FCC Test Report

Report No.: AGC02931240603FR01

FCC ID	:	2AWYH-GMR04
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Mobile Radio
BRAND NAME	:	Rugged Radios
MODEL NAME	:	G4
APPLICANT	:	Rugged Radios
DATE OF ISSUE	:	Aug. 01, 2024
STANDARD(S)	:	FCC Part 95 Subpart E
REPORT VERSION	:	V1.0

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Aug. 01, 2024	Valid	Initial Release

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1. General Information

Applicant	Rugged Radios
Address	509 Traffic Way, Arroyo Grande, CA 93420, United States
Manufacturer	Rugged Radios
Address	509 Traffic Way, Arroyo Grande, CA 93420, United States
Factory	Rugged Radios
Address	509 Traffic Way, Arroyo Grande, CA 93420, United States
Product Designation	Mobile Radio
Brand Name	Rugged Radios
Test Model	G4
Date of receipt of test item	Jun. 18, 2024
Date of Test	Jun. 18, 2024~Jul. 30, 2024
Deviation from Standard	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Test Report Form No	AGCER-FCC-GMRS-V1

Note: The test results of this report relate only to the tested sample identified in this report.

Prepared By	Bibo Zhang (Project Engineer)	Jul. 26, 2024
Reviewed By	Calvin Liu (Reviewer)	Jul. 26, 2024
Approved By	Max Zhang Authorized Officer	Jul. 26, 2024

2. Product Information

2.1 Product Technical Description

Communication Type	Voice / Tone only	
Operation Frequency Range	462.5500MHz-462.7250MHz (GMRS 462 MHz main channels)	
	462.5625MHz-462.7125MHz (GMRS 462 MHz interstitial channels)	
	467.5500MHz-467.7250MHz (GMRS 467 MHz main channels)	
Hardware Version	V1.2	
Software Version	V1.2	
Modulation Type	FM	
Channel Separation	12.5 kHz/25 kHz	
Emission Bandwidth	5.461 kHz (50W-12.5kHz)	15.31 kHz (50W-25kHz)
	5.452 kHz (25W-12.5kHz)	15.32 kHz (25W-25kHz)
	5.436 kHz (5W-12.5kHz)	15.90 kHz (5W-25kHz)
Emission Designator	11K0F3E/16K0F3E	
Number of Channels:	23 Channels	
Rated Output Power	50W/25W/5W (It was fixed by the manufacturer, any individual can't arbitrarily change it.)	
Maximum Transmitter Power	46.68dBm (50W-12.5kHz)	46.70dBm (50W-25kHz)
	43.97dBm (25W-12.5kHz)	43.96dBm (25W-25kHz)
	36.41dBm (5W-12.5kHz)	36.43dBm (5W-25kHz)
Antenna Designation	Detachable Antenna	
Antenna Gain	0dBi (Typical)	
Frequency Tolerance	1.092ppm	
Power Supply	DC 13.8V	

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

Channel. No	CH. Freq	Rated Power	CH. No	CH. Freq	Rated Power
1	462.5625	5W	15	462.5500	50W/25W/5W
2	462.5875		16	462.5750	
3	462.6125		17	462.6000	
4	**462.6375**		18	462.6250	
5	462.6625		19	**462.6500**	
6	462.6875		20	462.6750	
7	462.7125		21	462.7000	
8	--	--	22	462.7250	
9	--		23	467.5500	50W/25W/5W
10	--		24	467.5750	
11	--		25	467.6000	
12	--		26	467.6250	
13	--		27	**467.6500**	
14	--		28	467.6750	
--			29	467.7000	
			30	467.7250	

2.3 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: **2AWYH-GMR04,** filing to comply with Part 2, Part 95 of the Federal Communication Commission rules.

2.4 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

2.5 Calculation of Emission Indicators

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

For FM Mode (Channel Spacing: 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.

For FM Mode (Channel Spacing: 25kHz)
Emission Designator 16K0F3E
In this case, the maximum modulating frequency is 3.0 kHz with a 5.0 kHz deviation.
BW = 2(M+D) = 2*(3.0 kHz + 5.0 kHz) = 16 kHz = 16K0
F3E portion of the designator represents an FM voice transmission.
Therefore, the entire designator for 25 kHz channel spacing FM mode is 16K0F3E.

2.6 Special Accessories

Not available for this EUT intended for grant.

2.7 Equipment Modifications

Not available for this EUT intended for grant.

2.8 Antenna Requirement

Excerpt from §95.1787 of the FCC Rules/Regulations:

The antenna of each GMRS Transmitter type must meet the following requirements.
(1) The antenna must be a non-removable integral part of the GMRS unit.
(2) Digital data transmissions may contain location information, or requesting location information from one or more other GMRS or FRS units, or containing a brief text message to another specific GMRS or FRS unit. Digital data transmissions may be initiated by a manual action of the operator or on an automatic or periodic basis, and a GMRS unit receiving an interrogation request may automatically respond with its location.
(3) GMRS units must not be capable of transmitting digital data on the 467 MHz main channels.
(4) Digital data transmissions must not exceed one second in duration.

User	Applicable Conditions
☒	This GMRS device does not support digital transmission
☐	The antenna of this device is permanently attached.
☒	Configuration with external detachable antenna
☒	This GMRS device has a fixed antenna port
Conclusion: The unit complies with the requirement of §95.1787.	

3. Test Environment

3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

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

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories.)

A2LA-Lab Cert. No.: 5054.02

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow 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.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) 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 with Registration 975832.

IC-Registration No.: 24842(CAB identifier: CN0063)

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

3.3 Environmental Conditions

	Normal Conditions	Extreme Conditions
Temperature range (℃)	15 - 35	-30 - 50
Relative humidity range	20 % - 75 %	20 % - 75 %
Pressure range (kPa)	86 - 106	86 - 106
Power supply	DC 13.8V	LV DC 11.73V/HV DC 15.87V
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 Equipment Used

● RF Conducted Test System							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
☒	AGC-ER-E086	Spectrum Analyzer	KEYSIGHT	N9020A	MY53300860	2023-06-01	2024-05-31
☒	AGC-ER-E086	Spectrum Analyzer	KEYSIGHT	N9020A	MY53300860	2024-05-23	2025-05-22
☒	AGC-EM-E002	Wireless Connectivity Tester	HP	8920B	US35010161	2023-06-02	2024-06-01
☒	AGC-EM-E002	Wireless Connectivity Tester	HP	8920B	US35010161	2024-05-24	2025-05-23
☒	AGC-ER-E059	Signal Generator	Agilent	N5182B	MY53050647	2023-03-03	2024-03-02
☒	AGC-ER-E059	Signal Generator	Agilent	N5182B	MY53050647	2024-02-01	2025-01-31
☒	AGC-ER-E037	Signal Generator	Agilent	N5182A	MY50140530	2023-06-01	2024-05-31
☒	AGC-ER-E037	Signal Generator	Agilent	N5182A	MY50140530	2024-05-23	2025-05-22
☒	AGC-ER-E075	Small Environmental Tester	SH-242	ESPEC	93008290	2022-08-03	2024-08-02
☒	AGC-EM-A007	30dB Attenuator	Weinachel	58-30-33	ML030	2022-08-03	2024-08-02
☒	AGC-EM-E040	Directional coupler	Werlatone	C5571-10	99463	2022-03-10	2024-03-09
☒	AGC-EM-E040	Directional coupler	Werlatone	C5571-10	99463	2024-02-01	2026-01-31
☒	--	RF Connection Cable	N/A	1#	N/A	Each time	N/A
☒	--	RF Connection Cable	N/A	2#	N/A	Each time	N/A

● Radiated Spurious Emission							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
☒	AGC-EM-E046	EMI Test Receiver	R&S	ESCI	10096	2023-02-18	2024-02-17
☒	AGC-EM-E046	EMI Test Receiver	R&S	ESCI	10096	2024-02-01	2025-01-31
☒	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2023-06-01	2024-05-31
☒	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2024-05-28	2025-05-27
☒	AGC-EM-E086	Loop Antenna	ZHINAN	ZN30900C	18051	2022-03-12	2024-03-11
☒	AGC-EM-E086	Loop Antenna	ZHINAN	ZN30900C	18051	2024-03-05	2026-03-04
☒	AGC-EM-E001	Wideband Antenna	SCHWARZBECK	VULB9168	D69250	2023-05-11	2025-05-10
☒	AGC-EM-E005	Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-494	2023-01-05	2025-01-04
☒	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2023-03-23	2025-03-22
☒	AGC-EM-E102	Broadband Ridged Horn Antenna	ETS	3117	00154520	2023-06-03	2025-06-02
☐	AGC-EM-E082	Horn Antenna	SCHWARZBECK	BBHA 9170	#768	2023-11-13	2024-11-12
☒	AGC-EM-E146	Pre-amplifier	ETS	3117-PA	00246148	2022-08-04	2024-08-03

☐	AGC-EM-E021	Pre-amplifier	MITEQ	AM-4A-000115	1465421	2022-06-08	2024-06-07
☐	AGC-EM-E021	Pre-amplifier	MITEQ	AM-4A-000115	1465421	2024-05-28	2026-05-27
☒	AGC-ER-E037	Signal Generator	Agilent	N5182A	MY50140530	2023-06-01	2024-05-31
☒	AGC-ER-E037	Signal Generator	Agilent	N5182A	MY50140530	2024-05-23	2025-05-22
☐	AGC-EM-A139	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08
☒	AGC-EM-A088	UHF Filter	Microwave	N26460M1	498705	2023-06-01	2024-05-31
☒	AGC-EM-A088	UHF Filter	Microwave	N26460M1	498705	2024-05-23	2025-05-22

● Test Software

Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Version Information
☒	AGC-EM-S004	RE Test System	Tonscend	TS+ Ver2.1(JS32-RE)	4.0.0.0

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

No.	Equipment	Model No.	Manufacturer	Specification Information	Cable
1	50ohm Load	N/A	Amphenol	DC-3G, Max.50W	N/A

☒ Test Accessories Come From The Manufacturer

No.	Equipment	Model No.	Manufacturer	Specification Information	Cable
1	Hand microphone	N/A	N/A	N/A	0.8m unshielded
2	Power Line	N/A	N/A	N/A	1.5m unshielded

4.5 Summary of Test Results

Item	FCC Rules	Description of Test	Result
1	FCC 47 CFR PART 95	Antenna Equipment	Pass
2	§ 95.1767& 2.1046(a)	Maximum Transmitter Power	Pass
3	§95.1775& 2.1047(a) (b)	Modulation Limit	Pass
4	§95.1775& 2.1047(a)	Audio Frequency Response	Pass
4	§95.1775(e)	Audio Low Pass Filter Response	Pass
5	§95.1773& 2.1049	26dB Emission Bandwidth and 99% Occupied Bandwidth	Pass
6	§95.1779& 2.1049	Emission Mask	Pass
7	§95.1765& 2.1055(a) (1)	Frequency Stability	Pass
9	§95.1779& 2.1051	Spurious Emission on Antenna Port	Pass
10	§95.1779& 2.1053	Spurious Radiated Emission	Pass

5. Description of Test Modes

The EUT (**Mobile Radio**) has been tested under normal operating condition. (GMRS TX) are chosen for testing at each channel separation.

No.	Test Mode Description	Channel Separation
1	GMRS TX Channel 4	12.5 kHz/25 kHz
2	GMRS TX Channel 19	12.5 kHz/25 kHz
3	GMRS TX Channel 27	12.5 kHz/25 kHz

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. 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

Standard Applicable [Part 95.1765] The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

- The carrier frequency of each GMRS transmitter transmitting an emission with an occupied bandwidth of 12.5 kHz or less must remain within 2.5 ppm
- The carrier frequency of each GMRS transmitter transmitting an emission with an occupied bandwidth greater than 12.5 kHz must remain within 5 ppm

6.2 Measurement Procedure

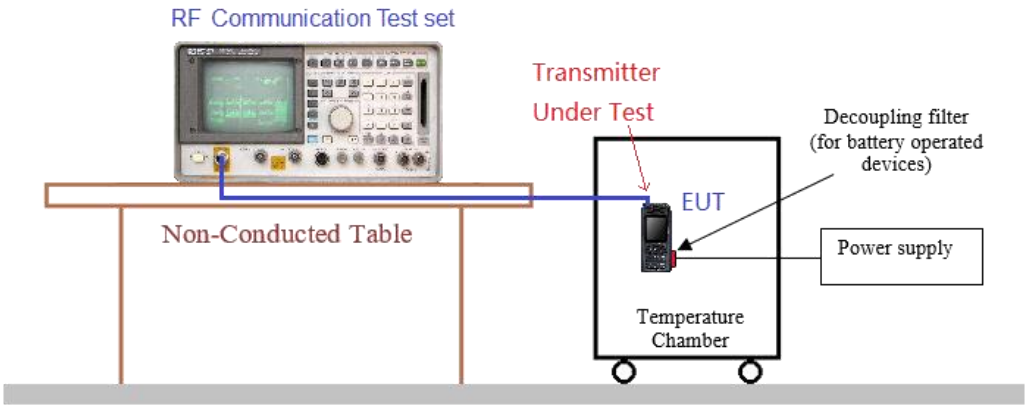
6.2.1 Frequency stability versus environmental temperature

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 7.4V.
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 Result

12.5 kHz Channel Separation, FM modulation, Assigned Frequency For GMRS						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage (V)	Temp (℃)	Test Frequency (MHz)				
		462.6375	462.6500	467.6500		
13.8	-30	0.335	0.653	0.796	2.5	Pass
	-20	1.064	0.780	0.817		
	-10	0.947	0.569	0.709		
	0	0.987	1.029	0.777		
	10	0.590	0.530	0.799		
	20	0.844	0.509	0.841		
	30	0.740	1.092	0.609		
	40	0.703	0.994	0.795		
	50	0.845	0.861	0.839		
15.87	20	0.524	1.016	0.715		
11.73	20	0.808	0.549	0.967		

25 kHz Channel Separation, FM modulation, Assigned Frequency For GMRS						
Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage (V)	Temp (℃)	Test Frequency (MHz)				
		462.6375	462.6500	467.6500		
13.8	-30	1.020	0.587	0.545	5	Pass
	-20	0.879	0.536	0.626		
	-10	0.598	0.598	0.627		
	0	0.740	1.029	0.668		
	10	0.660	0.599	0.820		
	20	0.589	1.009	0.851		
	30	0.951	1.022	0.953		
	40	1.034	1.049	0.837		
	50	0.905	0.881	0.710		
15.87	20	0.648	0.924	0.980		
11.73	20	0.512	0.755	1.093		

7. 26dB Emission Bandwidth and 99% Occupied Bandwidth

7.1 Provisions Applicable

FCC Part 95.1773: GMRS Main channels: the authorized bandwidth is 20 kHz for GMRS transmitters operating on any of the 462 MHz main channels, or any of the 467 MHz main channels.

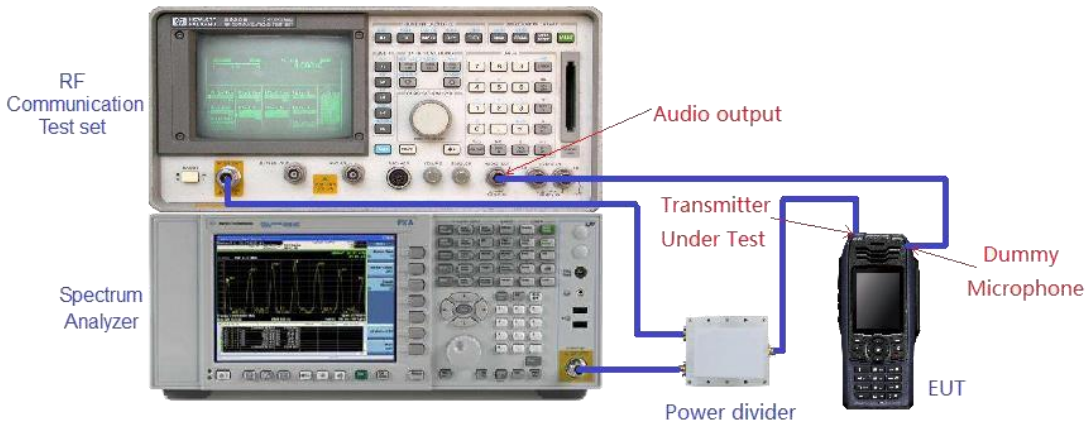
Interstitial channels:

The authorized bandwidth is 20 kHz for GMRS transmitters operating on any of the 462 MHz interstitial channels, and is 12.5 kHz for GMRS transmitters operating on any of the 467 MHz interstitial channels.
Occupied Bandwidth: 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.
2. For rated system deviation is 2.5 kHz for 12.5kHz channel spacing.
3. For rated system deviation is 3.0 kHz for 25kHz channel spacing.
4. Spectrum set as follow:
5. Centre frequency = Fundamental Frequency
6. Span=50kHz for 12.5kHz Channel Spacing, RBW=300Hz, VBW=1kHz, Sweep = Auto.
7. Span=50kHz for 25kHz Channel Spacing, RBW=300Hz, VBW=1kHz, Sweep = Auto.
8. Detector Function = Peak, Trace = Max Hold
9. Set 99% Occupied Bandwidth and 26dB Emission Bandwidth.
10. Measure and record the results in the test report.

7.3 Measurement Setup

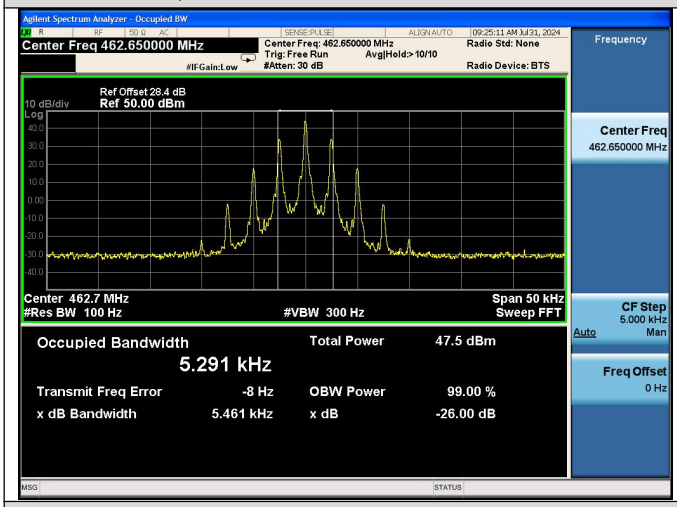


7.4 Measurement Result

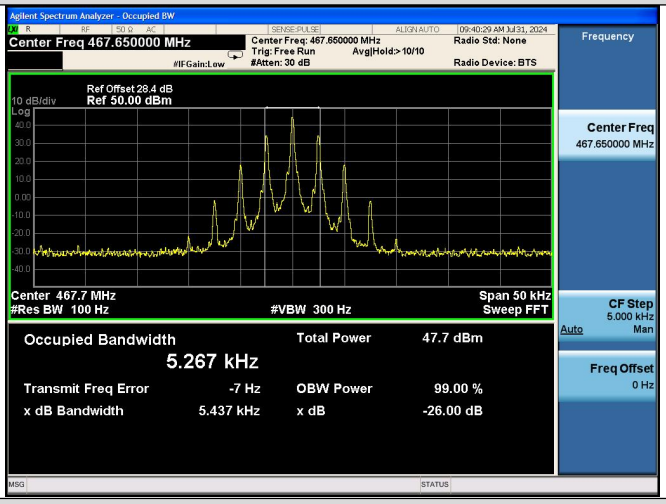
Emission Bandwidth Measurement Result-GMRS				
12.5 kHz Channel Separation-50W				
Operating Frequency (MHz)	Occupied Bandwidth (kHz)	Emission Bandwidth (kHz)	Limits (kHz)	Result
462.6500	5.291	5.461	20.0	Pass
467.6500	5.267	5.437	20.0	Pass
12.5 kHz Channel Separation-25W				
Operating Frequency (MHz)	Occupied Bandwidth (kHz)	Emission Bandwidth (kHz)	Limits (kHz)	Result
462.6500	5.282	5.452	20.0	Pass
467.6500	5.271	5.424	20.0	Pass
12.5 kHz Channel Separation-5W				
Operating Frequency (MHz)	Occupied Bandwidth (kHz)	Emission Bandwidth (kHz)	Limits (kHz)	Result
462.6375	5.251	5.399	20.0	Pass
462.6500	5.276	5.430	20.0	Pass
467.6500	5.279	5.436	20.0	Pass

Test plot as follows:

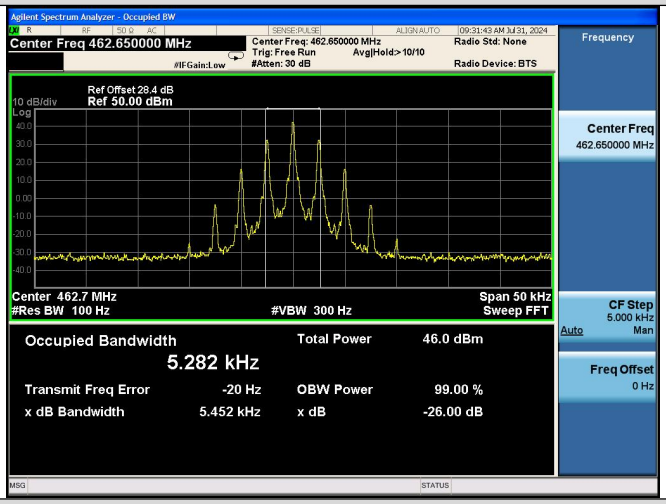
12.5kHz, FM Modulation:462.6500MHz-50W



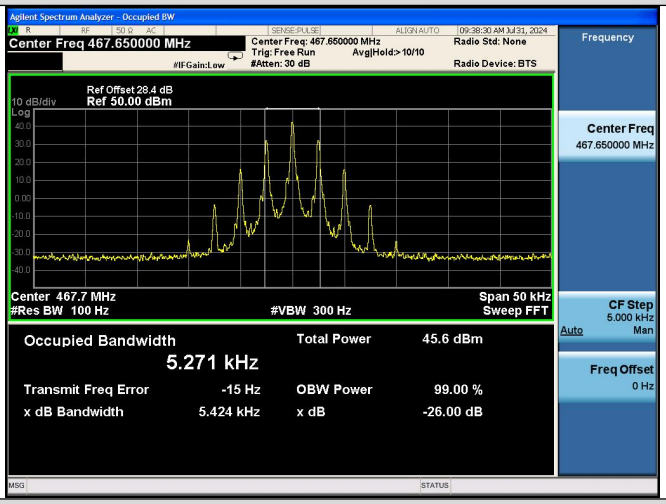
12.5kHz, FM Modulation:467.6500MHz-50W



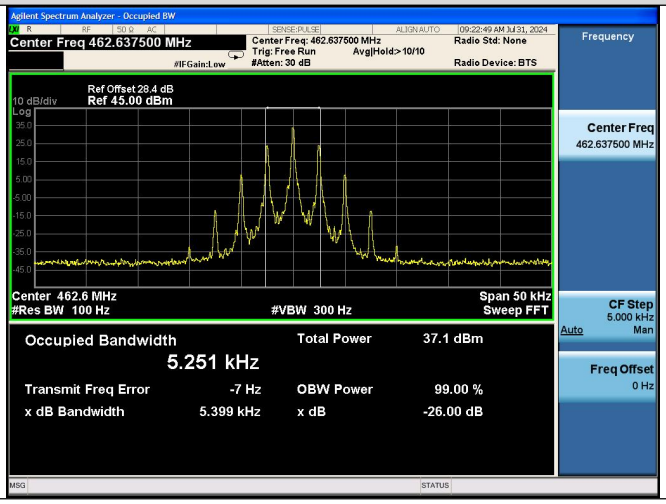
12.5kHz, FM Modulation:462.6500MHz-25W



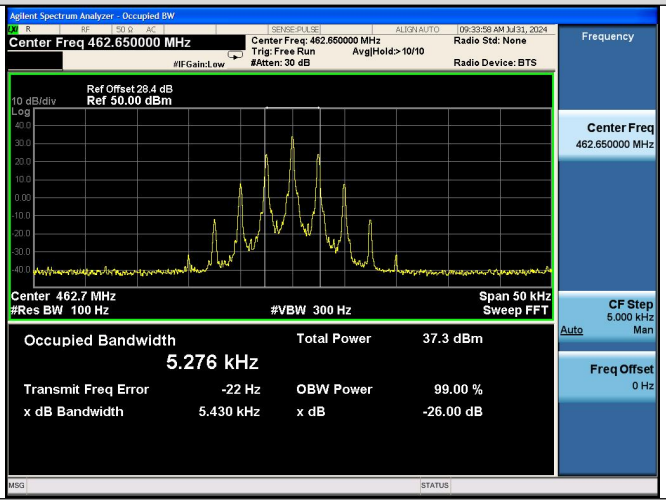
12.5kHz, FM Modulation:467.6500MHz-25W

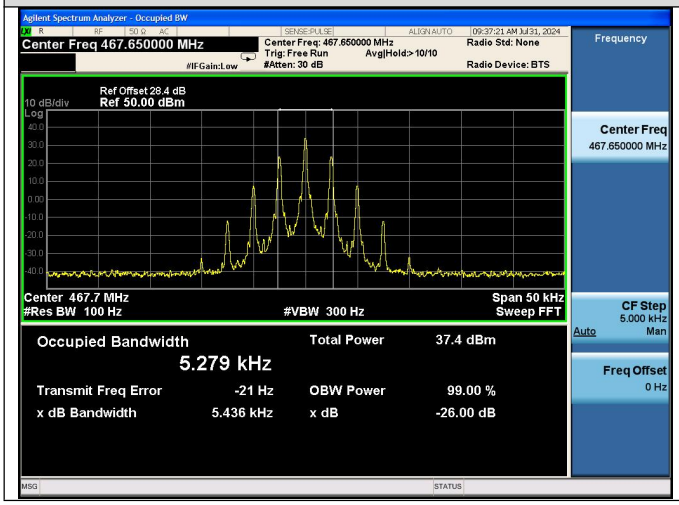


12.5kHz, FM Modulation:462.6375MHz-5W



12.5kHz, FM Modulation:462.6500MHz-5W

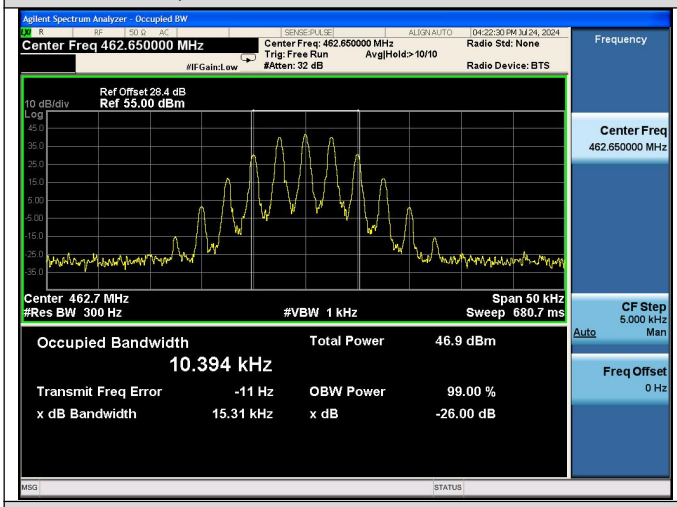


12.5kHz, FM Modulation:467.6500MHz-5W	
	

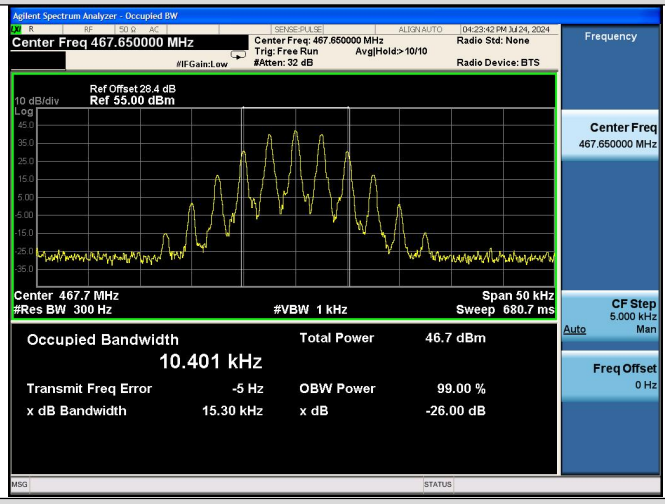
Emission Bandwidth Measurement Result-GMRS				
25 kHz Channel Separation -50W				
Operating Frequency (MHz)	Occupied Bandwidth (kHz)	Emission Bandwidth (kHz)	Limits (kHz)	Result
462.6500	10.394	15.31	20.0	Pass
467.6500	10.401	15.30	20.0	Pass
25 kHz Channel Separation-25W				
Operating Frequency (MHz)	Occupied Bandwidth (kHz)	Emission Bandwidth (kHz)	Limits (kHz)	Result
462.6500	10.374	15.32	20.0	Pass
467.6500	10.348	15.25	20.0	Pass
25 kHz Channel Separation-5W				
Operating Frequency (MHz)	Occupied Bandwidth (kHz)	Emission Bandwidth (kHz)	Limits (kHz)	Result
462.6375	10.370	15.30	20.0	Pass
462.6500	10.364	15.90	20.0	Pass
467.6500	10.352	15.26	20.0	Pass

Test plot as follows:

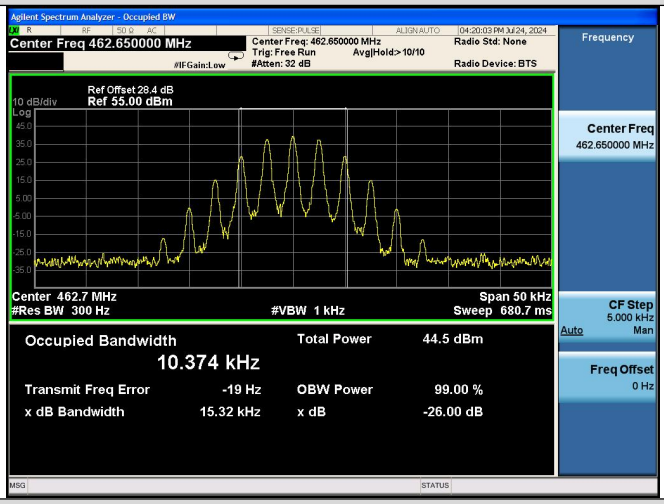
12.5kHz, FM Modulation:462.6500MHz-50W



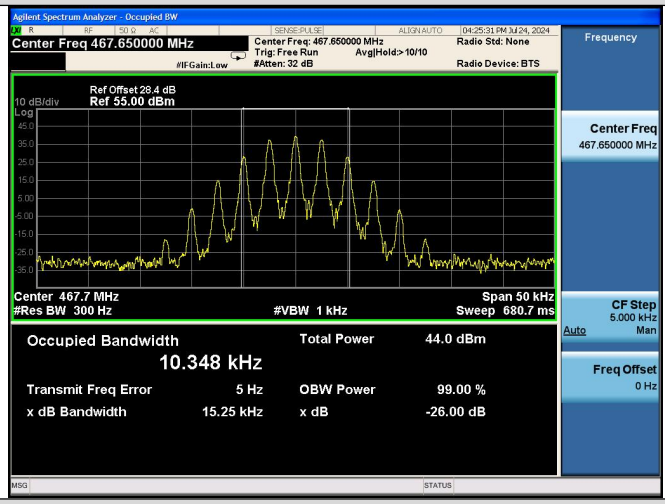
12.5kHz, FM Modulation:467.6500MHz-50W



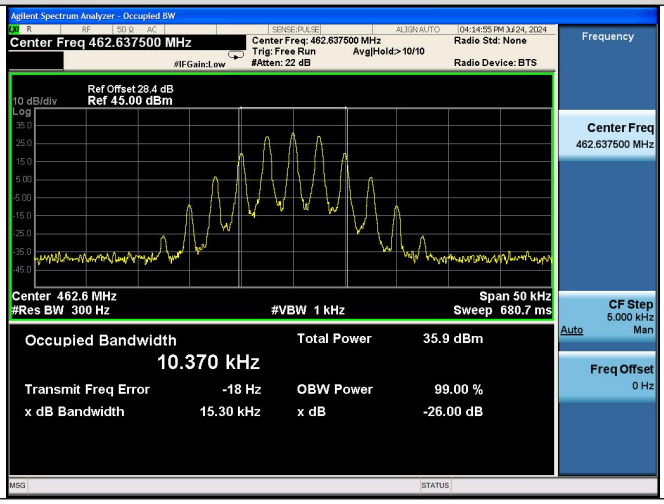
12.5kHz, FM Modulation:462.6500MHz-25W



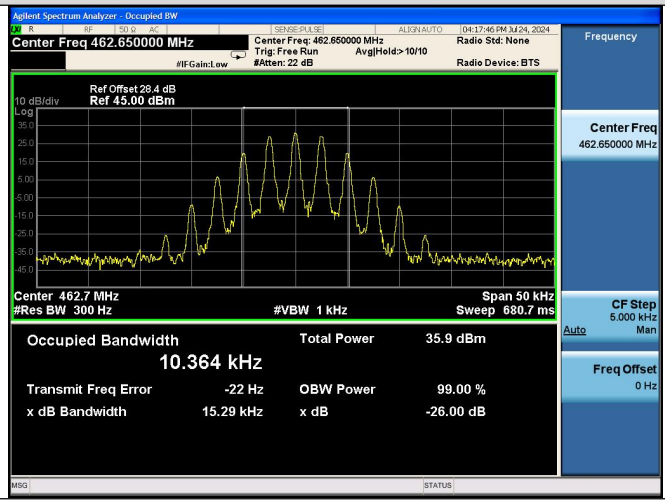
12.5kHz, FM Modulation:467.6500MHz-25W

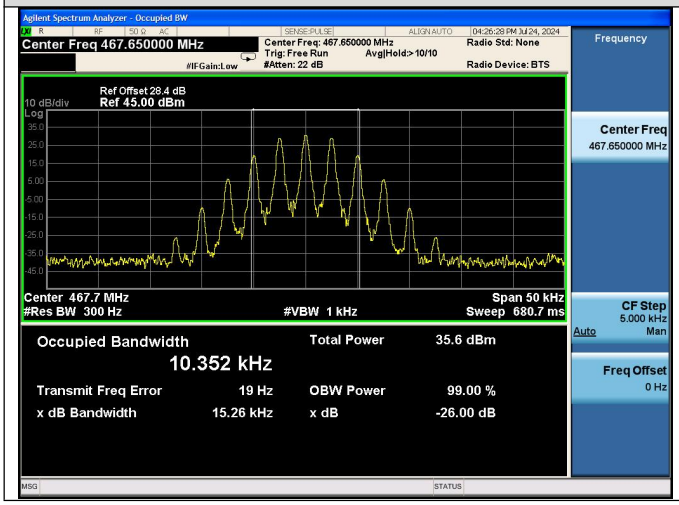


12.5kHz, FM Modulation:462.6375MHz-5W



12.5kHz, FM Modulation:462.6500MHz-5W



12.5kHz, FM Modulation:467.6500MHz-5W	
	

8. Spurious Radiated Emission

8.1 Provisions Applicable

Standard Applicable [FCC Part 95.1779] According to FCC section 95.1779, the unwanted emission should be attenuated below TP by at least 43+10 log (Transmit Power) dB

8.2 Measurement Procedure

Each GMRS transmitter type must be designed to comply with the applicable unwanted emissions limits in this section.

a) Emission masks. Emission masks applicable to transmitting equipment in the GMRS are defined by the requirements in the following table. The numbers in the attenuation requirements column refer to rule paragraph numbers under paragraph (b) of this section.

Emission types filter	Attenuation requirements
A1D, A3E, F1D, G1D, F2D, F3E, G3E with audio filter	(1), (2), (7)
A1D, A3E, F1D, G1D, F3E, G3E without audio filter	(3), (4), (7)
H1D, J1D, R1D, H3E, J3E, R2E	(5), (6), (7)

1) Filtering noted for GMRS transmitters refers to the requirement in §95.1775(e).

2) Unwanted emission power may be measured as either mean power or peak envelope power,provided that the transmitter output power is measured the same way.

b) Attenuation requirements. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

1) 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.

2) 35 dB on any frequency removed from the center of the authorized bandwidth by more than100% up to and including 250% of the authorized bandwidth.

3) 83 log (fd ÷ 5) dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz up to and including 10 kHz.

4) 116 log (fd ÷ 6.1) dB or 50 + 10 log (P) dB, whichever is the lesser attenuation, on any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz), of more than 10 kHz up to and including 250% of the authorized bandwidth.

5) 25 dB on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 150% of the authorized bandwidth.

6) 35 dB on any frequency removed from the center of the authorized bandwidth by more than 150% up to and including 250% of the authorized bandwidth.

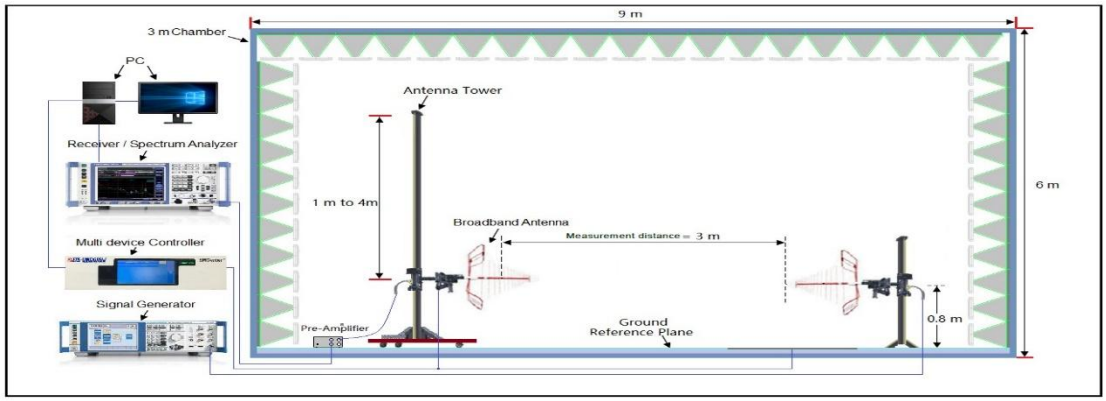
7) 43 + 10 log (P) dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

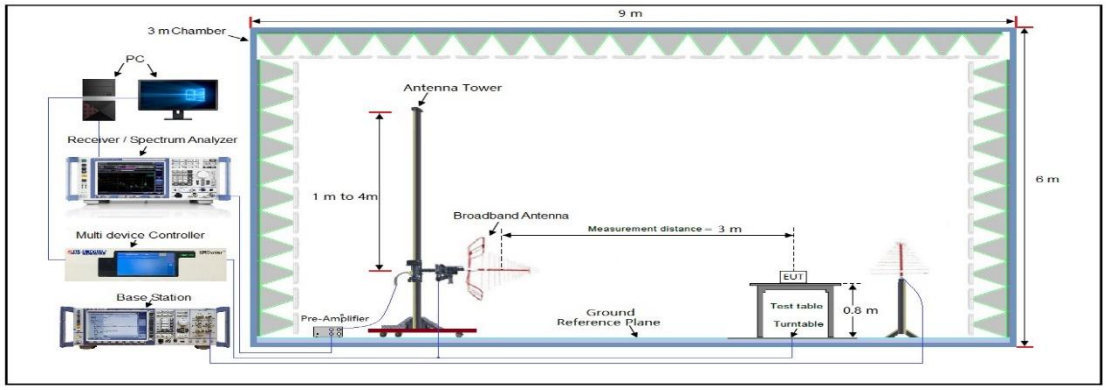
- **Detailed Overview of the Test Method is as Follows:**

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

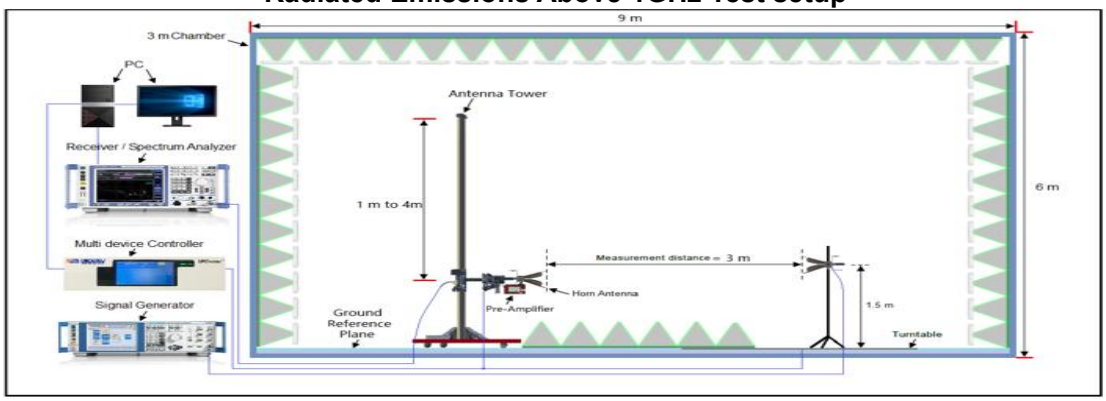
8.3 Measurement Setup

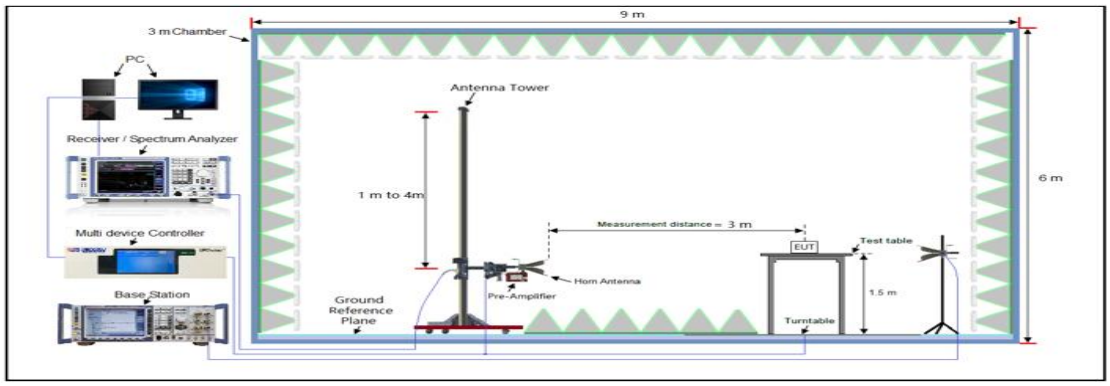
Radiated Emissions 30MHz to 1GHz Test setup





Radiated Emissions Above 1GHz Test setup



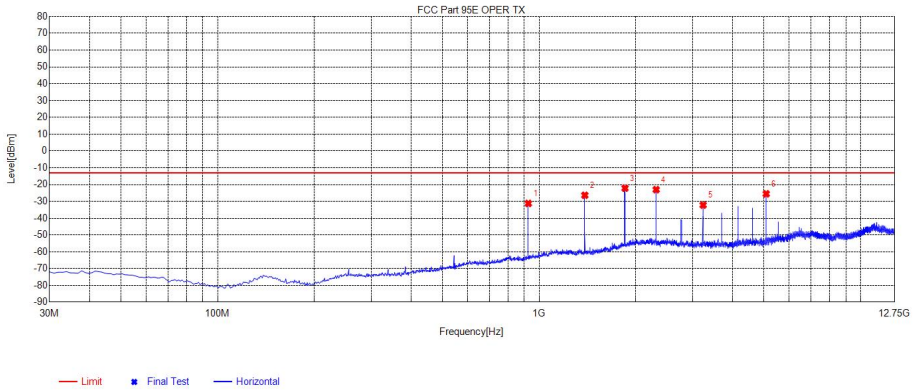


8.4 Measurement Result

Preliminary calculation	Final Result
At least 43+10 log (P) =43+10log (50) =59.99 (dB)	Limit=P- Preliminary calculation=36.99-59.99=-13 dBm
At least 43+10 log (P) =43+10log (25) =56.99 (dB)	Limit=P- Preliminary calculation=43.99-56.99=-13 dBm
At least 43+10 log (P) =43+10log (5) =49.99 (dB)	Limit=P- Preliminary calculation=26.99-49.99=-13 dBm

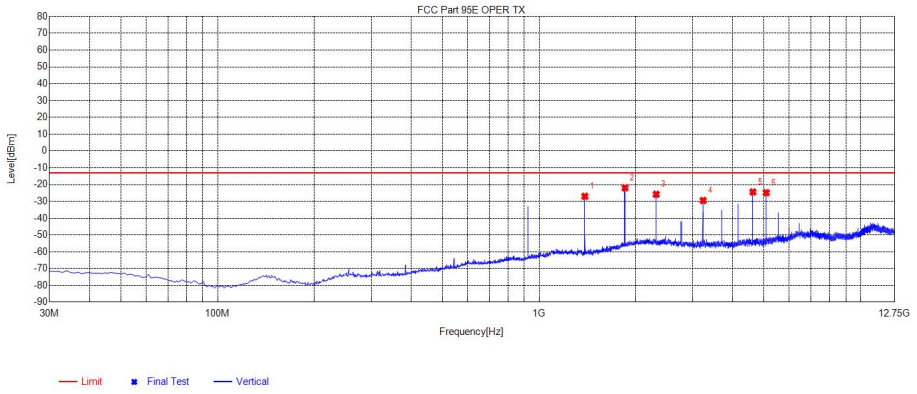
1. Factor=Antenna Factor + Cable loss. (Below 1GHz)
2. Factor=Antenna Factor+ Cable loss -Pre-amplifier. (Above 1 GHz)
3. Margin=Limit- Level

Test Mode:	TX-CH19-12.5kHz-50W	Polarity:	Horizontal



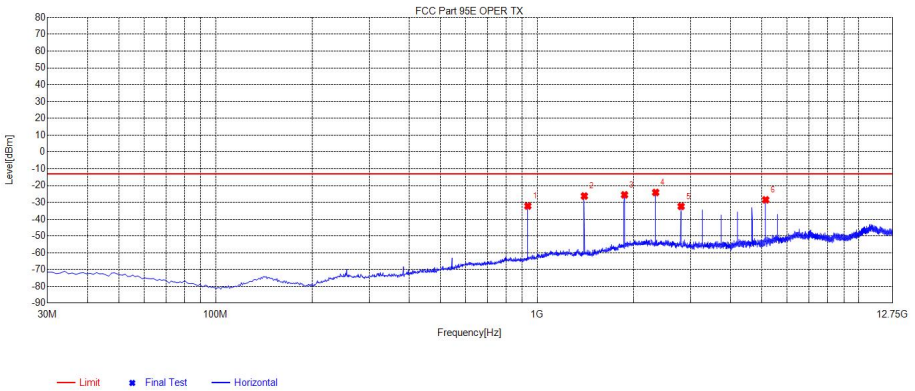
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	926.28	-69.25	-31.20	-13.00	18.20	38.05	304	Horizontal
2	1387.7888	-22.26	-26.37	-13.00	13.37	-4.11	294	Horizontal
3	1850.7851	-22.34	-22.16	-13.00	9.16	0.18	304	Horizontal
4	2313.7814	-25.35	-23.01	-13.00	10.01	2.34	139	Horizontal
5	3238.5989	-34.08	-32.19	-13.00	19.19	1.89	242	Horizontal
6	5089.4089	-30.63	-25.51	-13.00	12.51	5.12	139	Horizontal

Test Mode:	TX-CH19-12.5kHz-50W	Polarity:	Vertical



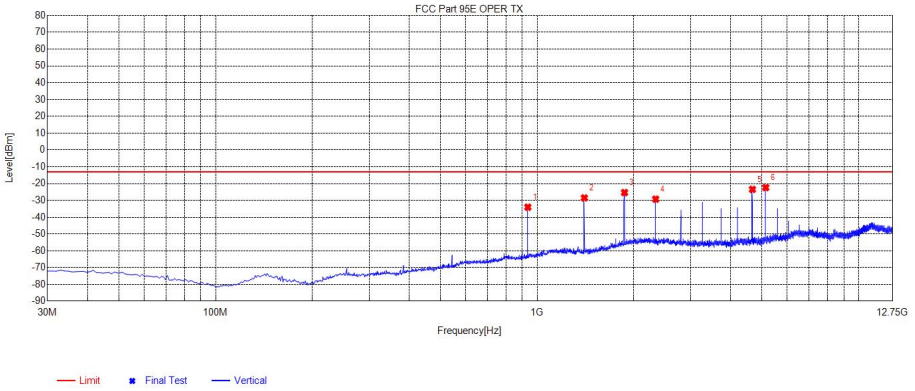
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1387.7888	-22.89	-27.00	-13.00	14.00	-4.11	350	Vertical
2	1850.7851	-22.12	-21.94	-13.00	8.94	0.18	3	Vertical
3	2313.7814	-28.13	-25.79	-13.00	12.79	2.34	128	Vertical
4	3238.5989	-31.36	-29.47	-13.00	16.47	1.89	342	Vertical
5	4626.4126	-28.98	-24.41	-13.00	11.41	4.57	128	Vertical
6	5089.4089	-29.97	-24.85	-13.00	11.85	5.12	148	Vertical

Test Mode:	TX-CH27-12.5kHz-50W	Polarity:	Horizontal



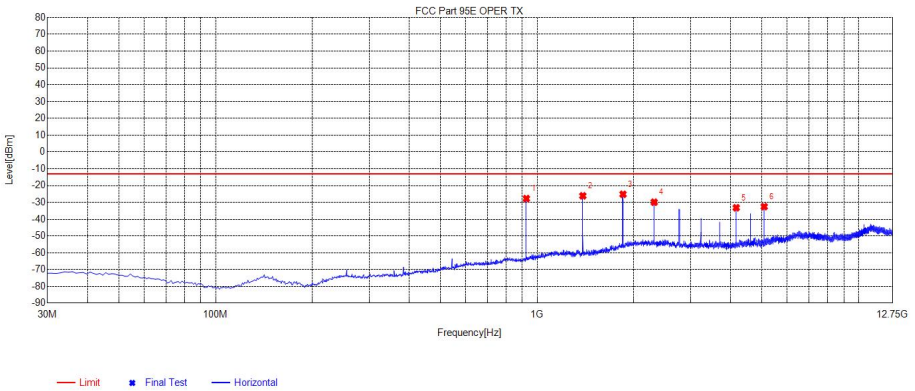
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.98	-70.39	-32.15	-13.00	19.15	38.24	304	Horizontal
2	1403.0653	-22.11	-26.22	-13.00	13.22	-4.11	140	Horizontal
3	1870.7621	-25.94	-25.51	-13.00	12.51	0.43	294	Horizontal
4	2338.4588	-26.49	-24.12	-13.00	11.12	2.37	140	Horizontal
5	2806.1556	-34.26	-32.35	-13.00	19.35	1.91	253	Horizontal
6	5144.6395	-33.68	-28.47	-13.00	15.47	5.21	314	Horizontal

Test Mode:	TX-CH27-12.5kHz-50W	Polarity:	Vertical



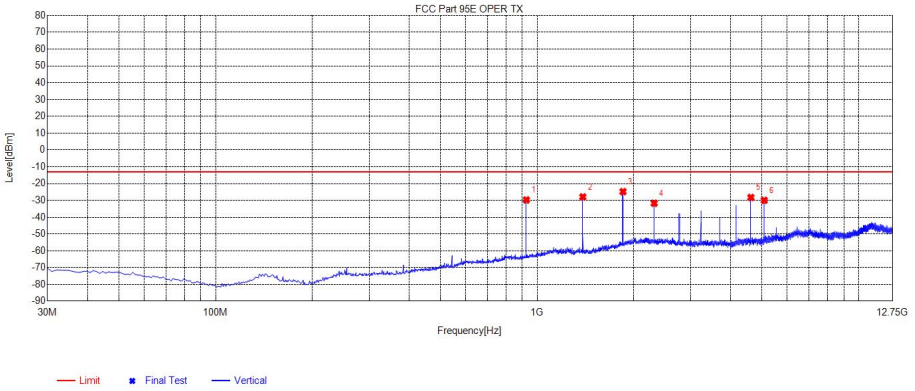
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.98	-72.29	-34.05	-13.00	21.05	38.24	320	Vertical
2	1403.0653	-24.41	-28.52	-13.00	15.52	-4.11	320	Vertical
3	1870.7621	-25.78	-25.35	-13.00	12.35	0.43	330	Vertical
4	2338.4588	-31.65	-29.28	-13.00	16.28	2.37	154	Vertical
5	4676.9427	-28.06	-23.44	-13.00	10.44	4.62	154	Vertical
6	5144.6395	-27.60	-22.39	-13.00	9.39	5.21	216	Vertical

Test Mode:	TX-CH19-12.5kHz-25W	Polarity:	Horizontal



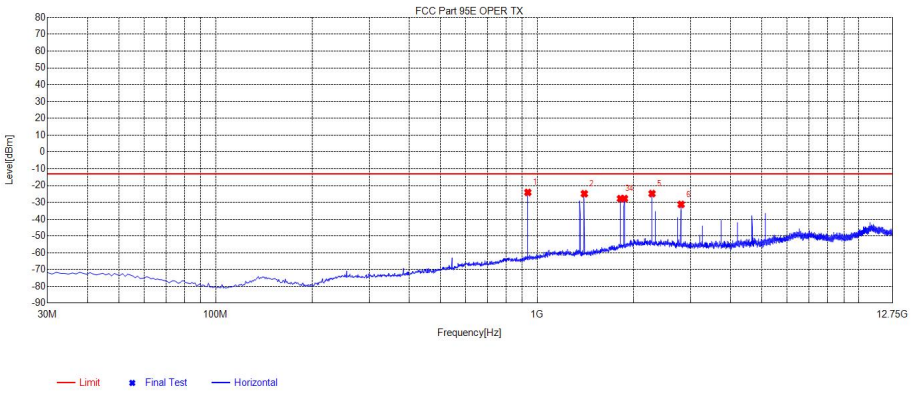
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	926.28	-65.80	-27.75	-13.00	14.75	38.05	311	Horizontal
2	1387.7888	-21.99	-26.10	-13.00	13.10	-4.11	125	Horizontal
3	1850.7851	-25.36	-25.18	-13.00	12.18	0.18	301	Horizontal
4	2313.7814	-32.22	-29.88	-13.00	16.88	2.34	135	Horizontal
5	4164.5915	-36.34	-33.20	-13.00	20.20	3.14	135	Horizontal
6	5089.4089	-37.64	-32.52	-13.00	19.52	5.12	146	Horizontal

Test Mode:	TX-CH19-12.5kHz-25W	Polarity:	Vertical



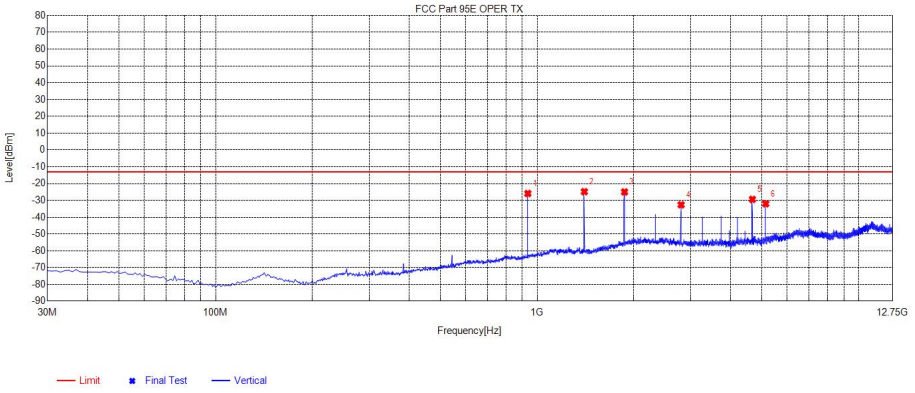
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	926.28	-67.79	-29.74	-13.00	16.74	38.05	323	Vertical
2	1387.7888	-23.83	-27.94	-13.00	14.94	-4.11	350	Vertical
3	1850.7851	-24.98	-24.80	-13.00	11.80	0.18	2	Vertical
4	2313.7814	-34.05	-31.71	-13.00	18.71	2.34	2	Vertical
5	4626.4126	-32.81	-28.24	-13.00	15.24	4.57	153	Vertical
6	5089.4089	-35.08	-29.96	-13.00	16.96	5.12	142	Vertical

Test Mode:	TX-CH27-12.5kHz-25W	Polarity:	Horizontal



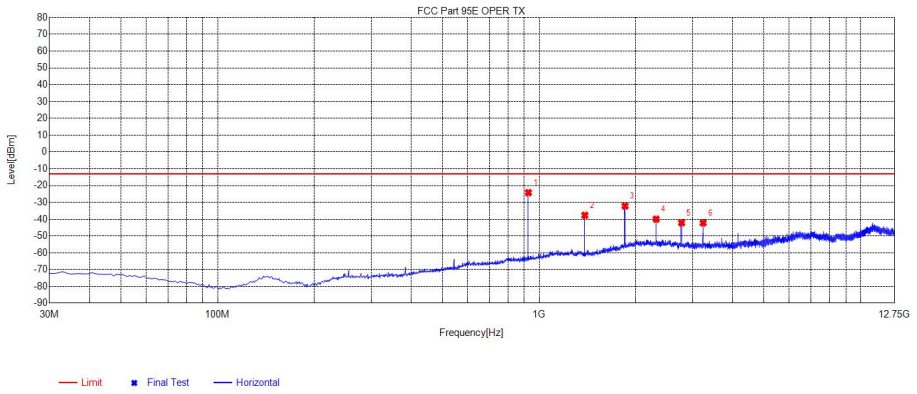
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.98	-62.32	-24.08	-13.00	11.08	38.24	304	Horizontal
2	1403.0653	-20.73	-24.84	-13.00	11.84	-4.11	180	Horizontal
3	1816.7067	-27.54	-27.77	-13.00	14.77	-0.23	138	Horizontal
4	1870.7621	-28.17	-27.74	-13.00	14.74	0.43	293	Horizontal
5	2278.5279	-27.07	-24.77	-13.00	11.77	2.30	138	Horizontal
6	2806.1556	-33.10	-31.19	-13.00	18.19	1.91	252	Horizontal

Test Mode:	TX-CH27-12.5kHz-25W	Polarity:	Vertical



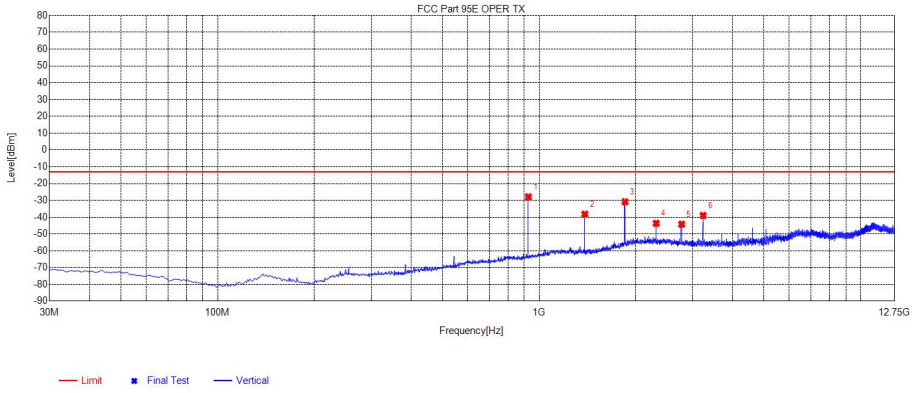
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.98	-64.13	-25.89	-13.00	12.89	38.24	322	Vertical
2	1403.0653	-20.70	-24.81	-13.00	11.81	-4.11	341	Vertical
3	1870.7621	-25.40	-24.97	-13.00	11.97	0.43	341	Vertical
4	2806.1556	-34.53	-32.62	-13.00	19.62	1.91	270	Vertical
5	4676.9427	-34.03	-29.41	-13.00	16.41	4.62	156	Vertical
6	5144.6395	-37.21	-32.00	-13.00	19.00	5.21	208	Vertical

Test Mode:	TX-CH4-12.5kHz-5W	Polarity:	Horizontal



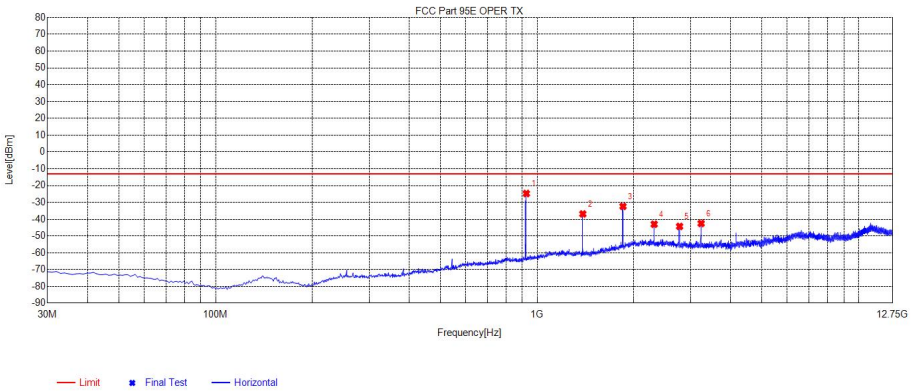
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	926.28	-62.25	-24.20	-13.00	11.20	38.05	303	Horizontal
2	1387.7888	-33.57	-37.68	-13.00	24.68	-4.11	168	Horizontal
3	1850.7851	-32.32	-32.14	-13.00	19.14	0.18	303	Horizontal
4	2313.7814	-42.31	-39.97	-13.00	26.97	2.34	120	Horizontal
5	2775.6026	-44.13	-42.16	-13.00	29.16	1.97	282	Horizontal
6	3238.5989	-44.10	-42.21	-13.00	29.21	1.89	120	Horizontal

Test Mode:	TX-CH4-12.5kHz-5W	Polarity:	Vertical



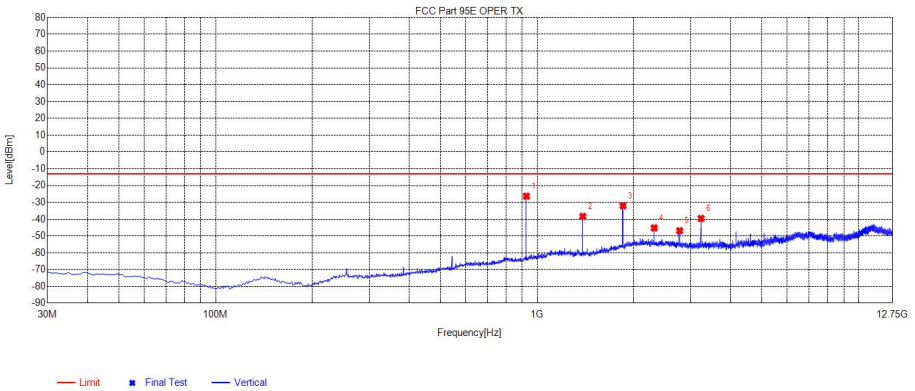
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	926.28	-66.03	-27.98	-13.00	14.98	38.05	207	Vertical
2	1387.7888	-34.13	-38.24	-13.00	25.24	-4.11	167	Vertical
3	1850.7851	-31.06	-30.88	-13.00	17.88	0.18	332	Vertical
4	2313.7814	-46.01	-43.67	-13.00	30.67	2.34	187	Vertical
5	2776.7777	-46.14	-44.17	-13.00	31.17	1.97	332	Vertical
6	3238.5989	-40.90	-39.01	-13.00	26.01	1.89	301	Vertical

Test Mode:	TX-CH19-12.5kHz-5W	Polarity:	Horizontal



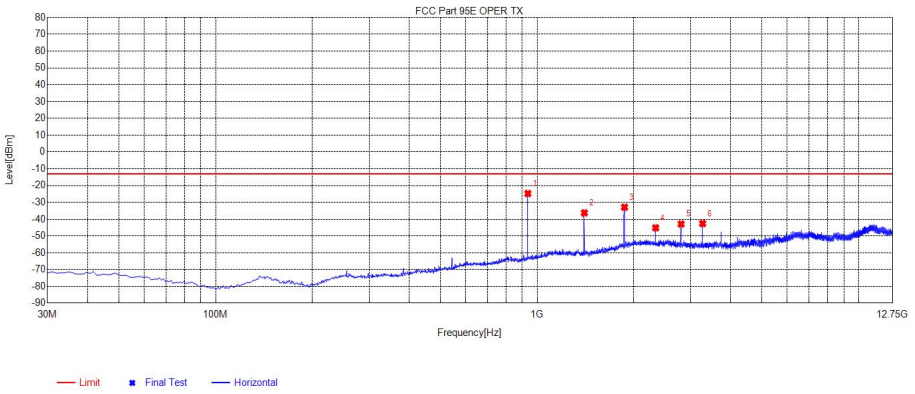
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	926.28	-62.77	-24.72	-13.00	11.72	38.05	307	Horizontal
2	1387.7888	-32.77	-36.88	-13.00	23.88	-4.11	173	Horizontal
3	1850.7851	-32.53	-32.35	-13.00	19.35	0.18	297	Horizontal
4	2313.7814	-45.34	-43.00	-13.00	30.00	2.34	111	Horizontal
5	2775.6026	-46.26	-44.29	-13.00	31.29	1.97	255	Horizontal
6	3238.5989	-44.41	-42.52	-13.00	29.52	1.89	297	Horizontal

Test Mode:	TX-CH19-12.5kHz-5W	Polarity:	Vertical



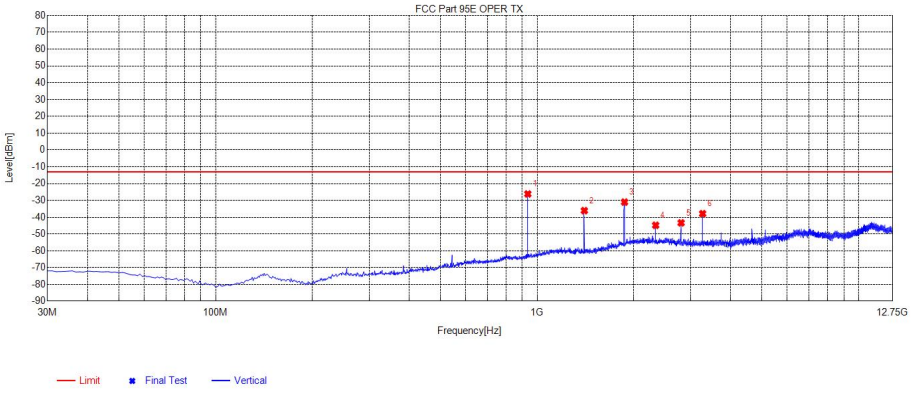
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	926.28	-64.35	-26.30	-13.00	13.30	38.05	322	Vertical
2	1387.7888	-34.25	-38.36	-13.00	25.36	-4.11	170	Vertical
3	1850.7851	-32.18	-32.00	-13.00	19.00	0.18	333	Vertical
4	2313.7814	-47.52	-45.18	-13.00	32.18	2.34	191	Vertical
5	2775.6026	-48.83	-46.86	-13.00	33.86	1.97	350	Vertical
6	3238.5989	-41.45	-39.56	-13.00	26.56	1.89	301	Vertical

Test Mode:	TX-CH27-12.5kHz-5W	Polarity:	Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.98	-62.97	-24.73	-13.00	11.73	38.24	306	Horizontal
2	1403.0653	-32.14	-36.25	-13.00	23.25	-4.11	224	Horizontal
3	1870.7621	-33.32	-32.89	-13.00	19.89	0.43	296	Horizontal
4	2338.4588	-47.51	-45.14	-13.00	32.14	2.37	120	Horizontal
5	2806.1556	-44.78	-42.87	-13.00	29.87	1.91	245	Horizontal
6	3273.8524	-44.52	-42.58	-13.00	29.58	1.94	120	Horizontal

Test Mode:	TX-CH27-12.5kHz-5W	Polarity:	Vertical



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	935.98	-64.42	-26.18	-13.00	13.18	38.24	323	Vertical
2	1403.0653	-31.99	-36.10	-13.00	23.10	-4.11	158	Vertical
3	1870.7621	-31.46	-31.03	-13.00	18.03	0.43	333	Vertical
4	2338.4588	-47.19	-44.82	-13.00	31.82	2.37	189	Vertical
5	2806.1556	-45.29	-43.38	-13.00	30.38	1.91	271	Vertical
6	3273.8524	-39.85	-37.91	-13.00	24.91	1.94	302	Vertical