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## FCC PART 95 FRS/GMRS TRANSCEIVER TEST REPORT

<b>APPLICANT</b>	<b>MIDLAND RADIO CORPORATION</b>
	<b>5900 PARRETTA DRIVE KANSAS CITY MISSOURI 64120 USA</b>
<b>FCC ID</b>	MMAGXT1050P
<b>MODEL NUMBER</b>	GXT1050P
<b>PRODUCT DESCRIPTION</b>	PORTABLE FRF/GMRS TRANSCEIVER
<b>FCC STANDARD APPLIED</b>	47 CFR § 95 Personal Radio Service Subpart A – General Mobile Radio Service (GMRS) Subpart B – Family Radio Service (FRS)
<b>DATE SAMPLE RECEIVED</b>	4/6/2015
<b>DATE TESTED</b>	2/24/2015 & 4/15/2015
<b>TESTED BY</b>	Cory Leverett
<b>APPROVED BY</b>	Sid Sanders

Report Number	Version Number	Description	Issue Date
365AZUT15TestReport	Rev.1	Initial Issue	4/23/2015

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL  
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**

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## GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

## Summary

The device under test does:

- ☒ Fulfill the general approval requirements as identified in this test report
- ☐ Not fulfill the general approval requirements as identified in this test report

## Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made, under my supervision, at:

**Timco Engineering Inc.**  
**849 NW State Road 45**  
**Newberry, FL 32669**

## Authorized Signatory Name:

Cory Leverett  
Engineering Project Manager

**Date: 4/23/2015**

A handwritten signature in black ink is written over a circular purple stamp. The stamp contains the text "TIMCO ENGINEERING INC." around the perimeter and a small star in the center.

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# GENERAL INFORMATION

## EUT Specification

<b>EUT Description</b>	PORTABLE FRS/GMRS TRANSCEIVER
<b>EUT Application</b>	Portable short range communications
<b>FCC ID</b>	MMAGXT1050P
<b>Model Number</b>	GXT1050P
<b>Operating Frequency</b>	GMRS: 462.5500-462.7250 MHz FRS: 467.5625-467.7125 MHz
<b>Test Frequencies</b>	GMRS: 462.5500 MHz FRS: 467.6375 MHz
<b>Type of Emission</b>	FRS: 10K5F3E GMRS: 16K0F3E
<b>EUT Power Source</b>	<input type="checkbox"/> 110-120Vac/50-60Hz (Optional AC power Adapter)
	<input type="checkbox"/> DC Power 13.8V
	<input checked="" type="checkbox"/> Battery Operated Exclusively
<b>Test Item</b>	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
<b>Type of Equipment</b>	<input type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input checked="" type="checkbox"/> Portable
<b>Antenna</b>	Fixed
<b>Test Conditions</b>	Temperature: 24- 26°C Relative humidity: 50-60%.
<b>Modification to the EUT</b>	None
<b>Applicable Standards</b>	FCC CFR 47 Part 95 Subpart A for GMRS; FCC CFR 47 Part 95 Subpart B for FRS;
<b>Test Standards</b>	ANSI/TIA 603-D:2004, KDB412172 D01
<b>Test Facility</b>	<b>Timco Engineering Inc.</b> <b>849 NW State Road 45</b> <b>Newberry, FL 32669 USA.</b>

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## TEST REPORT SUMMARY

Rule Part No.	Scope of Work	Status Pass/Fail/NA
<a href="#">Part 2.1033(c)(6)(7)</a> , <a href="#">Part 2.1046(a)</a> , <a href="#">PART 95 Subpart A</a> , Part 95 Subpart B,	RF Power Output	Pass
<a href="#">Part 2.1033(a)(b)</a>	Modulation Characteristics	Pass
<a href="#">2.1049(c)</a> , <a href="#">95.635(b)(1)(3)(7)</a>	Emission Mask and Occupied Bandwidths	Pass
<a href="#">2.1051</a>	Antenna Conducted Emissions	Pass
<a href="#">2.1053</a> , <a href="#">95.635(b)(7)</a>	Field Strength Spurious Emissions	Pass
<a href="#">Part 2.1055</a> <a href="#">Part 95.621(b)</a>	Frequency Stability	Pass

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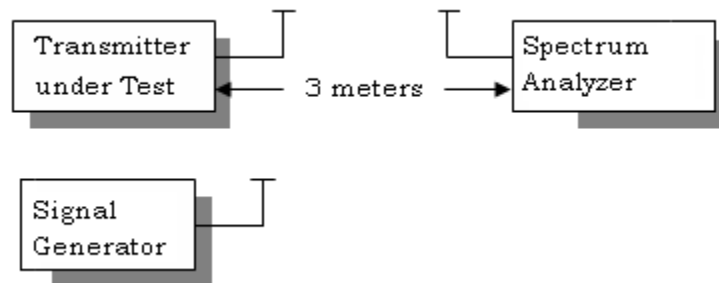
## RF POWER OUTPUT

**Rule Part No.:** [FCC Part 2.1033\(c\)\(6\)\(7\)](#), [FCC Part 2.1046\(a\)](#), [FCC PART 95.639\(a\)](#) for GMRS,  
FCC Part 95.639(b) for FRS

**Requirements:** Power output shall not exceed 0.50 Watts ERP 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: 50Watts

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.

**Method of Measurement:** RF power is measured as ERP as the antenna is permanently attached. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:



### Test Data:

GMRS OUTPUT POWER	
Tuned Frequency (MHz)	ERP (W)
462.5500	3.0710
FRS OUTPUT POWER	
Tuned Frequency (MHz)	ERP (W)
467.6375	0.4532

Results: Pass

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## DC INPUT TO FINAL AMPLIFIER

**Rule Part No.:** FCC part 2.1033 (C)(8)

GMRS Power Input = 6.6. Watts  
DC Power Consumption  
Vdc = 6 volts  
Ic = . 1.1 amps

FRS Power Input = 1.8. Watts  
DC Power Consumption  
Vdc = 6 volts  
Ic = . .30 amps

Results: Pass

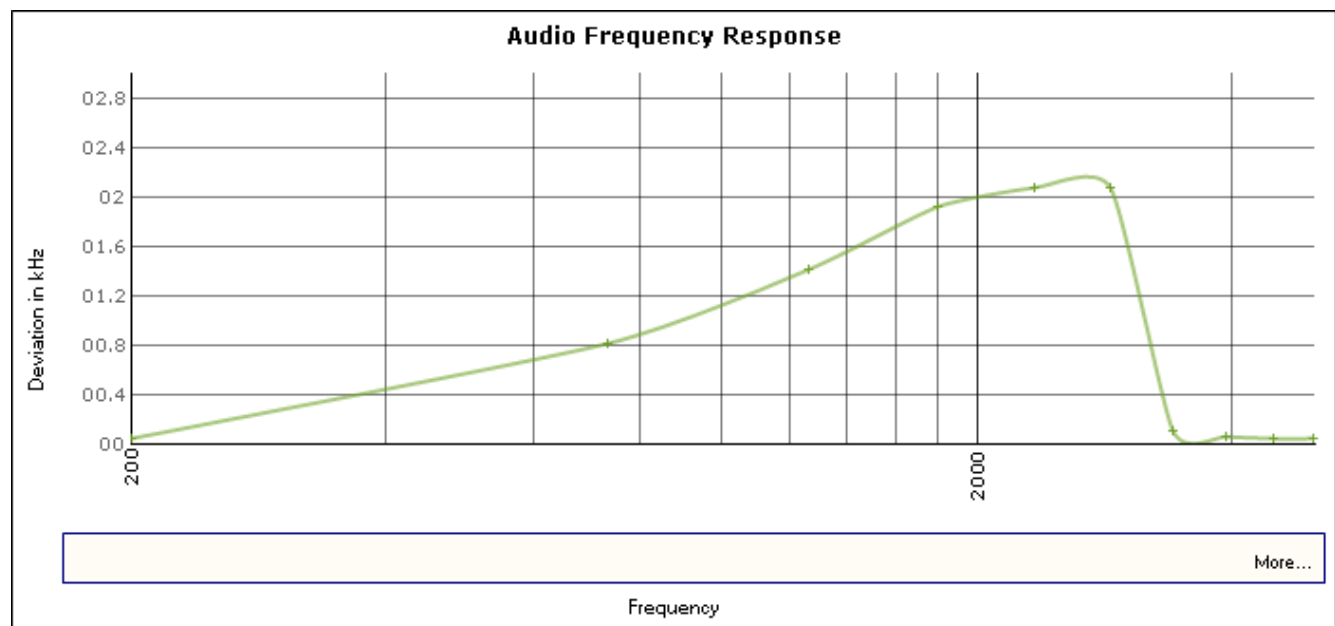
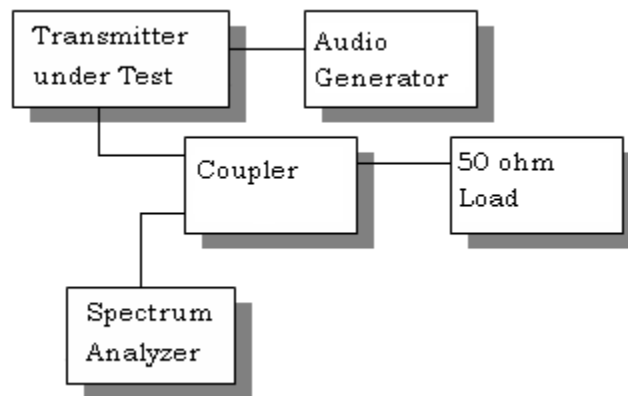
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## MODULATION CHARACTERISTICS

Requirements: [Part 2.1033\(a\) \(b\) & 95.637\(a\) GMRS](#)

Method of Measurement:

The audio frequency response was measured in accordance with ANSI/TIA 603. The audio frequency response curve is shown below. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured.



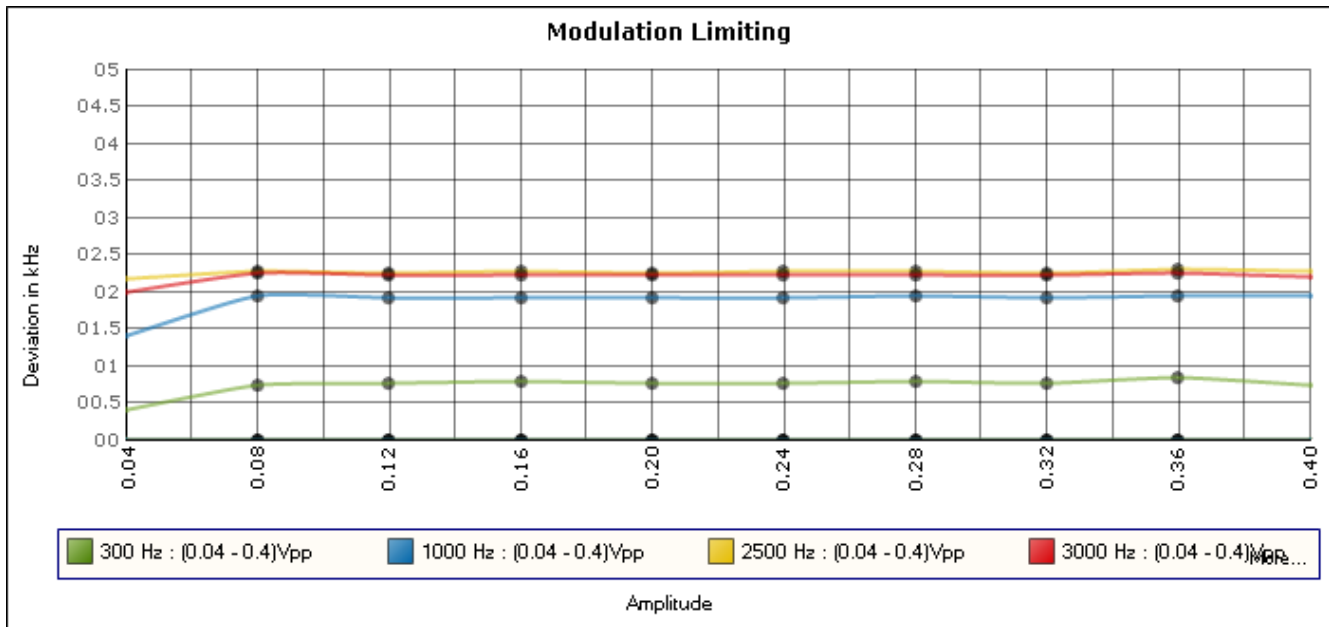
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## MODULATION CHARACTERISTICS for FRS

Requirement: 95.637(a) Audio input versus modulation (Max.  $\pm 2,5\text{kHz}$ )

Method of Measurement: The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz. See the plot below.

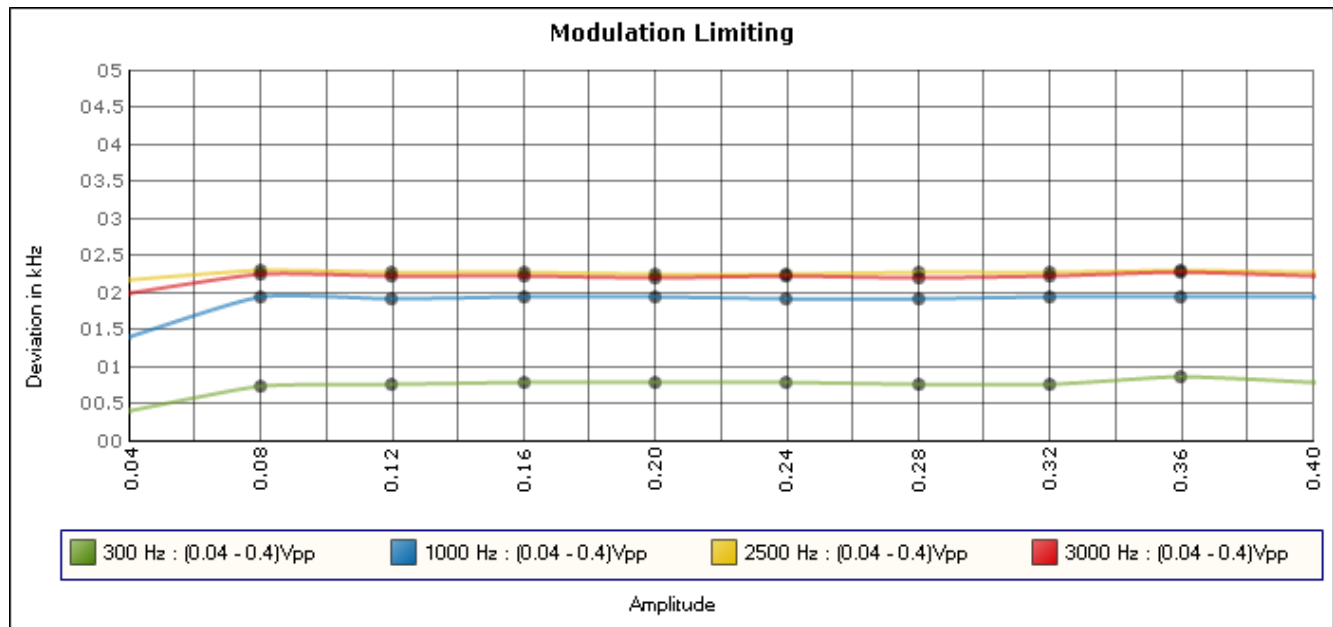


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## MODULATION CHARACTERISTICS for GMRS

Requirement: 95.637(a) Audio input versus modulation(Max.  $\pm 5.0\text{kHz}$ )

Method of Measurement: The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz. See the plot below.

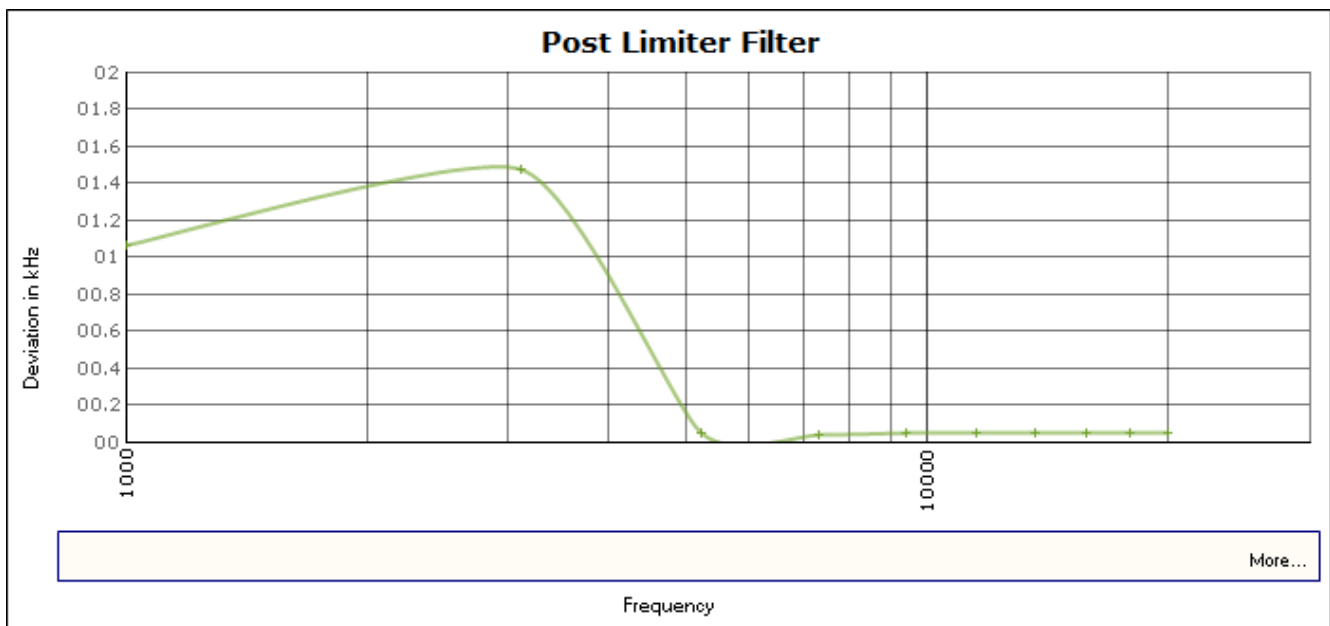


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## MODULATION CHARACTERISTICS

Requirements: 95.637(a)(b)Post Limiter Filter

Requirement: 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.



**Results: PASS**

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## EMISSION DESIGNATOR AND FREQUENCIES

Rule Part No.: [2.1033\(C\)\(4\)](#), [95.631\(a\)\(d\)](#), [95.626 \(a\)](#), [95.621 \(a\)](#)

**GMRS Emission Designator:** 16K0F3E  
 Type of Emission F3E  
 $B_n = 2M + 2D$   
 $M = 3000 \text{ KHz}$   
 $D = \text{KHzK}$   
 $B_n = 2(3000) + (5000) = 16 \text{ KHz}$

**GMRS Authorized Bandwidth** 20.0 kHz  
**GMRS Allowed Channel frequencies (MHz):**

1. 462.5500	10. 462.6625	19. 467.6250
2. 462.5625	11. 462.6750	20. 467.6500
3. 462.5750	12. 462.6875	21. 467.7000
4. 462.5875	13. 462.7000	22. 467.7250
5. 462.6000	14. 462.7125	
6. 462.6125	15. 462.7250	
7. 462.6250	16. 467.5500	
8. 462.6375	17. 467.5750	
9. 462.6500	18. 467.6000	

**FRS Emission Designator:** 10K5F3E  
 Type of Emission F3E  
 $B_n = 2M + 2D$   
 $M = 3000 \text{ KHz}$   
 $D = 2.25 \text{ KHz}$   
 $B_n = 2(3000) + 2(2250) = 10.5 \text{ KHz}$

**FRS Authorized Bandwidth:** 12.5 kHz  
**FRS Allowed Channel frequencies (MHz):**

1. 462.5625	8. 467.5625
2. 462.5875	9. 467.5875
3. 462.6125	10. 467.6125
4. 462.6375	11. 467.6375
5. 462.6625	12. 467.6625
6. 462.6875	13. 467.6875
7. 462.7125	14. 467.7125

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## OCCUPIED BANDWIDTH

Requirement: Part 2.1049(c)& [95.635\(b\)\(1\)\(3\)\(7\) For FRS & GMRS](#)

At least 25 dB 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 BW by more than 100% up to and including 250% of the authorized BW. At least  $43 + \log_{10}(TP)$  dB on any frequency removed from the center of the authorized bandwidth by more than 250%. See the following plot.

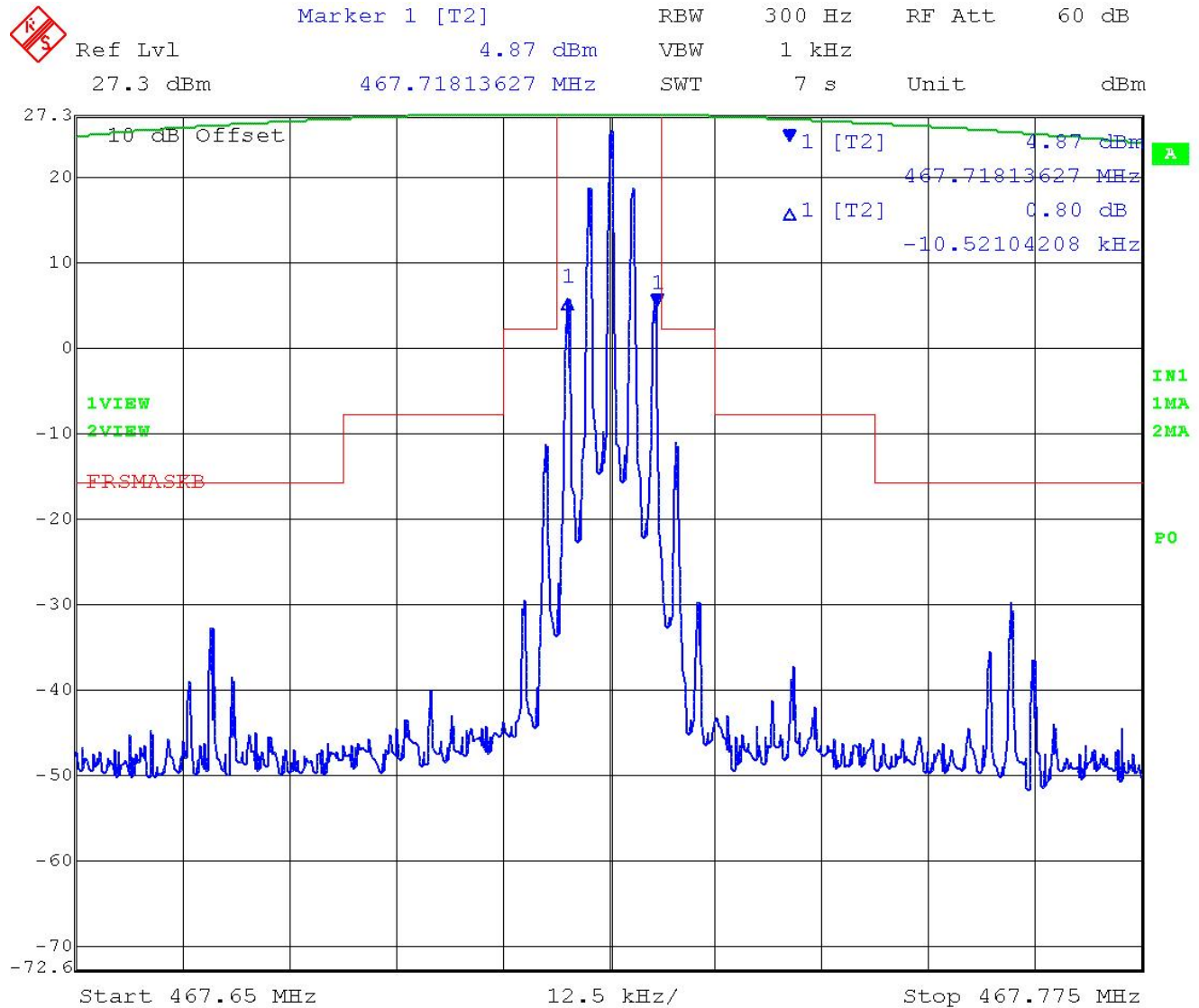
**Test procedure:** ANSI/TIA-603; The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

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# FRS OCCUPIED BANDWIDTH

## MASK B

### FCC 20dB Bandwidth



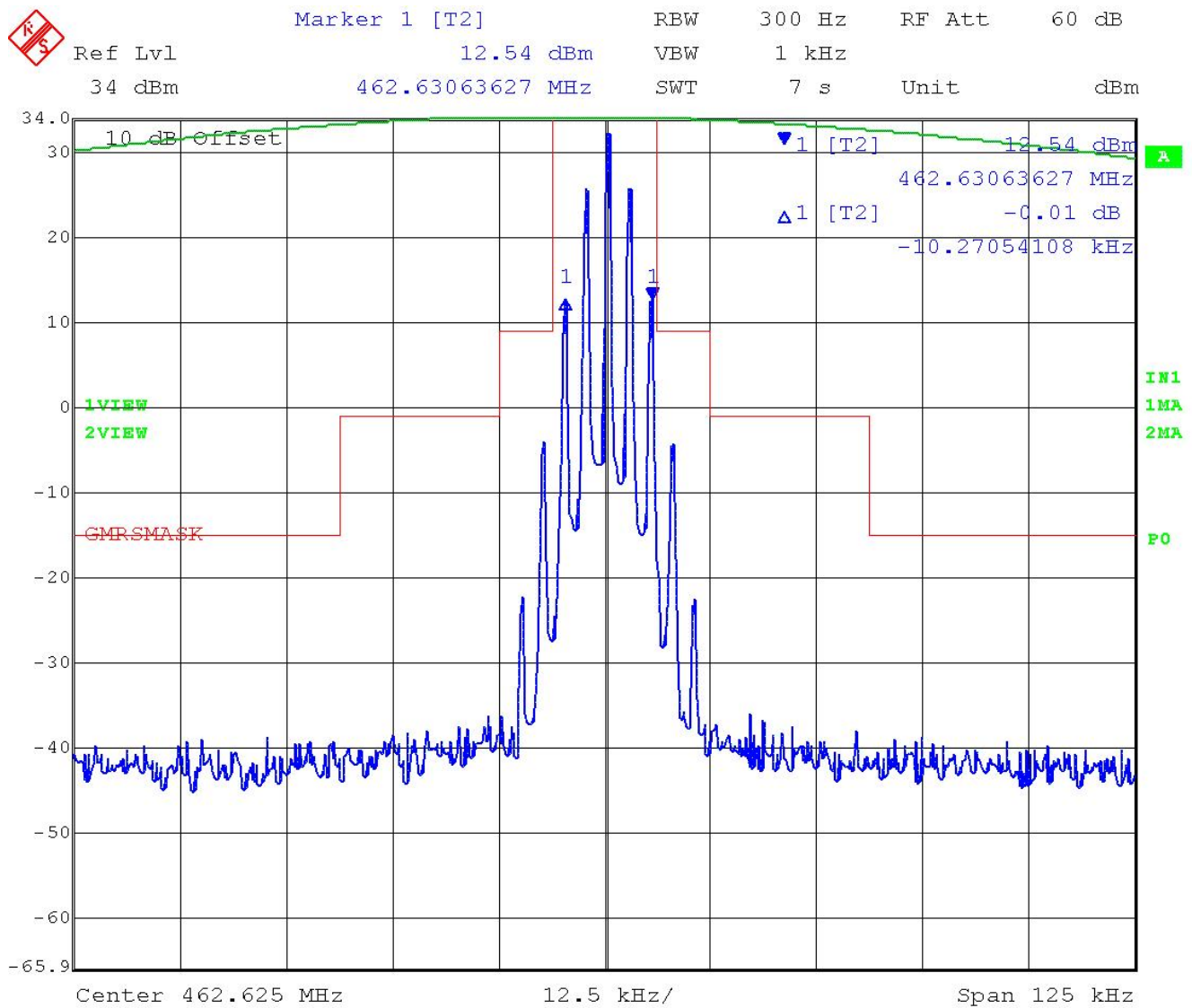
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## GMRS OCCUPIED BANDWIDTH

### MASK B

#### FCC 20dB Bandwidth



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## FIELD STRENGTH OF SPURIOUS EMISSIONS

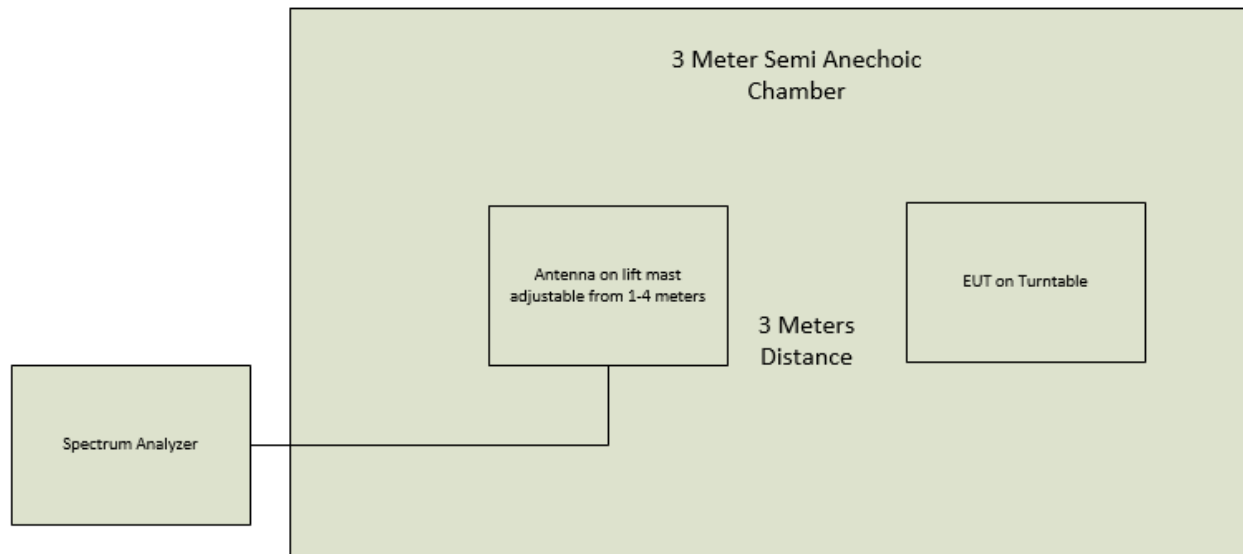
**Rule Parts. No.:** [FCC Part 2.1053](#), [95.635\(b\)\(7\)](#)

**Requirements:** GMRS:  $43 + 10\log(1.75) = 45.43$  dBc  
FRS:  $43 + 10\log(.5) = 42.69$  dBc

**METHOD OF MEASUREMENT:** The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-D: 2010 using the substitution method. Only the worst case for each antenna polarity is shown.

### TEST PROCEDURES:

**Radiation Interference:** The test procedure used was ANSI/TIA 603-C: 2004 using an Rohde & Schwartz Spectrum Analyzer with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.



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## FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: [FCC Part 2.1053](#), [95.635\(b\)\(7\)](#)

Requirements: FRS:  $43 + 10\log(.45) = 39.56$  dB

Test Data (FRS):

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
467.63	Lo	26.56	0.45	39.56	12.50
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)		Margin	
935.28	H	61.41		21.85	
1,402.91	V	63.05		23.49	
1,870.55	H	67.80		28.24	
2,338.19	V	70.69		31.13	
2,805.83	V	78.54		38.97	
3,273.46	V	67.55		27.99	
3,741.10	V	66.03		26.47	
4,208.74	H	70.62		31.06	
4,676.38	H	81.69		42.12	

## FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Data (GMRS):  $43 + 10\log(3.07) = 47.87 \text{ dB}$

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
462.55	Hi	34.87	3.07	47.87	20.00
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)		Margin	
925.10	H	51.40		3.53	
1,387.65	H	61.59		13.71	
1,850.20	H	61.13		13.26	
2,312.75	V	76.42		28.55	
2,775.30	H	79.08		31.21	
3,237.85	H	72.11		24.24	
3,700.40	H	72.77		24.90	
4,162.95	H	79.92		32.05	
4,625.50	V	89.69		41.82	

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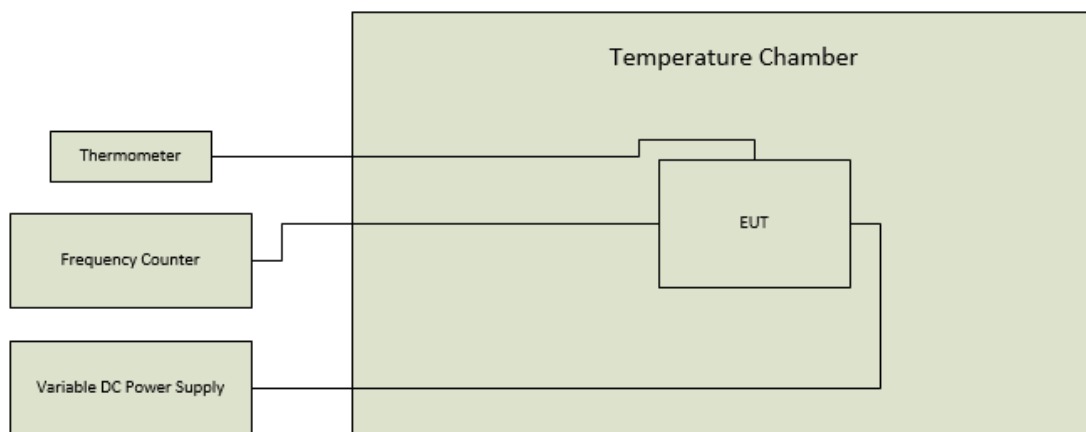
## FREQUENCY STABILITY

**Rule Parts. No.:** [FCC Part 2.1055](#) [Part 95.621\(b\)](#)

**Requirements:** Temperature and voltage tests were performed to verify that the frequency remains within the 0.0005%, 5 ppm specification limit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25° C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worst case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30° C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50° C.

### TEST PROCEDURES:

**Frequency Stability:** The EUT was placed into a temperature chamber. After a reference frequency is measured at room temperature, The EUT frequency is measured at the required extreme temperatures after a 20 minute soak time at each said temperature. The EUT antenna output port was connected to a frequency counter for the frequency measurement of an unmodulated CW signal. The voltage was also varied + and – 15% with a variable DC power supply and the frequency measured and compared to the reference frequency.



**Method of Measurements:** ANSI/TIA 603

**Test Data:**

Temperature	Frequency MHz	PPM
25°C (reference)	462.562538	0
-30°C	462.562455	-0.18
-20°C	462.562592	0.12
-10°C	462.562655	0.25
0°C	462.562654	0.25
10°C	462.562593	0.12
20°C	462.562502	-0.08
30°C	462.562474	-0.14
40°C	462.562488	-0.11
50°C	462.562619	0.17
Battery Voltage	Frequency	PPM
-15%	462.562526	-0.030
15%	462.562496	-0.090

Note: This EUT meets the frequency stability requirement for a FRS:  $\pm 2.5\text{ppm}$  over temp range of  $-20$  degrees  $C^{\circ}$  to  $+50$  degrees  $C^{\circ}$ . It also meets the GMRS frequency stability requirements:  $\pm 5\text{ppm}$  over the temp range  $-30$  degrees  $C^{\circ}$  to  $+50$  degrees  $C^{\circ}$ .

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## EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconnical Chamber	Eaton Chamber	94455-1	1057	06/14/13	06/14/15
Antenna: Log-Periodic	Electro- Metrics	LPA-25	1122	05/09/13	05/09/15
Antenna: Log-Periodic Chamber	Eaton	96005	1243	05/31/13	05/31/15
3-Meter Semi- Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Antenna: Double- Ridged Horn/ETS Horn 1	ETS- Lindgren	3117	00041534	10/05/14	10/05/16
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/12/14	08/12/16
Software: Field Strength Program	Timco	N/A	Version 4.0	N/A	N/A
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	03/11/14	03/11/16

### \*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

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