FCC PART 24TEST REPORT

Part 24 Subpart E

Report Reference No.....: HK1907301843-5E

FCC ID.....: 2AUAE-M3300001

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Date of issue.....: Aug. 13, 2019

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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 CFR Title 47 Part 2, Part 24E**

TRF Originator.....: Shenzhen HUAK Testing Technology Co., Ltd.

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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)

Modulation Type .....: QPSK, 16QAM

Rating .....: DC 8-48V

Hardware version .....: V2.0

Software version.....: V2.0

Result.....: **PASS**

TEST REPORT

Test Report No. :	HK1907301843-5E	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.

Revison History

Revision	Issue Date	Revisions	Revised By
V1.0	2019-8-13	Initial Issue	James Zhou

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Part 24 :PUBLIC MOBILE 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:v02r02MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS
ANSI C63.4:2014:Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Jul. 30, 2019
Testing commenced on	:	Jul. 30, 2019
Testing concluded on	:	Aug. 13, 2019

2.2 Product Description

The **Proscend Communications Inc.**'s Model:M330-W or the "EUT" as referred to in this report; more general information as follows,for more details, refer to the user's manual of the EUT.

Name of EUT	Industrial 4G LTE Cellular Router
Model/Type reference:	M330-W
List Model:	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)
Power supply:	DC 8-48V
Modilation Type	QPSK,16QAM
Antenna Type	External Antenna
Antenna Gain	2dBi
Operation Frequency Band	LTE Band 2
Operation frequency	LTE Band 2: 1850.7~1909.3 MHz
LTE Release	R8
Extreme temp. Tolerance	-30°C to +70°C
Extreme vol. Limits	21.6VDC to 26.4VDC (nominal: 24VDC)

2.3 Equipment under Test

Power supply system utilised

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

2.4 Short description of the Equipment under Test (EUT)

2.4.1 GeneralDescription

This is a Industrial 4G LTE Cellular Router .

For more details, refer to the user's manual of the EUT

2.5 Normal Accessory setting

Fully charged battery was used during the test.

2.6 EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

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

2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID:** 2AUAE-M3300001 filing to comply with FCC Part 24, Rules.

2.8 Modifications

No modifications were implemented to meet testing criteria.

2.9 GeneralTest Conditions/Configurations

2.10.1 TestEnvironment

EnvironmentParameter	SelectedValuesDuringTests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	21.6V
	VN	24V
	VH	26.4V

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

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

3.2 Environmental conditions

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

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

3.3 Test Description

PCSBand (1850-1915MHz pairedwith 1930-1995MHz)

Test Item	FCCRuleNo.	Requirements	Verdict
Effective(Isotropic)RadiatedOutputPower	Part§2.1046, Part§24.232	EIRP ≤ 2W	Pass
Peak-AverageRatio	Part§2.1046, Part§24.232	FCC:Limit≤13dB	Pass
Bandwidth	Part§2.1049 RSS-133	OBW: Nolimit. EBW: Nolimit.	Pass
BandEdgesCompliance	Part§2.1051, Part§24.238	≤ -13dBm/1%*EBW, In1MHzbandsimmediatelyoutsideandadjacentto Thefrequency block.	Pass
SpuriousEmissionatAntennaTerminals	Part§2.1051, Part§24.238	≤-13dBm/1MHz, from9kHzto10thharmonicsbut outsideauthorized Operatingfrequency ranges.	Pass
Field Strengthof Spurious Radiation	Part§2.1053, Part§24.238	≤ -13dBm/1MHz.	Pass
Frequency Stability	Part§2.1055, Part§24.235	FCC:withinauthorizedfrequency block.	Pass
NOTE 1:For theverdict,the“N/A”denotes“not applicable”,the“N/T”denotes “nottested”.			

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

3.4 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

4 TEST CONDITIONS AND RESULTS

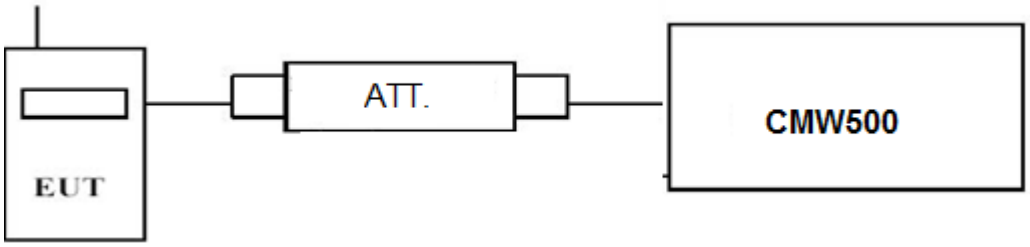
4.1 Output Power

4.1.1 Coducted Output Power

TEST APPLICABLE

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

TEST CONFIGURATION



TEST PROCEDURE

Conducted Power Measurement:

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

TEST RESULTS

Remark:

1. *We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2;*

LTE FDD Band 2				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	Burst Average Power [dBm]	
			QPSK	16QAM
1.4 MHz	1850.7	1 RB low	23.45	23.44
		1 RB high	23.45	23.46
		50% RB mid	23.42	23.40
		100% RB	22.39	22.44
	1880.0	1 RB low	22.69	21.85
		1 RB high	22.83	22.10
		50% RB mid	22.70	21.88
		100% RB	22.78	22.80
	1909.3	1 RB low	23.04	22.11
		1 RB high	23.16	23.13
		50% RB mid	23.02	23.13
		100% RB	23.10	23.13
3 MHz	1851.5	1 RB low	22.07	22.09
		1 RB high	22.01	22.01
		50% RB mid	22.00	22.01
		100% RB	21.86	20.91
	1880.0	1 RB low	22.25	21.44
		1 RB high	22.25	21.43
		50% RB mid	22.29	21.43
		100% RB	21.49	21.48

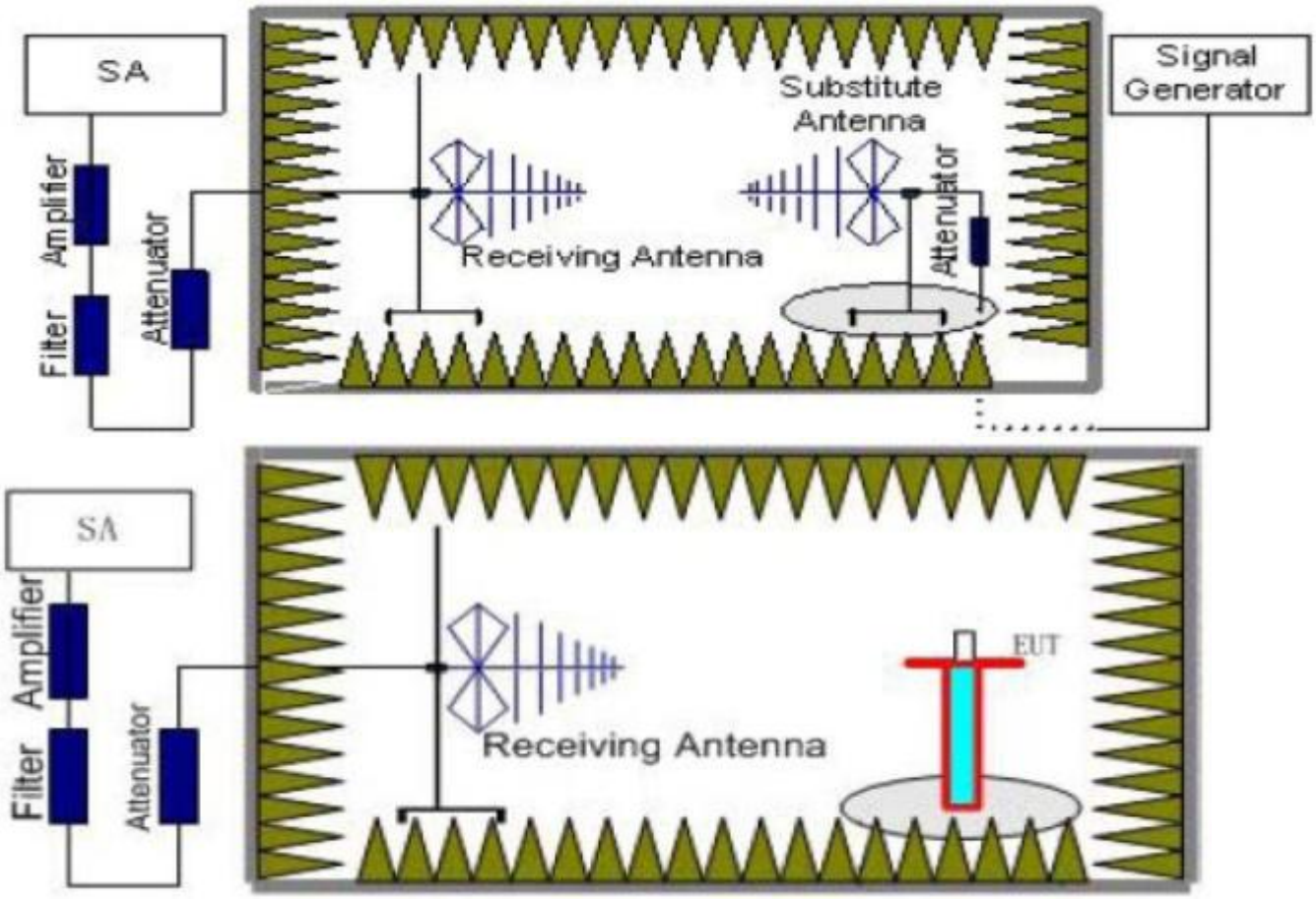
	1908.5	1 RB low	22.57	21.80
		1 RB high	22.59	21.76
		50% RB mid	22.58	21.70
		100% RB	21.81	20.61
5 MHz	1852.5	1 RB low	21.88	21.90
		1 RB high	21.89	21.88
		50% RB mid	21.91	21.86
		100% RB	21.96	20.98
	1880.0	1 RB low	22.26	21.44
		1 RB high	22.31	21.53
		50% RB mid	22.25	21.45
		100% RB	21.25	21.25
	1907.5	1 RB low	22.60	21.63
		1 RB high	22.71	21.73
		50% RB mid	22.56	21.58
		100% RB	21.61	21.65
10 MHz	1855.0	1 RB low	22.15	21.98
		1 RB high	21.99	21.94
		50% RB mid	21.98	21.93
		100% RB	21.98	20.98
	1880.0	1 RB low	22.77	21.48
		1 RB high	22.47	21.59
		50% RB mid	22.28	21.49
		100% RB	21.36	21.36
	1905.0	1 RB low	23.01	21.60
		1 RB high	22.77	21.65
		50% RB mid	22.62	21.52
		100% RB	21.87	21.86
15 MHz	1857.5	1 RB low	22.06	22.07
		1 RB high	22.01	22.02
		50% RB mid	21.70	21.69
		100% RB	21.91	20.84
	1880.0	1 RB low	22.26	21.56
		1 RB high	22.29	21.62
		50% RB mid	22.25	21.59
		100% RB	21.60	21.58
	1902.5	1 RB low	22.62	21.74
		1 RB high	22.70	21.89
		50% RB mid	22.50	21.71
		100% RB	21.77	21.78
20 MHz	1860.0	1 RB low	21.94	21.92
		1 RB high	21.95	21.94
		50% RB mid	21.67	21.70
		100% RB	21.79	20.81
	1880.0	1 RB low	22.17	21.31
		1 RB high	22.35	21.53
		50% RB mid	22.23	21.35
		100% RB	21.43	21.45
	1900.0	1 RB low	22.59	21.60
		1 RB high	22.88	21.96
		50% RB mid	22.54	21.54
		100% RB	21.91	21.90

4.1.2. Radiated Output Power

LIMIT

This is the test for the maximum radiated power from the EUT.
Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna.In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

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

TEST RESULTS

Radiated Measurement:

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

LTE FDD Band 2_Channel Bandwidth 1.4MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.7	-21.12	3.41	10.24	33.60	19.31	33.01	13.7	V
1880.0	-19.29	3.49	10.24	33.60	21.06	33.01	11.95	V
1909.3	-20.46	3.55	10.23	33.60	19.82	33.01	13.19	V

LTE FDD Band 2_Channel Bandwidth 3MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1851.5	-20.78	3.41	10.24	33.60	19.65	33.01	13.36	V
1880.0	-19.49	3.49	10.24	33.60	20.86	33.01	12.15	V
1908.5	-19.75	3.55	10.23	33.60	20.53	33.01	12.48	V

LTE FDD Band 2_Channel Bandwidth 5MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1852.5	-20.48	3.41	10.24	33.60	19.95	33.01	13.06	V
1880.0	-19.76	3.49	10.24	33.60	20.59	33.01	12.42	V
1907.5	-19.63	3.55	10.23	33.60	20.65	33.01	12.36	V

LTE FDD Band 2_Channel Bandwidth 10MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1855.0	-20.56	3.41	10.24	33.60	19.87	33.01	13.14	V
1880.0	-18.86	3.49	10.24	33.60	21.49	33.01	11.52	V
1905.0	-19.7	3.55	10.23	33.60	20.58	33.01	12.43	V

LTE FDD Band 2_Channel Bandwidth 15MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1857.5	-21.23	3.41	10.24	33.60	19.2	33.01	13.81	V
1880.0	-19.56	3.49	10.24	33.60	20.79	33.01	12.22	V
1902.5	-19.8	3.55	10.23	33.60	20.48	33.01	12.53	V

LTE FDD Band 2_Channel Bandwidth 20MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1860.0	-20.77	3.41	10.24	33.60	19.66	33.01	13.35	V
1880.0	-18.85	3.49	10.24	33.60	21.5	33.01	11.51	V
1900.0	-19.93	3.55	10.23	33.60	20.35	33.01	12.66	V

LTE FDD Band 2_Channel Bandwidth 1.4MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.7	-21.33	3.41	10.24	33.60	19.1	33.01	13.91	V
1880.0	-19.27	3.49	10.24	33.60	21.08	33.01	11.93	V
1909.3	-19.6	3.55	10.23	33.60	20.68	33.01	12.33	V

LTE FDD Band 2_Channel Bandwidth 3MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1851.5	-21.32	3.41	10.24	33.60	19.11	33.01	13.9	V
1880.0	-19.64	3.49	10.24	33.60	20.71	33.01	12.3	V
1908.5	-20.27	3.55	10.23	33.60	20.01	33.01	13	V

LTE FDD Band 2_Channel Bandwidth 5MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1852.5	-21.3	3.41	10.24	33.60	19.13	33.01	13.88	V
1880.0	-18.95	3.49	10.24	33.60	21.4	33.01	11.61	V
1907.5	-20.05	3.55	10.23	33.60	20.23	33.01	12.78	V

LTE FDD Band 2_Channel Bandwidth 10MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1855.0	-20.62	3.41	10.24	33.60	19.81	33.01	13.2	V
1880.0	-19.43	3.49	10.24	33.60	20.92	33.01	12.09	V
1905.0	-19.56	3.55	10.23	33.60	20.72	33.01	12.29	V

LTE FDD Band 2_Channel Bandwidth 15MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1857.5	-21.27	3.41	10.24	33.60	19.16	33.01	13.85	V
1880.0	-19.28	3.49	10.24	33.60	21.07	33.01	11.94	V
1902.5	-19.73	3.55	10.23	33.60	20.55	33.01	12.46	V

LTE FDD Band 2_Channel Bandwidth 20MHz_16QAM

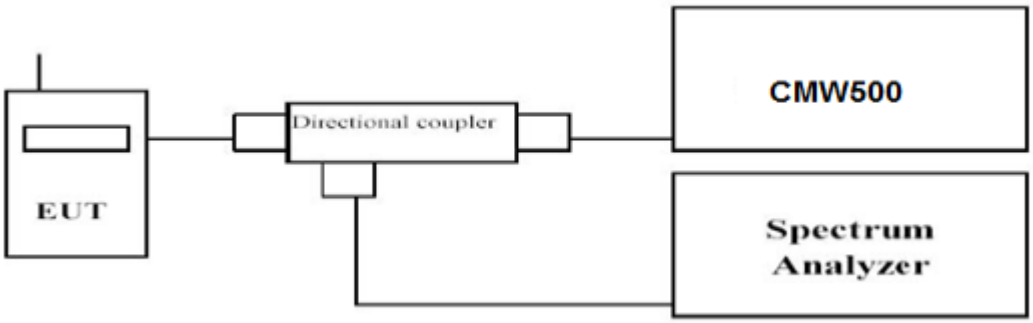
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1860.0	-20.88	3.41	10.24	33.60	19.55	33.01	13.46	V
1880.0	-18.96	3.49	10.24	33.60	21.39	33.01	11.62	V
1900.0	-20.45	3.55	10.23	33.60	19.83	33.01	13.18	V

4.2 Peak-to-Average Ratio (PAR)

LIMIT

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

TEST CONFIGURATION



TEST PROCEDURE

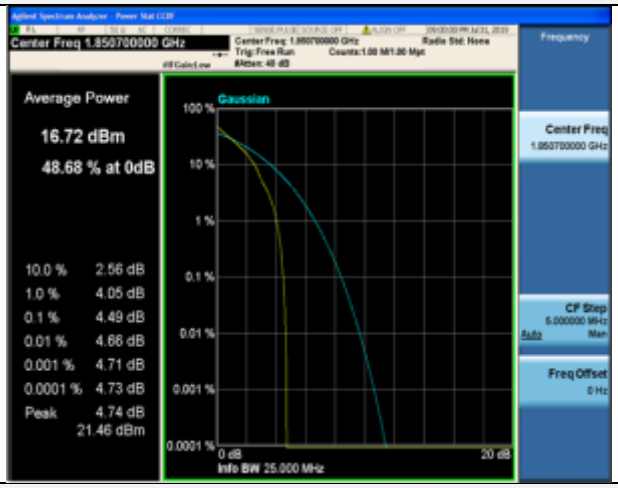
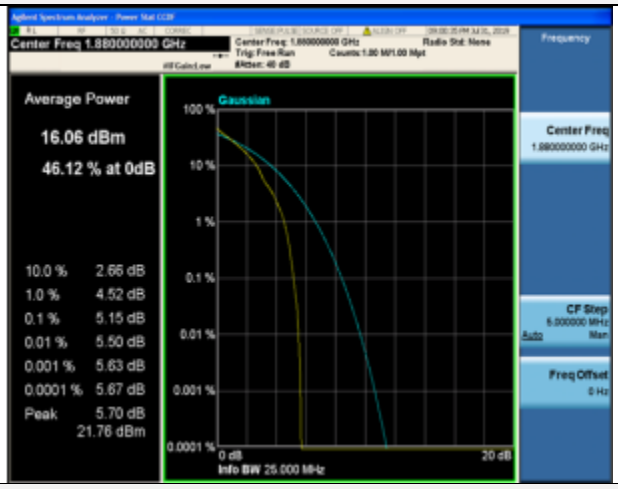
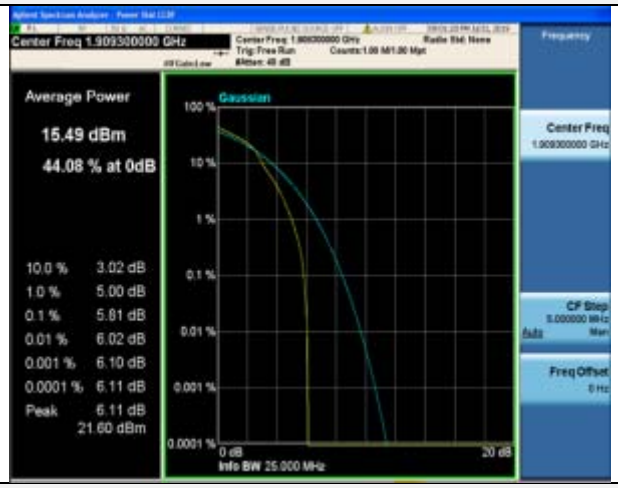
1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as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

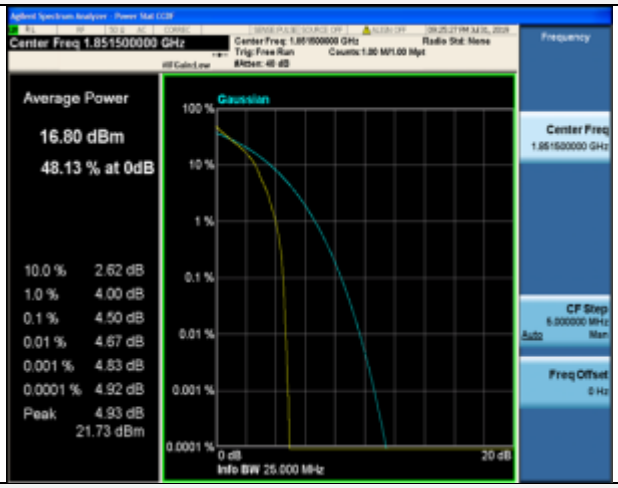
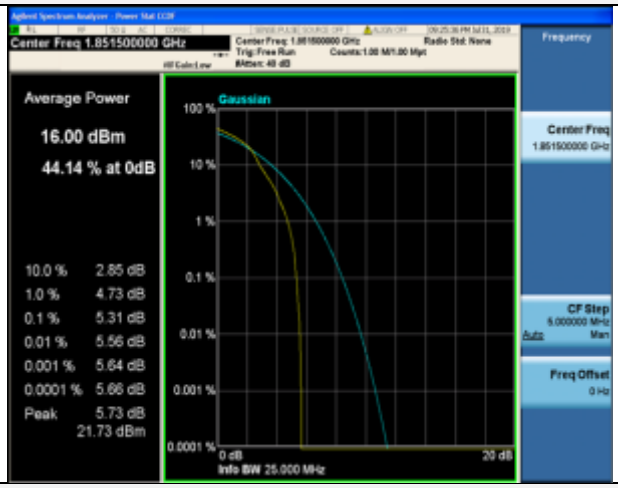
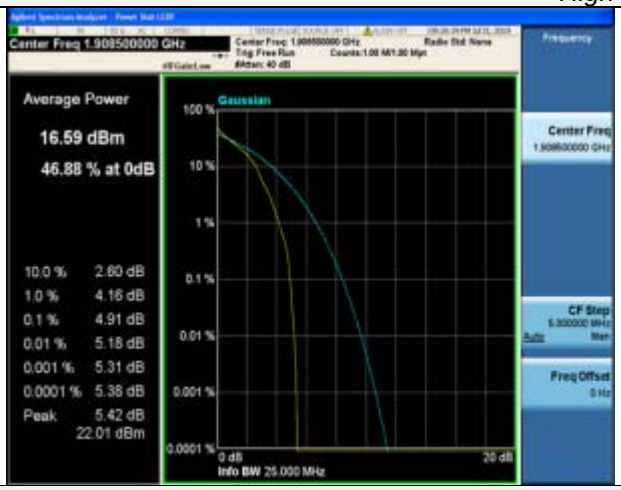
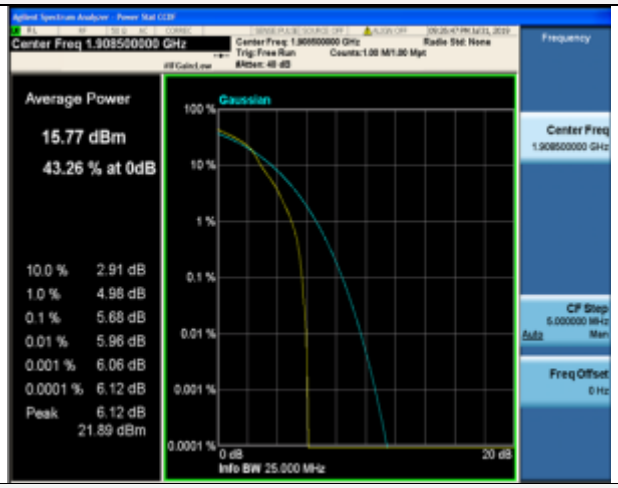
TEST RESULTS

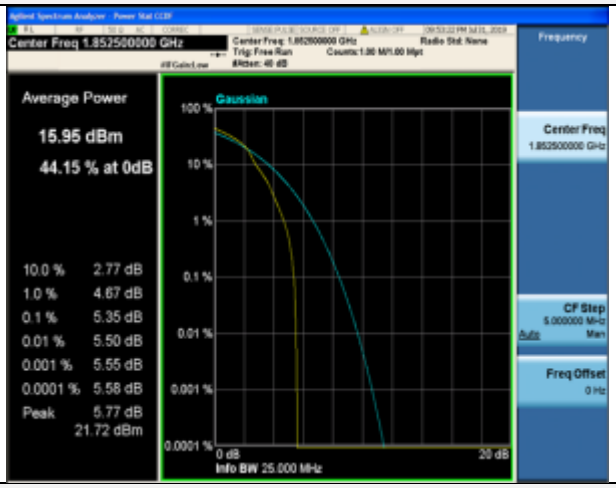
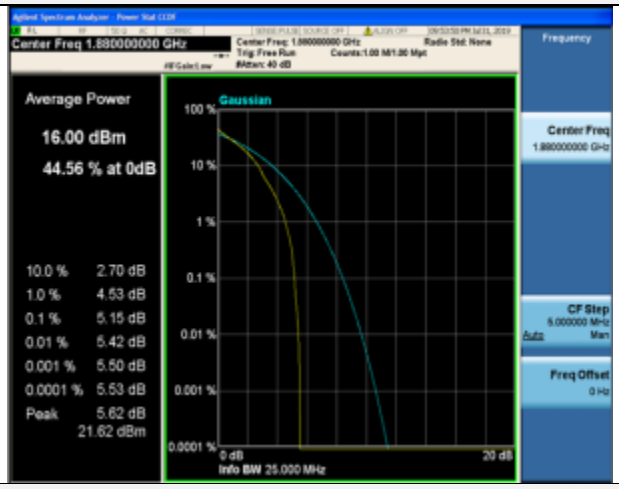
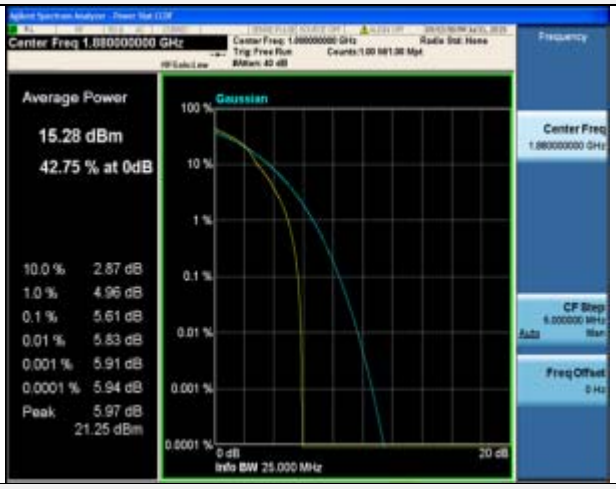
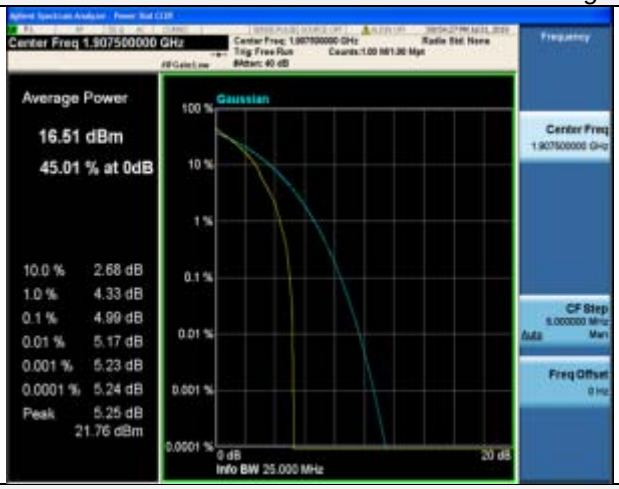
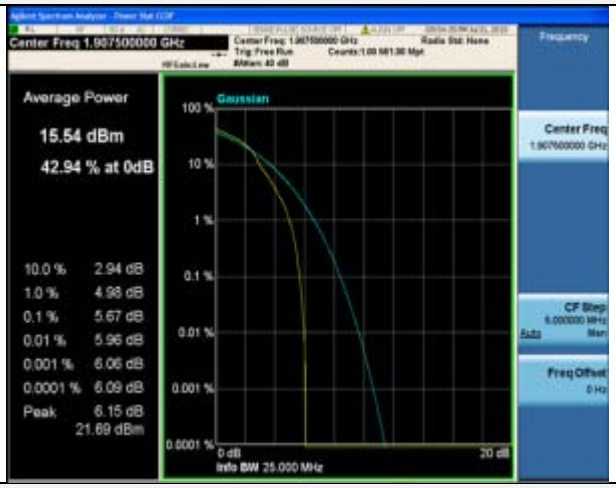
Remark:

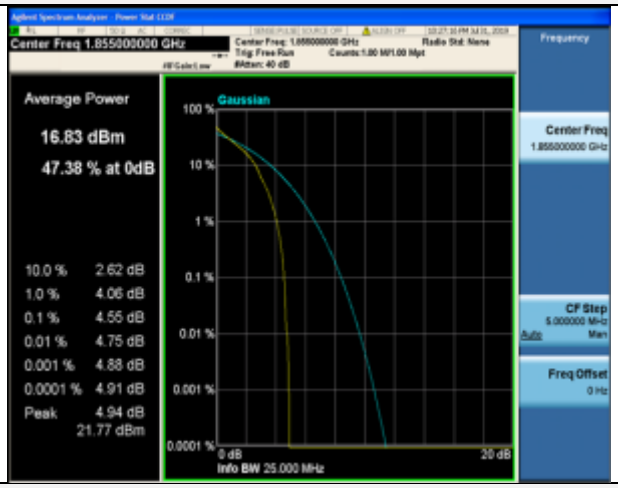
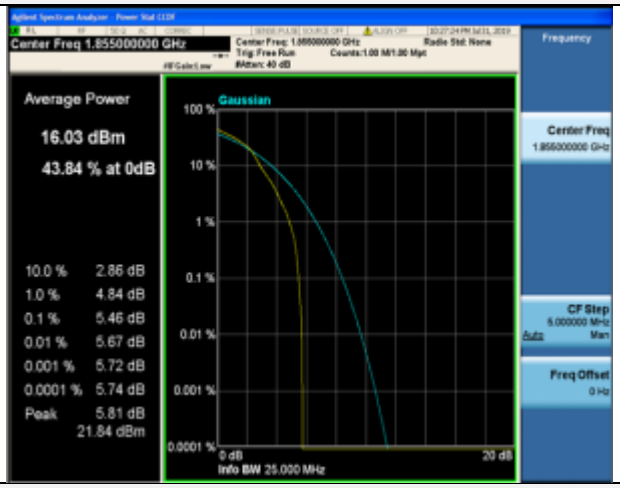
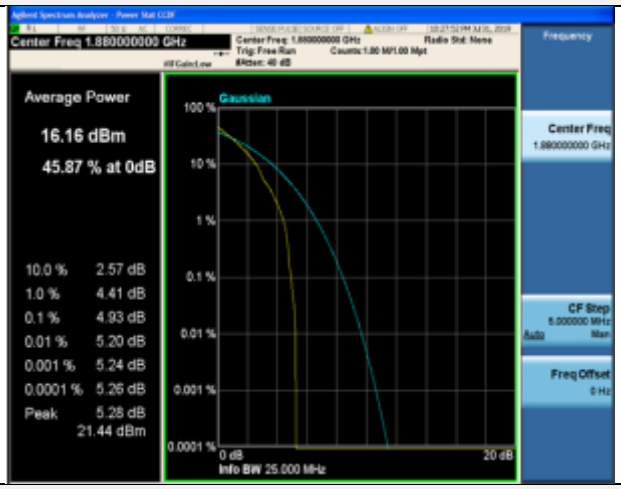
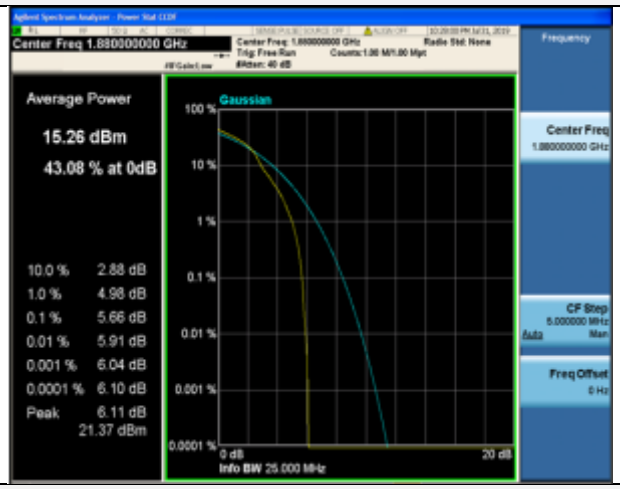
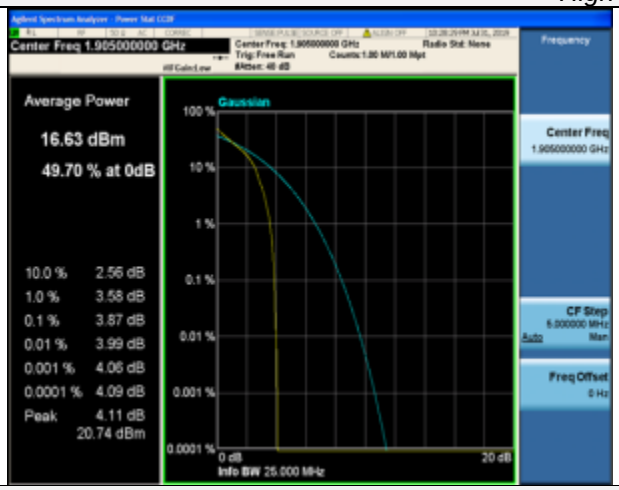
1. *We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case for each Channel Bandwidth of LTE FDD Band 2.*

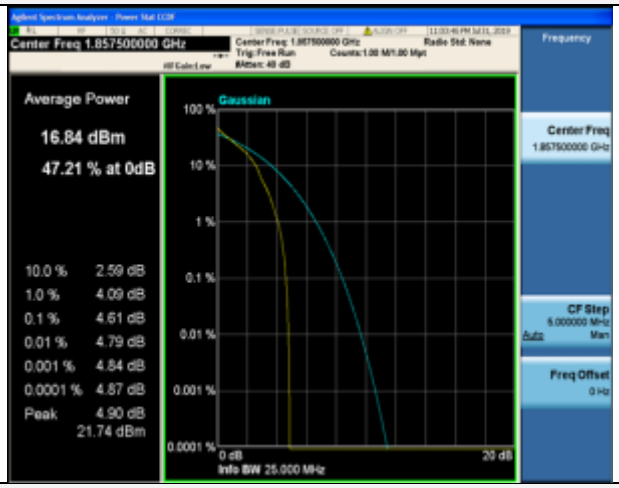
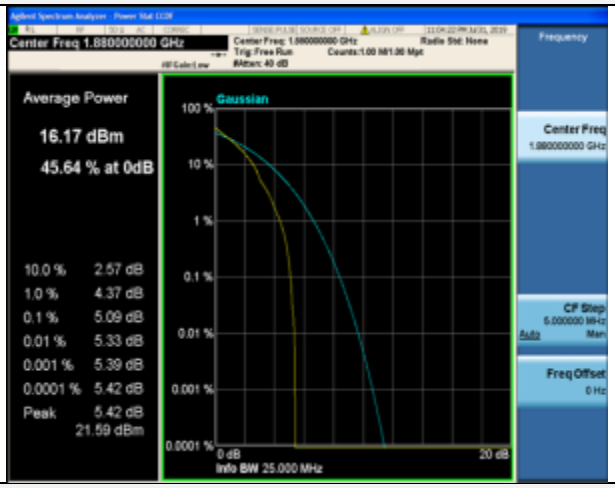
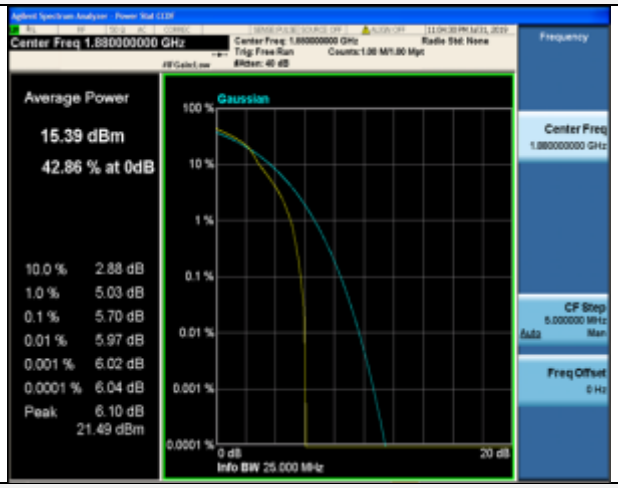
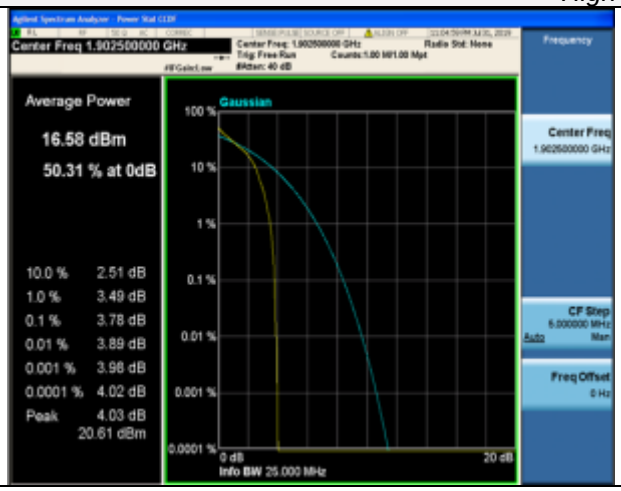
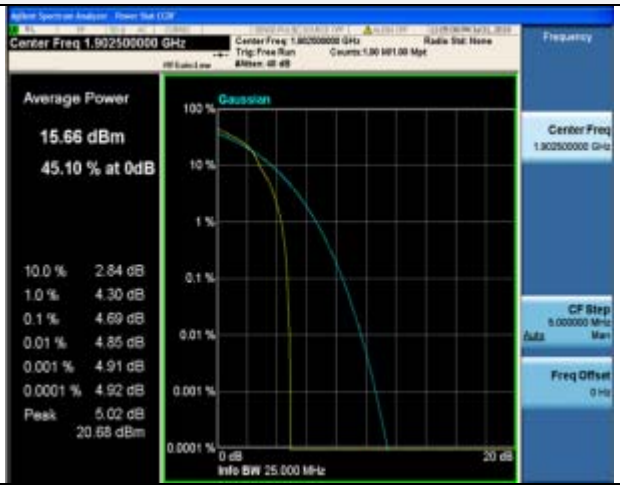
LTE FDD Band 2				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	PAPR(dB)	
			QPSK	16QAM
1.4 MHz	1850.7	*1RB#0*	4.49	5.23
	1880.0		5.15	6.13
	1909.3		4.86	5.81
3 MHz	1851.5	*1RB#0*	4.50	5.31
	1880.0		4.98	5.70
	1908.5		4.91	5.68
5 MHz	1852.5	*1RB#0*	4.63	5.35
	1880.0		5.15	5.61
	1907.5		4.99	5.67
10 MHz	1855.0	*1RB#0*	4.55	5.46
	1880.0		4.93	5.66
	1905.0		3.87	4.80
15 MHz	1857.5	*1RB#0*	4.61	5.54
	1880.0		5.09	5.70
	1902.5		3.78	4.69
20 MHz	1860.0	*1RB#0*	4.65	5.35
	1880.0		5.03	6.12
	1900.0		4.36	4.94

LTE FDD Band 2 – 1.4 MHz Channel BandwidthPAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

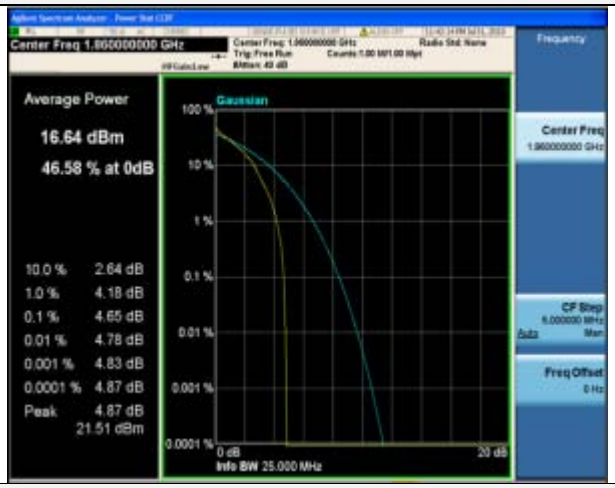
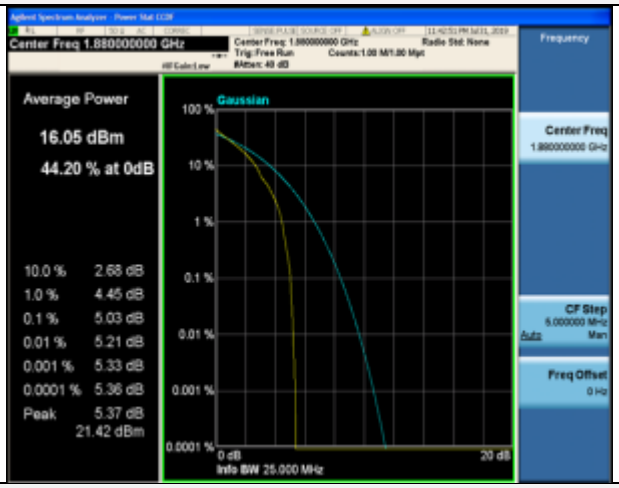
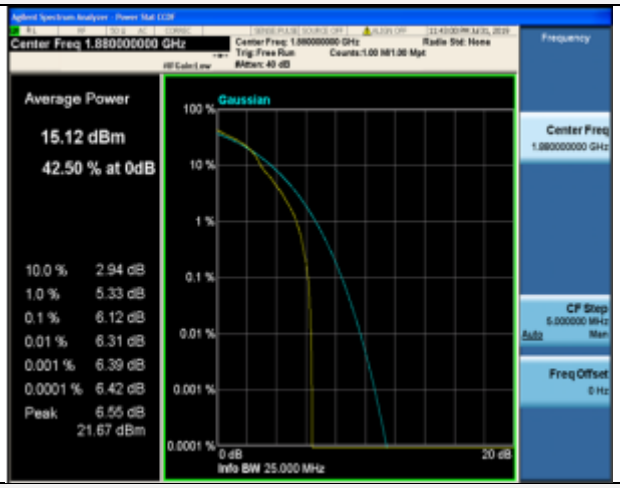
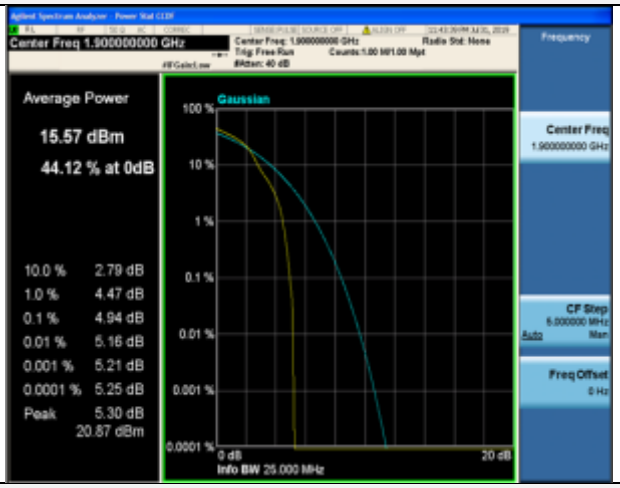
LTE FDD Band 2–3MHz Channel BandwidthPAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 2–5MHz Channel BandwidthPAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 2–10MHz Channel BandwidthPAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 2– 15 MHz Channel BandwidthPAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 2–20MHz Channel BandwidthPAPR

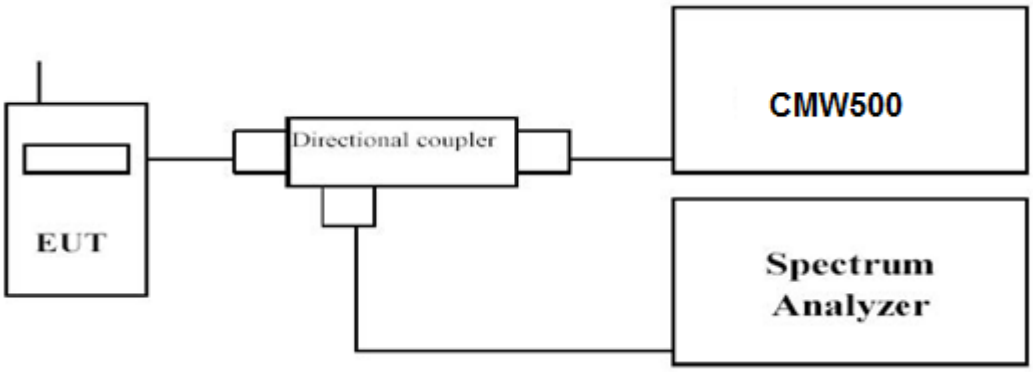
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

4.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

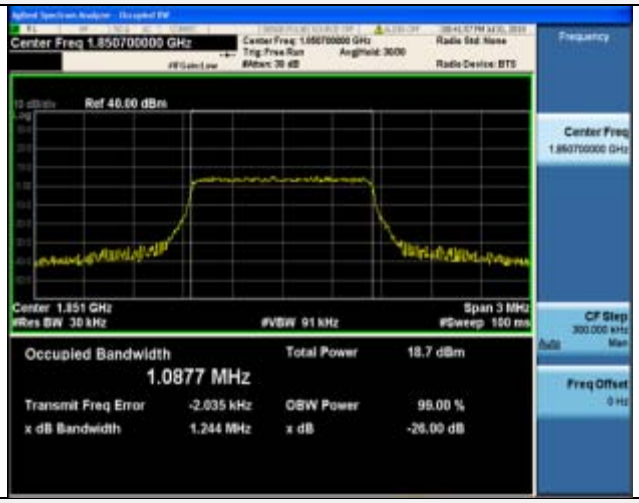
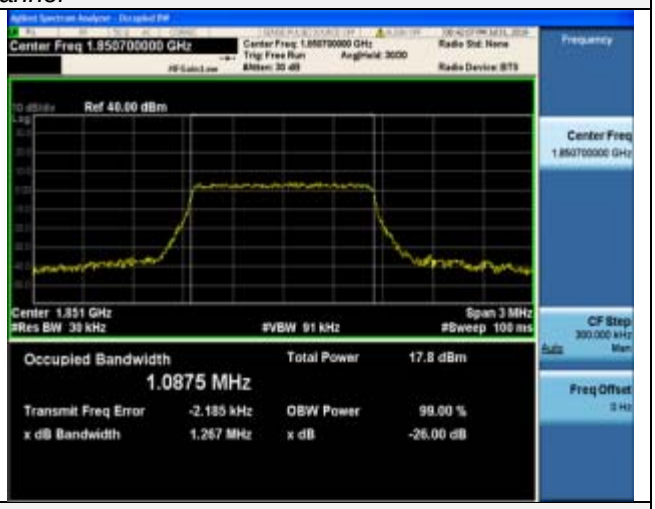
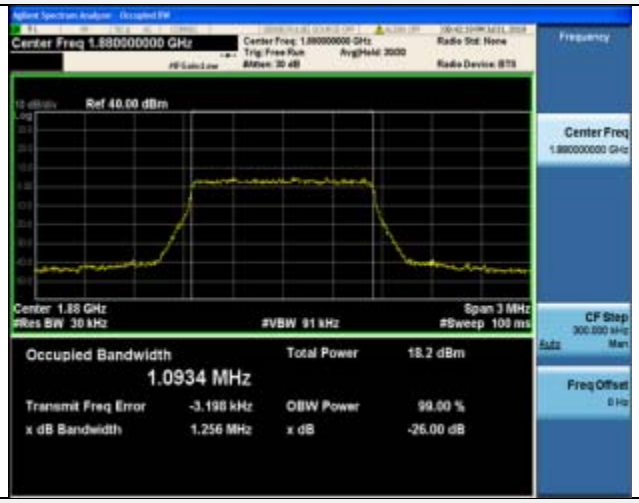
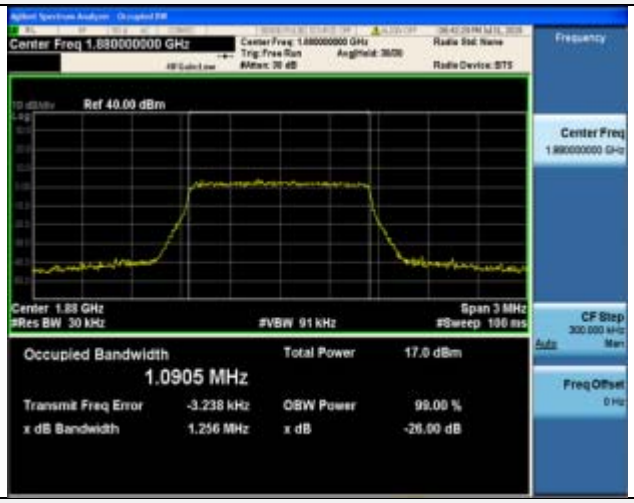
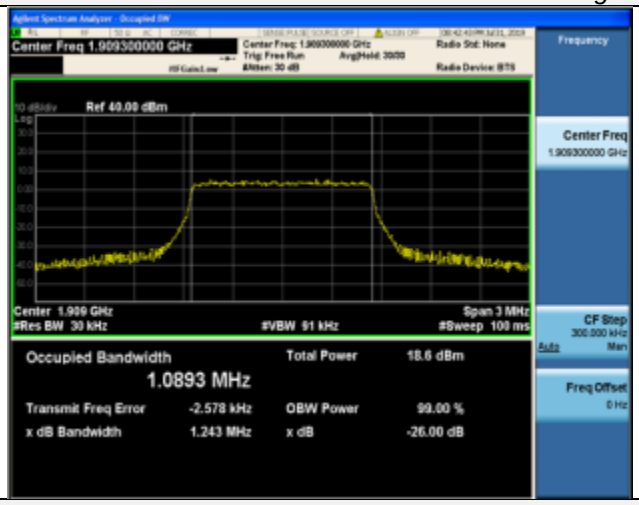
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and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

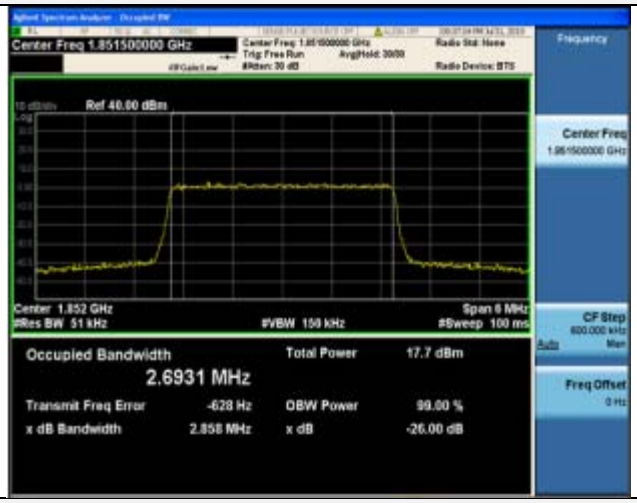
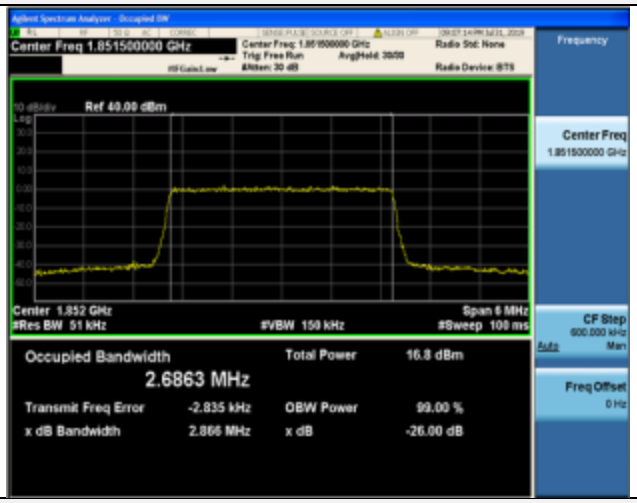
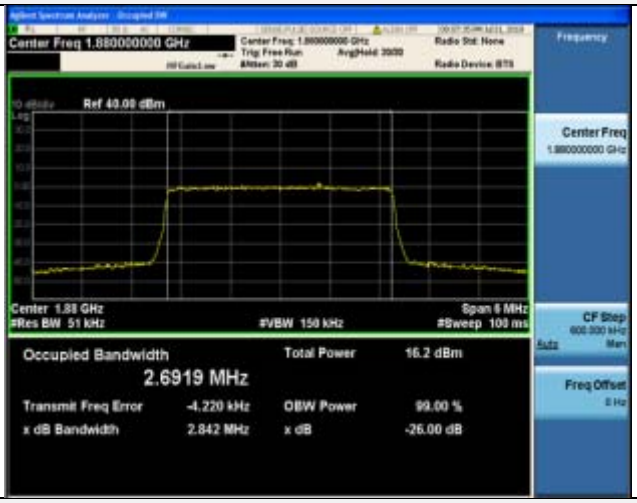
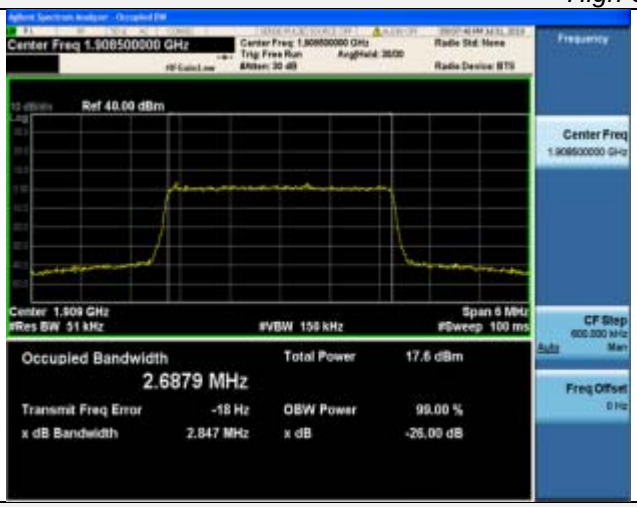
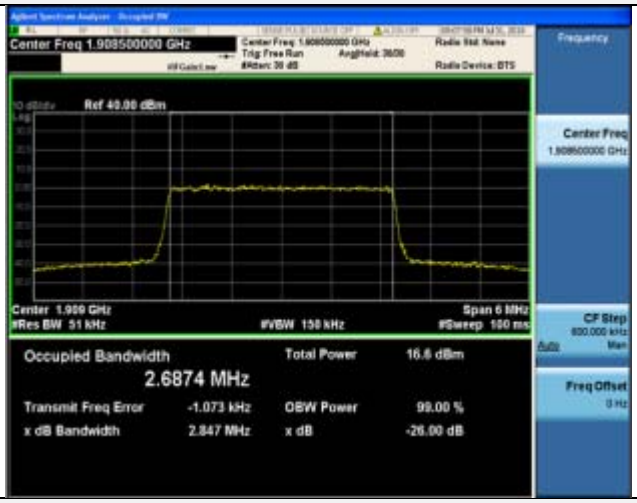
TEST RESULTS

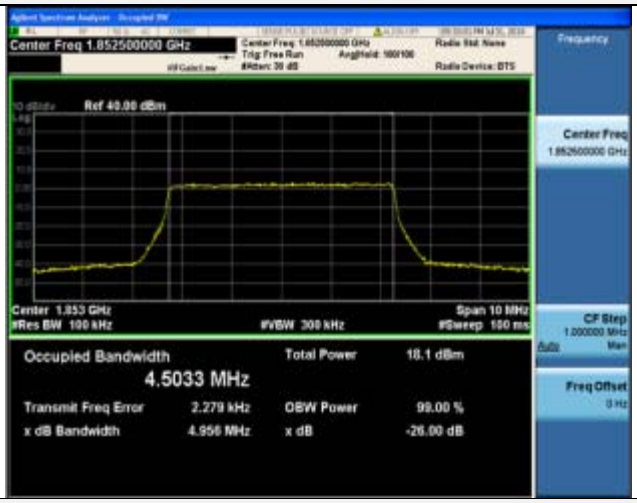
Remark:

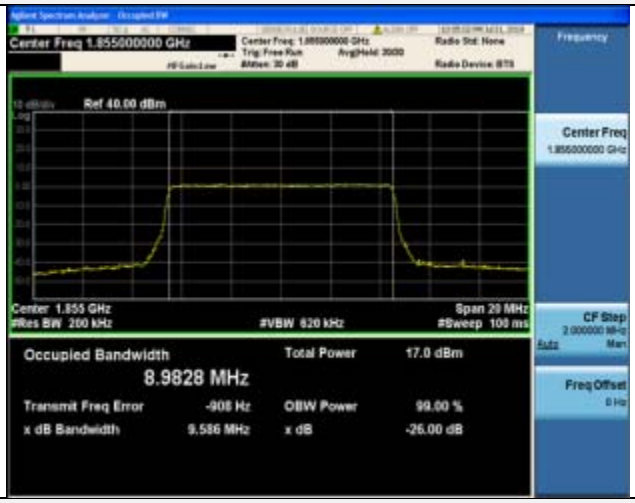
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case for each Channel Bandwidth of LTE FDD Band 2.*

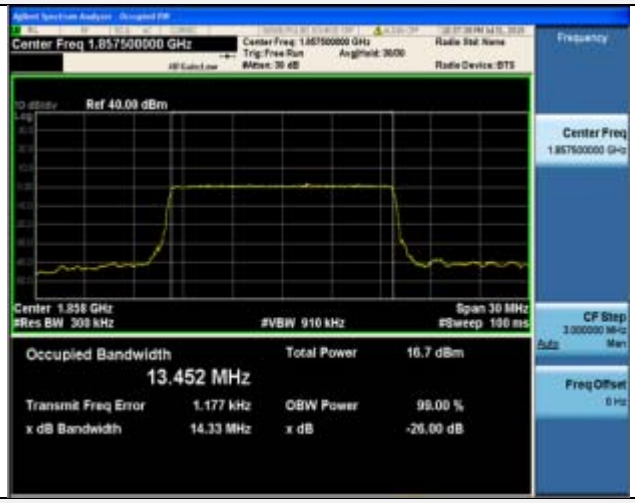
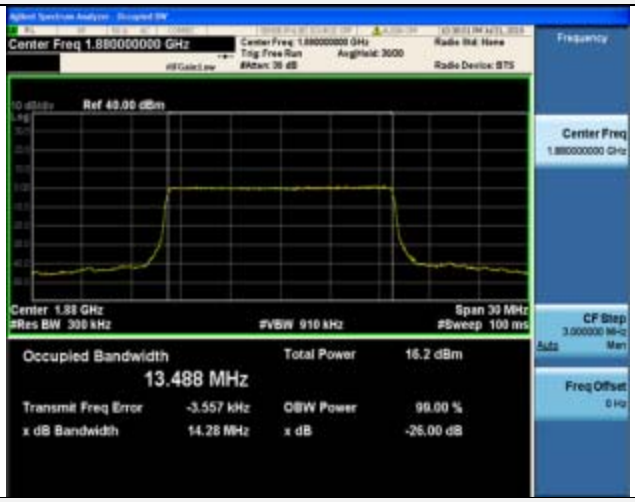
LTE FDD Band 2						
TX Channel Bandwidth	RB Size/Offset	Frequency (MHz)	-26dBc Emission bandwidth (MHz)		99% Occupied bandwidth (MHz)	
			QPSK	16QAM	QPSK	16QAM
1.4 MHz	*6RB#0*	1850.7	1.244	1.267	1.0877	1.0875
		1880.0	1.256	1.256	1.0934	1.0905
		1909.3	1.243	1.270	1.0893	1.0884
3 MHz	*15RB#0*	1851.5	2.858	2.866	2.6931	2.6863
		1880.0	2.865	2.842	2.6935	2.6919
		1908.5	2.847	2.847	2.6879	2.6874
5 MHz	*25RB#0*	1852.5	4.956	4.967	4.5033	4.5108
		1880.0	4.939	4.922	4.5108	4.5138
		1907.5	4.959	4.983	4.5056	4.5126
10 MHz	*50RB#0*	1855.0	9.586	9.567	8.9828	8.9712
		1880.0	9.586	9.609	8.9972	8.9820
		1905.0	9.602	9.548	9.0015	8.9836
15 MHz	*75RB#0*	1857.5	14.33	14.34	13.452	13.451
		1880.0	14.28	14.29	13.488	13.484
		1902.5	14.32	14.28	13.482	13.478
20 MHz	*100RB#0*	1860.0	18.96	18.97	17.927	17.913
		1880.0	19.04	19.02	17.944	17.973
		1900.0	18.96	18.97	17.946	17.927

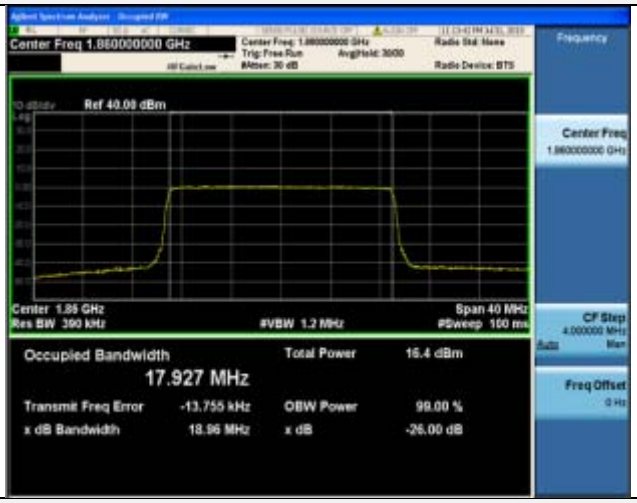
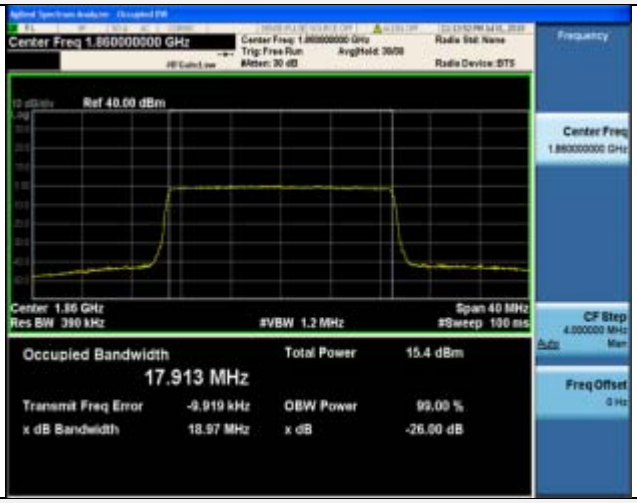
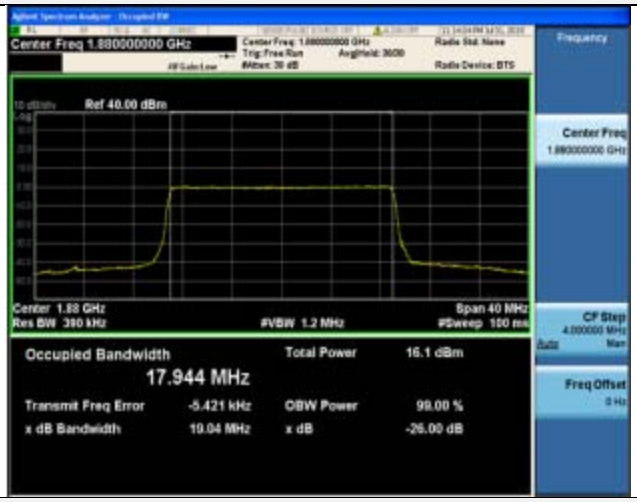
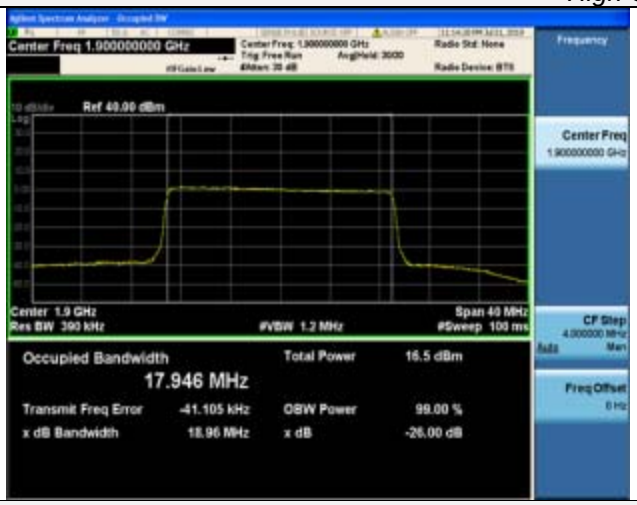
LTE FDD Band 2 – 1.4 MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
6RB#0	6RB#0
Middle Channel	
	
6RB#0	6RB#0
High Channel	
	
6RB#0	6RB#0

LTE FDD Band 2–3MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
15RB#0	15RB#0
Middle Channel	
	
15RB#0	15RB#0
High Channel	
	
15RB#0	15RB#0

LTE FDD Band 2–5MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
25RB#0	25RB#0
Middle Channel	
25RB#0	25RB#0
High Channel	
25RB#0	25RB#0

LTE FDD Band 2–10MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
50RB#0	50RB#0
Middle Channel	
50RB#0	50RB#0
High Channel	
50RB#0	50RB#0

LTE FDD Band 2–15MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
75RB#0	75RB#0
Middle Channel	
	
75RB#0	75RB#0
High Channel	
75RB#0	75RB#0

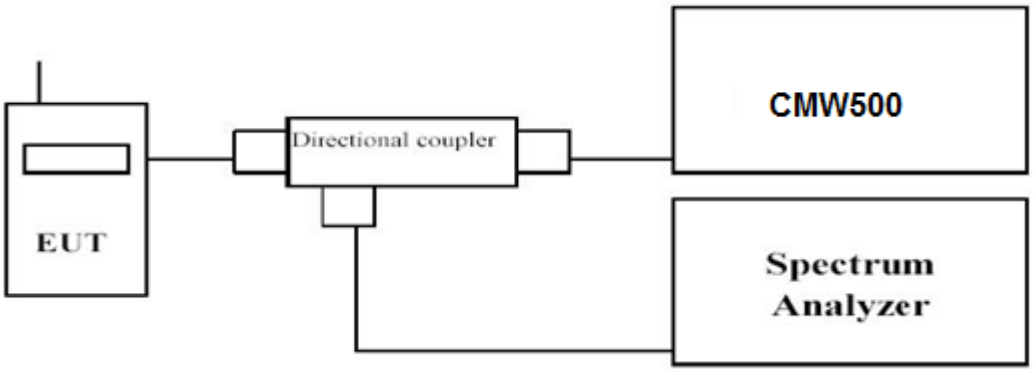
LTE FDD Band 2–20MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
100RB#0	100RB#0
Middle Channel	
	
100RB#0	100RB#0
High Channel	
	
100RB#0	100RB#0

4.4 Band Edge compliance

LIMIT

Per FCC §24.238 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

TEST CONFIGURATION



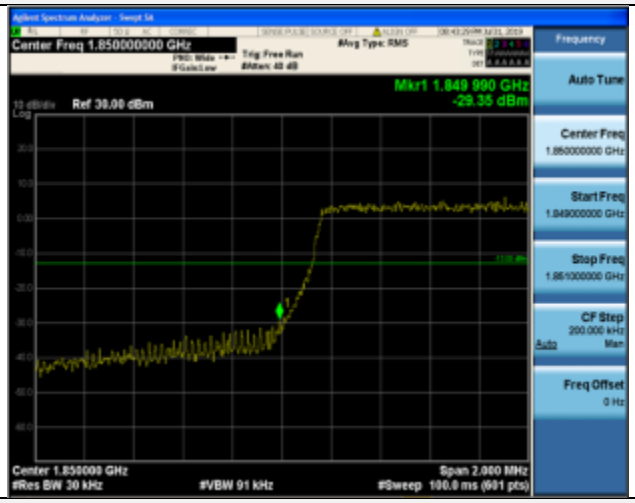
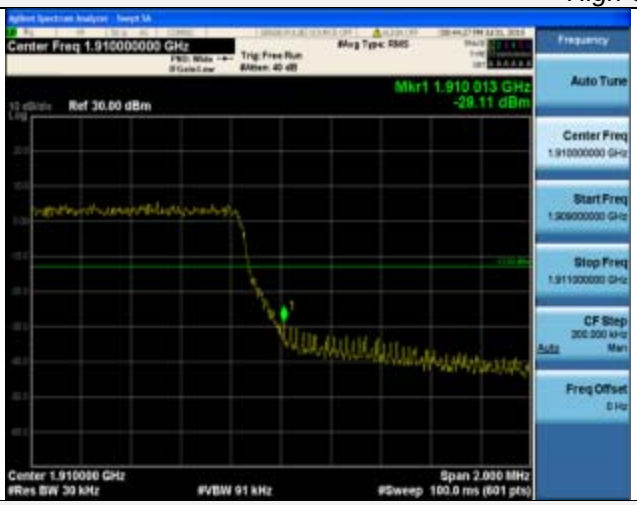
TEST PROCEDURE

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

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case for each Channel Bandwidth of LTE FDD Band 2.*

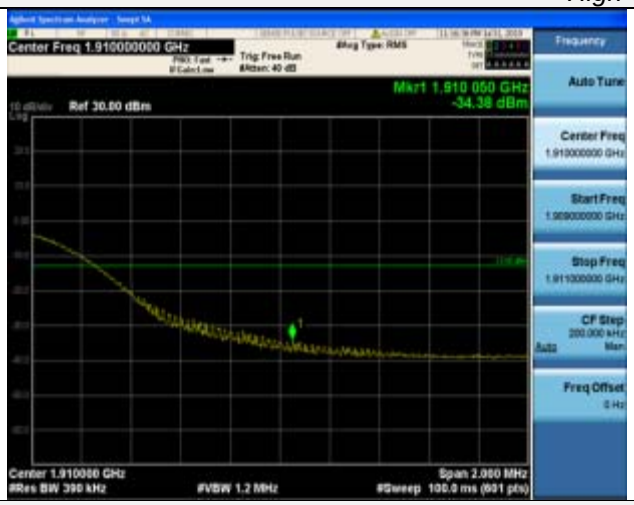
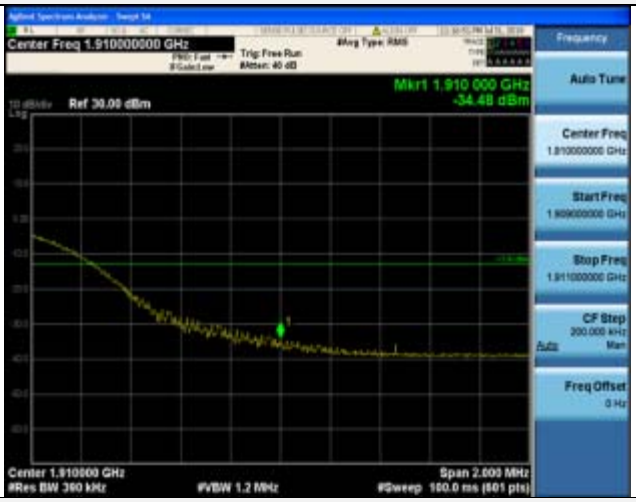
LTE FDD Band 2 – 1.4 MHz Channel BandwidthBand Edge Compliance	
QPSK	16QAM
Low Channel	
	
6RB#0	6RB#0
High Channel	
	
6RB#0	6RB#0

LTE FDD Band 2–3MHz Channel BandwidthBand Edge Compliance	
QPSK	16QAM
Low Channel	
15RB#0	15RB#0
High Channel	
15RB#0	15RB#0

LTE FDD Band 2–5MHz Channel BandwidthBand Edge Compliance	
QPSK	16QAM
Low Channel	
25RB#0	25RB#0
High Channel	
25RB#0	25RB#0

LTE FDD Band 2 – 10 MHz Channel BandwidthBand Edge Compliance	
QPSK	16QAM
Low Channel	
50RB#0	50RB#0
High Channel	
50RB#0	50RB#0

LTE FDD Band 2–15MHz Channel BandwidthBand Edge Compliance	
QPSK	16QAM
Low Channel	
75RB#0	75RB#0
High Channel	
75RB#0	75RB#0

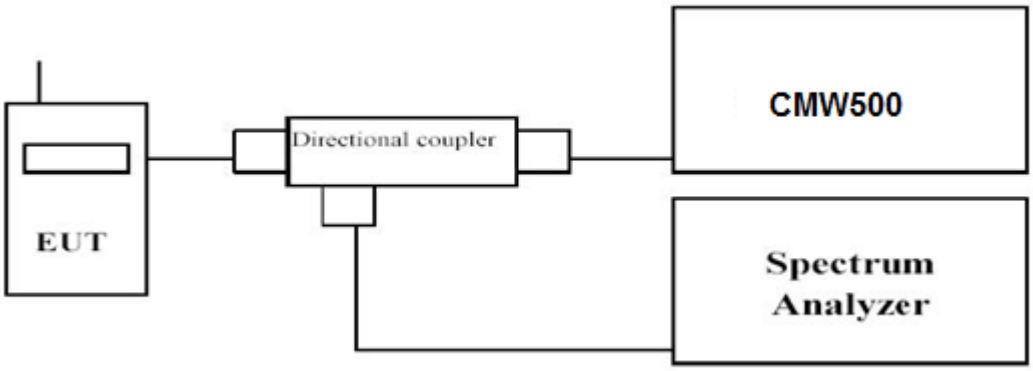
LTE FDD Band 2–20MHz Channel BandwidthBand Edge Compliance	
QPSK	16QAM
Low Channel	
100RB#0	100RB#0
High Channel	
	
100RB#0	100RB#0

4.5 Spurious Emssion on Antenna Port

LIMIT

Per FCC §24.238, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

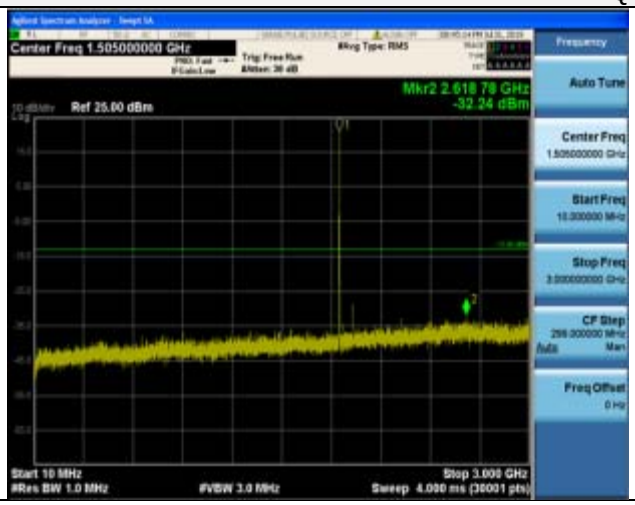
a. Place the EUT on a bench and set it in transmitting mode.
b. Connect a low loss RF cable from the antenna port to a spectrum analyzer andCMW500 by a Directional Couple.
c. EUT Communicate with CMW500, then select a channel for testing.
d. Add a correction factor to the display of spectrum, and then test.
e. The resolution bandwidth of the spectrum analyzer was setsufficient scans were taken to show the out of band Emission if any up to10th harmonic.
f. Please refer to following tables for test antenna conducted emissions.

Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 2	0.01~20	1 MHz	3 MHz	Auto

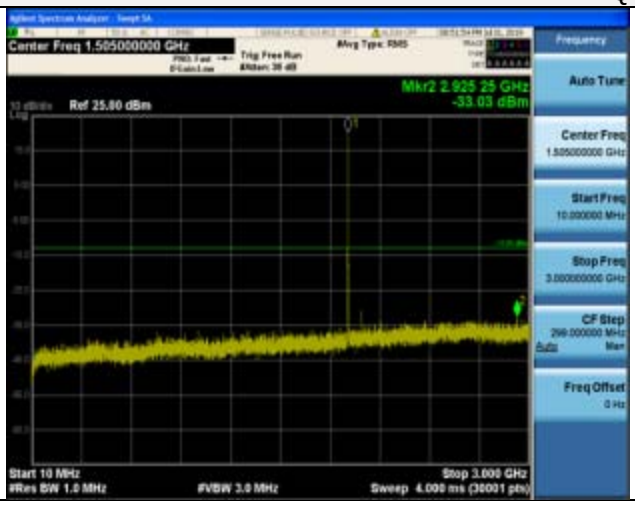
TEST RESULTS

Remark:

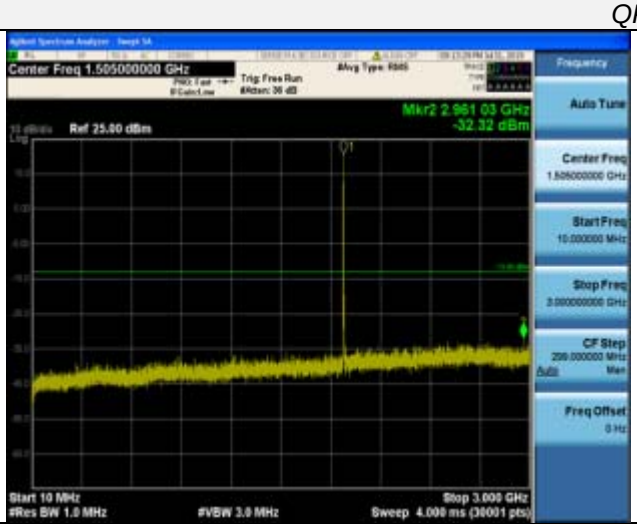
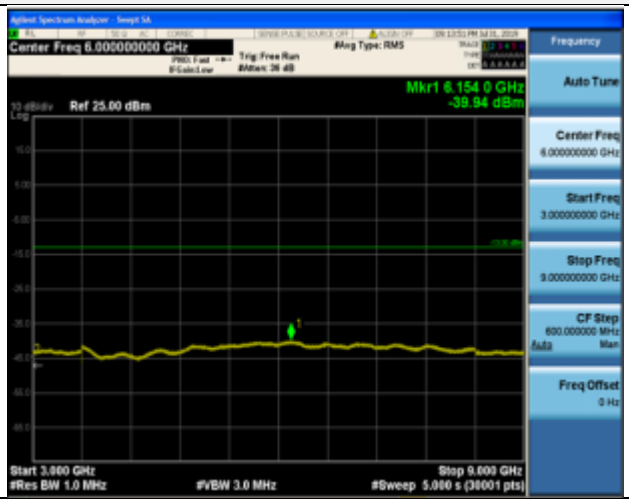
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case at the QPSK Mode for each Channel Bandwidth of LTE FDD Band 2*

LTE FDD Band 2-1.4MHz Channel Bandwidth	
Low Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-1.4MHz Channel Bandwidth	
Middle Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-1.4MHz Channel Bandwidth	
High Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-3MHz Channel Bandwidth	
Low Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

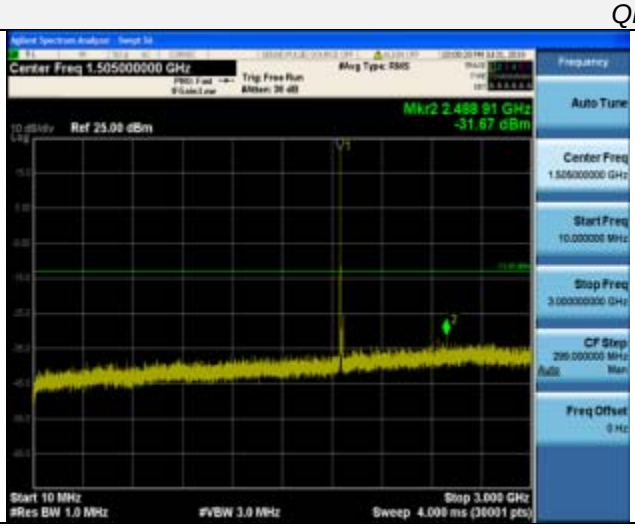
LTE FDD Band 2-3MHz Channel Bandwidth	
Middle Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

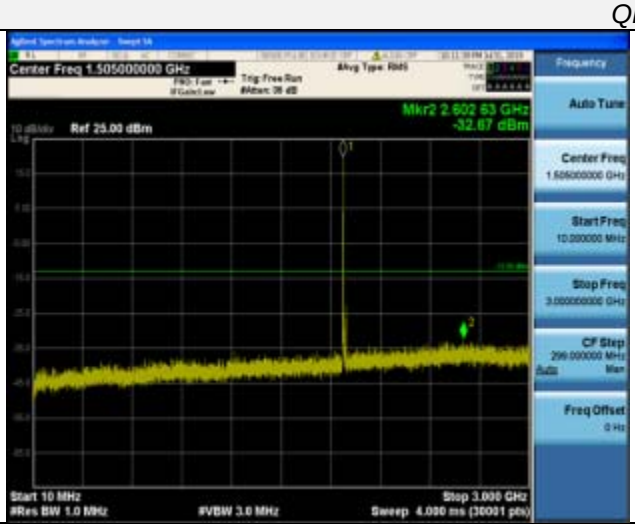
LTE FDD Band 2-3MHz Channel Bandwidth	
High Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

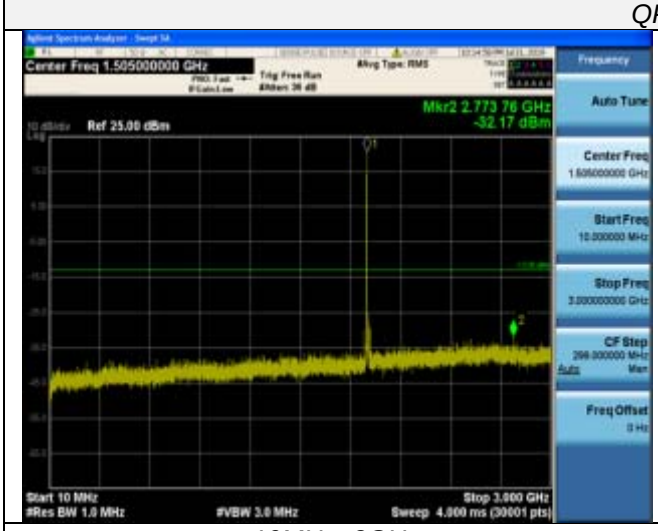
LTE FDD Band 2-5 MHz Channel Bandwidth	
Low Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

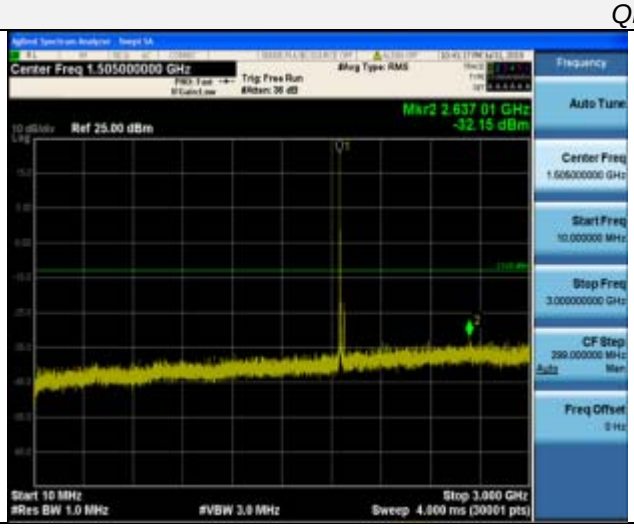
LTE FDD Band 2-5 MHz Channel Bandwidth	
Middle Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-5 MHz Channel Bandwidth	
High Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-10 MHz Channel Bandwidth	
Low Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

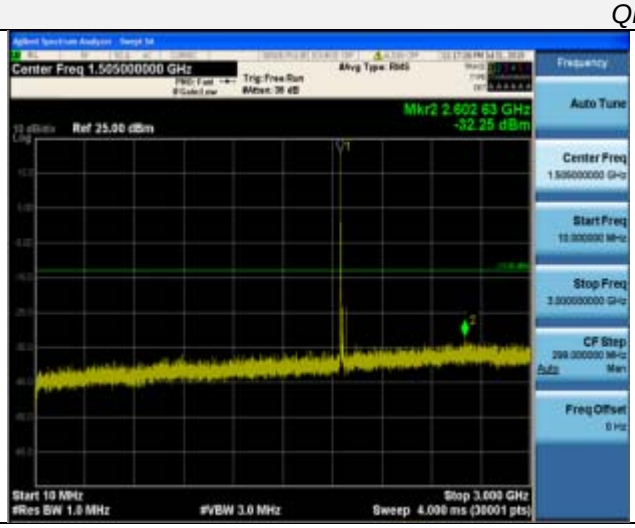
LTE FDD Band 2-10 MHz Channel Bandwidth	
Middle Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

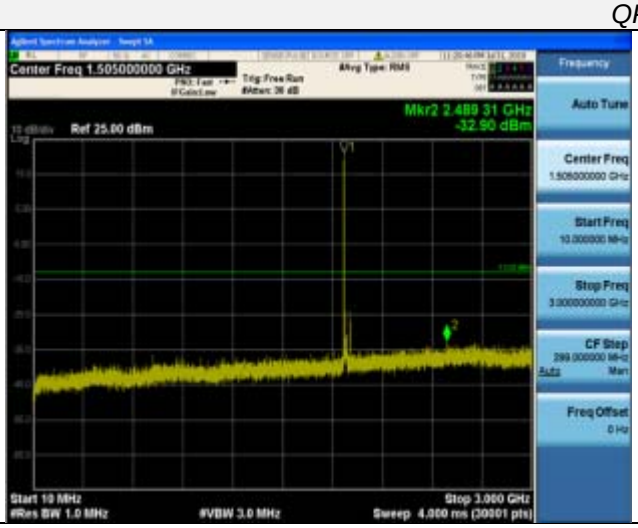
LTE FDD Band 2-10 MHz Channel Bandwidth	
High Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-15 MHz Channel Bandwidth	
Low Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-15 MHz Channel Bandwidth	
Middle Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-15 MHz Channel Bandwidth	
High Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-20 MHz Channel Bandwidth	
Low Channel	
QPSK	
	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

LTE FDD Band 2-20 MHz Channel Bandwidth	
Middle Channel	
QPSK	
	
10MHz~3GHz	*3GHz ~9GHz*
9 GHz ~15 GHz	15 GHz ~20GHz

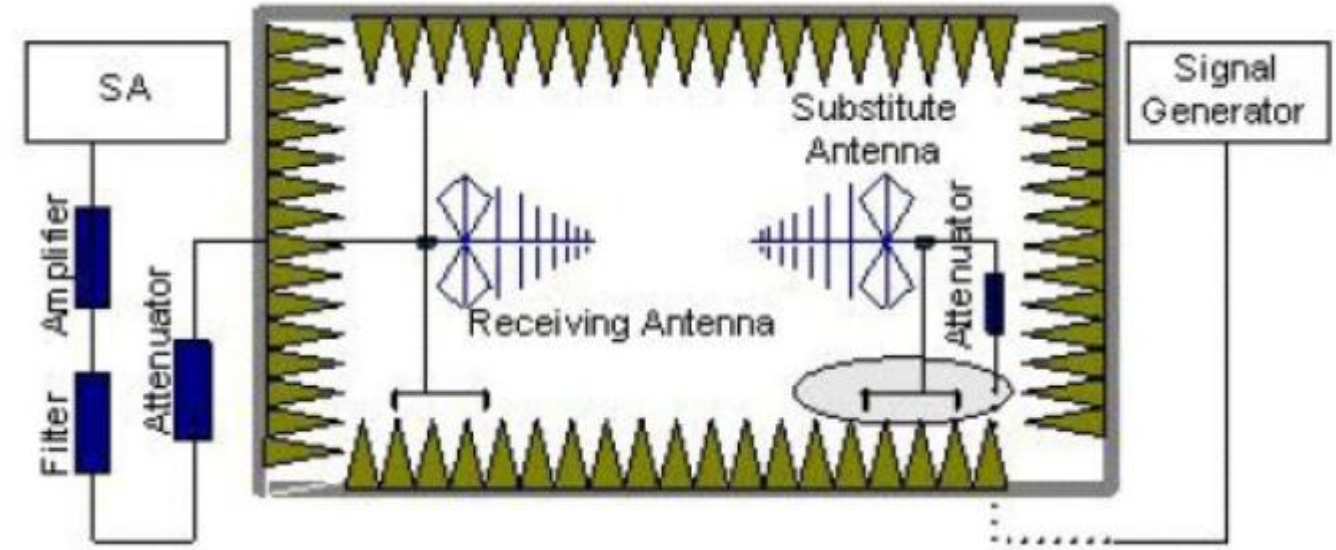
LTE FDD Band 2-20 MHz Channel Bandwidth	
High Channel	
QPSK	
10MHz~3GHz	3GHz ~9GHz
9 GHz ~15 GHz	15 GHz ~20GHz

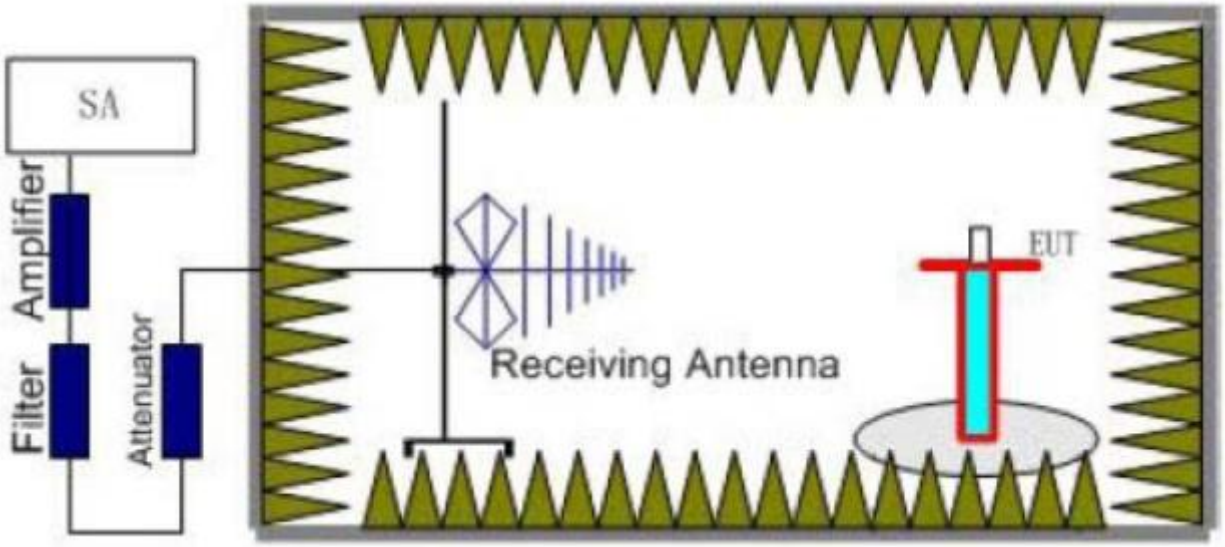
4.6 Radiated Spurious Emssion

TEST APPLICABLE

Per FCC §24.238, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

TEST CONFIGURATION





TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna.In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl}+ G_a
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.
8. In order to make sure test results more clearly,we set frequency range and sweep time for difference frequency range as follows table:

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 2	0.03~1	100KHz	300KHz	10
	1~20	1 MHz	3 MHz	2

TEST LIMITS

According to 24.238 specify 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.

Frequency	Channel	Frequency Range	Verdict
LTE FDD Band 2	Low	30MHz -20GHz	PASS
	Middle	30MHz -20GHz	PASS
	High	30MHz -20GHz	PASS

Radiated Measurement:

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

LTE FDD Band 2_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
3701.4	-43.77	4.39	3.00	12.34	-35.82	-13.00	22.82	H
5552.1	-49.3	5.31	3.00	13.52	-41.09	-13.00	28.09	H
3701.4	-50.72	4.39	3.00	12.34	-42.77	-13.00	29.77	V
5552.1	-53.74	5.31	3.00	13.52	-45.53	-13.00	32.53	V

LTE FDD Band 2_Channel Bandwidth 1.4MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-40.77	4.41	3.00	12.34	-32.84	-13.00	19.84	H
5640.0	-48.2	5.38	3.00	13.58	-40	-13.00	27.00	H
3760.0	-43.17	4.41	3.00	12.34	-35.24	-13.00	22.24	V
5640.0	-44.9	5.38	3.00	13.58	-36.7	-13.00	23.70	V

LTE FDD Band 2_Channel Bandwidth 1.4MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3806.6	-43.54	4.45	3.00	12.45	-35.54	-13.00	22.54	H
5709.9	-48.2	5.47	3.00	13.66	-40.01	-13.00	27.01	H
3806.6	-46.26	4.45	3.00	12.45	-38.26	-13.00	25.26	V
5709.9	-49.54	5.48	3.00	13.66	-41.36	-13.00	28.36	V

LTE FDD Band 2_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
3703.0	-43.83	4.39	3.00	12.34	-35.88	-13.00	22.88	H
5554.5	-49.07	5.31	3.00	13.52	-40.86	-13.00	27.86	H
3703.0	-41.11	4.39	3.00	12.34	-33.16	-13.00	20.16	V
5554.5	-50.88	5.31	3.00	13.52	-42.67	-13.00	29.67	V

LTE FDD Band 2_Channel Bandwidth 3MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-42.39	4.41	3.00	12.34	-34.46	-13.00	21.46	H
5640.0	-49.81	5.38	3.00	13.58	-41.61	-13.00	28.61	H
3760.0	-42.39	4.41	3.00	12.34	-34.46	-13.00	21.46	V
5640.0	-50.92	5.38	3.00	13.58	-42.72	-13.00	29.72	V

LTE FDD Band 2_Channel Bandwidth 3MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3817.0	-43.94	4.45	3.00	12.45	-35.94	-13.00	22.94	H
5725.5	-48.19	5.47	3.00	13.66	-40	-13.00	27.00	H
3817.0	-45.17	4.45	3.00	12.45	-37.17	-13.00	24.17	V
5725.5	-51.03	5.48	3.00	13.66	-42.85	-13.00	29.85	V

LTE FDD Band 2_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
3705.0	-43.72	4.39	3.00	12.34	-35.77	-13.00	22.77	H
5557.5	-48.43	5.31	3.00	13.52	-40.22	-13.00	27.22	H
3705.0	-40.87	4.39	3.00	12.34	-32.92	-13.00	19.92	V
5557.5	-51.2	5.31	3.00	13.52	-42.99	-13.00	29.99	V

LTE FDD Band 2_Channel Bandwidth 5MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-42.51	4.41	3.00	12.34	-34.58	-13.00	21.58	H
5640.0	-50.39	5.38	3.00	13.58	-42.19	-13.00	29.19	H
3760.0	-42.58	4.41	3.00	12.34	-34.65	-13.00	21.65	V
5640.0	-51.09	5.38	3.00	13.58	-42.89	-13.00	29.89	V

LTE FDD Band 2_Channel Bandwidth 5MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3815.0	-44.21	4.45	3.00	12.45	-36.21	-13.00	23.21	*H*
5722.5	-47.3	5.47	3.00	13.66	-39.11	-13.00	26.11	*H*
3815.0	-45.13	4.45	3.00	12.45	-37.13	-13.00	24.13	*V*
5722.5	-50.79	5.48	3.00	13.66	-42.61	-13.00	29.61	*V*

LTE FDD Band 2_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
3710.0	-44.11	4.39	3.00	12.34	-36.16	-13.00	23.16	H
5565.0	-48.65	5.31	3.00	13.52	-40.44	-13.00	27.44	H
3710.0	-40.92	4.39	3.00	12.34	-32.97	-13.00	19.97	V
5565.0	-50.91	5.31	3.00	13.52	-42.7	-13.00	29.70	V

LTE FDD Band 2_Channel Bandwidth 10MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-42.9	4.41	3.00	12.34	-34.97	-13.00	21.97	H
5640.0	-50.37	5.38	3.00	13.58	-42.17	-13.00	29.17	H
3760.0	-42.18	4.41	3.00	12.34	-34.25	-13.00	21.25	V
5640.0	-50.48	5.38	3.00	13.58	-42.28	-13.00	29.28	V

LTE FDD Band 2_Channel Bandwidth 10MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3810.0	-43.97	4.45	3.00	12.45	-35.97	-13.00	22.97	H
5715.0	-47.74	5.47	3.00	13.66	-39.55	-13.00	26.55	H
3810.0	-45.46	4.45	3.00	12.45	-37.46	-13.00	24.46	V
5715.0	-50.79	5.48	3.00	13.66	-42.61	-13.00	29.61	V

LTE FDD Band 2_Channel Bandwidth 15MHz_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
3715.0	-44.19	4.39	3.00	12.34	-36.24	-13.00	23.24	H
5572.5	-48.66	5.31	3.00	13.52	-40.45	-13.00	27.45	H
3715.0	-41.08	4.39	3.00	12.34	-33.13	-13.00	20.13	V
5572.5	-51.1	5.31	3.00	13.52	-42.89	-13.00	29.89	V

LTE FDD Band 2_Channel Bandwidth 15MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-42.43	4.41	3.00	12.34	-34.5	-13.00	21.50	H
5640.0	-49.47	5.38	3.00	13.58	-41.27	-13.00	28.27	H
3760.0	-41.79	4.41	3.00	12.34	-33.86	-13.00	20.86	V
5640.0	-50.48	5.38	3.00	13.58	-42.28	-13.00	29.28	V

LTE FDD Band 2_Channel Bandwidth 15MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3805.0	-44.16	4.45	3.00	12.45	-36.16	-13.00	23.16	H
5707.5	-47.34	5.47	3.00	13.66	-39.15	-13.00	26.15	H
3805.0	-45.15	4.45	3.00	12.45	-37.15	-13.00	24.15	V
5707.5	-51.48	5.48	3.00	13.66	-43.3	-13.00	30.30	V

LTE FDD Band 2_Channel Bandwidth 20MHz_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
3715.0	-43.56	4.39	3.00	12.34	-35.61	-13.00	22.61	H
5572.5	-48.8	5.31	3.00	13.52	-40.59	-13.00	27.59	H
3715.0	-41.65	4.39	3.00	12.34	-33.7	-13.00	20.70	V
5572.5	-50.95	5.31	3.00	13.52	-42.74	-13.00	29.74	V

LTE FDD Band 2_Channel Bandwidth 20MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3720.0	-42.73	4.41	3.00	12.34	-34.8	-13.00	21.80	H
5580.0	-49.49	5.38	3.00	13.58	-41.29	-13.00	28.29	H
3720.0	-42.53	4.41	3.00	12.34	-34.6	-13.00	21.60	V
5580.0	-51.37	5.38	3.00	13.58	-43.17	-13.00	30.17	V

LTE FDD Band 2_Channel Bandwidth 20MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3800.0	-44.31	4.45	3.00	12.45	-36.31	-13.00	23.31	H
5700.0	-47.64	5.47	3.00	13.66	-39.45	-13.00	26.45	H
3800.0	-45.57	4.45	3.00	12.45	-37.57	-13.00	24.57	V
5700.0	-51.53	5.48	3.00	13.66	-43.35	-13.00	30.35	V

LTE FDD Band 2_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
3701.4	-44.26	4.39	3.00	12.34	-36.31	-13.00	23.31	H
5552.1	-48.61	5.31	3.00	13.52	-40.4	-13.00	27.40	H
3701.4	-41.53	4.39	3.00	12.34	-33.58	-13.00	20.58	V
5552.1	-50.99	5.31	3.00	13.52	-42.78	-13.00	29.78	V

LTE FDD Band 2_Channel Bandwidth 1.4MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-43.33	4.41	3.00	12.34	-35.4	-13.00	22.40	H
5640.0	-49.69	5.38	3.00	13.58	-41.49	-13.00	28.49	H
3760.0	-42.58	4.41	3.00	12.34	-34.65	-13.00	21.65	V
5640.0	-51.16	5.38	3.00	13.58	-42.96	-13.00	29.96	V

LTE FDD Band 2_Channel Bandwidth 1.4MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3806.6	-44.31	4.45	3.00	12.45	-36.31	-13.00	23.31	H
5709.9	-48.23	5.47	3.00	13.66	-40.04	-13.00	27.04	H
3806.6	-45.6	4.45	3.00	12.45	-37.6	-13.00	24.60	V
5709.9	-50.69	5.48	3.00	13.66	-42.51	-13.00	29.51	V

LTE FDD Band 2_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
3703.0	-45.89	4.39	3.00	12.34	-37.94	-13.00	24.94	H
5554.5	-47.9	5.31	3.00	13.52	-39.69	-13.00	26.69	H
3703.0	-51.09	4.39	3.00	12.34	-43.14	-13.00	30.14	V
5554.5	-54.92	5.31	3.00	13.52	-46.71	-13.00	33.71	V

LTE FDD Band 2_Channel Bandwidth 3MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-43.3	4.41	3.00	12.34	-35.37	-13.00	22.37	H
5640.0	-47.49	5.38	3.00	13.58	-39.29	-13.00	26.29	H
3760.0	-49.76	4.41	3.00	12.34	-41.83	-13.00	28.83	V
5640.0	-53.26	5.38	3.00	13.58	-45.06	-13.00	32.06	V

LTE FDD Band 2_Channel Bandwidth 3MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3817.0	-44.45	4.45	3.00	12.45	-36.45	-13.00	23.45	H
5725.5	-50.03	5.47	3.00	13.66	-41.84	-13.00	28.84	H
3817.0	-49.91	4.45	3.00	12.45	-41.91	-13.00	28.91	V
5725.5	-56.4	5.48	3.00	13.66	-48.22	-13.00	35.22	V

LTE FDD Band 2_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
3705.0	-45.72	4.39	3.00	12.34	-37.77	-13.00	24.77	H
5557.5	-48.2	5.31	3.00	13.52	-39.99	-13.00	26.99	H
3705.0	-51.55	4.39	3.00	12.34	-43.6	-13.00	30.60	V
5557.5	-54.02	5.31	3.00	13.52	-45.81	-13.00	32.81	V

LTE FDD Band 2_Channel Bandwidth 5MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-43.29	4.41	3.00	12.34	-35.36	-13.00	22.36	H
5640.0	-48.34	5.38	3.00	13.58	-40.14	-13.00	27.14	H
3760.0	-49.63	4.41	3.00	12.34	-41.7	-13.00	28.70	V
5640.0	-53.12	5.38	3.00	13.58	-44.92	-13.00	31.92	V

LTE FDD Band 2_Channel Bandwidth 5MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3815.0	-45.07	4.45	3.00	12.45	-37.07	-13.00	24.07	H
5722.5	-50.35	5.47	3.00	13.66	-42.16	-13.00	29.16	H
3815.0	-50.3	4.45	3.00	12.45	-42.3	-13.00	29.30	V
5722.5	-56.51	5.48	3.00	13.66	-48.33	-13.00	35.33	V

LTE FDD Band 2_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
3710.0	-46.2	4.39	3.00	12.34	-38.25	-13.00	25.25	H
5565.0	-47.53	5.31	3.00	13.52	-39.32	-13.00	26.32	H
3710.0	-51.26	4.39	3.00	12.34	-43.31	-13.00	30.31	V
5565.0	-54.07	5.31	3.00	13.52	-45.86	-13.00	32.86	V

LTE FDD Band 2_Channel Bandwidth 10MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-43.09	4.41	3.00	12.34	-35.16	-13.00	22.16	H
5640.0	-47.48	5.38	3.00	13.58	-39.28	-13.00	26.28	H
3760.0	-49.43	4.41	3.00	12.34	-41.5	-13.00	28.50	V
5640.0	-52.71	5.38	3.00	13.58	-44.51	-13.00	31.51	V

LTE FDD Band 2_Channel Bandwidth 10MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3810.0	-45.05	4.45	3.00	12.45	-37.05	-13.00	24.05	H
5715.0	-50.67	5.47	3.00	13.66	-42.48	-13.00	29.48	H
3810.0	-50.35	4.45	3.00	12.45	-42.35	-13.00	29.35	V
5715.0	-55.95	5.48	3.00	13.66	-47.77	-13.00	34.77	V

LTE FDD Band 2_Channel Bandwidth 15MHz_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
3715.0	-46.27	4.39	3.00	12.34	-38.32	-13.00	25.32	H
5572.5	-48.28	5.31	3.00	13.52	-40.07	-13.00	27.07	H
3715.0	-51.03	4.39	3.00	12.34	-43.08	-13.00	30.08	V
5572.5	-54.17	5.31	3.00	13.52	-45.96	-13.00	32.96	V

LTE FDD Band 2_Channel Bandwidth 15MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.0	-43.18	4.41	3.00	12.34	-35.25	-13.00	22.25	H
5640.0	-48.11	5.38	3.00	13.58	-39.91	-13.00	26.91	H
3760.0	-50	4.41	3.00	12.34	-42.07	-13.00	29.07	V
5640.0	-53.33	5.38	3.00	13.58	-45.13	-13.00	32.13	V

LTE FDD Band 2_Channel Bandwidth 15MHz_16QAM _ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3805.0	-45.26	4.45	3.00	12.45	-37.26	-13.00	24.26	H
5707.5	-50	5.47	3.00	13.66	-41.81	-13.00	28.81	H
3805.0	-49.67	4.45	3.00	12.45	-41.67	-13.00	28.67	V
5707.5	-56.2	5.48	3.00	13.66	-48.02	-13.00	35.02	V

LTE FDD Band 2_Channel Bandwidth 20MHz_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
3715.0	-46.65	4.39	3.00	12.34	-38.7	-13.00	25.70	H
5572.5	-48.32	5.31	3.00	13.52	-40.11	-13.00	27.11	H
3715.0	-51.02	4.39	3.00	12.34	-43.07	-13.00	30.07	V
5572.5	-54.09	5.31	3.00	13.52	-45.88	-13.00	32.88	V

LTE FDD Band 2_Channel Bandwidth 20MHz_16QAM _ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3720.0	-42.98	4.41	3.00	12.34	-35.05	-13.00	22.05	H
5580.0	-48.03	5.38	3.00	13.58	-39.83	-13.00	26.83	H
3720.0	-49.65	4.41	3.00	12.34	-41.72	-13.00	28.72	V
5580.0	-53	5.38	3.00	13.58	-44.8	-13.00	31.80	V

LTE FDD Band 2_Channel Bandwidth 20MHz_16QAM _ High Channel

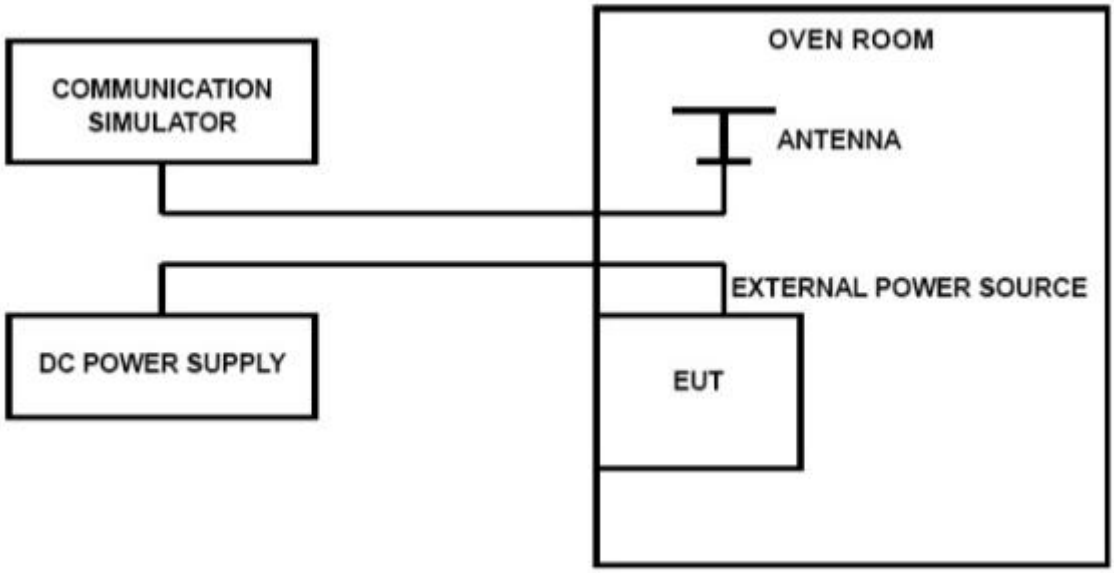
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3800.0	-44.88	4.45	3.00	12.45	-36.88	-13.00	23.88	H
5700.0	-50.53	5.47	3.00	13.66	-42.34	-13.00	29.34	H
3800.0	-49.69	4.45	3.00	12.45	-41.69	-13.00	28.69	V
5700.0	-55.86	5.48	3.00	13.66	-47.68	-13.00	34.68	V

4.7 Frequency Stability

LIMIT

According to §24.235, §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 2, 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, recordthe maximum frequency change.

TEST RESULTS

Remark:
1. We testedall RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 2; recorded worst case.

LTE Band 2, 1.4MHz bandwidth , QPSK (worst case of all bandwidths)

LTE FDD Band 2					
DC Power	**Temperature (℃)**	**Frequency error(Hz)**	**Frequency error(ppm)**	**Limit (ppm)**	**Verdict**
3.40	20	-14.91	-0.008056	2.50	PASS
3.60	20	-11.01	-0.005949	2.50	PASS
4.20	20	-19.43	-0.010499	2.50	PASS
3.60	-30	-18.95	-0.010080	2.50	PASS
3.60	-20	9.03	0.004803	2.50	PASS
3.60	-10	-18.53	-0.009856	2.50	PASS
3.60	0	-17.82	-0.009333	2.50	PASS
3.60	10	15.72	0.008233	2.50	PASS
3.60	20	-20.86	-0.010925	2.50	PASS
3.60	30	-18.35	-0.009915	2.50	PASS
3.60	40	-18.27	-0.009872	2.50	PASS
3.60	50	-17.40	-0.009402	2.50	PASS

LTE Band 2, 1.4MHz bandwidth , 16QAM (worst case of all bandwidths)

LTE FDD Band 2					
DC Power	**Temperature (℃)**	**Frequency error(Hz)**	**Frequency error(ppm)**	**Limit (ppm)**	**Verdict**
3.40	20	-16.57	-0.008814	2.50	PASS
3.60	20	-20.54	-0.010926	2.50	PASS
4.20	20	-15.85	-0.008431	2.50	PASS
3.60	-30	-19.57	-0.010250	2.50	PASS
3.60	-20	-19.03	-0.009967	2.50	PASS
3.60	-10	12.12	0.006348	2.50	PASS
3.60	0	-15.79	-0.008528	2.50	PASS
3.60	10	-14.32	-0.007734	2.50	PASS
3.60	20	-16.52	-0.008922	2.50	PASS
3.60	30	-16.84	-0.008957	2.50	PASS
3.60	40	-11.60	-0.006170	2.50	PASS
3.60	50	-14.33	-0.007622	2.50	PASS

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