MOTOROLA SOLUTIONS

CERTIFICATE 2518.08

MS ISO/IEC 17025
TESTING
SAMM NO. 0825

MOTOROLA PENANG ADV. COMM. LABORATORY
Motorola Solutions Malaysia SDN BHD
Plot 2A, Medan Bayan Lepas,
Mukim 12 S.W.D., 11900 Bayan Lepas,
Penang, Malaysia.

FCC / IC TEST REPORT

Report Revision : Rev.C

Date/s Tested	:	10-August-2020 - 27-September-2020
Report Issue Date	:	1-October-2020
Manufacturer/Location	:	Motorola Solutions Malaysia SDN BHD Plot 2A, Medan Bayan Lepas, Mukim 12 S.W.D., 11900 Bayan Lepas, Penang, Malaysia
Requestor	:	LEONG, JUN THYE
Product Type	:	Portable
Model Number	:	T600
Frequency Band	:	462-468 MHz
Max. Output Power	:	0.5W ERP/1.9W ERP
Firmware Version	:	0_40
Applicant Name		Motorola Solutions Inc
Applicant Address	:	8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322.
FCC Registration	:	461337
IC Registrations	:	MY0001

The equipment was tested accordance to the requirement listed below:

FCC 47 CFR Part 95 — **PASS**

Prepared By:

GAN BOON TEONG
Test Personnel

Approved Signatory :

VINCENT FOONG CHUEN KIT
Responsible Engineer

Table of Contents

Revision History	Description	Date	Originator
Rev. A	Initial Report	**28-Spetember-2020**	**Gan Boon Teong**
Rev. B	Change cover page Max ERP from 2W to 1.9W. Add battery 1532 to EUT Description and test data for Radiated Spurious Emission. Update summary of test result for Unwanted Radiation.	**16-October-2020**	**Gan Boon Teong**
Rev. C	Update Product Channel Table	**05-November-2020**	**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, 1.39dBi
Technologies	FM
Device voltage	4.5 Vdc (AA ALKALINE) and 3.6 Vdc (1532)

Note: Battery kit 1532 only tested on worst case result channel from AA Alkaline battery testing.

The EUT contains following accessory devices and data cable:

Item	**Brand**	**Model or P/N**
AA ALKALINE	NA	NA
1300MAH 3XAA NIMH RECHARGEABLE BATTERY PACK	Motorola	1532

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

Deviation from standard
Not applicable as no deviation from standard test method

Modifications to EUT
For RF conducted measurements a pigtail was soldered out of the board while for radiated measurements there were no modifications to the device

2.0. Summary of Test Results

FCC Clause	Test Item	Result	Remark	Tested by	Serial number	Environmental conditions
95.567 95.1767	Maximum Output Power	Pass	NA	Gan	1758WN0009	25.0°C 50%RH
95.575 95.1775	Modulation Limiting	Pass	NA	Gan	1758WN0009	25.0°C 50%RH
95.575 95.1775	Audio Frequency Response	Pass	NA	Gan	1758WN0009	25.0°C 50%RH
95.1775	Audio Low Pass Filter	Pass	NA	Gan	1758WN0009	25.0°C 50%RH
95.565 95.1765	Frequency Stability	Pass	NA	Gan	1758WN0009	-30.0 - 60.0°C 50%RH
95.573 95.1773	Emission Bandwidth	Pass	11K0F3E – 9.9589kHz	Gan	1758WN0009	25.0°C 50%RH
95.579 95.1779	Unwanted Radiation	Pass	Max spurious emission -29.76dBm	Nazrin & Qawiman	1758WN0003	23.6°C 70.3%RH

3.0. Measurement Uncertainty

Measurement	**Frequency**	**Expended Uncertainty (k=1.96) (±dB)**
Maximum Output Power	462MHz ~ 468MHz	5.01
AC Power Line Conducted Spurious Emission	150KHz ~ 30MHz	3.43
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	5.01
	200MHz ~ 1000MHz	5.01
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.01
	18GHz ~ 25GHz	5.01
Conducted Spurious Emissions	9kHz ~ 12.75GHz	2.82

4.0. Equipment List

Analog ATE #9

Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF TRANSCEIVER CONTROLLER	AX2007AI	AX2007AI002	CNR	CNR
POWER SUPPLY	6031A	3506A03271	22-Oct-19	22-Oct-20
CHAMBER	SH-641	92006068	23-Apr-20	23-Apr-21
AUDIO ANALYZER	8903B	2520A00301	21-Sep-19	21-Sep-20
AUDIO ANALYZER	8903B	3011A12380	13-Aug-20	13-Aug-21
SIGNAL GENERATOR	SMA100A	112133	4-Jul-18	4-Jul-21
SIGNAL GENERATOR	E4425B	US39260201	11-May-20	11-May-21
TRANSCEIVER INTERFACE	8954A	2243A00330	22-May-20	22-May-21
POWER SENSOR	E9301B	MY41498969	3-Jul-20	3-Jul-21
MODULATION ANALYZER	8901B	3403A04772	8-Jul-20	8-Jul-21
SIGNAL GENERATOR	2042	203002/962	25-Jun-20	25-Jun-21
POWER METER	E4416A	MY45101448	15-Jun-19	15-Jun-21
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
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	Rev1.0.3			

FCC Transient ATE #1:

Description	Model	Serial Number	Calibration Date	Calibration Due Date
SWITCH CONTROL UNIT	3488A	2719A36210	CNR	CNR
ATTENUATOR / SWITCH DRIVER	11713A	2508A10141	CNR	CNR
POWER METER	E4416A	GB41293866	26-Feb-19	26-Feb-21
POWER SUPPLY	6032A	MY41002067	22-Feb-20	22-Feb-21
SIGNAL GENERATOR	8657A	3250A05137	19-Jun-20	19-Jun-21
STEP ATTENUATOR	8494G	MY42143006	12-Jun-20	12-Jun-21
STEP ATTENUATOR	8496G	MY42143012	13-Jun-20	13-Jun-21
OSCILLOSCOPE	MSO8104A	MY45002372	26-Jun-20	26-Jun-21
MODULATION ANALYZER	8901B	3438A05093	23-Jun-20	23-Jun-21
AUDIO ANALYZER	8903B	3011A12671	11-Mar-20	11-Mar-21
AUDIO ANALYZER	8903B	3011A08952	29-Jul-20	29-Jul-21
POWER SENSOR	E9301B	MY41495629	16-Jun-20	16-Jun-21
SPECTRUM ANALYZER	E4443A	MY46181974	2-Aug-19	2-Aug-21
N to N RF Cable # 1	SF126/11N/11N	NA	NA	NA
N to N RF Cable # 2	M17/128-RG400	NA	NA	NA
N to N RF Cable # 3	M17/128-RG400	NA	NA	NA
N to N RF Cable # 4	M17/128-RG400	NA	NA	NA
N to N RF Cable # 5	M17/128-RG400	NA	NA	NA
N to N RF Cable # 6	M17/128-RG400	NA	NA	NA
N to N RF Cable # 7	M17/128-RG400	NA	NA	NA
N to N RF Cable # 8	M17/128-RG400	NA	NA	NA
BNC to BNC RF Cable # 1	RG 58	NA	NA	NA
BNC to BNC RF Cable # 2	RG 58	NA	NA	NA
BNC to BNC RF Cable # 3	RG 58	NA	NA	NA
BNC to BNC RF Cable # 4	RG 58	NA	NA	NA
BNC to BNC RF Cable # 5	RG 58	NA	NA	NA
BNC to BNC RF Cable # 6	RG 58	NA	NA	NA
BNC to N RF Cable # 1	RG 58	NA	NA	NA
Aeroflex Attenuator 10dB	49-10-43-LIM	NA	NA	NA
Aeroflex Attenuator 10dB	33-10-34-LIM	NA	NA	NA
Test Software	FCC Transient			
Version	R1.1.3			

EMC Chamber 1

DESCRIPTION	MODEL	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE
DRG HORN FREQ.	SAS-571	720	21-Mar-19	21-Mar-21
DRG HORN FREQ.	SAS-571	1143	14-Feb-19	14-Feb-21
POWER SUPPLY	6032A	2615A01178	21-May-20	21-May-21
SIGNAL GENERATOR	SMB 100A	181117	8-Nov-18	8-Nov-21
EMI TEST RECEIVER	ESW44	101750	24-Jul-19	24-Sep-20
EMI TEST RECEIVER	ESIB26	100017	19-Jul-19	19-Sep-20
5m Semi-anechoic Chamber	S800-HX	J2308	CNR	CNR
BILOG ANTENNA	CBL6112B	2964	23-Apr-19	23-Apr-21
BILOG ANTENNA	CBL6112B	2950	8-Jul-19	8-Jul-21
DATA LOGGER	SDL500	A.016776	4-Jun-20	4-Jun-21
SYSTEM CONTROLLER	SC104V	050806-1	CNR	CNR
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	CNR	CNR
ANTENNA POSITIONING TOWER	TLT2	NA	CNR	CNR
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170255	27-Jan-20	27-Jan-21
18 - 40GHz PREAMPLIFIER	Miteq Hi Gain Sucoflex	001	CNR	CNR
PREAMPLIFIER	PAM-0118	269	24-May-19	24-May-22
LOOP ANTENNA	6502	00208416	5-Sep-19	5-Sep-20
Test Software	EMC_FCC_IC_Bluetooth_RE_Test			
Version	EMC_FCC_RE_v1.6.1			

5.0. Test Mode Applicability and Test Channel Detail

Test Frequency list:

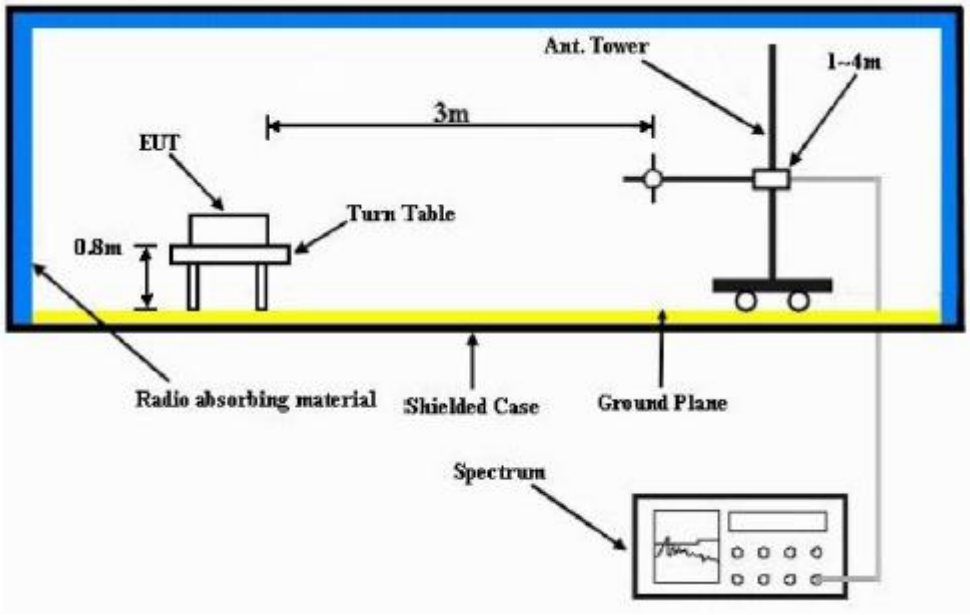
FRS

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.
4) Alternatively, max ERP can be calculated using conducted power measurement + max antenna gain (dBd)

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.

6.1.3. Test Data

EIRP/ERP

S/N: 1758WN0009 **Tx Power: 1.79 Watts**
Channel Spacing : 12.5 kHz **Modulation: FM**
Accessory: NA
Max antenna gain: -0.76dBd

Frequency (MHz)	Measured conducted power (dBm)	Max ERP (dBm)
462.6375	32.53	31.77

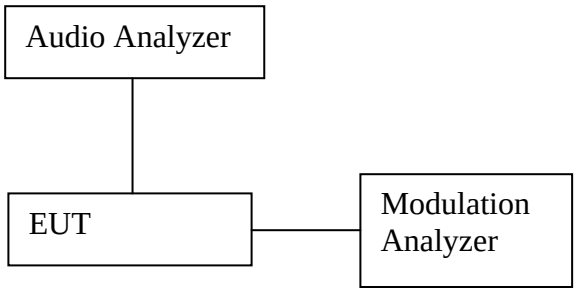
EIRP/ERP

S/N: 1758WN0009 **Tx Power: 0.50 Watts**
Channel Spacing : 12.5 kHz **Modulation: FM**
Accessory: NA
Max antenna gain: -0.76dBd

Frequency (MHz)	Measured conducted power (dBm)	Max ERP (dBm)
467.6375	27.01	26.25

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.

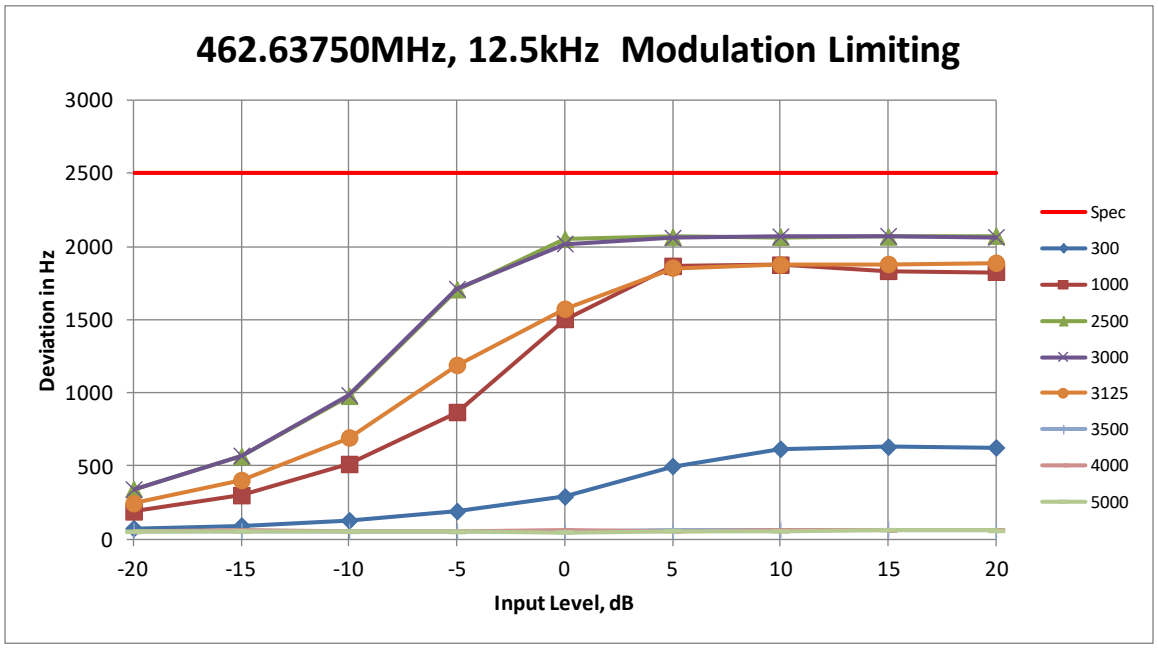
(a) Main channels. The peak frequency deviation for emissions to be transmitted on the main channels must not exceed ± 5 kHz.

(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.

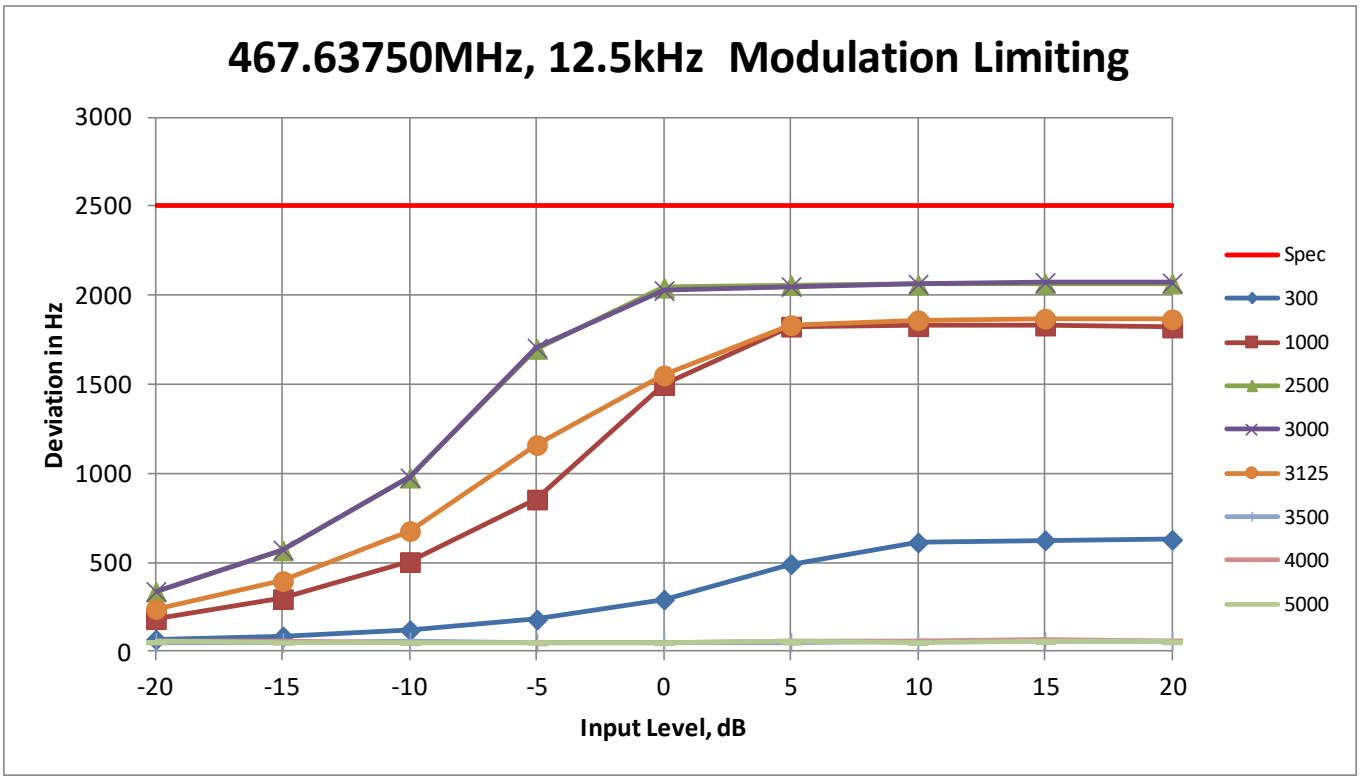
(c) 467 MHz interstitial channels. The peak frequency deviation for emissions to be transmitted on the 467 MHz interstitial channels must not exceed ± 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

(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.

6.2.3. Test Result



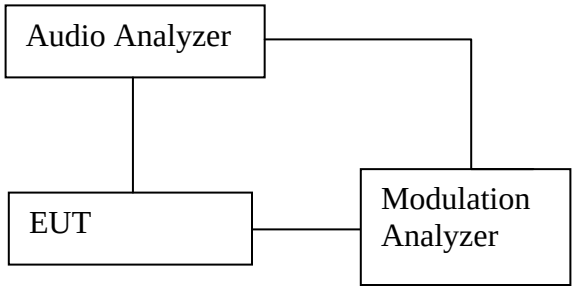
Frequency / Channel Spacing	462.63750MHz / 12.5kHz																	
Voltage	4.5V																	
Temperature, °C	25																	
Freq Deviation, Hz	300		1000		2500		3000		3125		3500		4000		5000		Spec	
Input Level, dB	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%	Dev, Hz	%
-20	72	2.9	187	7.5	340	13.6	339	13.6	243	9.7	54	2.2	50	2.0	51	2.0	2500	100
-15	90	3.6	298	11.9	565	22.6	569	22.8	401	16.0	55	2.2	57	2.3	53	2.1	2500	100
-10	126	5.0	511	20.4	977	39.1	983	39.3	692	27.7	52	2.1	51	2.0	52	2.1	2500	100
-5	189	7.6	866	34.6	1705	68.2	1709	68.4	1188	47.5	53	2.1	52	2.1	49	2.0	2500	100
0	289	11.6	1502	60.1	2050	82.0	2018	80.7	1572	62.9	53	2.1	58	2.3	47	1.9	2500	100
5	497	19.9	1865	74.6	2065	82.6	2058	82.3	1853	74.1	59	2.4	53	2.1	56	2.2	2500	100
10	615	24.6	1873	74.9	2064	82.6	2067	82.7	1874	75.0	60	2.4	57	2.3	54	2.2	2500	100
15	629	25.2	1831	73.2	2066	82.6	2071	82.8	1878	75.1	63	2.5	59	2.4	62	2.5	2500	100
20	624	25.0	1825	73.0	2072	82.9	2063	82.5	1886	75.4	58	2.3	61	2.4	57	2.3	2500	100



Frequency / Channel Spacing	467.63750MHz / 12.5kHz																	
Voltage	4.5V																	
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	68	2.7	182	7.3	337	13.5	338	13.5	239	9.6	52	2.1	57	2.3	53	2.1	2500	100
-15	85	3.4	295	11.8	568	22.7	571	22.8	396	15.8	50	2.0	53	2.1	51	2.0	2500	100
-10	120	4.8	503	20.1	977	39.1	976	39.0	677	27.1	54	2.2	49	2.0	50	2.0	2500	100
-5	180	7.2	854	34.2	1700	68.0	1705	68.2	1160	46.4	51	2.0	48	1.9	52	2.1	2500	100
0	292	11.7	1497	59.9	2044	81.8	2028	81.1	1551	62.0	51	2.0	50	2.0	49	2.0	2500	100
5	491	19.6	1825	73.0	2058	82.3	2050	82.0	1833	73.3	52	2.1	53	2.1	53	2.1	2500	100
10	613	24.5	1828	73.1	2061	82.4	2064	82.6	1861	74.4	55	2.2	60	2.4	50	2.0	2500	100
15	625	25.0	1831	73.2	2068	82.7	2073	82.9	1870	74.8	58	2.3	62	2.5	55	2.2	2500	100
20	628	25.1	1820	72.8	2067	82.7	2071	82.8	1866	74.6	56	2.2	61	2.4	54	2.2	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.

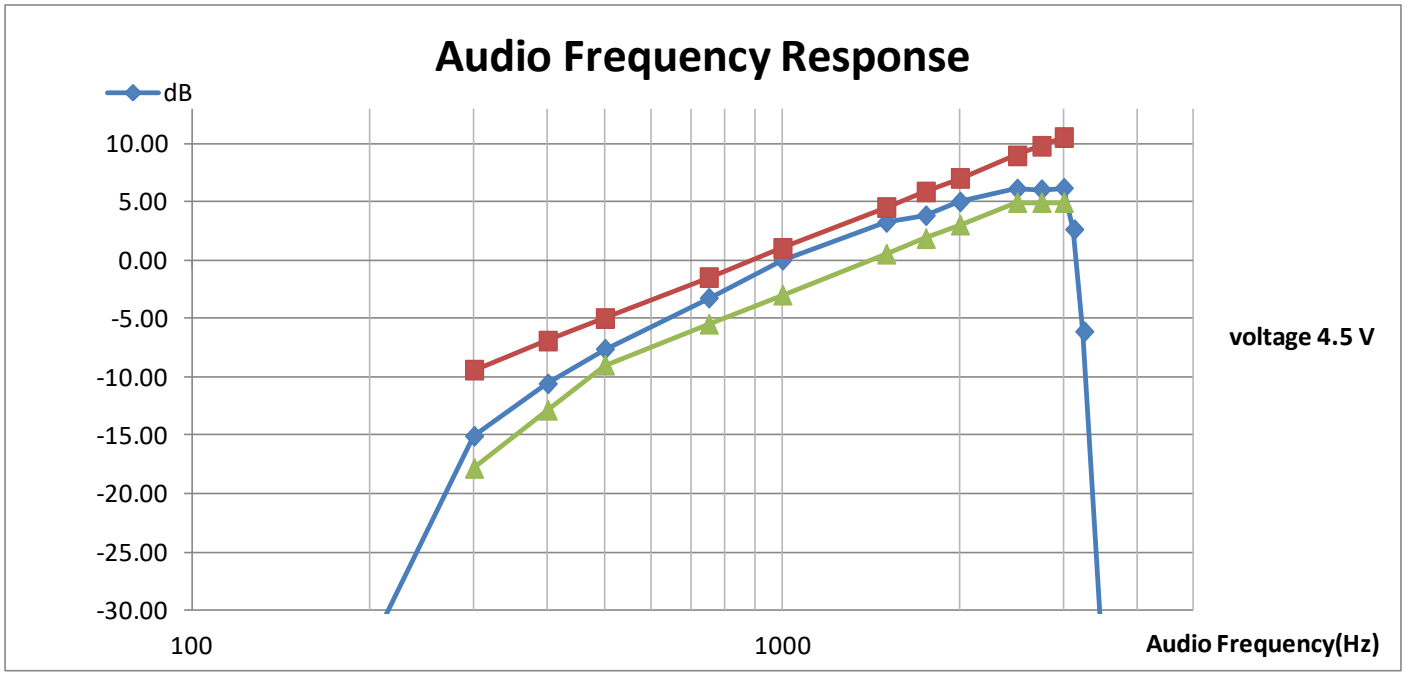
§95.1775 GMRS modulation requirements

(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

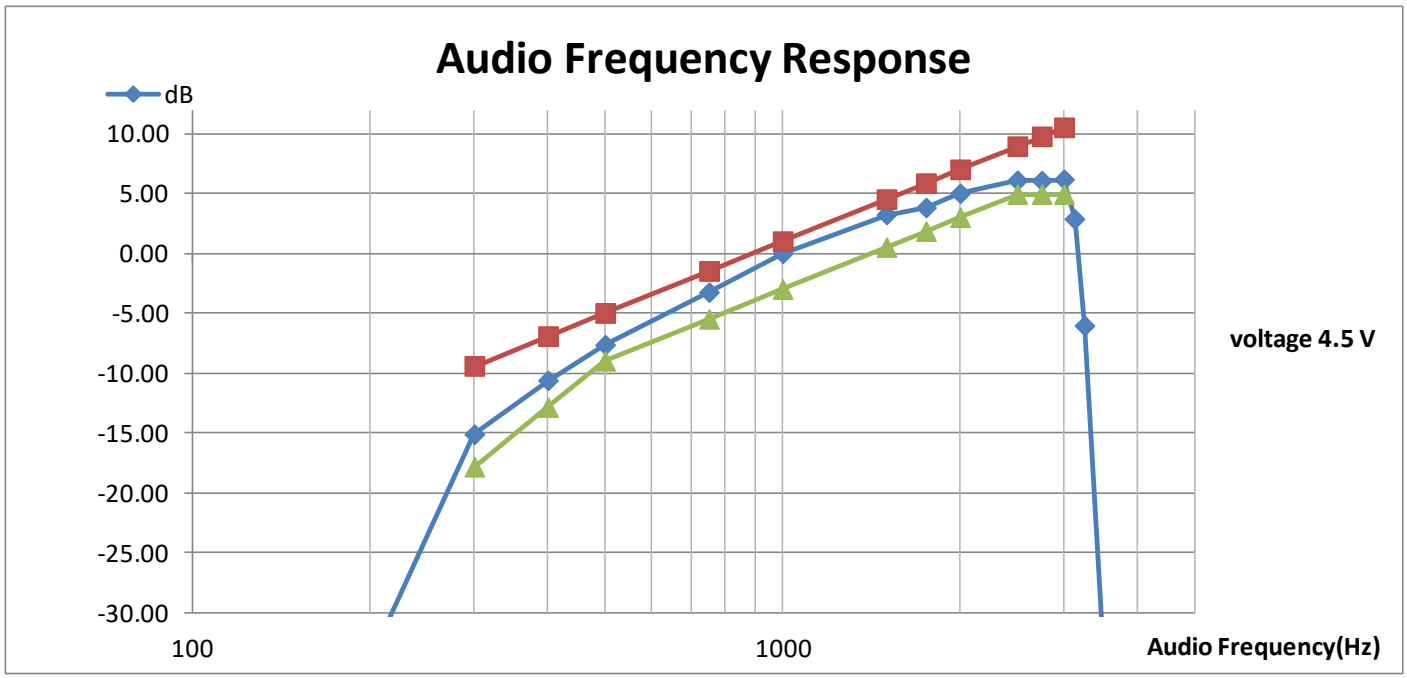
Frequency : 462.6375 MHz 2W

voltage	4.5 V		
Temp. (°C)	25		
Audio Frequency(Hz)	dB	HighSide Specs	LowSide Specs
100	-33.06		
200	-33.23		
300	-15.09	-9.4218	-17.8436
400	-10.60	-6.9316	-12.8631
500	-7.63	-5.0000	-9.0000
750	-3.26	-1.4902	-5.4902
1000	-0.01	1.0000	-3.0000
1500	3.23	4.5098	0.5098
1750	3.81	5.8441	1.8441
2000	4.99	7.0000	3.0000
2500	6.10	8.9316	4.9316
2750	6.04	9.7566	4.9316
3000	6.16	10.5098	4.9316
3125	2.62		
3250	-6.13		
3500	-33.25		
4000	-33.09		
5000	-33.16		



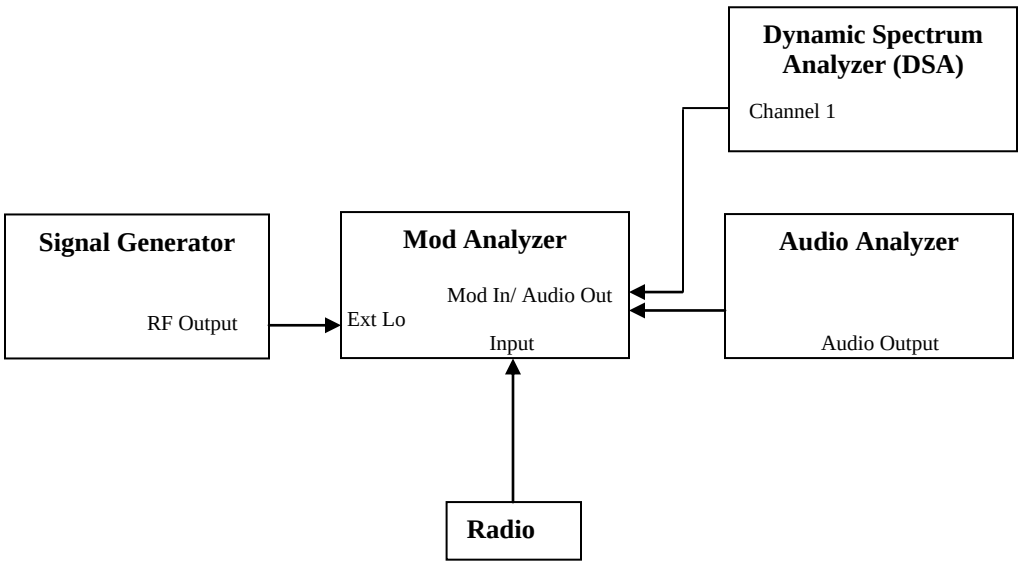
Frequency : 467.6375 MHz 0.5W

voltage	4.5 V		
Temp. (°C)	25		
Audio Frequency(Hz)	dB	HighSide Specs	LowSide Specs
100	-33.70		
200	-34.02		
300	-15.13	-9.4218	-17.8436
400	-10.63	-6.9316	-12.8631
500	-7.65	-5.0000	-9.0000
750	-3.26	-1.4902	-5.4902
1000	-0.01	1.0000	-3.0000
1500	3.23	4.5098	0.5098
1750	3.81	5.8441	1.8441
2000	5.00	7.0000	3.0000
2500	6.09	8.9316	4.9316
2750	6.06	9.7566	4.9316
3000	6.17	10.5098	4.9316
3125	2.86		
3250	-6.05		
3500	-33.70		
4000	-33.51		
5000	-34.08		



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.

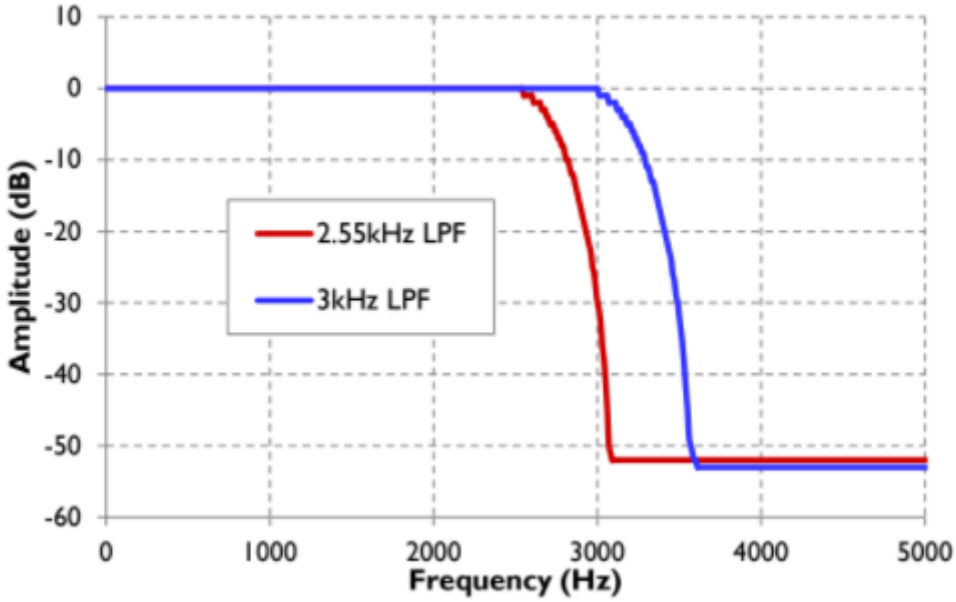
(2) At any frequency (f in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least 60 log (f/3) dB more than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB more than the attenuation at 1 kHz.

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

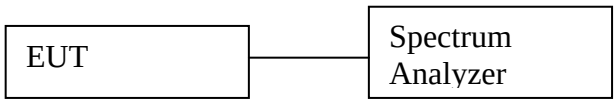
6.4.3. Test Result

This circuit cannot be tested directly as requested by FCC regulation because it is built in the IC BK4815N and not electrically connected to any exterior pins of the IC.



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

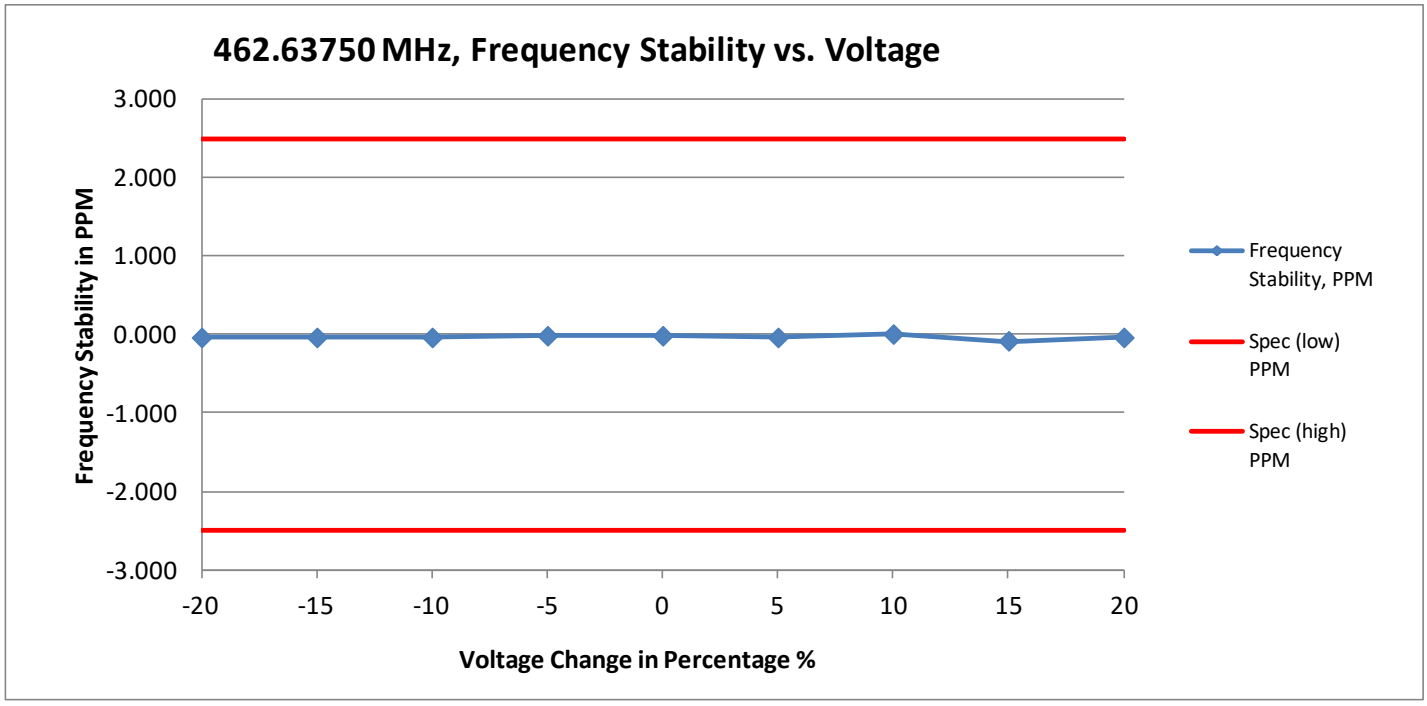
Each GMRS transmitter type must be designed to comply with the frequency accuracy requirements in this section under normal operating conditions. Operators of GMRS stations must also ensure compliance with these requirements.

(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.

6.5.3. Test Result

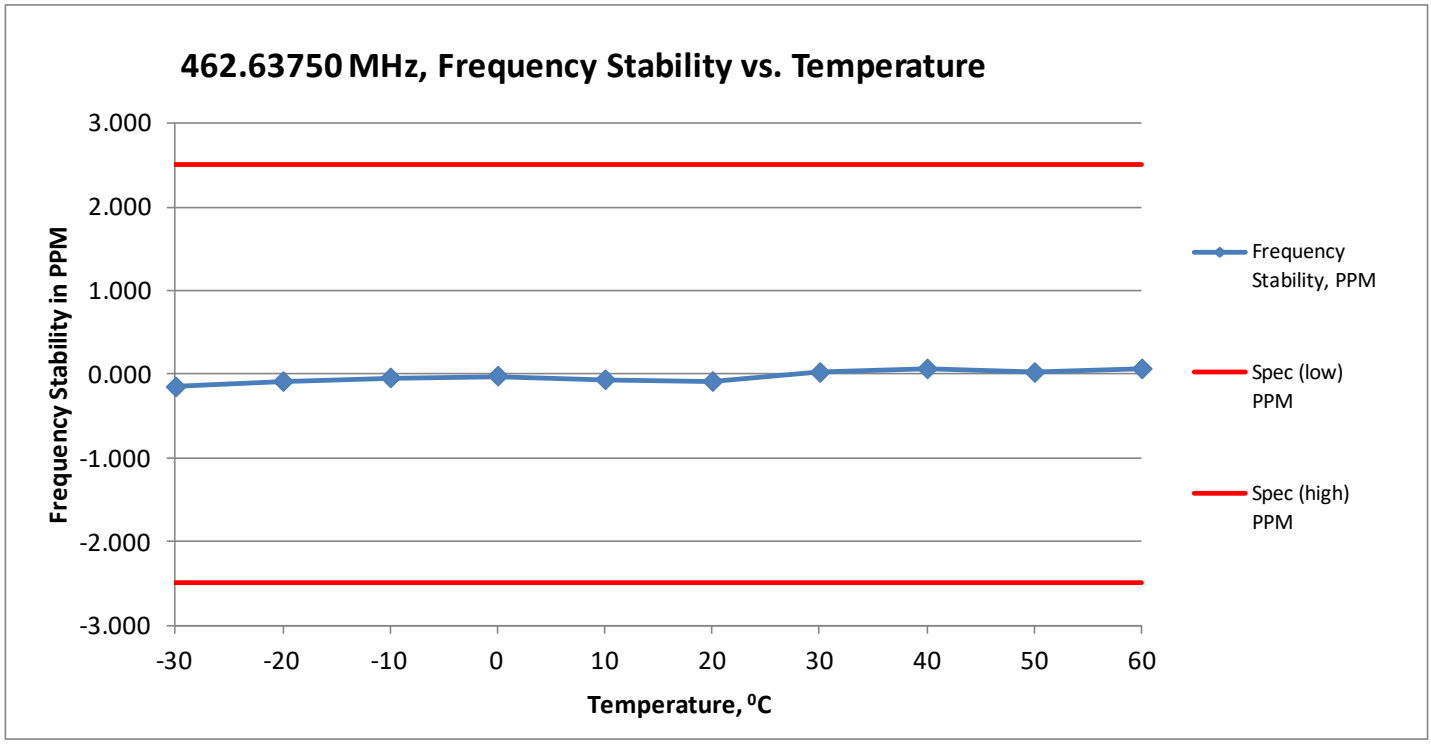
(i) Frequency Stability VS Voltage

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	462.637480	-0.043	-2.500	2.500
-15	3.825	462.637480	-0.043	-2.500	2.500
-10	4.050	462.637480	-0.043	-2.500	2.500
-5	4.275	462.637490	-0.022	-2.500	2.500
0	4.500	462.637490	-0.022	-2.500	2.500
5	4.725	462.637480	-0.043	-2.500	2.500
10	4.950	462.637500	0.000	-2.500	2.500
15	5.175	462.637460	-0.086	-2.500	2.500
20	5.400	462.637480	-0.043	-2.500	2.500



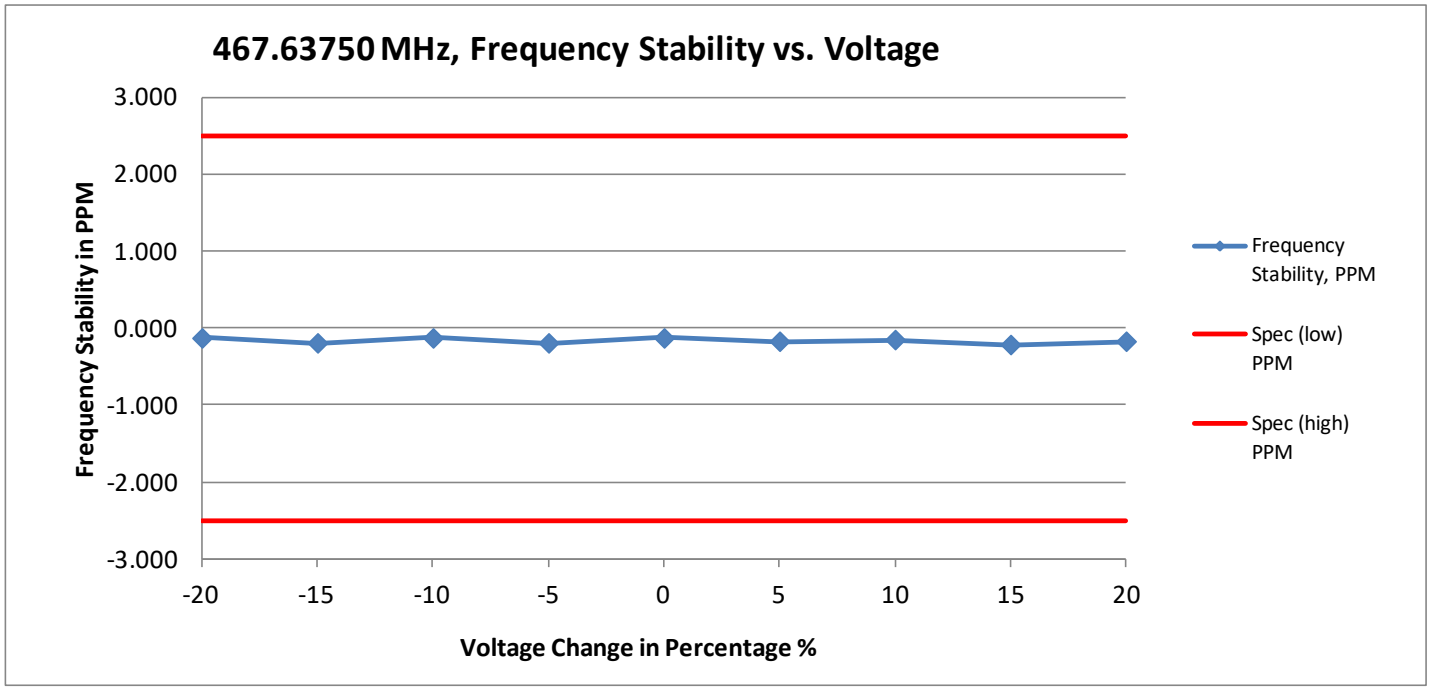
(ii) Frequency Stability VS temperature

Frequency / Channel Spacing	462.63750 MHz / 12.5 kHz			
Voltage, V	4.5			
Temperature, ^{0}C	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-30	462.637430	-0.151	-2.500	2.500
-20	462.637460	-0.086	-2.500	2.500
-10	462.637480	-0.043	-2.500	2.500
0	462.637490	-0.022	-2.500	2.500
10	462.637470	-0.065	-2.500	2.500
20	462.637460	-0.086	-2.500	2.500
30	462.637510	0.022	-2.500	2.500
40	462.637530	0.065	-2.500	2.500
50	462.637510	0.022	-2.500	2.500
60	462.637530	0.065	-2.500	2.500



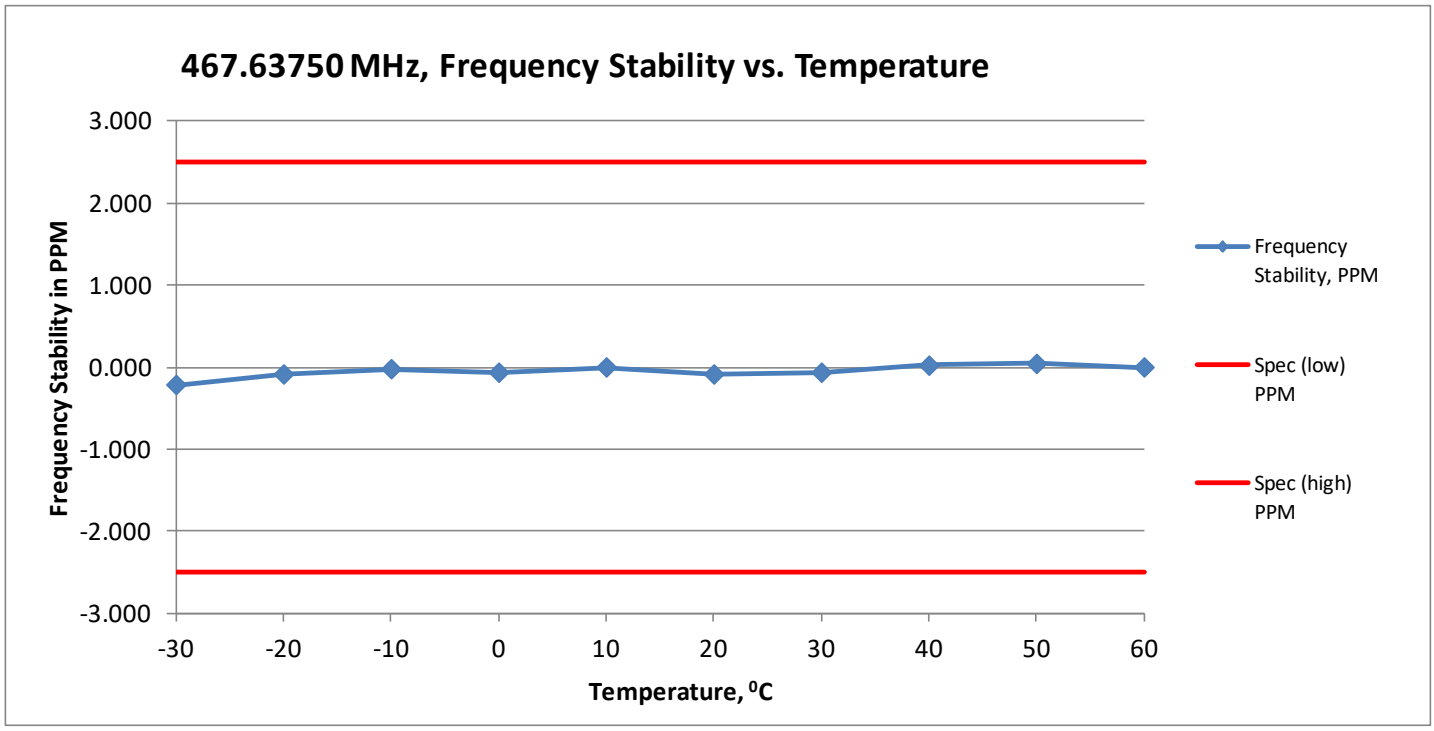
(i) Frequency Stability VS Voltage

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
-20	3.600	467.637440	-0.128	-2.500	2.500
-15	3.825	467.637410	-0.192	-2.500	2.500
-10	4.050	467.637440	-0.128	-2.500	2.500
-5	4.275	467.637410	-0.192	-2.500	2.500
0	4.500	467.637440	-0.128	-2.500	2.500
5	4.725	467.637420	-0.171	-2.500	2.500
10	4.950	467.637430	-0.150	-2.500	2.500
15	5.175	467.637400	-0.214	-2.500	2.500
20	5.400	467.637420	-0.171	-2.500	2.500



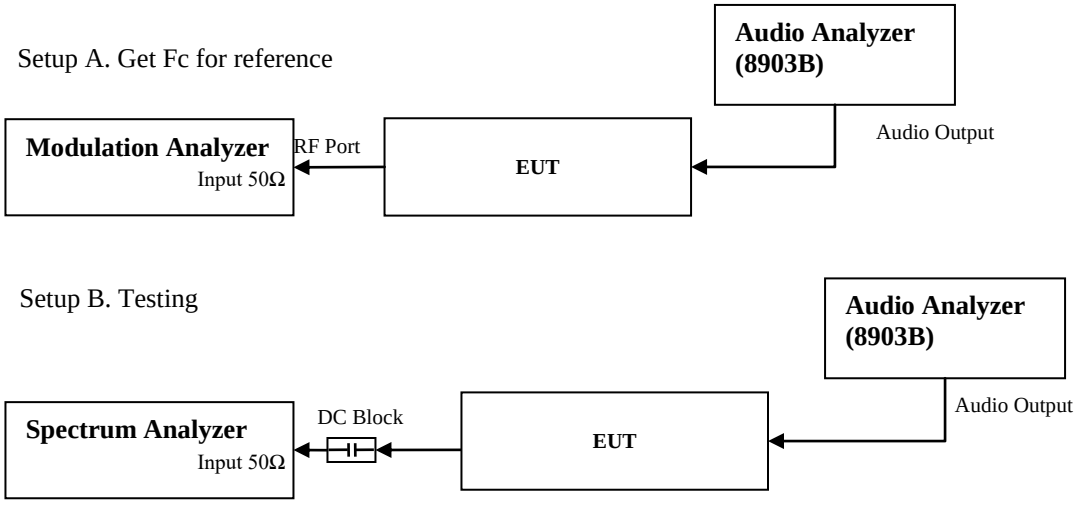
(ii) Frequency Stability VS temperature

Frequency / Channel Spacing	467.63750 MHz / 12.5 kHz			
Voltage, V	4.5			
Temperature, ^{0}C	Frequency, MHz	Frequency Stability, PPM	Spec (low) PPM	Spec (high) PPM
-30	467.637400	-0.214	-2.500	2.500
-20	467.637460	-0.086	-2.500	2.500
-10	467.637490	-0.021	-2.500	2.500
0	467.637470	-0.064	-2.500	2.500
10	467.637500	0.000	-2.500	2.500
20	467.637460	-0.086	-2.500	2.500
30	467.637470	-0.064	-2.500	2.500
40	467.637510	0.021	-2.500	2.500
50	467.637520	0.043	-2.500	2.500
60	467.637500	0.000	-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.

6.6.3. Test Data

BANDWIDTH CALCULATIONS:

Carson's Rule for FM modulation is utilized to compute the bandwidth shown in the FCC emission designator. Carson's Rule is: BW = 2 * (M + D)

where: BW = Bandwidth
M = Maximum modulating frequency
D = Deviation

Standard Audio Modulation (12.5 kHz Channelization, Analog Voice):

Emission Designator 11K0F3E

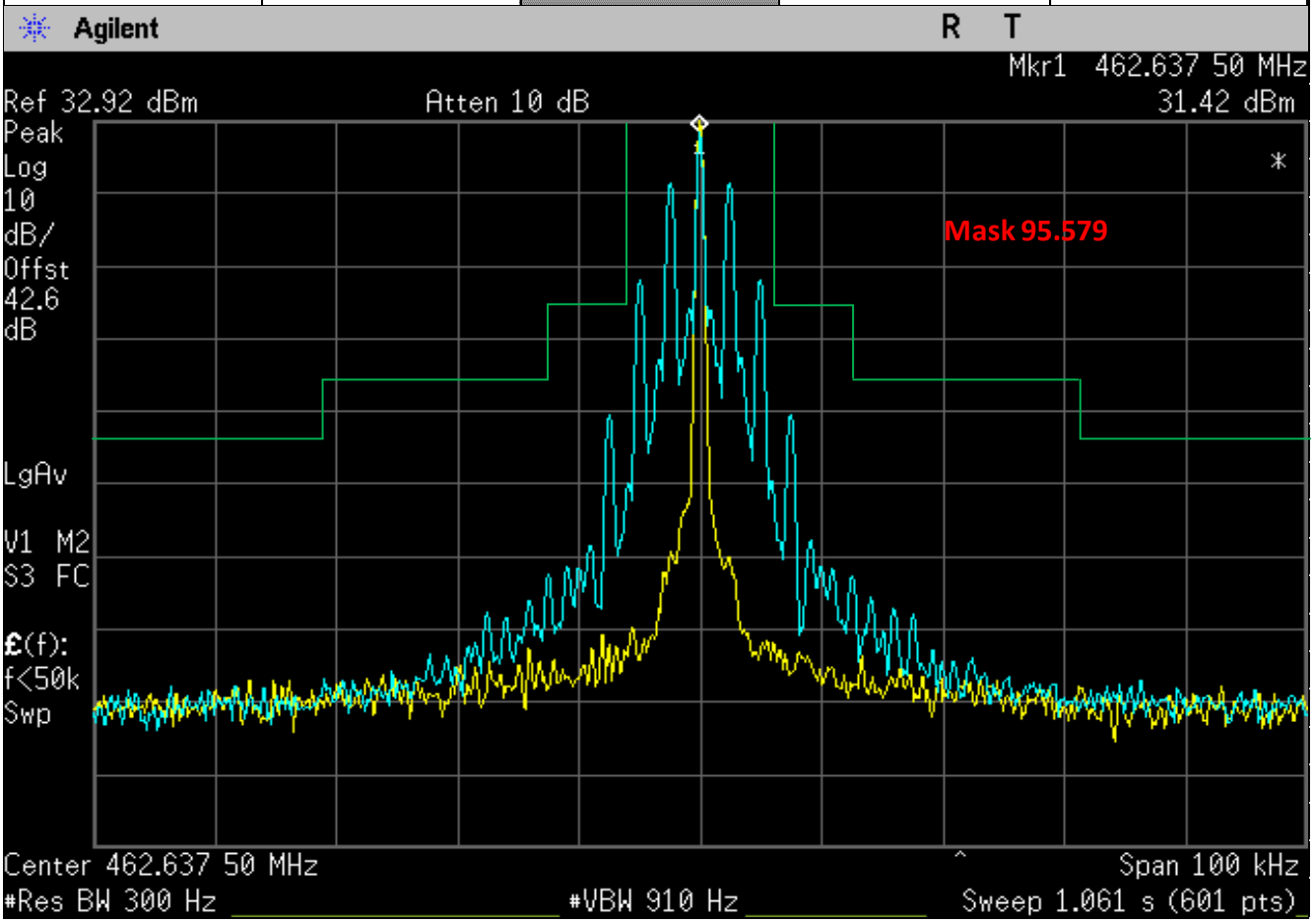
In this case, the maximum modulating frequency is 3.0 kHz with a 2.5 kHz deviation.

BW = 2(M+D) = 2*(3.0 kHz + 2.5 kHz) = 11 kHz ➔ 11K0

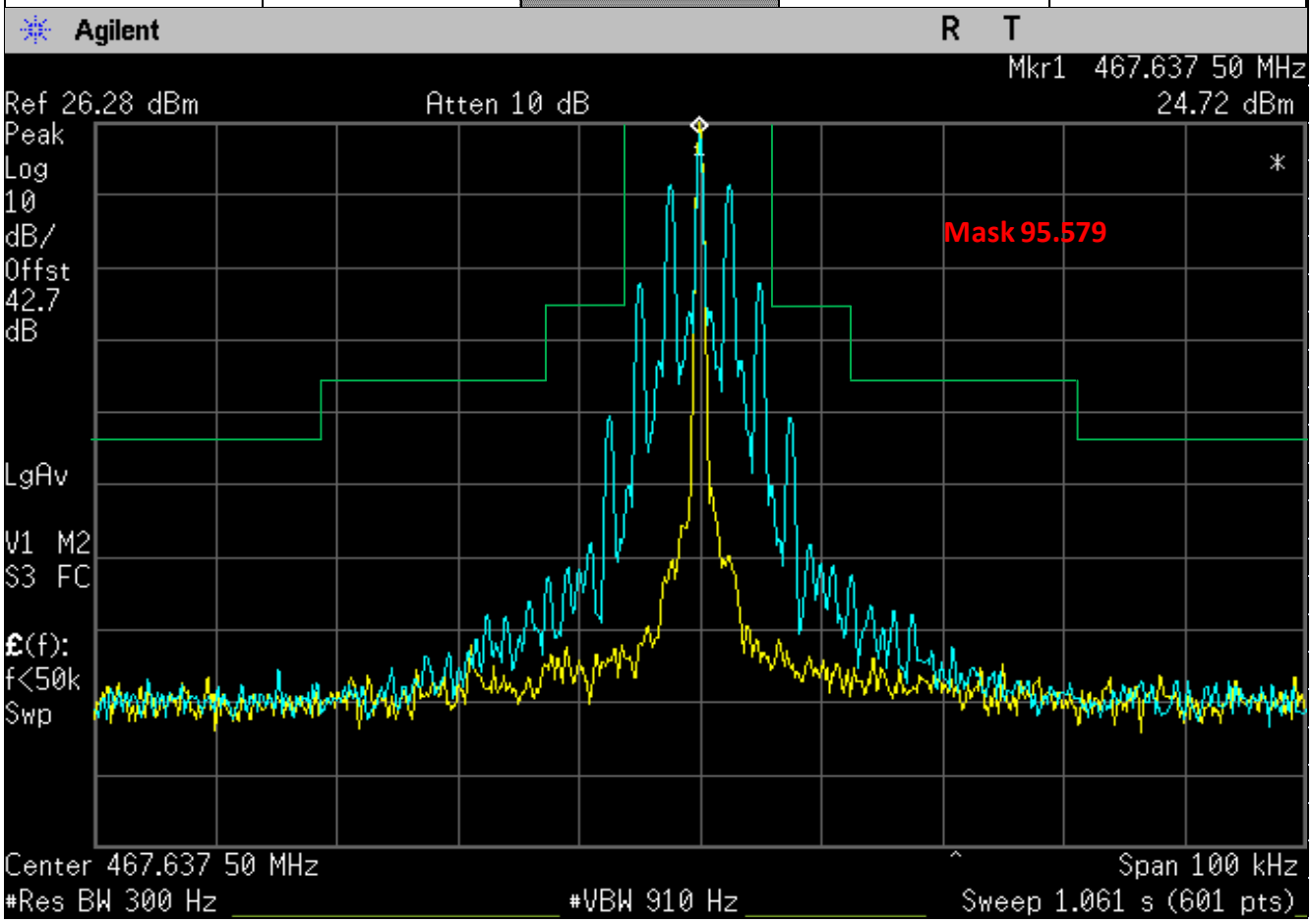
F3E portion of the designator indicates voice.

Therefore, the entire designator for 12.5 kHz channelization analog voice is 11K0F3E.

Modulation			Rules Part	
Analog Voice			FCC Part 95.579	
Channel Frequency (MHz)	**Channel Spacing (kHz)**		**99% OCB (kHz)**	**Emission Designator**
462.6375	12.5		9.7303	11K0F3E

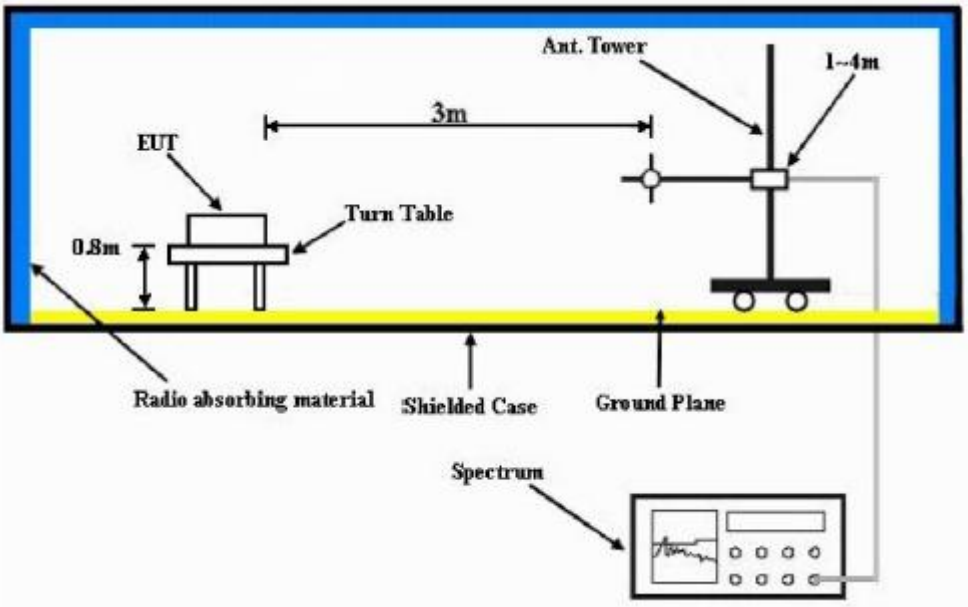


Modulation			Rules Part	
Analog Voice			FCC Part 95.579	
Channel Frequency (MHz)	**Channel Spacing (kHz)**		**99% OCB (kHz)**	**Emission Designator**
467.6375	12.5		9.7346	11K0F3E



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 (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.

6.7.2. Test Result

SAC Transmitter Radiated Emission:

Model Number: T600 **S/N: 1758WN0003** **SR: 23292-RF-00010**

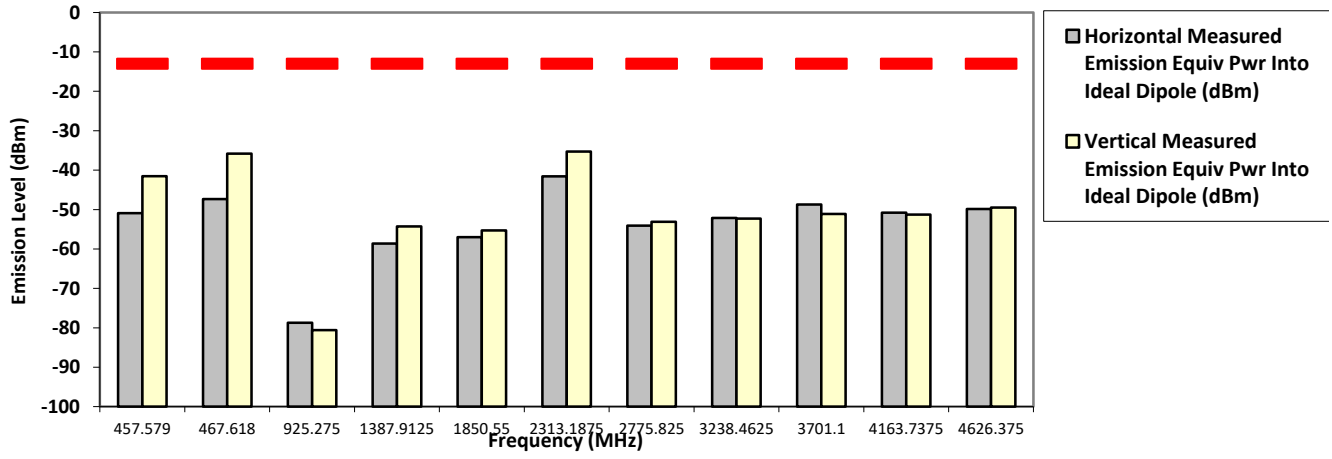
Battery Part No: AA ALKALINE **Accy Part No: NA**

Test Mode: TX Analog

462.637500 MHz **12.5 kHz** **1.900 Watt(s) ERP/Max Power**

Frequency (MHz)	Limit	Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm)
457.5790	-13.0000	-50.9300 *	-41.5200 *
467.6180	-13.0000	-47.3200 *	-35.8200 *
925.2750	-13.0000	-78.7212 **	-80.5674 **
1387.9125	-13.0000	-58.6400 *	-54.2600 *
1850.5500	-13.0000	-56.9843 **	-55.2779 **
2313.1875	-13.0000	-41.5700 *	-35.3000 *
2775.8250	-13.0000	-54.0856 **	-53.0839 **
3238.4625	-13.0000	-52.1128 **	-52.2813 **
3701.1000	-13.0000	-48.7071 **	-51.1212 **
4163.7375	-13.0000	-50.7820 **	-51.2836 **
4626.3750	-13.0000	-49.8720 **	-49.5010 **

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: Nazrin&Qawiman **Tue, Aug 11, 2020**

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): 23.6 Hum(%RH): 70.3

System MU: 4.03 dB

Remarks: Passed Results | **Marginal Results** | **Failed Results**

SAC Transmitter Radiated Emission:

Model Number: T600 **S/N: 1758WN0003** **SR: 23292-RF-00010**

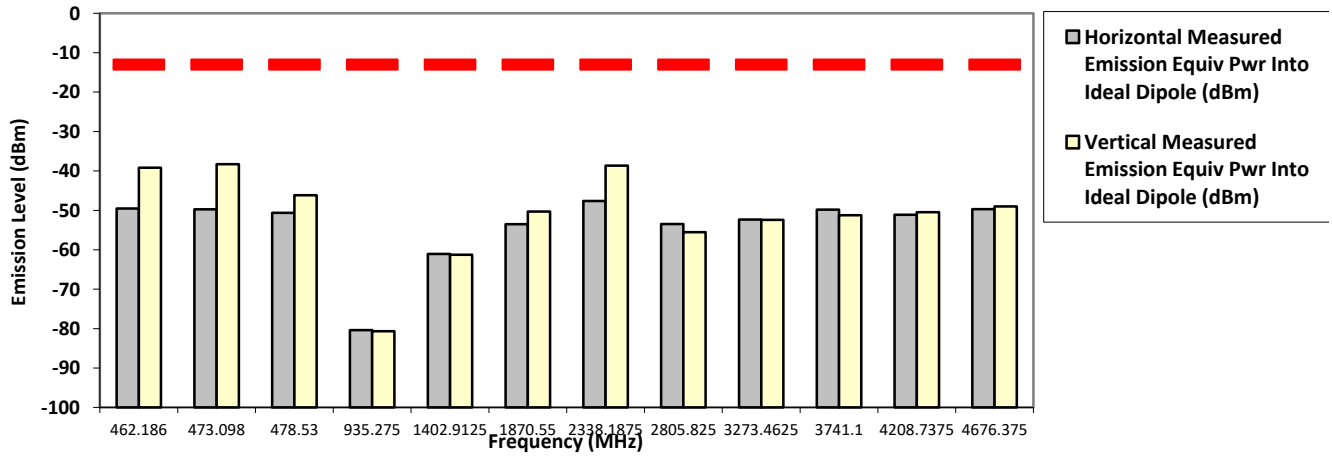
Battery Part No: AA ALKALINE **Accy Part No: NA**

Test Mode: TX Analog

467.637500 MHz **12.5 kHz** **0.500 Watt(s) ERP/Max Power**

Frequency (MHz)	Limit	Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm)
462.1860	-13.0000	-49.5300 *	-39.1800 *
473.0980	-13.0000	-49.7200 *	-38.2700 *
478.5300	-13.0000	-50.6400 *	-46.1500 *
935.2750	-13.0000	-80.3617 **	-80.6505 **
1402.9125	-13.0000	-61.0429 **	-61.2435 **
1870.5500	-13.0000	-53.5000 *	-50.3000 *
2338.1875	-13.0000	-47.6400 *	-38.6700 *
2805.8250	-13.0000	-53.4853 **	-55.5504 **
3273.4625	-13.0000	-52.3473 **	-52.4045 **
3741.1000	-13.0000	-49.8186 **	-51.2207 **
4208.7375	-13.0000	-51.1155 **	-50.4664 **
4676.3750	-13.0000	-49.6900 **	-48.9855 **

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: Nazrin&Qawiman **Tue, Aug 11, 2020**

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): 23.6 Hum(%RH): 70.3

System MU: 4.03 dB

Remarks:

Passed Results	Marginal Results	Failed Results

SAC Transmitter Radiated Emission:

Model Number: T600 **S/N: 1758WN0003** **SR:23292-EMC-00006**

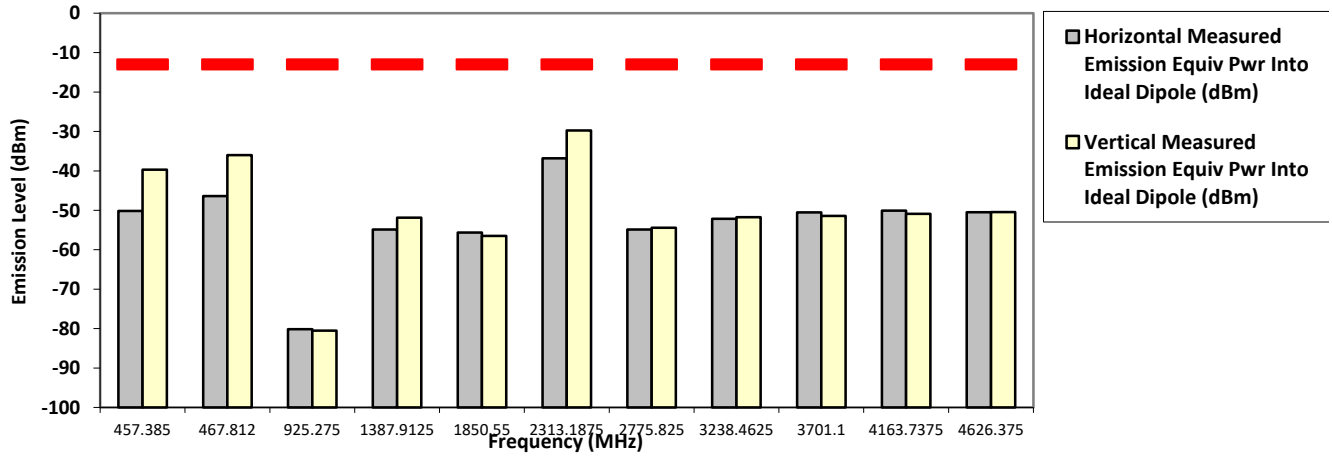
Battery Part No: 1532 **Accy Part No: NA**

Test Mode: TX Analog

462.637500 MHz **12.5 kHz** **1.900 Watt(s) ERP/Max Power**

Frequency (MHz)	Limit	Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm)	Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm)
457.3850	-13.0000	-50.1500 *	-39.7100 *
467.8120	-13.0000	-46.3900 *	-36.0000 *
925.2750	-13.0000	-80.1496 **	-80.5123 **
1387.9125	-13.0000	-54.8900 *	-51.8600 *
1850.5500	-13.0000	-55.6495 **	-56.4823 **
2313.1875	-13.0000	-36.8300 *	-29.7600
2775.8250	-13.0000	-54.8694 **	-54.4169 **
3238.4625	-13.0000	-52.1486 **	-51.7332 **
3701.1000	-13.0000	-50.5379 **	-51.4409 **
4163.7375	-13.0000	-50.0903 **	-50.8761 **
4626.3750	-13.0000	-50.4741 **	-50.4465 **

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: Nazrin&Qawiman **Tue, Aug 11, 2020**

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): 23.6 Hum(%RH): 70.3

System MU: 4.03 dB

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 -