TEST REPORT

FCC Part 27
RSS-130 Issue 1/ RSS-GEN

Report Reference No.:	**HK1907301843-4E**
FCC ID :	**2AUAE-M3300001**
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Date of issue.....:	Aug. 13, 2019
Testing Laboratory Name .....:	**Shenzhen HUAK Testing Technology Co., Ltd.**
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Applicant's name.....:	**Proscend Communications Inc.**
Address.....:	2F, No. 36, Industry E. Rd. IV, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
Test specification ..... :	
Standard ..... :	**FCC Part 27**

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Test item description .....:	Industrial 4G LTE Cellular Router
Trade Mark .....:	Proscend
Manufacturer.....:	**Proscend Communications Inc.**
Model/Type reference.....:	M330-W
Listed Models .....:	MXXX-XXXXX-XX (Where "X" can be used as "A-Z", or "0-9", or "-", or blank for hardware/software changes/applications or marketing purpose only)
Ratings.....:	DC 8-48V
Modulation .....:	QPSK, 16QAM
Hardware version .....:	V2.0
Software version .....:	V2.0
Frequency.....	LTE Band 12
Result.....:	**PASS**

TEST REPORT

Test Report No. :	HK1907301843-4E	Aug. 13, 2019 Date of issue

Equipment under Test	:	Industrial 4G LTE Cellular Router
Model /Type	:	M330-W
Listed Models	:	MXXX-XXXXX-XX(Where “X” can be used as “A-Z”, or “0-9”, or “-”, or blank for hardware/software changes/applications or marketing purpose only)
Applicant	:	**Proscend Communications Inc.**
Address	:	2F, No. 36, Industry E. Rd. IV, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
Manufacturer	:	**Proscend Communications Inc.**
Address	:	2F, No. 36, Industry E. Rd. IV, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.

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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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: 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

1.3 Test Facility

1.3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,Heping Community, Fuhai Street, Bao’an District, Shenzhen, China

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.

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 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	ENV216	R&S	HKE-059	2018/12/27	2019/12/26
LISN	R&S	ENV216	HKE-002	2018/12/27	2019/12/26
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	2018/12/27	2019/12/26
Receiver	R&S	ESCI 7	HKE-010	2018/12/27	2019/12/26
Spectrum analyzer	Agilent	N9020A	HKE-048	2018/12/27	2019/12/26
RF automatic control unit	Tonscend	JS0806-2	HKE-060	2018/12/27	2019/12/26
Horn antenna	Schwarzbeck	9120D	HKE-013	2018/12/27	2019/12/26
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	2018/12/27	2019/12/26
Preamplifier	EMCI	EMC051845SE	HKE-015	2018/12/27	2019/12/26
Preamplifier	Agilent	83051A	HKE-016	2018/12/27	2019/12/26
Temperature and humidity meter	Boyang	HTC-1	HKE-075	2018/12/27	2019/12/26
High pass filter unit	Tonscend	JS0806-F	HKE-055	2018/12/27	2019/12/26
RF cable	Times	1-40G	HKE-034	2018/12/27	2019/12/26
Power meter	Agilent	E4419B	HKE-085	2018/12/27	2019/12/26
Power Sensor	Agilent	E9300A	HKE-086	2018/12/27	2019/12/26
Wireless Communication Test Set	R&S	CMW500	HKE-026	2018/12/27	2019/12/26

2.4 Modifications

No modifications were implemented to meet testing criteria.

3 TEST CONDITIONS AND RESULTS

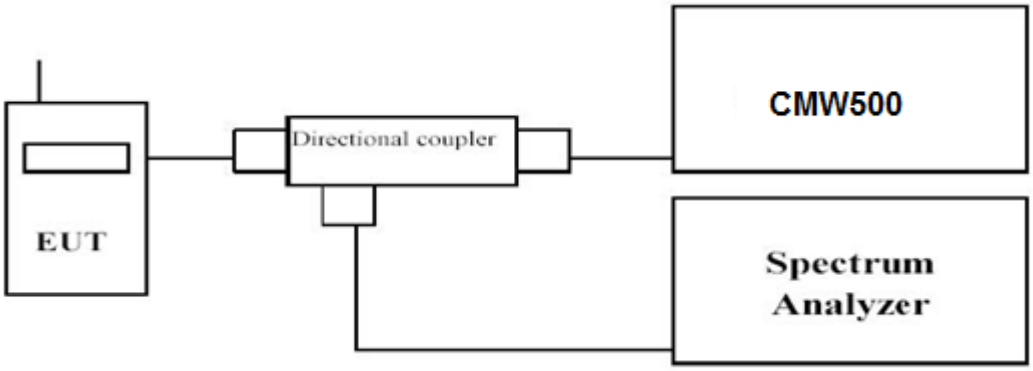
3.1 Output Power

LIMIT

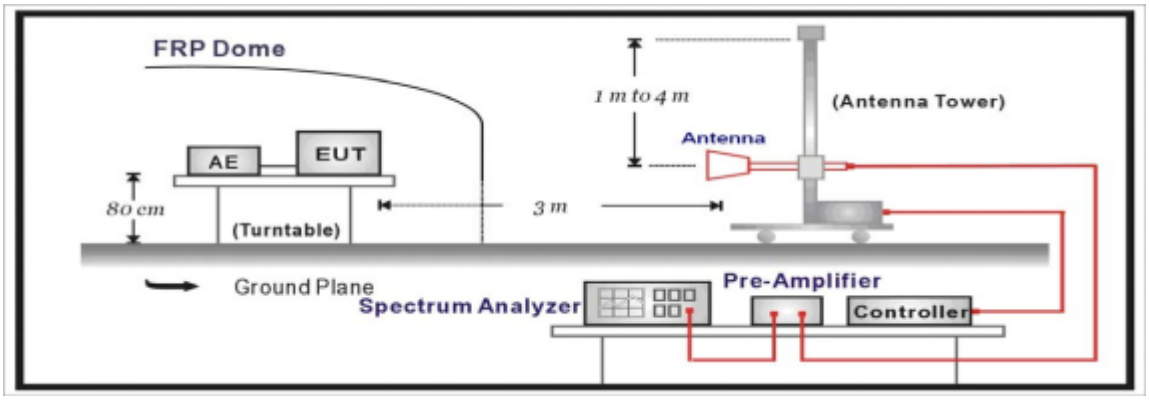
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are FCC limited to 3 watts ERP."IC limited to 5 watts ERP."

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.
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				
TX Channel Bandwidth	RB Size/Offset	Frequency (MHz)	Average Power [dBm]	
			QPSK	16QAM
1.4 MHz	1 RB low	699.7	23.28	22.54
		707.5	23.42	22.37
		715.3	23.31	23.37
	1 RB high	699.7	23.38	22.37
		707.5	23.56	22.53
		715.3	23.41	22.35
	50% RB mid	699.7	23.33	22.33
		707.5	23.48	22.17
		715.3	23.31	23.34
	100% RB	699.7	23.42	23.29
		707.5	23.24	23.04
		715.3	23.04	22.43
3 MHz	1 RB low	700.5	22.81	21.97
		707.5	22.83	21.99
		714.5	22.81	22.01
	1 RB high	700.5	22.85	21.74
		707.5	22.82	21.70
		714.5	22.80	21.67
	50% RB mid	700.5	22.83	21.97
		707.5	22.82	21.95
		714.5	22.03	22.04
	100% RB	700.5	21.69	21.71
		707.5	21.70	21.69
		714.5	21.67	21.80
5 MHz	1 RB low	701.5	22.75	21.95
		707.5	22.98	21.83
		713.5	22.83	21.85
	1 RB high	701.5	22.80	21.79
		707.5	22.96	21.87
		713.5	22.80	21.73
	50% RB mid	701.5	21.81	21.95
		707.5	21.83	21.81
		713.5	21.87	21.87
	100% RB	701.5	21.87	21.91
		707.5	21.81	21.84
		713.5	21.84	21.01

10 MHz	1 RB low	704.0	22.79	21.93
		707.5	22.82	22.12
		711.0	22.80	21.96
	1 RB high	704.0	22.84	21.72
		707.5	22.95	21.82
		711.0	22.82	21.68
	50% RB mid	704.0	21.92	21.95
		707.5	21.89	21.90
		711.0	21.86	21.90
	100% RB	704.0	21.92	21.87
		707.5	21.83	21.86
		711.0	21.84	20.98

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 1.4MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
699.7	-21.43	2.38	8.23	2.15	36.7	18.97	34.77	36.99	V
707.5	-19.4	2.4	8.29	2.15	36.7	21.04	34.77	36.99	V
715.3	-19.91	2.43	8.28	2.15	36.7	20.49	34.77	36.99	V

LTE FDD Band 12_Channel Bandwidth 3MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
700.5	-21.86	2.38	8.23	2.15	36.7	18.54	34.77	36.99	V
707.5	-19.52	2.4	8.29	2.15	36.7	20.92	34.77	36.99	V
714.5	-19.64	2.43	8.28	2.15	36.7	20.76	34.77	36.99	V

LTE FDD Band 12_Channel Bandwidth 5MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
701.5	-21.77	2.38	8.23	2.15	36.7	18.63	34.77	36.99	V
707.5	-19.6	2.4	8.29	2.15	36.7	20.84	34.77	36.99	V
713.5	-19.69	2.43	8.28	2.15	36.7	20.71	34.77	36.99	V

LTE FDD Band 12_Channel Bandwidth 10MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
704.0	-21.02	2.38	8.23	2.15	36.7	19.38	34.77	36.99	V
707.5	-19.09	2.4	8.29	2.15	36.7	21.35	34.77	36.99	V
711.0	-20.09	2.43	8.28	2.15	36.7	20.31	34.77	36.99	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
699.7	-21.67	2.38	8.23	2.15	36.7	18.73	34.77	36.99	V
707.5	-19.65	2.4	8.29	2.15	36.7	20.79	34.77	36.99	V
715.3	-20.1	2.43	8.28	2.15	36.7	20.3	34.77	36.99	V

LTE FDD Band 12_Channel Bandwidth 3MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
700.5	-21.69	2.38	8.23	2.15	36.7	18.71	34.77	36.99	V
707.5	-19.87	2.4	8.29	2.15	36.7	20.57	34.77	36.99	V
714.5	-20.48	2.43	8.28	2.15	36.7	19.92	34.77	36.99	V

LTE FDD Band 12_Channel Bandwidth 5MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
701.5	-21.16	2.38	8.23	2.15	36.7	19.24	34.77	36.99	V
707.5	-19.86	2.4	8.29	2.15	36.7	20.58	34.77	36.99	V
713.5	-20.09	2.43	8.28	2.15	36.7	20.31	34.77	36.99	V

LTE FDD Band 12_Channel Bandwidth 10MHz_16QAM

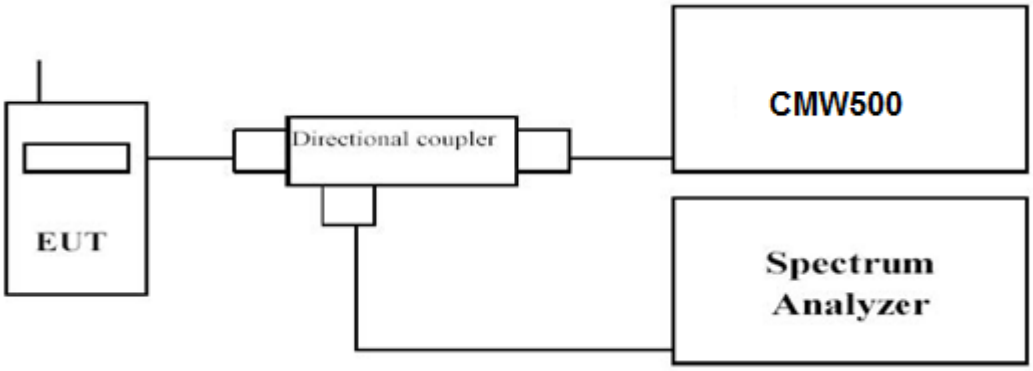
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	Correction (dB)	P_{Ag} (dB)	ERP (dBm)	FCC Limit (dBm)	IC Limit (dBm)	Polarization
704.0	-21.36	2.38	8.23	2.15	36.7	19.04	34.77	36.99	V
707.5	-19.43	2.4	8.29	2.15	36.7	21.01	34.77	36.99	V
711.0	-20.37	2.43	8.28	2.15	36.7	20.03	34.77	36.99	V

3.3 Peak-to-Average Ratio (PAR)

LIMIT

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

TEST CONFIGURATION



TEST PROCEDURE

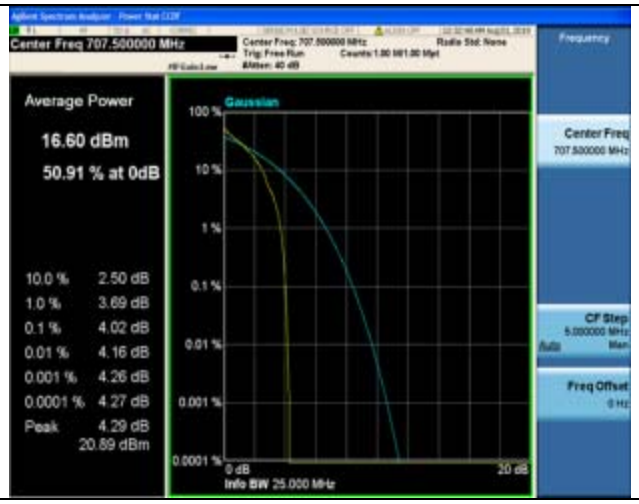
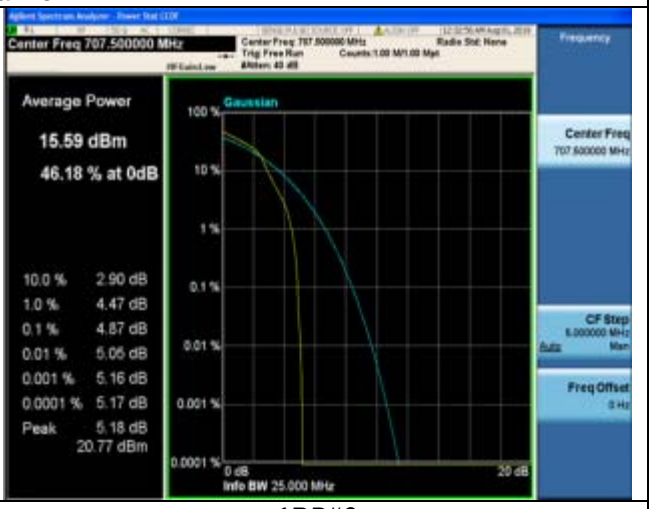
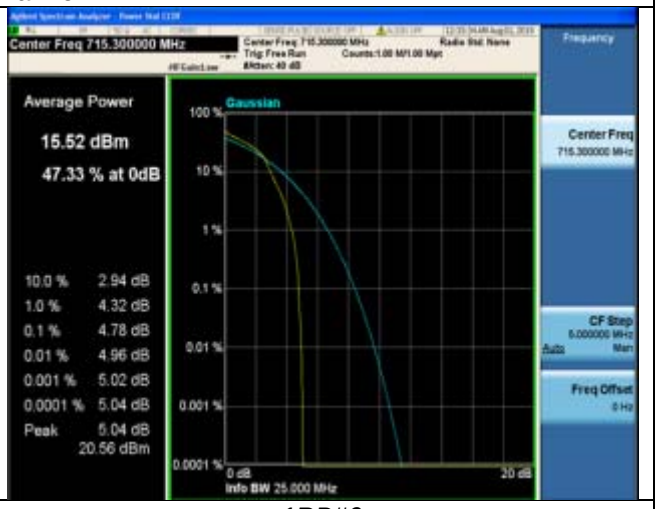
1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as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

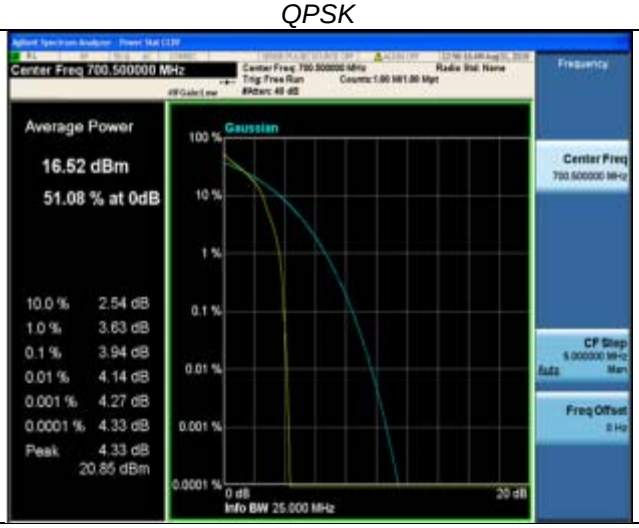
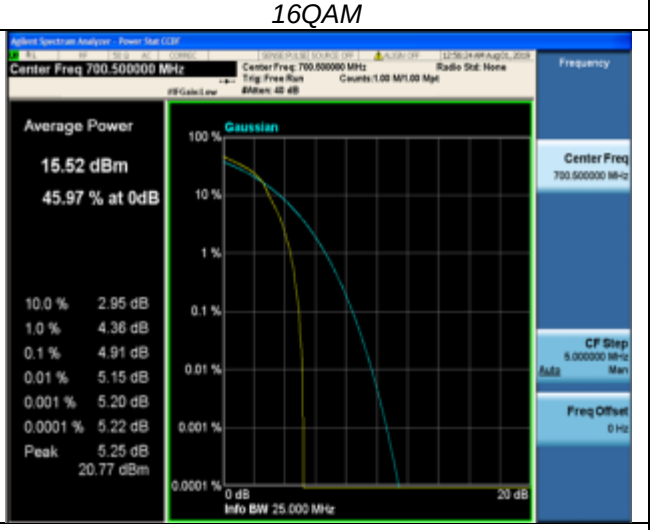
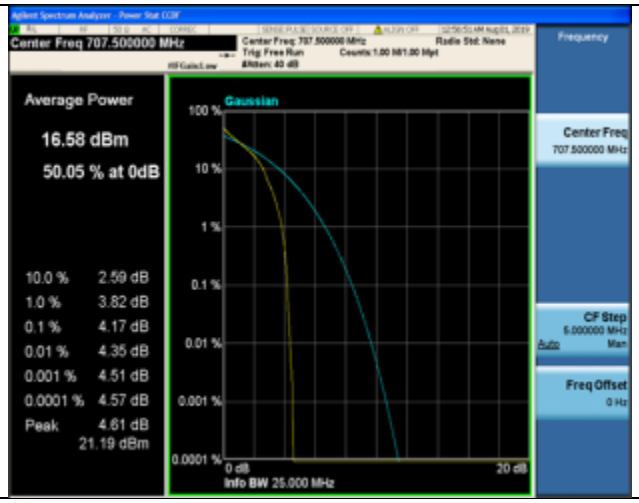
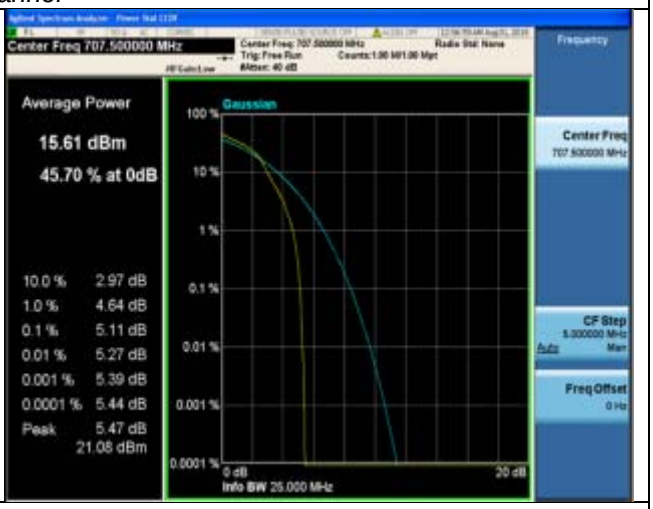
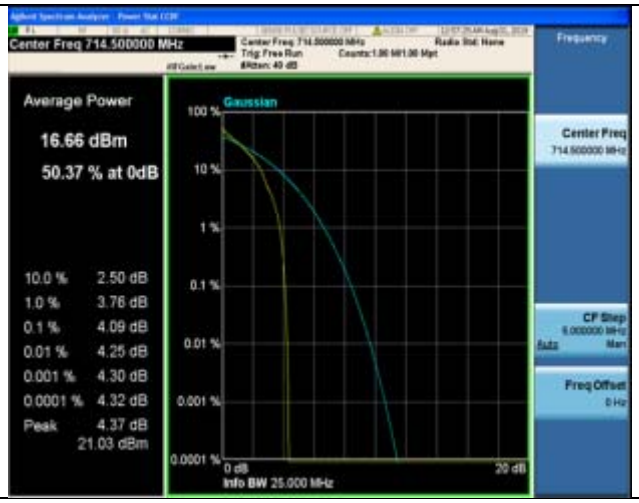
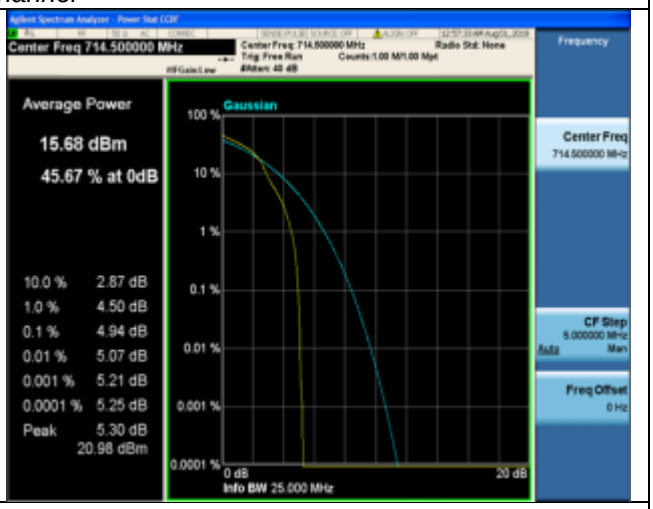
TEST RESULTS

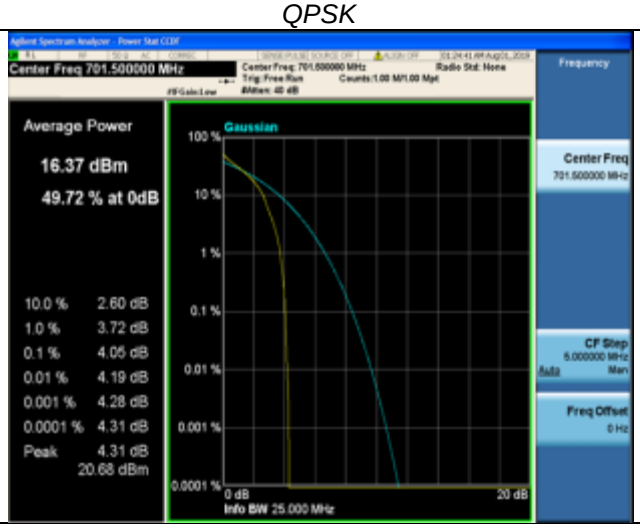
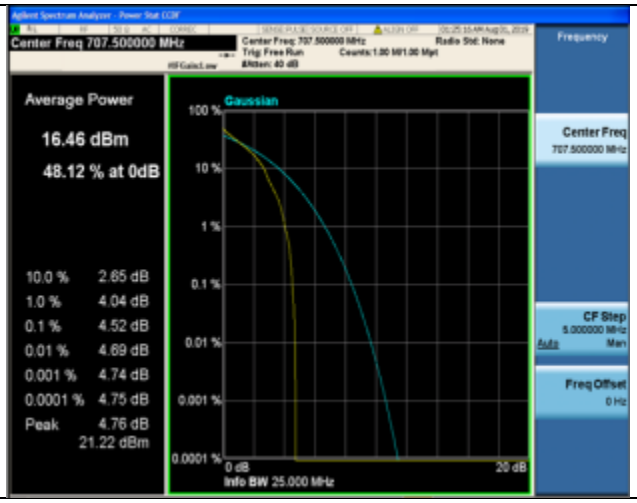
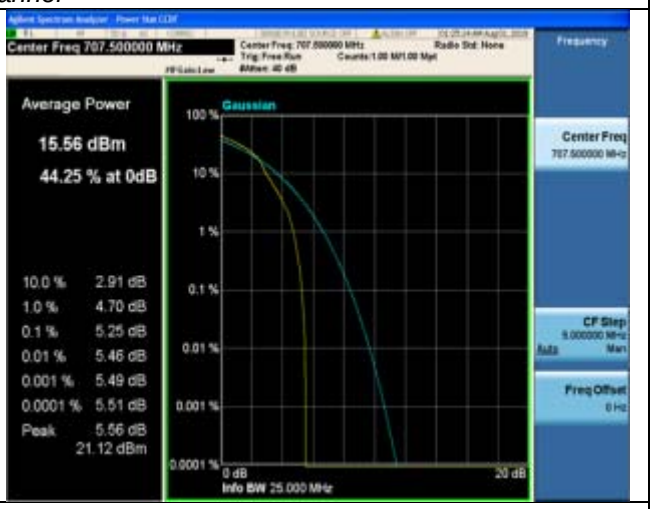
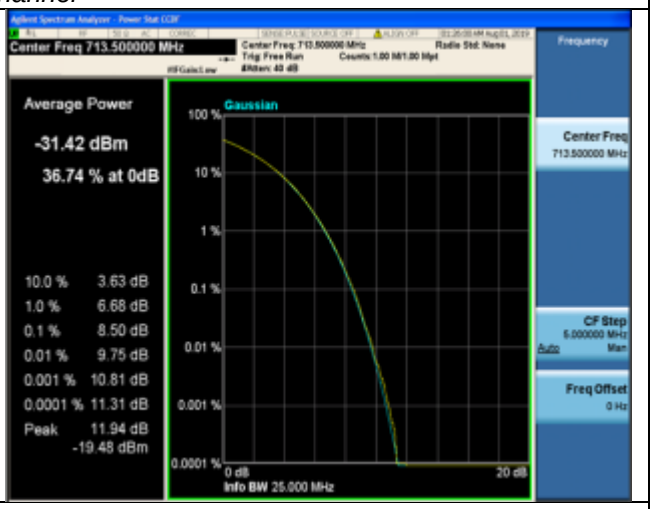
Remark:

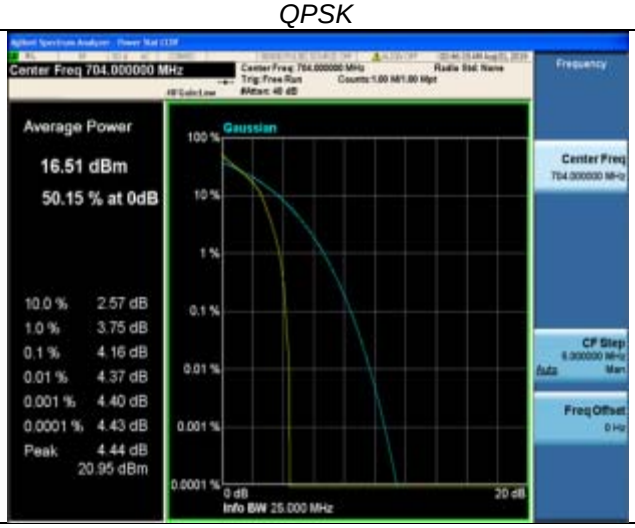
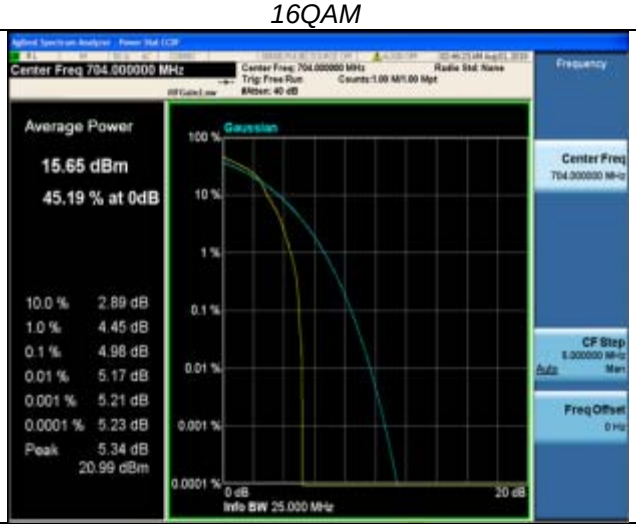
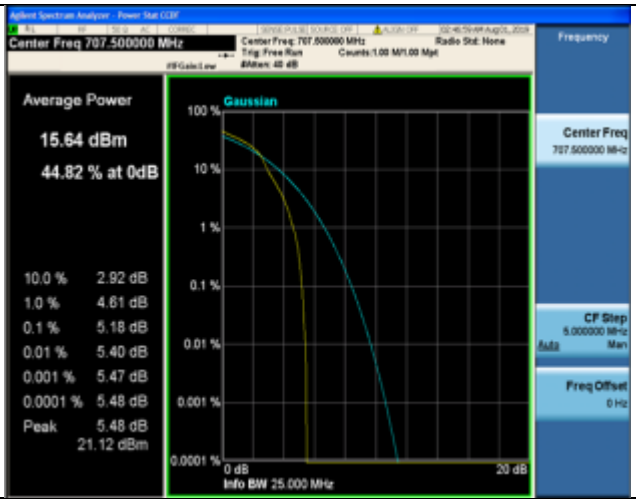
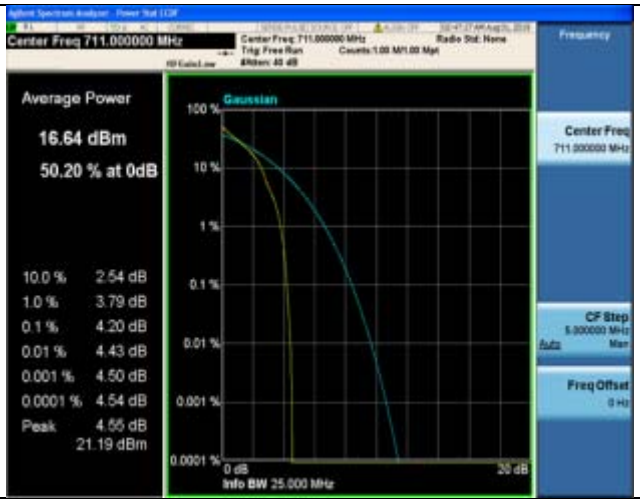
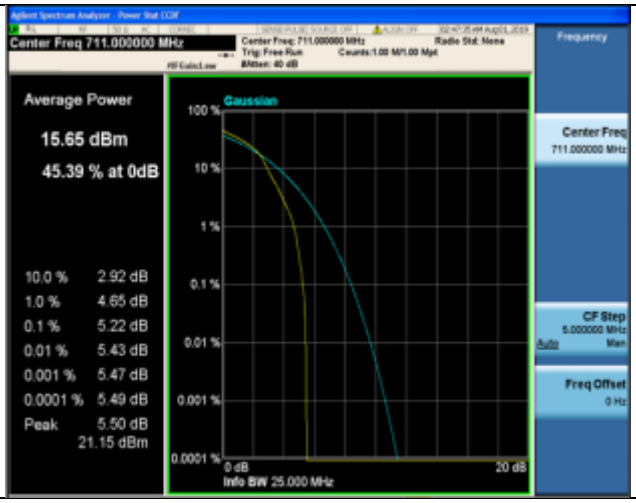
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12.*

LTE FDD Band 12				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	PAPR (dB)	
			QPSK	16QAM
1.4 MHz	699.7	*1RB#0*	4.07	4.94
	707.5		4.02	4.87
	715.3		3.76	4.78
3 MHz	700.5	*1RB#0*	3.94	4.91
	707.5		4.17	5.11
	714.5		4.09	4.94
5 MHz	701.5	*1RB#0*	4.05	4.84
	707.5		4.52	5.25
	713.5		4.53	8.50
10 MHz	704.0	*1RB#0*	4.16	4.98
	707.5		4.39	5.18
	711.0		4.20	5.22

LTE FDD Band 12-1.4MHz Channel Bandwidth PAPR	
QPSK	16QAM
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	

LTE FDD Band 12-3MHz Channel Bandwidth PAPR	
QPSK	16QAM
	
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	

LTE FDD Band 12-5MHz Channel Bandwidth PAPR	
QPSK	16QAM
	
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	

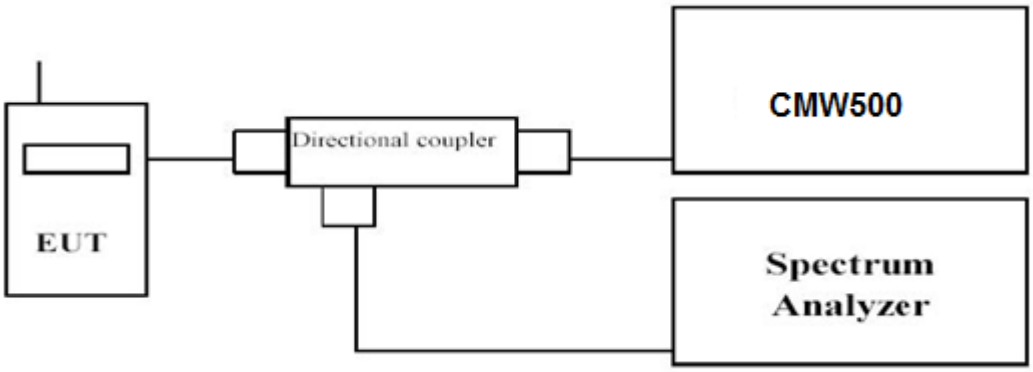
LTE FDD Band 12-10MHz Channel Bandwidth PAPR	
QPSK	16QAM
	
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	

3.4 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

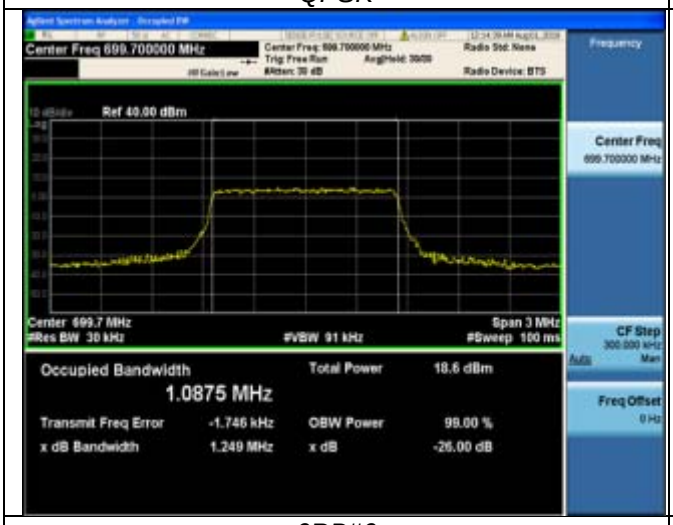
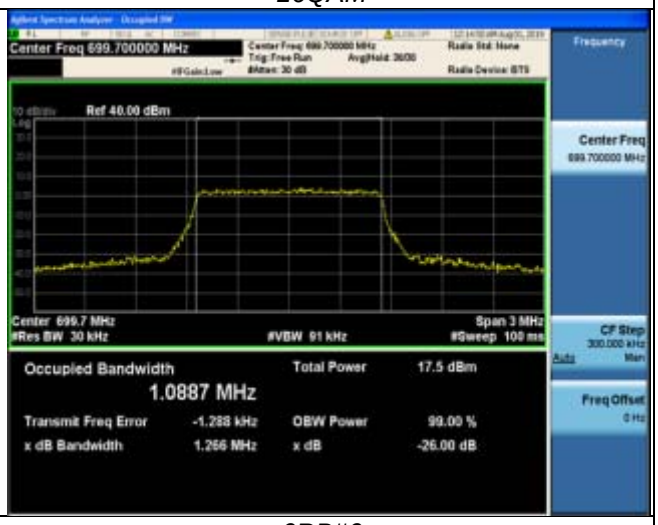
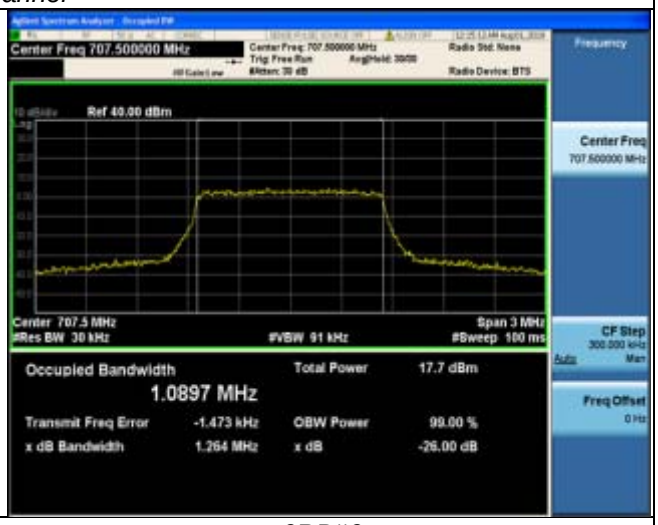
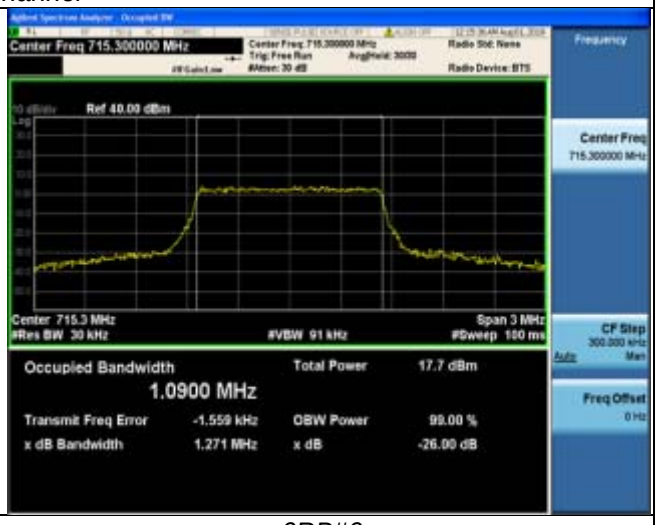
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and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

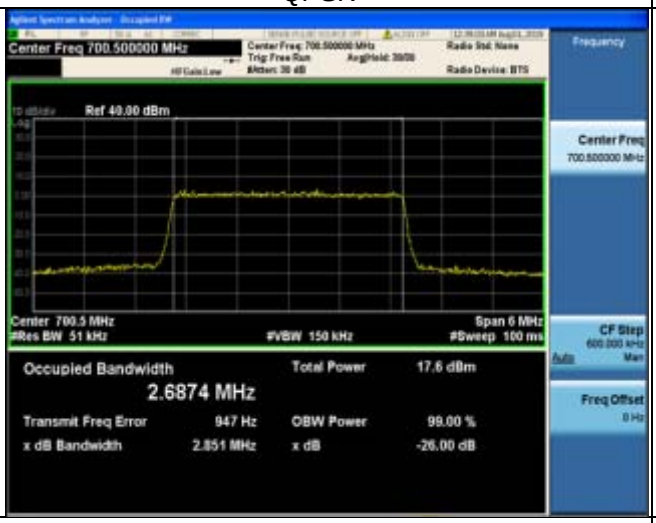
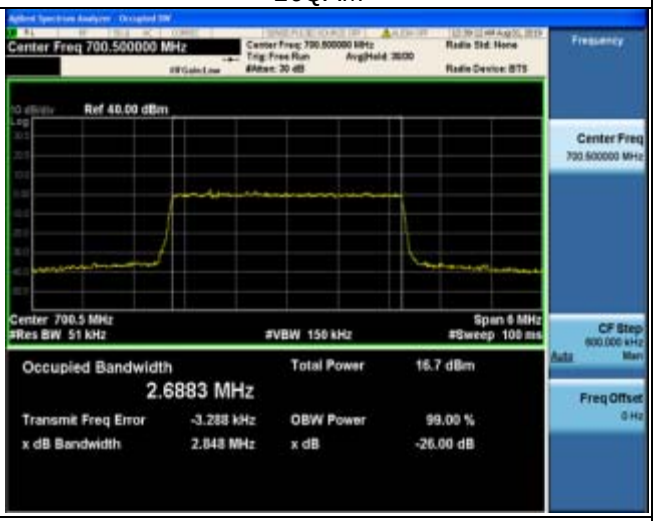
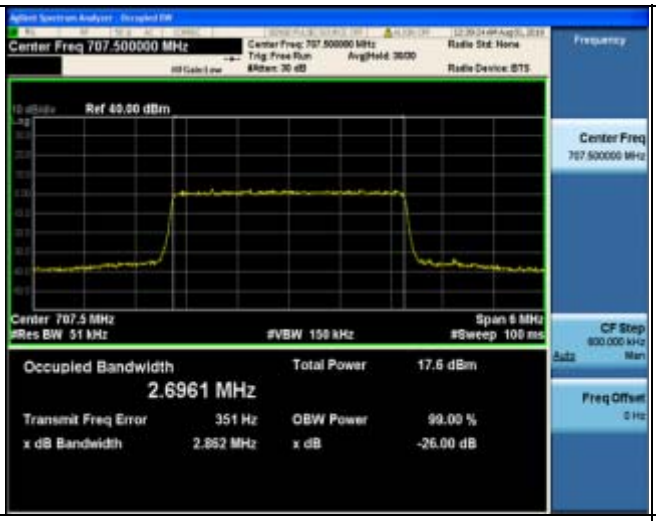
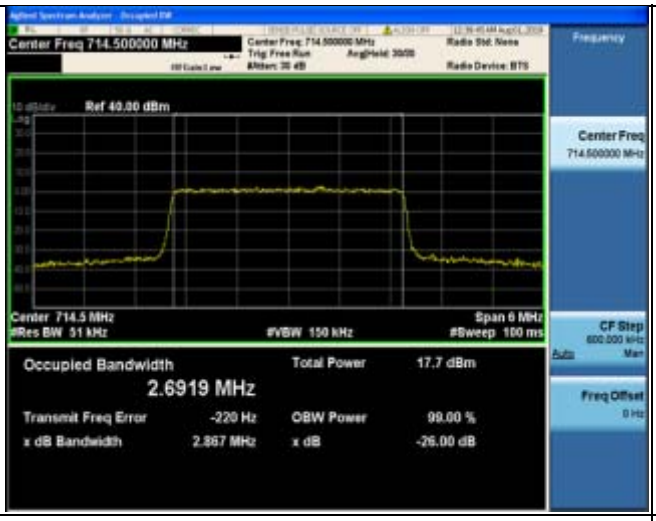
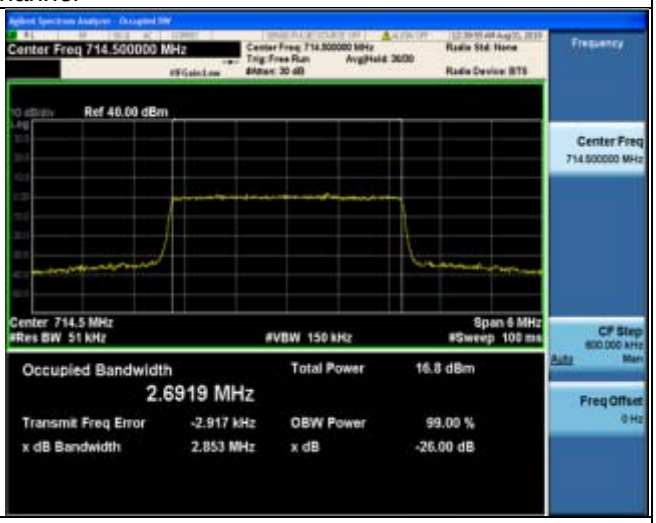
TEST RESULTS

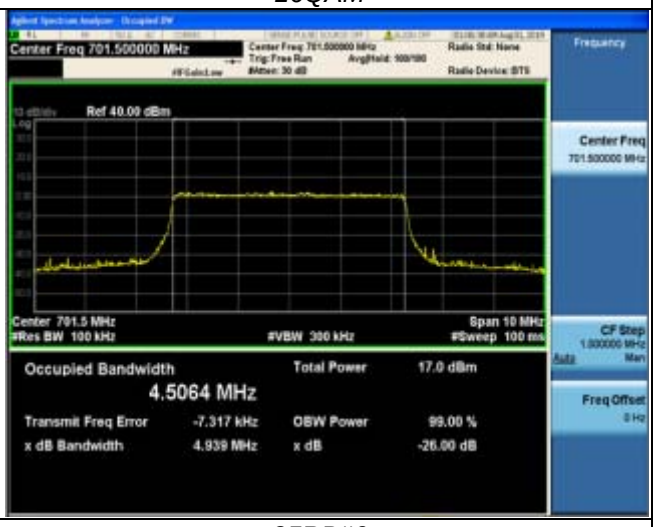
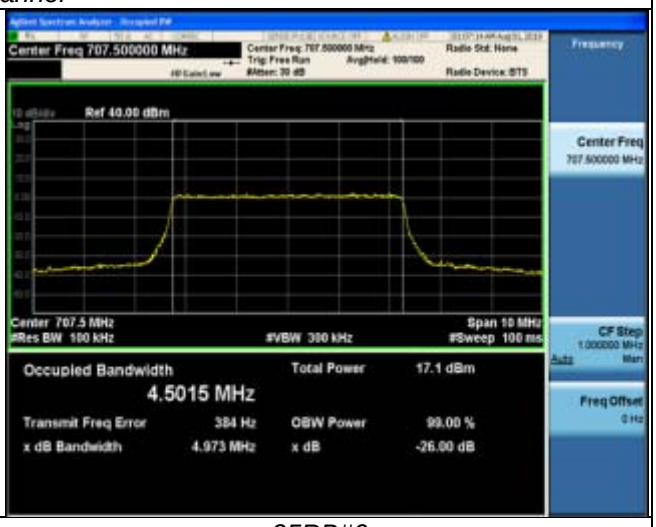
Remark:

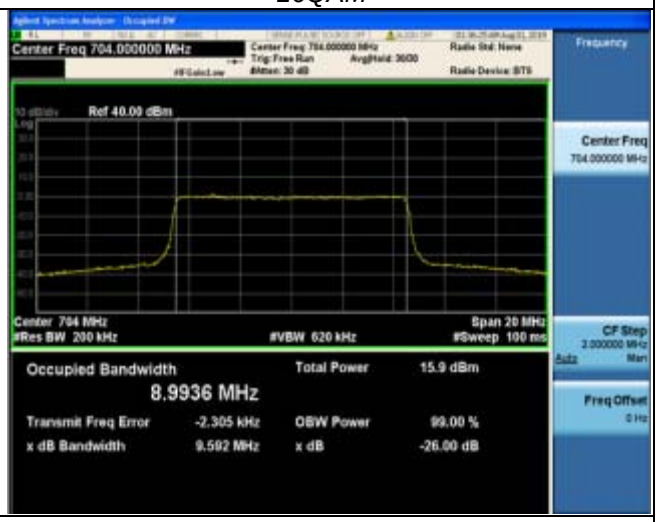
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12.*

LTE FDD Band 12						
TX Channel Bandwidth	RB Size/Offset	Frequency (MHz)	-26dBc Emission bandwidth (MHz)		99% Occupied bandwidth (MHz)	
			QPSK	16QAM	QPSK	16QAM
1.4 MHz	*6RB#0*	699.7	1.249	1.266	1.0875	1.0887
		707.5	1.268	1.264	1.0954	1.0897
		715.3	1.269	1.271	1.0895	1.0900
3 MHz	*15RB#0*	700.5	2.851	2.848	2.6874	2.6883
		707.5	2.862	2.869	2.6961	2.6870
		714.5	2.867	2.853	2.6919	2.6919
5 MHz	*25RB#0*	701.5	5.000	4.939	4.5086	4.5064
		707.5	4.944	4.973	4.5009	4.5015
		713.5	4.957	4.981	4.5057	4.5121
10 MHz	*50RB#0*	704.0	9.600	9.592	9.0022	8.9936
		707.5	9.571	9.588	8.9809	8.9811
		711.0	9.572	9.565	8.9820	8.9780

LTE FDD Band 12-1.4MHz Channel Bandwidth	
QPSK	16QAM
	
6RB#0	6RB#0
Low Channel	
	
6RB#0	6RB#0
Middle Channel	
	
6RB#0	6RB#0
High Channel	

LTE FDD Band 12-3MHz Channel Bandwidth	
QPSK	16QAM
	
15RB#0	15RB#0
Low Channel	
	
15RB#0	15RB#0
Middle Channel	
	
15RB#0	15RB#0
High Channel	

LTE FDD Band 12-5MHz Channel Bandwidth	
QPSK	16QAM
	
25RB#0	25RB#0
Low Channel	
	
25RB#0	25RB#0
Middle Channel	
25RB#0	25RB#0
High Channel	

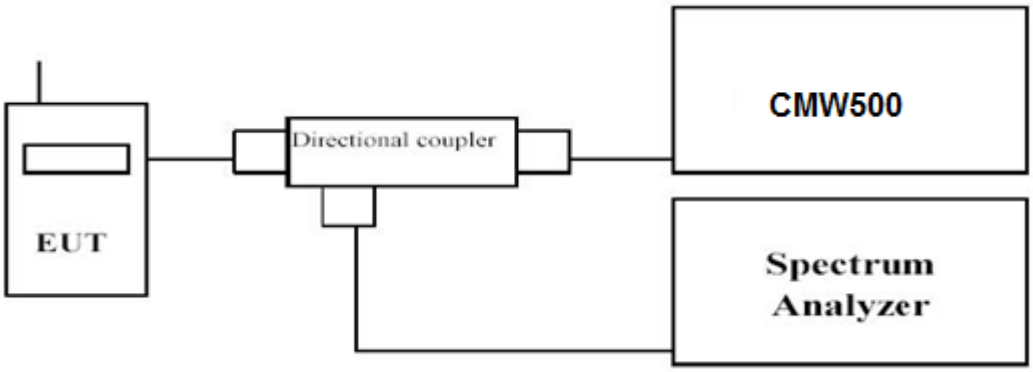
LTE FDD Band 12-10MHz Channel Bandwidth	
QPSK	16QAM
	
50RB#0	50RB#0
Low Channel	
50RB#0	50RB#0
Middle Channel	
50RB#0	50RB#0
High Channel	

3.5 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



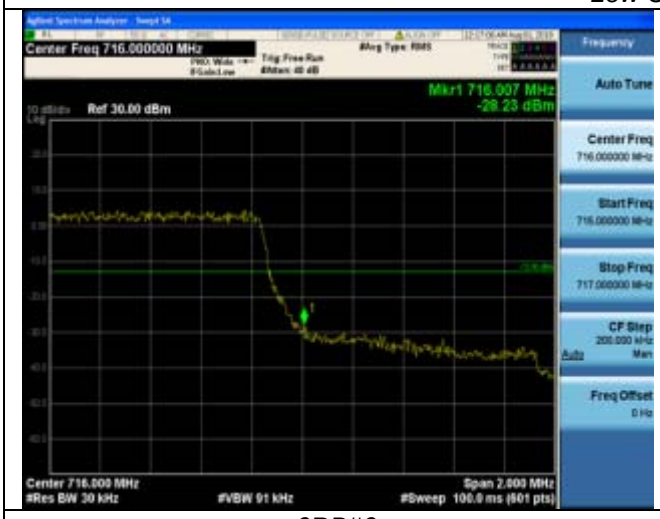
TEST PROCEDURE

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

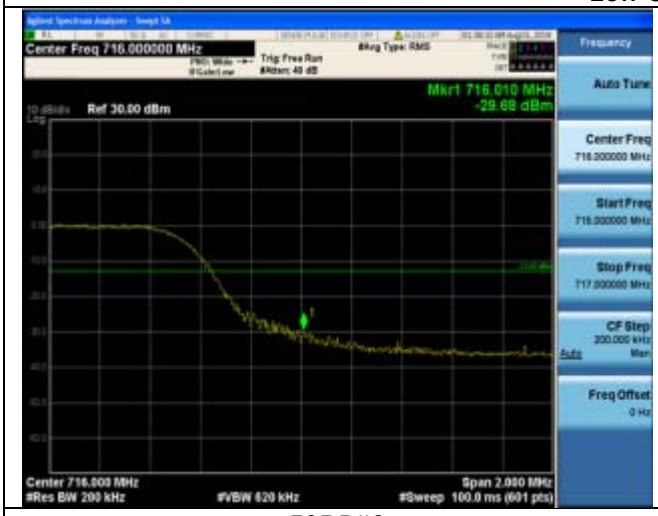
Remark:

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.*

LTE FDD Band 12-1.4MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
6RB#0	6RB#0
Low Channel	
	
6RB#0	6RB#0
High Channel	

LTE FDD Band 12-3MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
15RB#0	15RB#0
Low Channel	
15RB#0	15RB#0
High Channel	

LTE FDD Band 12-5MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
25RB#0	25RB#0
Low Channel	
25RB#0	25RB#0
High Channel	

LTE FDD Band 12-10MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
50RB#0	50RB#0
Low Channel	
	
50RB#0	50RB#0
High Channel	

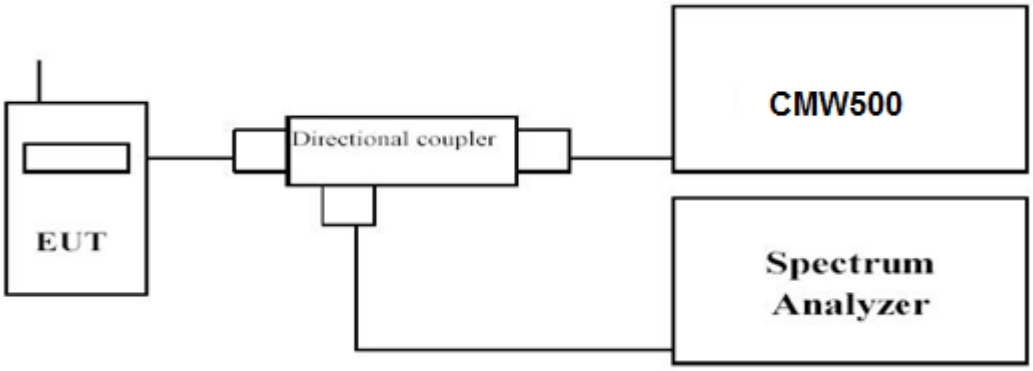
3.6 Spurious Emission

LIMIT

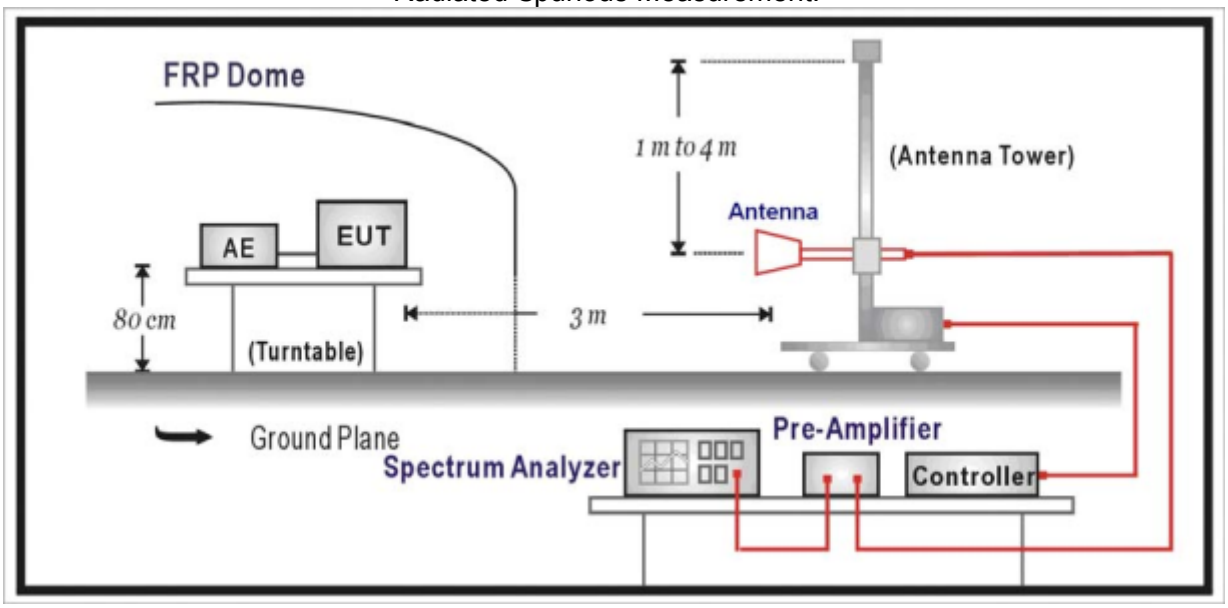
that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates 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.

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:

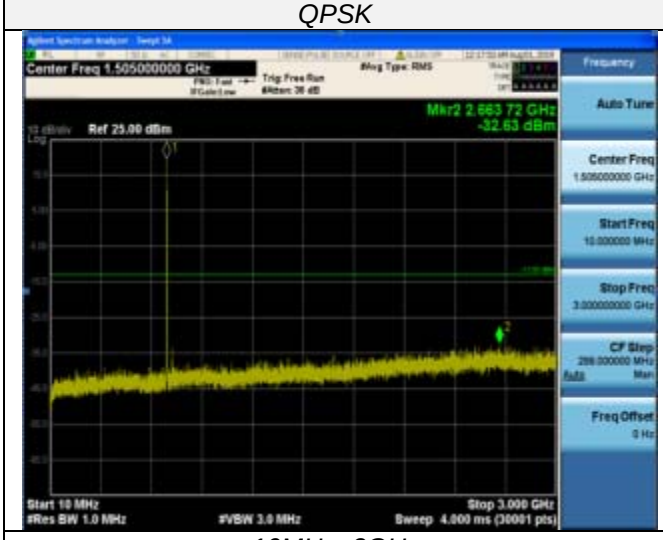
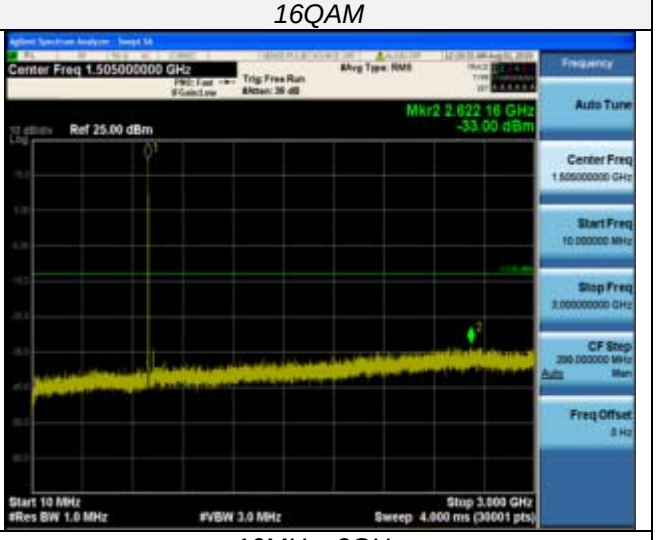
a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
c. The output of the test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

<u>TEST RESULTS</u>

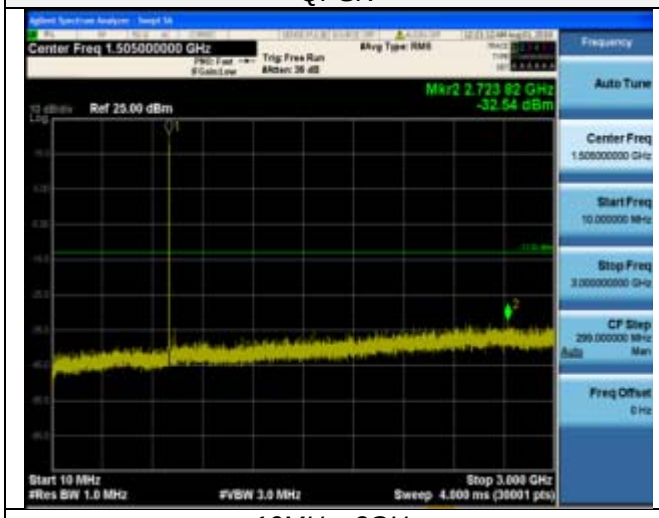
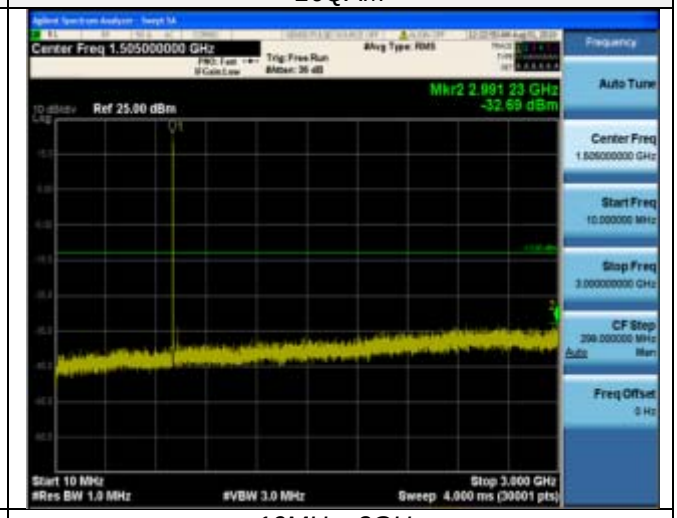
Remark:

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.*

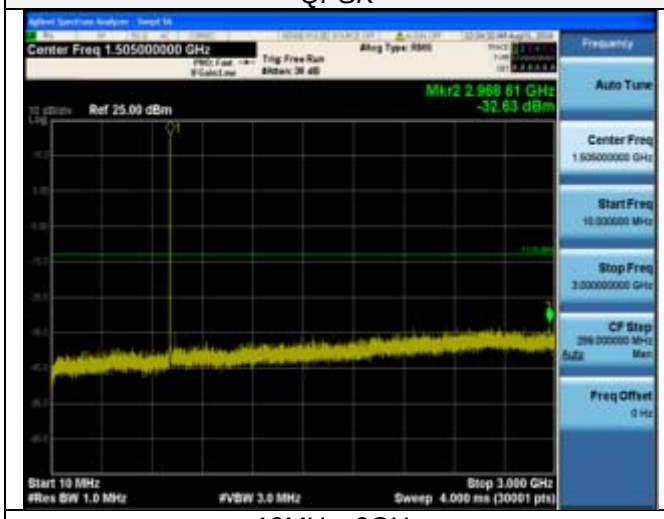
Conducted Measurement:

LTE FDD Band 12-1.4MHz Channel Bandwidth	
Low Channel	
QPSK	16QAM
	
10MHz~3GHz	10MHz~3GHz
3GHz ~9GHz	3GHz ~9GHz
9GHz ~15GHz	9GHz ~15GHz

15GHz ~20GHz	*15GHz ~20GHz*
1RB#0	*1RB#0*

LTE FDD Band 12-1.4MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
10MHz~3GHz	*10MHz~3GHz*
3GHz ~9GHz	*3GHz ~9GHz*

9GHz ~15GHz	*9GHz ~15GHz*
15GHz ~20GHz	*15GHz ~20GHz*
1RB#0	*1RB#0*

LTE FDD Band 12-1.4MHz Channel Bandwidth	
High Channel	
QPSK	*16QAM*
	
10MHz~3GHz	*10MHz~3GHz*

3GHz ~9GHz

3GHz ~9GHz

9GHz ~15GHz

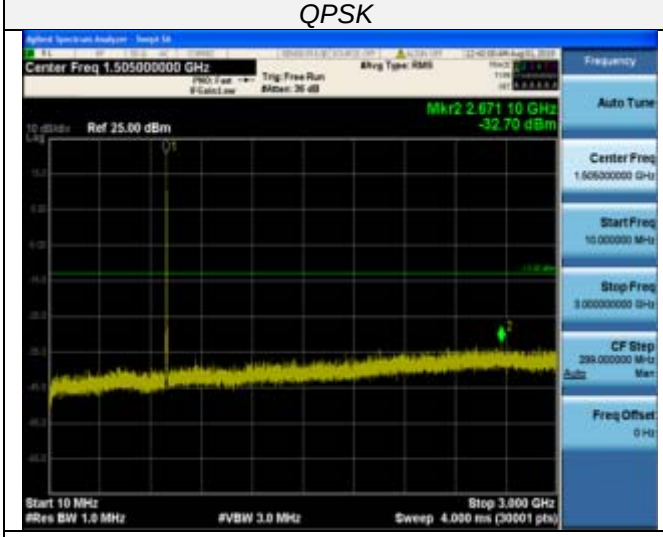
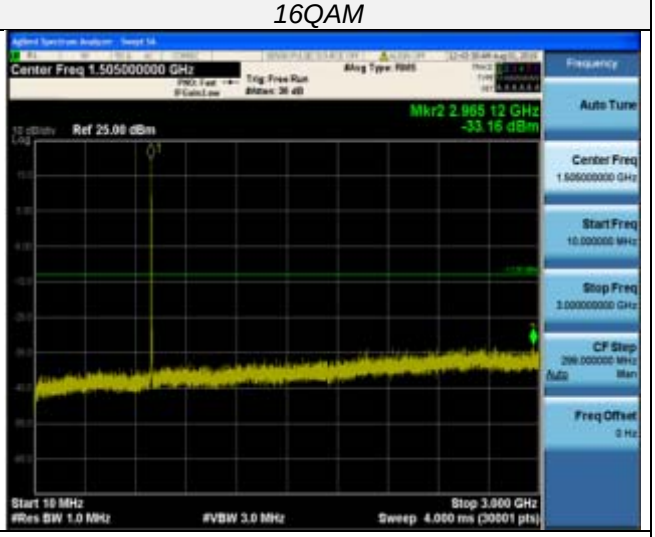
9GHz ~15GHz

15GHz ~20GHz

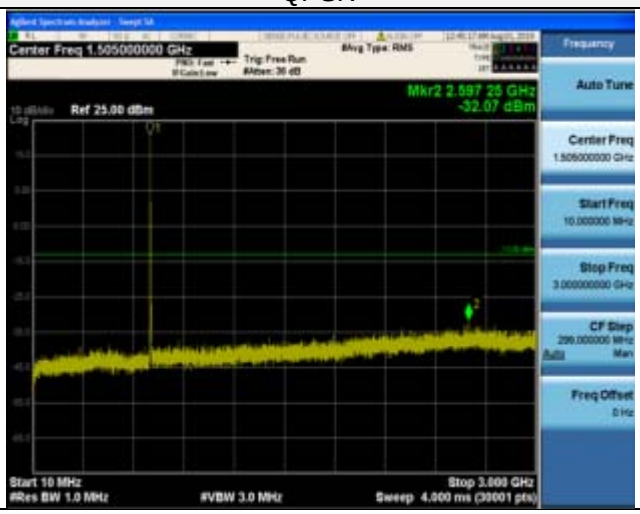
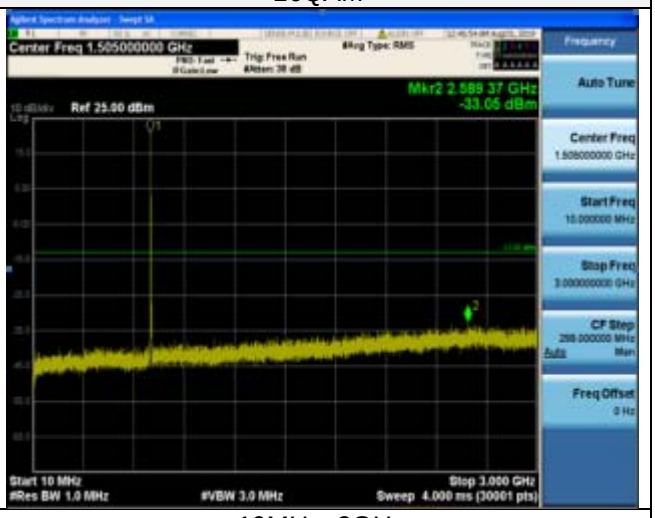
15GHz ~20GHz

1RB#0

1RB#0

LTE FDD Band 12-3MHz Channel Bandwidth	
Low Channel	
QPSK	16QAM
	
10MHz~3GHz	10MHz~3GHz
3GHz ~9GHz	3GHz ~9GHz
9GHz ~15GHz	9GHz ~15GHz

15GHz ~20GHz	*15GHz ~20GHz*
1RB#0	*1RB#0*

LTE FDD Band 12-3MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
10MHz~3GHz	*10MHz~3GHz*
3GHz ~9GHz	*3GHz ~9GHz*

9GHz ~15GHz

9GHz ~15GHz

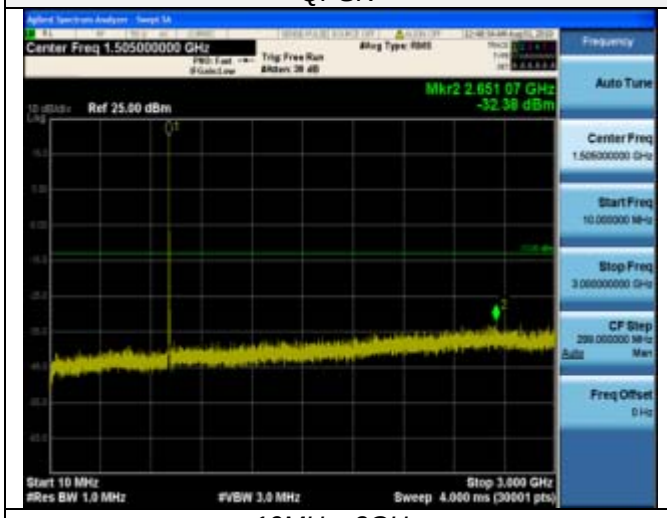
15GHz ~20GHz

1RB#0

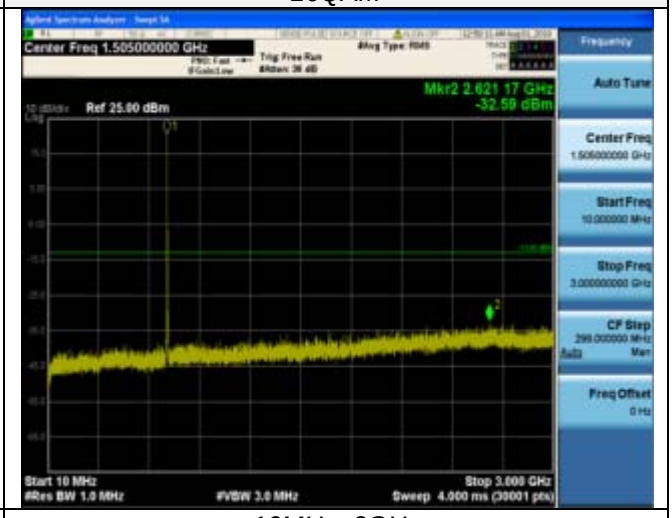
15GHz ~20GHz

1RB#0

LTE FDD Band 12-3MHz Channel Bandwidth	
High Channel	
QPSK	16QAM



10MHz~3GHz



10MHz~3GHz

3GHz ~9GHz

3GHz ~9GHz

9GHz ~15GHz

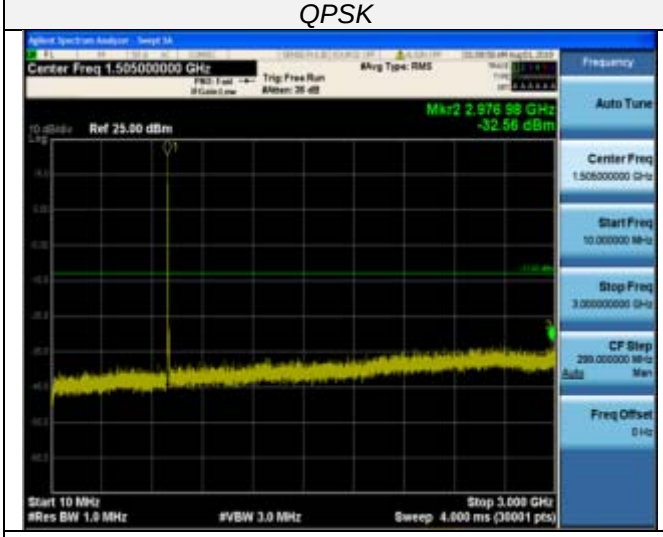
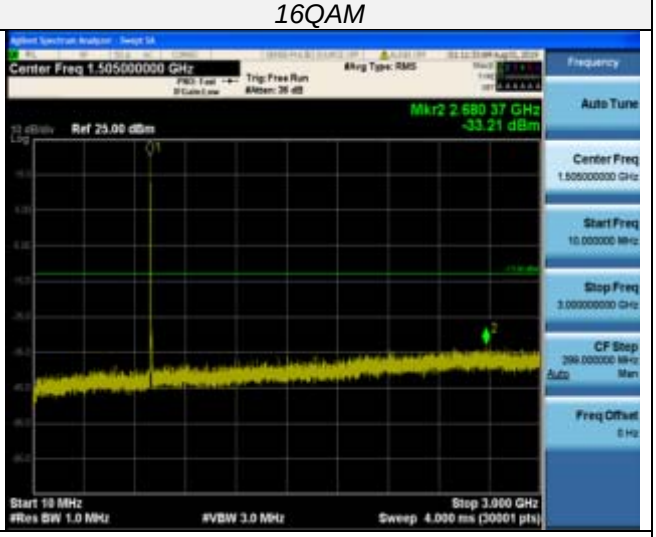
9GHz ~15GHz

15GHz ~20GHz

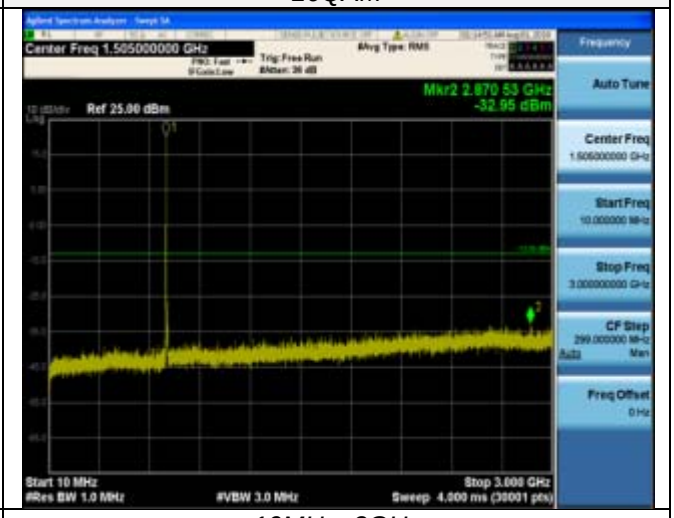
15GHz ~20GHz

1RB#0

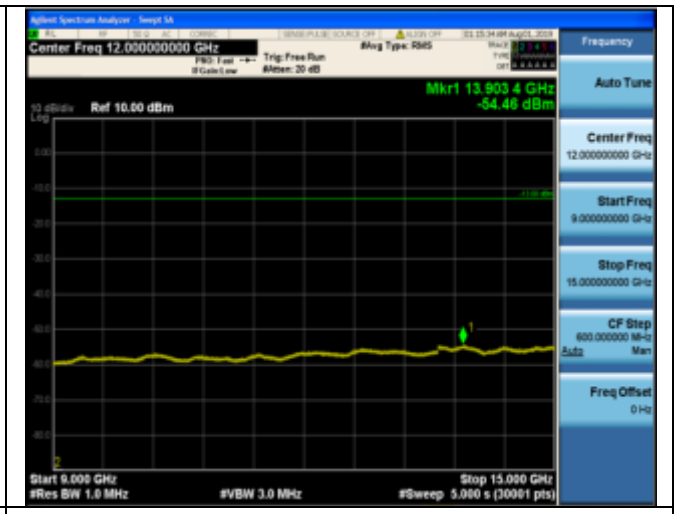
1RB#0

LTE FDD Band 12-5MHz Channel Bandwidth	
Low Channel	
QPSK	16QAM
	
10MHz~3GHz	10MHz~3GHz
3GHz ~9GHz	3GHz ~9GHz
9GHz ~15GHz	9GHz ~15GHz

15GHz ~20GHz	*15GHz ~20GHz*
1RB#0	*1RB#0*

LTE FDD Band 12-5MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
10MHz~3GHz	*10MHz~3GHz*
3GHz ~9GHz	*3GHz ~9GHz*

9GHz ~15GHz



9GHz ~15GHz

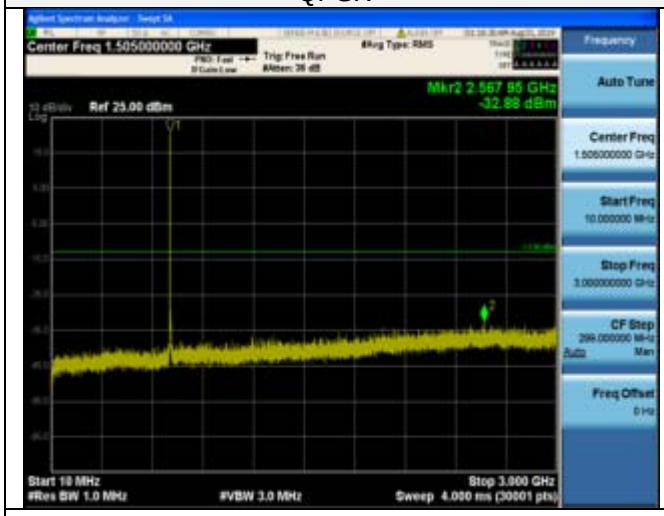
15GHz ~20GHz

1RB#0

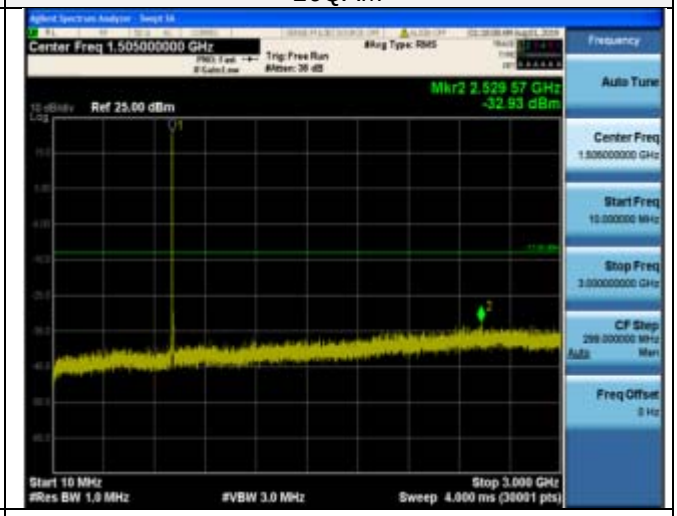
15GHz ~20GHz

1RB#0

LTE FDD Band 12-5MHz Channel Bandwidth	
High Channel	
QPSK	16QAM



10MHz~3GHz



10MHz~3GHz

3GHz ~9GHz

3GHz ~9GHz

9GHz ~15GHz

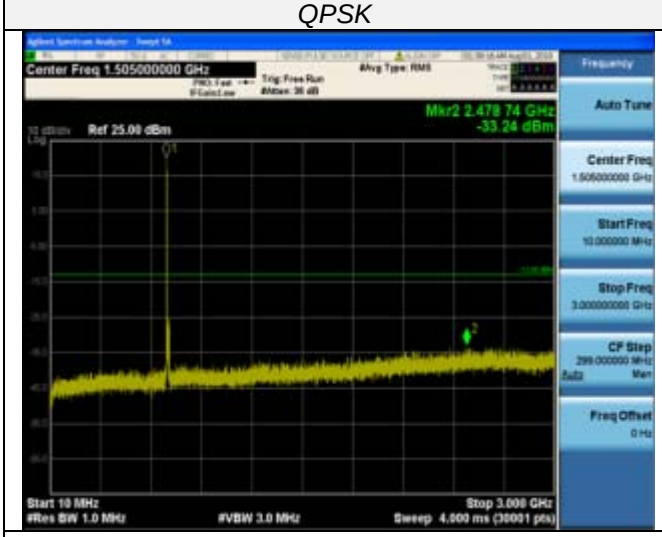
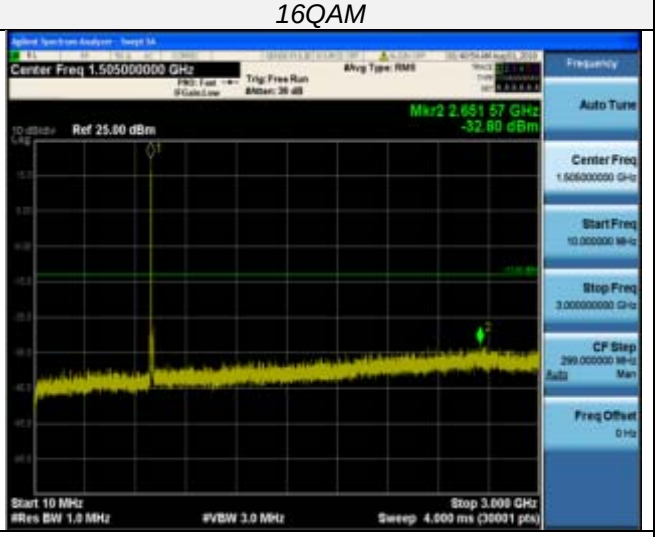
9GHz ~15GHz

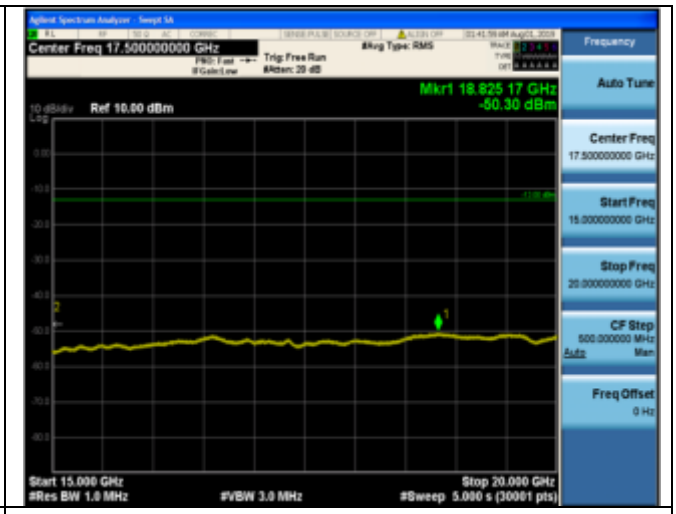
15GHz ~20GHz

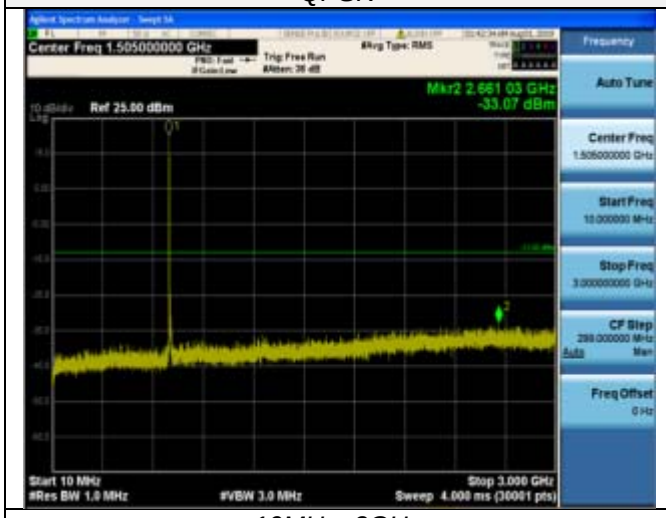
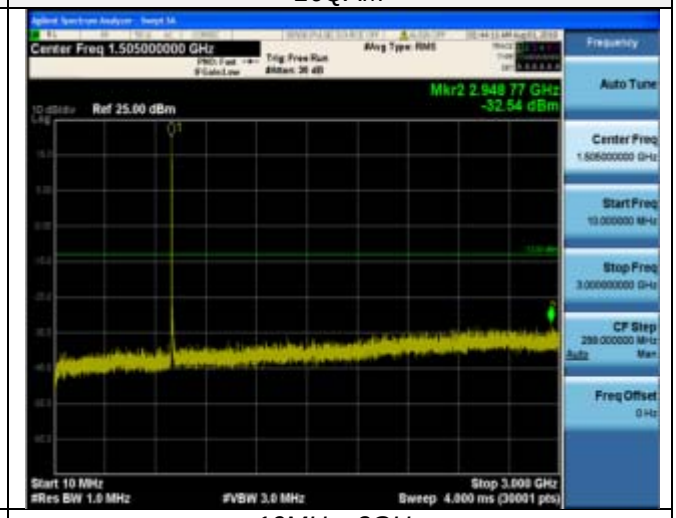
15GHz ~20GHz

1RB#0

1RB#0

LTE FDD Band 12-10MHz Channel Bandwidth	
Low Channel	
QPSK	16QAM
	
10MHz~3GHz	10MHz~3GHz
3GHz ~9GHz	3GHz ~9GHz
9GHz ~15GHz	9GHz ~15GHz

	
15GHz ~20GHz	*15GHz ~20GHz*
1RB#0	*1RB#0*

LTE FDD Band 12-10MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
10MHz~3GHz	*10MHz~3GHz*
3GHz ~9GHz	*3GHz ~9GHz*

9GHz ~15GHz

9GHz ~15GHz

15GHz ~20GHz

15GHz ~20GHz

1RB#0 | 1RB#0

LTE FDD Band 12-10MHz Channel Bandwidth	
High Channel	
QPSK	16QAM

10MHz~3GHz

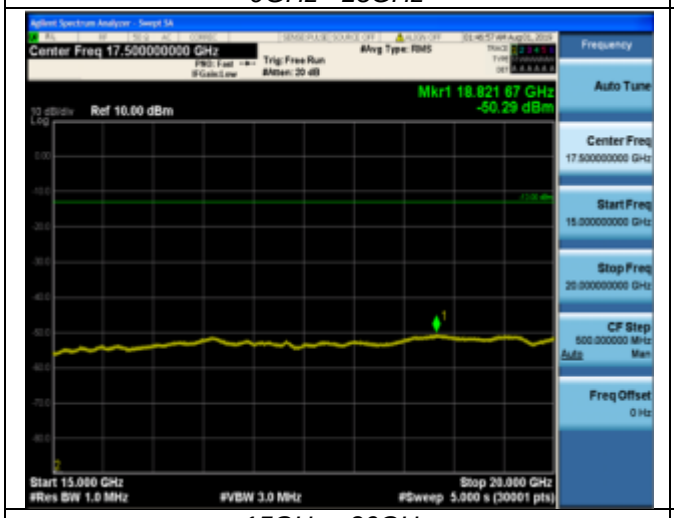
10MHz~3GHz

3GHz ~9GHz

3GHz ~9GHz

9GHz ~15GHz

9GHz ~15GHz



15GHz ~20GHz

15GHz ~20GHz

1RB#0

1RB#0

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) +G_a(dBi)*
3. *We were not recorded other points as values lower than limits.*
4. *Margin = Limit - EIRP*

LTE FDD Band 12_Channel Bandwidth 1.4MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1399.4	-35.69	2.86	3.00	7.25	-31.3	-13.00	18.30	H
2099.1	-43.21	2.94	3.00	9.53	-36.62	-13.00	23.62	H
1399.4	-44.42	2.86	3.00	7.25	-40.03	-13.00	27.03	V
2099.1	-47.13	2.94	3.00	9.53	-40.54	-13.00	27.54	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-33.97	2.86	3.00	7.25	-29.58	-13.00	16.58	H
2122.5	-40.06	2.94	3.00	9.53	-33.47	-13.00	20.47	H
1415.0	-41.45	2.86	3.00	7.25	-37.06	-13.00	24.06	V
2122.5	-48.84	2.94	3.00	9.53	-42.25	-13.00	29.25	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1430.6	-40.48	2.86	3.00	7.82	-35.52	-13.00	22.52	H
2145.9	-45.01	2.94	3.00	9.35	-38.6	-13.00	25.60	H
1430.6	-49.53	2.86	3.00	7.82	-44.57	-13.00	31.57	V
2145.9	-53.2	2.94	3.00	9.35	-46.79	-13.00	33.79	V

LTE FDD Band 12_Channel Bandwidth 3MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1401.0	-35.08	2.86	3.00	7.25	-30.69	-13.00	17.69	H
2101.5	-42.9	2.94	3.00	9.53	-36.31	-13.00	23.31	H
1401.0	-42.87	2.86	3.00	7.25	-38.48	-13.00	25.48	V
2101.5	-47.11	2.94	3.00	9.53	-40.52	-13.00	27.52	V

LTE FDD Band 12_Channel Bandwidth 3MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-34.99	2.86	3.00	7.25	-30.6	-13.00	17.60	H
2122.5	-39.15	2.94	3.00	9.53	-32.56	-13.00	19.56	H
1415.0	-41.32	2.86	3.00	7.25	-36.93	-13.00	23.93	V
2122.5	-48.51	2.94	3.00	9.53	-41.92	-13.00	28.92	V

LTE FDD Band 12_Channel Bandwidth 3MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1429.0	-40.3	2.86	3.00	7.82	-35.34	-13.00	22.34	H
2143.5	-44.57	2.94	3.00	9.35	-38.16	-13.00	25.16	H
1429.0	-48.17	2.86	3.00	7.82	-43.21	-13.00	30.21	V
2143.5	-51.73	2.94	3.00	9.35	-45.32	-13.00	32.32	V

LTE FDD Band 12_Channel Bandwidth 5MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1403.0	-35.51	2.86	3.00	7.25	-31.12	-13.00	18.12	H
2104.5	-42.67	2.94	3.00	9.53	-36.08	-13.00	23.08	H
1403.0	-43.46	2.86	3.00	7.25	-39.07	-13.00	26.07	V
2104.5	-47.47	2.94	3.00	9.53	-40.88	-13.00	27.88	V

LTE FDD Band 12_Channel Bandwidth 5MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-34.35	2.86	3.00	7.25	-29.96	-13.00	16.96	H
2122.5	-40.19	2.94	3.00	9.53	-33.6	-13.00	20.60	H
1415.0	-40.9	2.86	3.00	7.25	-36.51	-13.00	23.51	V
2122.5	-47.52	2.94	3.00	9.53	-40.93	-13.00	27.93	V

LTE FDD Band 12_Channel Bandwidth 5MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1427.0	-39.24	2.86	3.00	7.82	-34.28	-13.00	21.28	H
2140.5	-44.36	2.94	3.00	9.35	-37.95	-13.00	24.95	H
1427.0	-48.83	2.86	3.00	7.82	-43.87	-13.00	30.87	V
2140.5	-52.9	2.94	3.00	9.35	-46.49	-13.00	33.49	V

LTE FDD Band 12_Channel Bandwidth 10MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1408.0	-35.28	2.86	3.00	7.25	-30.89	-13.00	17.89	H
2112.0	-42.94	2.94	3.00	9.53	-36.35	-13.00	23.35	H
1408.0	-43.29	2.86	3.00	7.25	-38.9	-13.00	25.90	V
2112.0	-46.77	2.94	3.00	9.53	-40.18	-13.00	27.18	V

LTE FDD Band 12_Channel Bandwidth 10MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-33.9	2.86	3.00	7.25	-29.51	-13.00	16.51	H
2122.5	-40.38	2.94	3.00	9.53	-33.79	-13.00	20.79	H
1415.0	-42.18	2.86	3.00	7.25	-37.79	-13.00	24.79	V
2122.5	-47.66	2.94	3.00	9.53	-41.07	-13.00	28.07	V

LTE FDD Band 12_Channel Bandwidth 10MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1422.0	-39.13	2.86	3.00	7.82	-34.17	-13.00	21.17	H
2133.0	-43.24	2.94	3.00	9.35	-36.83	-13.00	23.83	H
1422.0	-49.26	2.86	3.00	7.82	-44.3	-13.00	31.30	V
2133.0	-52.47	2.94	3.00	9.35	-46.06	-13.00	33.06	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_16QAM _ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1399.4	-35.54	2.86	3.00	7.25	-31.15	-13.00	18.15	H
2099.1	-42.61	2.94	3.00	9.53	-36.02	-13.00	23.02	H
1399.4	-43.9	2.86	3.00	7.25	-39.51	-13.00	26.51	V
2099.1	-46.42	2.94	3.00	9.53	-39.83	-13.00	26.83	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-34.17	2.86	3.00	7.25	-29.78	-13.00	16.78	H
2122.5	-40.36	2.94	3.00	9.53	-33.77	-13.00	20.77	H
1415.0	-41.71	2.86	3.00	7.25	-37.32	-13.00	24.32	V
2122.5	-47.24	2.94	3.00	9.53	-40.65	-13.00	27.65	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1430.6	-38.92	2.86	3.00	7.82	-33.96	-13.00	20.96	H
2145.9	-44.07	2.94	3.00	9.35	-37.66	-13.00	24.66	H
1430.6	-49.79	2.86	3.00	7.82	-44.83	-13.00	31.83	V
2145.9	-52.4	2.94	3.00	9.35	-45.99	-13.00	32.99	V

LTE FDD Band 12_Channel Bandwidth 3MHz_16QAM _ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1401.0	-35.92	2.86	3.00	7.25	-31.53	-13.00	18.53	H
2101.5	-42.87	2.94	3.00	9.53	-36.28	-13.00	23.28	H
1401.0	-43.44	2.86	3.00	7.25	-39.05	-13.00	26.05	V
2101.5	-46.17	2.94	3.00	9.53	-39.58	-13.00	26.58	V

LTE FDD Band 12_Channel Bandwidth 3MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-33.95	2.86	3.00	7.25	-29.56	-13.00	16.56	H
2122.5	-39.55	2.94	3.00	9.53	-32.96	-13.00	19.96	H
1415.0	-42.3	2.86	3.00	7.25	-37.91	-13.00	24.91	V
2122.5	-47.43	2.94	3.00	9.53	-40.84	-13.00	27.84	V

LTE FDD Band 12_Channel Bandwidth 3MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1429.0	-39.31	2.86	3.00	7.82	-34.35	-13.00	21.35	H
2143.5	-43.67	2.94	3.00	9.35	-37.26	-13.00	24.26	H
1429.0	-49.22	2.86	3.00	7.82	-44.26	-13.00	31.26	V
2143.5	-51.66	2.94	3.00	9.35	-45.25	-13.00	32.25	V

LTE FDD Band 12_Channel Bandwidth 5MHz_16QAM _ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1403.0	-35.87	2.86	3.00	7.25	-31.48	-13.00	18.48	H
2104.5	-42.81	2.94	3.00	9.53	-36.22	-13.00	23.22	H
1403.0	-43.36	2.86	3.00	7.25	-38.97	-13.00	25.97	V
2104.5	-46.06	2.94	3.00	9.53	-39.47	-13.00	26.47	V

LTE FDD Band 12_Channel Bandwidth 5MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-34.31	2.86	3.00	7.25	-29.92	-13.00	16.92	H
2122.5	-39.78	2.94	3.00	9.53	-33.19	-13.00	20.19	H
1415.0	-42.36	2.86	3.00	7.25	-37.97	-13.00	24.97	V
2122.5	-47.83	2.94	3.00	9.53	-41.24	-13.00	28.24	V

LTE FDD Band 12_Channel Bandwidth 5MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1427.0	-38.6	2.86	3.00	7.82	-33.64	-13.00	20.64	H
2140.5	-43.5	2.94	3.00	9.35	-37.09	-13.00	24.09	H
1427.0	-49.51	2.86	3.00	7.82	-44.55	-13.00	31.55	V
2140.5	-52.11	2.94	3.00	9.35	-45.7	-13.00	32.70	V

LTE FDD Band 12_Channel Bandwidth 10MHz_16QAM _ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1408.0	-35.54	2.86	3.00	7.25	-31.15	-13.00	18.15	H
2112.0	-42.33	2.94	3.00	9.53	-35.74	-13.00	22.74	H
1408.0	-44.1	2.86	3.00	7.25	-39.71	-13.00	26.71	V
2112.0	-46.72	2.94	3.00	9.53	-40.13	-13.00	27.13	V

LTE FDD Band 12_Channel Bandwidth 10MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-34.65	2.86	3.00	7.25	-30.26	-13.00	17.26	H
2122.5	-39.96	2.94	3.00	9.53	-33.37	-13.00	20.37	H
1415.0	-42.14	2.86	3.00	7.25	-37.75	-13.00	24.75	V
2122.5	-47.31	2.94	3.00	9.53	-40.72	-13.00	27.72	V

LTE FDD Band 12_Channel Bandwidth 10MHz_16QAM _ High Channel

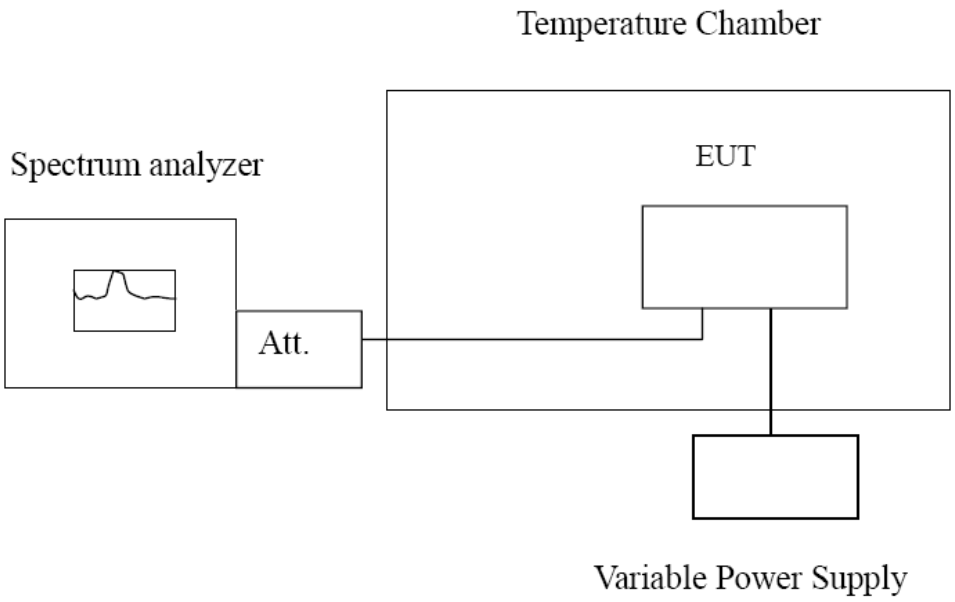
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1422.0	-38.93	2.86	3.00	7.82	-33.97	-13.00	20.97	H
2133.0	-43.69	2.94	3.00	9.35	-37.28	-13.00	24.28	H
1422.0	-49.66	2.86	3.00	7.82	-44.7	-13.00	31.70	V
2133.0	-51.78	2.94	3.00	9.35	-45.37	-13.00	32.37	V

3.7 Frequency Stability under Temperature & Voltage Variations

LIMIT

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 12, 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 12; recorded worst case.

LTE Band 12, 1.4MHz bandwidth (worst case of all bandwidths)

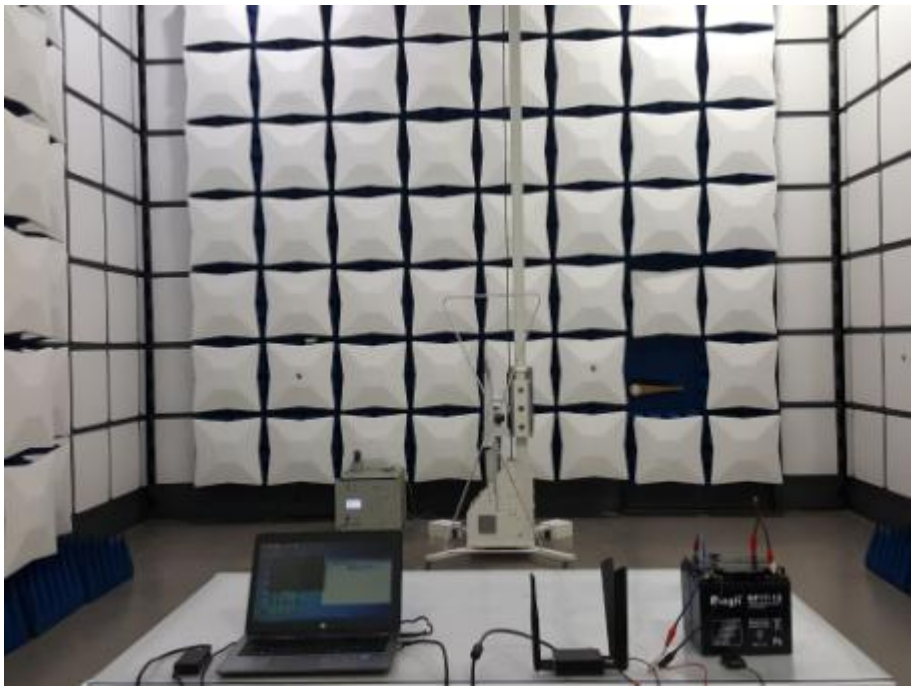
Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
3.40	-15.08	-18.55	-0.008138	-0.009870	2.50
3.60	-11.46	-22.48	-0.006186	-0.011955	2.50
4.20	-15.15	-21.10	-0.008180	-0.011225	2.50

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
-30°	-17.15	-17.93	-0.009123	-0.009399	2.50
-20°	-12.76	-16.25	-0.006785	-0.008519	2.50
-10°	-16.56	-15.17	-0.008806	-0.007951	2.50
0°	-18.16	-15.88	-0.009658	-0.008327	2.50
10°	-13.99	-11.95	-0.007443	-0.006263	2.50
20°	-22.38	-17.04	-0.011907	-0.008935	2.50
30°	-16.17	-20.49	-0.008603	-0.010743	2.50
40°	-20.17	-15.38	-0.010730	-0.008063	2.50
50°	-14.04	-12.95	-0.007467	-0.006791	2.50

4 Test Setup Photos of the EUT



********** End of Report **********