FCC Test Report

Report Reference No.:	**HK2411207047-12E**
FCC ID :	2A4FR-LS4G-6-G
Compiled by (position+printed name+signature)..:	Testing Engineer Len Liao
Supervised by (position+printed name+signature)..:	Technical Manager Sliver Wan
Approved by (position+printed name+signature)..:	Authorized Signatory Jason Zhou
Date of issue.....:	Dec. 24, 2024
Testing Laboratory Name .....:	**Shenzhen HUAK Testing Technology Co., Ltd.**
Address.....:	1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Applicant's name.....:	**IGEN TECH CO.,Ltd.**
Address.....:	Block F4, No. 200, Linghu Avenue, Wuxi, Jiangsu, P. R. China 225400
Test specification ..... :	
Standard ..... :	**FCC Part 27**

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Test item description .....:	Stick Logger(4G)
Trade Mark .....:	N/A
Manufacturer.....:	**IGEN TECH CO.,Ltd.**
Model/Type reference.....:	LS4G-6-G
Series Models .....:	LS4G-6, LS4G-6-D, LS4G-6-C, LS4G-6K-D
Ratings.....:	DC 5~12V 4W
Modulation .....:	BPSK, QPSK
Hardware version .....:	V2.0
Software version .....:	V2.0
Frequency.....	LTE Band 12
Result.....:	**PASS**

TEST REPORT

Test Report No. :	HK2411207047-12E	Dec. 24, 2024 Date of issue

Equipment under Test	:	Stick Logger(4G)
Model /Type	:	LS4G-6-G
Series Models	:	LS4G-6, LS4G-6-D, LS4G-6-C, LS4G-6K-D
Applicant	:	**IGEN TECH CO.,Ltd.**
Address	:	Block F4, No. 200, Linghu Avenue, Wuxi, Jiangsu, P. R. China 225400
Manufacturer	:	**IGEN TECH CO.,Ltd.**
Address	:	Block F4, No. 200, Linghu Avenue, Wuxi, Jiangsu, P. R. China 225400

Test result	Pass

The test report merely corresponds to the test sample.
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** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Dec. 24, 2024	Jason Zhou

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1 Summary

1.1 Test Standards

The tests were performed according to following standards:

FCC Part 27: MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES.

TIA/EIA 603 D June 2010:Land Mobile FM or PM Communications Equipment Measurement and Performance Standards 47 CFR FCC Part 15 Subpart B: - Unintentional Radiators.

FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS.

KDB971168 D01:v03r01 Measurement Guidance For Certification Of Licensed Digital Transmitters.

1.2 Test Description

Test Item	FCC /IC Rule No.	Result
RF Output Power	Part 2.1046 Part 27.50(c)(10)	Pass
Peak-to-Average Ratio	Part 2.1046	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 27.53(g)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 27.53(g)	Pass
Out of band emission, Band Edge	Part 2.1051 Part 27.53(g)	Pass
Frequency stability	Part 2.1055 Part 27.54	Pass

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1.3 Information of The Test Laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization：

A2LA Accreditation Code is 4781.01.
FCC Designation Number is CN1229.
Canada IC CAB identifier is CN0045.
CNAS Registration Number is L9589.

1.4 Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4:Uncertainty in EMC Measurements“ and is documented in the Shenzhen HUAK Testing Technology Co., Ltd.. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen HUAK Testing Technology Co., Ltd.

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	Above 1GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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2 General Information

2.1 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2 Description of Test Modes

The EUT has been tested under typical operating condition. The CMW500 used to control the EUT staying in continuous transmitting and receiving mode for testing. Regards to the frequency band operation: the lowest、middle and highest frequency of channel were selected to perform the test, then shown on this report.

Note:

1. For the ERP/EIRP and radiated emission test, every axis (X, Y, Z) was verified, and show the worst resulton this report.
2. Test method and refer to 3GPP TS136521.

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2.3 Equipments Used During The Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	L.I.S.N.	R&S	ENV216	HKE-002	2024/02/20	2025/02/19
2	L.I.S.N.	R&S	ENV216	HKE-059	2024/02/20	2025/02/19
3	EMI Test Receiver	R&S	ESR	HKE-005	2024/02/20	2025/02/19
4	Spectrum analyzer	Agilent	N9020A	HKE-117	2024/02/20	2025/02/19
5	Spectrum analyzer	R&S	FSV3044	HKE-126	2024/02/20	2025/02/19
6	Preamplifier	EMCI	EMC051845S	HKE-006	2024/02/20	2025/02/19
7	Preamplifier	Schwarzbeck	BBV 9743	HKE-016	2024/02/20	2025/02/19
8	Preamplifier	A.H. Systems	SAS-574	HKE-182	2024/02/20	2025/02/19
9	6d Attenuator	Pasternack	6db	HKE-184	2024/02/20	2025/02/19
10	EMI Test Receiver	Rohde & Schwarz	ESR-7	HKE-010	2024/02/20	2025/02/19
11	Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	2024/02/21	2026/02/20
12	Loop Antenna	COM-POWER	AL-130R	HKE-014	2024/02/21	2026/02/20
13	Horn Antenna	Schwarzbeck	9120D	HKE-013	2024/02/21	2026/02/20
14	EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	/	/
15	EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
16	RF Automatic control unit	Tonscend	JS0806-1	HKE-096	2024/02/20	2025/02/19
17	High pass filter unit	Tonscend	JS0806-F	HKE-055	2024/02/20	2025/02/19
18	Wireless Communication Test Set	R&S	CMU200	HKE-026	2024/02/20	2025/02/19
19	Wireless Communication Test Set	R&S	CMW500	HKE-027	2024/02/20	2025/02/19
20	High-low temperature chamber	Guangke	HT-80L	HKE-118	2024/06/10	2025/06/09
21	Temperature and humidity meter	Boyang	HTC-1	HKE-075	2024/06/10	2025/06/09
22	RF Test Software	Tonscend	JS1120 Version 3.1.46	HKE-183	/	/
23	RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	/	/

2.4 Modifications

No modifications were implemented to meet testing criteria.

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3 Test Conditions and Results

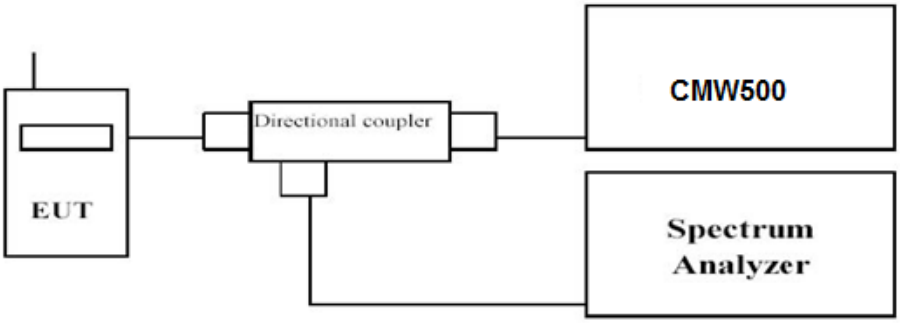
3.1 Output Power

LIMIT

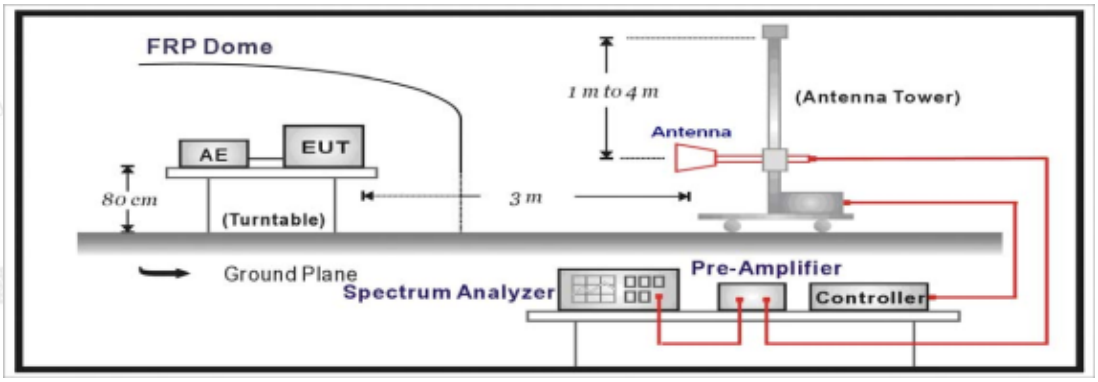
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are FCC limited to 3 watts ERP."IC limited to 5 watts ERP."

TEST CONFIGURATION

Conducted Power Measurement



Radiated Power Measurement:



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D.

Conducted Power Measurement:

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c) EUT Communicate with CMW500, then select a channel for testing.
d) Add a correction factor to the display of spectrum, and then test.

Radiated Power Measurement:

a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to thefrequency of the transmitter.
c. The output of the test antenna shall be connected to the measuring receiver.
d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.

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f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
h. The maximum signal level detected by the measuring receiver shall be noted.
i. The transmitter shall be replaced by a substitution antenna.
j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
k. The substitution antenna shall be connected to a calibrated signal generator.
l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
q. Test site anechoic chamber refer to ANSI C63.4.

TEST RESULTS

Conducted Measurement:

LTE FDD Band 12				
Modulation	Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	Average Power [dBm]
BPSK	3.75	1@0	699.1	23.05
		1@47	699.1	22.95
		1@0	707.5	22.97
		1@47	707.5	22.88
		1@0	715.9	23.12
		1@47	715.9	23.10
	15	1@0	699.1	23.34
		1@11	699.1	22.35
		12@0	699.1	23.15
		1@0	707.5	22.26
		1@11	707.5	22.23
		12@0	707.5	23.02
		1@0	715.9	23.55
		1@11	715.9	22.47
		12@0	715.9	23.23
QPSK	3.75	1@0	699.1	23.05
		1@47	699.1	23.03
		1@0	707.5	23.01
		1@47	707.5	22.96
		1@0	715.9	23.22
		1@47	715.9	23.15

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	15	1@0	699.1	22.50
		1@11	699.1	23.45
		12@0	699.1	23.16
		1@0	707.5	22.38
		1@11	707.5	23.32
		12@0	707.5	23.02
		1@0	715.9	23.66
		1@11	715.9	22.58
		12@0	715.9	23.23

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Radiated Measurement:

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12.*
2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBi)*
3. *ERP = EIRP – 2.15dBi as EIRP by subtracting the gain of the dipole.*

LTE FDD Band 12_Channel Bandwidth 3.75KHz_BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Polarization
699.1	-19.48	2.38	8.23	2.15	36.7	20.92	34.77	V
707.5	-18.4	2.4	8.29	2.15	36.7	22.04	34.77	V
715.9	-17.64	2.43	8.28	2.15	36.7	22.76	34.77	V

LTE FDD Band 12_Channel Bandwidth 15KHz_BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Polarization
699.1	-17.57	2.38	8.23	2.15	36.7	22.83	34.77	V
707.5	-17.08	2.4	8.29	2.15	36.7	23.36	34.77	V
715.9	-17.47	2.43	8.28	2.15	36.7	22.93	34.77	V

LTE FDD Band 12_Channel Bandwidth 3.75KHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Polarization
699.1	-16.18	2.38	8.23	2.15	36.7	24.22	34.77	V
707.5	-18.88	2.4	8.29	2.15	36.7	21.56	34.77	V
715.9	-18.26	2.43	8.28	2.15	36.7	22.14	34.77	V

LTE FDD Band 12_Channel Bandwidth 15KHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Polarization
699.1	-15.85	2.38	8.23	2.15	36.7	24.55	34.77	V
707.5	-17.96	2.4	8.29	2.15	36.7	22.48	34.77	V
715.9	-18.99	2.43	8.28	2.15	36.7	21.41	34.77	V

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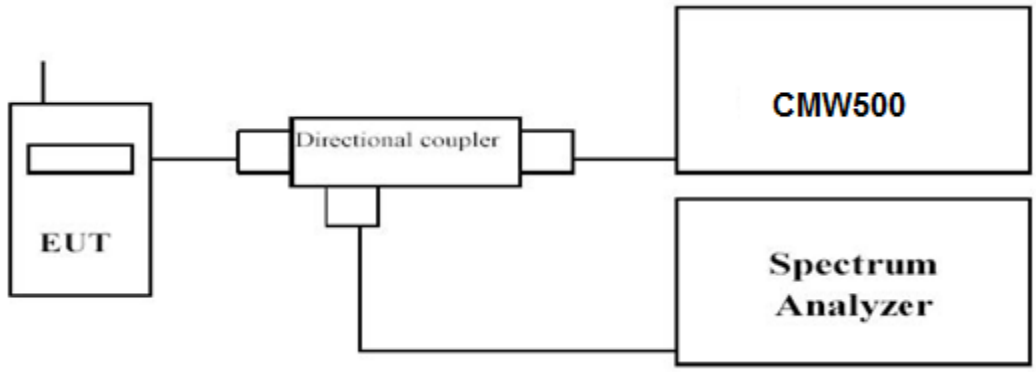
3.2 Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
   1). for continuous transmissions, set to 1 ms;
   2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12.*

LTE FDD Band 12				
Frequency (MHz)	Sub-carrier spacing (KHz)	Tones	Modulation PAPR (dB)	
			BPSK	QPSK
707.5	3.75	1@0	2.44	3.70
		1@47	2.99	2.73
707.5	15	1@0	4.99	6.74
		1@11	5.19	5.96

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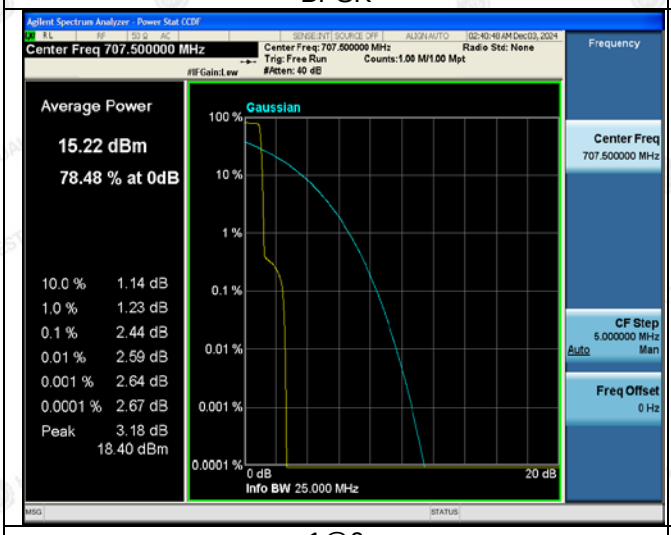
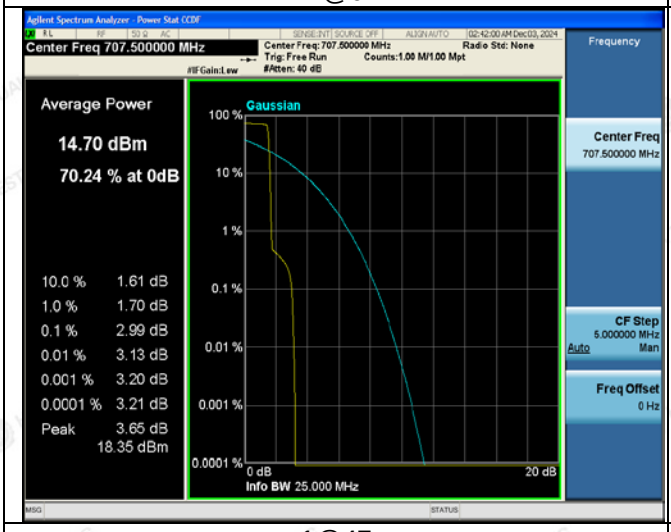
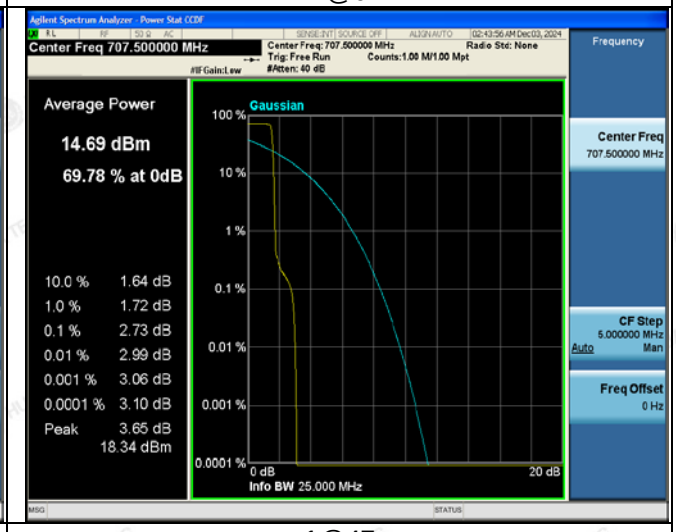
LTE FDD Band 12-3.75KHz	
BPSK	QPSK
	
1@0	1@0
	
1@47	1@47

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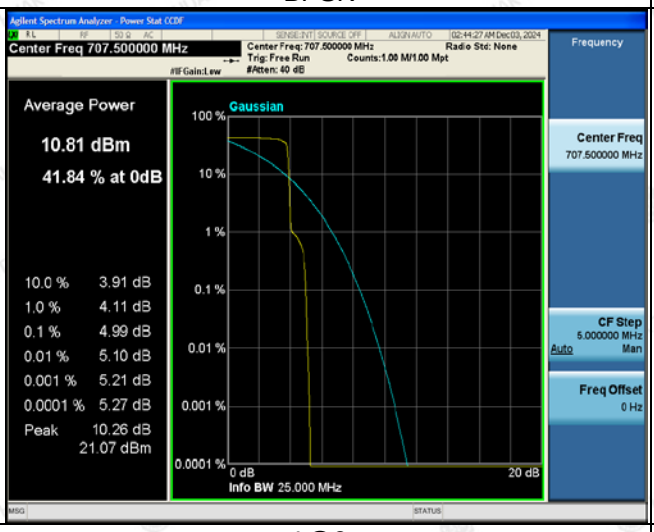
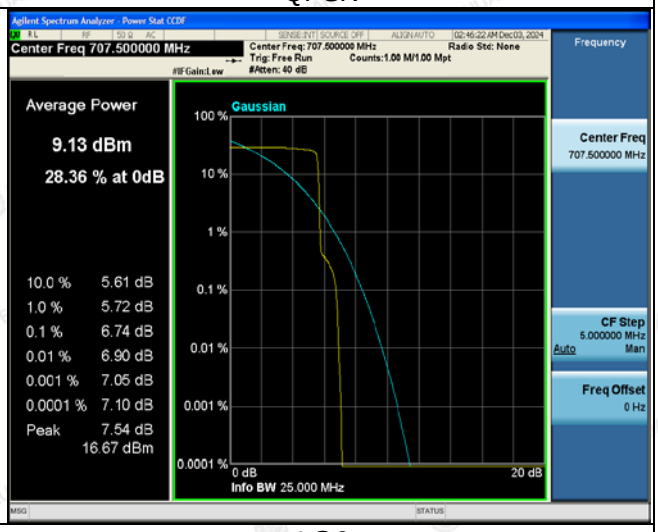
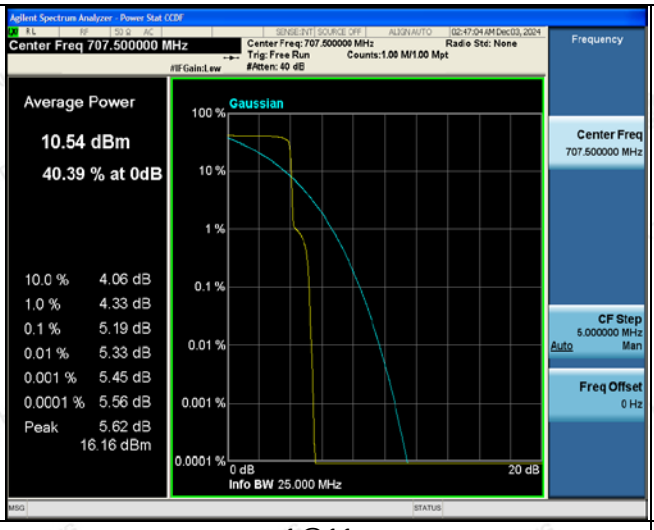
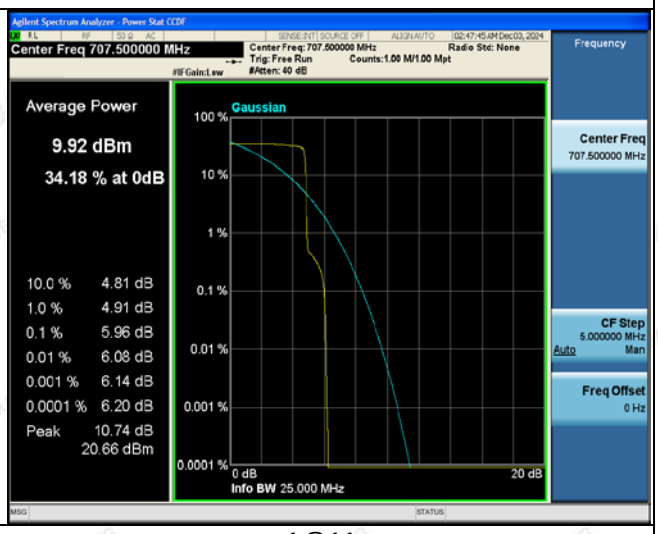
LTE FDD Band 12-15KHz	
BPSK	*QPSK*
	
1@0	1@0
	
1@11	1@11

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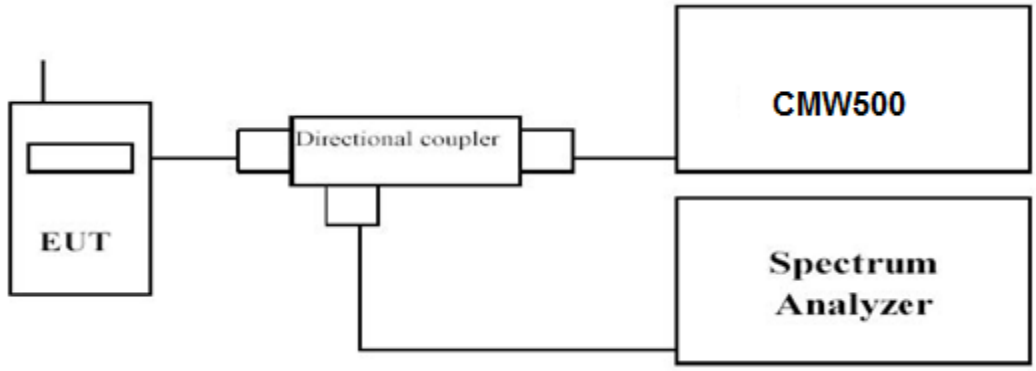
3.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded.
Set RBW was set to about 1% of emission BW, VBW≥3 times RBW.
-26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12.*

LTE FDD Band 12						
Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	-26dBc Emission bandwidth (KHz)		99% Occupied bandwidth (KHz)	
			BPSK	QPSK	BPSK	QPSK
3.75	1@0	699.1	50.99	50.95	69.032	82.776
	1@0	707.5	51.36	50.83	69.732	84.026
	1@0	715.9	51.72	49.53	69.690	84.830
15	1@0	699.1	106.2	129.4	126.78	126.68
	1@0	707.5	106.6	116.9	124.81	126.31
	1@0	715.9	106.3	116.2	125.77	123.50
	12@0	699.1	251.7	248.5	186.88	186.95
	12@0	707.5	237.8	248.8	187.11	184.06
	12@0	715.9	249.6	249.9	185.28	186.48

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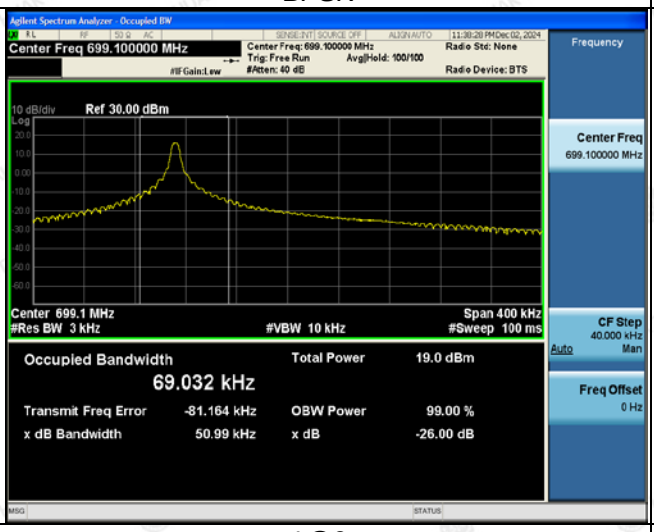
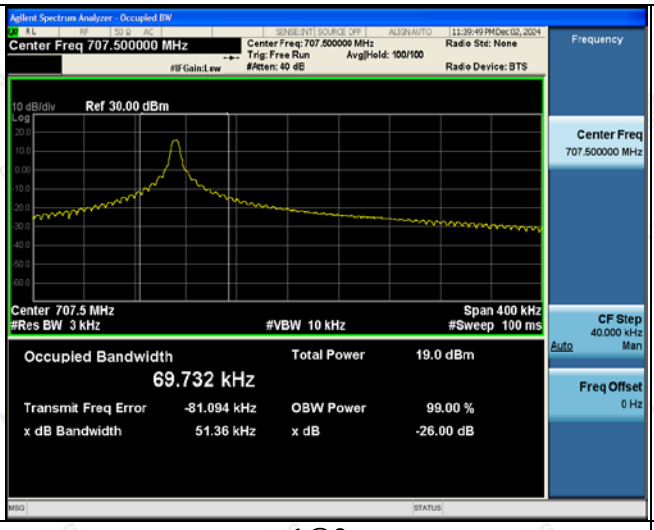
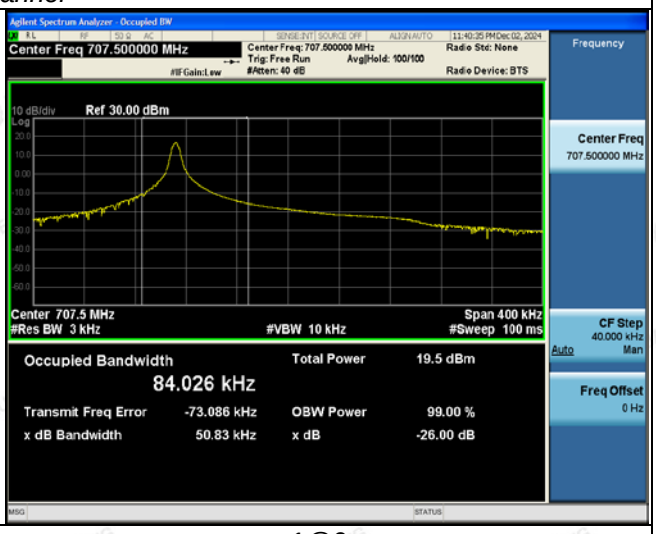
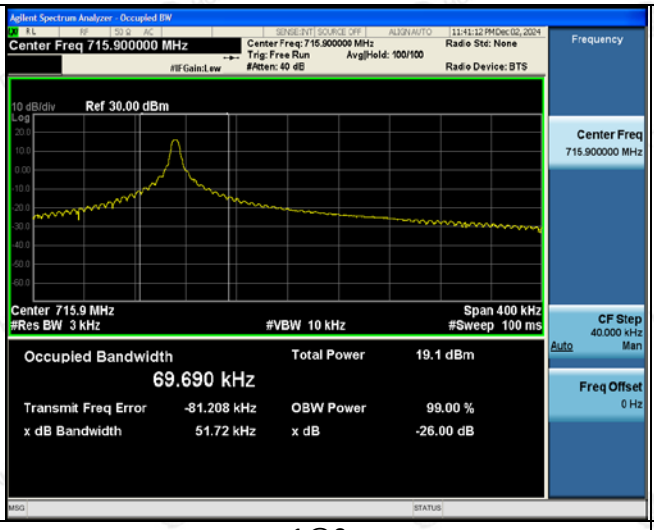
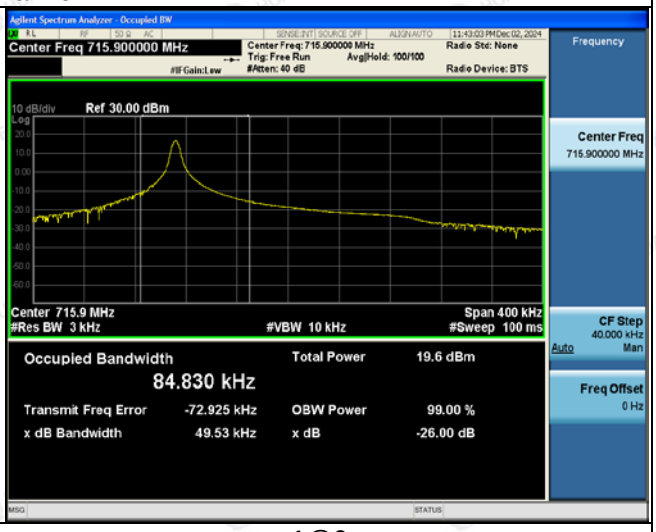
LTE FDD Band 12-3.75KHz	
BPSK	QPSK
	
1@0	1@0
Low Channel	
	
1@0	1@0
Middle Channel	
	
1@0	1@0
High Channel	

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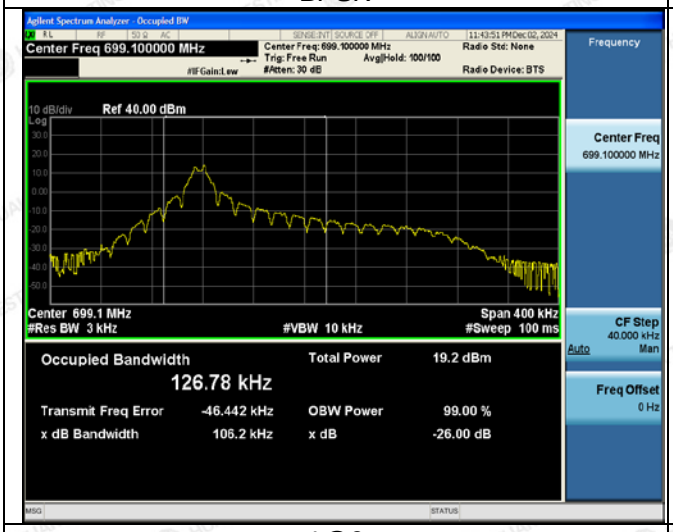
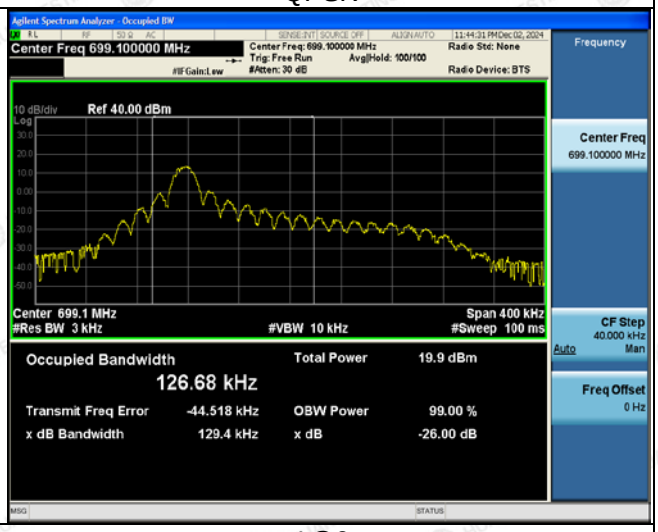
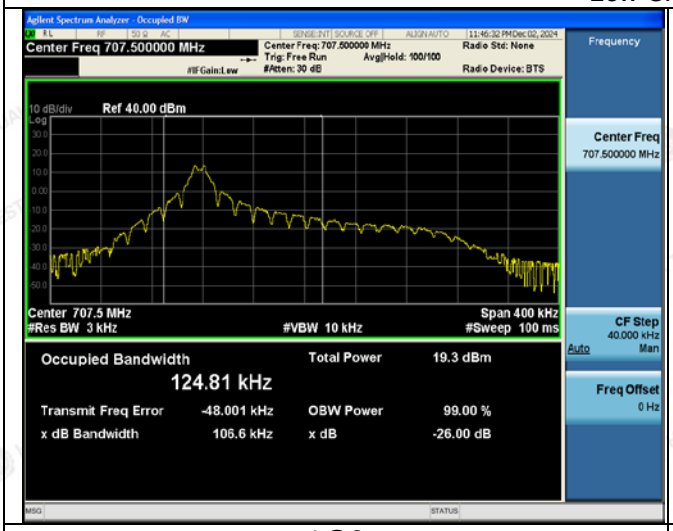
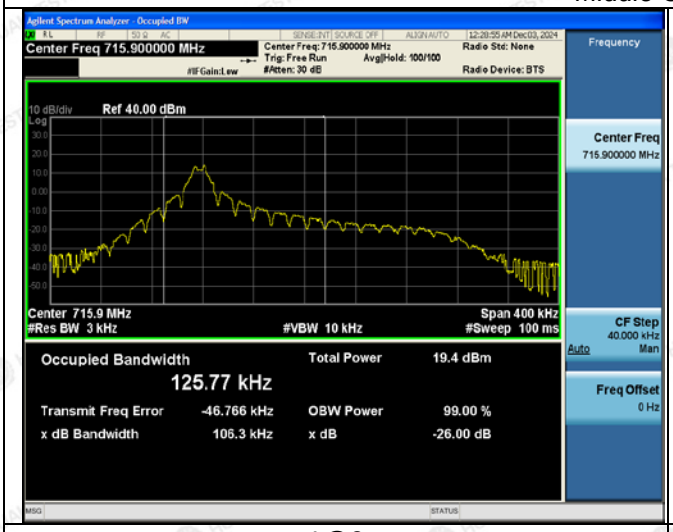
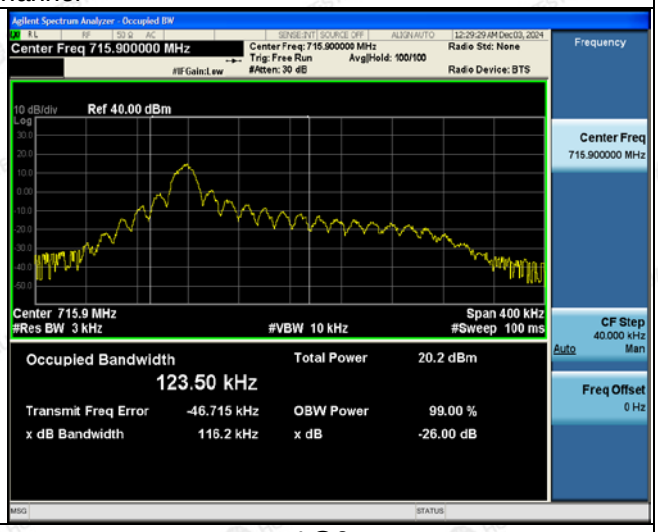
LTE FDD Band 12-15KHz	
BPSK	QPSK
	
1@0	1@0
Low Channel	
	
1@0	1@0
Middle Channel	
	
1@0	1@0
High Channel	

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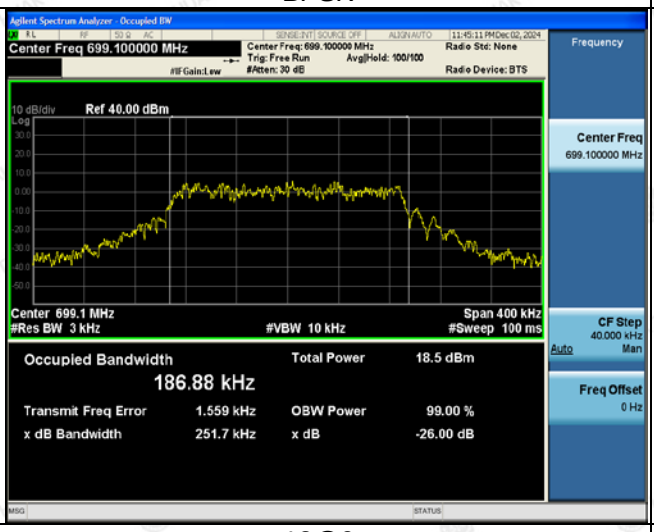
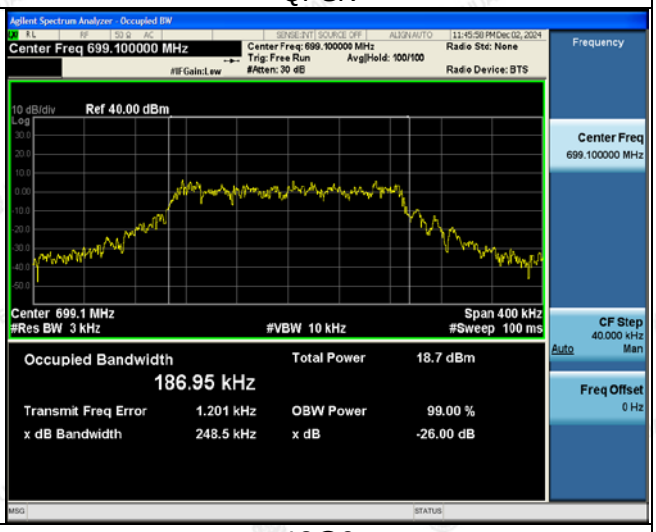
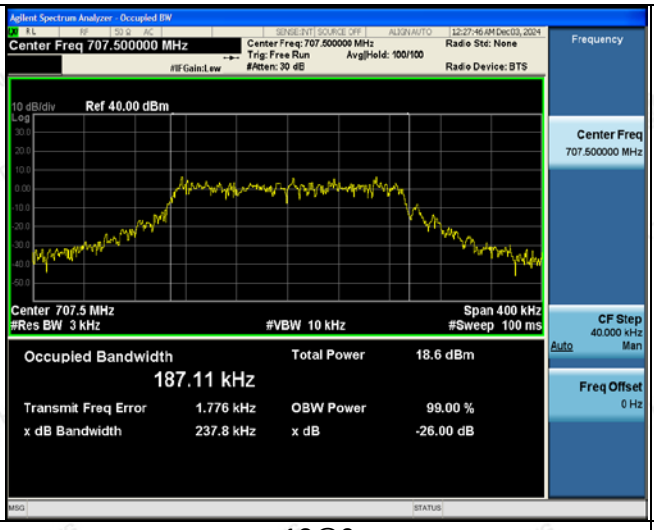
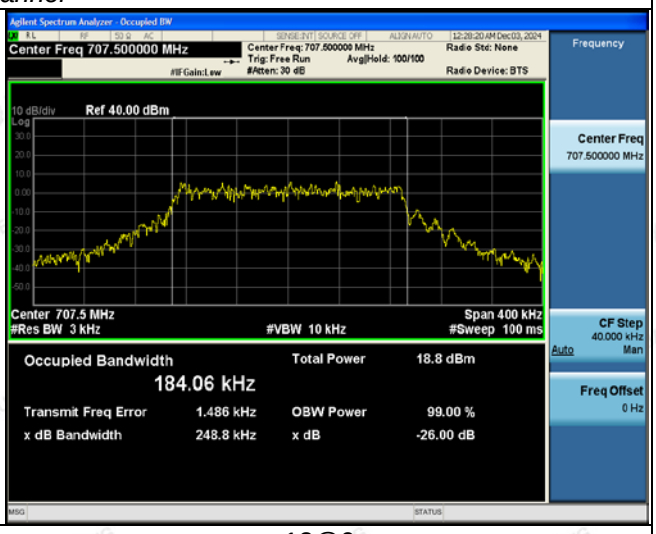
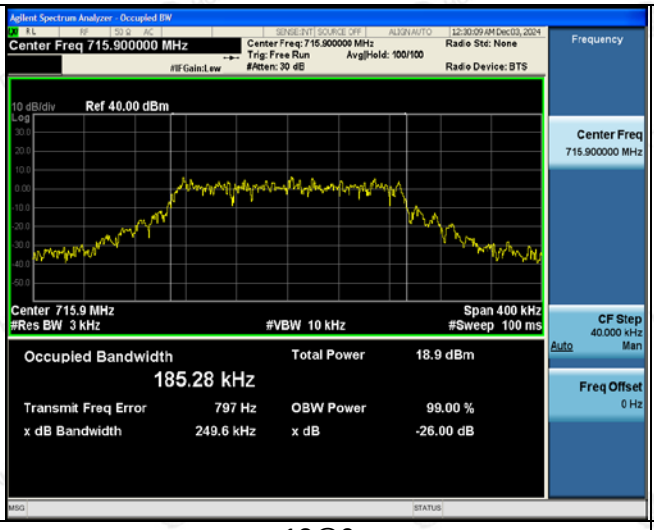
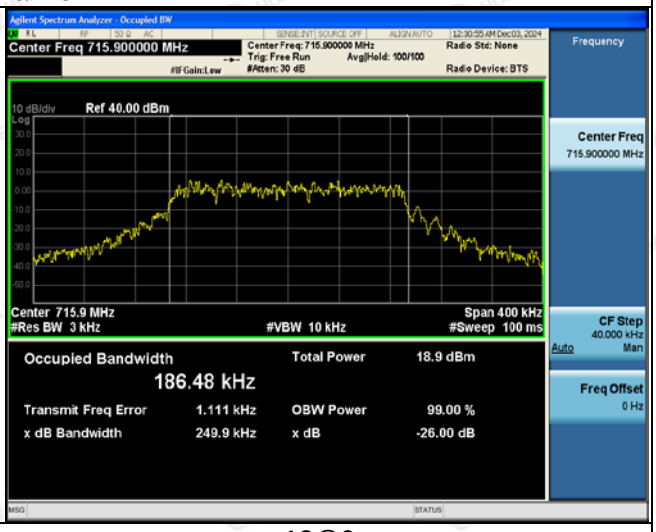
LTE FDD Band 12-15KHz	
BPSK	QPSK
	
12@0	12@0
Low Channel	
	
12@0	12@0
Middle Channel	
	
12@0	12@0
High Channel	

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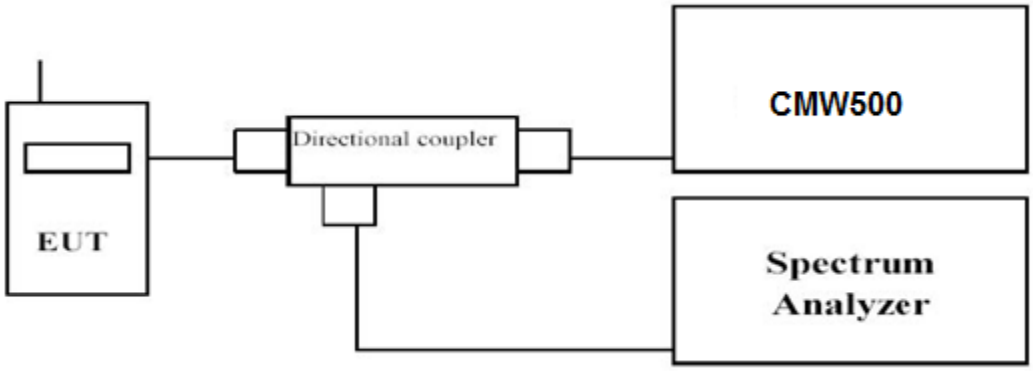
3.4 Band Edge Compliance

LIMIT

that 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 specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum.

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12.*

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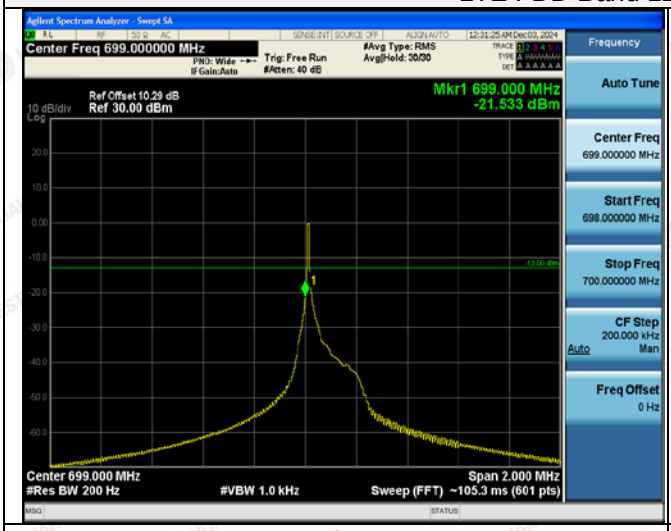
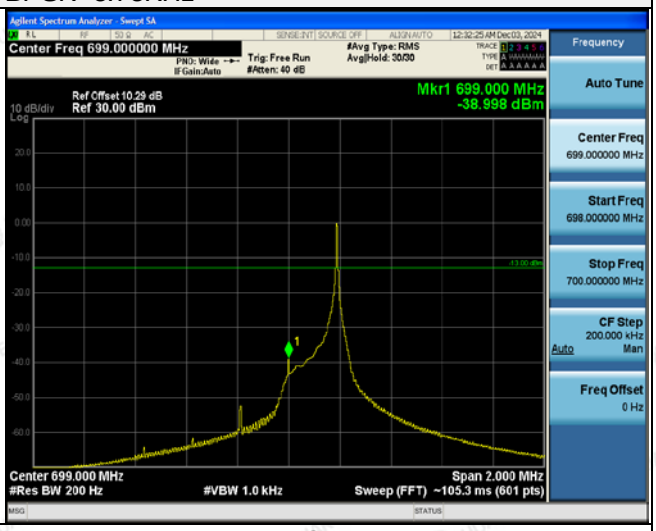
LTE FDD Band 12-BPSK- 3.75KHz

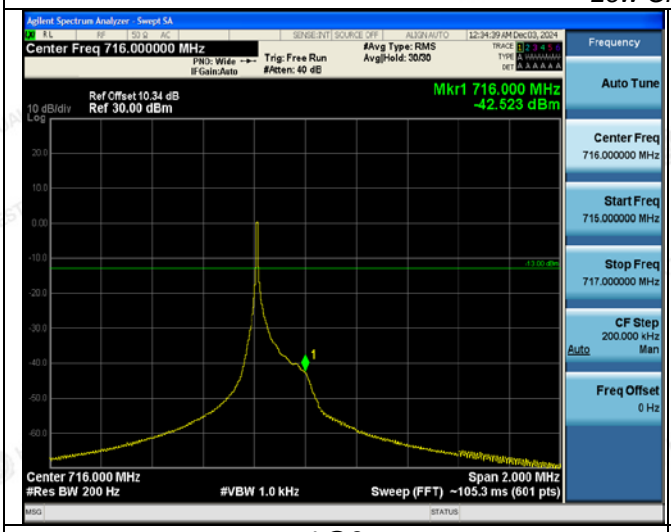


1@0

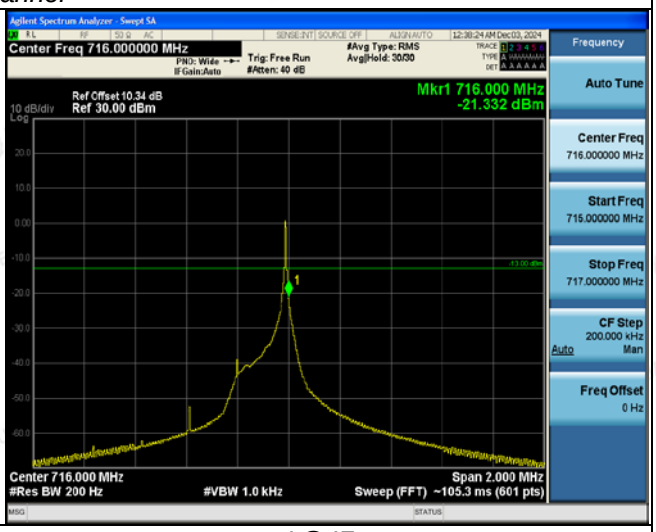


1@47

Low Channel



1@0



1@47

High Channel

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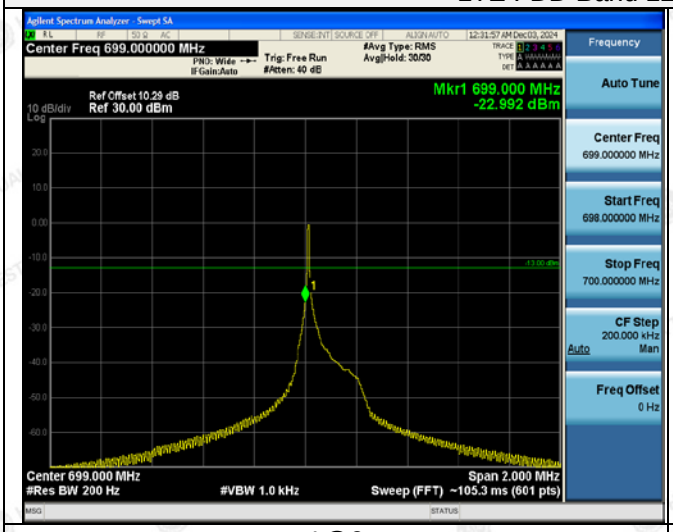
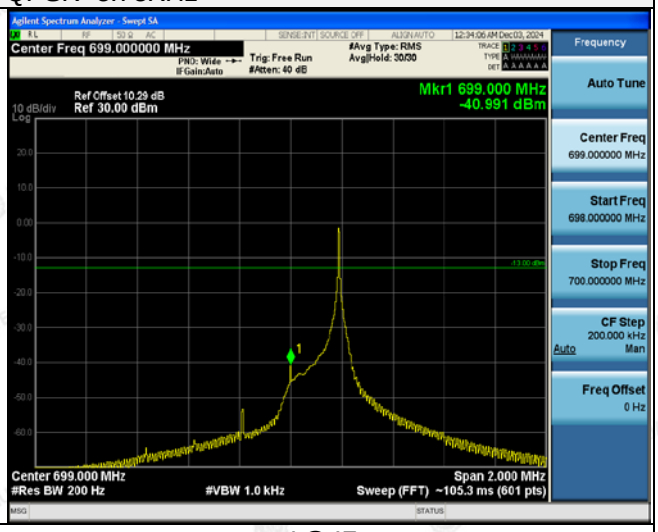
LTE FDD Band 12-QPSK- 3.75KHz

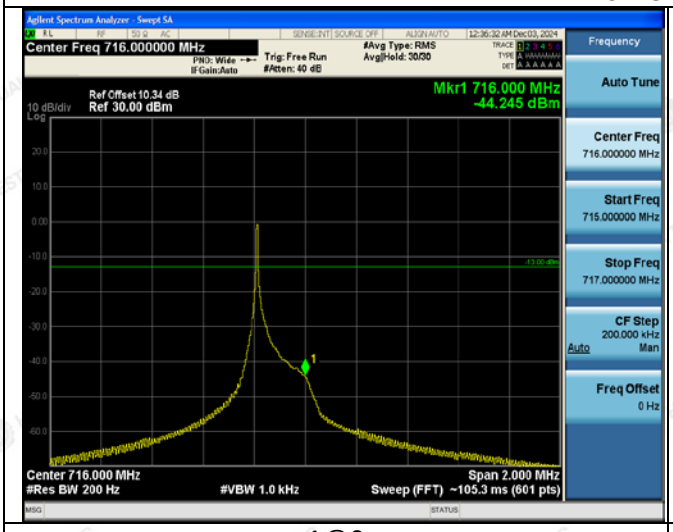


1@0

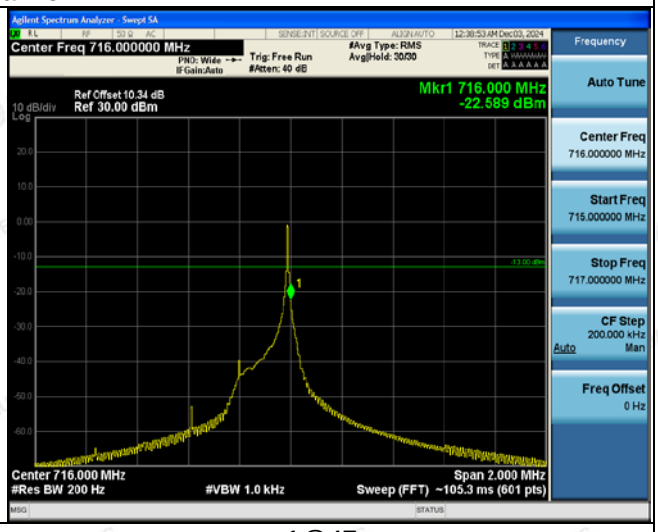


1@47

Low Channel



1@0



1@47

High Channel

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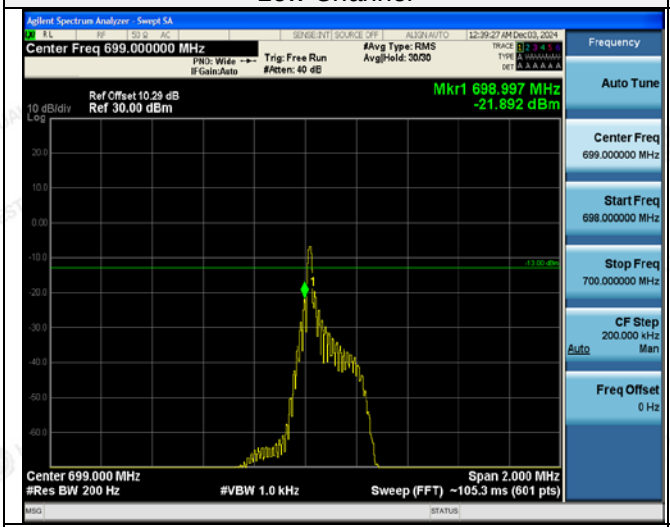
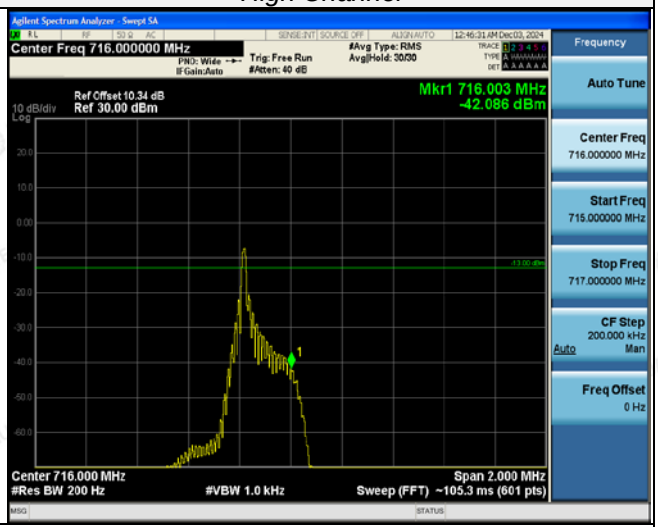
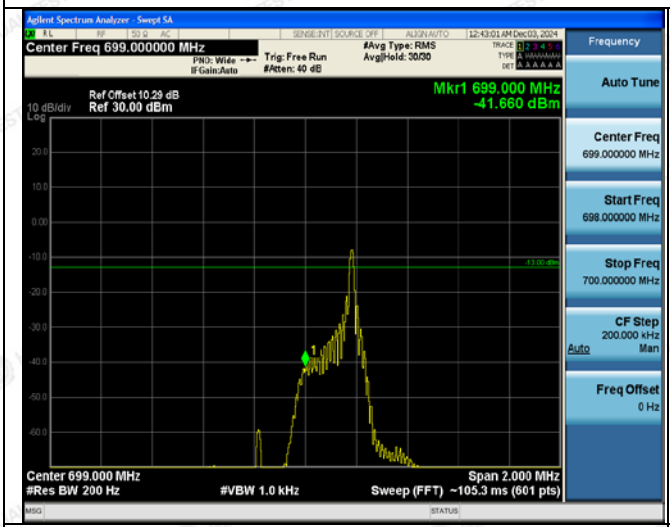
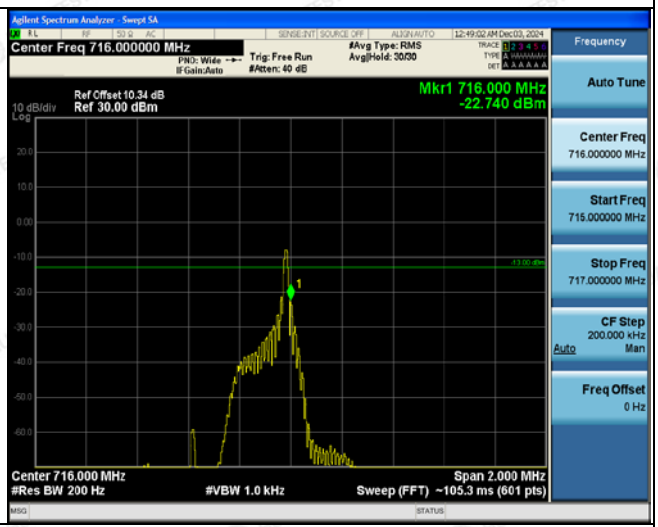
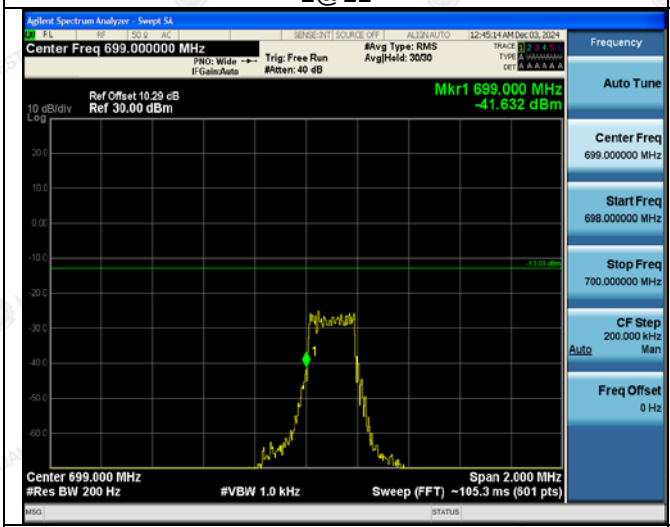
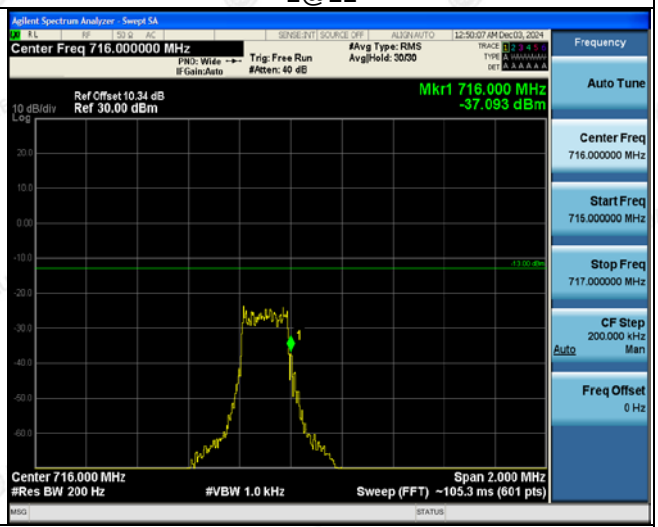
LTE FDD Band 12-BPSK- 15KHz	
Low Channel	High Channel
	
1@0	1@0
	
1@11	1@11
	
12@0	12@0

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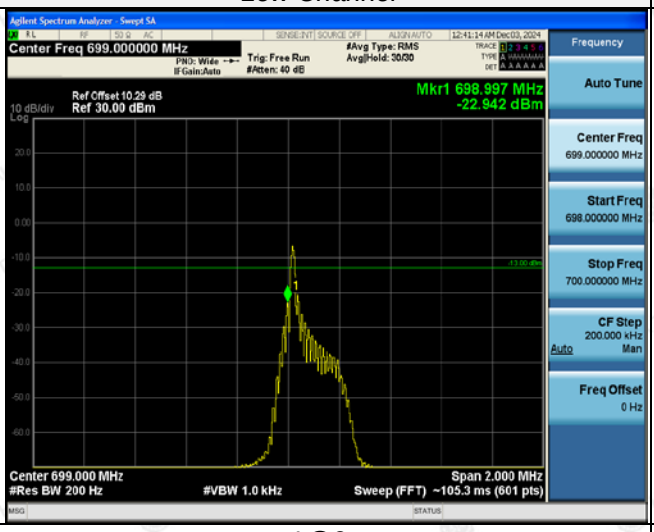
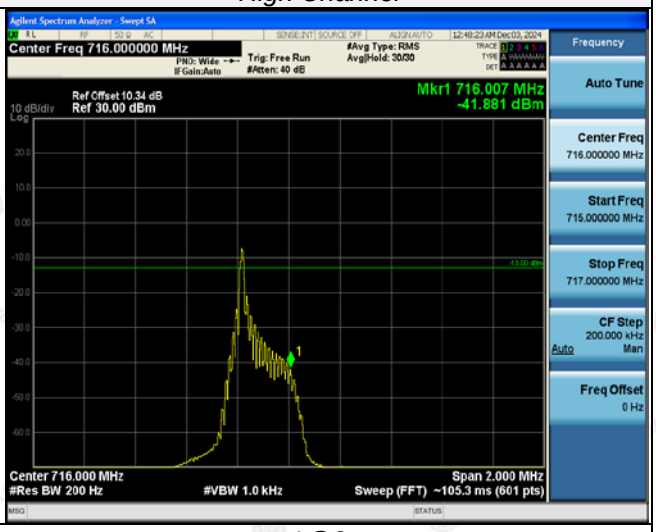
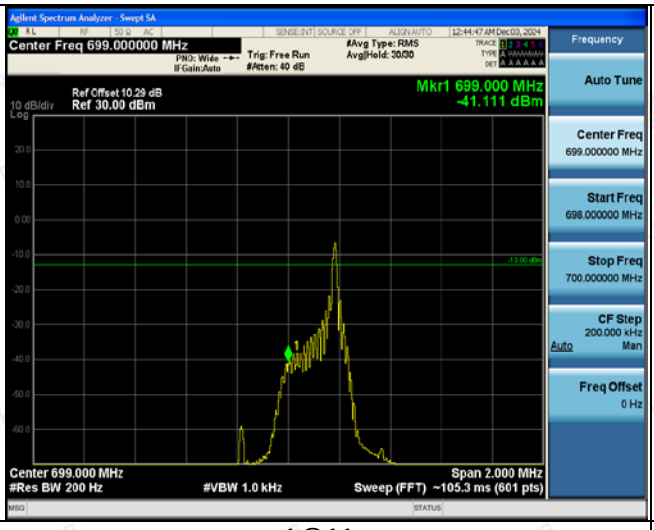
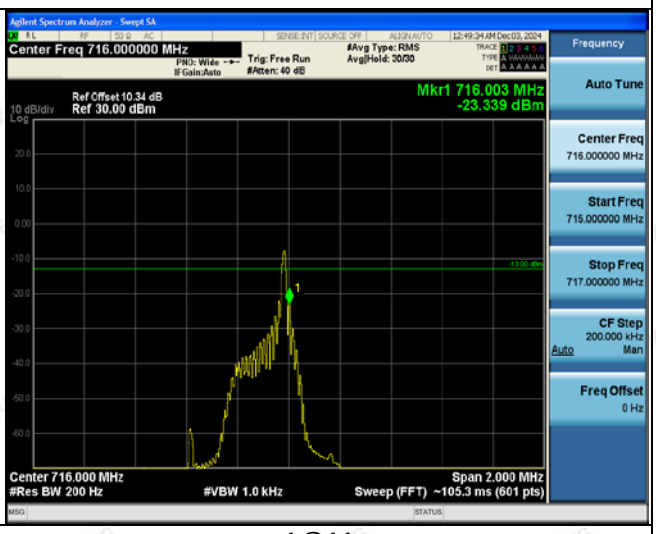
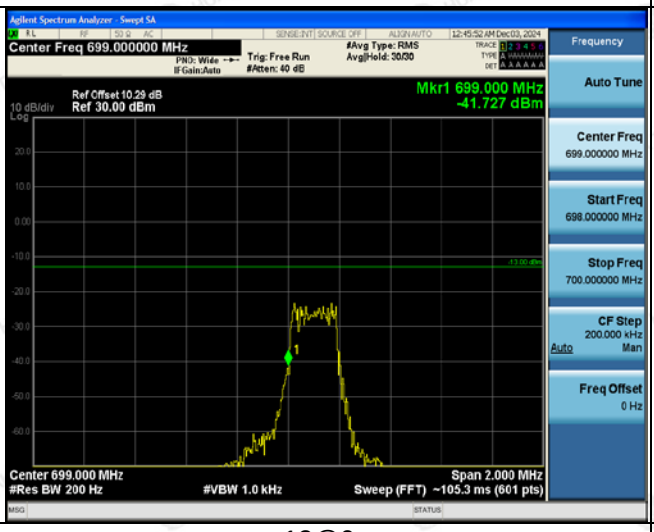
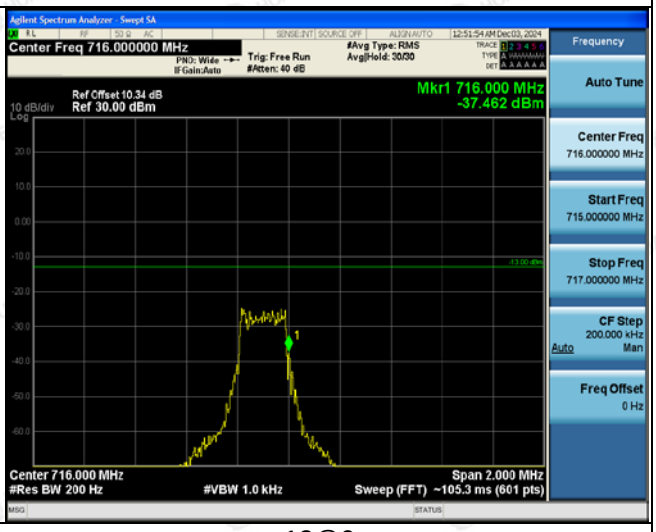
LTE FDD Band 12-QPSK- 15KHz	
Low Channel	High Channel
	
1@0	1@0
	
1@11	1@11
	
12@0	12@0

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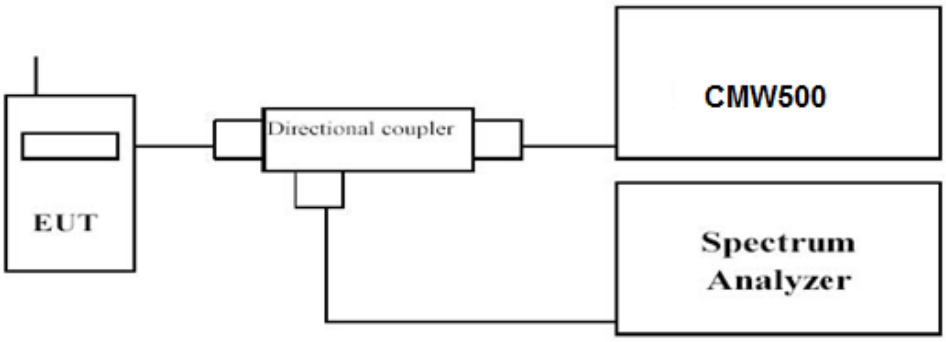
3.5 Spurious Emission

LIMIT

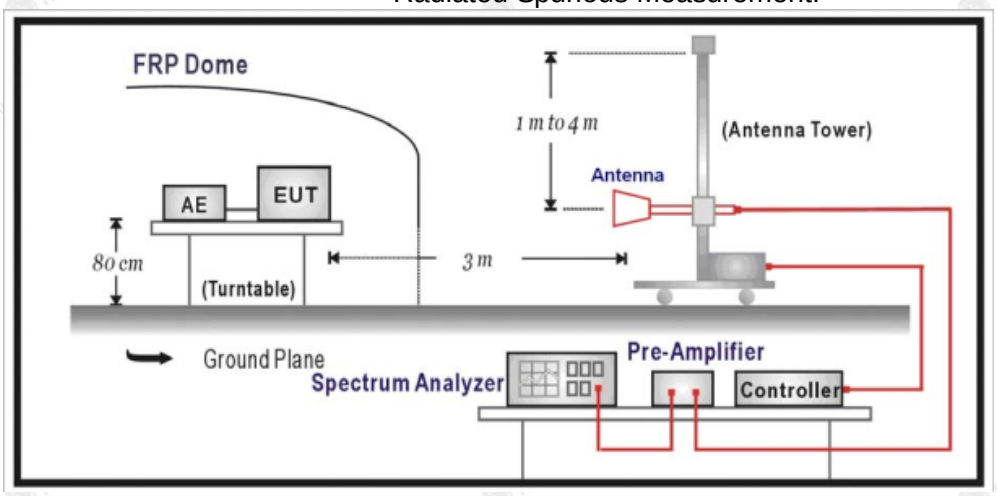
that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

TEST CONFIGURATION

Conducted Spurious Measurement:



Radiated Spurious Measurement:



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D.

Conducted Spurious Measurement:

a. Place the EUT on a bench and set it in transmitting mode.
b. Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c. EUT Communicate with CMW500, then select a channel for testing.
d. Add a correction factor to the display of spectrum, and then test.
e. The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to10th harmonic.
f. Please refer to following tables for test antenna conducted emissions.

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g.

Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 12	0.03~26.5	1 MHz	3 MHz	Auto

Radiated Spurious Measurement:

a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.
c. The output of the test antenna shall be connected to the measuring receiver.
d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
h. The maximum signal level detected by the measuring receiver shall be noted.
i. The transmitter shall be replaced by a substitution antenna.
j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
k. The substitution antenna shall be connected to a calibrated signal generator.
l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
q. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for Part 22 and 1MHz for Part 24. The frequency range was checked up to 10th harmonic.
r. Test site anechoic chamber refer to ANSI C63.

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12.*

Conducted Measurement:

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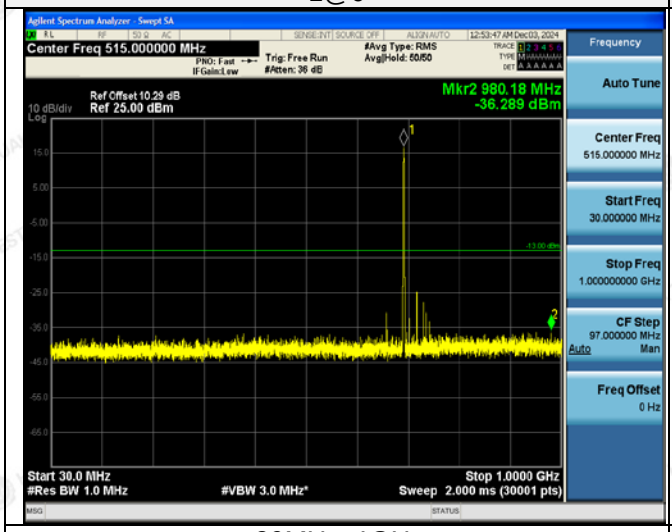
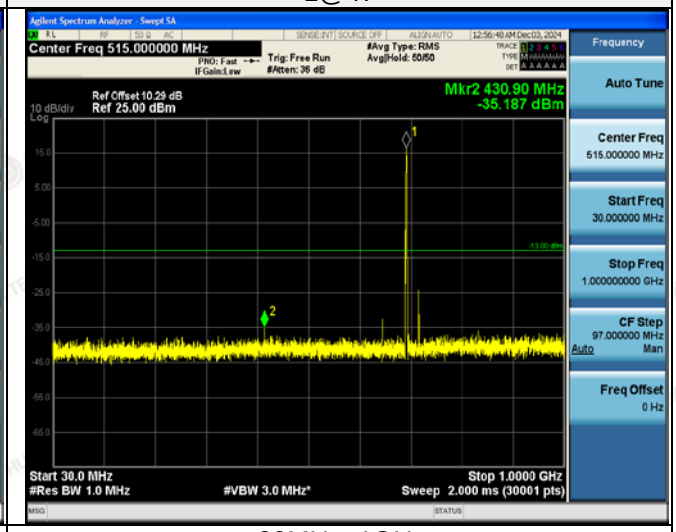
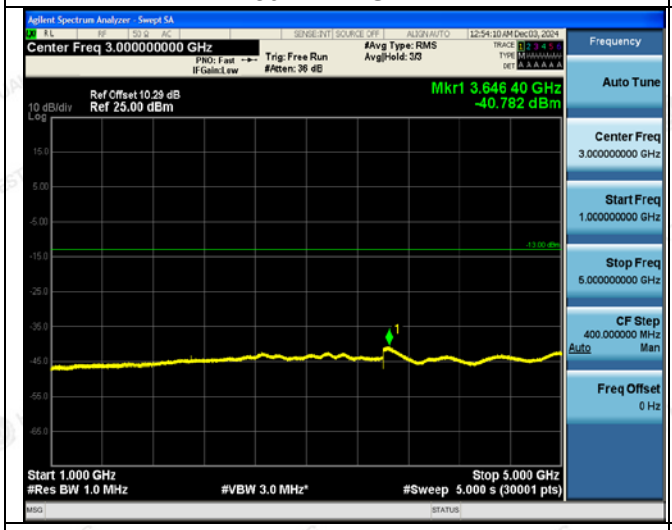
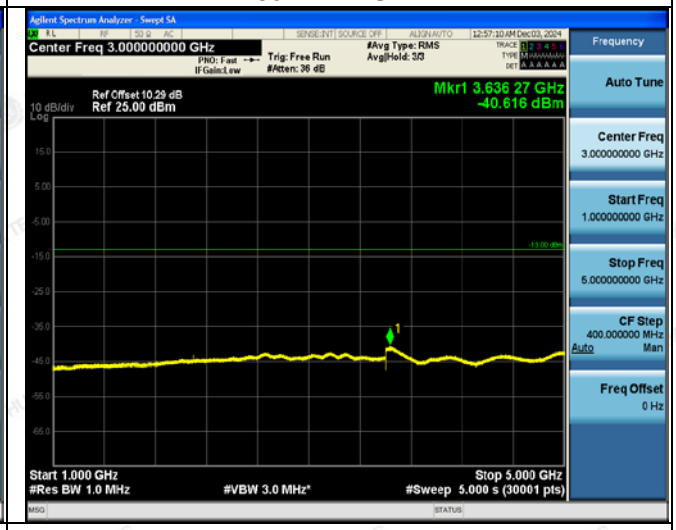
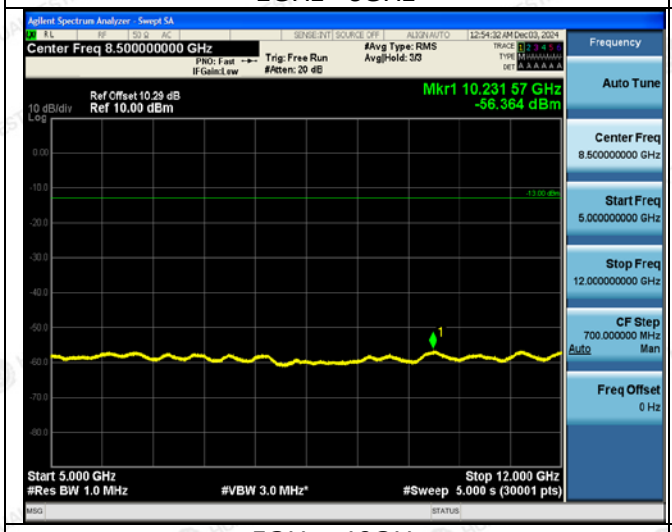
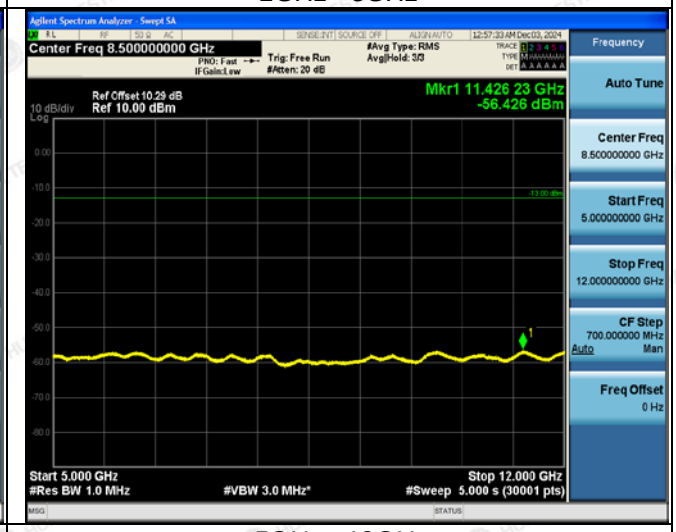
LTE FDD Band 12-QPSK-3.75KHz	
Low Channel	
1@0	1@47
	
30MHz~1GHz	30MHz~1GHz
	
1GHz ~5GHz	1GHz ~5GHz
	
5GHz ~12GHz	5GHz ~12GHz

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12GHz ~26.5GHz

12GHz ~26.5GHz

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