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Test report No.:
KES-RF-15T0023
Page (1) of (33)

TEST REPORT

Part 95(A/B) & IC RSS-210(Issue 8)

Equipment under test GMRS / FRS 2-way Radio

Model name LXT535P

FCC ID MMALXT535P

IC Certification 3690A-LXT535P

Applicant Midland Radio Corporation

Manufacturer Global Link Corporation Ltd.

Date of test(s) 2015.02.05~2015.02.11

Date of issue 2015.03.16

Issued to

Midland Radio Corporation

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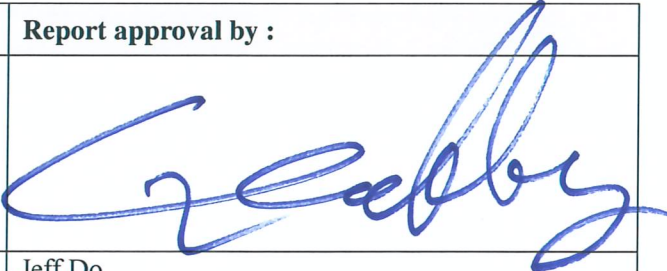
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Revision history

| Revision | Date of issue | Test report No. | Description |
|----------|---------------|-----------------|-------------|
| - | 2015.03.16 | KES-RF-15T0023 | 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, 431-716, Korea
473-29, Gayeo-ro, Yeosu-si, Gyeonggi-do, Korea
FCC rule part(s): FCC Part 95
IC rule part(s): RSS-210
Model: LXT535P
FCC ID: MMALXT535P
IC Certification: 3690A-LXT535P
Test device serial No.: ☐ Production ☒ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test FRS / GMRS
Serial number S1501000001
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: 0.484 W(High power), 0.269 W(Low power) // FRS: 0.190 W
Number of channels 22
Power source Rechargeable Ni-MH battery pack (DC 4.8 V)

1.2. Test configuration

The GMRS / FRS 2-way Radio FCC ID: MMALXT535P was tested per the guidance of ANSI C63.10-2013, ANSI/TIA 603C: 2004 and RSS-210 (Issue 8) 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. Device modifications

N/A

1.6. 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) | High / Low | Conducted output power | |
|------|-------------|------------------|-------------|------------------------|--------------|
| | | | | dBm | W |
| GMRS | 1 | 462.562 5 | High | 28.88 | 0.773 |
| | | | Low | 25.28 | 0.337 |
| | 2 | 462.587 5 | High | 28.87 | 0.771 |
| | | | Low | 25.27 | 0.337 |
| | 3 | 462.612 5 | High | 28.89 | 0.774 |
| | | | Low | 25.32 | 0.340 |
| | 4 | 462.637 5 | High | 28.86 | 0.769 |
| | | | Low | 25.29 | 0.338 |
| | 5 | 462.662 5 | High | 28.85 | 0.767 |
| | | | Low | 25.27 | 0.337 |
| | 6 | 462.687 5 | High | 28.86 | 0.769 |
| | | | Low | 25.28 | 0.337 |
| | 7 | 462.712 5 | High | 28.87 | 0.771 |
| | | | Low | 25.28 | 0.337 |
| FRS | 8 | 467.562 5 | N/A | 25.24 | 0.334 |
| | 9 | 467.587 5 | | 25.21 | 0.332 |
| | 10 | 467.612 5 | | 25.22 | 0.333 |
| | 11 | 467.637 5 | | 25.20 | 0.331 |
| | 12 | 467.662 5 | | 25.21 | 0.332 |
| | 13 | 467.687 5 | | 25.22 | 0.333 |
| | 14 | 467.712 5 | | 25.19 | 0.330 |

| Mode | Channel No. | Frequency(MHz) | High / Low | Conducted output power | |
|------|-------------|----------------|------------|------------------------|-------|
| | | | | dBm | W |
| GMRS | 15 | 462.550 0 | High | 28.87 | 0.771 |
| | | | Low | 25.29 | 0.338 |
| | 16 | 462.575 0 | High | 28.85 | 0.767 |
| | | | Low | 25.28 | 0.337 |
| | 17 | 462.600 0 | High | 28.86 | 0.769 |
| | | | Low | 25.29 | 0.338 |
| | 18 | 462.625 0 | High | 28.84 | 0.766 |
| | | | Low | 25.30 | 0.339 |
| | 19 | 462.650 0 | High | 28.87 | 0.771 |
| | | | Low | 25.30 | 0.339 |
| | 20 | 462.675 0 | High | 28.84 | 0.766 |
| | | | Low | 25.30 | 0.339 |
| | 21 | 462.700 0 | High | 28.87 | 0.771 |
| | | | Low | 25.31 | 0.340 |
| | 22 | 462.725 0 | High | 28.85 | 0.767 |
| | | | Low | 25.31 | 0.340 |

Therefore all applicable requirements were tested to the two channels, the 3th for GMRS and the 8th for FRS.

DC input into the final amplifier

| Mode | Voltage(V) | Current(A) | Power(W) |
|------------------|------------|------------|----------|
| GMRS(High power) | 4.8 | 0.34 | 1.63 |
| GMRS(Low power) | 4.8 | 0.29 | 1.39 |
| FRS | 4.8 | 0.28 | 1.34 |

2. Summary of tests

| Reference | Test description | Test results |
|---|--------------------------------------|--------------|
| 95.639 RSS-210 A6.1.4 RSS-210 A6.2.4 | RF output power | PASS |
| 95.635 RSS-210 A6.1.5 RSS-210 A6.2.5 | Radiated spurious emissions | PASS |
| 95.637 RSS-210 A6.1.2 RSS-210 A6.2.2 | Modulation limiting | PASS |
| 2.1047 | Audio frequency response | PASS |
| 95.637 RSS-210 A6.2.2 | Low-pass filter response | PASS |
| 2.1049, 95.633, 95.635 RSS-210 A6.1.3 RSS-210 A6.2.3 RSS-210 A6.1.5 RSS-210 A6.2.5 | Occupied bandwidth and emission mask | PASS |
| 2.1055, 95.621, 95.627 RSS-210 A6.1.6 RSS-210 A6.2.6 | Frequency stability | PASS |

Note:

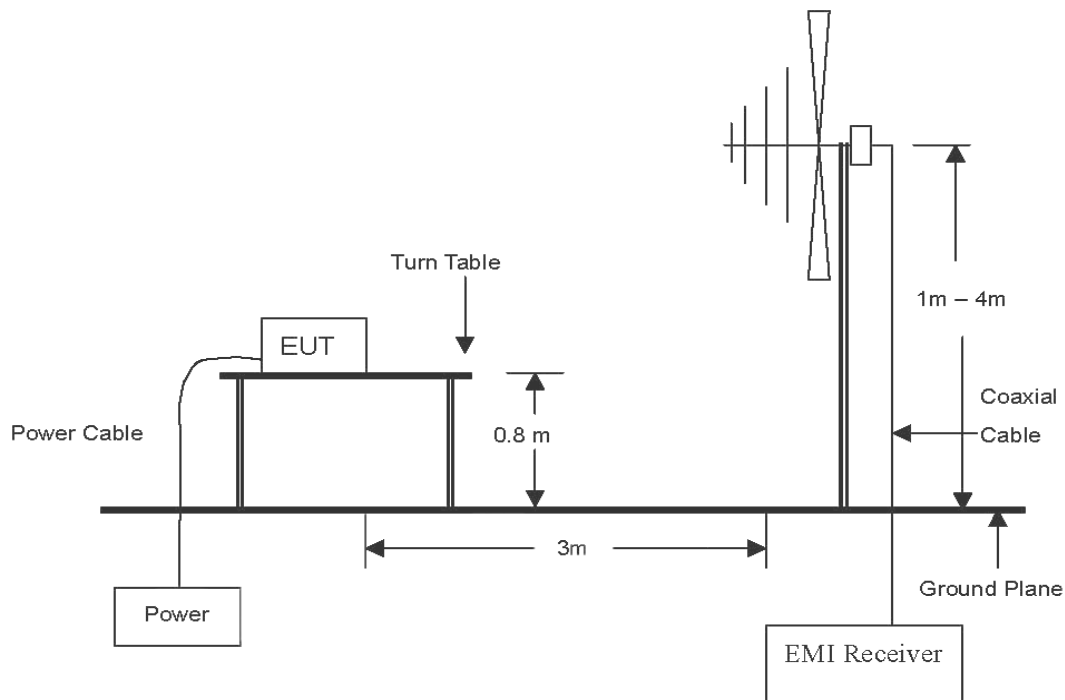
- The measurement procedures described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2009, ANSI/TIA 603C: 2004), RSS-210 (Issue 8) were used in the measurement of the DUT.
- All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.

3. Test results

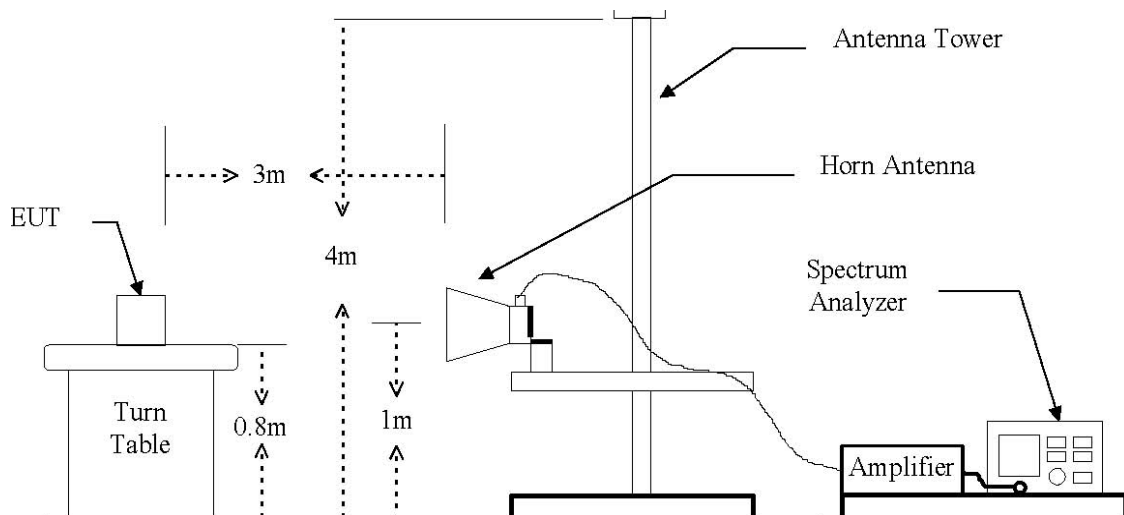
3.1. RF output power and radiated spurious emission

Test setup

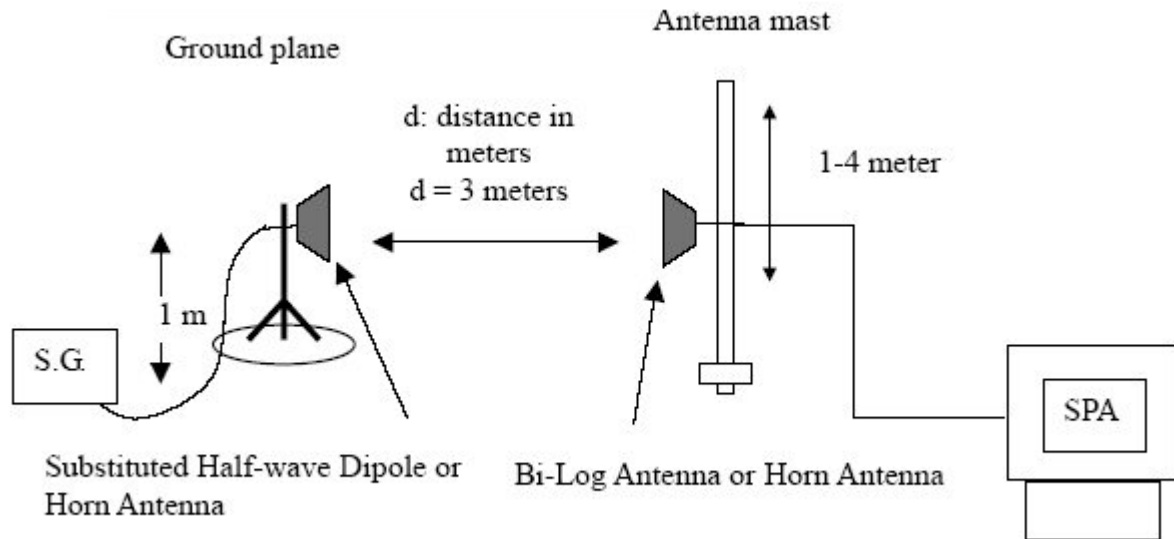
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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



Test procedure: Based on ANSI/TIA 603C: 2004

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.

RSS-210 A6.1.4

The maximum permissible transmitter output power under any operating conditions is 0.5 W effective radiated power (e.r.p.). The radio shall be equipped with an integral antenna.

RSS-210 A6.2.4

A GMRS transmitter may transmit with a maximum power of 2 W e.r.p.

Radiated spurious emissions

§95.635 & RSS-201 A6.1.5, A6.2.5

(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: GMRS (High power)
Distance of measurement: 3 meter
Operating frequency: 462.562 5 MHz
Channel: 03

| Frequency (MHz) | Ant. Pol. (H/V) | E.R.P. | |
|--------------------|--------------------|--------|-------|
| | | (dBm) | (W) |
| 462.6125 | H | 24.53 | 0.284 |
| 462.5625 | V | 26.85 | 0.484 |

Mode: GMRS (Low power)
Distance of measurement: 3 meter
Operating frequency: 462.562 5 MHz
Channel: 03

| Frequency (MHz) | Ant. Pol. (H/V) | E.R.P. | |
|--------------------|--------------------|--------|-------|
| | | (dBm) | (W) |
| 462.6125 | H | 22.08 | 0.161 |
| 462.6125 | V | 24.29 | 0.269 |

Mode: FRS
Distance of measurement: 3 meter
Operating frequency: 467.562 5 MHz
Channel: 08

| Frequency (MHz) | Ant. Pol. (H/V) | E.R.P. | |
|--------------------|--------------------|--------|-------|
| | | (dBm) | (W) |
| 467.5625 | H | 20.12 | 0.103 |
| 467.5625 | V | 22.79 | 0.190 |

Radiated spurious emissions

Mode: GMRS (High power)
Distance of measurement: 3 meter
Operating frequency: 462.612 5 MHz
Channel: 03

| Frequency (MHz) | Ant. Pol. (H/V) | Spurious attenuation (dBc) | Limit (dBc) | Margin (dB) |
|--------------------|--------------------|-------------------------------|----------------|----------------|
| 925.225 | H | 60.23 | 39.85 | 20.38 |
| 925.225 | V | 61.89 | 39.85 | 22.04 |
| 1387.838 | H | 54.26 | 39.85 | 14.41 |
| 1387.838 | V | 51.59 | 39.85 | 11.74 |
| 1850.450 | H | 62.14 | 39.85 | 22.29 |
| 1850.450 | V | 57.32 | 39.85 | 17.47 |
| 2313.063 | H | 67.48 | 39.85 | 27.63 |
| 2313.063 | V | 65.74 | 39.85 | 25.89 |
| 2775.675 | H | 66.43 | 39.85 | 26.58 |
| 2775.675 | V | 65.92 | 39.85 | 26.07 |
| 3238.288 | H | 62.03 | 39.85 | 22.18 |
| 3238.288 | V | 57.90 | 39.85 | 18.05 |
| 3700.900 | H | 62.57 | 39.85 | 22.72 |
| 3700.900 | V | 62.15 | 39.85 | 22.30 |
| 4163.513 | H | 67.43 | 39.85 | 27.58 |
| 4163.513 | V | 66.47 | 39.85 | 26.62 |

Remark;

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

Mode: GMRS (Low power)
Distance of measurement: 3 meter
Operating frequency: 462.612 5 MHz
Channel: 03

| Frequency (MHz) | Ant. Pol. (H/V) | Spurious attenuation (dBc) | Limit (dBc) | Margin (dB) |
|--------------------|--------------------|-------------------------------|----------------|----------------|
| 925.225 | H | 61.83 | 37.29 | 24.54 |
| 925.225 | V | 63.89 | 37.29 | 26.60 |
| 1387.838 | H | 59.43 | 37.29 | 22.14 |
| 1387.838 | V | 62.18 | 37.29 | 24.89 |
| 1850.450 | H | 66.38 | 37.29 | 29.09 |
| 1850.450 | V | 66.37 | 37.29 | 29.08 |
| 2313.063 | H | 69.83 | 37.29 | 32.54 |
| 2313.063 | V | 64.63 | 37.29 | 27.34 |
| 2775.675 | H | 73.65 | 37.29 | 36.36 |
| 2775.675 | V | 67.75 | 37.29 | 30.46 |
| 3238.288 | H | 73.82 | 37.29 | 36.53 |
| 3238.288 | V | 74.59 | 37.29 | 37.30 |
| 3700.900 | H | 68.01 | 37.29 | 30.72 |
| 3700.900 | V | 64.22 | 37.29 | 26.93 |
| 4163.513 | H | 74.55 | 37.29 | 37.26 |
| 4163.513 | V | 73.45 | 37.29 | 36.16 |

Remark;

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

Mode: FRS
Distance of measurement: 3 meter
Operating frequency: 467.562 5 MHz
Channel: 08

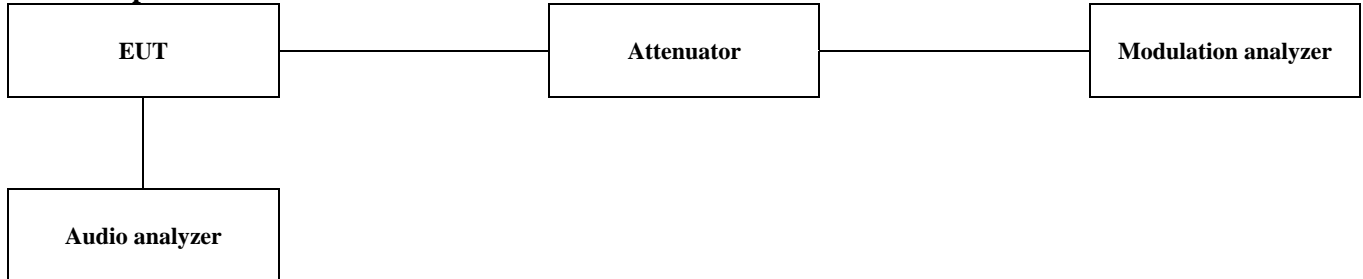
| Frequency (MHz) | Ant. Pol. (H/V) | Spurious attenuation (dBc) | Limit (dBc) | Margin (dB) |
|--------------------|--------------------|-------------------------------|----------------|----------------|
| 935.125 | H | 63.30 | 35.79 | 27.51 |
| 935.125 | V | 62.94 | 35.79 | 27.15 |
| 1402.688 | H | 61.04 | 35.79 | 25.25 |
| 1402.688 | V | 60.28 | 35.79 | 24.49 |
| 1870.250 | H | 63.96 | 35.79 | 28.17 |
| 1870.250 | V | 62.52 | 35.79 | 26.73 |
| 2337.813 | H | 69.80 | 35.79 | 34.01 |
| 2337.813 | V | 63.60 | 35.79 | 27.81 |
| 2805.375 | H | 70.51 | 35.79 | 34.72 |
| 2805.375 | V | 68.21 | 35.79 | 32.42 |
| 3272.938 | H | 62.57 | 35.79 | 26.78 |
| 3272.938 | V | 59.76 | 35.79 | 23.97 |
| 3740.500 | H | 62.97 | 35.79 | 27.18 |
| 3740.500 | V | 63.10 | 35.79 | 27.31 |
| 4208.063 | H | 69.19 | 35.79 | 33.40 |
| 4208.063 | V | 70.50 | 35.79 | 34.71 |

Remark;

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

3.2. Modulation limiting

Test setup



Test procedure

TIA/EIA-603-C

Limit

§95.639

(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.

RSS-210 A6.1.2

(c) The peak frequency deviation shall not exceed ± 2.5 kHz. The limiter shall be followed by a low-pass filter to remove unwanted harmonics.

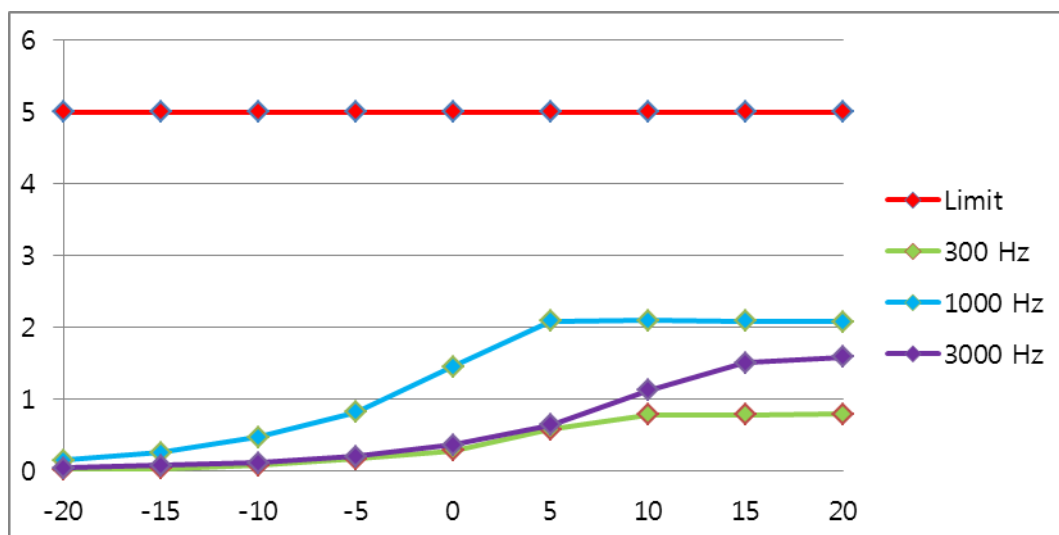
RSS-210 A6.2.2

(b) For emission types F1D, G1D, G3E, F3E or F2D, the peak frequency deviation shall not exceed ± 5 kHz. GMRS transmitters must include an audio frequency low-pass filter, unless they comply with the appropriate emission masks in Section A6.2.5 below. The filter must be between the modulation limiter and the modulated stage of the transmitter. The filter attenuation must be as follows: for $3 \text{ kHz} \leq f \leq 20 \text{ kHz}$, the attenuation is at least $60 \log_{10}(f, \text{ kHz}/3)$ dB greater than the attenuation at 1 kHz; and for $f > 20 \text{ kHz}$, the attenuation is at least 50 dB greater than the attenuation at 1 kHz.

Test results

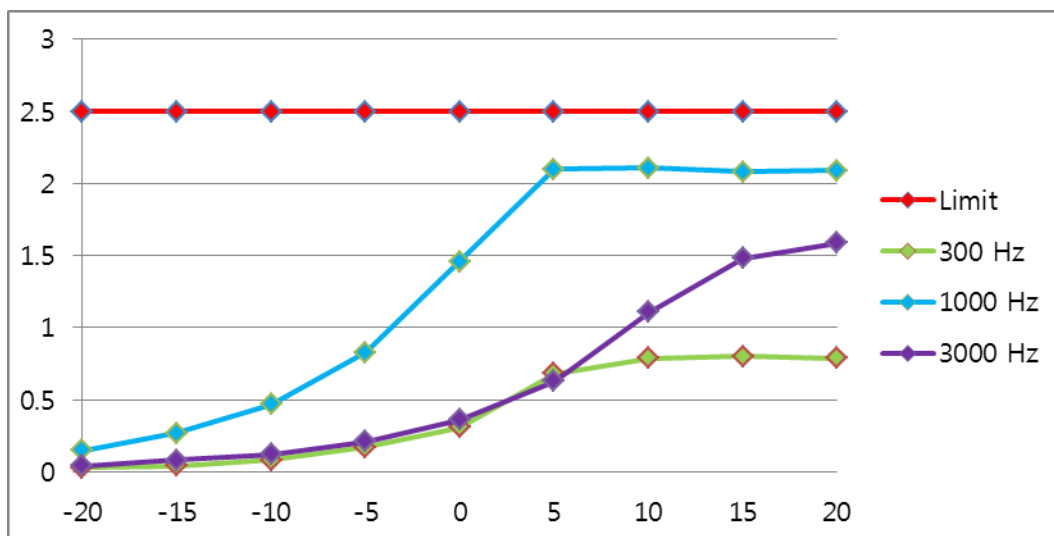
GMRS

| Audio level (dB) | Deviation at 300 Hz | Deviation at 1 kHz | Deviation at 3 kHz | Limit (kHz) |
|------------------|---------------------|--------------------|--------------------|-------------|
| -20 | 0.03 | 0.15 | 0.05 | 5 |
| -15 | 0.04 | 0.26 | 0.08 | 5 |
| -10 | 0.08 | 0.47 | 0.12 | 5 |
| -5 | 0.17 | 0.82 | 0.21 | 5 |
| 0 | 0.29 | 1.46 | 0.37 | 5 |
| 5 | 0.58 | 2.09 | 0.64 | 5 |
| 10 | 0.79 | 2.10 | 1.13 | 5 |
| 15 | 0.79 | 2.09 | 1.51 | 5 |
| 20 | 0.80 | 2.08 | 1.59 | 5 |



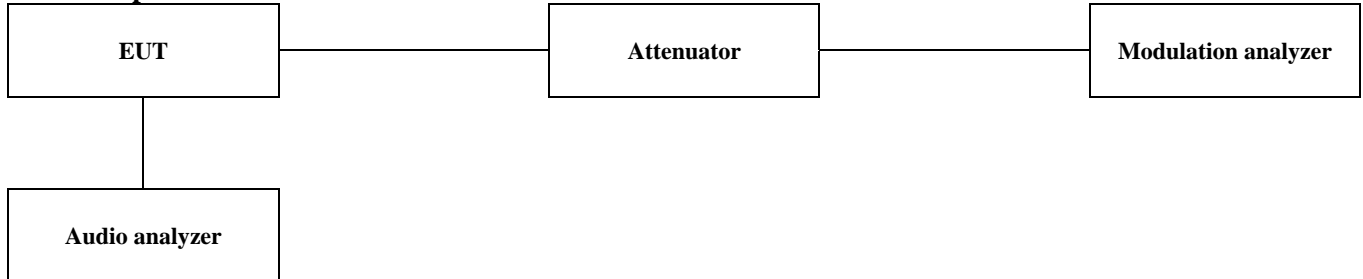
FRS

| Audio level (dB) | Deviation at 300 Hz | Deviation at 1 kHz | Deviation at 3 kHz | Limit (kHz) |
|------------------|---------------------|--------------------|--------------------|-------------|
| -20 | 0.03 | 0.15 | 0.04 | 2.5 |
| -15 | 0.04 | 0.27 | 0.08 | 2.5 |
| -10 | 0.08 | 0.47 | 0.12 | 2.5 |
| -5 | 0.17 | 0.83 | 0.21 | 2.5 |
| 0 | 0.31 | 1.46 | 0.36 | 2.5 |
| 5 | 0.68 | 2.10 | 0.63 | 2.5 |
| 10 | 0.79 | 2.11 | 1.11 | 2.5 |
| 15 | 0.80 | 2.08 | 1.48 | 2.5 |
| 20 | 0.79 | 2.09 | 1.59 | 2.5 |



3.3. Audio frequency response

Test setup



Test procedure

TIA/EIA-603-C

Limit

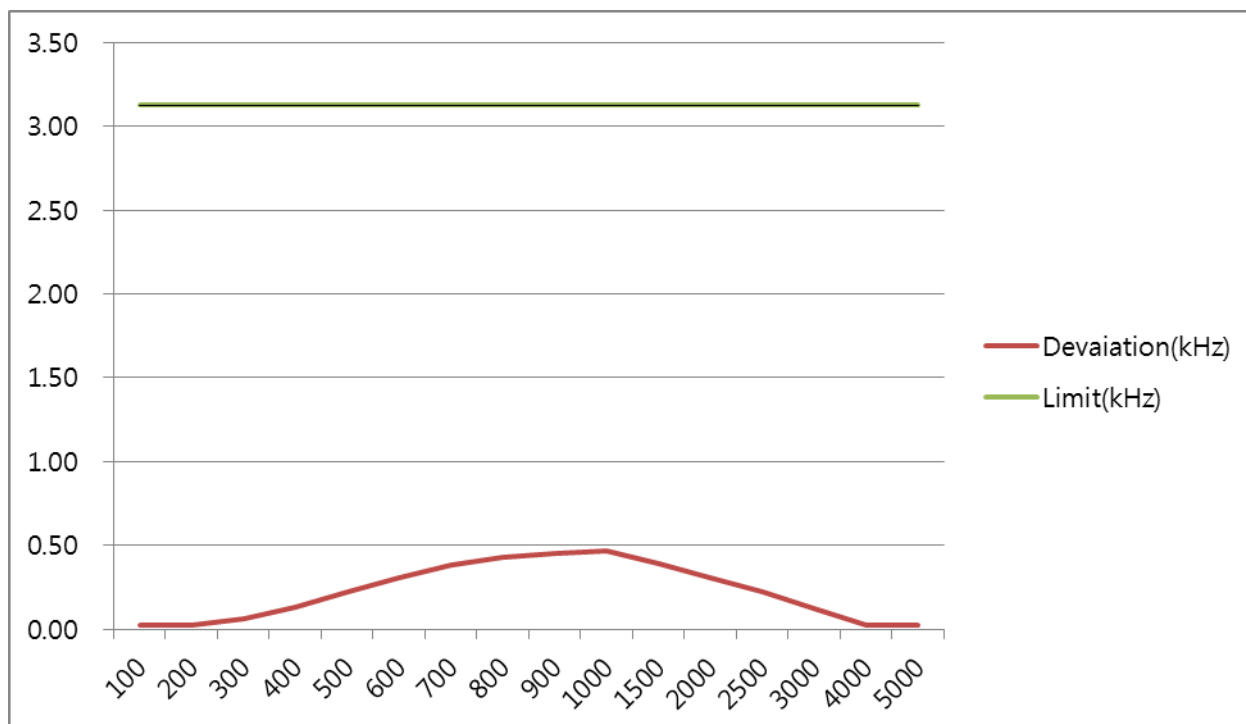
§2.1047

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

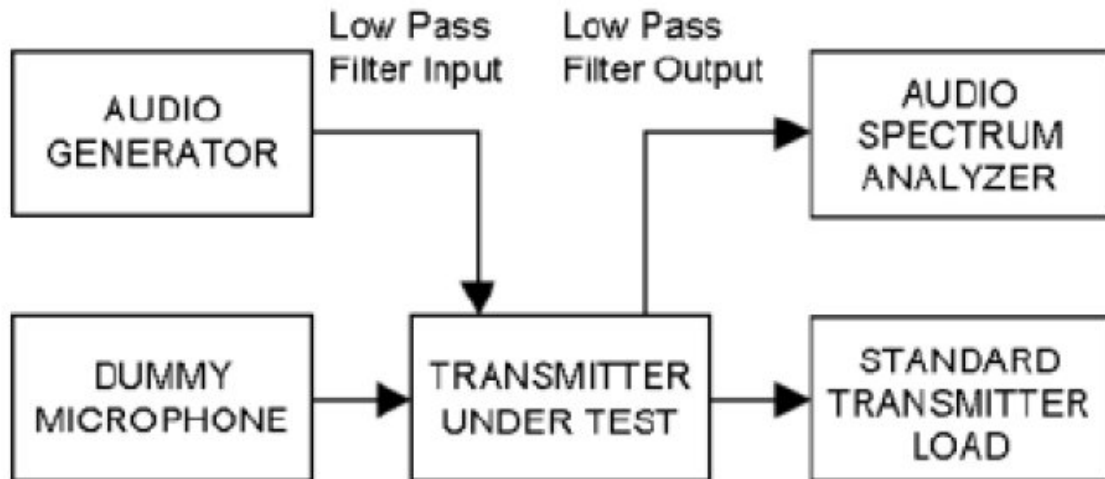
| Audio frequency(Hz) | Deviation(kHz) | Limit(kHz) |
|---------------------|----------------|------------|
| 100 | 0.02 | 3.125 |
| 200 | 0.02 | 3.125 |
| 300 | 0.06 | 3.125 |
| 400 | 0.13 | 3.125 |
| 500 | 0.22 | 3.125 |
| 600 | 0.31 | 3.125 |
| 700 | 0.38 | 3.125 |
| 800 | 0.43 | 3.125 |
| 900 | 0.45 | 3.125 |
| 1000 | 0.47 | 3.125 |
| 1500 | 0.39 | 3.125 |
| 2000 | 0.31 | 3.125 |
| 2500 | 0.22 | 3.125 |
| 3000 | 0.12 | 3.125 |
| 4000 | 0.02 | 3.125 |
| 5000 | 0.02 | 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-C

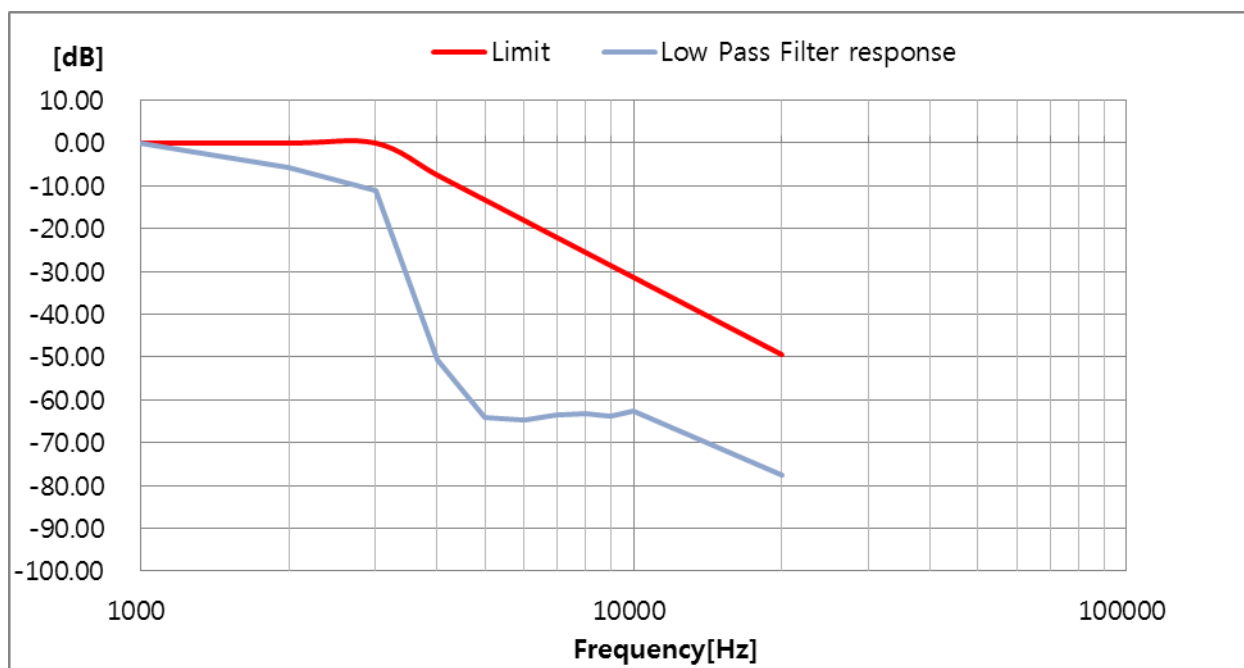
Limit

§95.637 & RSS-210 A6.2.2

(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.

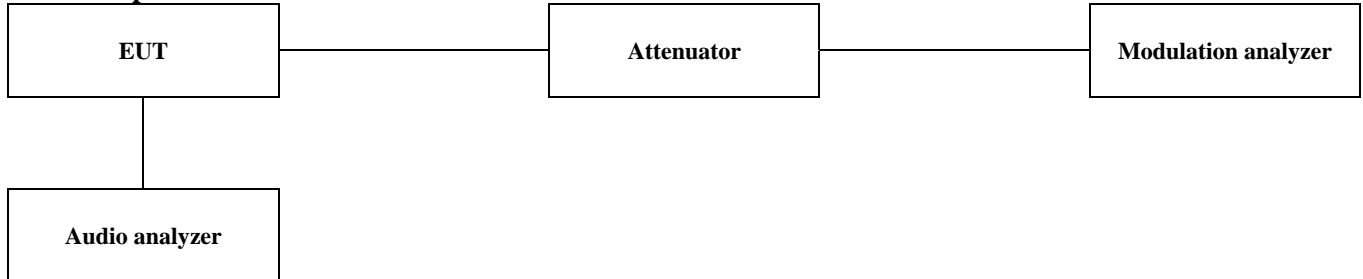
Test results

| Audio frequency(Hz) | Response(dB) | Limit(dB) |
|---------------------|--------------|-----------|
| 1000 | 0.00 | 0.00 |
| 2000 | -5.85 | 0.00 |
| 3000 | -11.07 | 0.00 |
| 4000 | -50.58 | -7.50 |
| 5000 | -64.16 | -13.31 |
| 6000 | -64.74 | -18.06 |
| 7000 | -63.55 | -22.08 |
| 8000 | -63.29 | -25.56 |
| 9000 | -63.87 | -28.63 |
| 10000 | -62.73 | -31.37 |
| 20000 | -77.56 | -49.43 |



3.5. Occupied bandwidth and emission mask

Test setup



Test procedure

TIA/EIA-603-C 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 & RSS-210 A6.1.3, A6.2.3

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 & RSS-210 A6.1.5, A6.2.5

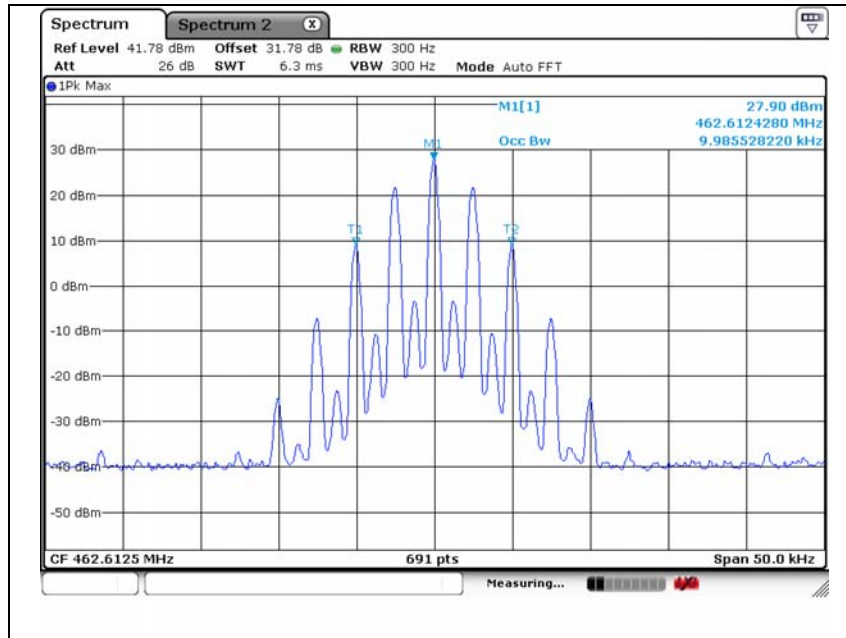
At least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50 % up to and including 100 % of the authorized bandwidth.

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.

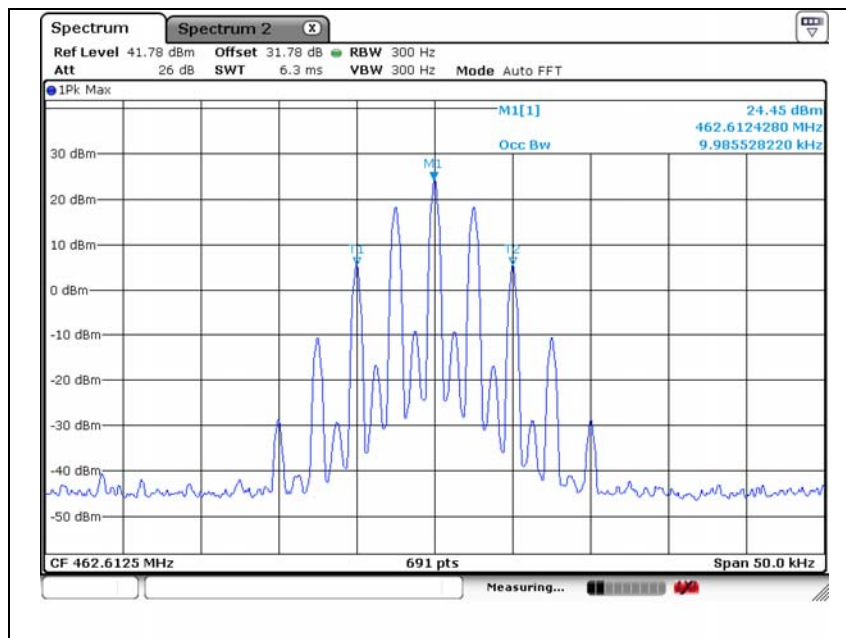
At least $43 + 10 \log_{10}(T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250 %.

Test results

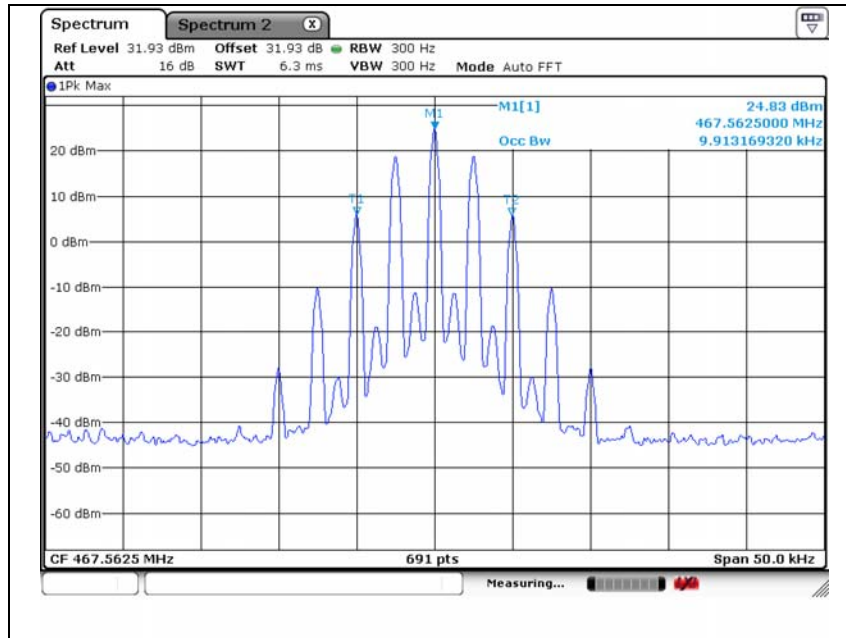
99 % bandwidth for GMRS (High power)



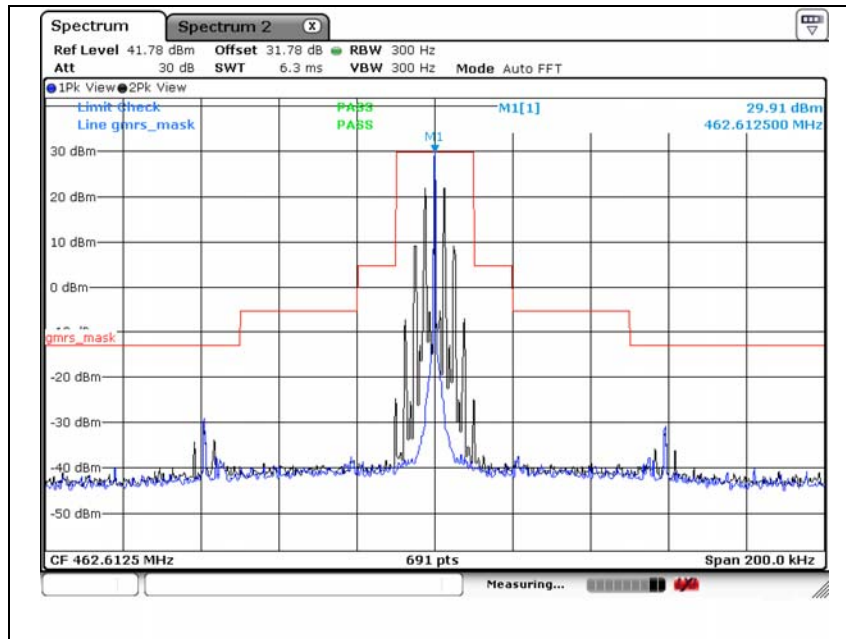
99 % bandwidth for GMRS (Low power)



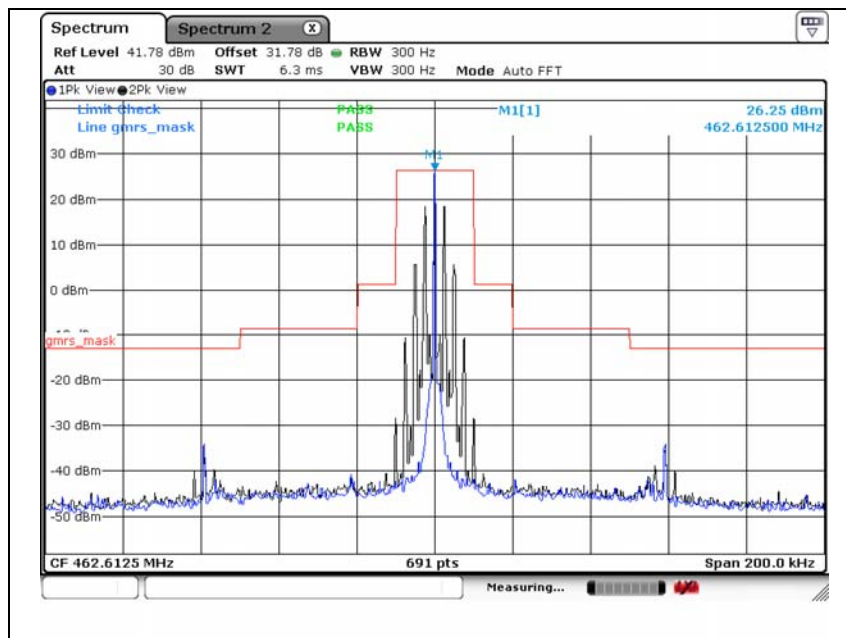
99 % bandwidth for FRS



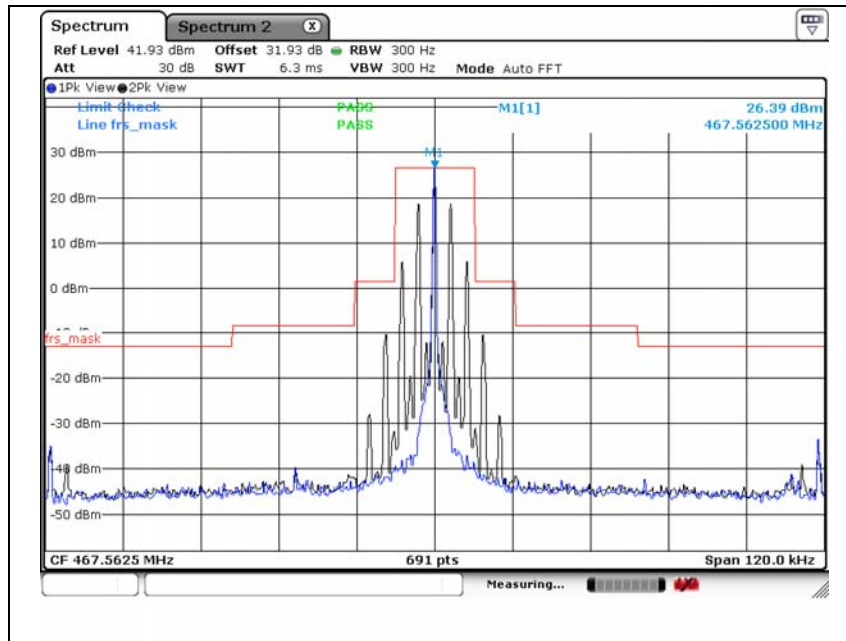
Emission mask for GMRS (High power)



Emission mask for GMRS (Low power)

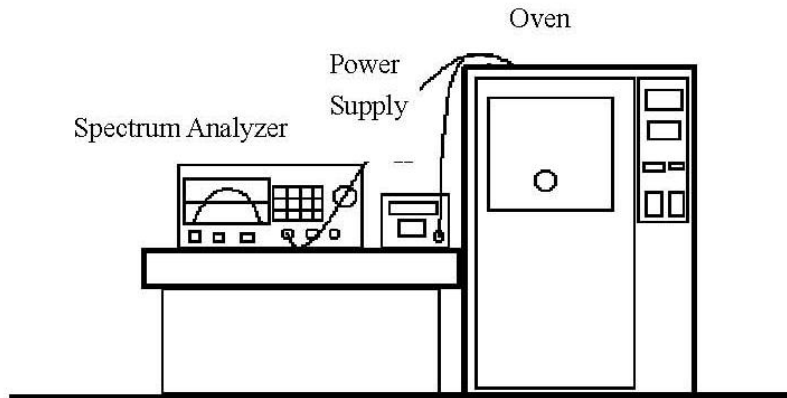


Emission mask for FRS



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.

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%.

§95.627

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

RSS-210 A6.1.6

FRS Devices: Carrier frequency tolerance shall be better than ± 5 ppm

RSS-210 A6.2.6

GMRS Devices: Carrier frequency tolerance shall be better than ± 5 ppm

Test results

Assigned frequency (MHz): 462.612 5

| Temperature (°C) | Measure frequency (MHz) | Frequency deviation (Hz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------------------|--------------------------|---------------------------|-------------------------|
| -30 | 462.612239 | -261 | -0.564 | -0.000056 |
| -20 | 462.612245 | -255 | -0.551 | -0.000055 |
| -10 | 462.612056 | -444 | -0.960 | -0.000096 |
| 0 | 462.612340 | -160 | -0.346 | -0.000035 |
| 10 | 462.612346 | -154 | -0.333 | -0.000033 |
| 20 | 462.612359 | -141 | -0.305 | -0.000031 |
| 30 | 462.612388 | -112 | -0.242 | -0.000024 |
| 40 | 462.612993 | 493 | 1.066 | 0.000107 |
| 50 | 462.613110 | 610 | 1.319 | 0.000132 |

| Temperature (°C) | Voltage (V) | Measure frequency (MHz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------|-------------------------|---------------------------|-------------------------|
| 25 | 4.32 | 462.612347 | -0.331 | -0.000033 |
| 25 | 5.28 | 462.612361 | -0.300 | -0.000030 |

Assigned frequency (MHz): 467.562 5

| Temperature (°C) | Measure frequency (MHz) | Frequency deviation (Hz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------------------|--------------------------|---------------------------|-------------------------|
| -30 | 467.562290 | -210 | -0.449 | -0.000045 |
| -20 | 467.562305 | -195 | -0.417 | -0.000042 |
| -10 | 467.562338 | -162 | -0.346 | -0.000035 |
| 0 | 467.562441 | -59 | -0.126 | -0.000013 |
| 10 | 467.562462 | -38 | -0.081 | -0.000008 |
| 20 | 467.562481 | -19 | -0.041 | -0.000004 |
| 30 | 467.562590 | 90 | 0.192 | 0.000019 |
| 40 | 467.562795 | 295 | 0.631 | 0.000063 |
| 50 | 467.562922 | 422 | 0.903 | 0.000090 |

| Temperature (°C) | Voltage (V) | Measure frequency (MHz) | Frequency deviation (ppm) | Frequency deviation (%) |
|------------------|-------------|-------------------------|---------------------------|-------------------------|
| 25 | 4.32 | 467.562473 | -0.058 | -0.000006 |
| 25 | 5.28 | 467.562468 | -0.068 | -0.000007 |

Appendix A. Measurement equipment

| Equipment | Manufacturer | Model | Serial No. | Calibration interval | Calibration due. |
|--------------------------------|-----------------------------|-----------------|--------------|----------------------|------------------|
| Spectrum analyzer | R&S | FSV30 | 101389 | 1 year | 2016.01.22 |
| Vector signal generator | R&S | SMBV2100A | 1407.6004K02 | 1 year | 2015.07.24 |
| Power Meter | Anritsu | ML2495A | 1438001 | 1 year | 2016.01.22 |
| Pulse Power Sensor | Anritsu | MA2411B | 1339205 | 1 year | 2016.01.26 |
| Trilog-broadband antenna | Schwarzbeck | VULB 9168 | 9168-385 | 2 years | 2015.05.09 |
| Dipole antenna | R&S | VHAP | 574 | 2 years | 2015.05.09 |
| Dipole antenna | R&S | VHAP | 575 | 2 years | 2015.05.09 |
| Dipole antenna | R&S | UHAP | 545 | 2 years | 2015.05.09 |
| Dipole antenna | R&S | UHAP | 546 | 2 years | 2015.05.09 |
| Horn antenna | A.H. | SAS-571 | 414 | 2 years | 2017.02.09 |
| Horn antenna | A.H. | SAS-571 | 781 | 2 years | 2015.05.13 |
| Preamplifier | HP | 8447F | 2805A02570 | 1 year | 2016.01.23 |
| Preamplifier | Schwarzbeck | BBV 9721 | 9721-003 | 1 year | 2015.09.04 |
| Broadband coaxial preamplifier | Schwarzbeck Mess-Elektronik | BB9718 | 9718-245 | 1 year | 2015.08.13 |
| Attenuator | HP | 8494B | 2630A12857 | 1 year | 2016.01.22 |
| Attenuator | BRID | 8325 | 4676 | 1 year | 2016.01.23 |
| EMI Test Receiver | LIG NEX1 | ISA-80 | L0912K014 | 1 year | 2015.11.14 |
| High pass filter | Mini-circuits | NHP-800+ | 15542 | 1 year | 2015.07.23 |
| High pass filter | Weinschel | WHKX1.2/15G-6TT | 1 | 1 year | 2015.07.23 |
| Modulation analyzer | HP | 8901B | 3438A05094 | 1 year | 2016.01.23 |
| Audio analyzer | HP | 8903B | 3413A14728 | 1 year | 2015.07.23 |
| DC power supply | HP | 6674A | US36370369 | 1 year | 2015.07.23 |
| Temperature chamber | TABAI | MC711P | 112000492 | 1 year | 2016.01.23 |

Peripheral devices

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

Appendix B. Test setup photo

Radiated field emissions

