FCC Part 95 Rules
TEST REPORT

Test report
On Behalf of
Midland Radio Corporation
For
Midland Radio Corporation
Model No.: T295, T290
FCC ID: MMAT295

Prepared for :	**Midland Radio Corporation** **5900 Parretta Drive Kansas City, Missouri United States 64120-2134**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China**
Date of Test:	**Sept. 27, 2018~Oct. 25, 2018**
Date of Report:	**Nov. 14, 2018**
Report Number:	**HK1810251376E**

TEST RESULT CERTIFICATION

Applicant's name ..... :	Midland Radio Corporation
Address ..... :	5900 Parretta Drive Kansas City, Missouri United States 64120-2134
Manufacture's Name ..... :	Global Link Corp.Ltd.
Address ..... :	Room 13B, China Minmetals Tower 79 Chatham Rd. S. Tsim Sha Tsui, Kowloon, Hong Kong
Product description	X-Talker two way radio
Brand Name	Midland Radio
Mode Name	T295
Standards ..... :	FCC Rules and Regulations Part 95

Date of Test ..... :	**Oct. 25, 2018**
Date (s) of performance of tests ..... :	**Sept. 27, 2018~Oct. 25, 2018**
Date of Issue ..... :	**Nov. 14, 2018**
Test Result ..... :	**Pass**

Testing Engineer : Gary Qian

(Gary Qian)

Technical Manager : Eden Hu

(Eden Hu)

Authorized Signatory : Jason Zhou

(Jason Zhou)

Revision	Issue Date	Revisions	Revised By
V1.0	Oct. 25, 2018	Initial Issue	Jason Zhou
V1.1	Nov.14, 2018	Revise Report P.5/P.10/P.15/P.19~21	Jason Zhou

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

The EUT is a GMRS Radio 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:

Hardware Version	T290_X0
Software Version	1.27
Modulation	FM
Channel Separation	12.5KHz/25KHz
Emission Type	F3E
Emission Bandwidth	10.512KHz (25KHz) 10.517KHz (12.5KHz)
Maximum Transmitter Power	33.67dBm(2.33W) 26.45dBm(0.44W)
Rated Output power	0.5W/2.85W (It was fixed by the manufacturer, any individual can't arbitrarily change it.)
Antenna Designation	Inseparable
Antenna Gain	1.5dBi
Power Supply	DC6V, 700 mAh (by Battery)
Limiting Voltage	DC 5.1 V~ 6.9V
Operation Frequency Range and Channel	GMRS: 462.5625MHz -462.7125MHz(2.85W) 467.5625MHz -467.7125MHz(0.5W) 462.550MHz -462.7250MHz(2.85W) Test Channel :4, 11 and 19 channel
Frequency Tolerance	1.063 ppm

NOTE:The battery terminal voltage is claimed by the supplier itself.

Channel List:

CH. No	CH. Freq	Power	CH. No	CH. Freq	Power
1	462.5625	2.85W	12	467.6625	0.5W
2	462.5875		13	467.6875	
3	462.6125		14	467.7125	
4	462.6375		15	462.5500	2.85W
5	462.6625		16	462.5750	
6	462.5875		17	462.6000	
7	462.7125		18	462.6250	
8	467.5625	0.5W	19	462.6500	
9	467.5875		20	462.6750	
10	467.6125		21	462.7000	
11	467.6375		22	462.7250	

1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: **MMAT295**, filing to comply with the FCC Part 95 requirements.

1.3 TEST METHODOLOGY.

The radiated emission testing was performed according to the procedures of ANSI/TIA-603-E (2016)

1.4 TEST FACILITY

Site	Shenzhen HUAK Testing Technology Co., Ltd.
Location	1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China
Designation Number	CN1229
Test Firm Registration Number : 616276	

1.5 SPECIAL ACCESSORIES

Not available for this EUT intended for grant.

1.6 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.

2.4 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	X-Talker two way radio	T295	FCC ID: MMAT295	EUT

3. SUMMARY OF TEST RESULTS

FCC 47 CFR Part 95 Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
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	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	ANSI/TIA-603-E-2016	PASS
Spurious Emission On Antenna Port	FCC CFR Part 95.1779	ANSI/TIA-603-E-2016	N/A Note 1, 2
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
Receiver	R&S	ESCI 7	HKE-010	2017/12/28	2019/12/26
Spectrum analyzer	Agilent	N9020A	HKE-048	2017/12/28	2018/12/27
Horn Antenna	Schewarzbeck	9120D	HKE-013	2017/12/28	2019/12/26
Preamplifier	EMCI	EMC051845SE	HKE-015	2017/12/28	2018/12/27
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	HKE-087	2017/12/28	2018/12/27
Preamplifier	Schwarzbeck	BBV 9743	HKE-006	2017/12/28	2018/12/27
Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	2017/12/28	2018/12/27
Loop Antenna	Schewarzbeck	FMZB 1519 B	HKE-014	2017/12/28	2018/12/27
Small environmental tester	ESPEC	SH-242	HKE-088	2018/03/02	2019/03/01
RF Communication Test Set	HP	HP8920B	HKE-089	2018/06/12	2019/06/11
ANTENNA	A.H.	SAS-521-4	HKE-091	2018/03/01	2020/02.28
ANTENNA	Schwarzbeck	9168	HKE-095	2018/03/01	2020/02.28
HORN ANTENNA	E.M.	EM-AH-10180	HKE-090	2018/03/01	2020/02.28
Signal Generator	AGILENT	E8257D	HKE-096	2018/09/21	2019/09/20
Vector Analyzer	Agilent	E4440A	HKE-079	2018/03/01	2019/02/28

4. DESCRIPTION OF TEST MODES

RF TEST MODES

The EUT (X-Talker two way radio) has been tested under normal operating condition. (GMRS TX) are chosen for testing at each channel separation.

No.	TEST MODES	CHANNEL SEPARATION
1	GMRS TX	12.5 KHz
2	GMRS TX	25 KHz

Note: Only the result of the worst case was recorded in the report.

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 tolerance shall be better than ±2.5 ppm for an occupied bandwidth of 12.5 kHz or less.

5.2 MEASUREMENT PROCEDURE

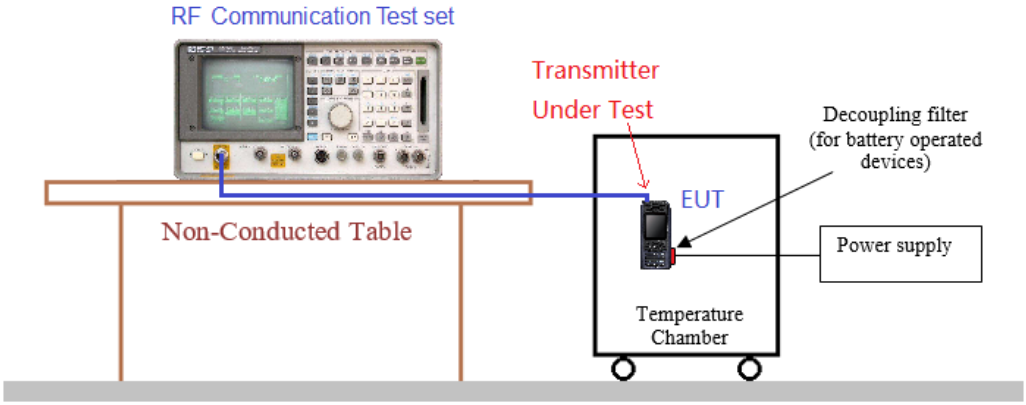
5.2.1 Frequency stability versus environmental temperature

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 6V.
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



5.4 TEST RESULT

(1) Frequency stability versus input voltage (Supply nominal voltage is 6.0V)

Environment Temperature(℃)	Power (V)	Reference Frequency 462.6375MHz	462.6500MHz	467.6375MHz	Limit: ppm
50	DC 6.0V	0.533	0.574	0.675	±2.5for GMRS
40	DC 6.0V	0.818	0.496	0.920	
30	DC 6.0V	0.532	0.900	0.726	
20	DC 6.0V	1.063	0.955	0.599	
10	DC 6.0V	0.663	0.642	0.603	
0	DC 6.0V	1.051	0.316	0.812	
-10	DC 6.0V	0.503	0.777	0.839	
-20	DC 6.0V	0.909	0.317	1.048	
-30	DC 6.0V	0.786	0.539	0.555	
Result	Pass				

(2) Frequency stability versus input voltage (Battery limiting voltage is 5.1V)

Environment Temperature(℃)	Power (V)	Reference Frequency 462.6375MHz	462.6500MHz	467.6375MHz	Limit: ppm
50	DC 5.1V	0.475	0.737	0.555	±2.5for GMRS
40	DC 5.1V	0.820	0.399	0.374	
30	DC 5.1V	0.911	0.355	0.869	
20	DC 5.1V	0.517	0.757	0.822	
10	DC 5.1V	0.923	0.563	0.807	
0	DC 5.1V	0.991	0.829	0.447	
-10	DC 5.1V	0.426	0.574	0.338	
-20	DC 5.1V	0.631	0.799	0.665	
-30	DC 5.1V	0.705	0.666	0.772	
Result	Pass				

(3) Frequency stability versus input voltage (Battery Fully Charged voltage is 6.9V)

Environment Temperature(℃)	Power (V)	Reference Frequency 462.6375MHz	462.6500MHz	467.6375MHz	Limit: ppm
50	DC 6.9V	0.821	0.463	0.697	±2.5for GMRS
40	DC 6.9V	0.823	0.754	0.487	
30	DC 6.9V	0.923	0.563	0.968	
20	DC 6.9V	0.935	0.831	0.447	
10	DC 6.9V	0.426	0.574	0.338	
0	DC 6.9V	0.923	0.563	0.807	
-10	DC 6.9V	0.707	0.842	0.491	
-20	DC 6.9V	0.461	0.629	0.635	
-30	DC 6.9V	0.776	0.443	0.594	
Result	Pass				

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.

(b) Interstitial channels. The authorized bandwidth is 20 kHz for GMRS transmitters operating on any of the 462 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

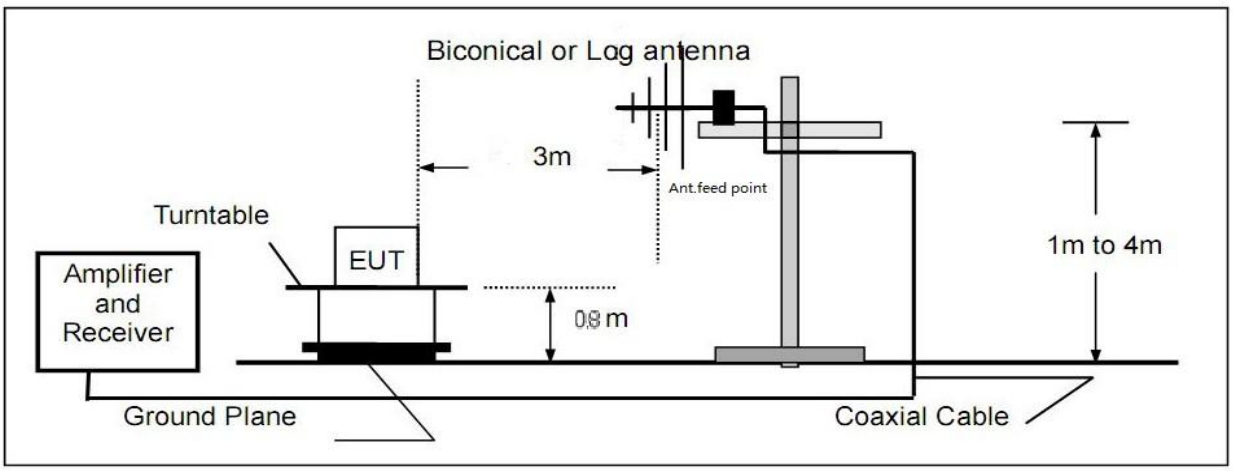
1). The EUT was modulated by 2.5 KHz Sine wave audio signal, The level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing).

2). Set SPA Center Frequency = fundamental frequency, RBW=300Hz.VBW= 1kHz, Span =30 KHz.

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

6.3 TEST SETUP BLOCK DIAGRAM

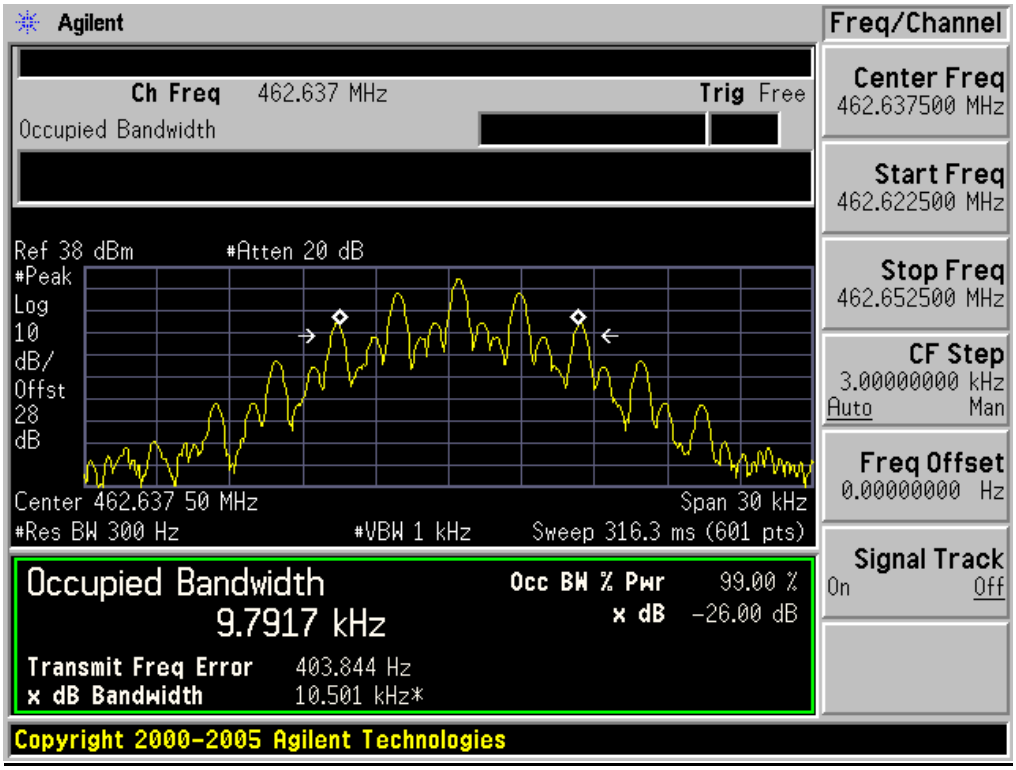
BELOW1GHZ



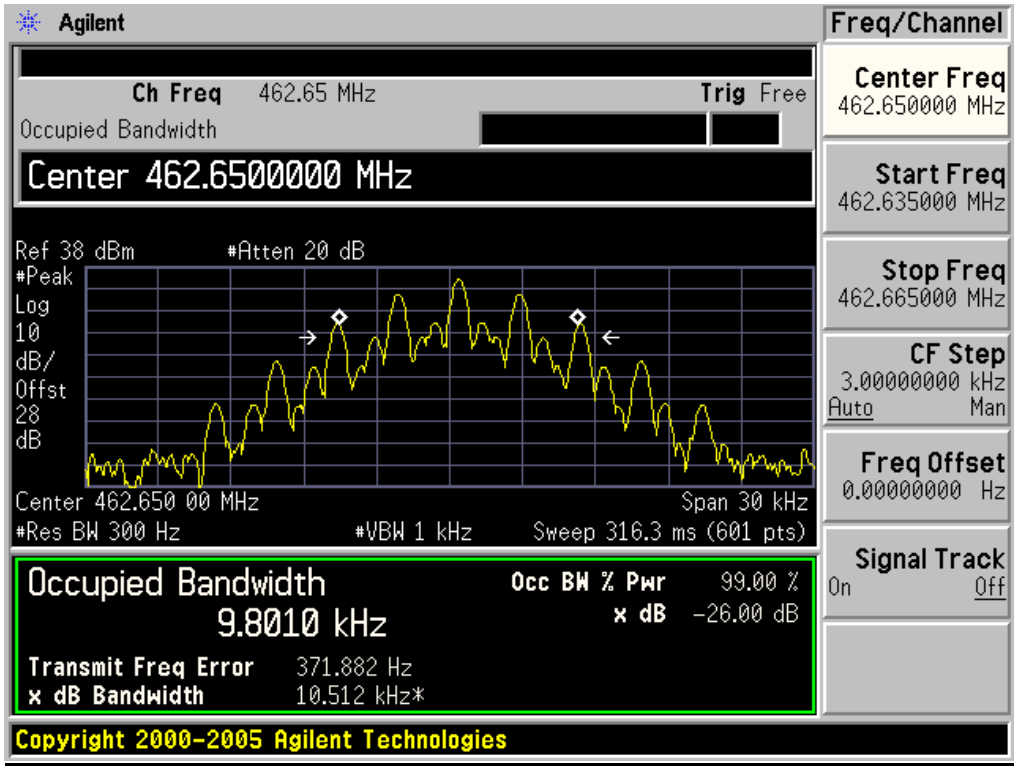
6.4 MEASUREMENT RESULT

26 dB Bandwidth Measurement Result			
Operating Frequency	12.5 KHz/25KHz Channel Separation		
	Test Data	Limits	Result
462.6375MHz	10.501 KHz	20.0 KHz	Pass
462.6500MHz	10.512 KHz	20.0 KHz	Pass
467.6375MHz	10.517 KHz	12.5 KHz	Pass

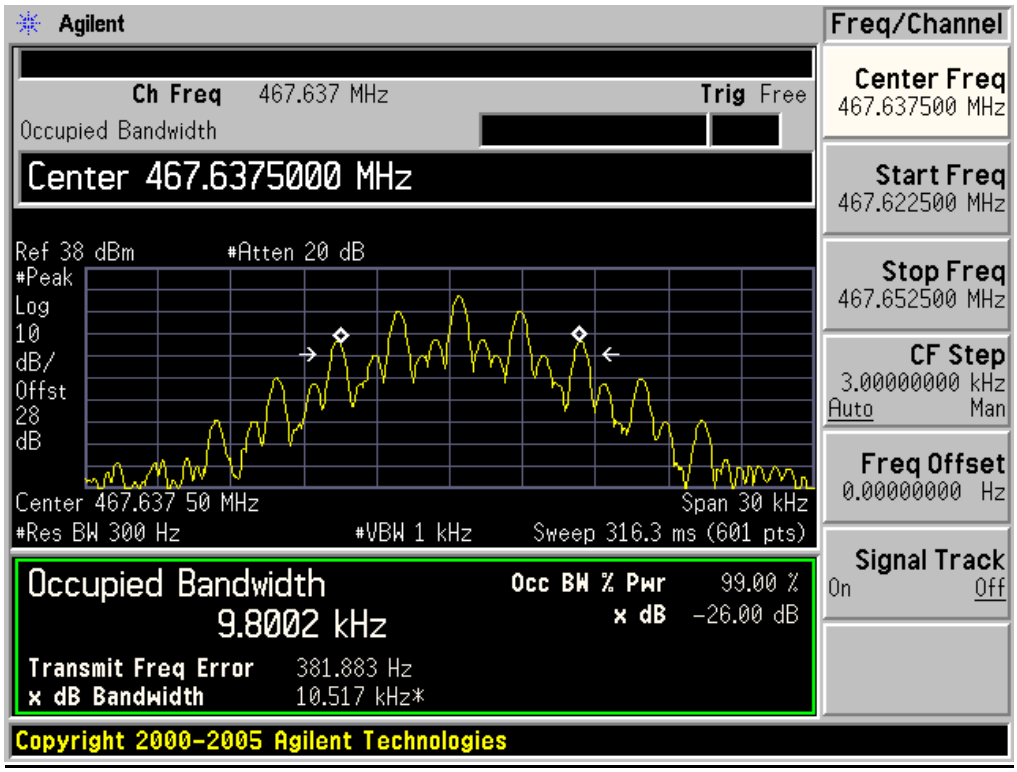
Occupied bandwidth of 462.6375MHz



Occupied bandwidth of 462.6500MHz



Occupied bandwidth of 467.6375MHz



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) The spectrum setting for scanning Radiated Emission below 1 GHz is RBW = 100 kHz, VBW = 300 kHz and above 1 GHz is RBW = 1 MHz, VBW = 3 MHz. Detector mode is positive peak.

(2) In the semi-anechoic chamber, setup as illustrated above the EUT placed on the 0.8m height (for frequencies < 1GHz) or 1.5m (for frequencies > 1GHz) of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.

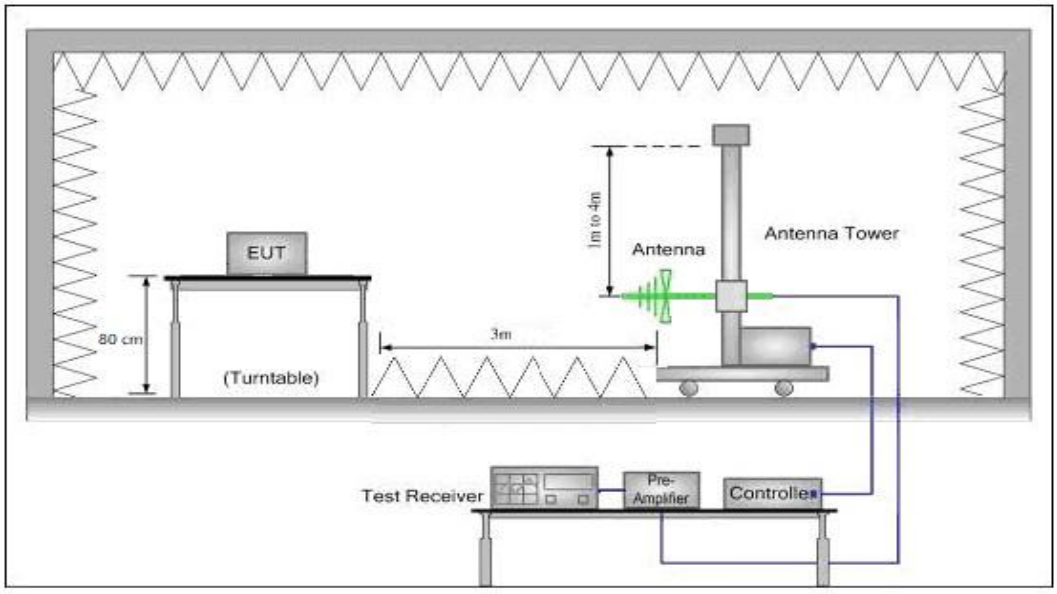
(3) The substitution antenna is substituted for EUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the measured substitution value = Ref level of S.G+ TX cables loss – Substituted Antenna Gain.

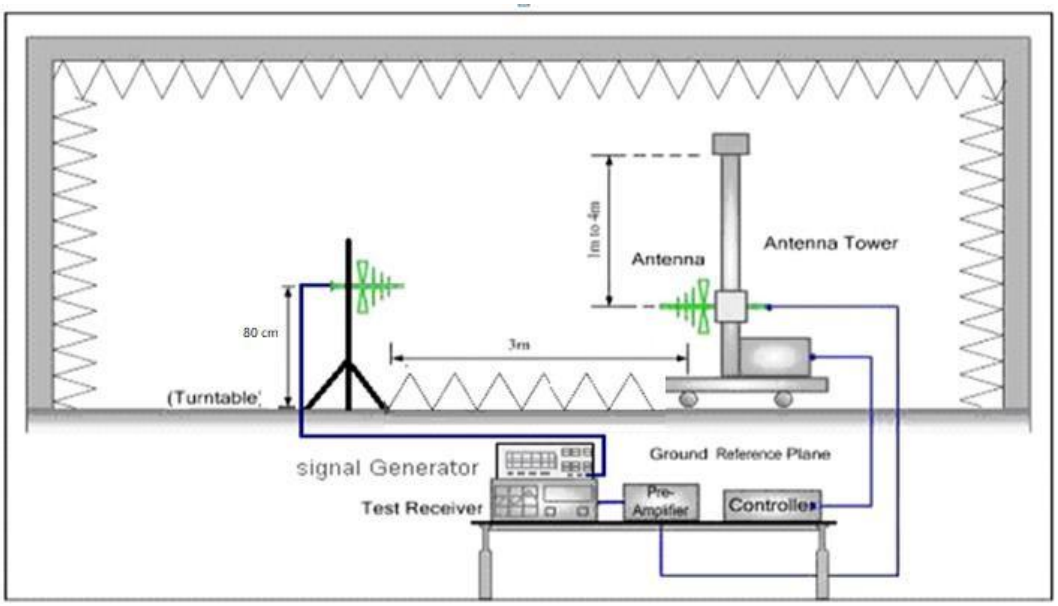
(4) Final Radiated Spurious Emission = “Read Value” + Measured substitution value

7.3 TEST SETUP BLOCK DIAGRAM

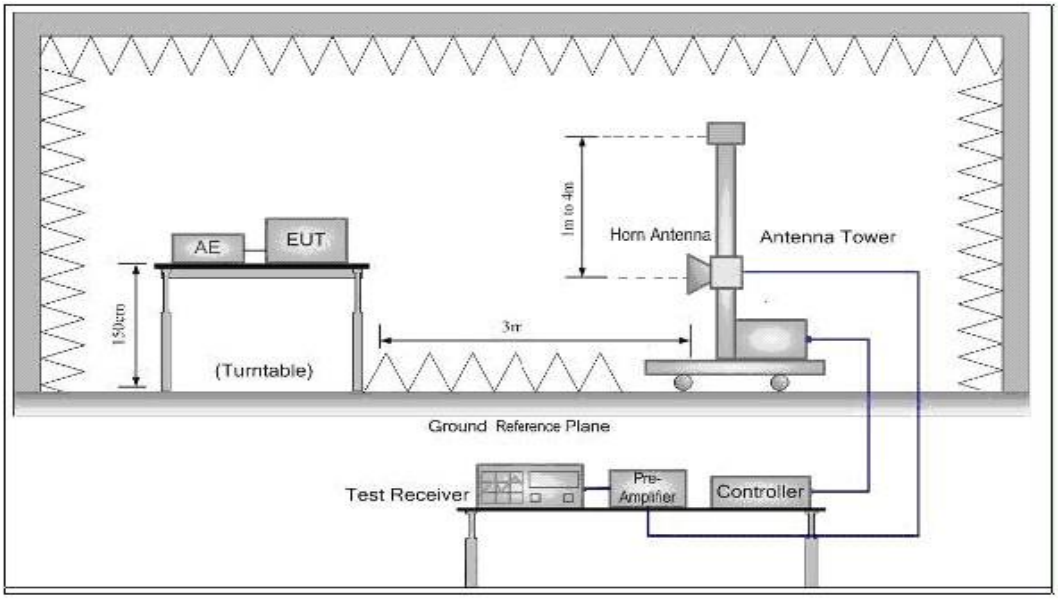
SUBSTITUTION METHOD: (Radiated Emissions)

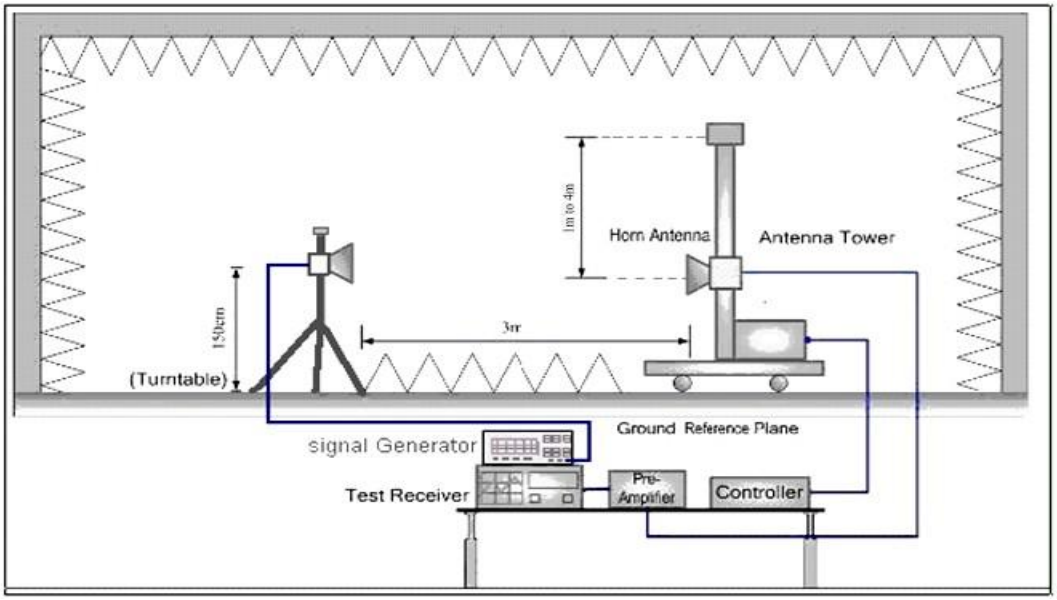
Radiated Below1GHz





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 (0.5) =40 (dBc) 27-40=-13dBm
At least 43+10 log (P) =43+10log (2.85) =47.5 (dBc) 34.5-47.5=-13dBm

Measurement Result for 12.5 KHz Channel Separation @ 462.6375MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result (dBm)	Limit (dBm)	Result(P/F)
462.638	H	0		pass
925.275	H	-42.6	-13	pass
1387.91	H	-39.6	-13	pass
1850.550	H	-38.5	-13	pass
2313.188	H	-42.7	-13	pass
2775.825	H	-40.7	-13	pass
3238.463	H	-54.1	-13	pass
3701.100	H	-38.6	-13	pass
4163.738	H	-40.8	-13	pass
4626.375	H	-46.6	-13	pass

Emission Frequency (MHz)	Ant. Polarity(H/H)	Measurement Result (dBm)	Limit (dBm)	Result(P/F)
462.638	V	0		pass
925.275	V	-47.6	-13	pass
1387.91	V	-52.9	-13	pass
1850.550	V	-45.5	-13	pass
2313.188	V	-36.9	-13	pass
2775.825	V	-38.7	-13	pass
3238.463	V	-49.1	-13	pass
3701.100	V	-49.7	-13	pass
4163.738	V	-46.3	-13	pass
4626.375	V	-37.5	-13	pass

Measurement Result for 12.5 KHz Channel Separation @ 462.6500MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result (dBm)	Limit (dBm)	Result(P/F)
462.638	H	0		pass
925.275	H	-38.1	-13	pass
1387.91	H	-39.6	-13	pass
1850.550	H	-42.6	-13	pass
2313.188	H	-40.8	-13	pass
2775.825	H	-47.6	-13	pass
3238.463	H	-48.9	-13	pass
3701.100	H	-35.2	-13	pass
4163.738	H	-39.7	-13	pass
4626.375	H	-42.3	-13	pass

Emission Frequency (MHz)	Ant. Polarity(H/H)	Measurement Result (dBm)	Limit (dBm)	Result(P/F)
462.638	V	0		pass
925.275	V	-51.2	-13	pass
1387.91	V	-51.7	-13	pass
1850.550	V	-46.6	-13	pass
2313.188	V	-43.5	-13	pass
2775.825	V	-40.1	-13	pass
3238.463	V	-47.6	-13	pass
3701.100	V	-50.4	-13	pass
4163.738	V	-41.1	-13	pass
4626.375	V	-38.1	-13	pass

Measurement Result for 12.5 KHz Channel Separation @ 467.6375MHz

Emission Frequency (MHz)	Ant. Polarity(H/V)	Measurement Result (dBm)	Limit (dBm)	Result(P/F)
467.638	H	0		pass
935.275	H	-50.1	-13	pass
1402.913	H	-46.3	-13	pass
1870.550	H	-35.9	-13	pass
2338.188	H	-38.7	-13	pass
2805.825	H	-41.8	-13	pass
3273.463	H	-50.2	-13	pass
3741.100	H	-49.7	-13	pass
4208.738	H	-42.7	-13	pass
4676.375	H	-46.6	-13	pass

Emission Frequency (MHz)	Ant. Polarity(H/H)	Measurement Result (dBm)	Limit (dBm)	Result(P/F)
467.638	V	0		pass
935.275	V	-57.7	-13	pass
1402.913	V	-53.6	-13	pass
1870.550	V	-45.6	-13	pass
2338.188	V	-50.9	-13	pass
2805.825	V	-48.1	-13	pass
3273.463	V	-40.7	-13	pass
3741.100	V	-46.7	-13	pass
4208.738	V	-48.2	-13	pass
4676.375	V	-53.2	-13	pass

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.

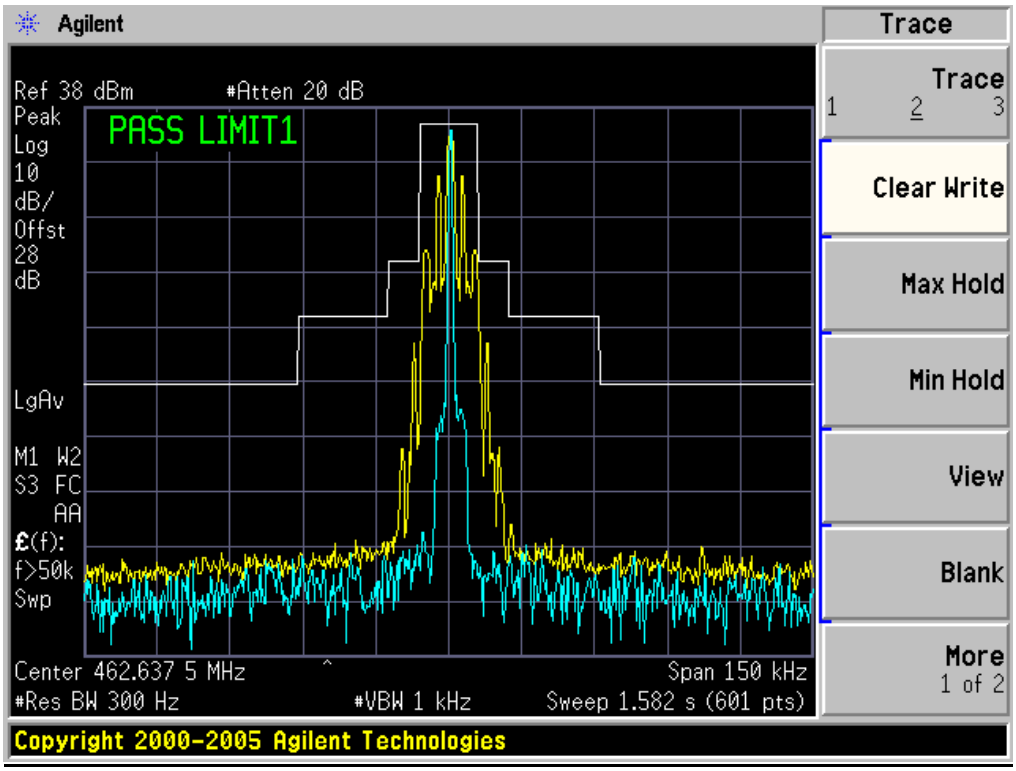
(3) At least 43 + 10 log10 (T) dB on any frequency removed from the center of the authorized bandwidth by more than250 %.

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.

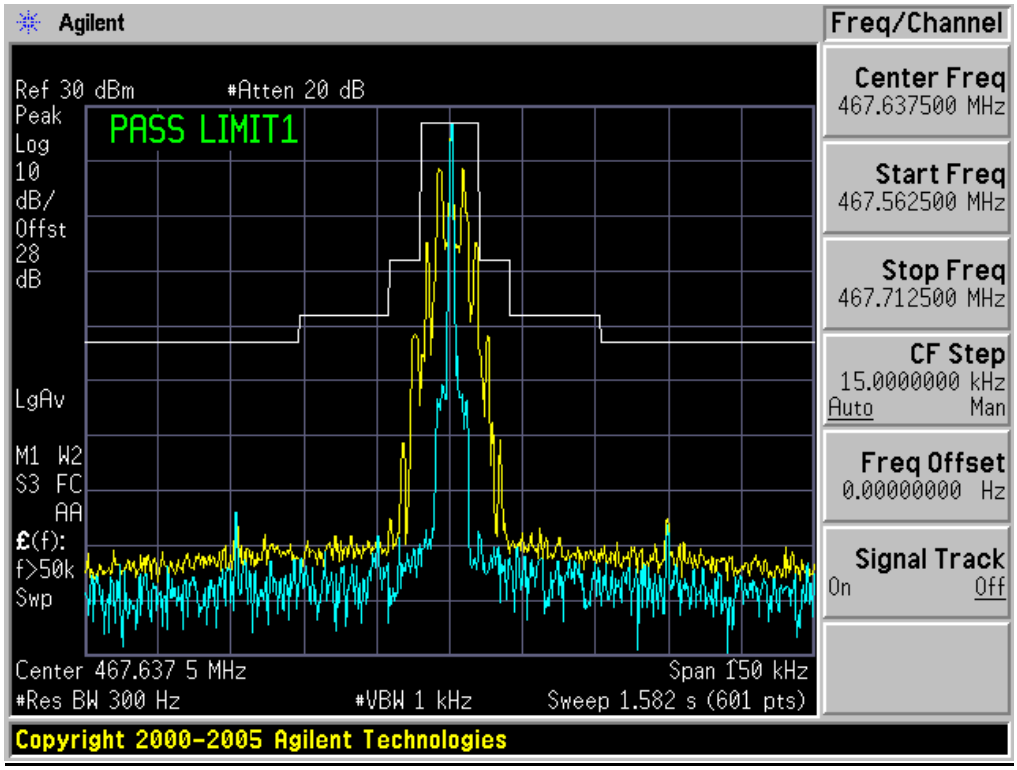
Channel 4:

The Worst Emission Mask for channel 4



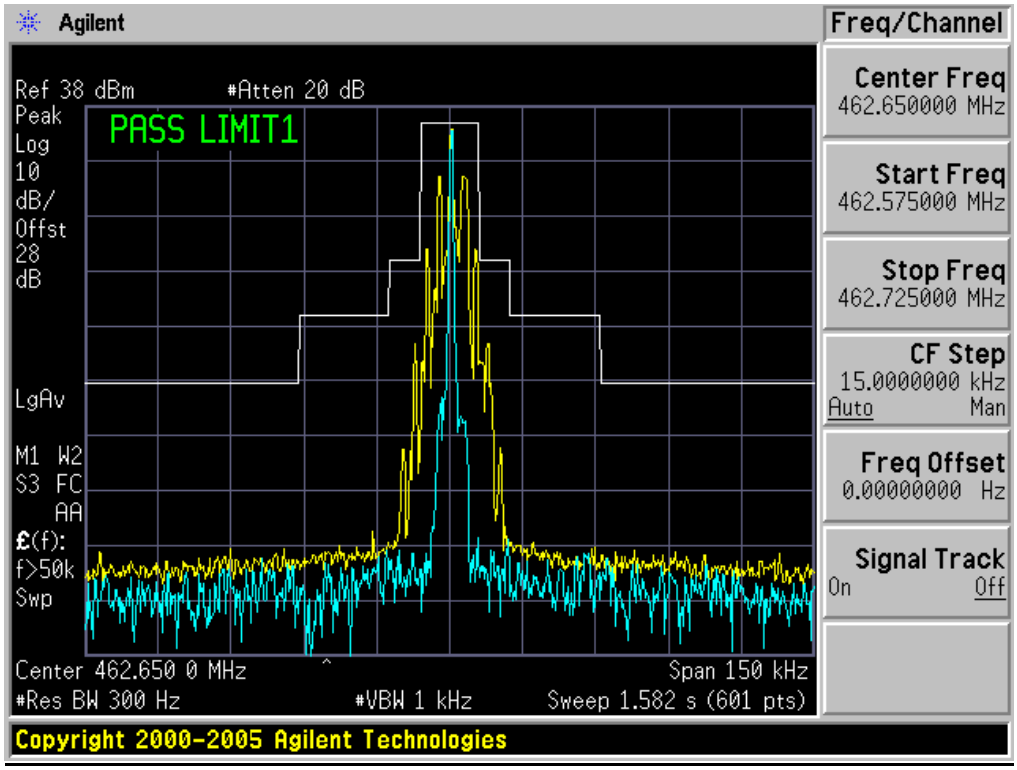
CHANNEL 11:

The Worst Emission Mask for channel 11



Channel 19:

The Worst Emission Mask for channel 19



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.

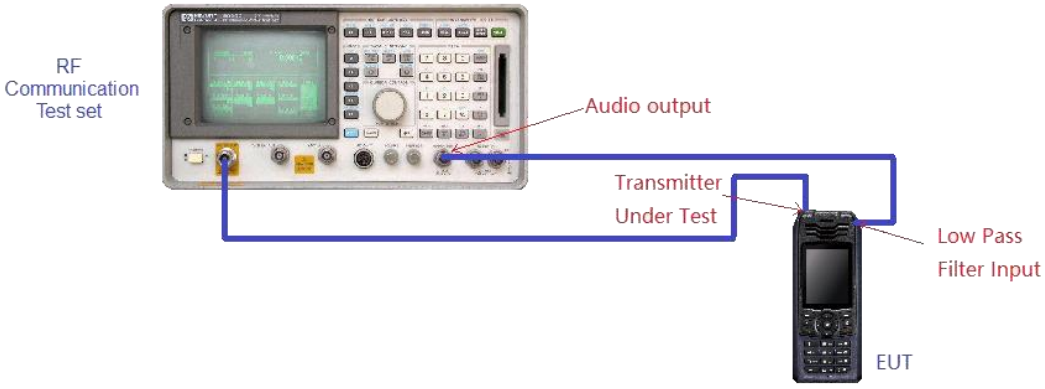
(5) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 60% of the maximum deviation.

(6) Up the amplitude by 20dB.

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

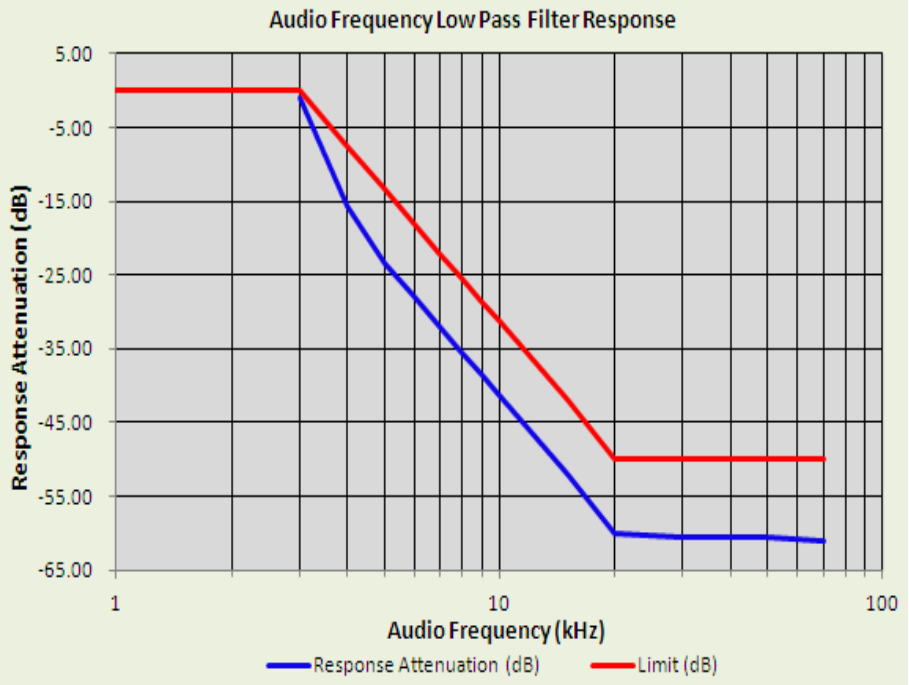
(8) Vary the frequency on audio analyzer from 3 kHz to 30 kHz, record the audio tone from DSA.

8.3 TEST CONFIGURATION



8.4 TEST RESULT

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1	0	/
3	-0.77	0.00
4	-14.89	-7.50
5	-22.96	-13.31
6	-27.03	-18.06
7	-32.14	-22.08
8	-34.63	-25.56
9	-37.02	-28.63
10	-40.36	-31.37
15	-50.03	-41.94
20	-59.77	-50.00
30	-60.32	-50.00
50	-60.52	-50.00
70	-60.97	-50.00



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) The spectrum setting for Equivalent Isotropically Radiated Power (EIRP) is RBW = 100 kHz, VBW = 300 kHz. Detector Mode is RMS.

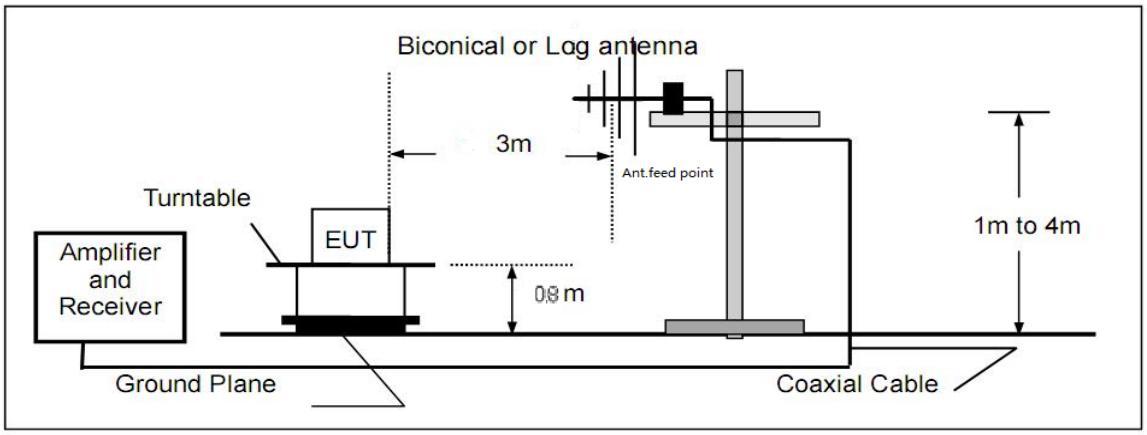
(2) In the semi-anechoic chamber, setup as illustrated above the EUT placed on the 0.8m height of Turn Table, rotated the table 45 degree each interval to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power for each degree interval. The “Read Value” is the spectrum reading of maximum power value.

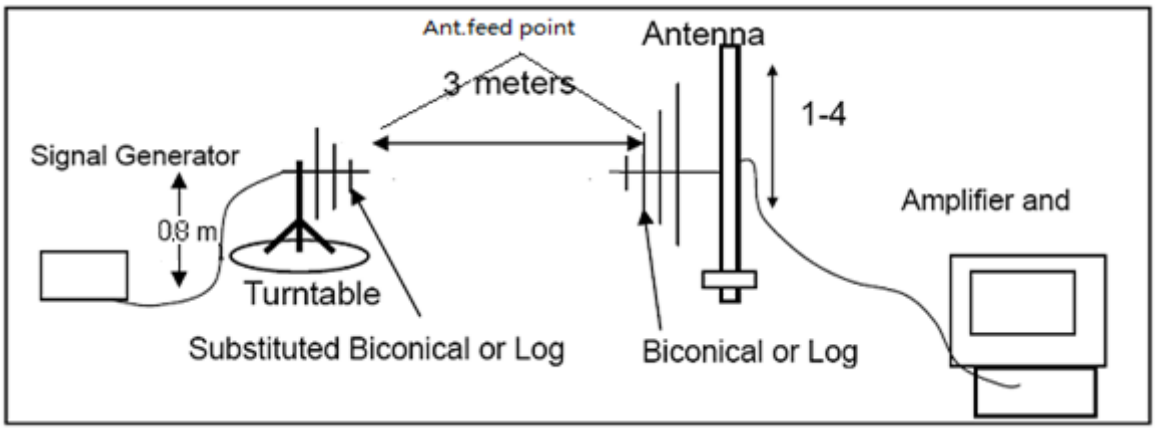
(3) The substitution antenna is substituted for EUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the Measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain

9.3 TEST CONFIGURATION

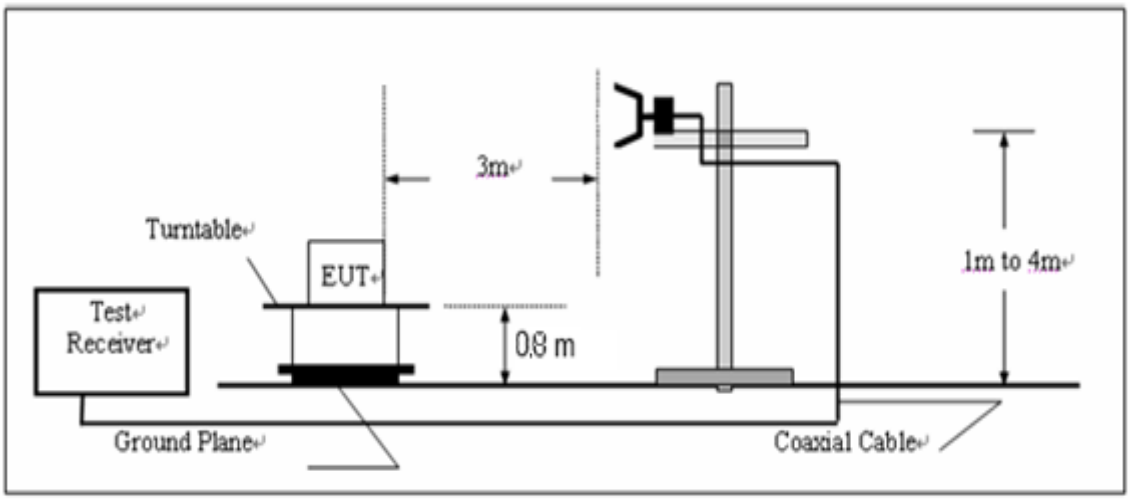
Effective Radiated Power

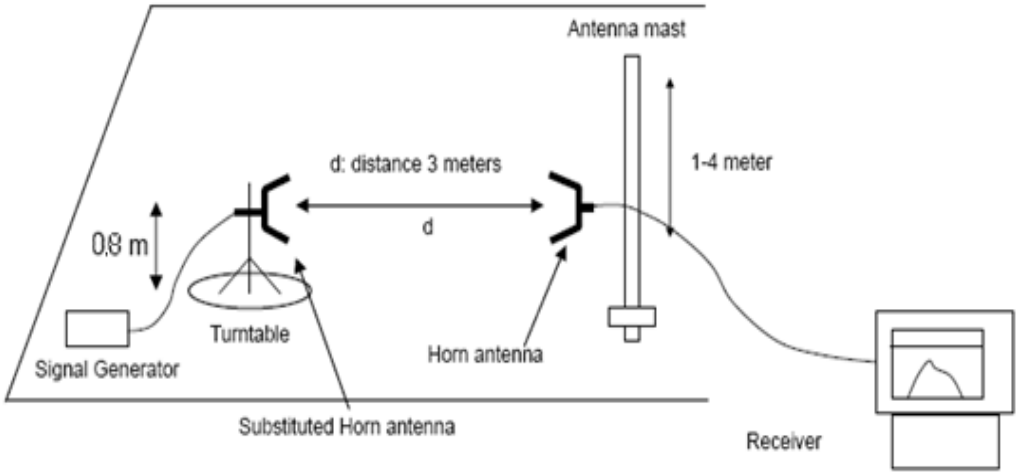
Radiated Below1GHz





Radiated Above 1 GHz





9.4 TEST RESULT

The maximum Power (CP) for UHF is

Analog: 2.85W 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 (MHz)	Reading Level (dBuv/m)	Antenna Polarization	S.G. (dBm)	Cable Loss (dB)	Ant.Gain (dBi)	Emission Level (dBm)	Limit (dBm)	Margin (dB)
Frequency: 462.6375MHz								
462.6375	101.63	V	27.45	0.38	6.60	33.67	36.99	3.45
462.6375	100.45	H	26.99	0.38	6.60	33.21	36.99	3.78
Frequency: 467.6375MHz								
467.6375	93.63	V	20.23	0.38	6.60	26.45	27	0.55
467.6375	92.65	H	19.56	0.38	6.60	25.78	27	1.22
Frequency: 462.6500MHz								
462.6500	101.26	V	27.19	0.38	6.60	33.41	36.99	3.63
462.6500	100.76	H	26.93	0.38	6.60	33.15	36.99	3.84

10. MODULATION CHARACTERISTICS

10.1 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 thefrequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shallbe submitted.

10.2 MEASUREMENT METHOD

10.2.1 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.

10.2.2 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.

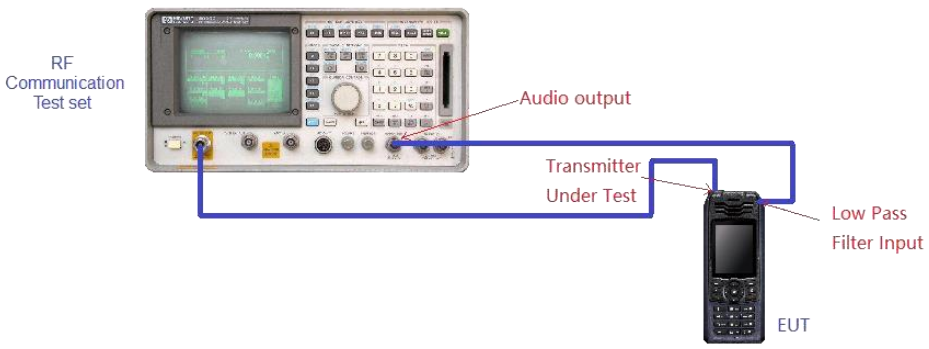
(b) Tones that are subaudible (having a frequency of 300 Hertz or less), may be transmitted continuously during a communication session.

(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).



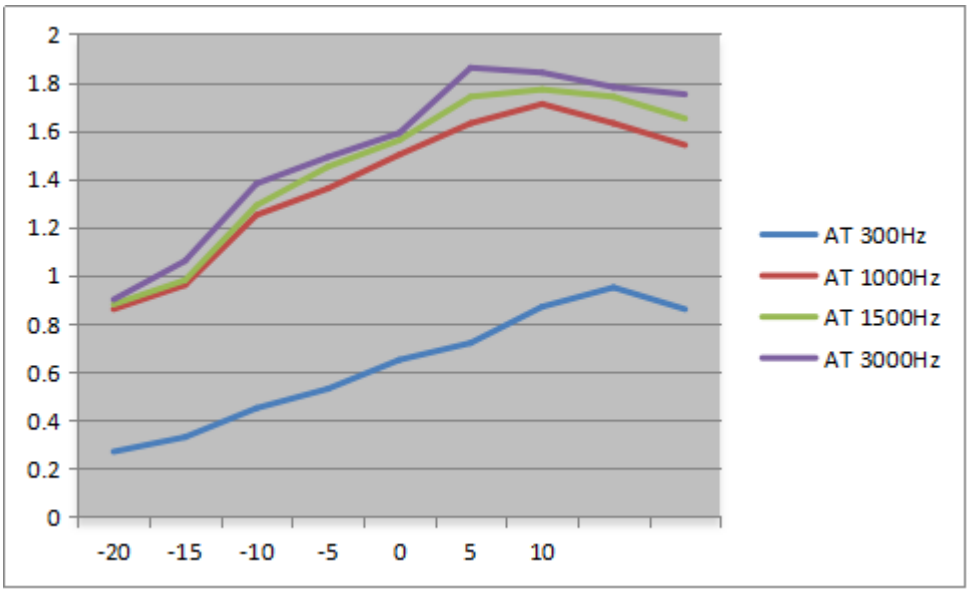
10.3 MEASUREMENT RESULT

TEST CHANNEL: 4

(A). MODULATION LIMIT:

462.6375MHz @ 12.5 KHz Channel Separations

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	0.27	0.86	0.88	0.9
-15	0.33	0.96	0.98	1.06
-10	0.45	1.25	1.29	1.38
-5	0.53	1.36	1.45	1.49
0	0.65	1.50	1.56	1.59
+5	0.72	1.63	1.74	1.86
+10	0.87	1.71	1.77	1.84
+15	0.95	1.63	1.74	1.78
+20	0.86	1.54	1.65	1.75



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fnfd

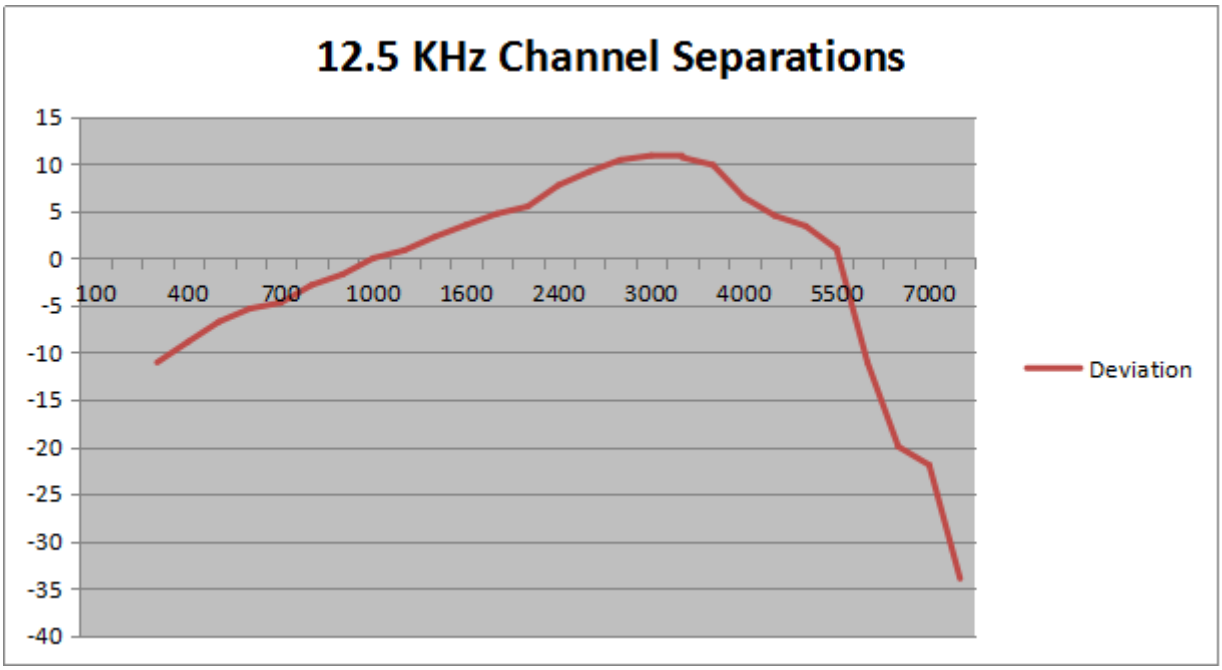
Note: All the modes had been tested, but only the worst data recorded in the report.

(B). AUDIO FREQUENCY RESPONSE:

462.6375MHz @ 12.5 KHz Channel Separations

Frequency (Hz)	Deviation (KHz)	Audio Frequency Response(dB)
100	--	--
200	--	--
300	0.14	-11.06
400	0.18	-8.87
500	0.23	-6.74
600	0.27	-5.35
700	0.29	-4.73
800	0.36	-2.85
900	0.41	-1.72
1000	0.50	0.00
1200	0.55	0.83
1400	0.65	2.28
1600	0.75	3.52
1800	0.86	4.71
2000	0.94	5.48
2400	1.22	7.75
2500	1.44	9.19
2800	1.66	10.42
3000	1.75	10.88
3200	1.71	10.68
3600	1.56	9.88
4000	1.05	6.44
4500	0.84	4.51
5000	0.74	3.41
5500	0.56	0.98
6000	0.14	-11.06
6500	0.05	-20.00
7000	0.04	-21.94
7500	0.01	-33.98
9000	--	--
10000	--	--
14000	--	--
18000	--	--
20000	--	--
30000	--	--

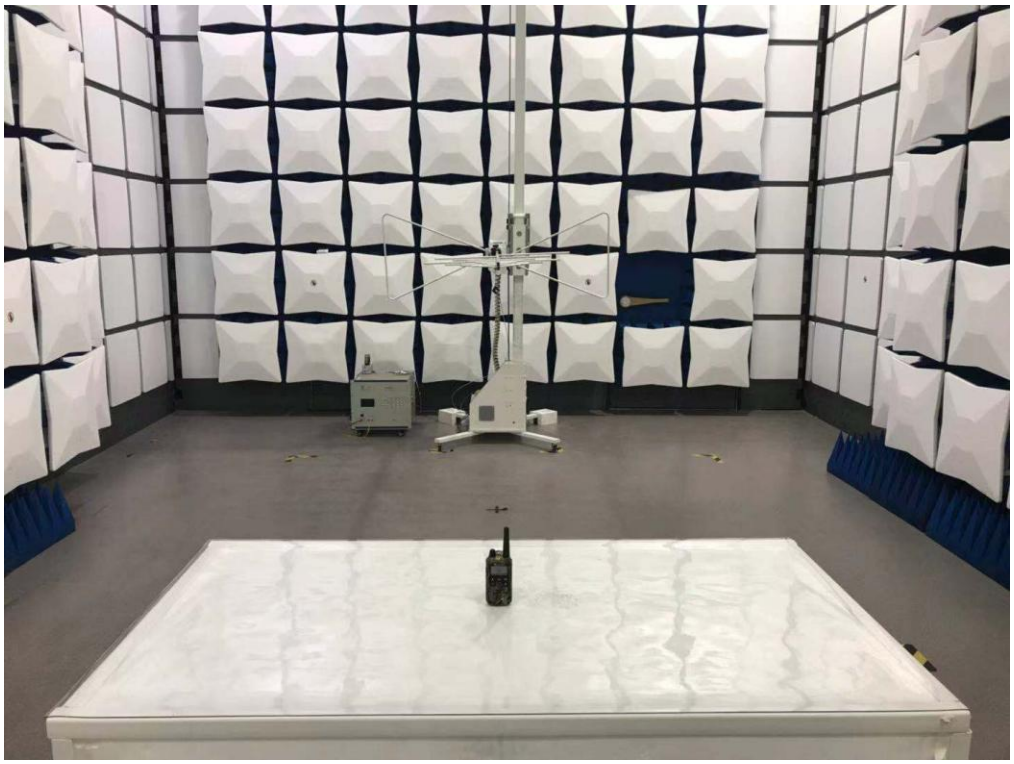
Frequency Response Result



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: EXTERNAL VIEW OF EUT

TOTAL VIEW OF EUT

TOP VIEW OF EUT

BOTTOM VIEW OF EUT

FRONT VIEW OF EUT

BACK VIEW OF EUT

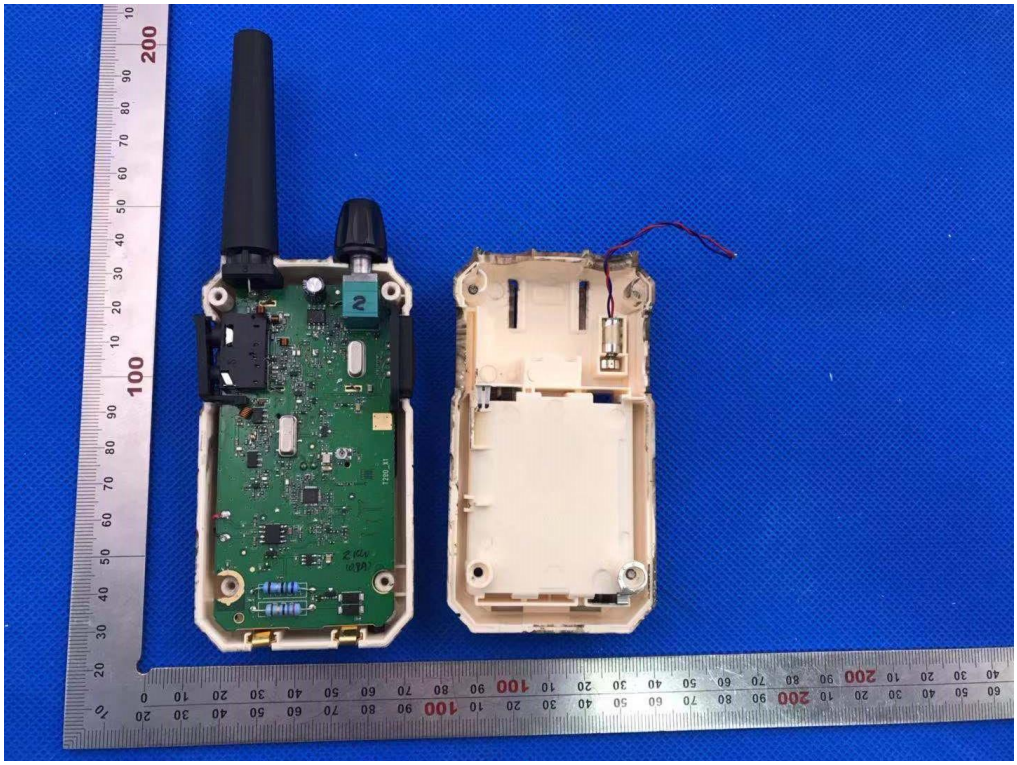
LEFT VIEW OF EUT

RIGHT VIEW OF EUT

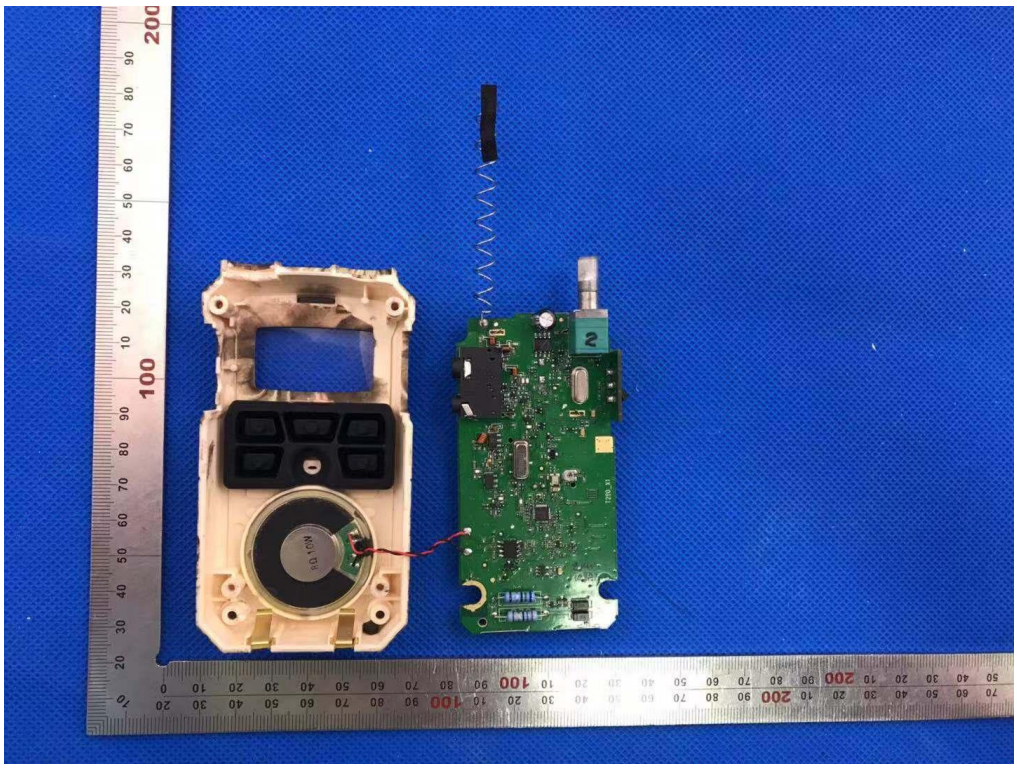
OPEN VIEW-1 OF EUT

OPEN VIEW-2 OF EUT

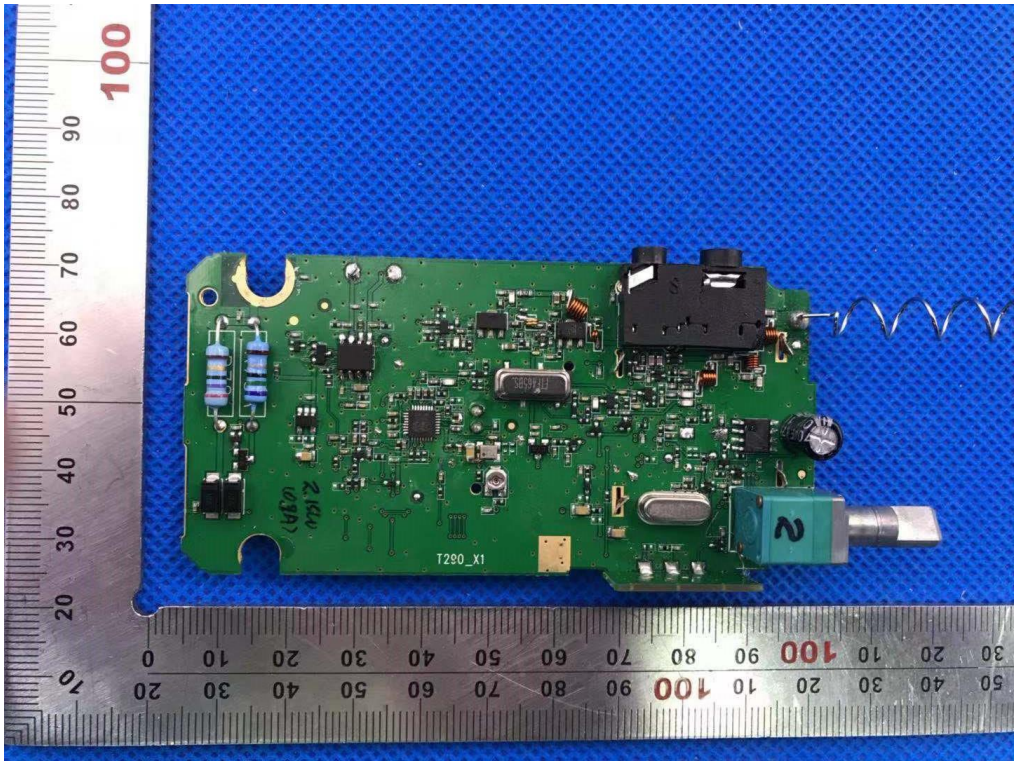
OPEN VIEW-3 OF EUT



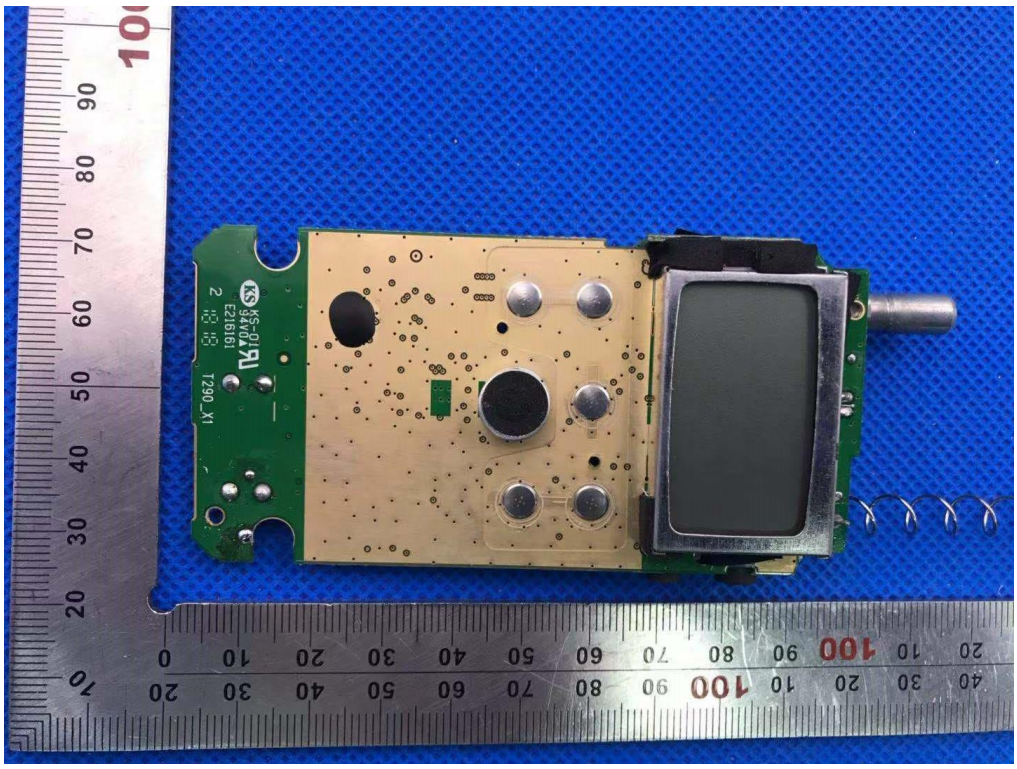
INTERNAL VIEW-1 OF EUT



INTERNAL VIEW-2 OF EUT



INTERNAL VIEW-3 OF EUT



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