MOTOROLA SOLUTIONS

MS ISO/IEC 17025
TESTING

SAMM No. 0825

MOTOROLA PENANG ADV. COMM. LABORATORY
Motorola Solutions Malaysia SDN BHD
Plot 2A, Bayan Lepas Technoplex,
11900 Bayan Lepas,
Penang, Malaysia.

FCC TEST REPORT
Report Revision : Rev.A

Date/s Tested	:	19-December-2018 - 22-January-2019
Report Issue Date	:	24-January-2019
Manufacturer/Location	:	Motorola Solutions Malaysia Sdn Bhd Innoplex, Plot 2A, Medan Bayan Lepas, 11900 Bayan Lepas, Penang, Malaysia.
Requestor	:	LIM CHEE SEONG
Product Type	:	Portable
Model Number	:	T100
Frequency Band	:	462 - 467 MHz
Max. Output Power	:	0.6 Watt (Conducted) , 0.32 Watt (ERP)
Firmware Version	:	NA
Applicant Name	:	Motorola Solutions Inc
FCC Registration	:	461337
IC Registrations	:	109AK

The equipment was tested accordance to the requirement listed below:

FCC 47 CFR Part 95	**PASS**

Prepared By:

Gan Boon Teong
Test Personnel

Approved By:

Vincent Foong
Responsible Engineer

Table of Contents

Revision History	Description	Date	Originator
Rev. A	Initial Report	**24-January-2019**	**Gan Boon Teong**

1.0. General Information

EUT Description:

Tx Frequency range	
462.55MHz to 467.7125MHz	
Antenna type gain	Fix antenna, -1.0 dBi
Technologies	FM
Device voltage	4.50V dc

Channel number and frequency information:

Product channel table:

FRS Channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	462.5625	12	467.6625
2	462.5875	13	467.6875
3	462.6125	14	467.7125
4	462.6375	15	462.5500
5	462.6625	16	462.5750
6	462.6875	17	462.6000
7	462.7125	18	462.6250
8	467.5625	19	462.6500
9	467.5875	20	462.6750
10	467.6125	21	462.7000
11	467.6375	22	462.7250

In §15.31 (m), Frequency range over which device operates in1MHz or less, middle frequency of channel is selected to perform test.

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

ANSI C63.26
FCC Part 2 & 95

2.0. Summary of Test Results

FCC Clause	Test Item	Result	Remark
95.567 95.1767	Maximum Output Power	Pass	Highest output power: 24.01 dBm
95.575 95.1775	Modulation Limiting	Pass	NA
95.575 95.1775	Audio Frequency Response	Pass	NA
95.1775	Audio Low Pass Filter	Pass	NA
95.565 95.1765	Frequency Stability	Pass	NA
95.573 95.1773	Emission Bandwidth	Pass	NA
95.579 95.1779	Unwanted Radiation	Pass	NA

3.0. Measurement Uncertainty

Measurement	Expended Uncertainty (k=1.96) (±)
Maximum Output Power	5.01dB

4.0. Equipment List

Analog ATE # 2

DESCRIPTION	MODEL	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE
POWER SENSOR	E4412A	MY41501734	03-Oct-18	03-Oct-19
CHAMBER	PL-3KP	14011891	12-Feb-18	12-Feb-19
RF TRANSCEIVER CONTROLLER	AX2007AI	AX2007AI005	Not Required	Not Required
POWER METER	E4416A	MY45101695	09-Aug-18	09-Aug-19
SIGNAL GENERATOR	SMA100A	111382	04-July-17	04-July-20
TRANSCEIVER INTERFACE	8954A	2924A00823	05-Feb-18	05-Feb-19
AUDIO ANALYZER	8903B	3413A13846	04-Apr-18	04-Apr-19
MODULATION ANALYZER	8901B	2920A02173	18-Aug-18	18-Aug-19
SIGNAL GENERATOR	SMA100A	111423	02-July-16	02-July-19
SIGNAL GENERATOR	E4424B	US39260213	09-Oct-18	09-Oct-19
DYNAMIC SIGNAL ANALYZER	35670A	MY42506847	01-Apr-18	01-Apr-19
POWER SUPPLY	6031A	3543A03355	17-Apr-18	17-Apr-19
ROHDE & SCHWARZ RF SHIELD BOX	CMW-Z10	1204.7000K02-103120-BC	Not Required	Not Required
TEST SOFTWARE	Analog ATE			
VERSION	2.4.5			
TEST SOFTWARE	FCC_FreqStability			
VERSION	Rev1.0.03			

FCC Transient

DESCRIPTION	MODEL	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE
ATTENUATOR/SWITCH DRIVER	11713A	MY44321022	Not Required	Not Required
SWITCH CONTROL UNIT	3488A	CN37145920	Not Required	Not Required
OSCILLOSCOPE	MSO8064A	MY45001903	23-Oct-18	23-Oct-19
POWER SENSOR	E9326A	MY44420138	07-Sep-18	07-Sep-19
AUDIO ANALYZER	8903B	3413A14095	05-Feb-18	05-Feb-19
MODULATION ANALYZER	8901B	2912A01985	17-Sep-18	17-Sep-19
SIGNAL GENERATOR	8657A	3025A02255	12-Oct-18	12-Oct-19
POWER METER	E4416A	MY50000116	20-Apr-18	20-Apr-20
SPECTRUM ANALYZER	E4445A	MY45301089	21-July-17	21-July-19
POWER SUPPLY	6623A	3417A03546	15-Nov-18	15-Nov-19
STEP ATTENUATOR	8496G	MY42140158	13-Aug-18	13-Aug-19
STEP ATTENUATOR	8494G	MY52300689	27-Jun-18	27-Jun-19
AUDIO ANALYZER	8903B	2533A00529	02-May-18	02-May-19
ROHDE & SCHWARZ RF SHIELD BOX	CMW-Z10	1204.7000K02-103120-BC	Not Required	Not Required
TEST SOFTWARE	FCC Transient			
VERSION	Rev1.1.2			

EMC Chamber 1

DESCRIPTION	MODEL	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE
DRG HORN FREQ.	SAS-571	719	18-July-17	18-July-19
DRG HORN FREQ.	SAS-571	720	02-Mar-17	02-Mar-19
POWER SUPPLY	6032A	2615A-01178	13-Jun-18	13-Jun-19
MICROWAVE SIGNAL GENERATOR	SMP04	100131	12-July-18	11-July-19
EMI TEST RECEIVER	ESIB26	100017	11-Apr-18	11-Apr-19
EMI TEST RECEIVER	ESW44	101750	25-Jun-18	25-Jun-19
5m SEMI-ANECHOIC CHAMBER	S800-HX	J2308	Not Required	Not Required
BILOG ANTENNA	CBL6112D	30991	23-Apr-18	23-Apr-19
BILOG ANTENNA	CBL6112B	2964	16-Feb-18	16-Feb-20
DATA LOGGER	SDL500	A.016776	18-Mar-17	18-Mar-19
SYSTEM CONTROLLER	SC104V	050806-1	Not Required	Not Required
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	Not Required	Not Required
ANTENNA POSITIONING TOWER	TLT2	NA	Not Required	Not Required
18 - 40GHz PREAMPLIFIER	Miteq Hi Gain Sucoflex	002	Not Required	Not Required
PREAMPLIFIER	PAM-0118P	361	Not Required	Not Required
TEST SOFTWARE	EMC_FCC_IC_Bluetooth_RE_Test			
VERSION	EMC_FCC_RE_v1.5.1			

5.0. Test Mode Applicability and Test Channel Detail

Test Frequency list:

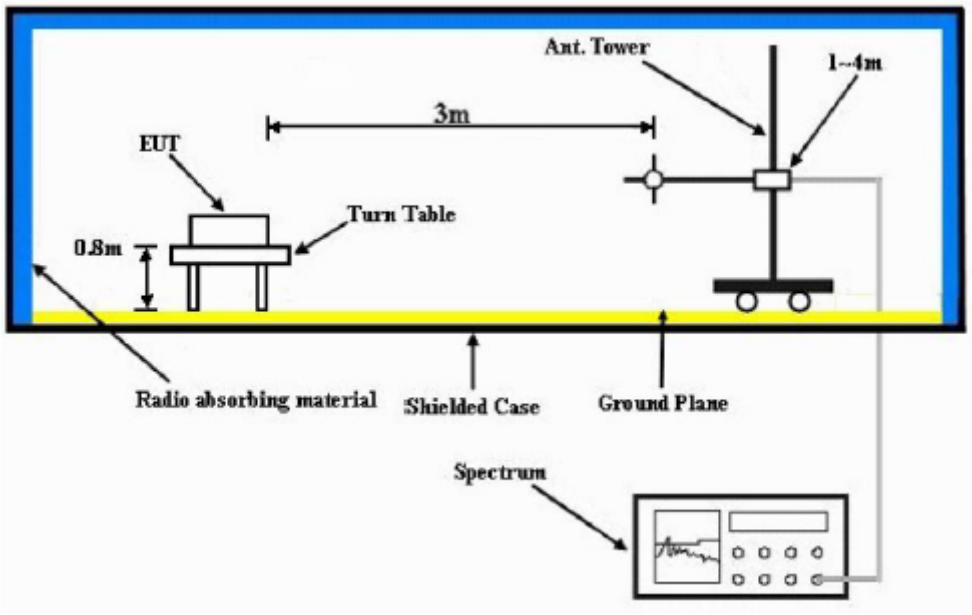
FRS

Channel	Frequency
4	462.6375 MHz
11	467.6375 MHz

6.0. Transmitter Test Parameters

6.1. Maximum Output Power

6.1.1. Test Setup



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.

6.1.2. Test Limits

§95.567 FRS Transmit Power

Each FRS transmitter type must be designed such that the effective radiated power (ERP) on channels 8 through 14 does not exceed 0.5 Watts and the ERP on channels 1 through 7 and 15 through 22 does not exceed 2.0 Watts.

§95.567 GMRS Transmitting Power Limits

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.

RSS 210 E.2.4 Output Power

The maximum permissible transmitted ERP of the equipment under any operating conditions shall not exceed 0.5 W.

RSS 210 E.3.5 Output Power

A GMRS transmitter may transmit with a maximum power of 2.0 W e.r.p.

6.1.3. Test Data

EIRP/ERP

S/N: 6904UW0009 **Tx Power: 0.320 Watts**
Channel Spacing : 12.5 kHz **Modulation: FM**
Accessory: NA

Antenna Polarization	Frequency (MHz)	EIRP (dBm)	ERP (dBm)
Horiz.	462.6375	12.62	10.47
Vert.	462.6375	26.16	24.01

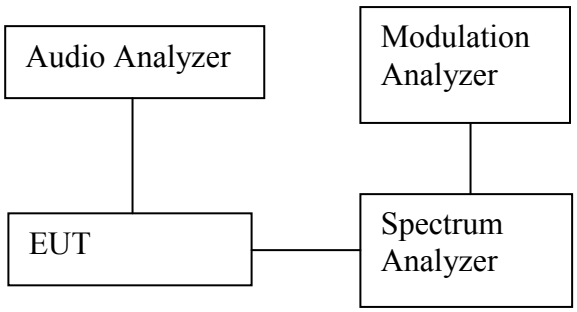
EIRP/ERP

S/N: 6904UW0009 **Tx Power: 0.320 Watts**
Channel Spacing : 12.5 kHz **Modulation: FM**
Accessory: NA

Antenna Polarization	Frequency (MHz)	EIRP (dBm)	ERP (dBm)
Horiz.	467.6375	10.82	8.67
Vert.	467.6375	25.50	23.35

6.2. Modulation Limiting

6.2.1. Test Setup



1) The DUT transmitter output port was connected to Modulation Analyzer.
2) Path loss for the measurement included.
3) Set the audio bandwidth filter to 15 kHz.
4) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 60% of the maximum deviation.
5) Record the frequency deviation as 0dB input level at 1kHz audio frequency.
6) Repeat the step and record the frequency deviation from -20dB to 20dB by 5dB increments and different audio freq 300Hz, 2.5 KHz and 3 KHz.

6.2.2. Test Limits

§95.575 FRS Modulation limits

Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

§95.1775 GMRS modulation requirements

Each GMRS transmitter type must be designed to satisfy the modulation requirements in this section. Operation of GMRS stations must also be in compliance with these requirements.

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

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

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

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

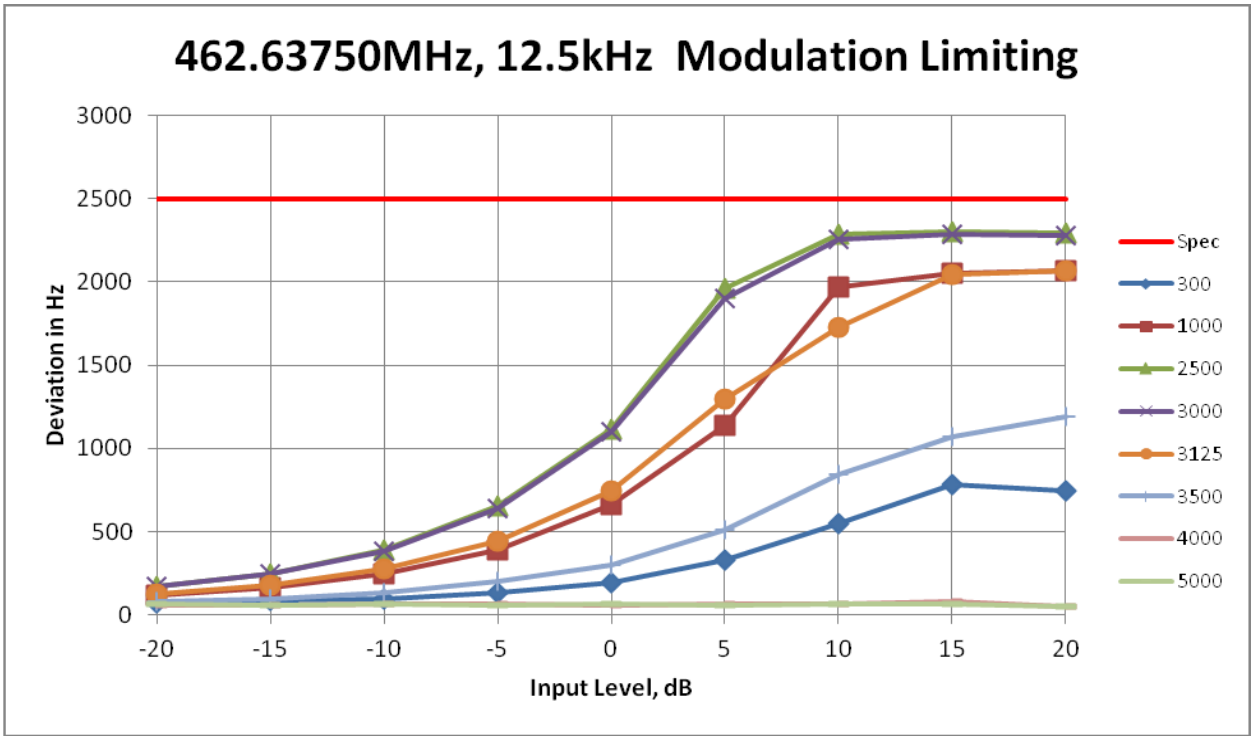
RSS-210 E.2.2 (FRS) Modulation Requirements

The peak frequency deviation shall not exceed +/- 2.5kHz

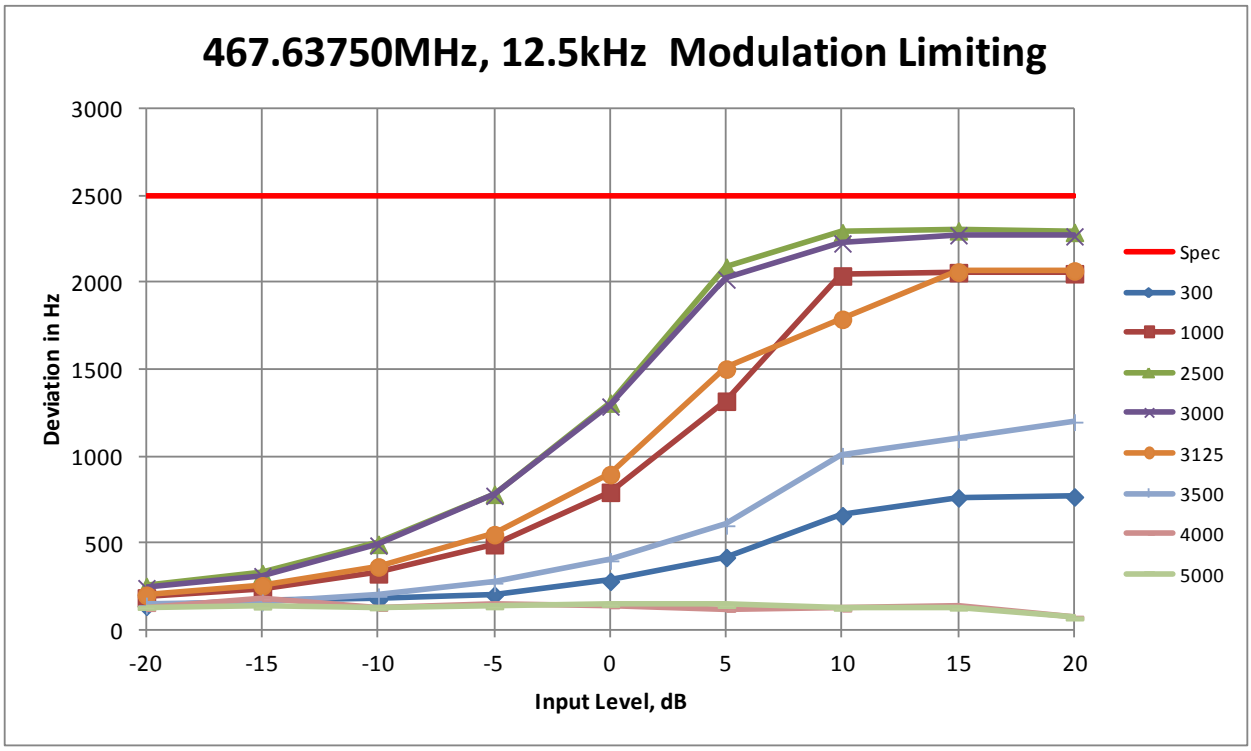
RSS-210 E.3.2(GMRS) Modulation Requirements

The peak frequency deviation shall not exceed +/-5kHz.

6.2.3. Test Result



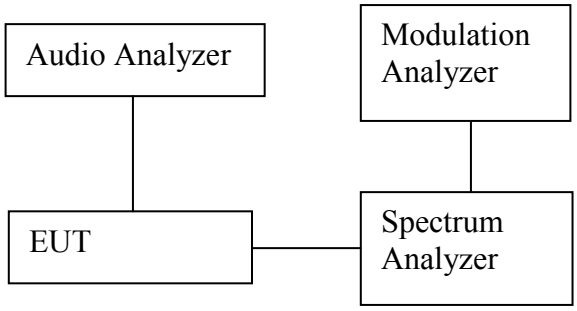
Frequency / Channel Spacing	462.63750MHz / 12.5kHz																	
Voltage	4.50 V																	
Temperature, °C	25																	
Freq Deviation, Hz	300		1000		2500		3000		3125		3500		4000		5000		Spec	
Input Level, dB	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%
-20	69	2.8	117	4.7	169	6.8	172	6.9	128	5.1	80	3.2	56	2.2	61	2.4	2500	100
-15	86	3.4	166	6.6	244	9.8	245	9.8	179	7.1	98	3.9	60	2.4	60	2.4	2500	100
-10	95	3.8	248	9.9	393	15.7	384	15.4	277	11.1	133	5.3	64	2.6	63	2.5	2500	100
-5	136	5.5	392	15.7	651	26.1	639	25.6	444	17.8	197	7.9	63	2.5	60	2.4	2500	100
0	197	7.9	666	26.6	1119	44.8	1098	43.9	746	29.9	302	12.1	60	2.4	61	2.5	2500	100
5	329	13.1	1139	45.5	1959	78.4	1905	76.2	1295	51.8	512	20.5	64	2.5	60	2.4	2500	100
10	549	22.0	1971	78.9	2284	91.4	2260	90.4	1727	69.1	845	33.8	65	2.6	61	2.4	2500	100
15	779	31.2	2055	82.2	2301	92.1	2286	91.4	2047	81.9	1072	42.9	78	3.1	64	2.5	2500	100
20	741	29.7	2070	82.8	2297	91.9	2281	91.2	2068	82.7	1187	47.5	49	2.0	48	1.9	2500	100



Frequency / Channel Spacing	467.63750 MHz \ 12.5kHz																	
Voltage	4.50 V																	
Temperature, °C	25																	
Freq Deviation, Hz	300		1000		2500		3000		3125		3500		4000		5000		Spec	
Input Level, dB	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%
-20	140	5.6	188	7.5	254	10.2	244	9.8	203	8.1	144	5.8	124	5.0	131	5.2	2500	100
-15	173	6.9	230	9.2	328	13.1	313	12.5	258	10.3	162	6.5	181	7.2	133	5.3	2500	100
-10	175	7.0	327	13.1	497	19.9	490	19.6	366	14.7	197	7.9	125	5.0	128	5.1	2500	100
-5	203	8.1	495	19.8	785	31.4	776	31.0	552	22.1	273	10.9	145	5.8	134	5.4	2500	100
0	283	11.3	796	31.9	1311	52.4	1290	51.6	899	35.9	401	16.1	140	5.6	148	5.9	2500	100
5	421	16.8	1321	52.8	2093	83.7	2022	80.9	1506	60.3	604	24.1	119	4.8	142	5.7	2500	100
10	662	26.5	2043	81.7	2292	91.7	2230	89.2	1793	71.7	1007	40.3	121	4.8	126	5.0	2500	100
15	764	30.6	2062	82.5	2303	92.1	2277	91.1	2065	82.6	1102	44.1	138	5.5	127	5.1	2500	100
20	770	30.8	2056	82.2	2294	91.8	2271	90.8	2072	82.9	1201	48.0	74	2.9	70	2.8	2500	100

6.3. Audio Frequency Response

6.3.1. Test Setup



1) The DUT transmitter output port was connected to Modulation Analyzer.
2) Path loss for the measurement included.
3) Set the audio bandwidth filter to 15 kHz and 50kHz.
4) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 20% of the maximum deviation.
5) On audio analyzer, set the rated level as reference to zero.
6) Vary the audio frequency from 300Hz to 3 kHz. Record the change in dB on the audio analyzer.

6.3.2. Test Limits:

§95.575 FRS modulation limits

Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

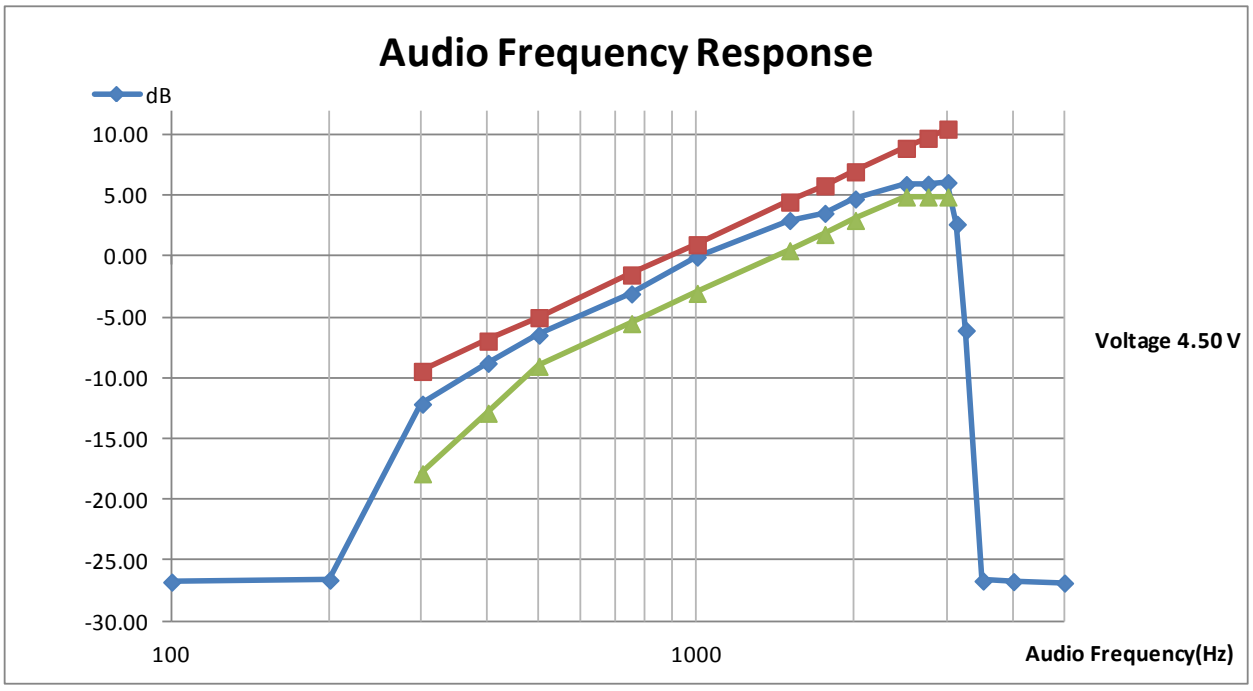
§95.1775 GMRS modulation requirements

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

6.3.3. Test Result

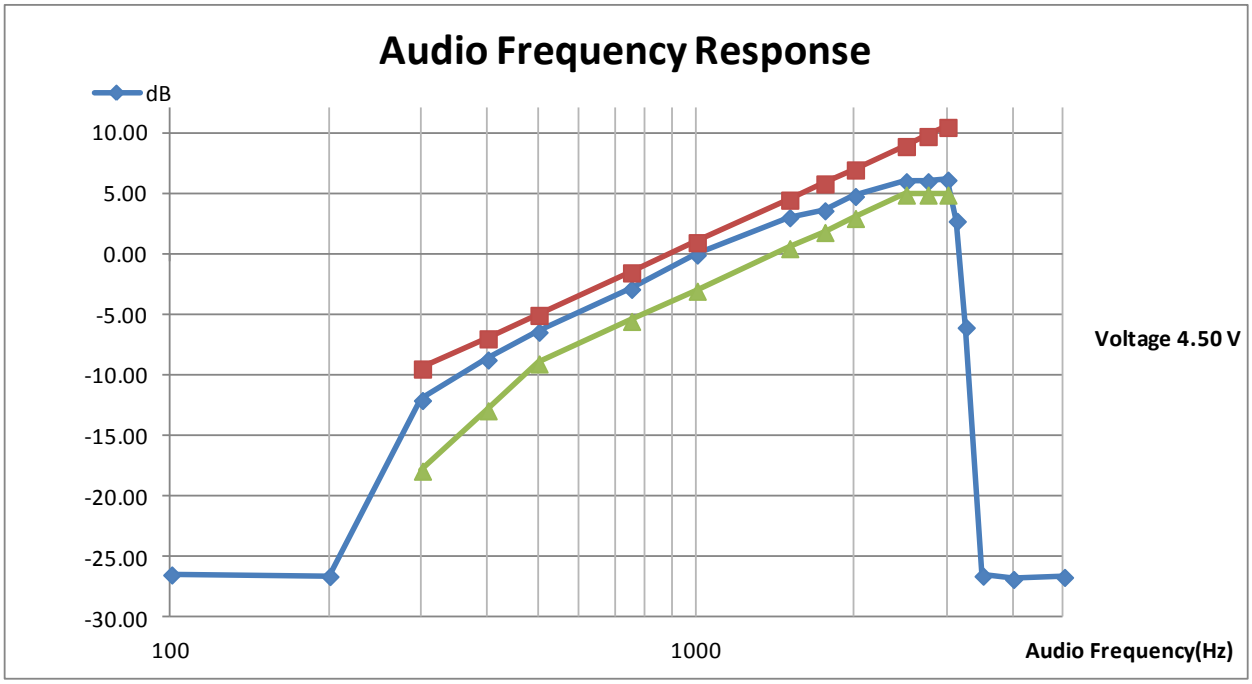
Frequency : 462.6375 MHz 0.6 Watt

Voltage	4.50 V		
Temp. (°C)	25		
Audio Frequency(Hz)	dB	HighSide Specs	LowSide Specs
100	-26.76		
200	-26.60		
300	-12.12	-9.4218	-17.8436
400	-8.76	-6.9316	-12.8631
500	-6.44	-5.0000	-9.0000
750	-3.05	-1.4902	-5.4902
1000	-0.02	1.0000	-3.0000
1500	2.99	4.5098	0.5098
1750	3.58	5.8441	1.8441
2000	4.76	7.0000	3.0000
2500	5.95	8.9316	4.9316
2750	5.98	9.7566	4.9316
3000	6.11	10.5098	4.9316
3125	2.68		
3250	-6.06		
3500	-26.67		
4000	-26.72		
5000	-26.84		



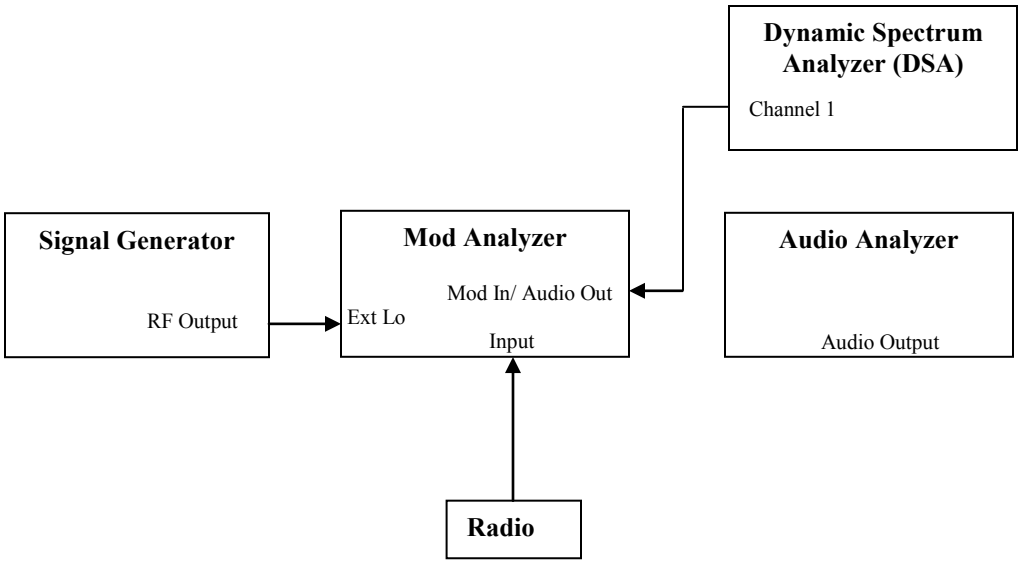
Frequency : 467.6375 MHz 0.6 Watt

Voltage	4.50 V		
Temp. (°C)	25		
Audio Frequency(Hz)	dB	HighSide Specs	LowSide Specs
100	-26.41		
200	-26.54		
300	-12.02	-9.4218	-17.8436
400	-8.68	-6.9316	-12.8631
500	-6.39	-5.0000	-9.0000
750	-2.85	-1.4902	-5.4902
1000	-0.02	1.0000	-3.0000
1500	3.06	4.5098	0.5098
1750	3.63	5.8441	1.8441
2000	4.81	7.0000	3.0000
2500	6.03	8.9316	4.9316
2750	6.03	9.7566	4.9316
3000	6.16	10.5098	4.9316
3125	2.76		
3250	-6.01		
3500	-26.51		
4000	-26.78		
5000	-26.61		



6.4. Audio Low Pass Filter

6.4.1. Test Setup



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.

6.4.2. Test Limits:

§95.1775 GMRS modulation requirements

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

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

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

RSS-210 E.3.3(GMRS) Modulation Requirements

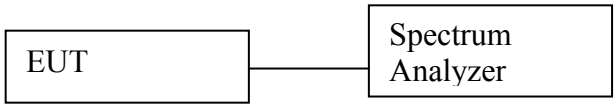
Table E3 — Audio Frequency Filter Attenuation for GMRS Devices	
Frequency, f (kHz)	Attenuation Greater Than the Attenuation at 1 kHz (dB)
$3 \leq f \leq 20$	$60 \log_{10}(f/3)$
$f > 20$	50

6.4.3. Test Result

The EUT uses an internal IC low pass filter. The audio low pass filter response is not measurable per the filter manufacturer. Compliance to requirements will be demonstrated using the manufacturer's filter specification as described in the equipment Theory of Operation.

6.5. Frequency Stability

6.5.1. Test Setup



1) The DUT transmitter output port was connected to Modulation Analyzer.
2) Transmit the DUT and record the freq in MCFMHz.
3) Test in 2 conditions: Different Temperature & Supply Voltage input.
   - Temperature: Vary from -30^{O}C to +50^{O}C with Nominal supply voltage.
   - Supply Voltage: Vary +/-15 % in room temperature
4) Calculate the ppm frequency error by the following:

$$ppm\ error = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1 \right) * 10^{6}$$

Where: *MCF*MHz is the Measured Carrier Frequency in MHz
*ACF*MHz is the Assigned Carrier Frequency in MHz

6.5.2. Test Limits:

§95.565 FRS frequency accuracy

Each FRS transmitter type must be designed such that the carrier frequencies remain within ±2.5 parts-per-million of the channel center frequencies specified in §95.563 during normal operating conditions.

§95.1765 GMRS frequency accuracy

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

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

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

RSS-210 E.2.6 (FRS) Frequency Stability

The carrier frequency tolerance shall be better than ±5 ppm.

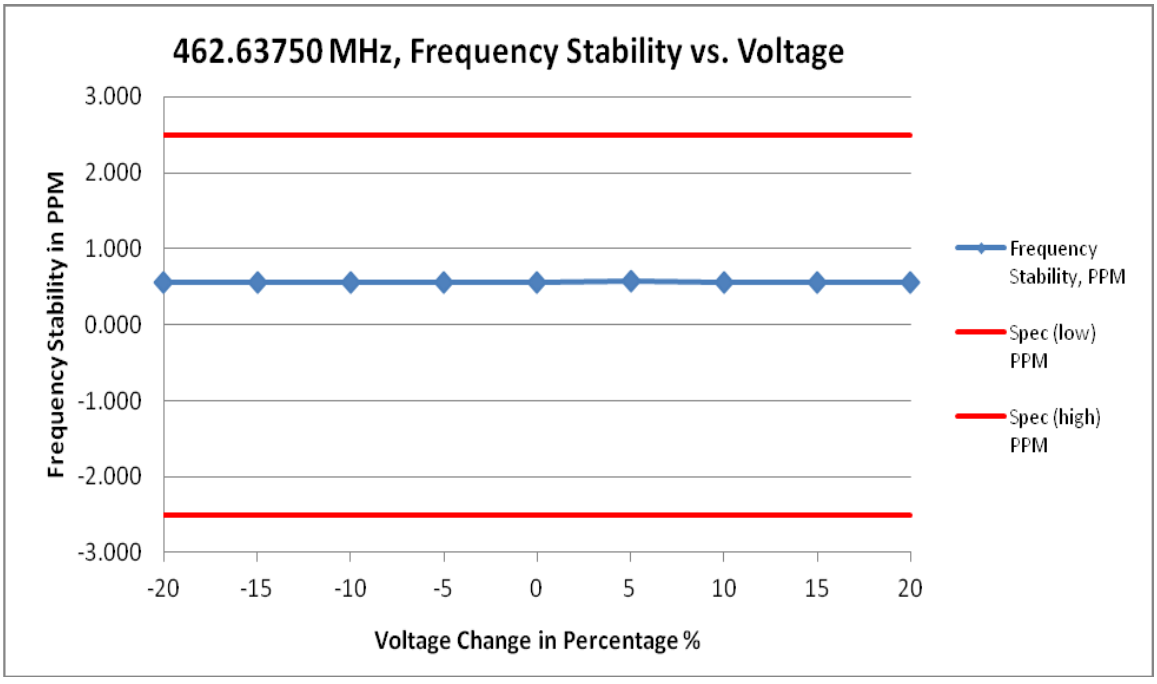
RSS-210 E.3.7 (GMRS) Frequency Stability

The carrier frequency tolerance shall be better than ±5 ppm.

6.5.3. Test Result

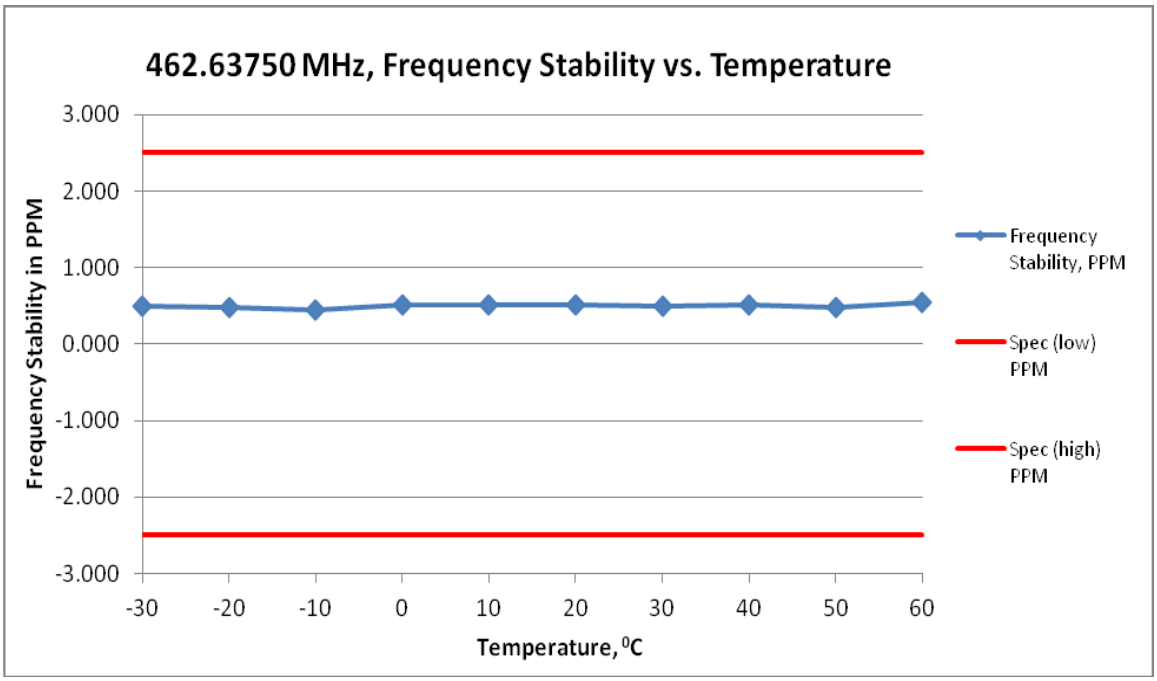
(i) Frequency Stability VS Voltage

Frequency / Channel Spacing	462.63750 MHz / 12.5 kHz				
Temperature, ^{0}C	25				
Voltage %	Voltage, V	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-20	3.600	462.637760	0.562	-2.500	2.500
-15	3.825	462.637760	0.562	-2.500	2.500
-10	4.050	462.637760	0.562	-2.500	2.500
-5	4.275	462.637760	0.562	-2.500	2.500
0	4.500	462.637760	0.562	-2.500	2.500
5	4.725	462.637770	0.584	-2.500	2.500
10	4.950	462.637760	0.562	-2.500	2.500
15	5.175	462.637760	0.562	-2.500	2.500
20	5.400	462.637760	0.562	-2.500	2.500



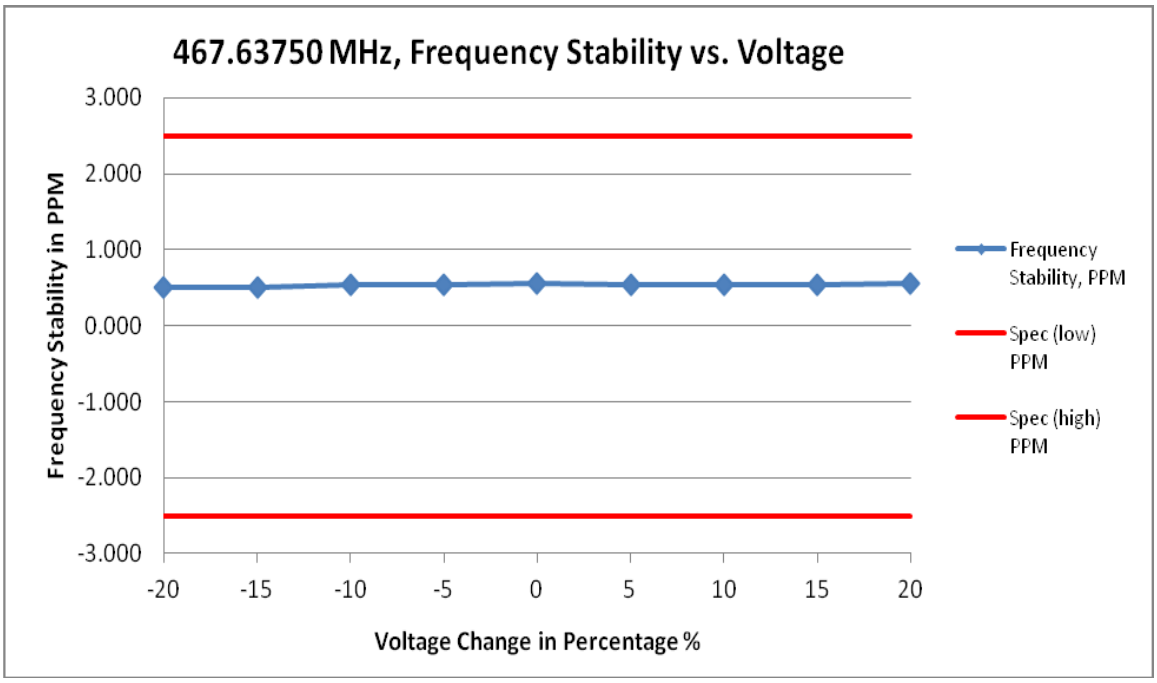
(ii) Frequency Stability VS temperature

Frequency / Channel Spacing	462.63750 MHz / 12.5kHz			
Voltage, V	4.5			
Temperature, ^{0}C	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-30	462.637730	0.497	-2.500	2.500
-20	462.637720	0.476	-2.500	2.500
-10	462.637710	0.454	-2.500	2.500
0	462.637740	0.519	-2.500	2.500
10	462.637740	0.519	-2.500	2.500
20	462.637740	0.519	-2.500	2.500
30	462.637730	0.497	-2.500	2.500
40	462.637740	0.519	-2.500	2.500
50	462.637720	0.476	-2.500	2.500
60	462.637750	0.540	-2.500	2.500



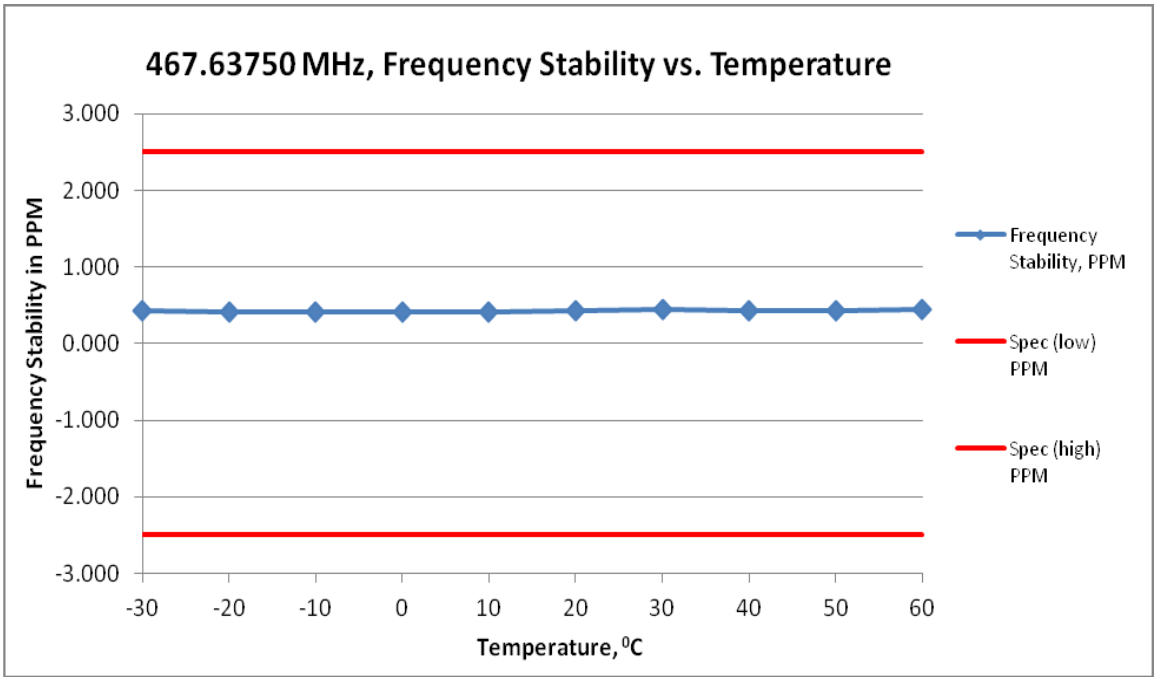
(i) Frequency Stability VS Voltage

Frequency / Channel Spacing	467.63750 MHz / 12.50 kHz				
Temperature, ^{0}C	25				
Voltage %	Voltage, V	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-20	3.600	467.637740	0.513	-2.500	2.500
-15	3.825	467.637740	0.513	-2.500	2.500
-10	4.050	467.637750	0.535	-2.500	2.500
-5	4.275	467.637750	0.535	-2.500	2.500
0	4.500	467.637760	0.556	-2.500	2.500
5	4.725	467.637750	0.535	-2.500	2.500
10	4.950	467.637750	0.535	-2.500	2.500
15	5.175	467.637750	0.535	-2.500	2.500
20	5.400	467.637760	0.556	-2.500	2.500



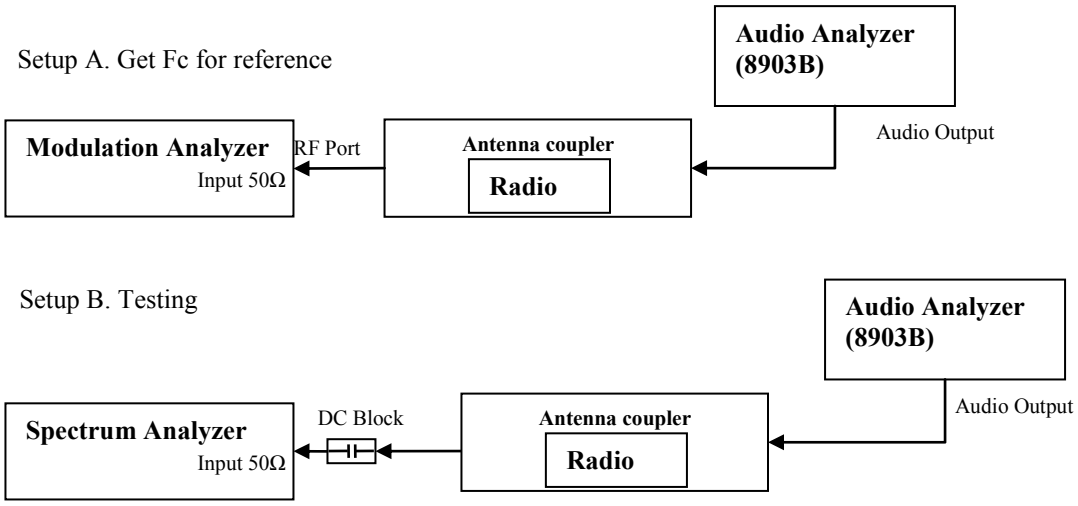
(ii) Frequency Stability VS temperature

Frequency / Channel Spacing	467.63750 MHz / 12.50 kHz			
Voltage, V	4.5			
Temperature, ^{0}C	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-30	467.637700	0.428	-2.500	2.500
-20	467.637690	0.406	-2.500	2.500
-10	467.637690	0.406	-2.500	2.500
0	467.637690	0.406	-2.500	2.500
10	467.637690	0.406	-2.500	2.500
20	467.637700	0.428	-2.500	2.500
30	467.637710	0.449	-2.500	2.500
40	467.637700	0.428	-2.500	2.500
50	467.637700	0.428	-2.500	2.500
60	467.637710	0.449	-2.500	2.500



6.6. Emission Mask

6.6.1. Test Setup



1) The DUT transmitter output port was connected to Modulation Analyzer.
2) Path loss for the measurement included.
3) Key in the Fc to assigned center frequency with the span 100 kHz.
4) Set the spectrum analyzer with RBW= 300Hz and VBW= 900Hz.
5) Transmit the UUT and record the result.
6) Set modulation analyzer audio bandwidth filter to 15 kHz low pass filter and 50 kHz high pass filter.
7) Transmit the radio and set the audio analyzer to 2.5 kHz audio frequency and 60% of the maximum deviation.
8) Up the amplitude by 16dB and remove the audio tone from audio analyzer.
9) Capture the screen shot with and without modulation.

6.6.2. Test Limits:

§95.579 FRS unwanted emissions limits

Each FRS transmitter type must be designed to satisfy the applicable unwanted emissions limits in this paragraph.

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

(1) 25 dB (decibels) in the frequency band 6.25 kHz to 12.5 kHz removed from the channel center frequency.
(2) 35 dB in the frequency band 12.5 kHz to 31.25 kHz removed from the channel center frequency.
(3) 43 + 10 log (P) dB in any frequency band removed from the channel center frequency by more than 31.25 kHz.

(b) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (a)(1) and (2) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (a)(3) is measured with a reference bandwidth of at least 30 kHz.

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

§95.1779 GMRS unwanted emissions limits (1), (2), (7)

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%.

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

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

RSS 210 E.2.5 Unwanted Emissions

Unwanted emissions shall be attenuated below the unmodulated carrier power in accordance with the following:
25 dB, measured with a bandwidth of 300 Hz, in the band 6.25 kHz to 12.5 kHz removed from the channel centre frequency;

35 dB, measured with a bandwidth of 300 Hz, in the band 12.5 kHz to 31.25 kHz removed from the channel centre frequency; and

43 dB + 10 log10 (carrier power in watts) dB, measured with a bandwidth of at least 30 kHz for frequencies beyond 31.25 kHz removed from the channel centre frequency.

RSS 210 E.3.6 Unwanted Emissions

Unwanted emissions shall be attenuated below the unmodulated carrier power in accordance with the following:

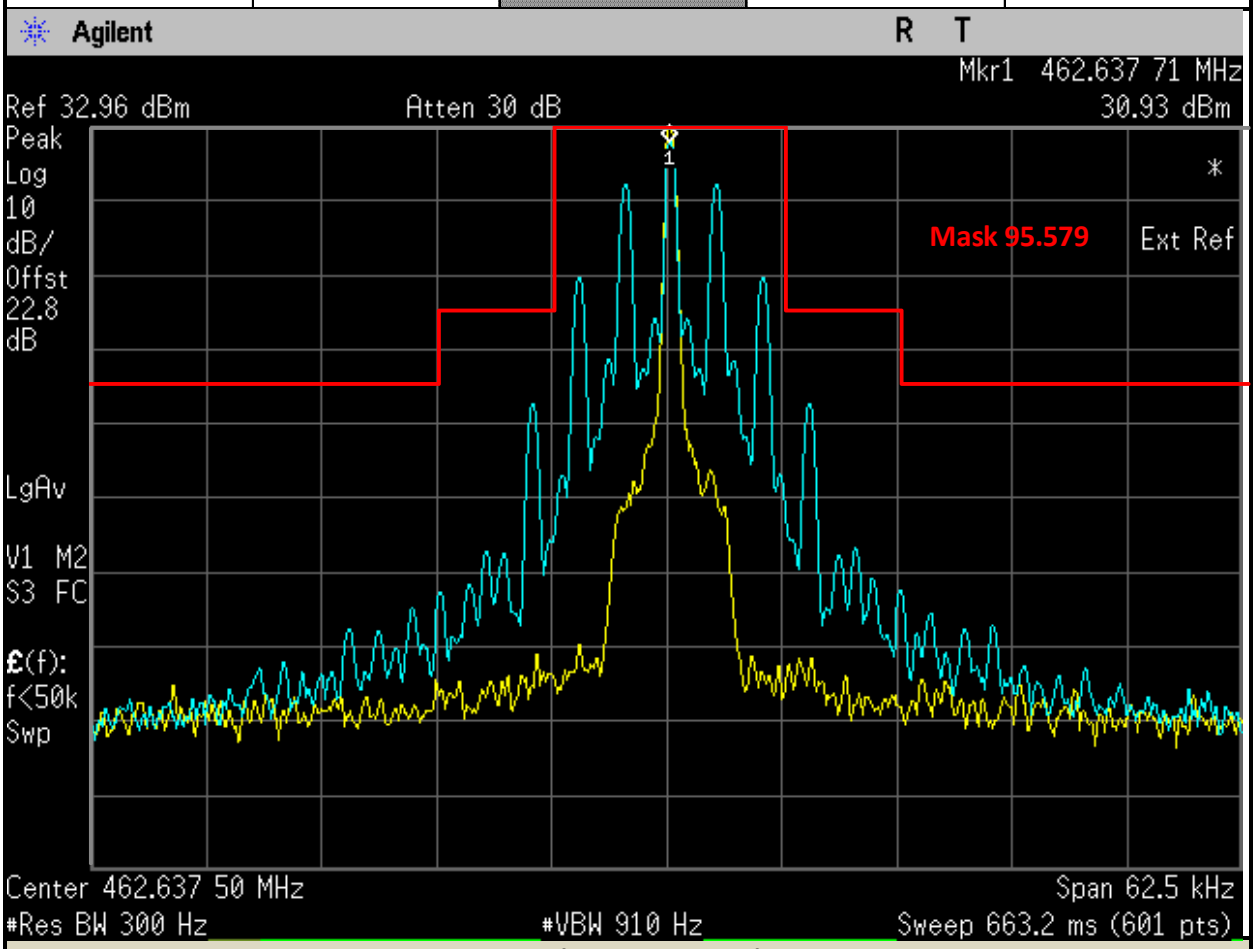
a. For emission types A1D, A3E, F1D, G1D, F3E, G3E and F2D with filtering:

   i. 25 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth;

   ii. 35 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 100%, up to and including 250% of the authorized bandwidth; and 43 dB + 10 $\log_{10}$(carrier power in watts) dB, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth.

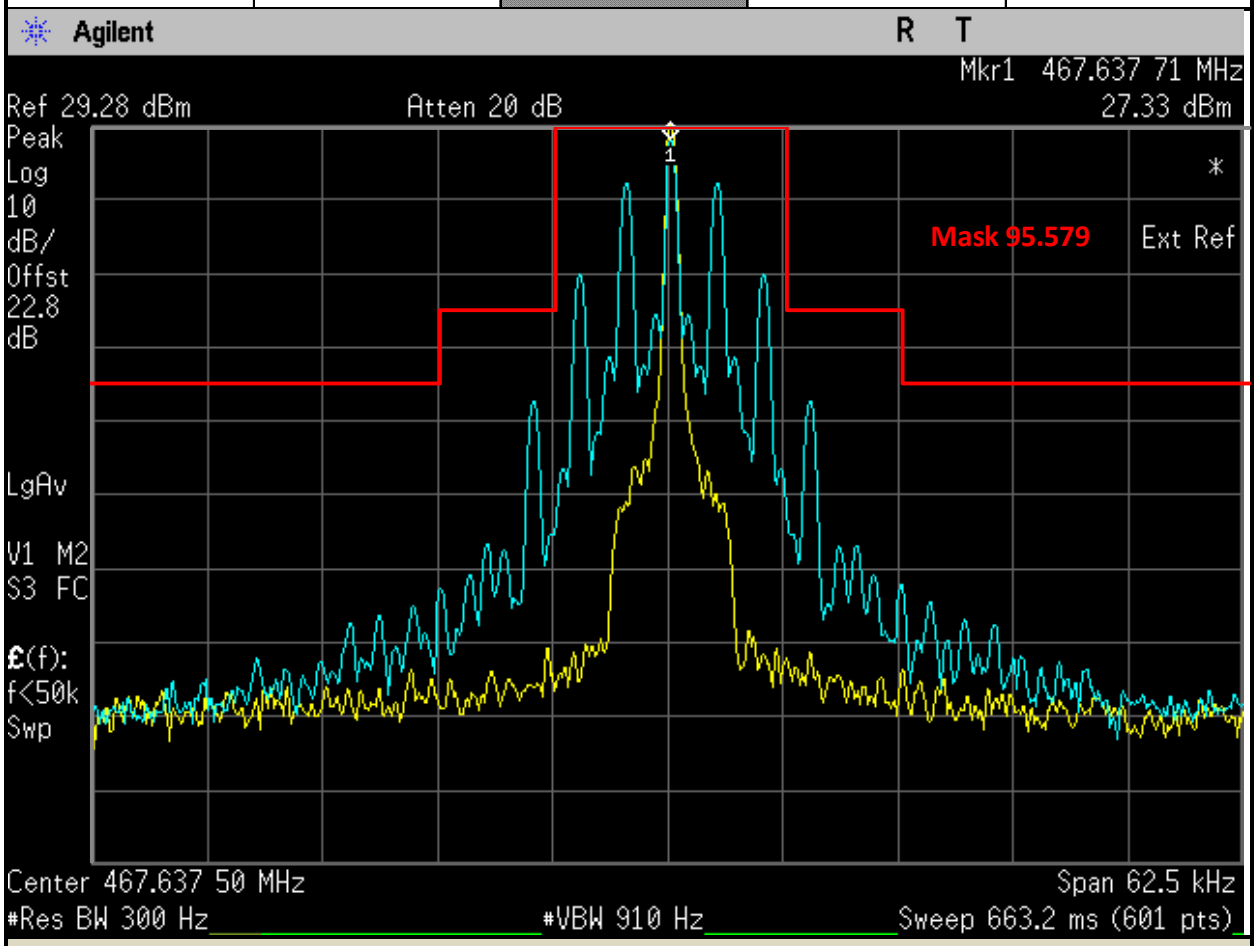
6.6.1. Test Data

Modulation			Rules Part	
Analog Voice			FCC Part 95.579	
Channel Frequency (MHz)	**Channel Spacing (kHz)**		**99% OCB (kHz)**	**Emission Designator**
462.6375	12.5		9.9938	11K0F3E



NTIA (x dB OCB Points)				
-26 dB Point (kHz)	**-3 dB Point (kHz)**	**-20 dB Point (kHz)**	**-40 dB Point (kHz)**	**-60 dB Point (kHz)**
10.5903	0.3810	10.3124	15.4808	22.5163

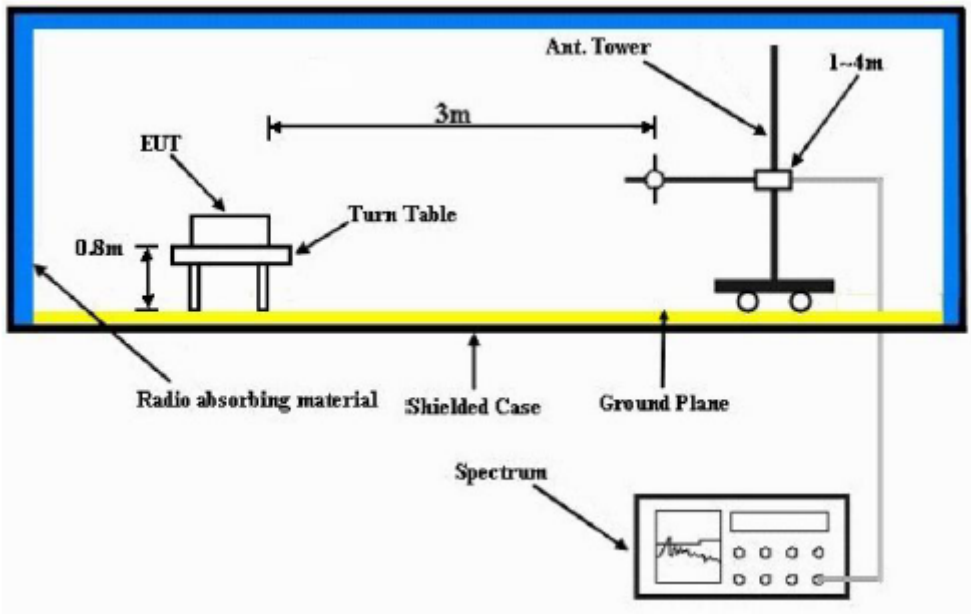
Modulation			Rules Part	
Analog Voice			FCC Part 95.579	
Channel Frequency (MHz)	**Channel Spacing (kHz)**		**99% OCB (kHz)**	**Emission Designator**
467.6375	12.5		9.9926	11K0F3E



NTIA (x dB OCB Points)				
-26 dB Point (kHz)	**-3 dB Point (kHz)**	**-20 dB Point (kHz)**	**-40 dB Point (kHz)**	**-60 dB Point (kHz)**
10.5940	0.3815	10.3114	15.4804	23.6602

6.7. Radiated Spurious Emission

6.7.1. Test Setup



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 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.

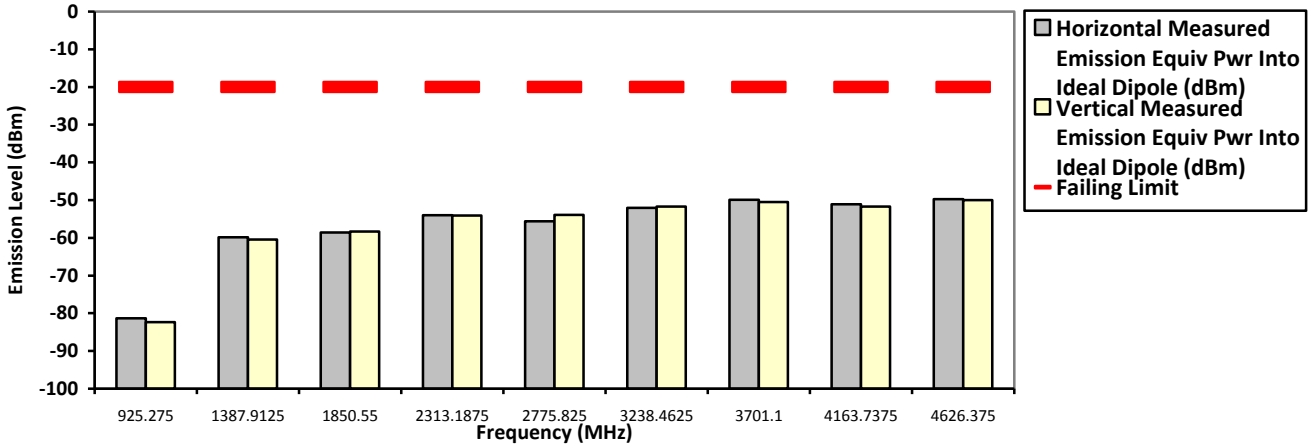
6.7.2. Test Result

SAC Transmitter Radiated Emission:

Model Number: T100 | **S/N: 6904UW0009** | **SR:15834-RF-00003**
Test Mode: TX Analog | **Battery Part No: AAA ALKALINE** | **Accy Part No: NA**
462.637500 MHz | **12.5 kHz** | **0.600 Watt(s) /Max Power**

Frequency (MHz)	Limit	Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm)
925.2750	-20.0000	-81.2932 **	-82.3115 **
1387.9125	-20.0000	-59.8212 **	-60.4795 **
1850.5500	-20.0000	-58.5850 **	-58.3304 **
2313.1875	-20.0000	-54.0085 **	-54.0852 **
2775.8250	-20.0000	-55.5897 **	-53.9356 **
3238.4625	-20.0000	-52.0091 **	-51.6816 **
3701.1000	-20.0000	-49.9329 **	-50.5362 **
4163.7375	-20.0000	-51.0726 **	-51.6831 **
4626.3750	-20.0000	-49.7634 **	-50.0168 **

RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the ANSI C63.26-2015 document.
Motorola Penang EMC Lab - Test Performed by: Azil&Qawiman **Wed, Dec 19, 2018**

Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.
***Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported**

System MU: 5.01 dB

Temp(Deg): 23.9
Hum(%RH): 70.3

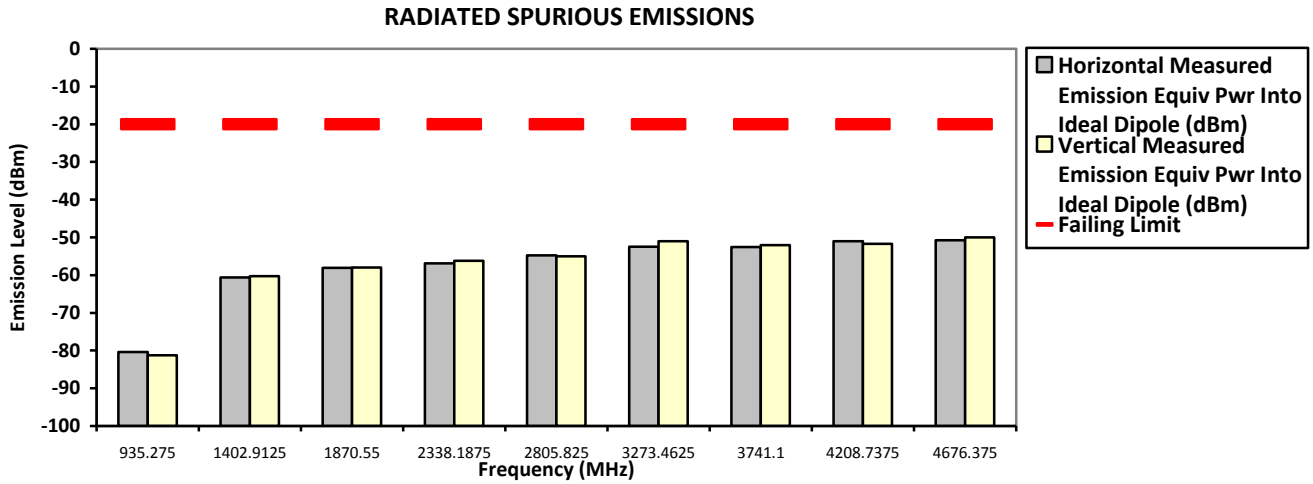
Remarks:

Passed Results	**Marginal Results**	**Failed Results**

SAC Transmitter Radiated Emission:

Model Number: T100 | **S/N: 6904UW0009** | **SR:15834-RF-00003**
Test Mode: TX Analog | **Battery Part No: AAA ALKALINE** | **Accy Part No: NA**
467.637500 MHz | **12.5 kHz** | **0.600 Watt(s) /Max Power**

Frequency (MHz)	Limit	Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm)
935.2750	-20.0000	-80.3676 **	-81.2674 **
1402.9125	-20.0000	-60.6378 **	-60.2646 **
1870.5500	-20.0000	-58.0854 **	-57.9693 **
2338.1875	-20.0000	-56.8665 **	-56.1936 **
2805.8250	-20.0000	-54.7848 **	-55.0497 **
3273.4625	-20.0000	-52.4547 **	-51.0334 **
3741.1000	-20.0000	-52.5867 **	-52.0013 **
4208.7375	-20.0000	-51.0114 **	-51.6781 **
4676.3750	-20.0000	-50.7987 **	-50.0142 **



The data presented here was taken using the substitution method as found in the ANSI C63.26-2015 document.
Motorola Penang EMC Lab - Test Performed by: Azil&Qawiman **Wed, Dec 19, 2018**

Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.
***Pursuant to CFR 47 Part 2.1057 (c), emissions attenuated more than 20 dB below the permissible limit are not reported**

System MU: 5.01 dB

Temp(Deg): 23.9
Hum(%RH): 70.3

Remarks:

Passed Results	**Marginal Results**	**Failed Results**

6.7.3. Test limit

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

§95.579 FRS unwanted emissions limits

Each FRS transmitter type must be designed to satisfy the applicable unwanted emissions limits in this paragraph.

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

(1) 25 dB (decibels) in the frequency band 6.25 kHz to 12.5 kHz removed from the channel center frequency.
(2) 35 dB in the frequency band 12.5 kHz to 31.25 kHz removed from the channel center frequency.
(3) 43 + 10 log (P) dB in any frequency band removed from the channel center frequency by more than 31.25 kHz.

(b) Measurement bandwidths. The power of unwanted emissions in the frequency bands specified in paragraphs (a)(1) and (2) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency range specified in paragraph (a)(3) is measured with a reference bandwidth of at least 30 kHz.

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

§95.1779 GMRS unwanted emissions limits (1), (2), (7)

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%.

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

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

- End of Test Report -