FCC Test Report
FCC Part 27

Report Reference No.....:	HK2302270554-13E
FCC ID.....:	2A2FCBT4101
Compiled by (position+printed name+signature)..:	File administrators Gary Qian
Supervised by (position+printed name+signature)..:	Technique principal Eden Hu
Approved by (position+printed name+signature)..:	Manager Jason Zhou
Date of issue.....:	Apr. 28, 2023
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.....:	**PowUnity GmbH**
Address .....:	Feldstrasse 9d Innsbruck, 6020 Austria
Test specification .....**:**	
Standard .....:	**FCC CFR Title 47 Part 2, Part 27**
TRF Originator.....:	Shenzhen HUAK Testing Technology Co., Ltd.

Test item description .....:	GPS Tracker
Trade Mark .....:	BikeTrax
Manufacturer.....:	**PowUnity GmbH**
Model/Type reference.....:	BT41-01
Series Models .....:	T4101-03-04
Modulation Type.....:	BPSK, QPSK
Rating .....:	DC 3.7V from battery
Hardware version .....:	V2.2
Software version .....:	V2.2
Result.....:	**PASS**

TEST REPORT

Test Report No. :	HK2302270554-13E	Apr. 28, 2023 Date of issue

Equipment under Test	:	GPS Tracker
Model /Type	:	BT41-01
Series Models	:	T4101-03-04
Applicant	:	**PowUnity GmbH**
Address	:	Feldstrasse 9d Innsbruck, 6020 Austria
Manufacturer	:	**PowUnity GmbH**
Address	:	Feldstrasse 9d Innsbruck, 6020 Austria

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.

Contents

** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Apr. 28, 2023	Jason Zhou

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Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

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: v02r02 MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS.

1.2 Test Description

Test Item	Section in CFR 47	Result
RF Output Power	Part 2.1046 Part 27.50(d)(4)	Pass
Peak-to-Average Ratio	Part 27.50(d)(4)	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 27.53(h)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 27.53(h)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 27.53(h)	Pass
Out of band emission, Band Edge	Part 2.1051 Part 27.53(h)	Pass
Frequency stability	Part 2.1055 Part 27.54	Pass

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.is reported:

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.

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.

2.3 Test frequency list

TX Channel Bandwidth	Frequency (MHz)	channel
3.75KHz	1710.1	19951
	1732.5	20175
	1754.9	20399
15KHz	1710.1	19951
	1732.5	20175
	1754.9	20399

2.4 Equipments Used During The Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	ENV216	R&S	HKE-059	2023/02/17	2024/02/16
LISN	R&S	ENV216	HKE-002	2023/02/17	2024/02/16
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	2023/02/17	2024/02/16
Receiver	R&S	ESR-7	HKE-010	2023/02/17	2024/02/16
Spectrum analyzer	Agilent	N9020A	HKE-048	2023/02/17	2024/02/16
RF automatic control unit	Tonscend	JS0806-2	HKE-060	2023/02/17	2024/02/16
Horn antenna	Schwarzbeck	9120D	HKE-013	2023/02/17	2024/02/16
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	2023/02/17	2024/02/16
Preamplifier	EMCI	EMC051845SE	HKE-015	2023/02/17	2024/02/16
Preamplifier	Agilent	83051A	HKE-016	2023/02/17	2024/02/16
Temperature and humidity meter	Boyang	HTC-1	HKE-075	2023/02/17	2024/02/16
High pass filter unit	Tonscend	JS0806-F	HKE-055	2023/02/17	2024/02/16
RF cable	Times	1-40G	HKE-034	2023/02/17	2024/02/16
Power meter	Agilent	E4419B	HKE-085	2023/02/17	2024/02/16
Power Sensor	Agilent	E9300A	HKE-086	2023/02/17	2024/02/16
Wireless Communication Test Set	R&S	CMU200	HKE-026	2023/02/17	2024/02/16
High gain antenna	Schwarzbeck	LB-180400KF	HKE-054	2023/02/17	2024/02/16
Horn antenna	Schwarzbeck	9120D	HKE-135	2023/02/17	2024/02/16
High gain antenna	Schwarzbeck	LB-180400KF	HKE-128	2023/02/17	2024/02/16
Broadband antenna	Schwarzbeck	VULB 9163	HKE-087	2023/02/17	2024/02/16
Signal generator	Agilent	E4433B	HKE-120	2023/02/17	2024/02/16
Signal generator	Agilent	E4421B	HKE-121	2023/02/17	2024/02/16

2.5 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2A2FCBT4101 filing to comply with of the FCC Part 27 Rules.

2.6 Modifications

No modifications were implemented to meet testing criteria.

3 Test Conditions and Results

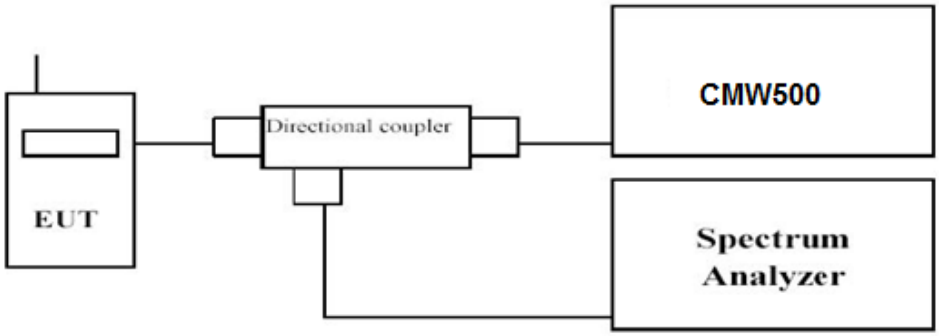
3.1 Output Power

LIMIT

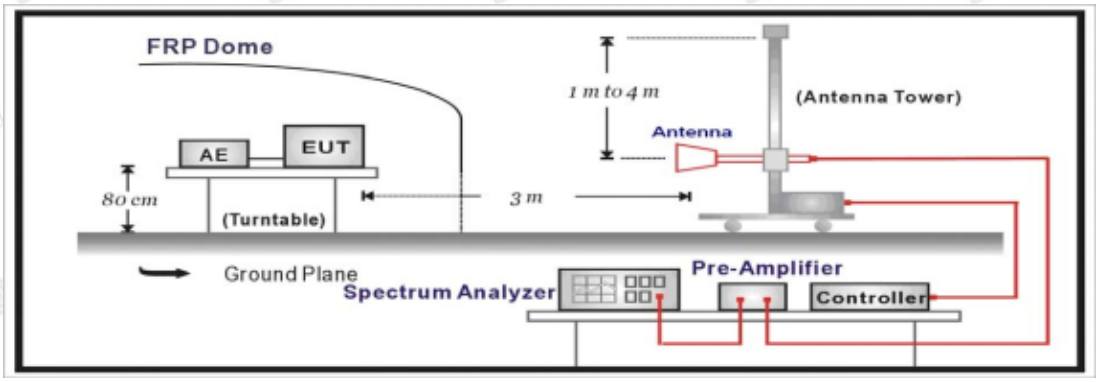
According to §27.50 (d) (4): Fixed, mobile, and portable (hand- held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.

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.

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 4				
Modulation	Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	Average Power [dBm]
BPSK	3.75	1@0	1710.1	21.69
		1@47	1710.1	21.49
		1@0	1732.5	20.78
		1@47	1732.5	20.76
		1@0	1754.9	21.07
		1@47	1754.9	20.97
	15	1@0	1710.1	21.65
		1@11	1710.1	21.48
		12@0	1710.1	21.31
		1@0	1732.5	20.79
		1@11	1732.5	20.77
		12@0	1732.5	20.89
		1@0	1754.9	20.89
		1@11	1754.9	20.83
		12@0	1754.9	21.15
QPSK	3.75	1@0	1710.1	21.48
		1@47	1710.1	21.51
		1@0	1732.5	20.88
		1@47	1732.5	20.73
		1@0	1754.9	21.13
		1@47	1754.9	20.82
	15	1@0	1710.1	21.44
		1@11	1710.1	21.46
		12@0	1710.1	21.34
		1@0	1732.5	21.05
		1@11	1732.5	20.80
		12@0	1732.5	20.84
		1@0	1754.9	21.05
		1@11	1754.9	21.05
		12@0	1754.9	21.15

Radiated Measurement

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*
2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBi)*

LTE FDD Band 4-3.75KHz-BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-16.39	3.06	9.68	34.80	25.03	30.00	4.97	V
1732.5	-17.12	3.17	9.68	34.80	24.19	30.00	5.81	V
1754.9	-15.95	3.22	9.75	34.80	25.38	30.00	4.62	V

LTE FDD Band 4-15KHz-BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-15.88	3.06	9.68	34.80	25.54	30.00	4.46	V
1732.5	-15.25	3.17	9.68	34.80	26.06	30.00	3.94	V
1754.9	-15.77	3.22	9.75	34.80	25.56	30.00	4.44	V

LTE FDD Band 4-3.75KHz-QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-16.03	3.06	9.68	34.80	25.39	30.00	4.61	V
1732.5	-16.24	3.17	9.68	34.80	25.07	30.00	4.93	V
1754.9	-14.56	3.22	9.75	34.80	26.77	30.00	3.23	V

LTE FDD Band 4-15KHz-QPSK

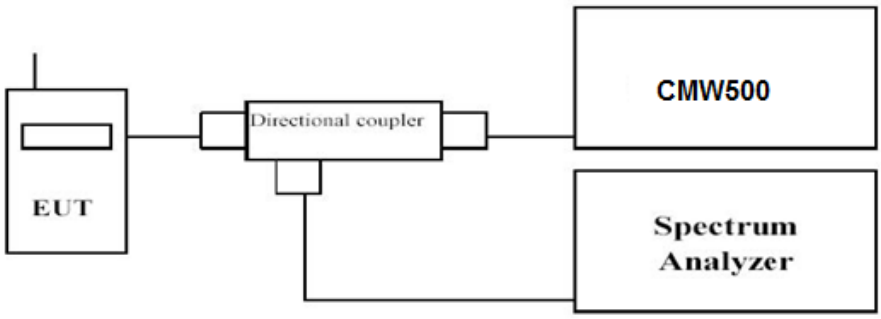
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-14.56	3.06	9.68	34.80	26.86	30.00	3.14	V
1732.5	-16.26	3.17	9.68	34.80	25.05	30.00	4.95	V
1754.9	-16.39	3.22	9.75	34.80	24.94	30.00	5.06	V

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

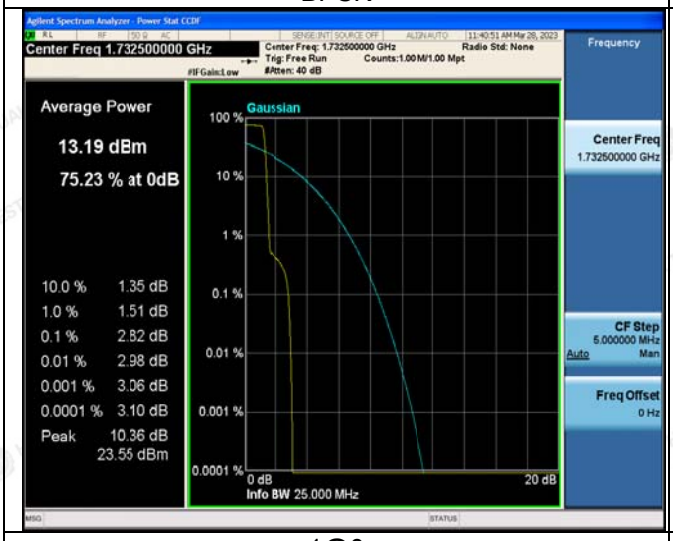
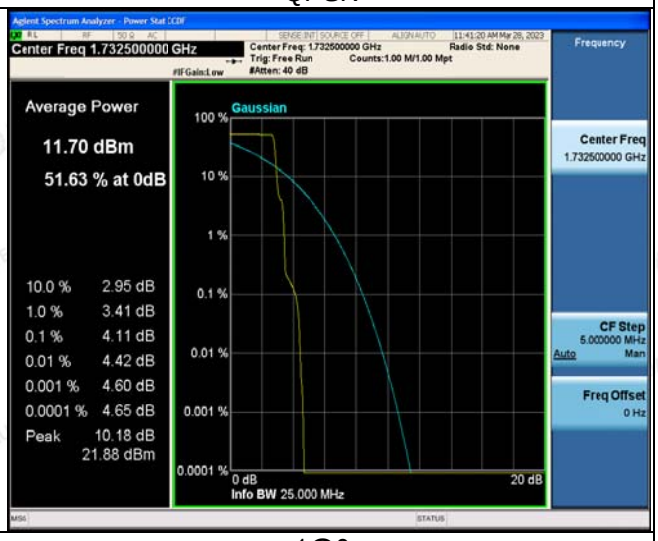
1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as 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%.

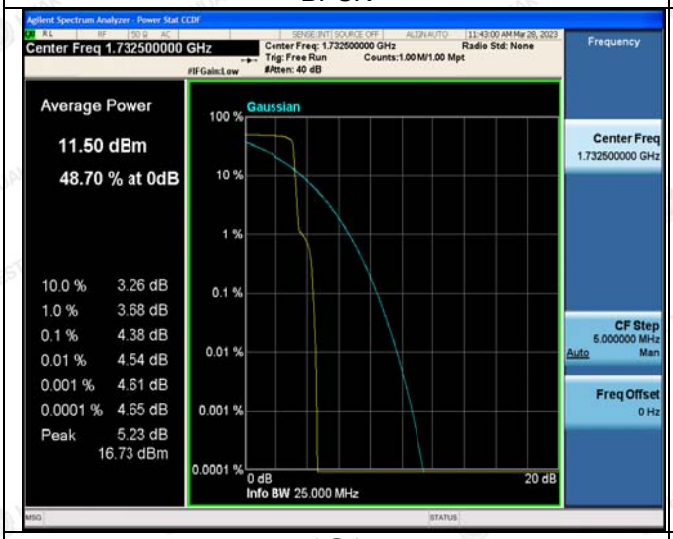
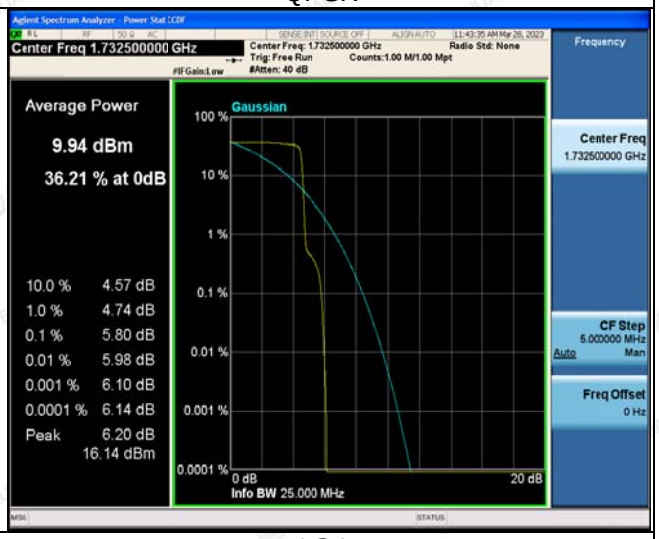
TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.

LTE FDD Band 4				
Frequency (MHz)	Sub-carrier spacing (KHz)	Tones	Modulation PAPR (dB)	
			BPSK	QPSK
1732.5	3.75	1@0	2.82	4.11
		1@47	2.54	3.74
1732.5	15	1@0	4.38	5.8
		1@11	5.21	6.74

LTE FDD Band 4-3.75KHz	
BPSK	*QPSK*
	
1@0	1@0
	
1@47	1@47

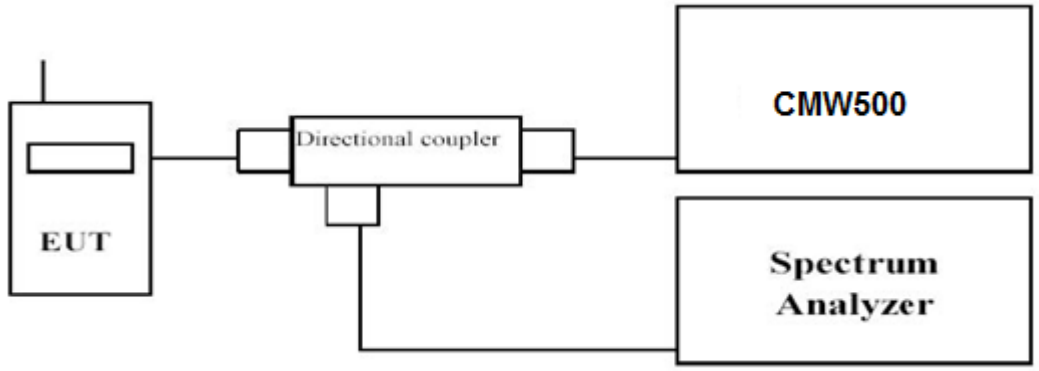
LTE FDD Band 4-15KHz	
BPSK	*QPSK*
	
1@0	1@0
	
1@11	1@11

3.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

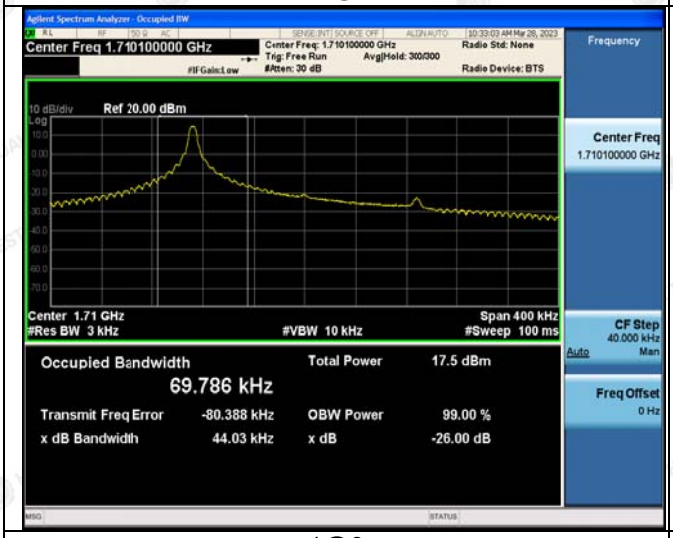
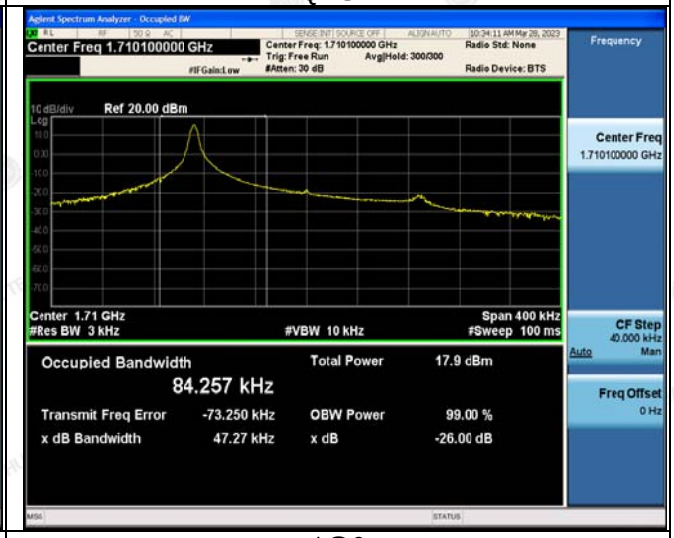
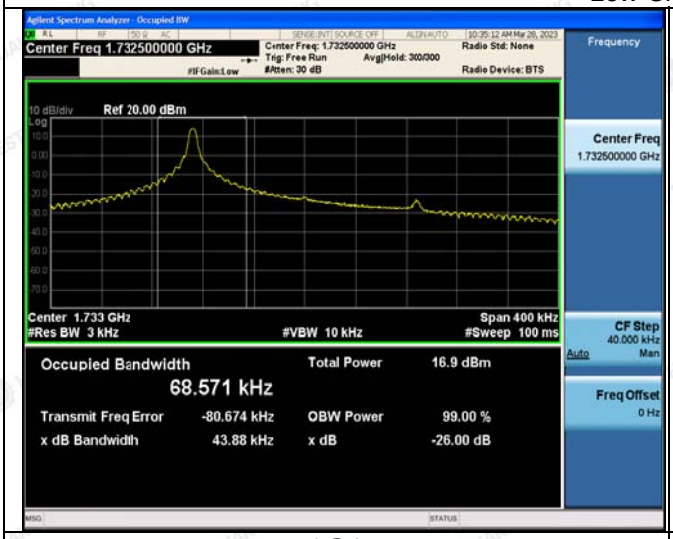
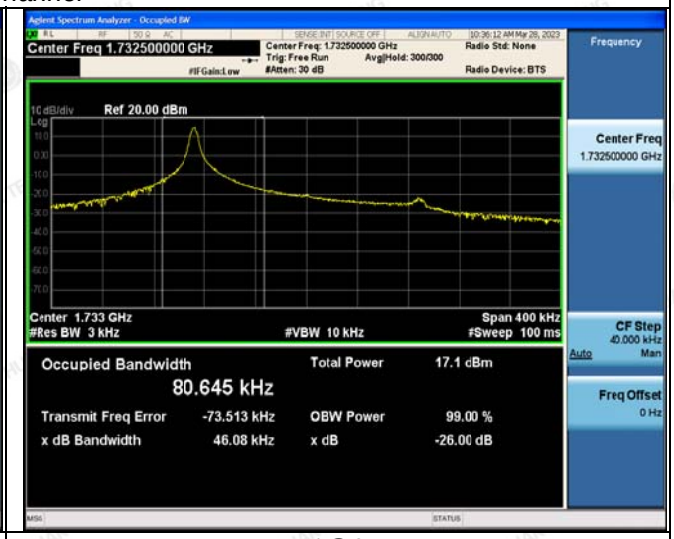
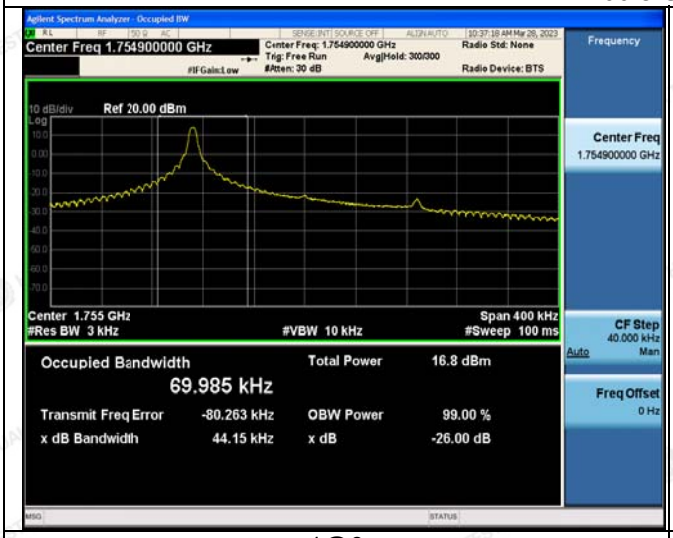
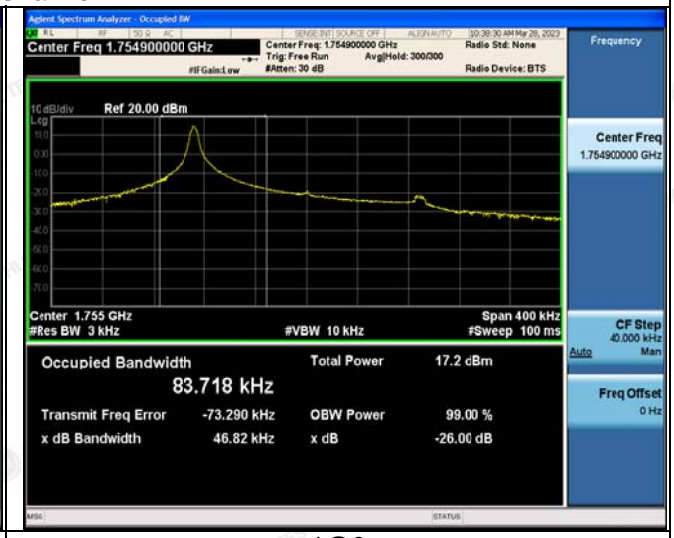
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and 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

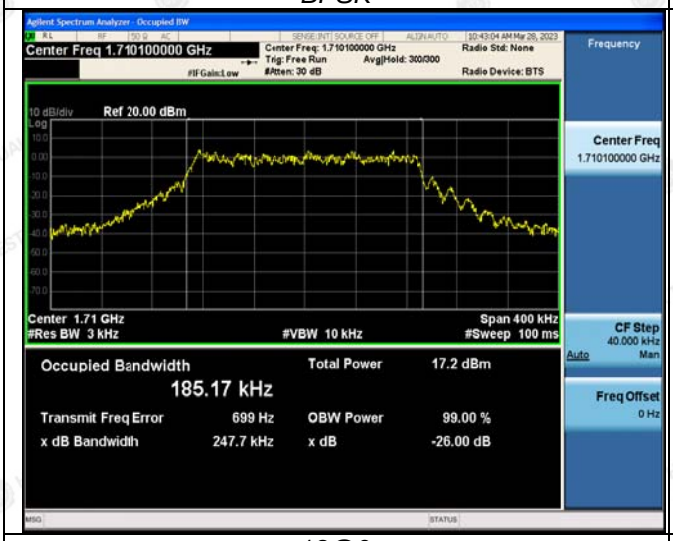
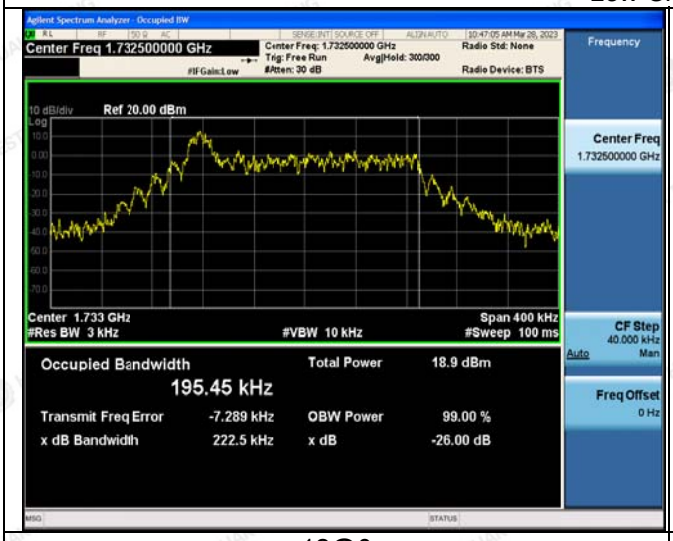
Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*

LTE FDD Band 4						
Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	-26dBc Emission bandwidth (KHz)		99% Occupied bandwidth (KHz)	
			BPSK	QPSK	BPSK	QPSK
3.75	1@0	1710.1	44.03	47.27	69.786	84.257
	1@0	1732.5	43.88	46.08	68.571	80.645
	1@0	1754.9	44.15	46.82	69.985	83.718
15	1@0	1710.1	106.3	117.0	127.19	125.34
	1@0	1732.5	106.2	115.6	127.60	120.25
	1@0	1754.9	104.1	117.1	127.26	124.93
	12@0	1710.1	247.7	237.7	185.17	185.14
	12@0	1732.5	222.5	255.1	195.45	185.78
	12@0	1754.9	254.5	255.9	185.66	186.24

LTE FDD Band 4-3.75KHz	
BPSK	*QPSK*
	
1@0	1@0
Low Channel	
	
1@0	1@0
Middle Channel	
	
1@0	1@0
High Channel	

LTE FDD Band 4-15KHz	
BPSK	*QPSK*
	
1@0	1@0
Low Channel	
	
1@0	1@0
Middle Channel	
	
1@0	1@0
High Channel	

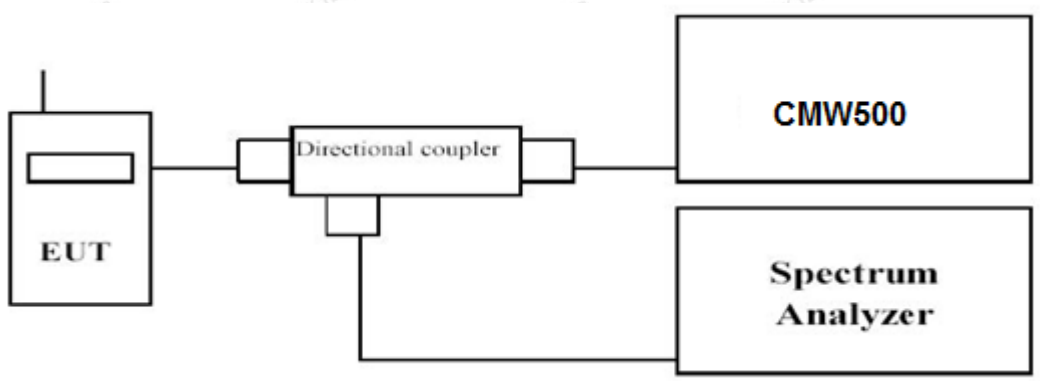
LTE FDD Band 4-15KHz	
BPSK	*QPSK*
	
12@0	12@0
Low Channel	
	
12@0	12@0
Middle Channel	
	
12@0	12@0
High Channel	

3.4 Band Edge Compliance

LIMIT

According to §27.53 (h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10(P) dB.

TEST CONFIGURATION



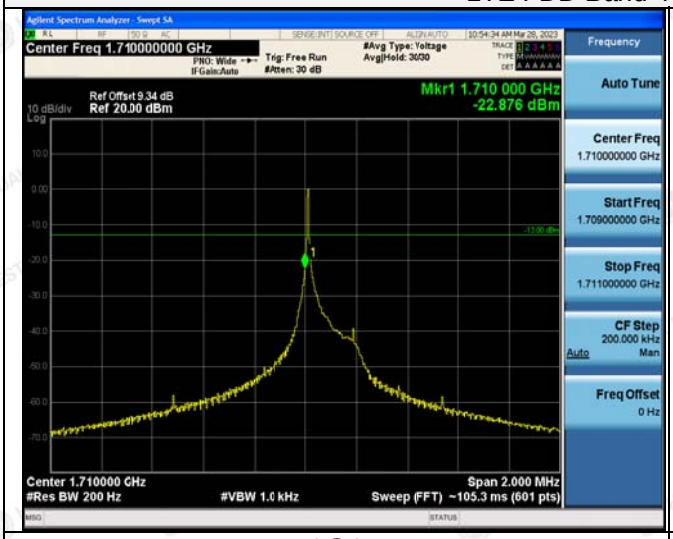
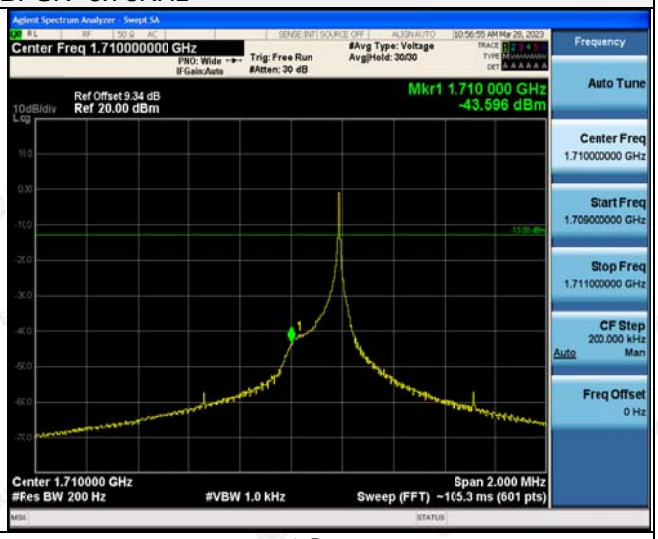
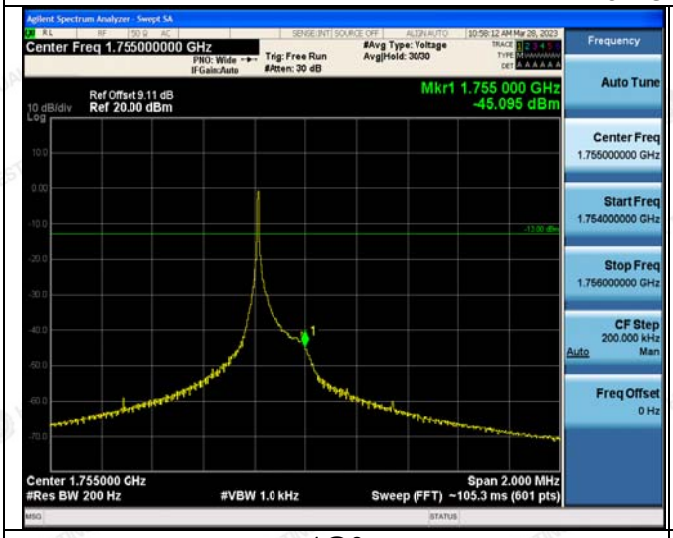
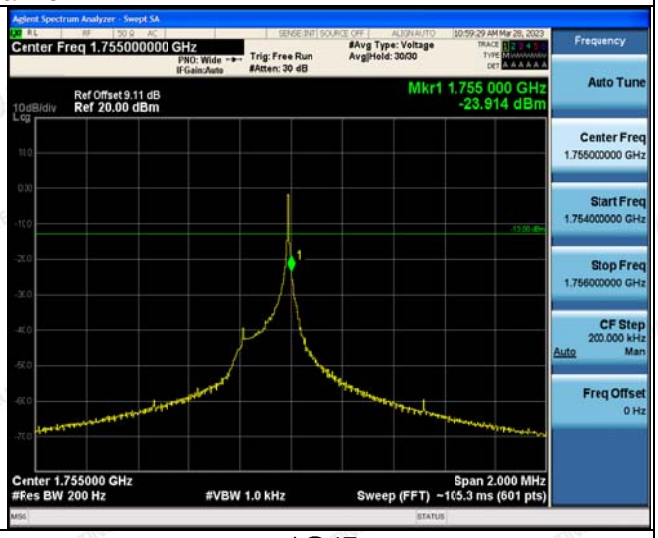
TEST PROCEDURE

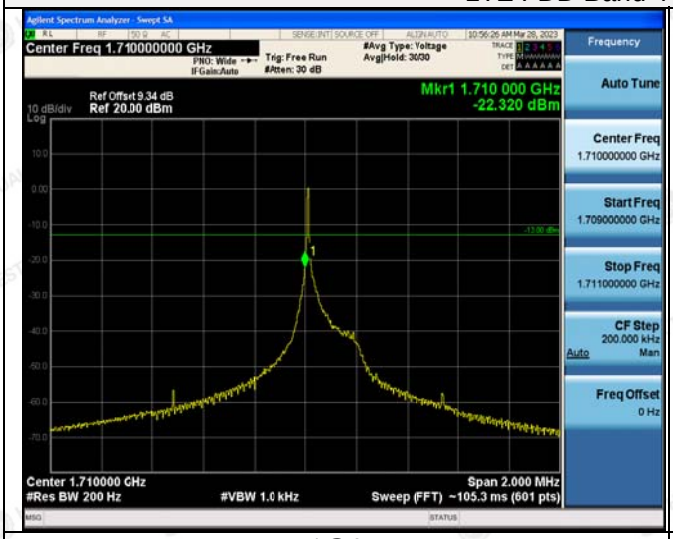
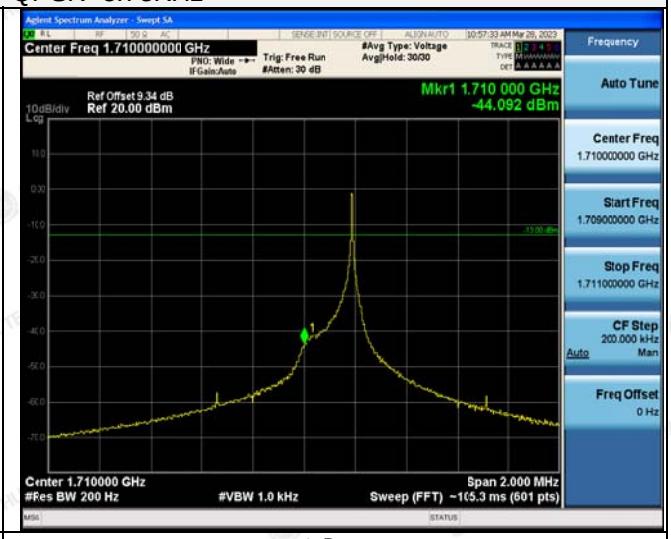
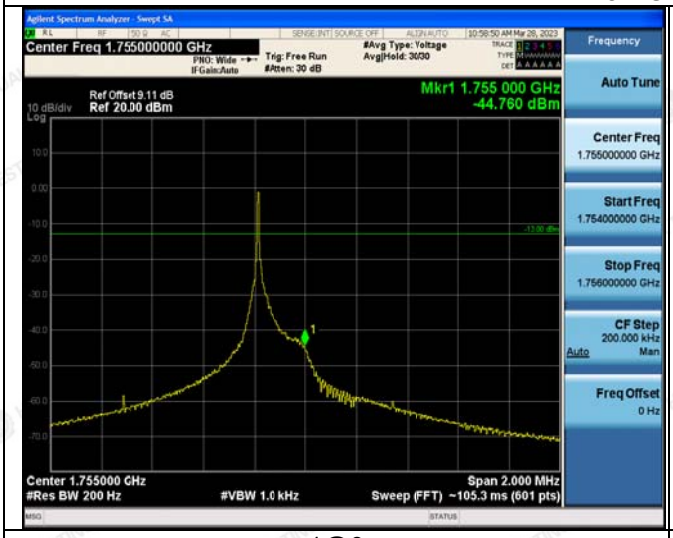
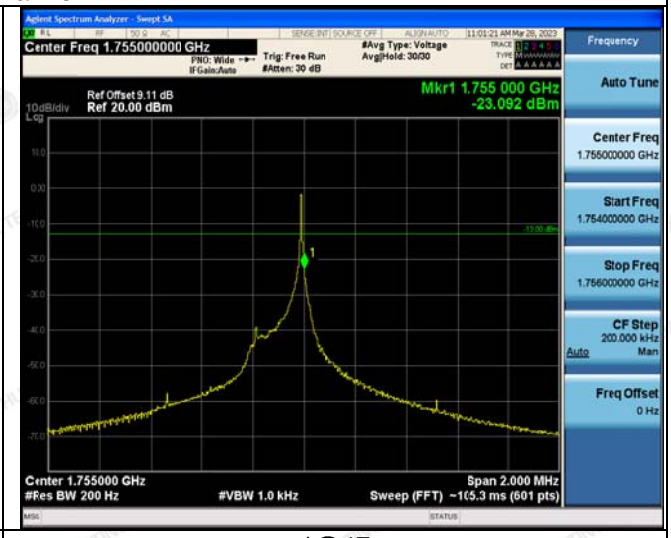
1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels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

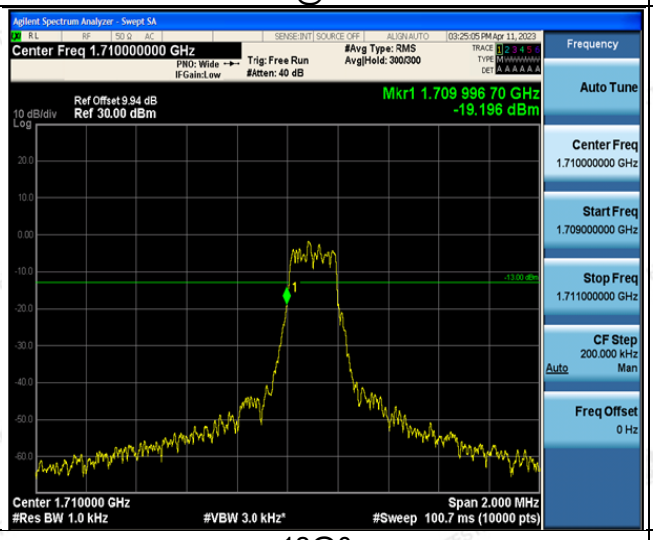
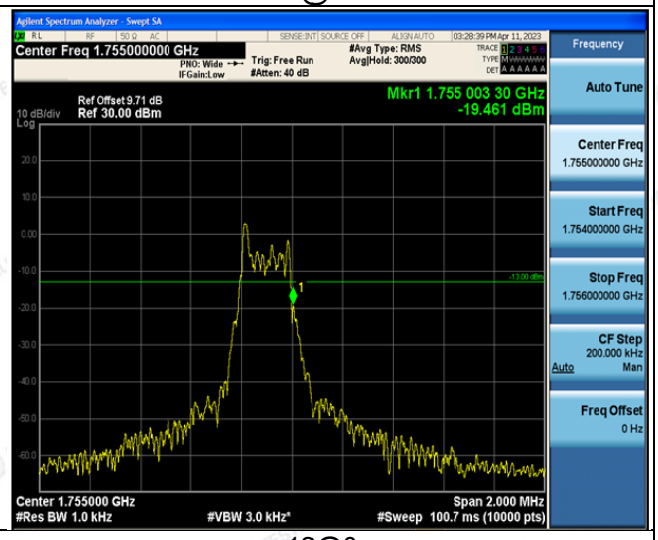
TEST RESULTS

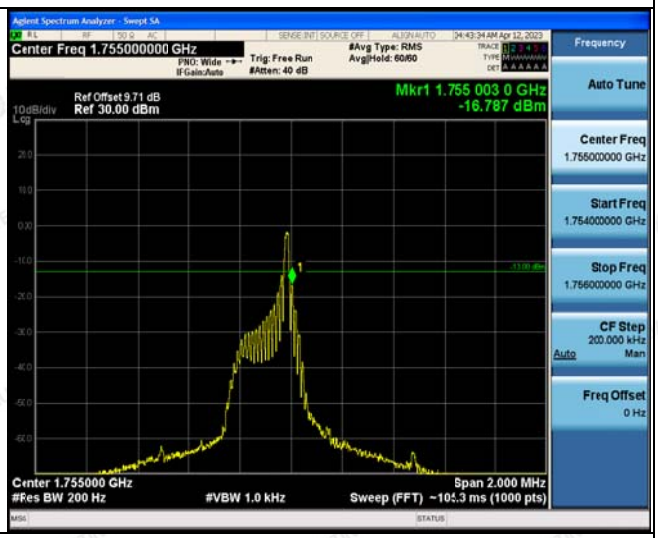
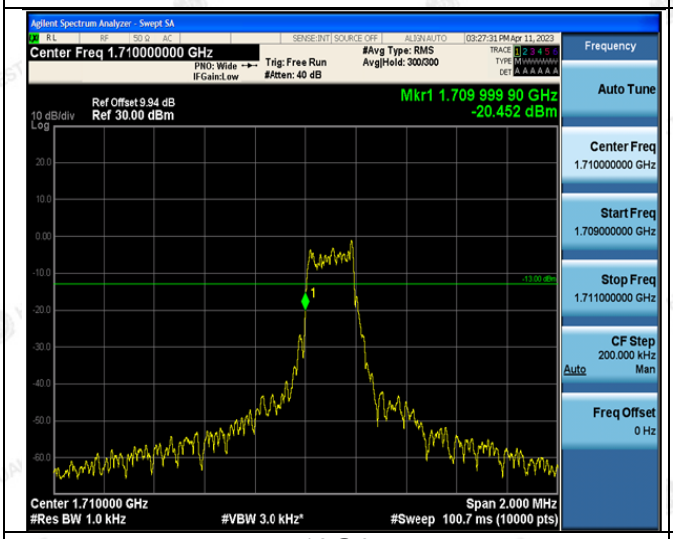
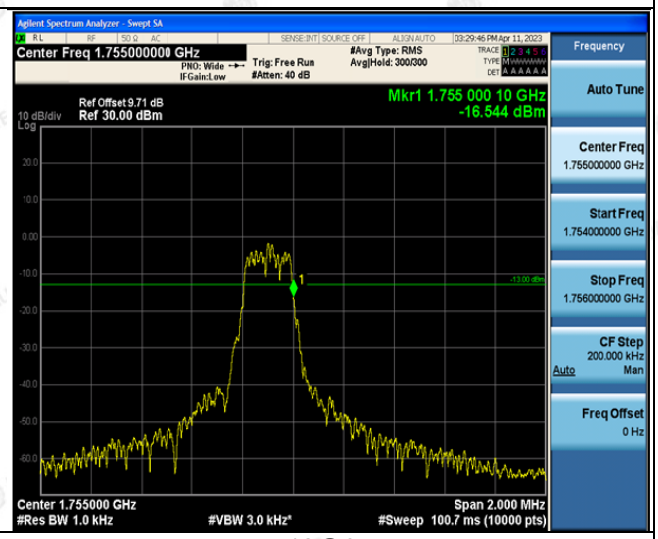
Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*

LTE FDD Band 4-BPSK- 3.75KHz	
	
1@0	1@47
Low Channel	
	
1@0	1@47
High Channel	

LTE FDD Band 4-QPSK- 3.75KHz	
	
1@0	1@47
Low Channel	
	
1@0	1@47
High Channel	

LTE FDD Band 4-BPSK- 15KHz	
Low Channel	*High Channel*
	
1@0	1@0
	
1@11	1@11
	
12@0	12@0

LTE FDD Band 4-QPSK- 15KHz	
Low Channel	*High Channel*
	
1@0	1@0
	
1@11	1@11
	
12@0	12@0

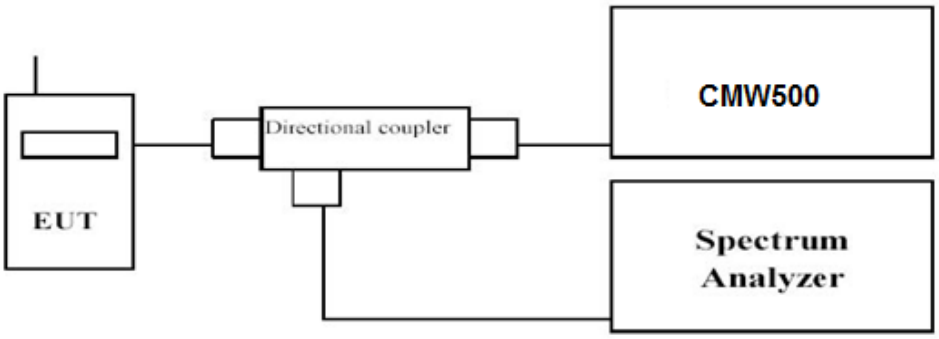
3.5 Spurious Emission

LIMIT

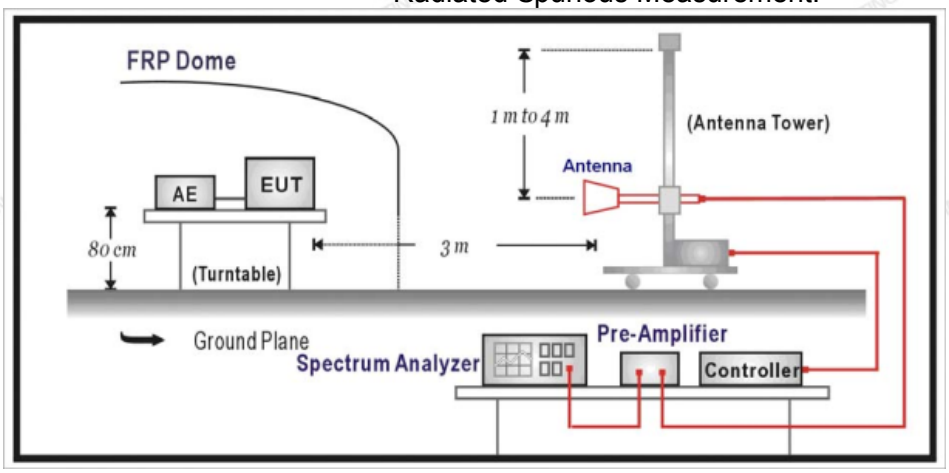
According to §27.53 (h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10(P) dB.

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 to 10^{th} 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 4	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~26.5	1 MHz	3 MHz	Auto

Radiated Spurious Measurement:

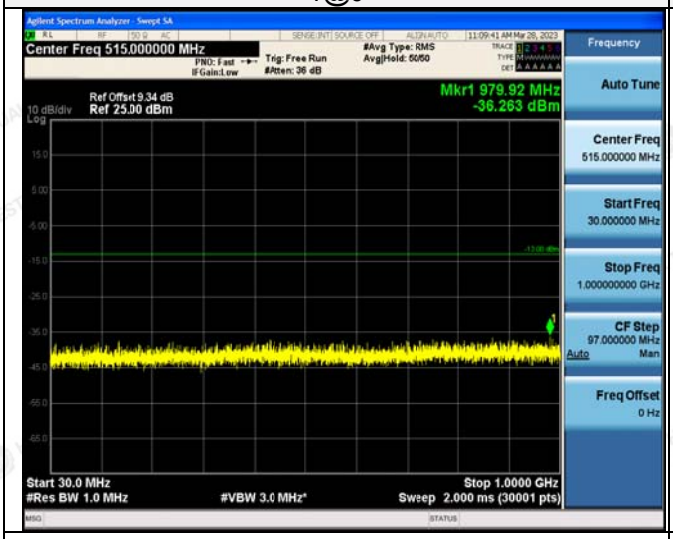
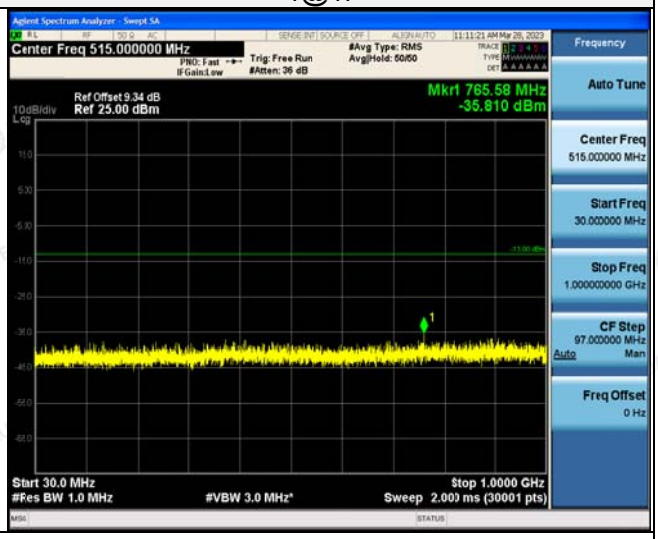
a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.
c. The output of the test 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

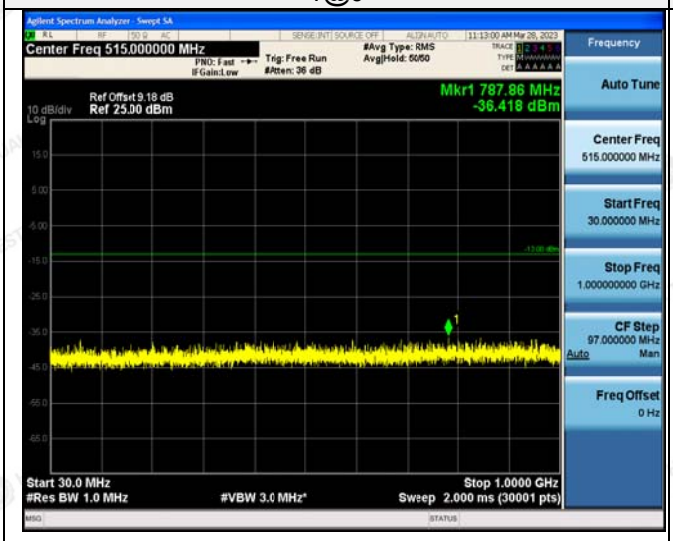
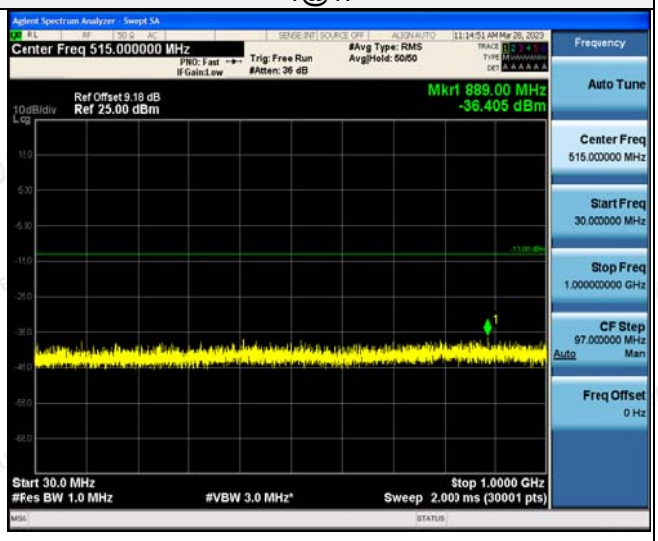
Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*

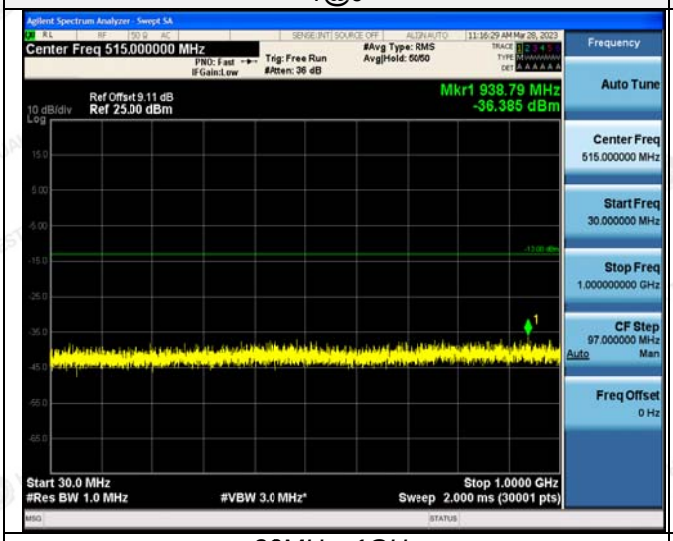
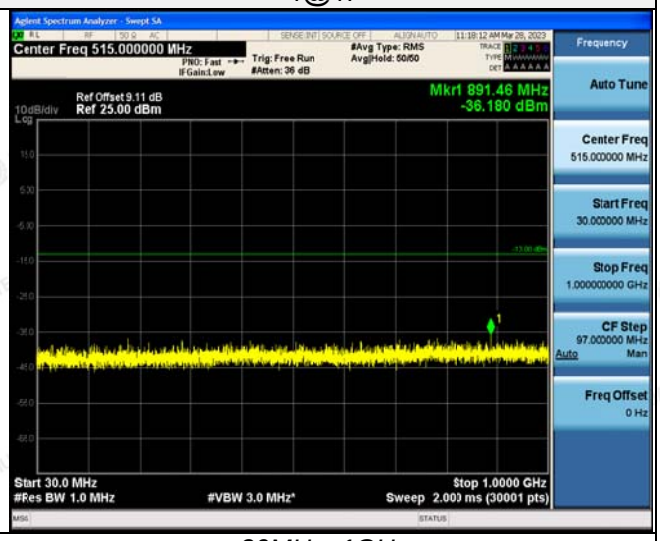
Conducted Measurement:

LTE FDD Band 4-QPSK-3.75KHz	
Low Channel	
1@0	1@47
	
30MHz~1GHz	*30MHz~1GHz*
	
1GHz ~5GHz	*1GHz ~5GHz*
	
5GHz ~12GHz	*5GHz ~12GHz*

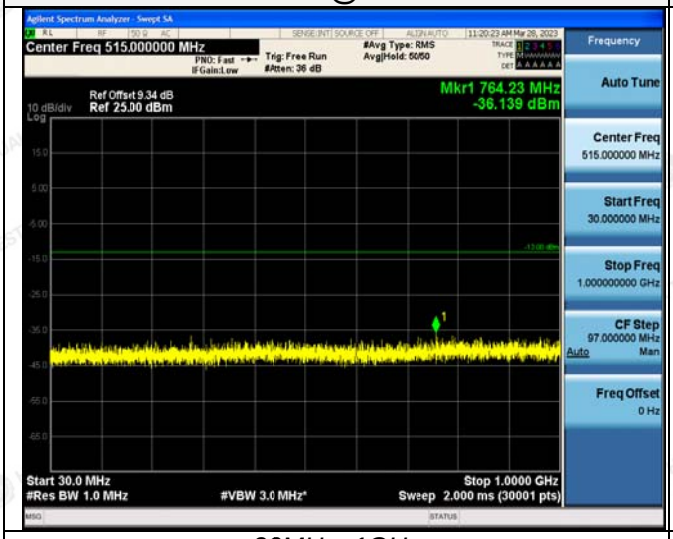
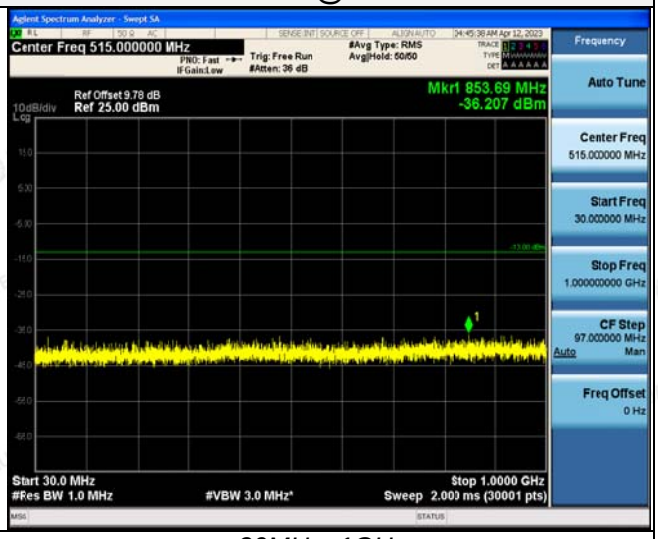
	
12GHz ~26.5GHz	*12GHz ~26.5GHz*

LTE FDD Band 4-QPSK-3.75KHz	
Middle Channel	
1@0	1@47
	
30MHz~1GHz	30MHz~1GHz
	
1GHz ~5GHz	1GHz ~5GHz
	
5GHz ~12GHz	5GHz ~12GHz

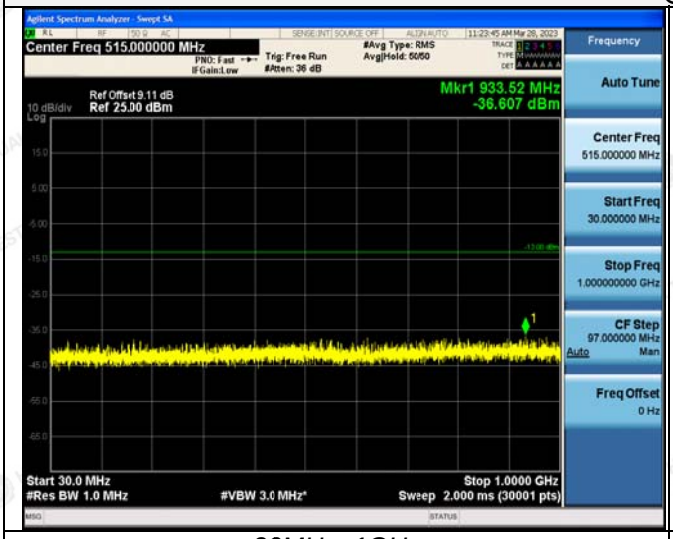
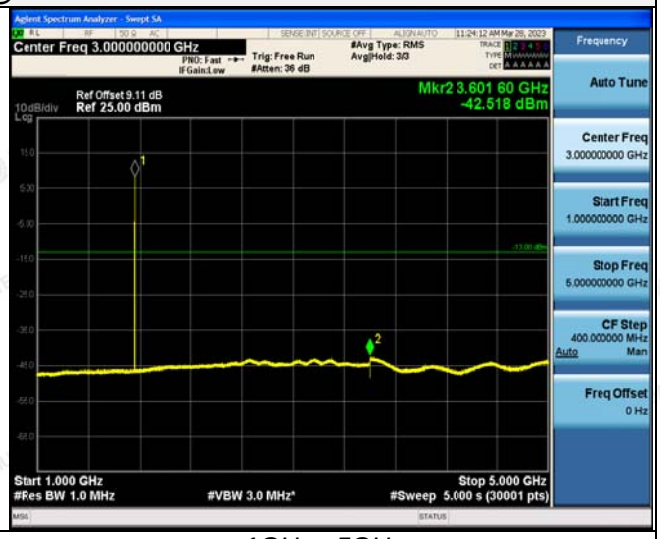
	
12GHz ~26.5GHz	*12GHz ~26.5GHz*

LTE FDD Band 4-QPSK-3.75KHz	
High Channel	
1@0	1@47
	
30MHz~1GHz	30MHz~1GHz
	
1GHz ~5GHz	1GHz ~5GHz
	
5GHz ~12GHz	5GHz ~12GHz

	
12GHz ~26.5GHz	*12GHz ~26.5GHz*

LTE FDD Band 4-QPSK-15KHz	
Low Channel	*Middle Channel*
12@0	12@0
	
30MHz~1GHz	*30MHz~1GHz*
	
1GHz ~5GHz	*1GHz ~5GHz*
	
5GHz ~12GHz	*5GHz ~12GHz*

	
12GHz ~26.5GHz	*12GHz ~26.5GHz*

LTE FDD Band 4-QPSK-15KHz	
High Channel	
12@0	
	
30MHz~1GHz	*1GHz ~5GHz*
	
5GHz ~12GHz	*12GHz ~26.5GHz*

Radiated Measurement:

Remark:
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*
2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB) +G_a(dBi)*
3. *We were not recorded other points as values lower than limits.*
4. *Margin = Limit – EIRP*

LTE FDD Band 4-15KHz-BPSK-Low Channel

Frequency (MHz)	PMea (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3420.2	-43.26	4.02	3.00	12.5	-34.78	-13.00	21.78	H
5130.3	-50.16	5.11	3.00	13.38	-41.89	-13.00	28.89	H
3420.2	-53.56	4.02	3.00	12.5	-45.08	-13.00	32.08	V
5130.3	-51.94	5.11	3.00	13.38	-43.67	-13.00	30.67	V

LTE FDD Band 4-15KHz-BPSK-Middle Channel

Frequency (MHz)	PMea (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-44.08	4.02	3.00	12.45	-35.65	-13.00	22.65	H
5197.5	-47.86	5.11	3.00	13.38	-39.59	-13.00	26.59	H
3465.0	-49.31	4.02	3.00	12.45	-40.88	-13.00	27.88	V
5197.5	-48.28	5.11	3.00	13.38	-40.01	-13.00	27.01	V

LTE FDD Band 4-15KHz-BPSK-High Channel

Frequency (MHz)	PMea (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3509.8	-44.09	4.02	3.00	12.21	-35.9	-13.00	22.9	H
5264.7	-46.58	5.11	3.00	13.26	-38.43	-13.00	25.43	H
3509.8	-48.25	4.02	3.00	12.21	-40.06	-13.00	27.06	V
5264.7	-47.72	5.11	3.00	13.26	-39.57	-13.00	26.57	V

LTE FDD Band 4-15KHz-QPSK-Low Channel

Frequency (MHz)	PMea (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3420.2	-48.56	4.02	3.00	12.5	-40.08	-13.00	27.08	H
5130.3	-49.38	5.11	3.00	13.38	-41.11	-13.00	28.11	H
3420.2	-52.24	4.02	3.00	12.5	-43.76	-13.00	30.76	V
5130.3	-50.14	5.11	3.00	13.38	-41.87	-13.00	28.87	V

LTE FDD Band 4-15KHz-QPSK-Middle Channel

Frequency (MHz)	PMea (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-43.68	4.02	3.00	12.45	-35.25	-13.00	22.25	H
5197.5	-47.36	5.11	3.00	13.38	-39.09	-13.00	26.09	H
3465.0	-49.46	4.02	3.00	12.45	-41.03	-13.00	28.03	V
5197.5	-48.3	5.11	3.00	13.38	-40.03	-13.00	27.03	V

LTE FDD Band 4-15KHz-QPSK-High Channel

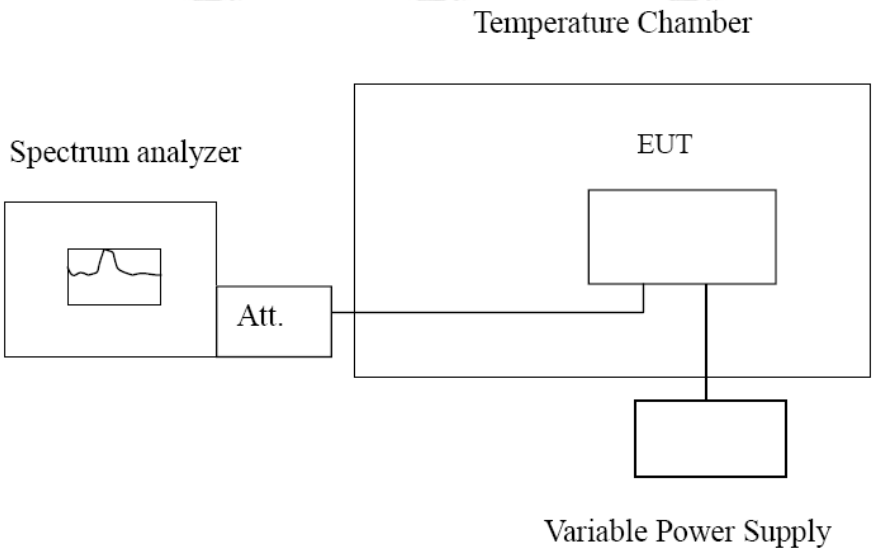
Frequency (MHz)	PMea (dBm)	Pcl (dB)	Diatance	Ga Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3509.8	-43.28	4.02	3.00	12.21	-35.09	-13.00	22.09	H
5264.7	-48.06	5.11	3.00	13.26	-39.91	-13.00	26.91	H
3509.8	-48.69	4.02	3.00	12.21	-40.5	-13.00	27.5	V
5264.7	-47.72	5.11	3.00	13.26	-39.57	-13.00	26.57	V

3.6 Frequency Stability Under Temperature & Voltage Variations

LIMIT

According to §27.54, §2.1055 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

TEST CONFIGURATION



TEST PROCEDURE

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

Frequency Stability Under Temperature Variations:
In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.
1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 4, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ increments from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

Frequency Stability Under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

TEST RESULTS

Remark:
1. We tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case.

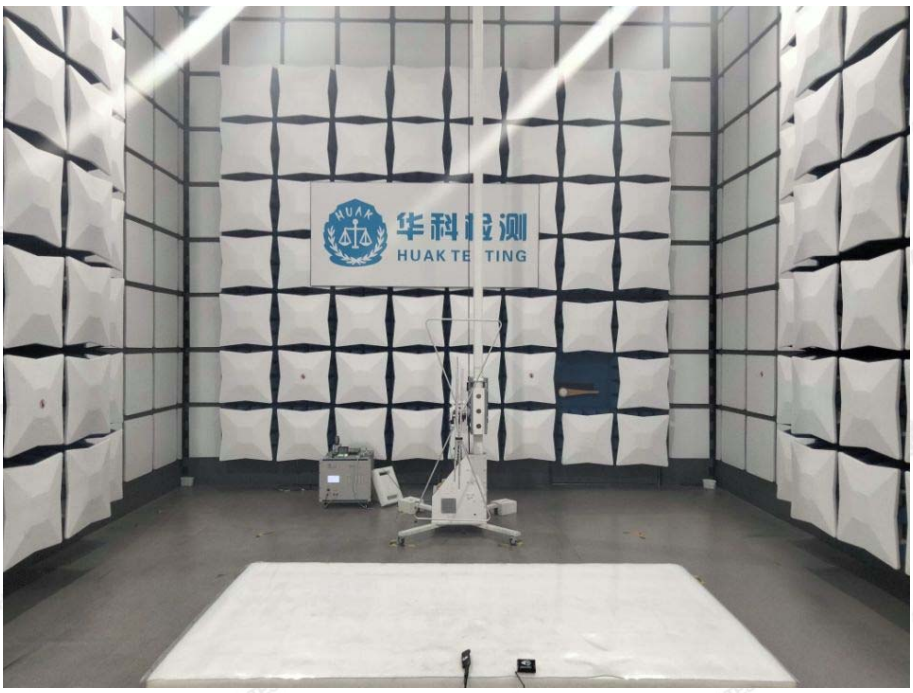
LTE Band 4, 15KHz, BPSK (worst case of all bandwidths).

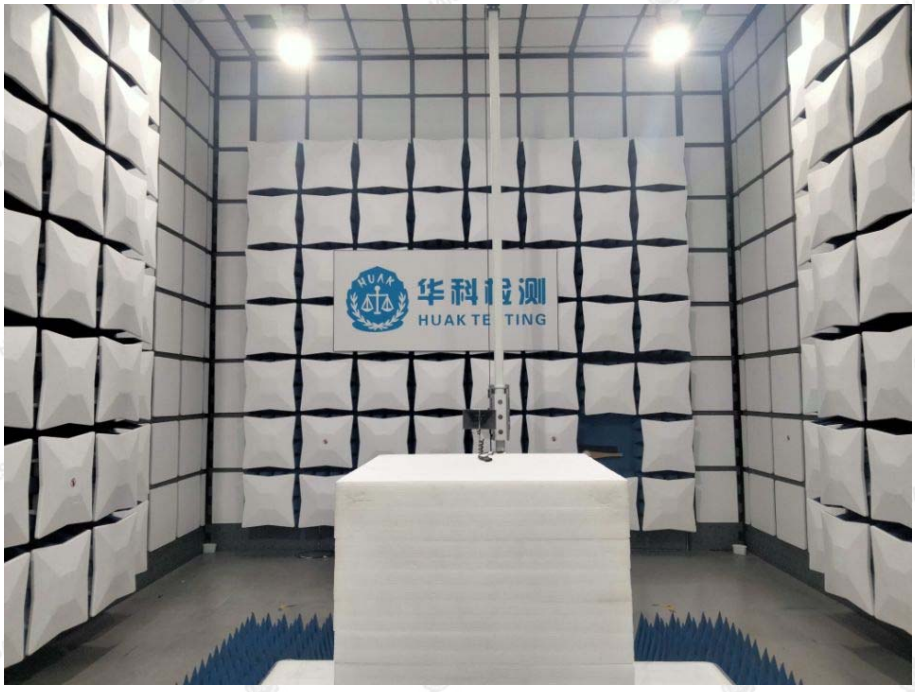
LTE FDD Band 4				
DC Power(V)	**Temperature (℃)**	**Frequency error(Hz)**	**Frequency error(ppm)**	**Verdict**
3.15	20	-46.89	-0.027419	PASS
3.70	20	-43.82	-0.025624	PASS
4.26	20	-48.13	-0.028145	PASS
3.70	-30	-43.81	-0.025618	PASS
3.70	-20	-40.93	-0.023934	PASS
3.70	-10	-41.60	-0.024326	PASS
3.70	0	-42.89	-0.024756	PASS
3.70	10	-42.85	-0.024733	PASS
3.70	20	-43.82	-0.025293	PASS
3.70	30	-36.28	-0.020941	PASS
3.70	40	-42.91	-0.024768	PASS
3.70	50	-35.32	-0.020387	PASS

LTE Band 4, 15KHz, QPSK (worst case of all bandwidths)

LTE FDD Band 4				
DC Power(V)	**Temperature (℃)**	**Frequency error(Hz)**	**Frequency error(ppm)**	**Verdict**
3.15	20	-33.50	-0.019589	PASS
3.70	20	-35.20	-0.020584	PASS
4.26	20	-31.18	-0.018233	PASS
3.70	-30	-34.54	-0.020198	PASS
3.70	-20	-35.13	-0.020543	PASS
3.70	-10	-35.97	-0.021034	PASS
3.70	0	-36.60	-0.021126	PASS
3.70	10	-38.38	-0.022153	PASS
3.70	20	-40.76	-0.023527	PASS
3.70	30	-37.86	-0.021853	PASS
3.70	40	-46.47	-0.026823	PASS
3.70	50	-46.17	-0.026649	PASS

4 Test Setup Photos of the EUT





5 Photos of the EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos.

.....End of Report.....

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