FCC Radio Test Report

FCC ID: ZMOSC228GL

This report concerns: Original Grant

Project No.	:	2403G086
Equipment	:	LTE Module
Brand Name	:	Fibocom
Test Model	:	SC228-GL
Series Model	:	N/A
Applicant	:	Fibocom Wireless Inc.
Address	:	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
Manufacturer	:	Fibocom Wireless Inc.
Address	:	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
Factory	:	Fibocom Wireless Inc.
Address	:	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
Date of Receipt	:	Mar. 14, 2024
Date of Test	:	Mar. 14, 2024 ~ Apr. 13, 2024
Issued Date	:	Sep. 30, 2024
Report Version	:	R01
Test Sample	:	Engineering Sample No.: SSL20240314104 for radiated, SSL20240314102 for conducted.
Standard(s)	:	47 CFR FCC Part 90 Subpart R 47 CFR FCC Part 2

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Prepared by : Abel. Cao

Abel Cao

Approved by : Steven Lu

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. BTL assumes no responsibility for the data provided by the customer, any statements, inferences or generalizations drawn by the customer or others from the reports issued by BTL.

The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the ISO/IEC 17025: 2017 requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-5-2403G086	R00	Original Report.	Sep. 23, 2024	Invalid
BTL-FCCP-5-2403G086	R01	Modified the comments.	Sep. 30, 2024	Valid

1. APPLICABLE STANDARDS

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:
ANSI C63.26-2015
The following reference test guidance is not within the scope of accreditation of A2LA:
FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 90 Subpart R & Part 2			
Standard(s) Section	**Test Item**	**Judgment**	**Remark**
2.1046 & 90.542 (a)(7)	Effective Radiated Power	PASS	------
2.1049	Occupied Bandwidth	PASS	------
2.1053 & 90.543(e)(3)	Conducted Spurious Emissions	PASS	------
2.1053 & 90.543(e)(3) & 90.543(f)	Radiated Spurious Emissions	PASS	------
2.1051 & 90.210(n)	Mask Measurements	PASS	------
-	Peak To Average Ratio	PASS	Record Only
2.1053 & 90.543(e)(2)(3)	Condcted Band Edge Measurement	PASS	------
2.1055 & 90.539(e)	Frequency Stability	PASS	------

Note:
(1) “N/A” denotes test is not applicable in this test report.

2.1 TEST FACILITY

For radiated emissions 9K to 30MHz:
The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Dalang Town, Dongguan City, Guangdong People's Republic of China.

For others:
The test facilities used to collect the test data in this report is at the location of Room 108, Building 2, No.1, Yile Road, Songshan Lake Zone, Dongguan City, Guangdong, People's Republic of China.
BTL's Registration Number for FCC: 747969
BTL's Designation Number for FCC: CN1377

2.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))
The BTL measurement uncertainty as below table:

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	*U*,(dB)
DG-CB01	CISPR	9kHz ~ 30MHz	2.36

Test Site	Method	Measurement Frequency Range	Ant. H / V	*U*,(dB)
SSL-CB01 (3m)	CISPR	30MHz ~ 200MHz	V	4.70
		30MHz ~ 200MHz	H	3.56
		200MHz ~ 1,000MHz	V	4.92
		200MHz ~ 1,000MHz	H	4.54

Test Site	Method	Measurement Frequency Range	*U*,(dB)
SSL-CB01 (3m)	CISPR	1GHz ~ 6GHz	4.56
		6GHz ~ 18GHz	5.14

B. Other Measurement:

Parameter	Uncertainty
Spectrum Bandwidth	±1.74%
Maximum Output Power	±0.87dB
Frequency Stability	±53.10 Hz
Temperature	±0.48 °C
Humidity	±1.37 %

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

2.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By	Test Date
Output Power & ERP	24°C	41%	DC 3.8V	Gavin Ge	Mar. 14, 2024~ Apr. 01, 2024
Occupied Bandwidth	24°C	41%	DC 3.8V	Gavin Ge	Mar. 14, 2024~ Apr. 01, 2024
Conducted Spurious Emissions	24°C	41%	DC 3.8V	Gavin Ge	Mar. 14, 2024~ Apr. 01, 2024 Apr. 11, 2024
Radiated Spurious Emissions (9 kHz to 30 MHz)	24°C	54%	DC 3.8V	Hayden Chen	Apr. 03, 2024
Radiated Spurious Emissions (30 MHz to 1000 MHz)	23°C	50%	DC 3.8V	Max Wang	Mar. 22, 2024~ Mar. 31, 2024
Radiated Spurious Emissions (Above 1000 MHz)	23°C	50-55%	DC 3.8V	Max Wang	Mar. 19, 2024~ Mar. 31, 2024
Band Edge	24°C	41%	DC 3.8V	Gavin Ge	Mar. 14, 2024~ Apr. 01, 2024
Mask	24°C	41%	DC 3.8V	Gavin Ge	Apr. 13, 2024
Peak to Average Ratio	24°C	41%	DC 3.8V	Gavin Ge	Mar. 14, 2024~ Apr. 01, 2024
Frequency Stability	Normal & Extreme	41%	Normal & Extreme	Gavin Ge	Mar. 14, 2024~ Apr. 01, 2024

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	LTE Module			
Brand Name	Fibocom			
Test Model	SC228-GL			
Series Model	N/A			
Model Difference(s)	N/A			
Hardware Version	V1.1			
Software Version	SC228-GL-T16.12.034			
Power Source	DC voltage supplied from external power supply.			
Power Rating	DC 3.5V - 4.35V, Typical: 3.8V			
IMEI No.	Radiated	864712070000349		
	Conducted	864712070000927		
Modulation Type	LTE	UL: QPSK,16QAM DL: QPSK,16QAM,64QAM		
Max. ERP	LTE	Channel Bandwidth (MHz)	QPSK (dBm)	16QAM (dBm)
	Band 14	5	22.34	22.75
		10	23.23	22.34

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

LTE Band 14(UL: 788-798 MHz, DL: 758-768 MHz)					
Test Frequency ID	Bandwidth (MHz)	N_{UL}	Frequency of Uplink (MHz)	N_{DL}	Frequency of Downlink (MHz)
Low Range	5	23305	790.5	5305	760.5
	10	23330	793	5330	763
Mid Range	5/10	23330	793	5330	763
High Range	5	23355	795.5	5.55	763.5
	10	23330	793	5330	763

3. Table for Filed Antenna:

Manufacturer	P/N	Antenna Type	Connector	Gain (dBi)	Note
Shenzhen Bogesi Communication Technology Co., Ltd	GHT-019A	Dipole	SMA Male J	2.19	LTE Band 14

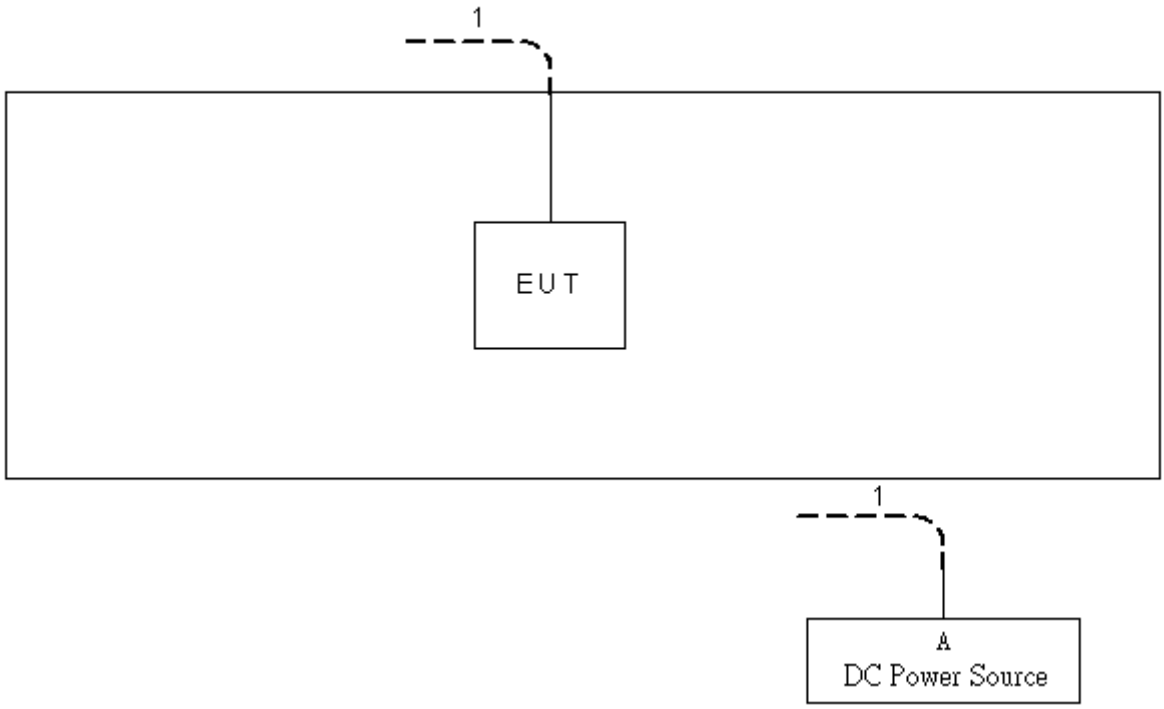
Note: The antenna gain is provided by the manufacturer.

3.2 DESCRIPTION OF TEST MODES

Following mode(s) is (were) found to be the worst case(s) and selected for the final test.

LTE BAND 14 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power &ERP	23305 to 23355	23305, 23330, 23355	5MHz	QPSK, 16QAM	1RB/12RB/25RB
	23330	23330	10MHz	QPSK, 16QAM	1RB/25RB/50RB
Occupied Bandwidth	23305 to 23355	23305, 23330, 23355	5MHz	QPSK, 16QAM	25RB
	23330	23330	10MHz	QPSK, 16QAM	50RB
Conducted Spurious Emissions	23305 to 23355	23330	5MHz	QPSK	1RB
	23330	23330	10MHz	QPSK	1RB
Radiated Spurious Emissions	23305 to 23355	23330	5MHz	QPSK	1RB
	23330	23330	10MHz	QPSK	1RB
Mask	23305 to 23355	23305, 23355	5MHz	QPSK	1RB
					25RB
	23330	23330	10MHz	QPSK	1RB
					50RB
Peak To Average Ratio	23305 to 23355	23305, 23330, 23355	5MHz	QPSK, 16QAM	1RB
	23330	23330	10MHz	QPSK, 16QAM	1RB
Condcted Band Edge Measurement	23305 to 23355	23305, 23355	5MHz	QPSK	1RB
					25RB
	23330	23330	10MHz	QPSK	1RB
					50RB
Frequency Stability	23305 to 23355	23330	10MHz	QPSK	50RB

3.3 BLOCK DIGRAM SHOWING THE CONFIGURATIONOFSYSTEMTESTED



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
A	DC Power Source	TRUE-POWER	GPC30300N	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	10m

4. TEST RESULT

4.1 OUTPUT POWER MEASUREMENT

4.1.1 LIMIT

Control stations and mobile stations transmitting in the 758–768 MHz band and the 788–798 MHz band are limited to 30 watts ERP.

Portable stations (hand-held devices) transmitting in the 758–768 MHz band and the 788–798 MHz band are limited to 3 watts ERP.

4.1.2 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 5.0 or ANSI C63.26-2015 Section 5.2.

ERP:

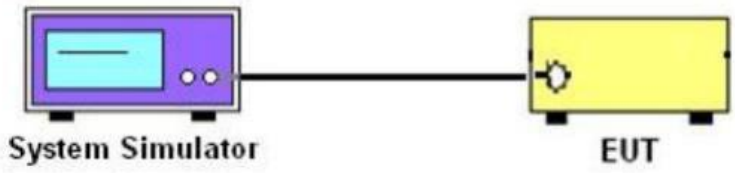
EIRP= Output Power + Antenan gain
ERP = EIPR - 2.15dBi.

Output Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 TEST SETUP LAYOUT

Output Power Measurement



4.1.4 TEST DEVIATION

No deviation.

4.1.5 TEST RESULTS

Please refer to the APPENDIX A.

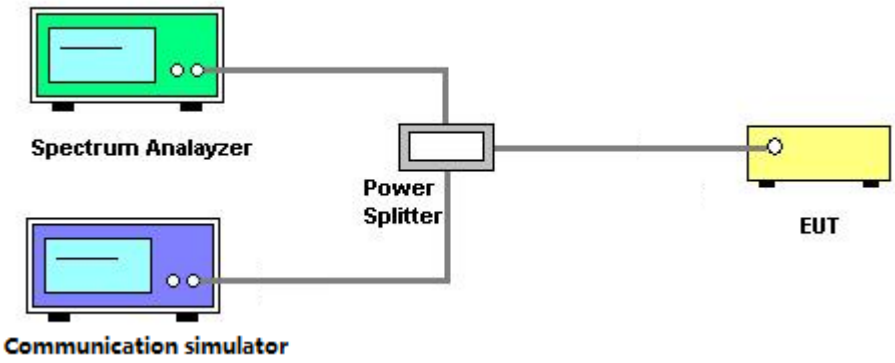
4.2 OCCUPIED BANDWIDTH MEASUREMENT

4.2.1 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 4.0 or ANSI C63.26-2015 Section 5.4.

1. The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth and 26dB bandwidth.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. RBW=(1% ~ 5%)*EBW
   VBW≥3* RBW
4. Set spectrum analyzer with RMS detector.

4.2.2 TEST SETUP LAYOUT



4.2.3 TEST DEVIATION

No deviation.

4.2.4 TEST RESULTS

Please refer to the APPENDIX B.

4.3 CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

4.3.1 LIMIT

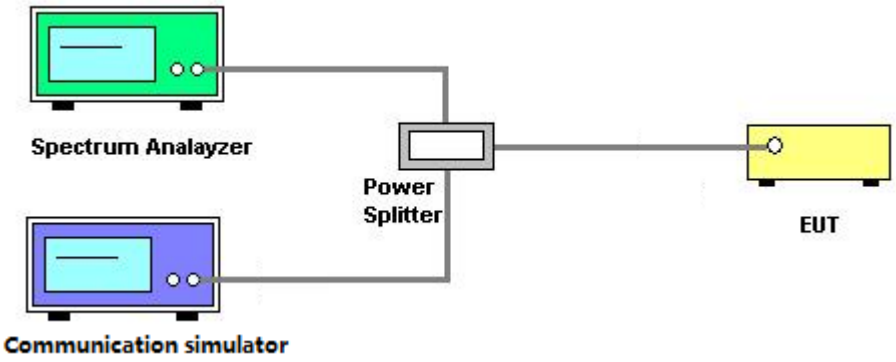
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

4.3.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.0 or ANSI C63.26-2015 Section 5.7.

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured. Set RBW>=1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
3. Set spectrum analyzer with Peak or RMS detector.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

4.3.3 TEST SETUP LAYOUT



4.3.4 TEST DEVIATION

No deviation.

4.3.5 TEST RESULTS

Please refer to the APPENDIX C.

4.4 RADIATED SPURIOUS EMISSIONS MEASUREMENT

4.4.1 LIMIT

Out of band emissions: The powerof any emission outside of theauthorized operating frequency ranges must be attenuated below the transmitting power (P) by a factorof at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

For operations in the 758–775 MHz and 788–805 MHz bands, all emissions including harmonics in the band 1559–1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

E (dBμV/m) = EIRP (dBm) - 20 log D + 104.8; where D is the measurement distance in meters. The emission limit equal to 82.26dBμV/m or 55.26dBμV/m.

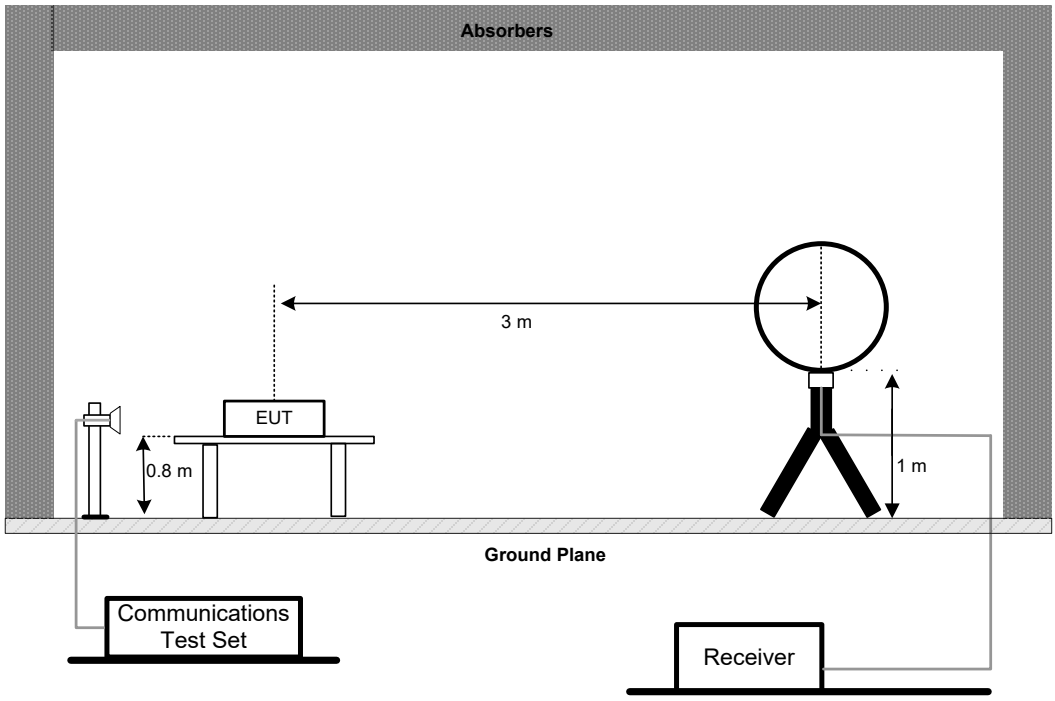
4.4.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.2 or ANSI C63.26-2015 Section 5.5.

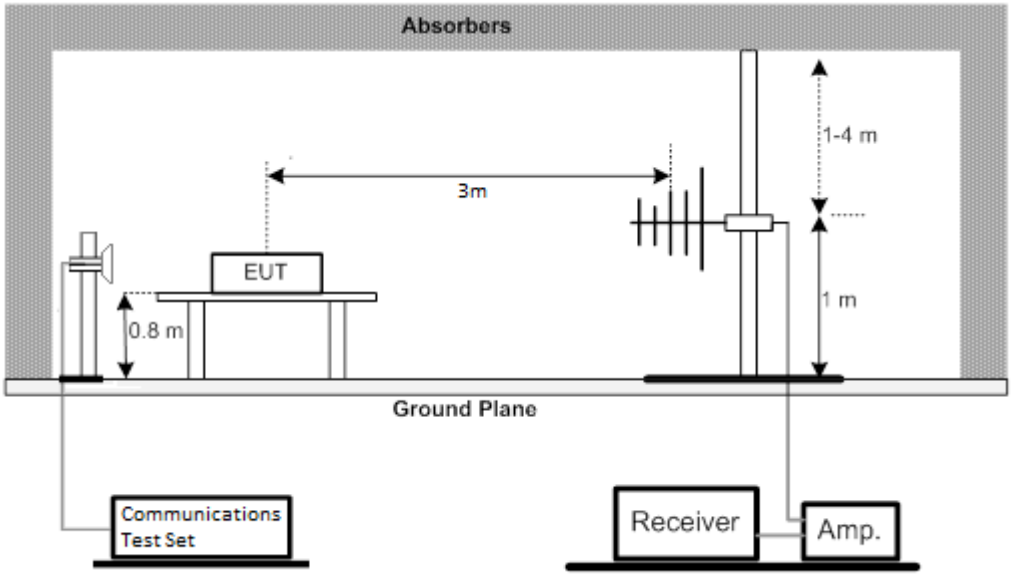
1. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
3. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
4. Start the test, rotate the table 360° to find the worst Angle, maintain the worst Angle, raise the antenna to 1-4m to find the worst height, maintain the worst height, then rotate the table to determine the final worst Angle, grab the spectrum diagram.
5. EUT shall be placed in accordance with X,Y,Z as required by Figure 5 in ANSI C63.26.
   Repeat Step 5 above to find the worst placement. Test all bands according to the worst placement.
6. Then EIRP is then converted to field strength as follows in Equation
7. E (dBuV/m) = EIRP (dBm) - 20log(D) + 104.8; where D is the measurement distance (in the far field region) in m.The emission limit equal to 82.26dBuV/m or 55.26dBμV/m.

4.4.3 TEST SETUP LAYOUT

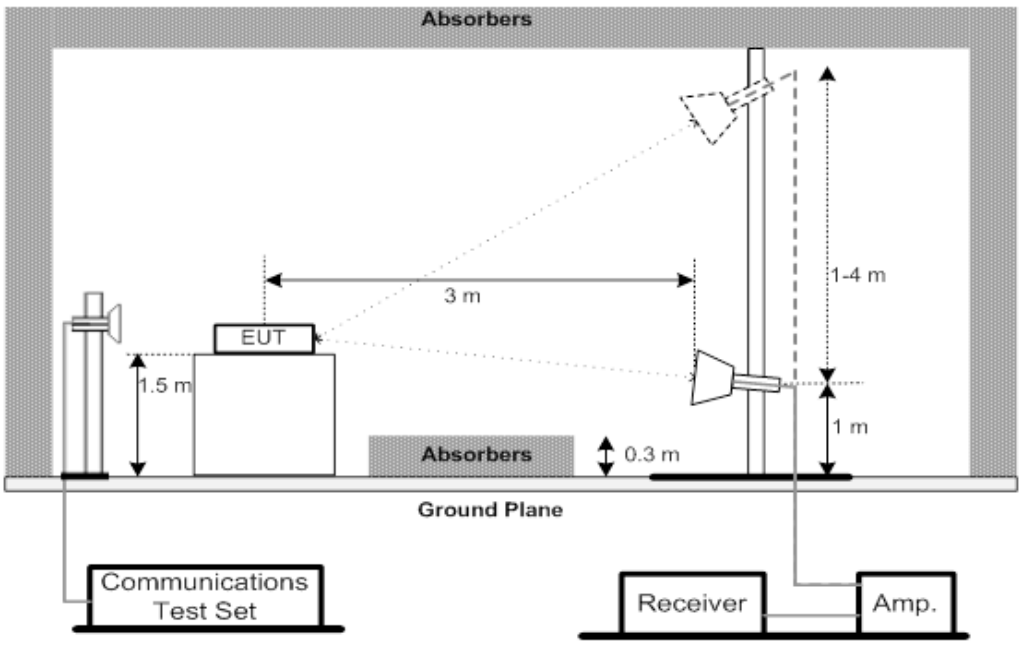
Below 30MHz



30MHz to 1000MHz



Above 1GHz



4.4.4 TEST DEVIATION

No deviation.

4.4.5 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the APPENDIX D.

4.4.6 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the APPENDIX E.

4.4.7 TEST RESULTS (ABOVE 1000MHZ)

Please refer to the APPENDIX F.

4.5 MASK MEASUREMENTS

4.5.1 LIMIT

<Mask B>

For transmitter that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

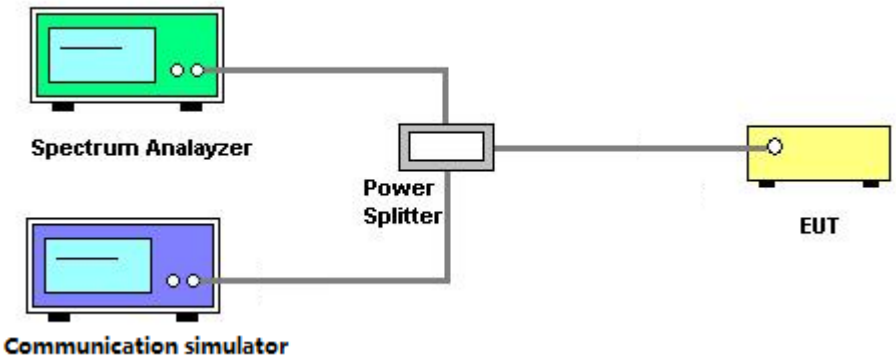
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43+10log(P) dB.

4.5.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.0 or ANSI C63.26-2015 Section 5.7.

1. All measurements were done at low and high operational frequency range.
2. Set RBW=1% of 26dBc bandwidth, VBW=3 X RBW, detector=RMS, Sweep time = Auto.
3. Record the max trace plot into the test report.

4.5.3 TEST SETUP LAYOUT



4.5.4 TEST DEVIATION

No deviation.

4.5.5 TEST RESULTS

Please refer to the APPENDIX G.

4.6 PEAK TO AVERAGE RATIO MEASUREMENT

4.6.1 LIMIT

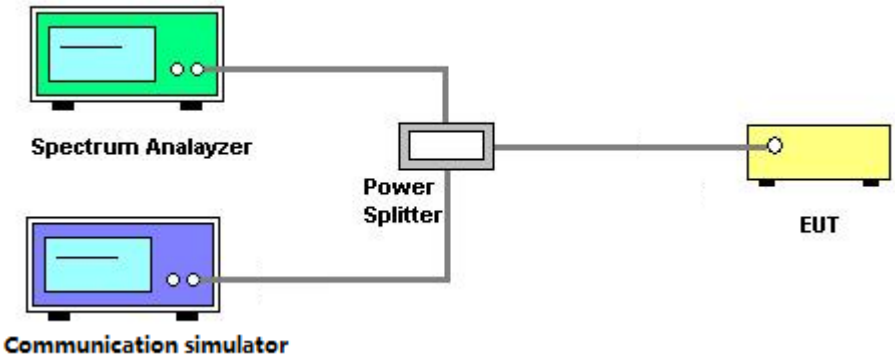
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.6.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 5.7 or ANSI C63.26-2015 Section 5.2.6.

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.3 TEST SETUP LAYOUT



4.6.4 TEST DEVIATION

No deviation.

4.6.5 TEST RESULTS

Please refer to the APPENDIX H.

4.7 CONDUCTED BAND EDGE MEASUREMENT

4.7.1 LIMIT

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76+10log(P) dB In a 6.25 KHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65+10log(P) dB In a 6.25 KHz band segment, for mobile and portable stations.

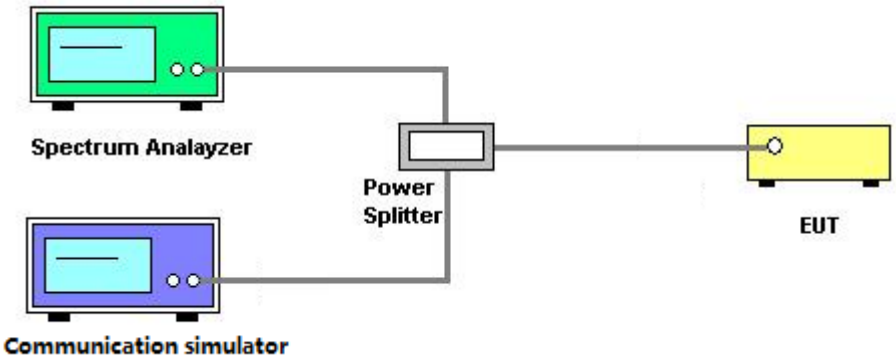
(3) On all frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43+10log(P) dB.

4.7.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6 or ANSI C63.26-2015 Section 5.7.

1. All measurements were done at low and high operational frequency range.
2. Record the max trace plot into the test report.

4.7.3 TEST SETUP LAYOUT



4.7.4 TEST DEVIATION

No deviation.

4.7.5 TEST RESULTS

Please refer to the APPENDIX I.

4.8 FREQUENCY STABILITY MEASUREMENT

4.8.1 LIMIT

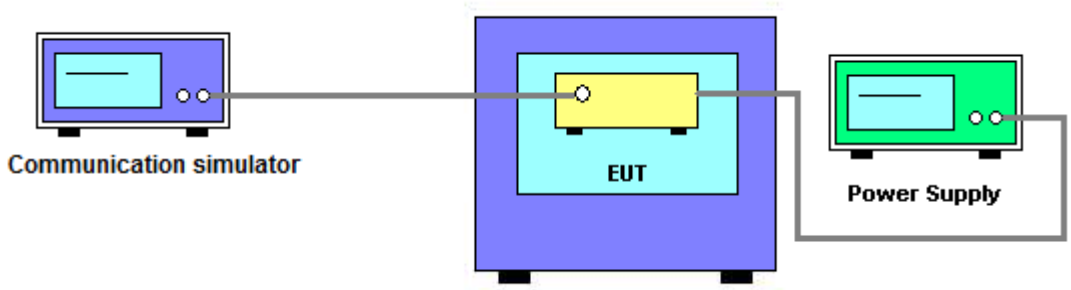
Tht frequency stability of mobile portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better.

4.8.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 9.0 or ANSI C63.26-2015 Section 5.6.

1. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
2. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
3. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5°C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.
4. The frequency error was recorded frequency error from the communication simulator.

4.8.3 TEST SETUP LAYOUT



4.8.4 TEST DEVIATION

No deviation.

4.8.5 TEST RESULTS

Please refer to the APPENDIX J.

5. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Active Loop Antenna	Schwarzbeck	FMZB 1513-60	25	Mar. 30, 2025
2	MXE EMI Receiver	Keysight	N9038A	MY56400091	Dec. 22, 2024
3	Cable	N/A	RW2350-3.8A-NMBM-1.5M	N/A	Jun. 10, 2024
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
5	966 Chamber room	ETS	9*6*6	N/A	Jul. 11, 2024

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	01269	May 15, 2024
2	Attenuator	EMCI	EMCI-N-6-06	AN-N0697	May 15, 2024
3	MXE EMI Receiver	Keysight	N9038A	MY59050118	Sep. 26, 2024
4	Preamplifier	EMC INSTRUMENT	EMC001330	980825	Jan. 19, 2025
5	Cable	EMC INSTRUMENT	EMCCFD400-NM-NM-2500	N/A	Jun. 08, 2024
6	Cable	EMC INSTRUMENT	EMCCFD400-NM-NM-7000	N/A	Jun. 08, 2024
7	Cable	EMC INSTRUMENT	EMCCFD400-NM-NM-3000	N/A	Jun. 08, 2024
8	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
9	966 Chamber room	Tai He	9*6*6 (NSA&VSWR)	N/A	Jun. 07, 2024

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	MXE EMI Receiver	Keysight	N9038A	MY59050118	Sep. 26, 2024
2	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
3	Preamplifier	EMC INSTRUMENT	EMC118A45SE	980739	Jan. 19, 2025
4	Cable	EMC INSTRUMENT	EMC104-SM-SM-10000	N/A	Jun. 08, 2024
5	Cable	EMC INSTRUMENT	EMC104-SM-SM-3000	N/A	Jun. 08, 2024
6	Cable	EMC INSTRUMENT	EMC104-SM-SM-800	N/A	Jun. 08, 2024
7	Double Ridged Broadband Horn Antenna	RF SPIN	DRH18-E	210106A18E	Jul. 04, 2024
8	Preamplifier	EMC INSTRUMENT	EMC184045SE	980793	Jan. 19, 2025
9	Cable	EMC INSTRUMENT	EMC101G-KM-KM-800	N/A	Aug. 13, 2024
10	Cable	EMC INSTRUMENT	EMC101G-KM-KM-6000	N/A	Aug. 13, 2024
11	Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	01046	Jul. 05, 2024
12	Band Reject Filter	COM-MW	ZHPF6-C3000-18000-174	7213126	Jul. 07, 2024
13	Band Reject Filter	COM-MW	ZHPF6-M6500-18000-547	7213124	Jul. 07, 2024
14	Attenuator	Talent Microwave	ATT-18G2W-10	N/A	N/A
15	966 Chamber room	Tai He	9*6*6 (NSA&VSWR)	N/A	Jun. 07, 2024

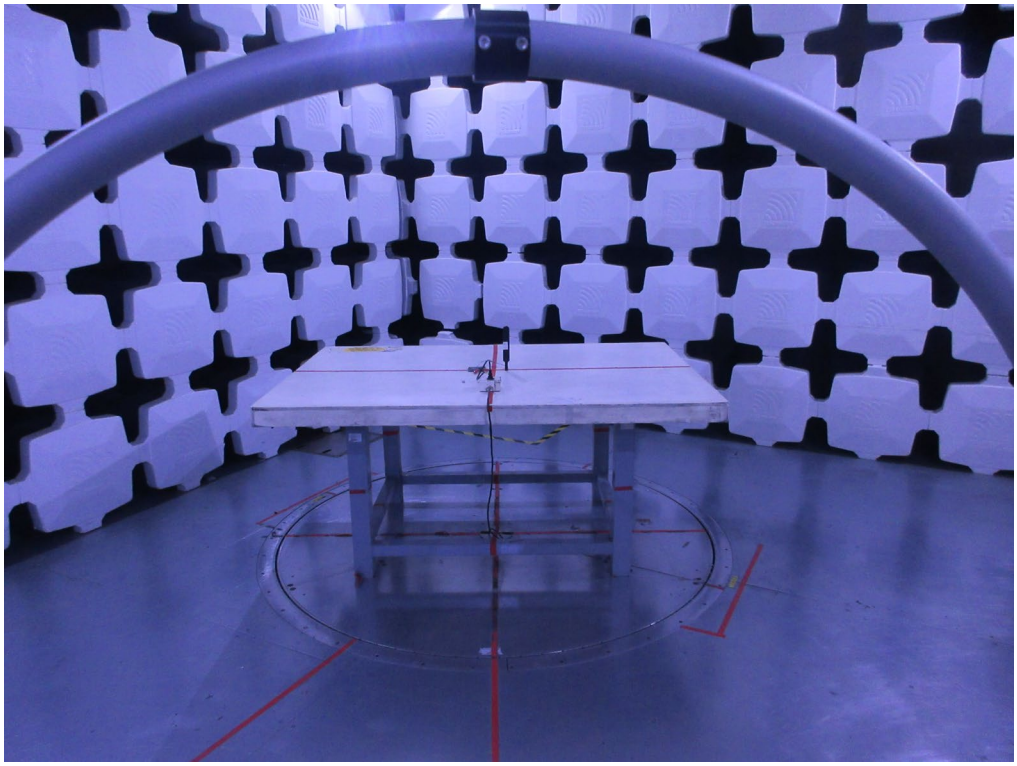
Conducted Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wideband Radio Communication Tester	R&S	CWM 500	131463	Jan. 19, 2025
2	Signal Analyzer	R&S	FSV 40	100948	Jul. 07, 2024
3	Temperature Chamber	ESPEC	SU-242	93018786	Jul. 07, 2024
4	MXA Signal Analyzer	Agilent Technologies	N9020A	MY49100060	Jul. 07, 2024
5	DC Source metter	Iteck	IT6154	006104126768201001	Jul. 08, 2024

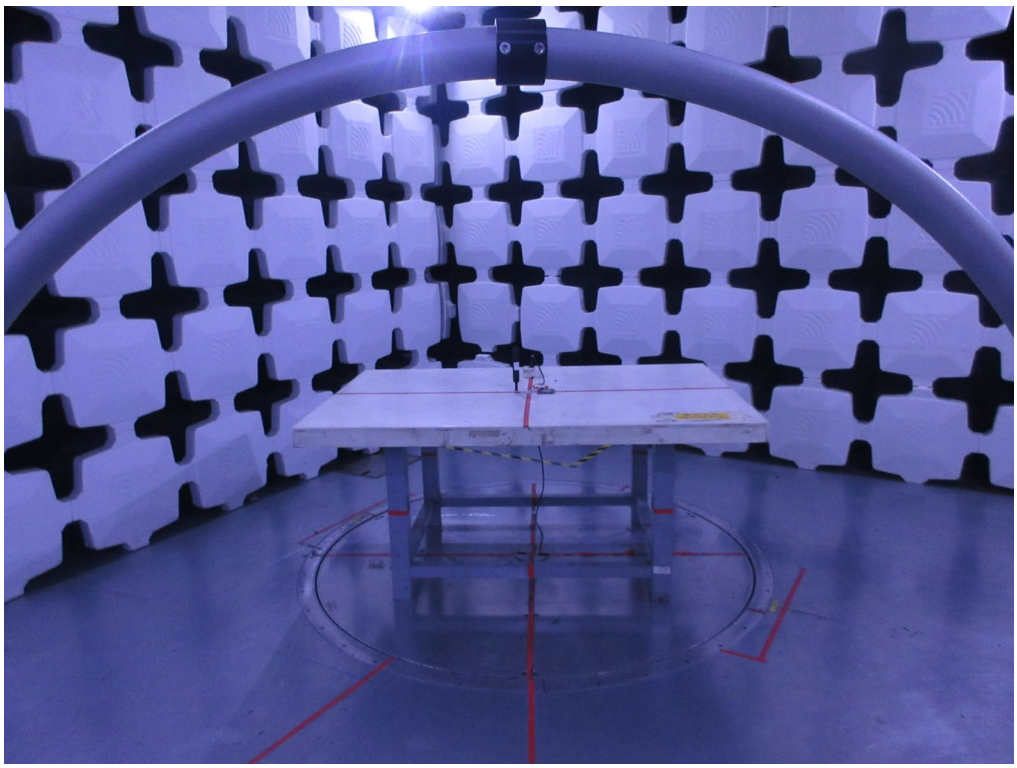
Remark: ”N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

5. EUT TEST PHOTO

Radiated Emissions Test Photos

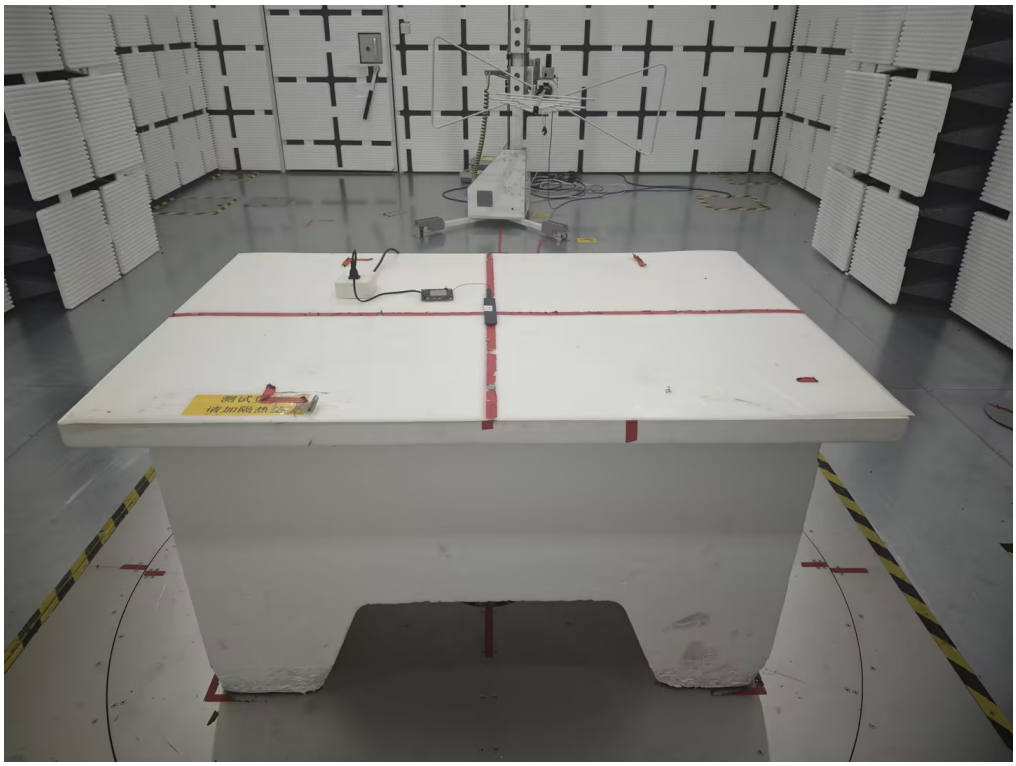
9 kHz to 30 MHz

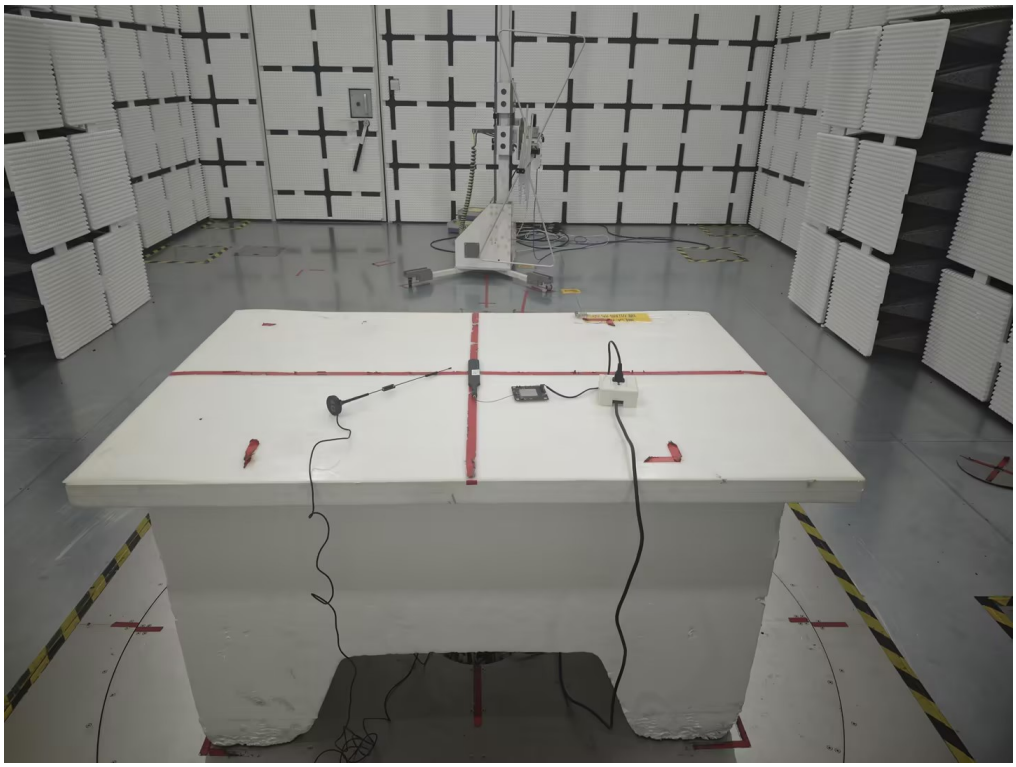




Radiated Emissions Test Photos

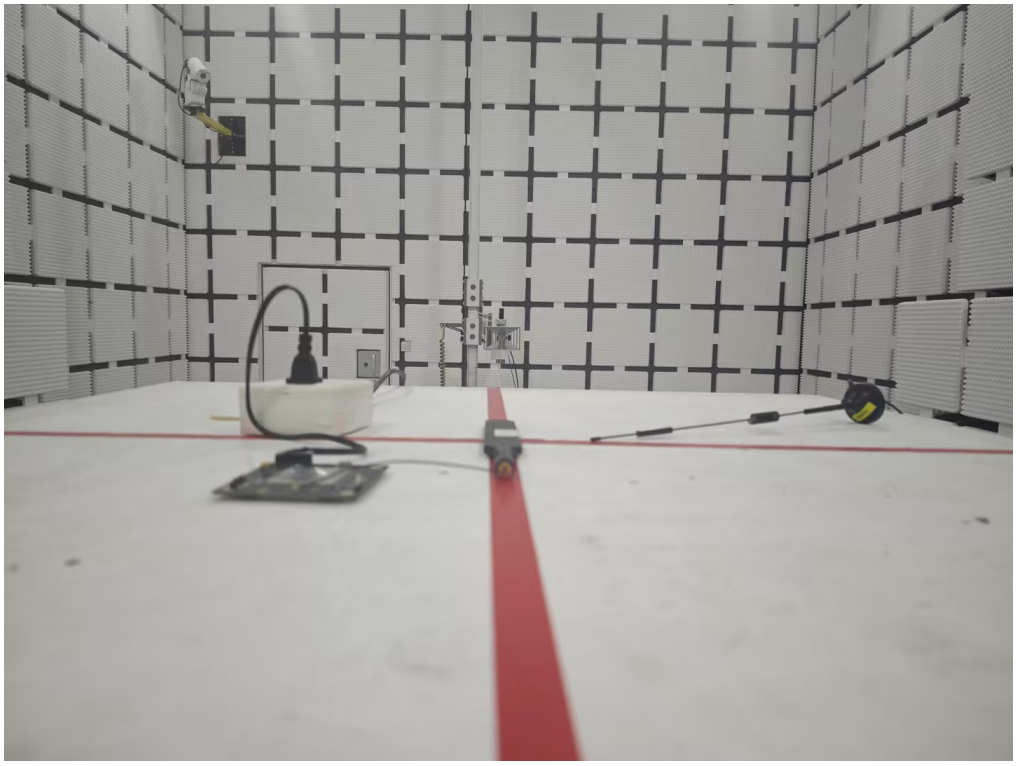
30 MHz to 1 GHz

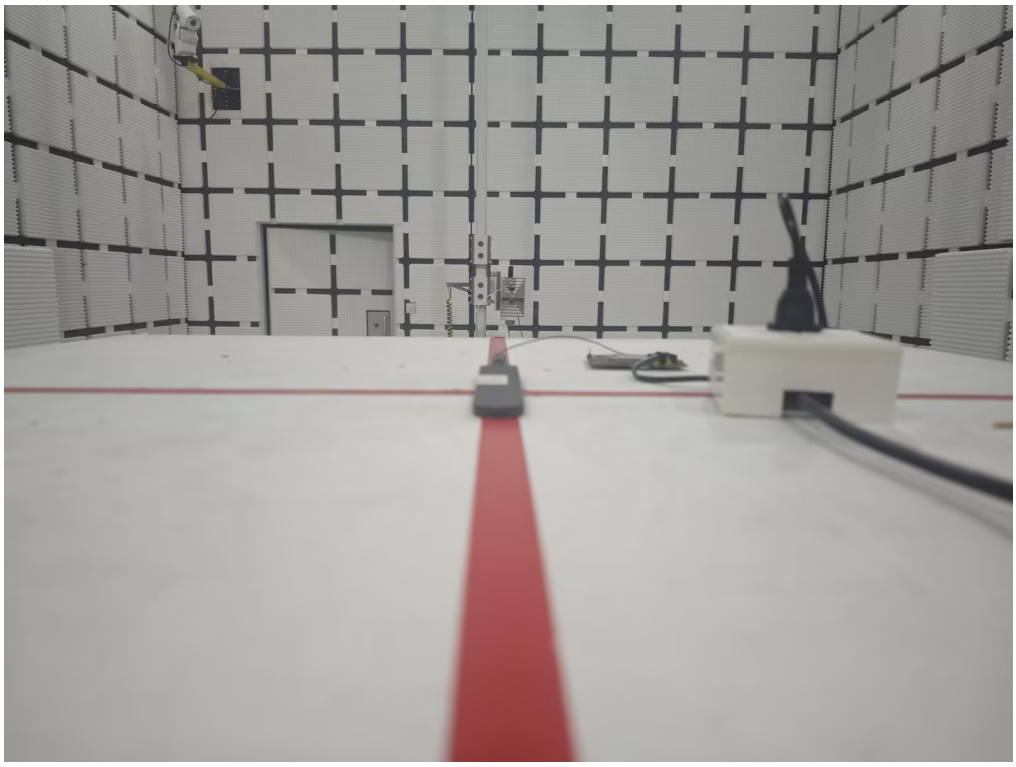




Radiated Emissions Test Photos

Above 1 GHz





APPENDIX A - OUTPUT POWER

Output Power (dBm)

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				23305CH	23330CH	23355CH
				790.5MHz	793MHz	795.5MHz
14 / 5MHz	QPSK	1	0	23.22	23.10	23.30
		1	13	23.23	23.15	23.29
		1	24	23.26	23.10	23.24
		12	0	22.13	22.08	22.22
		12	6	22.19	22.09	22.22
		12	11	22.23	22.04	22.29
		25	0	22.24	22.14	22.21
	16QAM	1	0	22.29	22.30	22.71
		1	13	22.34	22.35	22.70
		1	24	22.36	22.20	22.67
		12	0	21.29	21.13	21.36
		12	6	21.29	21.12	21.30
		12	11	21.31	21.10	21.34
		25	0	21.19	21.09	21.26

LTE Band / BW	Modulation	RB Size	RB Offset	Mid CH
				23330CH
				793MHz
14 / 10MHz	QPSK	1	0	23.19
		1	25	23.05
		1	49	23.17
		25	0	22.11
		25	13	22.11
		25	25	22.10
		50	0	22.18
	16QAM	1	0	22.30
		1	25	22.14
		1	49	22.21
		25	0	21.23
		25	13	21.21
		25	25	21.16
		50	0	21.24

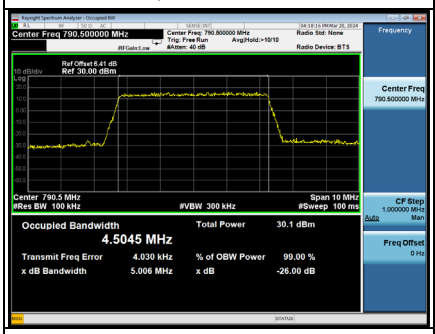
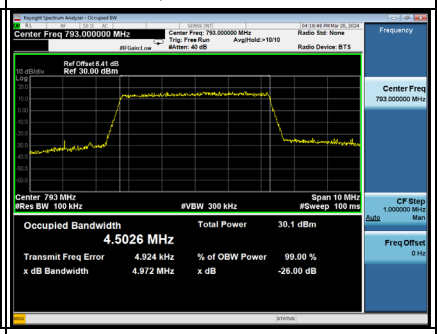
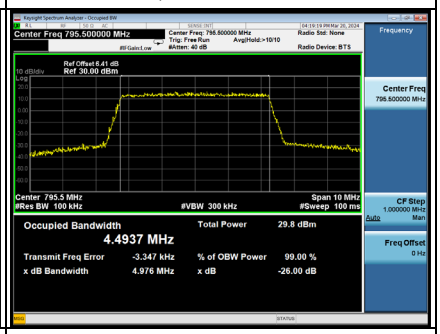
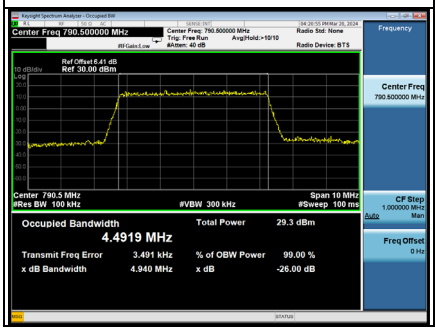
ERP (dBm)

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				23305CH	23330CH	23355CH
				790.5MHz	793MHz	795.5MHz
14 / 5MHz	QPSK	1	0	23.26	23.14	23.34
		1	13	23.27	23.19	23.33
		1	24	23.30	23.14	23.28
		12	0	22.17	22.12	22.26
		12	6	22.23	22.13	22.26
		12	11	22.27	22.08	22.33
		25	0	22.28	22.18	22.25
	16QAM	1	0	22.33	22.34	22.75
		1	13	22.38	22.39	22.74
		1	24	22.40	22.24	22.71
		12	0	21.33	21.17	21.40
		12	6	21.33	21.16	21.34
		12	11	21.35	21.14	21.38
		25	0	21.23	21.13	21.30

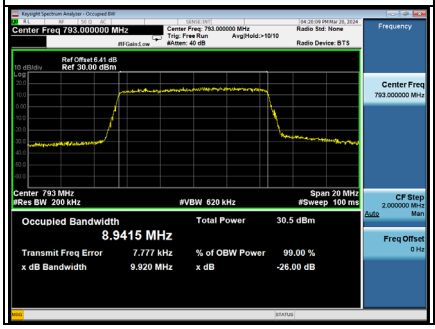
LTE Band / BW	Modulation	RB Size	RB Offset	Mid CH
				23330CH
				793MHz
14 / 10MHz	QPSK	1	0	23.23
		1	25	23.09
		1	49	23.21
		25	0	22.15
		25	13	22.15
		25	25	22.14
		50	0	22.22
	16QAM	1	0	22.34
		1	25	22.18
		1	49	22.25
		25	0	21.27
		25	13	21.25
		25	25	21.20
		50	0	21.28

APPENDIX B - OCCUPIED BANDWIDTH

LTE Band 14_5MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23305	790.5	4.5045	4.4919	5.006	4.490
23330	793	4.5026	4.4925	4.972	4.998
23355	795.5	4.4937	4.4879	4.976	4.945

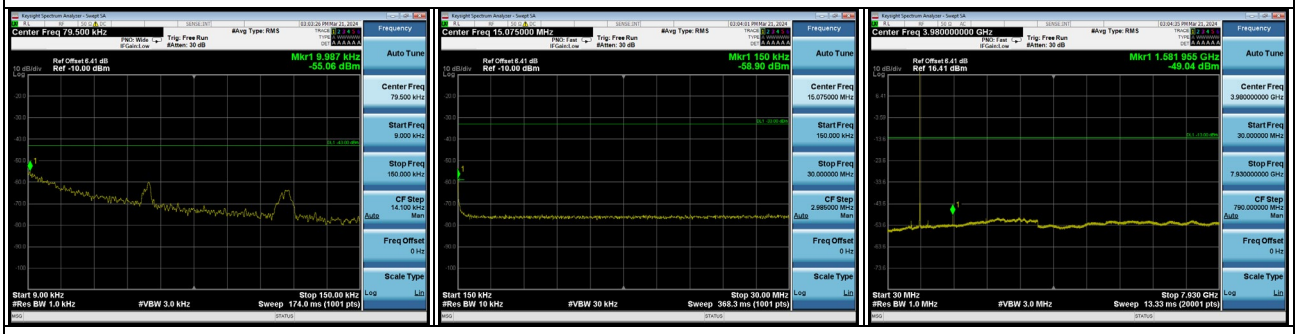
Spectrum Plot		
QPSK-23305	QPSK-23330	QPSK-23355
		
16QAM-23305	16QAM-23330	16QAM-23355
		

LTE Band 14_10MHz					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23330	793	8.9415	8.9652	9.920	9.866

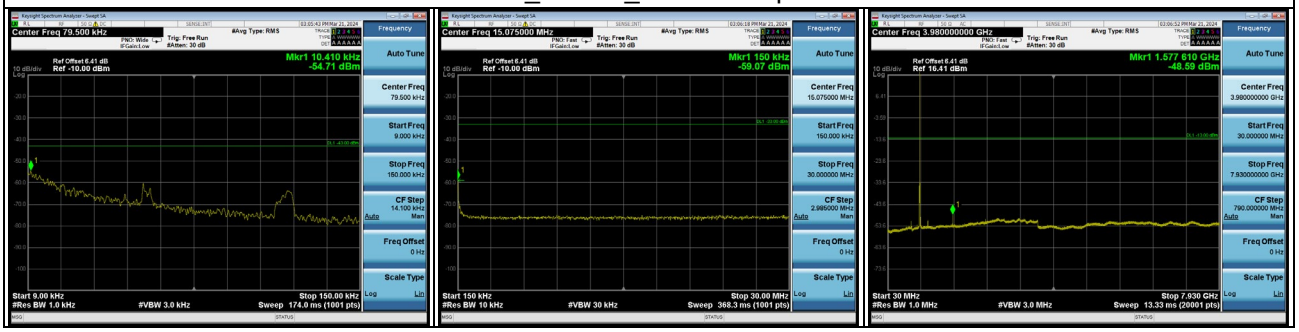
Spectrum Plot		
QPSK-23330	16QAM-23330	-
		-

APPENDIX C - CONDUCTED SPURIOUS EMISSIONS

LTE Band 14_5MHz_CH23355 Spectrum Plot



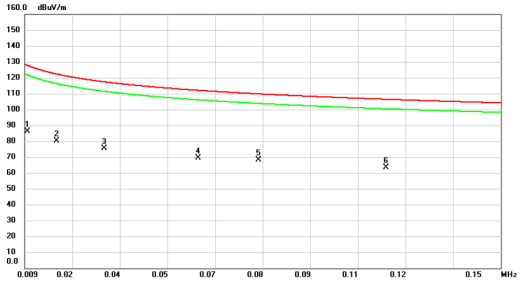
LTE Band 14_10MHz_CH26740 Spectrum Plot



APPENDIX D - RADIATED SPURIOUS EMISSIONS (9KHZ TO 30MHZ)

Test Mode :	TX Mode

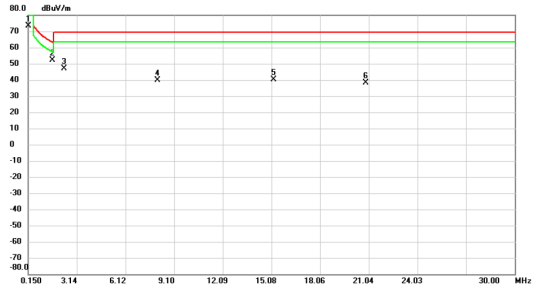
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.010	65.33	20.92	86.25	127.78	-41.53	peak	
2		0.018	59.01	21.03	80.04	122.31	-42.27	peak	
3		0.033	54.22	21.21	75.43	117.34	-41.91	peak	
4		0.060	48.11	21.30	69.41	111.97	-42.56	peak	
5		0.078	46.76	21.30	68.06	109.74	-41.68	peak	
6		0.116	42.29	21.31	63.60	106.32	-42.72	peak	

Test Mode :	TX Mode

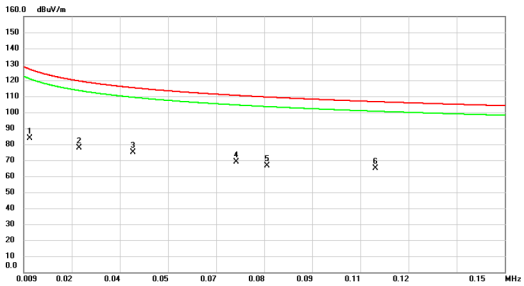
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.150	52.24	21.26	73.50	104.09	-30.59	peak	
2	*	1.643	30.96	21.18	52.14	63.29	-11.15	peak	
3		2.359	25.74	21.22	46.96	69.54	-22.58	peak	
4		8.075	18.16	21.58	39.74	69.54	-29.80	peak	
5		15.224	18.24	21.82	40.06	69.54	-29.48	peak	
6		20.866	16.33	21.96	38.29	69.54	-31.25	peak	

Test Mode :	TX Mode

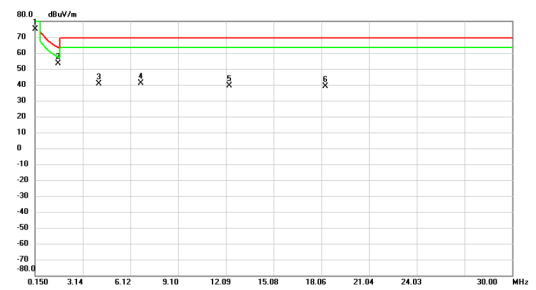
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.011	62.73	20.91	83.64	126.94	-43.30	peak	
2		0.025	56.78	21.13	77.91	119.54	-41.63	peak	
3	*	0.041	53.63	21.25	74.88	115.35	-40.47	peak	
4		0.071	47.57	21.30	68.87	110.54	-41.67	peak	
5		0.080	45.34	21.30	66.64	109.51	-42.87	peak	
6		0.112	43.52	21.31	64.83	106.62	-41.79	peak	

Test Mode :	TX Mode

Ant 90°

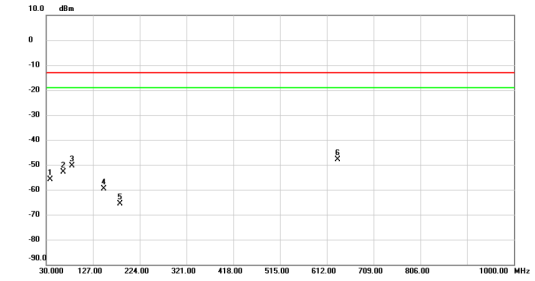


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.150	53.89	21.26	75.15	104.09	-28.94	peak	
2	*	1.613	32.37	21.18	53.55	63.45	-9.90	peak	
3		4.150	19.34	21.34	40.68	69.54	-28.86	peak	
4		6.777	19.57	21.51	41.08	69.54	-28.46	peak	
5		12.299	17.69	21.56	39.25	69.54	-30.29	peak	
6		18.329	17.23	21.89	39.12	69.54	-30.42	peak	

APPENDIX E - RADIATED SPURIOUS EMISSIONS (30MHZ TO 1000MHZ)

Test Mode :	LTE Band 14_TX CH23330_5MHz

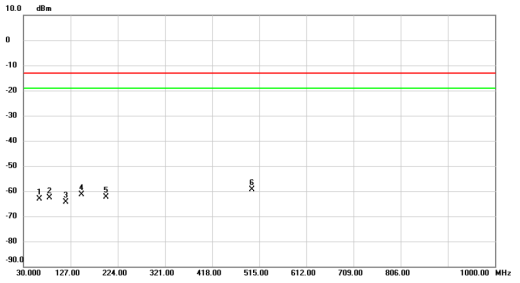
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		38.2450	-64.28	8.49	-55.79	-13.00	-42.79	peak	
2		65.4050	-60.80	7.84	-52.96	-13.00	-39.96	peak	
3		83.3500	-54.27	4.00	-50.27	-13.00	-37.27	peak	
4		149.7950	-68.90	9.20	-59.70	-13.00	-46.70	peak	
5		183.2600	-72.94	7.35	-65.59	-13.00	-52.59	peak	
6	*	634.3100	-63.84	16.04	-47.80	-13.00	-34.80	peak	

Test Mode :	LTE Band 14_TX CH23330_5MHz

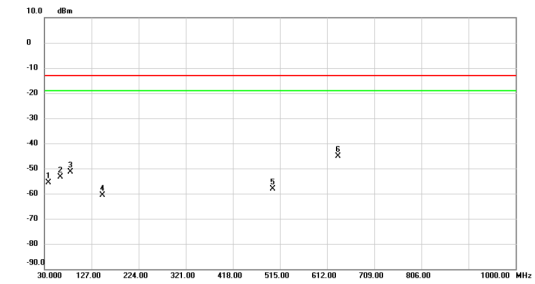
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		62.4950	-71.42	8.27	-63.15	-13.00	-50.15	peak	
2		83.3500	-66.55	4.00	-62.55	-13.00	-49.55	peak	
3		116.8150	-71.00	6.57	-64.43	-13.00	-51.43	peak	
4		149.7950	-70.54	9.20	-61.34	-13.00	-48.34	peak	
5		199.7500	-68.36	5.93	-62.43	-13.00	-49.43	peak	
6	*	499.9650	-72.84	13.48	-59.36	-13.00	-46.36	peak	

Test Mode :	LTE Band 14_TX CH23330_10MHz

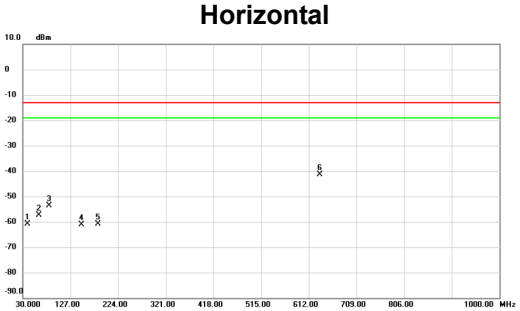
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		38.2450	-64.22	8.49	-55.73	-13.00	-42.73	peak	
2		63.4650	-61.56	8.13	-53.43	-13.00	-40.43	peak	
3		83.3500	-55.37	4.00	-51.37	-13.00	-38.37	peak	
4		149.7950	-69.70	9.20	-60.50	-13.00	-47.50	peak	
5		499.9650	-71.71	13.48	-58.23	-13.00	-45.23	peak	
6	*	634.3100	-61.13	16.04	-45.09	-13.00	-32.09	peak	

Test Mode :	LTE Band 14_TX CH23330_10MHz

Horizontal

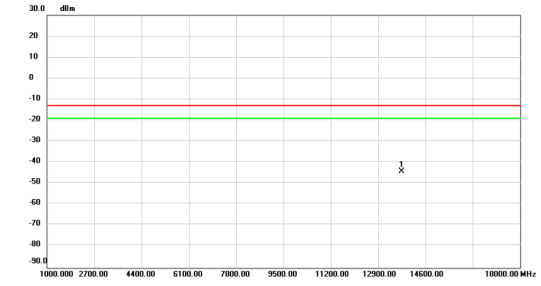


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		40.1850	-69.64	8.71	-60.93	-13.00	-47.93	peak	
2		62.4950	-65.65	8.27	-57.38	-13.00	-44.38	peak	
3		83.3500	-57.52	4.00	-53.52	-13.00	-40.52	peak	
4		149.7950	-70.38	9.20	-61.18	-13.00	-48.18	peak	
5		183.2600	-68.31	7.35	-60.96	-13.00	-47.96	peak	
6	*	634.7950	-57.50	16.04	-41.46	-13.00	-28.46	peak	

APPENDIX F - RADIATED SPURIOUS EMISSIONS (ABOVE 1000MHZ)

Test Mode :	LTE Band 14_TX CH23330_5MHz

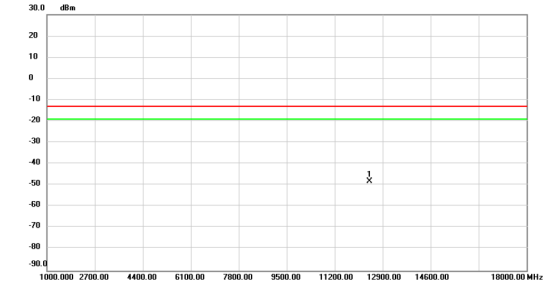
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	13750.00	-66.62	22.24	-44.38	-13.00	-31.38	peak	

Test Mode :	LTE Band 14_TX CH23330_5MHz

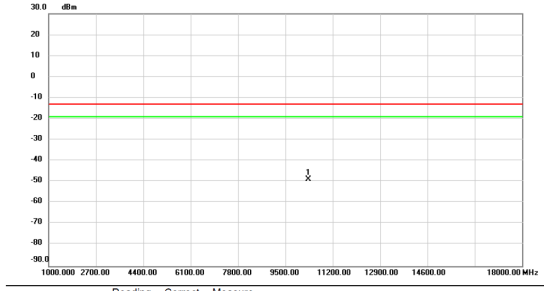
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	12432.50	-68.90	20.81	-48.09	-13.00	-35.09	peak	

Test Mode :	LTE Band 14_TX CH23330_10MHz

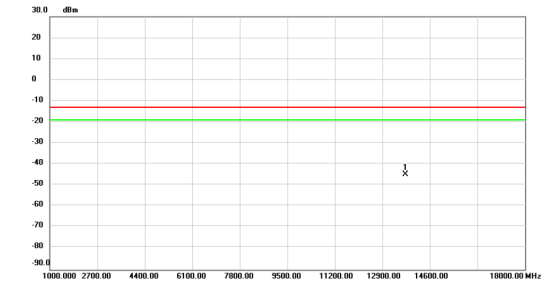
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	10324.50	-68.26	19.62	-48.64	-13.00	-35.64	peak	

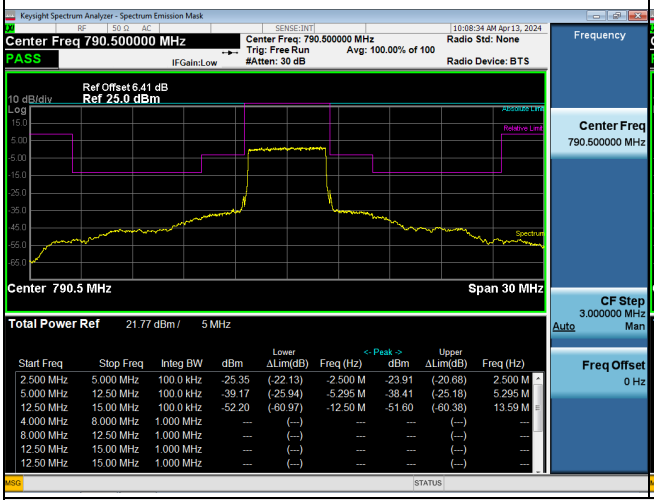
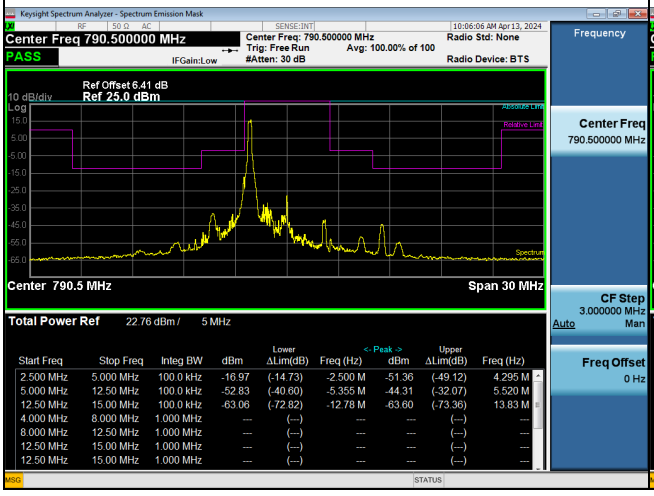
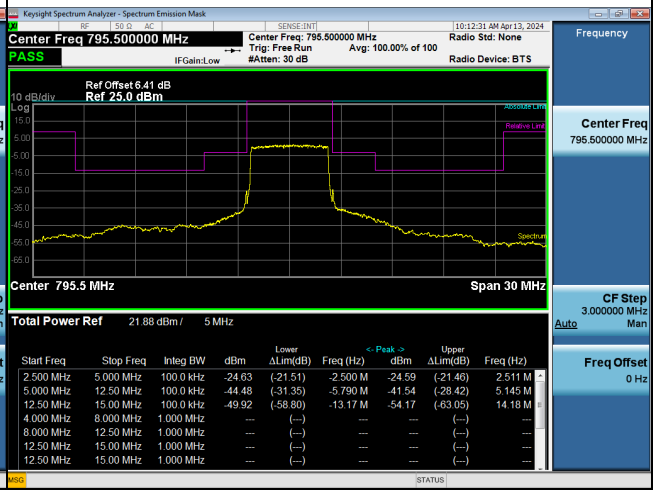
Test Mode :	LTE Band 14_TX CH23330_10MHz

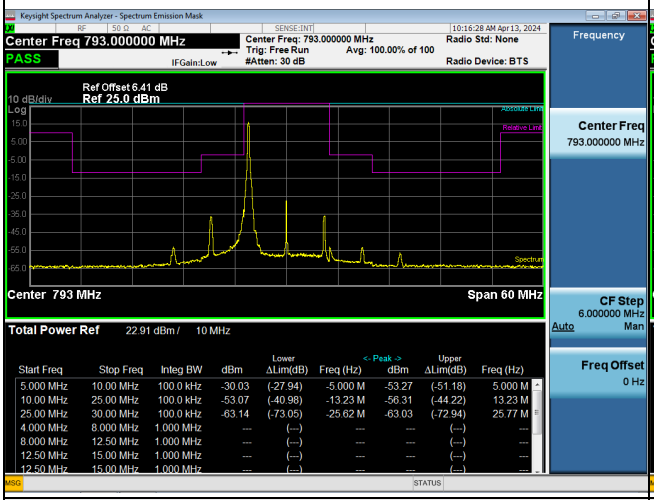
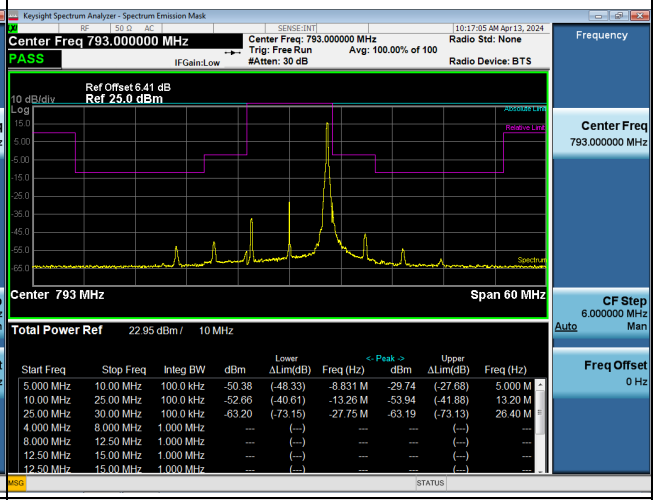
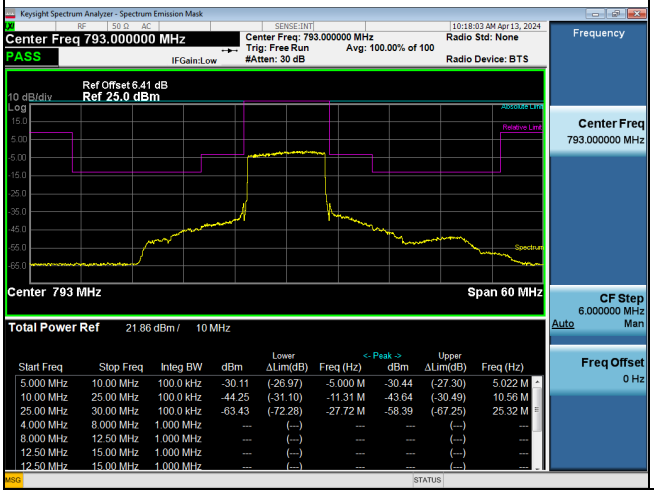
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	13716.00	-67.07	22.24	-44.83	-13.00	-31.83	peak	

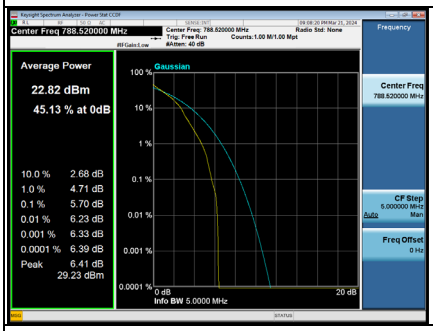
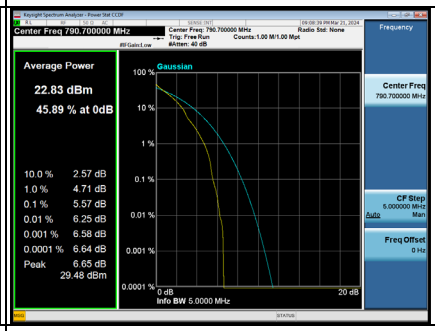
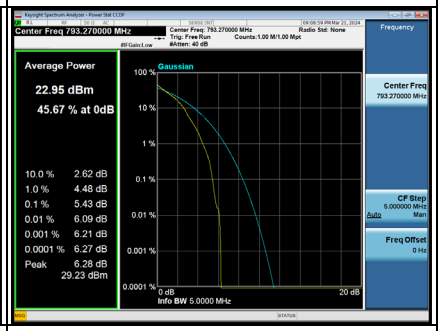
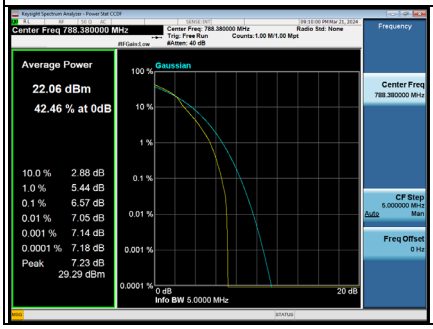
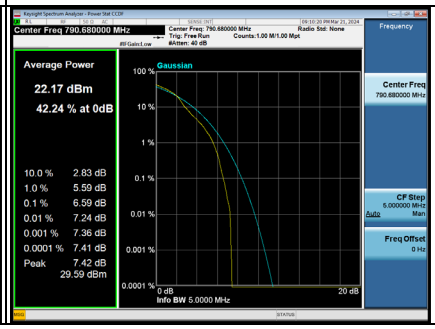
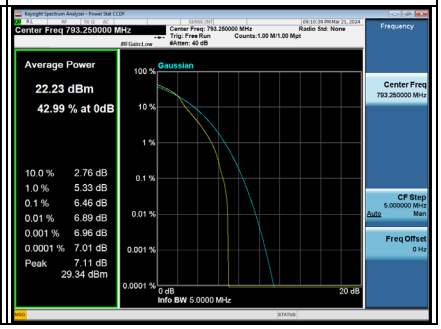
APPENDIX G - MASK

LTE Band 14_5MHz			
1RB#0		1RB#24	
Channel	23305	Channel	23355
			
25RB#0			
Channel	23305	Channel	23355
			

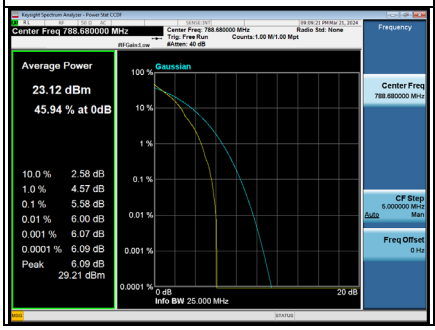
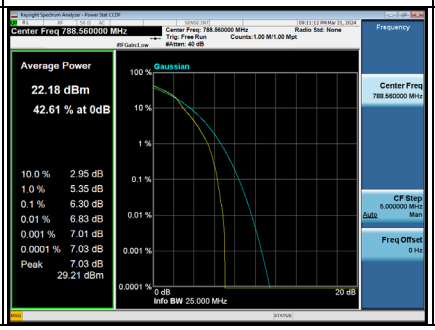
LTE Band 14_10MHz			
1RB#0		1RB#49	
Channel	23330	Channel	23330
			
50RB#0		-	
Channel	23330	-	
		-	

APPENDIX H - PEAK TO AVERAGE RATIO

LTE Band 14_5MHz					
Channel	Frequency (MHz)	Peak To Average Ratio (dB)		Max. Limit (dB)	Result
		QPSK	16QAM		
23305	790.5	5.70	6.57	13	Pass
23330	793	5.57	6.59	13	Pass
23355	795.5	5.43	6.46	13	Pass

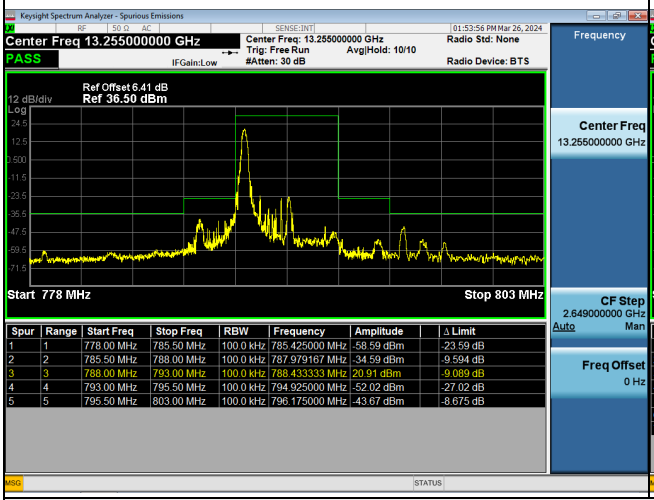
Spectrum Plot		
QPSK-23305	QPSK-23330	QPSK-23355
		
16QAM-23305	16QAM-23330	16QAM-23355
		

LTE Band 14_10MHz						
Channel	Frequency (MHz)	Peak To Average Ratio (dB)			Max. Limit (dB)	Result
		QPSK	16QAM	-		
23330	793	5.58	6.30	-	13	Pass

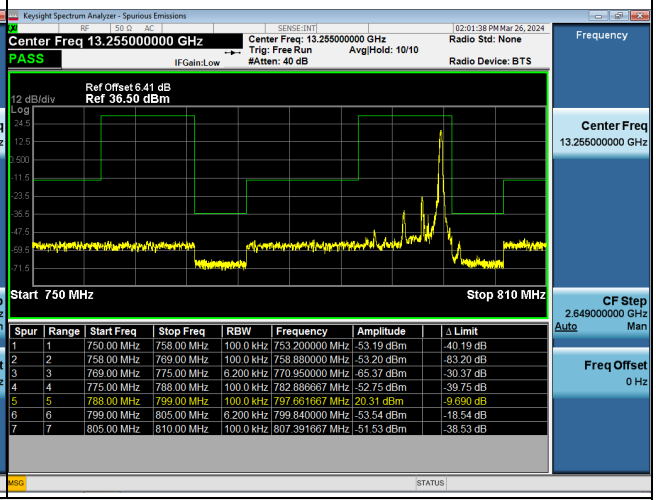
Spectrum Plot		
QPSK-23330	16QAM-23330	-
		-

APPENDIX I - CONDUCTED BAND EDGE MEASUREMENT

LTE Band 14_5MHz			
1RB#0		1RB#24	
Channel	23305	Channel	23355

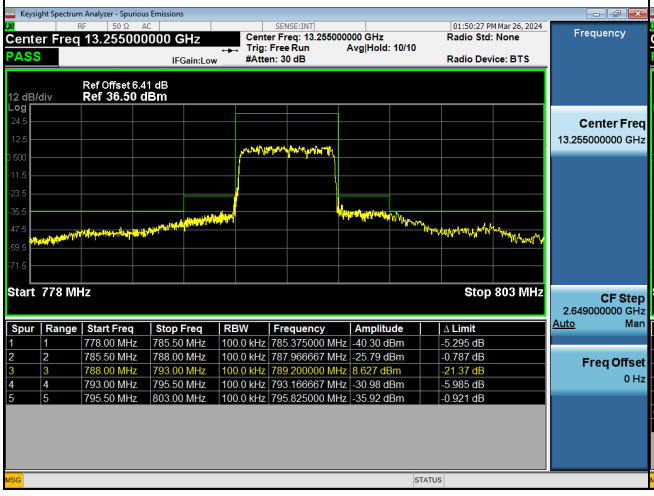


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	778.00 MHz	785.50 MHz	100.0 kHz	785.425000 MHz	-58.59 dBm	-23.59 dB
2	2	785.50 MHz	788.00 MHz	100.0 kHz	787.979167 MHz	-34.59 dBm	-9.594 dB
3	3	788.00 MHz	793.00 MHz	100.0 kHz	788.433333 MHz	20.91 dBm	-9.089 dB
4	4	793.00 MHz	795.50 MHz	100.0 kHz	794.925000 MHz	-52.02 dBm	-27.02 dB
5	5	795.50 MHz	803.00 MHz	100.0 kHz	796.175000 MHz	-43.67 dBm	-8.675 dB

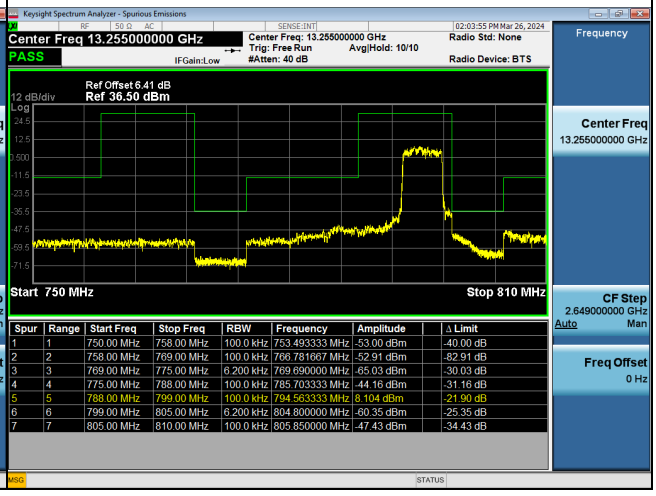


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	750.00 MHz	758.00 MHz	100.0 kHz	753.200000 MHz	-53.19 dBm	-40.19 dB
2	2	758.00 MHz	769.00 MHz	100.0 kHz	758.880000 MHz	-53.20 dBm	-83.20 dB
3	3	769.00 MHz	775.00 MHz	6.200 kHz	770.950000 MHz	-65.37 dBm	-30.37 dB
4	4	775.00 MHz	788.00 MHz	100.0 kHz	782.886667 MHz	-52.75 dBm	-39.75 dB
5	5	788.00 MHz	799.00 MHz	100.0 kHz	797.661667 MHz	20.31 dBm	-9.690 dB
6	6	799.00 MHz	805.00 MHz	6.200 kHz	799.840000 MHz	-53.54 dBm	-18.54 dB
7	7	805.00 MHz	810.00 MHz	100.0 kHz	807.391667 MHz	-51.53 dBm	-38.53 dB

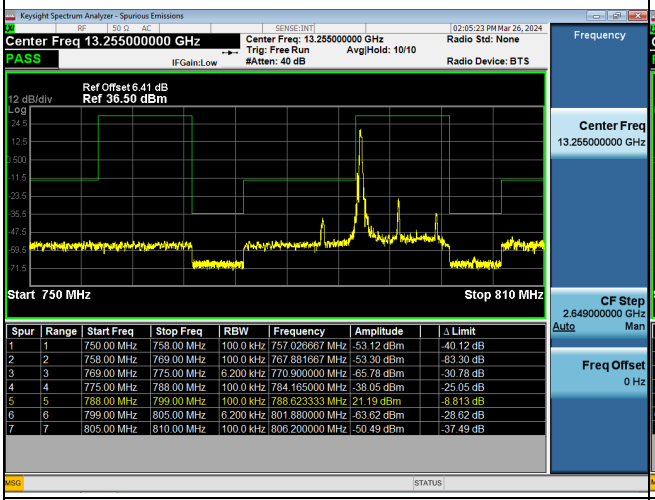
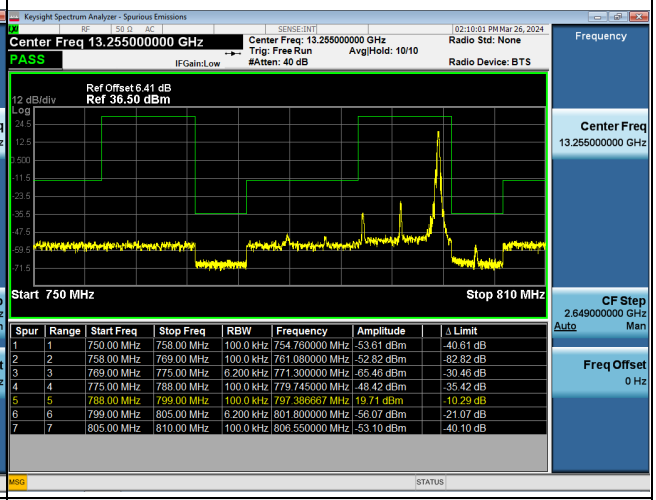
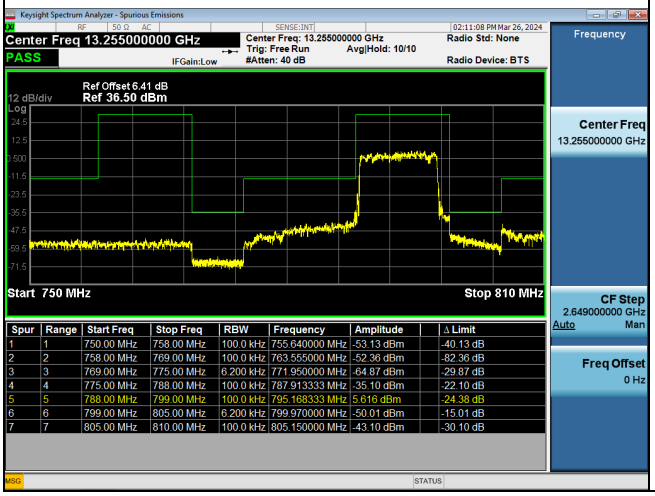
25RB#0			
Channel	23305	Channel	23355



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	778.00 MHz	785.50 MHz	100.0 kHz	785.375000 MHz	-40.30 dBm	-5.295 dB
2	2	785.50 MHz	788.00 MHz	100.0 kHz	787.966667 MHz	-25.79 dBm	-0.787 dB
3	3	788.00 MHz	793.00 MHz	100.0 kHz	789.200000 MHz	8.627 dBm	-21.37 dB
4	4	793.00 MHz	795.50 MHz	100.0 kHz	793.166667 MHz	-30.98 dBm	-5.985 dB
5	5	795.50 MHz	803.00 MHz	100.0 kHz	795.825000 MHz	-35.92 dBm	-0.921 dB



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	750.00 MHz	758.00 MHz	100.0 kHz	753.493333 MHz	-53.00 dBm	-40.00 dB
2	2	758.00 MHz	769.00 MHz	100.0 kHz	766.781667 MHz	-52.91 dBm	-82.91 dB
3	3	769.00 MHz	775.00 MHz	6.200 kHz	769.690000 MHz	-65.03 dBm	-30.03 dB
4	4	775.00 MHz	788.00 MHz	100.0 kHz	785.703333 MHz	-44.16 dBm	-31.16 dB
5	5	788.00 MHz	799.00 MHz	100.0 kHz	794.563333 MHz	8.104 dBm	-21.90 dB
6	6	799.00 MHz	805.00 MHz	6.200 kHz	804.800000 MHz	-60.35 dBm	-25.35 dB
7	7	805.00 MHz	810.00 MHz	100.0 kHz	805.850000 MHz	-47.43 dBm	-34.43 dB

LTE Band 14_10MHz			
1RB#0		1RB#49	
Channel	23330	Channel	23330
 Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit 1 | 1 | 750.00 MHz | 758.00 MHz | 100.0 kHz | 757.026667 MHz | -53.12 dBm | -40.12 dB 2 | 2 | 758.00 MHz | 769.00 MHz | 100.0 kHz | 767.881667 MHz | -53.30 dBm | -83.30 dB 3 | 3 | 769.00 MHz | 775.00 MHz | 6.200 kHz | 770.900000 MHz | -65.78 dBm | -30.78 dB 4 | 4 | 775.00 MHz | 788.00 MHz | 100.0 kHz | 784.165000 MHz | -38.05 dBm | -25.05 dB 5 | 5 | 788.00 MHz | 799.00 MHz | 100.0 kHz | 788.623333 MHz | 21.19 dBm | -8.813 dB 6 | 6 | 799.00 MHz | 805.00 MHz | 6.200 kHz | 801.880000 MHz | -63.62 dBm | -28.62 dB 7 | 7 | 805.00 MHz | 810.00 MHz | 100.0 kHz | 806.200000 MHz | -50.49 dBm | -37.49 dB	 Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit 1 | 1 | 750.00 MHz | 758.00 MHz | 100.0 kHz | 754.760000 MHz | -53.61 dBm | -40.61 dB 2 | 2 | 758.00 MHz | 769.00 MHz | 100.0 kHz | 761.080000 MHz | -52.82 dBm | -82.82 dB 3 | 3 | 769.00 MHz | 775.00 MHz | 6.200 kHz | 771.300000 MHz | -65.46 dBm | -30.46 dB 4 | 4 | 775.00 MHz | 788.00 MHz | 100.0 kHz | 779.745000 MHz | -48.42 dBm | -35.42 dB 5 | 5 | 788.00 MHz | 799.00 MHz | 100.0 kHz | 797.386667 MHz | 19.71 dBm | -10.29 dB 6 | 6 | 799.00 MHz | 805.00 MHz | 6.200 kHz | 801.800000 MHz | -56.07 dBm | -21.07 dB 7 | 7 | 805.00 MHz | 810.00 MHz | 100.0 kHz | 806.550000 MHz | -53.10 dBm | -40.10 dB
50RB#0		-	
Channel	23330	-	
 Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit 1 | 1 | 750.00 MHz | 758.00 MHz | 100.0 kHz | 755.640000 MHz | -53.13 dBm | -40.13 dB 2 | 2 | 758.00 MHz | 769.00 MHz | 100.0 kHz | 763.555000 MHz | -52.36 dBm | -82.36 dB 3 | 3 | 769.00 MHz | 775.00 MHz | 6.200 kHz | 771.950000 MHz | -64.87 dBm | -29.87 dB 4 | 4 | 775.00 MHz | 788.00 MHz | 100.0 kHz | 787.913333 MHz | -35.10 dBm | -22.10 dB 5 | 5 | 788.00 MHz | 799.00 MHz | 100.0 kHz | 795.168333 MHz | 5.616 dBm | -24.38 dB 6 | 6 | 799.00 MHz | 805.00 MHz | 6.200 kHz | 799.970000 MHz | -50.01 dBm | -15.01 dB 7 | 7 | 805.00 MHz | 810.00 MHz | 100.0 kHz | 805.150000 MHz | -43.10 dBm | -30.10 dB	-	

APPENDIX J - FREQUENCY STABILITY

Test Mode	LTE Band 14_CH23330_10MHz

Frequency error versus temperature and supply voltage			
Temperature (°C)	Frequency error (Hz)	ppm	Limit
50	4.61	0.0058	±1.25ppm
40	-6.52	-0.0082	
30	-4.91	-0.0062	
20	4.42	0.0056	
10	5.95	0.0075	
0	4.42	0.0056	
−10	3.85	0.0049	
−20	5.61	0.0071	
−30	4.03	0.0051	
Minimum voltage	3.52	0.0044	
Maximum voltage	-7.41	-0.0093	
Nominal voltage	-8.98	-0.0113	

Note: Nominal voltage= 3.8V, Maximum voltage= 4.35V, Minimum voltage= 3.5V.

End of Test Report