

FCC PART 95
MEASUREMENT AND TEST REPORT
For
Bullitt Group

No4, The Aquarium, King Street, Reading, RG1 2AN UK

FCC ID: ZL5TP851

Report Concerns: Original Report	Equipment Type: Mobile Phone
Model:	<u>TP851</u>
Report No.:	<u>STR11058136I-2</u>
Test Date:	<u>2011-09-01 to 2011-09-13</u>
Issue Date:	<u>2011-09-19</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Bullitt Group
Address of applicant: No4, The Aquarium, King Street, Reading, RG1 2AN UK

Manufacturer: Bullitt Group
Address of manufacturer: No4, The Aquarium, King Street, Reading, RG1 2AN UK

General Description of E.U.T

Items	Description
EUT Description:	Mobile phone
Trade Name:	Bullitt
Model No.:	TP851
Rated Voltage:	Battery DC 3.7V, Adapter DC USB 5V (Model:GQ07-050065-BU)
IMEI:	352580048195304, 352580048195312
RF Output Power:	20.42 mW (ERP)
Frequency Range:	462.5625-462.7125MHz 467.5625-467.7125 MHz
Classification of Radio Service:	FRS (Family Radio Service)
Emission Designator:	11K0F3E
Antenna Type:	Integral Antenna
For more information refer to the circuit diagram form and the user's manual.	

The test data is gathered from a production sample, provided by the manufacturer.

1.2 Test Standards

The following report of is prepared on behalf of the Bullitt Group in accordance with FCC Rules and Regulations Part 2 & FCC Rules and Regulations Part 95 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with the FCC Rules and Regulations Part 2 & FCC Rules and Regulations Part 95 Subpart E of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.4 Test Methodology

Measurements contained in this report were also conducted with Part 2 & FCC Rules and Regulations Part 95 Subpart E of the Federal Communication Commissions rules and ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level according to TIA/EIA 603A to represent the worst-case results during the final qualification test. The test modes were adapted with transmitting mode. For more detail refer to the Operating Instructions.

1.5 Test Facility

- **FCC – Registration No.: 994117**

SEM.Test Compliance Services Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**

The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

1.6 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components.

1.7 Accessories Equipment List and Details

Manufacturer	Description	Model	Serial Number
MEILI	Audio Generator	MFG-3005	200612187

1.8 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Cord/Without Cord
USB Cable	1.1	Shielded	Without Core
Earphone Cable	1.2	Unshielded	Without Core

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	LIMIT
2.1046 95.639 (a)(1), (d)	RF Output Power	<0.5W for FRS unit
2.1049 95.633 (a), (c)	Occupied Bandwidth Emission	12.5kHz for FRS unit
95.635(b)(1) 95.635(b)(3) 95.635(b)(7)	Radiated Spurious Emissions	Reference to section 5.6 in this report
2.1055 95.621 & 95.627	Frequency Stability Vs. Temperature Vs. Voltage	Deviation < 0.00025% for FRS unit
2.1047 95.637 (a), (b)	Modulation Characteristics	± 2.5 kHz for FRS unit

3. §2.1046 and §95.639(a) (1) & (d)- RF OUTPUT POWER

3.1 Standard Applicable

According to FCC §2.1046, and §95.639(a)(1), No GMRS transmitter, under and condition of modulation, shall exceed: (1) 50W Carrier power (average TP during one unmodulated RF cycle) when transmitting emission type A1, F1D, G1D, A3E, F3E or G3E. §95.639(d), No FRS unit, under and condition of modulation, shall exceed 0.500W effective radiated power (ERP).

3.2 Test Equipment List and Detail

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08
Signal Generator	Rohde & Schwarz	SMR20	100047	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

3.3 Test Procedure

1. The EUT was powered ON and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length of 91cm.
2. The fundamental frequency of the transmitter was maximized on the test receiver display by raising and lowering the receive antenna and by rotating the turntable. After the fundamental emission was maximized, a field strength measurement was made.
3. Steps 1 and 2 were preformed with the EUT and the receive antenna in both vertical and horizontal polarization and performed a pre-test three orthogonal planes.
4. The transmitter was then removed and replaced with a substitution antenna.
5. A signal at the fundamental frequency was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally and vertically polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2 is obtained for this set of conditions.

6. The output power into the substitution antenna was then measured.

4.4 Environmental Conditions

Temperature:	22 °C
Relative Humidity:	51%
ATM Pressure:	1012 mbar

3.4 Test Result/Plots

Frequency	Substitute SG Reading	Height	Table	Polar	Cable loss	Antenna Gain	Corrected Ampl.	Corrected Ampl.	FCC Part 95 Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	mW	mW
For FRS unit									
462.5625	11.30	1.5	26	H	2.30	0	9.0	7.94	500
462.5625	14.80	1.5	189	V	2.30	0	12.5	17.78	500
467.7125	11.00	1.5	261	H	2.30	0	8.7	7.41	500
467.7125	15.40	1.5	55	V	2.30	0	13.1	20.42	500

4. §2.1049 and § 95.633(a) & (c) - OCCUPIED BANDWIDTH OF EMISSION

4.1 Standard Applicable

According to FCC §2.1049 and FCC §95.633 (a), The authorized bandwidth for emission type F1D, G1D, F3E or G3E is 20 kHz. §95.633 (c), The authorized bandwidth for emission type F3E or F2D transmitted by a FRS unit is 12.5 kHz.

Per FCC §95.635 (b)(1), at least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

Per FCC §95.635 (b)(3), At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.

Per FCC §95.635 (b)(7), At least $43 + 10 \log_{10}(T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

4.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2010-12-20	2011-12-19
Atten	Attenuator	ATS100-4-20	/	2010-12-20	2011-12-19
Audio Generator	MEILI	MFG-3005	200612187	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.3 Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. Turn on the transmitter, and set it to transmit the pulse train continuously.
3. The bandwidth of the carrier was measured and recorded.

4.4 Environmental Conditions

Temperature:	22 °C
Relative Humidity:	55 %
ATM Pressure:	1012 mbar

4.5 Test Results/Masks

The occupied Bandwidth Emission of all fall in the Mask, full fit the requirements of the standards.

Narrowband Channel Separation: 12.5kHz:

$K=1$

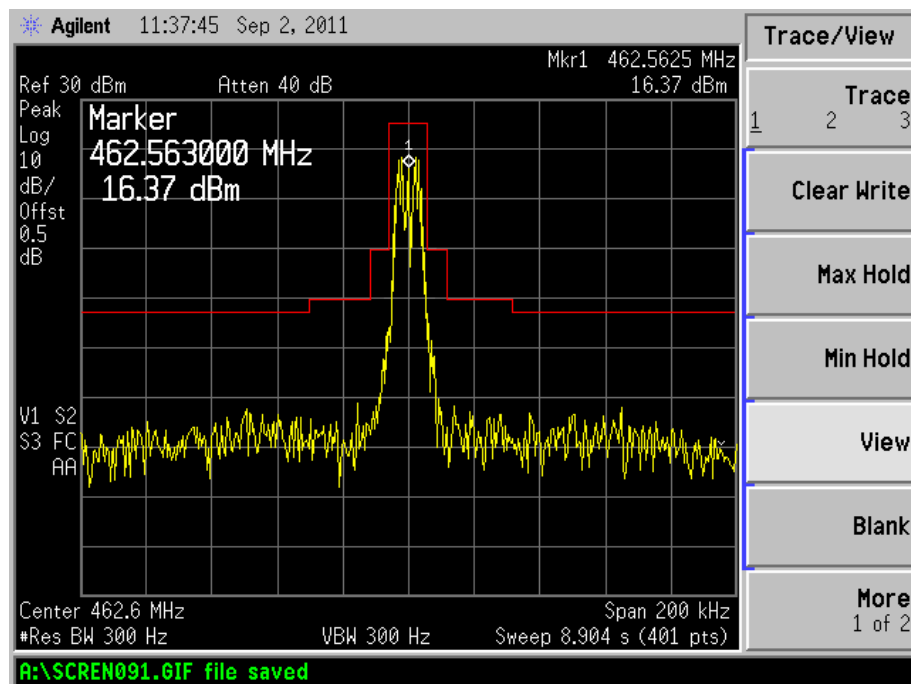
$M=3\text{kHz}$

$D=2.5\text{kHz}$

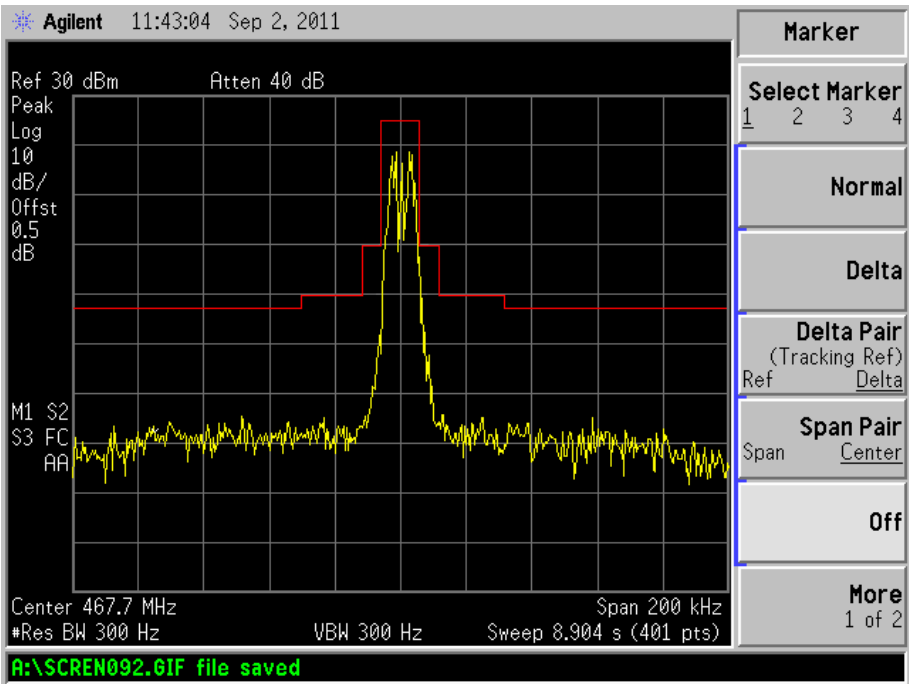
$B_n=2M+2DK=2*3+2*2.5*1=11\text{kHz}$

Emission Designation=11K0F3E

For FRS unit (462.5625 MHz)



For FRS unit (467.7125 MHz)



5. §95.635(b)- UNWANTED RADIATED EMISSION

5.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 0.5 dB.

5.2 Standard Applicable

Per FCC §95.635 (b)(1), at least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

Per FCC §95.635 (b)(3), At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.

Per FCC §95.635 (b)(7), At least $43 + 10 \log_{10}(T)$ dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08
Signal Generator	Rohde & Schwarz	SMR20	100047	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.4 Test Procedure

1. The setup of EUT is according with per TIA/EIA Standard 603 and ANSI C63.4-2003 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.

4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious attenuation limit in dB = $43 + 10 \log_{10}(\text{power out in Watts})$

5.5 Environmental Conditions

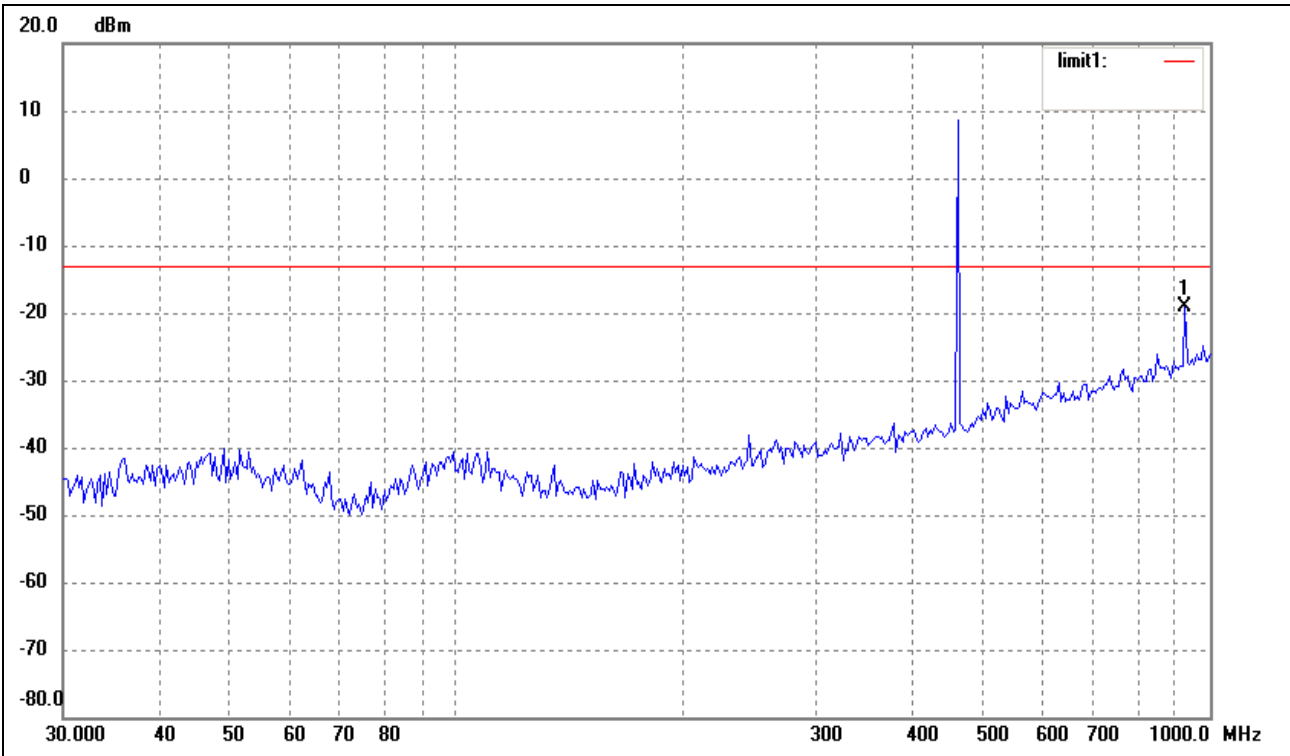
Temperature:	18° C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

5.6 Summary of Test Results/Plots

According to the data below, the FCC Part 95 standards, and had the worst margin of:

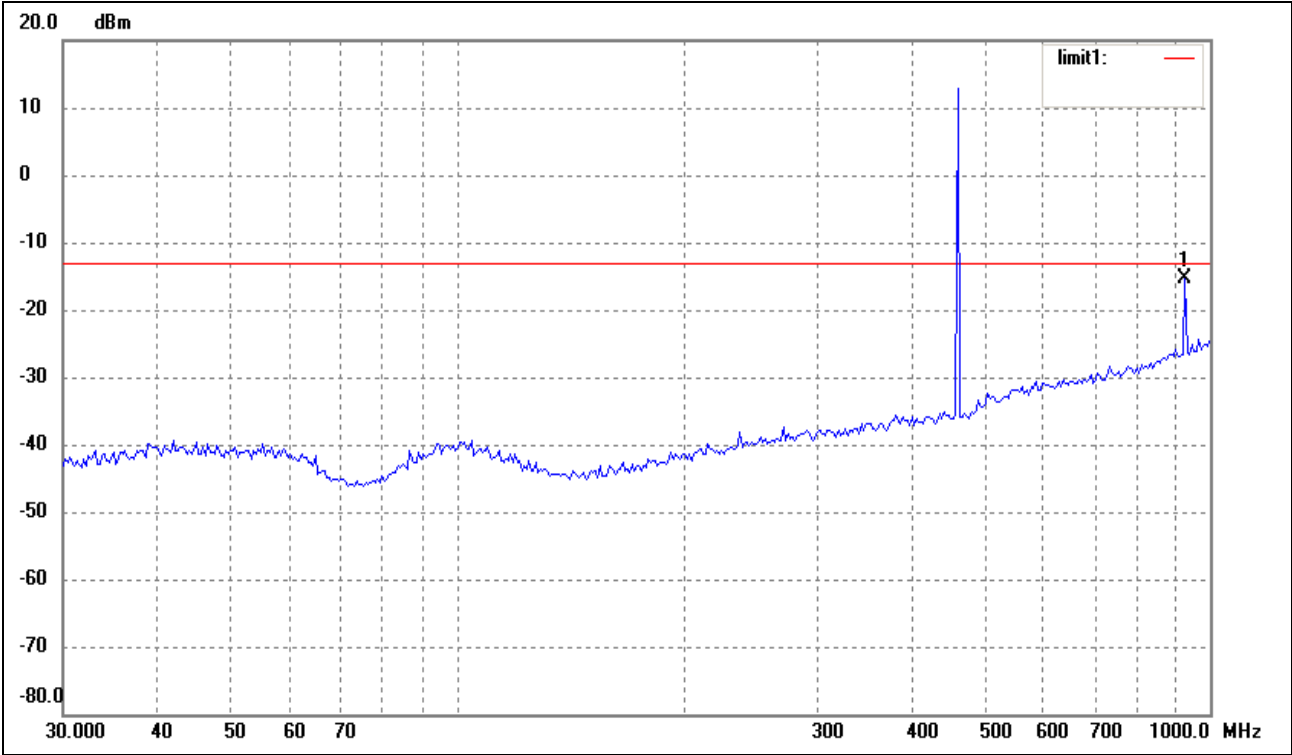
-2.25 dB at 938.8325 MHz in the Vertical polarization, 30 MHz to 5 GHz, 3 Meters

For FRS transmitter (462.5625 MHz)
Plots of the spurious emission for below 1GHz:
Horizontal



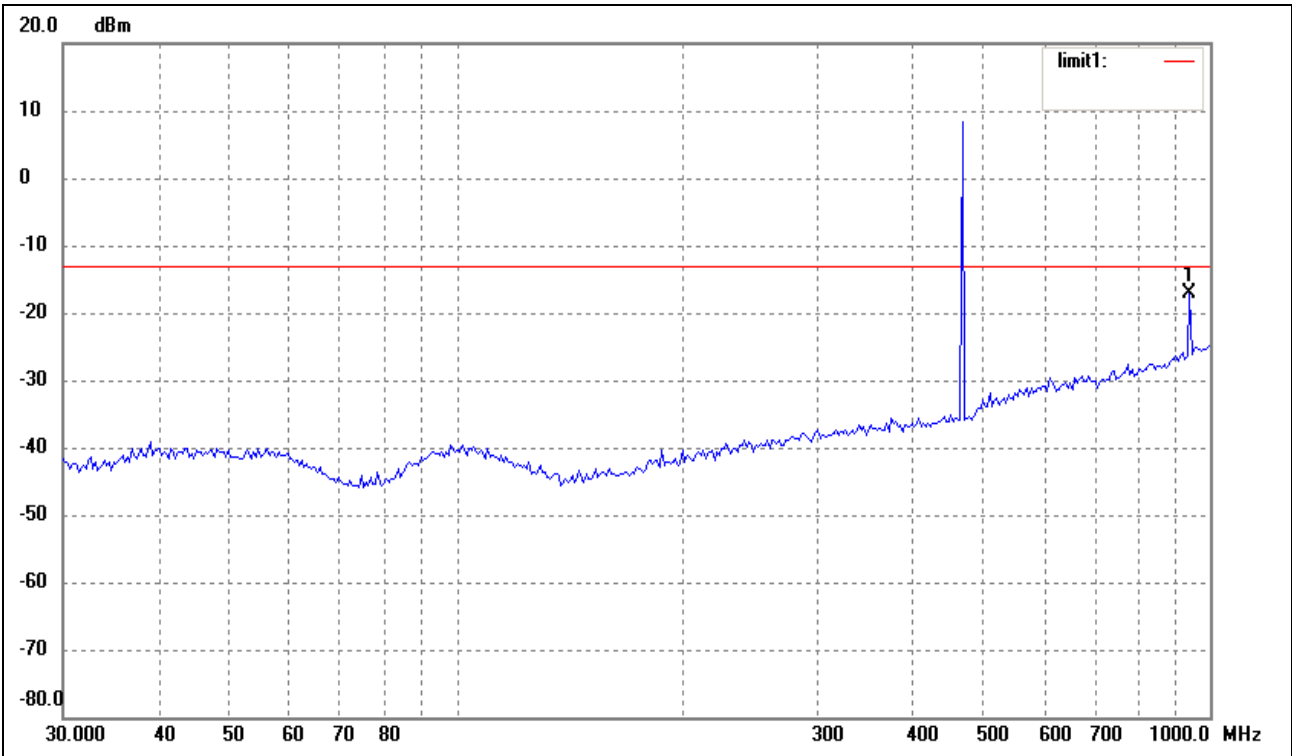
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	925.7563	-52.40	33.18	-19.22	-13.00	-6.22	ERP

Vertical



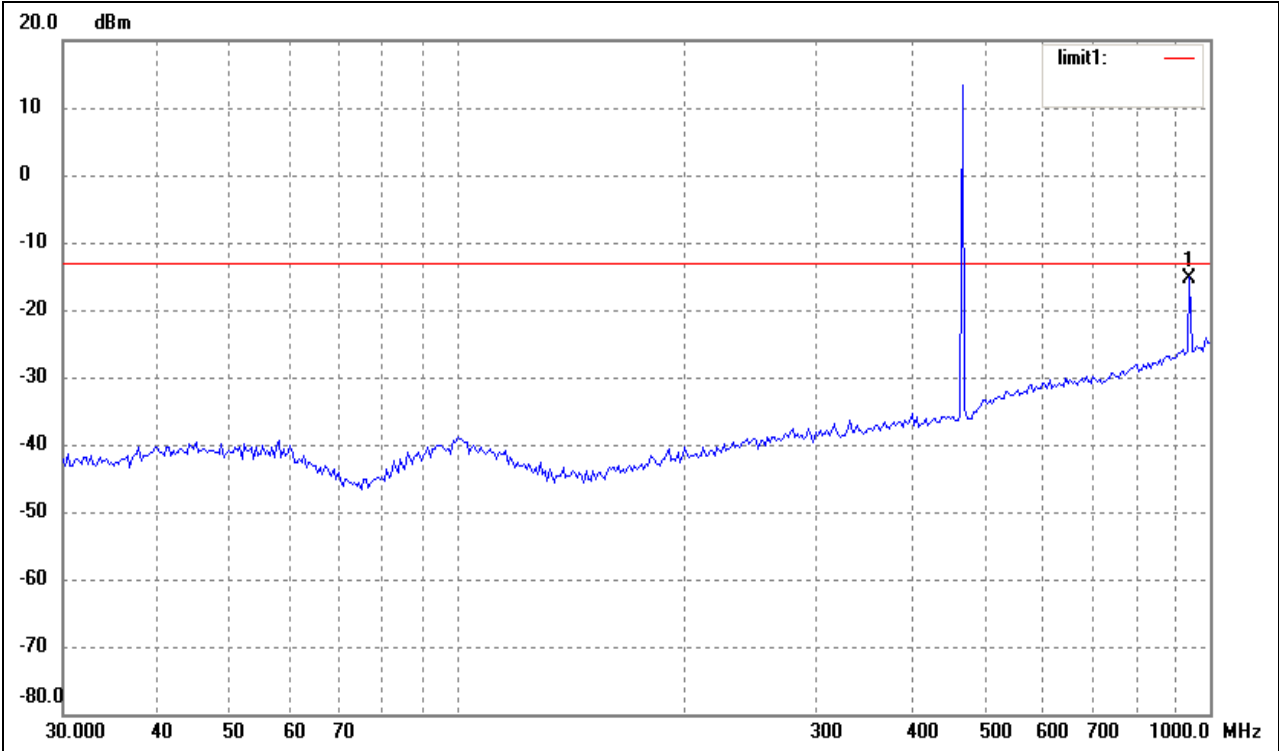
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	925.7563	-48.55	33.18	-15.37	-13.00	-2.37	ERP

For FRS Unit (467.7125 MHz)
Plots of the spurious emission for below 1GHz:
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	938.8326	-50.59	33.41	-17.18	-13.00	-4.18	ERP

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	938.8325	-48.66	33.41	-15.25	-13.00	-2.25	ERP

Plots of the spurious emission for Above 1GHz:

Frequency	SG Reading	Height	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 95 Limit	FCC Part 95 Margin
MHz	dBm	Meter	H / V	dB	dB	dBm	dBm	dB
FRS unit (462.5625MHz)								
1387.6875	-50.07	1.5	V	2.6	6.4	-46.27	-13	-33.27
1387.6875	-44.62	1.5	H	2.6	6.4	-40.82	-13	-27.82
1850.2500	-49.91	1.0	V	2.9	7.2	-45.61	-13	-32.61
1850.2500	-54.69	1.5	H	2.9	7.2	-50.39	-13	-37.39
FRS unit (467.7125MHz)								
1403.1375	-48.03	1.5	V	2.7	6.6	-44.13	-13	-31.13
1403.1375	-47.93	1	H	2.7	6.6	-44.03	-13	-31.03
1870.8500	-51.38	1.5	V	3.0	7.4	-46.98	-13	-33.98
1870.8500	-49.38	1.5	H	3.0	7.4	-44.98	-13	-31.98

Note: Testing is carried out with 3-orthogonal axis and frequency rang 30MHz to the tenth harmonics. Emissions undetected below the base noise are not reported.

6. §2.1055, §95.621 (b) and §95.627(b)- FREQUENCY STABILITY

6.1 Standard Applicable

According to FCC §2.1055(a)(1), the frequency stability shall be measure with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$, and according to FCC 2.1055(d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC §95.621(b), Each GMRS transmitter for mobile station, small base station and control operation must be maintained within a frequency tolerance of 0.0005%. §95.627(b), Each FRS unit must be maintained within a frequency tolerance of 0.00025%.

6.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2010-12-20	2011-12-19
Atten	Attenuator	ATS100-4-20	/	2010-12-20	2011-12-19
Audio Generator	MEILI	MFG-3005	200612187	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

6.3 Test Procedure

1. Setup the configuration of the ambient temperature form -30°C to 50°C with sufficient time. And measure the different power of the EUT with an artificial power from highest to end point voltage.
2. Active the Analyzer frequency counter option, center frequency to the right frequency needs to be measured.

6.4 Test Results/Plots

For FRS unit (462.5625MHz)

Reference Frequency: 462.5625 MHz, Limit: +/-0.00025%			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (MHz)	Error %
50	3.7	462.5629	0.000086
40	3.7	462.5627	0.000043
30	3.7	462.5624	-0.000022
20	3.7	462.5623	-0.000043
10	3.7	462.5622	-0.000065
0	3.7	462.5623	-0.000043
-10	3.7	462.5621	-0.000086
-20	3.7	462.5620	-0.000108
-30	3.7	462.5619	-0.000130

So, Frequency Stability Versus Input Voltage is:

Reference Frequency: 462.5625 MHz, Limit: +/-0.00025%		
Power Supplied (VDC)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	Error %
3.33	462.5618	-0.000151

For FRS unit (467.7125MHz)

Reference Frequency: 467.7125 MHz, Limit: +/-0.00025%			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (MHz)	Error %
50	3.7	467.7132	0.000150
40	3.7	467.7130	0.000107
30	3.7	467.7128	0.000064
20	3.7	467.7126	0.000021
10	3.7	467.7124	-0.000021
0	3.7	467.7122	-0.000064
-10	3.7	467.7121	-0.000085
-20	3.7	467.7120	-0.000107
-30	3.7	467.7118	-0.000150

So, Frequency Stability Versus Input Voltage is:

Reference Frequency: 467.7125 MHz, Limit: +/-0.00025%		
Power Supplied (VDC)	Frequency Measure with Time Elapsed	
	Frequency (MHz)	Error %
3.33	467.7117	-0.000171

7. §2.1047, and §90.637-MODULATION CHARACTERISTICS

7.1 Standard Applicable

According to FCC §95.637:

A GMRS transmitter that transmits emission types F1D, G1D, or G3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A GMRS transmitter that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 5 kHz. A FRS unit that transmits emission type F3E must not exceed a peak frequency deviation of plus or minus 2.5 kHz, and the audio frequency response must not exceed 3.125 kHz .

According to FCC §2.1047

(a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.

(b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Modulation Analyzer	Rohde & Schwarz	FAM 54	334.2015.54	2010-12-20	2011-12-19
Attenuator	Atten	ATS100-4-20	/	2010-12-20	2011-12-19
Audio Generator	MEILI	MFG-3005	200612187	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

7.3 Test Procedure

Test is carried out under the procedure of TIA/EIA-603 §2.2.3.

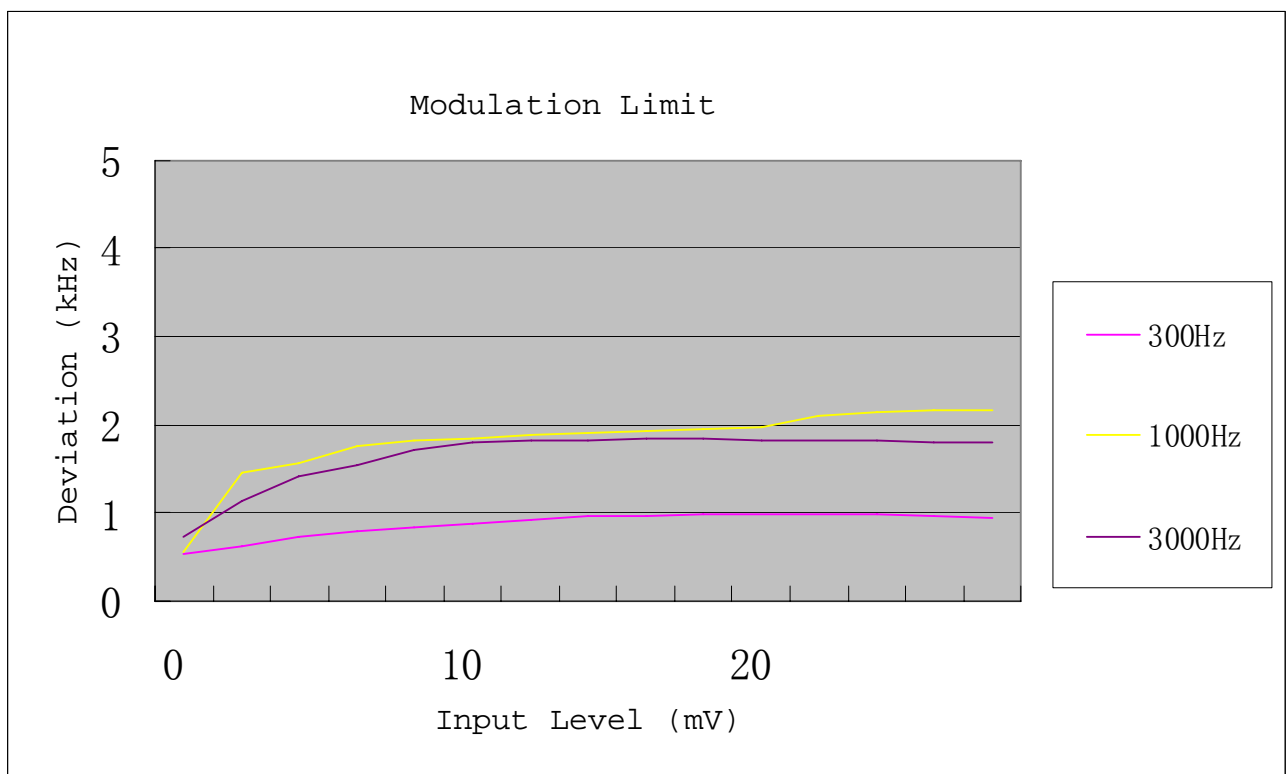
7.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55%
ATM Pressure:	1015mbar

7.5 Test Results/Plots

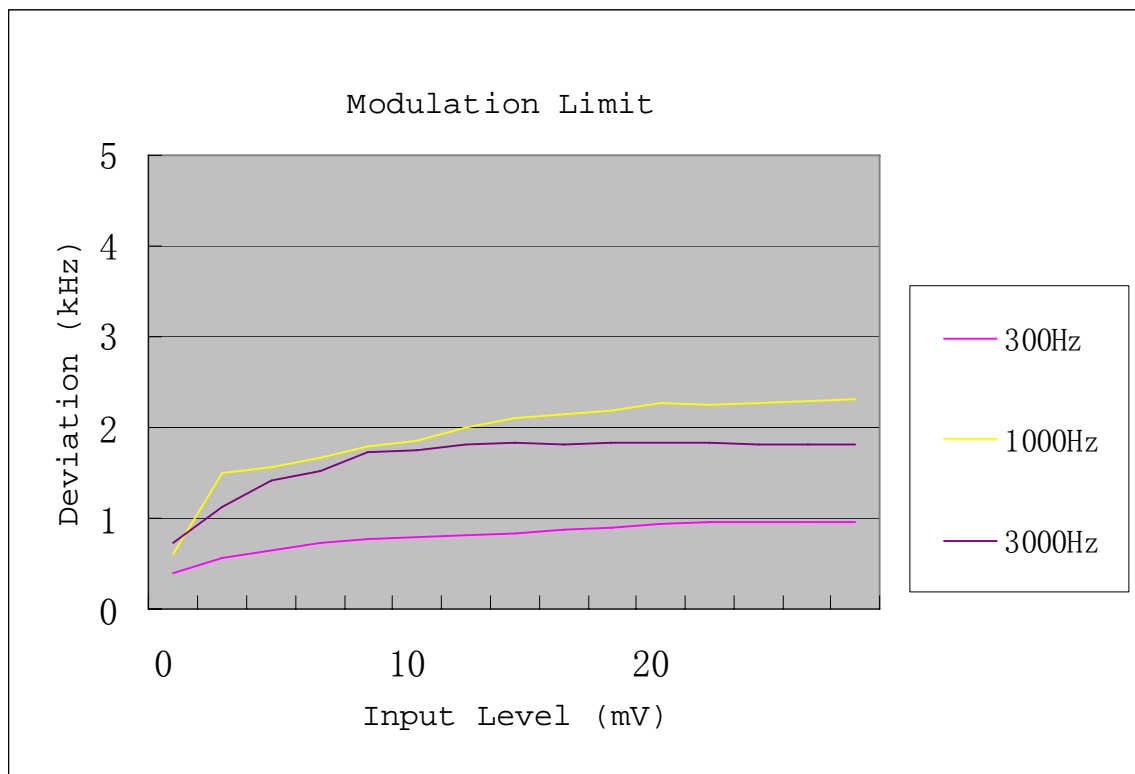
For FRS unit (462.5625MHz)

Audio Input (mV)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	FCC Limit (kHz)
0	0.53	0.56	0.68	2.5
2	0.62	1.46	1.21	2.5
4	0.73	1.57	1.37	2.5
6	0.80	1.75	1.45	2.5
8	0.83	1.82	1.68	2.5
10	0.88	1.84	1.76	2.5
12	0.91	1.89	1.88	2.5
14	0.96	1.90	1.93	2.5
16	0.96	1.93	1.95	2.5
18	0.98	1.94	1.96	2.5
20	0.98	1.98	1.95	2.5
24	0.99	2.10	1.94	2.5
28	0.98	2.14	1.93	2.5
32	0.96	2.16	1.94	2.5
36	0.95	2.17	1.95	2.5

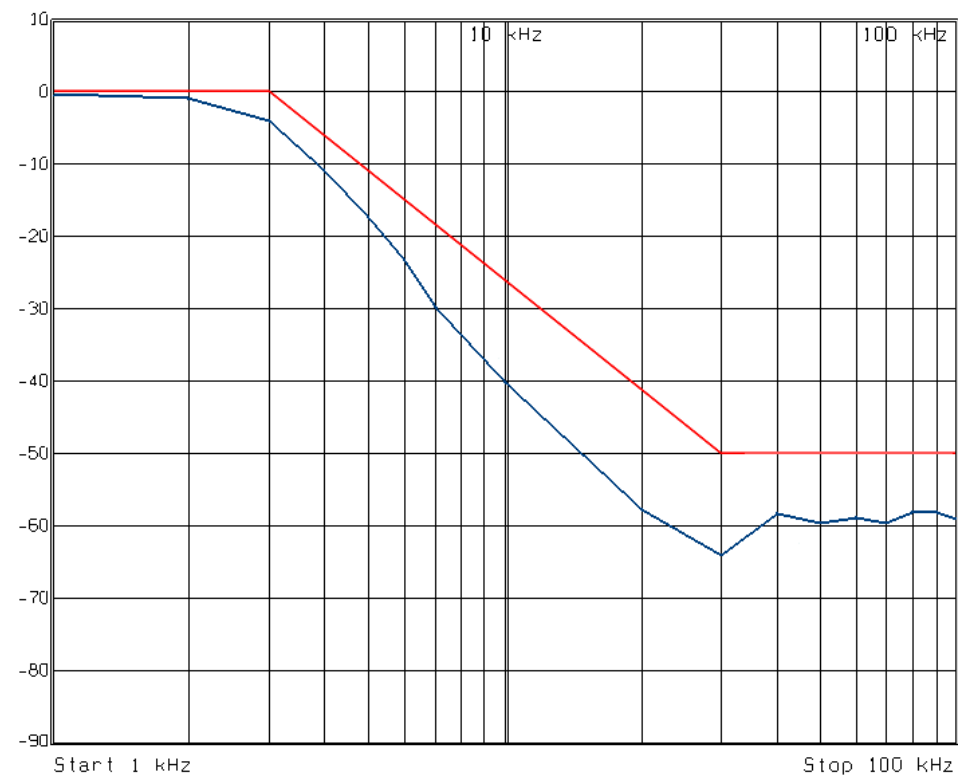
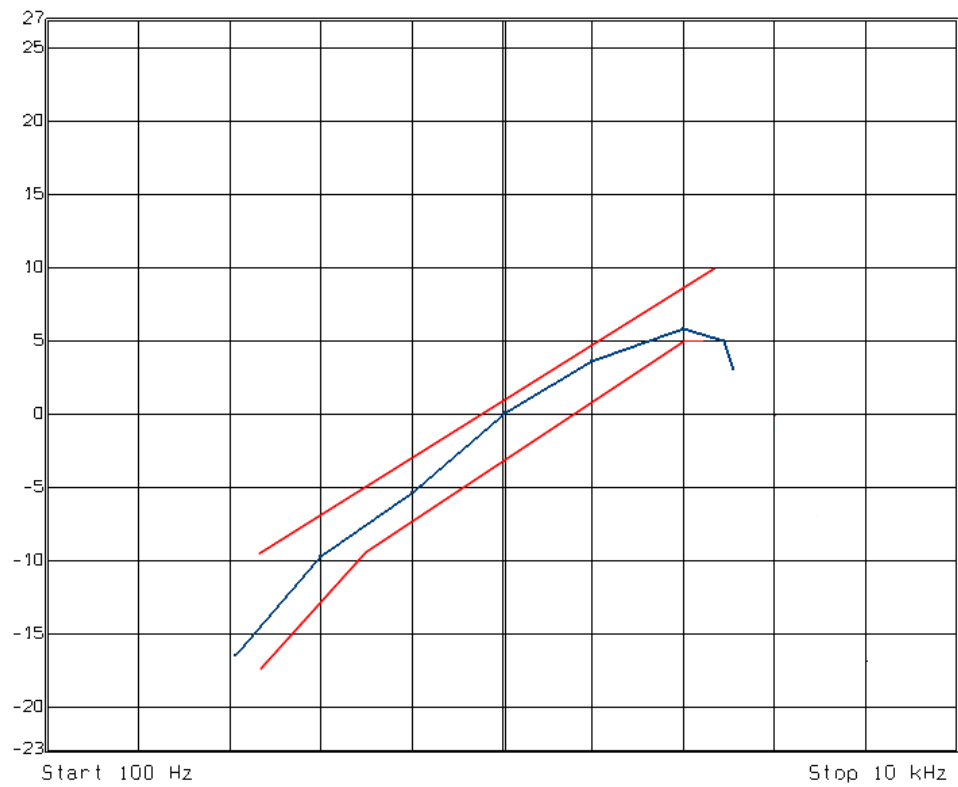


For FRS unit (467.7125MHz)

Audio Input (mV)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	FCC Limit (kHz)
0	0.39	0.61	0.68	2.5
2	0.56	1.50	1.07	2.5
4	0.65	1.57	1.38	2.5
6	0.73	1.67	1.49	2.5
8	0.78	1.79	1.69	2.5
10	0.79	1.86	1.72	2.5
12	0.81	2.00	1.8.	2.5
14	0.83	2.10	1.87	2.5
16	0.87	2.15	1.90	2.5
18	0.90	2.18	1.93	2.5
20	0.93	2.26	1.96	2.5
24	0.95	2.25	1.97	2.5
28	0.96	2.27	1.98	2.5
32	0.96	2.30	1.97	2.5
36	0.95	2.31	1.96	2.5



Audio Low Pass Filter Characteristic Curve



***** END OF REPORT *****