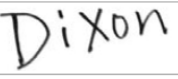
FCC PART 27 TEST REPORT

FCC Part 27

Report Reference No.....:	**MWR161000107**	
FCC ID.....:	**RQQHLT-L55UTM**	
Compiled by (position+printed name+signature)..:	File administrators Martin Ao	
Supervised by (position+printed name+signature)..:	Test Engineer Yuchao Wang	
Approved by (position+printed name+signature)..:	Manager Dixon Hao	
Date of issue.....:	October 24, 2016	
Representative Laboratory Name.:	**Maxwell International Co., Ltd.**	
Address .....:	Room 509, Hongfa center building, Baoan District, Shenzhen, Guangdong, China	
Testing Laboratory Name.....:	**CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.**	
Address .....:	Electronic Testing Building, Shahe Road，Xili, Nanshan District,Shenzhen, 518055, P. R. China	
Applicant's name.....:	**HYUNDAI CORPORATION**	
Address .....:	140-2, Kye-dong, Chongro-ku, Seoul, South Korea	
Test specification.....**:**		
Standard .....:	**FCC CFR Title 47 Part 2, Part 27** **EIA/TIA 603-D: 2010** **KDB 971168 D01**	
TRF Originator.....:	Maxwell International Co., Ltd.	

Test item description .....:	Mobile Phone
Trade Mark .....:	HYUNDAI
Manufacturer.....:	**Shenzhen Rainbow Time Technology Co.,Ltd**
Model/Type reference.....:	TITAN LTE
Listed Models .....:	N/A
Modulation Type.....:	QPSK, 16QAM
Rating .....:	DC 3.80V
Hardware version .....:	5101SP_S52
Software version .....:	V1.0
Result.....:	**PASS**

TEST REPORT

Test Report No. :	MWR161000107	October 24, 2016 Date of issue

Equipment under Test	:	Mobile Phone
Model /Type	:	TITAN LTE
Listed Models	:	N/A
Applicant	:	**HYUNDAI CORPORATION**
Address	:	140-2, Kye-dong, Chongro-ku, Seoul, South Korea
Manufacturer	:	**Shenzhen Rainbow Time Technology Co.,Ltd**
Address	:	Room 905, ChangHong Technology Building, Science and Technology Park, Nanshan District, Shenzhen, China

Test Result:	**PASS**

Revison History

Revision	Issue Date	Revisions	Revised By
00	2016-10-24	Initial Issue	Dixon Hao

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Part 27(10-1-12 Edition): 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
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
FCCKDB971168D01 Power Meas License Digital Systems

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	September 18, 2016
Testing commenced on	:	September 19, 2016
Testing concluded on	:	October 23, 2016

2.2 Product Description

The **HYUNDAI CORPORATION**'s Model: TITAN LTE 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	Mobile Phone
Model Number	TITAN LTE
Modilation Type	GMSK for GSM/GPRS/EDGE, 8-PSK for EDGE only downlink, QPSK for UMTS, QPSK/16QAM for LTE
Antenna Type	Internal
UMTS Operation Frequency Band	Device supported UMTS FDD Band II, FDD Band V
WLAN FCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
BT FCC Operation frequency	2402MHz-2480MHz
HSDPA Release Version	Release 10
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
WCDMA Release Version	R99
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
BT Modulation Type	GFSK,8DPSK,π/4DQPSK(BT3.0+EDR),GFSK(BLE)
Hardware version	5101SP_S52
Software version	V1.0
Android version	Android 5.1
GPS function	Supported
WLAN	Supported 802.11b/802.11g/802.11n
Bluetooth	Supported BT 4.0/BT 3.0+EDR
GSM/EDGE/GPRS	Supported GSM/GPRS/EDGE
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1
GSM/EDGE/GPRS Operation Frequency	GSM850 :824.2MHz-848.8MHz/PCS1900:1850.2MHz-1909.8MHz
GSM/EDGE/GPRS Operation Frequency Band	GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900
GSM Release Version	R99
GPRS/EDGE Multislot Class	GPRS: Multi-slot Class 12
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	3.40VDC to 4.20VDC (nominal: 3.80VDC)
GPRS operation mode	Class B

2.3 Equipment under Test

Power supply system utilised

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

DC 3.80V

2.4 Short description of the Equipment under Test (EUT)

2.4.1 General Description

TITAN LTE is subscriber equipment in the WCDMA/GSM system. The HSPA/UMTS frequency band is Band I, Band II and Band V; The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band II, Band V , GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

2.5 Internal Identification of AE used during the test

AE ID*	Description
AE1	Battery
AE2	Charger

AE1
Model: DC500
INPUT: AC180-240V~ 50/60Hz 0.15A
OUTPUT: DC 5.0V 1000mA

*AE ID: is used to identify the test sample in the lab internally.

2.6 Normal Accessory setting

Fully charged battery was used during the test.

2.7 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. :	/

2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: RQQHLT-L55UTM** filing to comply with FCC Part 27, Rules.

2.9 Modifications

No modifications were implemented to meet testing criteria.

2.10 General Test Conditions/Configurations

2.10.1 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.40V
	VN	3.80V
	VH	4.20V

NOTE: VL=lower extreme test voltage VN=nominal voltage
VH=upper extreme test voltage TN=normal temperature

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

3.3 Environmental conditions

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

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

3.4 Test Description

3.4.1 AWS Band (1710-1755MHz pairedwith 2110-2155MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective (Isotropic) Radiated Output Power	§2.1046, §27.50(d)	EIRP ≤ 1W;	Pass
Peak-Average Ratio	§2.1046, §27.50(d)	Limit≤13dB	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §27.53(h)	≤ -13dBm/1%*EBW,in1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13dBm/1MHz, from 9kHz to 10th harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1055, §27.54	Within authorized bands of operation/frequency block.	Pass
Frequency Stability	§2.1053, §27.53(h)	≤ -13dBm/1MHz.	Pass
NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” de notes “not tested”.			

3.5 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/06/02	2017/06/01
EMI Test Receiver	R&S	ESCI	103710	2016/06/02	2017/06/01
Spectrum Analyzer	Agilent	N9030A	MY49430428	2016/05/21	2017/05/20
Controller	EM Electronics	Controller EM 1000	N/A	2016/05/21	2017/05/20
Horn Antenna	SCHWARZBECK	BBHA9170D	BBH A9170179	2016/05/19	2017/05/18
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/05/19	2017/05/18
EMC Test Software	R&S	ES-K1	N/A	N/A	N/A
EMC Test Software	Audix	E3	N/A	N/A	N/A
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2016/05/19	2017/05/18
Amplifier	Agilent	8349B	3008A02306	2016/05/19	2017/05/18
Amplifier	Agilent	8447D	2944A10176	2016/05/19	2017/05/18
Temperature/ Humidity Meter	Gangxing	CTH-608	02	2016/05/20	2017/05/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2016/05/20	2017/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2016/05/20	2017/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
RF Cable	Megalon	RF-A303	N/A	2016/06/02	2017/06/01
Power Sensor	R&S	NRP-Z4	823.3618.03	2016/06/02	2017/06/01
Power Meter	R&S	NRVS	1020.1809.02	2016/06/02	2017/06/01
System Simulator	R&S	CMW500	A130101034	2016/05/22	2017/05/21

4 TEST CONDITIONS AND RESULTS

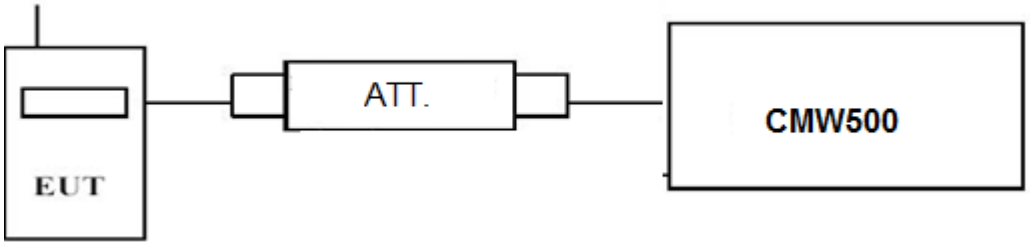
4.1 Output Power

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.

4.1.1. Conducted Output Power

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 4;*
2. *We measured at both SIM 1 and SIM 2, recorded worst case at SIM 1;*

LTE FDD Band 4				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	Average Power [dBm]	
			QPSK	16QAM
1.4 MHz	1710.7	1 RB low	22.37	21.72
		1 RB high	22.36	21.67
		50% RB mid	22.36	21.36
		100% RB	21.37	20.33
	1732.5	1 RB low	22.48	21.73
		1 RB high	22.50	21.75
		50% RB mid	22.52	21.58
		100% RB	21.51	20.66
	1754.3	1 RB low	22.45	21.58
		1 RB high	22.43	21.60
		50% RB mid	22.42	21.48
		100% RB	21.46	20.42
3 MHz	1711.5	1 RB low	22.24	21.54
		1 RB high	22.25	21.53
		50% RB mid	21.36	20.42
		100% RB	21.36	20.35
	1732.5	1 RB low	22.45	21.79
		1 RB high	22.43	21.80
		50% RB mid	21.52	20.53
		100% RB	21.49	20.48
	1753.5	1 RB low	22.43	21.65

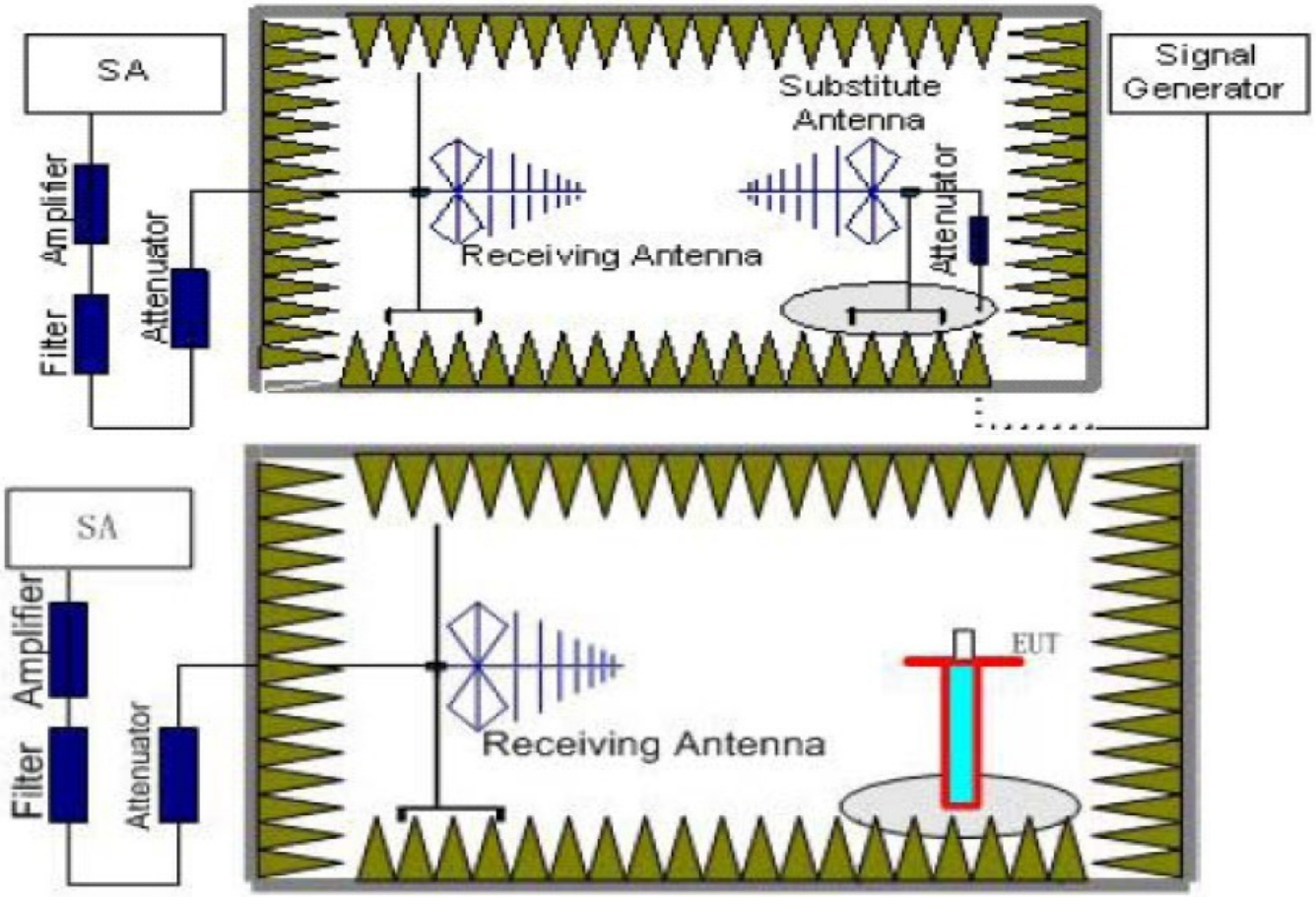
		1 RB high	22.38	21.57
		50% RB mid	21.49	20.42
		100% RB	21.47	20.46
5 MHz	1712.	1 RB low	22.46	21.69
		1 RB high	22.38	21.64
		50% RB mid	21.42	20.46
		100% RB	21.38	20.37
	1732.5	1 RB low	22.58	21.78
		1 RB high	22.53	21.77
		50% RB mid	21.54	20.66
		100% RB	21.50	20.53
	1752.5	1 RB low	22.59	21.75
		1 RB high	22.49	21.64
		50% RB mid	21.53	20.51
		100% RB	21.48	20.50
10 MHz	1715.0	1 RB low	22.23	21.68
		1 RB high	22.35	21.61
		50% RB mid	21.39	20.40
		100% RB	21.40	20.41
	1732.5	1 RB low	22.51	21.88
		1 RB high	22.50	21.90
		50% RB mid	21.52	20.56
		100% RB	21.52	20.57
	1750.0	1 RB low	22.60	21.85
		1 RB high	22.41	21.61
		50% RB mid	21.45	20.43
		100% RB	21.49	20.51
15 MHz	1717.5	1 RB low	22.41	21.70
		1 RB high	22.40	21.67
		50% RB mid	21.50	20.46
		100% RB	21.51	20.49
	1732.5	1 RB low	22.52	21.79
		1 RB high	22.51	21.80
		50% RB mid	21.62	20.61
		100% RB	21.62	20.58
	1747.5	1 RB low	22.66	21.91
		1 RB high	22.45	21.65
		50% RB mid	21.57	20.52
		100% RB	21.62	20.60
20 MHz	1720.0	1 RB low	22.56	21.73
		1 RB high	22.58	21.75
		50% RB mid	21.47	20.46
		100% RB	21.45	20.47
	1732.5	1 RB low	22.60	21.90
		1 RB high	22.64	21.98
		50% RB mid	21.55	20.61
		100% RB	21.55	20.56
	1745.0	1 RB low	22.54	21.85
		1 RB high	22.39	21.65
		50% RB mid	21.51	20.53
		100% RB	21.58	20.58

4.1.2. Radiated Output Power

LIMIT

This is the test for the maximum radiated power from the EUT.
Per Part 27.50(d) (4) specifies, Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755MHz band are limited to 1W EIRP. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in this band must employ a means for limiting power to the minimum necessary for successful communications.

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 is connected 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 were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*
2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBi)*
3. *We measured at SIM 1 as conducted burst average power higher at SIM 1;*
4. *We measured both Horizontal and Vertical direction, recorded worst case direction.*

LTE FDD Band 4_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
1710.7	-21.86	3.06	9.68	34.8	19.56	30	10.44	V
1732.5	-22.78	3.17	9.68	34.8	18.53	30	11.47	V
1754.3	-21.70	3.22	9.75	34.8	19.63	30	10.37	V

LTE FDD Band 4_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
1711.5	-21.90	3.06	9.68	34.8	19.52	30	10.48	V
1732.5	-21.45	3.17	9.68	34.8	19.86	30	10.14	V
1753.5	-22.72	3.22	9.75	34.8	18.61	30	11.39	V

LTE FDD Band 4_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
1712.5	-21.63	3.06	9.68	34.8	19.79	30	10.21	V
1732.5	-20.81	3.17	9.68	34.8	20.50	30	9.50	V
1752.5	-21.74	3.22	9.75	34.8	19.59	30	10.41	V

LTE FDD Band 4_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
1715.0	-21.11	3.06	9.68	34.80	19.20	30	10.80	V
1732.5	-20.21	3.17	9.68	34.80	20.87	30	9.13	V
1750.0	-21.55	3.22	9.75	34.80	19.76	30	10.24	V

LTE FDD Band 4_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
1717.5	-21.99	3.06	9.68	34.8	19.43	30	10.57	V
1732.5	-21.57	3.17	9.68	34.8	19.74	30	10.26	V
1747.5	-22.70	3.22	9.75	34.8	18.63	30	11.37	V

LTE FDD Band 4_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
1720.0	-22.19	3.06	9.68	34.8	19.23	30	10.77	V
1732.5	-21.26	3.17	9.68	34.8	20.05	30	9.95	V
1745.0	-22.59	3.22	9.75	34.8	18.74	30	11.26	V

LTE FDD Band 4_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
1710.7	-23.12	3.06	9.68	34.8	18.30	30	11.70	V
1732.5	-23.10	3.17	9.68	34.8	18.21	30	11.79	V
1754.3	-23.64	3.22	9.75	34.8	17.69	30	12.31	V

LTE FDD Band 4_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
1711.5	-23.88	3.06	9.68	34.8	17.54	30	12.46	V
1732.5	-23.46	3.17	9.68	34.8	17.85	30	12.15	V
1753.5	-23.64	3.22	9.75	34.8	17.69	30	12.31	V

LTE FDD Band 4_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
1712.5	-23.53	3.06	9.68	34.8	17.89	30	12.11	V
1732.5	-22.72	3.17	9.68	34.8	18.59	30	11.41	V
1752.5	-23.65	3.22	9.75	34.8	17.68	30	12.32	V

LTE FDD Band 4_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
1715.0	-23.41	3.06	9.68	34.8	18.01	30	11.99	V
1732.5	-22.38	3.17	9.68	34.8	18.93	30	11.07	V
1750.0	-22.97	3.22	9.75	34.8	18.36	30	11.64	V

LTE FDD Band 4_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
1717.5	-23.66	3.06	9.68	34.8	17.76	30	12.24	V
1732.5	-23.46	3.17	9.68	34.8	17.85	30	12.15	V
1747.5	-22.44	3.22	9.75	34.8	18.89	30	11.11	V

LTE FDD Band 4_Channel Bandwidth 20MHz_16QAM

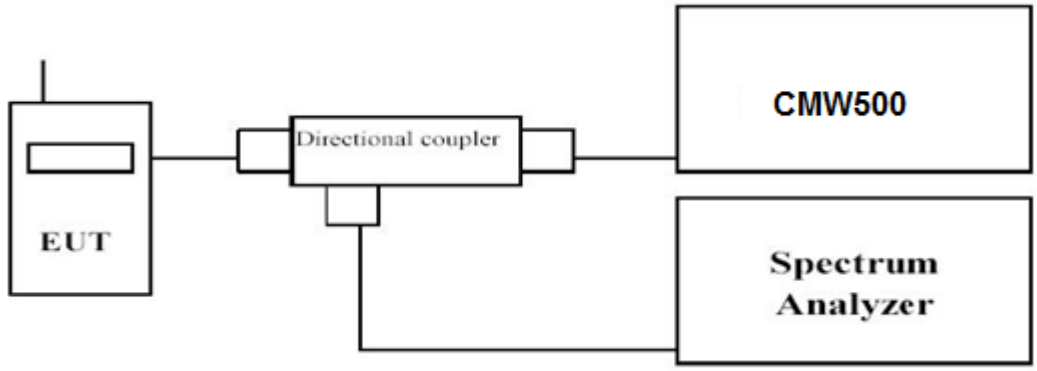
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1720.0	-22.94	3.06	9.68	34.8	18.48	30	11.52	V
1732.5	-22.14	3.17	9.68	34.8	19.17	30	10.83	V
1745.0	-22.63	3.22	9.75	34.8	18.70	30	11.30	V

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:

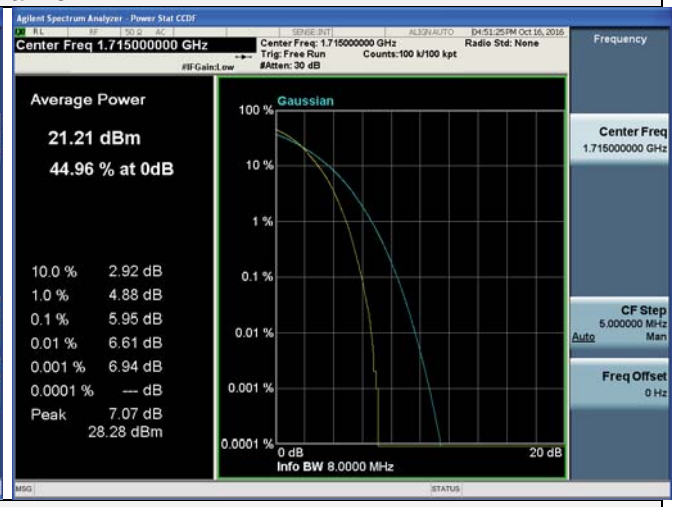
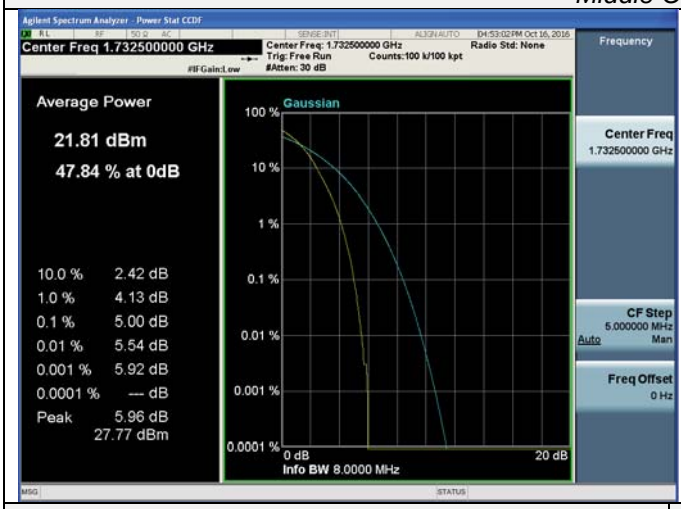
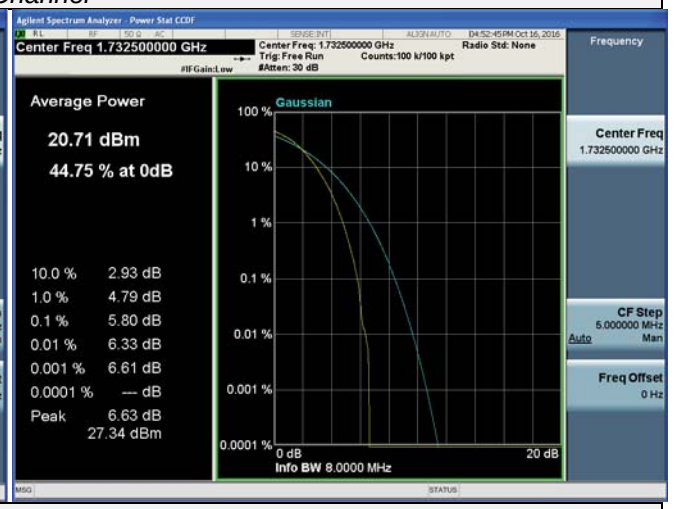
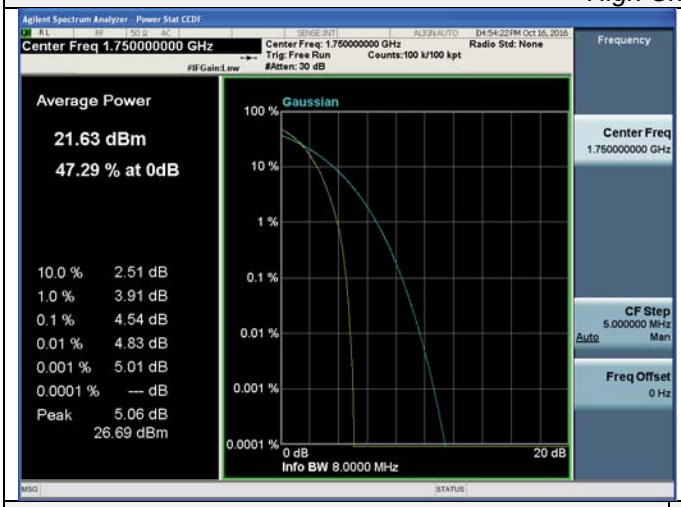
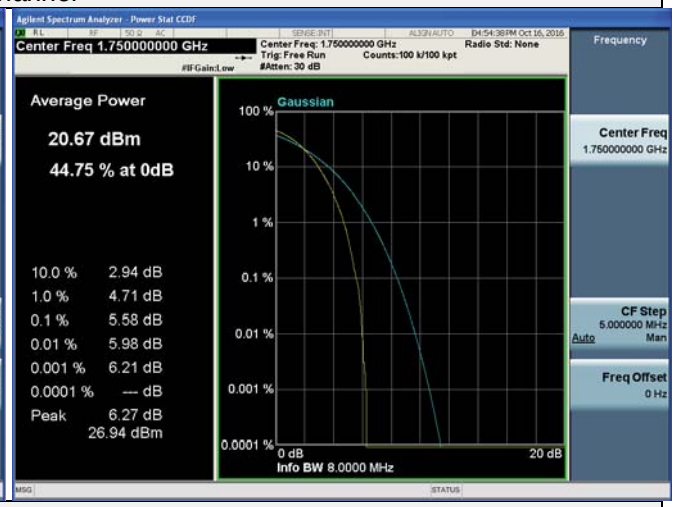
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*
2. *We measured at SIM 1 as conducted burst average power higher at SIM 1;*

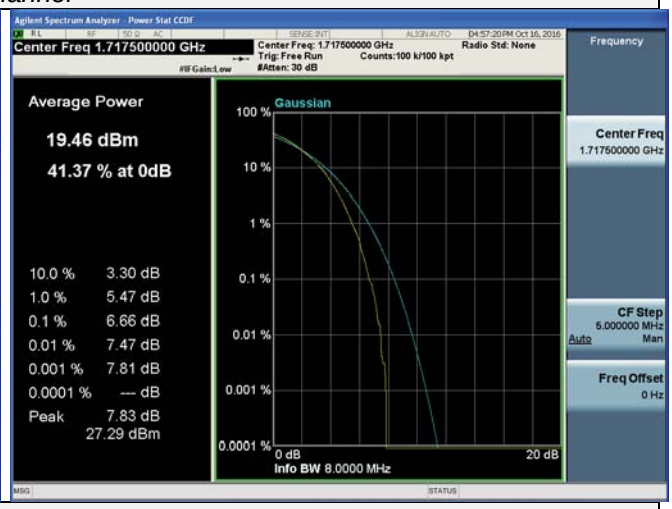
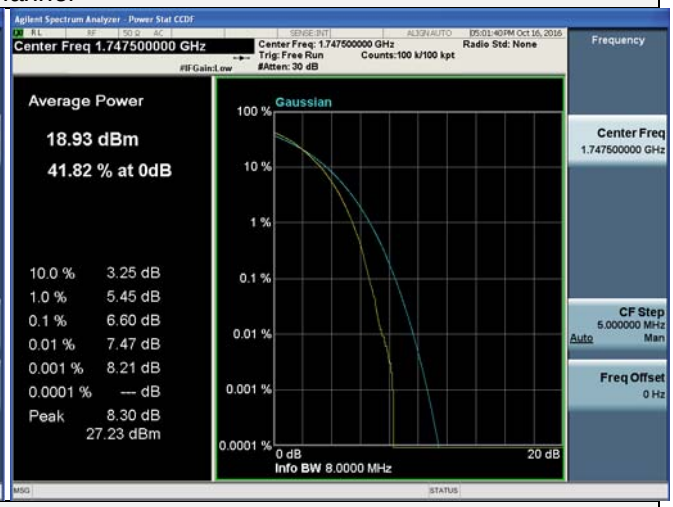
LTE FDD Band 4				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	PAPR (dB)	
			QPSK	16QAM
1.4 MHz	1710.7	*1RB#0*	3.84	4.38
	1732.5		4.28	4.62
	1754.3		3.24	4.31
3 MHz	1711.5	*1RB#0*	3.42	4.46
	1732.5		3.53	4.52
	1753.5		3.29	4.32
5 MHz	1712.5	*1RB#0*	3.35	4.55
	1732.5		3.35	4.46
	1752.5		3.19	4.31
10 MHz	1715.0	*1RB#0*	4.96	5.95
	1732.5		5.00	5.80
	1750.0		4.54	5.58
15 MHz	1717.5	*1RB#0*	5.76	6.66
	1732.5		5.81	6.73
	1747.5		5.80	6.60
20 MHz	1720.0	*1RB#0*	6.43	7.02
	1732.5		6.44	7.09
	1745.0		6.40	6.85

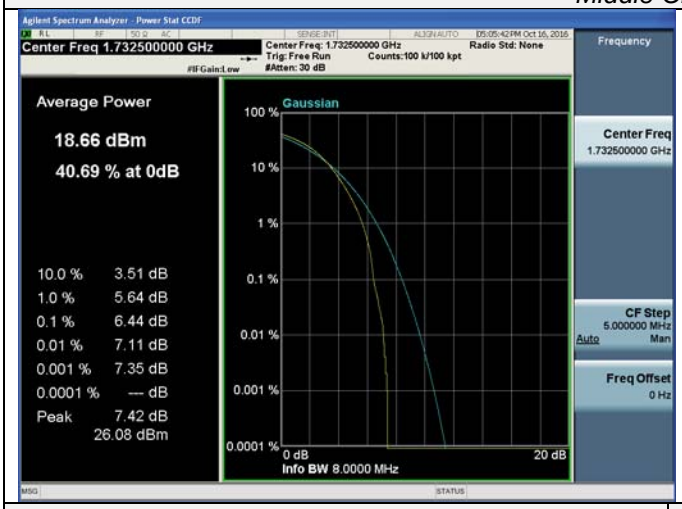
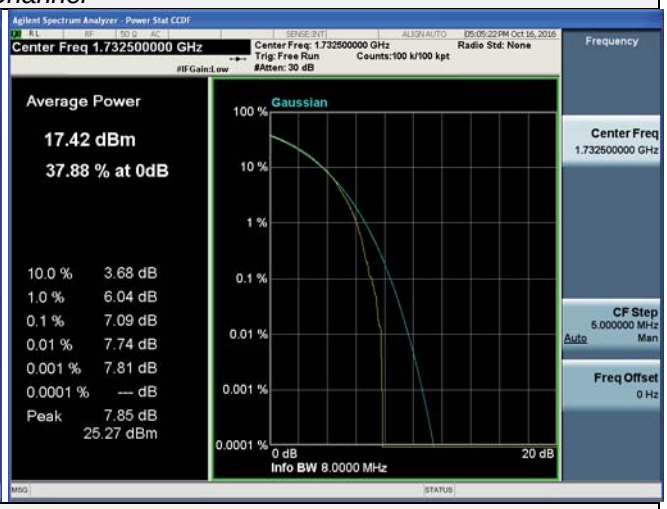
LTE FDD Band 4 – 1.4 MHz Channel Bandwidth PAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 4 – 3 MHz Channel Bandwidth PAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 4 – 5 MHz Channel Bandwidth PAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 4 – 10 MHz Channel Bandwidth PAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

LTE FDD Band 4 – 15 MHz Channel Bandwidth PAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

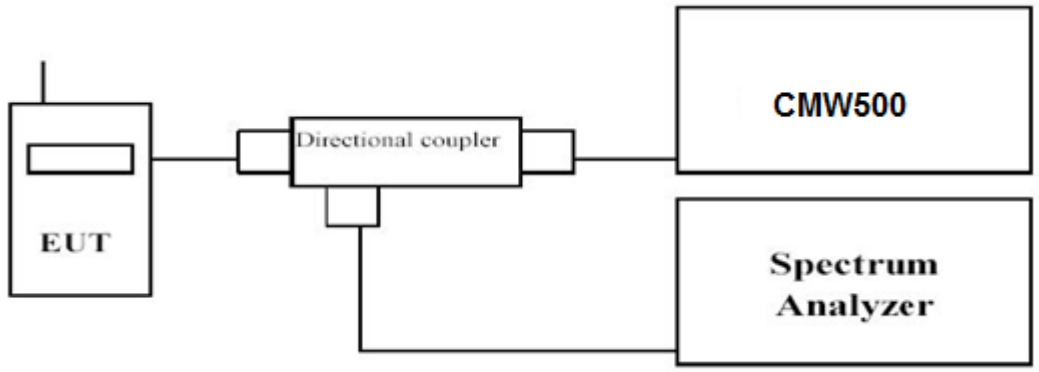
LTE FDD Band 4 – 20 MHz Channel Bandwidth PAPR	
QPSK	16QAM
Low Channel	
	
1RB#0	1RB#0
Middle Channel	
	
1RB#0	1RB#0
High Channel	
	
1RB#0	1RB#0

4.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

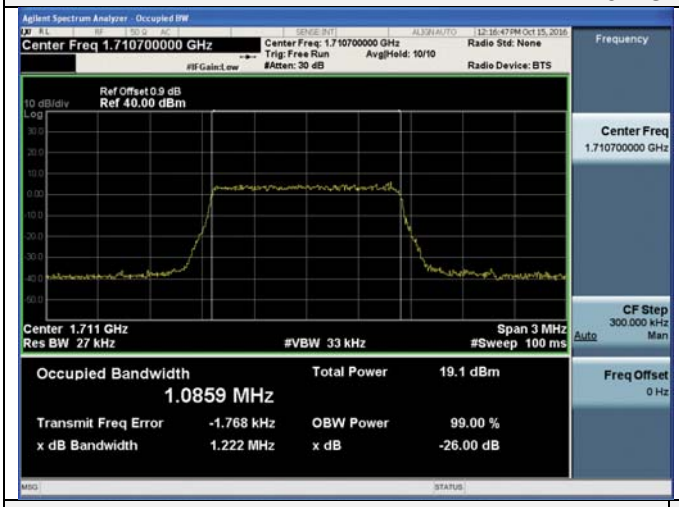
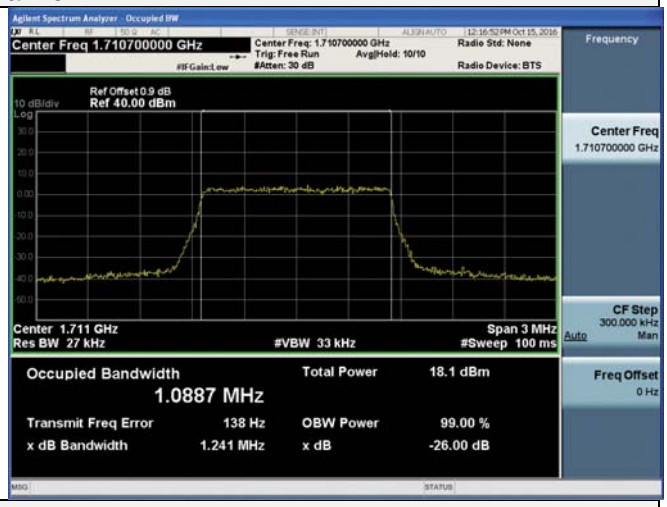
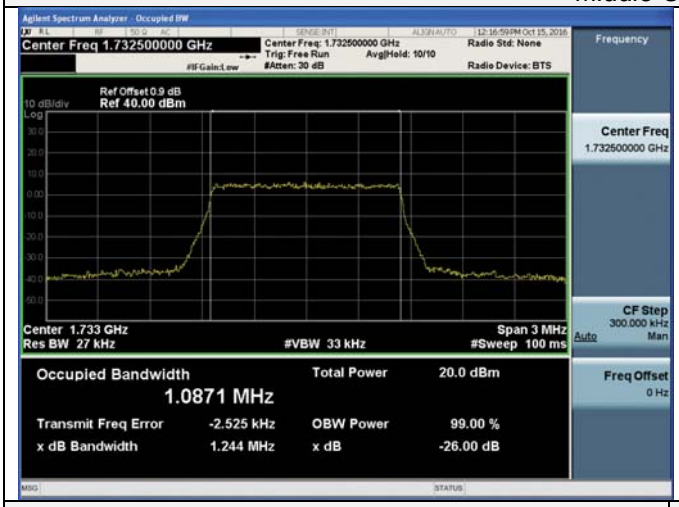
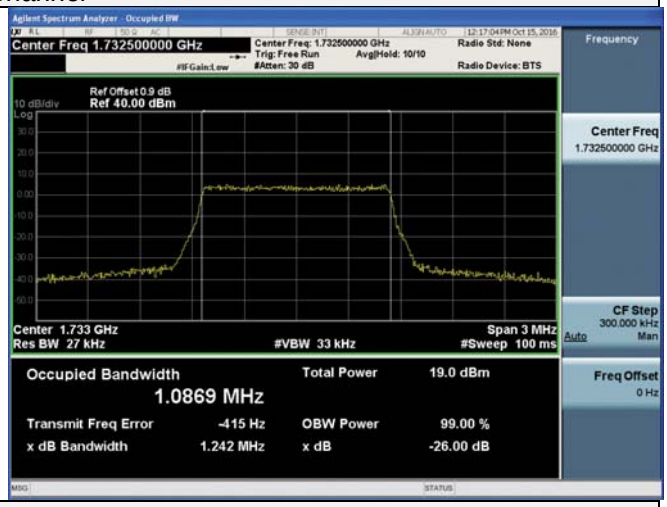
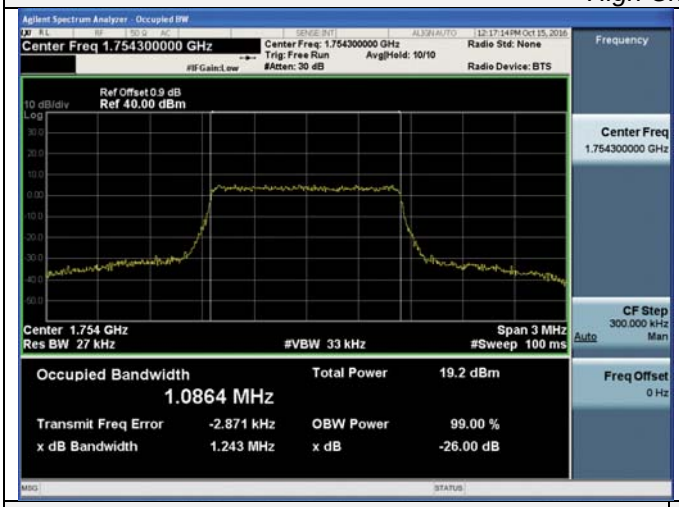
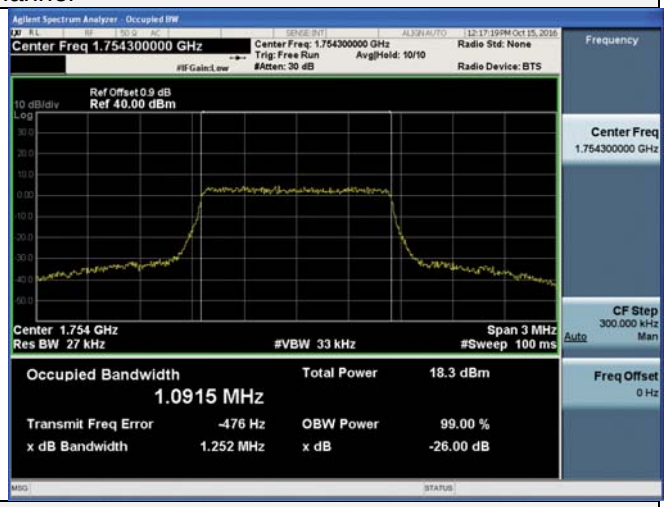
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and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

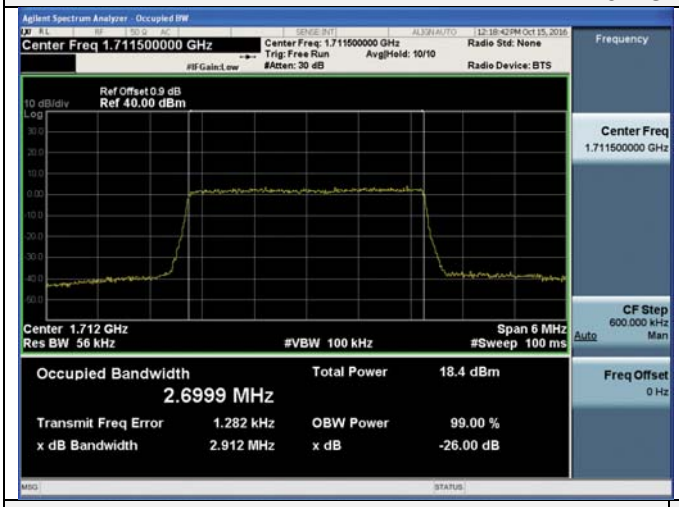
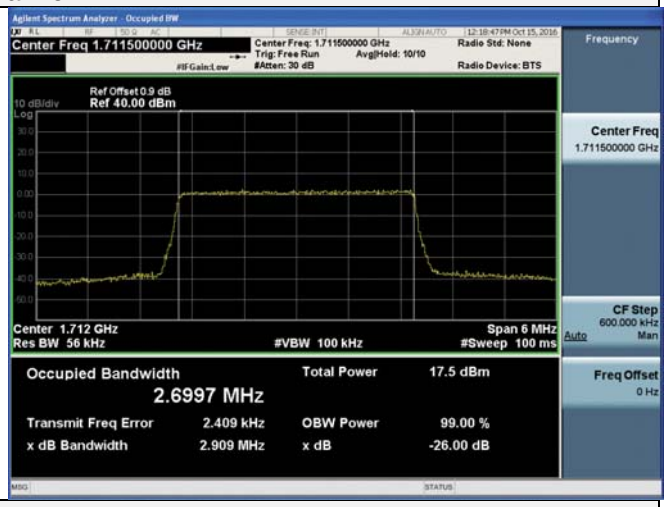
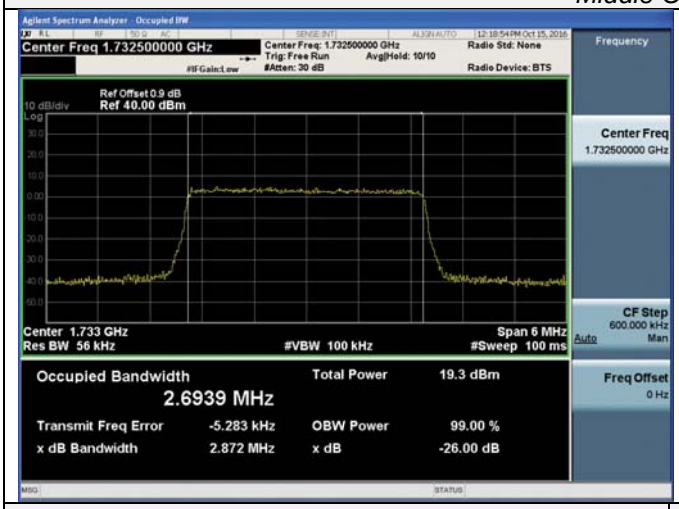
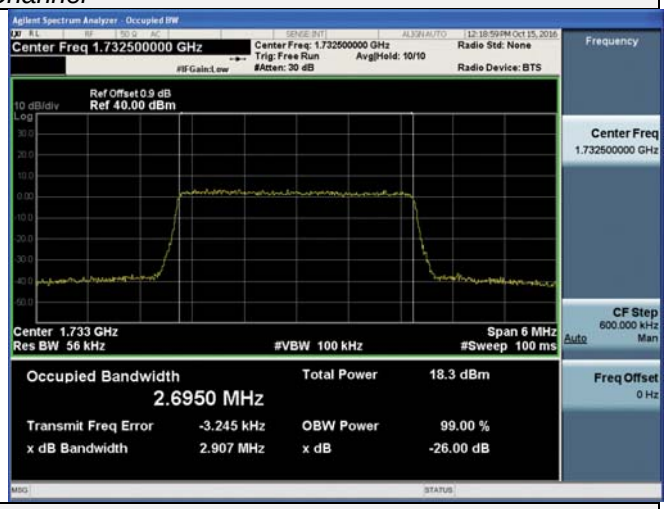
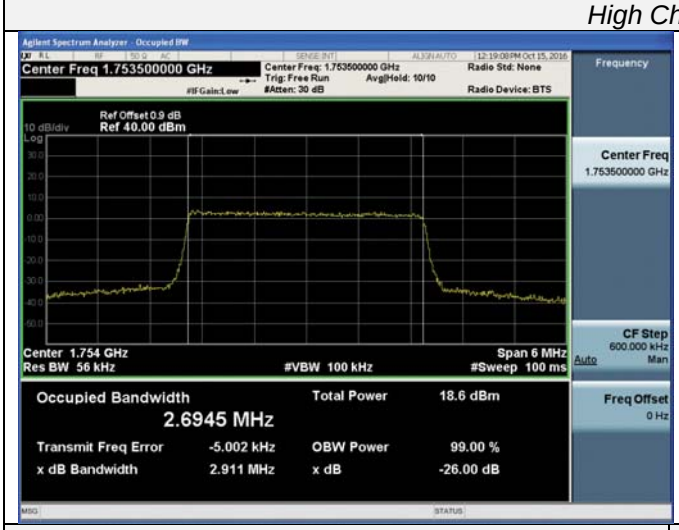
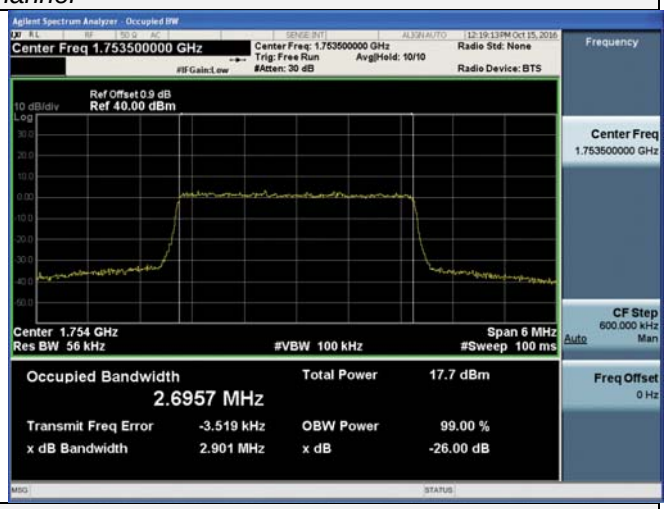
TEST RESULTS

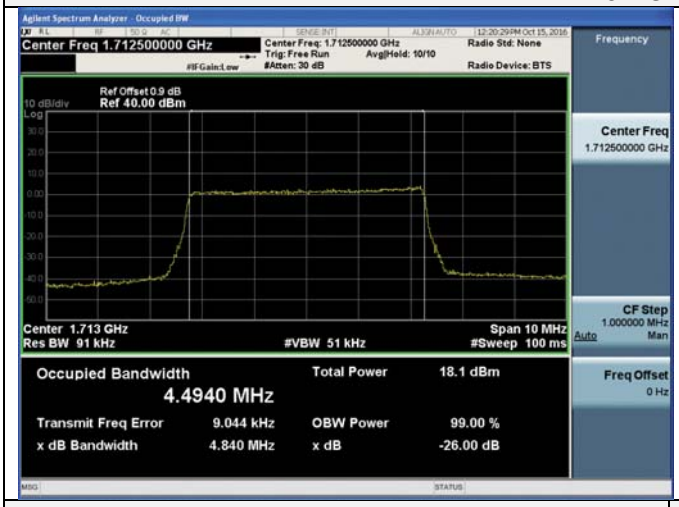
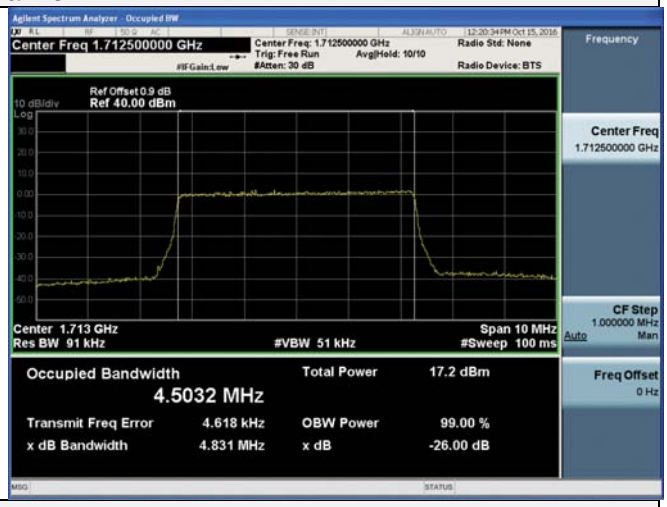
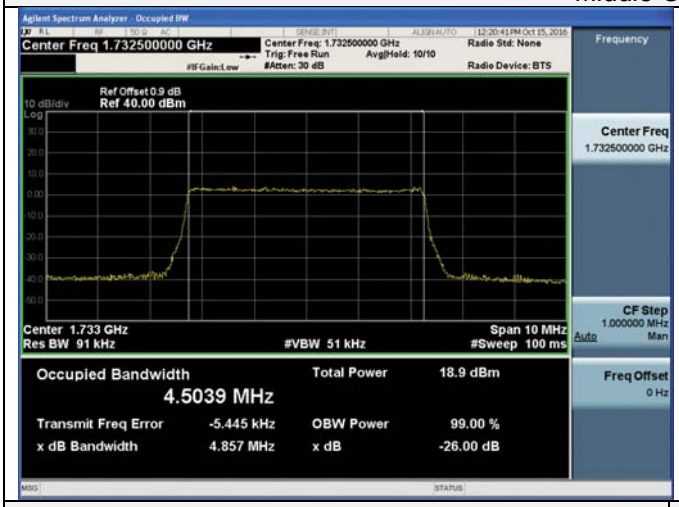
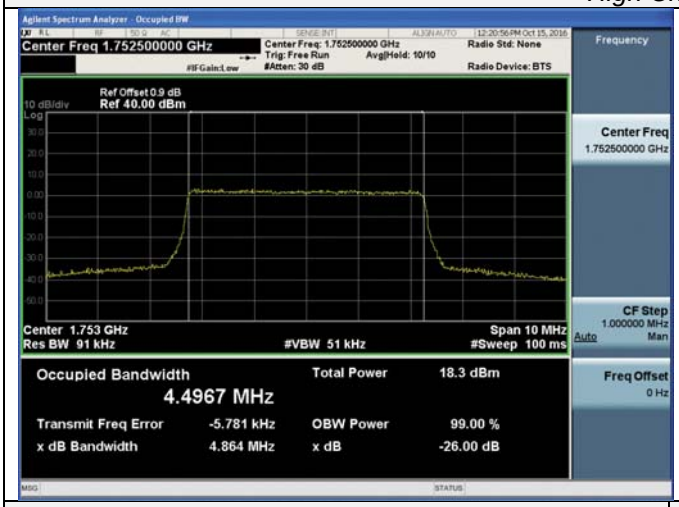
Remark:

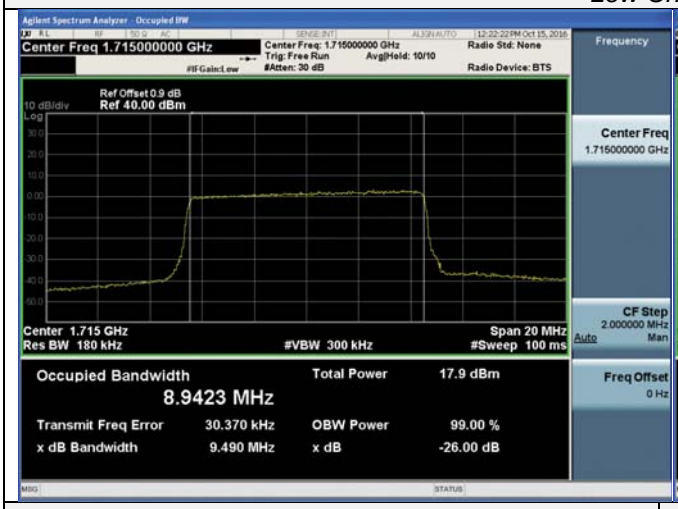
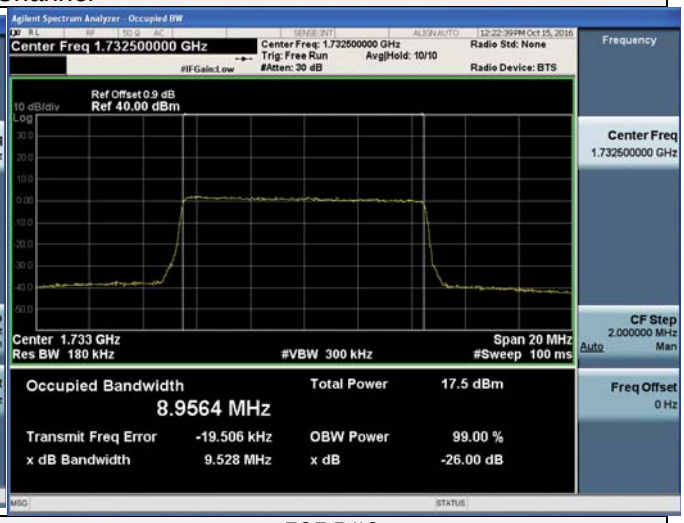
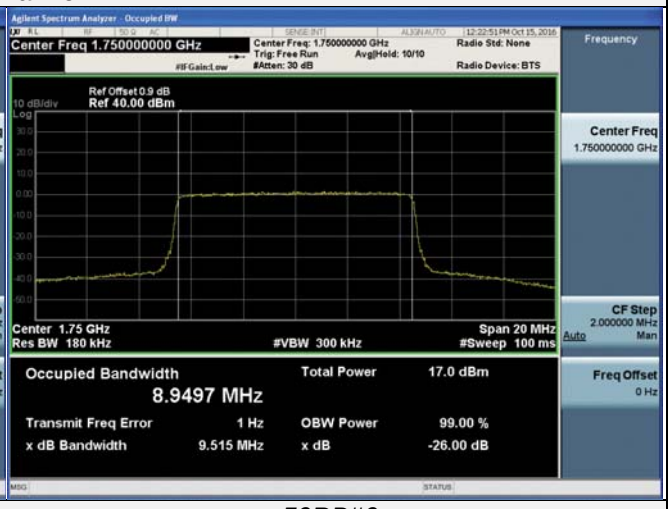
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*
2. *We measured at SIM 1 as conducted burst average power higher at SIM 1;*

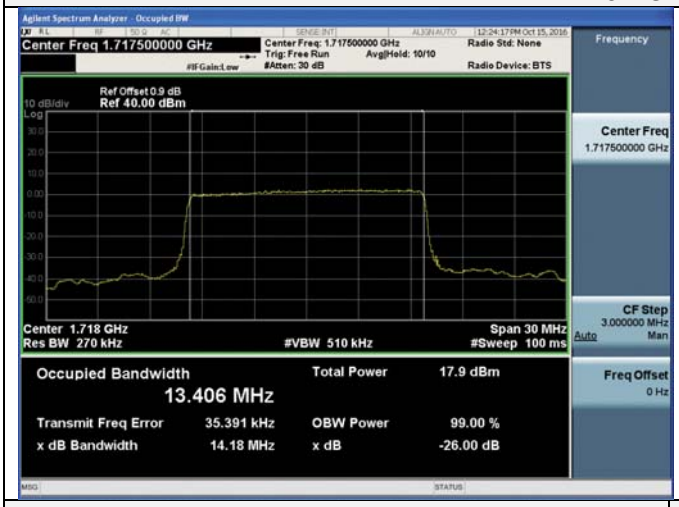
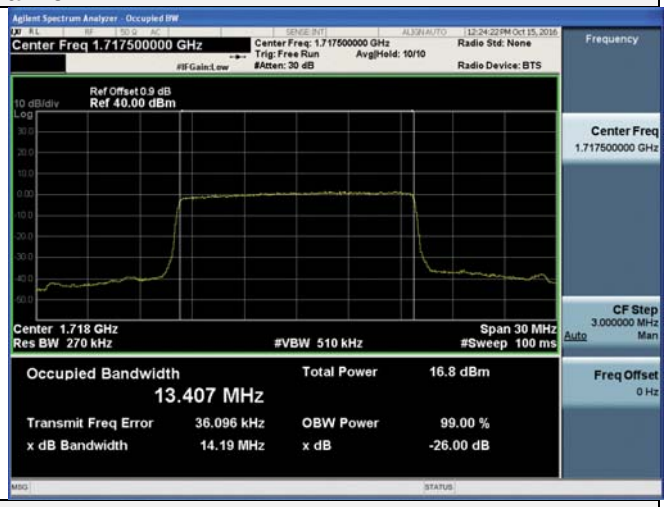
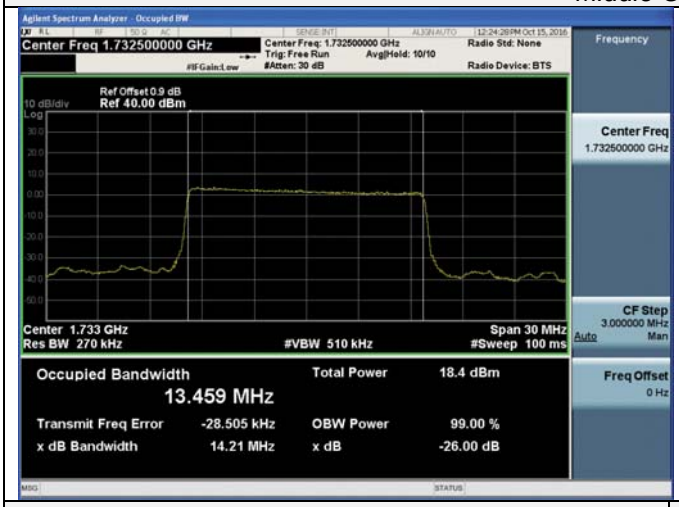
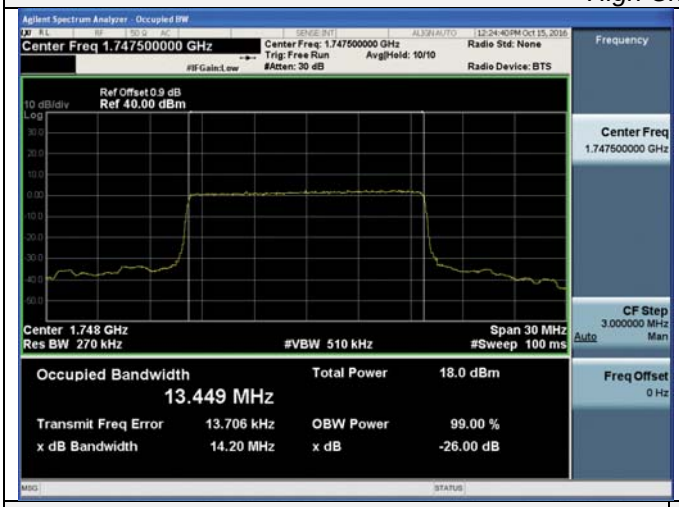
LTE FDD Band 4						
TX Channel Bandwidth	RB Size/Offset	Frequency (MHz)	-26dBc Emission bandwidth (MHz)		99% Occupied bandwidth (MHz)	
			QPSK	16QAM	QPSK	16QAM
1.4 MHz	*6RB#0*	1710.7	1.222	1.241	1.0859	1.0887
		1732.5	1.244	1.242	1.0871	1.0869
		1754.3	1.243	1.252	1.0864	1.0915
3 MHz	*15RB#0*	1711.5	2.912	2.909	2.6999	2.6997
		1732.5	2.872	2.907	2.6939	2.6950
		1753.5	2.911	2.901	2.6945	2.6957
5 MHz	*25RB#0*	1712.5	4.840	4.831	4.4940	4.5032
		1732.5	4.857	4.856	4.5039	4.4987
		1752.5	4.864	4.835	4.4967	4.5053
10 MHz	*50RB#0*	1715.0	9.490	9.477	8.9423	8.9607
		1732.5	9.517	9.528	8.9804	8.9564
		1750.0	9.504	9.515	8.9527	8.9497
15 MHz	*75RB#0*	1717.5	14.18	14.19	13.406	13.407
		1732.5	14.21	14.25	13.459	13.460
		1747.5	14.20	14.22	13.449	13.447
20 MHz	*100RB#0*	1720.0	18.92	18.92	17.865	17.875
		1732.5	18.96	18.97	17.977	17.967
		1745.0	18.96	18.98	17.963	17.960

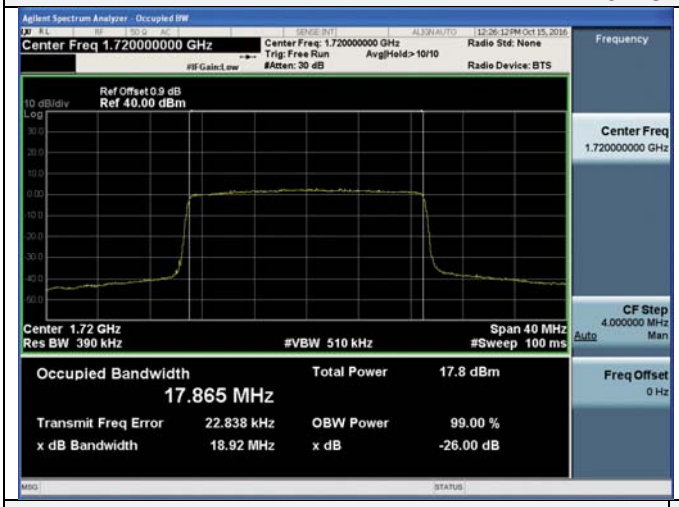
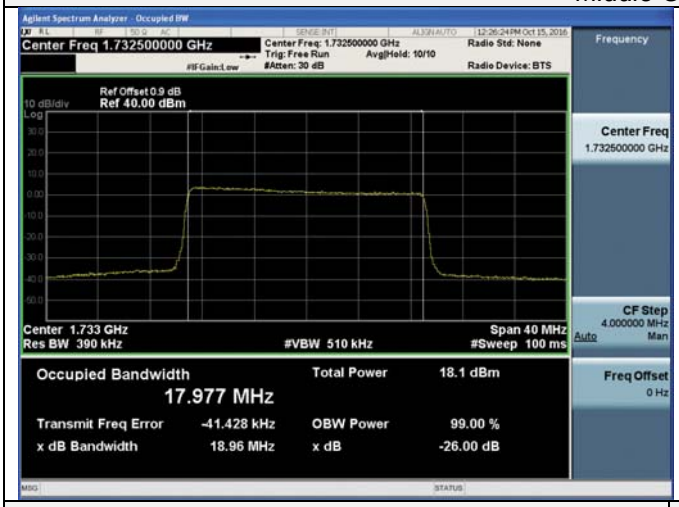
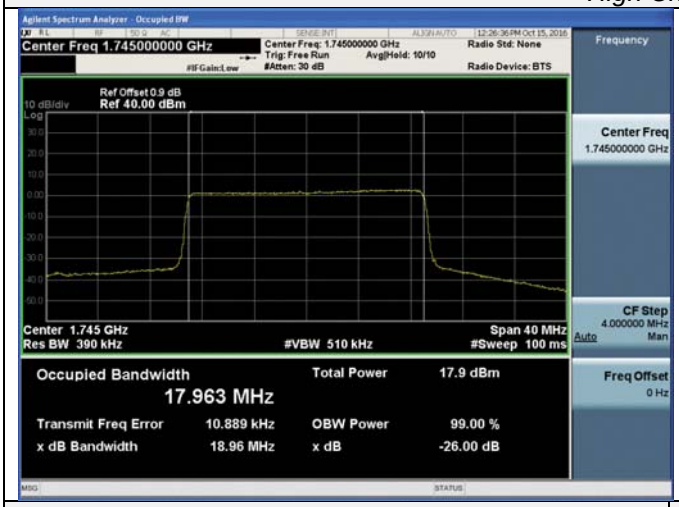
LTE FDD Band 4 – 1.4 MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
6RB#0	6RB#0
Middle Channel	
	
6RB#0	6RB#0
High Channel	
	
6RB#0	6RB#0

LTE FDD Band 4 – 3 MHz 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 4 – 5 MHz 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 4 – 10 MHz 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 4 – 15 MHz 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

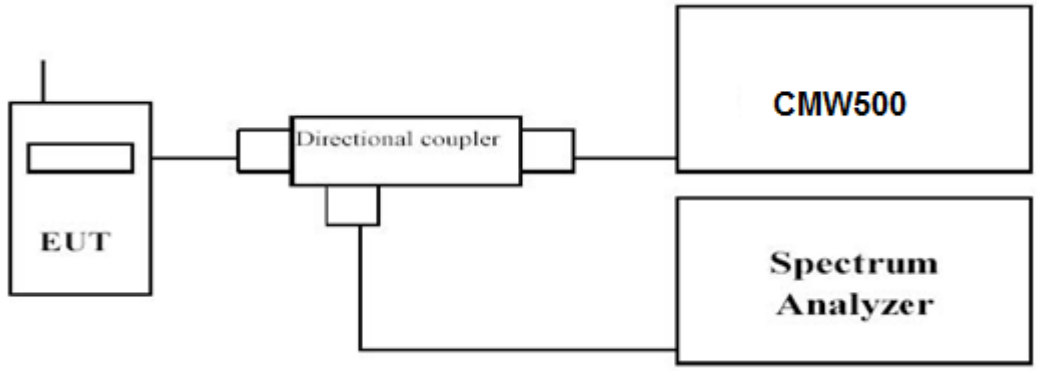
LTE FDD Band 4 – 20 MHz Channel Bandwidth Occupied Bandwidth and Emission Bandwidth	
QPSK	16QAM
Low Channel	
	
100RB#0	100RB#0
Middle Channel	
	
100RB#0	100RB#0
High Channel	
	
100RB#0	100RB#0

4.4 Band Edge compliance

LIMIT

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

TEST CONFIGURATION



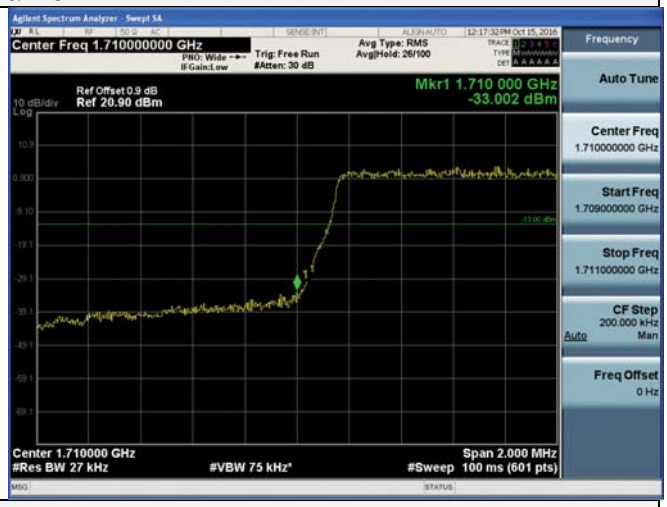
TEST PROCEDURE

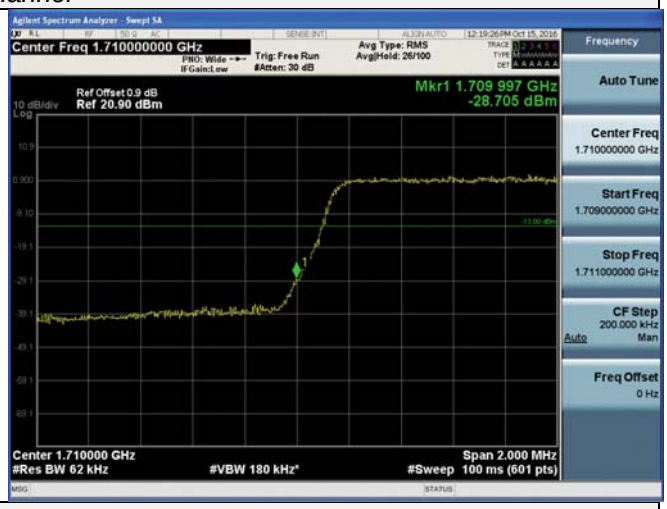
1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels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

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*
2. *We measured at SIM 1 as conducted burst average power higher at SIM 1;*

LTE FDD Band 4 – 1.4 MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
Low Channel	
	
6RB#0	6RB#0
High Channel	
	
6RB#0	6RB#0

LTE FDD Band 4 – 3 MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
Low Channel	
	
15RB#0	15RB#0
High Channel	
	
15RB#0	15RB#0

LTE FDD Band 4 – 5 MHz Channel Bandwidth Band Edge Compliance	
QPSK	*16QAM*
Low Channel	
	
25RB#0	*25RB#0*
High Channel	
	
25RB#0	*25RB#0*

LTE FDD Band 4 – 10 MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
Low Channel	
	
50RB#0	50RB#0
High Channel	
	
50RB#0	50RB#0

LTE FDD Band 4 – 15 MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
Low Channel	
	
75RB#0	75RB#0
High Channel	
	
75RB#0	75RB#0

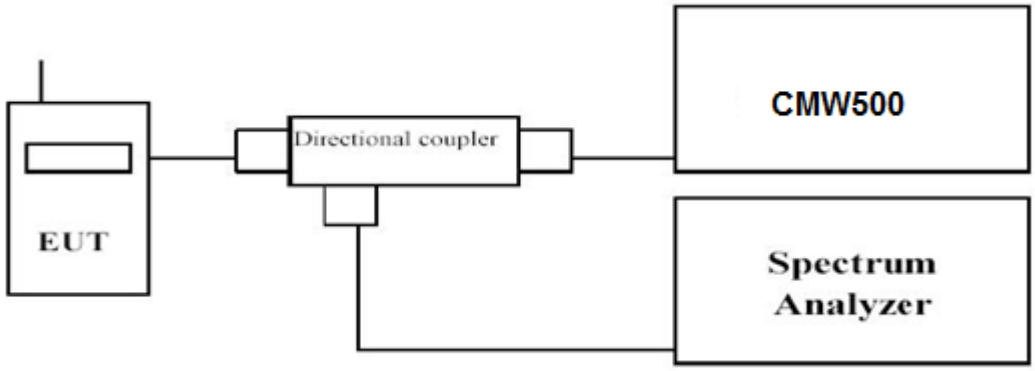
LTE FDD Band 4 – 20 MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
Low Channel	
	
100RB#0	100RB#0
High Channel	
	
100RB#0	100RB#0

4.5 Spurious Emssion on Antenna Port

LIMIT

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

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

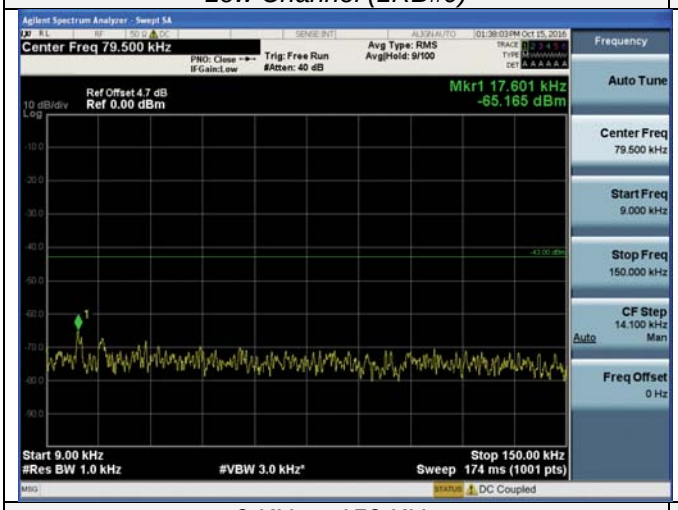
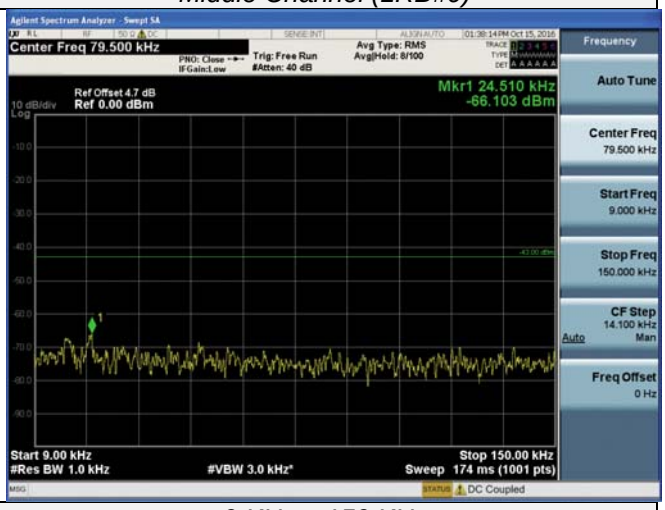
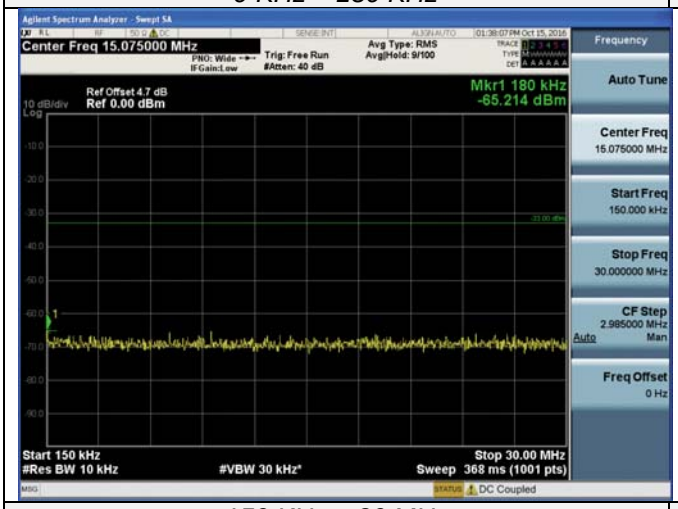
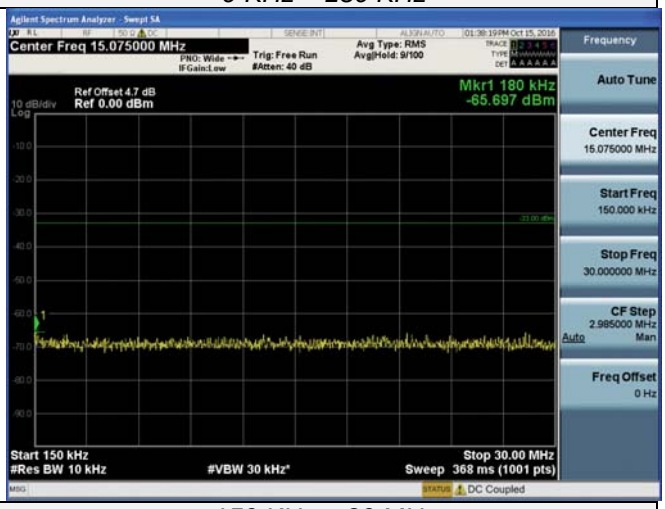
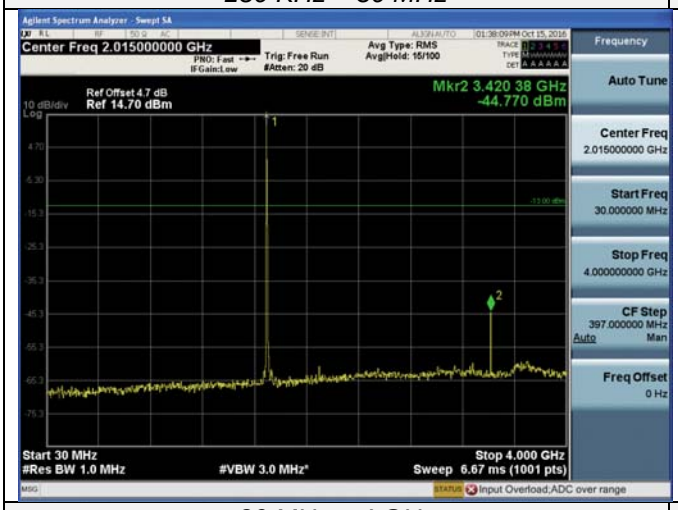
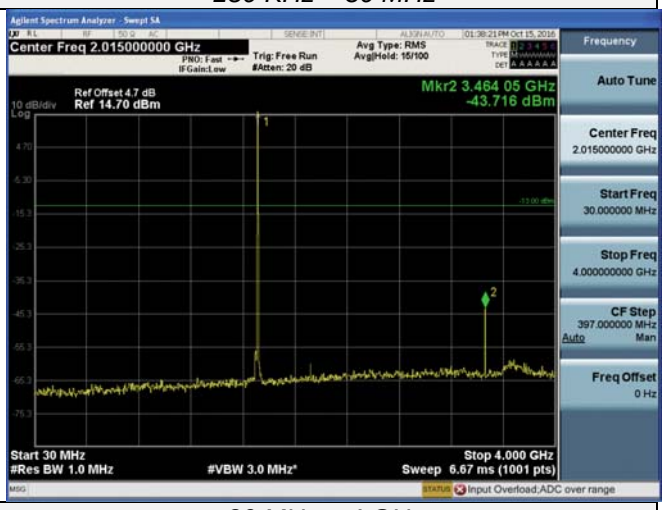
a. Place the EUT on a bench and set it in transmitting mode.
b. Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c. EUT Communicate with CMW500, then select a channel for testing.
d. Add a correction factor to the display of spectrum, and then 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 to10^{th} harmonic.
f. Please refer to following tables for test antenna conducted emissions.

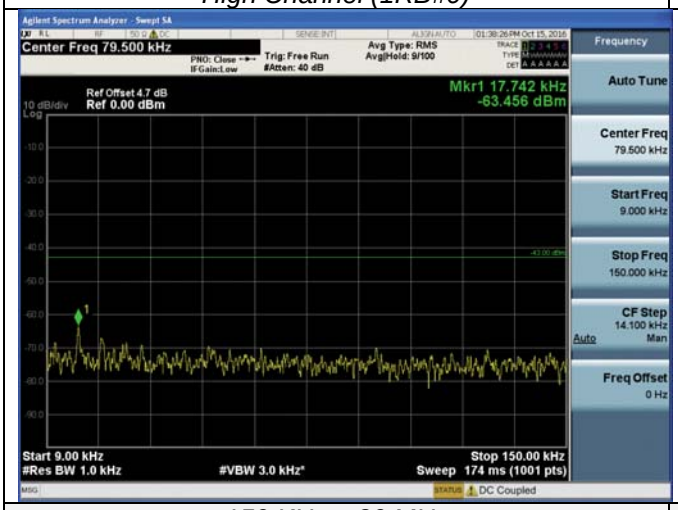
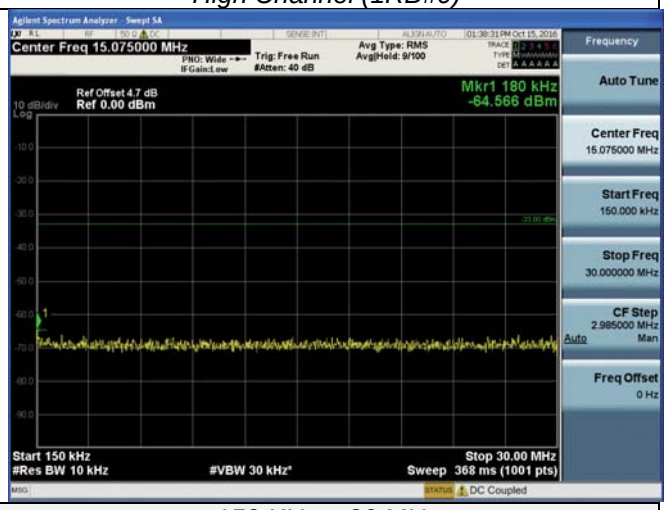
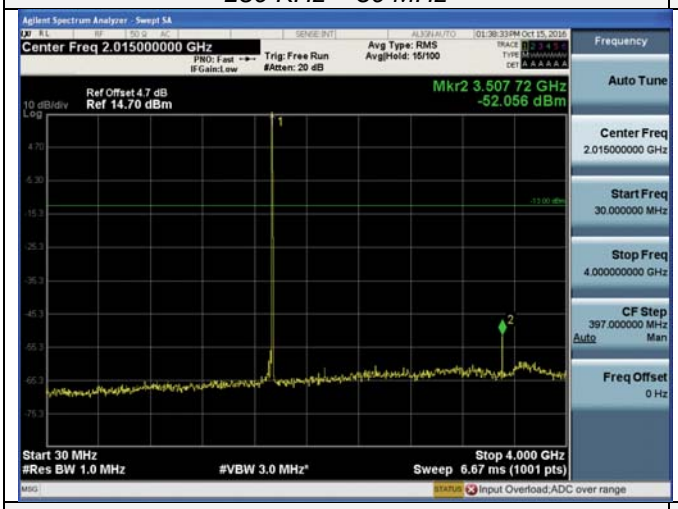
Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 4	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~4	1 MHz	3 MHz	Auto
	4~26	1 MHz	3 MHz	Auto

TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*
2. *We measured at SIM 1 as conducted burst average power higher at SIM 1;*
3. *We measured at both QPSK and 16QAM modulation, recorded worst case at QPSK modulation;*

LTE FDD Band 4 – 1.4 MHz Channel Bandwidth Conducted Spurious Emissions	
Low Channel (1RB#0)	Middle Channel (1RB#0)
	
9 KHz – 150 KHz	9 KHz – 150 KHz
	
150 KHz – 30 MHz	150 KHz – 30 MHz
	
30 MHz – 4 GHz	30 MHz – 4 GHz

LTE FDD Band 4 – 1.4 MHz Channel Bandwidth Conducted Spurious Emissions	
Low Channel (1RB#0)	Middle Channel (1RB#0)
	
4 GHz – 26 GHz	4 GHz – 26 GHz
High Channel (1RB#0)	High Channel (1RB#0)
	
150 KHz – 30 MHz	150 KHz – 30 MHz
	
30 MHz – 4 GHz	4 GHz – 26 GHz