

FCC Radio Test Report

FCC ID: 2AH4HMT4201

This report concerns: Original Grant

Project No. : 2104C020
Equipment : LTE Cat-M1 Tracker
Brand Name : Mobilogix
Test Model : MT4201E
Series Model : MT4201C
Applicant : Mobilogix, Inc.
Address : 5500 Trabuco Rd Suite 150 Irvine, CA, USA
Manufacturer : Mobilogix, Inc.
Address : 5500 Trabuco Rd Suite 150 Irvine, CA, USA
Factory : Suga Electronics (Dongguan) Co., Ltd.
Address : No.8 Fulong Road, Qingxi Town, Dongguan City
Date of Receipt : Apr. 28, 2021
Date of Test : Apr. 29, 2021 ~ May 18, 2021
Issued Date : Jun. 07, 2021
Report Version : R00
Test Sample : Engineering Sample No.: DG2021050858
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.

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.

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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 Version	Description	Issued Date
R00	Original Issue.	Jun. 07, 2021

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	-----
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 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	$\pm 3.8\%$
Maximum Output Power	$\pm 0.95\text{ dB}$
Power Spectral Density	$\pm 0.86\text{ dB}$
Frequency Stability	$\pm 0.16\text{ dB}$
Temperature	$\pm 0.08\text{ }^{\circ}\text{C}$
Time	$\pm 0.58\%$
Supply voltages	$\pm 0.3\%$

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	21.3°C	46%	DC 3.7	Tate Liu
Occupied Bandwidth	21.3°C	46%	DC 3.7	Tate Liu
Conducted Spurious Emissions	21.3°C	46%	DC 3.7	Tate Liu
Radiated Spurious Emissions	26°C	52%	DC 3.7	Grani Zhou
Band Edge	21.3°C	46%	DC 3.7	Tate Liu
Peak to Average Ratio	21.3°C	46%	DC 3.7	Tate Liu
Frequency Stability	Normal & Extreme	46%	Normal & Extreme	Tate Liu

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	LTE Cat-M1 Tracker			
Brand Name	Mobilogix			
Test Model	MT4201E			
Series Model	MT4201C			
Model Difference(s)	Only differ in model name and Harness.			
Hardware Version	1.2			
Software Version	1.5.0.1			
Power Source	1# DC voltage supplied from external power supply. 2# Supplied from battery.			
Power Rating	1# DC 48V 2# DC 3.7V			
IEMI No.	864475040048497			
LTE Category	M1			
Modulation Type	GSM		GMSK	
	EDGE/GPRS		GMSK, 8PSK	
	LTE		UL: QPSK,16QAM DL: QPSK,16QAM	
Max. ERP	GSM 850 / GPRS 850		GMSK	26.70 dBm
	EDGE 850		8PSK	20.12 dBm
	LTE	Channel Bandwidth (MHz)	QPSK (dBm)	16QAM (dBm)
	Band 5	1.4	15.99	15.38
		3	16.19	15.15
		5	16.01	16.00
		10	16.01	15.99
	Band 26	1.4	16.30	15.36
		3	16.08	15.47
		5	15.90	16.50
		10	15.85	16.26
		15	15.98	16.51

Note:

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

2. Channel List:

GSM 850				
Test Frequency ID	UARFCN	Frequency of Uplink (MHz)	UARFCN	Frequency of Downlink (MHz)
Low Range	128	824.2	137	869.2
Mid Range	190	836.6	199	881.6
High Range	251	848.8	260	893.8

LTE Band 5					
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

LTE Band 26					
Test Frequency ID	Bandwidth (MHz)	N _{UL}	Frequency of Uplink (MHz)	N _{DL}	Frequency of Downlink (MHz)
Low Range	1.4	26797	824.7	8797	869.7
	3	26805	825.5	8805	870.5
	5	26815	826.5	8815	871.5
	10	26840	829	8840	874
	15	26865	831.5	8865	876.5
Mid Range	1.4/3/5/10/15	26915	836.5	8915	881.5
High Range	1.4	27033	848.3	9033	893.3
	3	27025	847.5	9025	892.5
	5	27015	846.5	9015	891.5
	10	26990	844	8990	889
	15	26965	841.5	8965	886.5

3. Table for Filed Antenna:

Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
N/A	N/A	Internal	N/A	-3.62	GSM 850
N/A	N/A	Internal	N/A	-3.62	LTE Band 5
N/A	N/A	Internal	N/A	-3.62	LTE Band 26

Note: The antenna gain is provided by the manufacturer.

2.2 DESCRIPTION OF TEST MODES

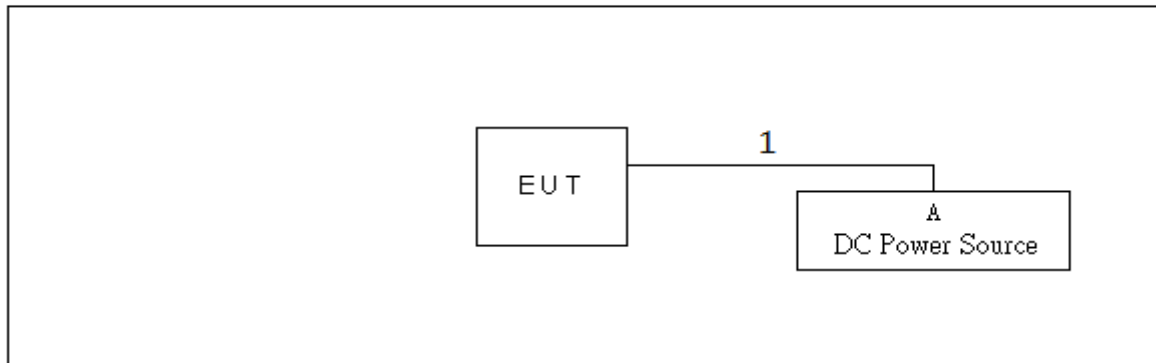
Following mode(s) is (were) found to be the worst case(s) and selected for the final test.

GSM MODE			
Test Item	Available Channel	Tested Channel	Mode
Output Power & ERP	128 to 251	128, 190, 251	GSM, GPRS, EDGE
Occupied Bandwidth	128 to 251	128, 190, 251	GSM, EDGE
Conducted Spurious Emissions	128 to 251	190	GSM, EDGE
Radiated Spurious Emissions	128 to 251	190	GSM
Band Edge	128 to 251	128, 251	GSM, EDGE
Peak to Average Ratio	128 to 251	128, 190, 251	GSM, EDGE
Frequency Stability	128 to 251	190	GSM

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	1RB/6RB
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	1RB/6RB
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	1RB/6RB
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	1RB/4RB
Occupied Bandwidth	20407 to 20643	20525	1.4MHz	QPSK, 16QAM	6RB
	20415 to 20635	20525	3MHz	QPSK, 16QAM	6RB
	20425 to 20625	20525	5MHz	QPSK, 16QAM	6RB
	20450 to 20600	20525	10MHz	QPSK, 16QAM	6RB
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/6RB
	20425 to 20625	20425, 20625	5MHz	QPSK	1RB/6RB
	20450 to 20600	20450, 20600	10MHz	QPSK	1RB/6RB
Peak To Average Ratio	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM	1RB
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	1RB
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	1RB
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	1RB
Frequency Stability	20407 to 20643	20525	1.4MHz	QPSK	1RB
	20415 to 20635	20525	3MHz	QPSK	1RB
	20425 to 20625	20525	5MHz	QPSK	1RB
	20450 to 20600	20525	10MHz	QPSK	1RB

LTE BAND 26 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power & ERP	26797 to 27033	26797, 26915, 27033	1.4MHz	QPSK, 16QAM	1RB/6RB
	26805 to 27025	26805, 26915, 27025	3MHz	QPSK, 16QAM	1RB/6RB
	26815 to 27015	26815, 26915, 27015	5MHz	QPSK, 16QAM	1RB/6RB
	26840 to 26990	26840, 26915, 26990	10MHz	QPSK, 16QAM	1RB/4RB
	26865 to 26965	26865, 26915, 26965	15MHz	QPSK, 16QAM	1RB/6RB
Occupied Bandwidth	26797 to 27033	26797, 26915, 27033	1.4MHz	QPSK, 16QAM	6RB
	26805 to 27025	26805, 26915, 27025	3MHz	QPSK, 16QAM	6RB
	26815 to 27015	26815, 26915, 27015	5MHz	QPSK, 16QAM	6RB
	26840 to 26990	26840, 26915, 26990	10MHz	QPSK, 16QAM	6RB
	26865 to 26965	26865, 26915, 26965	15MHz	QPSK, 16QAM	6RB
Conducted Spurious Emissions	26815 to 27015	26915	1.4MHz	QPSK	1RB
	26815 to 27015	26915	5MHz	QPSK	1RB
	26865 to 26965	26915	15MHz	QPSK	1RB
Radiated Spurious Emissions	26815 to 27015	26915	1.4MHz	QPSK	1RB
	26815 to 27015	26915	5MHz	QPSK	1RB
	26865 to 26965	26915	15MHz	QPSK	1RB
Band Edge	26797 to 27033	26797, 27033	1.4MHz	QPSK	1RB/6RB
	26805 to 27025	26805, 27025	3MHz	QPSK	1RB/6RB
	26815 to 27015	26815, 27015	5MHz	QPSK	1RB/6RB
	26840 to 26990	26840, 26990	10MHz	QPSK	1RB/6RB
	26865 to 26965	26865, 26965	15MHz	QPSK	1RB/6RB
Peak To Average Ratio	26797 to 27033	26797, 26915, 27033	1.4MHz	QPSK, 16QAM	1RB
	26805 to 27025	26805, 26915, 27025	3MHz	QPSK, 16QAM	1RB
	26815 to 27015	26815, 26915, 27015	5MHz	QPSK, 16QAM	1RB
	26840 to 26990	26840, 26915, 26990	10MHz	QPSK, 16QAM	1RB
	26865 to 26965	26865, 26915, 26965	15MHz	QPSK, 16QAM	1RB
Frequency Stability	26797 to 27033	26915	1.4MHz	QPSK	1RB
	26805 to 27025	26915	3MHz	QPSK	1RB
	26815 to 27015	26915	5MHz	QPSK	1RB
	26840 to 26990	26915	10MHz	QPSK	1RB
	26865 to 26965	26915	15MHz	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	DC Power Source	TRUE-POWER	GPC30300N	N/A

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 7 watts e.r.p.

3.1.2 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 5.

EIRP / ERP:

$EIRP = \text{Output Power} + \text{Antenan gain}$

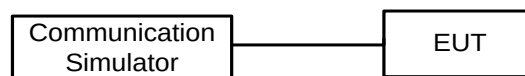
$ERP = EIPR - 2.15\text{dBi}$

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.

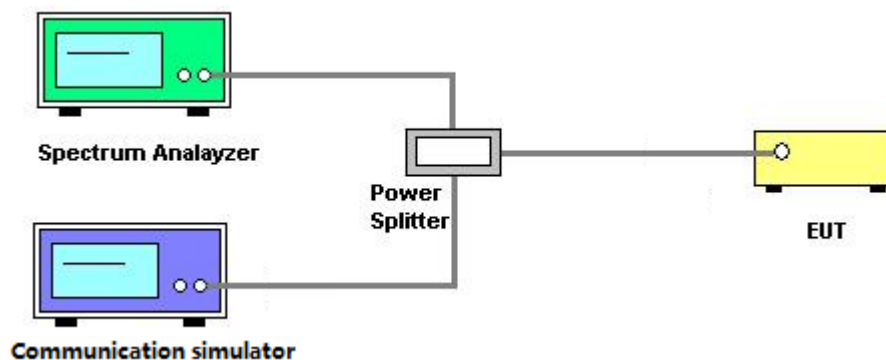
3.2 OCCUPIED BANDWIDTH MEASUREMENT

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. $RBW = (1\% \sim 5\%) * EBW$
 $VBW \geq 3 * RBW$
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

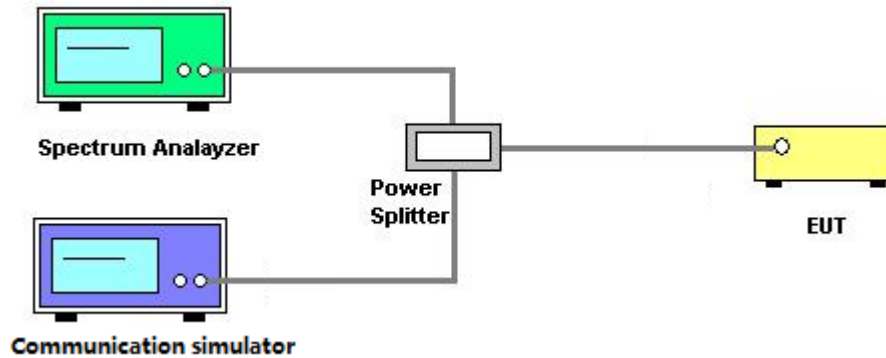
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

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 $\geq 1\%$ 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.

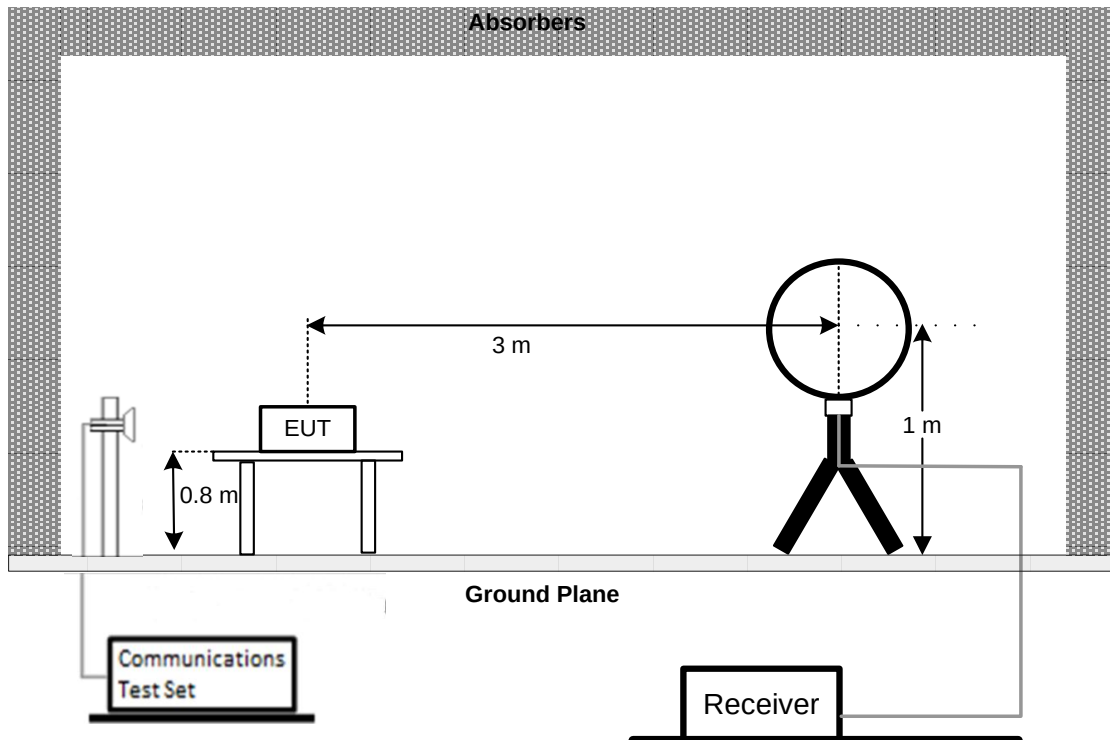
3.4.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.2.

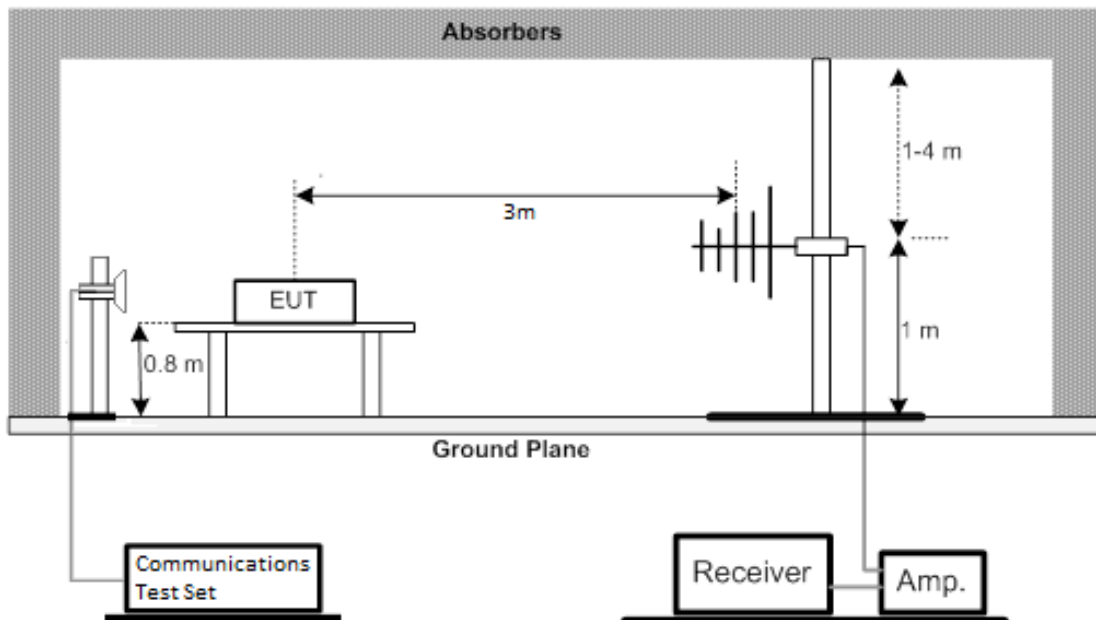
1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 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. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
4. ERP can be calculated form EIRP by subtracting the gain of dipole, $ERP = EIPR - 2.15\text{dBi}.$
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

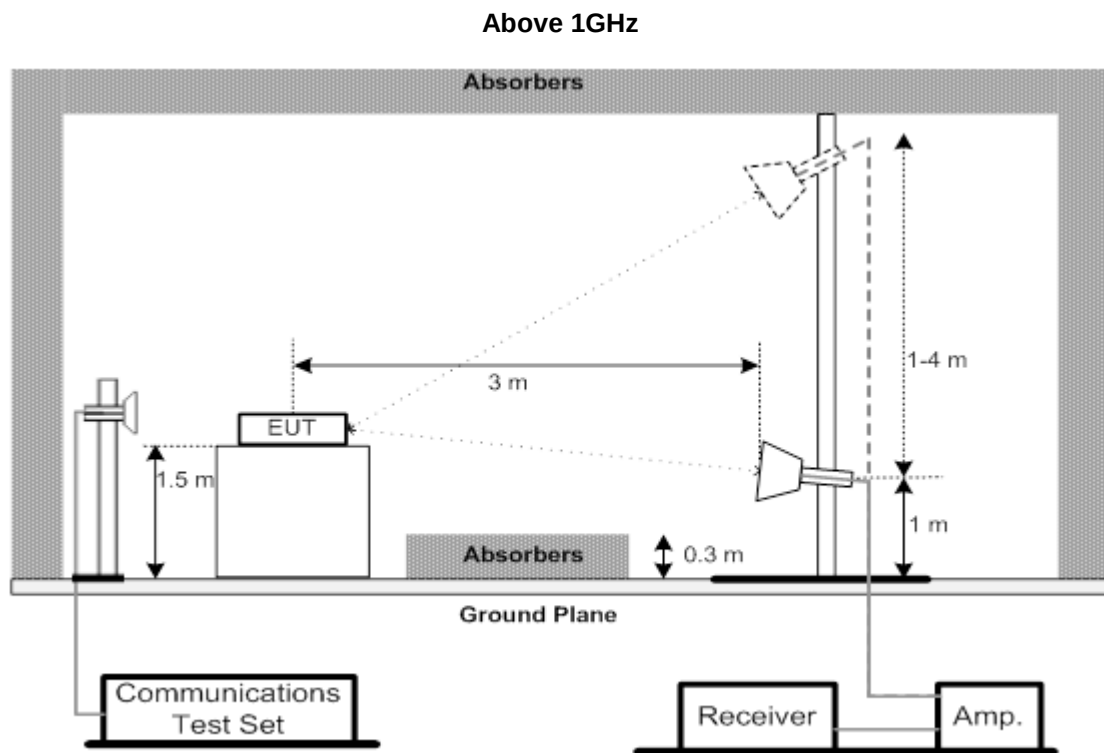
3.4.3 TEST SETUP LAYOUT

Below 30MHz



30MHz to 1000MHz





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

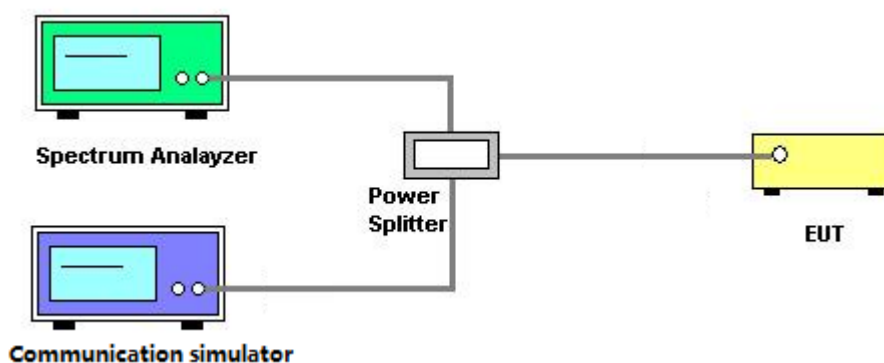
A Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the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

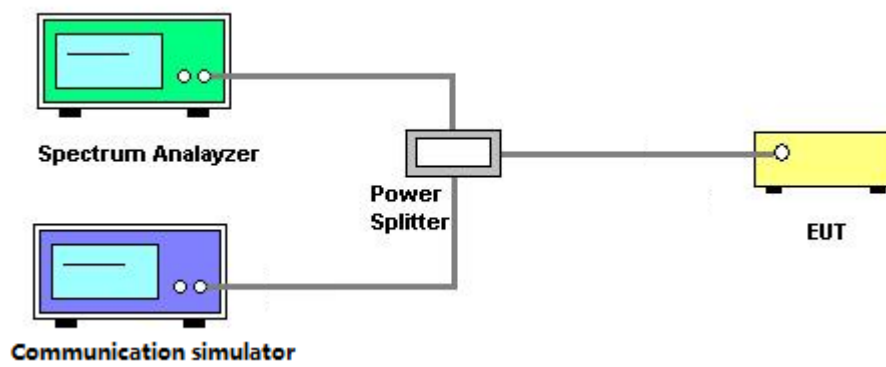
In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.6.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 5.7.

1. Set resolution/measurement bandwidth $\geq$ 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

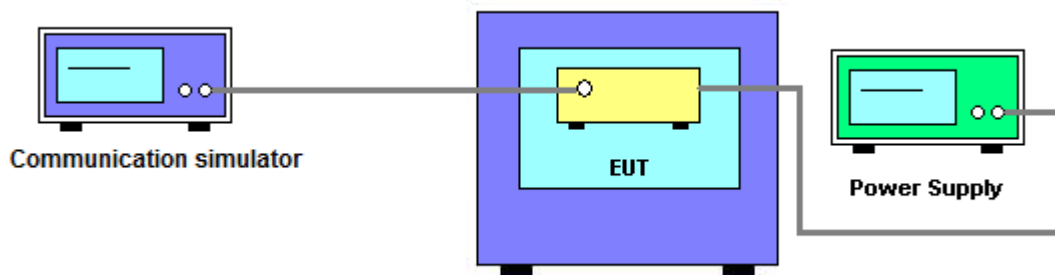
± 1.5 ppm is for base and fixed station. ± 2.5 ppm is for mobile station.

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 $\pm 0.5^{\circ}\text{C}$ 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	9160-3232	Mar. 15, 2022
2	Amplifier	Agilent	8449B	3008A02334	Feb. 27, 2022
3	High Pass Filter	Wairwright Instruments Gmbh	WHK 1.5/15G-10ST	11	Feb. 27, 2022
4	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 1710/1785-1690/1805-60/ 12SS	38	Feb. 27, 2022
5	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 824/849-810/863-60/9SS	7	Feb. 27, 2022
6	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 880/915-860/935-60/9SS	14	Feb. 27, 2022
7	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 1850/1910-1830/1930-60/ 10SS	17	Feb. 27, 2022
8	High Pass Filter	Wairwright 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. 28, 2022
21	Double Ridged Guide Antenna	ETS	3115	75846	Mar. 17, 2022
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.

APPENDIX A - OUTPUT POWER

Output Power (dBm):

GSM850		128CH	190CH	251CH
		824.2MHz	836.6MHz	848.8MHz
GSM (CS)		32.47	31.96	31.97
GPRS/EDGE (GMSK)	1 Tx Slot	31.94	32.34	32.40
	2 Tx Slot	31.72	32.07	31.59
	3 Tx Slot	29.76	30.58	30.63
	4 Tx Slot	29.3	29.21	29.14
EDGE (8PSK)	1 Tx Slot	25.89	25.72	25.44
	2 Tx Slot	25.49	25.47	25.31
	3 Tx Slot	23.74	23.77	23.69
	4 Tx Slot	22.7	22.29	21.95

LTE Band / BW	Channel / Frequency (MHz)	RB Size	RB Offset	Index	Conducted Power (dBm)	
					QPSK	16QAM
5 / 1.4M	20407 / 824.7	1	0	0	21.76	21.15
		6	0	0	20.79	19.95
	20525 / 836.5	1	0	0	20.48	20.59
		6	0	0	20.30	19.40
	20643 / 848.3	1	5	0	20.97	20.14
		6	0	0	20.15	19.26
5 / 3M	20415 / 825.5	1	0	0	21.96	20.92
		6	0	0	20.63	19.75
	20525 / 836.5	1	0	0	21.42	20.83
		6	0	0	20.37	19.55
	20635 / 847.5	1	5	1	21.30	20.21
		6	0	1	20.05	19.34
5 / 5M	20425 / 826.5	1	0	0	21.78	21.77
		6	0	0	20.64	20.86
	20525 / 836.5	1	0	0	21.47	21.66
		6	0	0	20.38	20.56
	20625 / 846.5	1	5	3	20.80	21.17
		6	0	3	20.01	20.34
5 / 10M	20450 / 829	1	0	3	21.78	21.71
		4	0	0	20.55	19.39
	20525 / 836.5	1	0	0	21.44	21.76
		4	0	0	21.36	21.60
	20600 / 844	1	5	7	20.90	21.22
		4	2	7	20.96	21.18

LTE Band / BW	Channel / Frequency (MHz)	RB Size	RB Offset	Index	Conducted Power (dBm)	
					QPSK	16QAM
26 / 1.4M	26797 / 824.7	1	0	0	22.07	21.13
		6	0	0	20.93	20.04
	26915 / 836.5	1	0	0	21.54	20.66
		6	0	0	20.45	19.54
	27033 / 848.3	1	5	0	20.99	20.04
		6	0	0	20.10	19.15
26 / 3M	26805 / 825.5	1	0	0	21.85	21.24
		6	0	0	20.86	20.08
	26915 / 836.5	1	0	0	21.39	20.81
		6	0	0	20.41	19.60
	27025 / 847.5	1	5	1	20.83	20.19
		6	0	1	20.02	19.24
26 / 5M	26815 / 826.5	1	0	3	21.67	22.27
		6	0	0	20.72	20.74
	26915 / 836.5	1	0	0	21.42	21.73
		6	0	0	20.34	20.49
	27015 / 846.5	1	5	0	20.87	21.15
		6	0	3	20.02	20.30
26 / 10M	26840 / 829	1	0	3	21.62	22.03
		4	0	0	21.57	21.79
	26915 / 836.5	1	0	0	21.32	21.71
		4	0	0	21.33	21.55
	26990 / 844	1	5	4	20.83	21.25
		4	2	7	20.94	21.22
26 / 15M	26865 / 831.5	1	0	3	21.75	22.28
		6	0	0	21.71	21.99
	26915 / 836.5	1	0	0	21.61	21.91
		6	0	0	21.50	21.73
	26965 / 841.5	1	5	8	21.10	21.38
		6	0	11	21.28	21.43

ERP (dBm):

GSM850		128CH	190CH	251CH
		824.2MHz	836.6MHz	848.8MHz
GSM (CS)		28.67	27.99	28.26
GPRS/EDGE (GMSK)	1 Tx Slot	28.61	27.81	28.16
	2 Tx Slot	27.54	27.12	26.94
	3 Tx Slot	24.74	25.17	24.07
	4 Tx Slot	23.95	23.15	23.22
EDGE (8PSK)	1 Tx Slot	25.11	24.14	24.42
	2 Tx Slot	24.24	23.44	23.17
	3 Tx Slot	22.57	21.80	21.37
	4 Tx Slot	20.57	20.84	20.55

LTE Band / BW	Channel / Frequency (MHz)	RB Size	RB Offset	Index	Conducted Power (dBm)	
					QPSK	16QAM
5 / 1.4M	20407/824.7	1	0	0	15.99	15.38
		6	0	0	15.02	14.18
	20525/836.5	1	0	0	14.71	14.82
		6	0	0	14.53	13.63
	20643/848.3	1	5	0	15.20	14.37
		6	0	0	14.38	13.49
5 / 3M	20415/825.5	1	0	0	16.19	15.15
		6	0	0	14.86	13.98
	20525/836.5	1	0	0	15.65	15.06
		6	0	0	14.60	13.78
	20635/847.5	1	5	1	15.53	14.44
		6	0	1	14.28	13.57
5 / 5M	20425/826.5	1	0	0	16.01	16.00
		6	0	0	14.87	15.09
	20525/836.5	1	0	0	15.70	15.89
		6	0	0	14.61	14.79
	20625/846.5	1	5	3	15.03	15.40
		6	0	3	14.24	14.57
5 / 10M	20450/829	1	0	3	16.01	15.94
		4	0	0	14.78	13.62
	20525/836.5	1	0	0	15.67	15.99
		4	0	0	15.59	15.83
	20600/844	1	5	7	15.13	15.45
		4	2	7	15.19	15.41

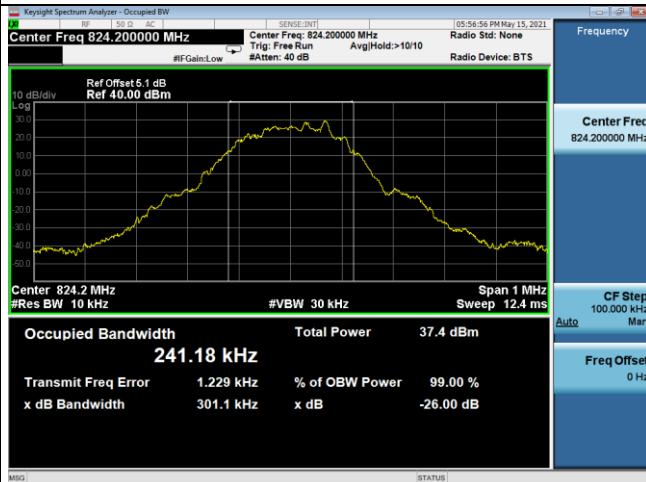
LTE Band / BW	Channel / Frequency (MHz)	RB Size	RB Offset	Index	Conducted Power (dBm)	
					QPSK	16QAM
26 / 1.4M	26797/824.7	1	0	0	16.30	15.36
		6	0	0	15.16	14.27
	26915/836.5	1	0	0	15.77	14.89
		6	0	0	14.68	13.77
	27033/848.3	1	5	0	15.22	14.27
		6	0	0	14.33	13.38
26 / 3M	26805/825.5	1	0	0	16.08	15.47
		6	0	0	15.09	14.31
	26915/836.5	1	0	0	15.62	15.04
		6	0	0	14.64	13.83
	27025/847.5	1	5	1	15.06	14.42
		6	0	1	14.25	13.47
26 / 5M	26815/826.5	1	0	3	15.90	16.50
		6	0	0	14.95	14.97
	26915/836.5	1	0	0	15.65	15.96
		6	0	0	14.57	14.72
	27015/846.5	1	5	0	15.10	15.38
		6	0	3	14.25	14.53
26 / 10M	26840/829	1	0	3	15.85	16.26
		4	0	0	15.80	16.02
	26915/836.5	1	0	0	15.55	15.94
		4	0	0	15.56	15.78
	26990/844	1	5	4	15.06	15.48
		4	2	7	15.17	15.45
26 / 15M	26865/831.5	1	0	3	15.98	16.51
		6	0	0	15.94	16.22
	26915/836.5	1	0	0	15.84	16.14
		6	0	0	15.73	15.96
	26965/841.5	1	5	8	15.33	15.61
		6	0	11	15.51	15.66

APPENDIX B - OCCUPIED BANDWIDTH

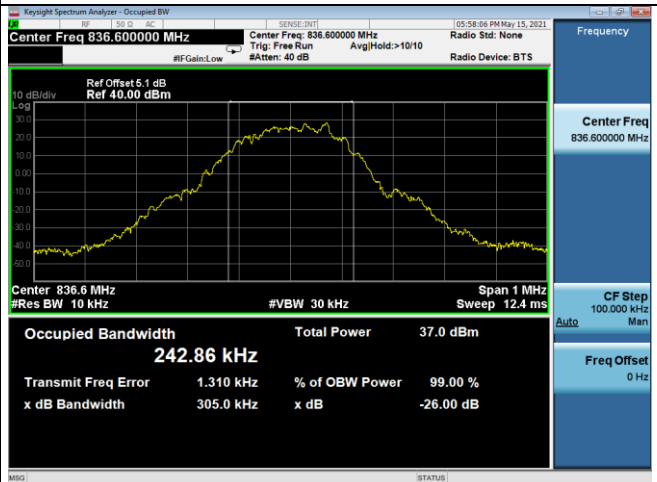
GSM850					
GSM			EDGE		
CS			8PSK		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
128	824.2	0.2412	128	824.2	0.2433
190	836.6	0.2429	190	836.6	0.2422
251	848.8	0.2389	251	848.8	0.2468
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
128	824.2	0.3011	128	824.2	0.3187
190	836.6	0.3050	190	836.6	0.3130
251	848.8	0.3010	251	848.8	0.2908

Spectrum Plot

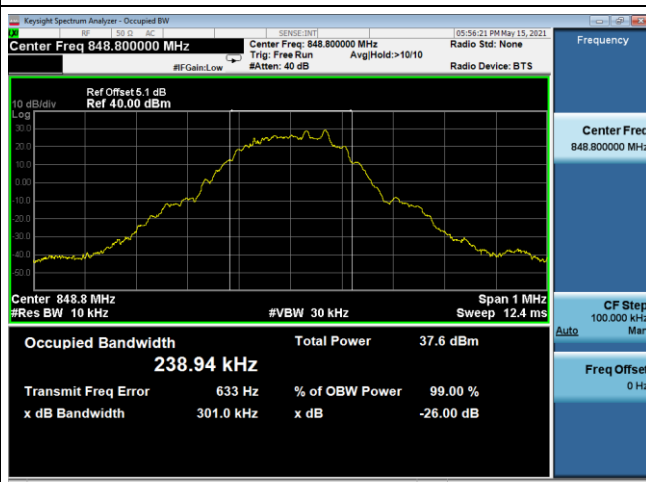
GSM-128



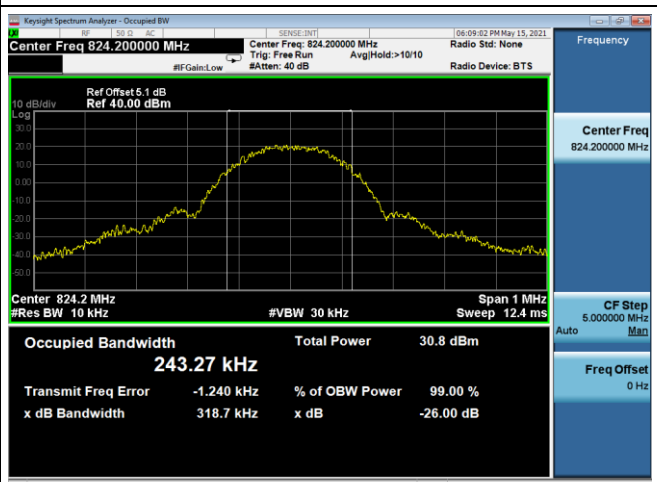
GSM-190



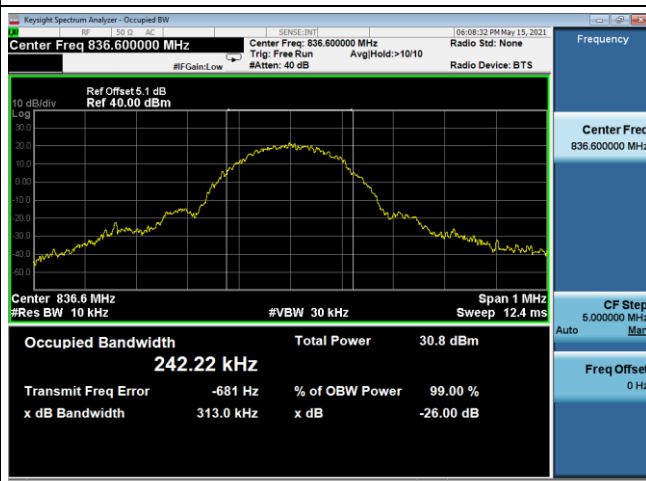
GSM-251



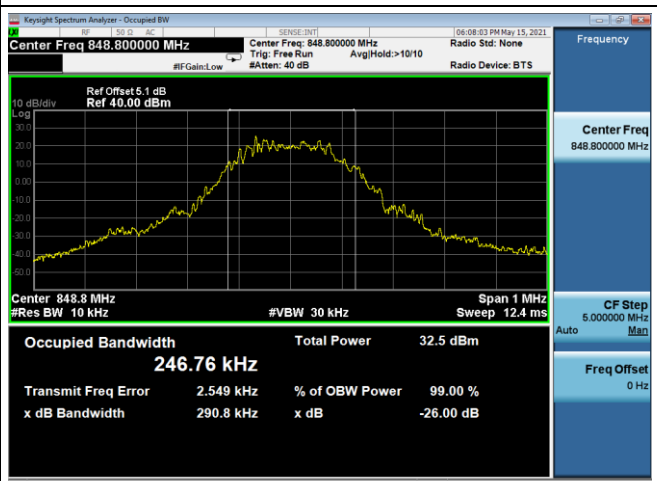
EDGE-128



EDGE-190



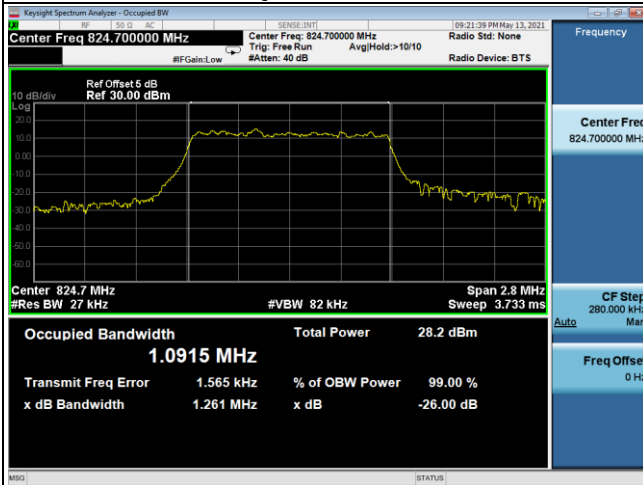
EDGE-251



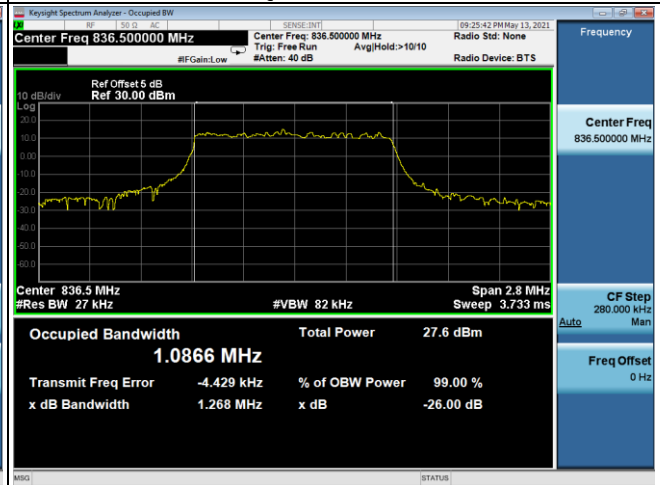
LTE Band 5_1.4M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20407	824.7	1.0915	20407	824.7	1.261
20525	836.5	1.0866	20525	836.5	1.268
20643	848.3	1.0887	20643	848.3	1.264
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20407	824.7	0.9284	20407	824.7	1.129
20525	836.5	0.9241	20525	836.5	1.250
20643	848.3	1.0931	20643	848.3	1.253

Spectrum Plot

QPSK-20407



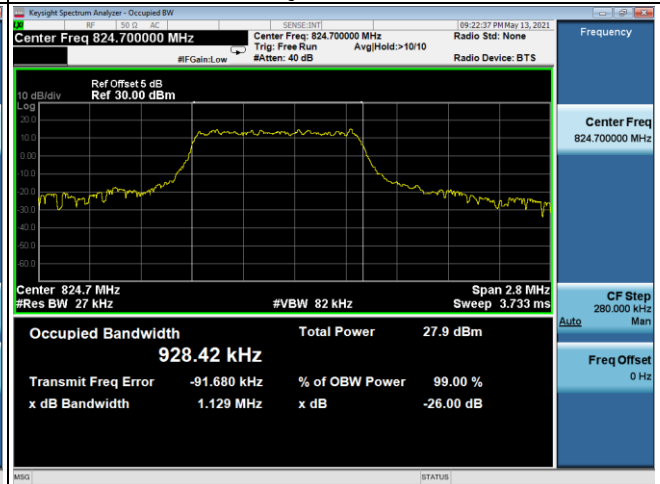
QPSK-20525



QPSK-20643



16QAM-20407



16QAM-20525



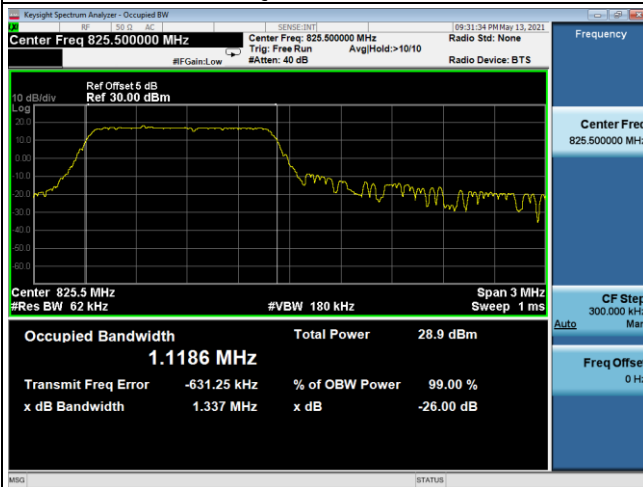
16QAM-20643



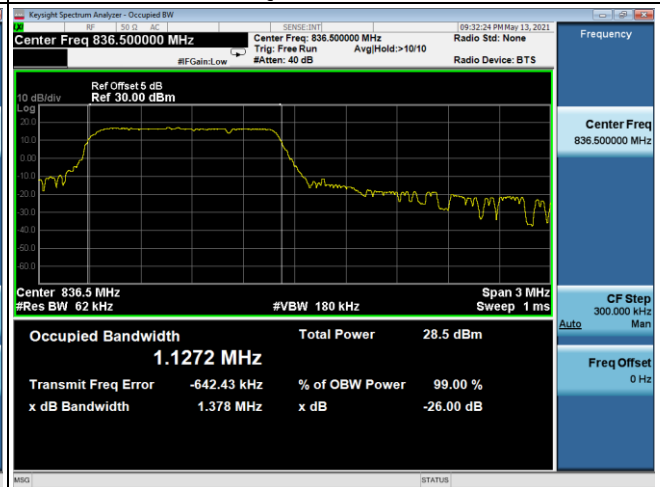
LTE Band 5_3M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20415	825.5	1.1186	20415	825.5	1.337
20525	836.5	1.1272	20525	836.5	1.378
20635	847.5	1.1152	20635	847.5	1.340
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20415	825.5	0.9968	20415	825.5	1.199
20525	836.5	0.9728	20525	836.5	1.589
20635	847.5	0.9755	20635	847.5	1.386

Spectrum Plot

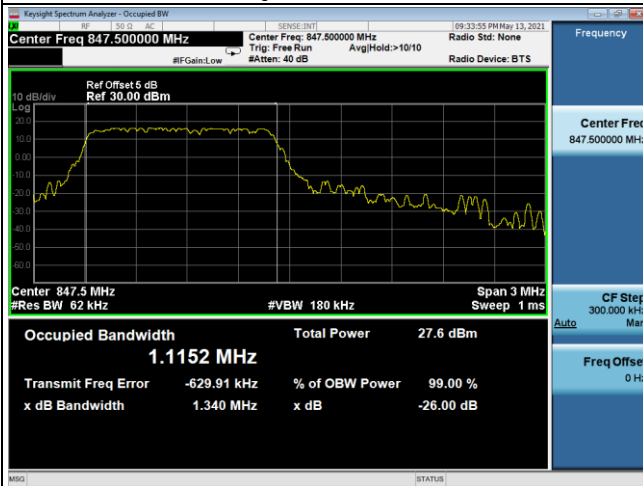
QPSK-20415



QPSK-20525



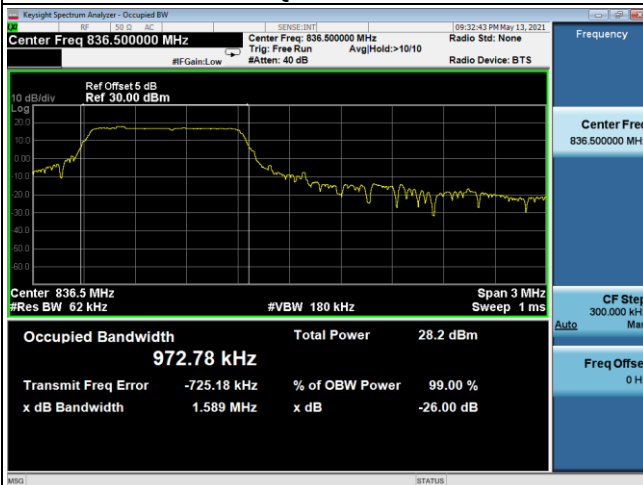
QPSK-20635



16QAM-20415



16QAM-20525



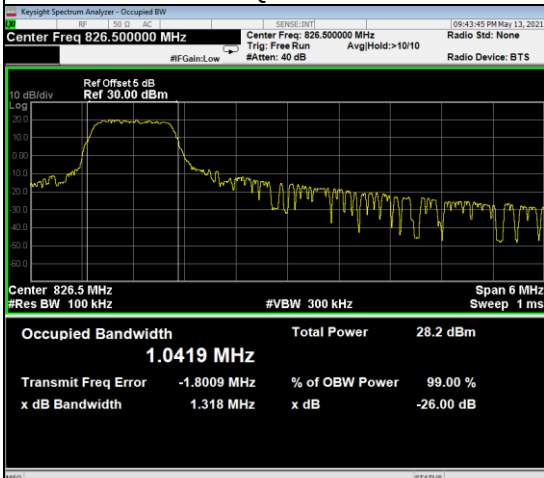
16QAM-20635



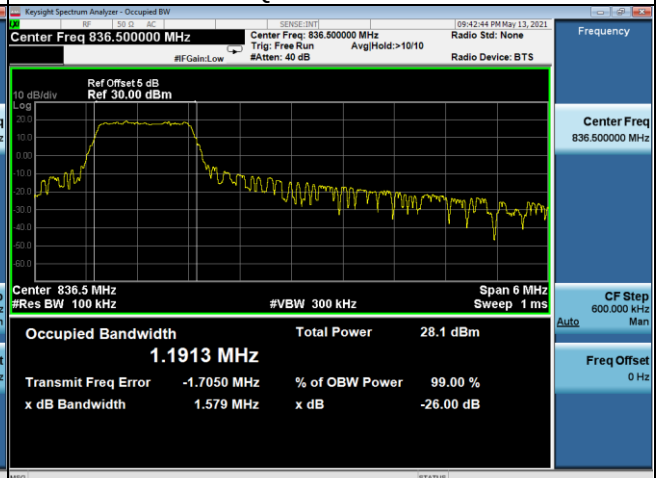
LTE Band 5_5M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20425	826.5	1.0419	20425	826.5	1.318
20525	836.5	1.1913	20525	836.5	1.579
20625	846.5	1.1842	20625	846.5	1.477
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20425	826.5	1.0455	20425	826.5	1.527
20525	836.5	1.0697	20525	836.5	1.488
20625	846.5	1.0313	20625	846.5	1.516

Spectrum Plot

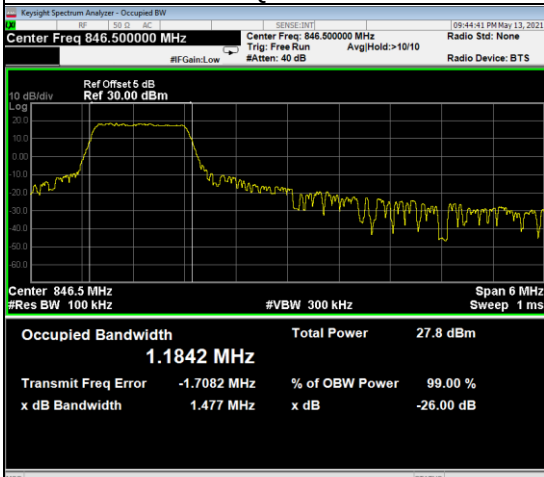
QPSK-20425



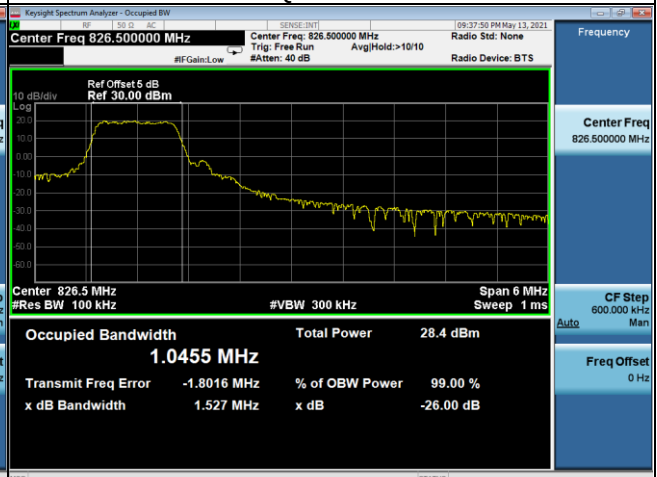
QPSK-20525



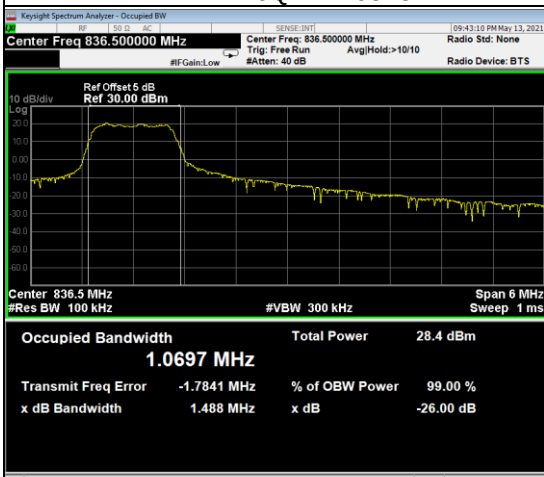
QPSK-20625



16QAM-20425



16QAM-20525



16QAM-20625



LTE Band 5_10M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20450	829.0	1.3708	20450	829.0	2.052
20525	836.5	1.3549	20525	836.5	1.985
20600	844.0	1.3566	20600	844.0	1.972
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20450	829.0	1.2276	20450	829.0	2.211
20525	836.5	1.2305	20525	836.5	2.079
20600	844.0	1.3810	20600	844.0	2.070

Spectrum Plot

QPSK-20450



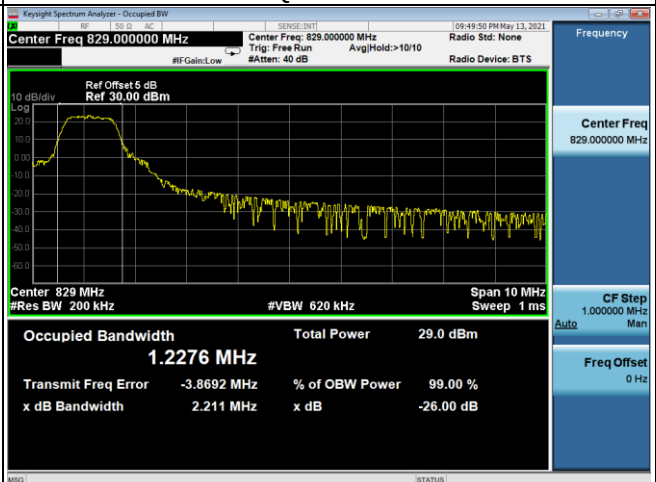
QPSK-20525



QPSK-20600



16QAM-20450



16QAM-20525



16QAM-20600



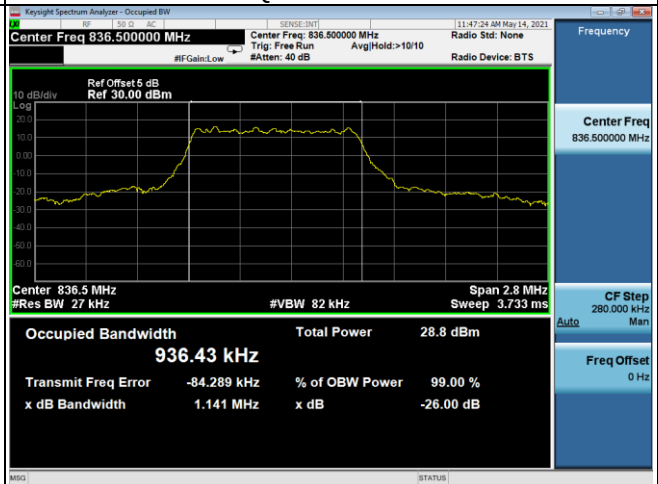
LTE Band 26_1.4M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26797	824.7	0.9222	26797	824.7	1.107
26915	836.5	0.9364	26915	836.5	1.141
27033	848.3	0.9213	27033	848.3	1.089
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26797	824.7	0.9283	26797	824.7	1.168
26915	836.5	0.9254	26915	836.5	1.244
27033	848.3	0.9274	27033	848.3	1.132

Spectrum Plot

QPSK-26797



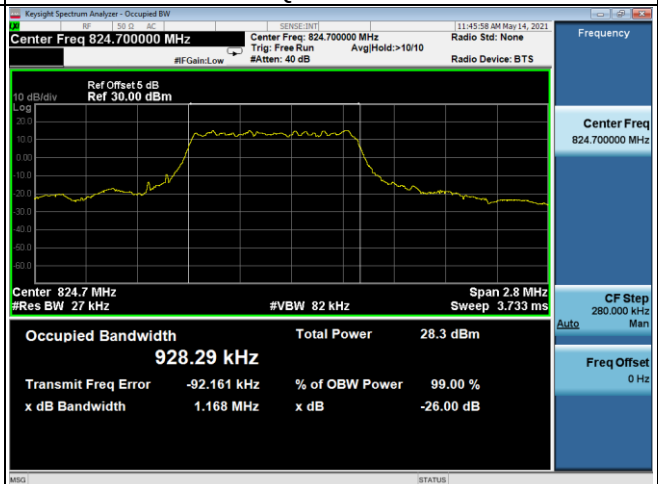
QPSK-26915



QPSK-27033



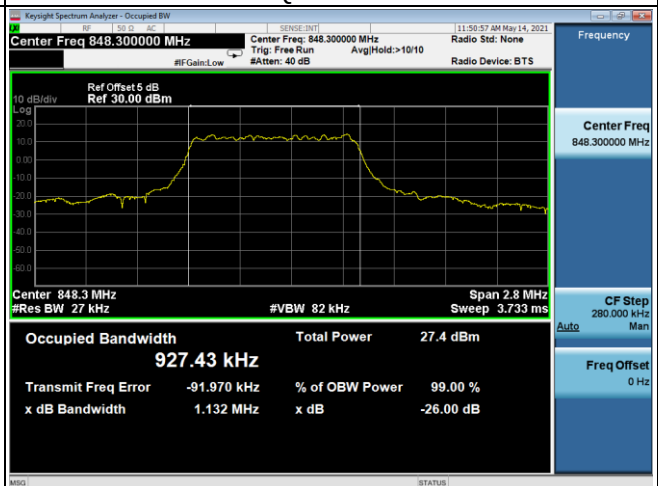
16QAM-26797



16QAM-26915



16QAM-27033



LTE Band 26_3M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26805	825.5	0.9632	26805	825.5	1.175
26915	836.5	0.9870	26915	836.5	1.237
27025	847.5	0.9614	27025	847.5	1.169
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26805	825.5	0.9870	26805	825.5	1.448
26915	836.5	0.9806	26915	836.5	1.556
27025	847.5	0.9863	27025	847.5	1.426

Spectrum Plot

QPSK-26805



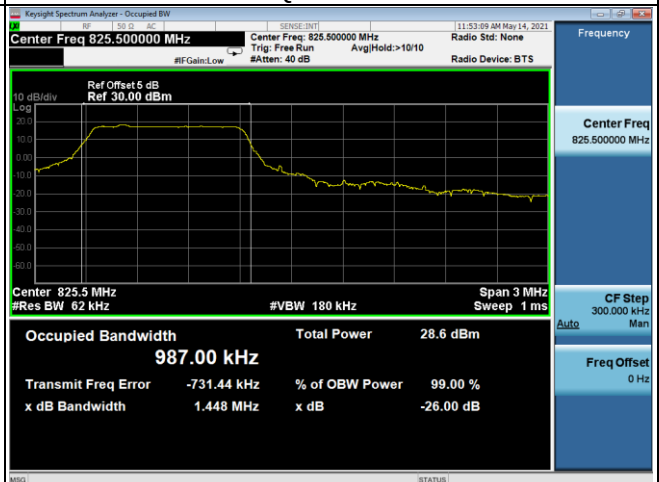
QPSK-26915



QPSK-27025



16QAM-26805



16QAM-26915



16QAM-27025



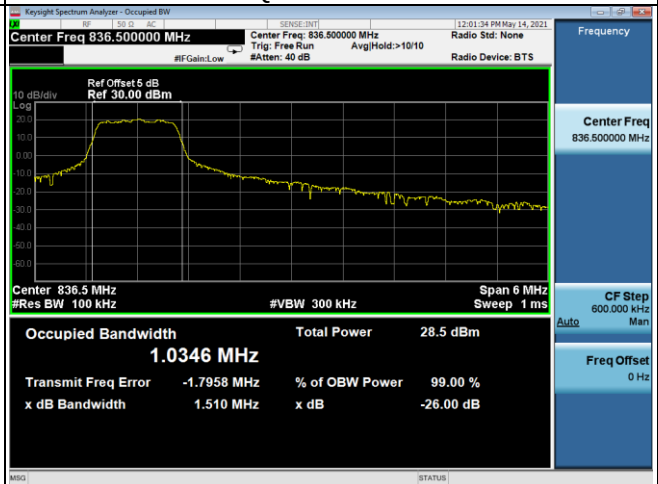
LTE Band 26_5M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26815	826.5	1.0375	26815	826.5	1.562
26915	836.5	1.0346	26915	836.5	1.510
27015	846.5	1.0566	27015	846.5	1.444
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26815	826.5	1.0470	26815	826.5	1.546
26915	836.5	1.0707	26915	836.5	1.480
27015	846.5	1.0714	27015	846.5	1.453

Spectrum Plot

QPSK-26815



QPSK-26915



QPSK-27015



16QAM-26815



16QAM-26915



16QAM-27015



LTE Band 26_10M					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26840	829	1.3140	26840	829	2.281
26915	836.5	1.3665	26915	836.5	1.982
26990	844	1.3483	26990	844	1.954
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
26840	829	1.3702	26840	829	2.250
26915	836.5	1.2468	26915	836.5	2.224
26990	844	1.2252	26990	844	2.152