FCC Test Report

Report No.:AGC02931201206FE10

FCC ID	:	2AWYH-GMR2
PRODUCT DESIGNATION	:	Analog Transceiver
BRAND NAME	:	Rugged Radios
MODEL NAME	:	GMR2
APPLICANT	:	Rugged Radios
DATE OF ISSUE	:	Jan. 04, 2021
STANDARD(S)	:	FCC Part 95 Rules
REPORT VERSION	:	V 1.0

*A*ttestation of *G*lobal *C*ompliance (Shenzhen) Co., Ltd

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 04, 2021	Valid	Initial release

VERIFICATION OF COMPLIANCE

Applicant	Rugged Radios
Address	951 E Grand Ave, Arroyo Grande, CA 93420
manufacturer	Rugged Radios
Address	951 E Grand Ave, Arroyo Grande, CA 93420
Factory	Rugged Radios
Address	951 E Grand Ave, Arroyo Grande, CA 93420
Product Designation	Analog Transceiver
Brand Name	Rugged Radios
Test Model	GMR2
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Date of Test	Dec. 22, 2020~Dec. 31, 2020
Test Result	PASS
Report Template	AGCRT-US-PTT/RF

WE HEREBY CERTIFY THAT:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA 603-E. The sample tested as described in this report is in compliance with the FCC Rules Part 95 requirements. The test results of this report relate only to the tested sample identified in this report.

Prepared By — Donjon Huang (Project Engineer) — Dec. 31, 2020

Reviewed By — Calvin Liu (Reviewer) — Jan. 04, 2021

Approved By — Forrest Lei (Authorized Officer) — Jan. 04, 2021

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

The EUT is a **Analog Transceiver** designed for voice communication. It is designed by way of utilizing the FM modulation achieves the system operating.

A major technical description of EUT is described as following:

Communication Type	Voice/Tone only
Product Designation	Analog Transceiver
Test Model	GMR2
Hardware Version	AUV88BK VER 1.3
Software Version	V1.17
Modulation	FM
Channel Separation	12.5KHz
Emission Type	11K0F3E
Emission Bandwidth	10.59KHz
Maximum Transmitter Power	32.56dBm-2W 26.91dBm-0.5W
Rated Output power	2W/0.5W (It was fixed by the manufacturer, any individual can't arbitrarily change it.)
Antenna Designation	Inseparable
Antenna Gain	1.5dBi
Power Supply	DC 7.4V by battery
Limiting Voltage	DC 6.29V~8.51V
Operation Frequency Range and Channel	GMRS: 462.5500MHz-462.7250MHz(2W) 462.5625MHz-462.7125MHz(2W) 467.5500MHz-467.7250MHz(2W) 467.5625MHz-467.7125MHz(0.5W) Test Channel : 4, 12, 20 and 27 channel
Frequency Tolerance	1.096ppm

Channel List:

CH. No	CH. Freq	Power	CH. No	CH. Freq	Power
1	462.5625	2W	16	467.5500	2W
2	462.5875		17	467.5750	
3	462.6125		18	467.6000	
4	462.6375		19	467.6250	
5	462.6625		20	467.6500	
6	462.6875		21	467.6750	
7	462.7125		22	467.7000	
8	462.5500	2W	23	467.7250	
9	462.5750		24	467.5625	0.5W
10	462.6000		25	467.5875	
11	462.6250		26	467.6125	
12	462.6500		27	467.6375	
13	462.6750		28	467.6625	
14	462.7000		29	467.6875	
15	462.7250		30	467.7125	

1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: **2AWYH-GMR2**, filing to comply with the FCC Part 95 requirements.

1.3 TEST METHODOLOGY.

FCC Part 95: Personal Radio Services
FCC Part 2: Frequency allocations and radio treaty matters, general rules and regulations.
TIA/EIA 603 E: March 2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

1.4 ADDRESS OF THE TEST LABORATORY

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

1.5 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories

A2LA-Lab Cert. No.: 5054.02

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

IC-Registration No.: 24842

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

1.6 SPECIAL ACCESSORIES

Not available for this EUT intended for grant.

1.7 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT EXERCISE

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.3 CONFIGURATION OF TESTED SYSTEM

Fig. 2-1 Configuration of Tested System

Table 2-1 Equipment Used in Tested System

Item	Equipment	Model No.	Identifier	Note
1	Analog Transceiver	GMR2	FCC ID: 2AWYH-GMR2	EUT
2	Adapter	480-10050-E.S	Input: AC 100-240V 50/60Hz, 0.2A Output:: DC 5.0V 1A	AE
3	Charger	N/A	Input: DC 10V 1A Output: DC 8.4V 0.5A	AE
4	Battery	BAT-GMR2	DC 7.4V 1400mA	AE
5	Back clip	N/A	N/A	AE

Note：The battery is full-charged during the test

2.4 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, Uc = ±0.8dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %
- Uncertainty of Frequency: Uc = ±2 %
- Uncertainty of FM deviation: Uc=±2 %
- Uncertainty of Audio Level: Uc=±0.98dB
- Uncertainty of Modulation Limiting: Uc=0.42 %
- Uncertainty of Transient Frequency Behavior: Uc=6.8%

3. SUMMARY OF TEST RESULTS

FCC 47 CFR Part 95 Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Antenna Equipment	FCC CFR Part 95	N/A	PASS
Maximum Transmitter Power	FCC CFR Part 95.1767 FCC 47 CFR Part 2.1046(a)	ANSI/TIA-603-E-2016	PASS
Modulation Limit	FCC CFR Part 95.1775 FCC 47 CFR Part 2.1047(a)(b)	ANSI/TIA-603-E-2016	PASS
Audio Frequency Response	FCC CFR Part 95.1775 FCC 47 CFR Part 2.1047(a)	ANSI/TIA-603-E-2016	PASS
Audio Low Pass Filter Response	FCC 47 CFR Part 95.1775(e)	ANSI/TIA-603-E-2016	PASS
Emission Bandwidth	FCC CFR Part 95.1773 FCC 47 CFR Part 2.1049	ANSI/TIA-603-E-2016	PASS
Emission Mask	FCC CFR Part 95.1779	ANSI/TIA-603-E-2016	PASS
Transmitter Radiated Spurious Emission	FCC CFR Part 95.1779 FCC 47 CFR Part 2.1053	ANSI/TIA-603-E-2016	PASS
Spurious Emission On Antenna Port	FCC CFR Part 95.1779 FCC 47 CFR Part 2.1051	ANSI/TIA-603-E-2016	N/A
Frequency Stability	FCC CFR Part 95.1765 FCC 47 CFR Part 2.1055 (a)(1)	ANSI/TIA-603-E-2016	PASS

Note:

1) N/A: In this whole report not application.
2) The EUT is Integral Antenna.

LIST OF EQUIPMENTS USED

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 09, 2020	Jun. 08, 2021
EXA Signal Analyzer	KEYSIGHT	N9020A	MY53300860	July 15, 2020	July 14, 2021
Horn antenna	SCHWARZBECK	BBHA9170	768	Oct. 09, 2019	Oct. 08, 2021
preamplifier	ETS	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 17, 2019	May. 16, 2021
Broadband Preamplifier	SCHWARZBECK	BBV9718	9718-205	Jun. 09, 2020	Jun. 08, 2021
Double-Ridged Waveguide Horn	ETS	3117	00154520	Oct. 26, 2019	Oct. 25, 2021
SIGNAL	AGILENT	E4421B	MY43351603	Jun. 09, 2020	Jun. 08, 2021
ANTENNA	SCHWARZBECK	VULB9168	VULB9168-494	Jan. 09, 2019	Jan. 08, 2021
ANTENNA	SCHWARZBECK	VULB9168	D69250	Sep.20, 2019	Sep.19, 2021
Modulation Domain Analyzer	HP	53310A	3121A02467	Aug. 26, 2020	Aug. 25, 2021
Small environmental tester	ESPEC	SH-242	93008290	Sep. 03, 2020	Sep. 02, 2022
RF Communication Test Set	HP	8920B	US35010161	Sep. 03, 2020	Sep. 02, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jun. 11, 2020	Jun. 10, 2021
Attenuator	Schaffner	58-30-33	ML030	Oct. 26, 2020	Oct. 25, 2021
RF Cable	R&S	1#	--	Each time	N/A
Fliter-UHF	Microwave	N25155M2	498705	May. 11, 2020	May. 10, 2021

Note: 8920B can generate audio modulation frequency.

4. DESCRIPTION OF TEST MODES

RF TEST MODES

The EUT (**Analog Transceiver**) has been tested under normal operating condition. (GMRS TX) are chosen for testing at each channel separation.

NO.	TEST MODE DESCRIPTION	CHANNEL SEPARATION
1	GMRS TX CHANNEL 4	12.5 kHz
2	GMRS TX CHANNEL 12	12.5 kHz
3	GMRS TX CHANNEL 20	12.5 kHz
4	GMRS TX CHANNEL 27	12.5 kHz

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. Manufacturers use computer PC programming software to switch and operate frequency points, refer to the instructions for details

5. FREQUENCY TOLERANCE

5.1 PROVISIONS APPLICABLE

Standard Applicable [Part 95.1765]The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.
FCC Part 95.1765,
GMRS: 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
The carrier frequency of each GMRS transmitter transmitting an emission with an occupied bandwidth greater than 12.5 kHz must remain within 5 ppm

5.2 MEASUREMENT PROCEDURE

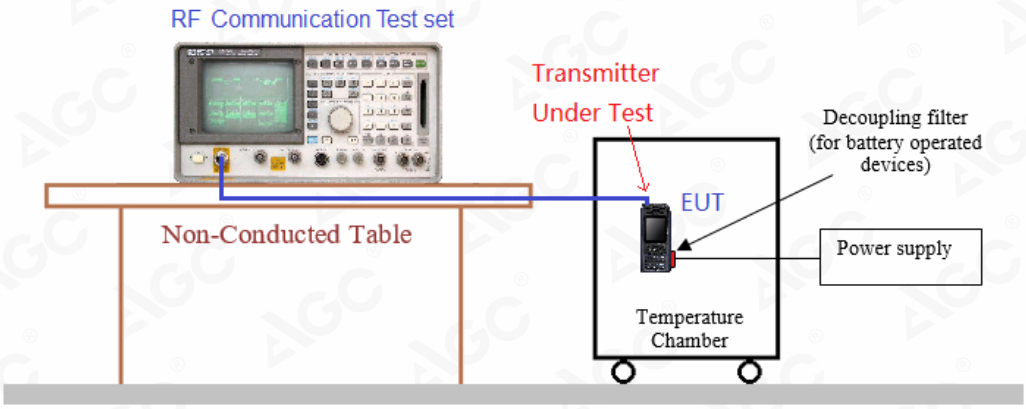
5.2.1 Frequency stability versus environmental temperature

1. Setup the configuration per figure 1 for frequencies measurement inside an environment chamber, Install new battery in the EUT.
2. Turn on EUT and set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1KHz and Video Resolution Bandwidth to 1KHz and Frequency Span to 50KHz.Record this frequency as reference frequency.
3. Set the temperature of chamber to 50℃. 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℃ decreased per stage until the lowest temperature -30℃ is measured, record all measured frequencies on each temperature step.

5.2.2 Frequency stability versus input voltage

1. Setup the configuration per figure 1 for frequencies measured at temperature if it is within 15℃ to 25℃. Otherwise, an environment chamber set for a temperature of 20℃ shall be used. The EUT shall be powered by DC 7.4V.
2. Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1 KHz and Video Resolution Bandwidth to 1KHz. Record this frequency as reference frequency.
3. Supply the EUT primary voltage at the operating end point which is specified by manufacturer and record the frequency.

5.3 TEST SETUP BLOCK DIAGRAM



5.4TEST RESULT

(1) Frequency stability versus input voltage (Supply nominal voltage is 7.4V)

Environment Temperature (℃)	Power Supply	Reference Frequency				Limit:
	(V)	462.6375MHz	462.6500MHz	467.6375MHz	467.6500MHz	ppm
50	DC 7.4	0.781	0.653	0.888	0.686	±2.5for GMRS
40	DC 7.4	0.942	0.923	0.695	0.968	
30	DC 7.4	0.835	0.502	0.742	0.604	
20	DC 7.4	0.611	1.096	0.792	0.718	
10	DC 7.4	0.983	0.576	0.741	0.864	
0	DC 7.4	0.780	0.557	0.704	0.895	
-10	DC 7.4	1.019	1.054	0.584	0.880	
-20	DC 7.4	0.748	0.551	0.770	0.830	
-30	DC 7.4	0.830	0.826	0.702	0.469	
Result	Pass					

(2) Frequency stability versus input voltage (Battery limiting voltage is 6.29V)

Environment Temperature (℃)	Power Supply	Reference Frequency				Limit:
	(V)	462.6375MHz	462.6500MHz	467.6375MHz	467.6500MHz	ppm
50	DC 6.29	0.724	0.558	0.793	0.494	±2.5for GMRS
40	DC 6.29	0.639	0.783	0.594	0.945	
30	DC 6.29	0.709	0.864	0.570	0.677	
20	DC 6.29	0.553	0.804	0.764	0.786	
10	DC 6.29	0.774	1.041	0.583	0.559	
0	DC 6.29	1.052	0.829	1.069	0.427	
-10	DC 6.29	0.507	0.576	0.824	0.696	
-20	DC 6.29	0.572	1.034	0.974	0.554	
-30	DC 6.29	0.522	0.933	0.586	0.983	
Result	Pass					

(3) Frequency stability versus input voltage (Battery Fully Charged voltage is 8.51V)

Environment Temperature (℃)	Power Supply (V)	462.6375MHz	462.6500MHz	467.6375MHz	467.6500MHz	Limit: ppm
50	DC 8.51	0.919	0.767	0.646	0.428	±2.5for GMRS
40	DC 8.51	0.845	0.559	0.926	0.971	
30	DC 8.51	0.652	0.759	1.004	0.749	
20	DC 8.51	1.084	1.090	0.912	0.632	
10	DC 8.51	1.018	0.805	0.540	0.880	
0	DC 8.51	0.926	0.934	0.748	0.379	
-10	DC 8.51	0.603	0.882	0.947	0.422	
-20	DC 8.51	0.638	1.057	1.061	0.444	
-30	DC 8.51	0.833	1.084	0.773	0.478	
Result	Pass					

Note: 1.Battery terminal voltage is declared and specified by the manufacturer.
2. All test values are in "ppm"

6. EMISSION BANDWIDTH

6.1 PROVISIONS APPLICABLE

FCC Part 95.1773: GMRS:

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

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

Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.

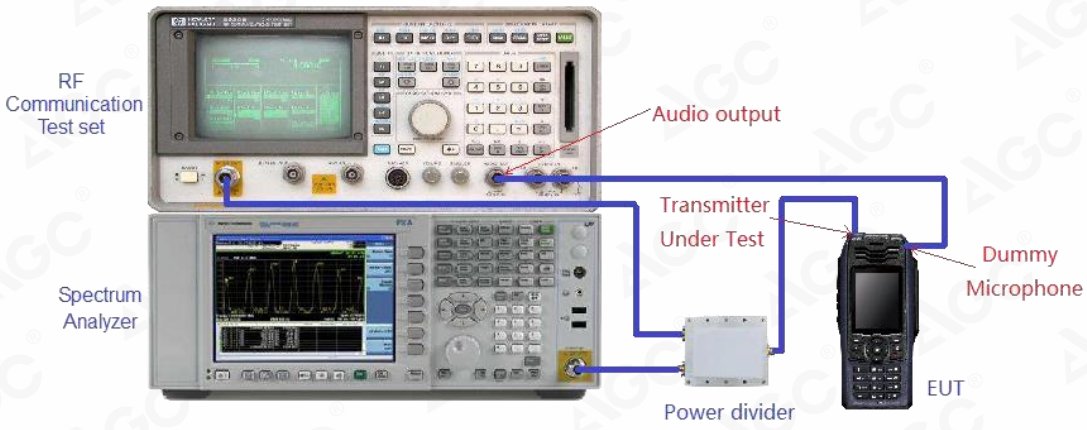
6.2 MEASUREMENT PROCEDURE

1). The EUT was modulated by 2.5 KHz Sine wave audio signal, The level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing).

2). Set SPA Center Frequency = fundamental frequency, RBW=300Hz.VBW= 1KHz, Span =50 KHz.

3). Set SPA Max hold. Mark peak, -26 dB.

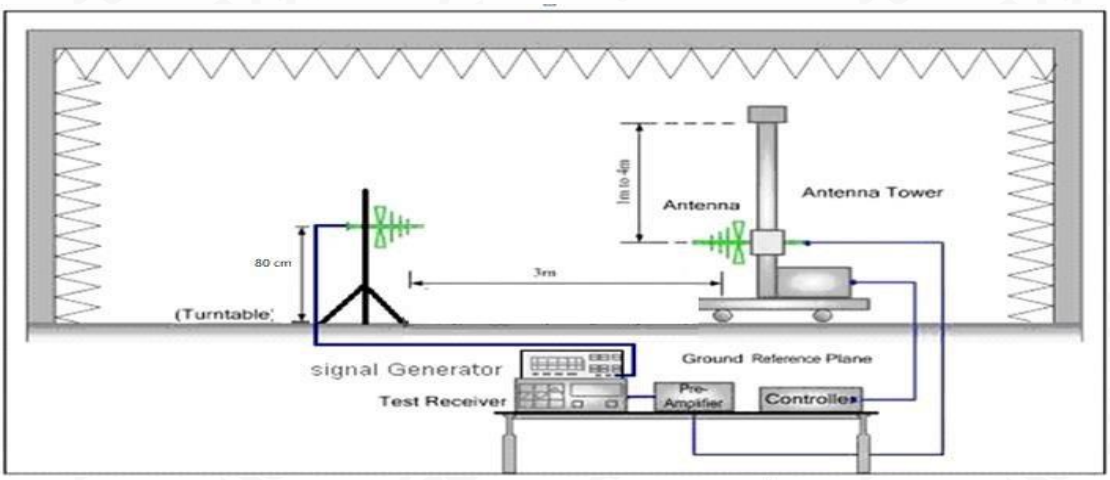
Conduction method:

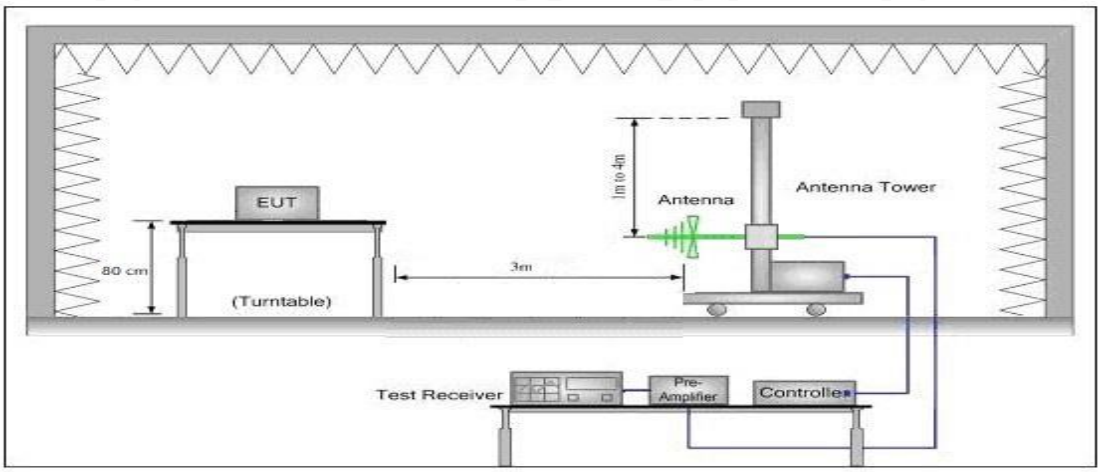


6.3 TEST SETUP BLOCK DIAGRAM

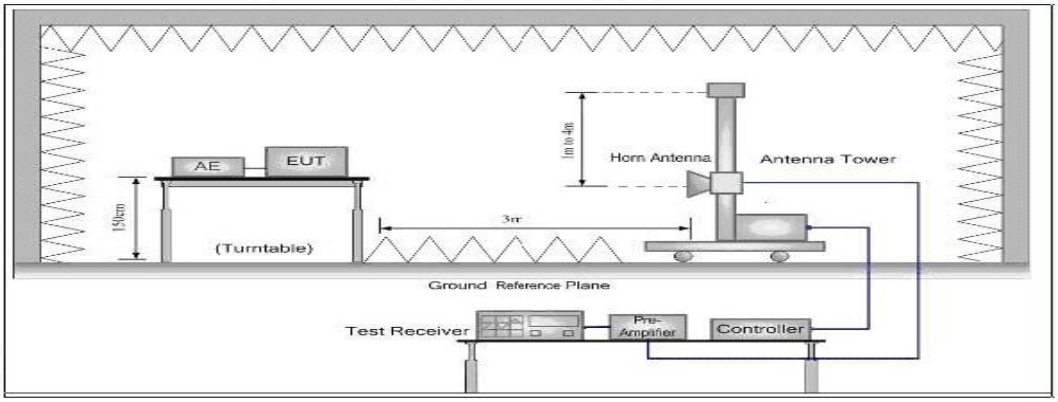
Radiation method:

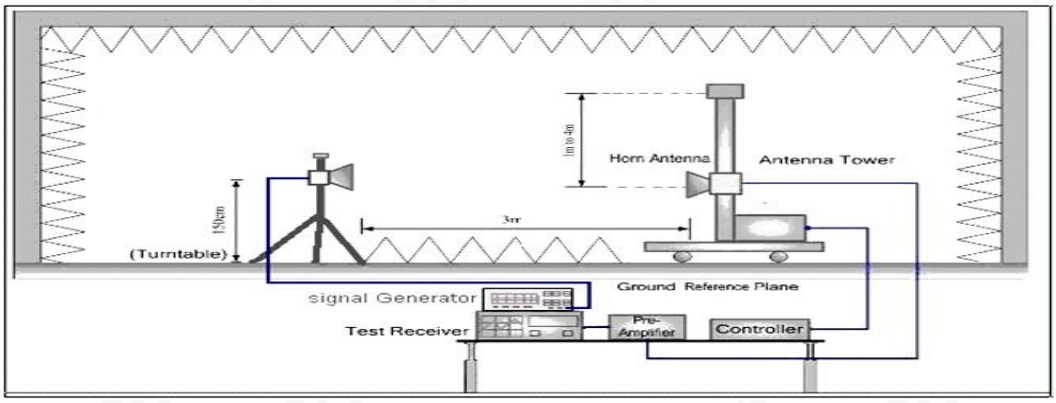
Radiated Below1GHz





Radiated Above 1 GHz

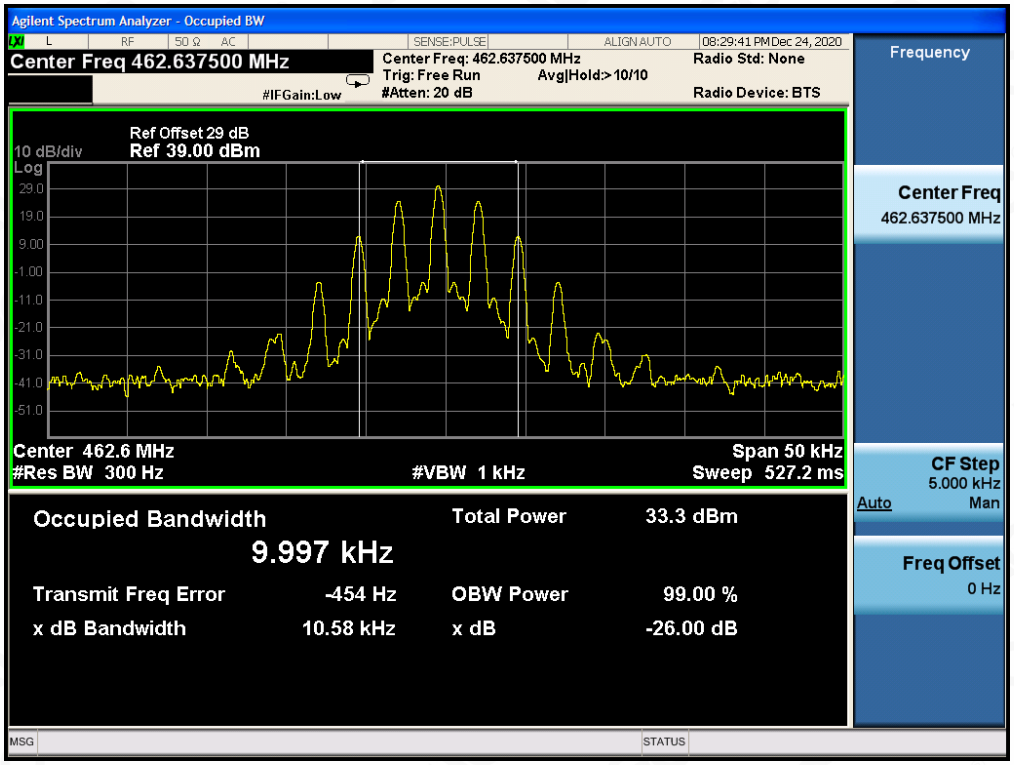




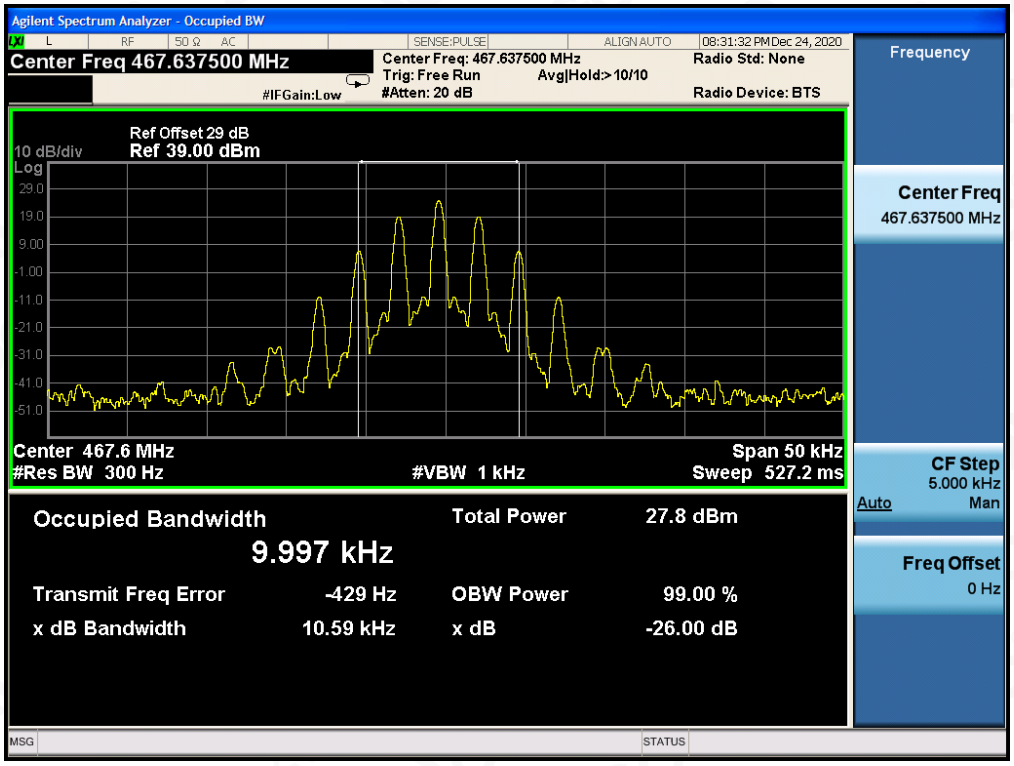
6.4 MEASUREMENT RESULT

Emission Bandwidth Measurement Result				
Operating Frequency	12.5 KHz Channel Separation			
	Occupied Bandwidth	Emission Bandwidth	Limits	Result
462.6375 MHz	9.997 KHz	10.58 KHz	20 KHz	Pass
467.6375 MHz	9.997 KHz	10.59 KHz	12.5KHz	Pass
462.6500 MHz	9.998 KHz	10.58 KHz	20 KHz	Pass
467.6500 MHz	9.998 KHz	10.59 KHz	20 KHz	Pass

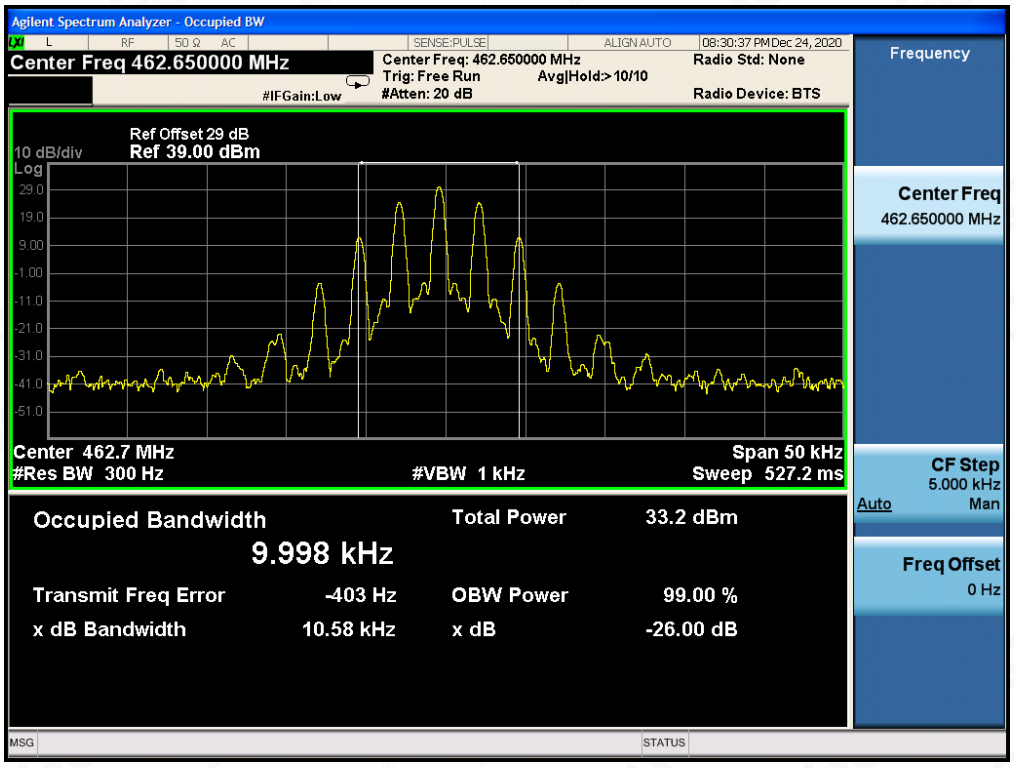
Occupied bandwidth of 462.6375MHz-2W



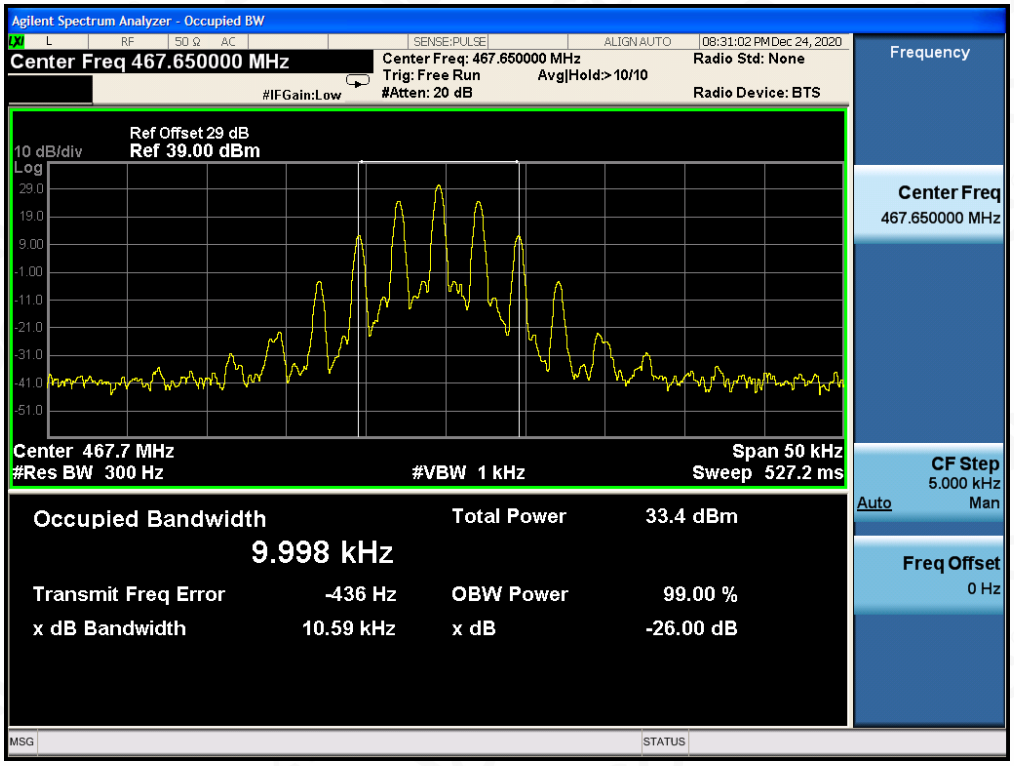
Occupied bandwidth of 467.6375MHz-0.5W



Occupied bandwidth of 462.6500MHz-2W



Occupied bandwidth of 467.6500MHz-2W



7. UNWANTED RADIATION

7.1 PROVISIONS APPLICABLE

Standard Applicable [FCC Part 95.1779]

According to FCC section 95.1779, the unwanted emission should be attenuated below TP by at least 43+10 log(Transmit Power) dB.

7.2 MEASUREMENT PROCEDURE

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
A1D, A3E, F1D, G1D, F2D, F3E, G3E with audio filter	(1), (2), (7)
A1D, A3E, F1D, G1D, F3E, G3E without audio filter	(3), (4), (7)
H1D, J1D, R1D, H3E, J3E, R2E	(5), (6), (7)

(1) Filtering noted for GMRS transmitters refers to the requirement in §95.1775(e).

(2) Unwanted emission power may be measured as either mean power or peak envelope power, provided that the transmitter output power is measured the same way.

(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.

(3) 83 log (fd ÷ 5) dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz up to and including 10 kHz.

(4) 116 log (fd ÷ 6.1) dB or 50 + 10 log (P) dB, whichever is the lesser attenuation, on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 10 kHz up to and including 250% of the authorized bandwidth.

(5) 25 dB on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 150% of the authorized bandwidth.

(6) 35 dB on any frequency removed from the center of the authorized bandwidth by more than 150% 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%.

(1) EUT was placed on a 0.8 or 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made. The radiated emission measurements of all transmit frequencies in all channels were measured with peak detector.

(2) A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

(3)The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).

(4)The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

(5)A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.

(6)The measurement results are obtained as described below: Power(EIRP)=PMea- PAg - Pcl - Ga The measurement results are amend as described below:
Power(EIRP)=PMea- Pcl - Ga

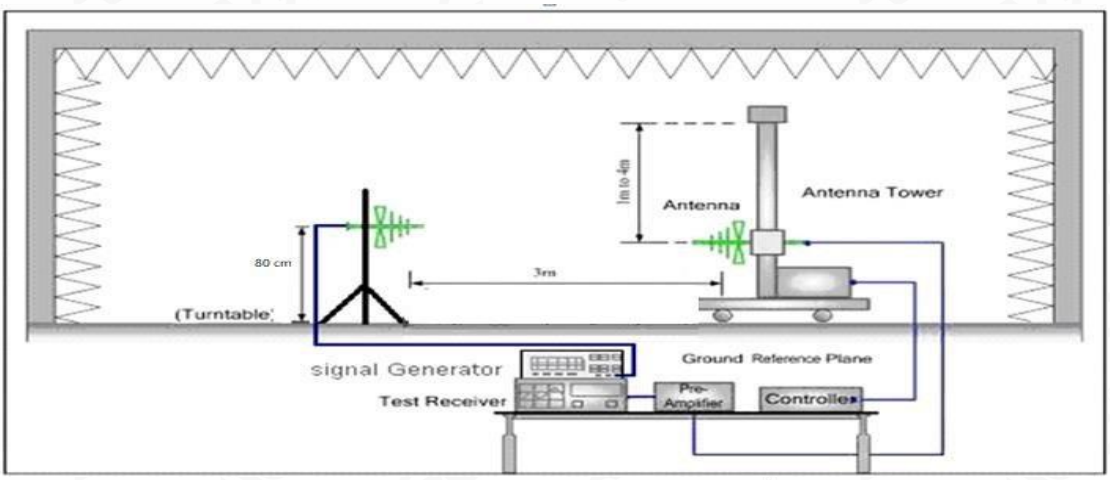
(7)This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

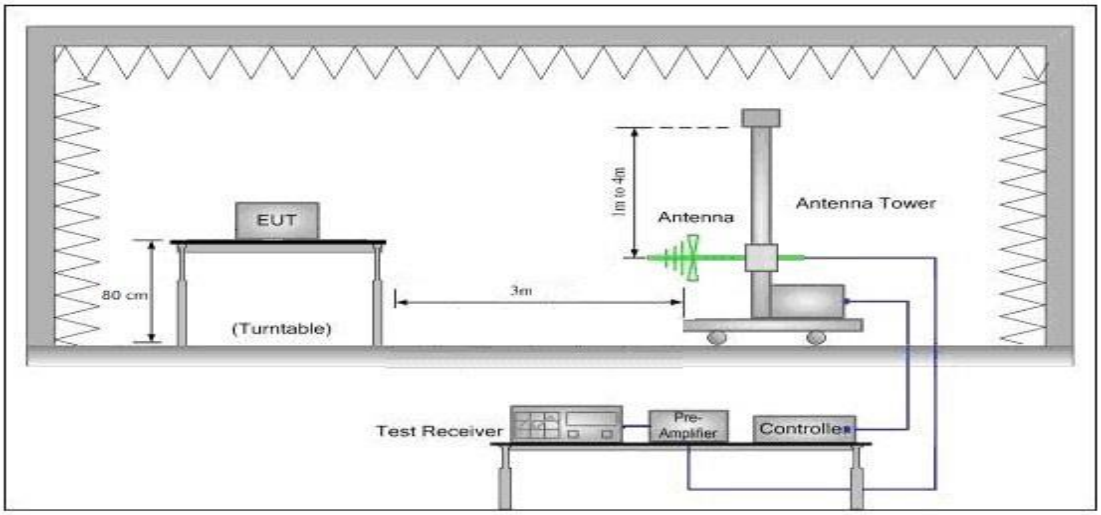
(8)Test the EUT in the lowest channel, the middle channel the Highest channel

7.3 TEST SETUP BLOCK DIAGRAM

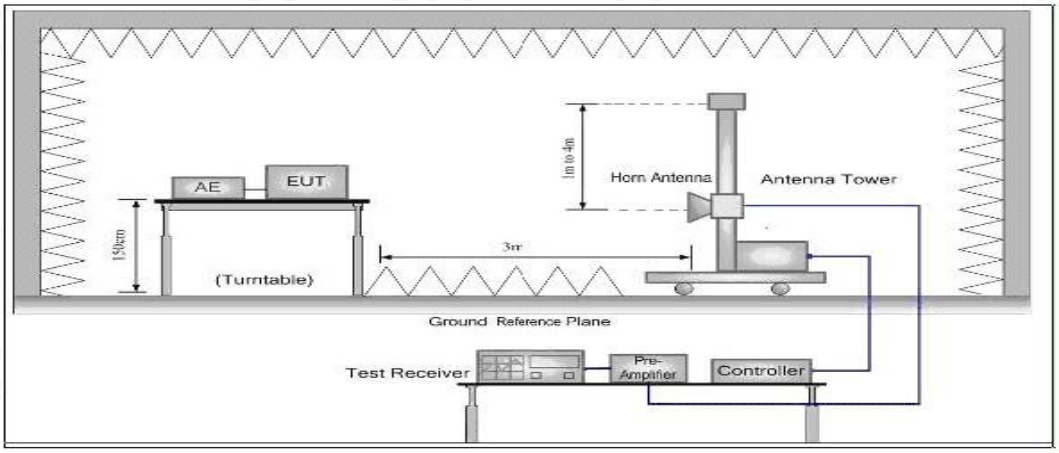
SUBSTITUTION METHOD: (Radiated Emissions)

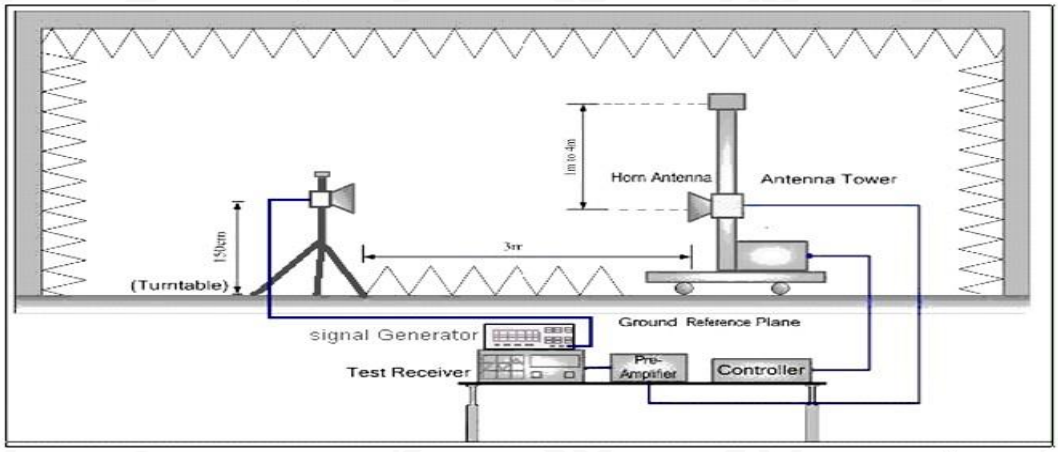
Radiated Below1GHz





Radiated Above 1 GHz



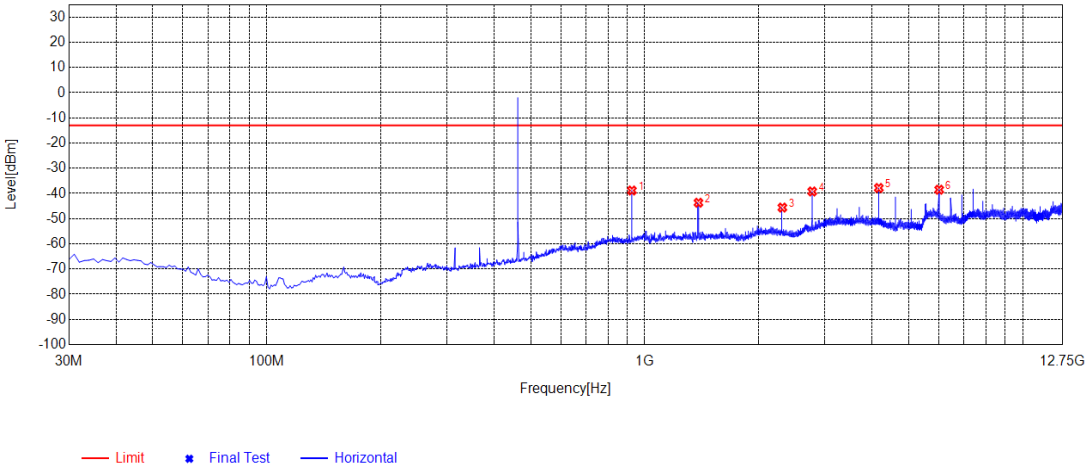


7.4 MEASUREMENT RESULTS:

the unwanted emission should be attenuated below TP by at least 43+10 log(Transmit Power) dB

Limit: At least 43+10 log (P) =43+10log (2) =46.01(dBc) 33.01-46.01= -13dBm
At least 43+10 log (P) =43+10log (0.5) =39.99(dBc) 26.99-39.99= -13dBm

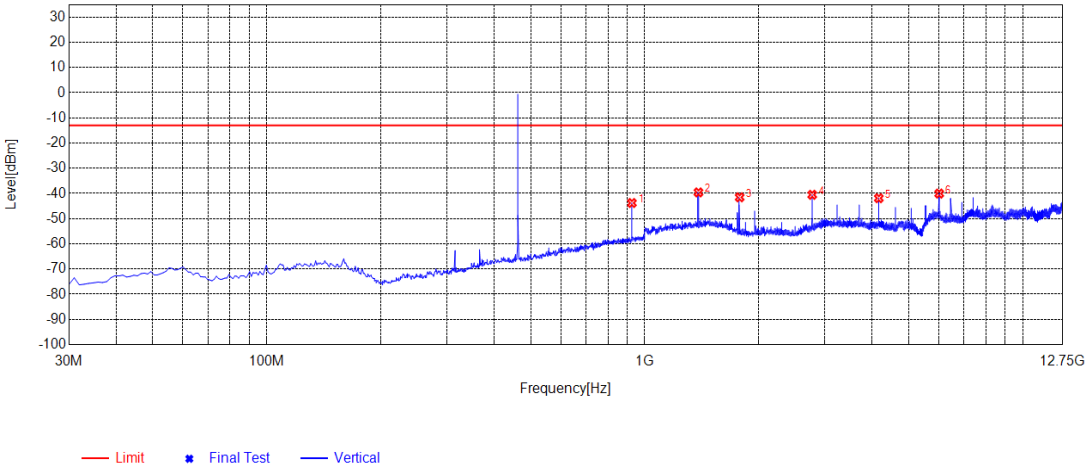
Measurement Result for 12.5 KHz Channel Separation @ 462.6375MHz-2W-Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	925.3100	-82.34	-38.85	-13.00	25.85	43.49	251	Horizontal
2	1387.7888	-40.24	-43.69	-13.00	30.69	-3.45	298	Horizontal
3	2313.7814	-44.90	-45.61	-13.00	32.61	-0.71	204	Horizontal
4	2775.6026	-40.40	-39.23	-13.00	26.23	1.17	158	Horizontal
5	4163.4163	-42.17	-37.84	-13.00	24.84	4.33	213	Horizontal
6	6014.2264	-49.34	-38.52	-13.00	25.52	10.82	195	Horizontal

RESULT: PASS

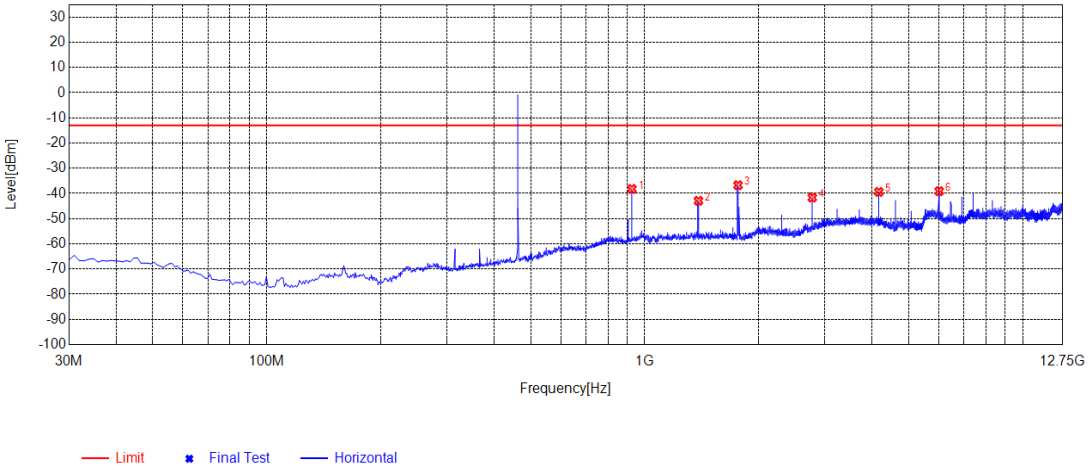
Measurement Result for 12.5 KHz Channel Separation @ 462.6375MHz-2W-Vertical



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	925.3100	-87.37	-43.80	-13.00	30.80	43.57	239	Vertical
2	1387.7888	-41.00	-39.59	-13.00	26.59	1.41	118	Vertical
3	1783.8034	-42.71	-41.54	-13.00	28.54	1.17	202	Vertical
4	2775.6026	-41.82	-40.54	-13.00	27.54	1.28	15	Vertical
5	4163.4163	-45.10	-41.89	-13.00	28.89	3.21	183	Vertical
6	6014.2264	-51.01	-40.06	-13.00	27.06	10.95	276	Vertical

RESULT: PASS

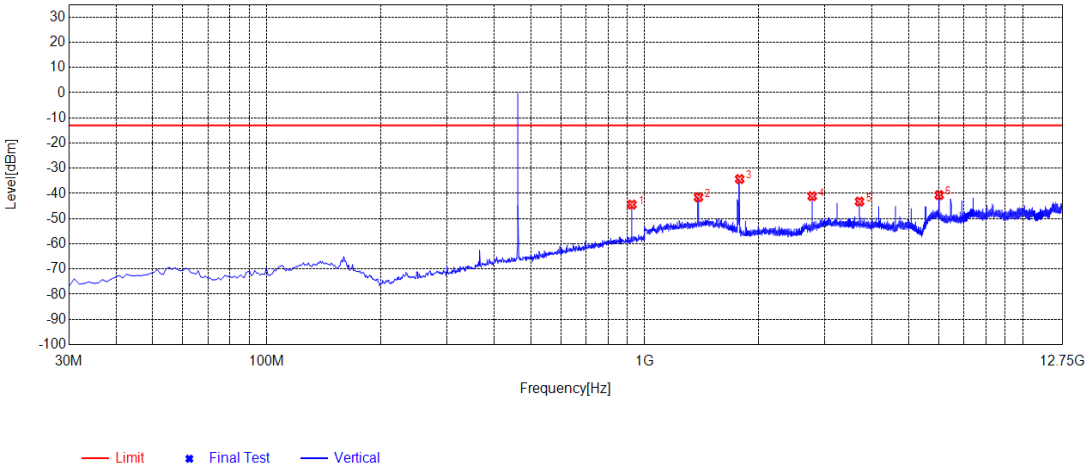
Measurement Result for 12.5 KHz Channel Separation @ 462.6500MHz-2W-Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	925.3100	-81.70	-38.21	-13.00	25.21	43.49	225	Horizontal
2	1387.7888	-39.46	-42.91	-13.00	29.91	-3.45	253	Horizontal
3	1766.1766	-35.51	-36.73	-13.00	23.73	-1.22	336	Horizontal
4	2775.6026	-42.82	-41.65	-13.00	28.65	1.17	169	Horizontal
5	4164.5915	-43.73	-39.40	-13.00	26.40	4.33	187	Horizontal
6	6014.2264	-49.93	-39.11	-13.00	26.11	10.82	225	Horizontal

RESULT: PASS

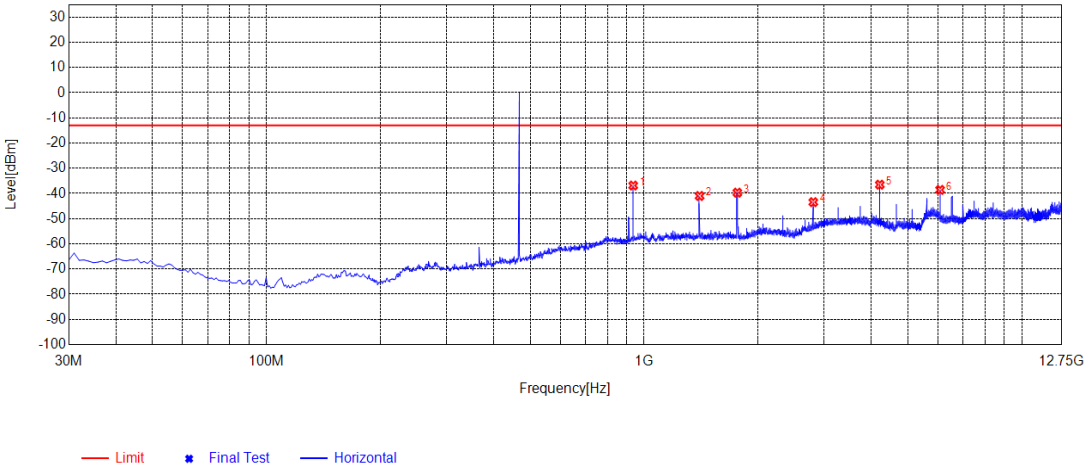
Measurement Result for 12.5 KHz Channel Separation @ 462.6500MHz-2W-Vertical



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	925.3100	-88.00	-44.43	-13.00	31.43	43.57	239	Vertical
2	1387.7888	-42.94	-41.53	-13.00	28.53	1.41	136	Vertical
3	1783.8034	-35.47	-34.30	-13.00	21.30	1.17	118	Vertical
4	2775.6026	-42.38	-41.10	-13.00	28.10	1.28	24	Vertical
5	3701.5952	-46.38	-43.23	-13.00	30.23	3.15	239	Vertical
6	6014.2264	-51.62	-40.67	-13.00	27.67	10.95	184	Vertical

RESULT: PASS

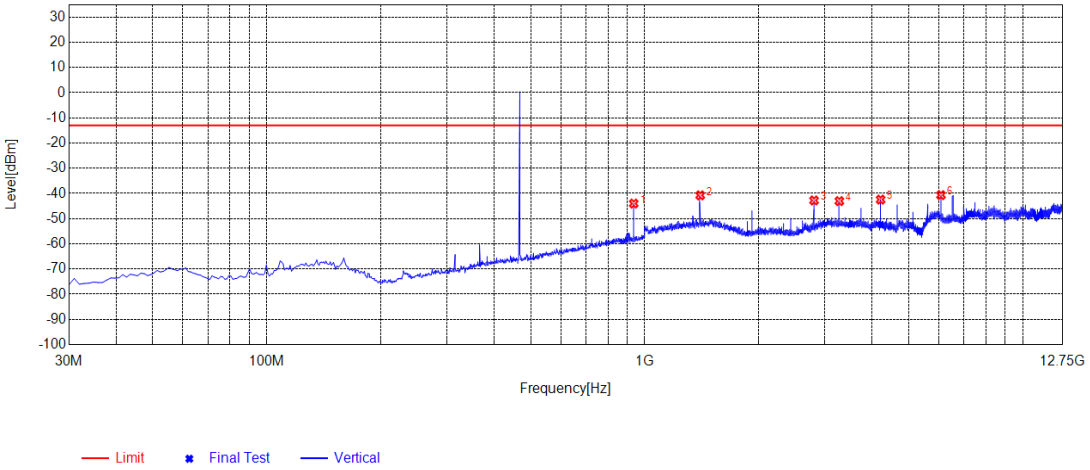
Measurement Result for 12.5 KHz Channel Separation @ 467.6500MHz-2W-Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.9800	-80.59	-36.87	-13.00	23.87	43.72	233	Horizontal
2	1403.0653	-37.60	-41.01	-13.00	28.01	-3.41	214	Horizontal
3	1766.1766	-38.47	-39.69	-13.00	26.69	-1.22	1	Horizontal
4	2806.1556	-44.92	-43.46	-13.00	30.46	1.46	148	Horizontal
5	4209.2459	-40.75	-36.53	-13.00	23.53	4.22	158	Horizontal
6	6080.0330	-49.52	-38.60	-13.00	25.60	10.92	260	Horizontal

RESULT: PASS

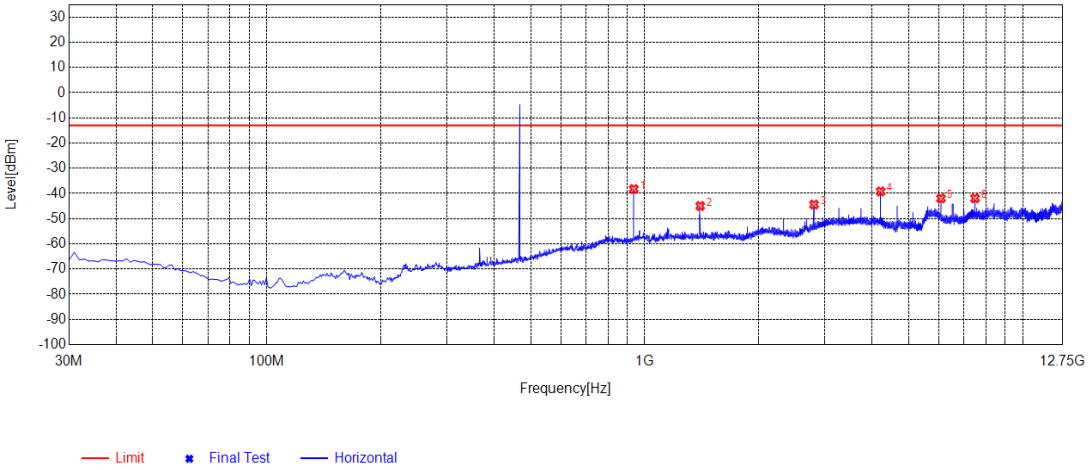
Measurement Result for 12.5 KHz Channel Separation @ 467.6500MHz-2W-Vertical



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.9800	-87.70	-44.02	-13.00	31.02	43.68	258	Vertical
2	1403.0653	-42.27	-40.75	-13.00	27.75	1.52	97	Vertical
3	2806.1556	-44.32	-42.78	-13.00	29.78	1.54	228	Vertical
4	3273.8524	-46.17	-43.04	-13.00	30.04	3.13	304	Vertical
5	4209.2459	-45.64	-42.45	-13.00	29.45	3.19	304	Vertical
6	6080.0330	-51.72	-40.67	-13.00	27.67	11.05	199	Vertical

RESULT: PASS

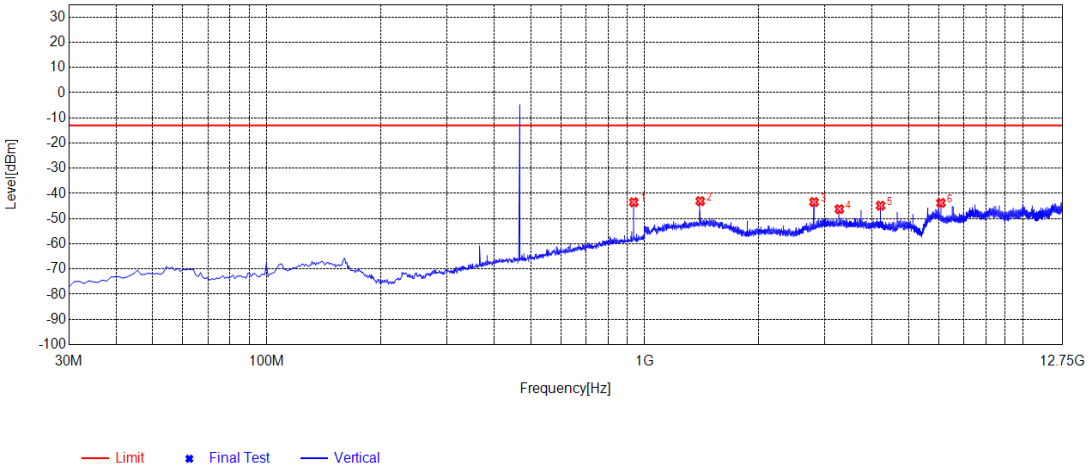
Measurement Result for 12.5 KHz Channel Separation @ 467.6375MHz-0.5W-Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.9800	-81.98	-38.26	-13.00	25.26	43.72	243	Horizontal
2	1403.0653	-41.56	-44.97	-13.00	31.97	-3.41	298	Horizontal
3	2806.1556	-45.88	-44.42	-13.00	31.42	1.46	308	Horizontal
4	4209.2459	-43.43	-39.21	-13.00	26.21	4.22	215	Horizontal
5	6080.0330	-52.89	-41.97	-13.00	28.97	10.92	280	Horizontal
6	7481.9482	-55.54	-41.94	-13.00	28.94	13.60	196	Horizontal

RESULT: PASS

Measurement Result for 12.5 KHz Channel Separation @ 467.6375MHz-0.5W-Vertical



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.9800	-87.18	-43.50	-13.00	30.50	43.68	193	Vertical
2	1403.0653	-44.57	-43.05	-13.00	30.05	1.52	87	Vertical
3	2806.1556	-44.97	-43.43	-13.00	30.43	1.54	50	Vertical
4	3273.8524	-49.37	-46.24	-13.00	33.24	3.13	324	Vertical
5	4209.2459	-48.05	-44.86	-13.00	31.86	3.19	116	Vertical
6	6080.0330	-54.81	-43.76	-13.00	30.76	11.05	184	Vertical

RESULT: PASS

Note:
1. Factor=Antenna Factor + Cable loss. (Below 1GHz)
2. Factor=Antenna Factor+ Cable loss-Pre-amplifier.(Above 1 GHz)
3. Margin=Limit- Level

7.5 EMISSION MASK PLOT

Standard Applicable [FCC Part 95.1779] GMRS: Unwanted emissions shall be attenuated below the unmodulated carrier power in accordance with the following:

(1) 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.

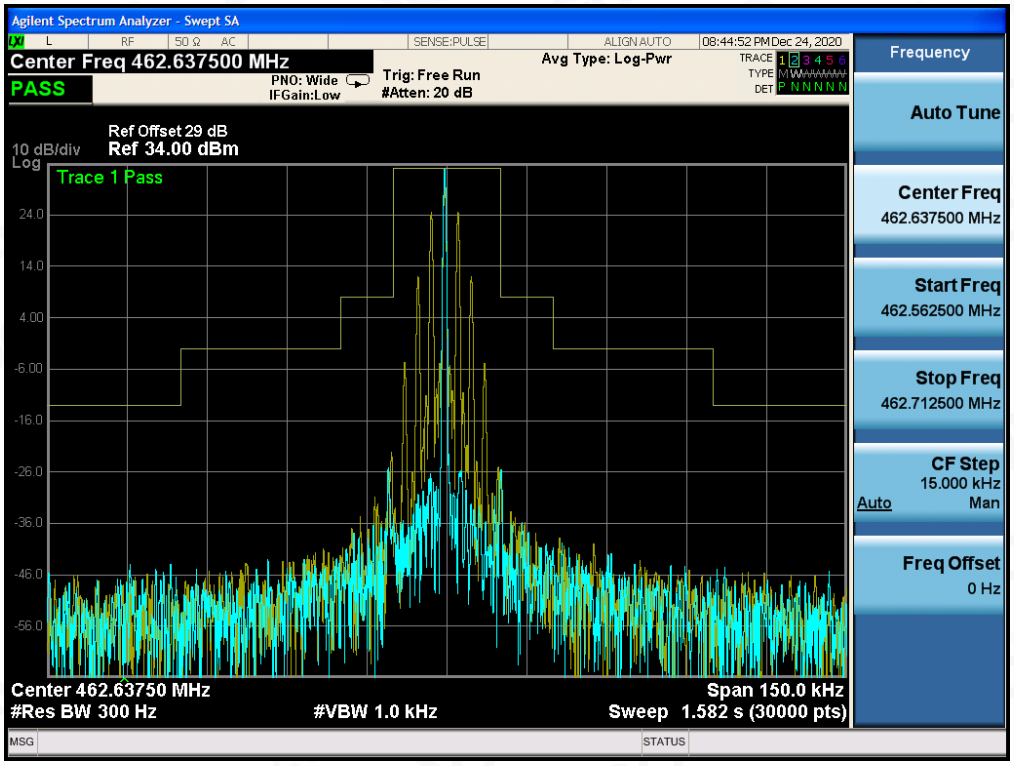
(2) At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100 % up to and including 250 % of the authorized bandwidth.

(3) At least 43 + 10 log10 (T) dB on any frequency removed from the center of the authorized bandwidth by more than250 %.

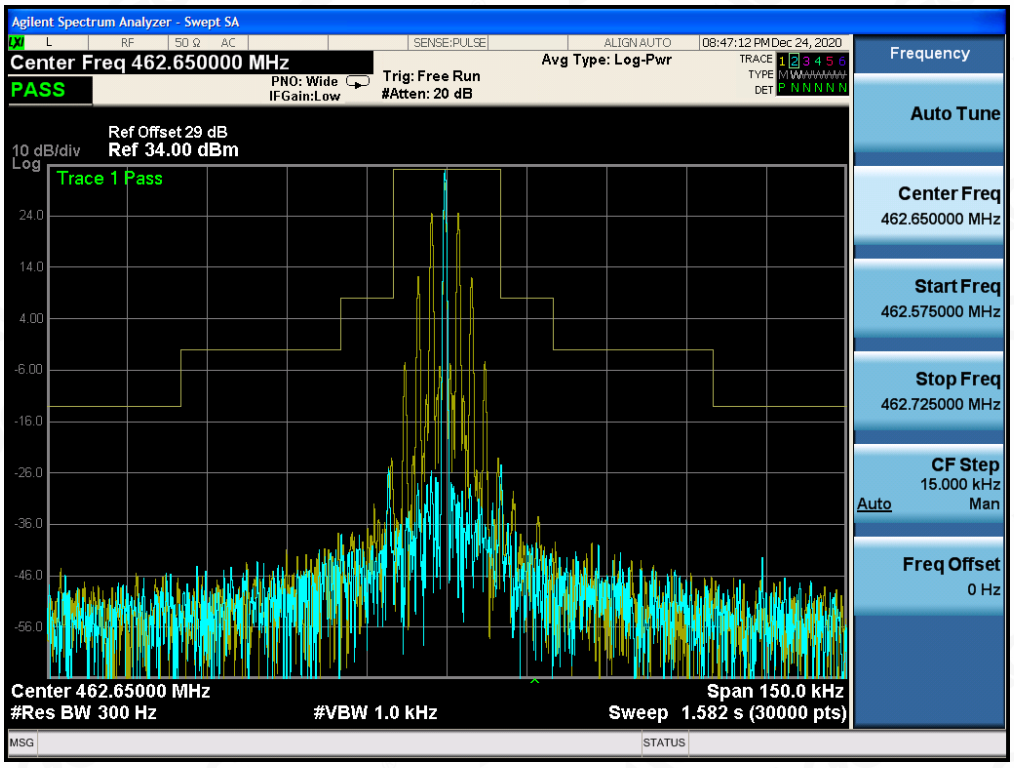
The detailed procedure employed for Emission Mask measurements are specified as following:

- The transmitter shall be modulated by a 2.5 kHz audio signal,
- The level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz.

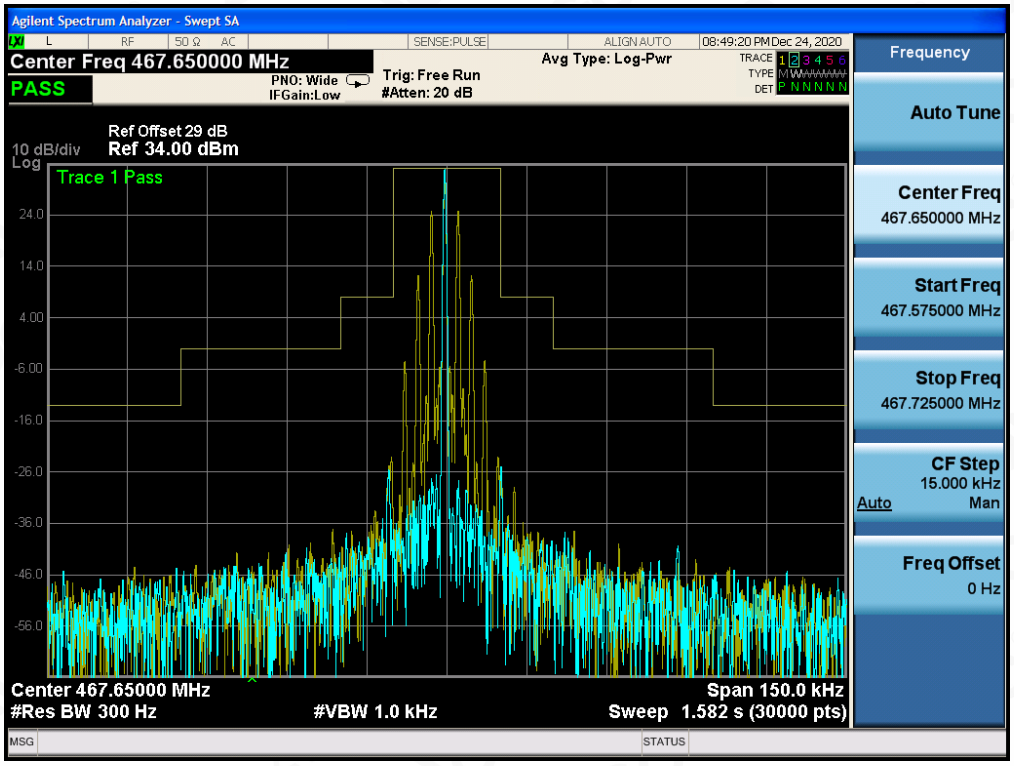
The Worst Emission Mask for channel 4 -2W-12.5K



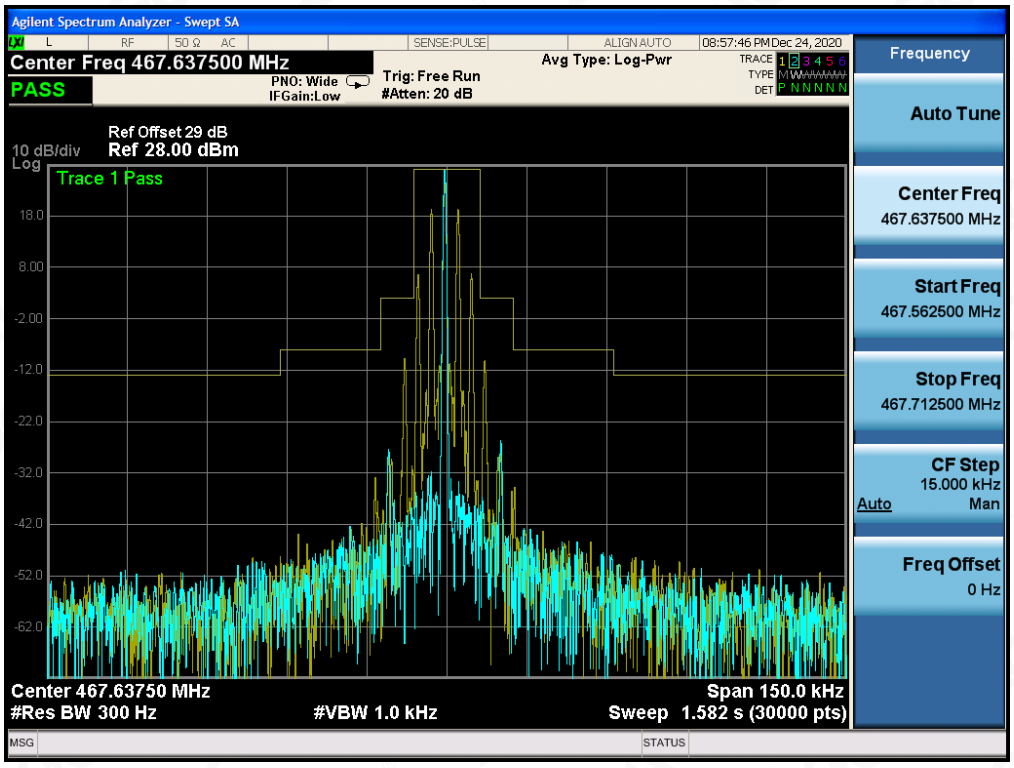
The Worst Emission Mask for channel 12-2W-12.5K



The Worst Emission Mask for channel 20 -2W-12.5K



The Worst Emission Mask for channel 27-0.5W-12.5K



8. AUDIO LOW PASS FILTER RESPONSE

8.1.PROVISIONS APPLICABLE

§95.1775 GMRS modulation requirements

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).

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 (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

8.2.TEST PROCEDURE

(1) The DUT transmitter output port was connected to Modulation Analyzer.

(2) Path loss for the measurement included.

(3) Press 23.1SPCL on modulation analyzer to enable the external LO from SIgen.

(4) Set the Sigen frequency to Fc + 1.5MHz, RF output level to 0dBm without modulation.

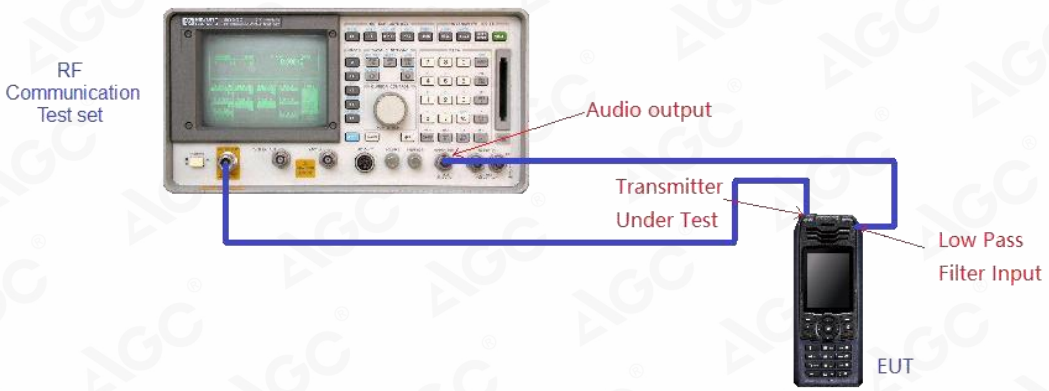
(5) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 60% of the maximum deviation.

(6) Up the amplitude by 20dB.

(7) On DSA, get the reference point to 0dB.

(8) Vary the frequency on audio analyzer from 3 kHz to 30 kHz, record the audio tone from DSA.

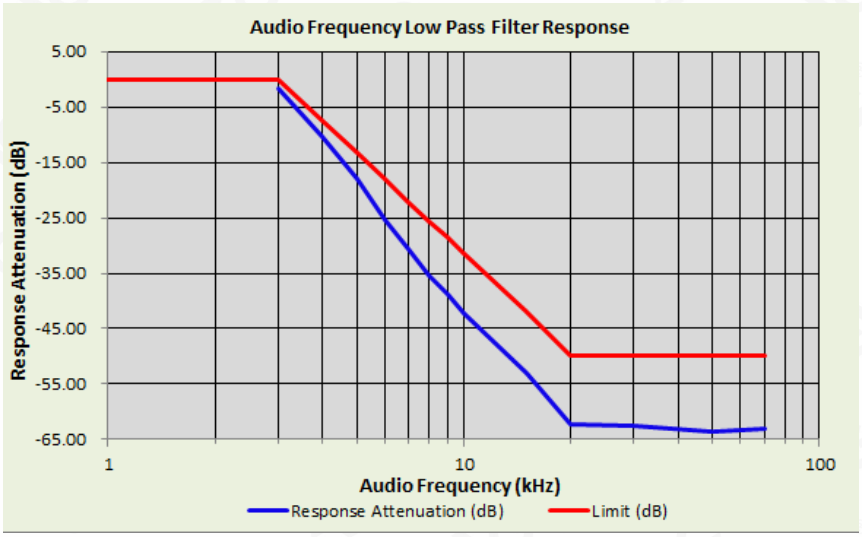
8.3 TEST CONFIGURATION



8.4 TEST RESULT

TEST CHANNEL: 12

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1	0	/
3	-1.74	0.00
4	-10.36	-7.50
5	-18.02	-13.31
6	-25.32	-18.06
7	-30.74	-22.08
8	-35.48	-25.56
9	-38.73	-28.63
10	-42.33	-31.37
15	-53.08	-41.94
20	-62.31	-50.00
30	-62.53	-50.00
50	-63.52	-50.00
70	-62.96	-50.00



Note: All the modes had been tested, but only the worst data recorded in the report.

9. MAXIMUMN TRANSMITTER POWER

9.1 PROVISIONS APPLICABLE

FCC Part 95.1767 For GMRS, the maximum permissible transmitter output power effective radiated power (e.r.p.) as follows.

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.

9.2 TEST PROCEDURE

(1)EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made. The radiated emission measurements of all transmit frequencies in all channels were measured with peak detector

(2)A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver

(3)The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).

(4)The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

(5)A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.

The measurement results are obtained as described below: Power(EIRP)=PMea- PAg - Pcl - Ga The measurement results are amend as described below:

Power(EIRP)=PMea- Pcl - Ga

(6)This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

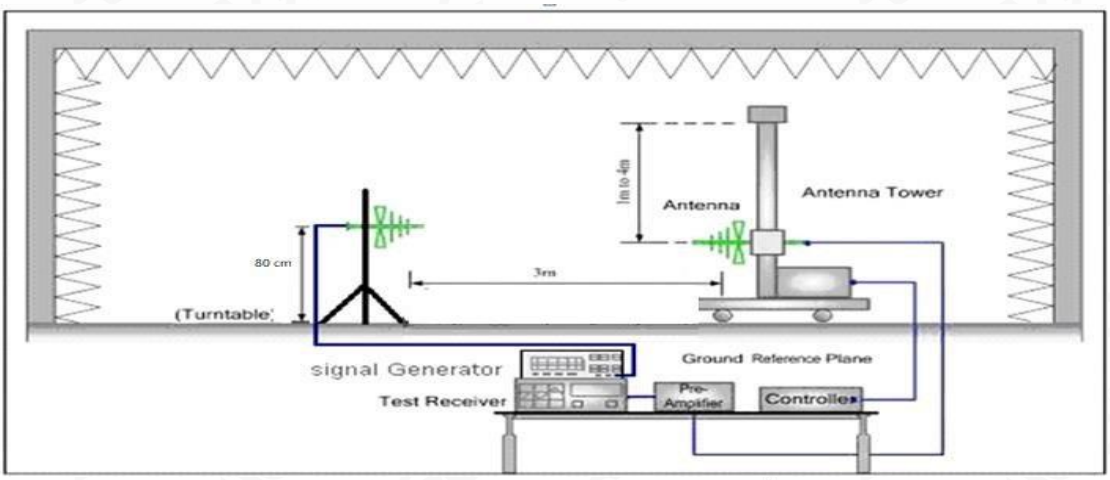
(7)ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

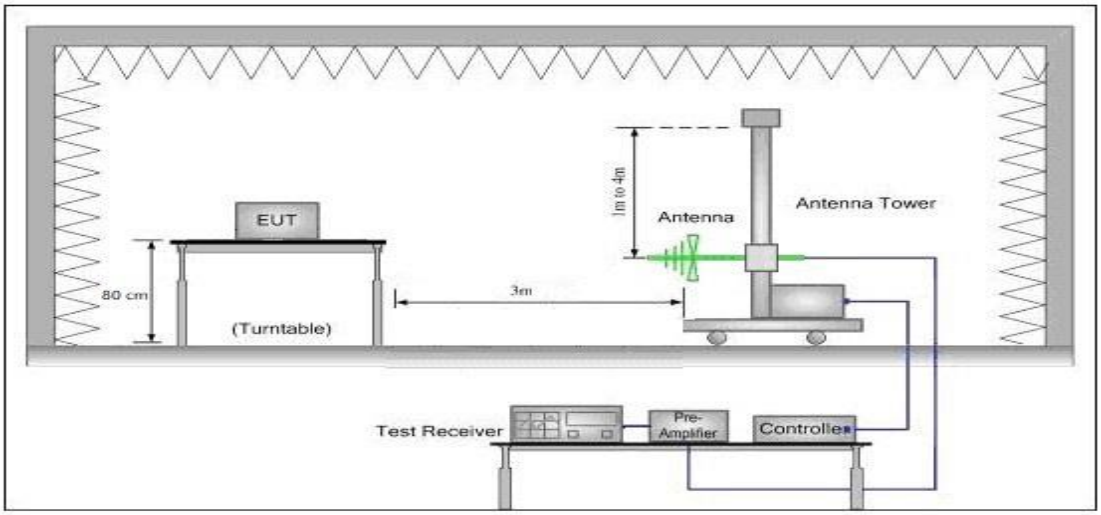
(8)Test the EUT in the lowest channel, the middle channel the Highest channel

9.3 TEST CONFIGURATION

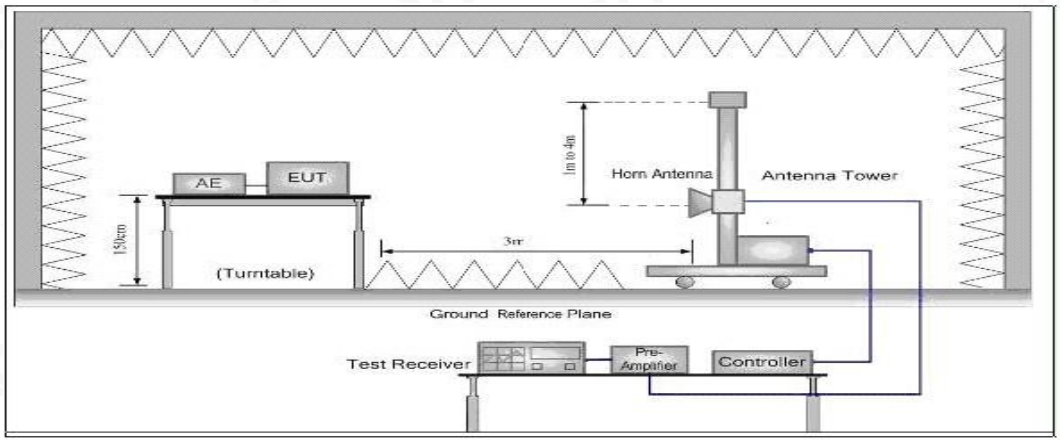
Effective Radiated Power

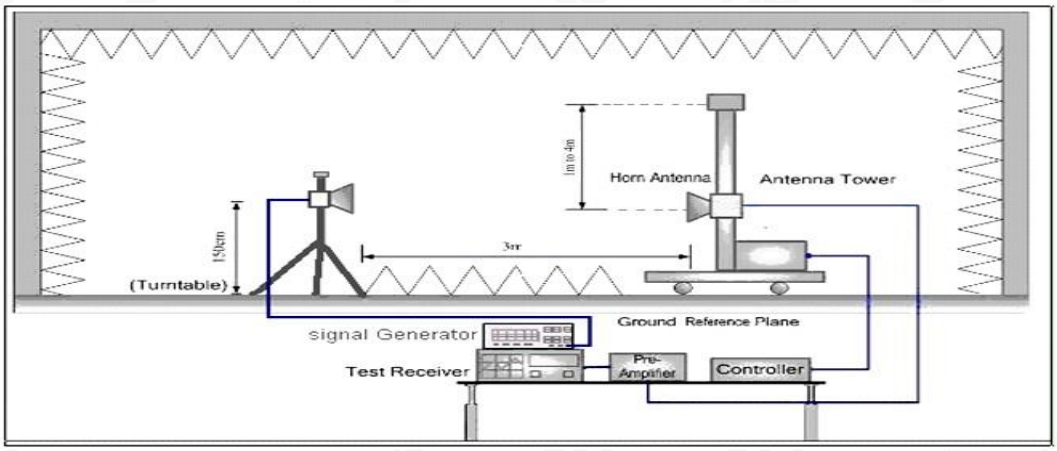
Radiated Below1GHz





Radiated Above 1 GHz





9.4 TEST RESULT

The maximum Power (CP) for UHF is

Analog: 2W/0.5W for 12.5 KHz Channel Separation

Calculation Formula: CP = R + A + L

***** Note:

CP: The final Conducted Power

R : The reading value from spectrum analyzer

A : The attenuation value of the used attenuator

L : The loss of all connection cables

ERP RESULT:

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(W)	(W)	(W)
ChannelSeparation:12.5KHz									
462.6375	101.44	V	26.21	0.38	6.6	32.43	1.75	5	3.25
462.6375	101.37	H	26.14	0.38	6.6	32.36	1.72	5	3.28
462.6500	101.43	V	26.20	0.38	6.6	32.42	1.75	50	48.25
462.6500	101.39	H	26.16	0.38	6.6	32.38	1.73	50	48.27
467.6500	101.57	V	26.34	0.38	6.6	**32.56**	1.80	50	48.20
467.6500	101.5	H	26.27	0.38	6.6	32.49	1.77	50	48.23
467.6375	95.92	V	20.69	0.38	6.6	26.91	0.49	0.5	0.01
467.6375	95.86	H	20.63	0.38	6.6	26.85	0.48	0.5	0.02

NOTE:

Calculation Formula:

Emission Level(dBm) = S.G.(dBm)- Cable Loss(dB)+ Ant.Gain(dBi)

The Ant. Gain including the correct factor 2.15.

Margin(dB) = Limit(dBm)- Emission Level(dBm)

10.SPURIOUS EMISSION ON ANTENNA PORT

10.1 PROVISIONS APPLICABLE

Please refer to FCC 47 CFR 2.1051, 2.1057 & 95.1779 for specification details.

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 95.1779	At least 43 + 10 log (P) dB

43 +10 log (Pwatts)

Note: In general, the worse case attenuation requirement shown above was applied.

Calculation: Limit (dBm) =EL-43-10log10 (TP)

EL is the emission level of the Output Power expressed in dBm,

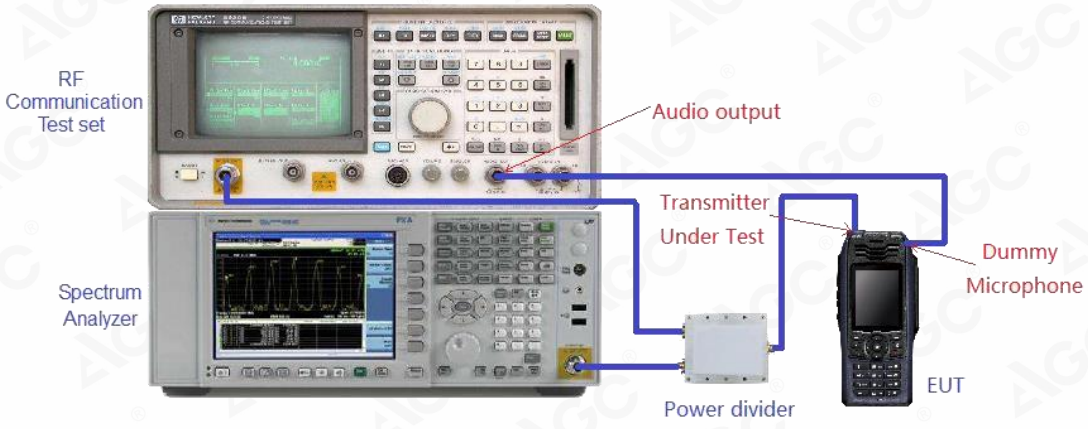
In this application, the EL is P(dBm)

Limit (dBm) = P(dBm)-43-10 log (Pwatts) = -13dBm

10.2 TEST PROCEDURE

1. The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th . Harmonic for the lower and the highest frequency range.
3. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10th Harmonic.
4. The audio input was set the unmodulated carrier, the resulting picture is print out for each channel separation.

10.3 TEST CONFIGURATION



10.4 TEST RESULT

Not applicable

Note: The product is a non-detachable antenna, no need to evaluate this test.

11. MODULATION CHARACTERISTICS

11.1 PROVISIONS APPLICABLE

According to [FCC Part 95.1775, Part 2.1047(a)], for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

Part 95.1775(a) A GMRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus orminus 2.5 kHz, and the audio frequency response must not exceed 3.125 kHz.

Part 2.1047(a) A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of100 to 5000Hz 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 shallbe submitted.

11.2 MEASUREMENT METHOD

11.2.1 Modulation Limit

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

(2). Repeat step 1 with input frequency changing to 300, 1000, 1500 and 3000Hz in sequence.

11.2.2 Audio Frequency Response

Personal Radio Service stations that transmit voice emissions may also transmit audible or subaudible tones or other signals for the purpose of selective calling and/or receiver squelch activation. These tones and signals are ancillary to voice communications and are considered to be included within the voice emission types, e.g., A3E, F3E, and G3E.

(a) Tones that are audible (having a frequency higher than 300 Hertz), must last no longer than 15 seconds at one time.

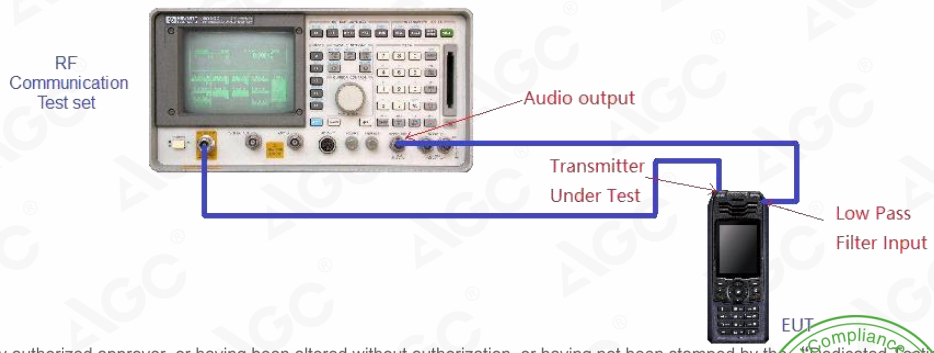
(b) Tones that are subaudible (having a frequency of 300 Hertz or less), may be transmitted continuously during a communication session.

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

(2). Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0 dB).

(3). Vary the Audio frequency from 100 Hz to 10 KHz and record the frequency deviation.

(4). Audio Frequency Response = 20log10 (Deviation of test frequency/Deviation of 1 KHz reference).



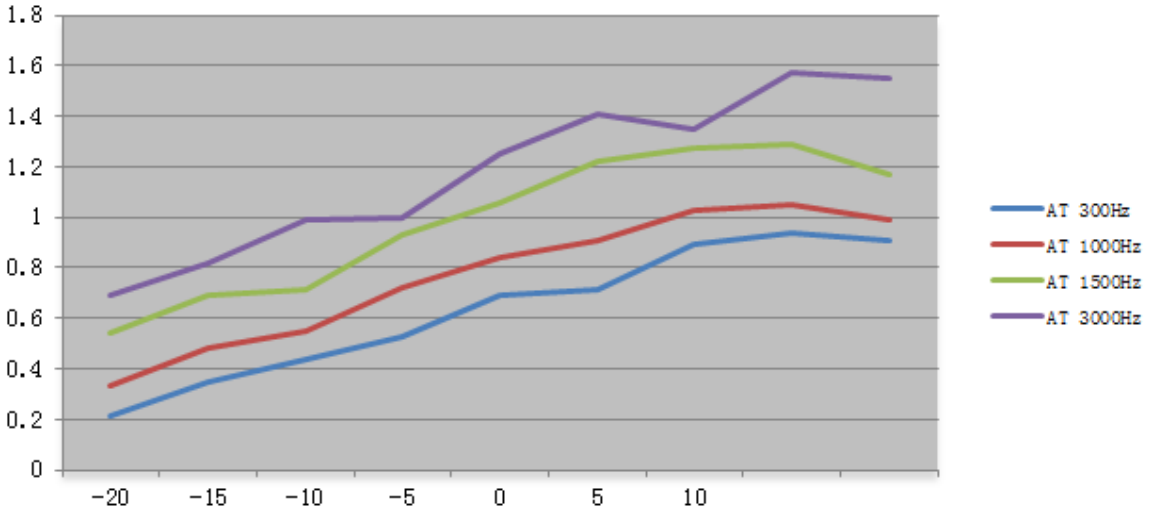
11.3 MEASUREMENT RESULT

TEST CHANNEL: 12

(A). MODULATION LIMIT:

462.6500MHz @ 12.5KHz Channel Separations-2W

Modulation Level (dB)	Peak Freq. Deviation At 300 Hz	Peak Freq. Deviation At 1000 Hz	Peak Freq. Deviation At 1500 Hz	Peak Freq. Deviation At 3000 Hz
-20	0.21	0.33	0.54	0.69
-15	0.35	0.48	0.69	0.82
-10	0.44	0.55	0.71	0.99
-5	0.53	0.72	0.93	1.00
0	0.69	0.84	1.06	1.25
+5	0.71	0.91	1.22	1.41
+10	0.89	1.03	1.27	1.35
+15	0.94	1.05	1.29	1.57
+20	0.91	0.99	1.17	1.55



Note: 1.All the modes had been tested, but only the worst data recorded in the report.

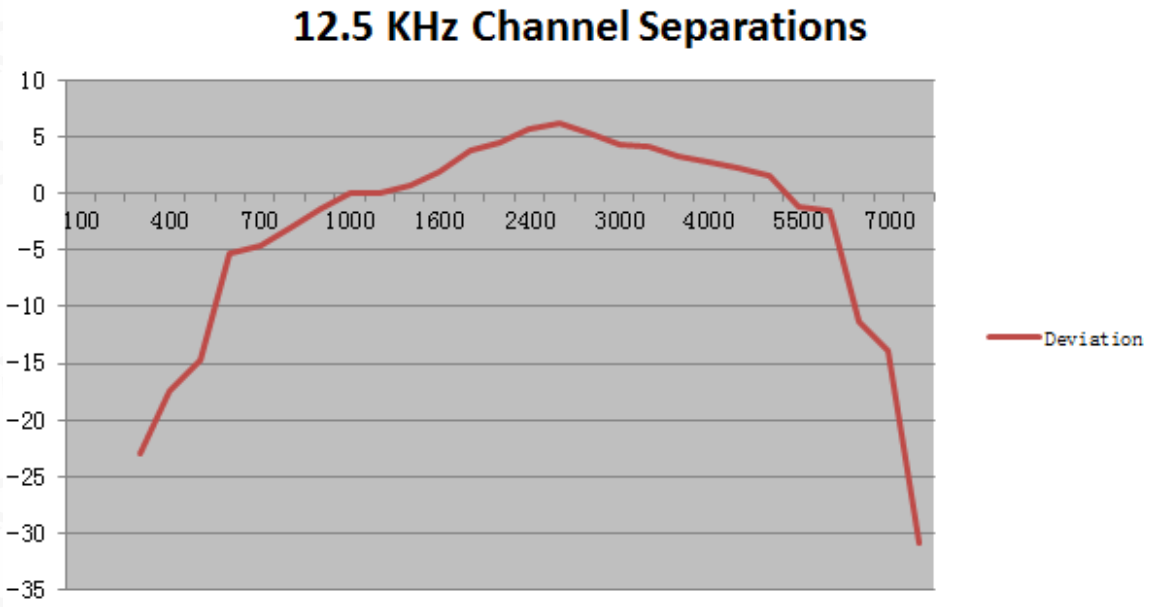
2. The data unit evaluated in this report is "KHz"

(B). AUDIO FREQUENCY RESPONSE:

462.6500MHz @ 12.5 KHz Channel Separations-2W

Frequency (Hz)	Deviation (KHz)	Audio Frequency Response(dB)
100	--	--
200	--	--
300	0.15	-22.96
400	0.28	-17.54
500	0.39	-14.66
600	1.15	-5.27
700	1.25	-4.55
800	1.49	-3.02
900	1.82	-1.28
1000	2.11	0.00
1200	2.13	0.08
1400	2.28	0.67
1600	2.63	1.91
1800	3.28	3.85
2000	3.57	4.57
2400	4.03	5.62
2500	4.31	6.20
2800	3.89	5.31
3000	3.47	4.32
3200	3.42	4.19
3600	3.11	3.37
4000	2.89	2.73
4500	2.74	2.27
5000	2.53	1.58
5500	1.85	-1.14
6000	1.77	-1.53
6500	0.57	-11.37
7000	0.43	-13.82
7500	0.06	-30.92
9000	--	--
10000	--	--
14000	--	--
18000	--	--
20000	--	--
30000	--	--

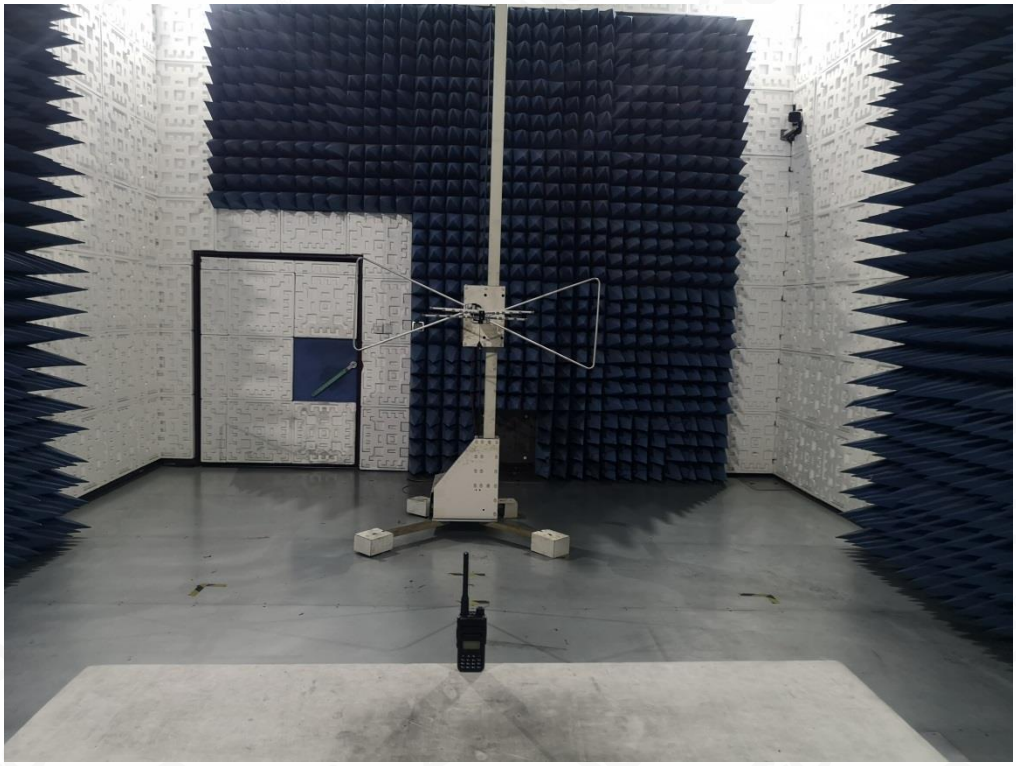
Frequency Response Result



Note: All the modes had been tested, but only the worst data recorded in the report.

APPENDIX I: PHOTOGRAPHS OF SETUP

RADIATED EMISSION TEST SETUP



RADIATED EMISSION ABOVE 1G TEST SETUP

APPENDIX II: PHOTOGRAPHS OF EUT

Please refer to the project number: AGC02931201206AP01

----END OF REPORT----

Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3.The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. The non-CMA report issued by AGC is only permitted to be used by the client as internal reference use and shall not be used for public demonstration purpose.

5. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

6. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

7. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

8.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

9. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.

10. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.