
FCC Test Report

Report No.: AGC05067251001FR01

FCC ID : MMABR200S

APPLICATION PURPOSE : Original Equipment

PRODUCT DESIGNATION : BUSINESS BAND TWO-WAY RADIO

BRAND NAME : Midland

MODEL NAME : BR200S

APPLICANT : Midland Radio Corporation

DATE OF ISSUE : Dec. 01, 2025

STANDARD(S) : FCC Part 90 Subpart I

REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Dec. 01, 2025	Valid	Initial Release

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1. General Information

Applicant	Midland Radio Corporation
Address	5900 Parretta Drive Kansas City Missouri 64120-2134 United States
Manufacturer	Midland Radio Corporation
Address	5900 Parretta Drive Kansas City Missouri 64120-2134 United States
Factory	Guangdong Samzuk Technology Co.,Ltd
Address	2/F of Ming Huang Electrical Park 3rd Science Road, High-Tech Zone Heyuan City Guangdong China
Product Designation	BUSINESS BAND TWO-WAY RADIO
Brand Name	Midland
Test Model	BR200S
Series Model(s)	N/A
Difference Description	N/A
Date of receipt of test item	Oct. 11, 2025
Date of Test	Oct. 11, 2025~Nov. 25, 2025
Deviation from Standard	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Test Report Form No	AGCER-FCC-PMR-V1

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

Prepared By



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(Project Engineer)

Dec. 01, 2025

Reviewed By



Jack Gui
(Reviewer)

Dec. 01, 2025

Approved By



Angela Li
(Authorized Officer)

Dec. 01, 2025

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2. Product Information

2.1 Product Technical Description

Communication Type	Voice / Tone only
Operation Frequency Range	From 451.1875MHz to 469.5625MHz--UHF
Hardware Version	V1.0
Software Version	V1.0
Modulation Type	FM
Channel Separation	12.5 kHz
Emission Designator	5K28F3E
Rated Output Power	2W (It was fixed by the manufacturer, any individual can't arbitrarily change it.)
Maximum Transmitter Power	33.533dBm
Antenna Designation	Detachable Antenna
Antenna Gain	1.5dBi
Frequency Tolerance	1.057ppm
Power Supply	DC 3.7V1800mAh by battery

Note:

The product has the same digital working characters when operating in both two digitized voice/data mode. So only one set of test results for digital modulation modes are provided in this test report.

2.2 Test Frequency List

Operation mode	Channel Separation	Operation Frequency Range	Test channel	Test Frequency
Analog	12.5 kHz	451.1875-469.5625MHz	Bottom	451.18750 MHz
	12.5 kHz	451.1875-469.5625MHz	Middle	456.18750 MHz
	12.5 kHz	451.1875-469.5625MHz	Middle	461.03750 MHz
	12.5 kHz	451.1875-469.5625MHz	Top	469.56250 MHz

Note:

In section KDB 634817 D01 Sections II) (f) (1) and (2):

Test at least one frequency in each band for each rule part applied under and ensure the device is capable of operating on the frequency under each rule part. This requirement may result in testing on multiple frequencies. Testing on one frequency may be acceptable if multiple listed bands for a rule part with a continuous frequency range are split to remove a conflict with other rules and the technical requirements in the split bands are the same. Additional requirements for RF exposure may apply.

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2.3 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: **MMABR200S**, filing to comply with Part 2, Part 90 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 90	Private Land Mobile Radio Services
2	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
3	ANSI/TIA-603-E-2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
4	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
5	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v03r01
6	KDB 579009 D03	KDB 579009 D03 Applications Part 90 Refarming Bands v01
7	KDB 634817 D01	KDB 634817 D01 Freq Range Listing for Grants v04r01

2.5 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.

$$BW = 2(M+D) = 2*(3.0 \text{ kHz} + 2.5 \text{ kHz}) = 11 \text{ kHz} = 11K0$$

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 Digital Mode (Channel Spacing: 12.5 kHz)

Emission Designator 7K60F1D and 7K60F1W

The 99% energy rule was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.60 kHz.

F1D and F1W portion of the designator indicates digital information.

Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1W.

2.6 Special Accessories

Not available for this EUT intended for grant.

2.7 Equipment Modifications

Not available for this EUT intended for grant.

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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 (°C)	15 - 35	-20 - 50
Relative humidity range	20 % - 75 %	20 % - 75 %
Pressure range (kPa)	86 - 106	86 - 106
Power supply	DC 3.7V	LV DC 3.15V/ HV DC 4.2V

Note: The Extreme Temperature and Extreme Voltages declared by the manufacturer.

3.4 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded 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	$\pm 0.5\%$
Transmitter power conducted	$\pm 0.8\text{dB}$
Transmitter power Radiated	$\pm 1.3\text{dB}$
Conducted spurious emission 9kHz-40 GHz	$\pm 2.7\text{dB}$
Conducted Emission	$\pm 3.2\text{ dB}$
Radiated Emission below 1GHz	$\pm 3.9\text{ dB}$
Radiated Emission above 1GHz	$\pm 4.8\text{ dB}$
Occupied Channel Bandwidth	$\pm 2\%$
FM deviation	$\pm 2\%$
Audio level	$\pm 0.98\text{dB}$
Low Pass Filter Response	$\pm 0.65\text{dB}$
Modulation Limiting	0.42%
Transient Frequency Behavior	6.8%

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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	2025-05-08	2026-05-07
☒	AGC-EM-E002	Wireless Connectivity Tester	HP	8920B	US35010161	2025-05-08	2026-05-07
☒	AGC-ER-E075	Small Environmental Tester	SH-242	ESPEC	93008290	2024-07-24	2026-07-23
☒	AGC-EM-A007	30dB Attenuator	Weinachel	58-30-33	ML030	2025-05-31	2027-05-30
☐	AGC-EM-E001	Digital Connectivity Tester	Aeroflex	3920B	N/A	2025-05-09	2027-05-08
☒	--	RF Connection Cable	N/A	1#	N/A	Each time	N/A
☒	--	RF Connection Cable	N/A	2#	N/A	Each time	N/A
☒	AGC-ER-A004	Power Splitter	Agilent	11667B	N/A	2025-05-08	2027-05-07

● 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	2025-01-14	2026-01-13
☒	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2025-05-08	2026-05-07
☒	AGC-EM-E001	Wideband Antenna	SCHWARZBECK	VULB9168	D69250	2025-03-14	2027-03-13
☒	AGC-EM-E005	Wideband Antenna	SCHWARZBECK	VULB9168	VULB9168-494	2025-01-15	2027-01-14
☒	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2025-03-27	2026-03-26
☒	AGC-EM-E102	Broadband Ridged Horn Antenna	ETS	3117	00154520	2025-05-18	2026-05-17
☒	AGC-EM-E146	Pre-amplifier	ETS	3117-PA	00246148	2024-07-24	2026-07-23
☐	AGC-EM-E021	Pre-amplifier	MITEQ	AM-4A-000115	1465421	2024-05-28	2026-05-27
☒	AGC-ER-E037	Signal Generator	Agilent	N5182A	MY50140530	2025-05-08	2026-05-07
☐	AGC-EM-A139	6dB Attenuator	Eeatsheep	LM-XX-6-1W	N/A	2025-05-16	2027-05-15
☒	AGC-EM-A088	UHF Filter	Microwave	N25155M2	498705	2025-05-21	2026-05-20

● Test Software					
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Version Information
☒	AGC-EM-S011	RSE Test System	Tonscend	TS ⁺ Ver2.1(JS36-RSE)	4.0.0.0

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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

No.	Equipment	Model No.	Manufacturer	Specification Information	Cable
1	Battery	BRB200	Midland Radio Corporation	DC 3.7V 1800mAh	--
2	Adapter	AK36WG-0500600W2	MIDLAND	Input: AC 100-240V 50/60Hz, 1.0A Output: DC 5V 6.0A	1.0m unshielded
3	DESKTOP CHARGER	BDC200	MIDLAND	Input: DC 5V 1A Output: DC 4.2V	
4	MULTI UNIT CHARGER	BGC200	MIDLAND	Input: DC 5.0V 6.0A Output: DC 4.2V	

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4.5 Summary of Test Results

Item	FCC Rules	Description of Test	Result
1	47 CFR FCC PART 90	Antenna Equipment	Pass
2	§90.205& 2.1046	Maximum Transmitter Power	Pass
3	§90.207& 2.1047	Modulation Characteristic	Pass
4	§2.1047	Audio Low Pass Filter Response	Pass
5	§90.209& 2.1049	26dB Emission Bandwidth and 99% Occupied Bandwidth	Pass
6	§90.210& 2.1049	Emission Mask	Pass
7	§90.213& 2.1055	Frequency Tolerance	Pass
8	§90.214	Transmitter Frequency Behavior	Pass
9	§90.210& 2.1051	Spurious Emission on Antenna Port	Pass
10	§90.210& 2.1053	Spurious Radiated Emission	Pass

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5. Description of Test Modes

The EUT (**BUSINESS BAND TWO-WAY RADIO**) has been tested under normal operating condition. (The top channel, the middle channel and the bottom channel) are chosen for testing at each channel separation.

No.	Test Mode Description	Channel Separation
1	TX Bottom channel-UHF	12.5 kHz
2	TX Middle channel-UHF	12.5 kHz
3	TX Middle channel-UHF	12.5 kHz
4	TX Top channel-UHF	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. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
5. Manufacturers use computer PC programming software to switch and operate frequency points, refer to the instructions for details

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6. Frequency Stability

6.1 Provisions Applicable

- According to FCC §2.1055, §90.213, the frequency stability shall be measured with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$ centigrade.
- According to FCC Part 2 Section 2.1055(d)(2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacturer.
- According to FCC Part 90 Section 90.213, the frequency tolerance must be maintained within 0.00025% for 12.5 kHz channel separation and 0.0001% for 6.25 kHz channel separation.

6.2 Measurement Procedure

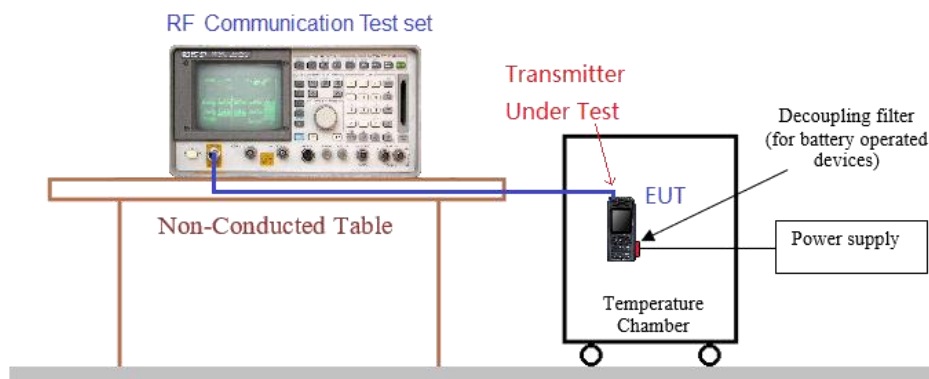
6.2.1 Frequency stability versus environmental temperature

- Setup the configuration per figure 1 for frequencies measurement inside an environment chamber, Install new battery in the EUT.
- 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.
- Set the temperature of chamber to 50°C . 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.
- Repeat step 2 with a 10°C decreased per stage until the lowest temperature -30°C is measured, record all measured frequencies on each temperature step.

6.2.2 Frequency stability versus input voltage

- Setup the configuration per figure 1 for frequencies measured at temperature if it is within 15°C to 25°C . Otherwise, an environment chamber set for a temperature of 20°C shall be used. The EUT shall be powered by DC 3.7V.
- 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.
- Supply the EUT primary voltage at the operating end point which is specified by manufacturer and record the frequency.

6.3 Measurement Setup



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6.4 Measurement Result

12.5 kHz Channel Separation, Analog modulation, Assigned Frequency For UHF							
Test conditions		Frequency error (ppm)				Limit (ppm)	Result
Voltage (V)	Temp (°C)	Test Frequency (MHz)					
		451.18750	456.18750	461.03750	469.56250		
3.70	-30	1.014	1.032	0.936	0.350	2.5	Pass
	-20	0.604	0.672	0.649	0.404		
	-10	0.510	1.001	0.877	0.602		
	0	0.863	0.973	0.552	0.660		
	10	0.749	0.789	0.769	0.895		
	20	0.552	0.838	1.057	0.374		
	30	0.814	0.912	0.875	0.508		
	40	0.872	0.807	0.740	0.473		
	50	0.850	0.662	0.603	0.559		
4.20	20	0.844	0.929	0.576	0.385		
3.15	20	0.546	0.580	0.635	0.990		

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7. 26dB Emission Bandwidth and 99% Occupied Bandwidth

7.1 Provisions Applicable

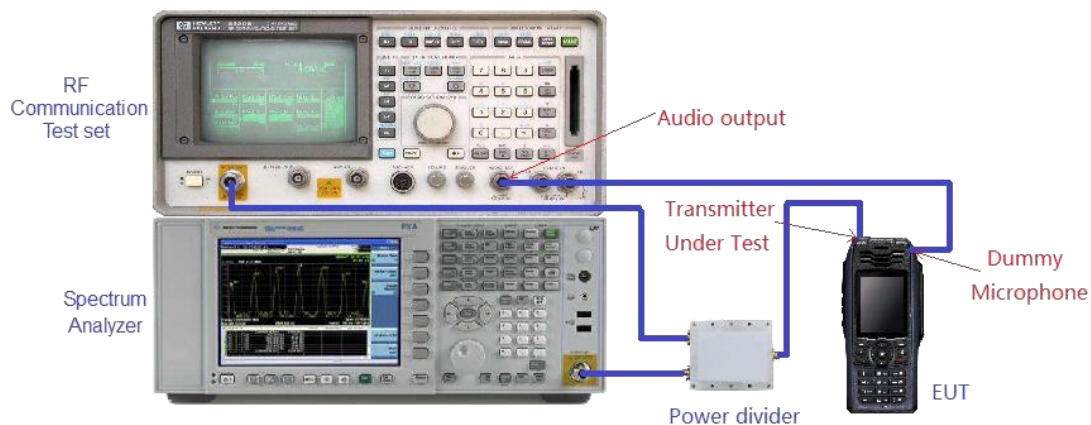
FCC Part 90.209 & FCC Part 2.1049:

The authorized bandwidth shall be 11.25 kHz for 12.5 kHz channel separation and 6 kHz for 6.25 kHz channel separation.

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. Rated system deviation is 2.5 kHz for 12.5kHz channel spacing.
3. Spectrum set as follow:
4. Centre frequency = fundamental frequency.
5. Span=50kHz for 12.5kHz channel spacing.
6. RBW=100Hz, VBW=300Hz, Sweep = auto.
7. Detector function = peak, Trace = max hold.
8. Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
9. Measure and record the results in the test report.

7.3 Measurement Setup

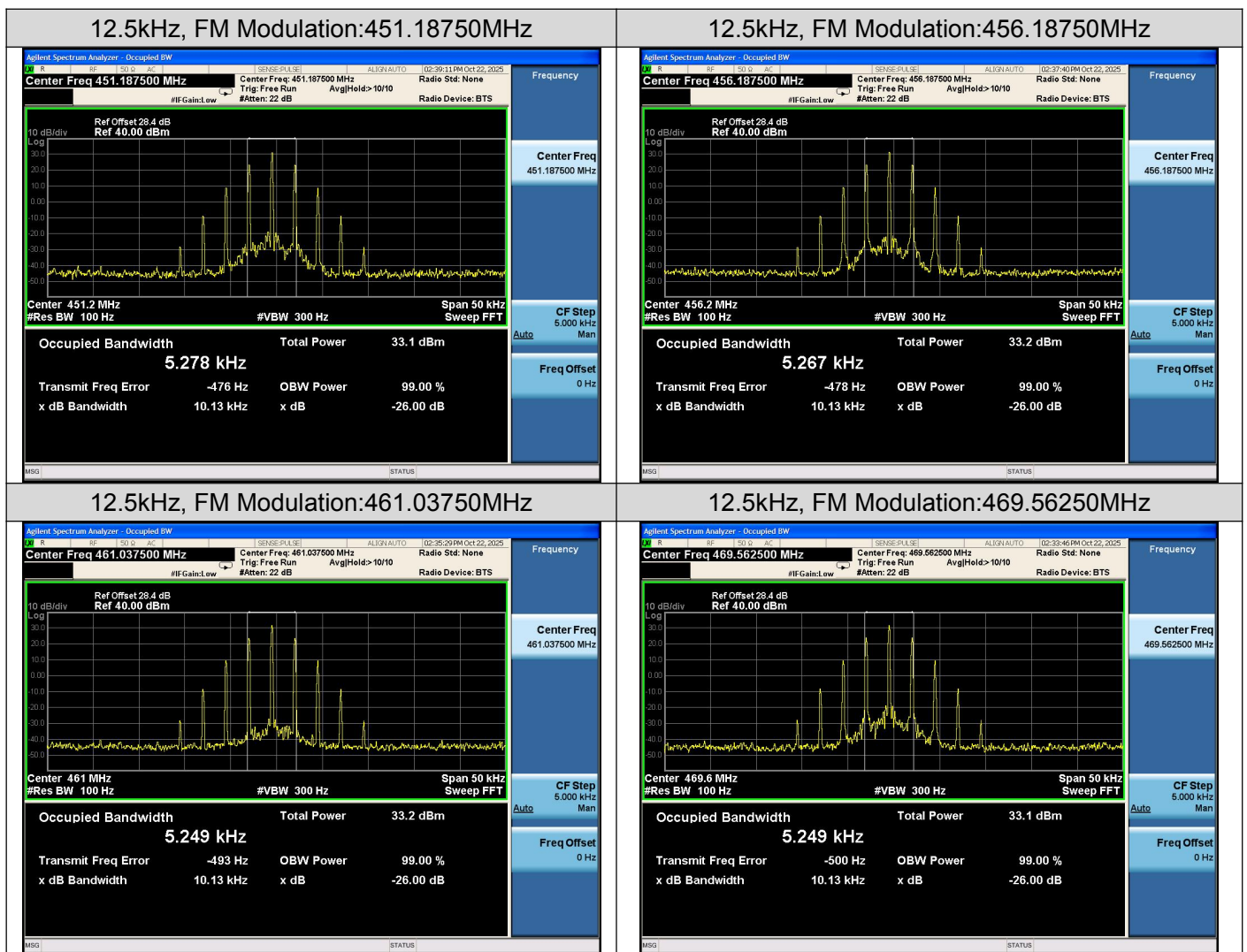


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7.4 Measurement Result

Measurement Result of UHF-Analog Modulation				
Operating Frequency	12.5 kHz Channel Separation			
	Occupied Bandwidth	Emission Bandwidth	Limits	Result
451.18750MHz	5.278 kHz	10.13 kHz	11.25 kHz	Pass
456.18750MHz	5.267 kHz	10.13 kHz	11.25 kHz	Pass
461.03750MHz	5.249 kHz	10.13 kHz	11.25 kHz	Pass
469.56250MHz	5.249 kHz	10.13 kHz	11.25 kHz	Pass

Test plot as follows:



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8. Spurious Radiated Emission

8.1 Provisions Applicable

According to FCC §2.1053 and §90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with each channel separation.

Emission Mask D -for 12.5 kHz Channel Separation:

- (1) On any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement Frequency (f_d in kHz) f_0 of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement Frequency (f_d in kHz) f_0 of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is lesser attenuation.

8.2 Measurement Procedure

1. On a test site, the EUT shall be placed on a 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.

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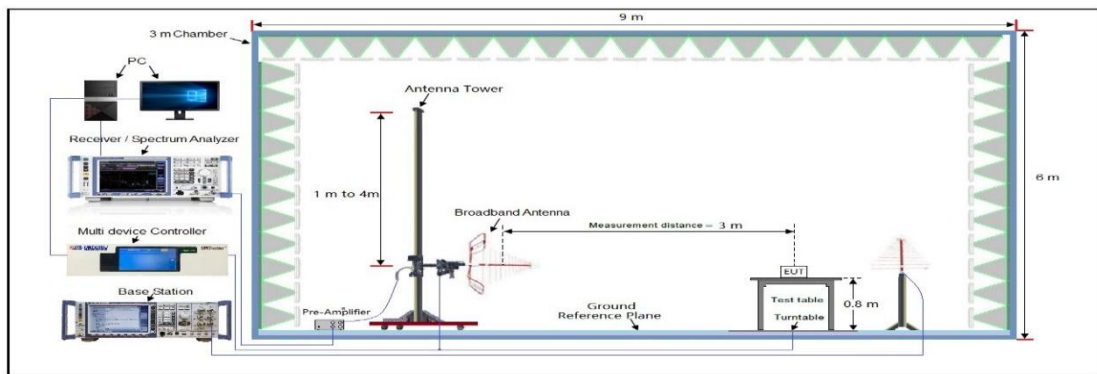
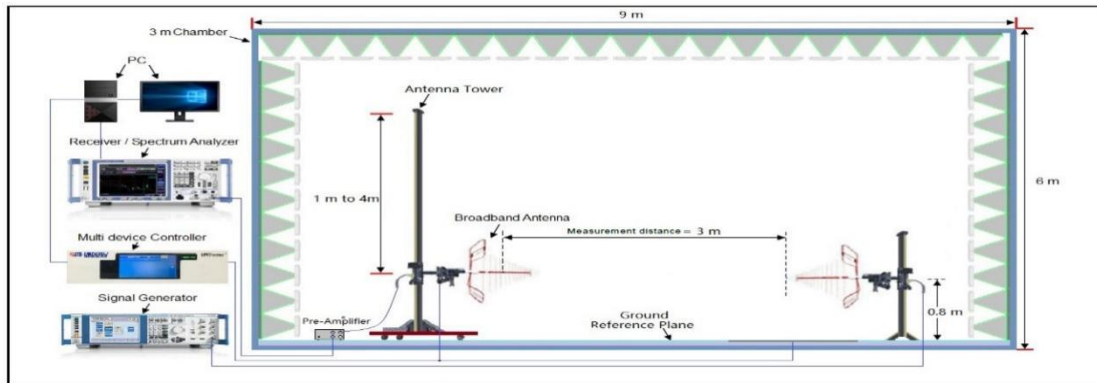
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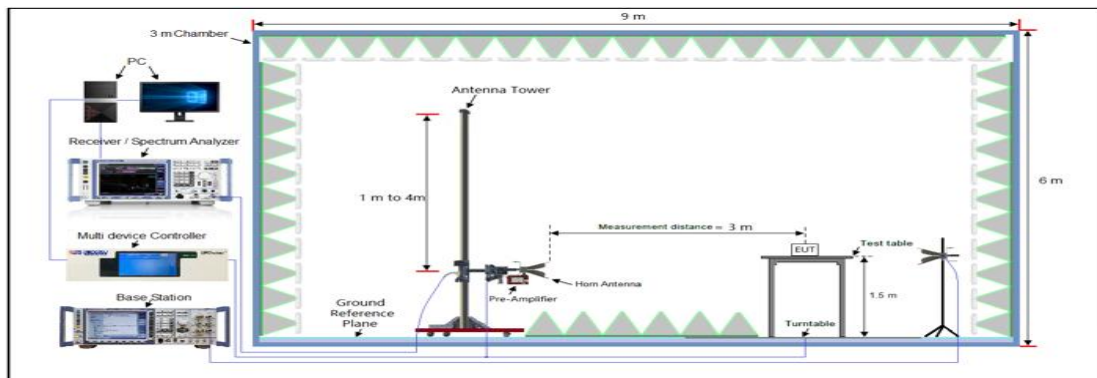
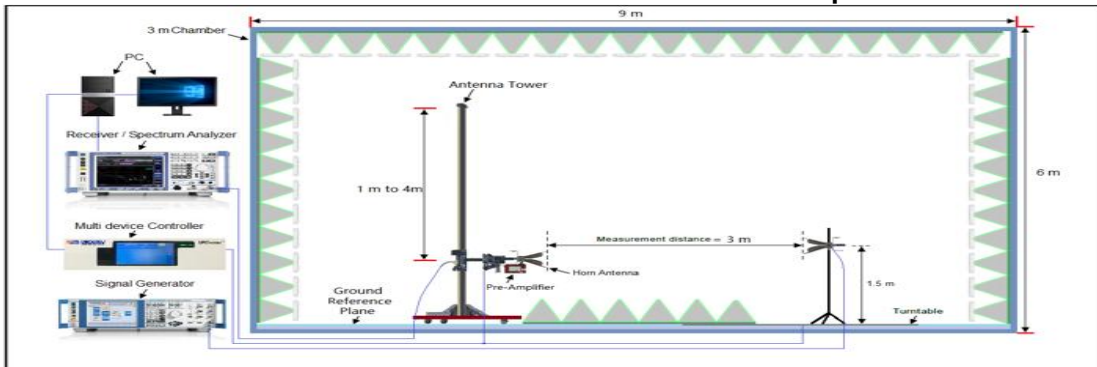
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: <http://www.agccert.com/>

8.3 Measurement Setup

Radiated Emissions 30MHz to 1GHz Test setup



Radiated Emissions Above 1GHz Test setup



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8.4 Measurement Result

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz, and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10 harmonic.

In the semi-anechoic chamber, setup as illustrated above the DUT placed on the 0.8m height of Turn Table, rotated the table 45 degree each interval to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power for each degree interval. The “Read Value” is the spectrum reading of maximum power value.

The substitution antenna is substituted for DUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the Measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.

EIRP = “Read Value” + Measured substitution value + 2.15.

Test limit calculation:

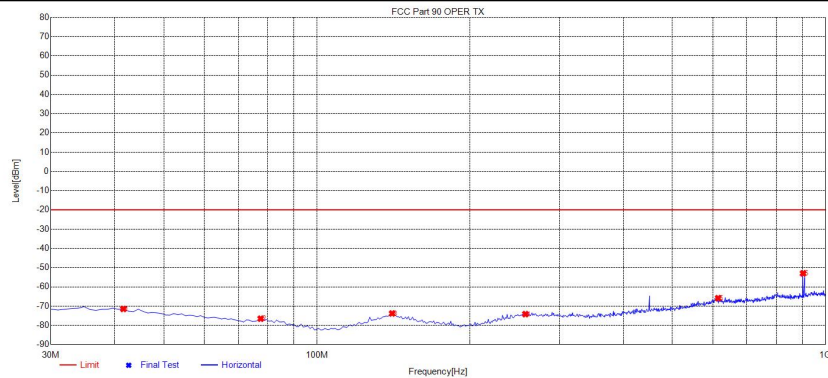
Preliminary calculation	Final Result
At least $50 + 10 \log (P) = 50 + 10 \log (2) = 53.01 \text{ (dB)}$	Limit=P- Preliminary calculation= $33.01 - 53.01 = -20 \text{ dBm}$

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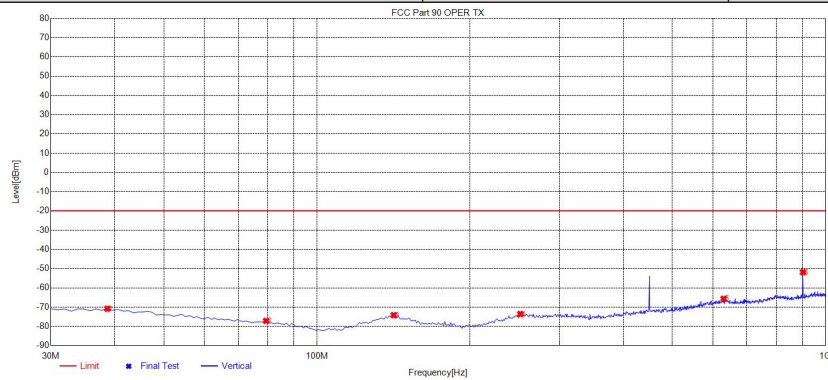
Radiated Emissions 30MHz to 1GHz

Test Mode:	TX:451.18750MHz	Polarity:	Horizontal
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	41.64	-100.83	-71.45	-20.00	51.45	29.38	215	Horizontal
2	77.53	-100.44	-76.50	-20.00	56.50	23.94	360	Horizontal
3	140.58	-100.78	-73.81	-20.00	53.81	26.97	242	Horizontal
4	256.98	-101.55	-74.15	-20.00	54.15	27.40	1	Horizontal
5	614.91	-100.00	-65.87	-20.00	45.87	34.13	360	Horizontal
6	903	-89.81	-52.98	-20.00	32.98	36.83	348	Horizontal

Test Mode:	TX:451.18750MHz	Polarity:	Vertical
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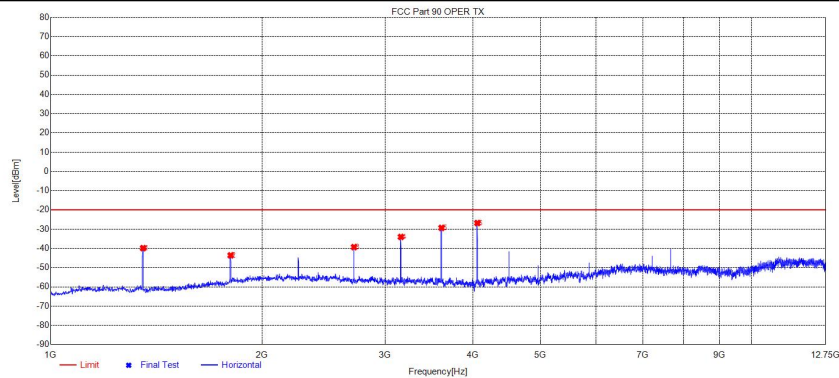


NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	38.73	-100.46	-70.82	-20.00	50.82	29.64	179	Vertical
2	79.47	-101.14	-77.14	-20.00	57.14	24.00	252	Vertical
3	141.55	-101.01	-74.19	-20.00	54.19	26.82	109	Vertical
4	251.16	-101.00	-73.55	-20.00	53.55	27.45	33	Vertical
5	630.43	-100.00	-65.67	-20.00	45.67	34.33	196	Vertical
6	903	-88.68	-51.85	-20.00	31.85	36.83	350	Vertical

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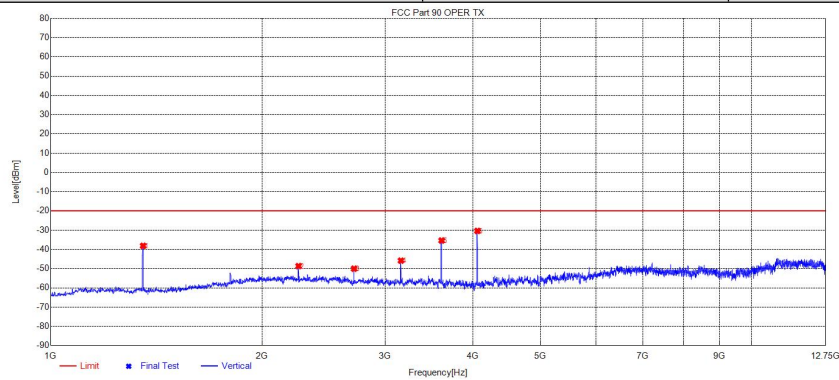
Radiated Emissions Above 1GHz

Test Mode:	TX:451.18750MHz	Polarity:	Horizontal
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1353.7104	-35.76	-39.87	-20.00	19.87	-4.11	200	Horizontal
2	1804.9555	-43.26	-43.64	-20.00	23.64	-0.38	321	Horizontal
3	2707.4457	-41.44	-39.33	-20.00	19.33	2.11	346	Horizontal
4	3158.6909	-35.83	-34.06	-20.00	14.06	1.77	10	Horizontal
5	3609.936	-31.69	-29.35	-20.00	9.35	2.34	360	Horizontal
6	4061.1811	-29.57	-26.84	-20.00	6.84	2.73	10	Horizontal

Test Mode:	TX:451.18750MHz	Polarity:	Vertical
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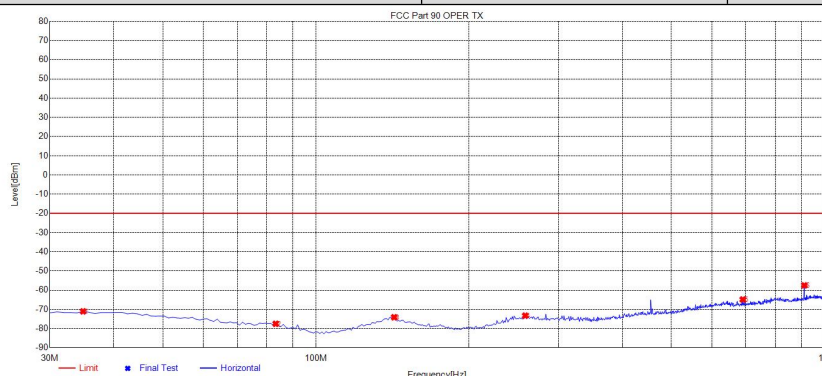


NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1353.7104	-34.05	-38.16	-20.00	18.16	-4.11	23	Vertical
2	2256.2006	-50.96	-48.68	-20.00	28.68	2.28	341	Vertical
3	2707.4457	-52.15	-50.04	-20.00	30.04	2.11	152	Vertical
4	3158.6909	-47.62	-45.85	-20.00	25.85	1.77	143	Vertical
5	3609.936	-37.75	-35.41	-20.00	15.41	2.34	6	Vertical
6	4061.1811	-33.14	-30.41	-20.00	10.41	2.73	221	Vertical

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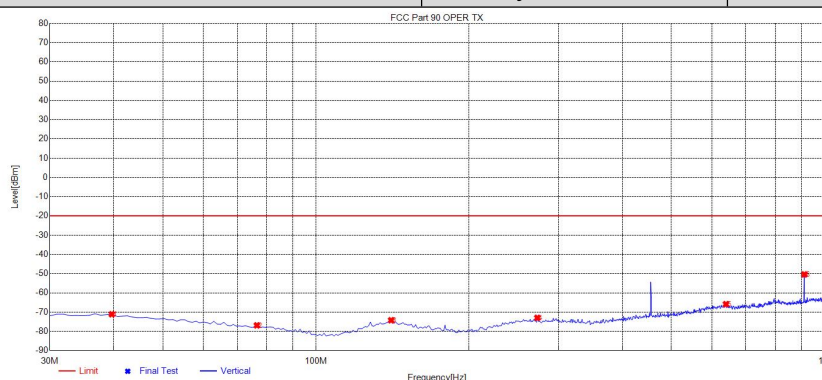
Radiated Emissions 30MHz to 1GHz

Test Mode:	TX:456.18750MHz	Polarity:	Horizontal
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	34.85	-100.53	-71.02	-20.00	51.02	29.51	350	Horizontal
2	83.35	-100.64	-77.50	-20.00	57.50	23.14	107	Horizontal
3	142.52	-100.78	-74.09	-20.00	54.09	26.69	325	Horizontal
4	257.95	-100.67	-73.26	-20.00	53.26	27.41	142	Horizontal
5	690.57	-99.17	-64.85	-20.00	44.85	34.32	204	Horizontal
6	912.7	-94.56	-57.50	-20.00	37.50	37.06	325	Horizontal

Test Mode:	TX:456.18750MHz	Polarity:	Vertical
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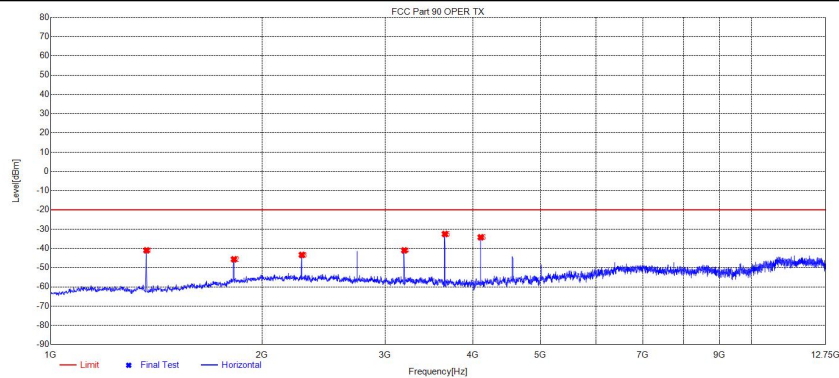


NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	39.7	-100.77	-71.11	-20.00	51.11	29.66	71	Vertical
2	76.56	-100.86	-76.87	-20.00	56.87	23.99	360	Vertical
3	140.58	-101.20	-74.23	-20.00	54.23	26.97	139	Vertical
4	272.5	-100.31	-72.96	-20.00	52.96	27.35	266	Vertical
5	640.13	-100.34	-65.87	-20.00	45.87	34.47	300	Vertical
6	912.7	-87.47	-50.41	-20.00	30.41	37.06	343	Vertical

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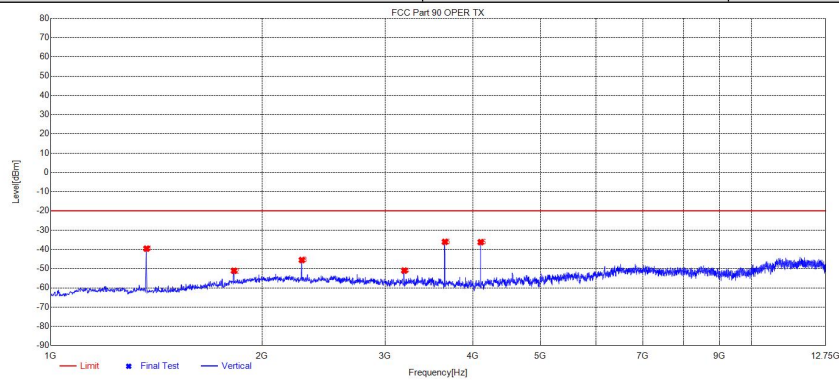
Radiated Emissions Above 1GHz

Test Mode:	TX:456.18750MHz	Polarity:	Horizontal
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1368.9869	-36.93	-41.04	-20.00	21.04	-4.11	351	Horizontal
2	1824.9325	-45.54	-45.68	-20.00	25.68	-0.14	308	Horizontal
3	2280.8781	-45.70	-43.40	-20.00	23.40	2.30	230	Horizontal
4	3193.9444	-42.87	-41.05	-20.00	21.05	1.82	359	Horizontal
5	3649.89	-34.90	-32.55	-20.00	12.55	2.35	351	Horizontal
6	4105.8356	-37.17	-34.26	-20.00	14.26	2.91	16	Horizontal

Test Mode:	TX:456.18750MHz	Polarity:	Vertical
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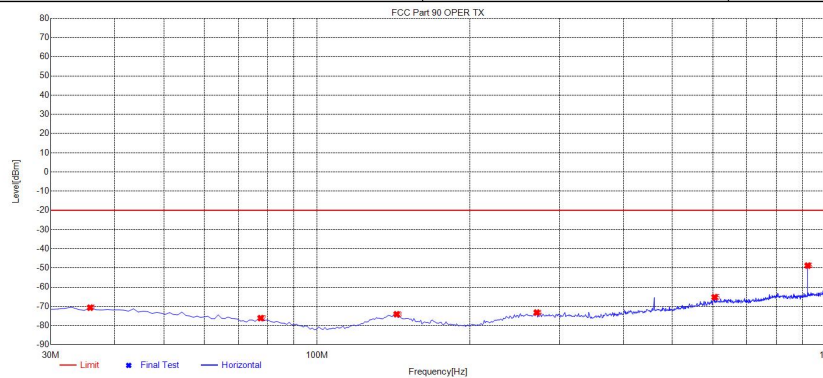


NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1368.9869	-35.51	-39.62	-20.00	19.62	-4.11	87	Vertical
2	1824.9325	-50.99	-51.13	-20.00	31.13	-0.14	139	Vertical
3	2280.8781	-47.84	-45.54	-20.00	25.54	2.30	44	Vertical
4	3193.9444	-52.85	-51.03	-20.00	31.03	1.82	336	Vertical
5	3649.89	-38.44	-36.09	-20.00	16.09	2.35	9	Vertical
6	4105.8356	-39.16	-36.25	-20.00	16.25	2.91	293	Vertical

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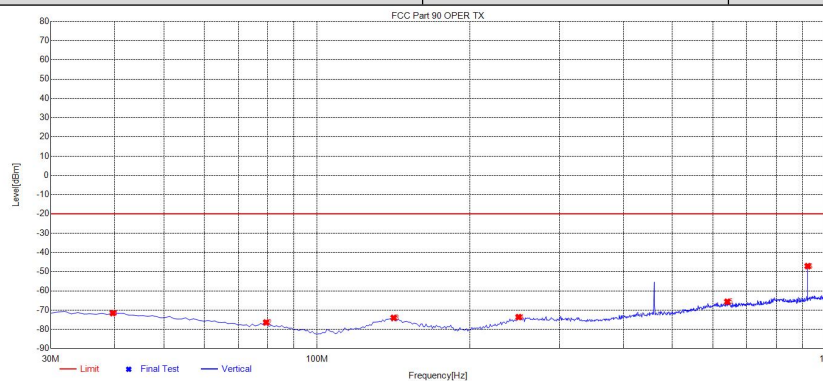
Radiated Emissions 30MHz to 1GHz

Test Mode: TX:461.03750MHz Polarity: Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	35.82	-100.23	-70.64	-20.00	50.64	29.59	143	Horizontal
2	77.53	-100.04	-76.10	-20.00	56.10	23.94	187	Horizontal
3	143.49	-100.64	-74.09	-20.00	54.09	26.55	0	Horizontal
4	270.56	-100.59	-73.20	-20.00	53.20	27.39	97	Horizontal
5	605.21	-99.28	-65.20	-20.00	45.20	34.08	134	Horizontal
6	922.4	-86.14	-48.77	-20.00	28.77	37.37	350	Horizontal

Test Mode: TX:461.03750MHz Polarity: Vertical



NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	39.7	-101.21	-71.55	-20.00	51.55	29.66	340	Vertical
2	79.47	-100.39	-76.39	-20.00	56.39	24.00	37	Vertical
3	141.55	-100.82	-74.00	-20.00	54.00	26.82	10	Vertical
4	249.22	-101.02	-73.62	-20.00	53.62	27.40	166	Vertical
5	641.1	-100.09	-65.64	-20.00	45.64	34.45	209	Vertical
6	922.4	-84.52	-47.15	-20.00	27.15	37.37	356	Vertical

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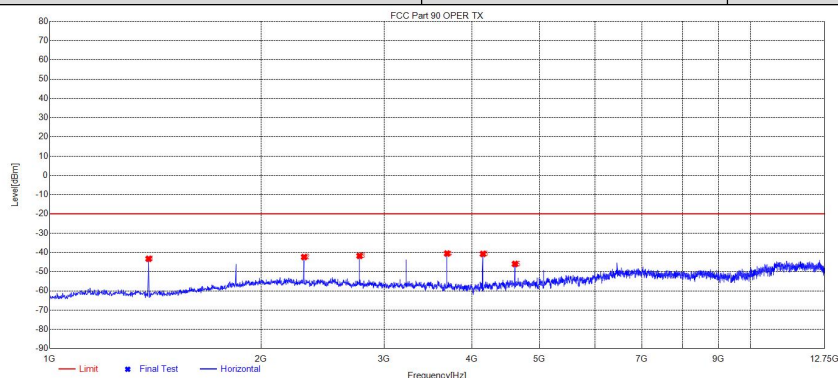
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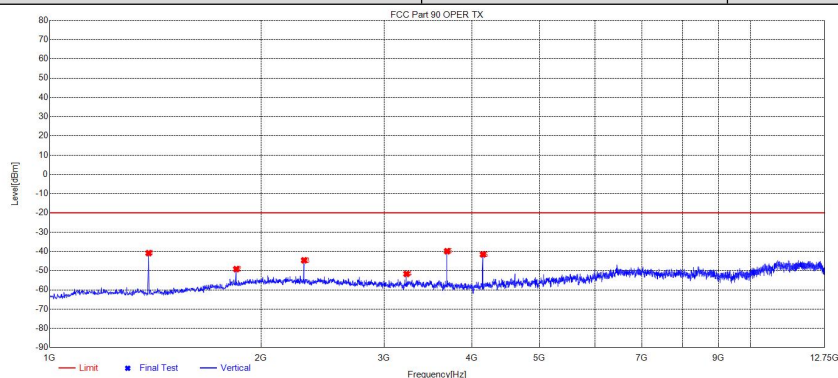
Radiated Emissions Above 1GHz

Test Mode:	TX:461.03750MHz	Polarity:	Horizontal
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1383.0883	-39.24	-43.35	-20.00	23.35	-4.11	204	Horizontal
2	2305.5556	-44.77	-42.44	-20.00	22.44	2.33	238	Horizontal
3	2766.2016	-43.82	-41.82	-20.00	21.82	2.00	342	Horizontal
4	3688.6689	-42.97	-40.60	-20.00	20.60	2.37	351	Horizontal
5	4149.3149	-43.88	-40.80	-20.00	20.80	3.08	15	Horizontal
6	4609.961	-50.55	-46.01	-20.00	26.01	4.54	15	Horizontal

Test Mode:	TX:461.03750MHz	Polarity:	Vertical
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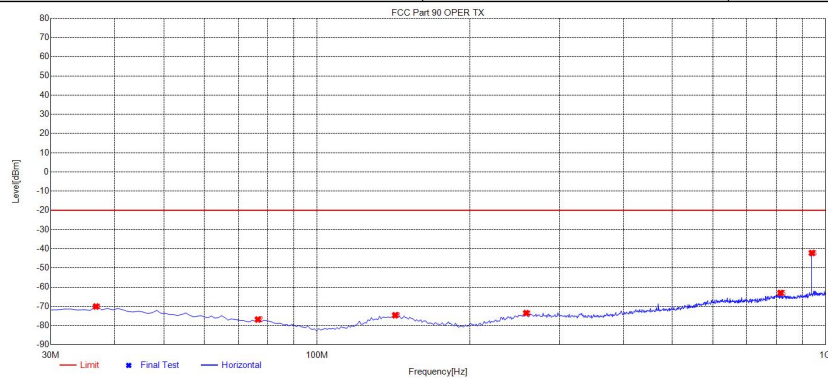


NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1383.0883	-36.79	-40.90	-20.00	20.90	-4.11	87	Vertical
2	1844.9095	-49.34	-49.22	-20.00	29.22	0.12	310	Vertical
3	2305.5556	-46.97	-44.64	-20.00	24.64	2.33	328	Vertical
4	3228.0228	-53.58	-51.71	-20.00	31.71	1.87	345	Vertical
5	3688.6689	-42.29	-39.92	-20.00	19.92	2.37	9	Vertical
6	4149.3149	-44.65	-41.57	-20.00	21.57	3.08	319	Vertical

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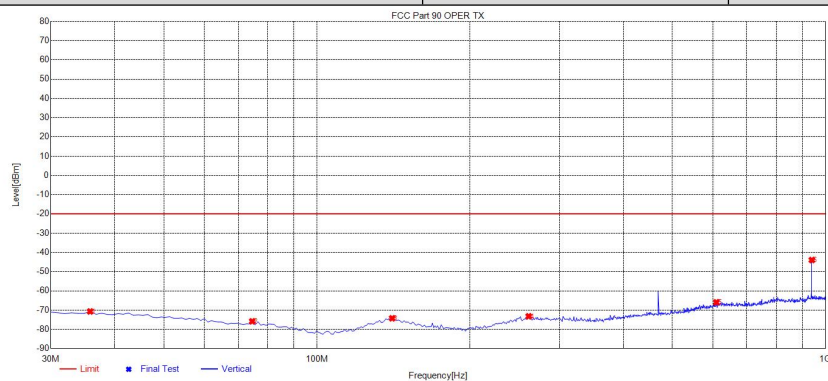
Radiated Emissions 30MHz to 1GHz

Test Mode:	TX:469.56250MHz	Polarity:	Horizontal
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	36.79	-99.68	-70.06	-20.00	50.06	29.62	242	Horizontal
2	76.56	-100.80	-76.81	-20.00	56.81	23.99	288	Horizontal
3	142.52	-101.32	-74.63	-20.00	54.63	26.69	4	Horizontal
4	257.95	-100.89	-73.48	-20.00	53.48	27.41	342	Horizontal
5	815.7	-99.95	-62.99	-20.00	42.99	36.96	350	Horizontal
6	939.86	-80.09	-42.19	-20.00	22.19	37.90	325	Horizontal

Test Mode:	TX:469.56250MHz	Polarity:	Vertical
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	35.82	-100.29	-70.70	-20.00	50.70	29.59	207	Vertical
2	74.62	-99.81	-75.82	-20.00	55.82	23.99	147	Vertical
3	140.58	-101.23	-74.26	-20.00	54.26	26.97	71	Vertical
4	260.86	-100.63	-73.19	-20.00	53.19	27.44	207	Vertical
5	610.06	-100.03	-65.93	-20.00	45.93	34.10	324	Vertical
6	939.86	-81.88	-43.98	-20.00	23.98	37.90	35	Vertical

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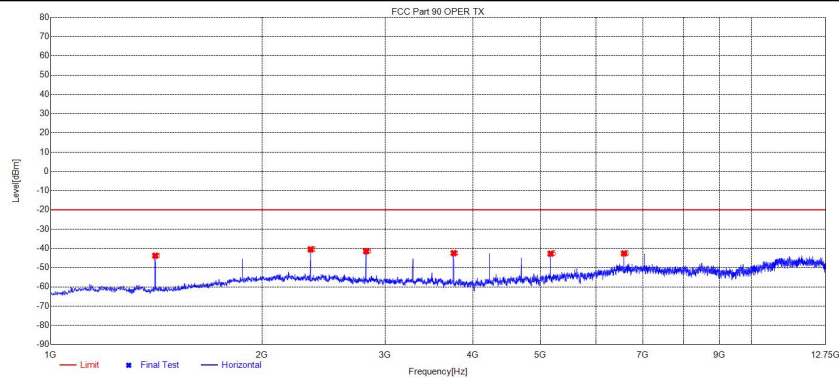
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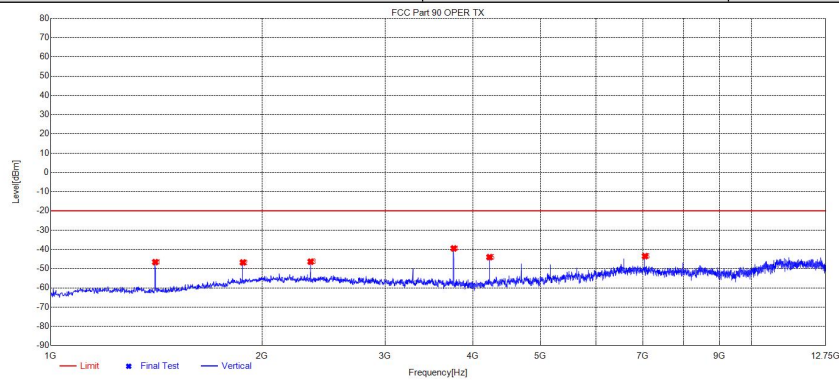
Radiated Emissions Above 1GHz

Test Mode:	TX:469.56250MHz	Polarity:	Horizontal
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1408.9409	-39.70	-43.82	-20.00	23.82	-4.12	341	Horizontal
2	2347.8598	-42.90	-40.53	-20.00	20.53	2.37	33	Horizontal
3	2817.9068	-43.39	-41.50	-20.00	21.50	1.89	341	Horizontal
4	3756.8257	-44.87	-42.47	-20.00	22.47	2.40	8	Horizontal
5	5165.7916	-47.97	-42.72	-20.00	22.72	5.25	16	Horizontal
6	6574.7575	-50.34	-42.59	-20.00	22.59	7.75	58	Horizontal

Test Mode:	TX:469.56250MHz	Polarity:	Vertical
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NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Angle [°]	Polarity
1	1408.9409	-42.50	-46.62	-20.00	26.62	-4.12	88	Vertical
2	1878.9879	-47.32	-46.79	-20.00	26.79	0.53	156	Vertical
3	2347.8598	-48.77	-46.40	-20.00	26.40	2.37	360	Vertical
4	3756.8257	-41.90	-39.50	-20.00	19.50	2.40	18	Vertical
5	4225.6976	-47.41	-44.04	-20.00	24.04	3.37	328	Vertical
6	7043.6294	-51.78	-43.54	-20.00	23.54	8.24	354	Vertical

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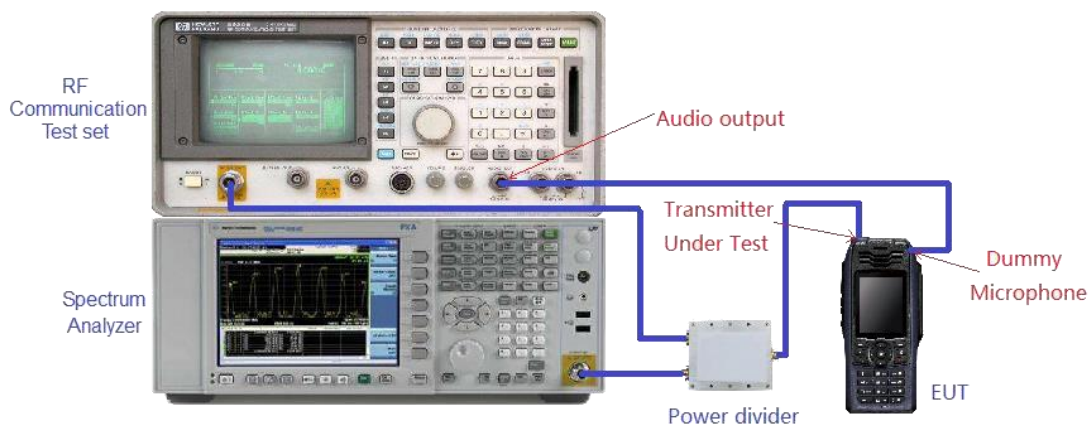
8.5 Emission Mask Measurement Part

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

-Connect the equipment as illustrated.

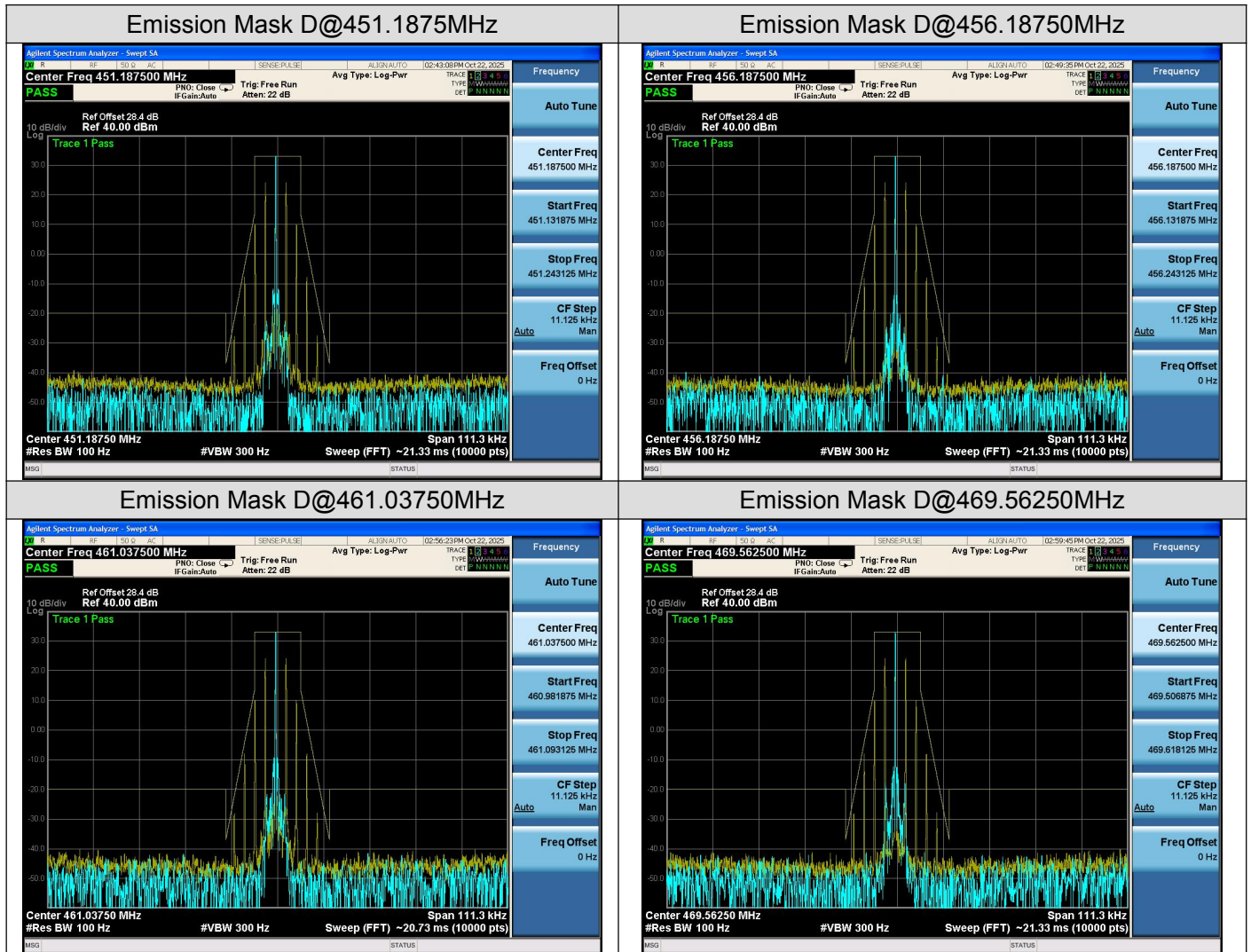
-Spectrum set as follow:

1. Centre frequency = fundamental frequency, Span=111.3kHz for 12.5kHz channel spacing, RBW=100Hz, VBW=300Hz for 12.5kHz, Sweep = auto, Detector function = peak, Trace = max hold
2. Key the transmitter, and set the level of the unmodulated carrier to a fullscale reference line. This is the 0dB reference for the measurement.
3. 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.
4. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer.
5. Measure and record the results in the test report.



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Test plot as follows:



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9. Modulation Characteristics

9.1 Provisions Applicable

According to FCC§2.1047 and §90.207, for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

9.2 Measurement Procedure

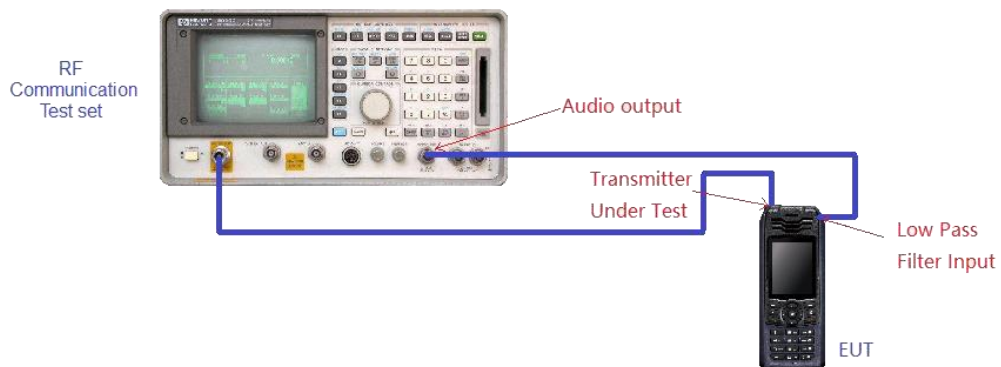
● Modulation Limit

1. Test layout and build equipment as shown below.
2. adjust the audio input for 60% of rated system deviation at 1kHz using this level as a reference (0dB).
3. Vary the input level from -20 to +20dB.
4. Record the frequency deviation obtained as a function of the input level.
5. Repeat step 2 with input frequency changing to 300, 1000, 1500 and 3000Hz in sequence.

● Audio Frequency Response

1. Test layout and build equipment as shown below.
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 = $20\log_{10} (\text{Deviation of test frequency} / \text{Deviation of 1 kHz reference})$.

9.3 Measurement Setup

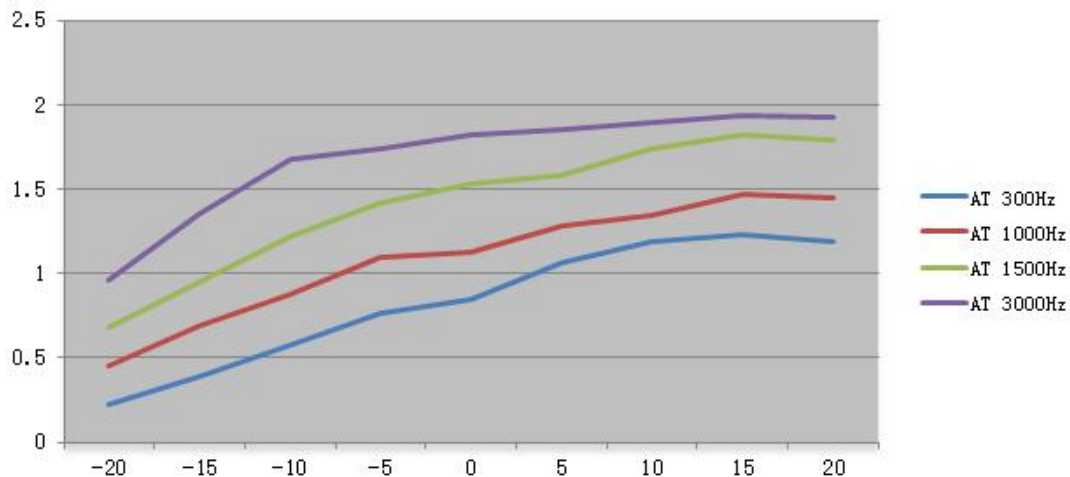


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9.4 Measurement Result

A. Modulation Limit:

12.5kHz, Analog modulation, Assigned Frequency:451.18750MHz				
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	0.22	0.45	0.68	0.96
-15	0.39	0.69	0.95	1.35
-10	0.58	0.88	1.22	1.68
-5	0.76	1.09	1.42	1.74
0	0.85	1.13	1.53	1.82
+5	1.06	1.28	1.58	1.85
+10	1.19	1.34	1.74	1.89
+15	1.23	1.47	1.82	1.93
+20	1.19	1.45	1.79	1.92

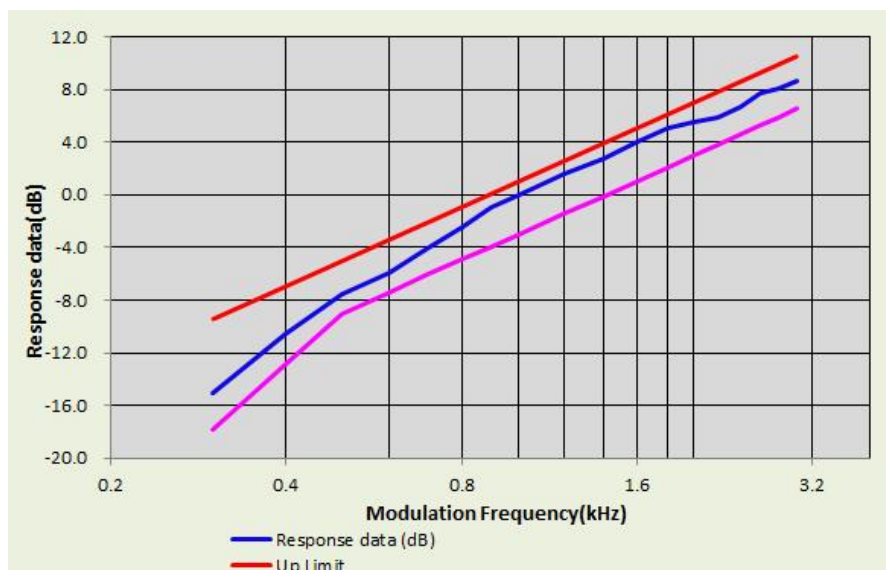


Note: All the modes had been tested, but only the worst data recorded in the report.

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B. Audio Frequency Response:

12.5kHz, Analog modulation, Assigned Frequency:136.025MHz-High Power		
Frequency (Hz)	Deviation (kHz)	Audio Frequency Response(dB)
100	--	--
200	--	--
300	0.16	-15.10
400	0.27	-10.55
500	0.38	-7.59
600	0.46	-5.93
700	0.57	-4.06
800	0.69	-2.40
900	0.82	-0.90
1000	0.91	0.00
1200	1.09	1.57
1400	1.25	2.76
1600	1.45	4.05
1800	1.63	5.06
2000	1.71	5.48
2400	1.78	5.83
2500	1.96	6.66
2800	2.22	7.75
3000	2.31	8.09
3200	2.45	8.60



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

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10. Maximum Transmitter Power

10.1 Provisions Applicable

Per FCC §2.1046 and §90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area.

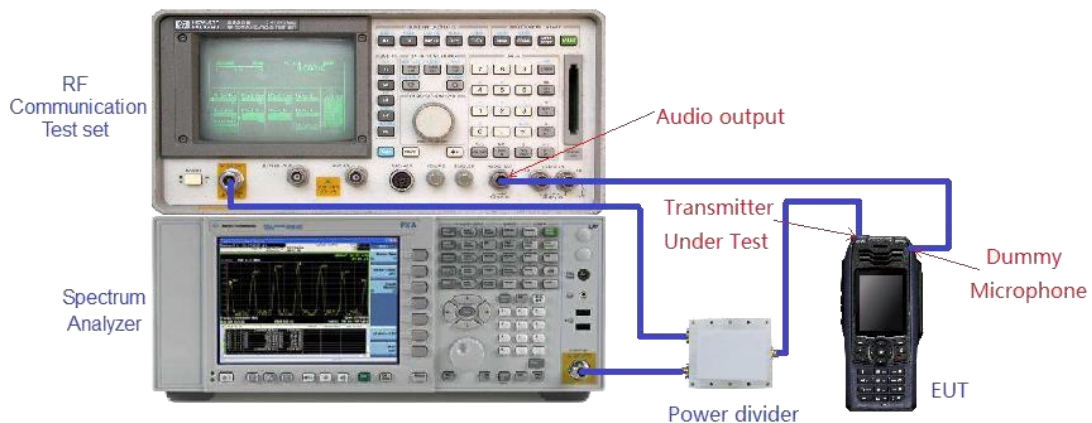
10.2 Measurement Procedure

The RF output of Two-way Radio was conducted to a spectrum analyzer through an appropriate attenuator. In the semi-anechoic chamber, setup as illustrated above the DUT placed on the 0.8m height of Turn Table, rotated the table 45 degree each interval to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power for each degree interval. The "Read Value" is the spectrum reading of maximum power value. The substitution antenna is substituted for DUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum.

So, the Measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.
EIRP = "Read Value" + Measured substitution value + 2.15.

10.3 Measurement Setup

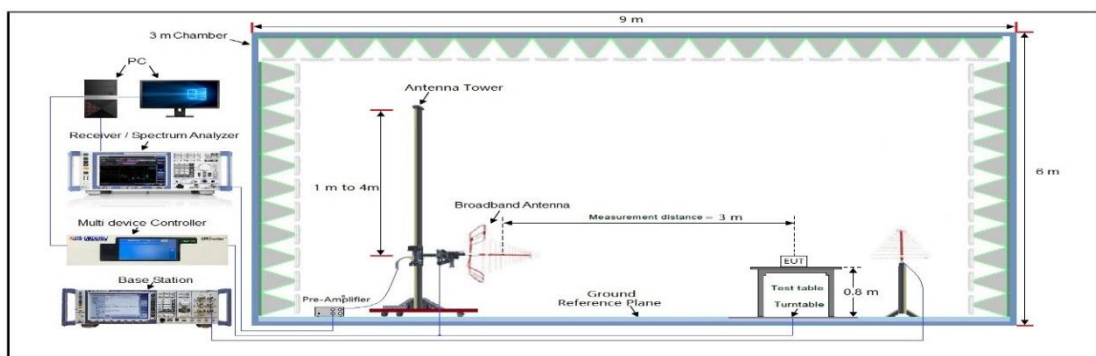
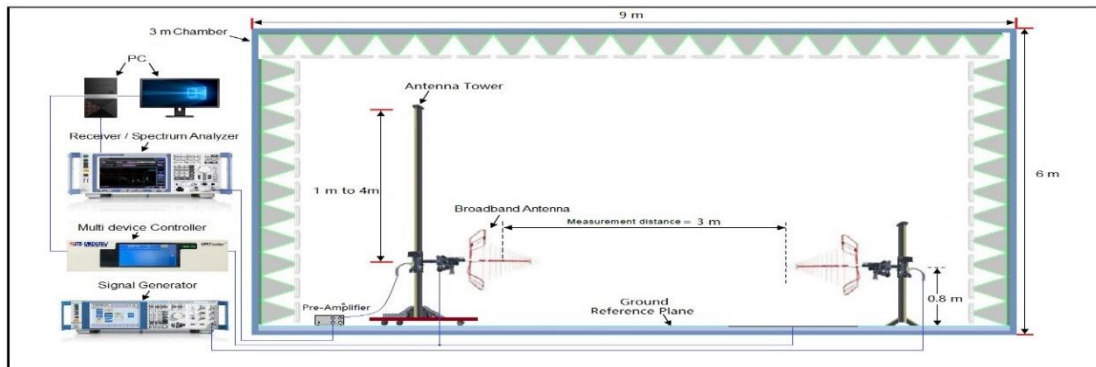
☒ Conducted Output Power:



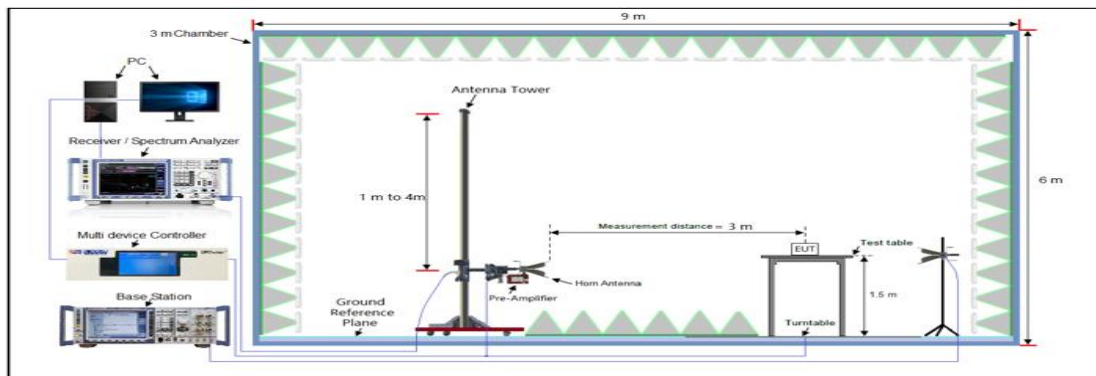
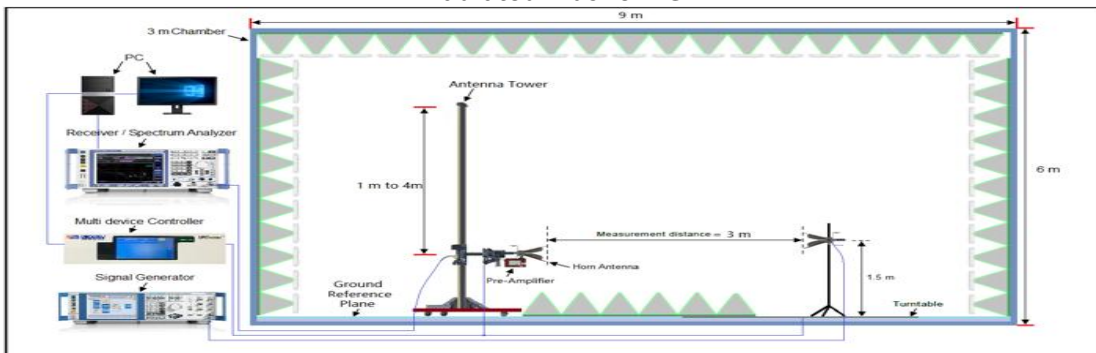
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☒ Effective Radiated Power:

Radiated Below 1GHz



Radiated Above 1 GHz



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10.4 Measurement Result

Conducted Power Measurement Results			
Mode	Channel Separation	Test Channel	Measurement Result (dBm)
			For 33.01dBm(2W)
Analog +Voice	12.5 kHz	Bottom(451.18750MHz)	33.523
		Middle(456.18750MHz)	33.503
		Middle(461.03750MHz)	33.533
		Top (469.56250MHz)	33.478

Radiated Power Measurement Results								
Test Mode	Frequency (MHz)	Reading Level (dBuv/m)	Antenna Polarization	S.G. (dBm)	Cable Loss (dB)	Ant.Gain (dBi)	ERP Results (dBm)	Limit (dBm)
Analog +Vioce	451.18750	102.16	V	26.93	0.85	6.9	32.98	33.01
	451.18750	102.09	H	26.86	0.85	6.9	32.91	33.01
	456.18750	102.08	V	26.85	0.85	6.9	32.90	33.01
	456.18750	102.00	H	26.77	0.85	6.9	32.82	33.01
	461.03750	102.17	V	26.94	0.85	6.9	32.99	33.01
	461.03750	102.03	H	26.80	0.85	6.9	32.85	33.01
	469.56250	102.07	V	26.84	0.85	6.9	32.89	33.01
	469.56250	102.00	H	26.77	0.85	6.9	32.82	33.01

Note:

Calculation Formula: $CP = R + A + L$

- CP: The final Conducted Power
- R: The reading value from spectrum analyzer
- A: The attenuation value of the used attenuator
- L: The loss of all connection cables
- Measurement Result=Peak Power (Max)

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11. Spurious Emission on Antenna Port

11.1 Provisions Applicable

Please refer to FCC 47 CFR 2.1051, 2.1057 & 90.210 for specification details.

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 90.210	At least $50 + 10 \log (P)$ dB

$50 + 10 \log (P_{\text{watts}})$

Note: In general, the worse case attenuation requirement shown above was applied.

Calculation: Limit (dBm) = EL - 50 - 10 log 10 (TP)

EL is the emission level of the Output Power expressed in dBm,

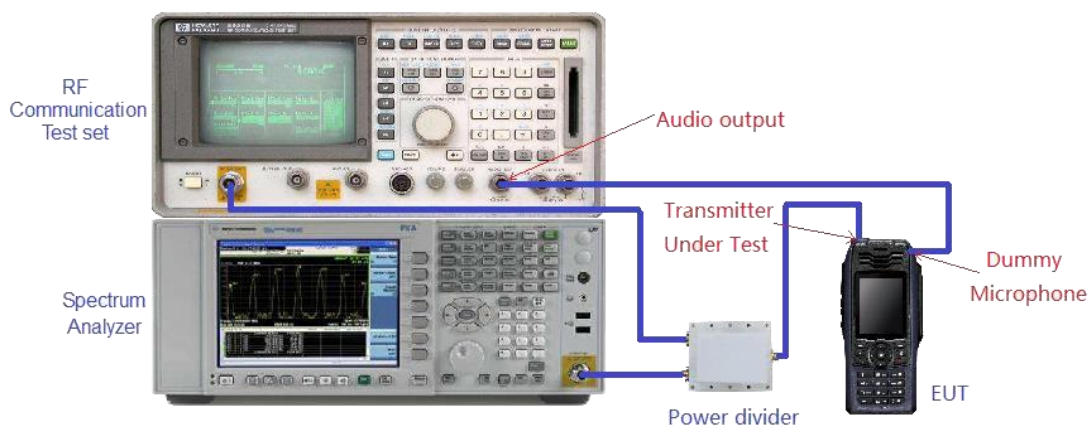
In this application, the EL is P (dBm)

Limit (dBm) = P (dBm) - 50 - 10 log (Pwatts) = -20dBm

11.2 Measurement Procedure

1. The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to
3. show any out of band emission up to 10th . Harmonic for the lower and the highest frequency range.
4. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz, while set RBW=1MHz.VBW=3MHz from the 1GHz to 10th Harmonic.
5. The audio input was set the unmodulated carrier, the resulting picture is print out for each channel separation.

11.3 Measurement Setup



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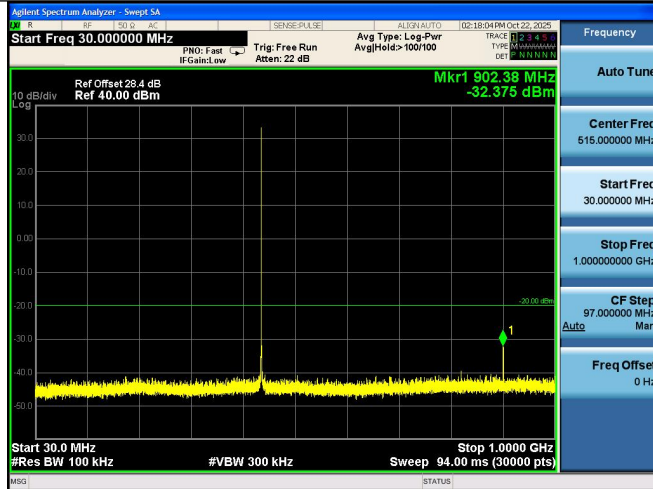
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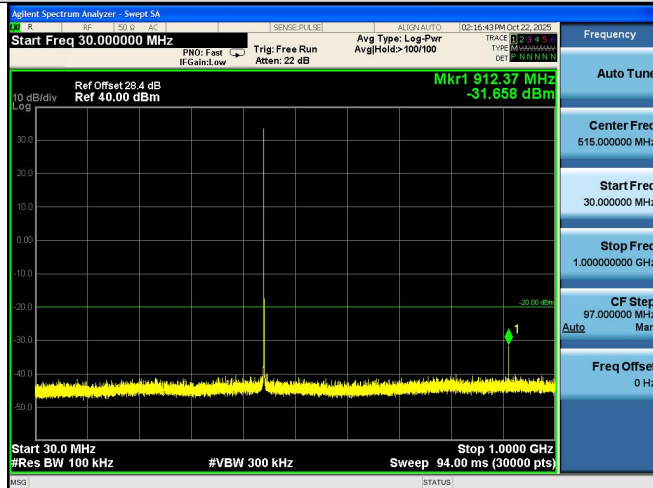
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11.4 Measurement Result

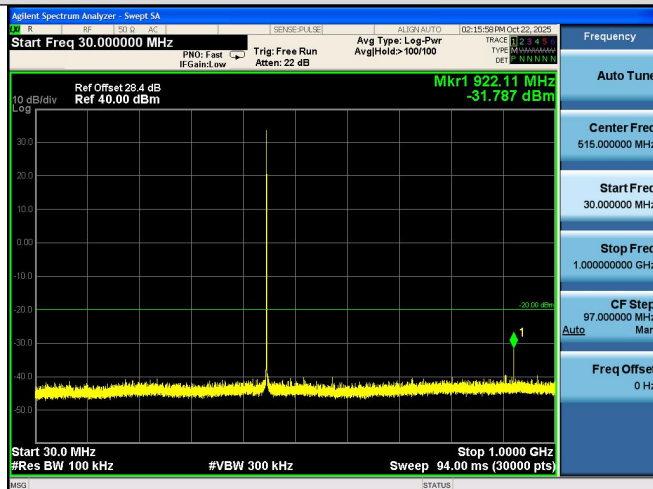
12.5kHz, Analog modulation, Assigned Frequency:451.18750MHz



12.5kHz, Analog modulation, Assigned Frequency:456.18750MHz



12.5kHz, Analog modulation, Assigned Frequency:461.03750MHz



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