FCC Radio Test Report

FCC ID: 2AYW8WL21C01

This report concerns: Original Grant

Project No.	:	2101C159
Equipment	:	LTE Wireless Router
Brand Name	:	WiLINQ
Test Model	:	D010U
Series Model	:	N/A
Applicant	:	Acentury Inc.
Address	:	120 West Beaver Creek Road, Unit 13, Richmond Hill, ON Canada, L4B 1L2
Manufacturer	:	Acentury Inc.
Address	:	120 West Beaver Creek Road, Unit 13, Richmond Hill, ON Canada, L4B 1L2
Factory	:	Acentury Inc.
Address	:	120 West Beaver Creek Road, Unit 13, Richmond Hill, ON Canada, L4B 1L2
Date of Receipt	:	Jan. 19, 2021
Date of Test	:	Jan. 19, 2021 ~ Feb. 24, 2021
Issued Date	:	Mar. 12, 2021
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG2021011916 for conducted, DG2021011917 for radiated.
Standard(s)	:	47 CFR FCC Part 90 Subpart S 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.

Vegeta Li

Prepared by : Vegeta Li

Steven Lu

Approved by : Steven Lu

Certificate #5123.02

Add: No.3, Jinshagang 1st Road, Shixia, Dalang Town,Dongguan, Guangdong, China.
Tel: +86-769-8318-3000
Web: www.newbtl.com

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.

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** 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.

Table of Contents

Page

REPORT ISSUED HISTORY 5

1 . SUMMARY OF TEST RESULTS 6

1.1 TEST FACILITY 7

1.2 MEASUREMENT UNCERTAINTY 7

1.3 TEST ENVIRONMENT CONDITIONS 7

2 . GENERAL INFORMATION 8

2.1 GENERAL DESCRIPTION OF EUT 8

2.2 DESCRIPTION OF TEST MODES 9

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATIONOFSYSTEMTESTED 10

2.4 DESCRIPTION OF SUPPORT UNITS 10

3 . TEST RESULT 11

3.1 OUTPUT POWER MEASUREMENT 11

3.1.1 LIMIT 11

3.1.2 TEST PROCEDURE 11

3.1.3 TEST SETUP LAYOUT 11

3.1.4 TEST DEVIATION 11

3.1.5 TEST RESULTS 11

3.2 OCCUPIED BANDWIDTH MEASUREMENT 12

3.2.1 TEST PROCEDURE 12

3.2.2 TEST SETUP LAYOUT 12

3.2.3 TEST DEVIATION 12

3.2.4 TEST RESULTS 12

3.3 CONDUCTED SPURIOUS EMISSIONS MEASUREMENT 13

3.3.1 LIMIT 13

3.3.2 TEST PROCEDURES 13

3.3.3 TEST SETUP LAYOUT 13

3.3.4 TEST DEVIATION 13

3.3.5 TEST RESULTS 13

3.4 RADIATED SPURIOUS EMISSIONS MEASUREMENT 14

3.4.1 LIMIT 14

3.4.2 TEST PROCEDURES 14

3.4.3 TEST SETUP LAYOUT 15

3.4.4 TEST DEVIATION 16

3.4.5 TEST RESULTS (9KHZ TO 30MHZ) 16

3.4.6 TEST RESULTS (30MHZ TO 1000MHZ) 16

3.4.7 TEST RESULTS (ABOVE 1000MHZ) 16

3.5 MASK MEASUREMENTS 17

3.5.1 LIMIT 17

Table of Contents | Page

3.5.2 TEST PROCEDURES 17
3.5.3 TEST SETUP LAYOUT 17
3.5.4 TEST DEVIATION 17
3.5.5 TEST RESULTS 17
3.6 PEAK TO AVERAGE RATIO MEASUREMENT 18
3.6.1 LIMIT 18
3.6.2 TEST PROCEDURES 18
3.6.3 TEST SETUP LAYOUT 18
3.6.4 TEST DEVIATION 18
3.6.5 TEST RESULTS 18
3.7 FREQUENCY STABILITY MEASUREMENT 19
3.7.1 LIMIT 19
3.7.2 TEST PROCEDURES 19
3.7.3 TEST SETUP LAYOUT 19
3.7.4 TEST DEVIATION 19
3.7.5 TEST RESULTS 19
4 . LIST OF MEASUREMENT EQUIPMENTS 20
5 . EUT TEST PHOTO 22
APPENDIX A - OUTPUT POWER 25
APPENDIX B - OCCUPIED BANDWIDTH 30
APPENDIX C - CONDUCTED SPURIOUS EMISSIONS 41
APPENDIX D - RADIATED SPURIOUS EMISSIONS (9KHZ TO 30MHZ) 45
APPENDIX E - RADIATED SPURIOUS EMISSIONS (30MHZ TO 1000MHZ) 50
APPENDIX F - RADIATED SPURIOUS EMISSIONS (ABOVE 1000MHZ) 57
APPENDIX G - MASK 64
APPENDIX H - PEAK TO AVERAGE RATIO 69
APPENDIX I - FREQUENCY STABILITY 77

REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Mar. 12, 2021

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 90 Subpart S & Part 2			
Standard(s) Section	**Test Item**	**Judgment**	**Remark**
2.1046 & 90.635 (b)	Effective Radiated Power	PASS	------
2.1049 & 90.209	Occupied Bandwidth	PASS	------
2.1053 & 90.669	Conducted Spurious Emissions	PASS	------
2.1053 & 90.669	Radiated Spurious Emissions	PASS	------
2.1053 & 90.691	Mask Measurements	PASS	------
-	Peak To Average Ratio	PASS	Record Only
2.1055 & 90.213	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 in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, 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	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	9KHz ~ 30MHz	V	3.79
		9KHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 6GHz	4.58
		6GHz ~ 18GHz	5.18

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	22°C	47%	AC 120V/60Hz	Tate Liu
Occupied Bandwidth	22°C	47%	AC 120V/60Hz	Tate Liu
Conducted Spurious Emissions	22°C	47%	AC 120V/60Hz	Tate Liu
Radiated Spurious Emissions	26°C	52%	AC 120V/60Hz	Grani Zhou
Band Edge	22°C	47%	AC 120V/60Hz	Tate Liu
Peak to Average Ratio	22°C	47%	AC 120V/60Hz	Tate Liu
Frequency Stability	Normal & Extreme	47%	Normal & Extreme	Tate Liu

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	LTE Wireless Router				
Brand Name	WiLINQ				
Test Model	D010U				
Series Model	N/A				
Model Difference(s)	N/A				
Hardware Version	TZ7.821.181				
Software Version	V1.0				
Power Source	1# DC Voltage supplied from AC adapter. Model: DCT24W120200US-A0 2# Supplied from battery. Model: Z2000				
Power Rating	1# I/P: 100-240V~ 50/60Hz 0.7A max O/P: 12V ⎓ 2.0A 2# 7.4V/ 2000mAh 14.8Wh				
IEMI No.	Radiated	866545040010941			
	Conducted	866545040010842			
Modulation Type	LTE	UL: QPSK,16QAM, 64QAM DL: QPSK,16QAM, 64QAM			
Max. ERP	LTE	Channel Bandwidth (MHz)	QPSK (dBm)	16QAM (dBm)	64QAM (dBm)
	Band 26	1.4	23.27	22.38	21.43
		3	23.22	22.36	21.48
		5	23.22	22.49	21.40
		10	23.03	22.38	21.21

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 26					
Test Frequency ID	Bandwidth (MHz)	N_{UL}	Frequency of Uplink (MHz)	N_{DL}	Frequency of Downlink (MHz)
Low Range	1.4	26697	814.7	8697	859.7
	3	26705	815.5	8705	860.5
	5	26715	816.5	8715	861.5
Mid Range	1.4/3/5/10	26740	819	8740	864
High Range	1.4	26783	823.3	8783	868.3
	3	26775	822.5	8775	867.5
	5	26765	821.5	8765	866.5

3. Table for Filed Antenna:

Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
N/A	N/A	FPC	N/A	3	LTE Band 26

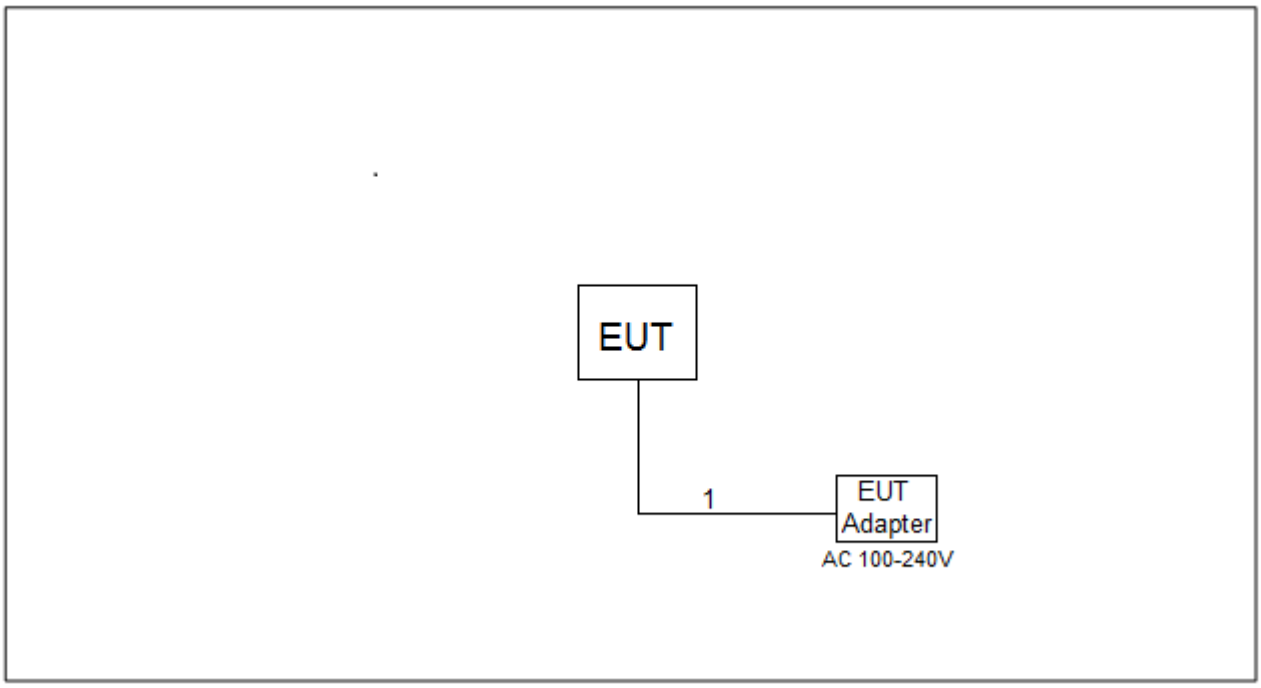
Note: The antenna gain is provided by the manufacturer.

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 26 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power & ERP	26697 to 26783	26697, 26740, 26783	1.4MHz	QPSK, 16QAM, 64QAM	1RB/3RB/6RB
	26705 to 26775	26705, 26740, 26775	3MHz	QPSK, 16QAM, 64QAM	1RB/8RB/15RB
	26715 to 26765	26715, 26740, 26765	5MHz	QPSK, 16QAM, 64QAM	1RB/12RB/25RB
	26740	26740	10MHz	QPSK, 16QAM, 64QAM	1RB/25RB/50RB
Occupied Bandwidth	26697 to 26783	26697, 26740, 26783	1.4MHz	QPSK, 16QAM, 64QAM	6RB
	26705 to 26775	26705, 26740, 26775	3MHz	QPSK, 16QAM, 64QAM	15RB
	26715 to 26765	26715, 26740, 26765	5MHz	QPSK, 16QAM, 64QAM	25RB
	26740	26740	10MHz	QPSK, 16QAM, 64QAM	1RB/25RB/50RB
Conducted Spurious Emissions	26697 to 26783	26740	1.4MHz	QPSK	1RB
	26705 to 26775	26740	5MHz	QPSK	1RB
	26715 to 26765	26740	10MHz	QPSK	1RB
Radiated Spurious Emissions	26697 to 26783	26740	1.4MHz	QPSK	1RB
	26705 to 26775	26740	5MHz	QPSK	1RB
	26715 to 26765	26740	10MHz	QPSK	1RB
Mask	26697 to 26783	26697, 26783	1.4MHz	QPSK	1RB
					6RB
	26705 to 26775	26705, 26775	3MHz	QPSK	1RB
					15RB
	26715 to 26765	26715, 26765	5MHz	QPSK	1RB
					25RB
	26740	26740	10MHz	QPSK	1RB
					50RB
Peak To Average Ratio	26697 to 26783	26697, 26740, 26783	1.4MHz	QPSK, 16QAM, 64QAM	1RB
	26705 to 26775	26705, 26740, 26775	3MHz	QPSK, 16QAM, 64QAM	1RB
	26715 to 26765	26715, 26740, 26765	5MHz	QPSK, 16QAM, 64QAM	1RB
	26740	26740	10MHz	QPSK, 16QAM, 64QAM	1RB
Frequency Stability	26697 to 26783	26740	1.4MHz	QPSK	1RB
	26705 to 26775	26740	3MHz	QPSK	1RB
	26715 to 26765	26740	5MHz	QPSK	1RB
	26740	26740	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.
-	-	-	-	-

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

3. TEST RESULT

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMIT

Mobile / Portable station are limited to 100 watts e.r.p.

3.1.2 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 5.0.

ERP:

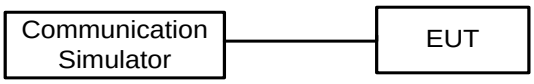
EIRP= Output Power + Antenan gain
ERP = EIPR - 2.15dBi.

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.

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.

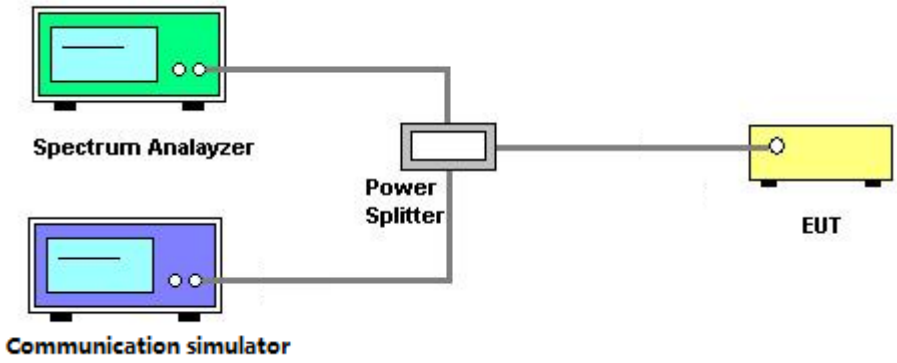
3.2 OCCUPIED BANDWIDTH MEASUREMENT

3.2.1 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 4.0.

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.

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

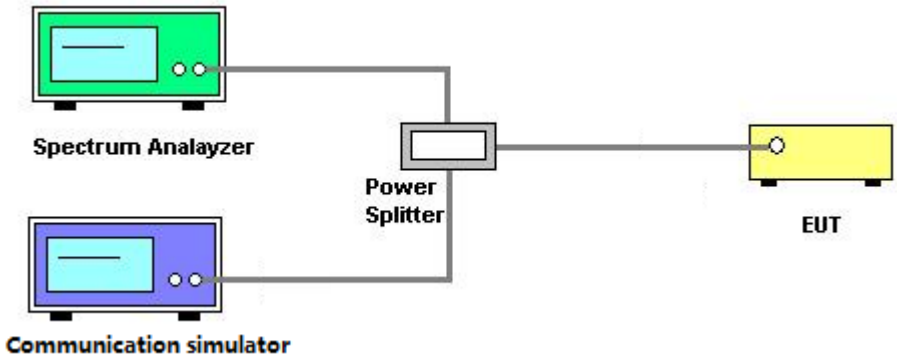
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

3.3.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.0.

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 RMS 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.

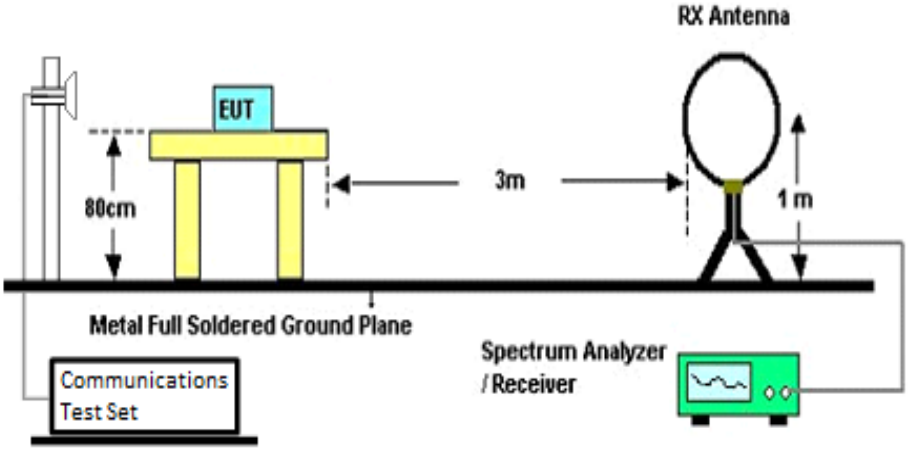
3.4.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 5.8.

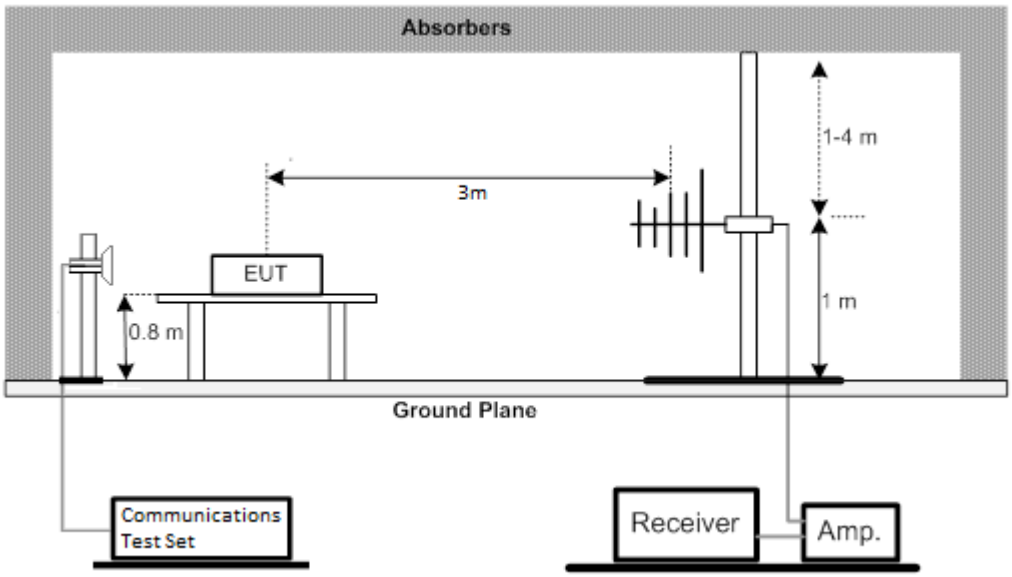
1. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. 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

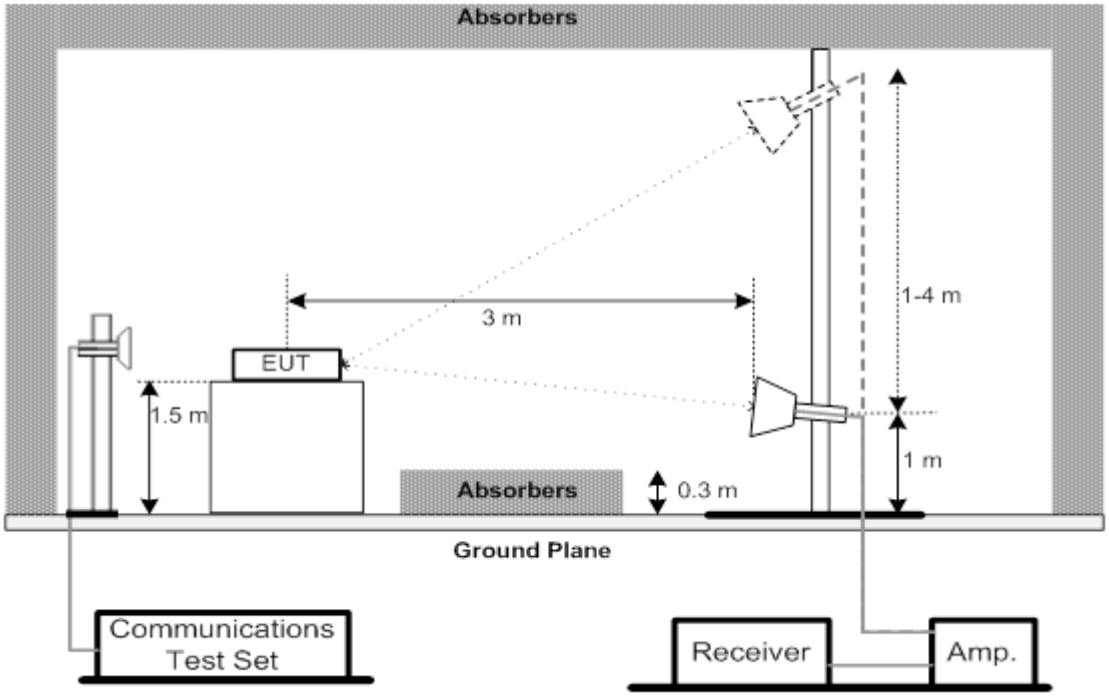
Below 30MHz



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 MASK MEASUREMENTS

3.5.1 LIMIT

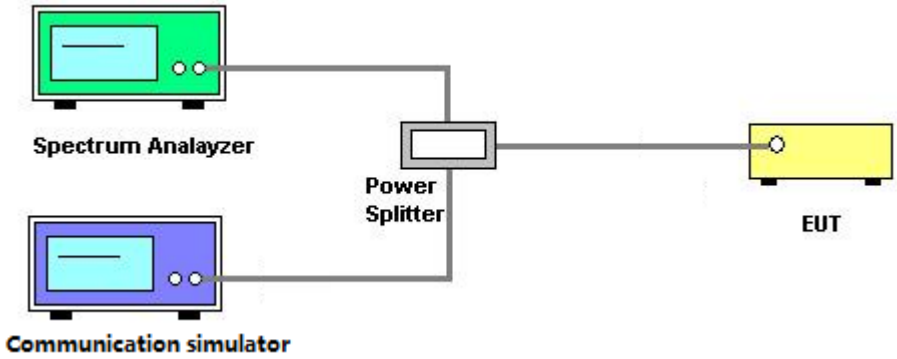
According to FCC part 90.691 shall be tested the emission mask. For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50+10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz. For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

3.5.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.0.

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. For Section 90.691(a) compliance testing, use RBW = 300 Hz for offsets less than 37.5 kHz from a channel edge; RBW = 100 kHz for offsets greater than 37.5 kHz is allowed.
3. 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

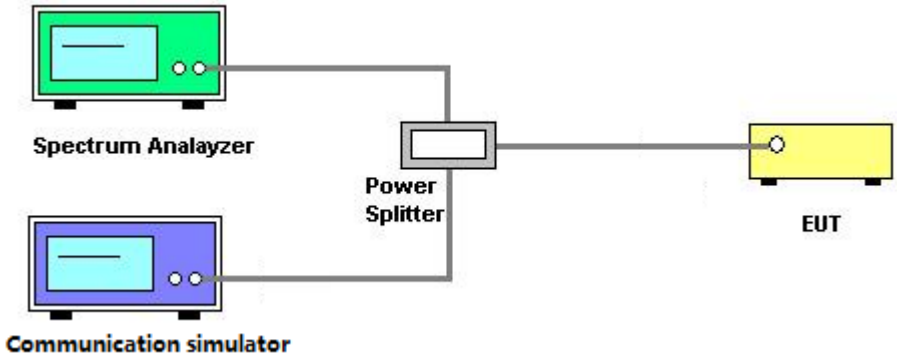
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

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

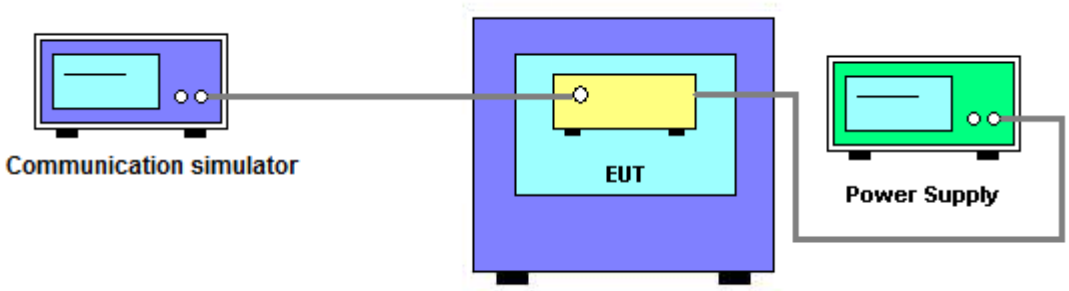
±1.5 ppm is for base and fixed station. ±2.5 ppm is for mobile station.

3.7.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 9.0.

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 Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3231	Apr. 17, 2021
2	Amplifier	Agilent	8449B	3008A02334	Feb. 27, 2022
3	HighPass Filter	Wairrwright Instruments Gmbh	WHK 1.5/15G-10ST	11	Feb. 27, 2022
4	Band Reject Filter	Wairrwright Instruments Gmbh	WRCG 1710/1785-1690/1805-60/12SS	38	Feb. 27, 2022
5	Band Reject Filter	Wairrwright Instruments Gmbh	WRCG 824/849-810/863-60/9SS	7	Feb. 27, 2022
6	Band Reject Filter	Wairrwright Instruments Gmbh	WRCG 880/915-860/935-60/9SS	14	Feb. 27, 2022
7	Band Reject Filter	Wairrwright Instruments Gmbh	WRCG 1850/1910-1830/1930-60/10SS	17	Feb. 27, 2022
8	HighPass Filter	Wairrwright Instruments Gmbh	WHK3.1/18G-10SS	24	Feb. 27, 2022
9	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Feb. 28, 2022
10	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Feb. 28, 2022
11	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021
12	wideband radio communication tester	R&S	CMW500	152372	Feb. 27, 2022
13	High pass filter	KANGMAIWEI	ZHPF-M3-12.75G-3869	B2015073763	Feb. 07, 2022
14	High pass filter	KANGMAIWEI	ZHPF-M1000-4000-1	B2015073762	Feb. 07, 2022
15	High pass filter	KANGMAIWEI	ZHPF-M6-186-1727	B2015073764	Feb. 07, 2022
16	Cable	emci	LMR-400(30MHz-1GHz) (8m+5m)	N/A	May 23, 2021
17	Cable	mitron	B10-01-01-12M	18072744	Jun. 28, 2021
18	Controller	ETS-Lindgren	2090	N/A	N/A
19	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
20	Loop Antenna	EM	EM-6876-1	230	Apr. 16, 2021
21	Double Ridged Guide Antenna	ETS	3115	75846	Mar. 19, 2021
22	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jul. 07, 2021

Conducted Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Feb. 28, 2022
2	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Feb. 28, 2022
3	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Feb. 27, 2022
4	wideband radio communication tester	R&S	CMW500	152372	Feb. 27, 2022

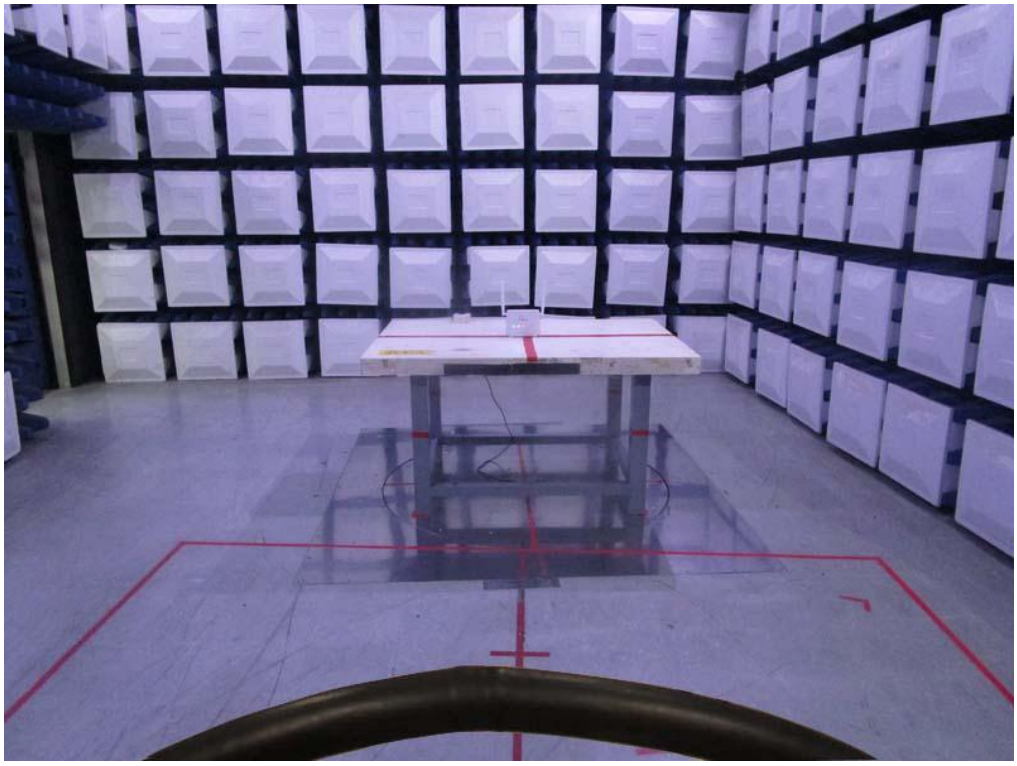
Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Feb. 28, 2022
2*	Multi-output DC Power Supply	GW Instek	GPC-3030DN	EK880675	Jul. 25, 2023
3	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Feb. 27, 2022
4	wideband radio communication tester	R&S	CMW500	152372	Feb. 27, 2022
5	Const Temp,& Humidity Chamber	Bell	BTH-50C	20170306001	Feb. 27, 2022

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

5. EUT TEST PHOTO

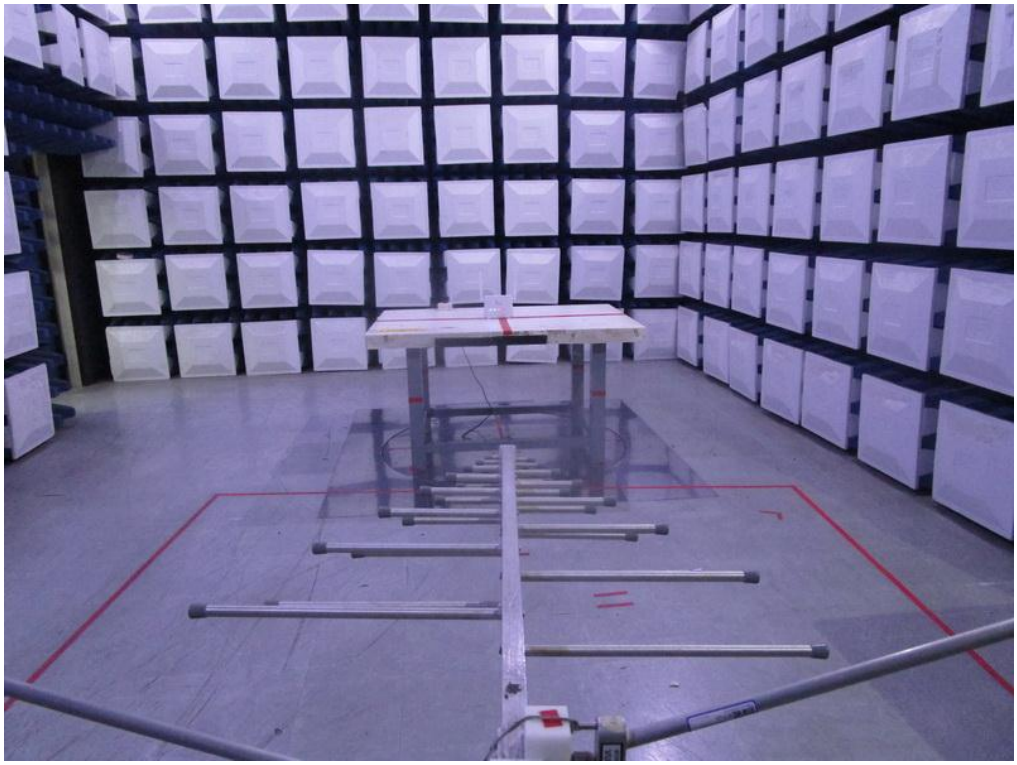
Radiated Emissions Test Photos

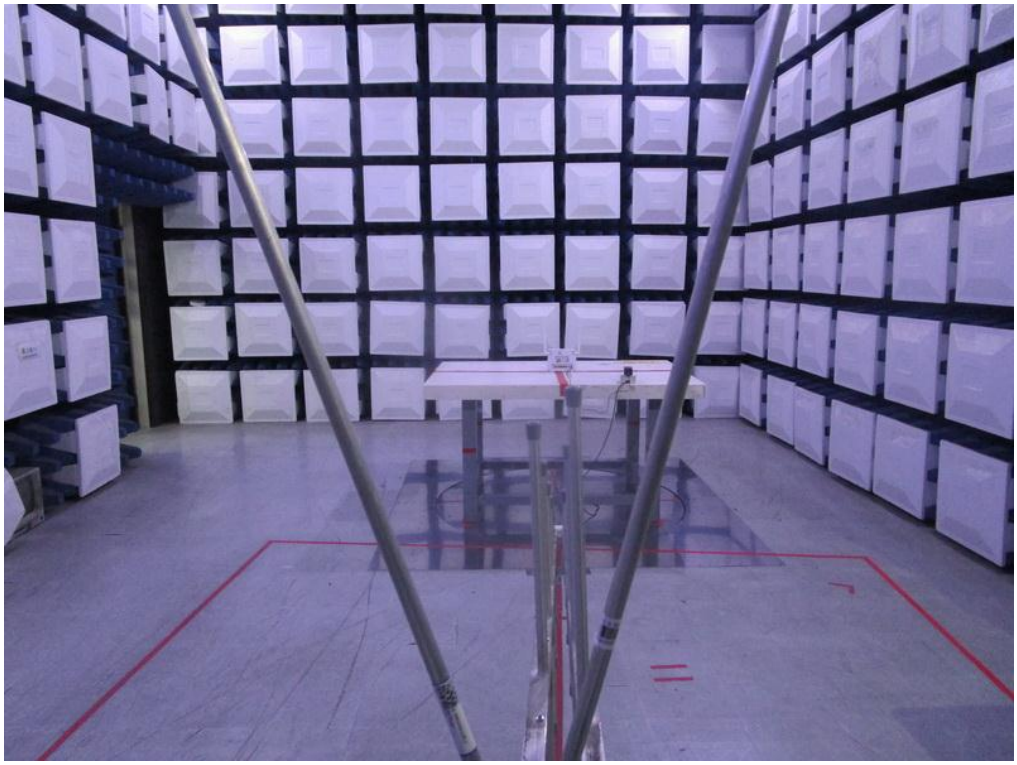
9 kHz to 30 MHz



Radiated Emissions Test Photos

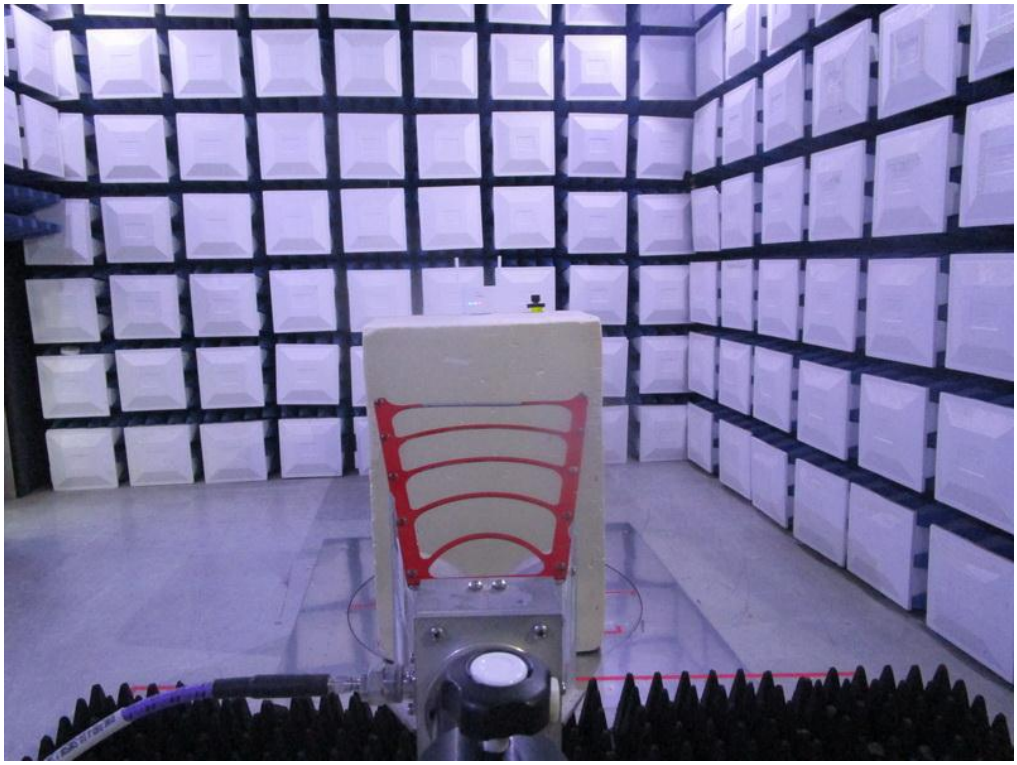
30 MHz to 1 GHz

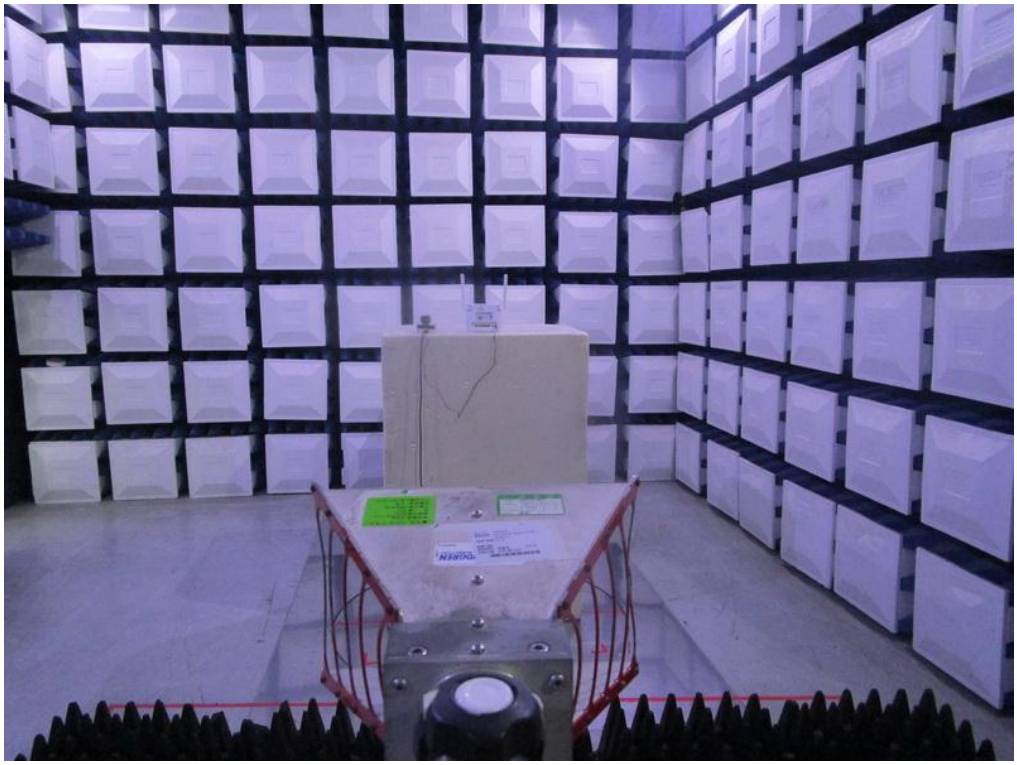




Radiated Emissions Test Photos

Above 1 GHz





APPENDIX A - OUTPUT POWER

Output Power (dBm):

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				26697CH	26740CH	26783CH
				814.7MHz	819MHz	823.3MHz
26 / 1.4M	QPSK	1	0	22.25	22.30	22.26
		1	2	22.40	22.38	22.34
		1	5	22.26	22.34	22.25
		3	0	22.25	22.37	22.16
		3	1	22.35	22.42	22.24
		3	2	22.30	22.37	22.19
		6	0	21.36	21.41	21.24
	16QAM	1	0	21.33	21.16	21.26
		1	2	21.53	21.23	21.24
		1	5	21.40	21.21	21.18
		3	0	21.25	21.28	21.17
		3	1	21.32	21.33	21.22
		3	2	21.24	21.31	21.19
		6	0	20.11	20.39	20.32
	64QAM	1	0	20.40	20.33	20.35
		1	2	20.58	20.35	20.36
		1	5	20.40	20.36	20.31
		3	0	20.41	20.30	20.08
		3	1	20.48	20.34	20.14
		3	2	20.42	20.36	20.07
		6	0	19.19	19.48	19.23

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				26705CH	26740CH	26775CH
				815.5MHz	819MHz	822.5MHz
26 / 3M	QPSK	1	0	22.26	22.15	22.37
		1	7	22.37	22.33	22.33
		1	14	22.15	22.36	22.24
		8	0	21.28	21.24	21.43
		8	4	21.21	21.37	21.32
		8	7	21.24	21.41	21.31
		15	0	21.20	21.37	21.34
	16QAM	1	0	21.41	21.13	21.21
		1	7	21.51	21.29	21.15
		1	14	21.40	21.33	21.04
		8	0	20.25	20.25	20.44
		8	4	20.21	20.31	20.36
		8	7	20.21	20.37	20.36
		15	0	20.17	20.19	20.31
	64QAM	1	0	20.20	20.36	20.63
		1	7	20.32	20.53	20.59
		1	14	20.21	20.53	20.48
		8	0	19.20	19.15	19.39
		8	4	19.17	19.22	19.33
		8	7	19.21	19.31	19.27
		15	0	19.15	19.29	19.25

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				26715CH	26740CH	26765CH
				816.5MHz	819MHz	821.5MHz
26 / 5M	QPSK	1	0	22.16	22.20	22.37
		1	13	22.22	22.37	22.37
		1	24	22.26	22.33	22.25
		12	0	21.29	21.15	21.39
		12	6	21.34	21.28	21.32
		12	11	21.14	21.35	21.22
		25	0	21.17	21.28	21.32
	16QAM	1	0	21.58	21.29	21.43
		1	13	21.63	21.38	21.42
		1	24	21.64	21.39	21.32
		12	0	20.34	20.21	20.48
		12	6	20.35	20.36	20.46
		12	11	20.23	20.41	20.34
		25	0	20.24	20.25	20.34
	64QAM	1	0	20.41	20.44	20.29
		1	13	20.51	20.55	20.26
		1	24	20.44	20.55	20.16
		12	0	19.14	19.18	19.44
		12	6	19.16	19.32	19.37
		12	11	19.01	19.42	19.26
		25	0	19.10	19.26	19.29

LTE Band / BW	Modulation	RB Size	RB Offset	Mid CH
				26740CH
				819MHz
26 / 10M	QPSK	1	0	22.10
		1	25	22.18
		1	49	22.04
		25	0	21.23
		25	13	21.28
		25	25	21.26
		50	0	21.19
	16QAM	1	0	21.41
		1	25	21.53
		1	49	21.41
		25	0	20.23
		25	13	20.31
		25	25	20.31
		50	0	20.21
	64QAM	1	0	20.23
		1	25	20.36
		1	49	20.22
		25	0	19.25
		25	13	19.35
		25	25	19.31
		50	0	19.20

ERP (dBm):

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				26697CH	26740CH	26783CH
				814.7MHz	819MHz	823.3MHz
26 / 1.4M	QPSK	1	0	23.10	23.15	23.11
		1	2	23.25	23.23	23.19
		1	5	23.11	23.19	23.10
		3	0	23.10	23.22	23.01
		3	1	23.20	23.27	23.09
		3	2	23.15	23.22	23.04
		6	0	22.21	22.26	22.09
	16QAM	1	0	22.18	22.01	22.11
		1	2	22.38	22.08	22.09
		1	5	22.25	22.06	22.03
		3	0	22.10	22.13	22.02
		3	1	22.17	22.18	22.07
		3	2	22.09	22.16	22.04
		6	0	20.96	21.24	21.17
	64QAM	1	0	21.25	21.18	21.20
		1	2	21.43	21.20	21.21
		1	5	21.25	21.21	21.16
		3	0	21.26	21.15	20.93
		3	1	21.33	21.19	20.99
		3	2	21.27	21.21	20.92
		6	0	20.04	20.33	20.08

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				26705CH	26740CH	26775CH
				815.5MHz	819MHz	822.5MHz
26 / 3M	QPSK	1	0	23.11	23.00	23.22
		1	7	23.22	23.18	23.18
		1	14	23.00	23.21	23.09
		8	0	22.13	22.09	22.28
		8	4	22.06	22.22	22.17
		8	7	22.09	22.26	22.16
		15	0	22.05	22.22	22.19
	16QAM	1	0	22.26	21.98	22.06
		1	7	22.36	22.14	22.00
		1	14	22.25	22.18	21.89
		8	0	21.10	21.10	21.29
		8	4	21.06	21.16	21.21
		8	7	21.06	21.22	21.21
		15	0	21.02	21.04	21.16
	64QAM	1	0	21.05	21.21	21.48
		1	7	21.17	21.38	21.44
		1	14	21.06	21.38	21.33
		8	0	20.05	20.00	20.24
		8	4	20.02	20.07	20.18
		8	7	20.06	20.16	20.12
		15	0	20.00	20.14	20.10

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				26715CH	26740CH	26765CH
				816.5MHz	819MHz	821.5MHz
26 / 5M	QPSK	1	0	23.01	23.05	23.22
		1	13	23.07	23.22	23.22
		1	24	23.11	23.18	23.10
		12	0	22.14	22.00	22.24
		12	6	22.19	22.13	22.17
		12	11	21.99	22.20	22.07
		25	0	22.02	22.13	22.17
	16QAM	1	0	22.43	22.14	22.28
		1	13	22.48	22.23	22.27
		1	24	22.49	22.24	22.17
		12	0	21.19	21.06	21.33
		12	6	21.20	21.21	21.31
		12	11	21.08	21.26	21.19
		25	0	21.09	21.10	21.19
	64QAM	1	0	21.26	21.29	21.14
		1	13	21.36	21.40	21.11
		1	24	21.29	21.40	21.01
		12	0	19.99	20.03	20.29
		12	6	20.01	20.17	20.22
		12	11	19.86	20.27	20.11
		25	0	19.95	20.11	20.14

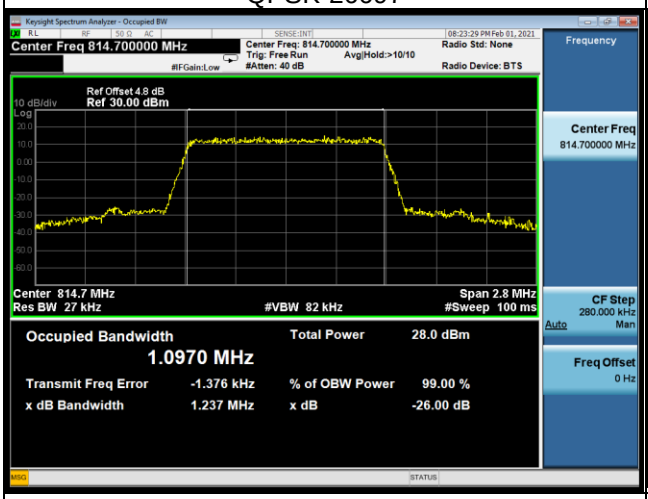
LTE Band / BW	Modulation	RB Size	RB Offset	Mid CH
				26740CH
				819MHz
26 / 10M	QPSK	1	0	22.95
		1	25	23.03
		1	49	22.89
		25	0	22.08
		25	13	22.13
		25	25	22.11
		50	0	22.04
	16QAM	1	0	22.26
		1	25	22.38
		1	49	22.26
		25	0	21.08
		25	13	21.16
		25	25	21.16
		50	0	21.06
	64QAM	1	0	21.08
		1	25	21.21
		1	49	21.07
		25	0	20.10
		25	13	20.20
		25	25	20.16
		50	0	20.05

APPENDIX B - OCCUPIED BANDWIDTH

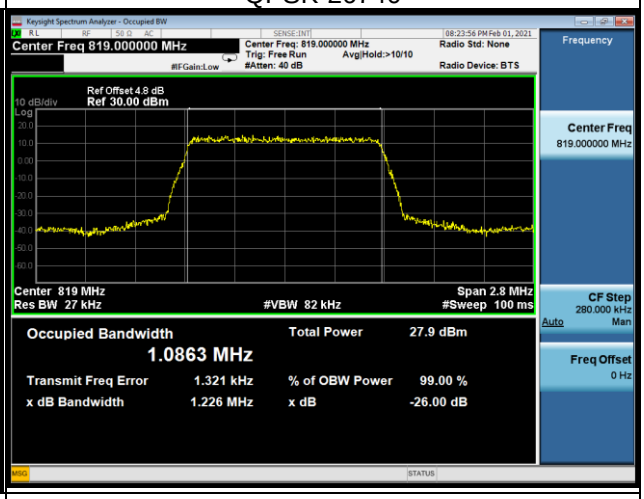
LTE Band 26_1.4M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26697	814.7	1.0970	26697	814.7	1.237
26740	819	1.0863	26740	819	1.226
26783	823.3	1.0921	26783	823.3	1.232
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26697	814.7	1.0898	26697	814.7	1.232
26740	819	1.0824	26740	819	1.228
26783	823.3	1.0864	26783	823.3	1.233
64QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26697	814.7	1.0871	26697	814.7	1.246
26740	819	1.0827	26740	819	1.223
26783	823.3	1.0837	26783	823.3	1.226

Spectrum Plot

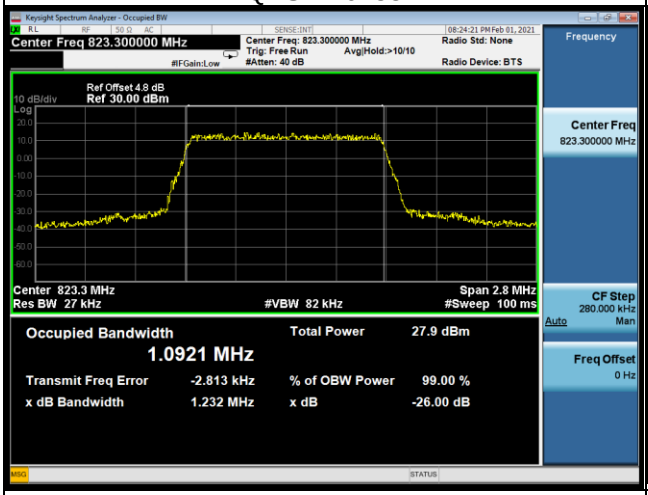
QPSK-26697



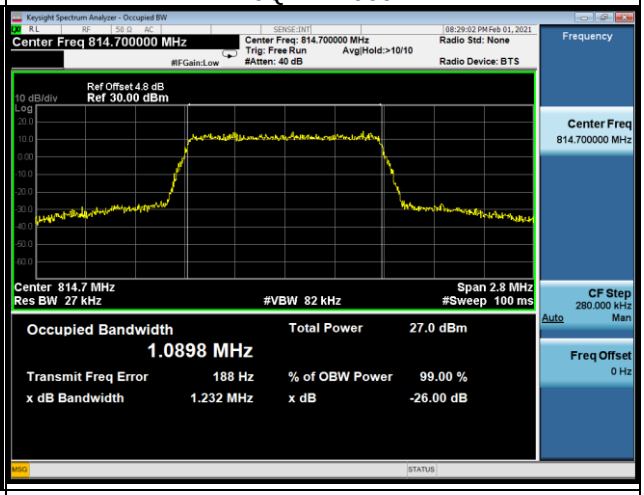
QPSK-26740



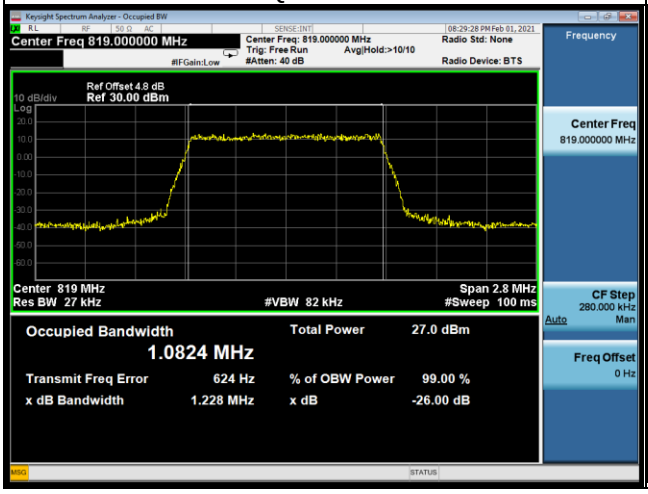
QPSK-26783



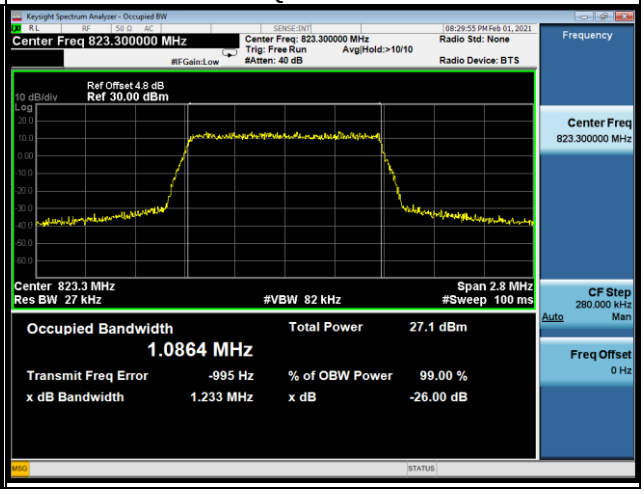
16QAM-26697

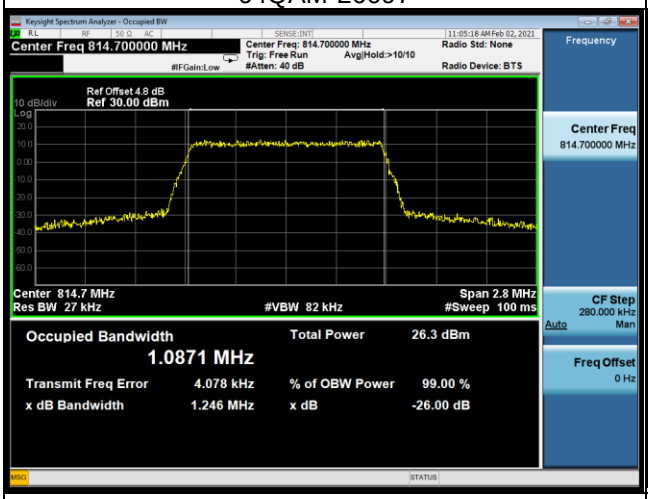
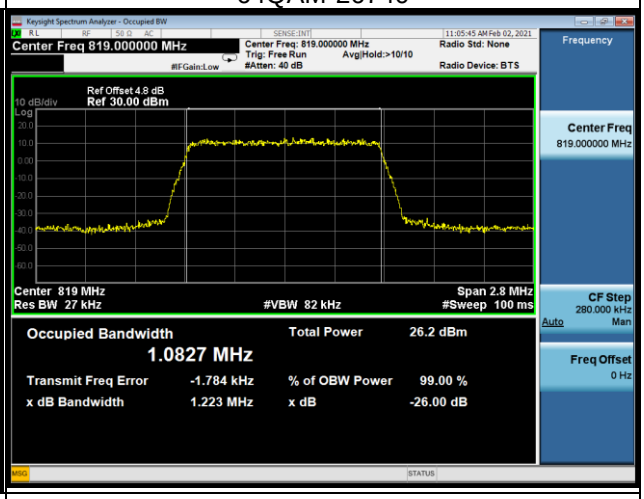
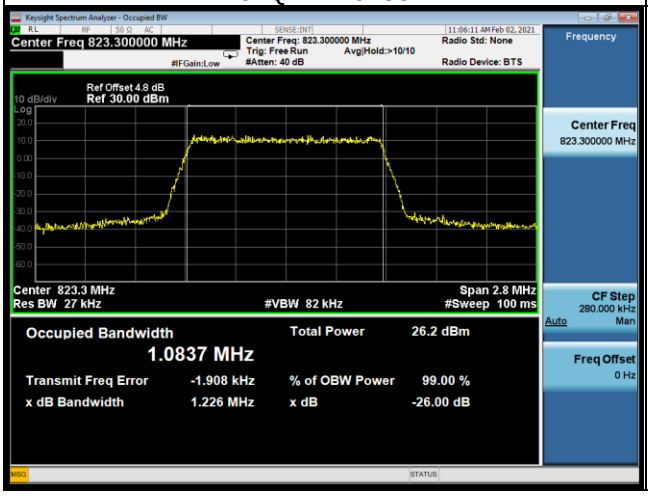


16QAM-26740



16QAM-26783

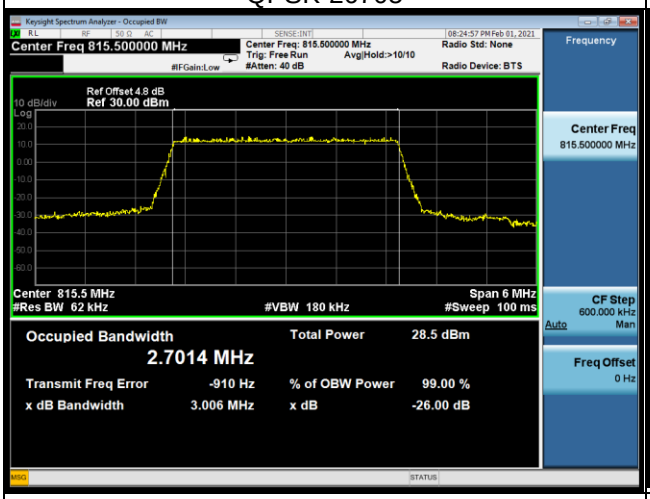


Spectrum Plot	
64QAM-26697	64QAM-26740
	
64QAM-26783	-
	-

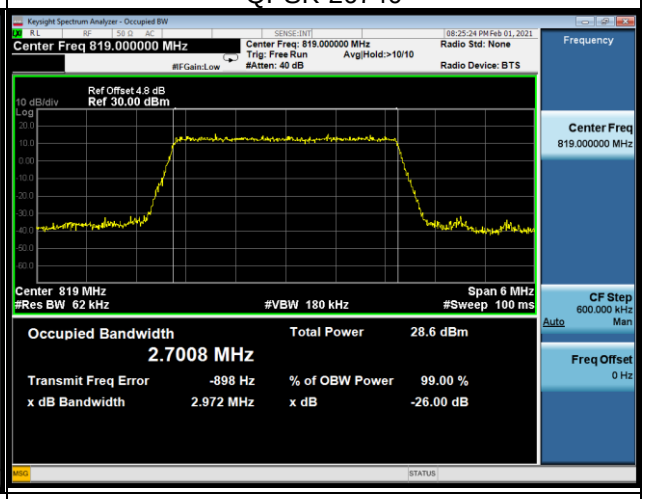
LTE Band 26_3M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26705	815.5	2.7014	26705	815.5	3.006
26740	819	2.7008	26740	819	2.972
26775	822.5	2.6971	26775	822.5	2.991
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26705	815.5	2.7025	26705	815.5	2.982
26740	819	2.6968	26740	819	3.013
26775	822.5	2.7013	26775	822.5	3.023
64QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26705	815.5	2.6993	26705	815.5	2.959
26740	819	2.6957	26740	819	3.004
26775	822.5	2.7018	26775	822.5	3.007

Spectrum Plot

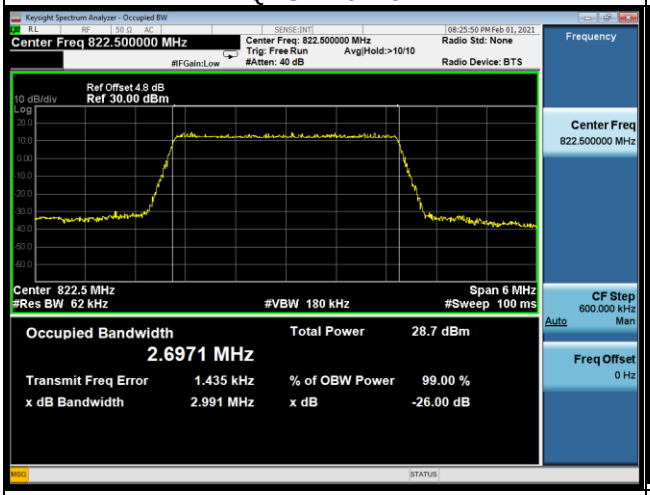
QPSK-26705



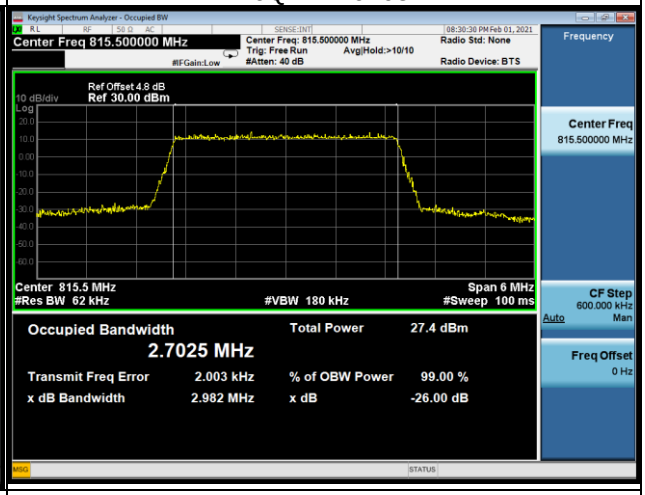
QPSK-26740



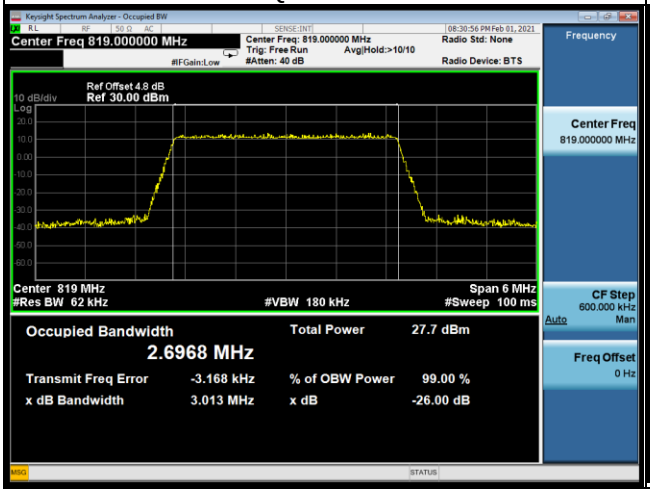
QPSK-26775



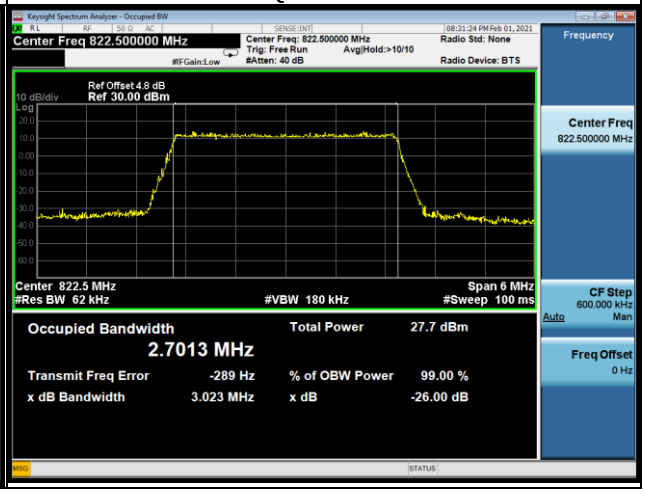
16QAM-26705

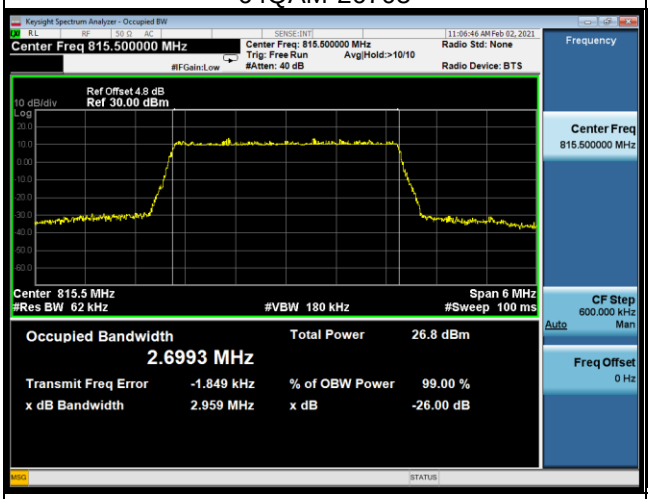
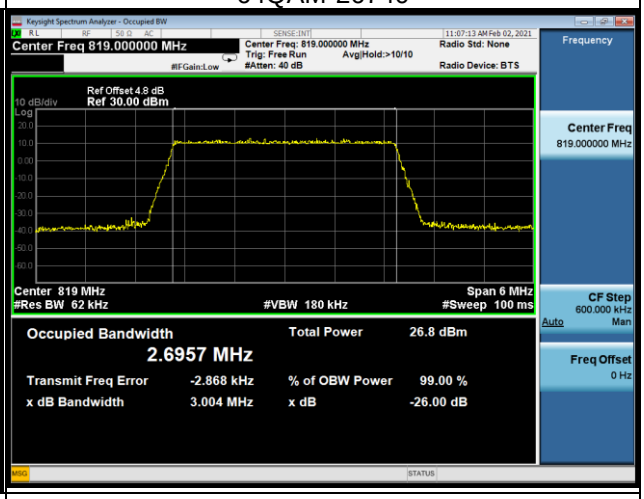
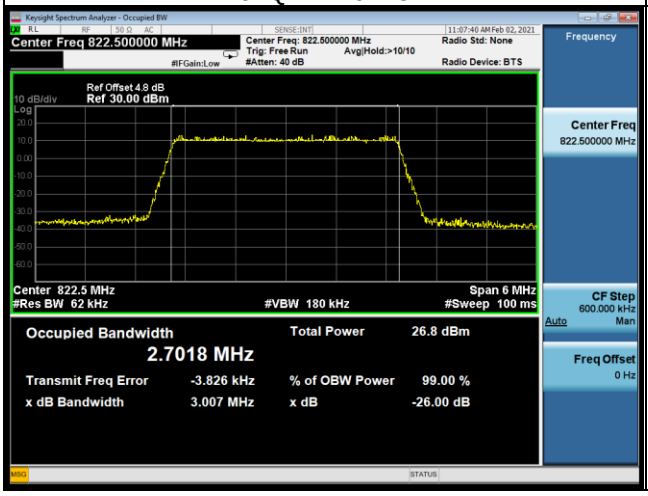


16QAM-26740



16QAM-26775

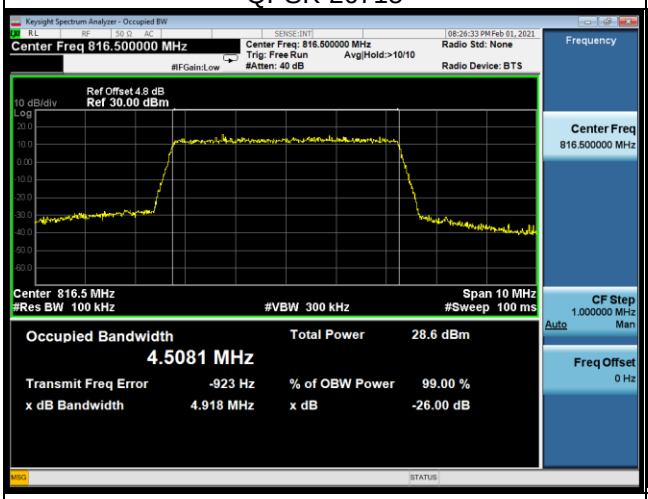


Spectrum Plot	
64QAM-26705	64QAM-26740
	
64QAM-26775	-
	-

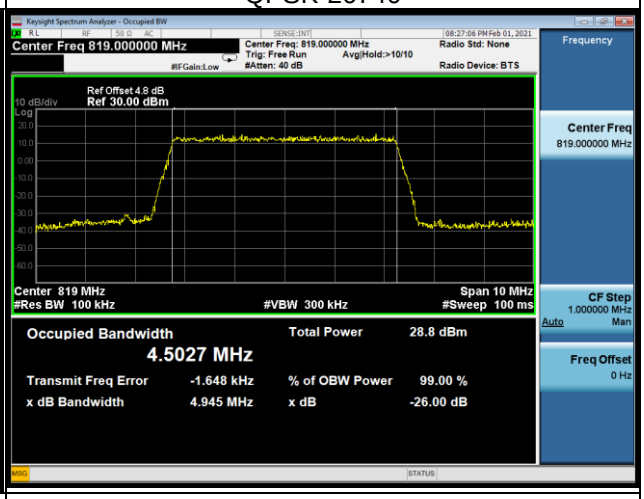
LTE Band 26_5M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26715	816.5	4.5081	26715	816.5	4.918
26740	819	4.5027	26740	819	4.945
26765	821.5	4.5047	26765	821.5	4.965
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26715	816.5	4.4934	26715	816.5	4.955
26740	819	4.4919	26740	819	4.925
26765	821.5	4.4997	26765	821.5	4.992
64QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26715	816.5	4.5129	26715	816.5	4.949
26740	819	4.5016	26740	819	4.930
26765	821.5	4.5171	26765	821.5	4.957

Spectrum Plot

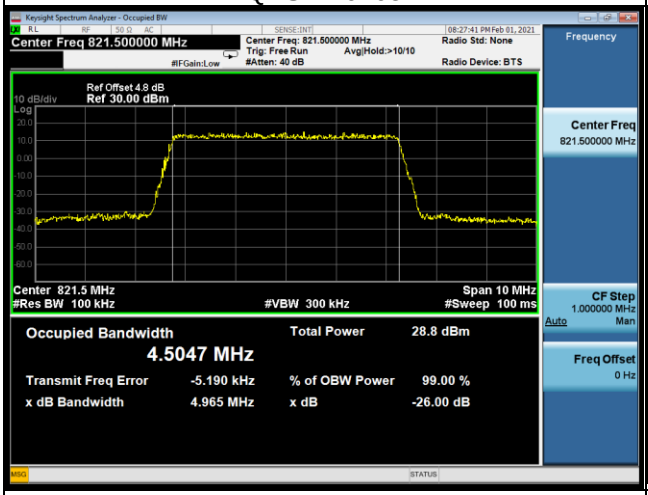
QPSK-26715



QPSK-26740

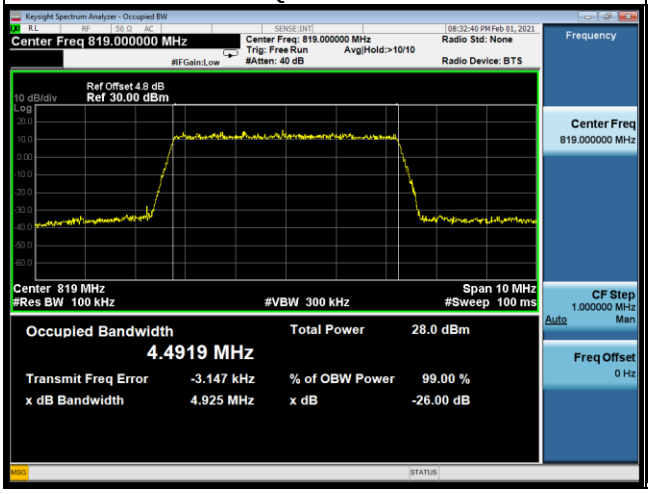


QPSK-26765

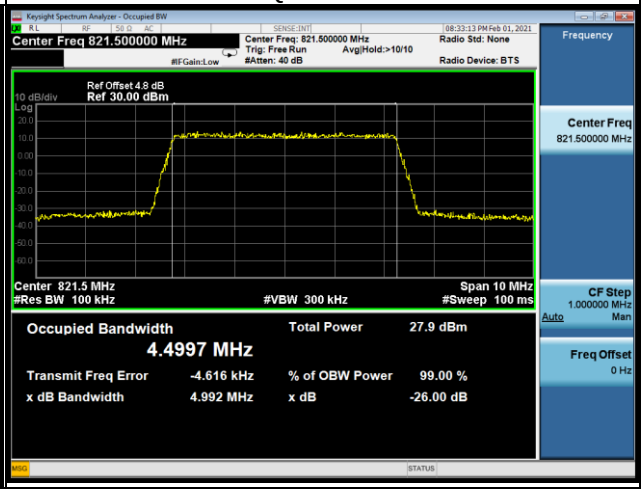


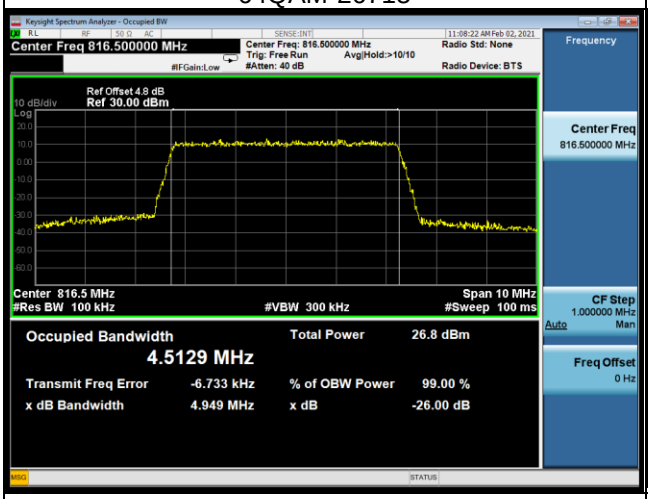
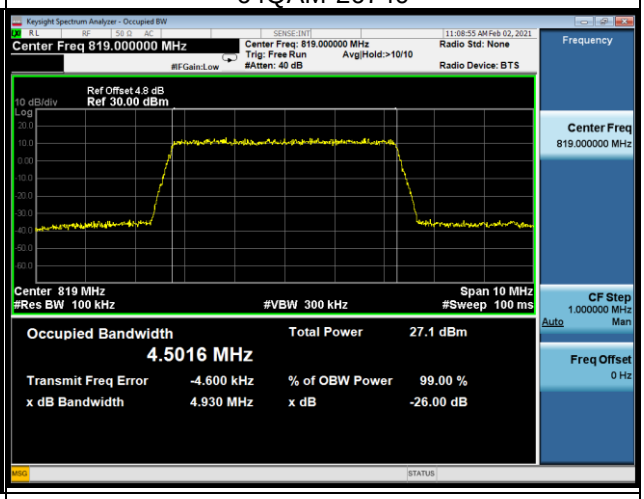
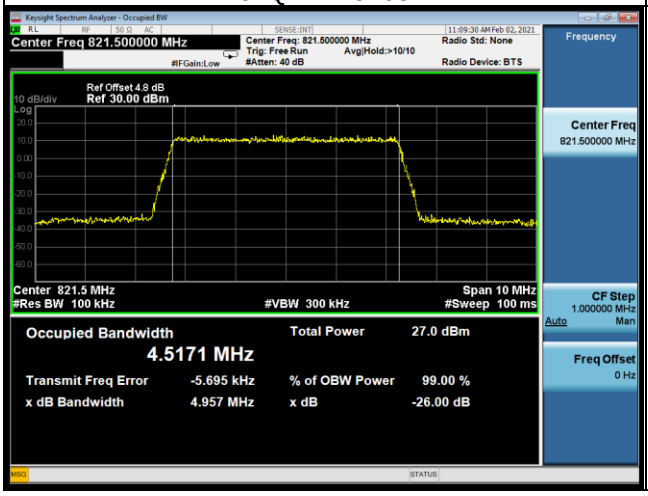
16QAM-26715

16QAM-26740



16QAM-26765

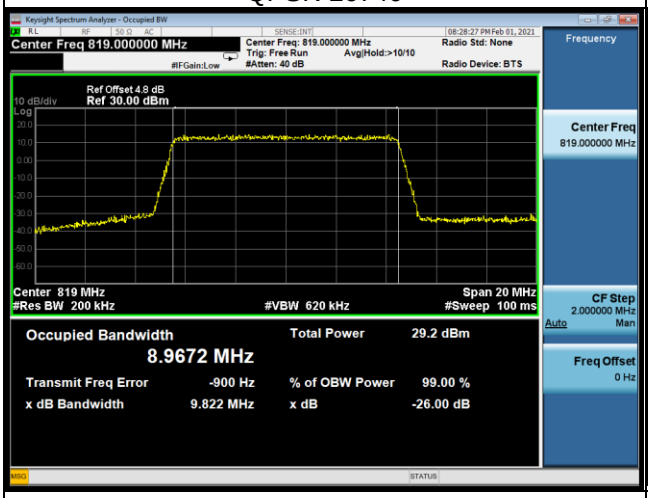


Spectrum Plot	
64QAM-26715	64QAM-26740
	
64QAM-26765	-
	-

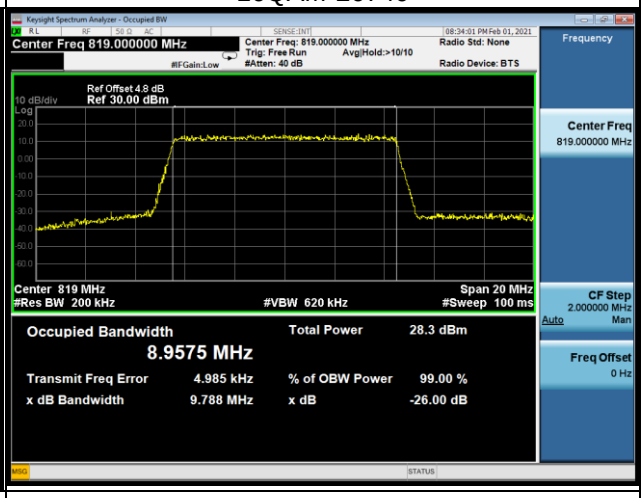
LTE Band 26_10M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26740	819	8.9672	26740	819	9.822
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26740	819	8.9575	26740	819	9.788
64QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26740	819	8.9548	26740	819	9.795

Spectrum Plot

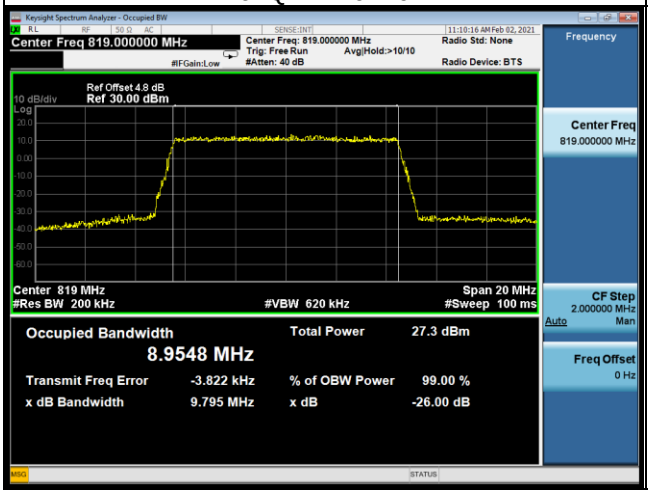
QPSK-26740



16QAM-26740



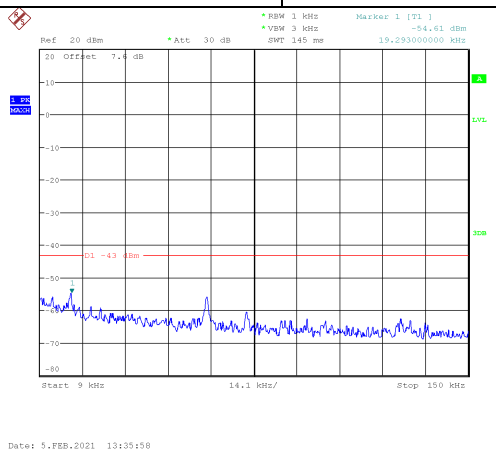
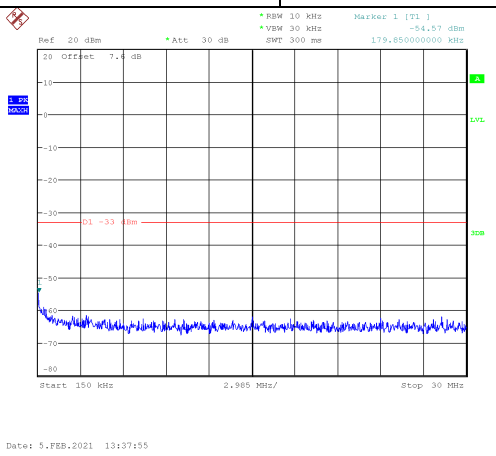
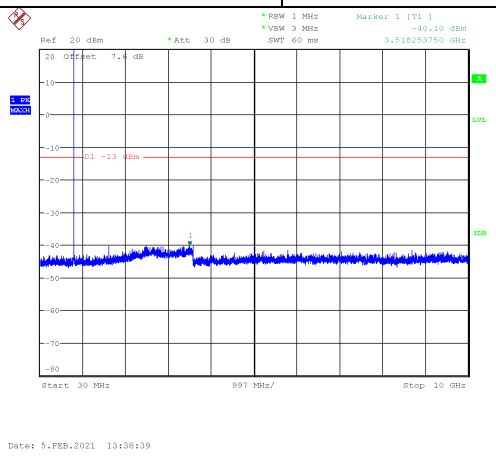
64QAM-26740

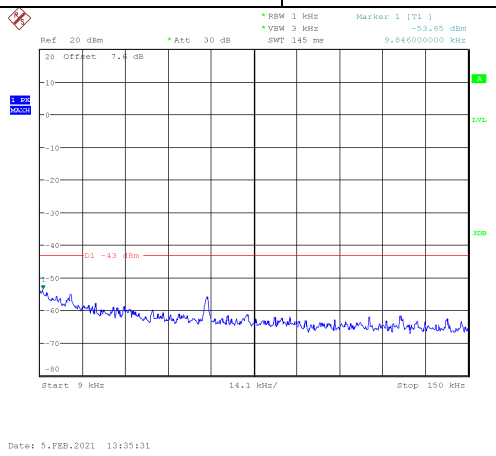
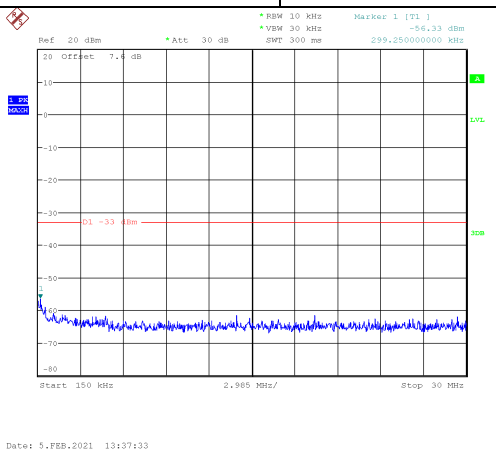
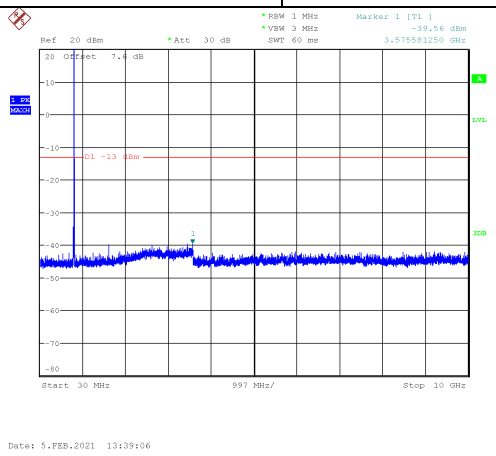


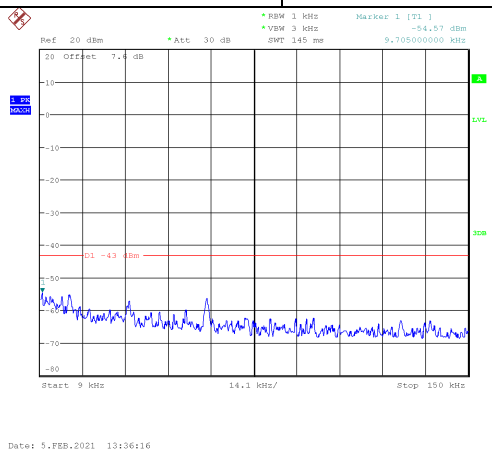
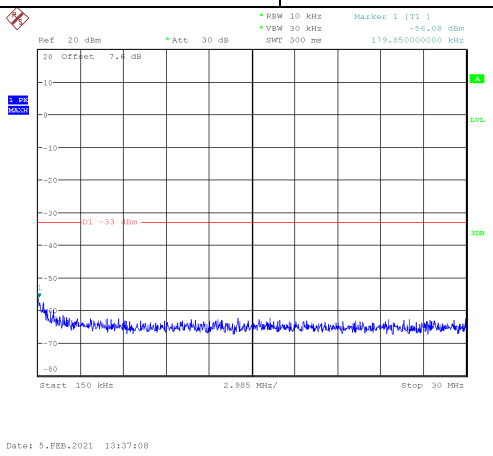
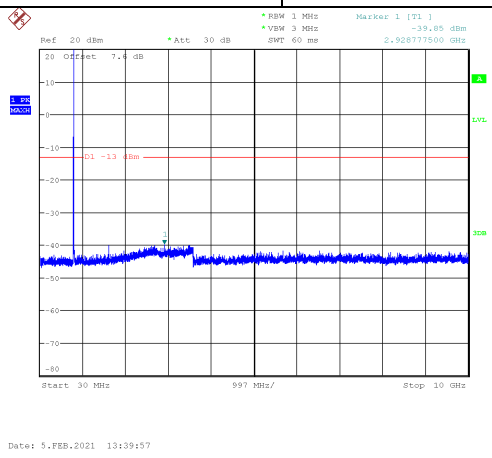
-

-

APPENDIX C - CONDUCTED SPURIOUS EMISSIONS

LTE Band 26_1.4M Spectrum Plot			
Channel	Frequency(MHz)	Channel	Frequency(MHz)
26740	819	26740	819
			
Channel	Frequency(MHz)	-	-
26740	819	-	-
		-	

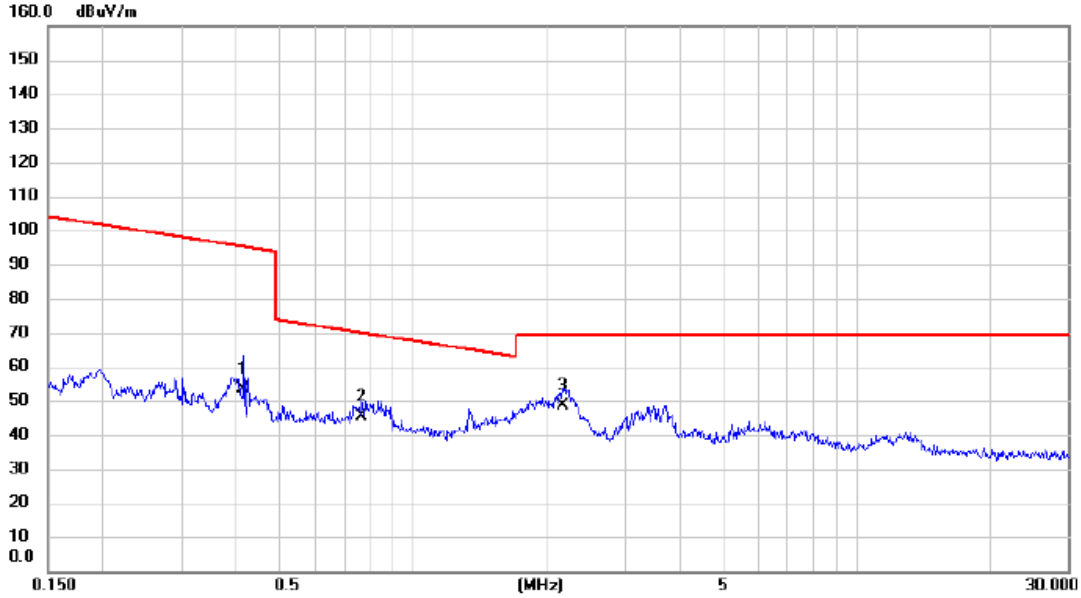
LTE Band 26_5M Spectrum Plot			
Channel	Frequency(MHz)	Channel	Frequency(MHz)
26740	819	26740	819
			
Channel	Frequency(MHz)	-	-
26740	819	-	-
		-	

LTE Band 26_10M Spectrum Plot			
Channel	Frequency(MHz)	Channel	Frequency(MHz)
26740	819	26740	819
			
Channel	Frequency(MHz)	-	-
26740	819	-	-
		-	

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

Test Mode	TX Mode

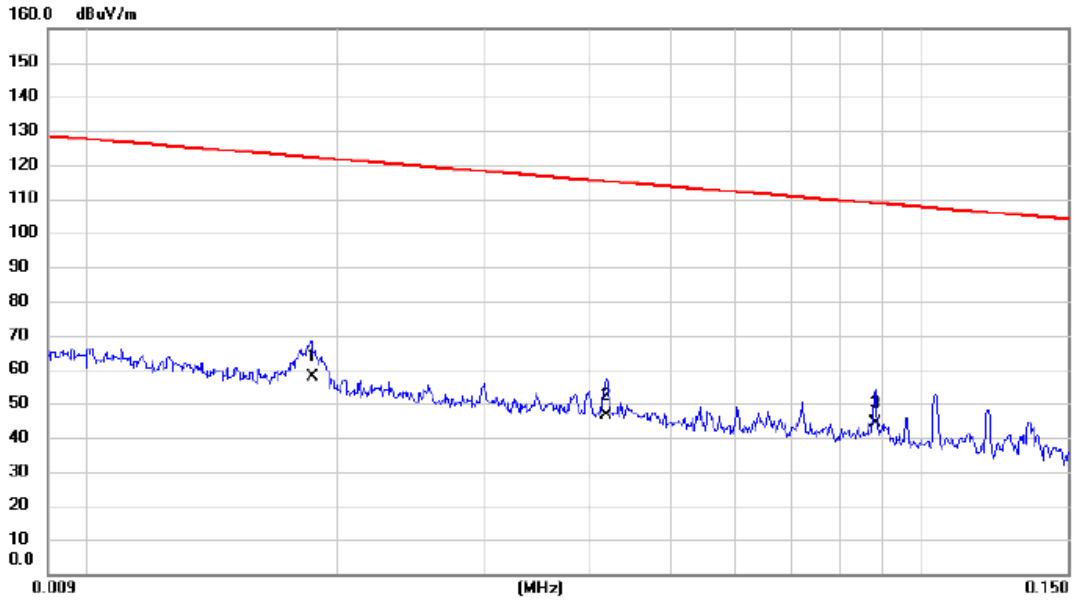
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.415	41.20	12.23	53.43	95.25	-41.82	AVG	
2		0.763	33.69	11.89	45.58	69.95	-24.37	QP	
3	*	2.178	37.58	11.21	48.79	69.54	-20.75	QP	

Test Mode	TX Mode

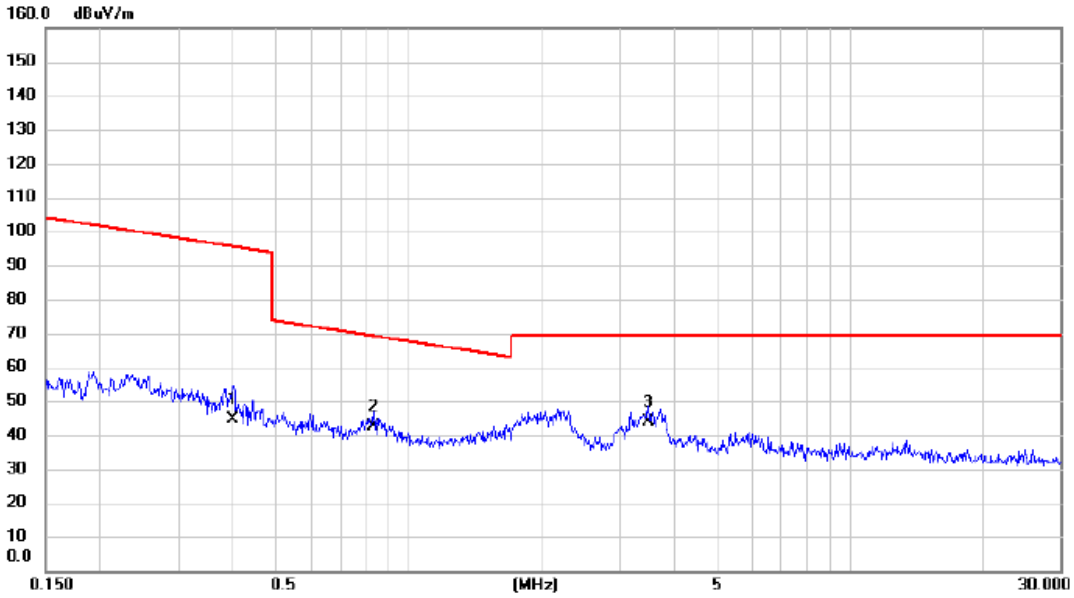
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.019	44.15	13.62	57.77	122.17	-64.40	AVG	
2		0.042	34.17	12.63	46.80	115.14	-68.34	AVG	
3		0.088	31.58	12.65	44.23	108.71	-64.48	AVG	

Test Mode	TX Mode

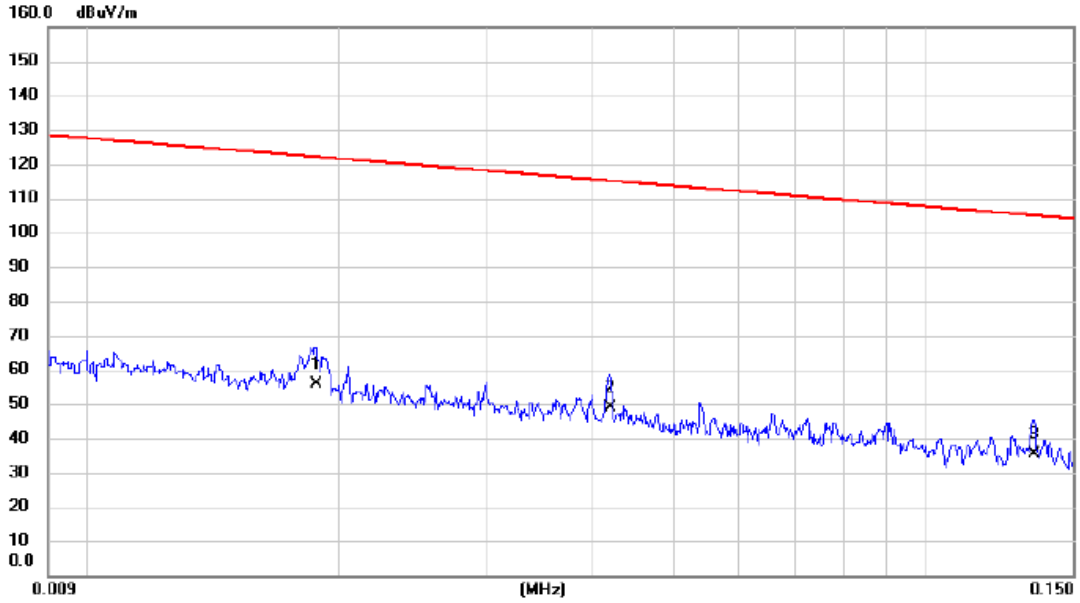
Ant 90°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.400	32.37	12.26	44.63	95.57	-50.94	AVG	
2		0.831	30.87	11.87	42.74	69.22	-26.48	QP	
3	*	3.491	32.94	10.88	43.82	69.54	-25.72	QP	

Test Mode	TX Mode

Ant 90°

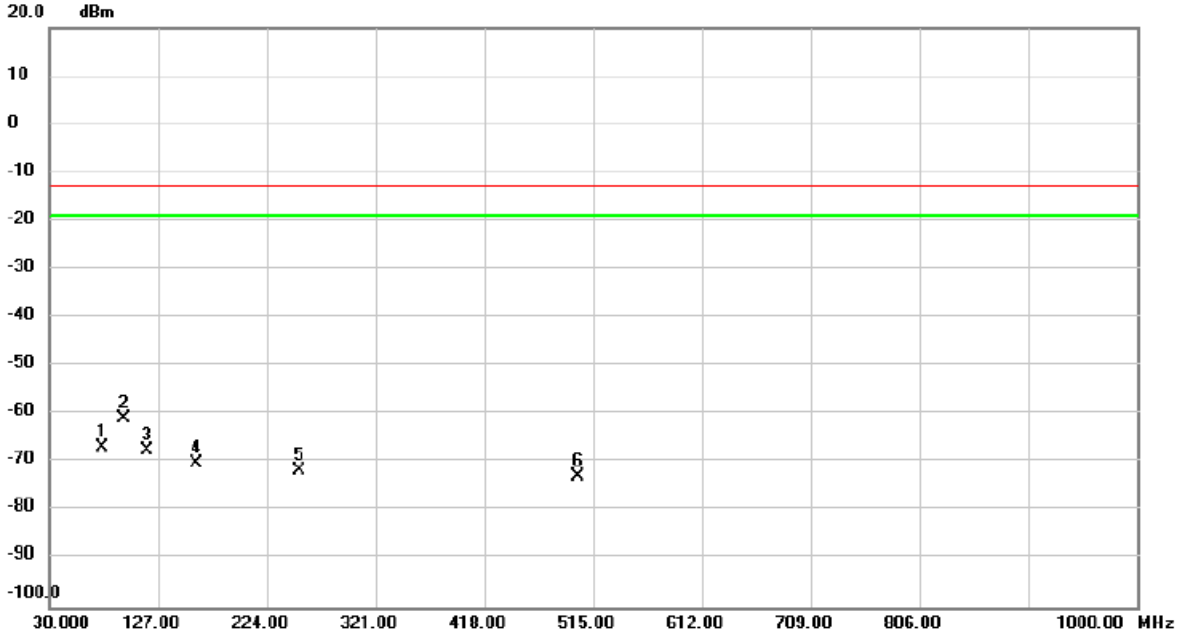


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.019	42.36	13.59	55.95	122.12	-66.17	AVG	
2		0.042	36.18	12.63	48.81	115.12	-66.31	AVG	
3		0.135	22.58	12.73	35.31	105.01	-69.70	AVG	

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

Test Mode	LTE Band 26_TX CH26740_1.4M

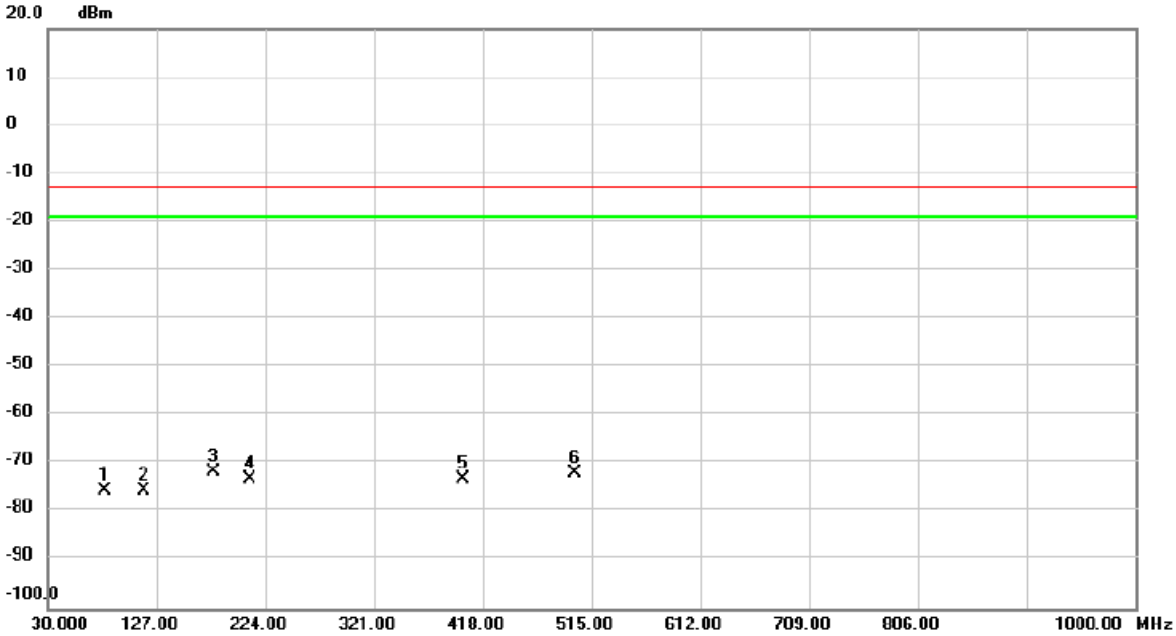
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		76.560	-59.43	-7.53	-66.96	-13.00	-53.96	peak	
2	*	96.930	-55.17	-5.54	-60.71	-13.00	-47.71	peak	
3		117.300	-63.78	-3.55	-67.33	-13.00	-54.33	peak	
4		160.950	-69.01	-1.21	-70.22	-13.00	-57.22	peak	
5		252.615	-68.37	-3.43	-71.80	-13.00	-58.80	peak	
6		501.420	-75.11	2.34	-72.77	-13.00	-59.77	peak	

Test Mode	LTE Band 26_TX CH26740_1.4M

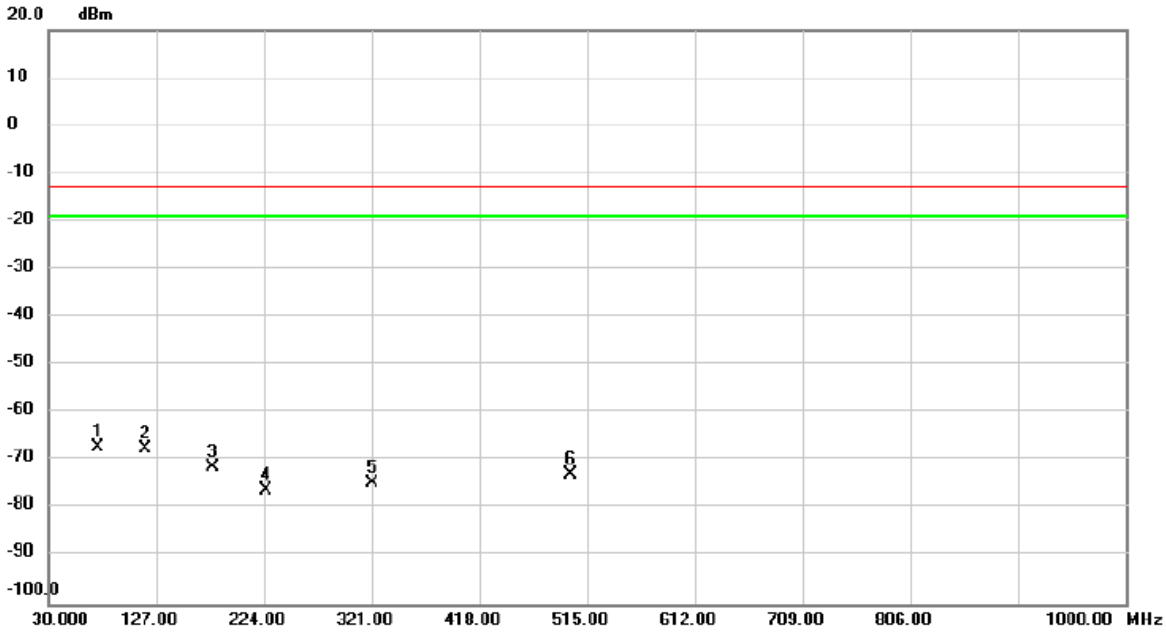
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		81.410	-67.67	-7.85	-75.52	-13.00	-62.52	peak	
2		115.360	-71.62	-3.84	-75.46	-13.00	-62.46	peak	
3	*	177.440	-68.71	-3.02	-71.73	-13.00	-58.73	peak	
4		209.935	-67.48	-5.63	-73.11	-13.00	-60.11	peak	
5		400.055	-73.75	0.58	-73.17	-13.00	-60.17	peak	
6		499.965	-74.31	2.33	-71.98	-13.00	-58.98	peak	

Test Mode	LTE Band 26_TX CH26740_5M

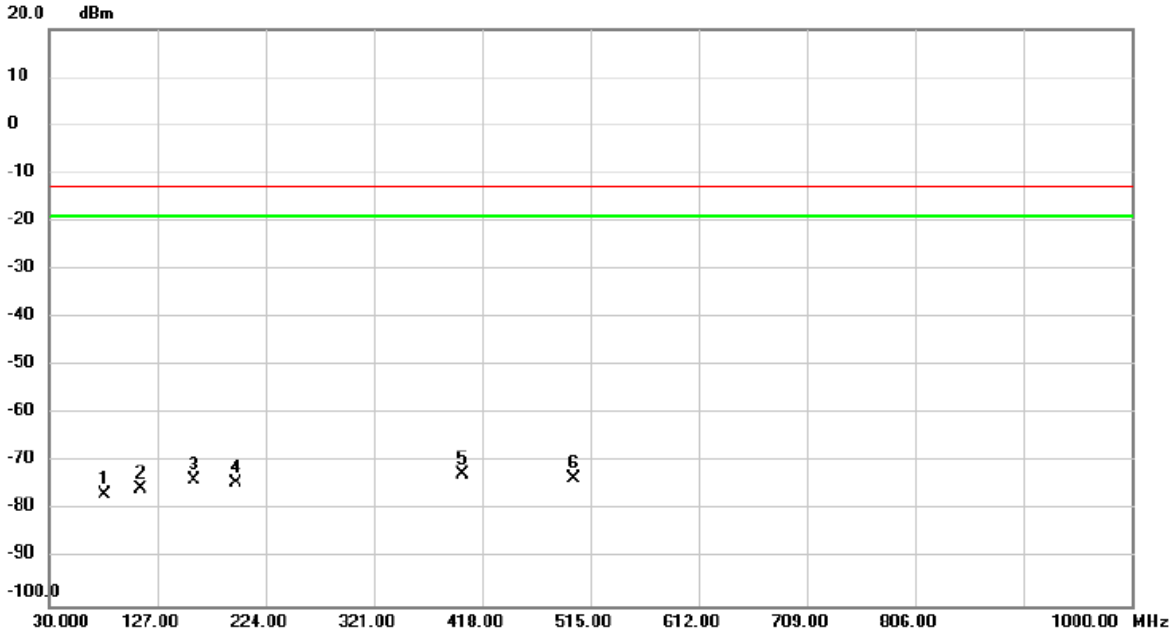
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	75.105	-59.84	-7.28	-67.12	-13.00	-54.12	peak	
2		117.300	-64.00	-3.55	-67.55	-13.00	-54.55	peak	
3		178.410	-68.14	-3.08	-71.22	-13.00	-58.22	peak	
4		225.940	-71.76	-4.43	-76.19	-13.00	-63.19	peak	
5		321.970	-73.58	-1.06	-74.64	-13.00	-61.64	peak	
6		499.965	-75.31	2.33	-72.98	-13.00	-59.98	peak	

Test Mode	LTE Band 26_TX CH26740_5M

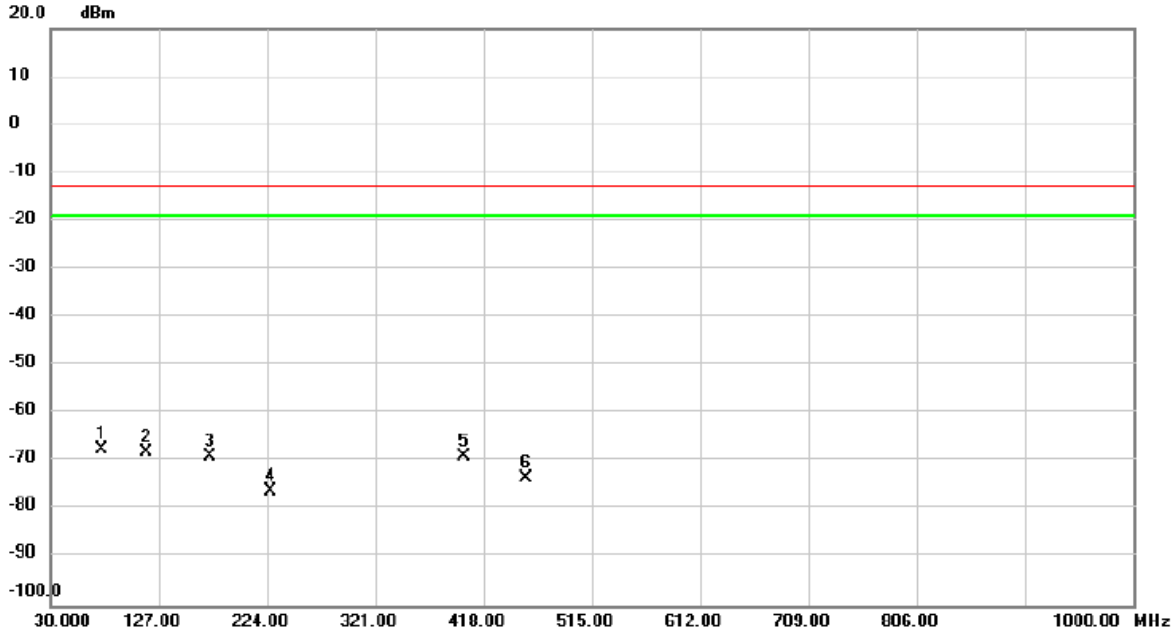
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		79.955	-68.59	-8.10	-76.69	-13.00	-63.69	peak	
2		112.450	-71.33	-4.27	-75.60	-13.00	-62.60	peak	
3		159.980	-72.59	-1.08	-73.67	-13.00	-60.67	peak	
4		197.810	-69.28	-5.05	-74.33	-13.00	-61.33	peak	
5	*	400.055	-73.12	0.58	-72.54	-13.00	-59.54	peak	
6		499.965	-75.70	2.33	-73.37	-13.00	-60.37	peak	

Test Mode	LTE Band 26_TX CH26740_10M

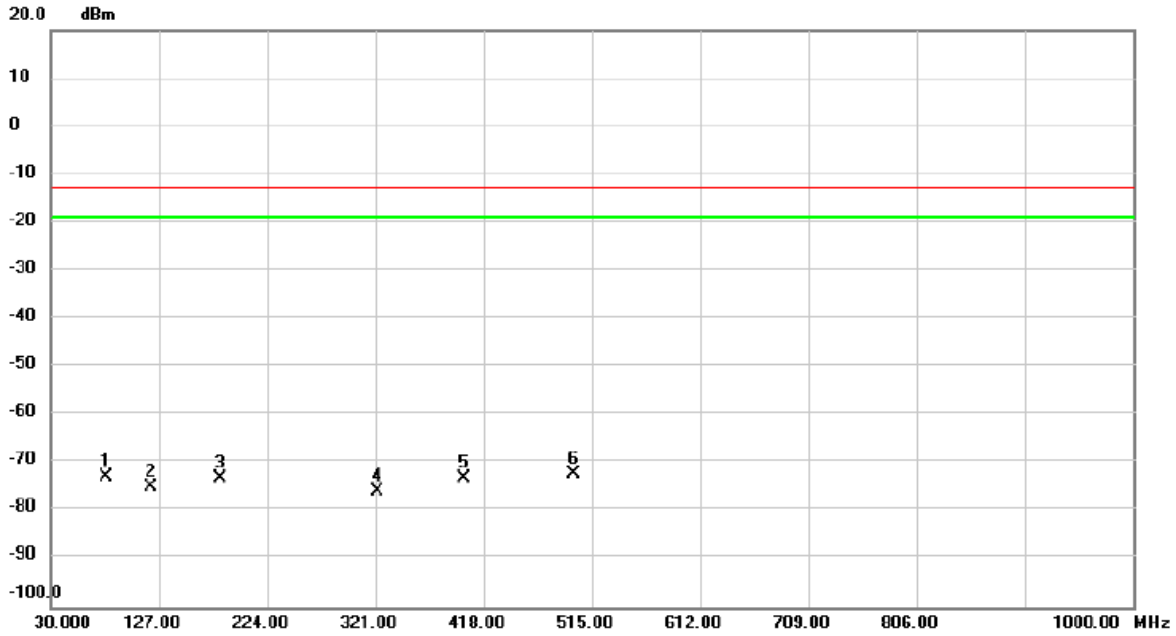
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	75.590	-60.12	-7.37	-67.49	-13.00	-54.49	peak	
2		115.845	-64.28	-3.76	-68.04	-13.00	-55.04	peak	
3		173.075	-66.13	-2.71	-68.84	-13.00	-55.84	peak	
4		227.395	-71.85	-4.37	-76.22	-13.00	-63.22	peak	
5		400.055	-69.41	0.58	-68.83	-13.00	-55.83	peak	
6		455.830	-75.60	2.00	-73.60	-13.00	-60.60	peak	

Test Mode	LTE Band 26_TX CH26740_10M

Horizontal

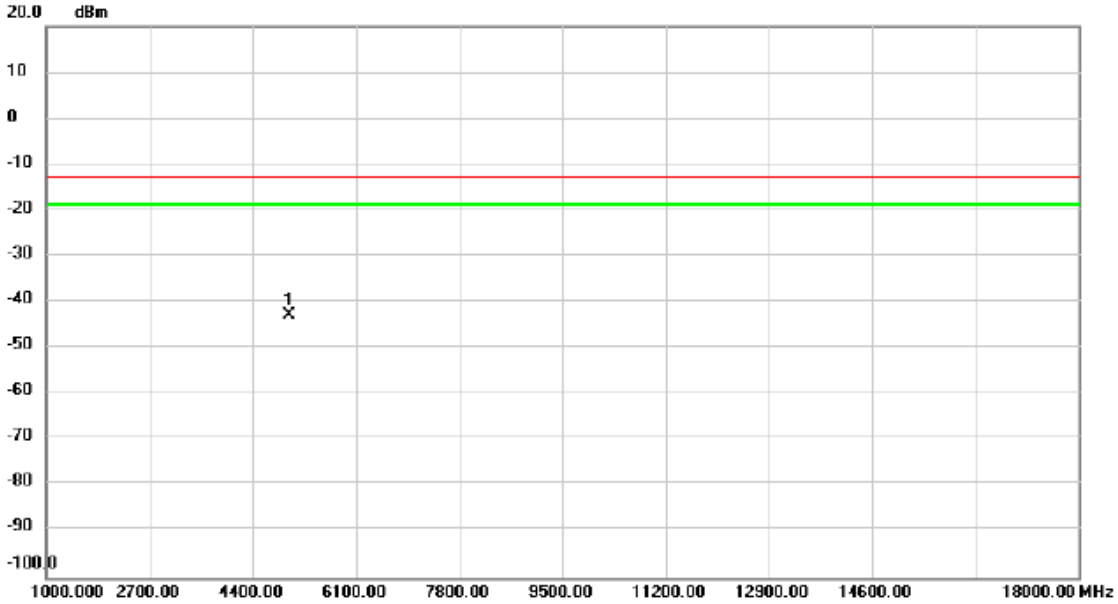


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		79.955	-64.63	-8.10	-72.73	-13.00	-59.73	peak	
2		119.725	-71.80	-3.19	-74.99	-13.00	-61.99	peak	
3		181.320	-69.89	-3.36	-73.25	-13.00	-60.25	peak	
4		322.455	-74.73	-1.05	-75.78	-13.00	-62.78	peak	
5		400.055	-73.77	0.58	-73.19	-13.00	-60.19	peak	
6	*	498.995	-74.43	2.32	-72.11	-13.00	-59.11	peak	

APPENDIX F - RADIATED SPURIOUS EMISSIONS (ABOVE 1000MHZ)

Test Mode	LTE Band 26_TX CH26740_1.4M

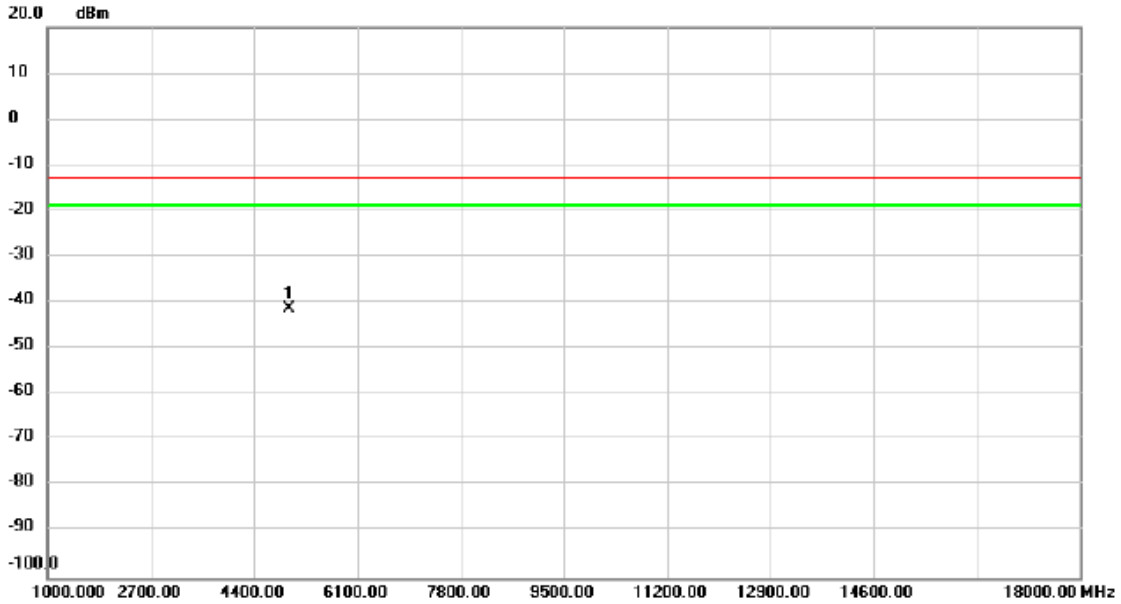
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	4995.000	-61.84	18.99	-42.85	-13.00	-29.85	peak	

Test Mode	LTE Band 26_TX CH26740_1.4M

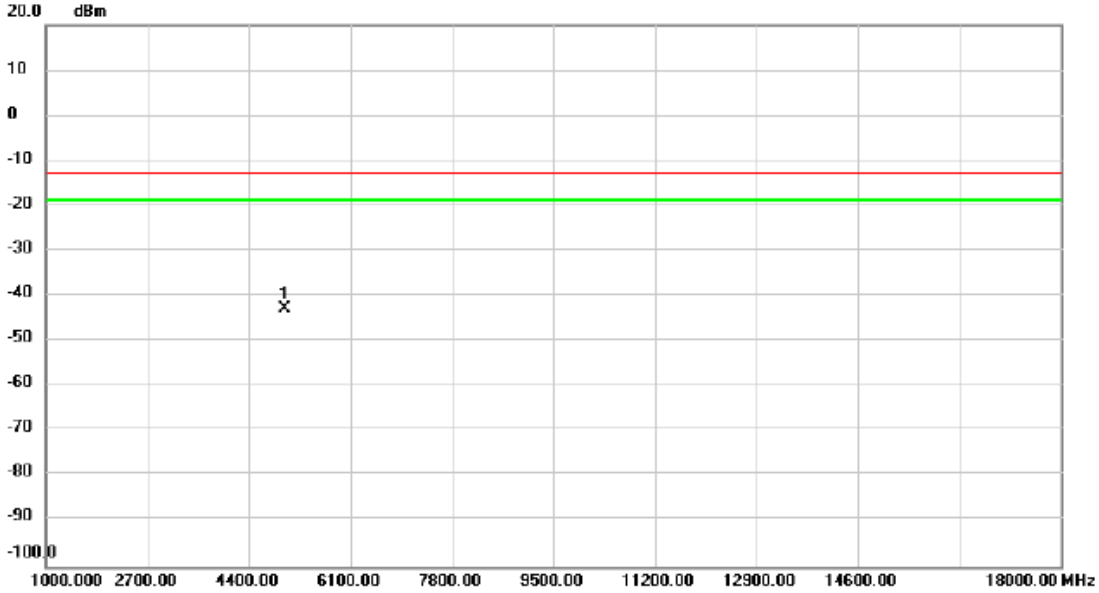
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	4978.000	-60.42	18.94	-41.48	-13.00	-28.48	peak	

Test Mode	LTE Band 26_TX CH26740_5M

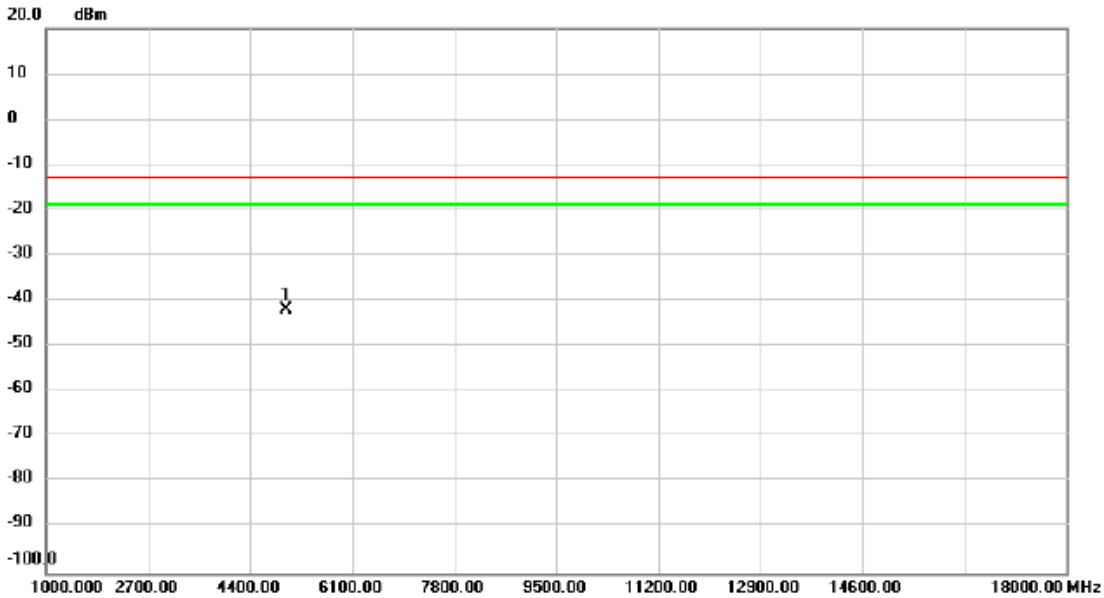
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	4995.000	-61.98	18.99	-42.99	-13.00	-29.99	peak	

Test Mode	LTE Band 26_TX CH26740_5M

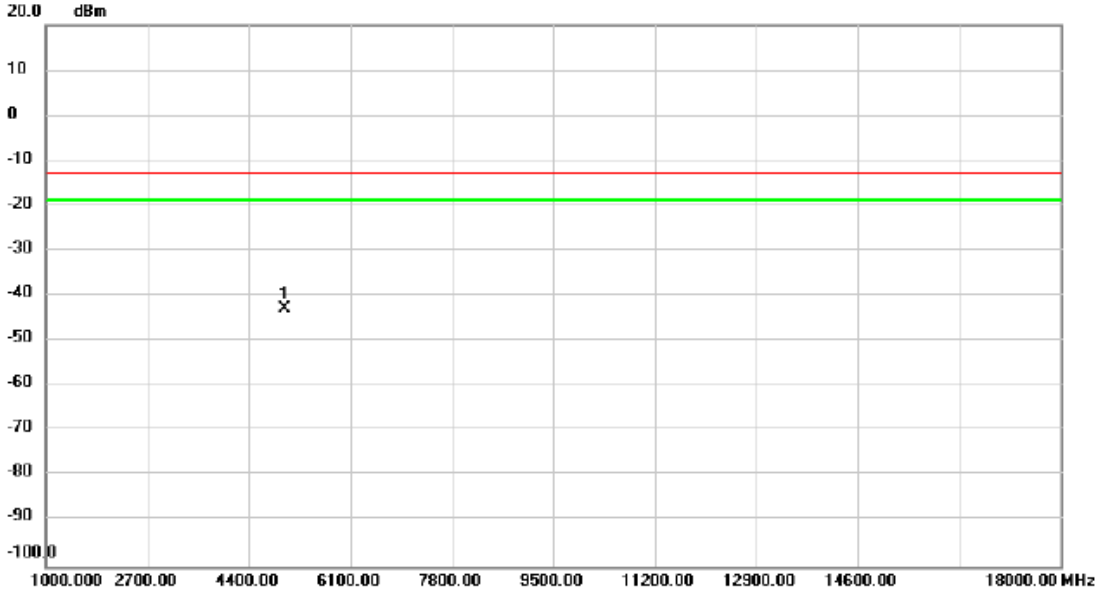
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	4995.000	-60.82	18.99	-41.83	-13.00	-28.83	peak	

Test Mode	LTE Band 26_TX CH26740_10M

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	4995.000	-61.97	18.99	-42.98	-13.00	-29.98	peak	

Test Mode	LTE Band 26_TX CH26740_10M

Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	4995.000	-60.35	18.99	-41.36	-13.00	-28.36	peak	