FCC ID: MMAT55A was tested per the guidance of ANSI C63.10-2009, ANSI/TIA 603D: 2010 was used to reference the appropriate EUT setup for radiated spurious emissions testing.

### 1.3. Frequency/channel operations

| Mode | Ch. | Frequency (MHz) |
|------|-----|-----------------|
| GMRS | 1   | 462.562 5       |
|      | 2   | 462.587 5       |
|      | 3   | 462.612 5       |
|      | 4   | 462.637 5       |
|      | 5   | 462.662 5       |
|      | 6   | 462.687 5       |
|      | 7   | 462.712 5       |
| FRS  | 8   | 467.562 5       |
|      | 9   | 467.587 5       |
|      | 10  | 467.612 5       |
|      | 11  | 467.637 5       |
|      | 12  | 467.662 5       |
|      | 13  | 467.687 5       |
|      | 14  | 467.712 5       |
| GMRS | 15  | 462.550 0       |
|      | 16  | 462.575 0       |
|      | 17  | 462.600 0       |
|      | 18  | 462.625 0       |
|      | 19  | 462.650 0       |
|      | 20  | 462.675 0       |
|      | 21  | 462.700 0       |
|      | 22  | 462.725 0       |

### 1.4. Information about derivative model

N/A

### 1.5. Conclusion of worst-case for each mode of representative channel respectively

The EUT has 2 type of mode (GMRS and FRS). Each conducted output power as following;

| Mode | Channel No. | Frequency(MHz)   | Conducted output power |              |
|------|-------------|------------------|------------------------|--------------|
|      |             |                  | dBm                    | W            |
| GMRS | 1           | 462.562 5        | 25.10                  | 0.324        |
|      | 2           | 462.587 5        | 25.15                  | 0.327        |
|      | 3           | 462.612 5        | 25.18                  | 0.330        |
|      | 4           | 462.637 5        | 25.20                  | 0.331        |
|      | 5           | 462.662 5        | 25.19                  | 0.330        |
|      | 6           | 462.687 5        | 25.20                  | 0.331        |
|      | 7           | 462.712 5        | 25.22                  | 0.333        |
| FRS  | 8           | 467.562 5        | 25.69                  | 0.371        |
|      | 9           | 467.587 5        | 25.70                  | 0.372        |
|      | 10          | 467.612 5        | 25.68                  | 0.370        |
|      | 11          | 467.637 5        | 25.72                  | 0.373        |
|      | 12          | 467.662 5        | 25.73                  | 0.374        |
|      | 13          | 467.687 5        | 25.73                  | 0.374        |
|      | <b>14</b>   | <b>467.712 5</b> | <b>25.74</b>           | <b>0.375</b> |
| GMRS | 15          | 462.550 0        | 25.25                  | 0.335        |
|      | 16          | 462.575 0        | 25.26                  | 0.336        |
|      | 17          | 462.600 0        | 25.26                  | 0.336        |
|      | 18          | 462.625 0        | 25.27                  | 0.337        |
|      | 19          | 462.650 0        | 25.29                  | 0.338        |
|      | 20          | 462.675 0        | 25.32                  | 0.340        |
|      | 21          | 462.700 0        | 25.33                  | 0.341        |
|      | <b>22</b>   | <b>462.725 0</b> | <b>25.33</b>           | <b>0.341</b> |

Therefore all applicable requirements were tested to the two channels, the 22<sup>th</sup> for GMRS and the 14<sup>th</sup> for FRS.

DC input into the final amplifier

| Mode | Voltage(V) | Current(A) | Power(W) |
|------|------------|------------|----------|
| GMRS | 3.6        | 0.35       | 1.26     |
| FRS  | 3.6        | 0.36       | 1.30     |

## 2. Summary of tests

| Reference                 | Test description                     | Test results |
|---------------------------|--------------------------------------|--------------|
| 95.639                    | RF output power                      | PASS         |
| 95.635                    | Radiated spurious emissions          | PASS         |
| 95.637                    | Modulation limiting                  | PASS         |
| 2.1047                    | Audio frequency response             | PASS         |
| 95.637                    | Low-pass filter response             | PASS         |
| 2.1049, 95.633,<br>95.635 | Occupied bandwidth and emission mask | PASS         |
| 2.1055, 95.621,<br>95.627 | Frequency stability                  | PASS         |

### Note:

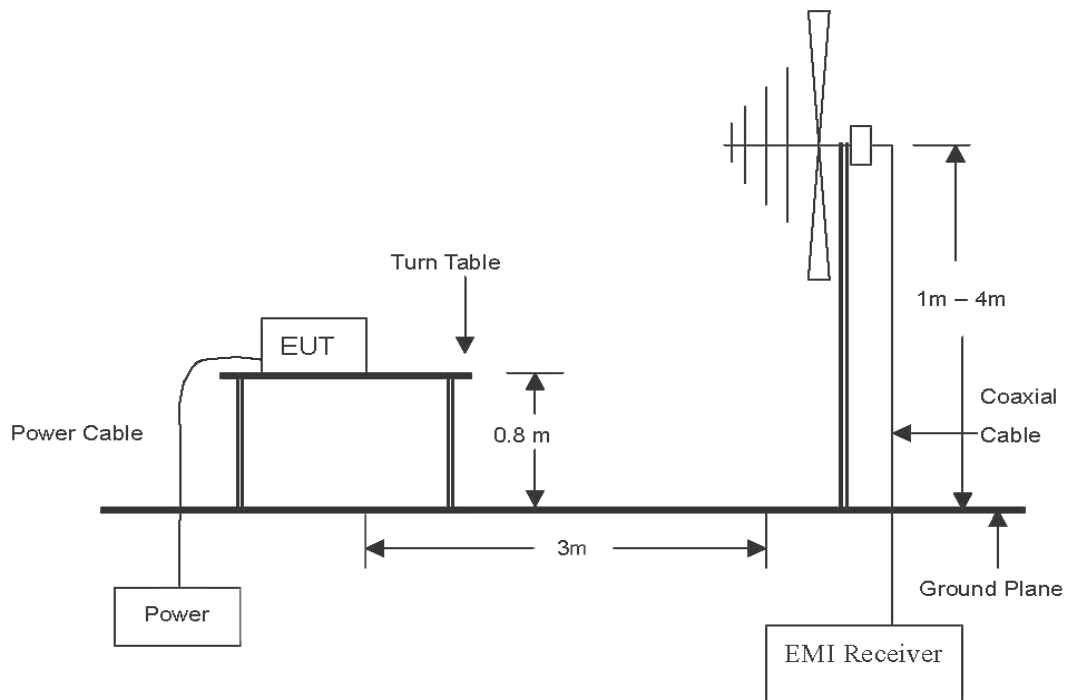
- The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009, ANSI/TIA 603D: 2010) were used in the measurement of the DUT.
- All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.

### 3. Test results

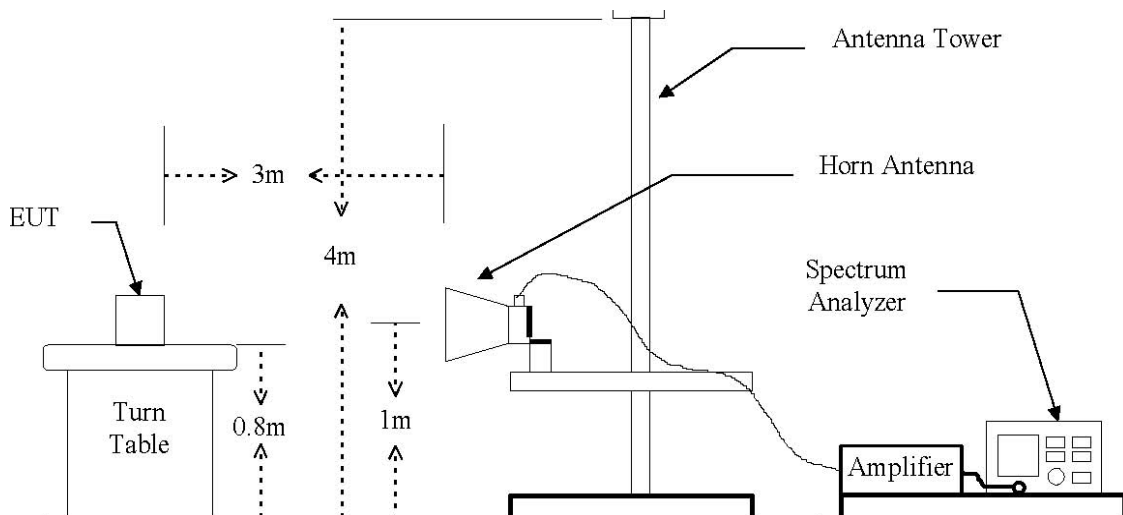
#### 3.1. RF output power and radiated spurious emission

##### Test setup

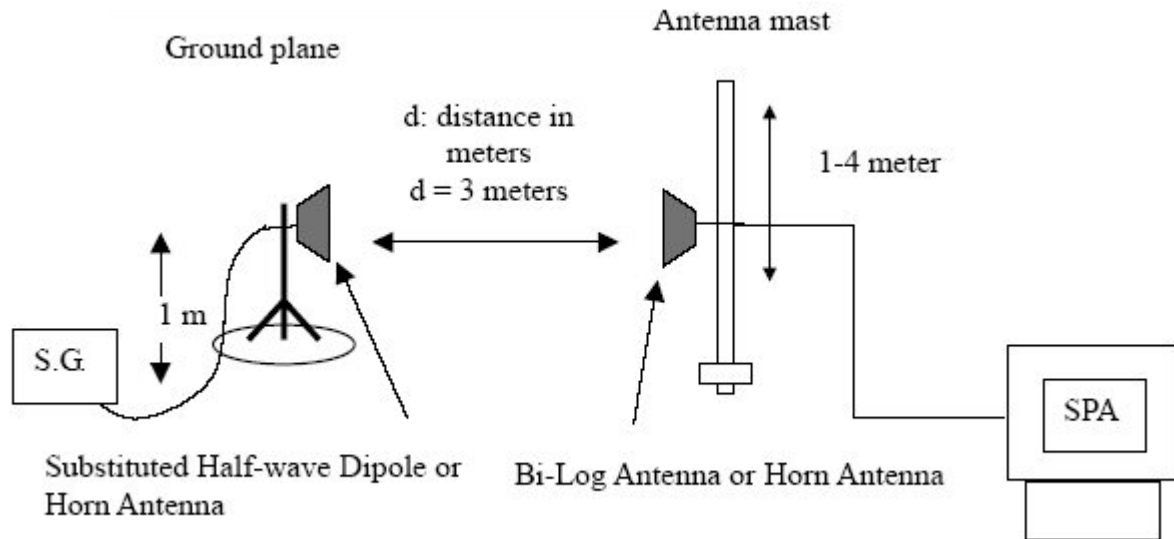
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 18 GHz Emissions.



The diagram below shows the test setup for substituted method



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**Test procedure: Based on ANSI/TIA 603D: 2010**

**RF output power & radiated spurious emissions**

1. On a test site, the EUT shall be placed at 80 cm height on a turn table, 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 fundamental 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. During the measurement of the EUT, the resolution bandwidth was to 1 MHz and the video bandwidth was set to 1 MHz
5. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. 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.
7. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole(below 1000 MHz) or horn antenna(above 1000 MHz) connected to a signal generator.
11. In necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which 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.
14. 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.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

---

## Limit

### RF output power

#### §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.

### Radiated spurious emissions

#### §95.635

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

## Test results

### RF output power

Mode: GRMS  
Distance of measurement: 3 meter  
Operating frequency: 462.725 0 MHz  
Channel: 22

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | E.R.P. |       |
|--------------------|--------------------|--------|-------|
|                    |                    | (dBm)  | (W)   |
| 462.725 0          | H                  | 7.97   | 0.006 |
| 462.725 0          | V                  | 23.93  | 0.247 |

Mode: FRS  
Distance of measurement: 3 meter  
Operating frequency: 467.712 5 MHz  
Channel: 14

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | E.R.P. |       |
|--------------------|--------------------|--------|-------|
|                    |                    | (dBm)  | (W)   |
| 467.712 5          | H                  | 9.57   | 0.009 |
| 467.712 5          | V                  | 24.85  | 0.305 |

### Radiated spurious emissions

Mode: GRMS  
Distance of measurement: 3 meter  
Operating frequency: 462.725 0 MHz  
Channel: 22

| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | Spurious attenuation<br>(dBc) | Limit<br>(dBc) | Margin<br>(dB) |
|--------------------|--------------------|-------------------------------|----------------|----------------|
| 925.450            | H                  | 59.86                         | 36.93          | 22.93          |
| 925.450            | V                  | 55.05                         | 36.93          | 18.12          |
| 1 388.175          | H                  | 69.43                         | 36.93          | 32.50          |
| 1 388.175          | V                  | 69.48                         | 36.93          | 32.55          |
| 1 850.900          | H                  | 61.19                         | 36.93          | 24.26          |
| 1 850.900          | V                  | 49.39                         | 36.93          | 12.46          |
| 2 313.625          | H                  | 56.89                         | 36.93          | 19.96          |
| 2 313.625          | V                  | 54.35                         | 36.93          | 17.42          |
| 2 776.350          | H                  | 62.30                         | 36.93          | 25.37          |
| 2 776.350          | V                  | 62.35                         | 36.93          | 25.42          |
| 3 239.075          | H                  | 64.30                         | 36.93          | 27.37          |
| 3 239.075          | V                  | 64.55                         | 36.93          | 27.62          |
| 3 701.800          | H                  | 65.04                         | 36.93          | 28.11          |
| 3 701.800          | V                  | 61.65                         | 36.93          | 24.72          |
| 4 164.525          | H                  | 65.44                         | 36.93          | 28.51          |
| 4 164.525          | V                  | 63.38                         | 36.93          | 26.45          |
| 4 627.250          | H                  | 73.42                         | 36.93          | 36.49          |
| 4 627.250          | V                  | 75.93                         | 36.93          | 39.00          |

Remark;

1. Spurious attenuation = EUT max. output power(dBm) - absolute level
2. Spurious attenuation limit in dB = 43 + 10log(power in watts)

Mode: FRS  
Distance of measurement: 3 meter  
Operating frequency: 467.712 5 MHz  
Channel: 14

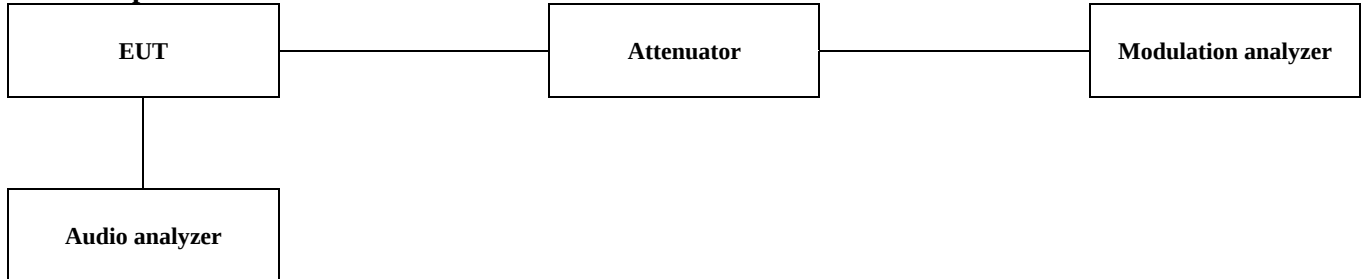
| Frequency<br>(MHz) | Ant. Pol.<br>(H/V) | Spurious attenuation<br>(dBc) | Limit<br>(dBc) | Margin<br>(dB) |
|--------------------|--------------------|-------------------------------|----------------|----------------|
| 935.425            | H                  | 70.29                         | 37.85          | 32.44          |
| 935.425            | V                  | 69.89                         | 37.85          | 32.04          |
| 1 403.138          | H                  | 69.50                         | 37.85          | 31.65          |
| 1 403.138          | V                  | 67.90                         | 37.85          | 30.05          |
| 1 870.850          | H                  | 57.36                         | 37.85          | 19.51          |
| 1 870.850          | V                  | 48.18                         | 37.85          | 10.33          |
| 2 338.563          | H                  | 56.20                         | 37.85          | 18.35          |
| 2 338.563          | V                  | 53.09                         | 37.85          | 15.24          |
| 2 806.275          | H                  | 63.69                         | 37.85          | 25.84          |
| 2 806.275          | V                  | 59.02                         | 37.85          | 21.17          |
| 3 273.988          | H                  | 58.92                         | 37.85          | 21.07          |
| 3 273.988          | V                  | 62.52                         | 37.85          | 24.67          |
| 3 741.700          | H                  | 60.53                         | 37.85          | 22.68          |
| 3 741.700          | V                  | 59.59                         | 37.85          | 21.74          |
| 4 209.413          | H                  | 67.15                         | 37.85          | 29.30          |
| 4 209.413          | V                  | 65.86                         | 37.85          | 28.01          |
| 4 677.125          | H                  | 72.94                         | 37.85          | 35.09          |
| 4 677.125          | V                  | 72.16                         | 37.85          | 34.31          |

Remark;

1. Spurious attenuation = EUT max. output power(dBm) - absolute level
2. Spurious attenuation limit in dB =  $43 + 10\log(\text{power in watts})$

### 3.2. Modulation limiting

#### Test setup



#### Test procedure

TIA/EIA-603-D

#### Limit

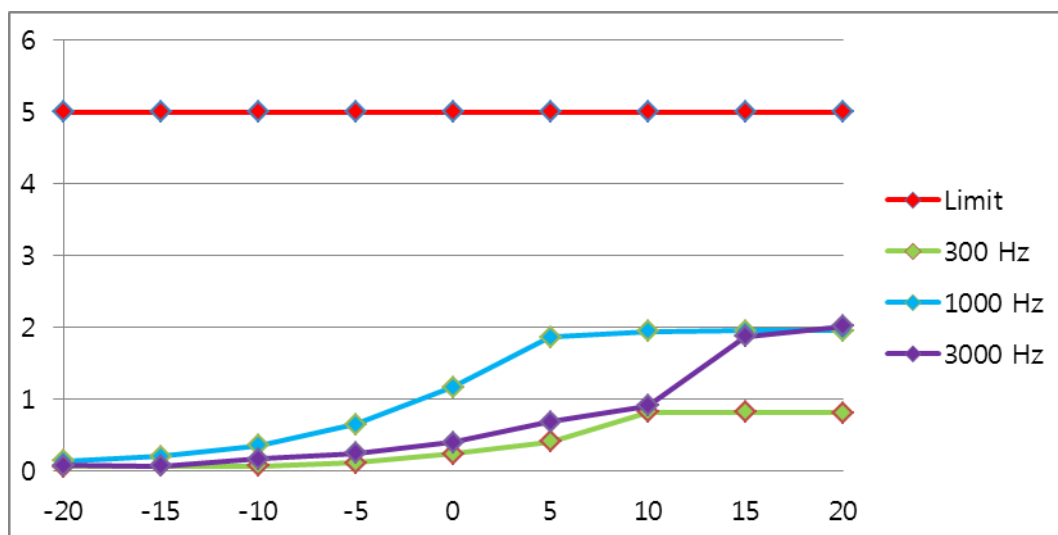
##### §95.637

(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.

## Test results

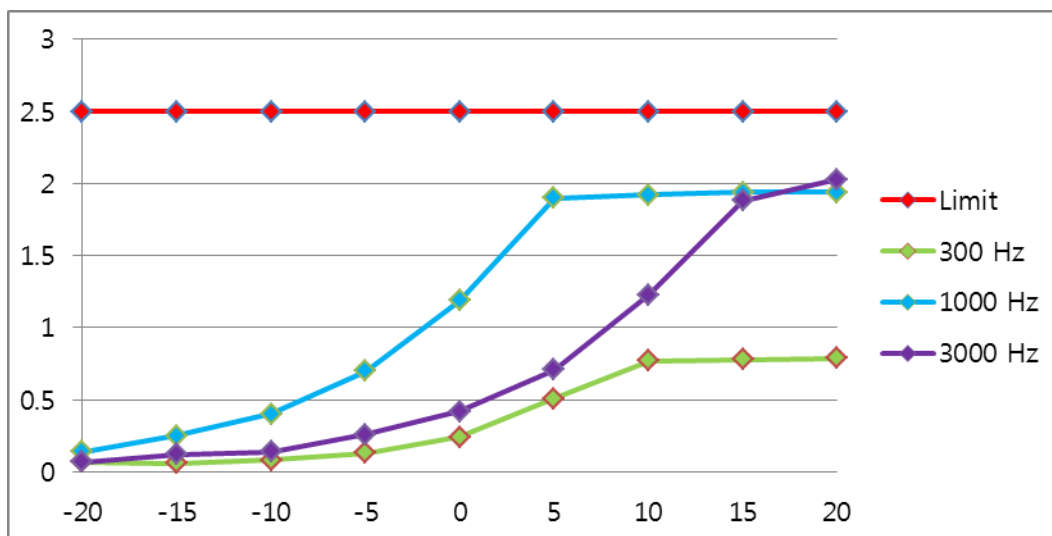
### GMRS

| Audio level (dB) | Deviation at 300 Hz | Deviation at 1 kHz | Deviation at 3 kHz | Limit (kHz) |
|------------------|---------------------|--------------------|--------------------|-------------|
| -20              | 0.06                | 0.14               | 0.08               | 5           |
| -15              | 0.07                | 0.21               | 0.07               | 5           |
| -10              | 0.07                | 0.36               | 0.17               | 5           |
| -5               | 0.12                | 0.65               | 0.25               | 5           |
| 0                | 0.24                | 1.17               | 0.40               | 5           |
| 5                | 0.41                | 1.87               | 0.69               | 5           |
| 10               | 0.82                | 1.95               | 0.91               | 5           |
| 15               | 0.82                | 1.96               | 1.88               | 5           |
| 20               | 0.81                | 1.96               | 2.02               | 5           |



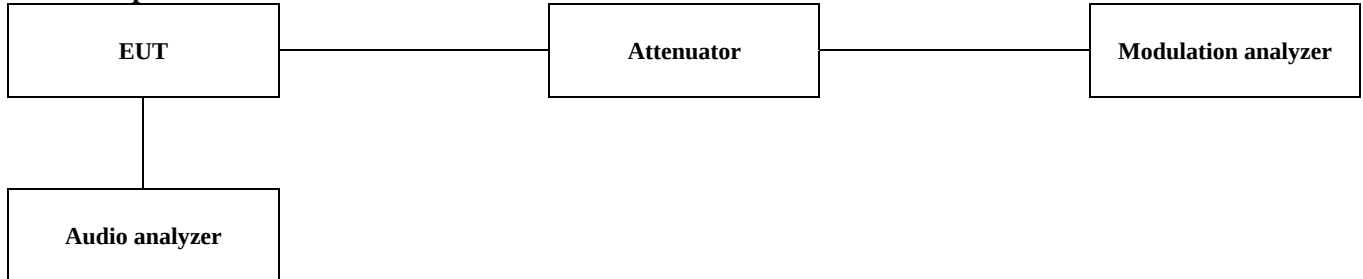
## FRS

| Audio level (dB) | Deviation at 300 Hz | Deviation at 1 kHz | Deviation at 3 kHz | Limit (kHz) |
|------------------|---------------------|--------------------|--------------------|-------------|
| -20              | 0.07                | 0.14               | 0.07               | 2.5         |
| -15              | 0.06                | 0.25               | 0.12               | 2.5         |
| -10              | 0.08                | 0.40               | 0.14               | 2.5         |
| -5               | 0.13                | 0.70               | 0.26               | 2.5         |
| 0                | 0.24                | 1.19               | 0.42               | 2.5         |
| 5                | 0.51                | 1.90               | 0.71               | 2.5         |
| 10               | 0.77                | 1.92               | 1.23               | 2.5         |
| 15               | 0.78                | 1.94               | 1.88               | 2.5         |
| 20               | 0.79                | 1.94               | 2.03               | 2.5         |



### 3.3. Audio frequency response

#### Test setup



#### Test procedure

TIA/EIA-603-D

#### Limit

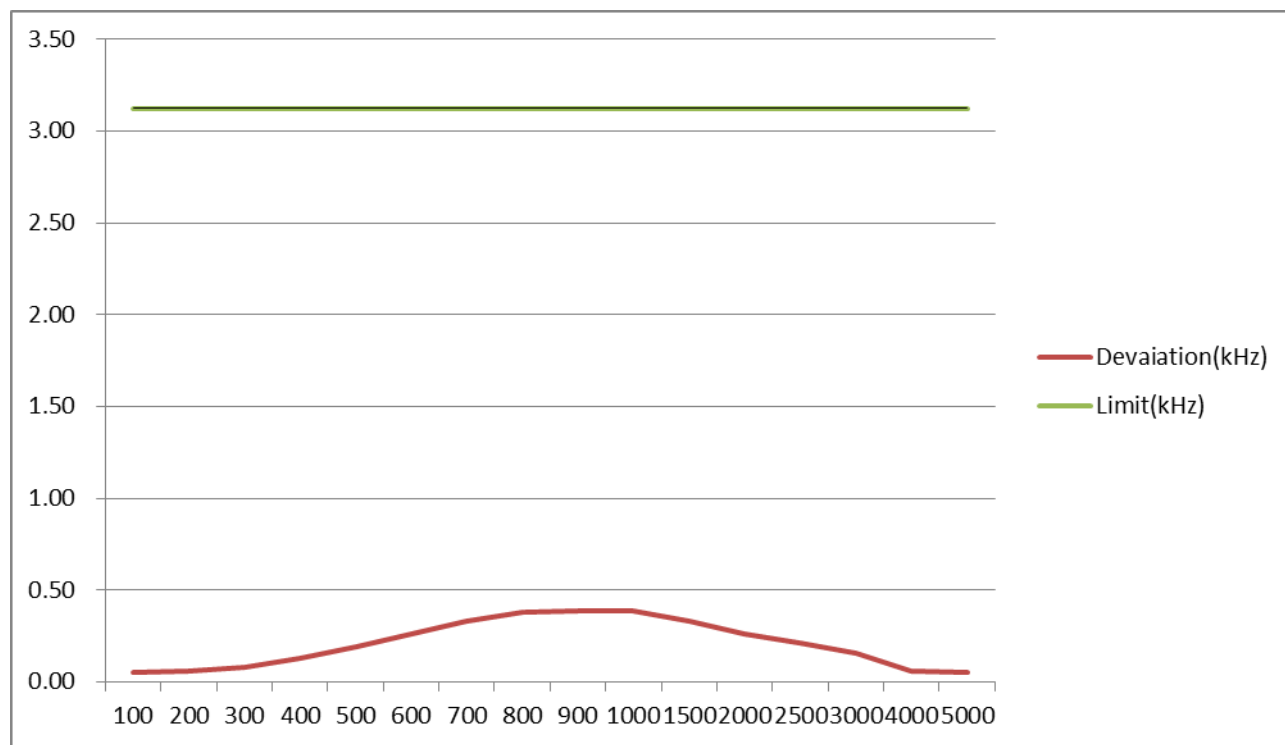
##### §2.1047

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.

## Test results

### FRS

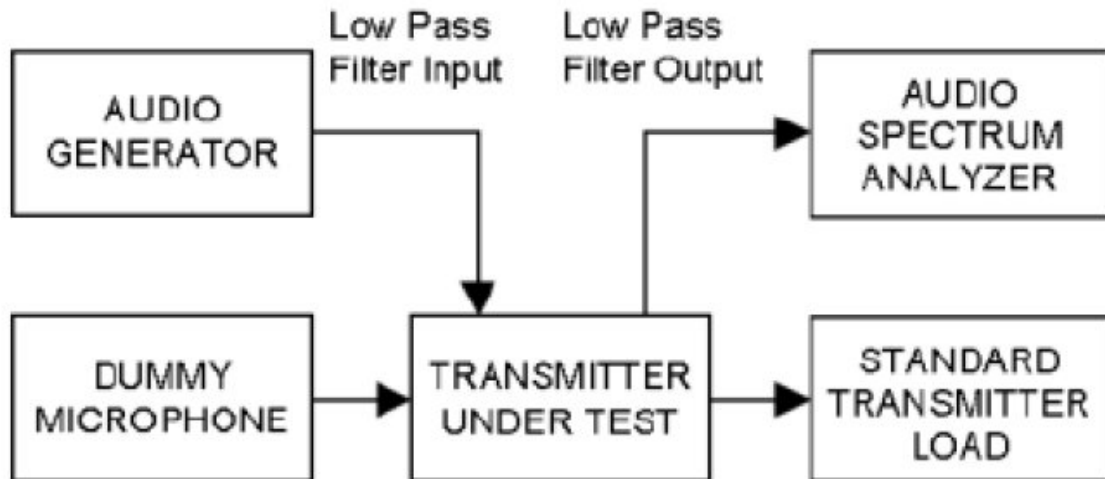
| Audio frequency(Hz) | Deviation(kHz) | Limit(kHz) |
|---------------------|----------------|------------|
| 100                 | 0.02           | 3.125      |
| 200                 | 0.02           | 3.125      |
| 300                 | 0.02           | 3.125      |
| 400                 | 0.05           | 3.125      |
| 500                 | 0.15           | 3.125      |
| 600                 | 0.21           | 3.125      |
| 700                 | 0.23           | 3.125      |
| 800                 | 0.24           | 3.125      |
| 900                 | 0.28           | 3.125      |
| 1000                | 0.33           | 3.125      |
| 1500                | 0.47           | 3.125      |
| 2000                | 0.56           | 3.125      |
| 2500                | 0.62           | 3.125      |
| 3000                | 0.63           | 3.125      |
| 4000                | 0.39           | 3.125      |
| 5000                | 0.21           | 3.125      |



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The test results in the report only apply to the tested sample.

### 3.4. Low-pass filter response

#### Test setup



#### Test procedure

TIA/EIA-603-D

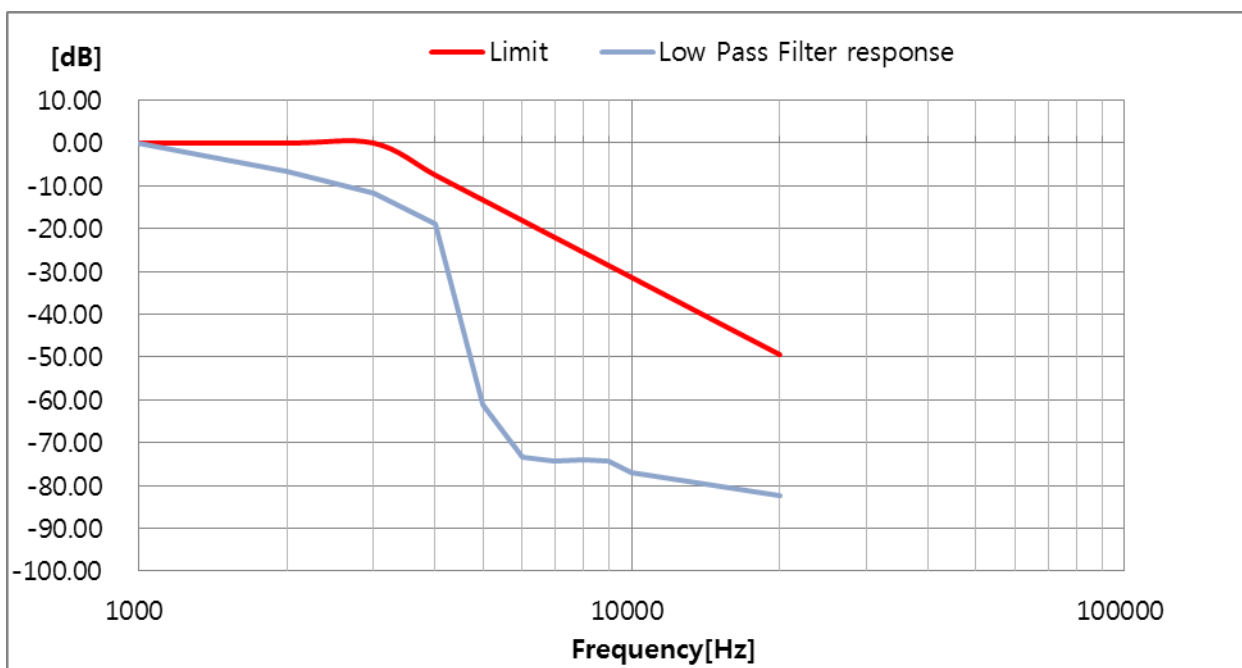
#### Limit

##### §95.637

(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 over modulation. 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.

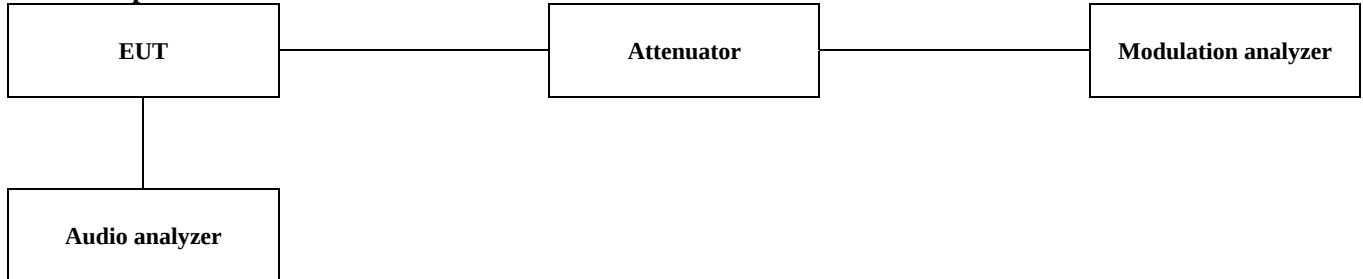
## Test results

| Audio frequency(Hz) | Response(dB) | Limit(dB) |
|---------------------|--------------|-----------|
| 1000                | 0.00         | 0.00      |
| 2000                | -6.48        | 0.00      |
| 3000                | -11.78       | 0.00      |
| 4000                | -18.81       | -7.50     |
| 5000                | -61.25       | -13.31    |
| 6000                | -73.29       | -18.06    |
| 7000                | -74.39       | -22.08    |
| 8000                | -73.92       | -25.56    |
| 9000                | -74.36       | -28.63    |
| 10000               | -76.88       | -31.37    |
| 20000               | -82.35       | -49.43    |



### 3.5. Occupied bandwidth and emission mask

#### Test setup



#### Test procedure

TIA/EIA-603-D section 2.2.11

(Modulate the transmitter with a 2 500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50 % of rated system deviation.)

#### Limit

##### §95.633

The authorized bandwidth (maximum permissible bandwidth of a transmission) for emission type H1D, J1D, R1D, H3E, J3E or R3E is 4 kHz. 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.

The authorized bandwidth for emission type F3E or F2D transmitted by a FRS unit is 12.5 kHz.

##### §95.635

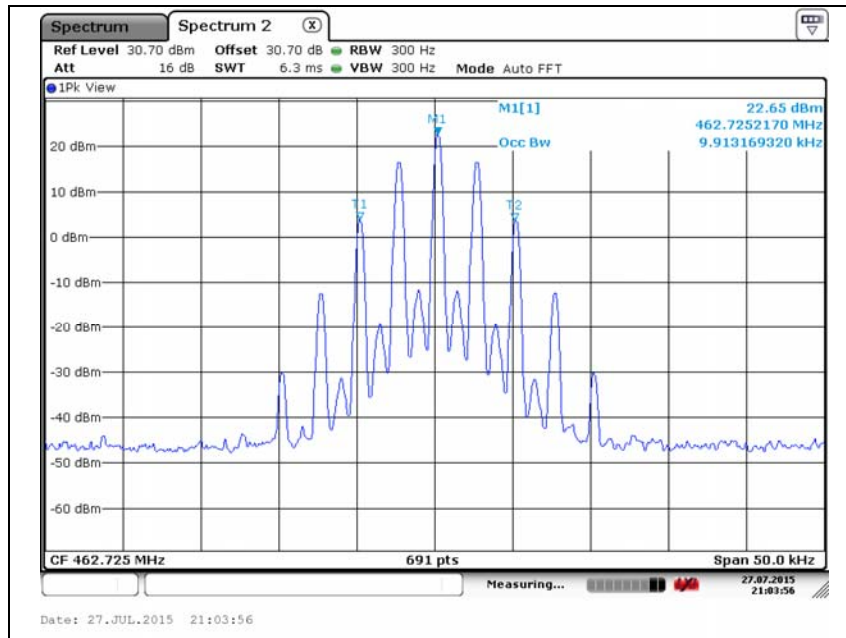
At least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50 % up to and including 100 % of the authorized bandwidth.

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.

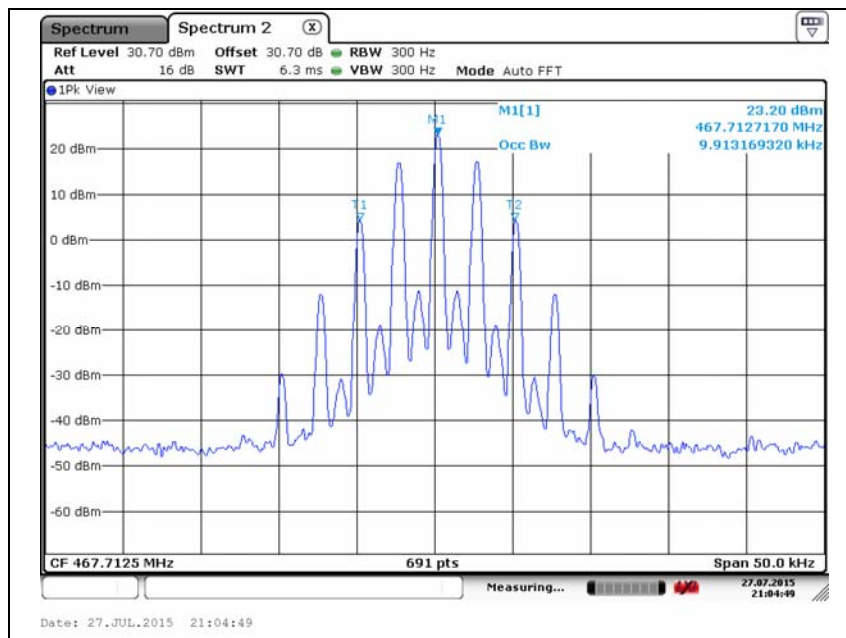
At least  $43 + 10 \log_{10}(T)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250 %.

## Test results

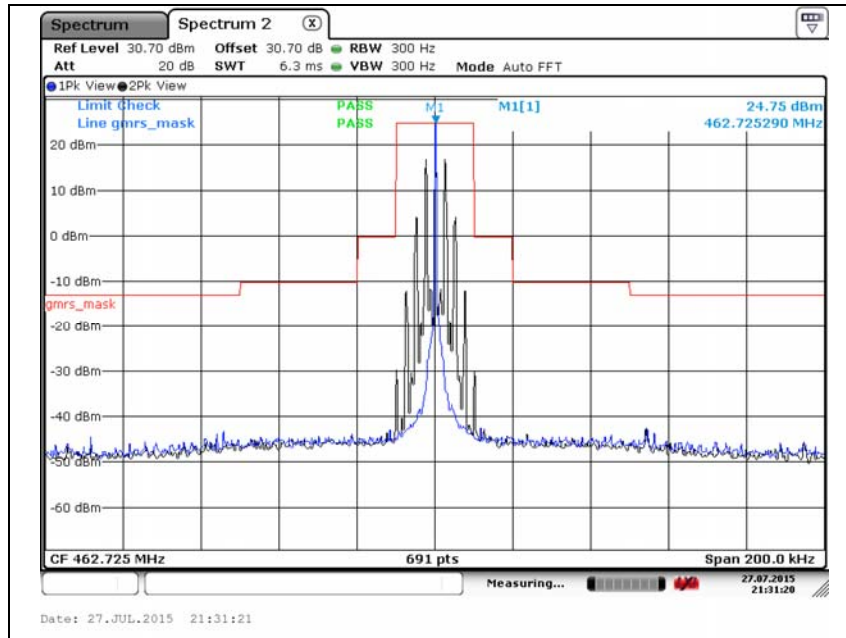
### 99 % bandwidth for GMRS



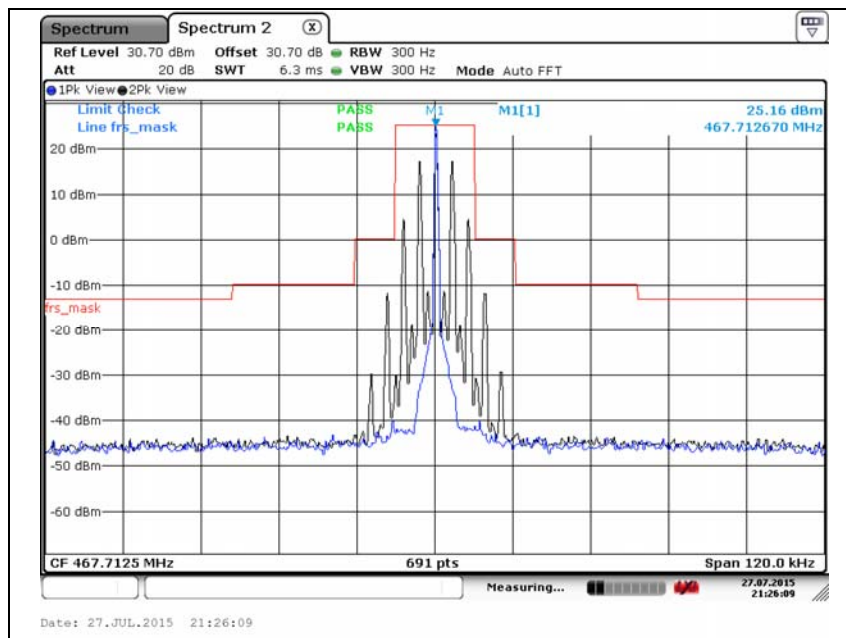
### 99 % bandwidth for FRS



### Emission mask for GMRS

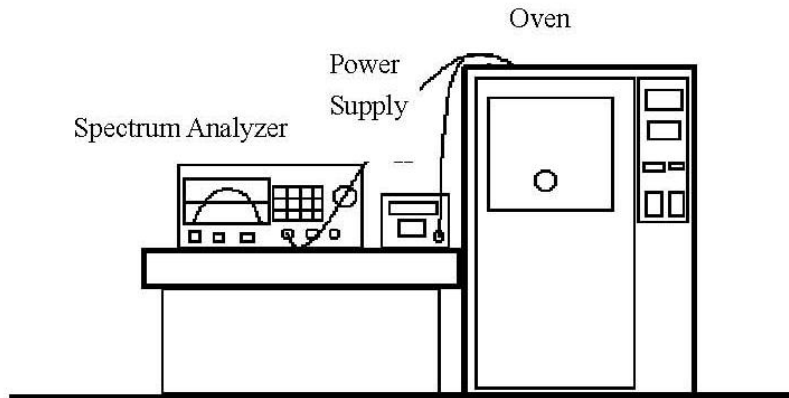


### Emission mask for FRS



### 3.6. Frequency stability

#### Test setup



#### Test procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The transmission time was measured with the spectrum analyzer using RBW=1 kHz, VBW=1 kHz.
3. Set the temperature of chamber to -30 °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 highest temperature 50 °C is measured, record all measured frequencies on each temperature step.

#### Frequency stability vs voltage;

1. Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment
2. For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

The output frequency was recorded for each voltage.

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**Limit**

**§95.621**

(b) Each GMRS transmitter for mobile station, small base station and control station operation must be maintained within a frequency tolerance of 0.000 5%. Each GMRS transmitter for base station (except small base), mobile relay station or fixed station operation must be maintained within a frequency tolerance of 0.000 25%.

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

## Test results

Assigned frequency (MHz): 462.725 0

| Temperature (°C) | Measure frequency (MHz) | Frequency deviation (Hz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------------------|--------------------------|---------------------------|-------------------------|
| -30              | 462.725442              | 442                      | 0.955                     | 0.000096                |
| -20              | 462.725406              | 406                      | 0.877                     | 0.000088                |
| -10              | 462.725285              | 285                      | 0.616                     | 0.000062                |
| 0                | 462.725125              | 125                      | 0.270                     | 0.000027                |
| 10               | 462.725089              | 89                       | 0.192                     | 0.000019                |
| 20               | 462.725062              | 62                       | 0.134                     | 0.000013                |
| 30               | 462.725008              | 8                        | 0.017                     | 0.000002                |
| 40               | 462.724962              | -38                      | -0.082                    | -0.000008               |
| 50               | 462.724802              | -198                     | -0.428                    | -0.000043               |

| Temperature (°C) | Voltage (V) | Measure frequency (MHz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------|-------------------------|---------------------------|-------------------------|
| 25               | 3.06        | 462.725075              | 0.162                     | 0.000016                |
| 25               | 4.14        | 462.725070              | 0.151                     | 0.000015                |

Assigned frequency (MHz): 467.712 5

| Temperature (°C) | Measure frequency (MHz) | Frequency deviation (Hz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------------------|--------------------------|---------------------------|-------------------------|
| -30              | 467.712993              | 493                      | 1.054                     | 0.000105                |
| -20              | 467.712889              | 389                      | 0.832                     | 0.000083                |
| -10              | 467.712813              | 313                      | 0.669                     | 0.000067                |
| 0                | 467.712702              | 202                      | 0.432                     | 0.000043                |
| 10               | 467.712618              | 118                      | 0.252                     | 0.000025                |
| 20               | 467.712575              | 75                       | 0.160                     | 0.000016                |
| 30               | 467.712535              | 35                       | 0.075                     | 0.000008                |
| 40               | 467.712470              | -30                      | -0.064                    | -0.000006               |
| 50               | 467.712332              | -168                     | -0.359                    | -0.000036               |

| Temperature (°C) | Voltage (V) | Measure frequency (MHz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------|-------------------------|---------------------------|-------------------------|
| 25               | 3.06        | 467.712568              | 0.145                     | 0.000015                |
| 25               | 4.14        | 467.712560              | 0.128                     | 0.000013                |

## Appendix A. Measurement equipment

| Equipment                           | Manufacturer  | Model                          | Serial No. | Calibration interval | Calibration due. |
|-------------------------------------|---------------|--------------------------------|------------|----------------------|------------------|
| Spectrum analyzer                   | R&S           | FSV30                          | 100736     | 1 year               | 2016.07.25       |
| Wideband Power Sensor               | R&S           | NRP-Z81                        | 101886     | 1 year               | 2016.04.10       |
| 8360B Series Swept Signal Generator | HP            | 83630B                         | 3844A00786 | 1 year               | 2016.01.23       |
| Trilog-broadband antenna            | Schwarzbeck   | VULB 9168                      | 9168-461   | 2 years              | 2017.04.03       |
| Dipole antenna                      | R&S           | VHAP                           | 574        | 2 years              | 2017.05.15       |
| Dipole antenna                      | R&S           | VHA 9103                       | 91032557   | 2 years              | 2016.07.10       |
| Dipole antenna                      | R&S           | UHA 9105                       | 91052417   | 2 years              | 2016.07.10       |
| Dipole antenna                      | R&S           | UHAP                           | 546        | 2 years              | 2017.05.15       |
| Horn antenna                        | A.H.          | SAS-571                        | 414        | 2 years              | 2017.02.09       |
| Horn antenna                        | A.H.          | SAS-571                        | 781        | 2 years              | 2017.05.07       |
| Preamplifier                        | HP            | 8447F                          | 2805A02570 | 1 year               | 2016.01.23       |
| Broadband preamplifier              | Schwarzbeck   | BBV9718                        | 9718-246   | 1 years              | 2015.10.23       |
| Attenuator                          | HP            | 8494B                          | 2630A12857 | 1 year               | 2016.01.22       |
| Attenuator                          | HP            | 30dB<br>ATTENUATOR<br>ASSEMBLY | 3318A05137 | 1 year               | 2016.01.22       |
| EMI Test Receiver                   | LIG NEX1      | ISA-80                         | L0912K014  | 1 year               | 2015.11.14       |
| High pass filter                    | Mini-circuits | NHP-800+                       | 15542      | 1 year               | 2016.07.24       |
| High pass filter                    | Weinschel     | WHKX1.2/15G-6TT                | 1          | 1 year               | 2016.07.24       |
| Modulation analyzer                 | HP            | 8901B                          | 3538A05593 | 1 year               | 2016.07.24       |
| Audio analyzer                      | HP            | 8903B                          | 3011A11219 | 1 year               | 2016.07.23       |
| DC power supply                     | HP            | 6632B                          | US36351824 | 1 year               | 2016.01.22       |
| Temperature chamber                 | TABAI         | MC711P                         | 112000492  | 1 year               | 2016.01.23       |

## Peripheral devices

| Device | Manufacturer | Model No. | Serial No. |
|--------|--------------|-----------|------------|
| N/A    |              |           |            |