FCC Radio Test Report

FCC ID: 2A5LO-TOZED5GCPEX21

This report concerns: Original Grant

Project No.	:	2201C050
Equipment	:	5G Wireless Router
Brand Name	:	TOZED KANGWEI
Test Model	:	ZLT X21
Series Model	:	ZLT X21Y("Y" in the model name can be A to Z)
Applicant	:	Guangzhou Tozed Kangwei Intelligent Technology Co., LTD
Address	:	13/F,Tower 1, Xiangjiang Sci-tech Innovation Center, No.37 Jinlong Road, Nansha District, Guangzhou
Manufacturer	:	Guangzhou Tozed Kangwei Intelligent Technology Co., LTD
Address	:	13/F,Tower 1, Xiangjiang Sci-tech Innovation Center, No.37 Jinlong Road, Nansha District, Guangzhou
Factory	:	Guangzhou Tozed Kangwei Intelligent Technology Co., LTD
Address	:	13/F,Tower 1, Xiangjiang Sci-tech Innovation Center, No.37 Jinlong Road, Nansha District, Guangzhou
Date of Receipt	:	Jan. 12, 2022
Date of Test	:	Jan. 13, 2022 ~ Mar. 14, 2022
Issued Date	:	Mar. 17, 2022
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG20220111219 for radiated, DG20220111225 for conducted.
Standard(s)	:	47 CFR FCC Part 22 Subpart H 47 CFR FCC Part 2 ANSI/TIA/EIA-603-E-2016 FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

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

Gabriel Zhu

Prepared by : Gabriel Zhu

Steven Lu

Approved by : Steven Lu

ACCREDITED

TESTING CERT #5123.02

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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** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** 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 is not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-1-2201C050	R00	Original Report.	Mar. 17, 2022	Valid

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 22 Subpart H & Part 2			
Standard(s) Section	**Test Item**	**Judgment**	**Remark**
2.1046 22.913(a)(5)	Effective Radiated Power	PASS	------
2.1049	Occupied Bandwidth	PASS	------
2.1051 22.917(a)	Conducted Spurious Emissions	PASS	------
2.1053 22.917(a)	Radiated Spurious Emissions	PASS	------
2.1051 22.917(a)	Band Edge Measurements	PASS	------
-	Peak To Average Ratio	PASS	Record Only
2.1055 22.355	Frequency Stability	PASS	------

Note:

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

1.1 TEST FACILITY

The test facilities used to collect the test data of radiated in this report is at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

The test facilities used to collect the test data of conduted 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 Test Firm Registration Number for FCC: 357015
BTL's Designation Number for FCC: CN1240

1.2 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)
DG-CB03 (3m)	CISPR	30MHz ~ 200MHz	V	4.36
		30MHz ~ 200MHz	H	3.32
		200MHz ~ 1,000MHz	V	4.08
		200MHz ~ 1,000MHz	H	3.96

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 6GHz	3.80
		6GHz ~ 18GHz	4.82

B. Other Measurement:

Parameter	Uncertainty
Spectrum Bandwidth	±3.8 %
Maximum Output Power	±0.95 dB
Power Spectral Density	±0.86 dB
Frequency Stability	±0.16 dB
Temperature	±0.08 °C
Time	±0.58 %
Supply voltages	±0.3 %

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

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
Output Power & ERP	21°C	40%	DC 12V	Rick Liao
Occupied Bandwidth	21°C	40%	DC 12V	Rick Liao
Conducted Spurious Emissions	21°C	40%	DC 12V	Rick Liao
Radiated Spurious Emissions (9 kHz to 30 MHz)	17°C	56%	AC 120V/60Hz	Jakyri Wen
Radiated Spurious Emissions (30 MHz to 1000 MHz)	17°C	56%	AC 120V/60Hz	Jakyri Wen
Radiated Spurious Emissions (Above 1000 MHz)	26°C	52%	AC 120V/60Hz	Jakyri Wen
Band Edge	21°C	40%	DC 12V	Rick Liao
Peak to Average Ratio	21°C	40%	DC 12V	Rick Liao
Frequency Stability	Normal & Extreme	40%	Normal & Extreme	Rick Liao

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	5G Wireless Router				
Brand Name	TOZED KANGWEI				
Test Model	ZLT X21				
Series Model	ZLT X21Y("Y" in the model name can be A to Z)				
Model Difference(s)	There is no difference except model difference, shell color and silk screen change.				
Hardware Version	TZ7.823.411				
Software Version	1.2.17				
Power Source	DC voltage supplied from AC adapter. Model: GS-P120200E334				
Power Rating	I/P: 100-240V ~ 50/60Hz 0.8A O/P: 12V ⎓ 2A				
IMEI No.	Radiated	355882561000078			
	Conducted	355882561000177			
Modulation Type	LTE		UL: QPSK,16QAM,64QAM DL: QPSK,16QAM,64QAM		
Max. ERP	LTE	Channel Bandwidth (MHz)	QPSK (dBm)	16QAM (dBm)	64QAM (dBm)
	Band 5	1.4	20.36	20.40	20.26
		3	20.20	20.19	20.23
		5	20.45	20.04	20.22
		10	20.22	20.43	20.44

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 5(UL: 824-849MHz,DL: 869-894MHz)					
Test Frequency ID	Bandwidth (MHz)	N_{UL}	Frequency of Uplink (MHz)	N_{DL}	Frequency of Downlink (MHz)
Low Range	1.4	20407	824.7	2407	869.7
	3	20415	825.5	2415	870.5
	5	20425	826.5	2425	871.5
	10	20450	829	2450	874
Mid Range	1.4/3/5/10	20525	836.5	2525	881.5
High Range	1.4	20643	848.3	2643	893.3
	3	20635	847.5	2635	892.5
	5	20625	846.5	2625	891.5
	10	20600	844	2600	889

3. Table for Filed Antenna:

Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
ShenZhen NQI network communication ltd	NQI-X21G-4G (3)-ASM-V01	PCB	IPEX	-0.93	LTE Band 5

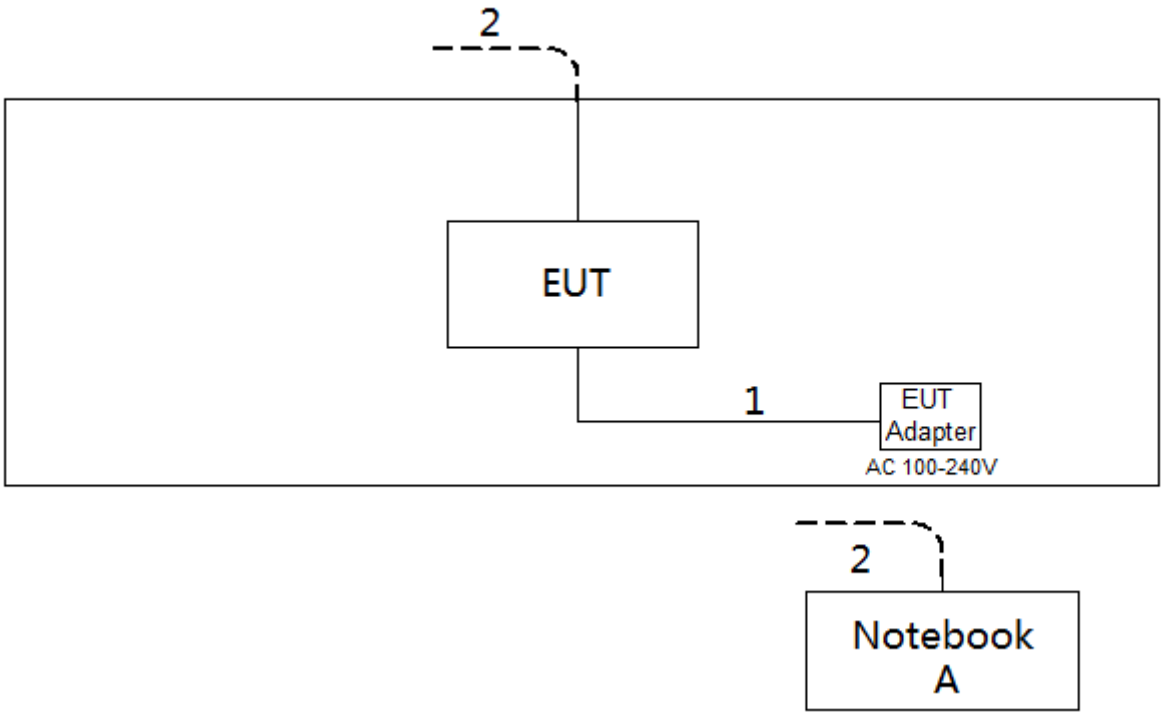
Note: The antenna gain is provided by the manufacturer.

2.2 DESCRIPTION OF TEST MODES

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

LTE BAND 5 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power & ERP	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM, 64QAM	1RB/3RB/6RB
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM, 64QAM	1RB/8RB/15RB
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM, 64QAM	1RB/12RB/25RB
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM, 64QAM	1RB/25RB/50RB
Occupied Bandwidth	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM, 64QAM	6RB
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM, 64QAM	15RB
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM, 64QAM	25RB
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM, 64QAM	50RB
Conducted Spurious Emissions	20407 to 20643	20525	1.4MHz	QPSK	1RB
	20425 to 20625	20525	5MHz	QPSK	1RB
	20450 to 20600	20525	10MHz	QPSK	1RB
Radiated Spurious Emissions	20407 to 20643	20525	1.4MHz	QPSK	1RB
	20425 to 20625	20525	5MHz	QPSK	1RB
	20450 to 20600	20525	10MHz	QPSK	1RB
Band Edge	20407 to 20643	20407, 20643	1.4MHz	QPSK	1RB/6RB
	20415 to 20635	20415, 20635	3MHz	QPSK	1RB/15RB
	20425 to 20625	20425, 20625	5MHz	QPSK	1RB/25RB
	20450 to 20600	20450, 20600	10MHz	QPSK	1RB/50RB
Peak To Average Ratio	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM, 64QAM	1RB
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM, 64QAM	1RB
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM, 64QAM	1RB
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM, 64QAM	1RB
Frequency Stability	20450 to 20600	20525	10MHz	QPSK	1RB

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATIONOFSYSTEMTESTED



2.4 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	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m
2	RJ45 Cable	NO	NO	10m

3. TEST RESULT

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMIT

Mobile / Portable station are limited to 7 watts e.r.p.

3.1.2 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 5.

EIRP / ERP:

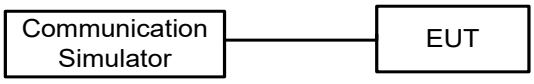
EIRP = Output Power + Antenan gain
ERP = EIPR - 2.15dBi

Output Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA 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.

3.1.3 TEST SETUP LAYOUT

Output Power Measurement



3.1.4 TEST DEVIATION

No deviation

3.1.5 TEST RESULTS

Please refer to the APPENDIX A.

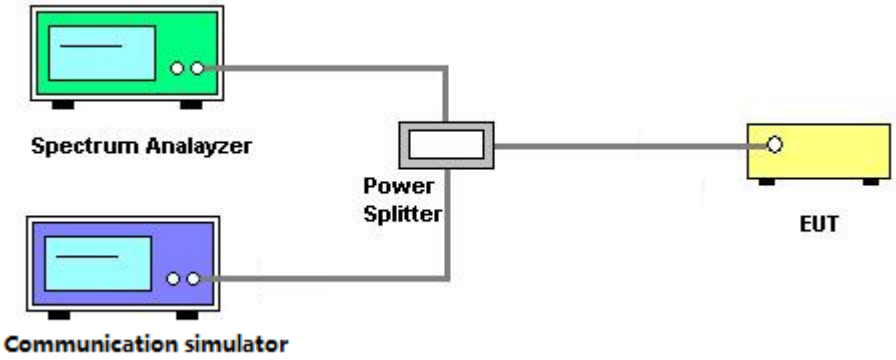
3.2 OCCUPIED BANDWIDTH MEASUREMENT

3.2.1 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 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 Peak detector.

3.2.2 TEST SETUP LAYOUT



3.2.3 TEST DEVIATION

No deviation

3.2.4 TEST RESULTS

Please refer to the APPENDIX B.

3.3 CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

3.3.1 LIMIT

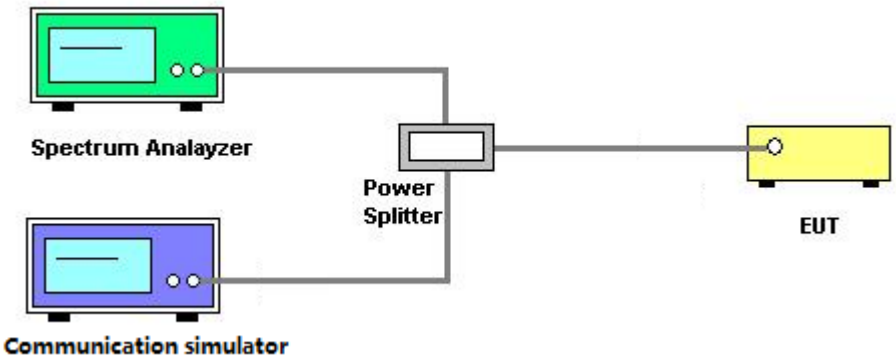
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

3.3.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.

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 detector.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.3.3 TEST SETUP LAYOUT



3.3.4 TEST DEVIATION

No deviation

3.3.5 TEST RESULTS

Please refer to the APPENDIX C.

3.4 RADIATED SPURIOUS EMISSIONS MEASUREMENT

3.4.1 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.

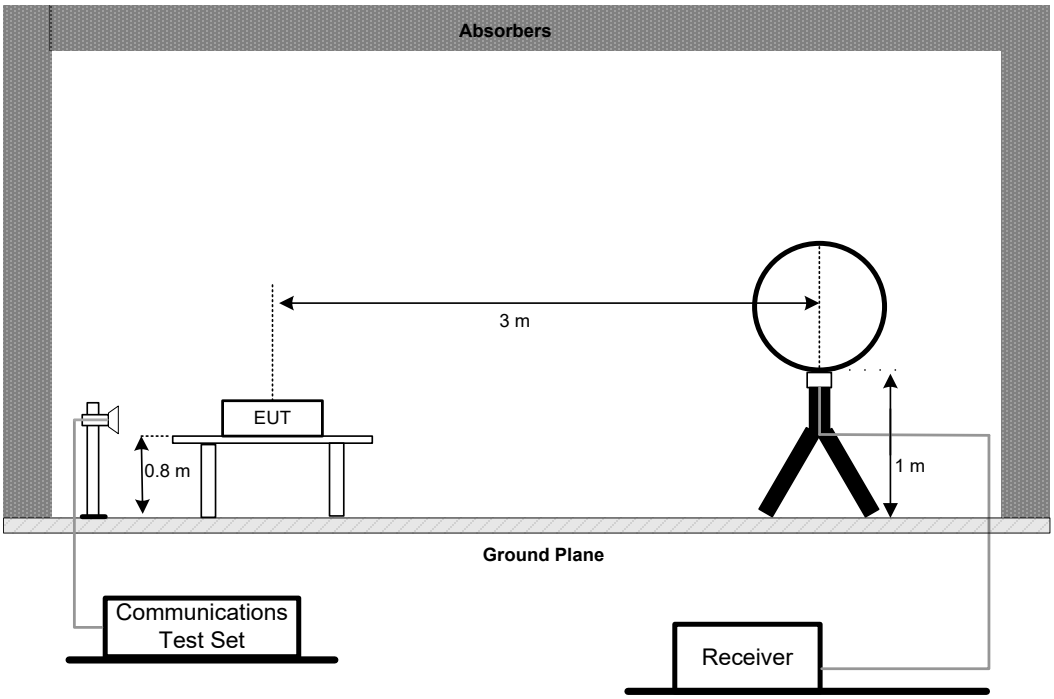
3.4.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.2.

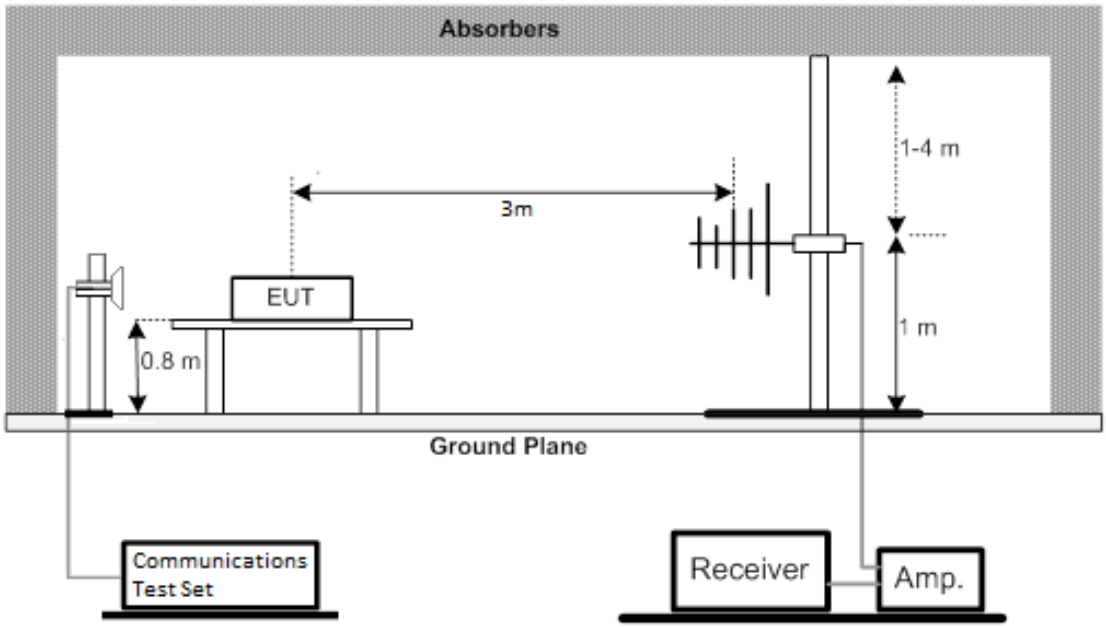
1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step a. Record the power level of S.G
3. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
4. ERP can be calculated form EIRP by subtracting the gain of dipole, ERP = EIPR - 2.15dBi.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

3.4.3 TEST SETUP LAYOUT

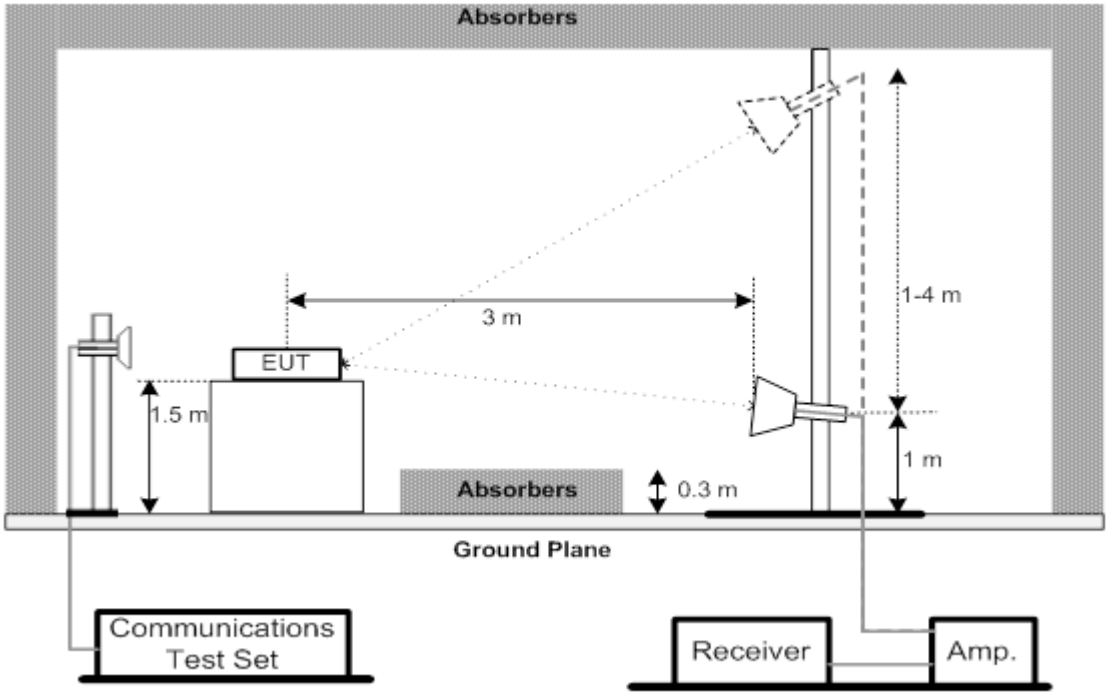
Below 30MHz



30MHz to 1000MHz



Above 1GHz



3.4.4 TEST DEVIATION

No deviation

3.4.5 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the APPENDIX D.

3.4.6 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the APPENDIX E.

3.4.7 TEST RESULTS (ABOVE 1000MHZ)

Please refer to the APPENDIX F.

3.5 BAND EDGE MEASUREMENT

3.5.1 LIMIT

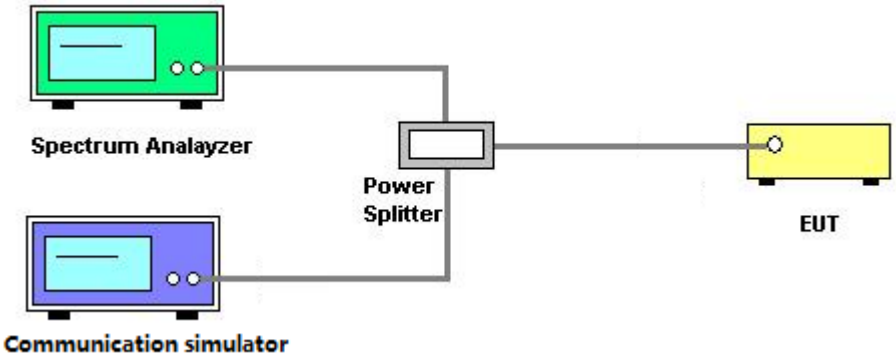
A Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.5.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.

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

3.5.3 TEST SETUP LAYOUT



3.5.4 TEST DEVIATION

No deviation

3.5.5 TEST RESULTS

Please refer to the APPENDIX G.

3.6 PEAK TO AVERAGE RATIO MEASUREMENT

3.6.1 LIMIT

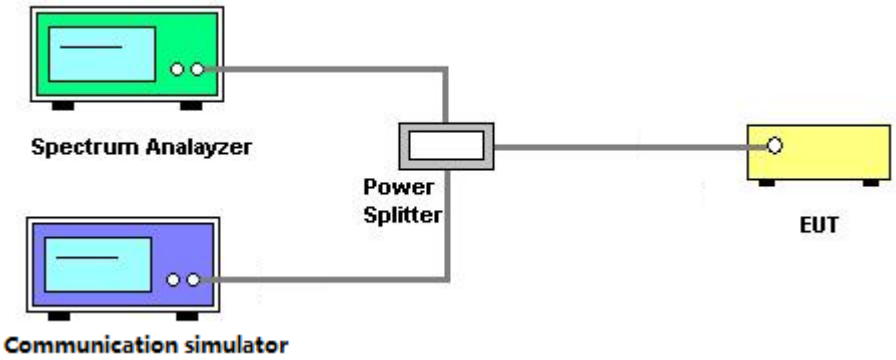
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.6.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 5.7.

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%.

3.6.3 TEST SETUP LAYOUT



3.6.4 TEST DEVIATION

No deviation

3.6.5 TEST RESULTS

Please refer to the APPENDIX H.

3.7 FREQUENCY STABILITY MEASUREMENT

3.7.1 LIMIT

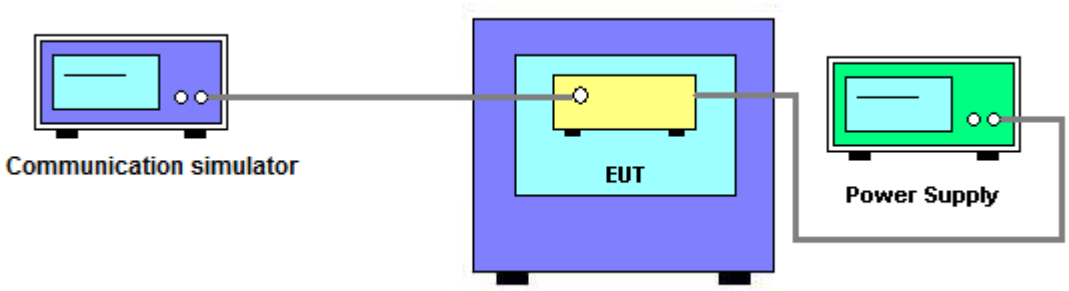
±1.5 ppm is for base and fixed station. ±2.5 ppm is for mobile station.

3.7.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 9.

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.

3.7.3 TEST SETUP LAYOUT



3.7.4 TEST DEVIATION

No deviation

3.7.5 TEST RESULTS

Please refer to the APPENDIX I.

4. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	MXE EMI Receiver	Keysight	N9038A	MY56400091	Jan. 22, 2023
2	Antenna	EM	EM-6876-1	230	Apr. 28, 2022
3	Cable	N/A	RG 213/U (9kHz~1GHz)	N/A	May 27, 2022
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
5	wideband radio communication tester	R&S	CMW500	164094	Dec. 26, 2022
6	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Jan. 23, 2023
7	966 Chamber Room	ETS	9*6*6	N/A	Jul. 17, 2022

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	586	Feb. 11, 2023
2	Amplifier	HP	8447D	2944A08742	Jan. 22, 2023
3	Cable	emci	LMR-400	N/A	Nov. 30, 2022
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Receiver	Agilent	N9038A	MY52130039	Jan. 22, 2023
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	wideband radio communication tester	R&S	CMW500	164094	Dec. 26, 2022
9	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Jan. 23, 2023
10	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Horn Antenna	ARA	DRG-118A	16554	Apr. 21, 2022
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 30, 2022
3	Amplifier	Agilent	8449B	3008A02584	Jul. 10, 2022
4	Controller	CT	SC100	N/A	N/A
5	Controller	MF	MF-7802	MF780208416	N/A
6	Receiver	Agilent	N9038A	MY52130039	Jan. 22, 2023
7	EXA Spectrum Analyzer	Keysight	N9010A	MY56480488	Jan. 22, 2023
8	Low Noise Amplifier	CONNPHY	CLN-18G40G -4330-K	619413	Jul. 16, 2022
9	Cable	Talent microwave	A81-SMAMSMAM -12.5M	N/A	Oct. 15, 2022
10	Cable	Talent microwave	A40-2.92M2.92M -2.5M	N/A	Nov. 30, 2022
11	Measurement Software	Farad	EZ-EMC Ver.NB -03A1-01	N/A	N/A
12	wideband radio communication tester	R&S	CMW500	164094	Dec. 26, 2022
13	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Jan. 23, 2023
14	966 Chamber Room	RM	9*6*6	N/A	Jul. 24, 2022

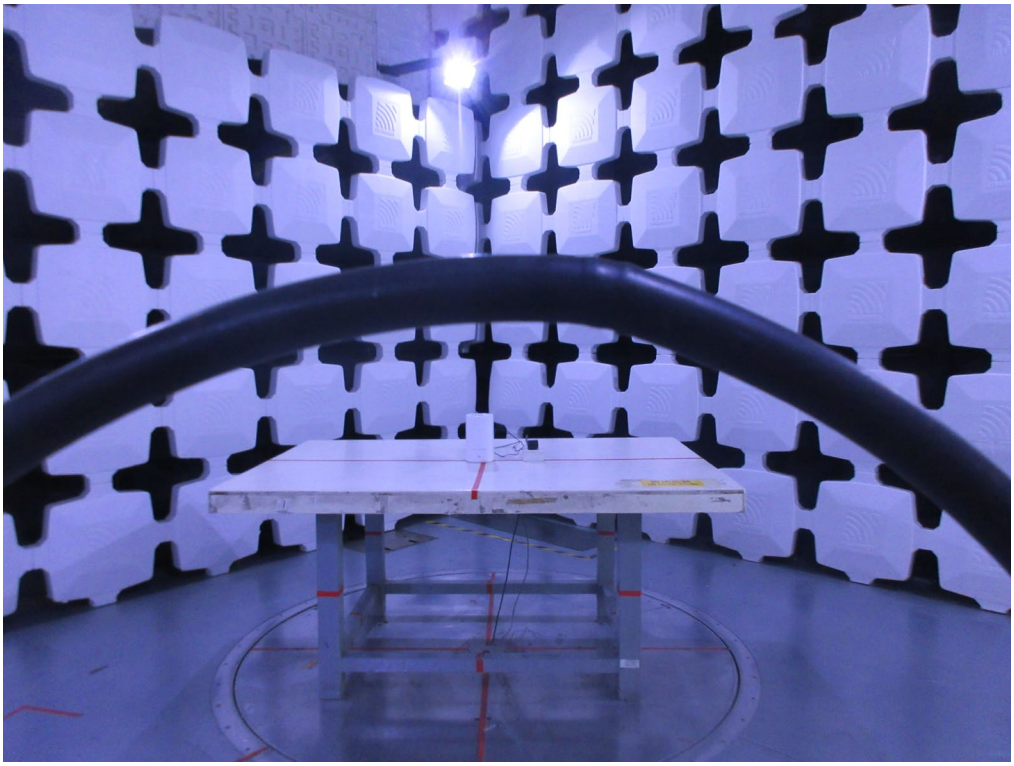
Conducted Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	8960 Series 10 Wireless Com Test set	Agilent	E5515E	MY52112163	Jul. 24, 2022
2	MXA Signal Analyzer	Keysight	N9020A	MY49100060	Jul. 24, 2022
3	Power Splitter	Mini-Circuits	ZFRSC-183-S+	SF103501511S	Jul. 24, 2022
4	wideband radio communication tester	R&S	CMW500	104462	Jul. 24, 2022
5	Const Temp. & Humidity Chamber	Bell	BTH-50C	20170306001	Feb. 19, 2023
6*	Multi-output DC Power Supply	GW Instek	GPC-3030DN	EK880675	Jul. 25, 2023
7	Signal Analyzer	R&S	FSQ-26	200822	Feb. 19, 2023

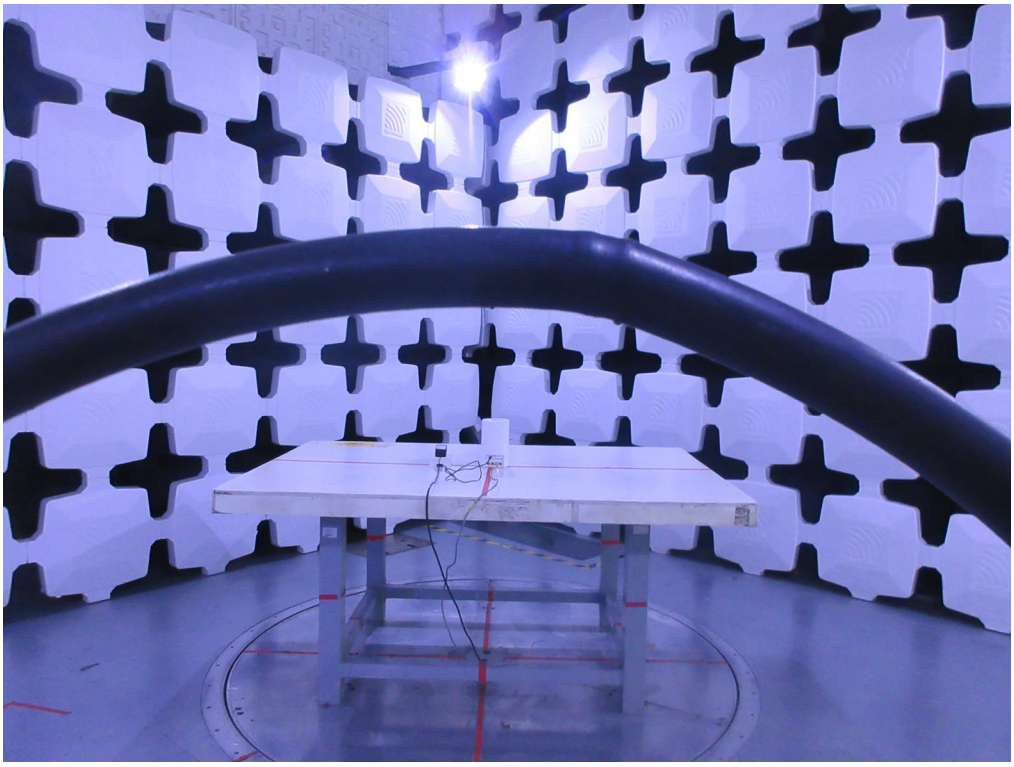
Remark: ”N/A” denotes no model name, serial no. or calibration specified.
Except * item, all calibration period of equipment list is one year.
“*” calibration period of equipment list is three year.

5. EUT TEST PHOTO

Radiated Emissions Test Photos

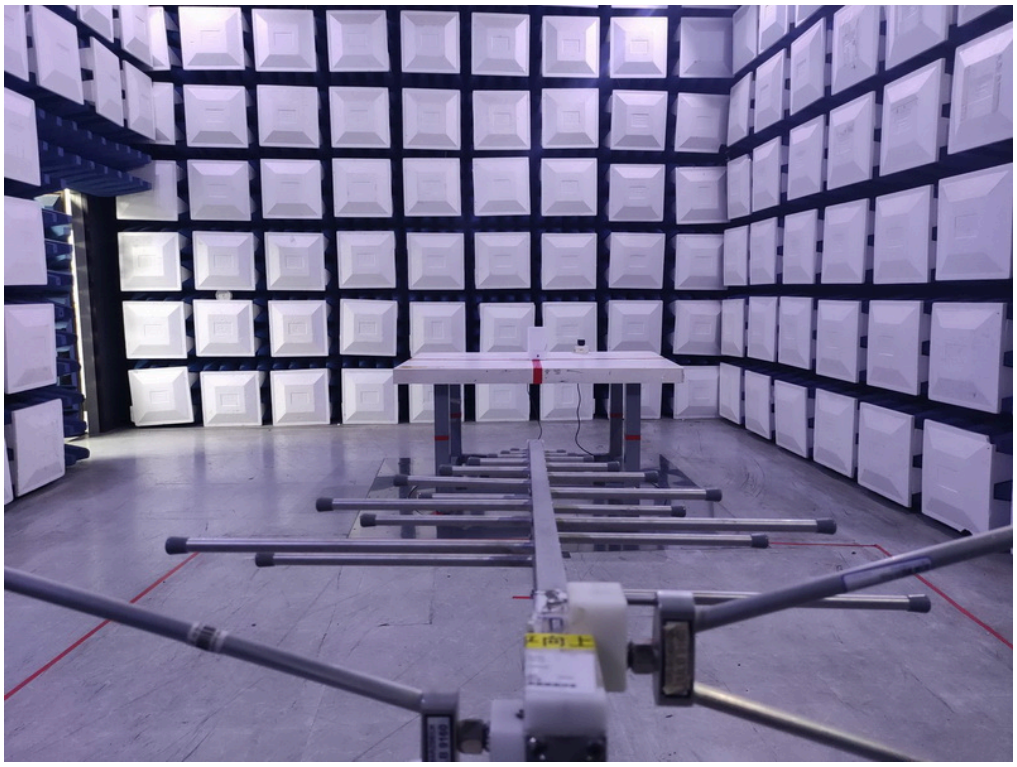
9 kHz to 30 MHz

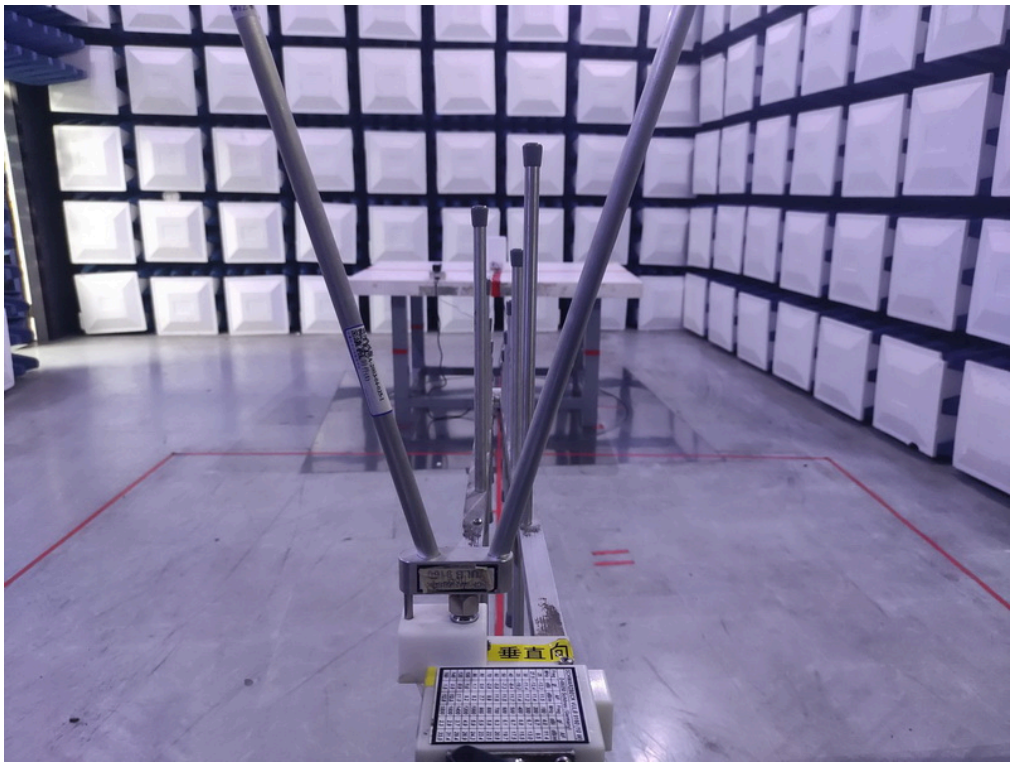




Radiated Emissions Test Photos

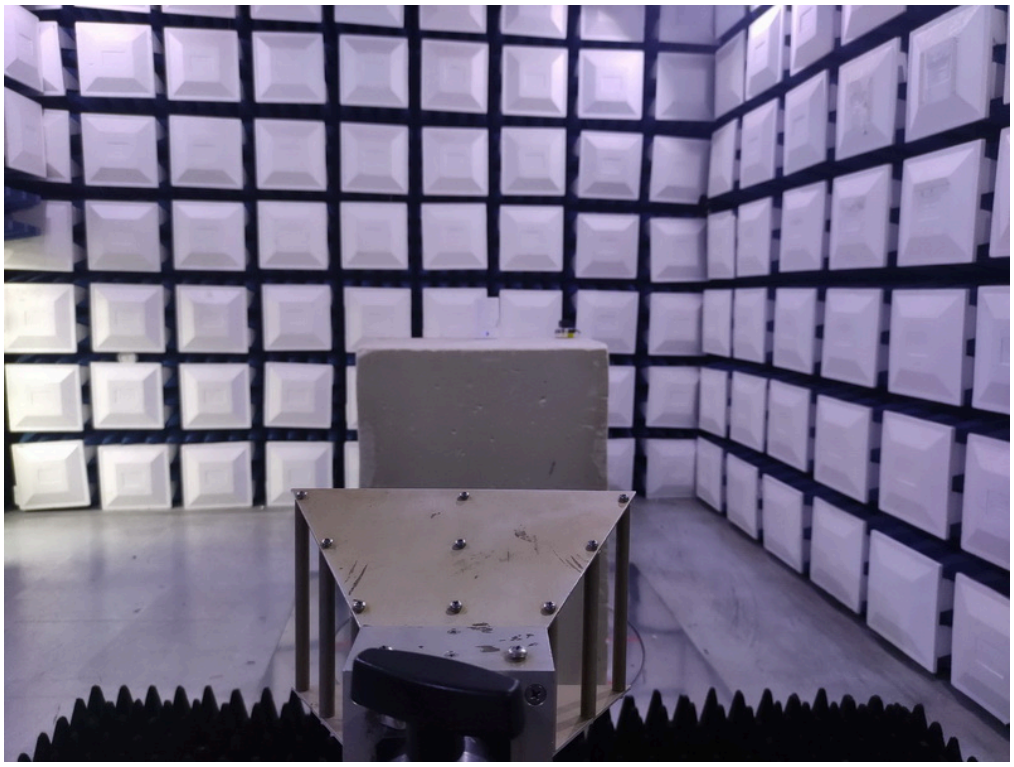
30 MHz to 1 GHz

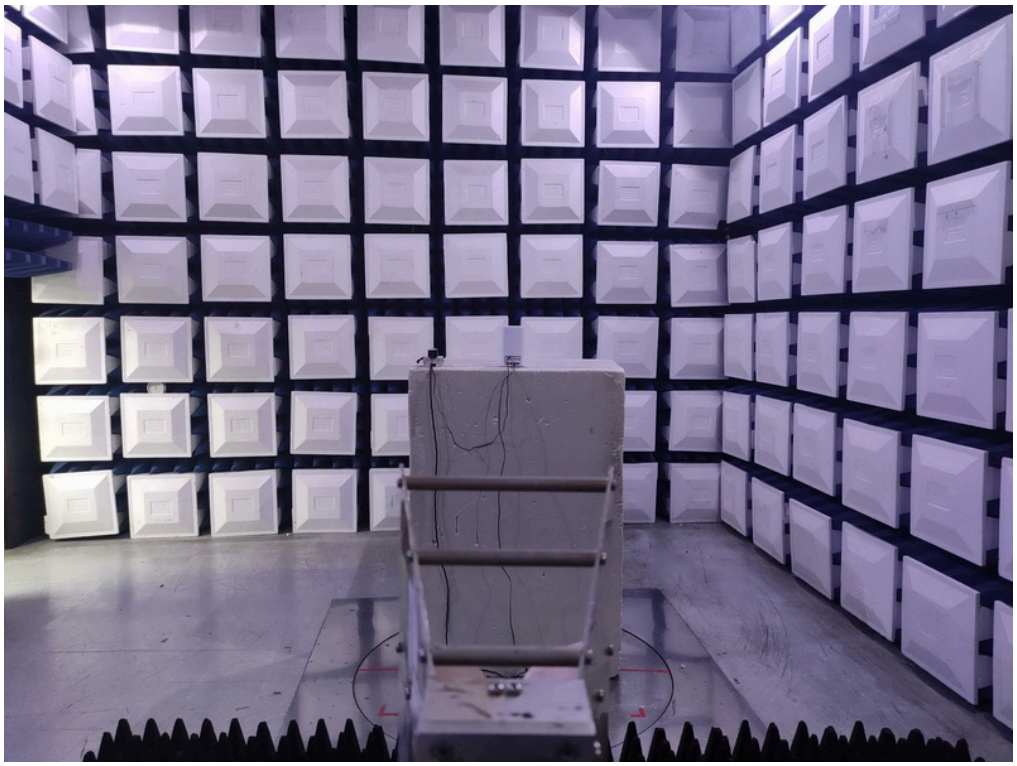




Radiated Emissions Test Photos

Above 1 GHz





APPENDIX A - OUTPUT POWER

Output Power (dBm)

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20407CH	20525CH	20643CH
				824.7MHz	836.5MHz	848.3MHz
5 / 1.4MHz	QPSK	1	0	23.34	23.30	23.16
		1	2	23.35	23.41	23.18
		1	5	23.44	23.35	23.15
		3	0	23.36	23.37	23.12
		3	1	23.31	23.36	23.13
		3	2	23.30	23.29	23.13
		6	0	21.87	21.77	21.70
	16QAM	1	0	23.32	22.74	23.47
		1	2	23.24	22.77	23.48
		1	5	23.21	22.73	23.44
		3	0	22.56	22.66	22.81
		3	1	22.52	22.65	22.84
		3	2	22.43	22.64	22.83
		6	0	21.80	21.86	21.84
	64QAM	1	0	23.34	22.71	22.63
		1	2	23.21	22.72	22.65
		1	5	23.29	22.70	22.67
		3	0	22.46	22.64	22.52
		3	1	22.48	22.63	22.59
		3	2	22.47	22.62	22.52
		6	0	21.75	21.87	21.91

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20415CH	20525CH	20635CH
				825.5MHz	836.5MHz	847.5MHz
5 / 3MHz	QPSK	1	0	23.23	23.18	23.24
		1	7	23.28	23.26	23.22
		1	14	23.24	23.26	23.11
		8	0	21.85	21.82	21.67
		8	4	21.85	21.86	21.66
		8	7	21.88	21.77	21.67
		15	0	21.85	21.80	21.64
	16QAM	1	0	22.85	23.27	22.72
		1	7	22.88	23.26	22.78
		1	14	22.85	23.21	22.68
		8	0	21.86	21.79	21.94
		8	4	21.86	21.80	21.94
		8	7	21.94	21.73	21.95
		15	0	21.87	21.78	21.65
	64QAM	1	0	22.47	23.31	22.30
		1	7	22.55	23.26	22.25
		1	14	22.52	23.21	22.22
		8	0	21.65	21.99	21.93
		8	4	21.67	22.00	21.89
		8	7	21.66	21.99	21.94
		15	0	21.77	21.90	21.71

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20425CH	20525CH	20625CH
				826.5MHz	836.5MHz	846.5MHz
5 / 5MHz	QPSK	1	0	23.12	23.53	23.10
		1	13	23.16	23.47	23.09
		1	24	23.17	23.36	23.05
		12	0	22.36	22.29	22.25
		12	6	22.41	22.27	22.25
		12	11	22.39	22.32	22.21
		25	0	21.88	21.71	21.65
	16QAM	1	0	23.12	22.39	22.75
		1	13	23.09	22.36	22.81
		1	24	23.12	22.31	22.72
		12	0	21.60	21.79	21.47
		12	6	21.60	21.82	21.47
		12	11	21.56	21.81	21.44
		25	0	21.71	21.77	21.77
	64QAM	1	0	22.17	23.25	22.59
		1	13	22.15	23.30	22.54
		1	24	22.11	23.20	22.50
		12	0	21.69	21.83	21.66
		12	6	21.73	21.87	21.70
		12	11	21.72	21.79	21.63
		25	0	21.79	21.62	21.66

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20450CH	20525CH	20600CH
				829.0MHz	836.5MHz	844.0MHz
5 / 10MHz	QPSK	1	0	23.17	23.14	23.30
		1	25	23.17	23.15	23.16
		1	49	23.21	23.20	23.11
		25	0	22.27	22.25	22.28
		25	13	22.29	22.22	22.27
		25	25	22.24	22.23	22.20
		50	0	21.78	21.75	21.78
	16QAM	1	0	22.75	23.51	22.95
		1	25	22.75	23.48	22.91
		1	49	22.72	23.44	22.89
		25	0	21.59	21.71	21.97
		25	13	21.68	21.76	21.88
		25	25	21.63	21.69	21.91
		50	0	21.71	21.74	21.78
	64QAM	1	0	23.01	23.52	22.97
		1	25	23.01	23.52	22.91
		1	49	23.00	23.44	22.88
		25	0	21.78	21.79	21.92
		25	13	21.79	21.77	21.87
		25	25	21.77	21.70	21.86
		50	0	21.73	21.67	21.76

ERP (dBm)

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20407CH	20525CH	20643CH
				824.7MHz	836.5MHz	848.3MHz
5 / 1.4MHz	QPSK	1	0	20.26	20.22	20.08
		1	2	20.27	20.33	20.10
		1	5	20.36	20.27	20.07
		3	0	20.28	20.29	20.04
		3	1	20.23	20.28	20.05
		3	2	20.22	20.21	20.05
		6	0	18.79	18.69	18.62
	16QAM	1	0	20.24	19.66	20.39
		1	2	20.16	19.69	20.40
		1	5	20.13	19.65	20.36
		3	0	19.48	19.58	19.73
		3	1	19.44	19.57	19.76
		3	2	19.35	19.56	19.75
		6	0	18.72	18.78	18.76
	64QAM	1	0	20.26	19.63	19.55
		1	2	20.13	19.64	19.57
		1	5	20.21	19.62	19.59
		3	0	19.38	19.56	19.44
		3	1	19.40	19.55	19.51
		3	2	19.39	19.54	19.44
		6	0	18.67	18.79	18.83

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20415CH	20525CH	20635CH
				825.5MHz	836.5MHz	847.5MHz
5 / 3MHz	QPSK	1	0	20.15	20.10	20.16
		1	7	20.20	20.18	20.14
		1	14	20.16	20.18	20.03
		8	0	18.77	18.74	18.59
		8	4	18.77	18.78	18.58
		8	7	18.80	18.69	18.59
		15	0	18.77	18.72	18.56
	16QAM	1	0	19.77	20.19	19.64
		1	7	19.80	20.18	19.70
		1	14	19.77	20.13	19.60
		8	0	18.78	18.71	18.86
		8	4	18.78	18.72	18.86
		8	7	18.86	18.65	18.87
		15	0	18.79	18.70	18.57
	64QAM	1	0	19.39	20.23	19.22
		1	7	19.47	20.18	19.17
		1	14	19.44	20.13	19.14
		8	0	18.57	18.91	18.85
		8	4	18.59	18.92	18.81
		8	7	18.58	18.91	18.86
		15	0	18.69	18.82	18.63

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20425CH	20525CH	20625CH
				826.5MHz	836.5MHz	846.5MHz
5 / 5MHz	QPSK	1	0	20.04	20.45	20.02
		1	13	20.08	20.39	20.01
		1	24	20.09	20.28	19.97
		12	0	19.28	19.21	19.17
		12	6	19.33	19.19	19.17
		12	11	19.31	19.24	19.13
		25	0	18.80	18.63	18.57
	16QAM	1	0	20.04	19.31	19.67
		1	13	20.01	19.28	19.73
		1	24	20.04	19.23	19.64
		12	0	18.52	18.71	18.39
		12	6	18.52	18.74	18.39
		12	11	18.48	18.73	18.36
		25	0	18.63	18.69	18.69
	64QAM	1	0	19.09	20.17	19.51
		1	13	19.07	20.22	19.46
		1	24	19.03	20.12	19.42
		12	0	18.61	18.75	18.58
		12	6	18.65	18.79	18.62
		12	11	18.64	18.71	18.55
		25	0	18.71	18.54	18.58

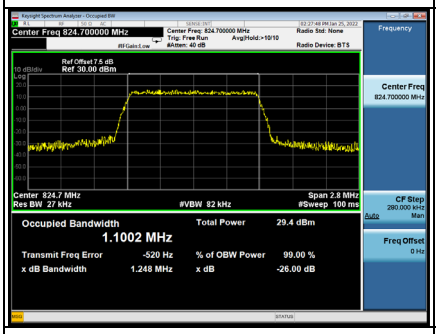
LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20450CH	20525CH	20600CH
				829.0MHz	836.5MHz	844.0MHz
5 / 10MHz	QPSK	1	0	20.09	20.06	20.22
		1	25	20.09	20.07	20.08
		1	49	20.13	20.12	20.03
		25	0	19.19	19.17	19.20
		25	13	19.21	19.14	19.19
		25	25	19.16	19.15	19.12
		50	0	18.70	18.67	18.70
	16QAM	1	0	19.67	20.43	19.87
		1	25	19.67	20.40	19.83
		1	49	19.64	20.36	19.81
		25	0	18.51	18.63	18.89
		25	13	18.60	18.68	18.80
		25	25	18.55	18.61	18.83
		50	0	18.63	18.66	18.70
	64QAM	1	0	19.93	20.44	19.89
		1	25	19.93	20.44	19.83
		1	49	19.92	20.36	19.80
		25	0	18.70	18.71	18.84
		25	13	18.71	18.69	18.79
		25	25	18.69	18.62	18.78
		50	0	18.65	18.59	18.68

APPENDIX B - OCCUPIED BANDWIDTH

LTE Band 5_1.4MHz							
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20407	824.7	1.1002	1.0929	1.0960	1.248	1.241	1.235
20525	836.5	1.0890	1.0902	1.0868	1.236	1.235	1.235
20643	848.3	1.0970	1.0929	1.0928	1.237	1.238	1.237

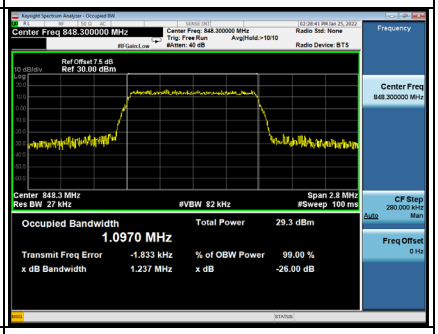
Spectrum Plot

QPSK-20407



QPSK-20525

QPSK-20643



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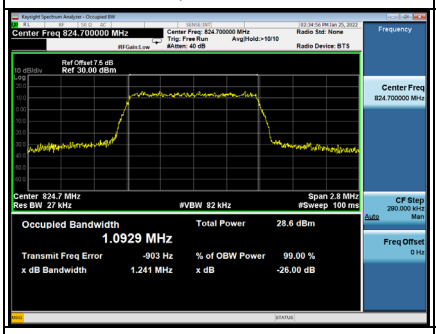

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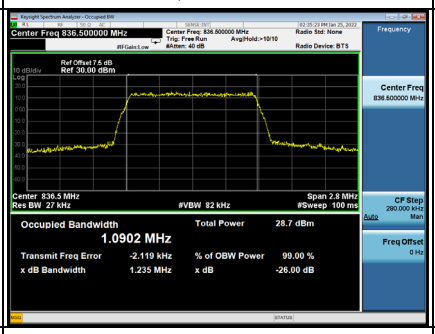

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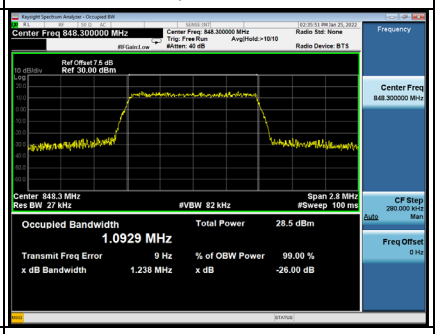

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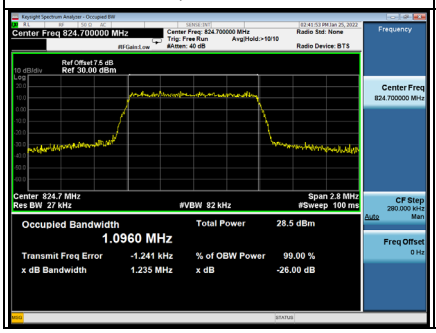

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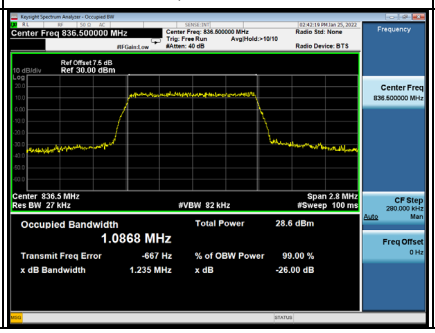

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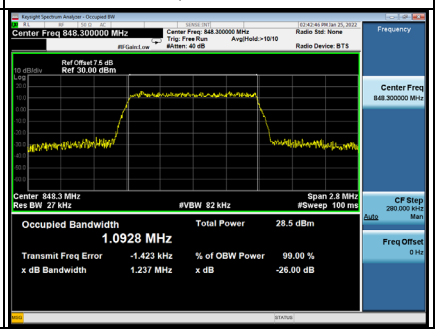
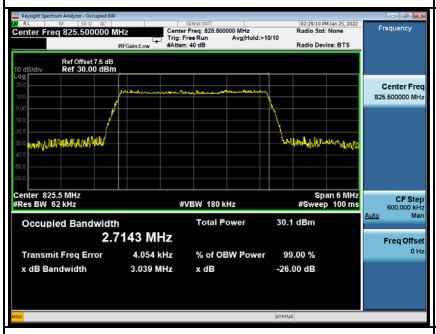


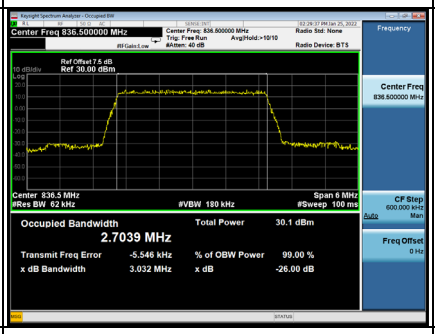
LTE Band 5_3MHz							
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20415	825.5	2.7143	2.7103	2.7138	3.039	3.038	3.027
20525	836.5	2.7039	2.7066	2.7095	3.032	3.043	3.024
20635	847.5	2.7098	2.7098	2.7066	3.026	3.057	3.047

Spectrum Plot

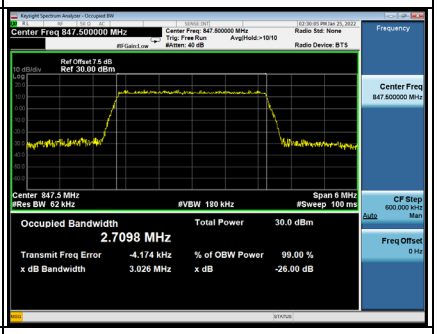
QPSK-20415



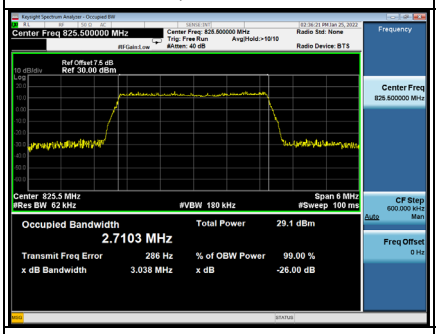
QPSK-20525



QPSK-20635



16QAM-20415



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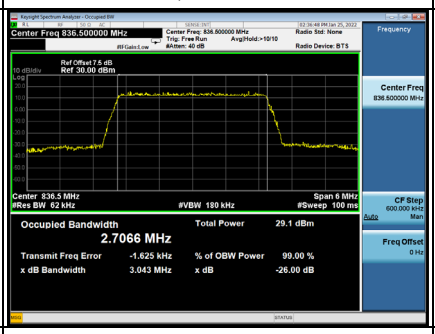
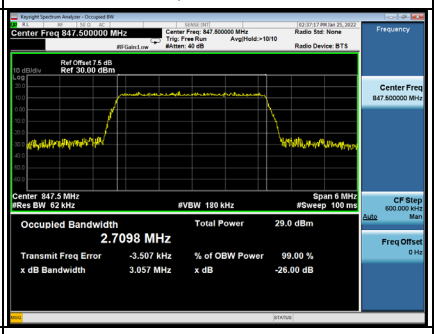
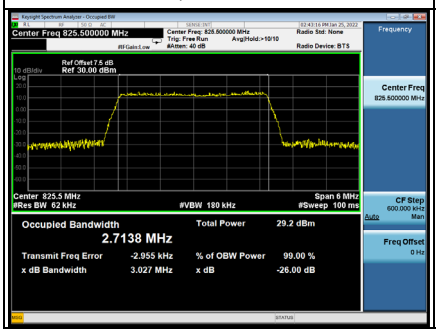


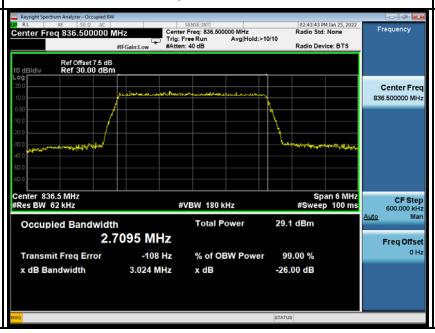
16QAM-20635



64QAM-20415



64QAM-20525



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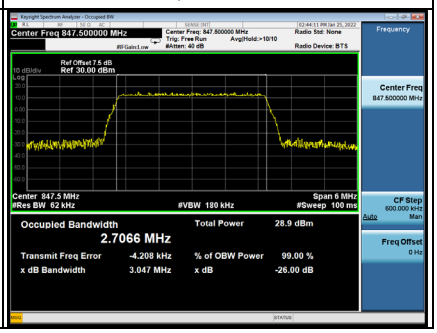
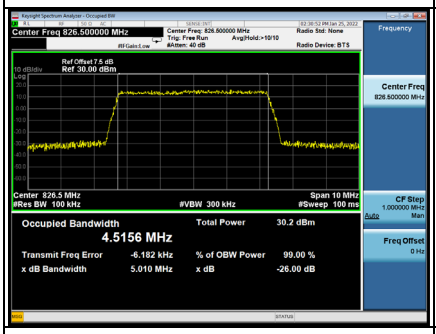


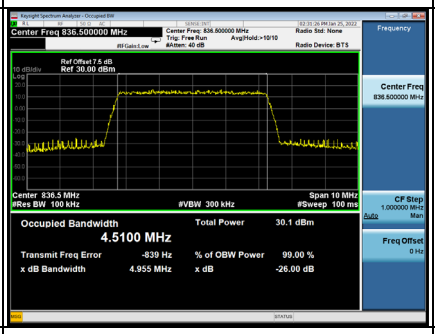
LTE Band 5_5MHz							
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20425	826.5	4.5156	4.5066	4.5037	5.010	4.967	4.961
20525	836.5	4.5100	4.5079	4.5018	4.955	4.987	4.963
20625	846.5	4.5097	4.5069	4.5043	4.966	4.939	4.959

Spectrum Plot

QPSK-20425



QPSK-20525



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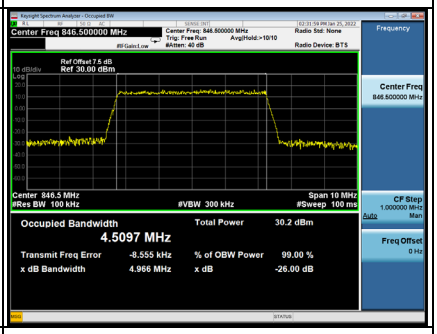

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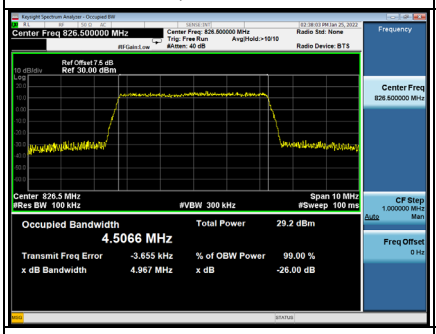

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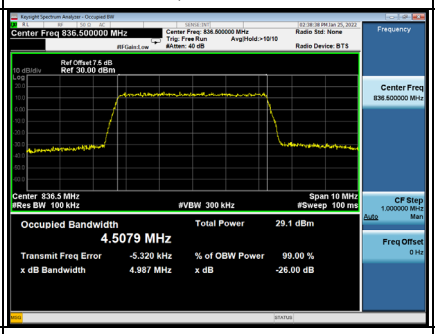

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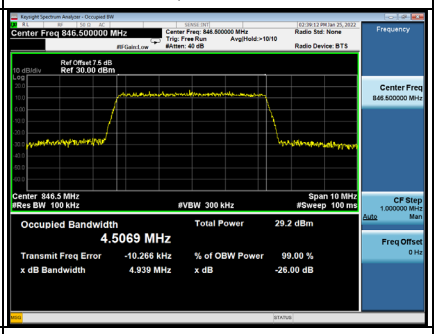
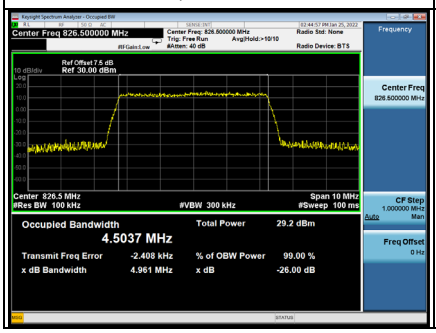
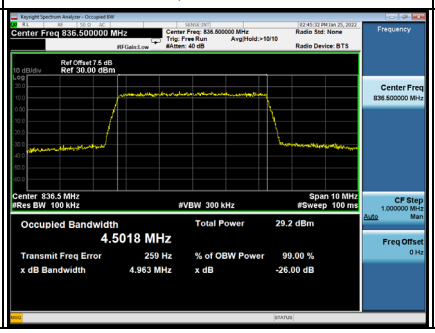


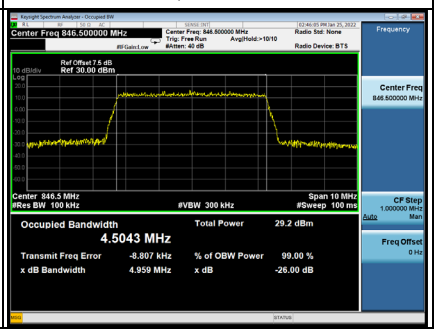
64QAM-20425



64QAM-20525



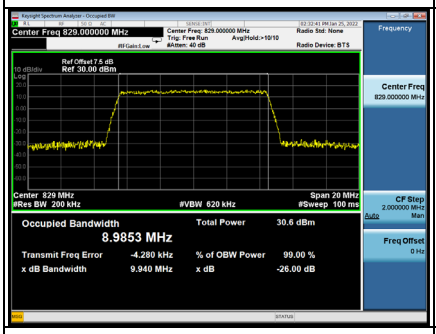
64QAM-20625



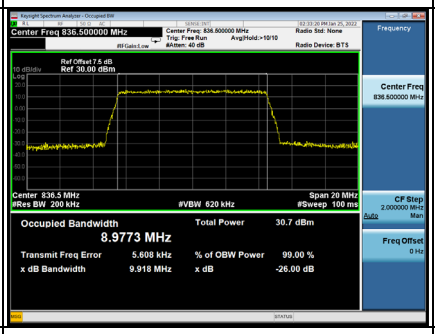
LTE Band 5_10MHz							
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)			26dB Bandwidth (MHz)		
		QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
20450	829.0	8.9853	8.9826	8.9947	9.940	9.968	9.894
20525	836.5	8.9773	9.9878	8.9592	9.918	9.940	9.876
20600	844.0	8.9895	8.9741	8.9911	9.883	9.854	9.897

Spectrum Plot

QPSK-20450

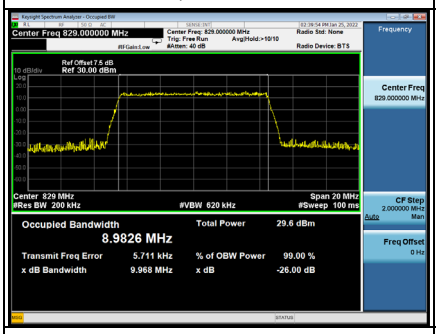


QPSK-20525

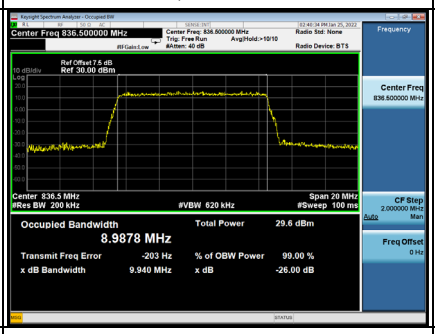


QPSK-20600

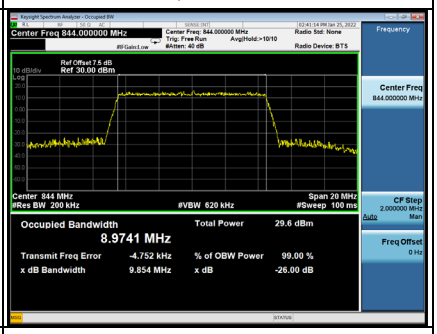
16QAM-20450



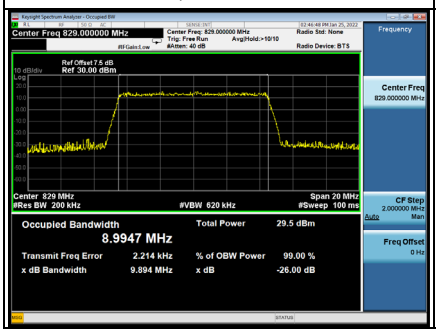
16QAM-20525



16QAM-20600



64QAM-20450



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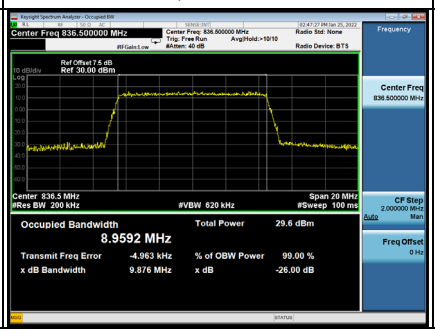
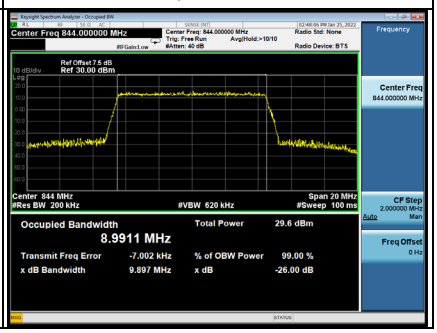
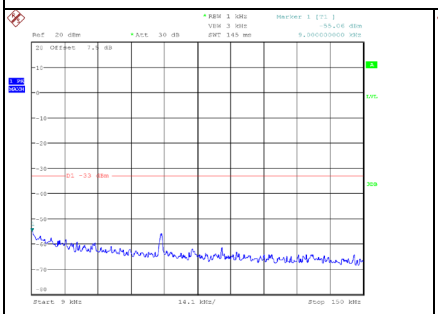
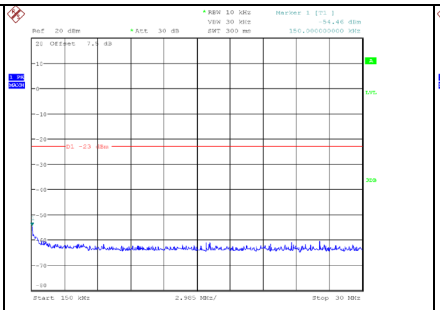
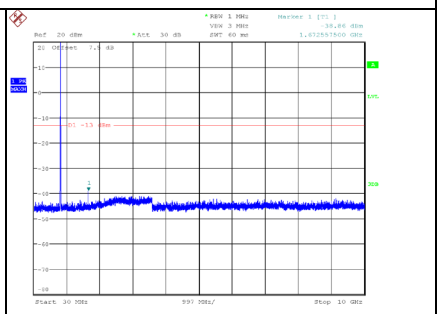


64QAM-20600

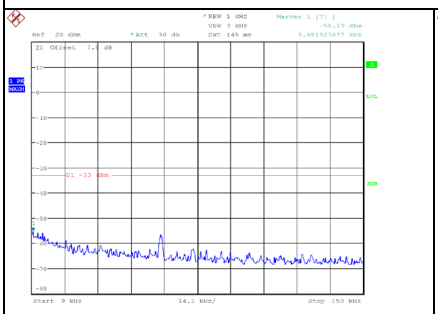
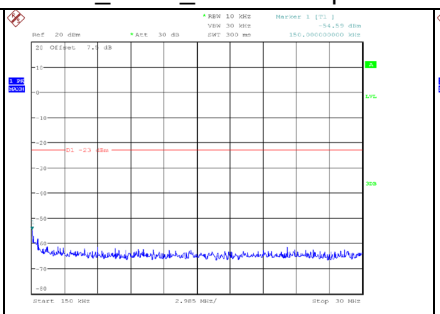
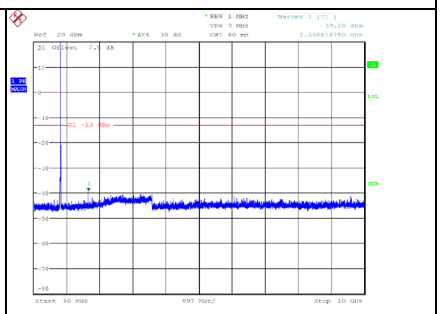


APPENDIX C - CONDUCTED SPURIOUS EMISSIONS

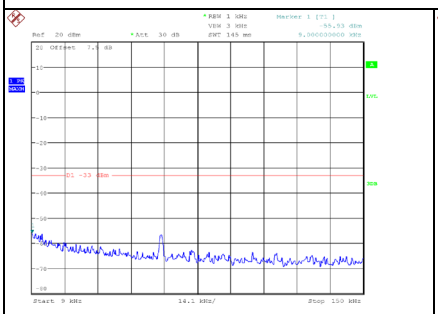
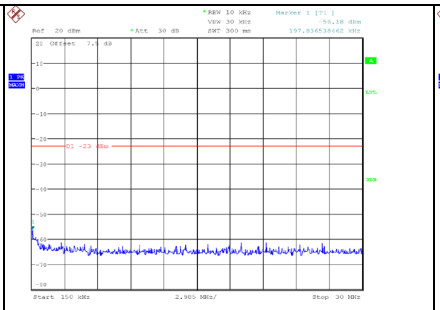
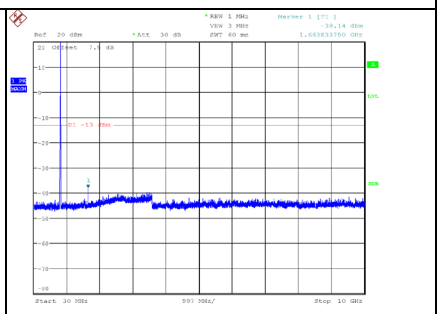
LTE Band 5_1.4MHz_CH20525 Spectrum Plot

LTE Band 5_5MHz_CH20525 Spectrum Plot

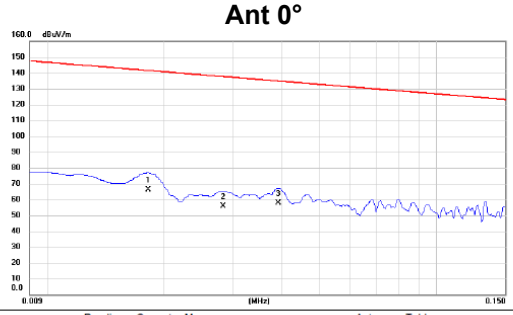
LTE Band 5_10M_CH20525 Spectrum Plot

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

Test Mode :	TX Mode

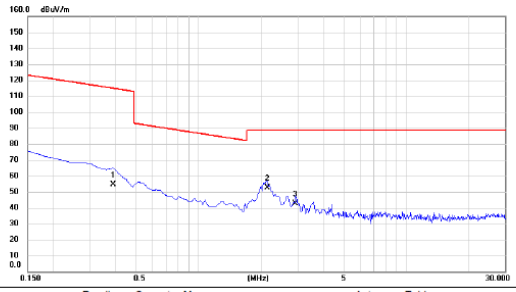
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	0.0182	51.22	14.86	66.08	141.48	-75.40	AVG			
2		0.0283	41.63	14.10	55.73	137.65	-81.92	AVG			
3		0.0392	43.85	13.85	57.70	134.82	-77.12	AVG			

Test Mode :	TX Mode

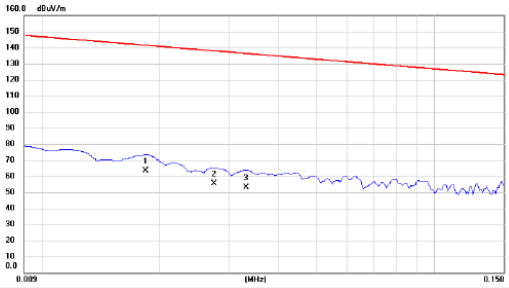
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		0.3888	41.32	13.47	54.79	114.90	-60.11	AVG			
2	*	2.1500	40.66	12.03	52.69	88.63	-35.94	QP			
3		2.9261	30.92	11.74	42.66	88.63	-45.97	QP			

Test Mode :	TX Mode

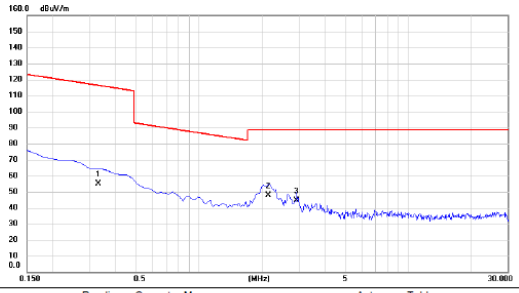
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	0.0184	48.52	14.79	63.31	141.39	-78.08	AVG			
2		0.0275	41.32	14.12	55.44	137.90	-82.46	AVG			
3		0.0331	39.11	13.99	53.10	136.29	-83.19	AVG			

Test Mode :	TX Mode

Ant 90°

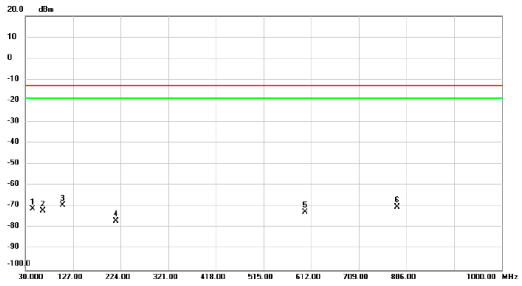


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		0.3291	41.36	13.52	54.88	116.35	-61.47	AVG			
2	*	2.1500	35.94	12.03	47.97	88.63	-40.66	QP			
3		2.9260	32.91	11.74	44.65	88.63	-43.98	QP			

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

Test Mode :	LTE Band 5_TX CH20525_1.4MHz

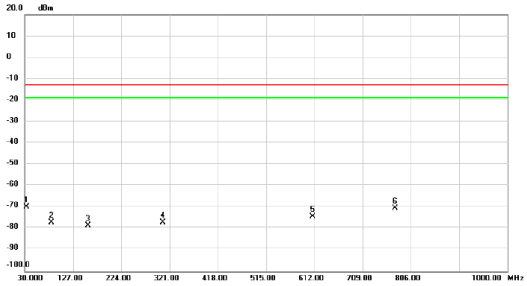
Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure-ment dBm	Limit dBm	Margin dB	Detector	Comment
1		44.5500	-57.23	-13.95	-71.18	-13.00	-58.18	peak	
2		65.4050	-56.71	-15.31	-72.02	-13.00	-59.02	peak	
3	*	105.1750	-53.46	-15.77	-69.23	-13.00	-56.23	peak	
4		214.3000	-61.60	-15.05	-76.65	-13.00	-63.65	peak	
5		599.8750	-68.14	-4.55	-72.69	-13.00	-59.69	peak	
6		787.0850	-69.21	-1.00	-70.21	-13.00	-57.21	peak	

Test Mode :	LTE Band 5_TX CH20525_1.4MHz

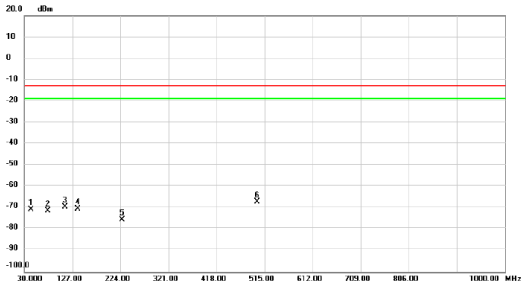
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure-ment dBm	Limit dBm	Margin dB	Detector	Comment
1	*	33.3950	-54.57	-15.16	-69.73	-13.00	-56.73	peak	
2		83.8350	-58.35	-18.61	-76.96	-13.00	-63.96	peak	
3		157.5550	-66.15	-12.43	-78.58	-13.00	-65.58	peak	
4		307.4200	-66.38	-10.75	-77.13	-13.00	-64.13	peak	
5		609.0900	-69.81	-4.41	-74.22	-13.00	-61.22	peak	
6		773.9900	-69.10	-1.34	-70.44	-13.00	-57.44	peak	

Test Mode :	LTE Band 5_TX CH20525_5MHz

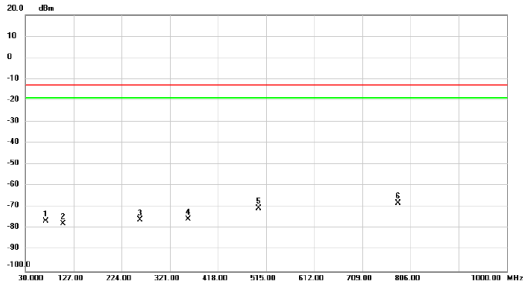
Vertical



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure-ment dBm	Limit dBm	Margin dB	Detector	Comment
1		43.5800	-56.76	-13.94	-70.70	-13.00	-57.70	peak	
2		77.5300	-53.56	-17.86	-71.42	-13.00	-58.42	peak	
3		111.4800	-54.72	-14.90	-69.62	-13.00	-56.62	peak	
4		137.6700	-57.48	-13.01	-70.49	-13.00	-57.49	peak	
5		226.9100	-61.46	-14.21	-75.67	-13.00	-62.67	peak	
6	*	499.9650	-60.49	-6.54	-67.03	-13.00	-54.03	peak	

Test Mode :	LTE Band 5_TX CH20525_5MHz

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBm	Correct Factor dB	Measure-ment dBm	Limit dBm	Margin dB	Detector	Comment
1		70.7400	-60.23	-16.37	-76.60	-13.00	-63.60	peak	
2		105.6600	-61.88	-15.70	-77.58	-13.00	-64.58	peak	
3		261.3450	-63.29	-12.51	-75.80	-13.00	-62.80	peak	
4		357.3750	-65.82	-9.78	-75.60	-13.00	-62.60	peak	
5		499.9650	-63.77	-6.54	-70.31	-13.00	-57.31	peak	
6	*	780.7800	-67.00	-1.17	-68.17	-13.00	-55.17	peak	