

FCC TEST REPORT
FOR
Shenzhen L&Y Audio Co., LTD
Bluetooth Speaker With Walkie Talkie
Test Model: VENTURE

Prepared for : Shenzhen L&Y Audio Co., LTD
Address : No.2 Bldg, No.2 Industrial Zone, Tong Fu Yu Industrial, Tang Xia Yong, Songgang, Bao'an District, Shenzhen, Guangdong, China

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

Tel : (+86)755-82591330

Fax : (+86)755-82591332

Web : www.LCS-cert.com

Mail : webmaster@LCS-cert.com

Date of receipt of test sample : November 07, 2015

Number of tested samples : 1

Sample number : Prototype

Date of Test : November 07, 2015 - December 04, 2015

Date of Report : December 04, 2015

FCC TEST REPORT
FCC CFR 47 PART 95 B: 2015

Report Reference No. : **LCS1512242423E**

Date of Issue..... : December 04, 2015

Testing Laboratory Name : **Shenzhen LCS Compliance Testing Laboratory Ltd.**

Address..... : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

Testing Location/ Procedure : Full application of Harmonised standards
Partial application of Harmonised standards
Other standard testing method

Applicant's Name : **Shenzhen L&Y Audio Co., LTD**

Address..... : No.2 Bldg, No.2 Industrial Zone, Tong Fu YuIndustrial,Tang Xia Yong, Songgang,Bao'an District, Shenzhen, Guangdong, China

Test Specification

Standard..... : FCC CFR 47 PART 95 B: 2015 / TIA/EIA 603D: 2010

Test Report Form No...... : LCSEMC-1.0

TRF Originator..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2011-03

Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen LCS Compliance Testing Laboratory Ltd. is acknowledged as copyright owner and source of the material. Shenzhen LCS Compliance Testing Laboratory Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test Item Description..... : **Bluetooth Speaker With Walkie Talkie**

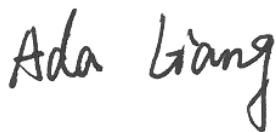
Trade Mark..... : DREAMWAVE

Test Model..... : VENTURE

Ratings..... : DC 3.7 V by LiPo Battery(3600mAh)
Recharge Voltage: DC 5 V/1A

Result : **Positive**

Compiled by:



Ada Liang/ File administrators

Supervised by:



Glin Lu/ Technique principal

Approved by:



Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS1512242423E	<u>December 04, 2015</u> Date of issue
---	---

Test Model.....	: VENTURE
EUT.....	: Bluetooth Speaker With Walkie Talkie
Applicant.....	: Shenzhen L&Y Audio Co., LTD
Address.....	: No.2 Bldg, No.2 Industrial Zone, Tong Fu YuIndustrial,Tang Xia Yong, Songgang,Bao'an District, Shenzhen, Guangdong, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Shenzhen L&Y Audio Co., LTD
Address.....	: No.2 Bldg, No.2 Industrial Zone, Tong Fu YuIndustrial,Tang Xia Yong, Songgang,Bao'an District, Shenzhen, Guangdong, China
Telephone.....	: /
Fax.....	: /
Factory.....	: Shenzhen L&Y Audio Co., LTD
Address.....	: No.2 Bldg, No.2 Industrial Zone, Tong Fu YuIndustrial,Tang Xia Yong, Songgang,Bao'an District, Shenzhen, Guangdong, China
Telephone.....	: /
Fax.....	: /

Test Result	Positive
--------------------	-----------------

The test report merely corresponds to the test sample.
 It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	5
1.1 Description of Device (EUT).....	5
1.2 Support equipment List.....	6
1.3 External I/O	6
1.4 Description of Test Facility	6
1.5 List Of Measuring Equipment	7
1.6 Statement of The Measurement Uncertainty	8
1.7 Measurement Uncertainty.....	8
2. TEST METHODOLOGY	9
2.1 EUT Configuration	9
2.2 EUT Exercise.....	9
2.3 EUT Channel Information	9
3. SYSTEM TEST CONFIGURATION.....	10
3.1 Justification.....	10
3.2 EUT Exercise Software	10
3.3 Special Accessories	10
3.4 Block Diagram/Schematics.....	10
3.5 Equipment Modifications	10
3.6 Test Setup	10
4. SUMMARY OF TEST RESULTS	11
5. ANTENNA PORT MEASUREMENT	12
5.1 Maximum Transmitter Power	12
5.2 Occupied bandwidth and emission mask.....	14
5.3 Modulation Characteristics	17
5.4 Radiated Spurious Emission	26
5.5 Frequency Stability.....	28

1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT : Bluetooth Speaker With Walkie Talkie
Test Model : VENTURE
Hardware Version : LB-289-MAIN
Software Version : LB-289 (BT1213H)
Power Supply : DC 3.7 V by LiPo Battery(3600mAh)
Recharge Voltage: DC 5 V/1A
Frequency Range : 462.5625 MHz - 462.7125 MHz, 467.5625 MHz.
Channel Spacing : 12.5KHz
Channel Number : 8
Modulation Type : FM
Antenna Description : Integrated Antenna

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	B470	--	DOC
Lenovo	AC/DC Adapter	ADP-900DB	--	VOC

1.3 External I/O

I/O Port Description	Quantity	Cable
CHARGE Interface	1	1.0m, unshielded
LINE IN	1	1.0m

1.4 Description of Test Facility

CNAS Registration Number. is L4595.

FCC Registration Number. is 899208.

Industry Canada Registration Number. is 9642A-1.

VCCI Registration Number. is C-4260 and R-3804.

ESMD Registration Number. is ARCB0108.

UL Registration Number. is 100571-492.

TUV SUD Registration Number. is SCN1081.

TUV RH Registration Number. is UA 50296516-001

1.5 List Of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18,2015	June 17,2016
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16,2015	July 15,2016
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18,2015	June 17,2016
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18,2015	June 17,2016
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18,2015	June 17,2016
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18,2015	June 17,2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-1GHz 3m	June 18,2015	June 17,2016
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHz	June 18,2015	June 17,2016
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16,2015	July 15,2016
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16,2015	July 15,2016
Spectrum Analyzer	Agilent	E4407B	MY41440292	9k-26.5GHz	July 16,2015	July 15,2016
MAX Signal Analyzer	Agilent	N9020A	MY50510140	20Hz~26.5GHz	Oct. 27,2015	Oct. 26,2016
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18,2015	June 17,2016
By-log Antenna	SCHWARZBECK	VULB9163	9163-470	30MHz-1GHz	June 10,2015	June 09,2016
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10,2015	June 09,2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz-40GHz	June 10,2015	June 09,2016
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18,2015	June 17,2016
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18,2015	June 17,2016
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18,2015	June 17,2016
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18,2015	June 17,2016
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18,2015	June 17,2016
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18,2015	June 17,2016
RF CABLE-2m	JYE Bao	RG142	CB035-2m	20MHz-1GHz	June 18,2015	June 17,2016
RF Communication Test Set	HP	8920A	3813A10227	0.1-1000MHz	June 18,2015	June 17,2016

Note: All equipment through GRGT EST calibration

1.6 Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.7 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiation Uncertainty	9KHz~30MHz	3.10dB	(1)
	30MHz~200MHz	2.96dB	(1)
	200MHz~1000MHz	3.10dB	(1)
	1GHz~26.5GHz	3.80dB	(1)
	26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	150kHz~30MHz	1.63dB	(1)
Power disturbance	30MHz~300MHz	1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA/EIA 603D:2010, FCC CFR PART 95.B.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

2.3 EUT Channel Information

CH #	FREQ (MHz)	TYPE	CH #	FREQ (MHz)	TYPE
1	462.5625	FRS	5	462.6625	FRS
2	462.5875	FRS	6	462.6875	FRS
3	462.6125	FRS	7	462.7125	FRS
4	462.6375	FRS	8	467.5625	FRS

As channel 1 – channel 7 for 462.5625 MHz - 462.7125 Mhz. the frequency range is less than 1MHz, we choose Channel 4 (462.6375 MHz) as test frequency according to FCC Part 2.1033, channel 8 (467.5625 MHz) is a standalone frequency points, we will choose as test frequency point.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a continuous transmits condition.

3.2 EUT Exercise Software

N/A.

3.3 Special Accessories

N/A.

3.4 Block Diagram/Schematics

Please refer to the related document.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

Please refer to the test setup photo.

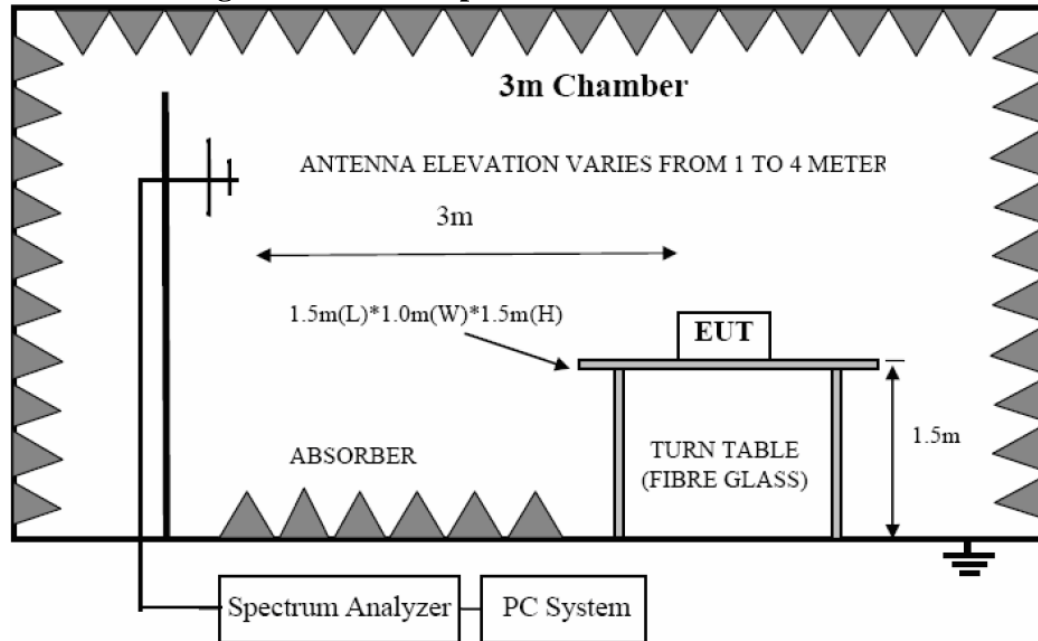
4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 95 Subpart B		
FCC Rules	Description of Test	Result
FCC Part 95.639	Maximum Transmitter Power	Compliant
FCC Part 2.1047, FCC Part 95.637	Modulation Characteristics	Compliant
FCC Part 2.1049, FCC Part 95.633, FCC Part 95.635	Occupied Bandwidth and Emission Mask	Compliant
FCC Part 95.635	Radiated Spurious Emission	Compliant
FCC Part 2.1055, FCC Part 95.621 FCC Part 95.626	Frequency Stability	Compliant

5. ANTENNA PORT MEASUREMENT

5.1 Maximum Transmitter Power

5.1.1 Block Diagram of Test Setup



5.1.2 Limit

According to FCC Part 95.639: No FRS unit, under any condition of modulation, shall exceed 0.500 W effective radiated powers (ERP).

5.1.3 Test Procedure

- (1) On a test site, the EUT shall be placed at 1.5m height on a wooden turntable, and in the position closest to normal use as declared by the applicant.
- (2) The test antenna shall be oriented initially for vertical polarization located 3m from EUT to correspond to the frequency of the transmitter.
- (3) The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
- (4) The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- (5) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- (6) The transmitter shall then be rotated through 360 degree in the horizontal plane, until a maximum signal level is detected by the measuring receiver.
- (7) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- (8) The maximum signal level detected by the measuring receiver shall be noted.
- (9) The transmitter shall be replaced by a tuned dipole (substitution antenna).
- (10) The substitution antenna shall be oriented for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- (11) The substitution antenna shall be connected to a calibrated signal generator.

- (12) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- (13) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- (14) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- (15) The input signal to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- (16) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
- (17) The measure of the ERP is the larger of the two levels recorded, at the input to the substitution antenna, corrected the gain of the substitution antenna if necessary.

5.1.4 Test Results

CH #	Frequency (MHz)	Type	Antenna Position	Result(ERP)		FCC Limit (W)	FCC Margin (W)
				(dBm)	(W)		
4	462.6375	FRS	Horizontal	21.26	0.1337	0.5000	0.3663
4	462.6375	FRS	Vertical	26.44	0.4406	0.5000	0.0594
8	467.5625	FRS	Horizontal	20.19	0.1045	0.5000	0.3955
8	467.5625	FRS	Vertical	25.76	0.3767	0.5000	0.1233
Test Results				Pass			

5.2 Occupied bandwidth and emission mask

5.2.1 Limit

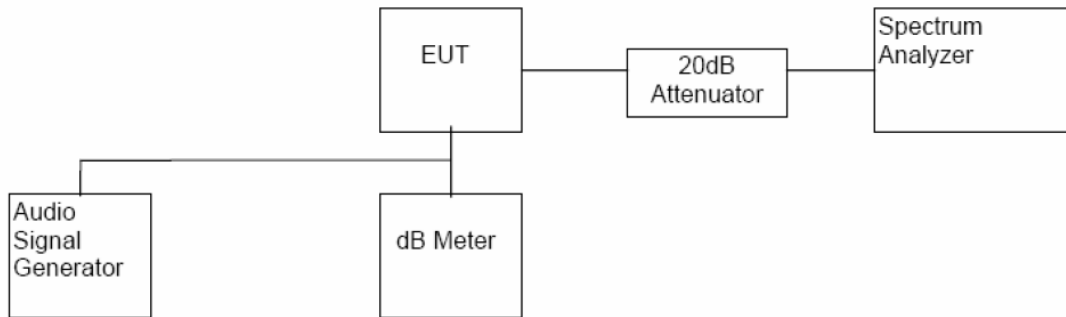
According to FCC 95.633: For FRS: the authorized bandwidth for emission type F3E or F2D is 12.5 KHz

According to FCC 95.635: At least 25dB (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.

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.

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

5.2.2 Block Diagram of Test Setup



5.2.3 Test Procedure

- (1). Configure EUT and assistant system according clause 5.2
- (2). The EUT was modulated by 2.5 KHz Sine wave audio signal, The level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing).
- (3). Set SPA Center Frequency = fundamental frequency, RBW=VBW= 300 Hz, Span =50 KHz.
- (4). Measure the -26 dB and 99% bandwidth of modulated signal.

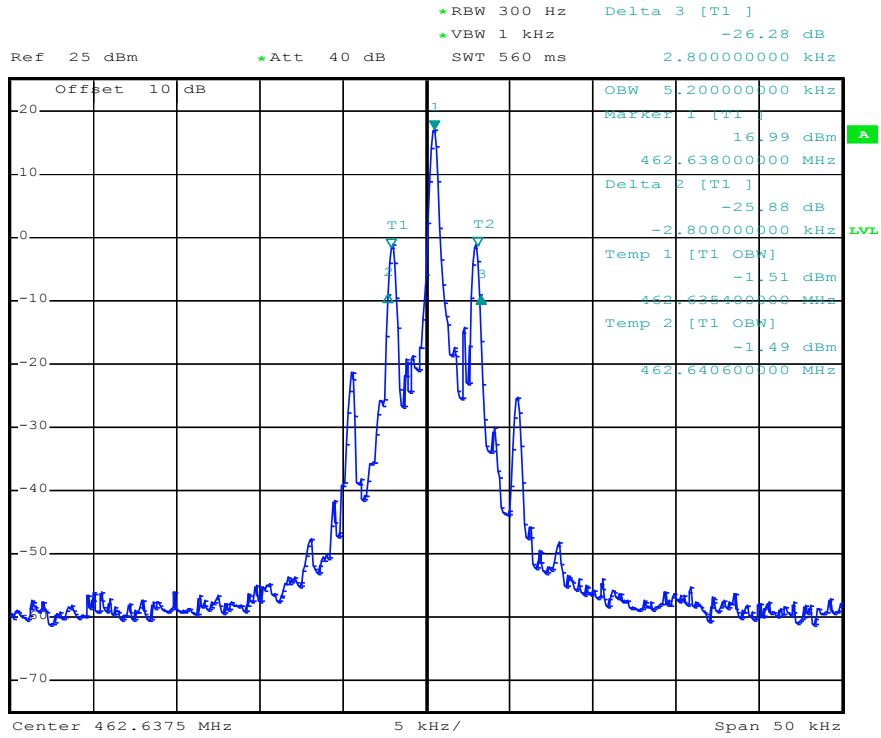
5.2.4 Test Results

Occupied Bandwidth:

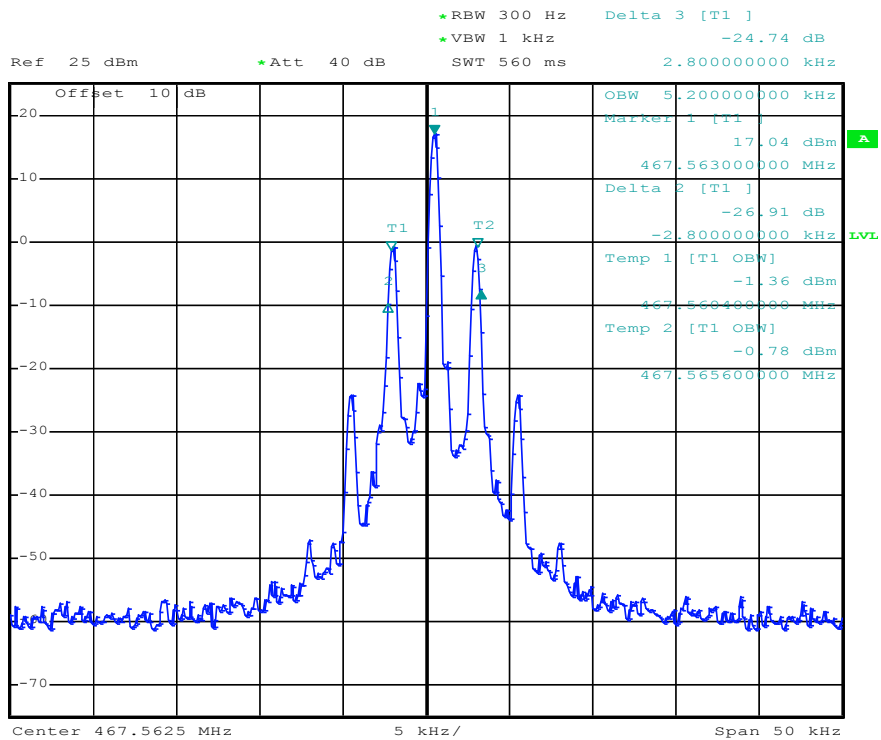
CH #	Frequency (MHz)	Type	99% Occupied Bandwidth	-26dBc Emission Bandwidth	Limit
CH4	462.6375	FRS	5.20KHz	5.60KHz	12.5KHz
CH8	467.5625	FRS	5.20KHz	5.60KHz	12.5KHz
Test Results			Pass		

Emission mask:

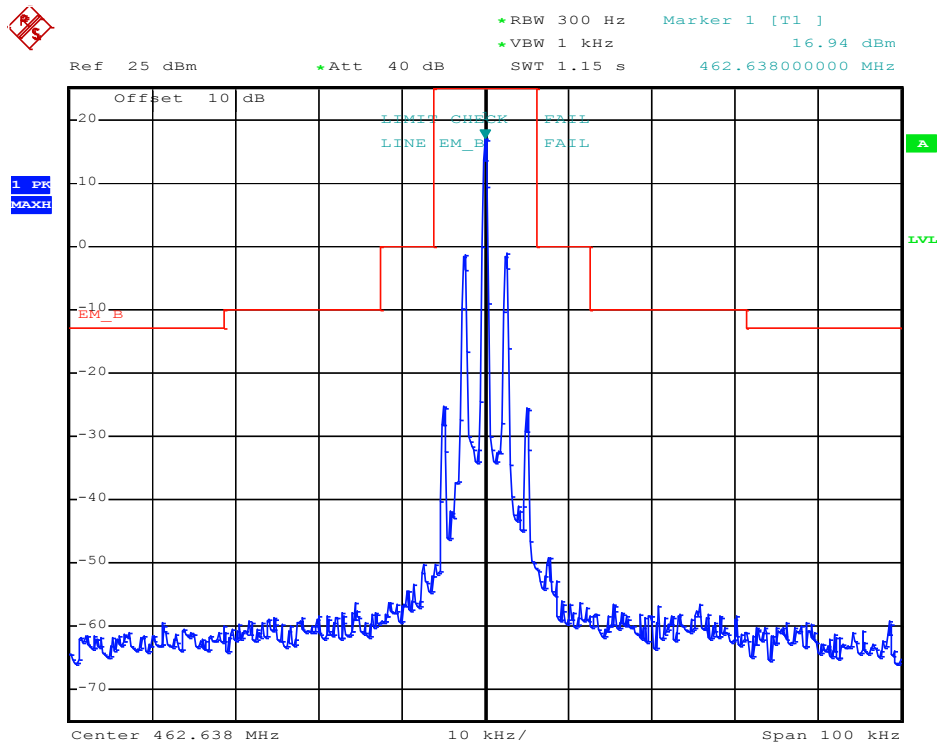
CH #	Frequency (MHz)	Type	Emission mask Type
CH4	462.6375	FRS	/
CH8	467.5625	FRS	/
Test Results			Pass



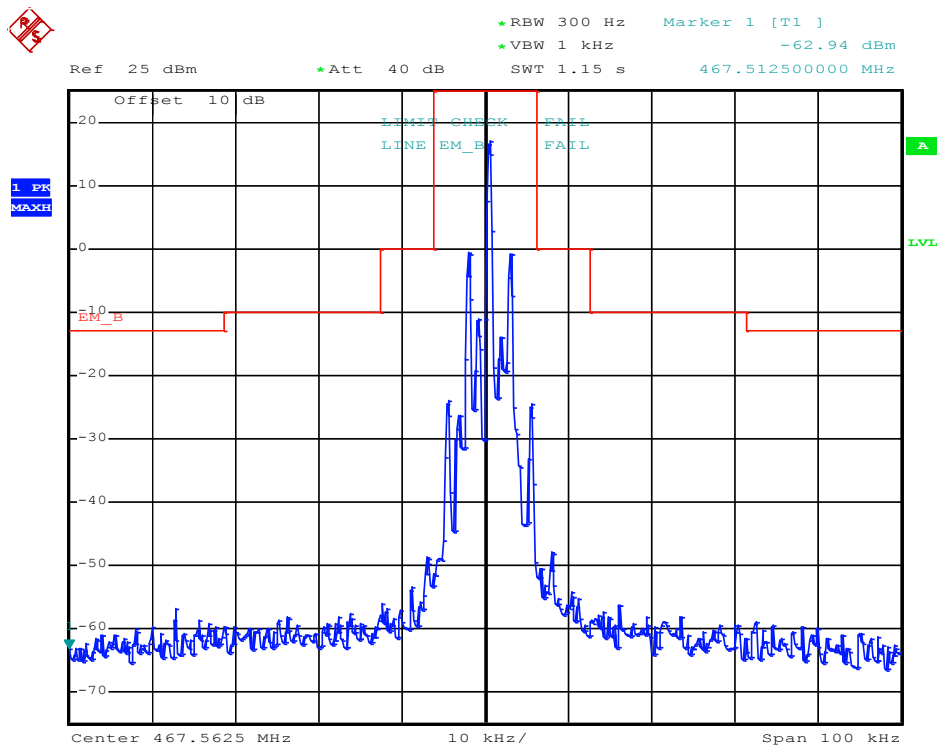
Occupied Bandwidth @ Channel 4 @ 462.6375 MHz



Occupied Bandwidth @ Channel 8 @ 467.5625 MHz



Emission Mask @ Channel 4 @ 462.6375 MHz



Emission Mask @ Channel 8 @ 467.5625 MHz

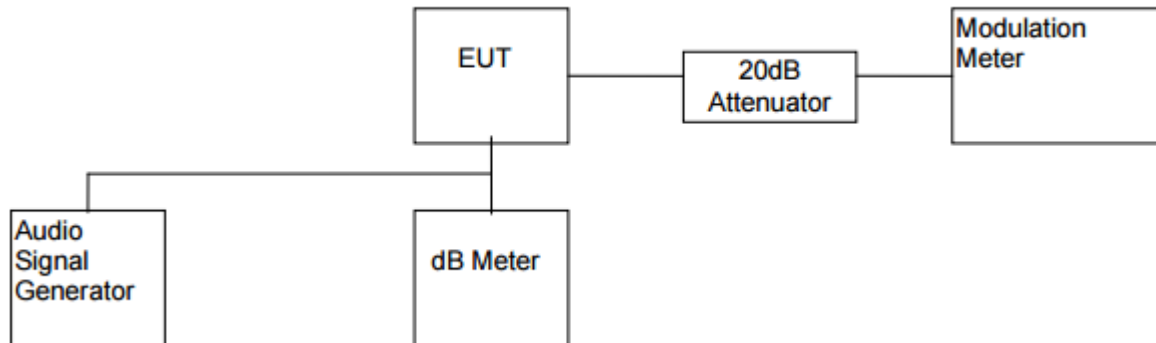
5.3 Modulation Characteristics

5.3.1 Modulation Frequency Response

5.3.1.1 Limit

Per §95.637: 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.

5.3.1.2 Block Diagram of Test Setup



5.3.1.3 Test Procedure

1. Setup the test equipment in the above Test Setup Block Diagram;
2. Set the audio signal generator frequency to the sound pressure level 127.0dB SPL at the microphone of the EUT.
3. The frequency of the audio signal generator is changed from 100Hz to 5 KHz.
4. Recorded the frequency deviation.
5. The Peak frequency deviation must not exceed:
FRS: +/- 2.5 KHz
6. Calculate the audio frequency response at each frequency as:

$$\text{Response} = 20 \log_{10} (\text{DEV}_{\text{FREQ}} / \text{DEV}_{\text{REF}})$$

$$\text{DEV}_{\text{FREQ}} = \text{Frequency Deviation at } 100 - 5000\text{Hz}$$

$$\text{DEV}_{\text{REF}} = \text{Frequency Deviation at } 1000 \text{ Hz}$$

5.3.1.4 Test Results

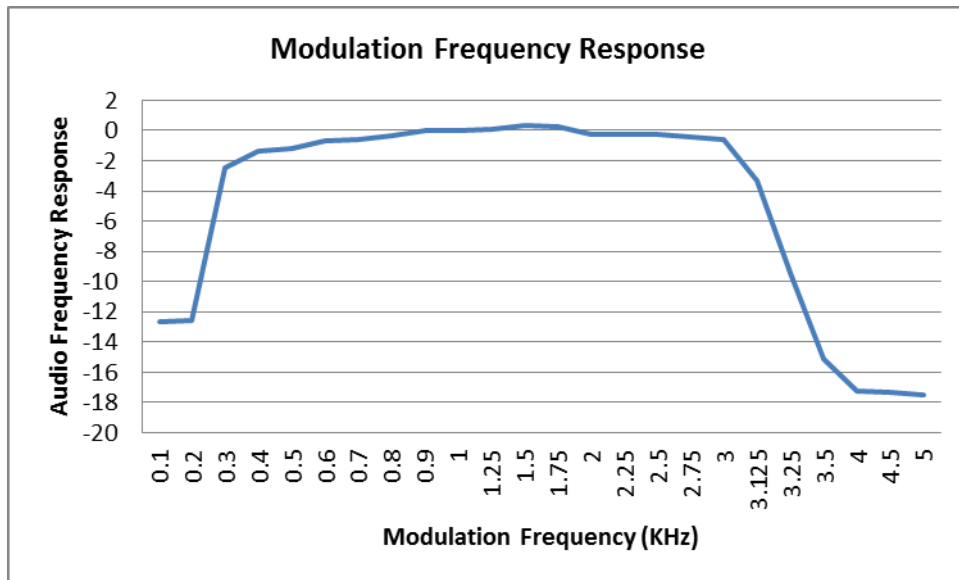
Test Channel: Channel 4

Test Frequency: 462.6375 MHz

Input Level: 127.0dB SPL

Modulation Frequency Response @ Channel 4 @ 462.6375 MHz

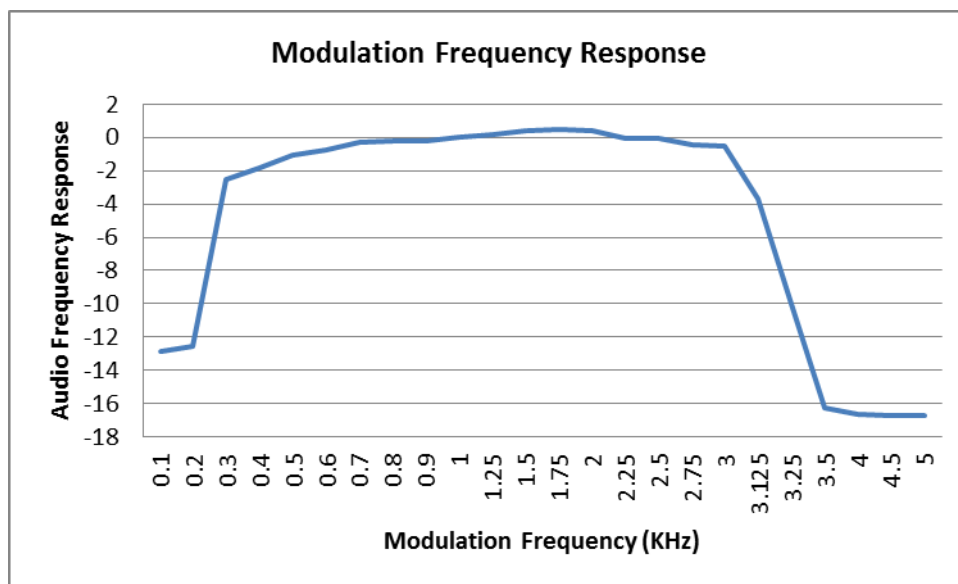
Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
0.100	0.533	2.292	-12.67
0.200	0.539	2.292	-12.57
0.300	1.726	2.292	-2.46
0.400	1.955	2.292	-1.38
0.500	2.000	2.292	-1.18
0.600	2.112	2.292	-0.71
0.700	2.135	2.292	-0.62
0.800	2.198	2.292	-0.36
0.900	2.284	2.292	-0.03
1.000	2.292	2.292	0.00
1.250	2.311	2.292	0.07
1.500	2.378	2.292	0.32
1.750	2.369	2.292	0.29
2.000	2.235	2.292	-0.22
2.250	2.230	2.292	-0.24
2.500	2.222	2.292	-0.27
2.750	2.171	2.292	-0.47
3.000	2.139	2.292	-0.60
3.125	1.558	2.292	-3.35
3.250	0.775	2.292	-9.42
3.500	0.404	2.292	-15.08
4.000	0.316	2.292	-17.21
4.500	0.311	2.292	-17.35
5.000	0.305	2.292	-17.52



Test Channel: Channel 8
 Test Frequency: 467.5625 MHz
 Input Level: 127.0dB SPL

Modulation Frequency Response @ Channel 8 @ 467.5625 MHz

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
0.100	0.512	2.242	-12.83
0.200	0.526	2.242	-12.59
0.300	1.678	2.242	-2.52
0.400	1.819	2.242	-1.82
0.500	1.978	2.242	-1.09
0.600	2.055	2.242	-0.76
0.700	2.166	2.242	-0.30
0.800	2.181	2.242	-0.24
0.900	2.199	2.242	-0.17
1.000	2.242	2.242	0.00
1.250	2.298	2.242	0.21
1.500	2.343	2.242	0.38
1.750	2.376	2.242	0.50
2.000	2.354	2.242	0.42
2.250	2.222	2.242	-0.08
2.500	2.219	2.242	-0.09
2.750	2.133	2.242	-0.43
3.000	2.117	2.242	-0.50
3.125	1.469	2.242	-3.67
3.250	0.707	2.242	-10.02
3.500	0.345	2.242	-16.26
4.000	0.331	2.242	-16.62
4.500	0.326	2.242	-16.75
5.000	0.326	2.242	-16.75

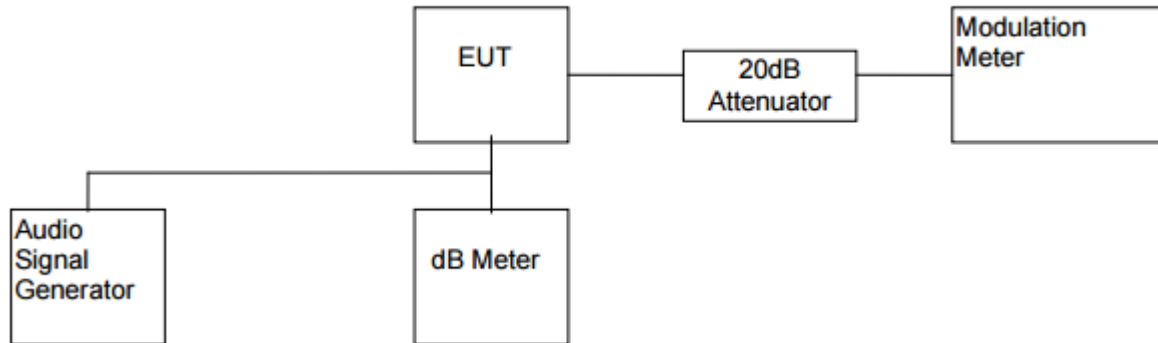


5.3.2 Modulation Limiting Characteristics

5.3.2.1 Limit

Per §95.637: 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.

5.3.2.2 Block Diagram of Test Setup



5.3.2.3 Test Procedure

1. Setup the test equipment in the above Test Setup Block Diagram;
2. Set the audio signal generator frequency to 500Hz and adjust the level from 47 dB SPL to 127.0 dB SPL at the microphone of the EUT.
3. Recorded the maximum values of plus or minus peak frequency deviation.
4. Repeated the above procedure with frequency 1000Hz, 2500Hz, and 3125Hz.
5. The Peak frequency deviation must not exceed:
FRS: +/- 2.5 KHz

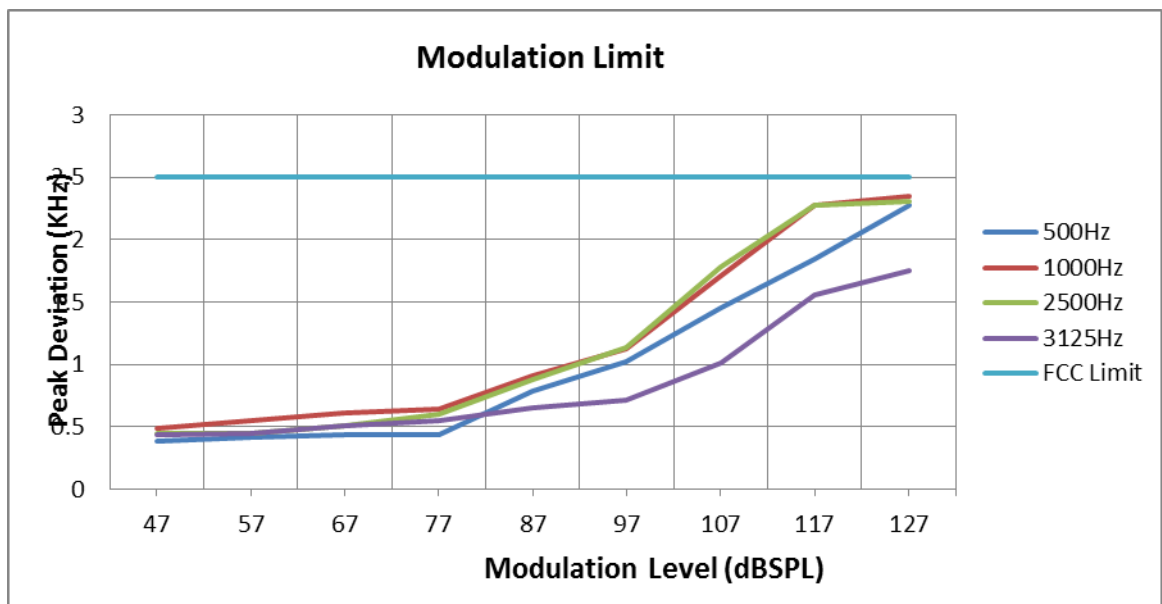
5.3.2.4 Test Results

Test Channel: Channel 4

Test Frequency: 462.6375 MHz

Modulation Limiting Characteristics @ Channel 4 @ 462.6375 MHz

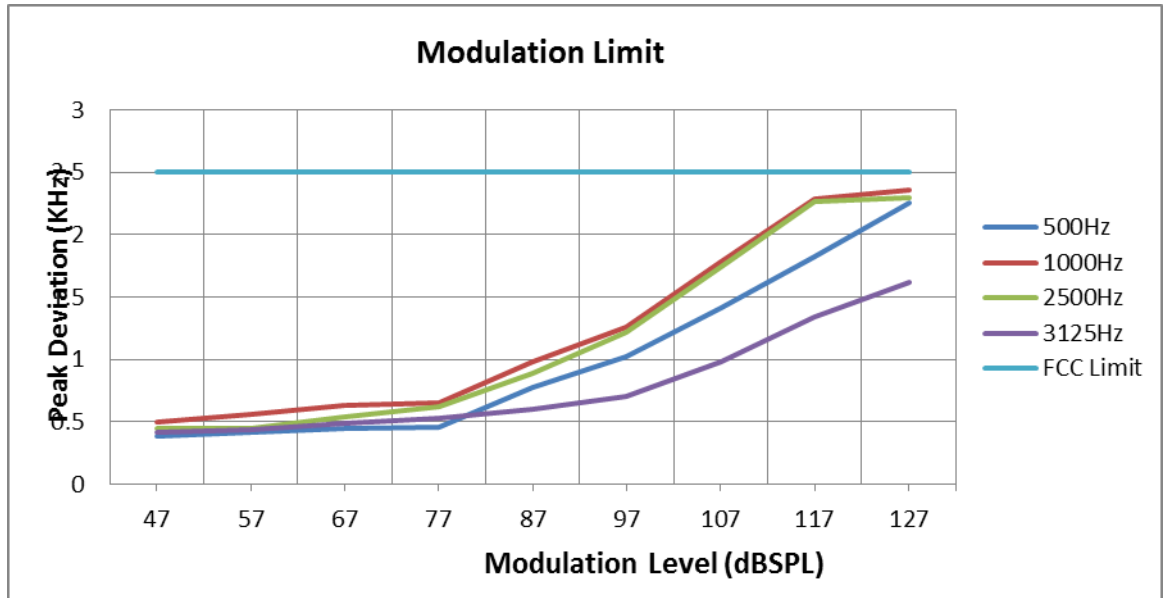
Modulation Input (dBSPL)	Peak Frequency Deviation (KHz) at 500Hz	Peak Frequency Deviation (KHz) at 1000Hz	Peak Frequency Deviation (KHz) at 2500Hz	Peak Frequency Deviation (KHz) at 3125Hz
47	0.385	0.491	0.442	0.440
57	0.411	0.545	0.446	0.449
67	0.432	0.612	0.511	0.505
77	0.436	0.646	0.599	0.547
87	0.789	0.914	0.874	0.652
97	1.026	1.124	1.139	0.714
107	1.456	1.714	1.784	1.009
117	1.846	2.275	2.275	1.558
127	2.274	2.346	2.312	1.757
137	2.899	2.371	2.312	1.757



Test Channel: Channel 8
 Test Frequency: 467.5625 MHz
 Input Level: 127.0dB SPL

Modulation Limiting Characteristics @ Channel 8 @ 467.5625 MHz

Modulation Input (dB SPL)	Peak Frequency Deviation (KHz) at 500Hz	Peak Frequency Deviation (KHz) at 1000Hz	Peak Frequency Deviation (KHz) at 2500Hz	Peak Frequency Deviation (KHz) at 3125Hz
47	0.380	0.497	0.445	0.420
57	0.420	0.556	0.449	0.434
67	0.446	0.634	0.535	0.488
77	0.455	0.655	0.622	0.526
87	0.777	0.978	0.891	0.597
97	1.026	1.264	1.217	0.701
107	1.414	1.788	1.745	0.978
117	1.825	2.291	2.264	1.344
127	2.261	2.355	2.297	1.619
137	2.794	2.383	2.297	1.615

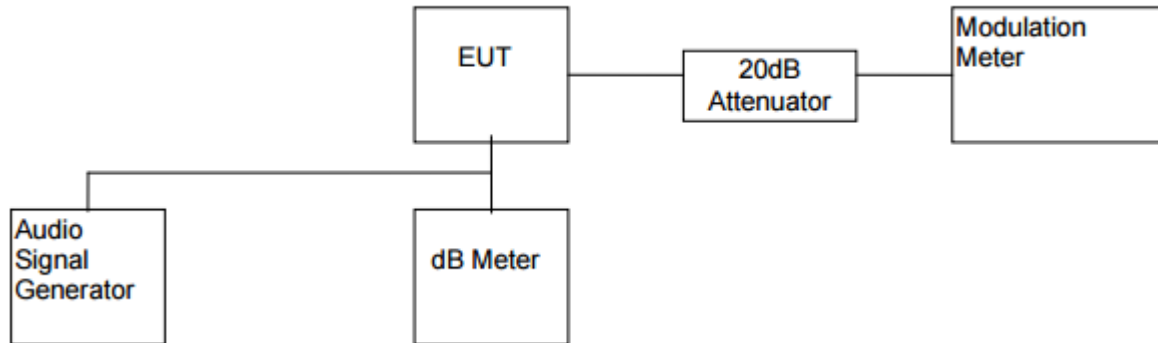


5.3.3 Audio Low Pass Filter Response

5.3.3.1 Limit

Per §95.637: 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.

5.3.3.2 Block Diagram of Test Setup



5.3.3.3 Test Procedure

1. Connect the audio signal generator to the input of the post limiter low pass filter and the dB meter to the output of the post limiter low pass filter.
2. Apply a 100Hz tone from the audio signal generator and adjust the level per manufacture's specification. Recorded the dB level of the 100Hz tone as LEV_{REF} .
3. Set the audio signal generator to the desired test frequency between 3000 Hz and the upper low pass filter limit. Record the dB level at the test frequency as LEV_{FREQ} .
4. Calculate the audio frequency response at the test frequency as:

$$\text{Lower pass filter response} = LEV_{FREQ} - LEV_{REF}$$

5. Repeat the above procedure for all the desired test frequencies.

5.3.3.4 Test Results

Audio Input Strength = 2000mVrms

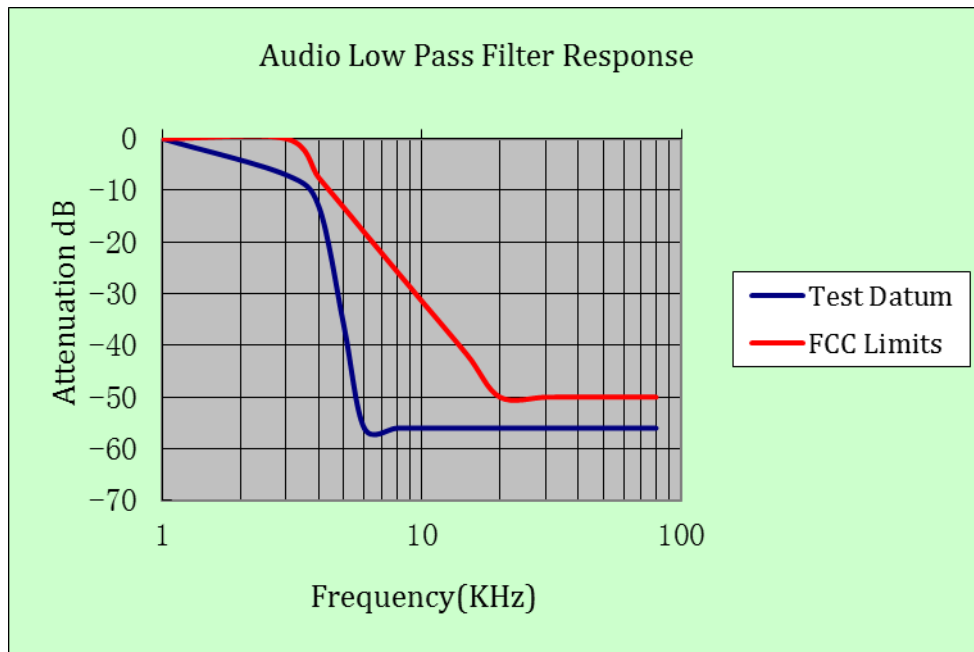
Audio Output at 1 KHz: 12.0dBV

Test Channel: Channel 4

Test Frequency: 462.6375 MHz

Audio Low Pass Filter Response @ Channel 4 @ 462.6375 MHz

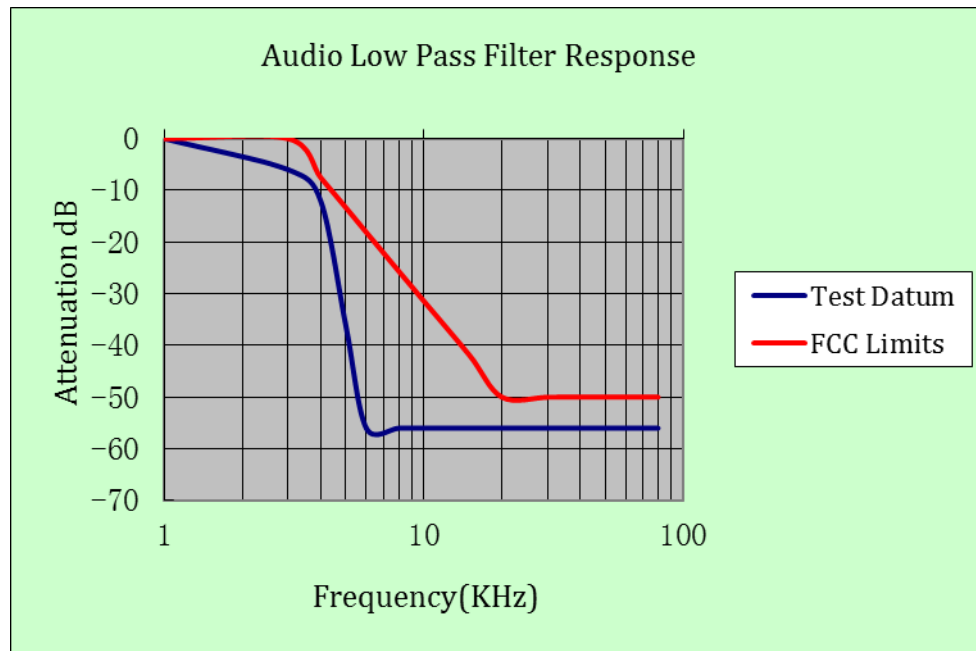
Frequency (KHz)	dB relative to 1 KHz	Part 95.637 (b)
1	0.0	0.0
3	-7.0	0.0
4	-13.0	-7.5
5	-36.0	-13.3
6	-56.0	-18.1
8	-56.0	-25.6
10	-56.0	-31.4
15	-56.0	-41.9
20	-56.0	-50.0
30	-56.0	-50.0
40	-56.0	-50.0
50	-56.0	-50.0
60	-56.0	-50.0
70	-56.0	-50.0
80	-56.0	-50.0
90	-56.0	-50.0
100	-56.0	-50.0



Test Channel: Channel 8
 Test Frequency: 467.5625 MHz

Audio Low Pass Filter Response @ Channel 8 @ 467.5625 MHz

Frequency (KHz)	dB relative to 1 KHz	Part 95.637 (b)
1	0.0	0.0
3	-6.0	0.0
4	-12.0	-7.5
5	-36.0	-13.3
6	-56.0	-18.1
8	-56.0	-25.6
10	-56.0	-31.4
15	-56.0	-41.9
20	-56.0	-50.0
30	-56.0	-50.0
40	-56.0	-50.0
50	-56.0	-50.0
60	-56.0	-50.0
70	-56.0	-50.0
80	-56.0	-50.0
90	-56.0	-50.0
100	-56.0	-50.0

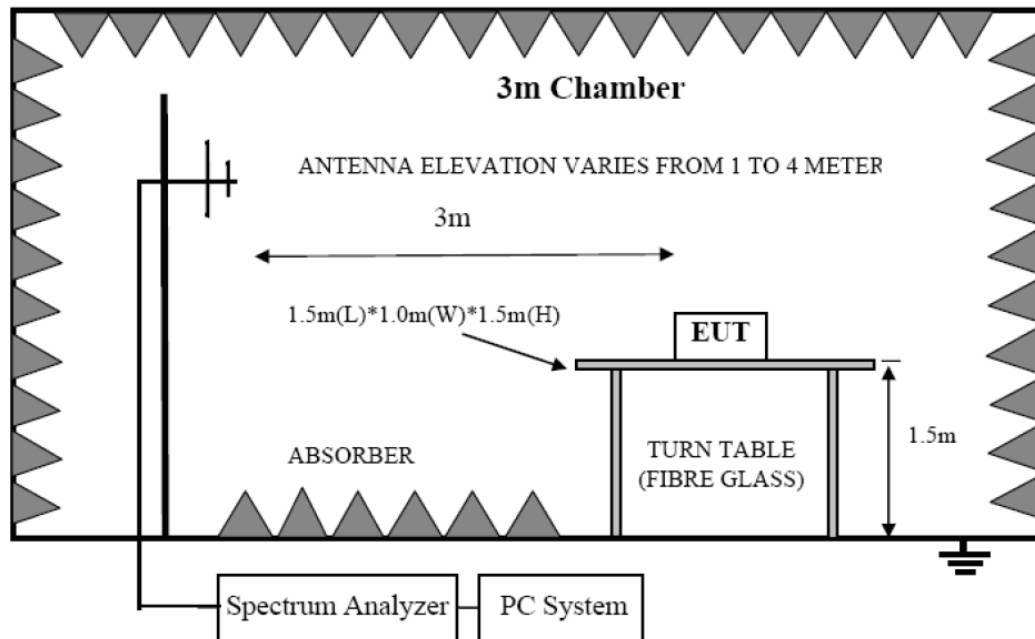


5.4 Radiated Spurious Emission

5.4.1 Limit

The unwanted emission should be attenuated below TP by at least $43+10\log(\text{Transmit Power})$ dB

5.4.2 Block Diagram of Test Setup



5.4.3 Test Procedure

1. On a test site, the EUT shall be placed on a 1.5m turntable and in the position closest to the normal use as declared by the user.
2. The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
3. The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4. The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The measurement shall be repeated with the test antenna set to horizontal polarization.
10. Replace the antenna with a proper Antenna (substitution antenna).
11. The substitution antenna shall be oriented for vertical polarization and, if necessary,

the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.

12. The substitution antenna shall be connected to a calibrated signal generator.

13. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.

14. The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.

15. The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

16. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

17. The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.

18. Frequency from lowest frequency 9 KHz) into 10th harmonic (5GHz) was measured.

5.4.4 Test Results

Test Mode: FRS mode continue transmitting Channel 4, Frequency= 462.6375MHz,					
Frequency (MHz)	Antenna polarization	Result (dBm)	Limit (dBm)	Margin (dB)	Conclusion
925.28	H	-36.18	-13.00	23.18	PASS
925.28	V	-28.91	-13.00	15.91	PASS
1387.91	H	-33.25	-13.00	20.25	PASS
1387.91	V	-25.70	-13.00	12.70	PASS
1850.55	H	-41.74	-13.00	28.74	PASS
1850.55	V	-34.43	-13.00	21.43	PASS

Note 1: According explorer test, this configuration have worst emission.
 Note 2: Limit= Transmit Power (W)- (43+10log(Transmit Power)) = -13dBm
 Note 3: Margin = Limit - Results

Test Mode: FRS mode continue transmitting Channel 8, Frequency= 467.5625MHz,					
Frequency (MHz)	Antenna polarization	Result (dBm)	Limit (dBm)	Margin (dB)	Conclusion
935.13	H	-30.57	-13.00	17.57	PASS
935.13	V	-23.09	-13.00	10.09	PASS
1402.68	H	-28.88	-13.00	15.88	PASS
1402.68	V	-22.14	-13.00	9.14	PASS
1870.25	H	-40.66	-13.00	27.66	PASS
1870.25	V	-35.59	-13.00	22.59	PASS

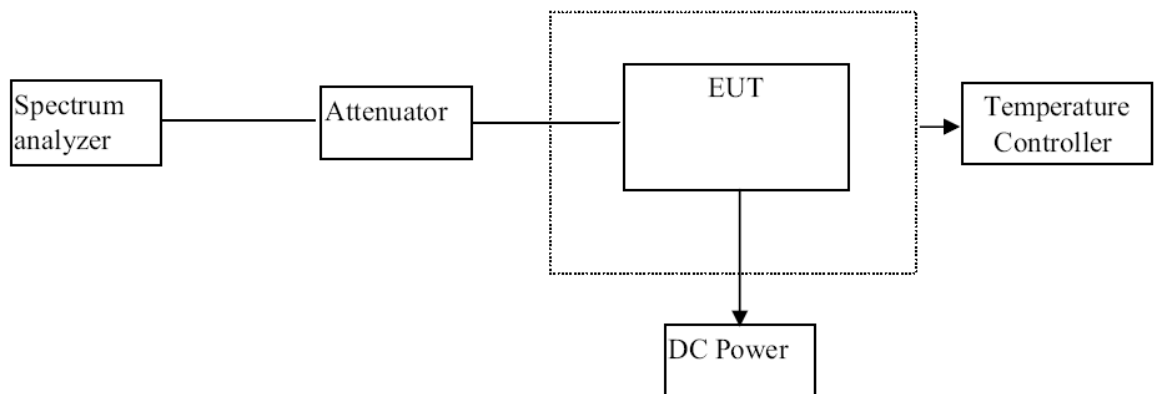
Note 1: According explorer test, this configuration have worst emission.
 Note 2: Limit= Transmit Power (W)- (43+10log(Transmit Power)) = -13dBm
 Note 3: Margin = Limit - Results

5.5 Frequency Stability

5.5.1 Limit

According to FCC 95.627 (b) Each FRS unit must be maintained within a frequency tolerance of 0.000 25%.

5.5.2 Block Diagram of Test Setup



5.5.3 Test Procedure

Frequency stability versus environmental temperature:

1. Setup the configuration per figure 1 for frequencies measurement inside an environment chamber, Install new battery in the EUT.
2. Turn on EUT and set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1 KHz and Video Resolution Bandwidth to 1 KHz and Frequency Span to 50KHz. Record this frequency as reference frequency.
3. Set the temperature of chamber to 50. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10 decreased per stage until the lowest temperature -30 is measured, record all measured frequencies on each temperature step.

Frequency stability versus input voltage:

1. Setup the configuration per figure 1 for frequencies measured at temperature if it is within 15 to 25. Otherwise, an environment chamber set for a temperature of 20 shall be used. The EUT shall be powered by DC 3.7 V.
2. Set SA center frequency to the EUT radiated frequency. Set SA Resolution Bandwidth to 1 KHz and Video Resolution Bandwidth to 1KHz. Record this frequency as reference frequency.
3. Supply the EUT primary voltage at the operating end point which is specified by manufacturer and record the frequency.

5.5.3 Test Results

Frequency Tolerance						
CH #	Frequency (MHz)	TYPE	Result			FCC limit
			Measured (MHz)	Tolerance (%)	Tolerance (ppm)	%
1	462.5625	FRS	462.5628	0.000065	0.65	0.00025
2	462.5875	FRS	462.5878	0.000065	0.65	0.00025
3	462.6125	FRS	462.6128	0.000065	0.65	0.00025
4	462.6375	FRS	462.6378	0.000065	0.65	0.00025
5	462.6625	FRS	462.6628	0.000065	0.65	0.00025
6	462.6875	FRS	462.6878	0.000065	0.65	0.00025
7	462.7125	FRS	462.7127	0.000065	0.65	0.00025
8	467.5625	FRS	467.5628	0.000065	0.65	0.00025

Frequency Deviation With Temperature Variation					
FRS Channel 4					
Temperature (°C)	Frequency (MHz)	Result			FCC limit
		Measured (MHz)	Tolerance (%)	Tolerance (ppm)	%
-30	462.6375	462.6373	-0.000043	-0.43	0.00025
-20	462.6375	462.6373	-0.000043	-0.43	0.00025
-10	462.6375	462.6375	0.00	0.00	0.00025
0	462.6375	462.6375	0.00	0.00	0.00025
10	462.6375	462.6375	0.00	0.00	0.00025
20	462.6375	462.6377	0.000043	0.43	0.00025
30	462.6375	462.6375	0.00	0.00	0.00025
40	462.6375	462.6374	-0.000022	-0.22	0.00025
50	462.6375	462.6375	0.00	0.00	0.00025
FRS Channel 8					
Temperature (°C)	Frequency (MHz)	Result			FCC limit
		Measured (MHz)	%	Tolerance (ppm)	%
-30	467.5625	467.5629	0.000086	0.86	0.00025
-20	467.5625	467.5626	0.000021	0.21	0.00025
-10	467.5625	467.5629	0.000086	0.86	0.00025
0	467.5625	467.5625	0.00	0.00	0.00025
10	467.5625	467.5621	-0.000086	-0.86	0.00025
20	467.5625	467.5621	-0.000086	-0.86	0.00025
30	467.5625	467.5625	0.00	0.00	0.00025
40	467.5625	467.5620	-0.000107	-1.07	0.00025
50	467.5625	467.5620	-0.000107	-1.07	0.00025

Frequency Deviation With Voltage Variation					
FRS Channel 4					
End Point Voltage(V)	Frequency (MHz)	Result			FCC limit
		Measured (MHz)	%	Tolerance (ppm)	%
3.40	462.6375	462.6371	-0.000086	-0.86	0.00025
FRS Channel 8					
End Point Voltage(V)	Frequency (MHz)	Result			FCC limit
		Measured (MHz)	%	Tolerance (ppm)	%
3.40	467.5625	467.5620	-0.000107	-1.07	0.00025

-----THE END OF REPORT-----