MOTOROLA SOLUTIONS

ACCREDITED

TESTING CERT # 2786.01

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

FCC / IC TEST REPORT
Report Revision : Rev.B

Date/s Tested	:	15-July-2018 - 23-July-2018
Report Issue Date	:	23-July-2018
Manufacturer/Location	:	Motorola Solutions Malaysia SDN BHD Plot 2, Bayan Lepas Technoplex, 11900 Bayan Lepas, Penang, Malaysia
Requestor	:	FOOI TENG GAN
Product Type	:	Portable
Model Number	:	T800
Frequency Band	:	462-468 MHz
Max. Output Power	:	2 W
Firmware Version	:	NA
Applicant Name		Motorola Solutions Inc
FCC Registration	:	461337
IC Registrations	:	109AK

The equipment was tested accordance to the requirement listed below:

PASS

FCC 47 CFR Part 95

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	**02-August-2018**	**Gan Boon Teong**
Rev. B	Added passive components in Equipment list	**17-August-2018**	**Gan Boon Teong**

1.0. General Information

EUT Description:

Tx Frequency range	
462.5500MHz to 467.7125MHz	
Antenna type gain	Fix antenna or integral antenna, -0.5dBi
Technologies	FM
Device voltage	4.5V 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
RSS 210, Issue 9

2.0. Summary of Test Results

FCC Clause	IC Clause	Test Item	Result	Remark
95.567 95.1767	RSS 210 E.2.4 RSS 210 E.3.5	Maximum Output Power	Pass	NA
95.575 95.1775	RSS 210 E.2.2 RSS 210 E.3.2	Modulation Limiting	Pass	NA
95.575 95.1775	-	Audio Frequency Response	Pass	NA
95.1775	RSS 210 E.3.3	Audio Low Pass Filter	Pass	NA
95.565 95.1765	RSS 210 E.2.6 RSS 210 E.3.7	Frequency Stability	Pass	NA
95.573 95.1773	RSS 210 E.2.3 RSS 210 E.3.4	Emission Bandwidth	Pass	NA
95.579 95.1779	RSS 210 E.2.5 RSS 210 E.3.6	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	E9326A	MY44420113	11-Sep-17	11-Sep-18
CHAMBER	PL-3KP	14011891	12-Feb-18	12-Feb-19
RF TRANSCEIVER CONTROLLER	AX2007AI	AX2007AI005	Not Required	Not Required
POWER METER	E4416A	MY45101705	15-Oct-16	15-Oct-18
SIGNAL GENERATOR	E4424B	MY43350147	26-Jul-17	26-Jul-18
SIGNAL GENERATOR	SMA100A	111382	4-Jul-17	4-Jul-20
TRANSCEIVER INTERFACE	8954A	2924A00823	5-Feb-18	5-Feb-19
AUDIO ANALYZER	8903B	3413A13846	4-Apr-18	4-Apr-19
MODULATION ANALYZER	8901B	2914A02038	22-Aug-17	22-Aug-18
SIGNAL GENERATOR	SMA100A	111423	2-Jul-16	2-Jul-19
SPECTRUM ANALYZER	8594E	3506A01703	29-Aug-17	29-Aug-18
DYNAMIC SIGNAL ANALYZER	35670A	MY42506847	1-Apr-18	1-Apr-19
POWER SUPPLY	6031A	3543A03355	17-Apr-18	17-Apr-19
N to N RF cable # 1	SUCOFLEX 104	NA	NA	NA
N to N RF cable # 2	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 3	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 4	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 5	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 6	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 7	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 8	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 9	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 10	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 11	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 12	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 13	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 14	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 15	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 16	84188418 H+S MY 0812	NA	NA	NA
BNC to BNC RF cable # 1	NA	NA	NA	NA
BNC to BNC RF cable # 2	NA	NA	NA	NA
BNC to BNC RF cable # 3	NA	NA	NA	NA

BNC to BNC RF cable # 4	NA	NA	NA	NA
BNC to BNC RF cable # 5	NA	NA	NA	NA
BNC to BNC RF cable # 6	NA	NA	NA	NA
BNC to BNC RF cable # 7	NA	NA	NA	NA
BNC to BNC RF cable # 8	NA	NA	NA	NA
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
AUDIO ANALYZER	8903B	2533A00529	2-May-18	2-May-19
STEP ATTENUATOR	8494G	MY42143870	19-May-18	19-May-19
STEP ATTENUATOR	8494G	MY42144175	17-Sep-16	17-Sep-18
ATTENUATOR/SWITCH DRIVER	11713A	MY44321022	Not Required	Not Required
SWITCH CONTROL UNIT	3488A	CN37145920	Not Required	Not Required
OSCILLOSCOPE	MSO8064A	MY45003003	30-Oct-17	30-Oct-18
POWER SENSOR	E4412A	MY41501734	20-Sep-17	20-Sep-18
AUDIO ANALYZER	8903B	3413A14095	5-Feb-18	5-Feb-19
MODULATION ANALYZER	8901B	3226A03982	2-Oct-17	2-Oct-18
SIGNAL GENERATOR (0.1-1040 MHZ)	8657A	3025A02255	14-Oct-17	14-Oct-18
POWER METER	E4416A	MY50000116	20-Apr-18	20-Apr-20
SPECTRUM ANALYZER	E4445A	MY45301089	21-Jul-17	21-Jul-19
POWER SUPPLY	6031A	3121A02341	6-Jun-17	6-Jun-19
N to N RF cable # 1	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 2	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 3	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 4	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 5	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 6	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 7	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 8	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 9	84188418 H+S MY 0812	NA	NA	NA
N to N RF cable # 10	84188418 H+S MY 0812	NA	NA	NA
BNC to BNC RF cable # 1	NA	NA	NA	NA

BNC to BNC RF cable # 2	NA	NA	NA	NA
BNC to BNC RF cable # 3	NA	NA	NA	NA
BNC to BNC RF cable # 4	NA	NA	NA	NA
BNC to BNC RF cable # 5	NA	NA	NA	NA
BNC to BNC RF cable # 6	NA	NA	NA	NA
BNC to BNC RF cable # 7	NA	NA	NA	NA
BNC to BNC RF cable # 8	NA	NA	NA	NA
BNC to BNC RF cable # 9	NA	NA	NA	NA
Aeroflex Attenuator 10dB	33-10-34-LIM	NA	NA	NA
Agilent Dual Directional Coupler	7778D	1144A07075	NA	NA
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-Jul-17	18-Jul-19
DRG HORN FREQ.	SAS-571	720	2-Mar-17	2-Mar-19
POWER SUPPLY	6032A	MY41001736	16-May-18	16-May-19
MICROWAVE SIGNAL GENERATOR	SMP04	100131	12-Jul-18	11-Jul-19
EMI TEST RECEIVER	ESIB26	100336	6-Jul-18	5-Jul-19
SIGNAL ANALYZER	FSV40	101103	4-Jul-18	3-Jul-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
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	7-Nov-17	7-Nov-18
DATA LOGGER	SDL500	A.016776	18-Mar-17	18-Mar-19
LOOP ANTENNA	6502	203479	8-Aug-17	8-Aug-18
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	2	Not Required	Not Required
PREAMPLIFIER	PAM-0118P	361	Not Required	Not Required
HIGH PASS FILTER	TRILITHIC INC	200551043	Not Required	Not Required
RF CABLE #8	SUCOFLEX 106P	500083/6P	Not Required	Not Required
RF CABLE #3	SUCOFLEX 106P	500175/6P	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:

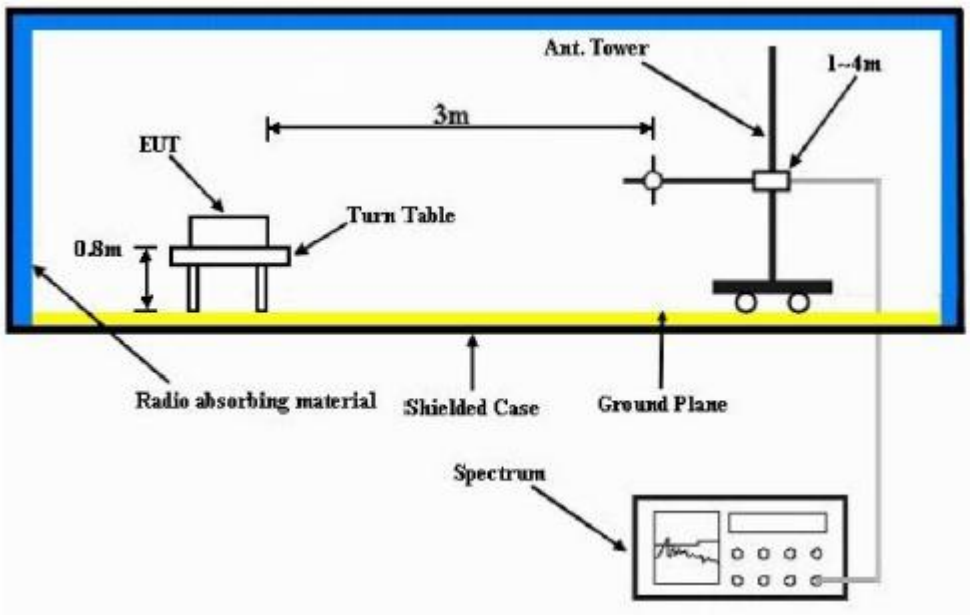
FRS

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: 1751UL6574 **Tx Power: 2.000 Watts**
Channel Spacing : 12.5 kHz **Modulation: FM**
Accessory: NA

Antenna Polarization	Frequency (MHz)	EIRP (dBm)	ERP (dBm)
Horiz.	462.6375	19.28	17.13
Vert.	462.6375	30.92	28.77

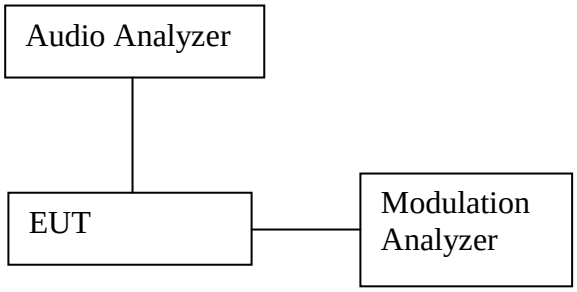
EIRP/ERP

S/N: 1751UL6574 **Tx Power: 0.500 Watts**
Channel Spacing : 12.5 kHz **Modulation: FM**
Accessory: NA

Antenna Polarization	Frequency (MHz)	EIRP (dBm)	ERP (dBm)
Horiz.	467.6375	14.72	12.57
Vert.	467.6375	27.99	25.84

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.

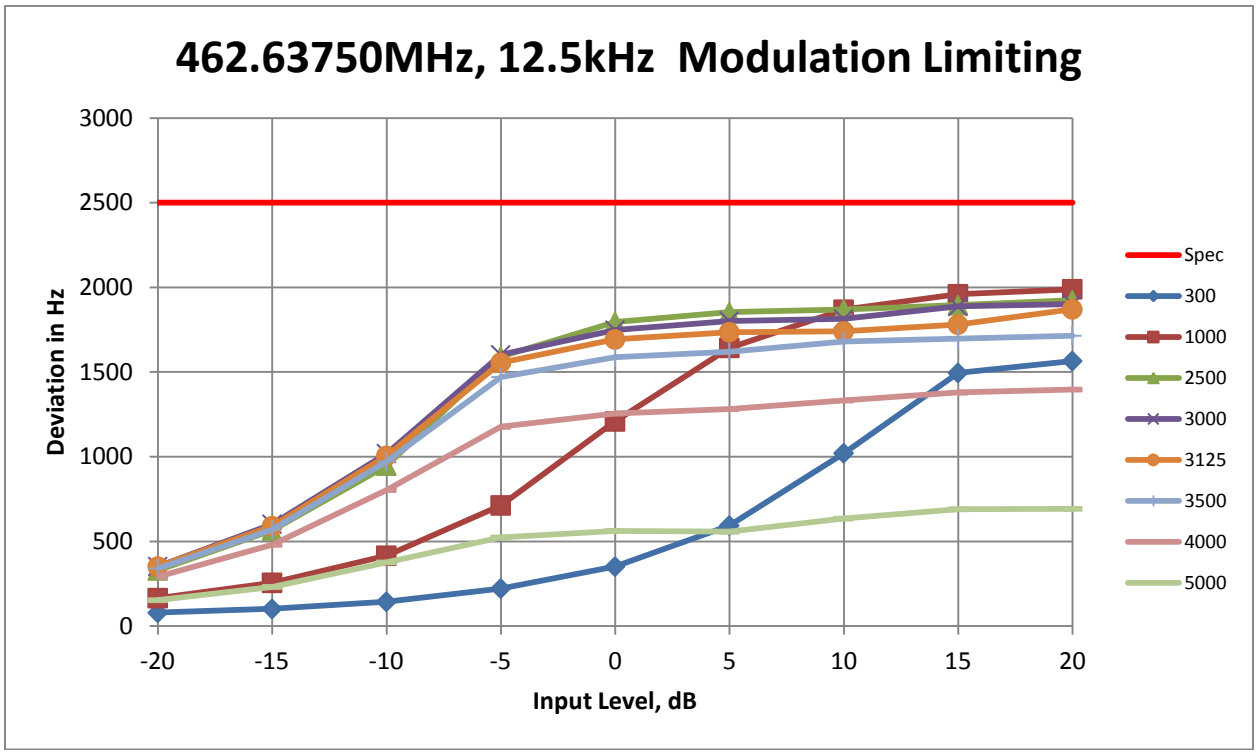
RSS-210 E.2.2 (FRS) Modulation Requirements

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

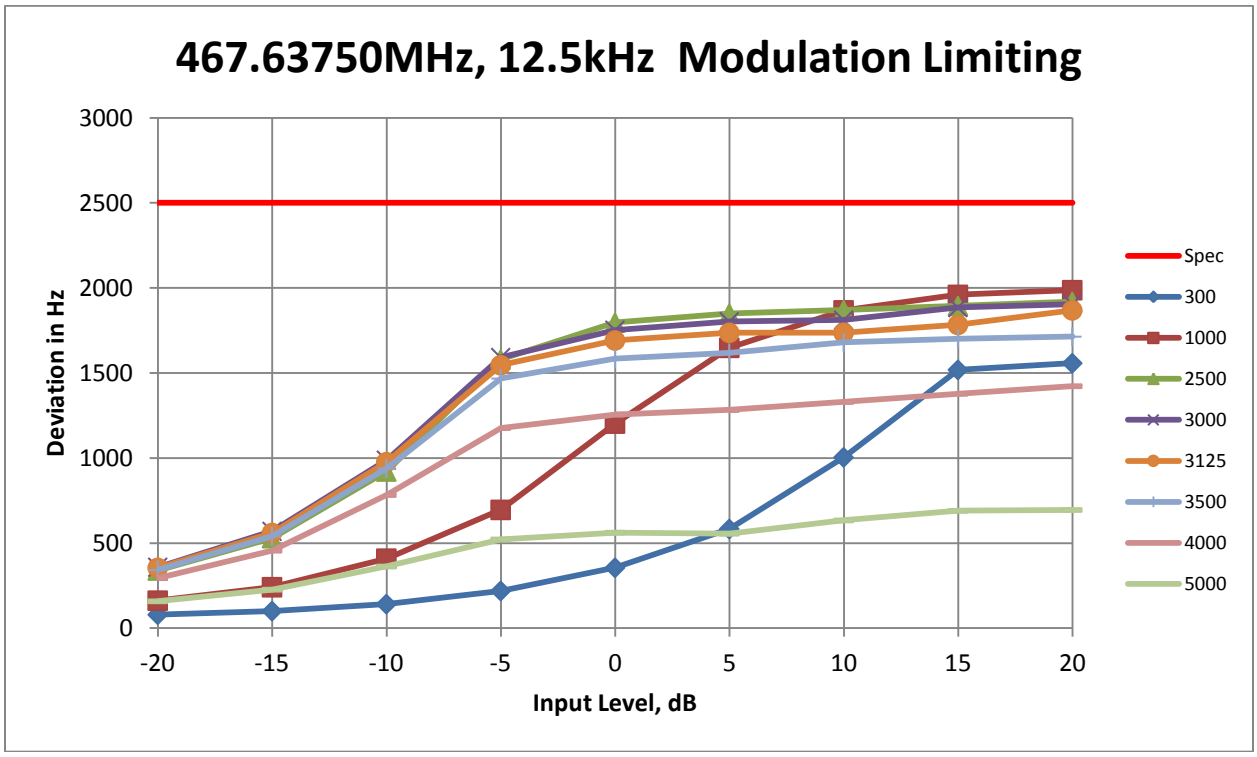
RSS-210 E.3.2(GMRS) Modulation Requirements

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

6.2.3. Test Result



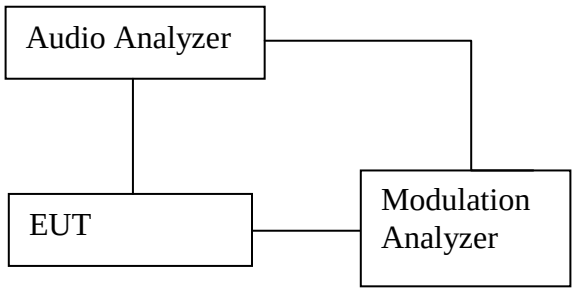
Frequency / Channel Spacing	462.63750MHz / 12.5kHz																	
Temperature, °C	25																	
Freq Deviation, Hz	300		1000		2500		3000		3125		3500		4000		5000		Spec	
Input Level, dB	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%
-20	79	3.2	166	6.6	329	13.2	353	14.1	352	14.1	341	13.6	291	11.6	153	6.1	2500	100
-15	102	4.1	256	10.2	565	22.6	602	24.1	591	23.6	569	22.8	480	19.2	232	9.3	2500	100
-10	144	5.8	416	16.6	948	37.9	1019	40.8	1006	40.2	972	38.9	804	32.2	376	15.1	2500	100
-5	222	8.9	713	28.5	1591	63.6	1603	64.1	1556	62.2	1471	58.8	1177	47.1	523	20.9	2500	100
0	352	14.1	1209	48.4	1796	71.9	1748	69.9	1693	67.7	1587	63.5	1256	50.2	563	22.5	2500	100
5	594	23.8	1643	65.7	1854	74.2	1802	72.1	1736	69.4	1619	64.8	1282	51.3	557	22.3	2500	100
10	1021	40.8	1869	74.7	1869	74.8	1814	72.6	1741	69.6	1681	67.2	1332	53.3	635	25.4	2500	100
15	1496	59.8	1960	78.4	1896	75.8	1888	75.5	1781	71.2	1698	67.9	1379	55.2	690	27.6	2500	100
20	1566	62.6	1989	79.6	1925	77.0	1902	76.1	1871	74.8	1715	68.6	1397	55.9	693	27.7	2500	100



Frequency / Channel Spacing	467.63750MHz / 12.5kHz																	
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	80	3.2	162	6.5	340	13.6	359	14.3	355	14.2	343	13.7	295	11.8	159	6.3	2500	100
-15	101	4.0	241	9.7	530	21.2	570	22.8	560	22.4	541	21.6	456	18.3	227	9.1	2500	100
-10	142	5.7	409	16.4	922	36.9	988	39.5	976	39.1	940	37.6	783	31.3	363	14.5	2500	100
-5	219	8.8	696	27.8	1580	63.2	1592	63.7	1546	61.9	1468	58.7	1177	47.1	522	20.9	2500	100
0	356	14.2	1203	48.1	1797	71.9	1752	70.1	1692	67.7	1584	63.4	1256	50.3	562	22.5	2500	100
5	584	23.3	1649	65.9	1850	74.0	1802	72.1	1737	69.5	1619	64.8	1283	51.3	556	22.2	2500	100
10	1005	40.2	1869	74.8	1870	74.8	1812	72.5	1737	69.5	1680	67.2	1330	53.2	634	25.4	2500	100
15	1519	60.8	1960	78.4	1895	75.8	1885	75.4	1783	71.3	1702	68.1	1379	55.1	690	27.6	2500	100
20	1558	62.3	1988	79.5	1919	76.8	1905	76.2	1869	74.8	1714	68.6	1423	56.9	695	27.8	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.

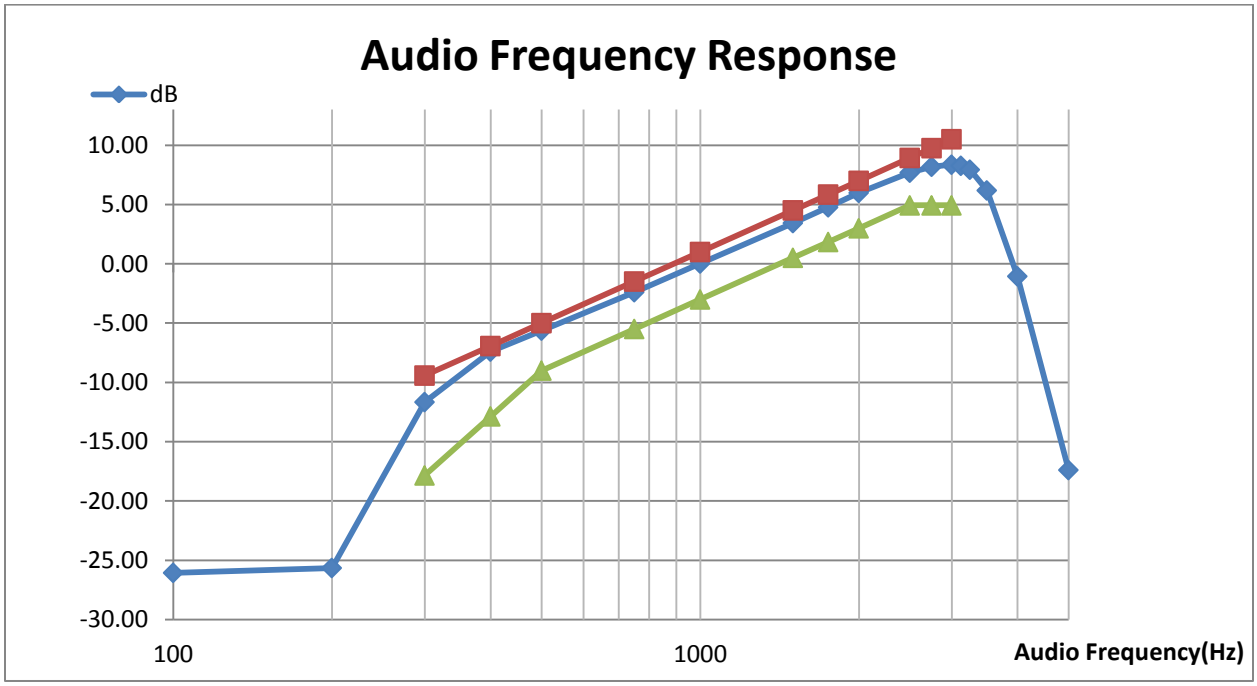
§95.1775 GMRS modulation requirements

(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

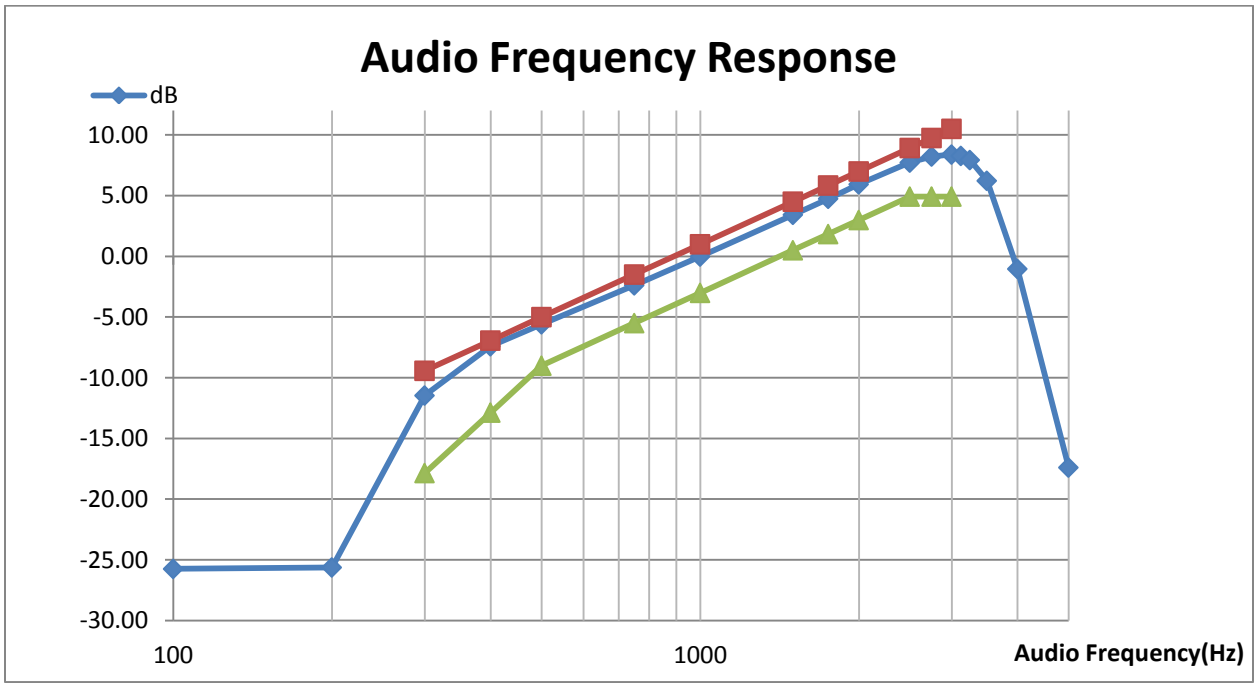
Frequency : 462.6375 MHz 2W

Audio Frequency(Hz)	dB	HighSide Specs	LowSide Specs
100	-26.06		
200	-25.65		
300	-11.66	-9.4218	-17.8436
400	-7.40	-6.9316	-12.8631
500	-5.63	-5.0000	-9.0000
750	-2.39	-1.4902	-5.4902
1000	0.03	1.0000	-3.0000
1500	3.44	4.5098	0.5098
1750	4.77	5.8441	1.8441
2000	5.99	7.0000	3.0000
2500	7.69	8.9316	4.9316
2750	8.19	9.7566	4.9316
3000	8.36	10.5098	4.9316
3125	8.27		
3250	7.94		
3500	6.19		
4000	-1.05		
5000	-17.39		



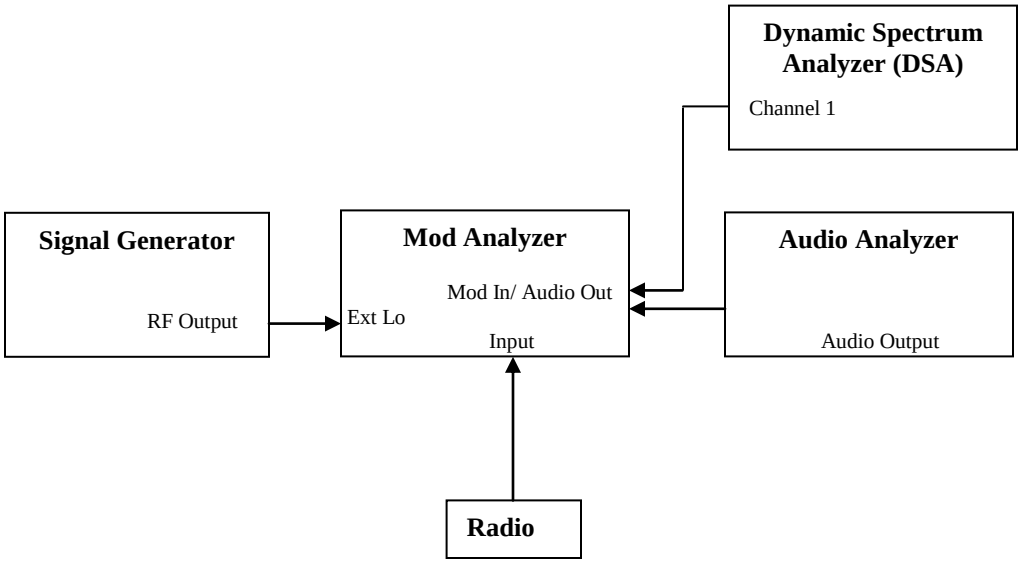
Frequency : 467.6375 MHz 0.5W

Audio Frequency(Hz)	dB	HighSide Specs	LowSide Specs
100	-25.74		
200	-25.62		
300	-11.46	-9.4218	-17.8436
400	-7.40	-6.9316	-12.8631
500	-5.59	-5.0000	-9.0000
750	-2.38	-1.4902	-5.4902
1000	-0.01	1.0000	-3.0000
1500	3.43	4.5098	0.5098
1750	4.75	5.8441	1.8441
2000	5.94	7.0000	3.0000
2500	7.73	8.9316	4.9316
2750	8.23	9.7566	4.9316
3000	8.39	10.5098	4.9316
3125	8.28		
3250	7.94		
3500	6.23		
4000	-1.03		
5000	-17.39		



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.

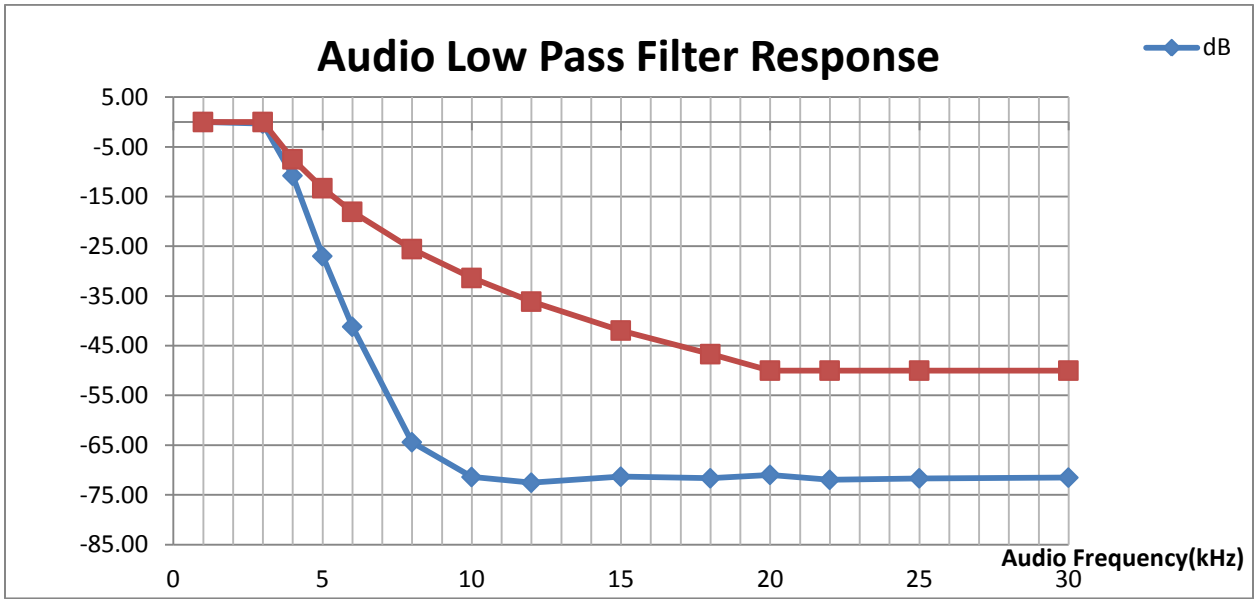
RSS-210 E.3.3(GMRS) Modulation Requirements

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

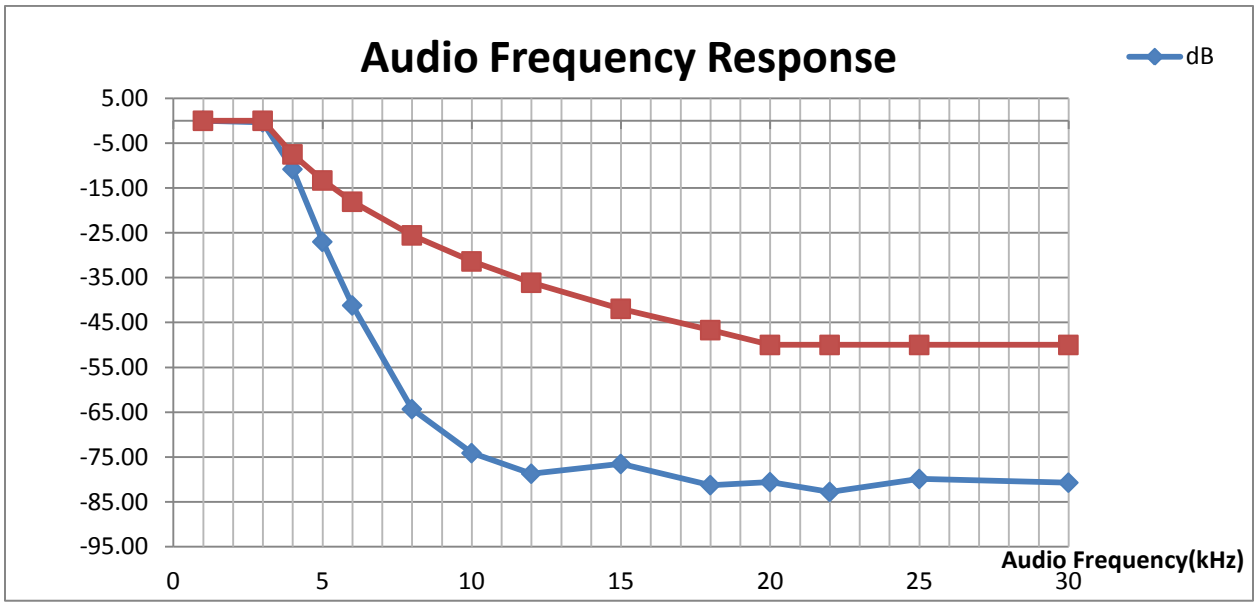
Frequency : 462.6375 MHz 2W

Audio Frequency(kHz)	dB	Limit
1	-0.01	0.00
3	-0.32	0.00
4	-10.81	-7.50
5	-26.99	-13.31
6	-41.18	-18.06
8	-64.41	-25.56
10	-71.41	-31.37
12	-72.55	-36.12
15	-71.35	-41.94
18	-71.67	-46.69
20	-70.98	-50.00
22	-71.97	-50.00
25	-71.68	-50.00
30	-71.53	-50.00



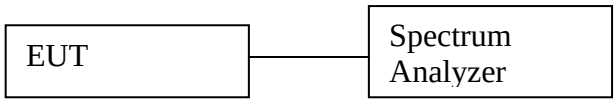
Frequency : 467.6375 MHz 0.5W

Audio Frequency(kHz)	dB	Limit
1	-0.01	0.00
3	-0.33	0.00
4	-10.81	-7.50
5	-27.00	-13.31
6	-41.19	-18.06
8	-64.31	-25.56
10	-74.12	-31.37
12	-78.72	-36.12
15	-76.55	-41.94
18	-81.27	-46.69
20	-80.61	-50.00
22	-82.78	-50.00
25	-79.89	-50.00
30	-80.71	-50.00



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 MCF_{MHz}.
3) Test in 2 conditions: Different Temperature & Supply Voltage input.
   - Temperature: Vary from -30°C to +50°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.

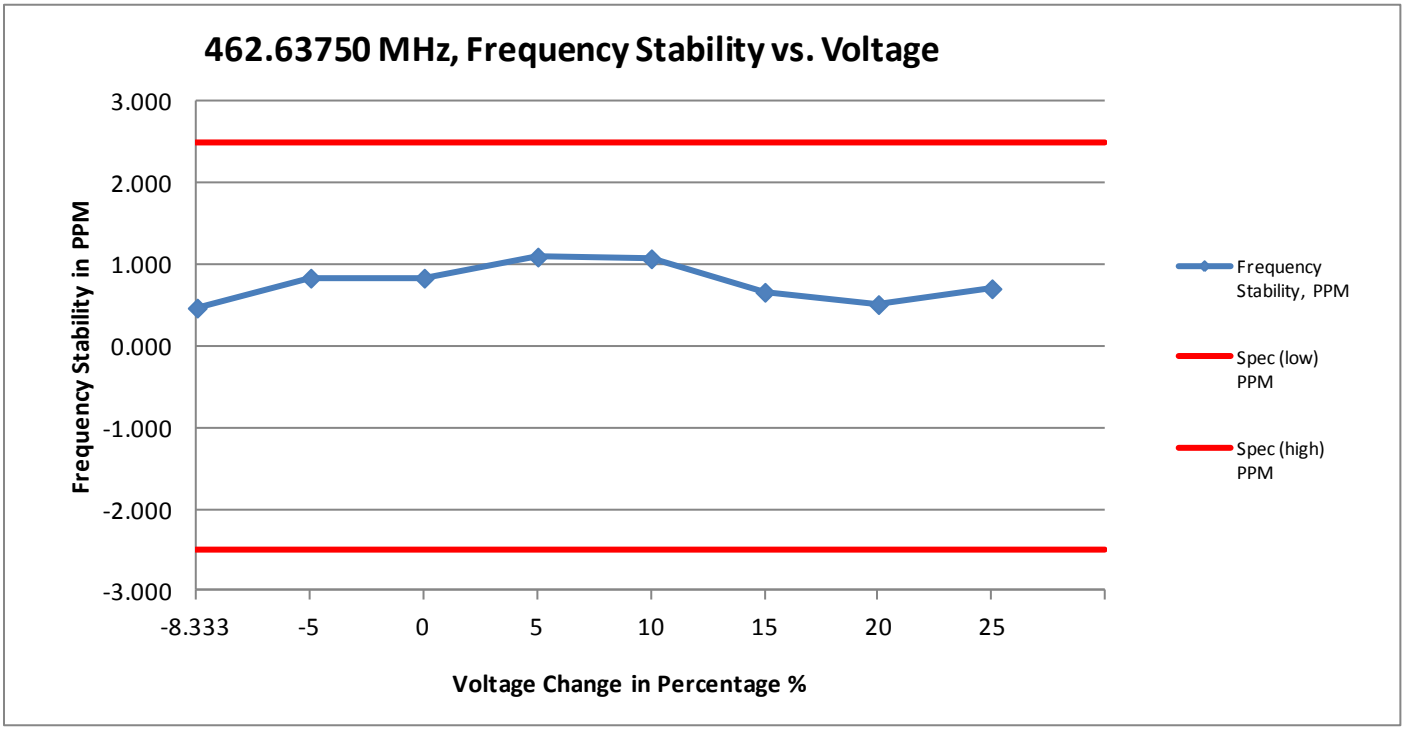
RSS-210 E.3.7 (GMRS) Frequency Stability

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

6.5.3. Test Result

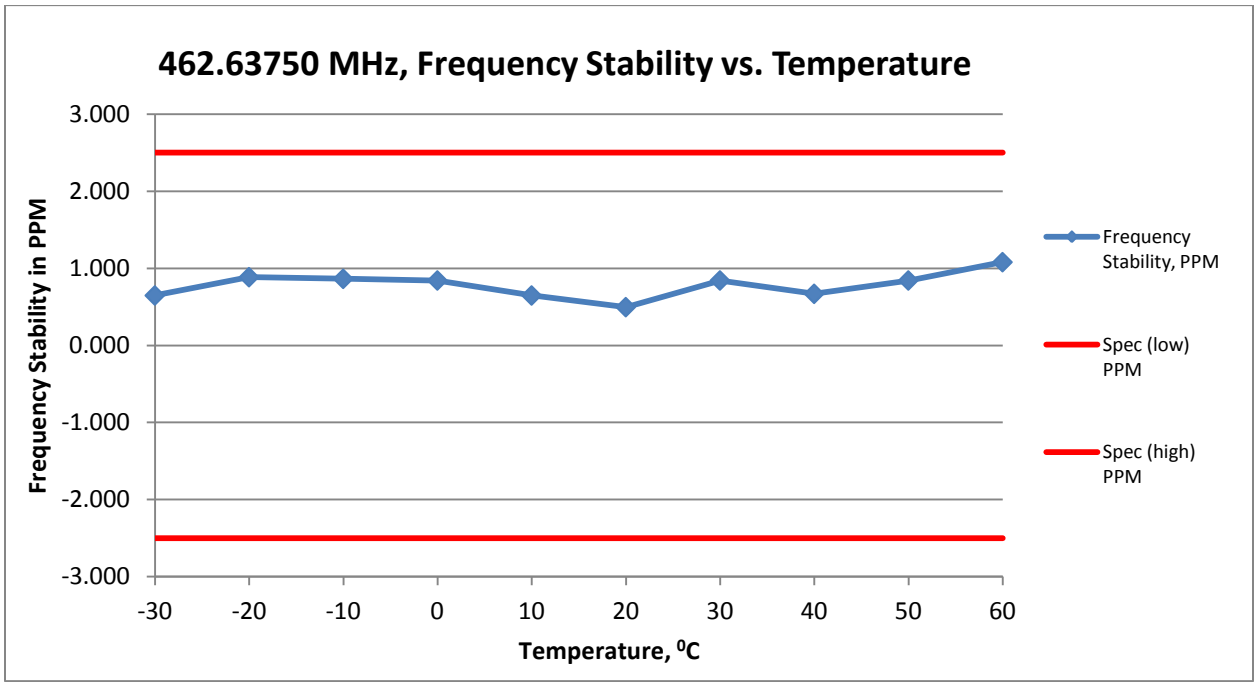
(i) Frequency Stability VS Voltage

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
-8.333	3.300	462.637930	0.476	-2.500	2.500
-5	3.420	462.637890	0.843	-2.500	2.500
0	3.600	462.637890	0.843	-2.500	2.500
5	3.780	462.638010	1.102	-2.500	2.500
10	3.960	462.638000	1.081	-2.500	2.500
15	4.140	462.637810	0.670	-2.500	2.500
20	4.320	462.637740	0.519	-2.500	2.500
25	4.500	462.637830	0.713	-2.500	2.500



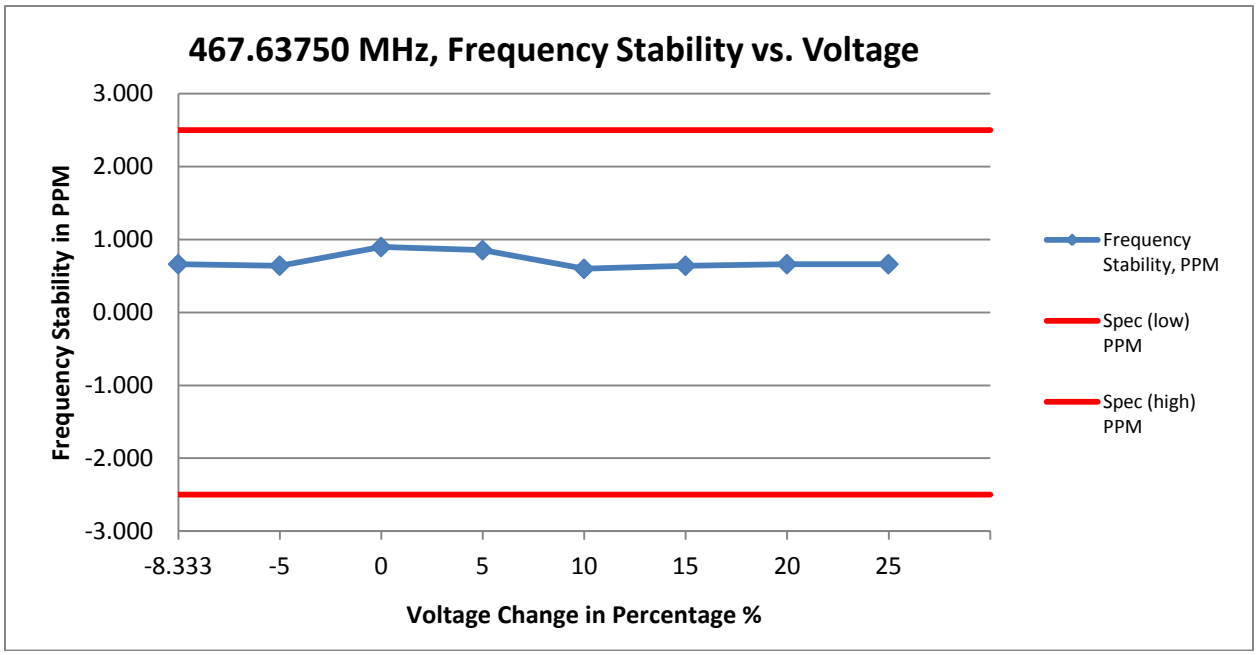
(ii) Frequency Stability VS temperature

Frequency / Channel Spacing	462.63750 MHz / 12.5 kHz			
Temperature, ^{0}C	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-30	462.637800	0.648	-2.500	2.500
-20	462.637910	0.886	-2.500	2.500
-10	462.637900	0.865	-2.500	2.500
0	462.637890	0.843	-2.500	2.500
10	462.637800	0.648	-2.500	2.500
20	462.637730	0.497	-2.500	2.500
30	462.637890	0.843	-2.500	2.500
40	462.637810	0.670	-2.500	2.500
50	462.637890	0.843	-2.500	2.500
60	462.638000	1.081	-2.500	2.500



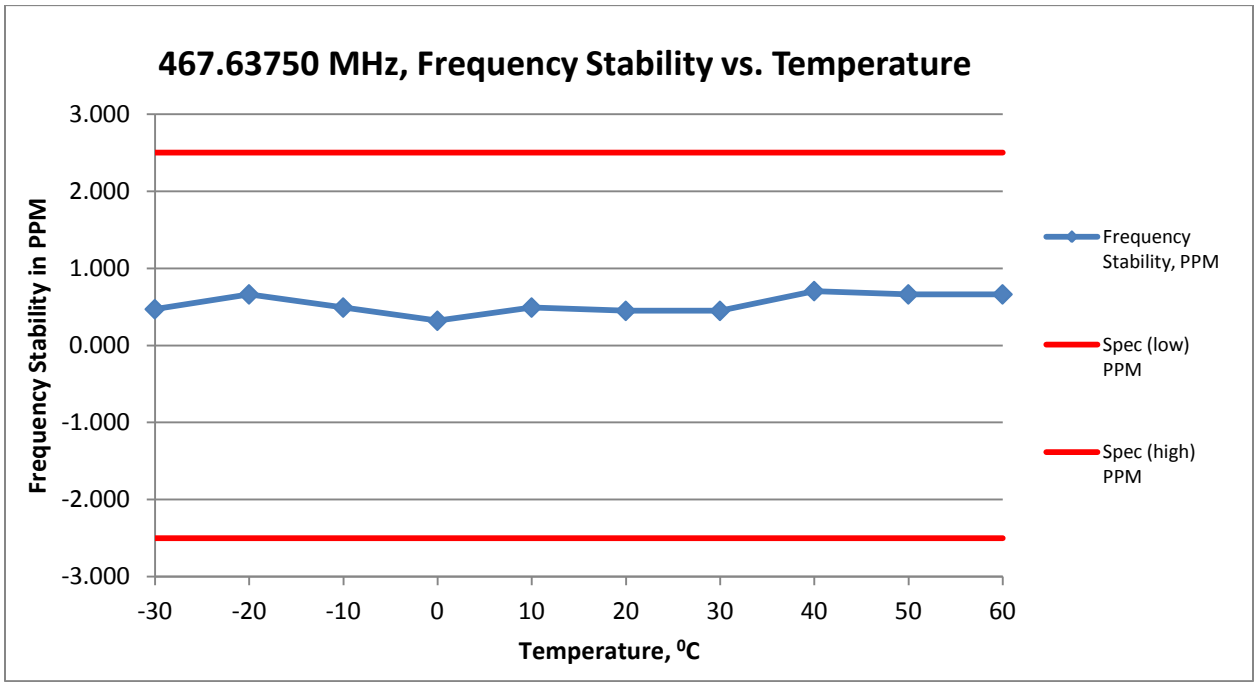
(i) Frequency Stability VS Voltage

Frequency / Channel Spacing	467.63750 MHz / 12.5 kHz				
Temperature, ^{0}C	25				
Voltage %	Voltage, V	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-8.333	3.300	467.637800	0.663	-2.500	2.500
-5	3.420	467.637800	0.642	-2.500	2.500
0	3.600	467.637920	0.898	-2.500	2.500
5	3.780	467.637900	0.855	-2.500	2.500
10	3.960	467.637780	0.599	-2.500	2.500
15	4.140	467.637800	0.642	-2.500	2.500
20	4.320	467.637810	0.663	-2.500	2.500
25	4.500	467.637810	0.663	-2.500	2.500



(ii) Frequency Stability VS temperature

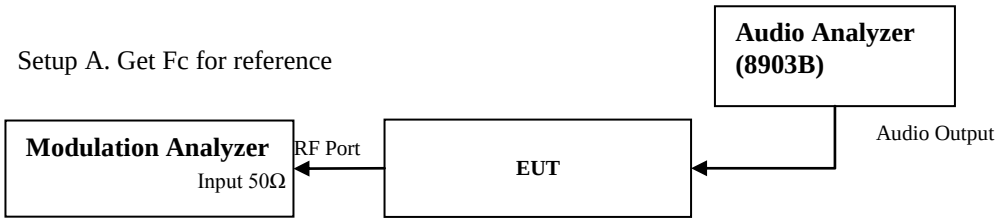
Frequency / Channel Spacing	467.63750 MHz / 12.5 kHz			
Voltage, V	3.6			
Temperature, ^{0}C	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-30	467.637720	0.470	-2.500	2.500
-20	467.637810	0.663	-2.500	2.500
-10	467.637730	0.492	-2.500	2.500
0	467.637650	0.321	-2.500	2.500
10	467.637730	0.492	-2.500	2.500
20	467.637710	0.449	-2.500	2.500
30	467.637710	0.449	-2.500	2.500
40	467.637830	0.706	-2.500	2.500
50	467.637810	0.663	-2.500	2.500
60	467.637810	0.663	-2.500	2.500



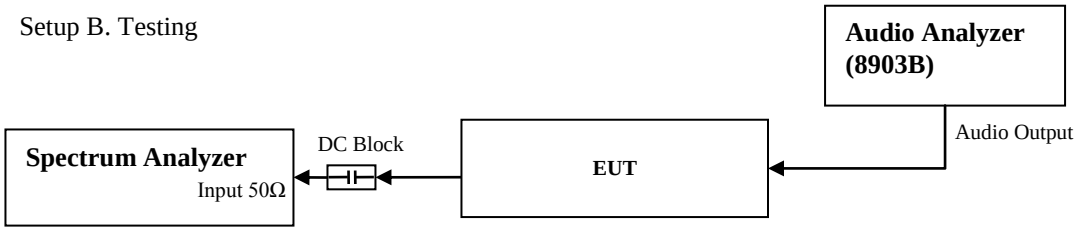
6.6. Emission Mask

6.6.1. Test Setup

Setup A. Get Fc for reference



Setup B. Testing



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

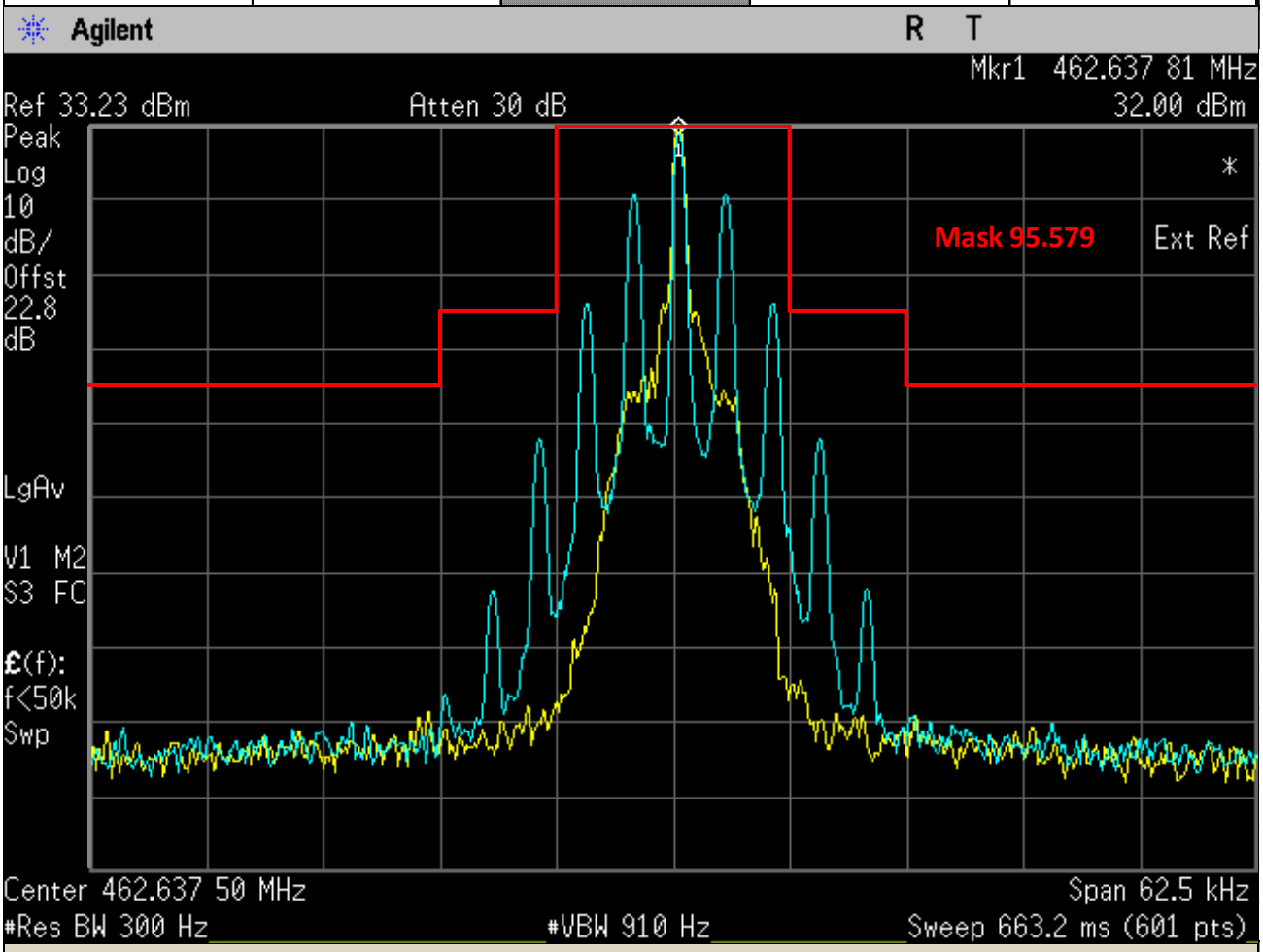
Unwanted emissions shall be attenuated below the unmodulated carrier power in accordance with the following:

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

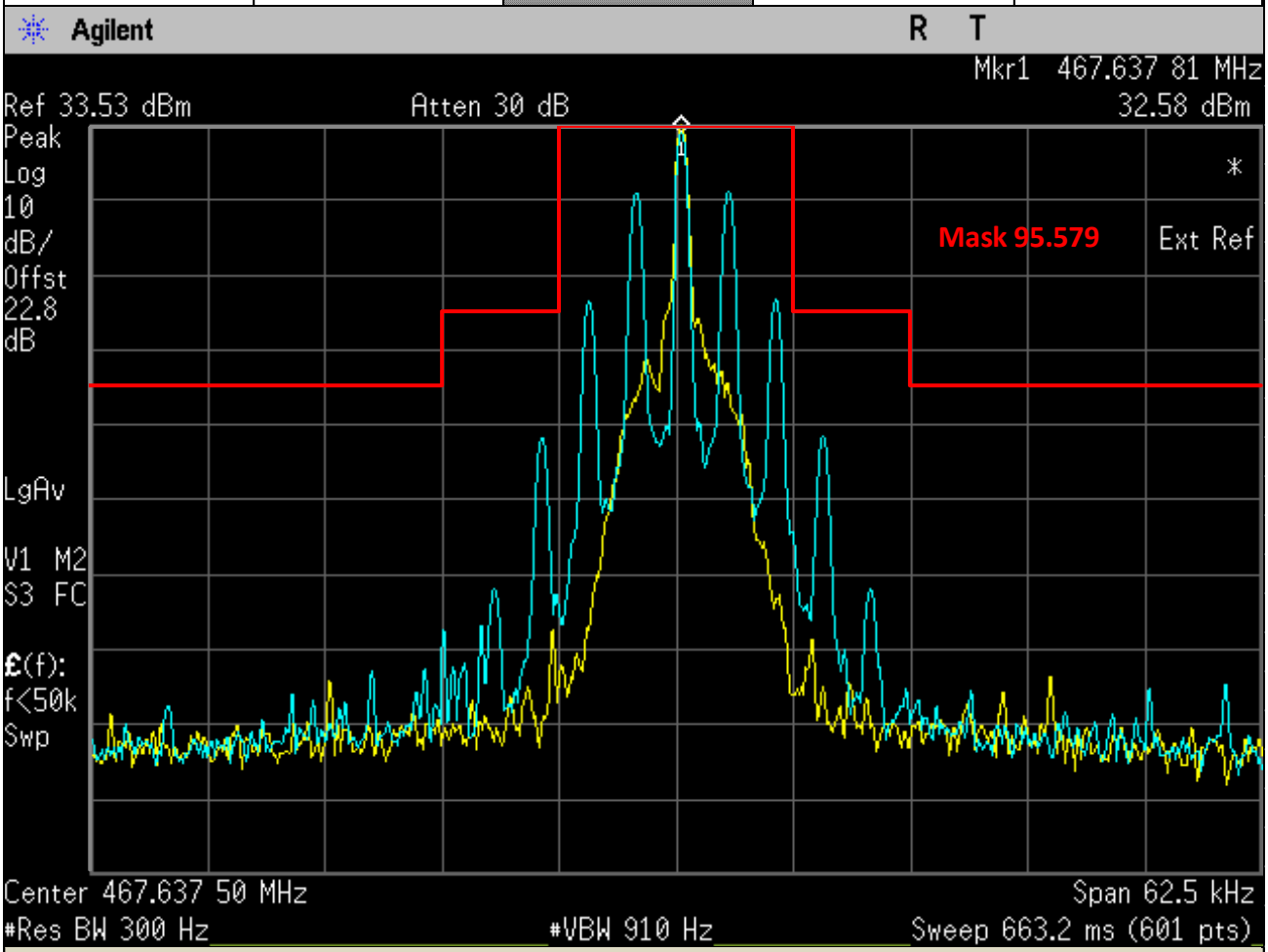
Modulation			Rules Part	
Analog Voice			FCC Part 95.579	
Channel Frequency (MHz)	**Channel Spacing (kHz)**		**99% OCB (kHz)**	**Emission Designator**
462.6375	12.5		5.7268	11K0F3E



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)**
10.3957	0.3839	5.7254	10.8767	15.9423

Note: For FRS FCC.

Modulation			Rules Part	
Analog Voice			FCC Part 95.579	
Channel Frequency (MHz)	**Channel Spacing (kHz)**		**99% OCB (kHz)**	**Emission Designator**
467.6375	12.5		5.7404	11K0F3E



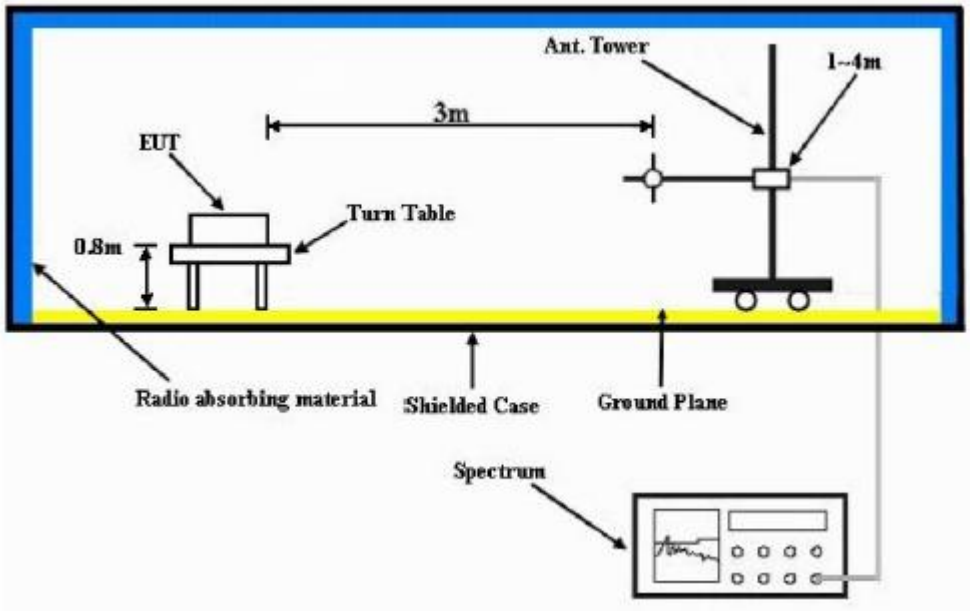
NTIA (x dB OCB Points)				
-26 dB Point (kHz)	**-3 dB Point (kHz)**	**-20 dB Point (kHz)**	**-40 dB Point (kHz)**	**-60 dB Point (kHz)**
10.3982	0.3889	5.7247	10.8715	15.9490

Note: For FRS FCC.

6.7. Radiated Spurious Emission

6.7.1. Test Setup

6.7.2. 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 (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.

6.7.3. Test Result

SAC Transmitter Radiated Emission:

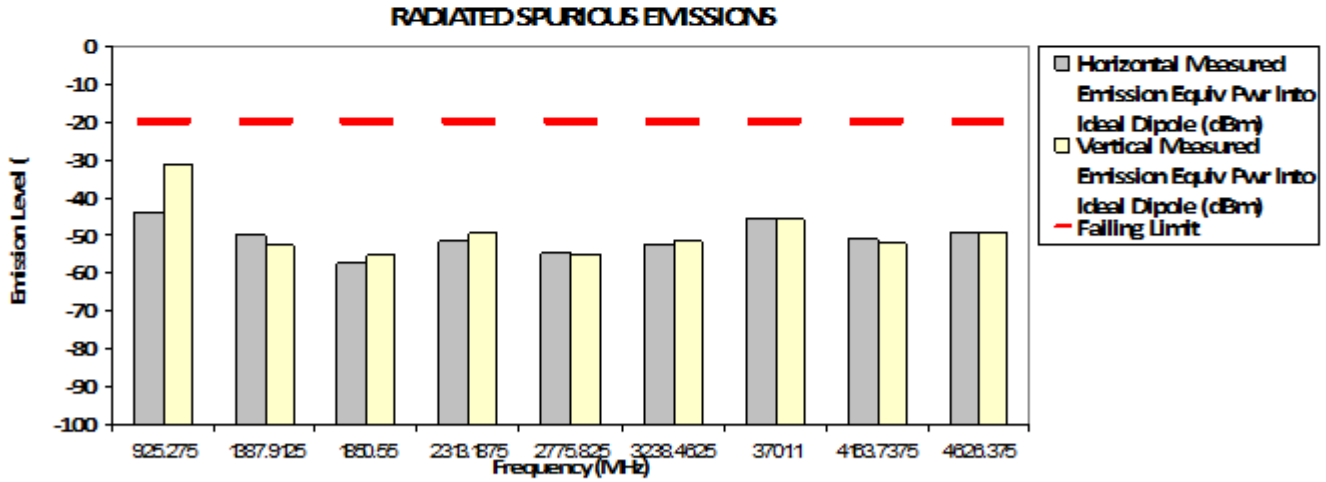
Model Number: T800 S/N: 1751UL6574 SR:10998-RF-00007

Battery Part No: AA Alkaline Accy Part No: NA

Test Mode: TX Analog

462.637500 MHz 12.5 kHz 2.000 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	-43.5100 *	-30.7900
1387.9125	-20.0000	-49.7700 *	-52.5700 *
1850.5500	-20.0000	-57.2425 **	-55.0077 **
2313.1875	-20.0000	-51.5500 *	-49.4000 *
2775.8250	-20.0000	-54.6296 **	-55.1019 **
3238.4625	-20.0000	-52.8339 **	-51.7124 **
3701.1000	-20.0000	-45.6800 *	-45.6900 *
4163.7375	-20.0000	-50.9870 **	-52.1549 **
4626.3750	-20.0000	-49.2685 **	-49.2277 **



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: Nazrin & Qawiman Mon, Jul 23, 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

Temp(Deg): 23.5 Hum(%RH): 70.3

System MU: 5.01 dB

Remarks: Passed Results | Marginal Results | Failed Results

SAC Transmitter Radiated Emission:

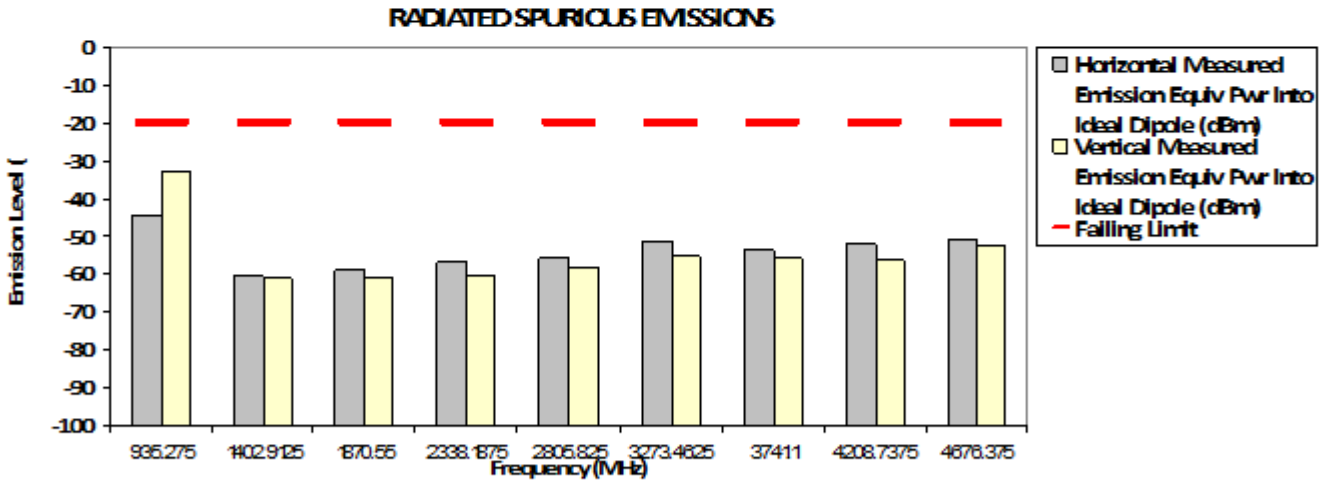
Model Number: T800 S/N: 1751UL6574 SR:10998-RF-00007

Battery Part No: AA Alkaline Accy Part No: NA

Test Mode: TX Analog

467.637500 MHz 12.5 kHz 0.500 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	-44.1400 *	-32.6400
1402.9125	-20.0000	-60.6050 **	-60.8868 **
1870.5500	-20.0000	-59.1557 **	-61.1856 **
2338.1875	-20.0000	-56.8176 **	-60.3123 **
2805.8250	-20.0000	-55.7733 **	-58.5070 **
3273.4625	-20.0000	-51.4859 **	-55.1730 **
3741.1000	-20.0000	-53.5759 **	-55.6435 **
4208.7375	-20.0000	-52.1796 **	-56.5464 **
4676.3750	-20.0000	-51.1690 **	-52.5529 **



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: Nazrin & Qawiman Mon, Jul 23, 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

Temp(Deg): 23.5 Hum(%RH): 70.3

System MU: 5.01 dB

Remarks: Passed Results | Marginal Results | Failed Results

6.7.4. 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 -