# FCC PART 95

# MEASUREMENT AND TEST REPORT

For

## Quanzhou Wouxun Electronics Co., Ltd.

Jiangnan High Technology Industry Park, No.928 Nanhuan Road, Quanzhou, Fujian, China

## FCC ID: WVTWOUXUN16

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Two-way radios |

| | |
|---|---|
| **Report Number:** | RXM200107050-00A |
| **Report Date:** | 2020-03-10 |
| **Reviewed By:** | Jimmy Xiao<br>RF Engineer |
| **Test Laboratory:** | Bay Area Compliance Laboratories Corp. (Shenzhen)<br>6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China<br>Tel: +86-755-33320018<br>Fax: +86-755-33320008<br>www.baclcorp.com.cn |

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# GENERAL INFORMATION

## Product Description for Equipment Under Test (EUT)

| | |
|---|---|
| Product | Two-way radios |
| Tested Model | KG-805 |
| Multiple Model | KG-805G, KG-703E, KG-801E, KG-879, KG-869, KG-659E, KG-978, KG-939, KG-998, KG-918, KG-828, KG-988, KG-958, KG-959, KG-969, KG-968, KG-928, KG-UV8H, KG-UV9DPlus, KG-UV9P, KG-839, KG-979, KG-989, KG-999, KG-916, KG-926, KG-936, KG-956, KG-966, KG-976, KG-986, KG-996, KG-826, KG-836, KG-856, KG-866, KG-876, KG-886, KG-896, KG-838, KG-858, KG-868, KG-878, KG-888, KG-898 |
| Model Differences | Refer to the DOS letter |
| Frequency Range | 462.5500-462.7250MHz<br>467.5675-467.7125MHz |
| The Maximum ERP | 37.08dBm |
| Modulation Technique | FM |
| Antenna Specification | SMA External Antenna,2.15dBi |
| Voltage Range | DC 7.4V by battery or DC 12.0 V from Adapter by charger |
| Date of Test | 2020-02-23 to 2020-03-04 |
| Sample serial number | RXM200107050-RF-S1(Assigned by BACL, Shenzhen) |
| Received date | 2020/01/07 |
| Sample/EUT Status | Good condition |
| Adapter Inofornation | Model:DSX-120050L-US<br>Input :100-240V ,0.3A<br>Output:12V,0.5A |

## Objective

This report is prepared on behalf of *Quanzhou Wouxun Electronics Co., Ltd.* in accordance with Part 2 and Part 95, Subpart A & Subpart E of the Federal Communication Commissions rules.

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

No related submittal(s).

## Test Methodology

All tests and measurements indicated in this document were performed in accordance with Part 95 Subpart A, Subpart E of the Federal Communication Commissions rules with TIA-603-D, Land Mobile FM or PM-Communications Equipment-Measurement and Performance Standards.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

| Parameter | | Uncertainty |
|---|---|---|
| Occupied Channel Bandwidth | | ±5% |
| RF Output Power with Power meter | | ±0.73dB |
| RF conducted test with spectrum | | ±1.6dB |
| Emissions, Radiated | Below 1GHz | ±4.75dB |
| | Above 1GHz | ±4.88dB |
| Temperature | | ±1℃ |
| Humidity | | ±6% |
| Supply voltages | | ±0.4% |

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 342867, the FCC Designation No. : CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

## Description of Channel List

**462MHz main channels**

| Channel No. | Channel Frequency (MHz) | Channel No. | Channel Frequency (MHz) |
|---|---|---|---|
| 1 | 462.5500 | 2 | 462.5750 |
| 3 | 462.6000 | 4 | 462.6250 |
| 5 | 462.6500 | 6 | 462.6750 |
| 7 | 462.7000 | 8 | 462.7250 |

**462MHz interstitial channels**

| Channel No. | Channel Frequency (MHz) | Channel No. | Channel Frequency (MHz) |
|---|---|---|---|
| 1 | 462.5625 | 2 | 462.5875 |
| 3 | 462.6125 | 4 | 462.6375 |
| 5 | 462.6625 | 6 | 462.6875 |
| 7 | 462.7125 | 8 | / |

**467MHz interstitial channels**

| Channel No. | Channel Frequency (MHz) | Channel No. | Channel Frequency (MHz) |
|---|---|---|---|
| 1 | 467.5675 | 2 | 467.5875 |
| 3 | 467.6125 | 4 | 467.6375 |
| 5 | 467.6625 | 6 | 467.6875 |
| 7 | 467.7125 | 8 | / |

## Equipment Modifications

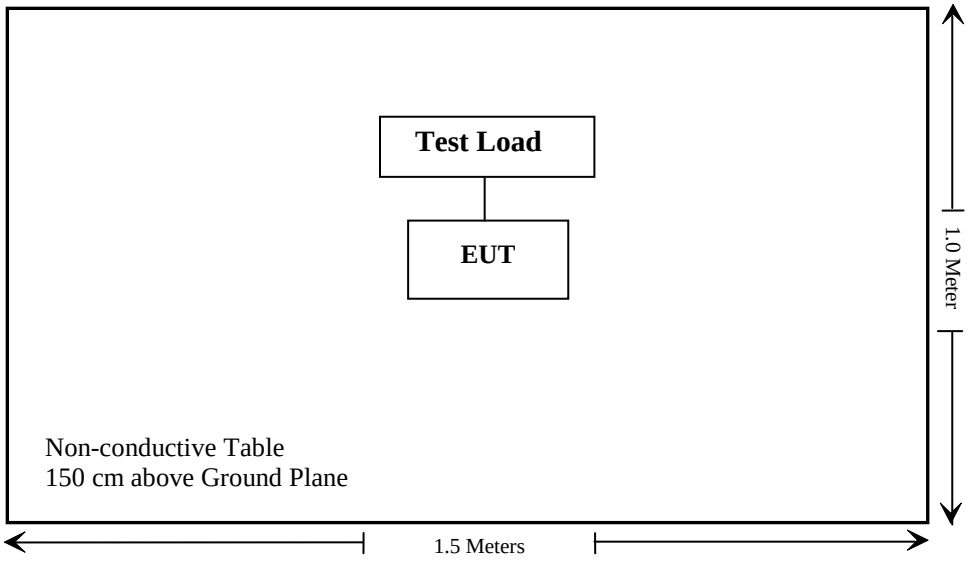
No modification was made to the EUT tested.

## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Unknown | Test Load | Unknown | Unknown |

## Block Diagram of Test Setup

Spurious emission test:



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Results |
|---|---|---|
| §2.1093 | RF Exposure | Compliance |
| §95.1787(a)(4) | Antenna Requirement | Not Applicable |
| §2.1046, §95.1767 | RF Output Power | Compliance |
| §2.1047, §95.1775 | Modulation Characteristic | Compliance |
| §2.1049, §95.1773, §95.1779 | Authorized Bandwidth & Emission Mask | Compliance |
| §2.1051, §95.1779 | Spurious Emission at Antenna Terminal | Compliance |
| §2.1053, §95.1779 | Spurious Radiated Emissions | Compliance |
| §2.1055(d), §95.1765 | Frequency Stability | Compliance |

Not Applicable: the EUT has no digital data transmissions function.

# TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| **Radiated Emission Test** | | | | | |
| Sunol Sciences | Horn Antenna | DRH-118 | A052604 | 2017/12/22 | 2020/12/21 |
| Rohde & Schwarz | Signal Analyzer | FSEM | 845987/005 | 2017/12/22 | 2020/12/21 |
| Sunol Sciences | Broadband Antenna | JB1 | A040904-1 | 2017/12/22 | 2020/12/21 |
| COM-POWER | Pre-amplifier | PA-122 | 181919 | 2019/11/29 | 2020/11/28 |
| Sonoma instrument | Pre-amplifier | 310 N | 186238 | 2019/4/20 | 2020/4/20 |
| Agilent | Signal Generator | N5183A | MY51040755 | 2019/12/3 | 2020/12/3 |
| COM POWER | Dipole Antenna | AD-100 | 41000 | NCR | NCR |
| A.H. System | Horn Antenna | SAS-200/571 | 135 | 2018/9/1 | 2021/8/31 |
| R&S | EMI Test Receiver | ESR3 | 102455 | 2019/7/9 | 2020/7/8 |
| UTiFLEX MICRO-C0AX | RF Cable | UFA147A-2362-100100 | MFR64639 231029-003 | 2019/11/12 | 2020/11/12 |
| Ducommun Technologies | RF Cable | 104PEA | 218124002 | 2019/11/12 | 2020/11/12 |
| Ducommun technologies | RF Cable | RG-214 | 1 | 2019/11/12 | 2020/11/12 |
| Ducommun technologies | RF Cable | RG-214 | 2 | 2019/11/12 | 2020/11/12 |
| Unknown | Notch Filter | SKU 5G3 | ATR0205-04-13 | NCR | NCR |
| **RF Conducted test** | | | | | |
| WEINSCHEL | 30dB Attenuator | 53-30-43 | PG633 | Each Time | |
| HP Agilent | RF Communication Test Set | 8920B | 3325U00859 | 2020/1/15 | 2021/1/15 |
| HP | Microwave frequency counter | 5343A | 2232A00827 | 2019/8/29 | 2022/8/29 |
| Fluke | Digital Multimeter | 287 | 19000011 | 2019/07/25 | 2020/07/24 |
| ESPEC | Temperature & Humidity Chamber | EL-10KA | 9107726 | 2019/12/25 | 2020/12/24 |
| Long Wei | DC Power Supply | TPR-6420D | 398363 | NCR | NCR |
| Unknown | Notch Filter | SKU 5G3 | ATR0205-04-13 | Each Time | |
| Rohde & Schwarz | SPECTRUM ANALYZER | FSU26 | 200982 | 2019/3/2 | 2020/3/2 |
| Ducommun Technologies | RF Cable | RG-214 | 3 | Each Time | |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

# FCC §1.1307(b) & §2.1093 - RF EXPOSURE

## Applicable Standard

According to FCC §1.1307(b) and §2.1093, protable device operates Part 95 should be subjected to rountine environmental evaluation for RF exposure prior or equipment authorization or use.

**Result:** Compliance.

Please refer to SAR Report Number: RXM200107050-20.

# FCC §2.1046 & §95.1767 - RF OUTPUT POWER

## Applicable Standard

Per FCC §2.1046, and §95.1767, This section contains transmitting power limits for GMRS stations. The maximum transmitting power depends on which channels are being used and the type of station.

(a) 462/467 MHz main channels. The limits in this paragraph apply to stations transmitting on any of the 462 MHz main channels or any of the 467 MHz main channels. Each GMRS transmitter type must be capable of operating within the allowable power range. GMRS licensees are responsible for ensuring that their GMRS stations operate in compliance with these limits.

(1) The transmitter output power of mobile, repeater and base stations must not exceed 50 Watts.

(2) The transmitter output power of fixed stations must not exceed 15 Watts.

(b) 462 MHz interstitial channels. The effective radiated power (ERP) of mobile, hand-held portable and base stations transmitting on the 462 MHz interstitial channels must not exceed 5 Watts.

(c) 467 MHz interstitial channels. The effective radiated power (ERP) of hand-held portable units transmitting on the 467 MHz interstitial channels must not exceed 0.5 Watt. Each GMRS transmitter type capable of transmitting on these channels must be designed such that the ERP does not exceed 0.5 Watt.

## Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the emissions were measured by the substitution.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22~24 °C |
| **Relative Humidity:** | 53-57 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed b Zero Yan on 2020-03-04.*

*Test Mode: Transmitting*

| Indicated | | Table Angle Degree | Test Ant. | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Reading (dBμV) | | Height (m) | Polar (H/V) | Substituted level (dBm) | Cable Loss (dB) | Ant. Gain (dB) | | | |
| 462.625MHz main channels | | | | | | | | | | |
| 462.625 | 95.04 | 245 | 2.1 | H | 20.2 | 1.32 | 0 | 18.88 | 47 | 28.12 |
| 462.625 | 108.91 | 99 | 2.4 | V | 38.4 | 1.32 | 0 | 37.08 | 47 | 9.92 |
| 462.6375MHz interstitial channels | | | | | | | | | | |
| 462.6375 | 95.33 | 240 | 2.5 | H | 20.5 | 1.32 | 0 | 19.18 | 37 | 17.82 |
| 462.6375 | 107.97 | 312 | 2.0 | V | 37.5 | 1.32 | 0 | 36.18 | 37 | 0.82 |
| 467.6375MHz interstitial channels | | | | | | | | | | |
| 467.6375 | 83.94 | 22 | 2.3 | H | 8.5 | 1.28 | 0 | 7.22 | 27 | 19.78 |
| 467.6375 | 97.46 | 174 | 1.0 | V | 25.8 | 1.28 | 0 | 24.52 | 27 | 2.48 |

**Test Result:** Compliance.

# FCC §2.1047 & §95.1775 - MODULATION CHARACTERISTIC

## Applicable Standard

Per FCC §2.1047 and §95.1775: Each GMRS transmitter type must be designed to satisfy the modulation requirements in this section. Operation of GMRS stations must also be in compliance with these requirements.

(a) Main channels. The peak frequency deviation for emissions to be transmitted on the main channels must not exceed ±5 kHz.

(b) 462 MHz interstitial channels. The peak frequency deviation for emissions to be transmitted on the 462 MHz interstitial channels must not exceed ±5 kHz.

(c) 467 MHz interstitial channels. The peak frequency deviation for emissions to be transmitted on the 467 MHz interstitial channels must not exceed ±2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

(d) Overmodulation. Each GMRS transmitter type, except for a mobile station transmitter type with a transmitter power output of 2.5 W or less, must automatically prevent a higher than normal audio level from causing overmodulation.

(e) Audio filter. Each GMRS transmitter type must include audio frequency low pass filtering, unless it complies with the applicable paragraphs of §95.1779 (without filtering).

(1) The filter must be between the modulation limiter and the modulated stage of the transmitter.

(2) At any frequency (f in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least 60 log (f/3) dB more than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB more than the attenuation at 1 kHz.

## Test Procedure

Test Method: TIA/EIA-603-D

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 °C |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Gavin Guo on 2020-03-03.*

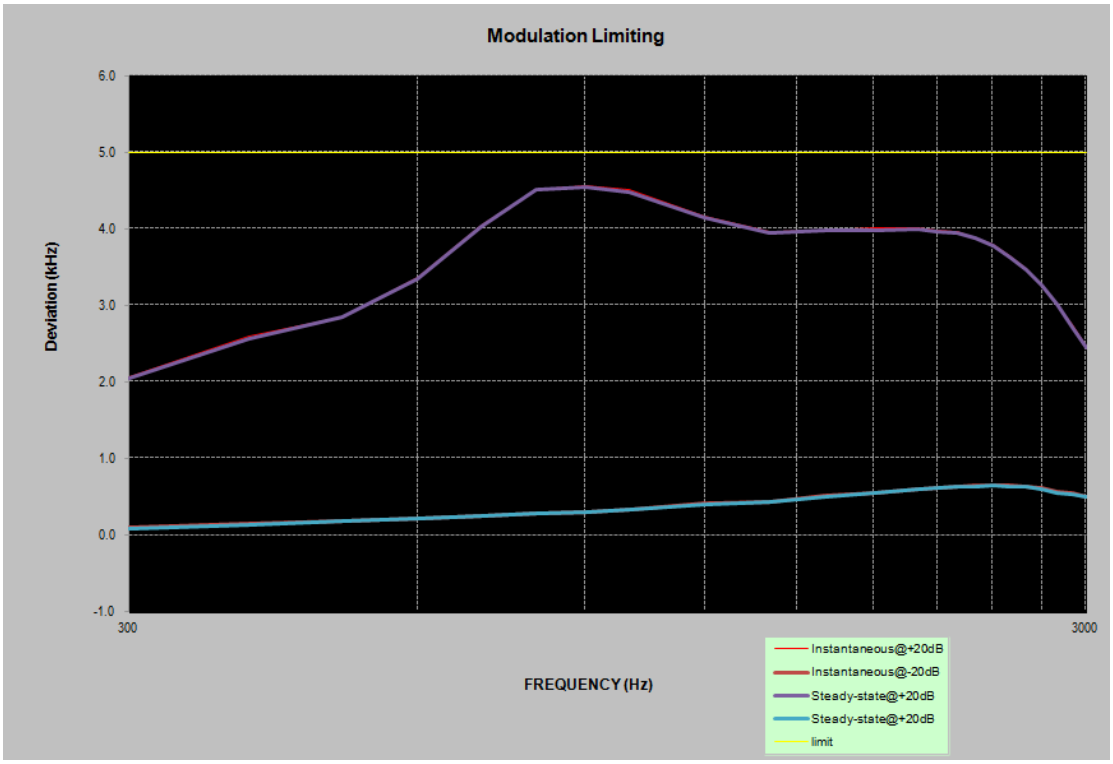
Please refer to the following tables and plots.

*Test Mode: Transmitting*

## MODULATION LIMITING

Carrier Frequency: 462.625MHz

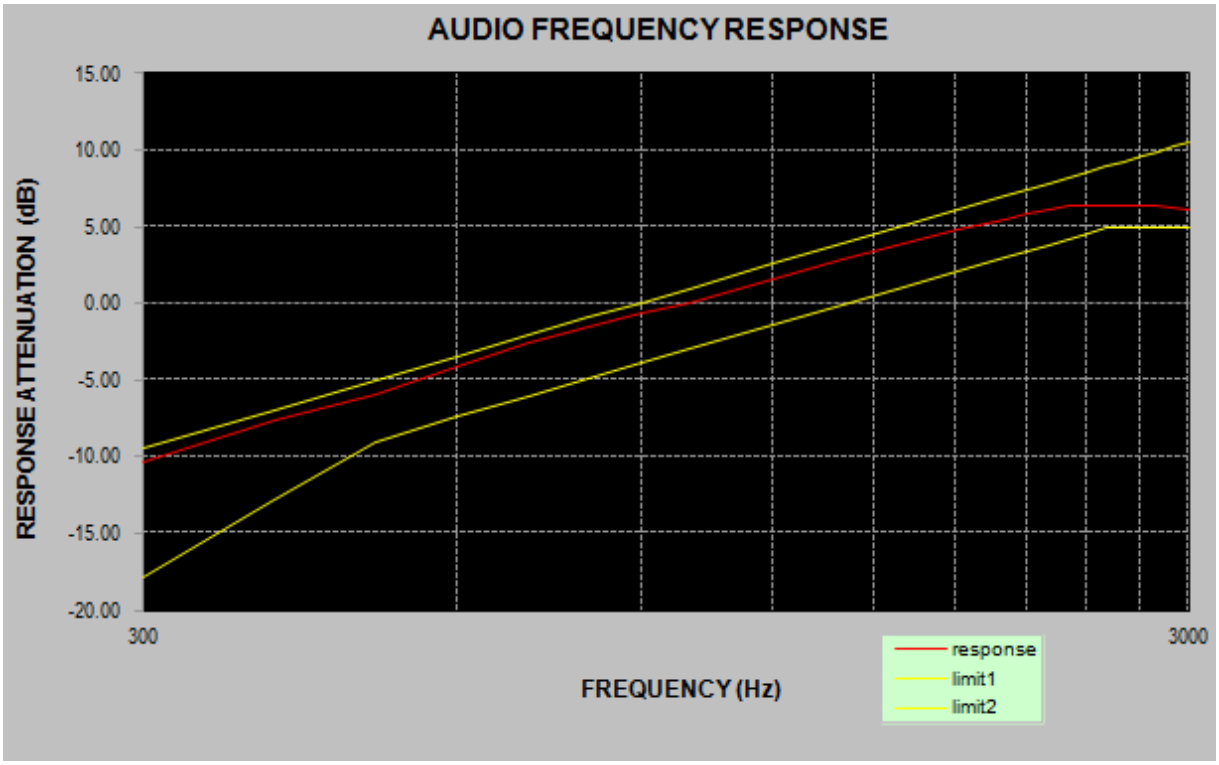
| Audio Frequency (Hz) | Instantaneous | | Steady-state | | FCC Limit [kHz] |
|---|---|---|---|---|---|
| | DEVIATION (@+20dB) [kHz] | DEVIATION (@-20dB) [kHz] | DEVIATION (@+20dB) [kHz] | DEVIATION (@-20dB) [kHz] | |
| 300 | 2.068 | 0.094 | 2.051 | 0.087 | 5.0 |
| 400 | 2.592 | 0.147 | 2.573 | 0.141 | 5.0 |
| 500 | 2.851 | 0.191 | 2.841 | 0.180 | 5.0 |
| 600 | 3.358 | 0.220 | 3.355 | 0.211 | 5.0 |
| 700 | 4.040 | 0.257 | 4.035 | 0.251 | 5.0 |
| 800 | 4.519 | 0.283 | 4.509 | 0.279 | 5.0 |
| 900 | 4.564 | 0.304 | 4.544 | 0.297 | 5.0 |
| 1000 | 4.510 | 0.339 | 4.487 | 0.328 | 5.0 |
| 1200 | 4.170 | 0.412 | 4.152 | 0.400 | 5.0 |
| 1400 | 3.967 | 0.440 | 3.949 | 0.429 | 5.0 |
| 1600 | 3.975 | 0.512 | 3.975 | 0.506 | 5.0 |
| 1800 | 4.006 | 0.552 | 3.981 | 0.551 | 5.0 |
| 2000 | 4.015 | 0.608 | 3.995 | 0.607 | 5.0 |
| 2100 | 3.987 | 0.623 | 3.967 | 0.611 | 5.0 |
| 2200 | 3.961 | 0.635 | 3.944 | 0.626 | 5.0 |
| 2300 | 3.884 | 0.643 | 3.882 | 0.630 | 5.0 |
| 2400 | 3.792 | 0.647 | 3.777 | 0.646 | 5.0 |
| 2500 | 3.650 | 0.654 | 3.631 | 0.639 | 5.0 |
| 2600 | 3.483 | 0.626 | 3.458 | 0.626 | 5.0 |
| 2700 | 3.267 | 0.612 | 3.264 | 0.602 | 5.0 |
| 2800 | 3.017 | 0.570 | 3.013 | 0.558 | 5.0 |
| 2900 | 2.743 | 0.544 | 2.721 | 0.533 | 5.0 |
| 3000 | 2.463 | 0.506 | 2.450 | 0.504 | 5.0 |


Modulation Limiting
Deviation (kHz)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
300
3000
FREQUENCY (Hz)
Instantaneous@+20dB
Instantaneous@-20dB
Steady-state@+20dB
Steady-state@+20dB
limit

## Audio Frequency Response

Carrier Frequency: 462.625 MHz

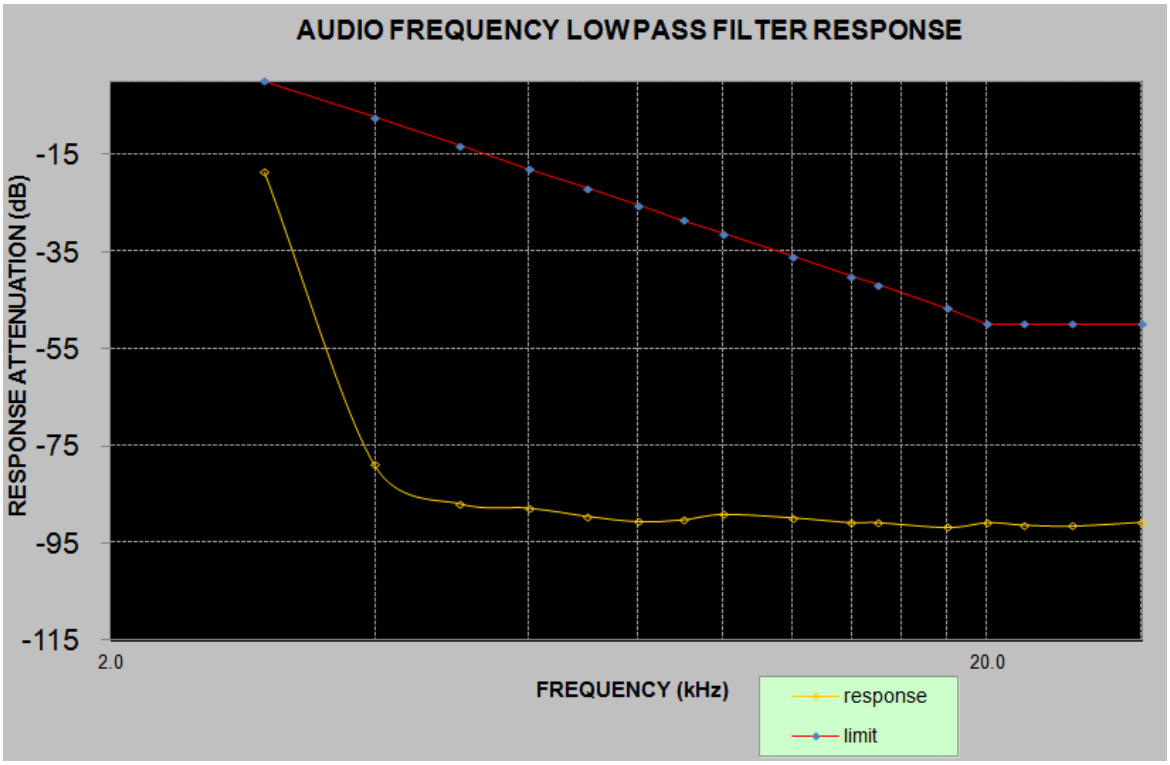
| Audio Frequency (Hz) | Response Attenuation (dB) |
|---|---|
| 300 | -10.29 |
| 400 | -7.58 |
| 500 | -5.92 |
| 600 | -4.11 |
| 700 | -2.63 |
| 800 | -1.48 |
| 900 | -0.59 |
| 1000 | 0.00 |
| 1200 | 1.63 |
| 1400 | 2.89 |
| 1600 | 3.86 |
| 1800 | 4.80 |
| 2000 | 5.52 |
| 2100 | 5.85 |
| 2200 | 6.12 |
| 2300 | 6.32 |
| 2400 | 6.43 |
| 2500 | 6.41 |
| 2600 | 6.42 |
| 2700 | 6.37 |
| 2800 | 6.33 |
| 2900 | 6.22 |
| 3000 | 6.08 |


AUDIO FREQUENCY RESPONSE
RESPONSE ATTENUATION (dB)
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
300
3000
FREQUENCY (Hz)
response
limit1
limit2

**Audio frequency lows pass filter response**

Carrier Frequency: 462.625 MHz

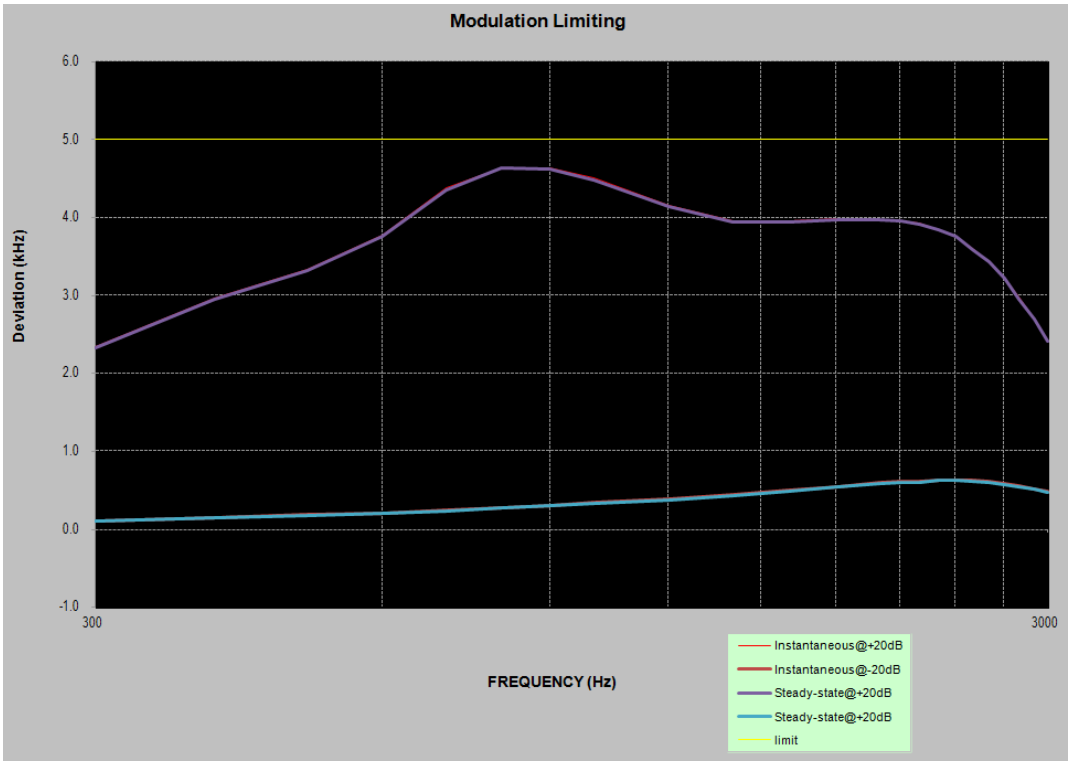
| Audio Frequency (kHz) | Response Attenuation (dB) | Limit (dB) |
|---|---|---|
| 1.0 | 0.0 | / |
| 3.0 | -18.7 | 0.0 |
| 4.0 | -78.9 | -7.5 |
| 5.0 | -86.9 | -13.3 |
| 6.0 | -87.8 | -18.1 |
| 7.0 | -89.5 | -22.1 |
| 8.0 | -90.6 | -25.6 |
| 9.0 | -90.2 | -28.6 |
| 10.0 | -89.1 | -31.4 |
| 12.0 | -89.8 | -36.1 |
| 14.0 | -90.8 | -40.1 |
| 15.0 | -90.8 | -41.9 |
| 18.0 | -91.8 | -46.7 |
| 20.0 | -90.8 | -50.0 |
| 22.0 | -91.3 | -50.0 |
| 25.0 | -91.5 | -50.0 |
| 30.0 | -90.7 | -50.0 |



## MODULATION LIMITING

Carrier Frequency: 462.6375MHz

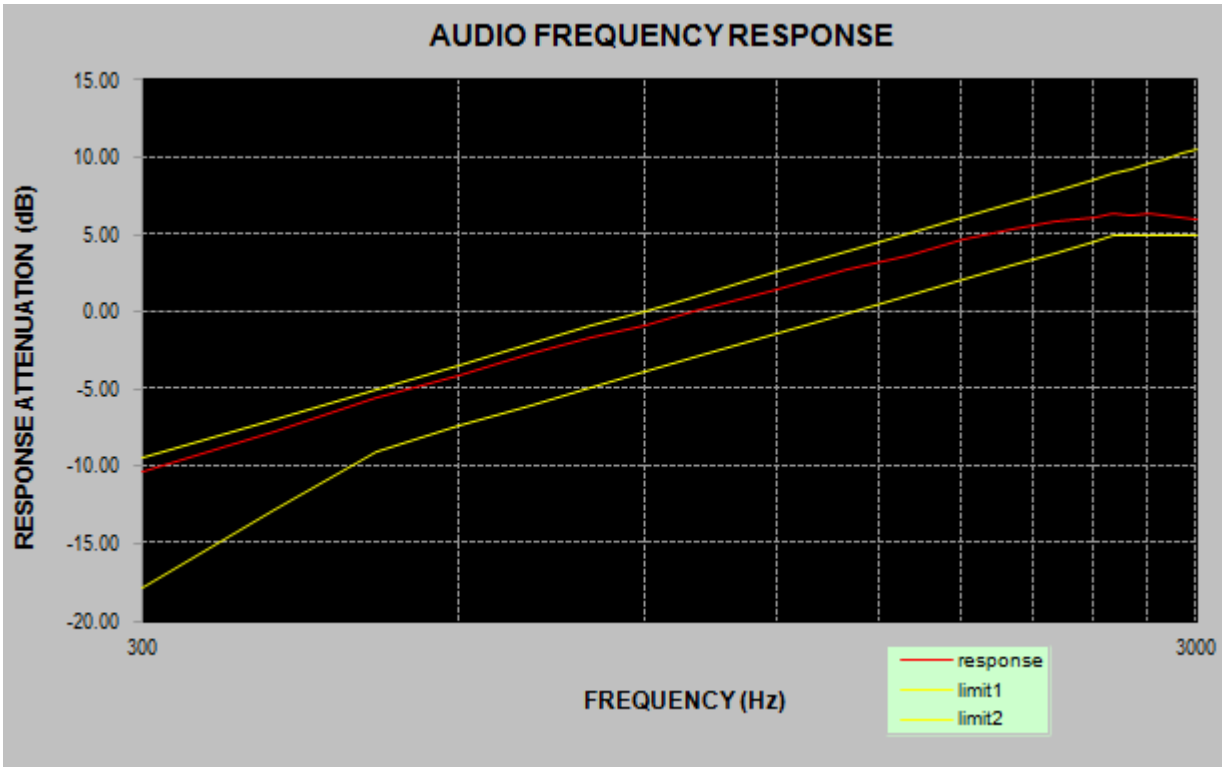
| Audio Frequency (Hz) | Instantaneous | | Steady-state | | FCC Limit [kHz] |
|---|---|---|---|---|---|
| | DEVIATION (@+20dB) [kHz] | DEVIATION (@-20dB) [kHz] | DEVIATION (@+20dB) [kHz] | DEVIATION (@-20dB) [kHz] | |
| 300 | 2.345 | 0.104 | 2.336 | 0.101 | 5.0 |
| 400 | 2.969 | 0.153 | 2.960 | 0.152 | 5.0 |
| 500 | 3.338 | 0.186 | 3.315 | 0.179 | 5.0 |
| 600 | 3.774 | 0.212 | 3.760 | 0.205 | 5.0 |
| 700 | 4.377 | 0.256 | 4.352 | 0.241 | 5.0 |
| 800 | 4.645 | 0.284 | 4.637 | 0.271 | 5.0 |
| 900 | 4.644 | 0.306 | 4.625 | 0.299 | 5.0 |
| 1000 | 4.510 | 0.345 | 4.487 | 0.338 | 5.0 |
| 1200 | 4.162 | 0.388 | 4.141 | 0.379 | 5.0 |
| 1400 | 3.957 | 0.441 | 3.940 | 0.435 | 5.0 |
| 1600 | 3.961 | 0.501 | 3.941 | 0.489 | 5.0 |
| 1800 | 3.982 | 0.545 | 3.970 | 0.542 | 5.0 |
| 2000 | 3.980 | 0.596 | 3.979 | 0.583 | 5.0 |
| 2100 | 3.961 | 0.611 | 3.959 | 0.609 | 5.0 |
| 2200 | 3.926 | 0.617 | 3.922 | 0.609 | 5.0 |
| 2300 | 3.851 | 0.629 | 3.851 | 0.627 | 5.0 |
| 2400 | 3.756 | 0.633 | 3.754 | 0.628 | 5.0 |
| 2500 | 3.612 | 0.625 | 3.592 | 0.622 | 5.0 |
| 2600 | 3.441 | 0.611 | 3.438 | 0.610 | 5.0 |
| 2700 | 3.221 | 0.592 | 3.219 | 0.581 | 5.0 |
| 2800 | 2.975 | 0.558 | 2.955 | 0.552 | 5.0 |
| 2900 | 2.704 | 0.524 | 2.702 | 0.515 | 5.0 |
| 3000 | 2.424 | 0.485 | 2.410 | 0.481 | 5.0 |


Modulation Limiting
Deviation (kHz)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
300
3000
FREQUENCY (Hz)
Instantaneous@+20dB
Instantaneous@-20dB
Steady-state@+20dB
Steady-state@+20dB
limit

## Audio Frequency Response

Carrier Frequency: 462.6375 MHz

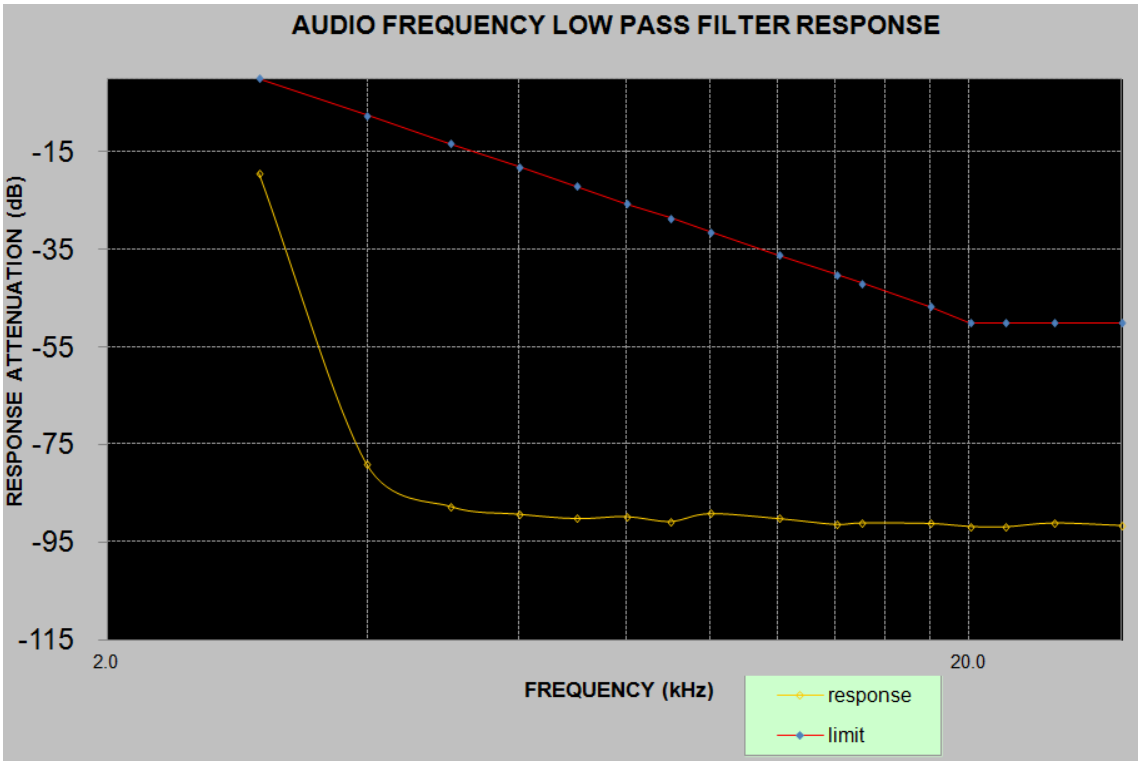
| Audio Frequency (Hz) | Response Attenuation (dB) |
|---|---|
| 300 | -10.31 |
| 400 | -7.77 |
| 500 | -5.50 |
| 600 | -4.07 |
| 700 | -2.69 |
| 800 | -1.65 |
| 900 | -0.87 |
| 1000 | 0.00 |
| 1200 | 1.47 |
| 1400 | 2.69 |
| 1600 | 3.69 |
| 1800 | 4.63 |
| 2000 | 5.33 |
| 2100 | 5.63 |
| 2200 | 5.85 |
| 2300 | 6.05 |
| 2400 | 6.15 |
| 2500 | 6.32 |
| 2600 | 6.25 |
| 2700 | 6.32 |
| 2800 | 6.19 |
| 2900 | 6.10 |
| 3000 | 5.99 |


AUDIO FREQUENCY RESPONSE
RESPONSE ATTENUATION (dB)
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
300
3000
FREQUENCY (Hz)
response
limit1
limit2

**Audio frequency lows pass filter response**

Carrier Frequency: 462.6375 MHz

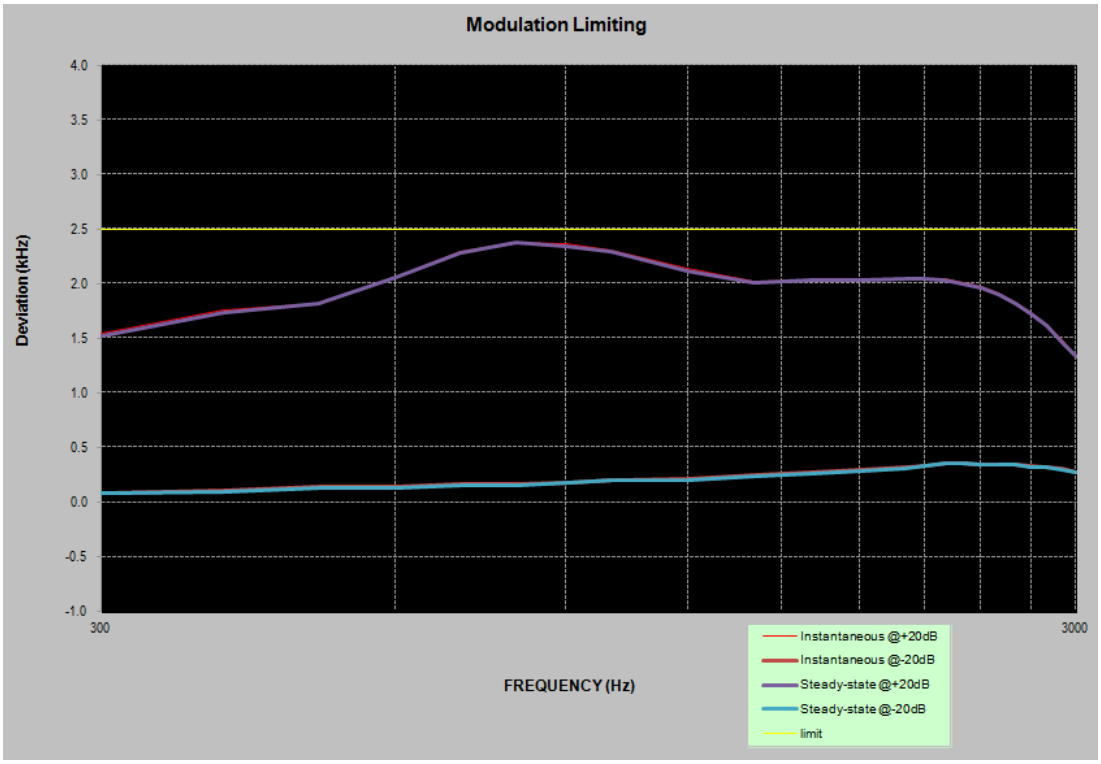
| Audio Frequency (kHz) | Response Attenuation (dB) | Limit (dB) |
|---|---|---|
| 1.0 | 0.0 | / |
| 3.0 | -19.3 | 0.0 |
| 4.0 | -79.0 | -7.5 |
| 5.0 | -87.7 | -13.3 |
| 6.0 | -89.3 | -18.1 |
| 7.0 | -90.2 | -22.1 |
| 8.0 | -89.8 | -25.6 |
| 9.0 | -90.8 | -28.6 |
| 10.0 | -89.2 | -31.4 |
| 12.0 | -90.2 | -36.1 |
| 14.0 | -91.4 | -40.1 |
| 15.0 | -91.1 | -41.9 |
| 18.0 | -91.2 | -46.7 |
| 20.0 | -91.8 | -50.0 |
| 22.0 | -91.9 | -50.0 |
| 25.0 | -91.1 | -50.0 |
| 30.0 | -91.6 | -50.0 |



## MODULATION LIMITING

Carrier Frequency: 467.6375MHz

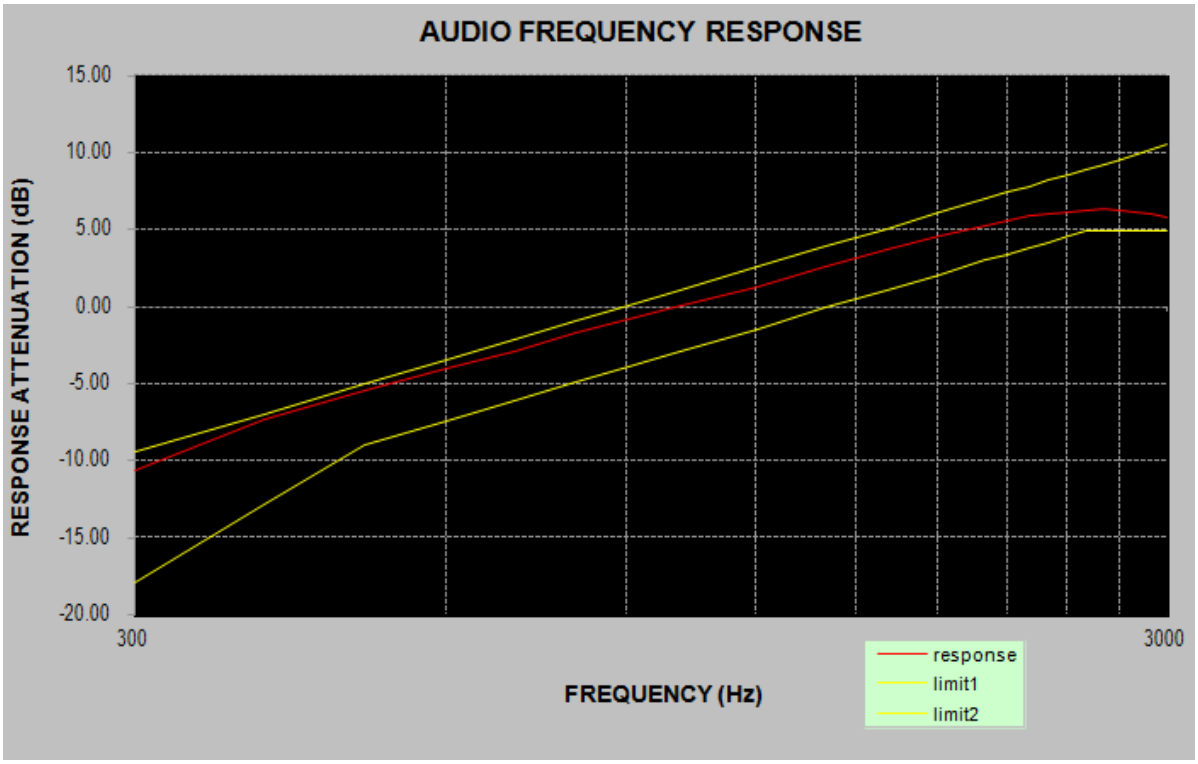
| Audio Frequency (Hz) | Instantaneous | | Steady-state | | FCC Limit [kHz] |
|---|---|---|---|---|---|
| | DEVIATION (@+20dB) [kHz] | DEVIATION (@-20dB) [kHz] | DEVIATION (@+20dB) [kHz] | DEVIATION (@-20dB) [kHz] | |
| 300 | 1.543 | 0.084 | 1.524 | 0.082 | 2.5 |
| 400 | 1.758 | 0.104 | 1.740 | 0.096 | 2.5 |
| 500 | 1.819 | 0.139 | 1.819 | 0.132 | 2.5 |
| 600 | 2.057 | 0.146 | 2.053 | 0.135 | 2.5 |
| 700 | 2.291 | 0.163 | 2.289 | 0.159 | 2.5 |
| 800 | 2.384 | 0.162 | 2.378 | 0.154 | 2.5 |
| 900 | 2.364 | 0.181 | 2.348 | 0.173 | 2.5 |
| 1000 | 2.311 | 0.202 | 2.297 | 0.198 | 2.5 |
| 1200 | 2.138 | 0.213 | 2.123 | 0.206 | 2.5 |
| 1400 | 2.020 | 0.248 | 2.012 | 0.236 | 2.5 |
| 1600 | 2.035 | 0.273 | 2.033 | 0.265 | 2.5 |
| 1800 | 2.048 | 0.303 | 2.033 | 0.291 | 2.5 |
| 2000 | 2.052 | 0.325 | 2.047 | 0.313 | 2.5 |
| 2100 | 2.048 | 0.336 | 2.041 | 0.336 | 2.5 |
| 2200 | 2.044 | 0.359 | 2.038 | 0.352 | 2.5 |
| 2300 | 2.013 | 0.353 | 1.993 | 0.352 | 2.5 |
| 2400 | 1.975 | 0.351 | 1.965 | 0.345 | 2.5 |
| 2500 | 1.915 | 0.349 | 1.903 | 0.343 | 2.5 |
| 2600 | 1.830 | 0.347 | 1.817 | 0.344 | 2.5 |
| 2700 | 1.732 | 0.332 | 1.726 | 0.326 | 2.5 |
| 2800 | 1.626 | 0.327 | 1.613 | 0.320 | 2.5 |
| 2900 | 1.483 | 0.306 | 1.463 | 0.294 | 2.5 |
| 3000 | 1.331 | 0.278 | 1.328 | 0.272 | 2.5 |


Modulation Limiting
Deviation (kHz)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
300
3000
FREQUENCY (Hz)
Instantaneous @+20dB
Instantaneous @-20dB
Steady-state @+20dB
Steady-state @-20dB
limit

## Audio Frequency Response

Carrier Frequency: 467.6375 MHz

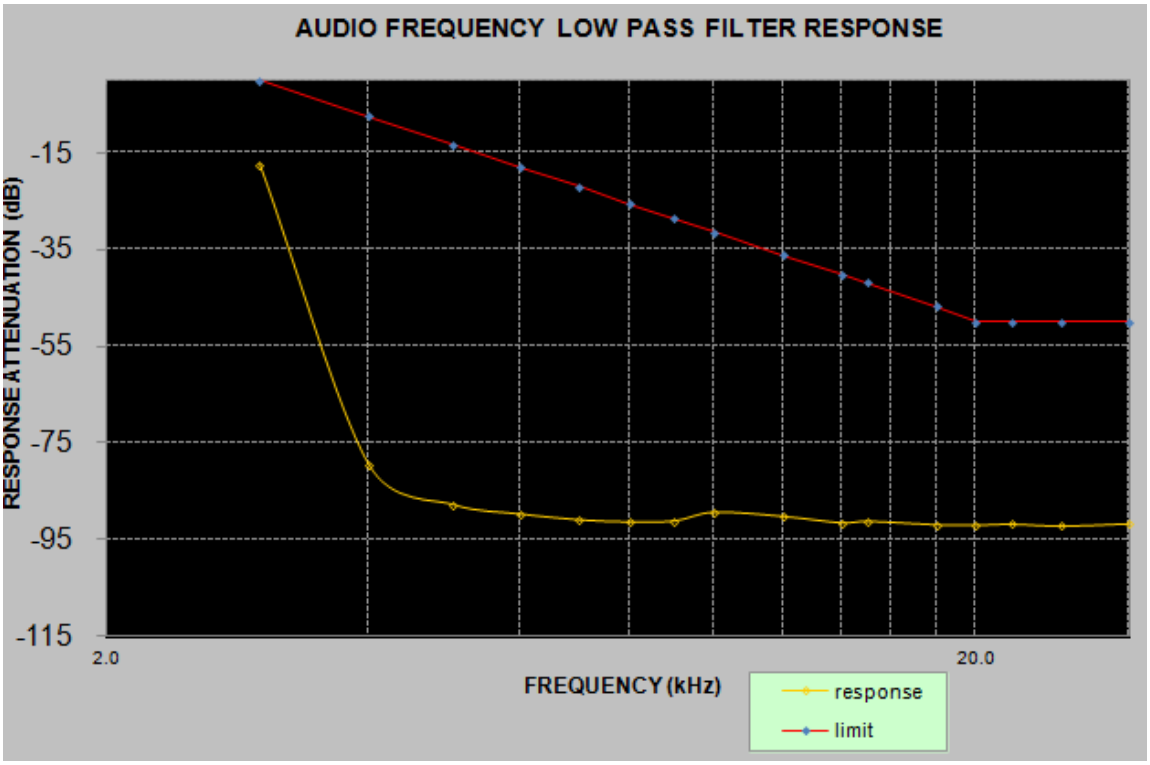
| Audio Frequency (Hz) | Response Attenuation (dB) |
|---|---|
| 300 | -10.66 |
| 400 | -7.35 |
| 500 | -5.45 |
| 600 | -4.04 |
| 700 | -2.91 |
| 800 | -1.69 |
| 900 | -0.80 |
| 1000 | 0.00 |
| 1200 | 1.33 |
| 1400 | 2.65 |
| 1600 | 3.72 |
| 1800 | 4.58 |
| 2000 | 5.31 |
| 2100 | 5.60 |
| 2200 | 5.90 |
| 2300 | 5.99 |
| 2400 | 6.10 |
| 2500 | 6.22 |
| 2600 | 6.32 |
| 2700 | 6.24 |
| 2800 | 6.10 |
| 2900 | 6.06 |
| 3000 | 5.82 |


AUDIO FREQUENCY RESPONSE
15.00
10.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
RESPONSE ATTENUATION (dB)
300
3000
FREQUENCY (Hz)
response
limit1
limit2

**Audio frequency lows pass filter response**

Carrier Frequency: 467.6375 MHz

| Audio Frequency (kHz) | Response Attenuation (dB) | Limit (dB) |
|---|---|---|
| 1.0 | 0.0 | / |
| 3.0 | -17.5 | 0.0 |
| 4.0 | -79.4 | -7.5 |
| 5.0 | -87.7 | -13.3 |
| 6.0 | -89.7 | -18.1 |
| 7.0 | -90.9 | -22.1 |
| 8.0 | -91.3 | -25.6 |
| 9.0 | -91.1 | -28.6 |
| 10.0 | -89.3 | -31.4 |
| 12.0 | -90.2 | -36.1 |
| 14.0 | -91.5 | -40.1 |
| 15.0 | -91.2 | -41.9 |
| 18.0 | -91.9 | -46.7 |
| 20.0 | -92.0 | -50.0 |
| 22.0 | -91.8 | -50.0 |
| 25.0 | -92.2 | -50.0 |
| 30.0 | -91.7 | -50.0 |



# FCC §2.1049 & §95.1773& §95.1779(a)(c) - AUTHOURIZED BANDWIDTH AND EMISSION MASK

## Applicable Standard

According to §95.1773. Each GMRS transmitter type must be designed such that the occupied bandwidth does not exceed the authorized bandwidth for the channels used. Operation of GMRS stations must also be in compliance with these requirements.

(a) Main channels. The authorized bandwidth is 20 kHz for GMRS transmitters operating on any of the 462 MHz main channels (see §95.1763(a)) or any of the 467 MHz main channels (see §95.1763(c)).

(b) Interstitial channels. The authorized bandwidth is 20 kHz for GMRS transmitters operating on any of the 462 MHz interstitial channels (see §95.1763(b)) and is 12.5 kHz for GMRS transmitters operating on any of the 467 MHz interstitial channels (see §95.1763(d)).

(c) Digital data transmissions. Digital data transmissions are limited to the 462 MHz main channels and interstitial channels in the 462 MHz and 467 MHz bands.

According to §95.1779. Each GMRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(a) Emission masks. Emission masks applicable to transmitting equipment in the GMRS are defined by the requirements in the following table. The numbers in the attenuation requirements column refer to rule paragraph numbers under paragraph (b) of this section.

| Emission types filter | Attenuation requirements |
|---|---|

(b) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

(1) 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.

(2) 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.

(b) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

(1) 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.

(2) 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.

(7) 43 + 10 log (P) dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

(c) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (b)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (b)(5) of this section is measured with a reference bandwidth of at least 30 kHz.

## Test Procedure

TIA-603-D, section 2.2.11

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 26°C |
| **Relative Humidity:** | 52 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Gavin Guo on 2020-02-23.*

*Test Mode: Transmitting*

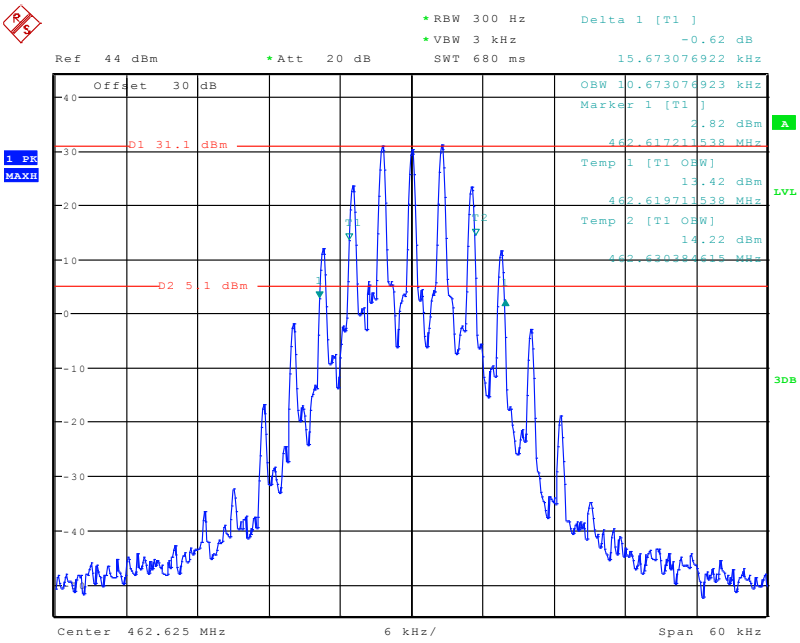
| Item | Frequency (MHz) | OBW (kHz) | 26dB Bandwidth (kHz) | Limit (kHz) | Result |
|---|---|---|---|---|---|
| GMRS | 462.6250 | 10.673 | 15.673 | 20 | Pass |
| GMRS | 462.6375 | 10.673 | 15.673 | 20 | Pass |
| GMRS | 467.6375 | 10.192 | 10.769 | 12.5 | Pass |

Emission Designator Per CFR 47 §2.201& §2.202&, Bn = 2M + 2D：

The maximum modulating frequency is 3.0 kHz with a 2.5 kHz deviation.
BW = 2(M+D) = 2*(3.0 kHz + 2.5 kHz) = 11 kHz → 11K0
F3E portion of the designator represents an FM voice transmission Therefore, the entire designator for 12.5 kHz channel spacing FM mode is 11K0F3E.

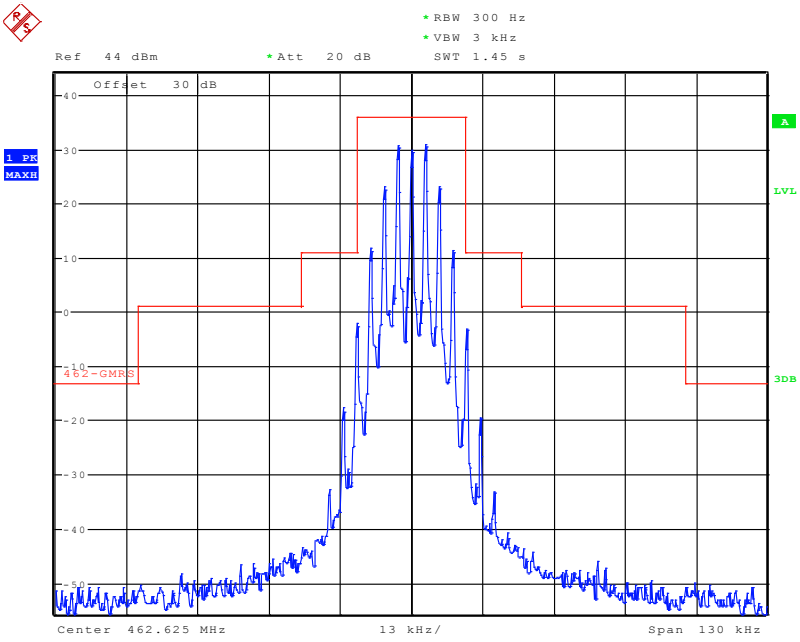
The maximum modulating frequency is 3.0 kHz with a 5.0 kHz deviation.
BW = 2(M+D) = 2*(3.0 kHz + 5.0 kHz) = 16 kHz → 16K0
F3E portion of the designator represents an FM voice transmission Therefore, the entire designator for 12.5 kHz channel spacing FM mode is 16K0F3E.

## OBW, 462.625 MHz



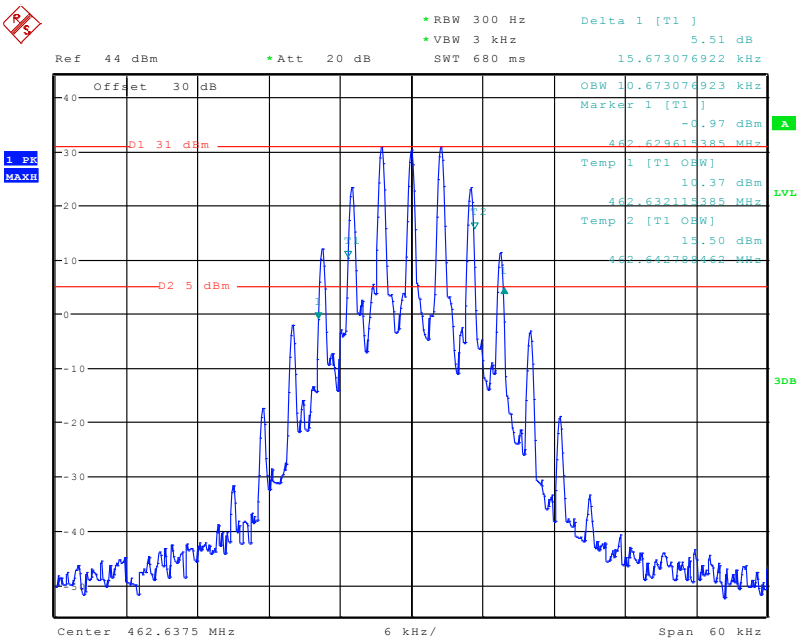

Date: 23.FEB.2020 14:02:05

## Emission Mask, 462.625 MHz



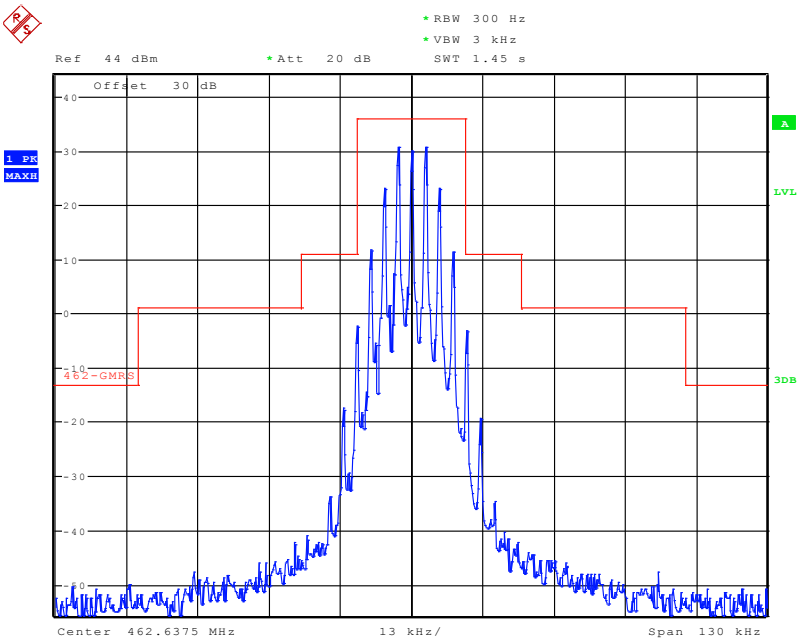

Date: 23.FEB.2020 14:24:16

## OBW, 462.6375 MHz



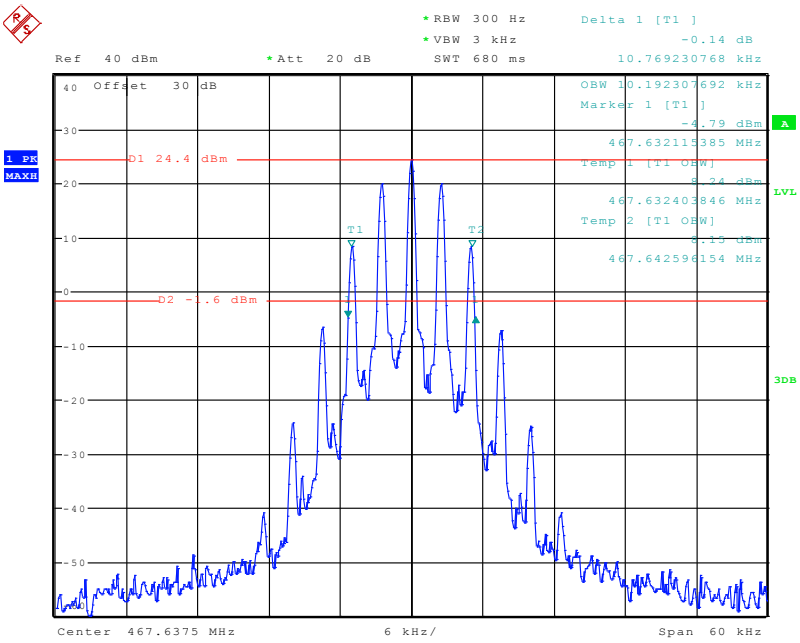

Date: 23.FEB.2020 13:52:18

## Emission Mask, 462.6375 MHz



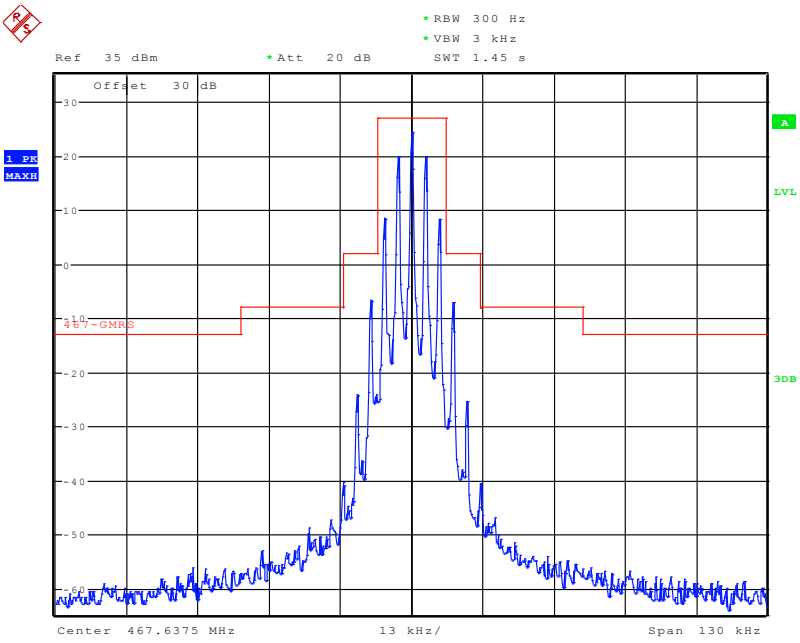

Date: 23.FEB.2020 14:15:56

## OBW, 467.6375 MHz




Date: 23.FEB.2020 13:59:11

## Emission Mask, 467.6375 MHz




Date: 23.FEB.2020 14:53:46

# FCC §2.1051 & §95.1779 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

## Applicable Standard

According to §95.1779. Each GMRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(b) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

(1) 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.

(2) 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.

(7) 43 + 10 log (P) dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

(c) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (b)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (b)(5) of this section is measured with a reference bandwidth of at least 30 kHz.

(d) Measurement conditions. The requirements in this section apply to each GMRS transmitter type both with and without the connection of permitted attachments, such as an external speaker, microphone, power cord and/or antenna.

Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz, and 1MHz for above 1GHz. sufficient scans were taken to show any out of band emissions up to 10$^{th}$ harmonic.

## Test Data

### Environmental Conditions

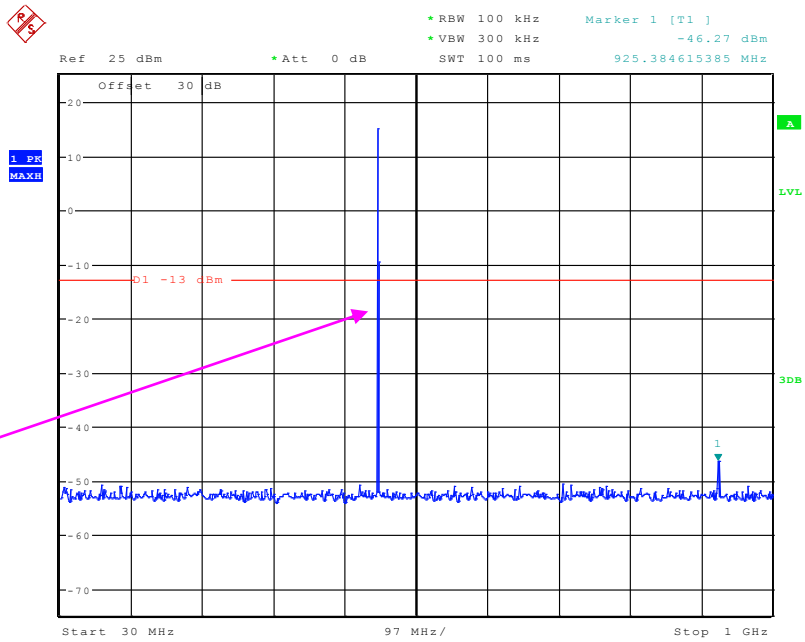
| | |
|---|---|
| **Temperature:** | 26 ℃ |
| **Relative Humidity:** | 52 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Gavin Guo on 2020-02-23.*

*Test Mode: Transmitting*

Please refer to the following plots.

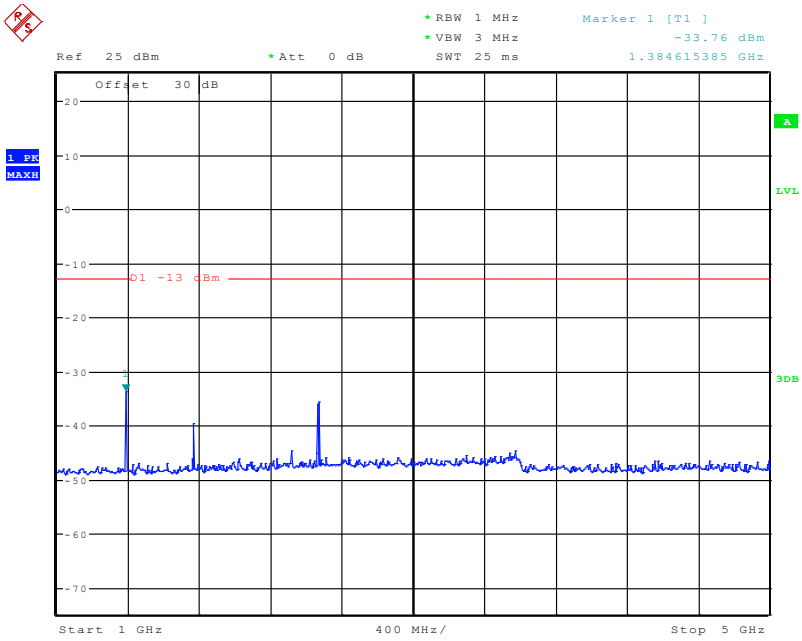
## 30 MHz – 1 GHz, 462.625 MHz




Fund.test with filter

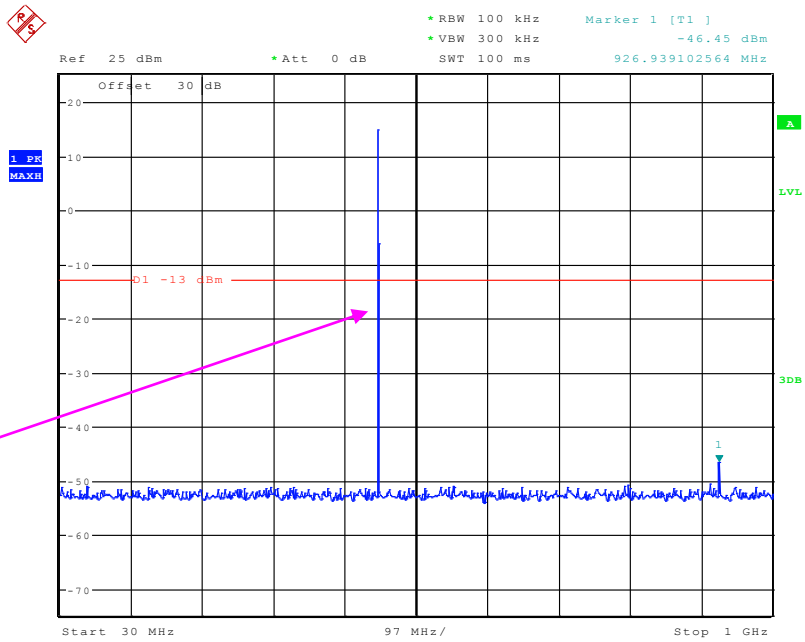
Date: 23.FEB.2020 15:11:49

## 1 GHz – 5.0 GHz, 462.625 MHz




Date: 23.FEB.2020 15:15:24

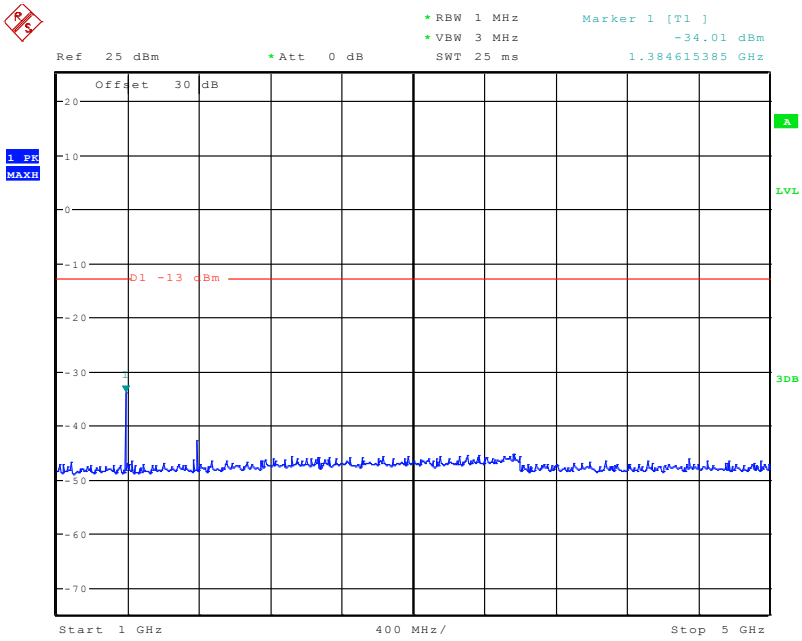
## 30 MHz – 1 GHz, 462.6375 MHz




Fund.test with filter

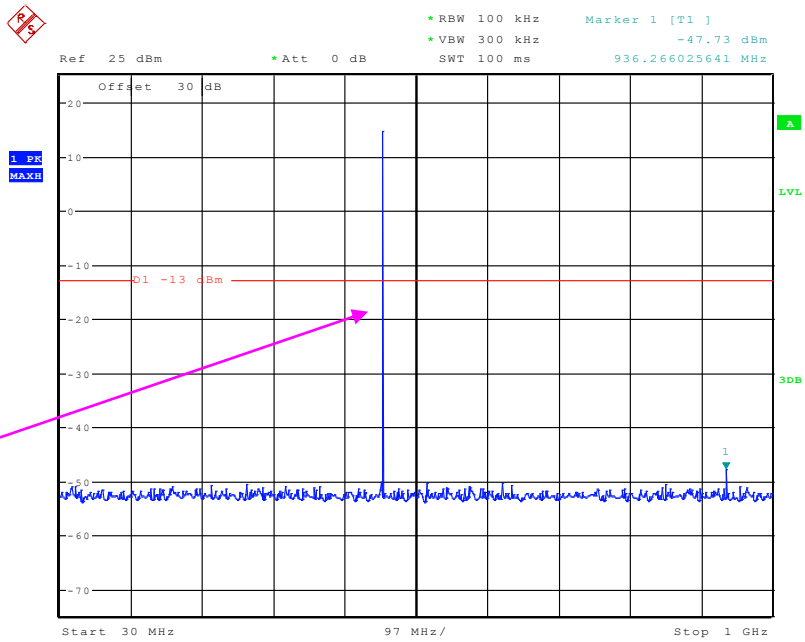
Date: 23.FEB.2020 15:07:22

## 1 GHz – 5.0 GHz, 462.6375 MHz




Date: 23.FEB.2020 15:17:54

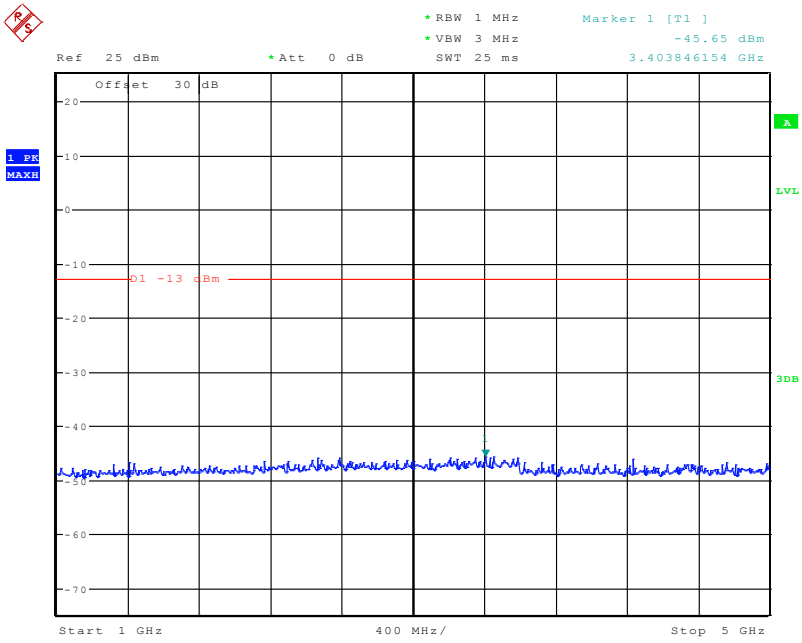
## 30 MHz – 1 GHz, 467.6375 MHz




Fund.test with filter

Date: 23.FEB.2020 15:09:21

## 1 GHz – 5.0 GHz, 467.6375 MHz




Date: 23.FEB.2020 15:16:46

# FCC §2.1053 & §95.1779- RADIATED SPURIOUS EMISSION

## Applicable Standard

FCC §2.1053 and §95.1779. Each GMRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

(b) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

(1) 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.

(2) 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.

(7) 43 + 10 log (P) dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

(c) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (b)(1) through (4) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (b)(5) of this section is measured with a reference bandwidth of at least 30 kHz.

(d) Measurement conditions. The requirements in this section apply to each GMRS transmitter type both with and without the connection of permitted attachments, such as an external speaker, microphone, power cord and/or antenna.

## Test Procedure

The transmitter was placed on a wooden turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10 1g (TXpwr in Watts/0.001)-the absolute level
Spurious attenuation limit in dB = 43+10 $Log_{10}$ (power out in Watts)

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22~24°C |
| **Relative Humidity:** | 53 ~57% |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Zero Yan and Alan He on 2020-03-04.*

*Test Mode: Transmitting*

| Indicated | | Table Angle Degree | Test Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Receiver Reading (dBuV) | | Height (m) | Polar (H/V) | Level (dBm) | Cable Loss (dB) | Antenna Gain (dB) | | | |
| 462.625MHz main channels | | | | | | | | | | |
| 925.25 | 39.08 | 23 | 1.0 | H | -61.5 | 1.37 | 0.0 | -62.87 | -13 | 49.87 |
| 925.25 | 41.86 | 213 | 1.3 | V | -57.5 | 1.37 | 0.0 | -58.87 | -13 | 45.87 |
| 1387.88 | 57.74 | 9 | 1.8 | H | -50.6 | 1.60 | 7.90 | -44.30 | -13 | 31.30 |
| 1387.88 | 67.99 | 357 | 2.0 | V | -40.6 | 1.60 | 7.90 | -34.30 | -13 | 21.30 |
| 1850.50 | 45.42 | 160 | 1.9 | H | -57.8 | 1.30 | 9.40 | -49.70 | -13 | 36.70 |
| 1850.50 | 46.82 | 217 | 1.3 | V | -56.7 | 1.30 | 9.40 | -48.60 | -13 | 35.60 |
| 2313.13 | 51.99 | 180 | 1.2 | H | -54.0 | 1.30 | 10.00 | -45.30 | -13 | 32.30 |
| 2313.13 | 48.98 | 97 | 2.2 | V | -56.9 | 1.30 | 10.00 | -48.20 | -13 | 35.20 |
| 462.6375MHz interstitial channels | | | | | | | | | | |
| 925.275 | 36.68 | 23 | 1.0 | H | -63.9 | 1.37 | 0.0 | -65.27 | -13 | 52.27 |
| 925.275 | 41.74 | 213 | 1.3 | V | -57.6 | 1.37 | 0.0 | -58.97 | -13 | 45.97 |
| 1387.91 | 56.15 | 191 | 2.4 | H | -52.1 | 1.60 | 7.90 | -45.80 | -13 | 32.80 |
| 1387.91 | 66.22 | 246 | 1.1 | V | -42.3 | 1.60 | 7.90 | -36.00 | -13 | 23.00 |
| 1850.55 | 45.94 | 287 | 1.7 | H | -57.3 | 1.30 | 9.40 | -49.20 | -13 | 36.20 |
| 1850.55 | 45.80 | 224 | 2.4 | V | -57.7 | 1.30 | 9.40 | -49.60 | -13 | 36.60 |
| 2313.19 | 51.07 | 282 | 1.7 | H | -54.9 | 1.30 | 10.00 | -46.20 | -13 | 33.20 |
| 2313.19 | 47.90 | 300 | 1.8 | V | -58.0 | 1.30 | 10.00 | -49.30 | -13 | 36.30 |
| 467.6375MHz interstitial channels | | | | | | | | | | |
| 935.275 | 36.26 | 23 | 1.0 | H | -64.3 | 1.37 | 0.0 | -65.67 | -13 | 52.67 |
| 935.275 | 38.64 | 213 | 1.3 | V | -60.7 | 1.37 | 0.0 | -62.07 | -13 | 49.07 |
| 1402.91 | 45.93 | 296 | 2.2 | H | -62.4 | 1.60 | 7.90 | -56.10 | -13 | 43.10 |
| 1402.91 | 58.32 | 117 | 1.9 | V | -50.2 | 1.60 | 7.90 | -43.90 | -13 | 30.90 |
| 1870.55 | 45.07 | 154 | 1.7 | H | -58.2 | 1.30 | 9.40 | -50.10 | -13 | 37.10 |
| 1870.55 | 42.57 | 167 | 1.6 | V | -60.9 | 1.30 | 9.40 | -52.80 | -13 | 39.80 |
| 2338.19 | 45.48 | 47 | 1.3 | H | -60.5 | 1.30 | 10.00 | -51.80 | -13 | 38.80 |
| 2338.19 | 42.99 | 58 | 1.3 | V | -62.9 | 1.30 | 10.00 | -54.20 | -13 | 41.20 |

**Note:**
1) Absolute Level = Substituted Level - Cable loss + Antenna Gain
2) Margin = Limit- Absolute Level

# FCC §2.1055 (d) & §95.1765 - FREQUENCY STABILITY

## Applicable Standard

According to FCC §2.1055(a) (1), the frequency stability shall be measured with variation of ambient temperature from –30 ℃ to +50 ℃, and according to FCC 2.1055(d) (2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §95.1765,Each GMRS transmitter type must be designed to comply with the frequency accuracy requirements in this section under normal operating conditions. Operators of GMRS stations must also ensure compliance with these requirements.

(a) The carrier frequency of each GMRS transmitter transmitting an emission with an occupied bandwidth greater than 12.5 kHz must remain within 5 parts-per-million (ppm) of the channel center frequencies listed in §95.1763 under normal operating conditions.

(b) The carrier frequency of each GMRS transmitter transmitting an emission with an occupied bandwidth of 12.5 kHz or less must remain within 2.5 ppm of the channel center frequencies listed in §95.1763 under normal operating conditions.

## Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a Frequency Counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Frequency Counter.

Frequency Stability vs. Voltage (item 1or item 2 will be chosen according to different condition) :

☐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.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Gavin Guo on 2020-03-03.*

*Test Mode: Transmitting*

| Reference Frequency: 462.625 MHz, Limit: ±2.5ppm | | | |
|---|---|---|---|
| **Environment Temperature (℃)** | **Voltage Supplied ($V_{DC}$)** | **Measurement Frequency (MHz)** | **Frequency Error (ppm)** |
| Frequency Stability Ver. Temperature | | | |
| 50 | 7.4 | 462.624793 | -0.45 |
| 40 | 7.4 | 462.624798 | -0.44 |
| 30 | 7.4 | 462.624805 | -0.42 |
| 20 | 7.4 | 462.624816 | -0.40 |
| 10 | 7.4 | 462.624803 | -0.43 |
| 0 | 7.4 | 462.624811 | -0.41 |
| -10 | 7.4 | 462.624792 | -0.45 |
| -20 | 7.4 | 462.624788 | -0.46 |
| -30 | 7.4 | 462.624791 | -0.45 |
| Frequency Stability Ver. Input Voltage | | | |
| 20 | 6.4 | 462.624813 | -0.40 |
| 20 | 8.1 | 462.624819 | -0.39 |

| Reference Frequency: 462.6375 MHz, Limit: ±2.5 ppm | | | |
|---|---|---|---|
| **Environment Temperature (℃)** | **Voltage Supplied ($V_{DC}$)** | **Measurement Frequency (MHz)** | **Frequency Error (ppm)** |
| Frequency Stability Ver. Temperature | | | |
| 50 | 7.4 | 462.637363 | -0.30 |
| 40 | 7.4 | 462.637372 | -0.28 |
| 30 | 7.4 | 462.637370 | -0.28 |
| 20 | 7.4 | 462.637378 | -0.26 |
| 10 | 7.4 | 462.637376 | -0.27 |
| 0 | 7.4 | 462.637371 | -0.28 |
| -10 | 7.4 | 462.637366 | -0.29 |
| -20 | 7.4 | 462.637368 | -0.29 |
| -30 | 7.4 | 462.637364 | -0.29 |
| Frequency Stability Ver. Input Voltage | | | |
| 20 | 6.4 | 462.637380 | -0.26 |
| 20 | 8.1 | 462.637372 | -0.28 |

| Reference Frequency: 467.6375 MHz, Limit: ±2.5 ppm | | | |
|---|---|---|---|
| **Environment Temperature (℃)** | **Voltage Supplied ($V_{DC}$)** | **Measurement Frequency (MHz)** | **Frequency Error (ppm)** |
| Frequency Stability Ver. Temperature | | | |
| 50 | 7.4 | 467.637331 | -0.36 |
| 40 | 7.4 | 467.637338 | -0.35 |
| 30 | 7.4 | 467.637346 | -0.33 |
| 20 | 7.4 | 467.637342 | -0.34 |
| 10 | 7.4 | 467.637340 | -0.34 |
| 0 | 7.4 | 467.637348 | -0.33 |
| -10 | 7.4 | 467.637333 | -0.36 |
| -20 | 7.4 | 467.637327 | -0.37 |
| -30 | 7.4 | 467.637329 | -0.37 |
| Frequency Stability Ver. Input Voltage | | | |
| 20 | 6.4 | 467.637347 | -0.33 |
| 20 | 8.1 | 467.637345 | -0.33 |

******* END OF REPORT *******