RF TEST REPORT

FCC ID: 2AF3W-1136235

Equipment	:	Emax Pro BT Comms
Brand Name	:	Caldwell
Test Model	:	1136235
Series Model	:	N/A
Applicant	:	AOB Products Company
Address	:	1800 North Route Z Suite A, Columbia, Missouri, United States, 65202
Manufacturer	:	Wenzhou Only Electronics Co.,Ltd.
Address	:	No.139 Jiangnan Avenue,Nanbin Street, Ruian, Wenzhou, Zhejiang (Room 401, 402, 501, 502, Building 23, Gexiang High-Tech Industrial Park)
Date of Receipt	:	2022.11.05
Date of Test	:	2022.11.05-2022.11.21
Issued Date	:	2022.11.21
Report Version	:	V1.0
Test Sample	:	Engineering Sample No.: AIT22110413-1
Standard(s)	:	FCC Part 95 Rules

Lab: Dongguan Yaxu (AiT) Technology Limited
Add: No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China
Tel.: +86-769-8202 0499 Fax.: +86-769-8202 0495

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Reviewed by: Simba huang **Approved by:** Seal Chen

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2022-11-21	Valid	Initial Release

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1. GENERAL INFORMATION

Applicant	AOB Products Company
Address	1800 North Route Z Suite A, Columbia, Missouri, United States, 65202
Manufacturer	Wenzhou Only Electronics Co.,Ltd.
Address	No.139 Jiangnan Avenue,Nanbin Street, Ruian, Wenzhou, Zhejiang (Room 401, 402, 501, 502, Building 23, Gexiang High-Tech Industrial Park)
Product Designation	Emax Pro BT Comms
Brand Name	Caldwell
Test Model	1136235
Operation Mode	Push to talk
Rated Output Power	0.0023W (It was fixed by the manufacturer, any individual can't arbitrarily change it.)
Antenna Designation	Detachable
Power Supply	DC 4.5V By Battery
Test Result	Pass

Note: For more details, refer to the user's manual of the EUT.

2. PRODUCT INFORMATION

2.1 PRODUCT TECHNICAL DESCRIPTION

Hardware Version	N/A
Software Version	N/A
Communication Type	Voice / Tone only
Operation Frequency Range	462.5625 - 462.7125MHz (1~7 channel)
	467.5625 - 467.7125MHz (8~14 channel)
	462.5500 - 462.7250MHz (15~22 channel)
Modulation Type	FM
Channel Separation	12.5 KHz
Emission Bandwidth	10.56 KHz
Emission Designator	11K0F3E
Number of Channels:	22 Channels
Rated Output Power	0.00232W/0.0021W (It was fixed by the manufacturer, any individual can't arbitrarily change it.)
Maximum Transmitter Power	FRS: 3.62dBm (2W-12.5KHz) FRS: 3.26dBm (0.5W-12.5KHz)
Antenna Designation	FPC Antenna
Antenna Gain	2.0dBi
Frequency Tolerance	1.011ppm

2.2 TEST FREQUENCY LIST

According to ANSI C63.26 section 5.1.2.1:
Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in Table 2.

Frequency range Over which EUT operates	Number of Frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

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

2.3 TEST METHODOLOGY

The tests were performed according to following standards:

No.	Identity	Document Title
1	FCC 47 CFR Part 95	Personal Radio Services
2	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
3	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
4	ANSI/TIA-603-E-2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
5	KDB 888861 D01	888861 D01 Part 95 GMRS FRS v01

2.4 CALCULATION OF EMISSION INDICATORS

FCC Rules and Regulations Part 2.202: Necessary Bandwidth and Emission Bandwidth

For FM Mode (ChannelSpacing: 12.5kHz)
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 represents an FM voice transmission.
Therefore, the entire designator for 12.5 kHz channel spacing FM mode is 11K0F3E.

2.5 SPECIAL ACCESSORIES

Not available for this EUT intended for grant.

2.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.8 ANTENNA REQUIREMENT

Excerpt from §95.587 of the FCC Rules/Regulations:

The antenna of each FRS transmitter type must meet the following requirements.
(1) The antenna must be a non-removable integral part of the FRS transmitter type.
(2) The gain of the antenna must not exceed that of a half-wave dipole antenna.
(3) The antenna must be designed such that the electric field of the emitted waves is vertically polarized when the unit is operated in the normal orientation.

- The antenna of this device is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion: The unit complies with the requirement of §95.587.

3. TEST ENVIRONMENT

3.1. TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2017 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on April 17, 2022

FCC-Registration No.: 703111 Designation Number: CN1313

Dongguan Yaxu (AiT) technology Limited 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.

IC —Registration No.: 6819A CAB identifier: CN0122

The 3m Semi-anechoic chamber of Dongguan Yaxu (AiT) technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 6819A

A2LA-Lab Cert. No.: 6317.01

Dongguan Yaxu (AiT) technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

3.3 ENVIRONMENTAL CONDITIONS

	NORMAL CONDITIONS	EXTREME CONDITIONS
Temperature range (℃)	15 - 35	-20 - 50
Relative humidty range	20 % - 75 %	20 % - 75 %
Pressure range (kPa)	86 - 106	86 - 106
Power supply	DC 4.5V	LV DC 3.82V/HV DC 5.18V
Note: The Extreme Temperature and Extreme Voltages declared by the manufacturer.		

3.4 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Test Items	Measurement Uncertainty
Frequency stability	±0.5%
Transmitter power conducted	±0.8dB
Transmitter power Radiated	±1.3dB
Conducted spurious emission 9kHz-40 GHz	±2.7dB
Conducted Emission	±3.2 dB
Radiated Emission below 1GHz	±3.9 dB
Radiated Emission above 1GHz	±4.8 dB
Occupied Channel Bandwidth	±2 %
FM deviation	±2 %
Audio level	±0.98dB
Low Pass Filter Response	±0.65dB
Modulation Limiting	0.42 %
Transient Frequency Behavior	6.8 %

3.5 LIST OF EQUIPMENTS USED

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2022.09.02	2023.09.01
2	EMI Measuring Receiver	R&S	ESR	101660	2022.09.02	2023.09.01
3	Low Noise Pre Amplifier	HP	HP8447E	1937A01855	2022.09.02	2023.09.01
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2022.09.02	2023.09.01
5	Passive Loop	ETS	6512	00165355	2022.09.04	2024.09.03
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2021.08.29	2024.08.28
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2021.08.29	2024.08.28
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2020.11.24	2023.11.23
9	EMI Test Receiver	R&S	ESCI	100124	2022.09.02	2023.09.01
10	LISN	Kyoritsu	KNW-242	8-837-4	2022.09.02	2023.09.01
11	LISN	R&S	ESH3-Z2	0357.8810.54-101161-S2	2022.09.02	2023.09.01
12	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2022.09.02	2023.09.01
13	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01
14	Signal Generator	Agilent	N5182A	MY50143009	2022.09.02	2023.09.01
15	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2022.09.02	2023.09.01
16	RF Automatic Test system	MW	MW100-RFCB	21033016	2022.09.02	2023.09.01
17	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
18	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
19	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
20	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A
21	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A
22	Aglient	N9020A	M785556H02	21033028	2022.09.02	2023.09.01

23	Fliter-UHF	Microwave	N25155H9	21033029	2022.09.02	2023.09.01
24	Fliter-VHF	Microwave	N26460M5	21033029	2022.09.02	2023.09.01
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

4.SYSTEM TEST CONFIGURATION

4.1 EUT CONFIGURATION

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

4.2 EUT EXERCISE

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

4.3 CONFIGURATION OF TESTED SYSTEM

Fig. 2-1 Configuration of Tested System

Table 2-1 Equipment Used in Tested System

4.4 EQUIPMENT USED IN TESTED SYSTEM

The Following Peripheral Devices And Interface Cables Were Connected During The Measurement:
☐ Test Accessories Come From The Laboratory
☒ Test Accessories Come From The Manufacturer

Item	Equipment	Model No.	Identifier	Note
2	Battery	18650	DC 4.5V	Accessories
3	Back clip	N/A	N/A	Accessories
4	USB Cable	N/A	N/A	Accessories
5	Lanyard	N/A	N/A	Accessories

4.5 SUMMARY OF TEST RESULTS

Item	FCC Rules	Description of Test	Result
1	FCC 47 CFR PART 95	Antenna Equipment	Pass
2	§ 95.567& 2.1046(a)	Maximum Transmitter Power	Pass
3	§95.575& 2.1047(a) (b)	Modulation Limit	Pass
4	§95.575& 2.1047(a)	Audio Frequency Response	Pass
5	§95.573& 2.1049	Emission Bandwidth	Pass
6	§95.579& 2.1049	Emission Mask	Pass
7	§95.565& 2.1055(a) (1)	Frequency Stability	Pass
8	§95.579& 2.1053	Spurious Ratiated Emission	Pass

5. DESCRIPTION OF TEST MODES

The EUT (**Two-way radio**) has been tested under normal operating condition. (FRS TX) are chosen for testing at each channel separation.

NO.	TEST MODE DESCRIPTION	CHANNEL SEPARATION
1	FRS TX CHANNEL 4	12.5 kHz
2	FRS TX CHANNEL 11	12.5 kHz
3	FRS TX CHANNEL 19	12.5 kHz

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. The battery is full-charged during the test.
3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
4. Manufacturers use computer PC programming software to switch and operate frequency points, refer to the instructions for details

6.FREQUENCY STABILITY

6.1 PROVISIONS APPLICABLE

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

6.2 MEASUREMENT PROCEDURE

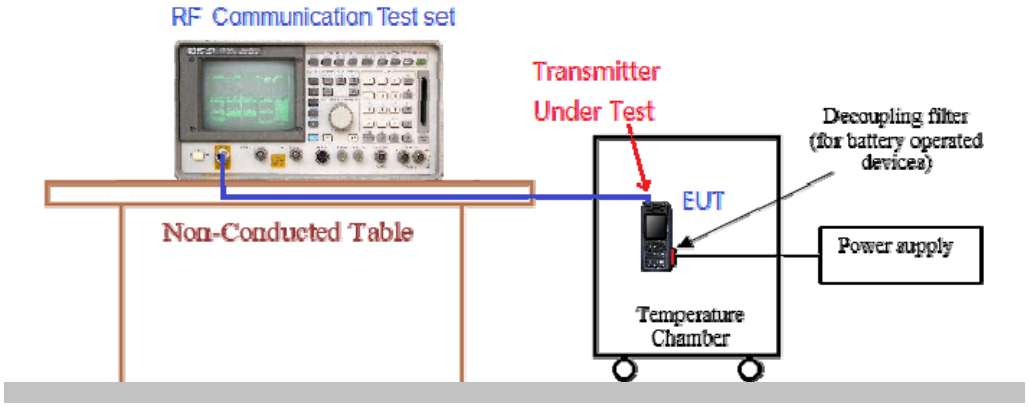
6.2.1 Frequency stability versus environmental temperature

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 1kHz and Video Resolution Bandwidth to 1kHz 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.

6.2.2 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 3.7V.
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.

6.3 MEASUREMENT SETUP



6.4 MEASUREMENT RESULTS

12.5 kHz Channel Separation, FM modulation, Assigned Frequency For FRS						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage (V)	Temp (℃)	Test Frequency (MHz)				
		462.6375	467.6375	462.6500		
4.5V	-30	0.970	0.653	0.974	2.5	Pass
	-20	0.611	0.529	1.002		
	-10	0.552	0.641	0.653		
	0	0.795	0.643	0.732		
	10	0.955	0.870	0.685		
	20	0.714	1.024	0.675		
	30	0.741	0.806	0.654		
	40	0.810	1.083	1.011		
	50	0.855	0.940	0.931		
5.18V	20	0.903	1.006	0.661		
3.82V	20	0.569	0.744	0.800		

7. EMISSION BANDWIDTH

7.1 PROVISIONS APPLICABLE

FCC Part 95.573: FRS: The authorized bandwidth for an FRS unit is 12.5 kHz.

Occupied Bandwidth (Section 2.1049, 95.573): The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.

7.2 MEASUREMENT PROCEDURE

1.The EUT was modulated by 2.5kHz sine wave audio signal; the level of the audio signal employed is 16dB greater than that necessary to produce 50% of rated system deviation.

Rated system deviation is 2.5 kHz for 12.5kHz channel spacing).

2.Spectrum set as follow:

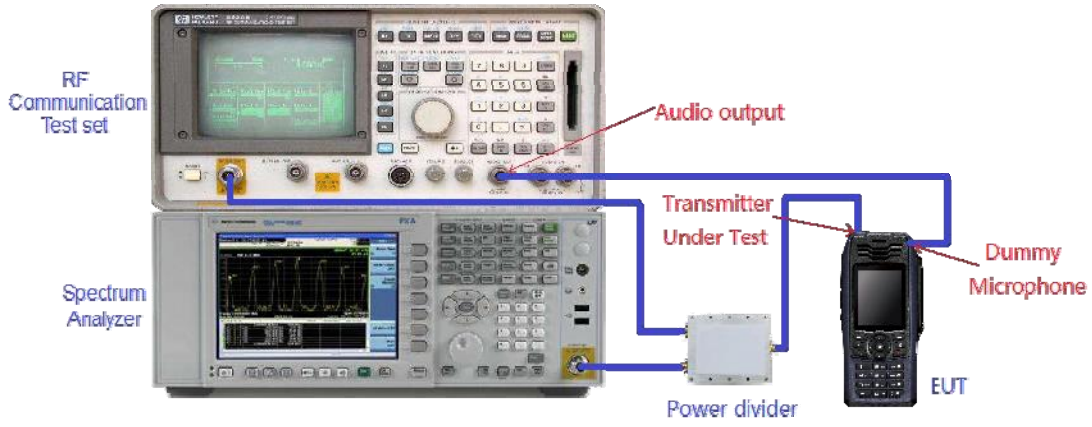
Centre frequency = fundamental frequency, span=50kHz for 12.5kHz channel spacing, RBW=300Hz, VBW=1KHz, Sweep = auto,

Detector function = peak, Trace = max hold

3.Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.

4.Measure and record the results in the test report.

7.3 MEASUREMENT SETUP

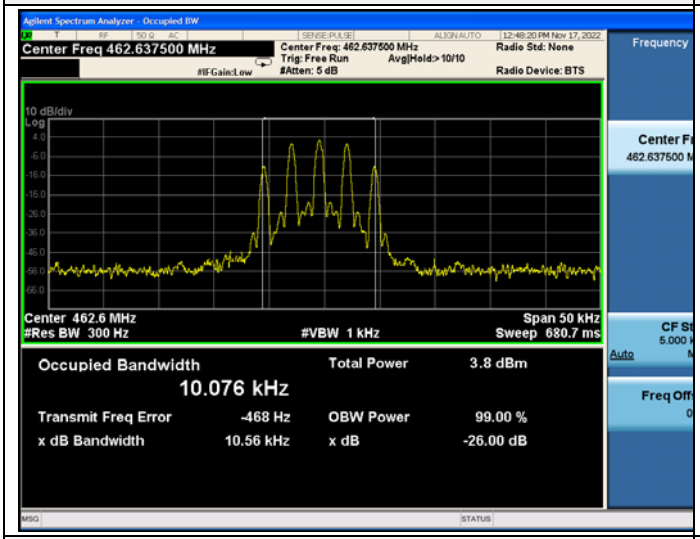


7.4 MEASUREMENT RESULTS

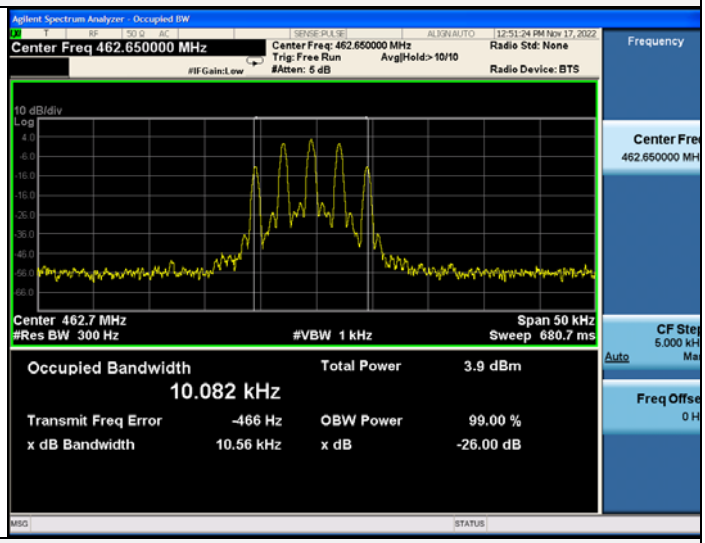
Emission Bandwidth Measurement Result-FRS				
Operating Frequency	12.5 kHz Channel Separation			
	Occupied Bandwidth	Emission Bandwidth	Limits	Result
462.6375 MHz	10.076 kHz	10.56 kHz	12.5 kHz	Pass
462.6500 MHz	10.082 kHz	10.56 kHz	12.5 kHz	Pass
467.6375 MHz	10.081 kHz	10.56 kHz	12.5 kHz	Pass

Test plot as follows:

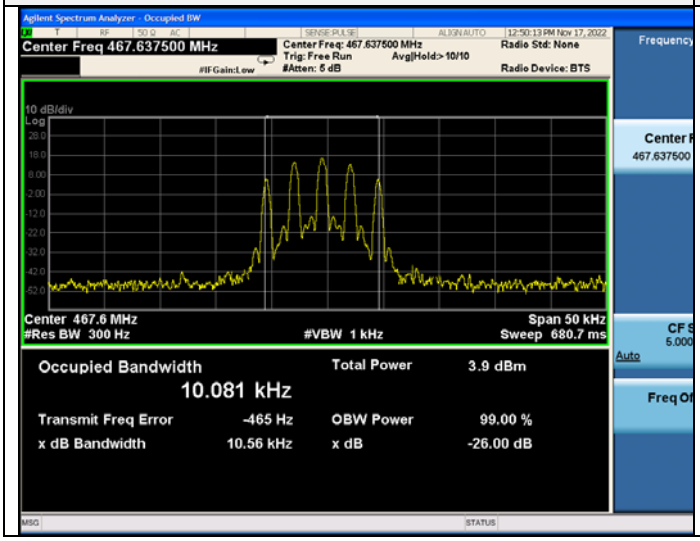
12.5kHz, FM Modulation:462.6375MHz



12.5kHz, FM Modulation:462.6500MHz



12.5kHz, FM Modulation:467.6375MHz



8. SPURIOUS RATIATED EMISSION

8.1 PROVISIONS APPLICABLE

Standard Applicable [FCC Part 95.579] According to FCC section 95.579, the unwanted emission should be attenuated below TP by at least 43+10 log (Transmit Power) Db.

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

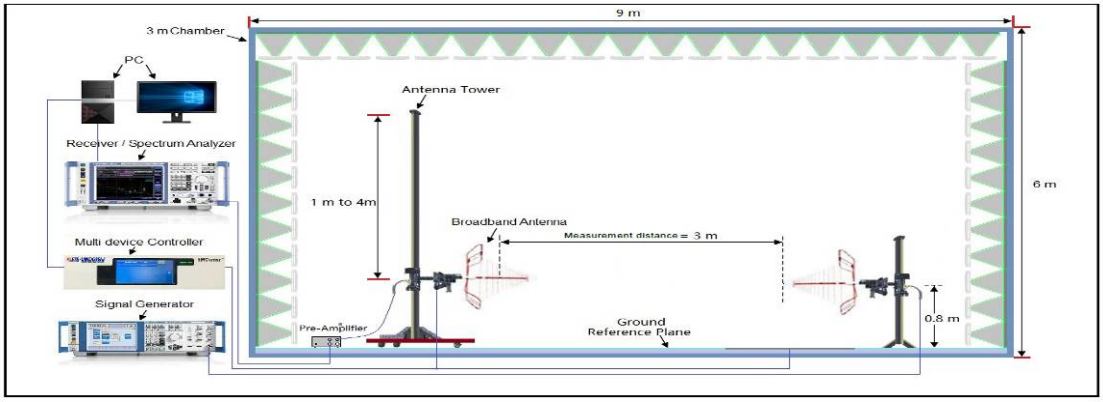
8.2 MEASUREMENT PROCEDURE

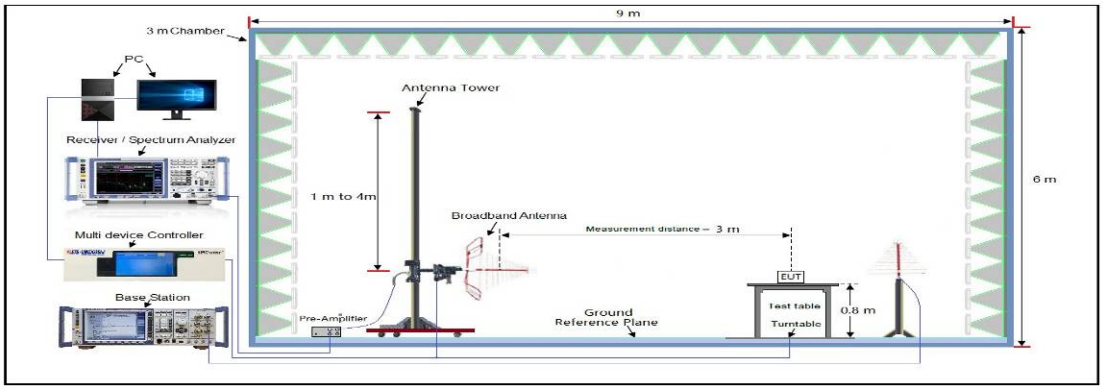
1) EUT was placed on a 0.8 or 1.5meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made. The radiated emission measurements of all transmit frequencies in all channels were measured with peak detector.
2) A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3) The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
4) The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5) A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test

6) The measurement results are obtained as described below: Power(EIRP)=PMea- PAg - Pcl - Ga The measurement results are amend as described below:Power(EIRP)=PMea- Pcl - Ga
7) This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
8) ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.
9) Test the EUT in the lowest channel, the middle channel the Highest channel

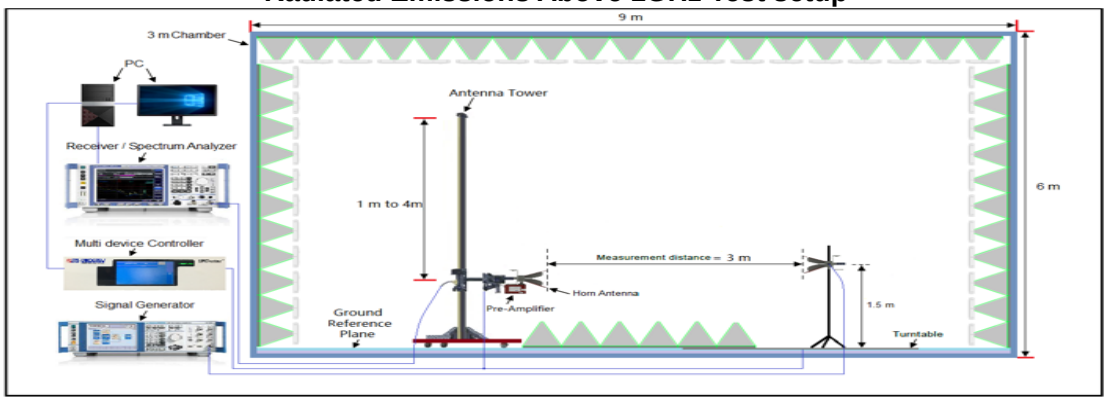
8.3 MEASUREMENT SETUP

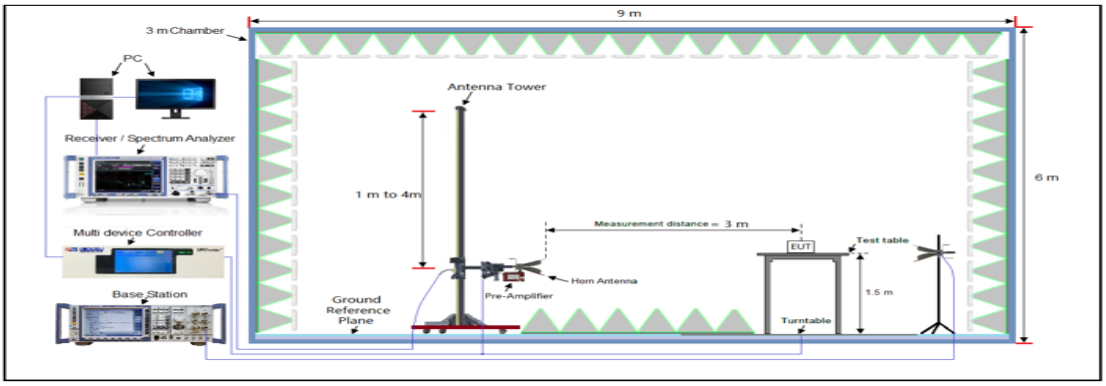
Radiated Emissions 30MHz to 1GHz Test setup





Radiated Emissions Above 1GHz Test setup





8.4 MEASUREMENT RESULTS

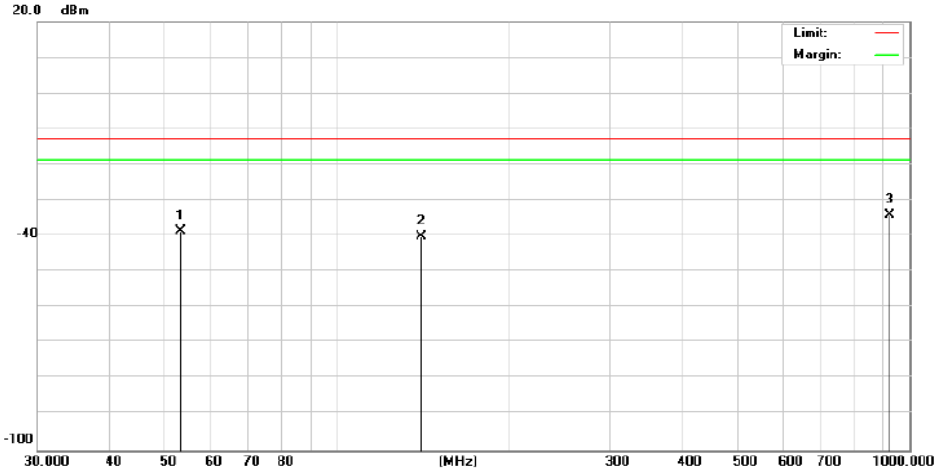
Preliminary calculation	Final Result
At least 43+10 log (P) =43+10log (2) =46.01 (dB)	Limit=P- Preliminary calculation=33.01-46.01=-13 dBm
At least 43+10 log (P) =43+10log (0.5) =39.99 (dB)	Limit=P- Preliminary calculation=26.99-39.99=-13 dBm

1. Factor=Antenna Factor + Cable loss. (Below 1GHz)
2. Factor=Antenna Factor+ Cable loss -Pre-amplifier. (Above 1 GHz)
3. Margin=Limit- Level

30MHz~1GHz

Test Mode:	TX 462.6375MHz	Polarity:	Horizontal

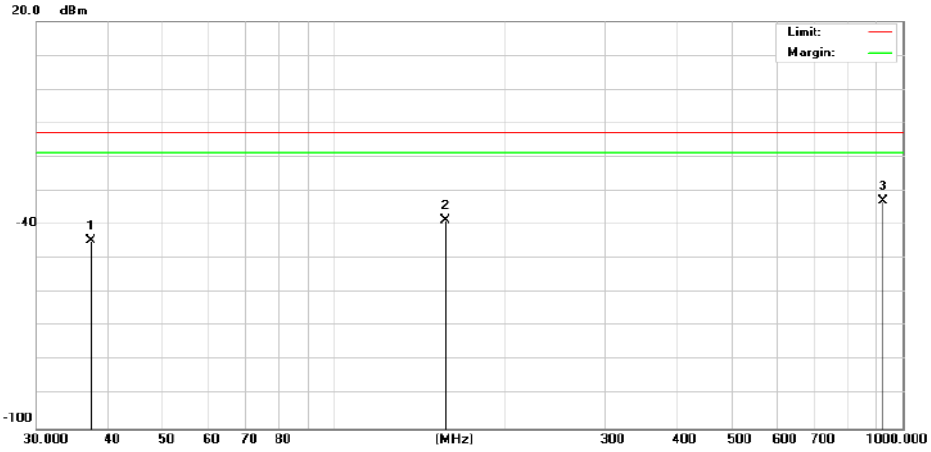
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		53.3179	-39.94	1.44	-38.50	-13.00	-25.50	peak
2		139.8507	-42.49	2.49	-40.00	-13.00	-27.00	peak
3	*	925.2800	-53.75	19.75	-34.00	-13.00	-21.00	peak

Test Mode:	TX 462.6375MHz	Polarity:	Vertical

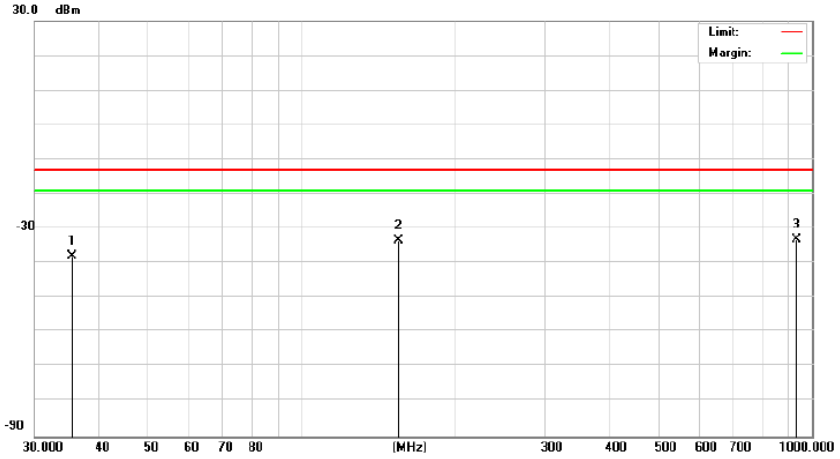
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		37.4164	-47.28	2.78	-44.50	-13.00	-31.50	peak
2		157.0073	-40.32	1.82	-38.50	-13.00	-25.50	peak
3	*	925.2800	-52.75	19.75	-33.00	-13.00	-20.00	peak

Test Mode:	TX 467.6375MHz	Polarity:	Horizontal

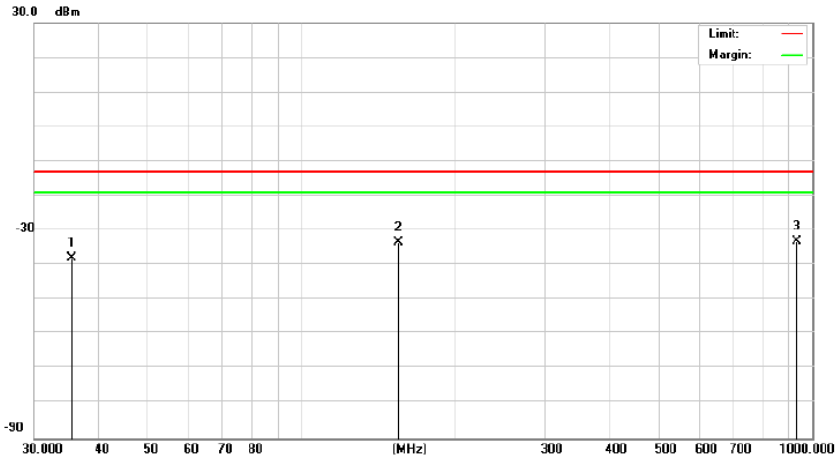
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		35.4992	-40.50	2.50	-38.00	-13.00	-25.00	peak
2		154.8204	-35.20	1.70	-33.50	-13.00	-20.50	peak
3	*	935.2800	-52.86	19.86	-33.00	-13.00	-20.00	peak

Test Mode:	TX 467.6375MHz	Polarity:	Vertical

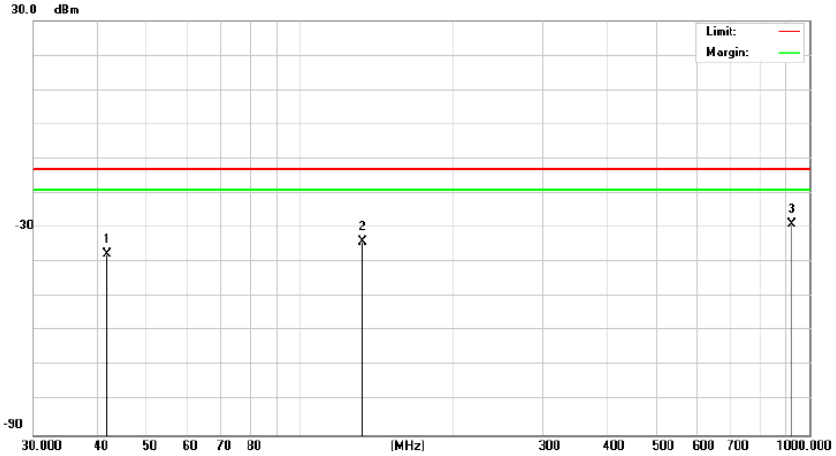
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		35.4992	-40.50	2.50	-38.00	-13.00	-25.00	peak
2		154.8204	-35.20	1.70	-33.50	-13.00	-20.50	peak
3	*	935.2800	-52.86	19.86	-33.00	-13.00	-20.00	peak

Test Mode:	TX 462.6500MHz	Polarity:	Horizontal

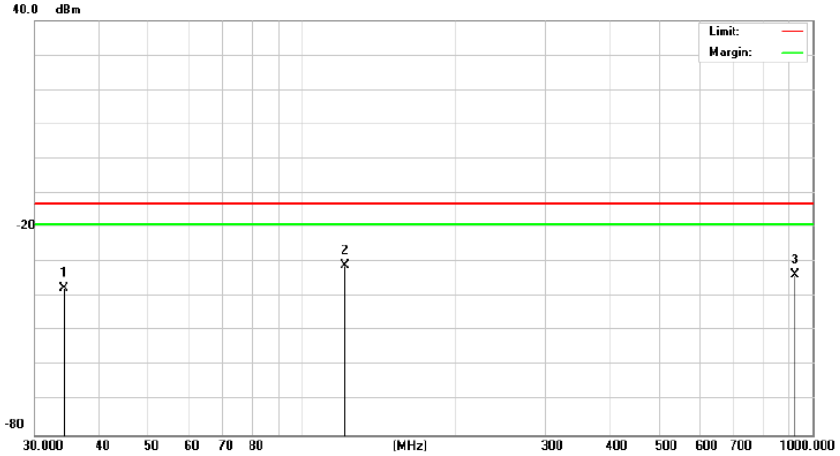
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		41.8596	-40.11	2.61	-37.50	-13.00	-24.50	peak
2		132.2205	-36.13	2.13	-34.00	-13.00	-21.00	peak
3	*	925.3000	-48.75	19.75	-29.00	-13.00	-16.00	peak

Test Mode:	TX 462.6500MHz	Polarity:	Vertical

Radiated Emission Measurement

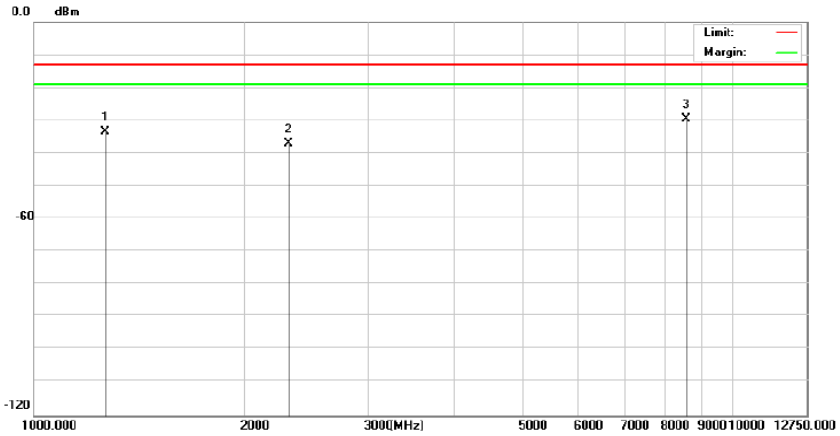


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		34.2760	-40.00	2.50	-37.50	-13.00	-24.50	peak
2	*	121.5485	-32.84	1.84	-31.00	-13.00	-18.00	peak
3		925.3000	-53.25	19.75	-33.50	-13.00	-20.50	peak

Above 1GHz

Test Mode:	TX 462.6375MHz	Polarity:	Horizontal

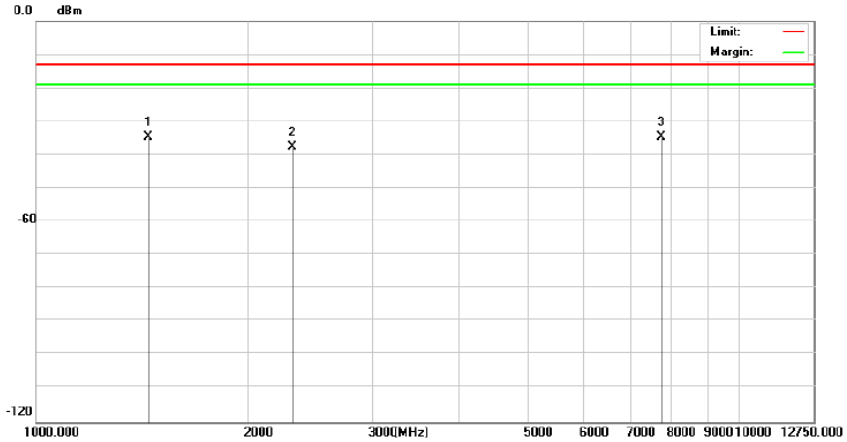
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		1267.104	-39.58	6.08	-33.50	-13.00	-20.50	peak
2		2313.200	-49.07	12.07	-37.00	-13.00	-24.00	peak
3	*	8549.586	-44.95	15.45	-29.50	-13.00	-16.50	peak

Test Mode:	TX 462.6375MHz	Polarity:	Vertical

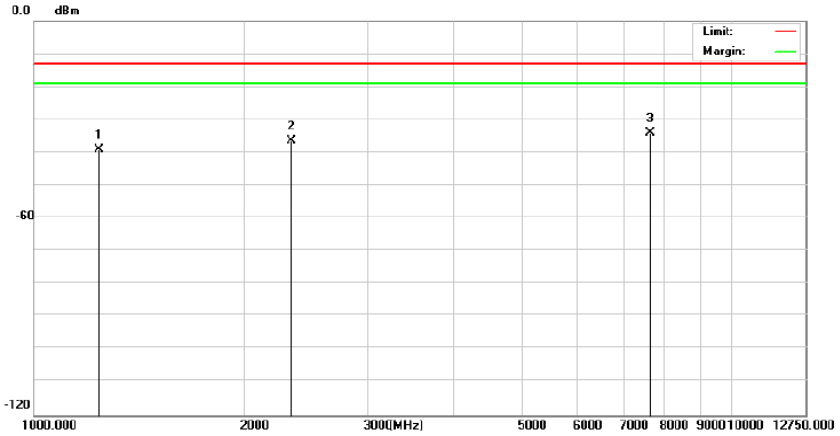
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1	*	1439.090	-44.66	10.16	-34.50	-13.00	-21.50	peak
2		2313.200	-49.57	12.07	-37.50	-13.00	-24.50	peak
3		7721.909	-49.89	15.39	-34.50	-13.00	-21.50	peak

Test Mode:	TX 467.6375MHz	Polarity:	Horizontal

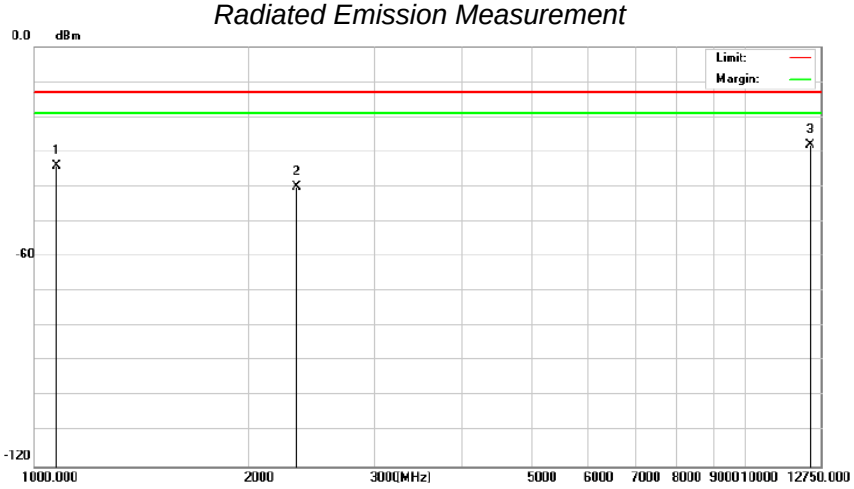
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		1238.406	-46.58	7.58	-39.00	-13.00	-26.00	peak
2		2338.200	-48.84	12.34	-36.50	-13.00	-23.50	peak
3	*	7643.682	-49.38	15.38	-34.00	-13.00	-21.00	peak

Test Mode:	TX 467.6375MHz	Polarity:	Vertical

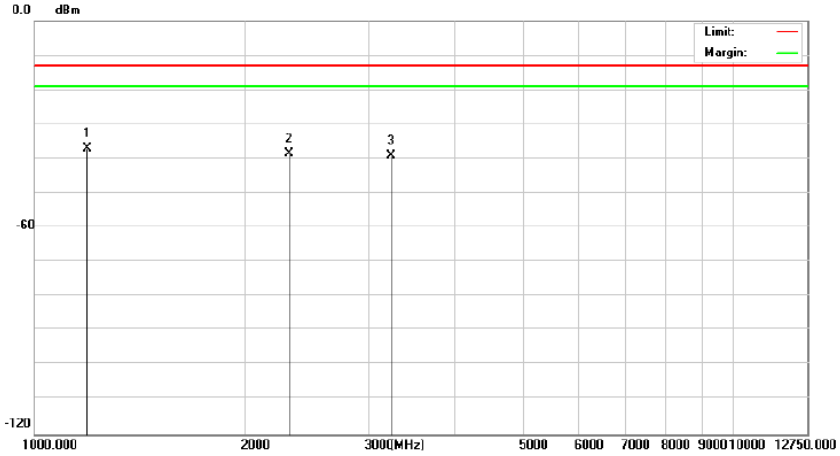
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1		1076.613	-38.10	4.10	-34.00	-13.00	-21.00	peak
2		2338.200	-52.34	12.34	-40.00	-13.00	-27.00	peak
3	*	12303.62	-43.00	15.00	-28.00	-13.00	-15.00	peak

Test Mode:	TX 462.6500MHz	Polarity:	Horizontal

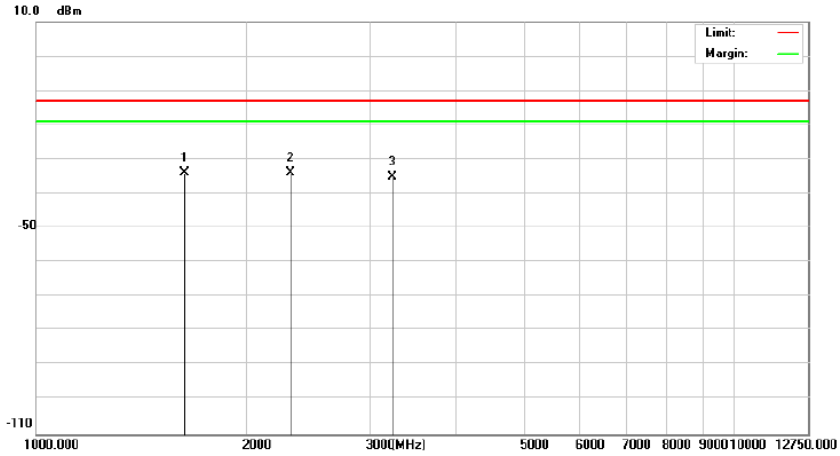
Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1	*	1188.980	-46.39	9.39	-37.00	-13.00	-24.00	peak
2		2313.250	-50.57	12.07	-38.50	-13.00	-25.50	peak
3		3238.550	-49.58	10.58	-39.00	-13.00	-26.00	peak

Test Mode:	TX 462.6500MHz	Polarity:	Vertical

Radiated Emission Measurement



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBm	dB	dBm	dBm	dB	Detector
1	*	1626.120	-42.20	8.20	-34.00	-13.00	-21.00	peak
2		2313.250	-46.07	12.07	-34.00	-13.00	-21.00	peak
3		3238.550	-45.58	10.58	-35.00	-13.00	-22.00	peak

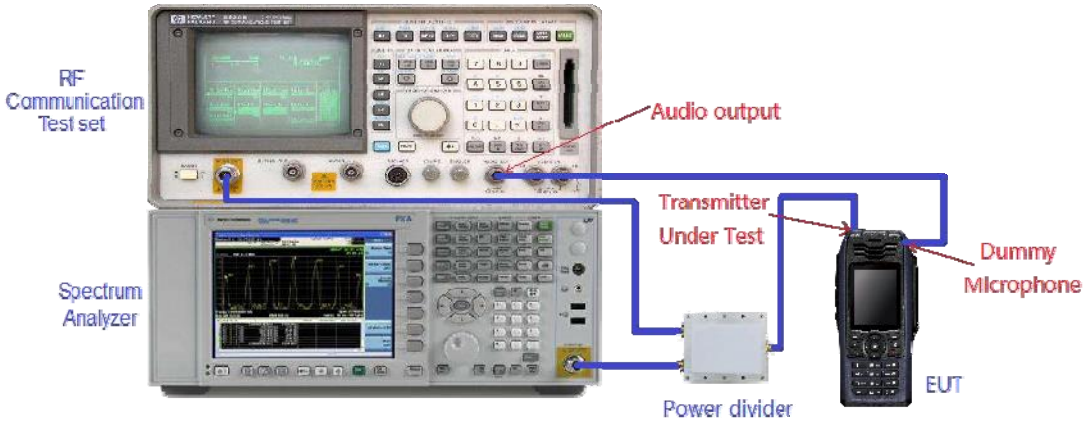
8.5 EMISSION MASK PLOT

The detailed procedure employed for Emission Mask measurements are specified as following:

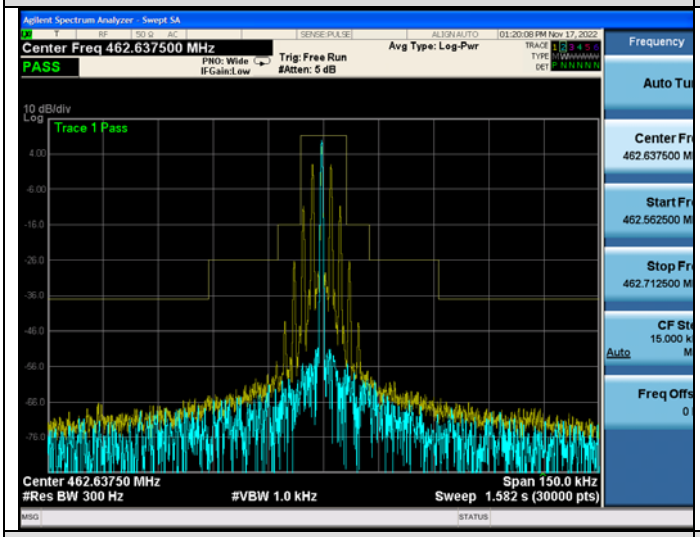
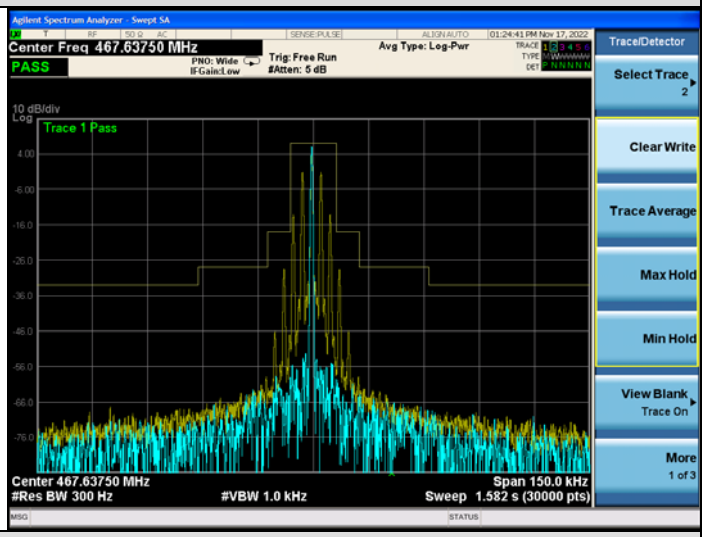
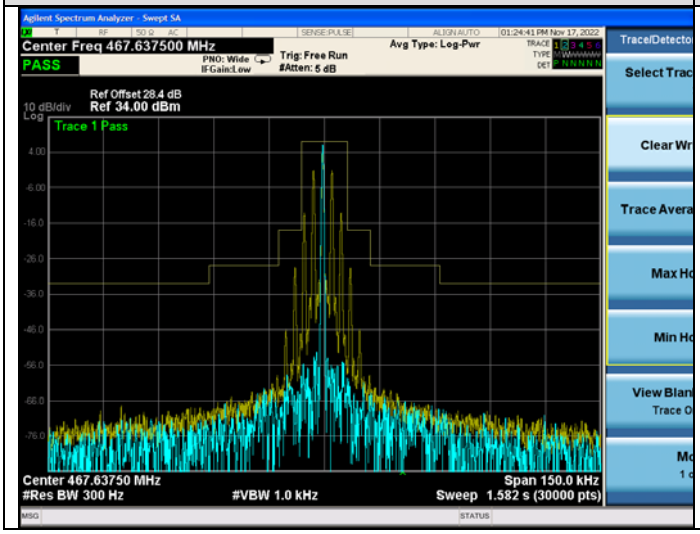
-Connect the equipment as illustrated.

-Spectrum set as follow:

1. Centre frequency = fundamental frequency, Span=150kHz for 12.5kHz , RBW=300Hz, VBW=1000Hz ;
2. Sweep = auto, Detector function = peak, Trace = max hold
3. Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0dB reference for the measurement.
4. Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation (Rated system deviation is 2.5 kHz for 12.5kHz channel spacing). The input level shall be established at the frequency of maximum response of the audio modulating circuit.
5. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer.
6. Measure and record the results in the test report.



Test plot as follows:

Emission Mask @ 462.6375MHz-2W	Emission Mask @ 462.6500MHz-2W
	
Emission Mask @ 467.6375MHz-0.5W	
	

9. MAXIMUMN TRANSMITTER POWER

9.1 PROVISIONS APPLICABLE

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.

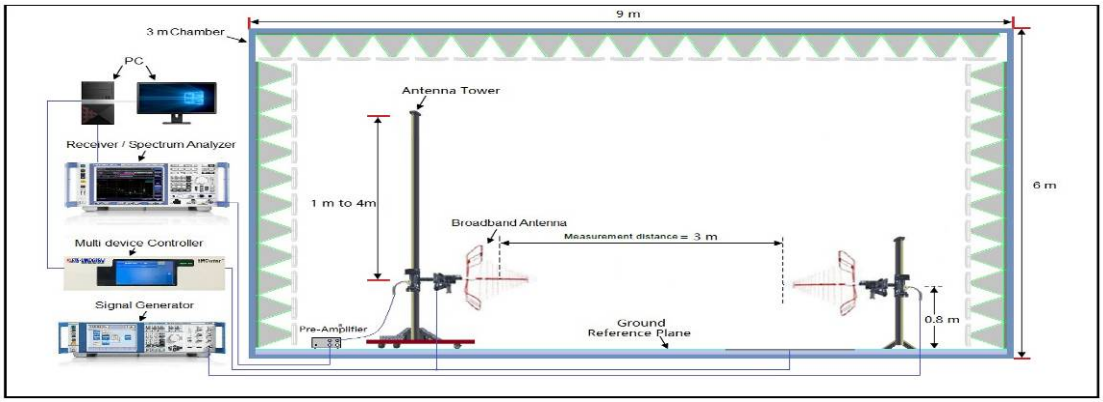
9.2 MEASUREMENT METHOD

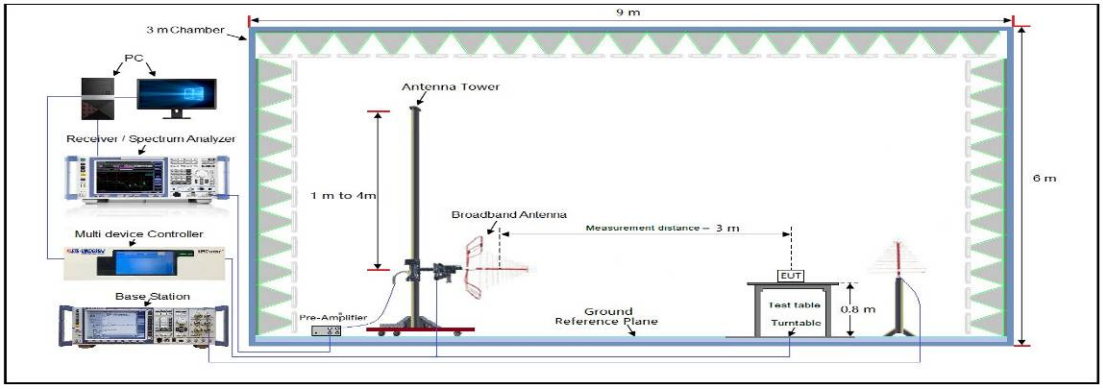
1) EUT was placed on a 0.8 or 1.5meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made. The radiated emission measurements of all transmit frequencies in all channels were measured with peak detector.
2) A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3) The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
4) The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5) A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test
6) The measurement results are obtained as described below: Power(EIRP)=PMea- PAg - Pcl - Ga The measurement results are amend as described below:Power(EIRP)=PMea- Pcl - Ga
7) This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
8) ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.
9) Test the EUT in the lowest channel, the middle channel the Highest channel

9.3 MEASUREMENT SETUP

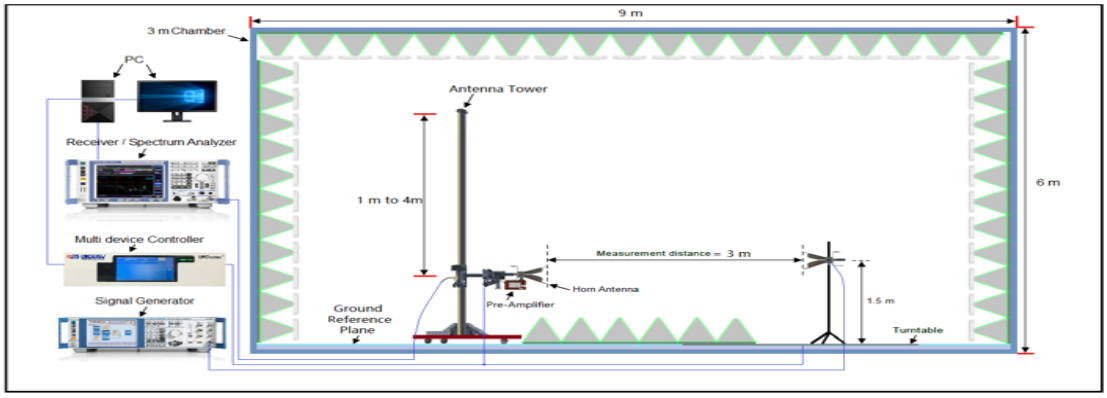
☒Effective Radiated Power:

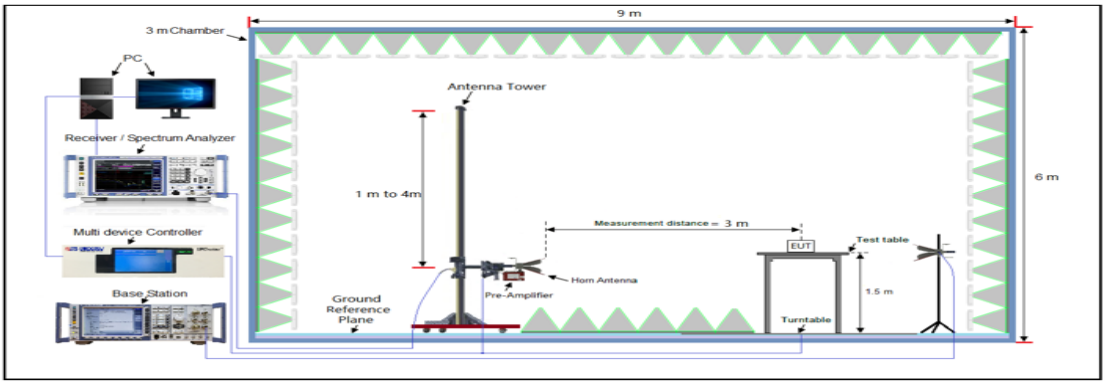
Radiated Below 1GHz





Radiated Above 1 GHz





9.4 MEASUREMENT RESULTS

ERP RESULT:

Frequency	Reading Level	Antenna	S.G.	Cable Loss	An t.Gain	Emission Level	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(W)	(W)	(W)
ChannelSeparation:12.5KHz									
462.6375	51.80	V	4.08	1.46	1.0	3.62	0.0023	2	1.998
462.6375	51.68	H	4.05	1.46	1.0	3.59	0.0023	2	1.998
462.6500	51.59	V	4.08	1.46	1.0	3.62	0.0023	2	1.980
462.6500	55.54	H	3.62	1.46	1.0	3.16	0.0021	2	1.998
467.6375	54.56	V	3.72	1.46	1.0	3.26	0.0021	0.5	0.498
467.6375	54.50	H	3.59	1.46	1.0	3.13	0.0021	0.5	0.498

NOTE: 1. Calculation Formula: Emission Level(dBm) = S.G. (dBm)- Cable Loss(dB)+ Ant.Gain(dBi)
2.The Ant. Gain including the correct factor 2.15
3.Margin (dB) = Limit(dBm)- Emission Level(dBm)

10.MODULATION CHARACTERISTICS

10.1 PROVISIONS APPLICABLE

According to FCC§2.1047 and §95.575, for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

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.

10.2 MEASUREMENT METHOD

10.2.1 Modulation Limit

(1). Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1kHz using this level as a reference (0dB) and vary the input level from –20 to +20dB. Record the frequency deviation obtained as a function of the input level.

(2). Repeat step 1 with input frequency changing to 300, 1000, 1500 and 3000Hz in sequence.

10.2.2 Audio Frequency Response

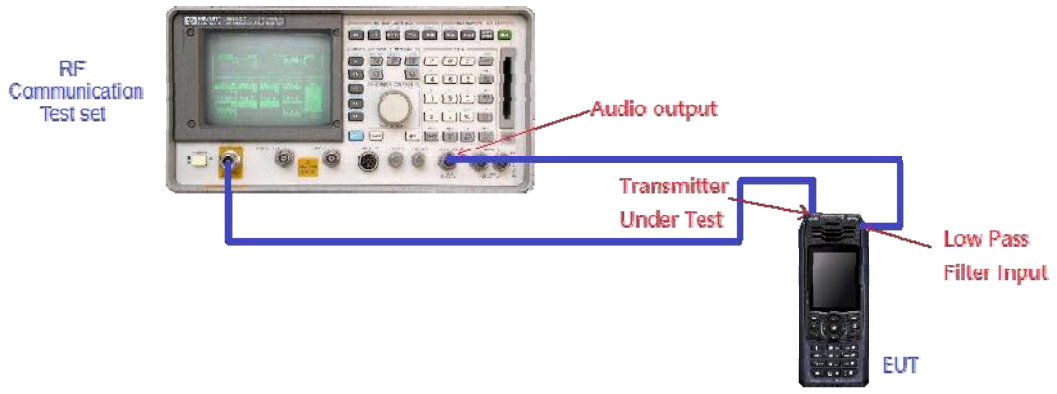
(1). Configure the EUT as shown in figure 1.

(2). Adjust the audio input for 20% of rated system deviation at 1 kHz using this level as a reference (0 dB).

(3). Vary the Audio frequency from 100 Hz to 10 kHz and record the frequency deviation.

(4). Audio Frequency Response = 20log10 (Deviation of test frequency/Deviation of 1 kHz reference).

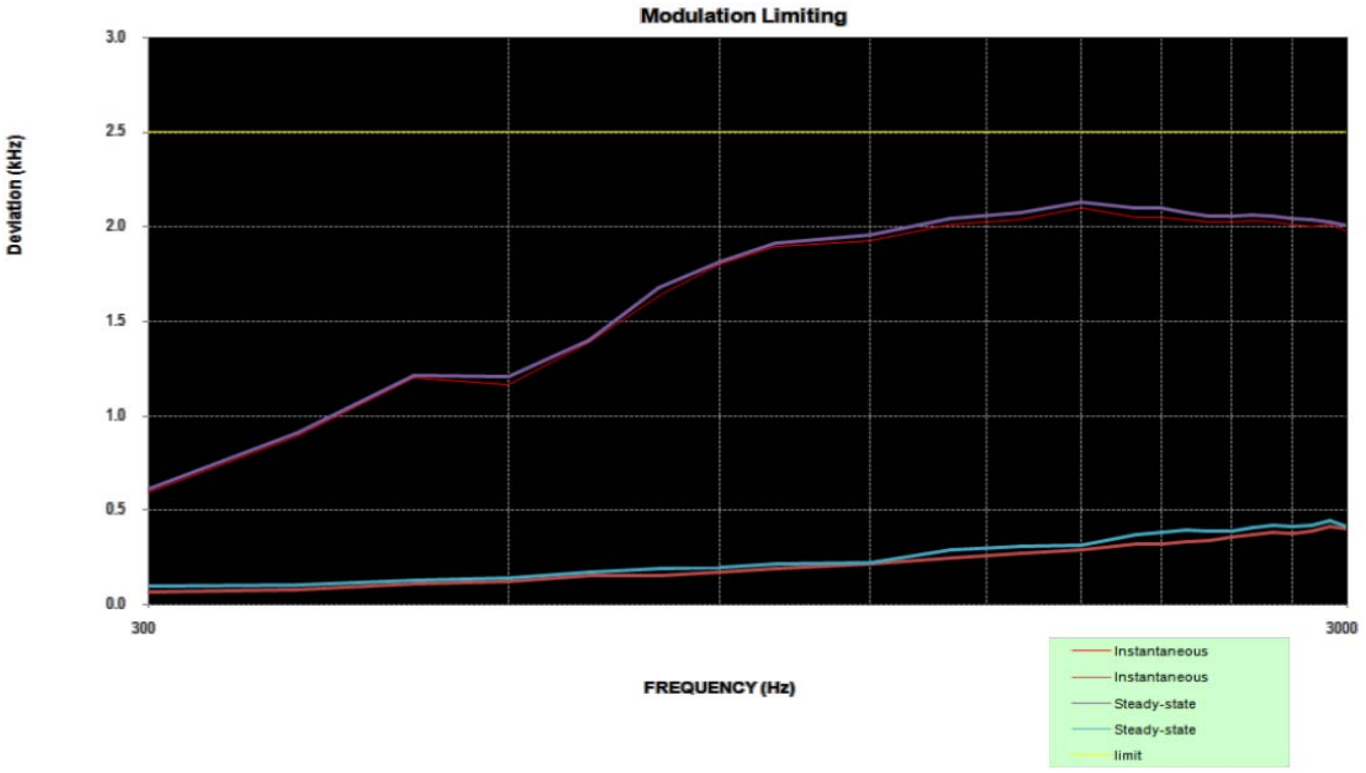
10.3 MEASUREMENT SETUP



10.4 MEASUREMENT RESULTS

(A). MODULATION LIMIT:

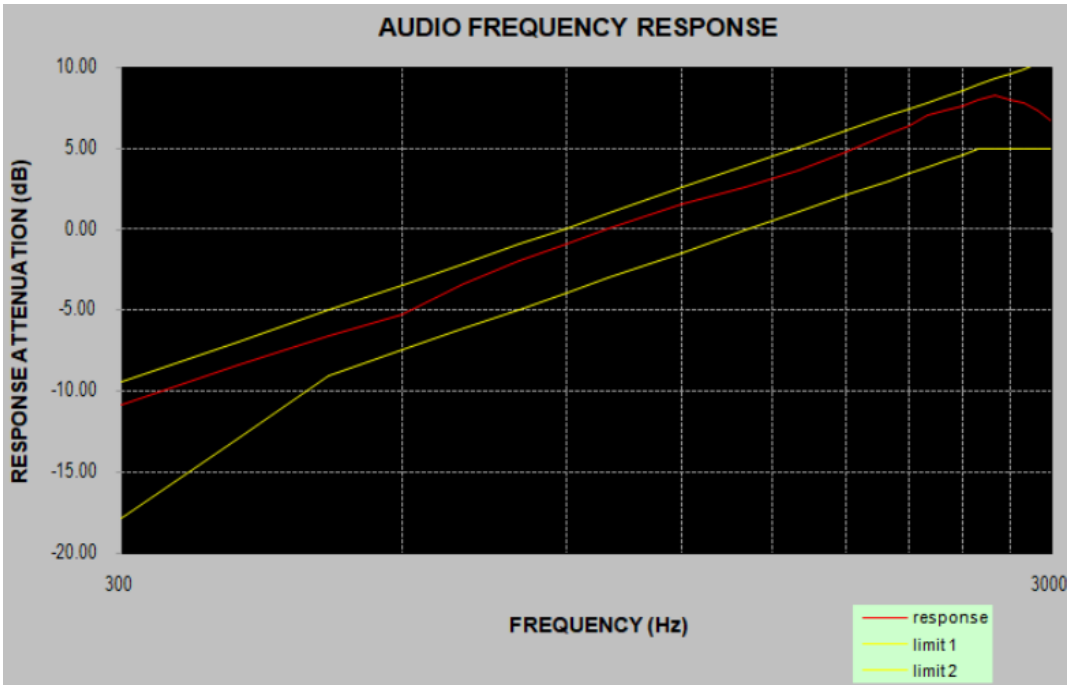
12.5kHz, FM modulation, Assigned Frequency:462.6500MHz				
Modulation Level (dB)	Peak Freq. Deviation At 300 Hz (kHz)	Peak Freq. Deviation At 1000 Hz (kHz)	Peak Freq. Deviation At 1500 Hz (kHz)	Peak Freq. Deviation At 3000 Hz (kHz)
-20	0.118	0.225	0.355	0.474
-15	0.148	0.313	0.648	0.659
-10	0.177	0.357	0.605	0.81
-5	0.199	0.685	0.943	1.005
0	0.238	1.022	1.238	1.261
+5	0.275	1.167	1.355	1.448
+10	0.333	1.385	1.671	1.626
+15	0.422	1.622	1.888	2.064
+20	0.647	1.926	2.118	2.048



Note: All the modes had been tested, but only the worst data recorded in the report

(B). AUDIO FREQUENCY RESPONSE:

12.5kHz, FM modulation, Assigned Frequency:462.6500MHz		
Frequency (Hz)	Deviation (kHz)	Audio Frequency Response(dB)
300	0.168	-15.477
400	0.278	-10.157
500	0.348	-7.927
600	0.428	-5.937
700	0.518	-4.127
800	0.548	-3.607
900	0.668	-1.767
1000	0.808	-0.027
1200	0.878	0.733
1400	1.068	2.503
1600	1.148	3.153
1800	1.288	4.183
2000	1.418	5.043
2400	1.508	5.593
2500	1.588	6.053
2800	1.818	7.493
3000	1.868	6.253



Note: All the modes had been tested, but only the worst data recorded in the report.

APPENDIX I: PHOTOGRAPHS OF TEST SETUP

Refer to the Report No.: Test Setup Photo

APPENDIX II: PHOTOGRAPHS OF TEST EUT

Refer to the Report No.: EUT Photo

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