FCC Test Report

Report Reference No. ..... :	HK2411207047-15E
FCC ID. ..... :	2A4FR-LS4G-6-G
Compiled by (position+printedname+signature).. :	Testing Engineer Len Liao
Supervised by (position+printedname+signature)... :	Technical Manager Sliver Wan
Approved by (position+printedname+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 CFR Title 47 Part 2, Part 22H**
TRF Originator ..... :	Shenzhen HUAK Testing Technology Co., Ltd.

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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
Modulation Type ..... :	BPSK, QPSK
Rating..... :	DC 5~12V 4W
Hardware version..... :	V2.0
Software version ..... :	V2.0
Result..... :	**PASS**

TEST REPORT

Test Report No. :	HK2411207047-15E	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.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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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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TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : service@cer-mark.com
Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

1 Test Standards

The tests were performed according to following standards:

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

FCC Part 22Subpart H:PRIVATE LAND MOBILE RADIO SERVICES.

ANSI/TIA-603-E-2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

ANSI C63.26-2015: IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

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

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2 Summary

2.1 General Remarks

Date of receipt of test sample	:	Nov. 20, 2024
Testing commenced on	:	Nov. 20, 2024
Testing concluded on	:	Dec. 24, 2024

2.2 Product Description

Name of EUT:	Stick Logger(4G)
Model/Type reference:	LS4G-6-G
Series Models:	LS4G-6, LS4G-6-D, LS4G-6-C, LS4G-6K-D
Model Difference:	All model's the function, software and electric circuit are the same, only with model named different. Test sample model: LS4G-6-G.
Power supply:	DC 5~12V 4W
Modilation Type:	BPSK, QPSK
Antenna Type:	External Antenna
Antenna Gain:	2dBi
Operation Frequency Band:	LTE BAND 19
Operation frequency:	LTE BAND 19:830~845 MHz
LTE Release:	R8
Extreme temp. Tolerance:	-30°C to +50°C
Extreme vol. Limits:	4.25VDC to 5.75VDC (nominal: 5.0VDC)
Note: 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2. Antenna gain Refer to the antenna specifications. 3. The cable loss data is obtained from the supplier. 4. The test results in the report only apply to the tested sample.	

2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	○	120V/ 60 Hz	○	115V/60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 5~12V 4W

2.4 Normal Accessory Setting

Fully charged battery was used during the test.

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2.5 EUT Configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended filing to comply with FCC Part 22H, Rules.

2.7 Modifications

No modifications were implemented to meet testing criteria.

2.8 GeneralTest Conditions/Configurations

2.10.1 Test Environment

EnvironmentParameter	SelectedValuesDuringTests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	4.25V
	VN	5.0V
	VH	5.75V

NOTE:VL=lowerextreme testvoltageVN=nominalvoltage
VH=upperextreme testvoltageTN=normaltemperature

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3 Test Environment

3.1 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.

3.2 Environmental Conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3 Test Description

Band 19 (830-845 MHz)

Test Item	FCCRuleNo.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §22.913(a)(2)	FCC: ERP ≤ 7W.	Pass
Peak-Average Ratio	§24.232(d)	FCC:Limit≤13dB	Pass
Modulation Characteristics	§2.1047	Digital modulation	Pass
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	Pass
Band Edges Compliance	§2.1051, §22.917	≤ -13dBm/1%*EBW, In1MHz bands immediately outside and adjacent to Thefrequency block.	Pass
Spurious Emission at AntennaTerminals	§2.1051, §22.917	≤-13dBm/1MHz, from9kHz to 10th harmonics but outside authorized Operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	≤ -13dBm/1MHz.	Pass
Frequency Stability	§2.1055, §22.355,	FCC:within authorized frequency block.	Pass
NOTE 1:For theverdict, the"N/A"denotes"not applicable", the"N/T"denotes "nottested".			

Remark:
1. The measurement uncertainty is not included in the test result.

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3.4 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	/	/

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4 Test Conditions and Results

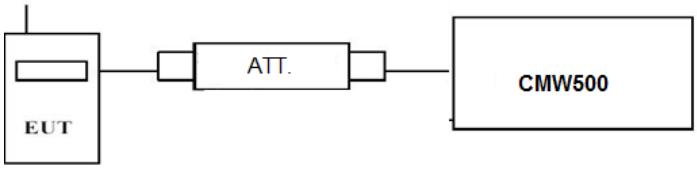
4.1 Output Power

4.1.1 Coducted Output Power

TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

TEST CONFIGURATION



TEST PROCEDURE

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 CMW500 by an Att.
c) EUT Communicate with CMW500 then selects a channel for testing.
d) Add a correction factor to the display CMW500, and then test.

TEST RESULTS

compliance *

Remark:

1. *We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 19;*

LTE FDD Band 19				
Modulation	Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	Average Power [dBm]
BPSK	3.75	1@0	830.1	20.81
		1@47	830.1	20.71
		1@0	839.5	20.98
		1@47	839.5	20.84
		1@0	844.9	20.99
		1@47	844.9	20.87
	15	1@0	830.1	20.87
		1@11	830.1	20.87
		12@0	830.1	21.13
		1@0	839.5	21.18
		1@11	839.5	21.01
		12@0	839.5	21.32
		1@0	844.9	21.23
		1@11	844.9	21.06
		12@0	844.9	21.32

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QPSK	3.75	1@0	830.1	20.80
		1@47	830.1	20.73
		1@0	839.5	21.01
		1@47	839.5	20.96
		1@0	844.9	21.01
		1@47	844.9	20.89
	15	1@0	830.1	21.07
		1@11	830.1	21.03
		12@0	830.1	21.05
		1@0	839.5	21.31
		1@11	839.5	21.21
		12@0	839.5	21.34
		1@0	844.9	21.36
		1@11	844.9	21.25
		12@0	844.9	21.34

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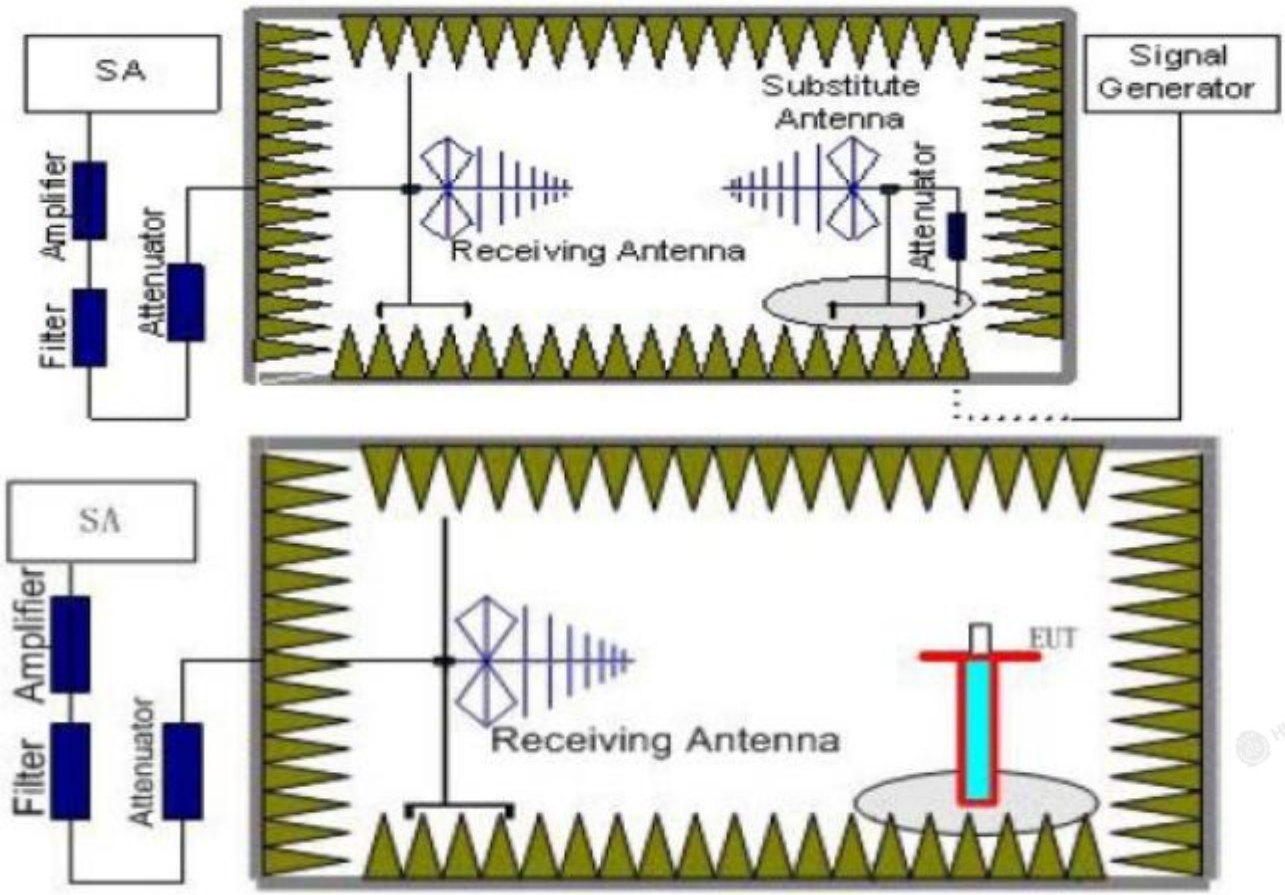
4.1.2. Radiated Output Power

LIMIT

This is the test for the maximum radiated power from the EUT.
Rule Part 22H. 913(a)(2) specifies, "Mobile/portable stations are limited to 7 watts ERP.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 0.1 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 0.1m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna.In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver.

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5. reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below: Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl}+ G_a
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=P_{Mea}- P_{cl}+ G_a
7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST RESULTS

Radiated Measurement:

Remark:

1. *We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 19; recorded worst case for each Channel Bandwidth of LTE FDD Band 19.*
2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBi)*
3. *Margin=Limit-ERP*
4. *We measured both Horizontal and Vertical direction, recorded worst case direction.*

LTE FDDBand 19-3.75KHz-BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
830.1	-19.38	2.42	8.45	36.82	23.47	21.32	38.45	17.13	V
839.5	-17.74	3.46	8.45	36.82	24.07	21.92	38.45	16.53	V
844.9	-18.26	2.53	8.36	36.82	24.39	22.24	38.45	16.21	V

LTE FDDBand 19-15KHz-BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
830.1	-19.46	2.42	8.45	36.82	23.39	21.24	38.45	17.21	V
839.5	-16.71	3.46	8.45	36.82	25.1	22.95	38.45	15.5	V
844.9	-17.98	2.53	8.36	36.82	24.67	22.52	38.45	15.93	V

LTE FDDBand 19-3.75KHz-QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
830.1	-18.75	2.42	8.45	36.82	24.1	21.95	38.45	16.5	V
839.5	-17.86	3.46	8.45	36.82	23.95	21.8	38.45	16.65	V
844.9	-18.15	2.53	8.36	36.82	24.5	22.35	38.45	16.1	V

LTE FDDBand 19-15KHz-QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
830.1	-16.15	2.42	8.45	36.82	26.7	24.55	38.45	13.9	V
839.5	-17.99	3.46	8.45	36.82	23.82	21.67	38.45	16.78	V
844.9	-20.06	2.53	8.36	36.82	22.59	20.44	38.45	18.01	V

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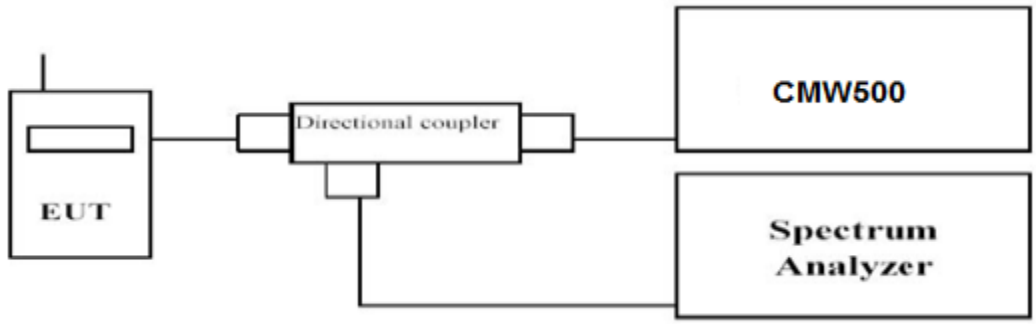
4.2 Peak-to-Average Ratio (PAR)

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 measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 19; recorded worst case for each Channel Bandwidth of LTE FDD Band 19.*

LTE FDD Band 19				
Frequency (MHz)	Sub-carrier spacing (KHz)	Tones	Modulation PAPR (dB)	
			BPSK	QPSK
839.5	3.75	1@0	2.78	3.09
		1@47	3.30	3.03
839.5	15	1@0	4.39	6.15
		1@11	4.46	5.58

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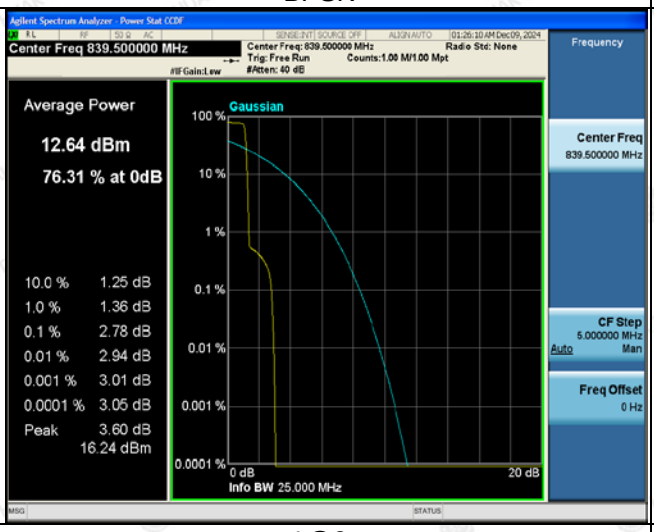
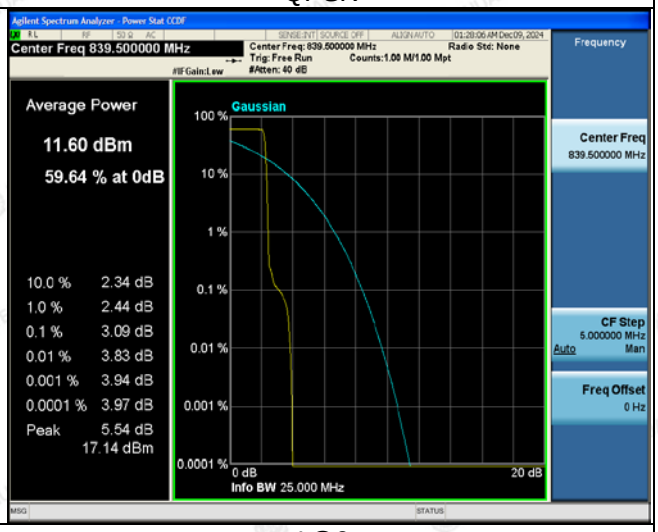
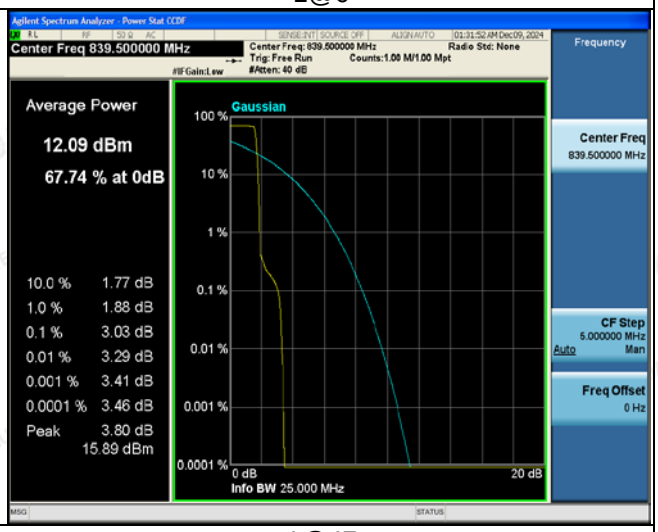
LTE FDD Band 19-3.75KHz	
BPSK	QPSK
	
1@0	1@0
	
1@47	1@47

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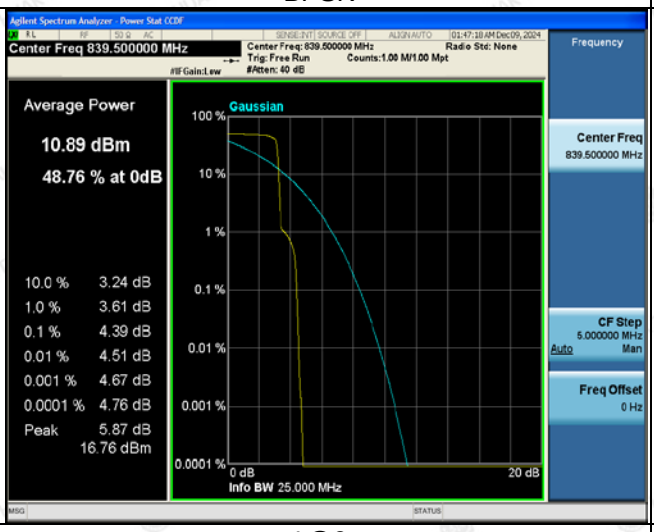
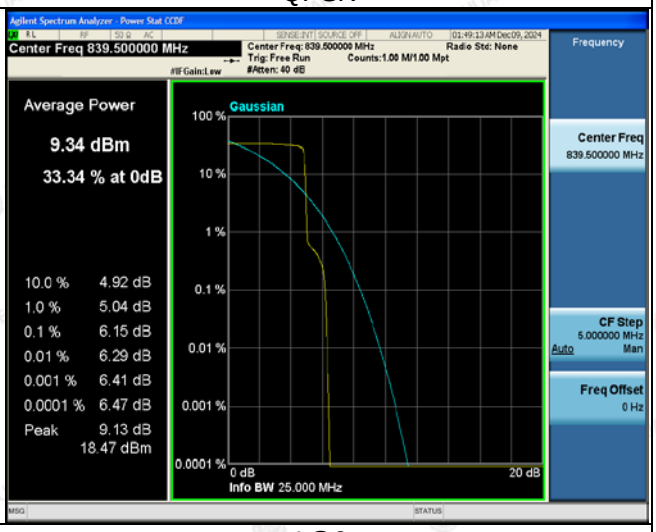
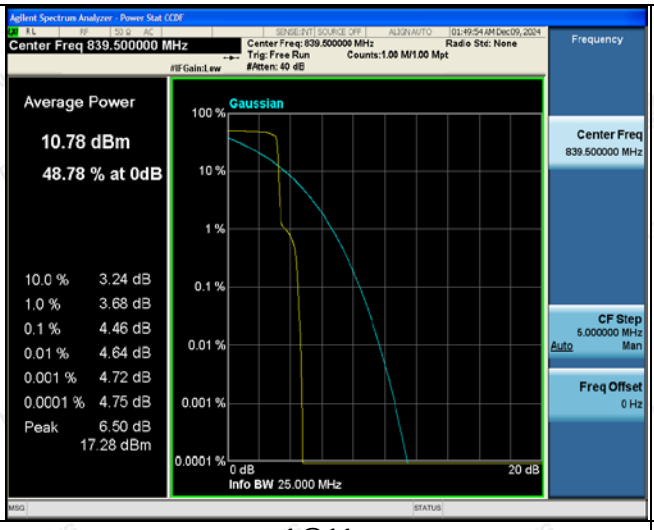
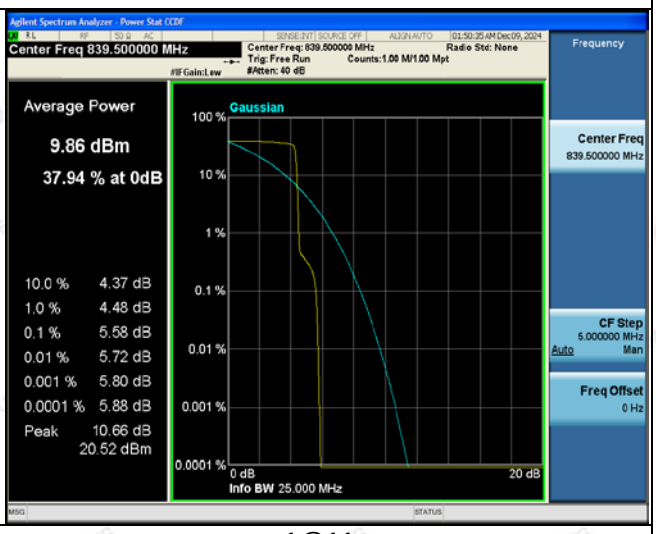
LTE FDD Band 19-15KHz	
BPSK	*QPSK*
	
1@0	1@0
	
1@11	1@11

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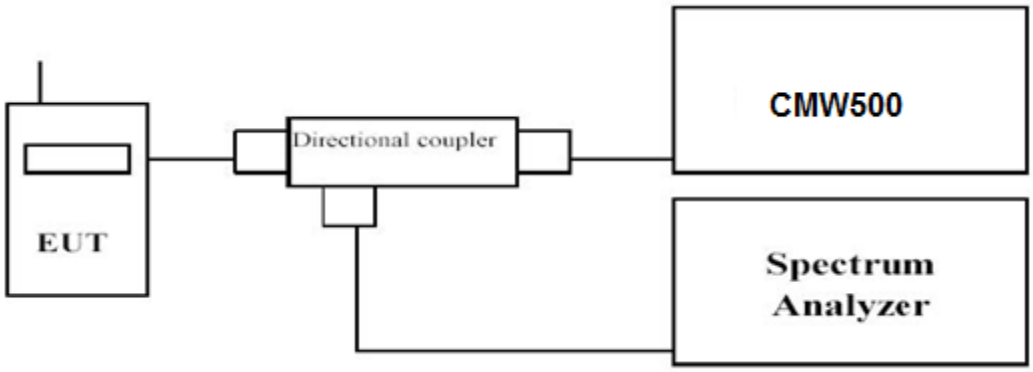
4.3 Occupied Bandwidth and Emission Bandwidth

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 RBWwas 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 isthe 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 19; recorded worst case for each Channel Bandwidth of LTE FDD Band 19.*

LTE FDD Band 19						
Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	-26dBc Emission bandwidth (KHz)		99% Occupied bandwidth (KHz)	
			BPSK	QPSK	BPSK	QPSK
3.75	1@0	830.1	51.36	50.67	68.813	80.515
	1@0	839.5	51.21	49.71	68.793	79.949
	1@0	844.9	48.20	49.46	68.733	80.894
15	1@0	830.1	105.5	117.1	125.33	121.18
	1@0	839.5	106.6	129.3	128.47	122.40
	1@0	844.9	106.1	115.4	125.34	121.88
	12@0	830.1	237.2	252.2	185.47	185.81
	12@0	839.5	249.6	237.9	184.48	186.27
	12@0	844.9	249.4	251.0	187.96	191.63

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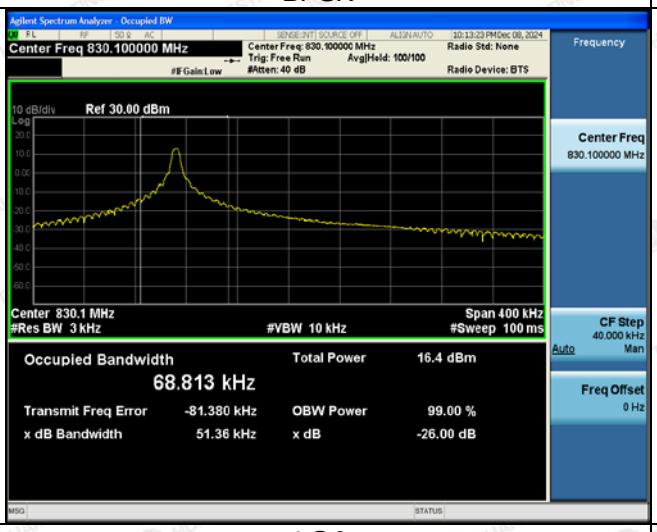
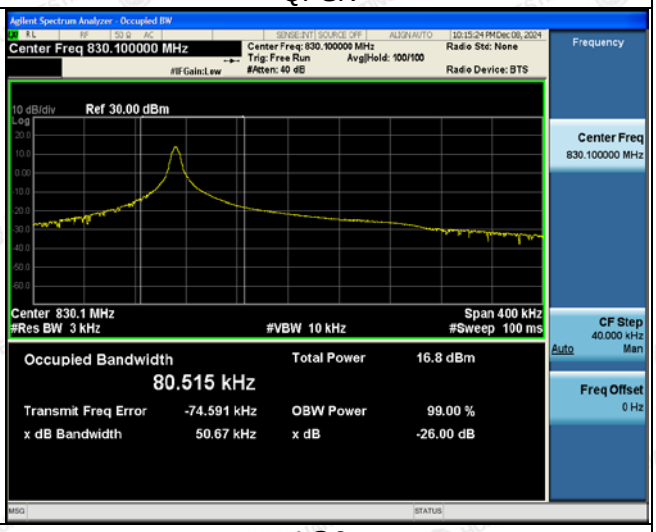
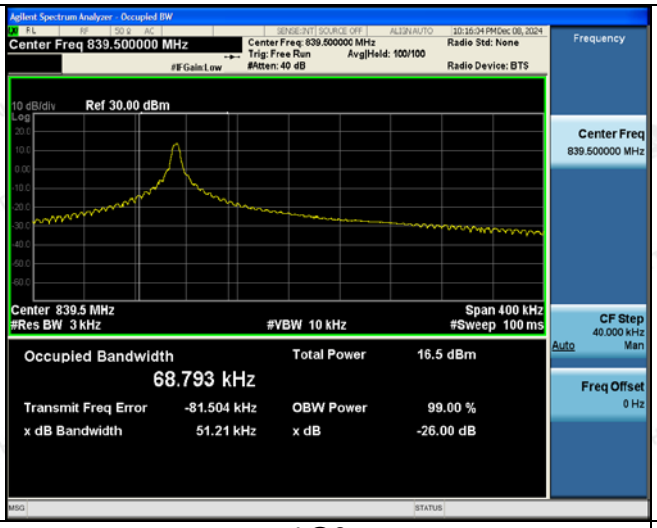
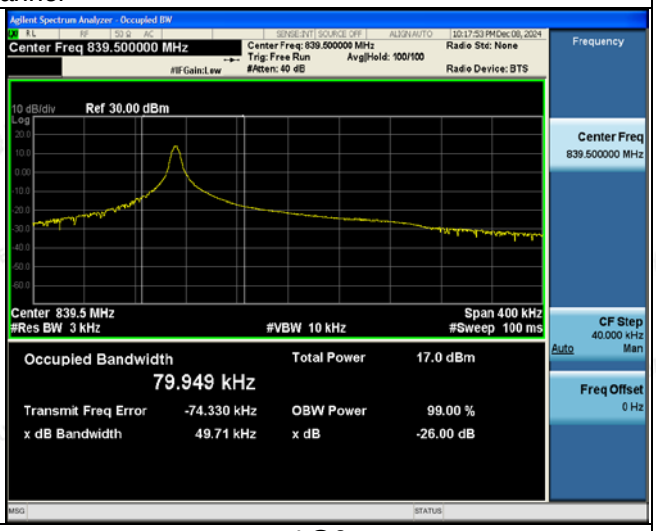
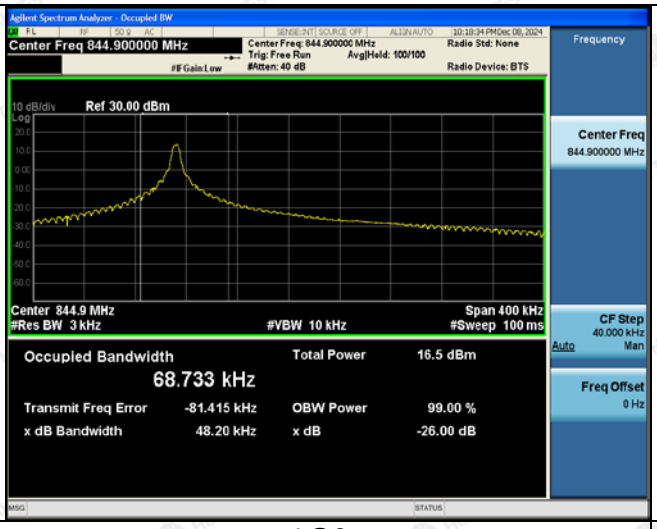
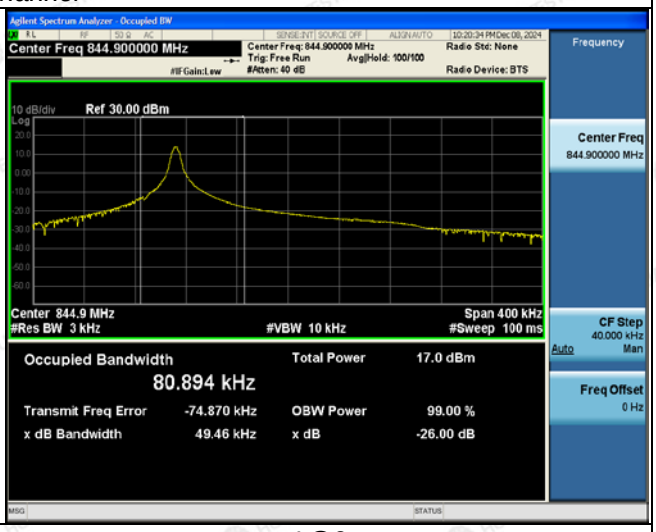
LTE FDD Band 19-3.75KHz	
BPSK	QPSK
	
1@0	1@0
Low Channel	
	
1@0	1@0
Middle Channel	
	
1@0	1@0
High Channel	

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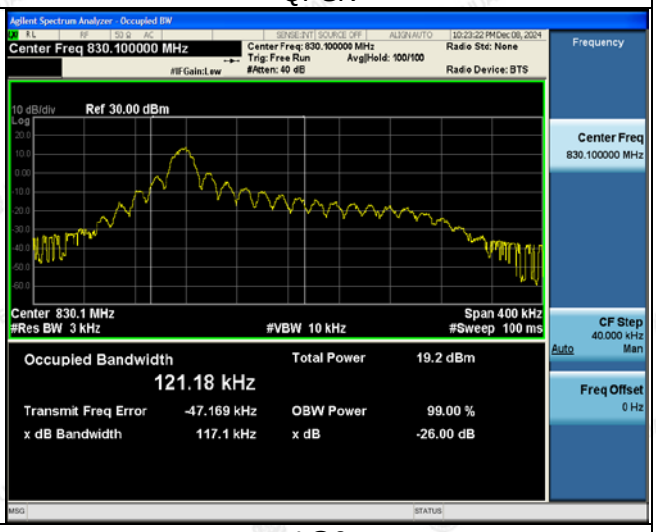
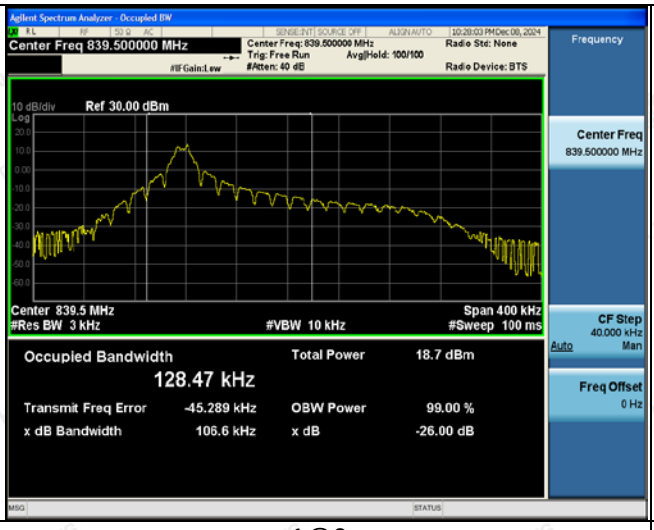
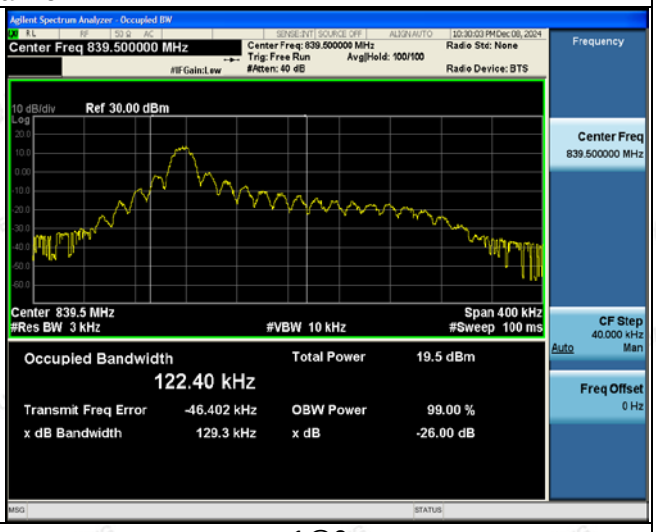
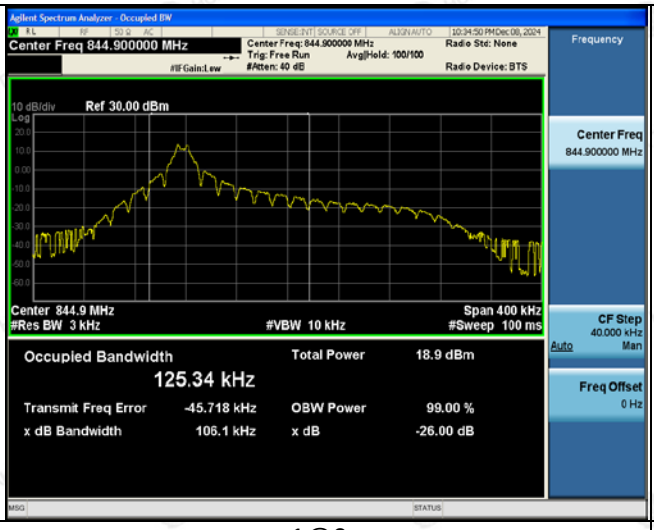
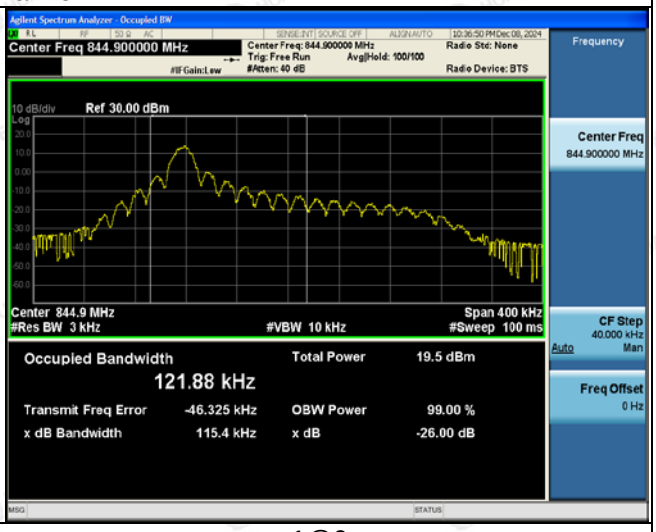
LTE FDD Band 19-15KHz	
BPSK	QPSK
	
1@0	1@0
Low Channel	
	
1@0	1@0
Middle Channel	
	
1@0	1@0
High Channel	

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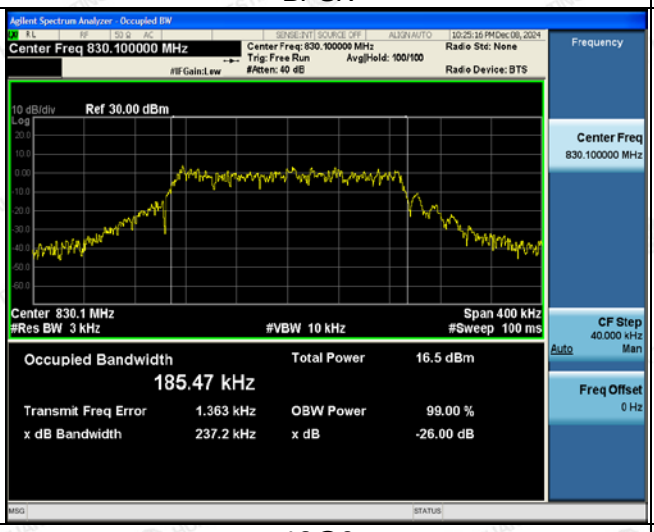
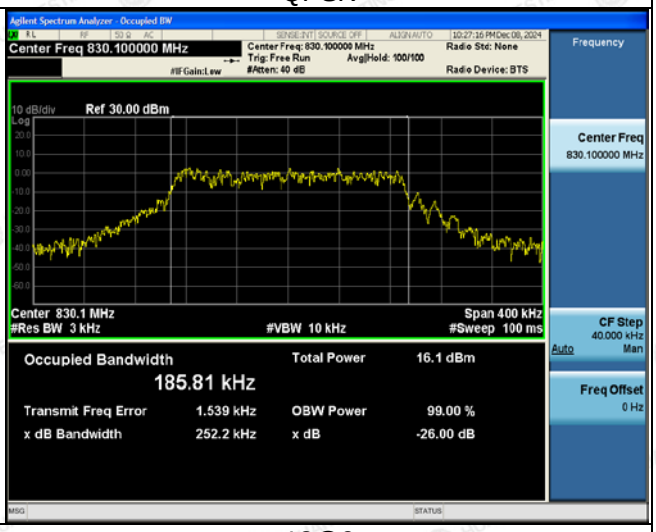
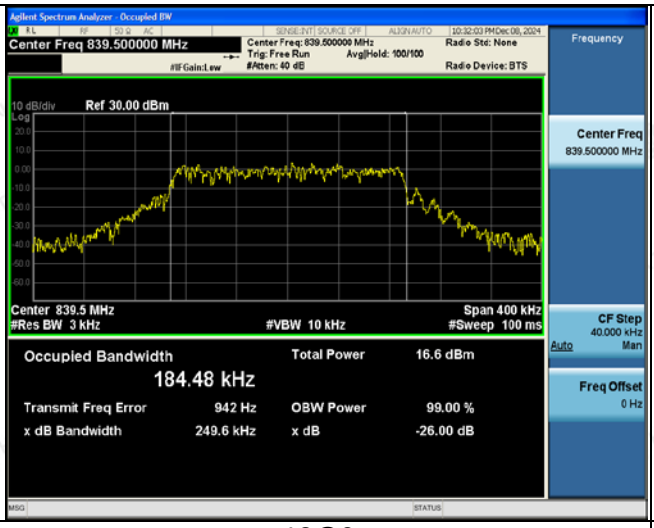
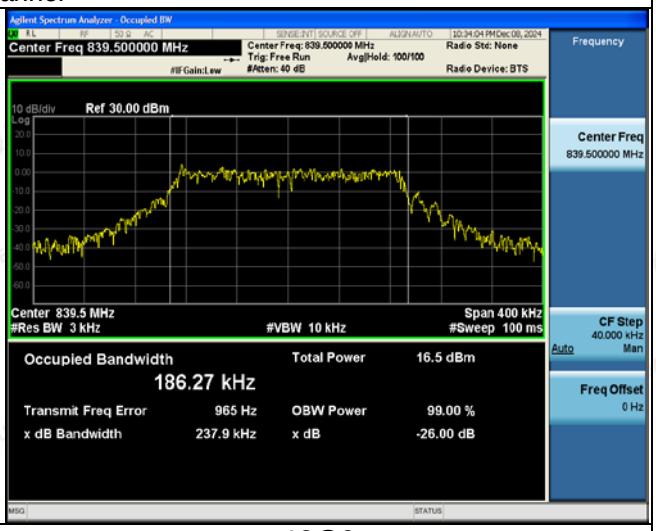
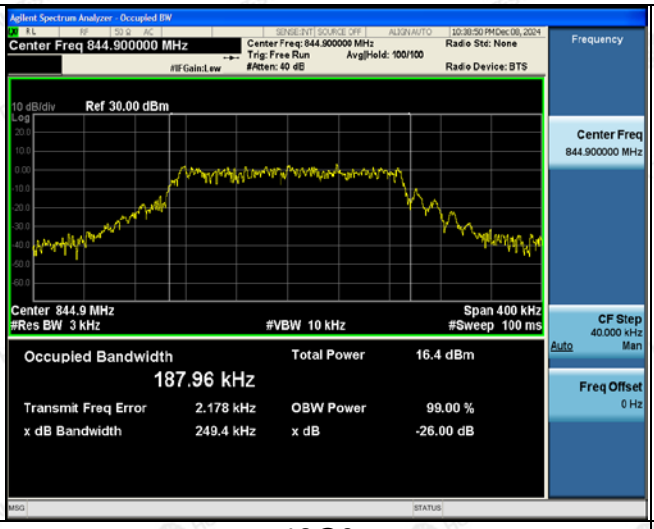
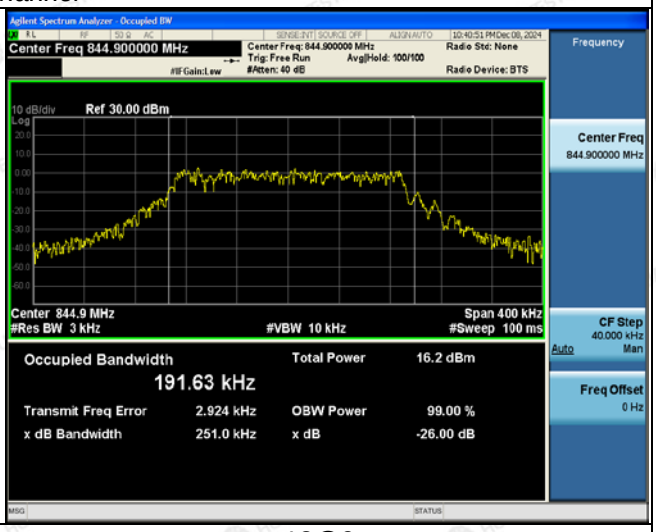
LTE FDD Band 19-15KHz	
BPSK	QPSK
	
12@0	12@0
Low Channel	
	
12@0	12@0
Middle Channel	
	
12@0	12@0
High Channel	

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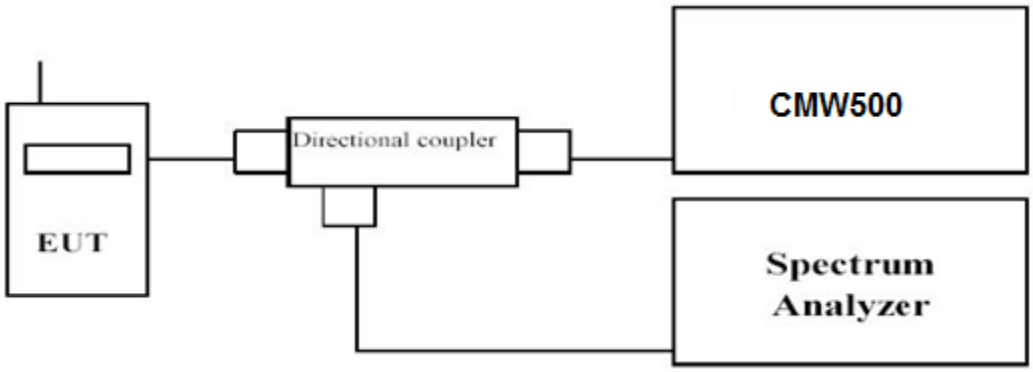
4.4 Band Edge Compliance

LIMIT

Per FCC §22.917 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 + 10log(P) dB.

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 lowestand 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 19; recorded worst case for each Channel Bandwidth of LTE FDD Band 19.*

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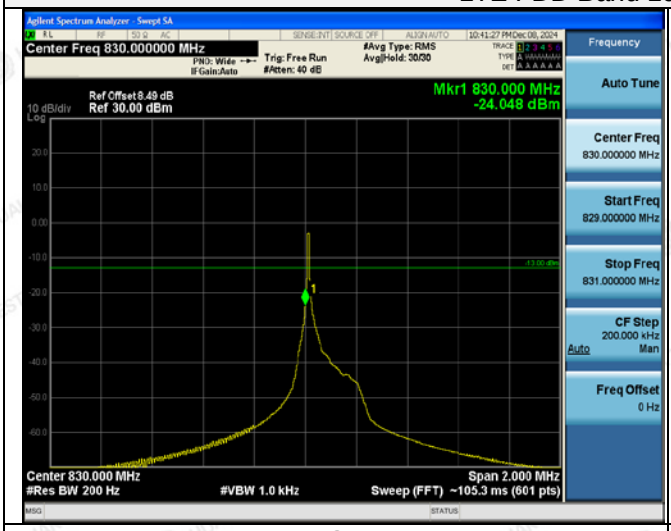
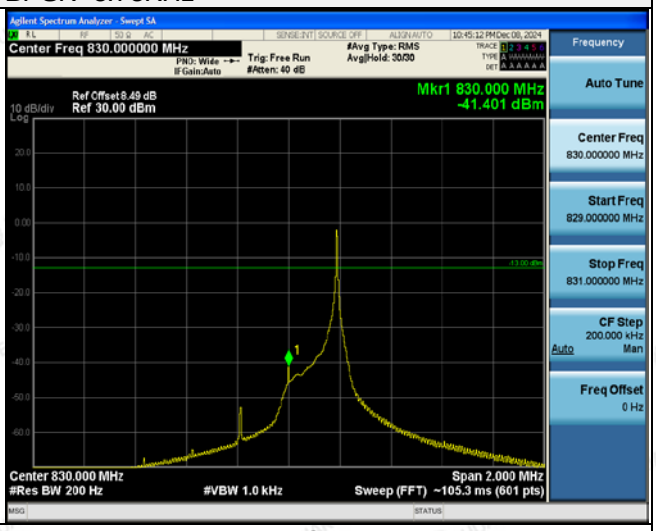
LTE FDD Band 19-BPSK- 3.75KHz

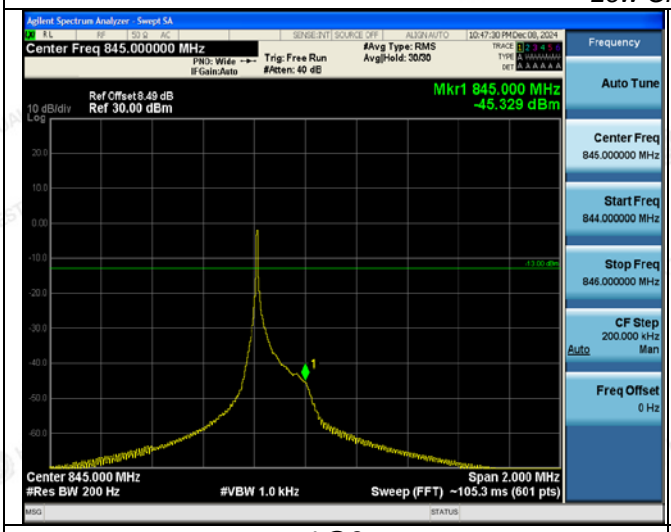


1@0

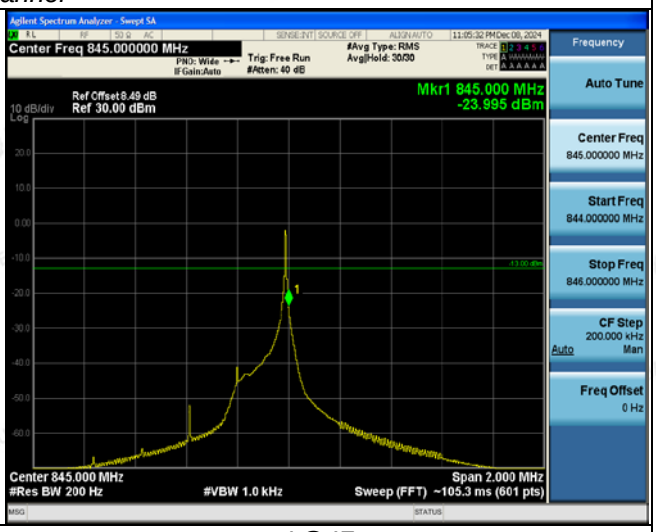


1@47

Low Channel



1@0



1@47

High Channel

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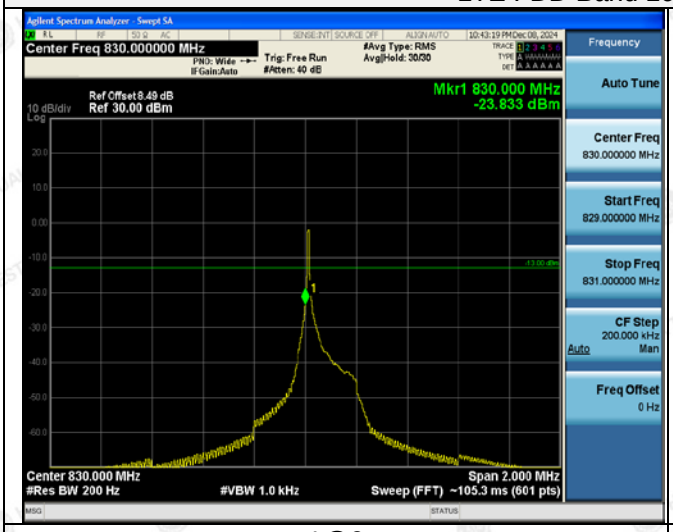
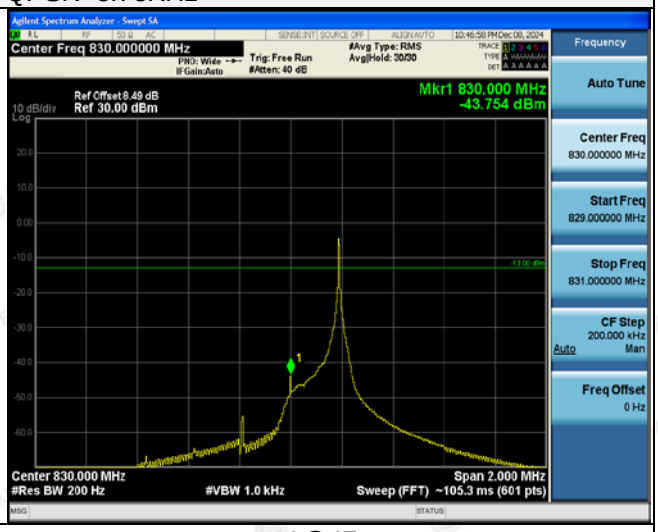
LTE FDD Band 19-QPSK- 3.75KHz

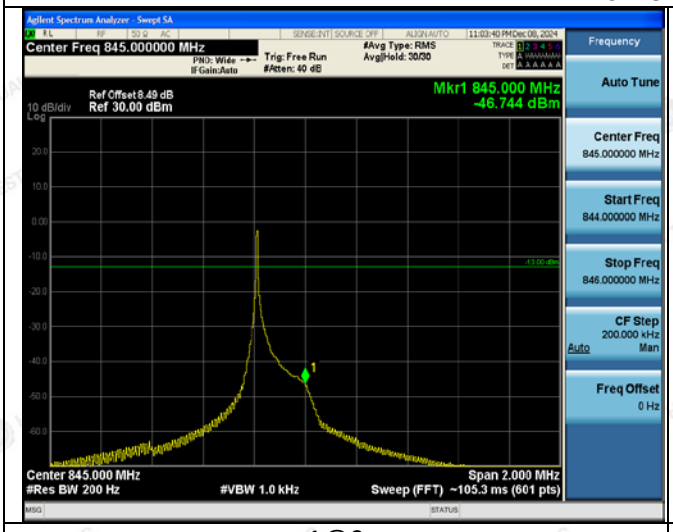


1@0

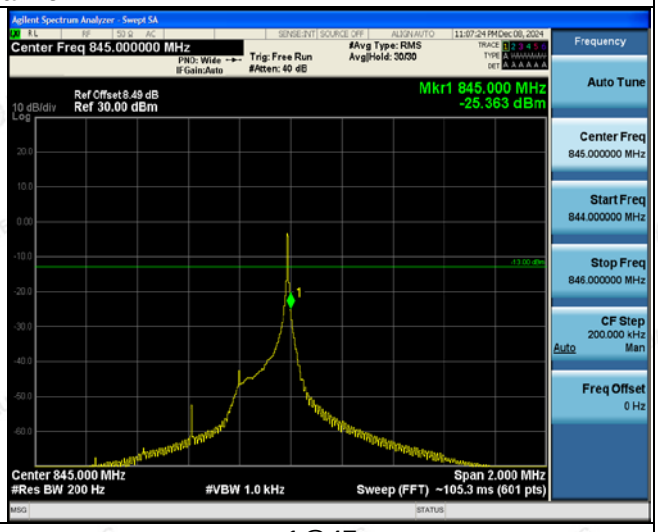


1@47

Low Channel



1@0



1@47

High Channel

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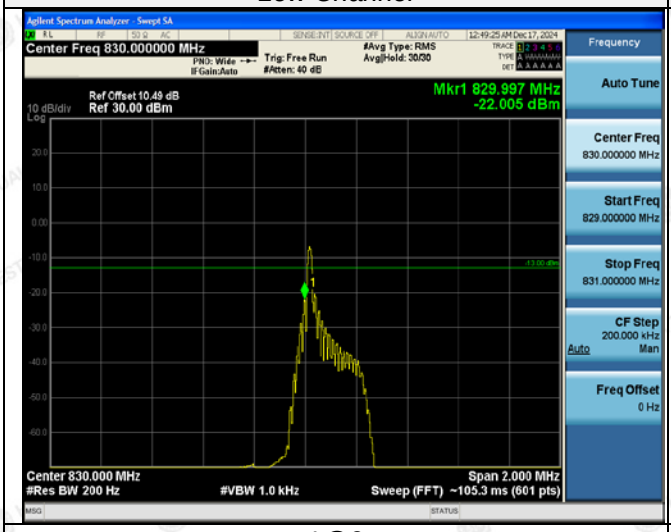
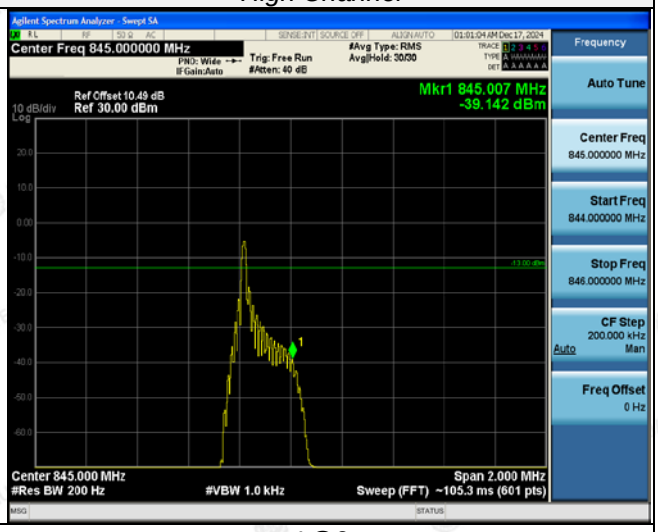
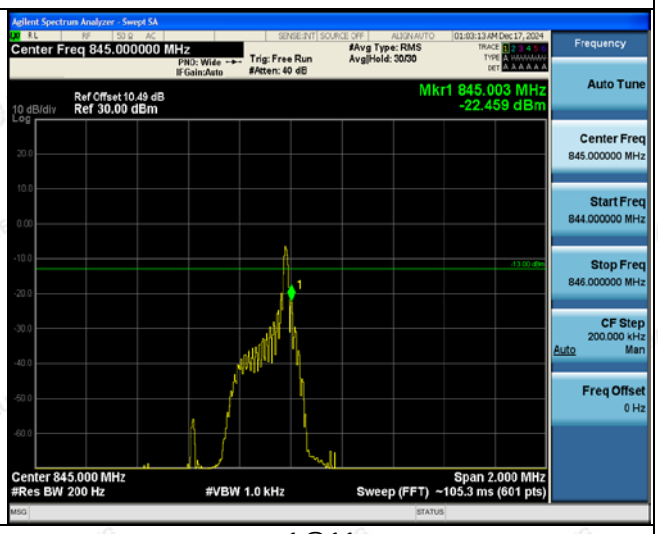
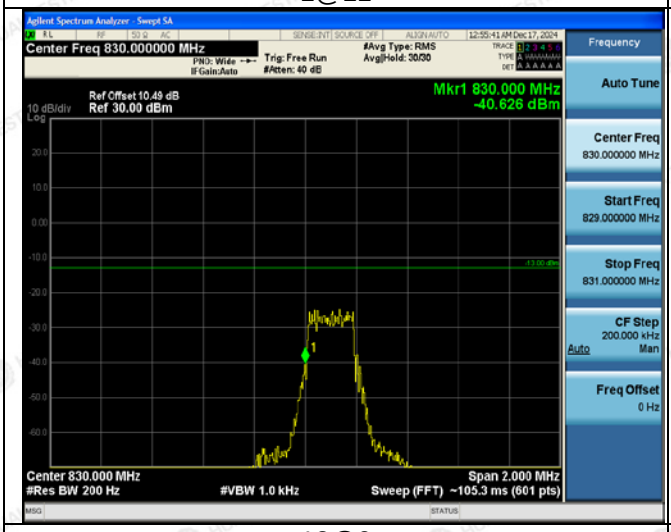
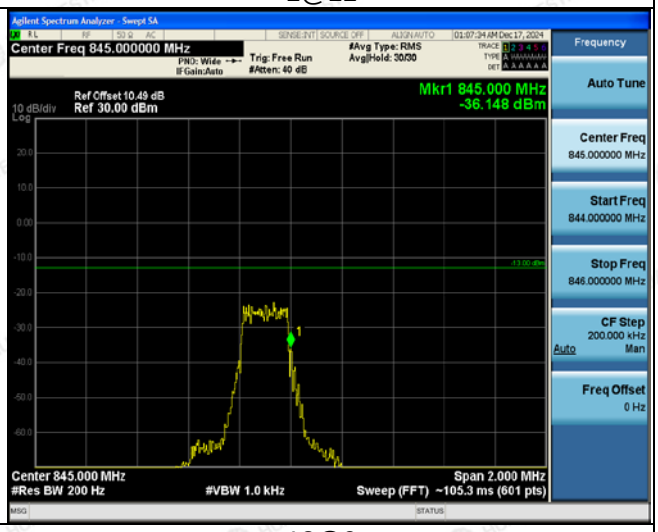
LTE FDD Band 19-BPSK- 15KHz	
Low Channel	High Channel
	
1@0	1@0
	
1@11	1@11
	
12@0	12@0

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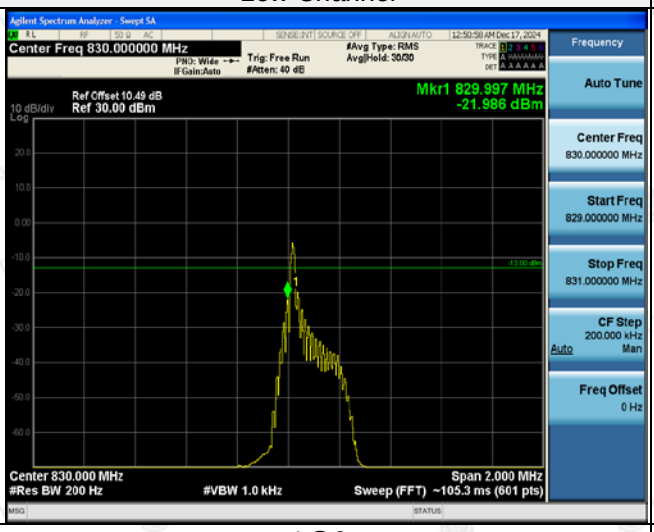
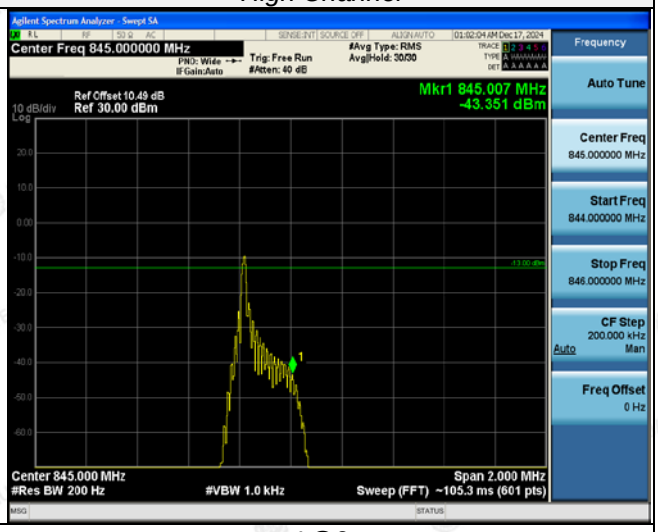
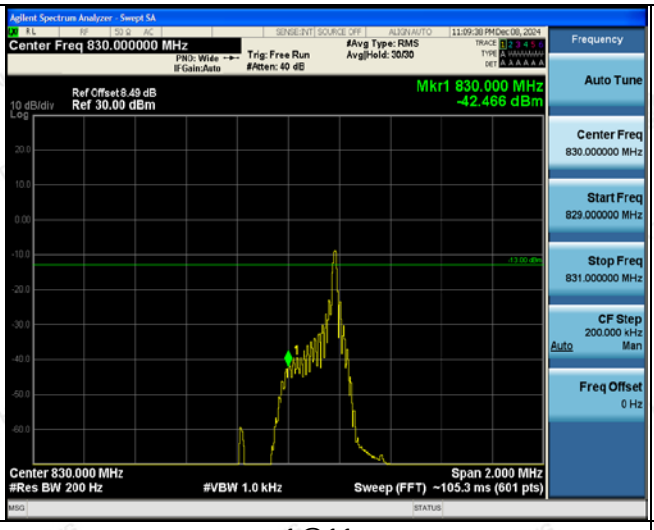
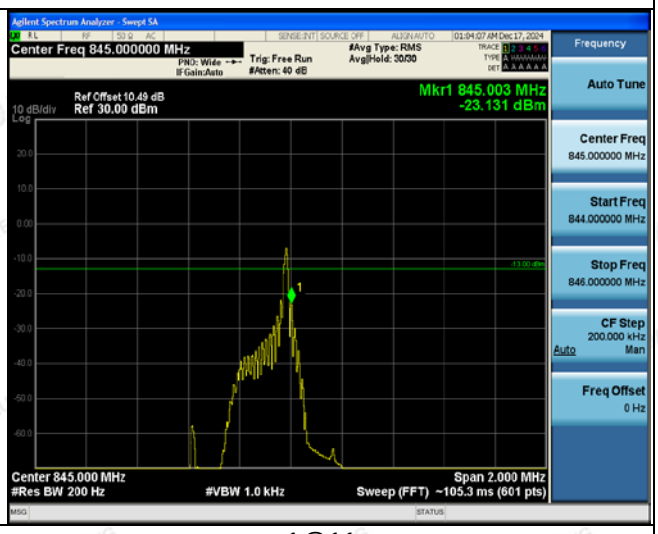
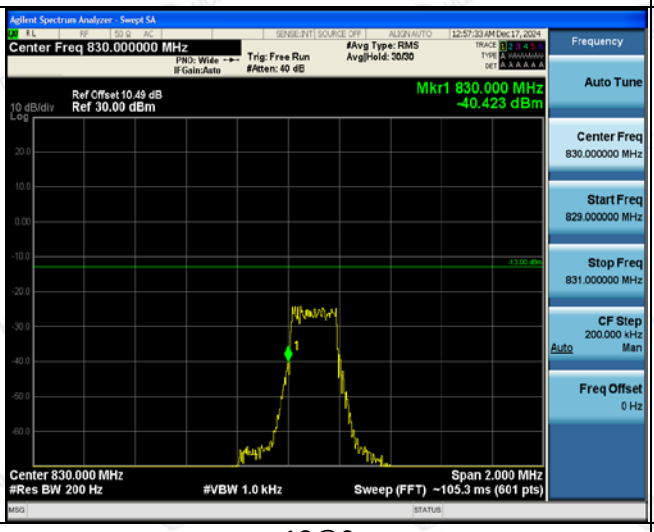
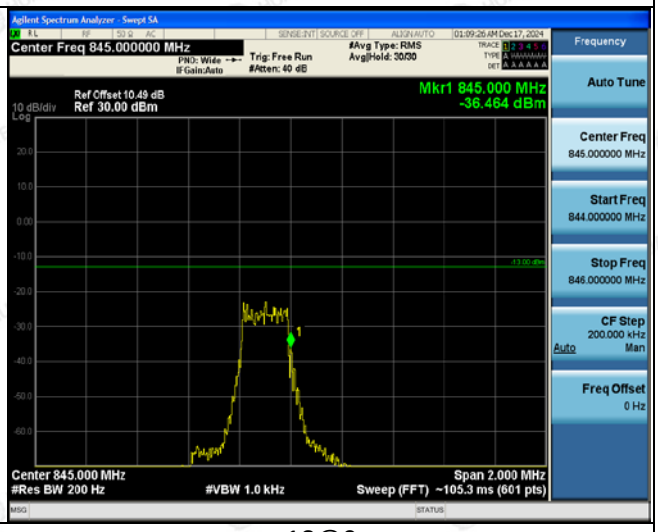
LTE FDD Band 19-QPSK- 15KHz	
Low Channel	High Channel
	
1@0	1@0
	
1@11	1@11
	
12@0	12@0

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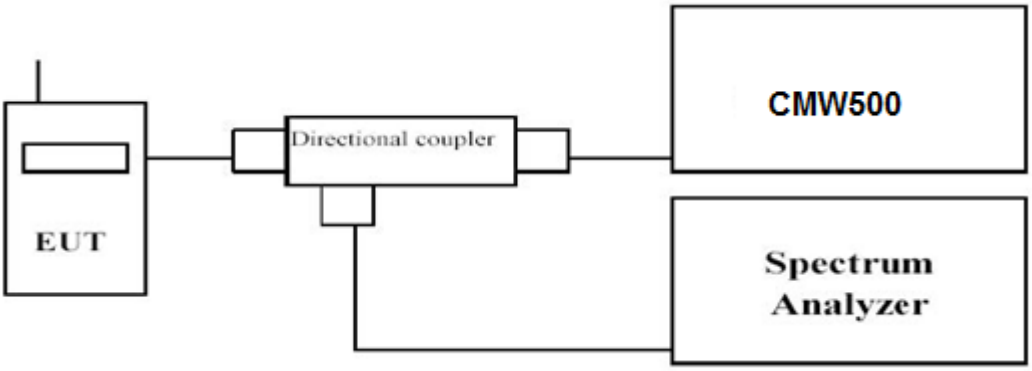
4.5 Spurious Emssionon Antenna Port

LIMIT

Per FCC §22.917, 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 + 10log(P) dB.

TEST CONFIGURATION



TEST PROCEDURE

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

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 andCMW500 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 setsufficient 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.

Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 19	0.01~20	1 MHz	3 MHz	Auto

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 19; recorded worst case at the QPSK Mode for each Channel Bandwidth of LTE FDD Band 19.*

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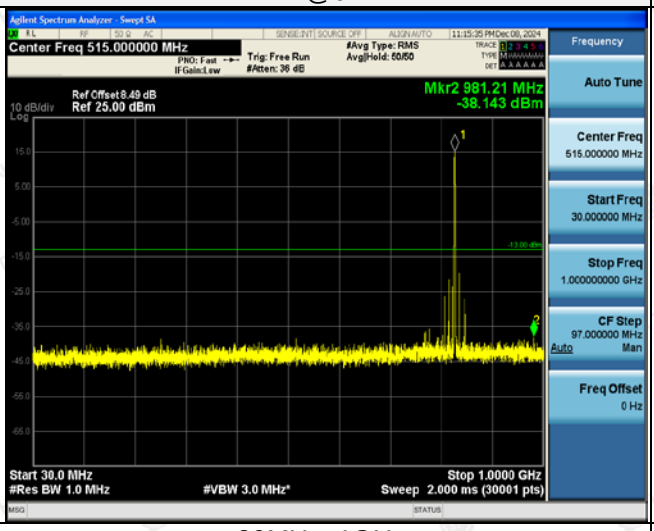
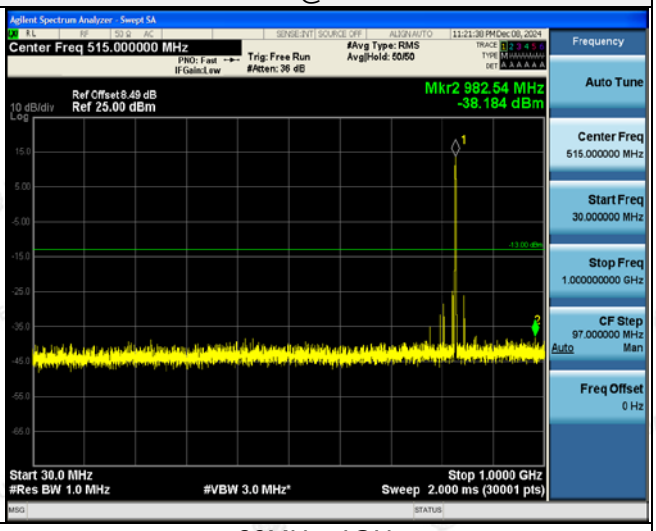
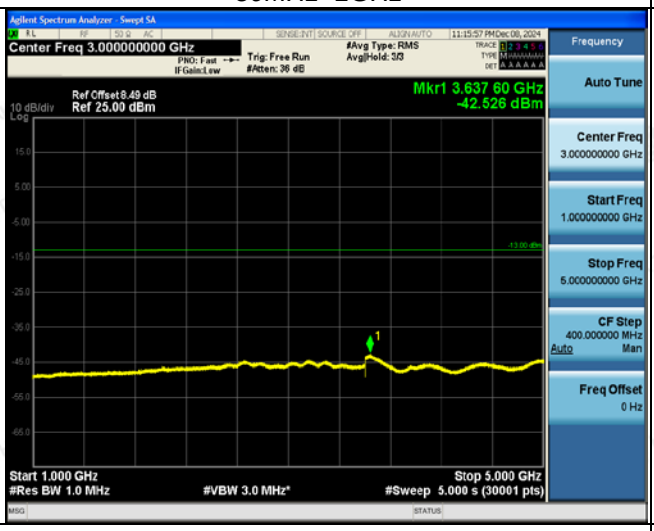
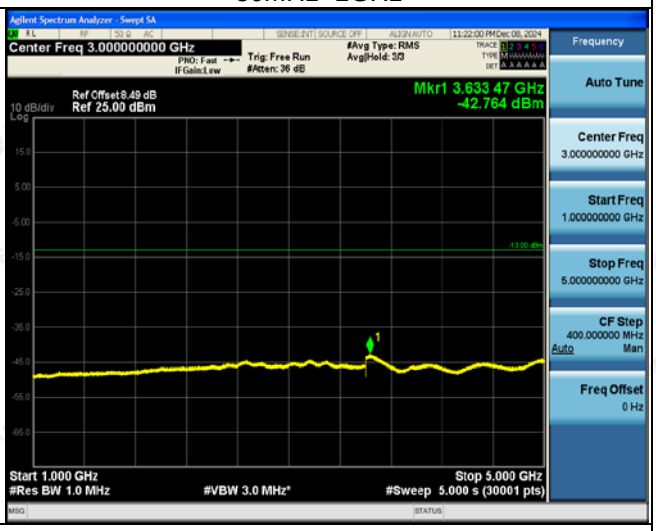
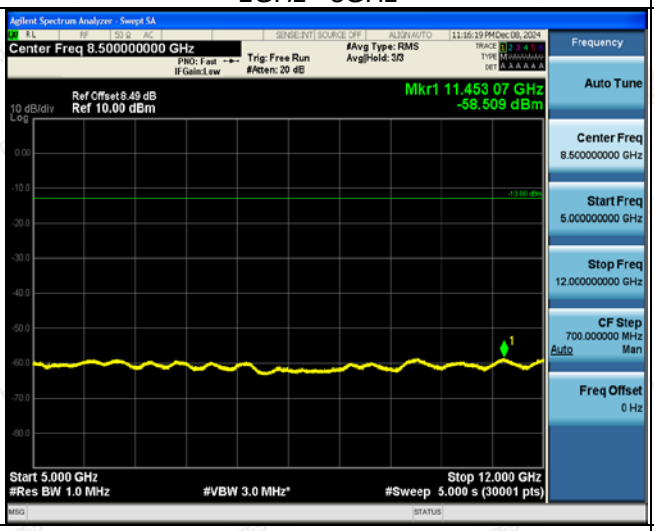
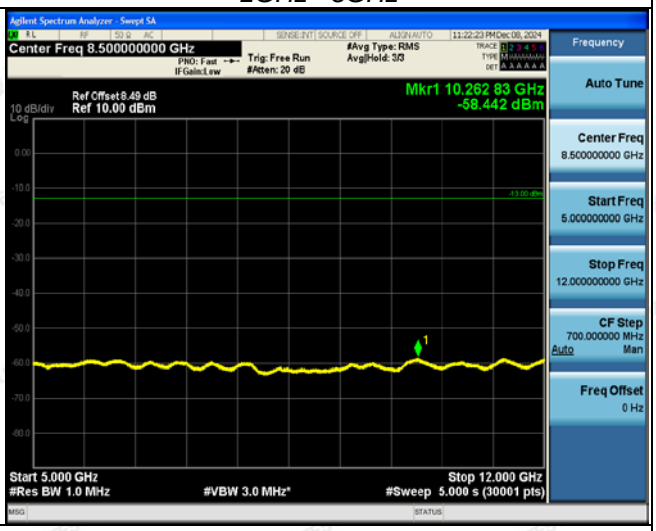
LTE FDD Band 19-QPSK-3.75KHz	
Low Channel	
1@0	1@47
	
30MHz~1GHz	30MHz~1GHz
	
1GHz ~5GHz	1GHz ~5GHz
	
5GHz ~12GHz	5GHz ~12GHz

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12GHz ~26.5GHz

12GHz ~26.5GHz

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