Shenzhen Huaxia Testing Technology Co., Ltd

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Report Template Version: V03
Report Template Revision Date: Mar.1st, 2017

Test Report

Report No. :	CQASZ20190500014EX-08
Applicant:	Speedata Group Ltd
Address of Applicant:	Room 2-308, building No. 25, No. 9 Anningzhuang Road West, Haidian district, Beijing, China
Manufacturer:	Speedata Group Ltd
Address of Manufacturer:	Room 2-308, building No. 25, No. 9 Anningzhuang Road West, Haidian district, Beijing, China
Equipment Under Test (EUT):	
Product:	PDA
Test Model No.:	SD60
All Model No.:	SD60, SD35, T35, PG35, SD55, T55, SD55LG, SD55MD, SD55UHF, SD55PTT, T55UHF, T55PPT, PG55, T60, SD60LG, SD60RT, SD60PRT, T60RT, Bio60, SD50, SN50, SD50RT, T50, PG50
Brand Name:	N/A
FCC ID:	2AJO5SD60
Standards:	47 CFR Part 2 47 CFR Part 22 subpart H
Date of Test:	Mar. 26, 2019 to Jun. 12, 2019
Date of Issue:	Jun. 13, 2019
Test Result :	**PASS***

Tested By： Daisy Qin

(Daisy Qin)

Reviewed By: Aaron Ma

(Aaron Ma)

Approved By:

(Jack Ai)

SHENZHEN HUAXIA TESTING TECHNOLOGY CO., LTD. 华夏准测 APPROVED

* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20190500014EX-08	Rev.01	Initial report	Jun. 13, 2019

Contents

2 SUMMARY

2.1 TEST STANDARDS

The tests were performed according to following standards:
FCC Part 22: PRIVATE LAND MOBILE RADIO SERVICES.
EIA/TIA 603 D June 2010: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
KDB971168 D01:v02r02 MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

2.2 Test Description

Test Item	Section in CFR 47	Result
RF Output Power	Part 2.1046 Part 22.913(a)	Pass
Peak-to-Average Ratio	N/A	Pass
99% & -26 dB Occupied Bandwidth	Part 2.1049 Part 22.917(b)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917(b)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917(b)	Pass
Out of band emission, Band Edge	Part 2.1051 Part 22.917(b)	Pass
Frequency stability	Part 2.1055 22.917	Pass

2.3 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

2.4 Test Facility

• CNAS (No. CNAS L5785)

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 4742.01)

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

• FCC Registration No.: 522263

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen 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 No.:522263

2.5 Statement of the measurement uncertainty

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	±5.12dB	(1)
2	Radiated Emission (Above 1GHz)	±4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	±3.34dB	(1)
4	Radio Frequency	3×10-8	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	time	0.6 %.	(1)
14	Frequency Error	5.5 Hz	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.6 Test Equipment

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2018/9/26	2019/9/25
Spectrum analyzer	R&S	FSU26	CQA-038	2018/10/28	2019/10/27
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2018/9/26	2019/9/25
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2018/11/2	2019/11/1
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2018/10/28	2020/10/27
Bilog Antenna	R&S	HL562	CQA-011	2018/9/26	2020/9/25
Horn Antenna	R&S	HF906	CQA-012	2018/9/26	2020/9/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2018/9/26	2020/9/25
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2018/9/26	2019/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2018/9/26	2019/9/25
Antenna Connector	CQA	RFC-01	CQA-080	2018/9/26	2019/9/25
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2018/9/26	2019/9/25
Spectrum analyzer	Agilent	E4440A	CQA-103	2018/10/28	2019/10/27
Universal Radio Communication Tester	Rohde & Schwarz	CMW500	CQA-022	2018/9/26	2019/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2018/9/26	2019/9/25
H & T Chamber	Auchno	OJN-9606	CQA-CB2	2018/9/26	2019/9/25

3 GENERAL INFORMATION

3.1 Client Information

Applicant:	Speedata Group Ltd
Address of Applicant:	1F Zhiyuan Building, NO.28, ShangDi 6th Street HaiDian District, Beijing, China
Manufacturer:	Speedata Group Ltd
Address of Manufacturer:	1F Zhiyuan Building, NO.28, ShangDi 6th Street HaiDian District, Beijing, China

3.2 Environmental conditions

Environment Parameter	Selected Values During Tests	
Relative Humidity	52%	
Atmospheric Pressure:	1001mbar	
Temperature	TN	25 °C
Voltage :	VL	3.5V
	VN	4.2V
	VH	4.5V

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

3.3 General Description of EUT

Product Name:	PDA
All Model No.:	SD60, SD35, T35, PG35, SD55, T55, SD55LG, SD55MD, SD55UHF, SD55PTT, T55UHF, T55PPT, PG55, T60, SD60LG, SD60RT, SD60PRT, T60RT, Bio60, SD50, SN50, SD50RT, T50, PG50
Test Model No.:	SD60
Trade Mark:	N/A
Hardware Version:	8.1.0
Software Version:	V.SD60.2.1.20.2019041909
Product Type:	☐ Mobile ☒ Portable ☐ Fix Location
Antenna Type:	Monopole antenna
Antenna Gain:	-3.8dBi.
EUT Power Supply:	DC 3.8V from Battery
Adapter Information:	Model: A138A-120150U-US2 Input: 100-240V-50/60Hz, 0.5A Output: 5V 2.5A/ 9V 2A/ 12V 1.5A

Note: 1. This report is only for FDD-LTE Band5.

2. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3. There are many products,Only the model SD60 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

3.4 Technical Specification

Characteristics	Description	
Radio System Type	☐ GSM ☐ UMTS ☒ LTE	
Supported Frequency Range	LTE BAND5	Uplink: 824 to 849 MHz
		Downlink: 869 to 894 MHz
Power Class	Class 3	
Supported Channel Bandwidth	LTE BAND5	☒1.4MHz ☒3MHz ☒5MHz☒10MHz
Designation of Emissions (Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	LTE BAND5:	1.4M QPSK modulation 1.4MHz 16QAM modulation 3M QPSK modulation 3MHz 16QAM modulation 5M QPSK modulation 5MHz 16QAM modulation 10M QPSK modulation 10MHz 16QAM modulation

3.5 Test Mode

Test Mode	Test Modes Description
FDD-LTE	FDD-LTE system, QPSK modulation
	FDD-LTE system, 16QAM modulation

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

4 TEST CONDITIONS AND RESULTS

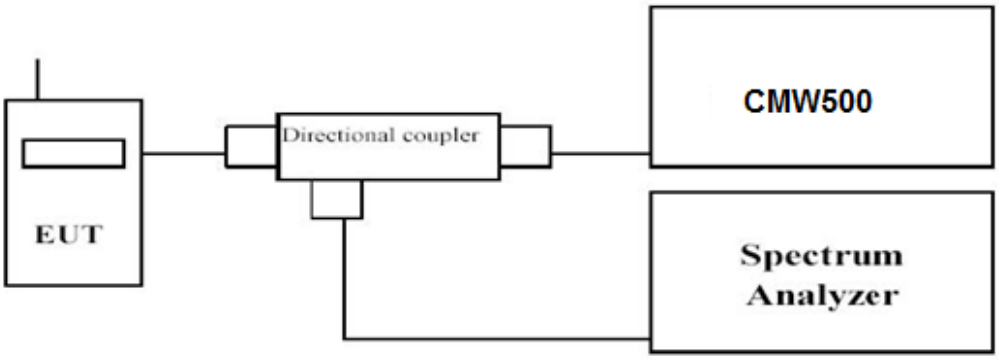
4.1 Output Power

LIMIT

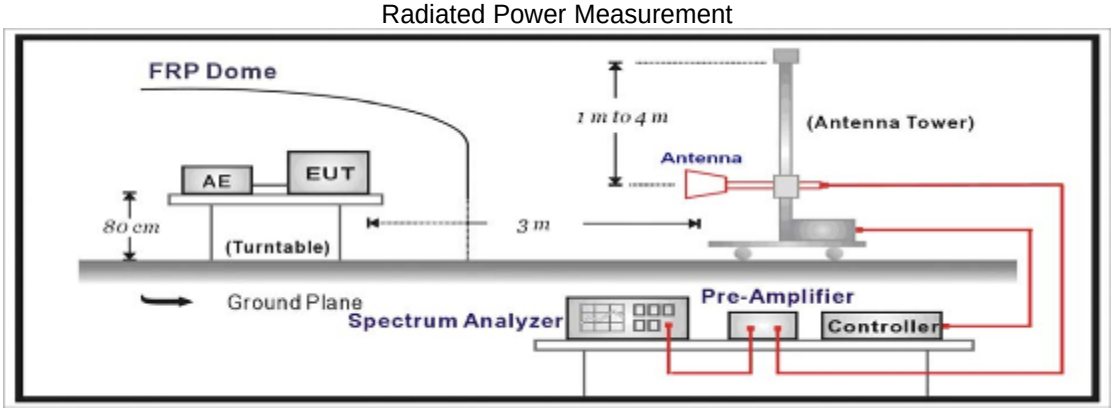
According to § 22.913(a) specifies ” The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.”

TEST CONFIGURATION

Conducted Power Measurement



Radiated Power Measurement



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603E

Conducted Power Measurement:

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c) EUT Communicate with CMW500 then selects a channel for testing.

d) Add a correction factor to the display of spectrum, and then test.

Radiated Power Measurement:

a) The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b) The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to thefrequency of the transmitter
c) The output of the test antenna shall be connected to the measuring receiver.
d) The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
e) The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
f) The transmitter shall then be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
g) The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
h) The maximum signal level detected by the measuring receiver shall be noted.
i) The transmitter shall be replaced by a substitution antenna.
j) The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
k) The substitution antenna shall be connected to a calibrated signal generator.
l) If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
m) The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
n) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
o) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
p) The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
q) Test site anechoic chamber refer to ANSI C63.4.

TEST RESULTS

Conducted Measurement:

LTE FDD Band 5				
TX Channel Bandwidth	RB Size/Offset	Frequency (MHz)	Average Power [dBm]	
			QPSK	16QAM
1.4 MHz	1 RB low	824.7	21.97	21.20
		836.5	22.85	22.12
		848.3	23.03	22.28
	1 RB high	824.7	23.42	22.62
		836.5	23.05	22.61
		848.3	22.87	22.41
	50% RB mid	824.7	22.95	22.43
		836.5	23.00	22.58

		848.3	23.00	22.52
	100% RB	824.7	23.12	22.73
		836.5	22.51	21.67
		848.3	23.02	22.43
3 MHz	1 RB low	825.5	21.64	20.87
		836.5	21.73	20.88
		847.5	22.23	21.46
	1 RB high	825.5	22.28	21.87
		836.5	21.72	21.08
		847.5	21.68	21.20
	50% RB mid	825.5	22.47	21.95
		836.5	22.27	21.71
		847.5	21.86	21.15
	100% RB	825.5	22.40	21.68
		836.5	21.90	21.24
		847.5	23.09	22.66
5 MHz	1 RB low	826.5	21.78	20.95
		836.5	22.87	22.28
		846.5	22.91	22.50
	1 RB high	826.5	21.81	21.09
		836.5	22.97	22.15
		846.5	22.06	21.47
	50% RB mid	826.5	23.01	22.47
		836.5	22.67	21.87
		846.5	23.28	22.84
	100% RB	826.5	21.66	21.06
		836.5	22.72	22.15
		846.5	22.17	21.36
10 MHz	1 RB low	829.0	22.72	22.31
		836.5	22.12	21.56
		844.0	23.27	22.90
	1 RB high	829.0	21.91	21.52
		836.5	21.72	21.19
		844.0	21.50	20.67
	50% RB mid	829.0	21.59	21.21

		836.5	22.27	21.56
		844.0	23.28	22.77
	100% RB	829.0	23.37	22.52
		836.5	22.84	22.11
		844.0	22.57	21.92

Radiated Measurement:

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.*
2. *ERP=P_{Mea}(dBm)-P_{cl}(dB)+P_{Ag}(dB)+G_a(dBd)*

LTE FDD Band 5_Channel Bandwidth 1.4MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.7	-19.45	2.42	6.3	36.82	21.25	38.45	17.20	V
836.5	-18.51	2.46	6.3	36.82	22.15	38.45	16.30	V
848.3	-19.05	2.53	6.21	36.82	21.45	38.45	17.00	V

LTE FDD Band 5_Channel Bandwidth 3MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
825.5	-18.56	2.42	6.3	36.82	22.14	38.45	16.31	V
836.5	-18.77	2.46	6.3	36.82	21.89	38.45	16.56	V
847.5	-18.57	2.53	6.21	36.82	21.93	38.45	16.52	V

LTE FDD Band 5_Channel Bandwidth 5MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.5	-19.04	2.42	6.3	36.82	21.66	38.45	16.79	V
836.5	-18.88	2.46	6.3	36.82	21.78	38.45	16.67	V
846.5	-18.78	2.53	6.21	36.82	21.72	38.45	16.73	V

LTE FDD Band 5_Channel Bandwidth 10MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
829.0	-19.05	2.42	6.3	36.82	21.65	38.45	16.80	V
836.5	-18.77	2.46	6.3	36.82	21.89	38.45	16.56	V
844.0	-18.81	2.53	6.21	36.82	21.69	38.45	16.76	V

LTE FDD Band 5_Channel Bandwidth 1.4MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.7	-19.83	2.42	6.3	36.82	20.87	38.45	17.58	V
836.5	-19.88	2.46	6.3	36.82	20.78	38.45	17.67	V
848.3	-19.87	2.53	6.21	36.82	20.63	38.45	17.82	V

LTE FDD Band 5_Channel Bandwidth 3MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
825.5	-20.07	2.42	6.3	36.82	20.63	38.45	17.82	V
836.5	-19.92	2.46	6.3	36.82	20.74	38.45	17.71	V
847.5	-19.89	2.53	6.21	36.82	20.61	38.45	17.84	V

LTE FDD Band 5_Channel Bandwidth 5MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.5	-20.15	2.42	6.3	36.82	20.55	38.45	17.90	V
836.5	-20.08	2.46	6.3	36.82	20.58	38.45	17.87	V
846.5	-19.77	2.53	6.21	36.82	20.73	38.45	17.72	V

LTE FDD Band 5_Channel Bandwidth 10MHz_16QAM

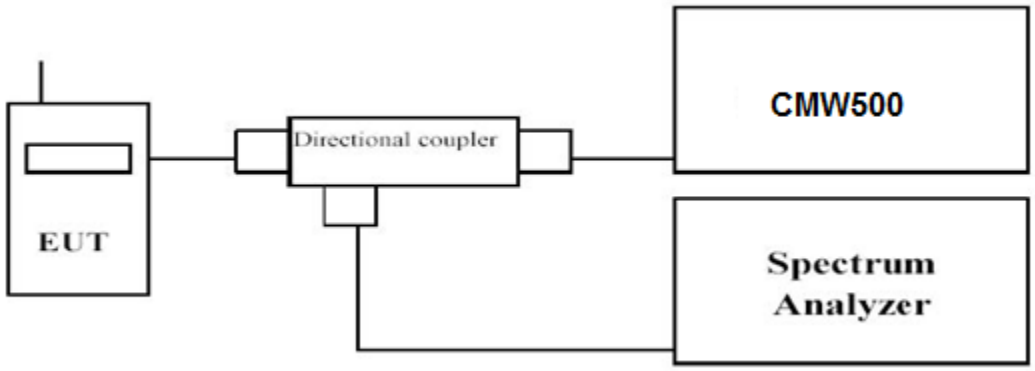
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dBd)	P_{Ag} (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
829.0	-19.85	2.42	6.3	36.82	20.85	38.45	17.60	V
836.5	-20.00	2.46	6.3	36.82	20.66	38.45	17.79	V
844.0	-19.69	2.53	6.21	36.82	20.81	38.45	17.64	V

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

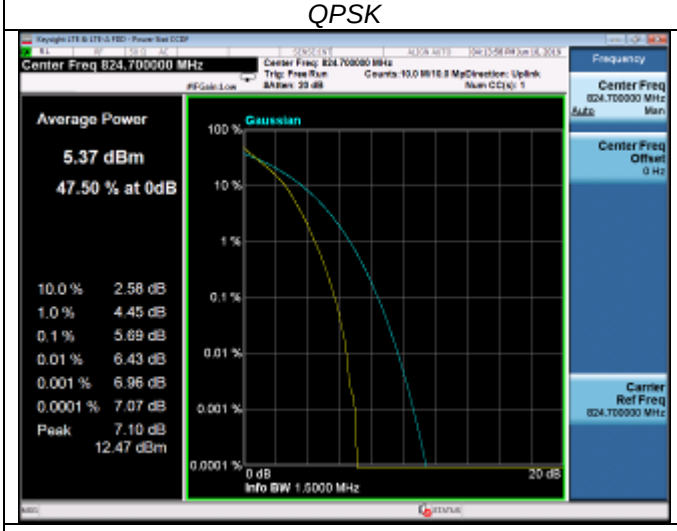
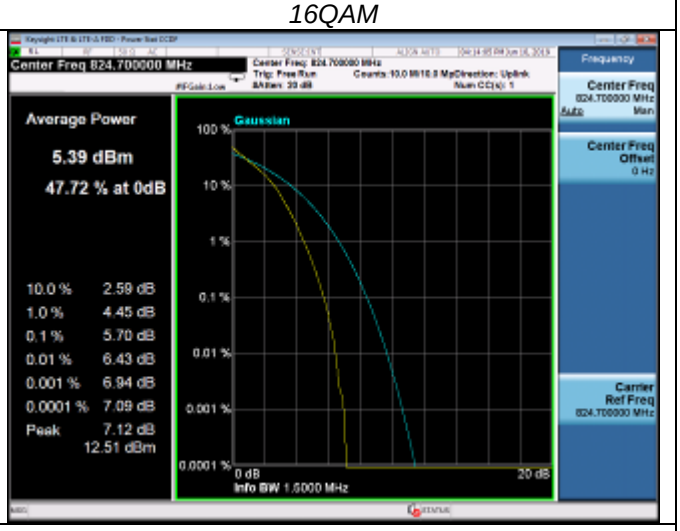
1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as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

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

LTE FDD Band 5				
TX Channel Bandwidth	Frequency (MHz)	RB Size/Offset	PAPR (dB)	
			QPSK	16QAM
1.4 MHz	824.7	*1RB#0*	5.69	5.70
	836.5		5.60	5.58
	848.3		6.13	6.11
3 MHz	825.5	*1RB#0*	5.57	5.59
	836.5		5.63	5.62
	847.5		6.13	6.13
5 MHz	826.5	*1RB#0*	5.73	5.76
	836.5		5.67	5.67
	846.5		6.11	6.10
10 MHz	829.0	*1RB#0*	5.72	5.75
	836.5		5.62	5.63
	844.0		5.81	5.82

LTE FDD Band 5-1.4MHz Channel Bandwidth PAPR	
QPSK	16QAM
	
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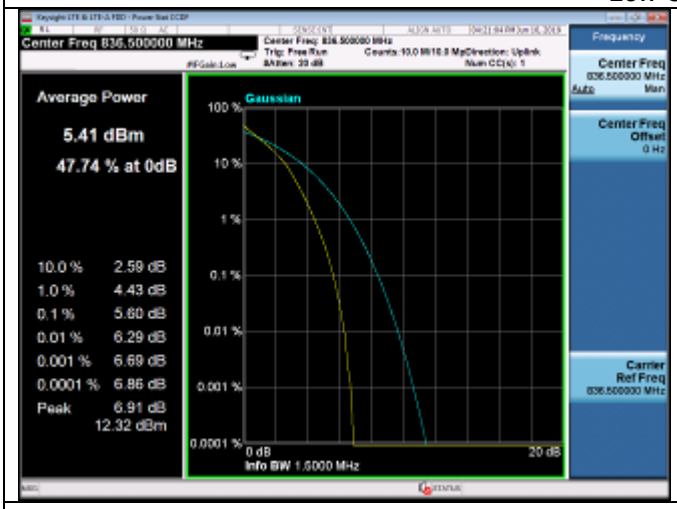
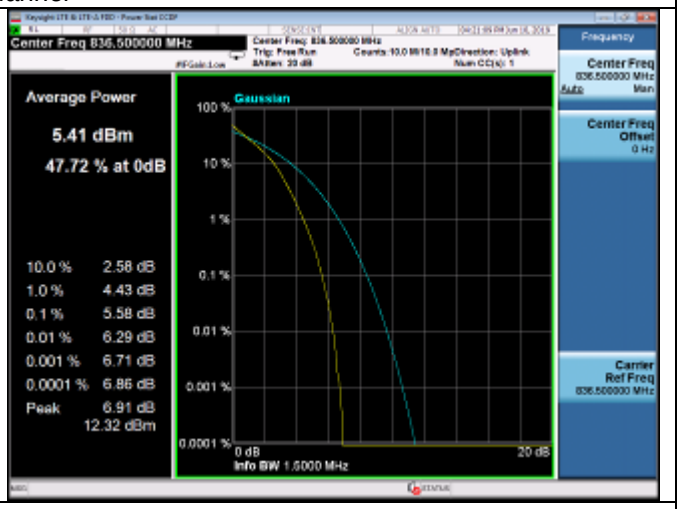
Low Channel	
	
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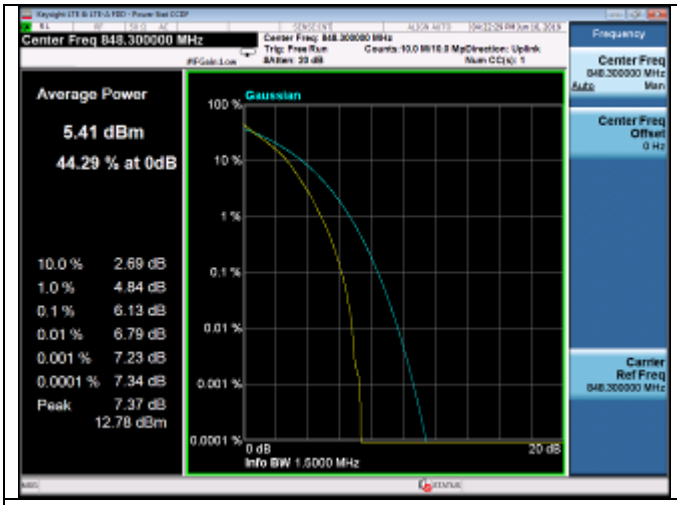
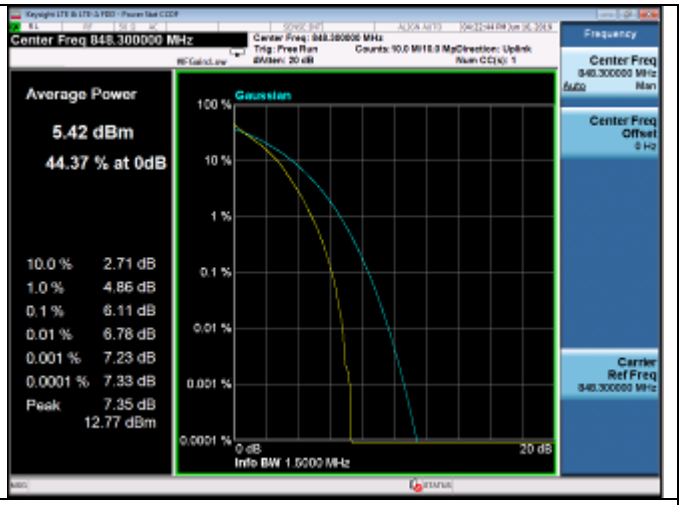
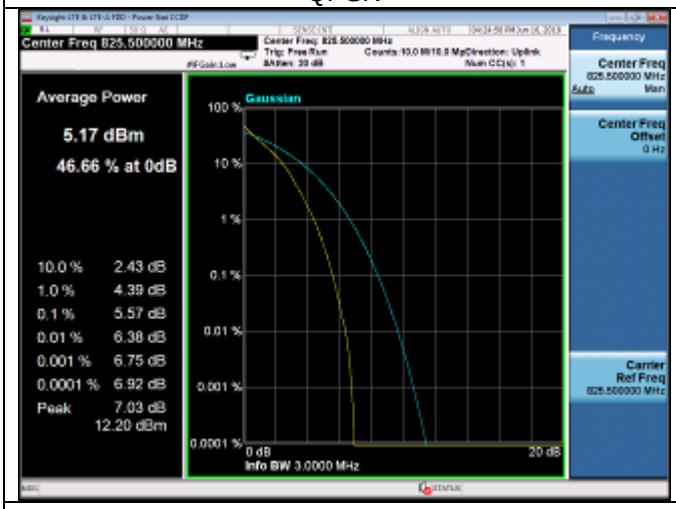
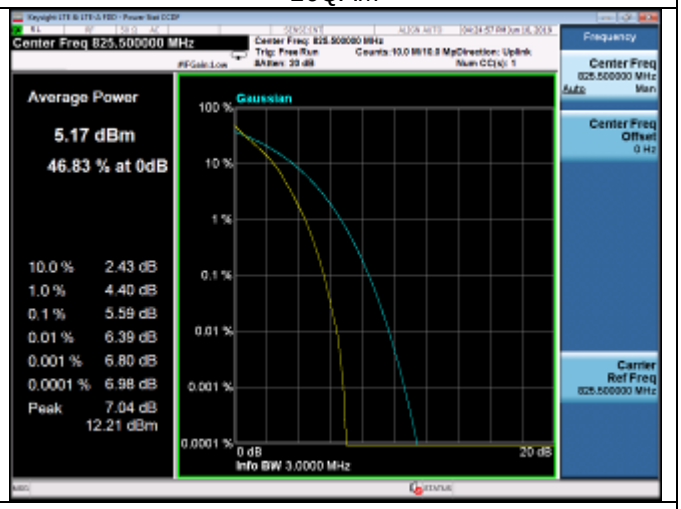
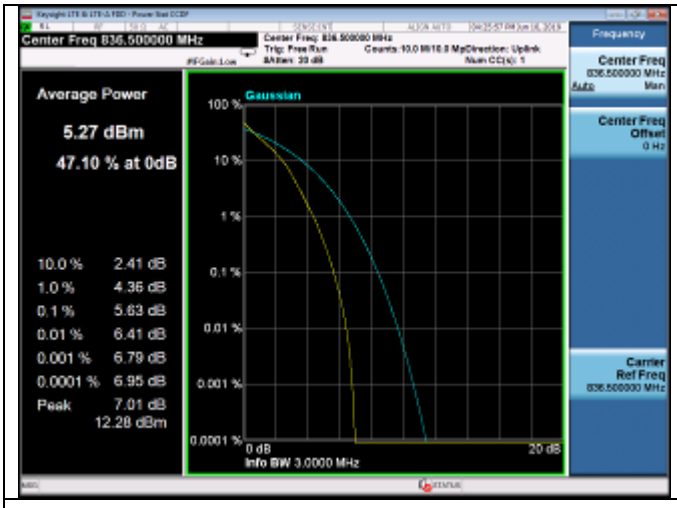
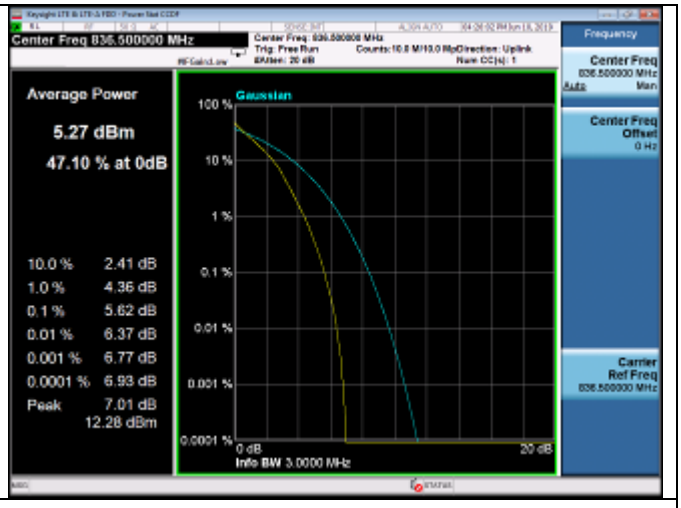
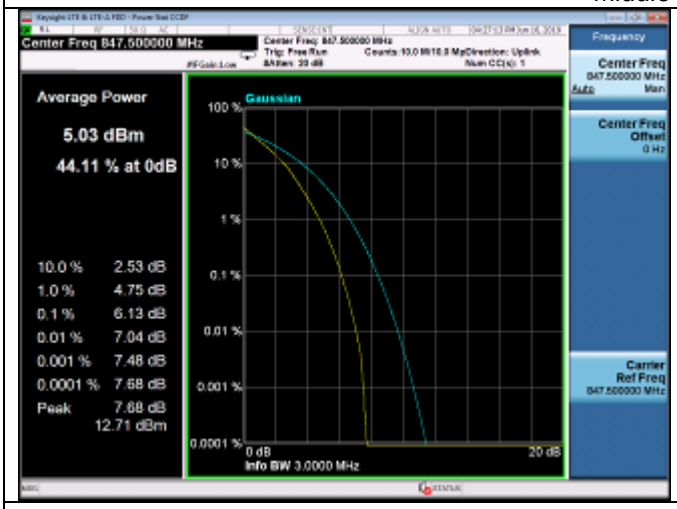
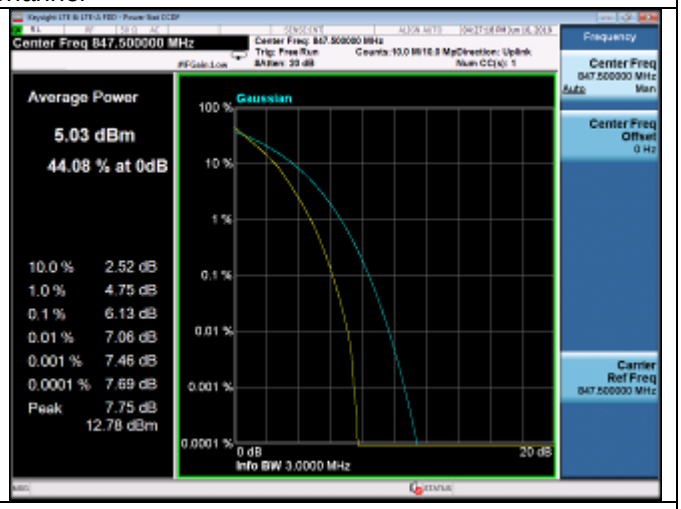
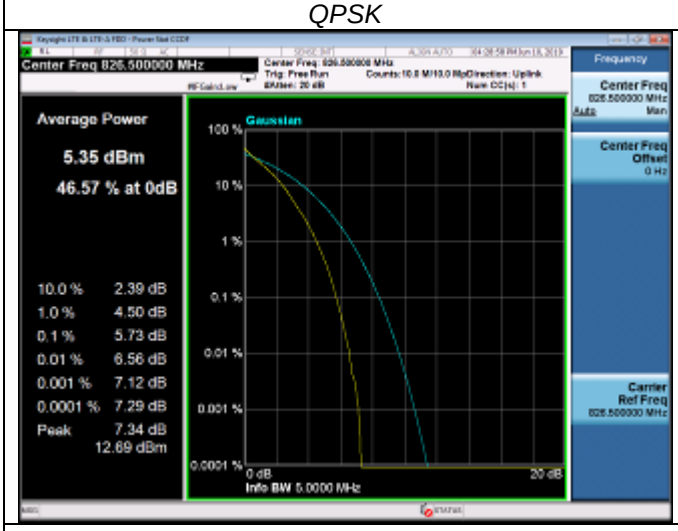
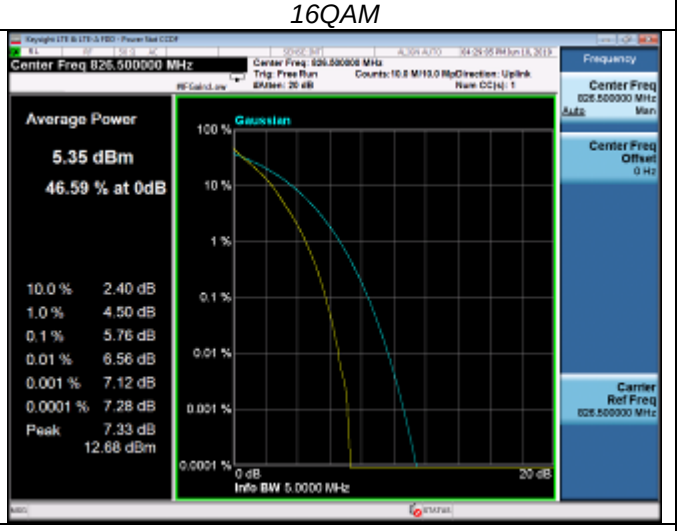
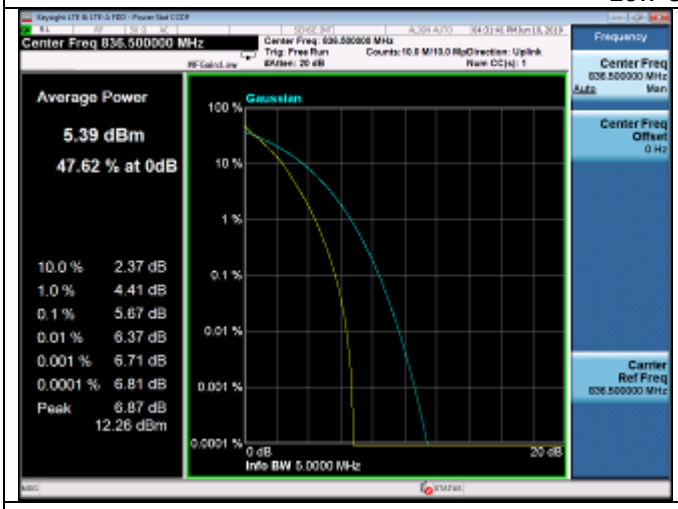
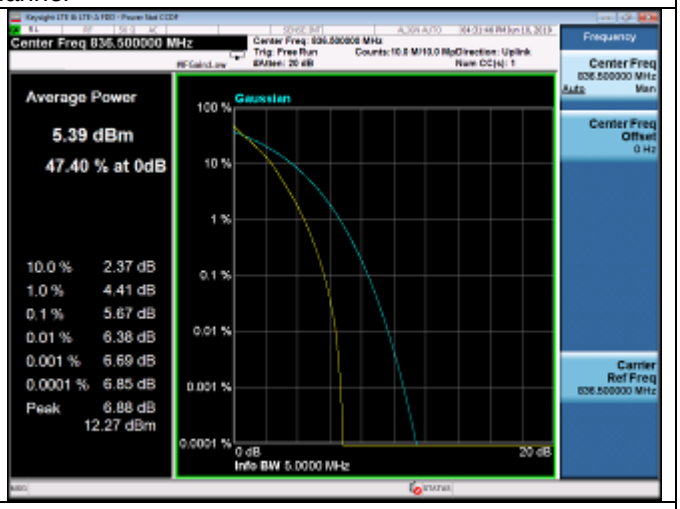
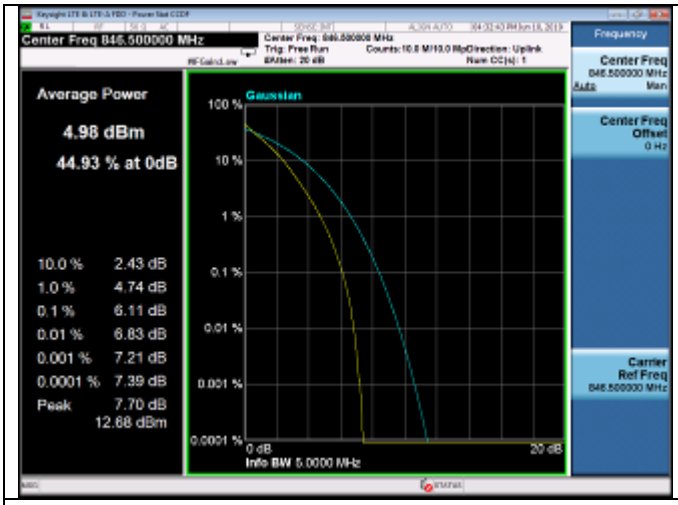
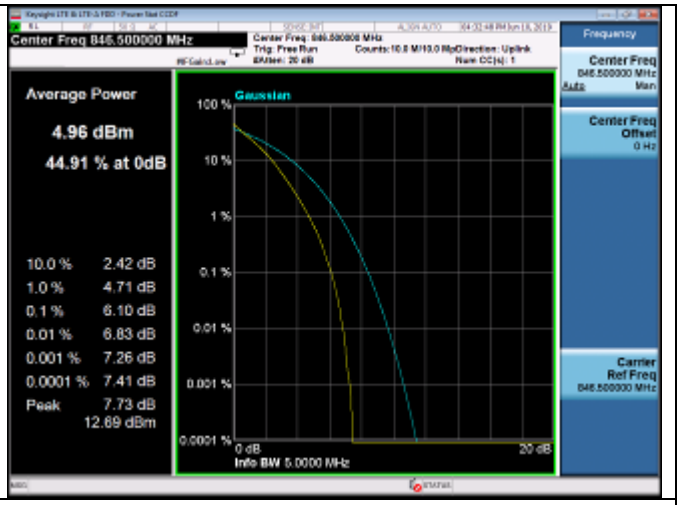
Middle Channel	

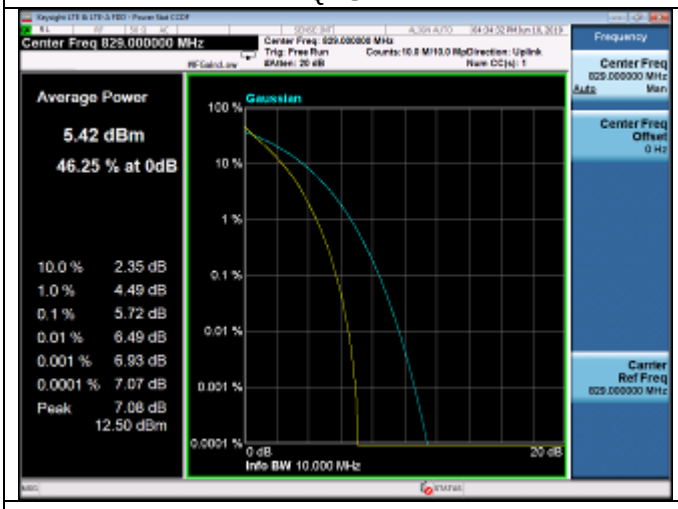
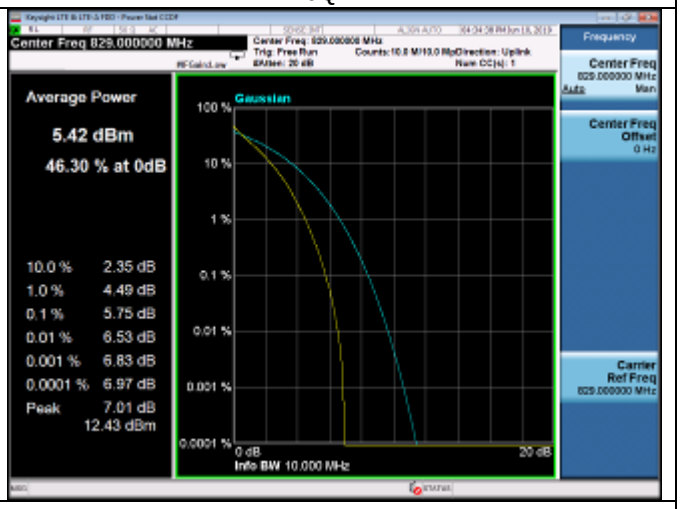
	
1RB#0	*1RB#0*
High Channel	

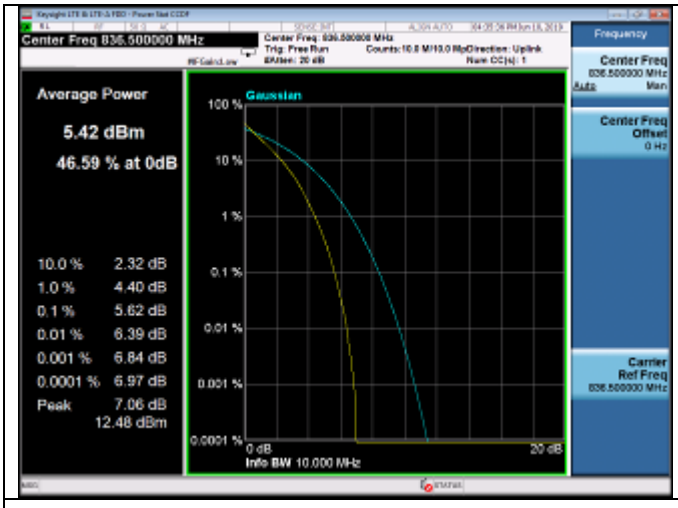
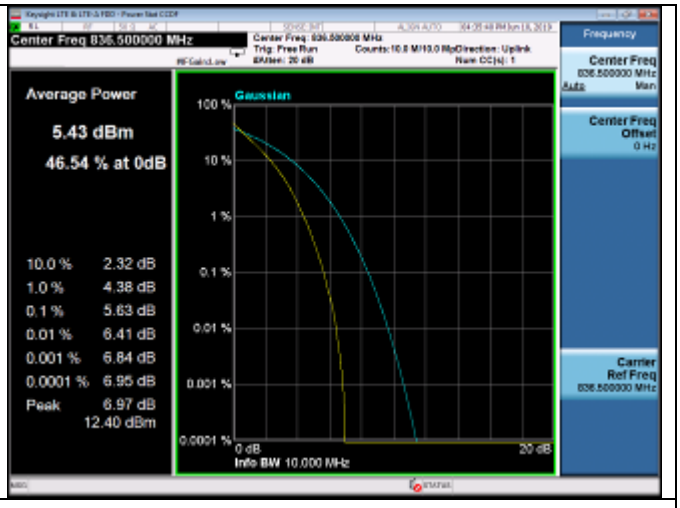
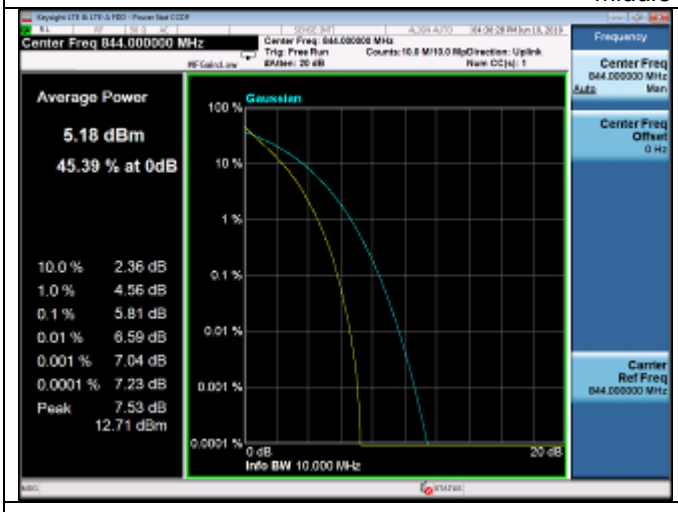
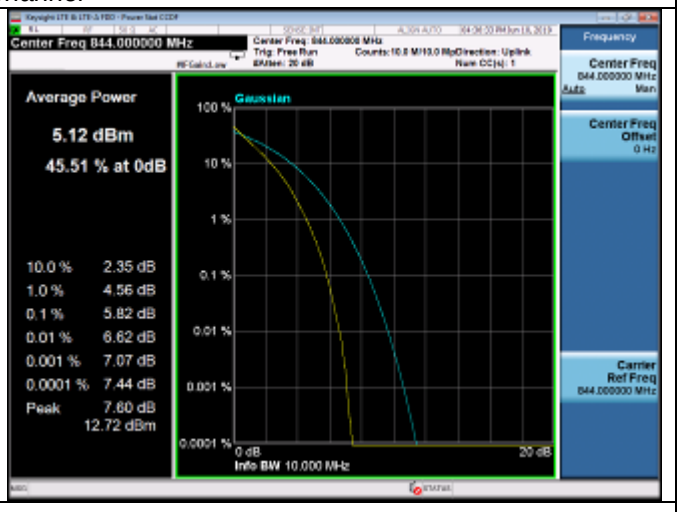
LTE FDD Band 5-3MHz Channel Bandwidth PAPR	
QPSK	*16QAM*
	
1RB#0	*1RB#0*
Low Channel	

	
1RB#0	*1RB#0*
Middle Channel	
	
1RB#0	*1RB#0*
High Channel	

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

	
1RB#0	*1RB#0*
High Channel	

LTE FDD Band 5-10MHz Channel Bandwidth PAPR	
QPSK	*16QAM*
	
1RB#0	*1RB#0*
Low Channel	

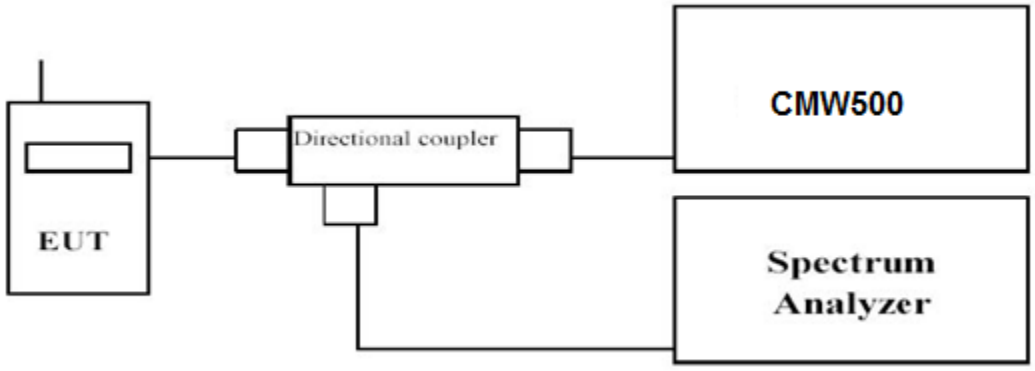
	
1RB#0	*1RB#0*
Middle Channel	
	
1RB#0	*1RB#0*
High Channel	

4.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

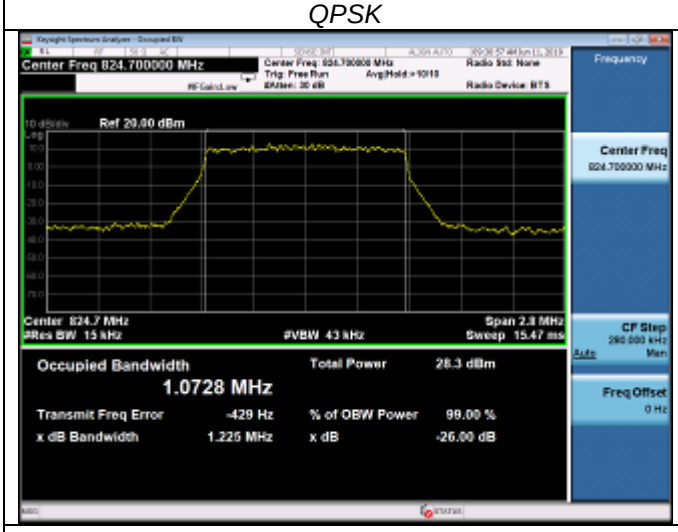
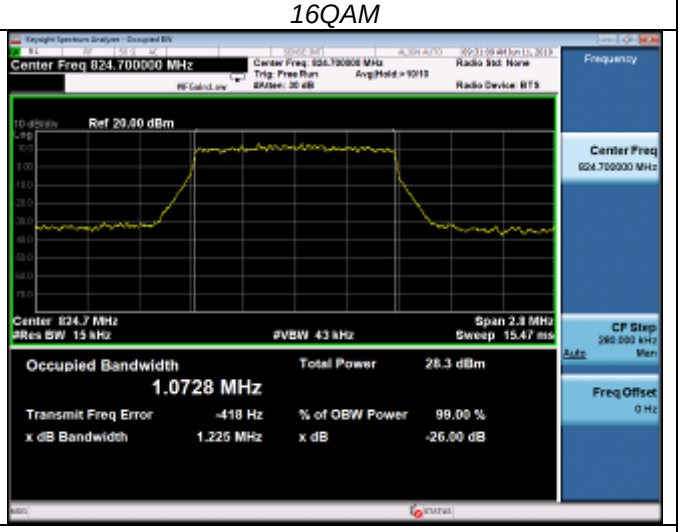
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and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

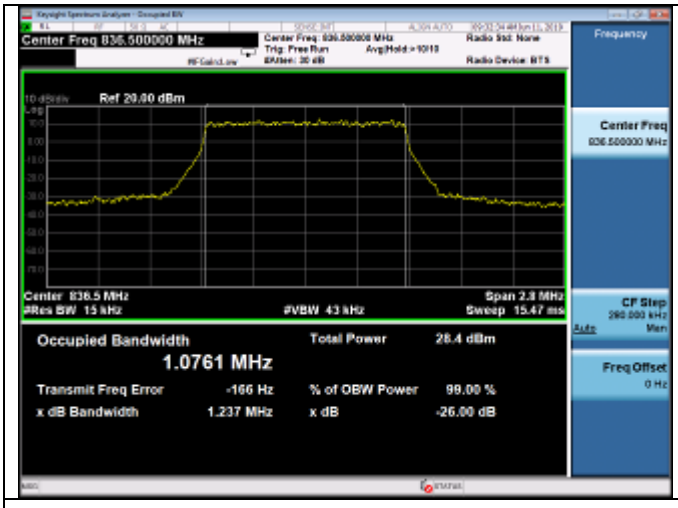
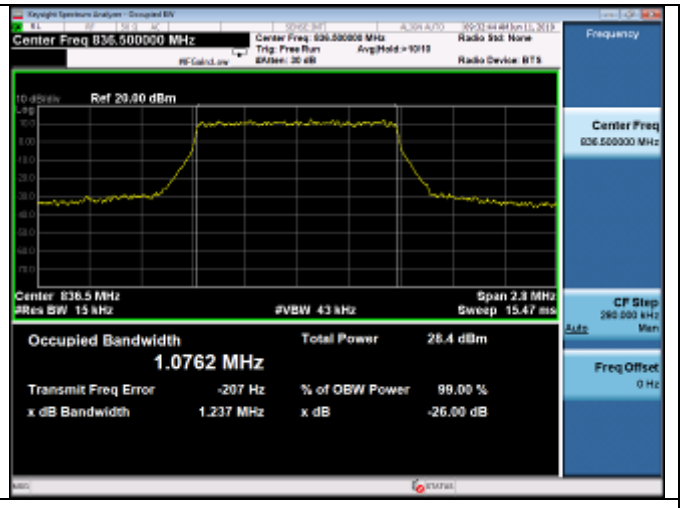
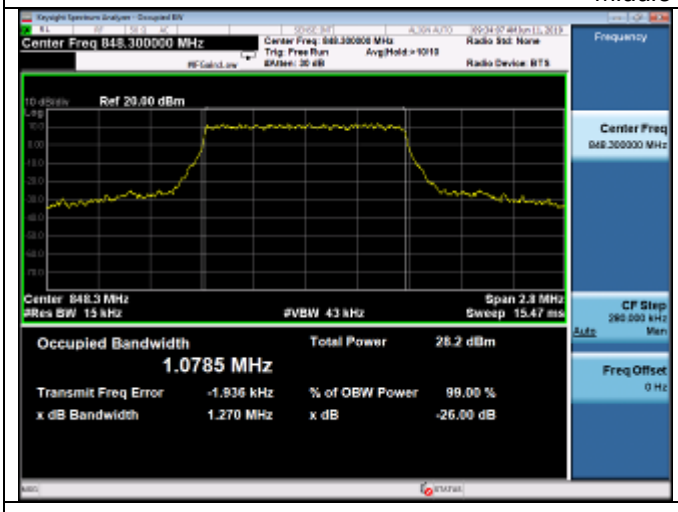
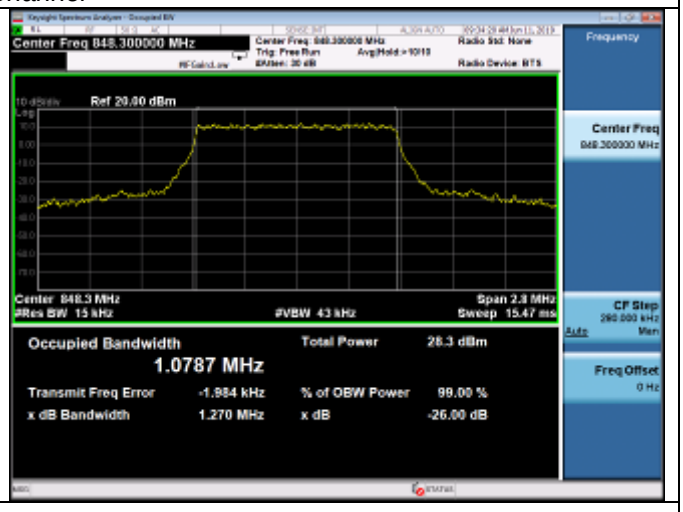
TEST RESULTS

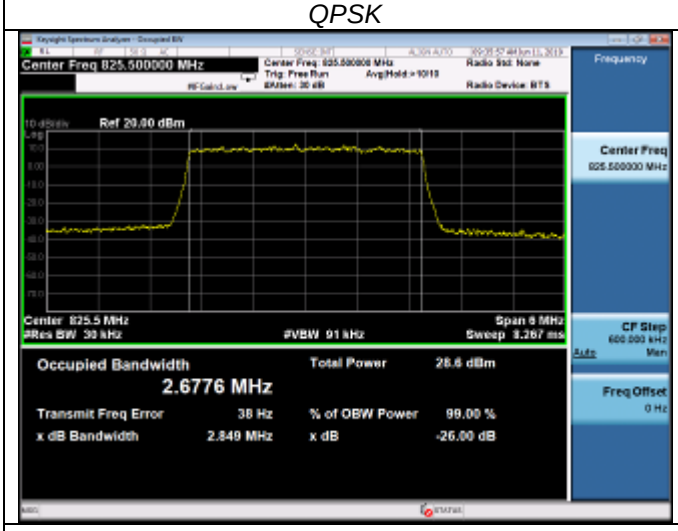
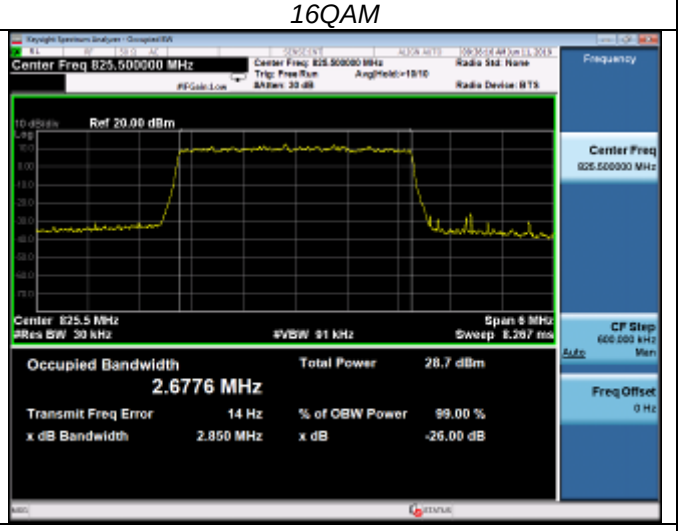
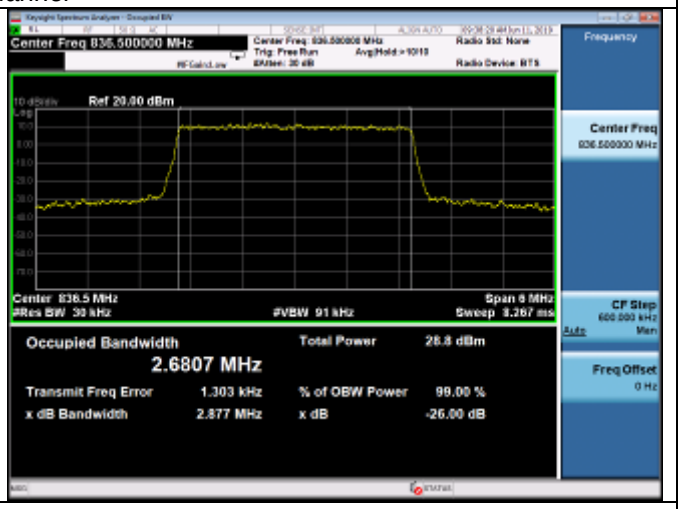
Remark:

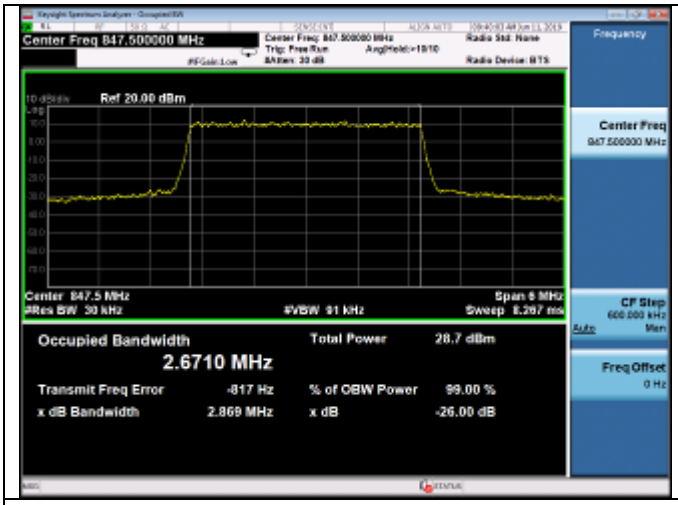
We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5.recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

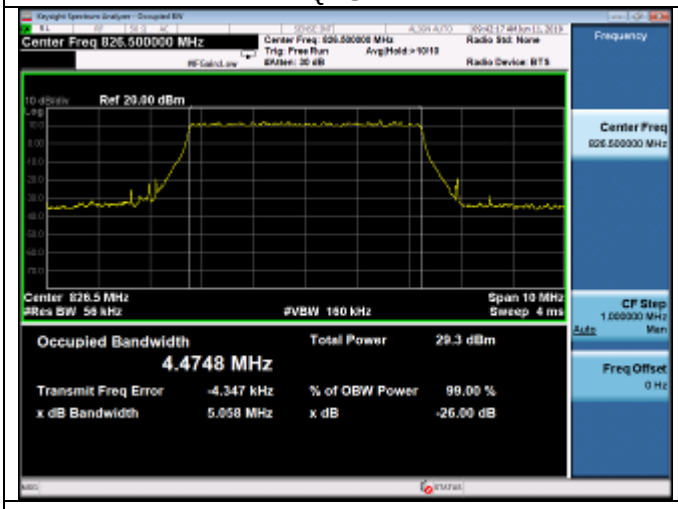
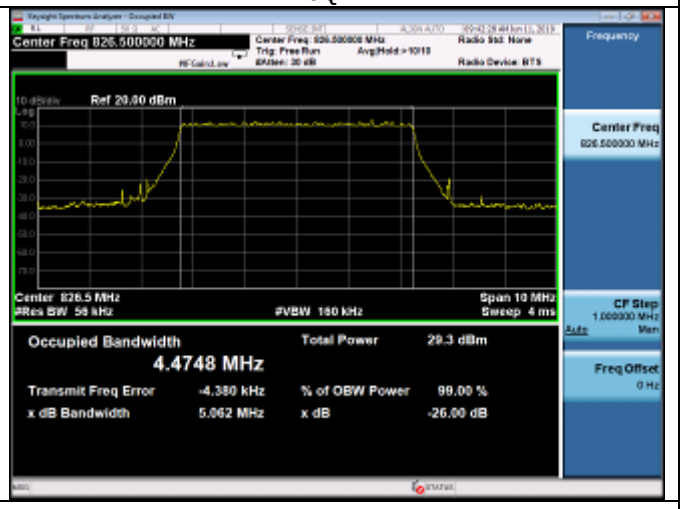
LTE FDD Band 5						
TX Channel Bandwidth	RB Size/Offset	Frequency (MHz)	-26dBc Emission bandwidth (MHz)		99% Occupied bandwidth (MHz)	
			QPSK	16QAM	QPSK	16QAM
1.4 MHz	*6RB#0*	824.7	1.225	1.225	1.0728	1.0728
		836.5	1.237	1.237	1.0761	1.0762
		848.3	1.270	1.270	1.0785	1.0787
3 MHz	*15RB#0*	825.5	2.849	2.850	2.6776	2.6776
		836.5	2.877	2.877	2.6806	2.6807
		847.5	2.869	2.868	2.6710	2.6711
5 MHz	*25RB#0*	826.5	5.058	5.062	4.4748	4.4748
		836.5	5.120	5.127	4.4987	4.4990
		846.5	5.039	5.039	4.4766	4.4766
10 MHz	*50RB#0*	829.0	9.836	9.838	8.9505	8.9497
		836.5	9.946	9.946	8.9520	8.9517
		844.0	9.828	9.840	8.9503	8.9500

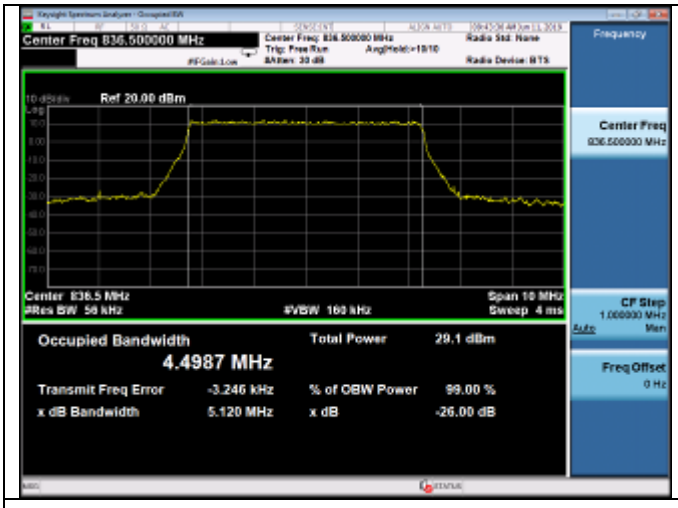
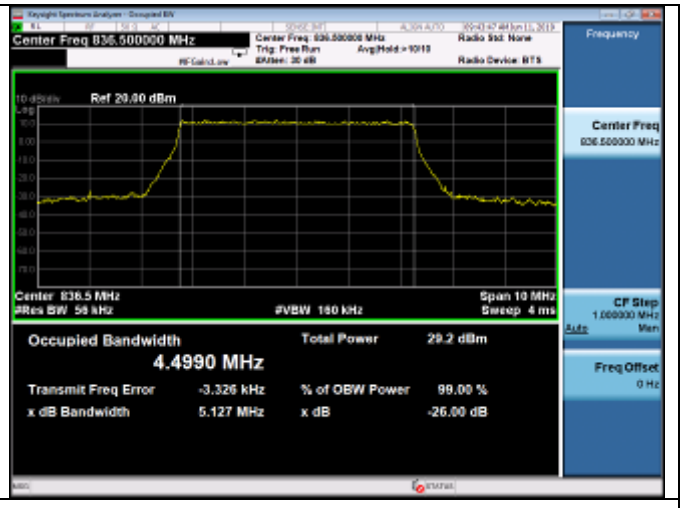
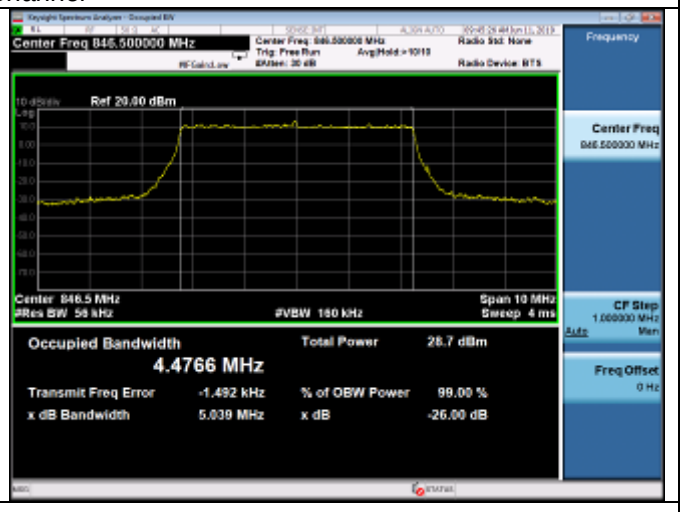
LTE FDD Band 5-1.4MHz Channel Bandwidth	
QPSK	*16QAM*
	
6RB#0	*6RB#0*
Low Channel	

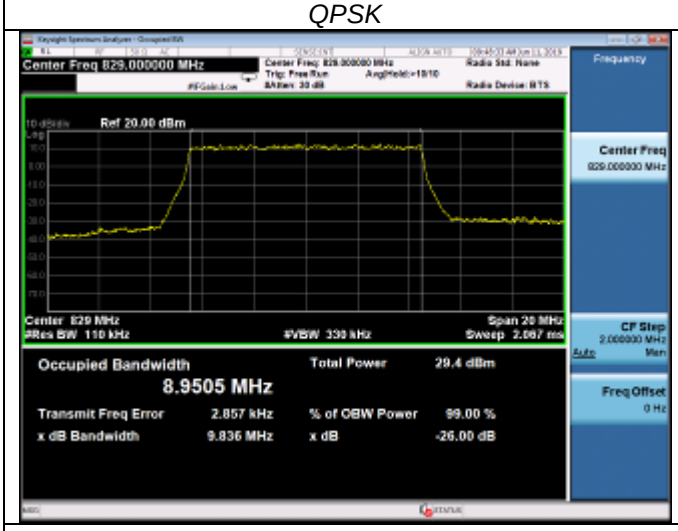
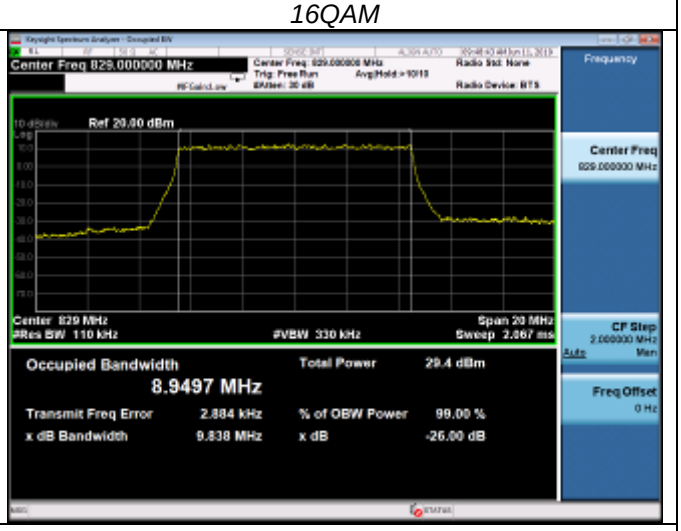
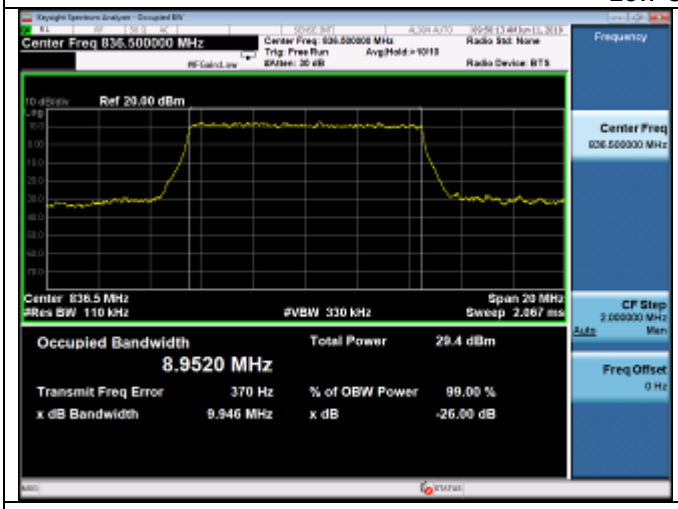
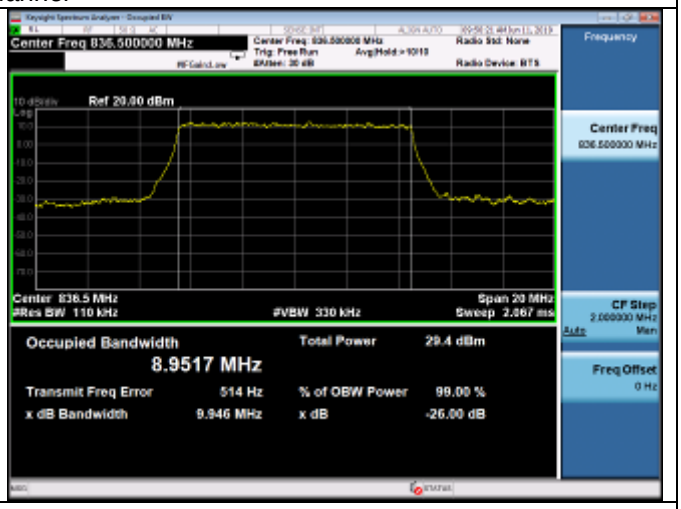
	
6RB#0	*6RB#0*
Middle Channel	
	
6RB#0	*6RB#0*
High Channel	

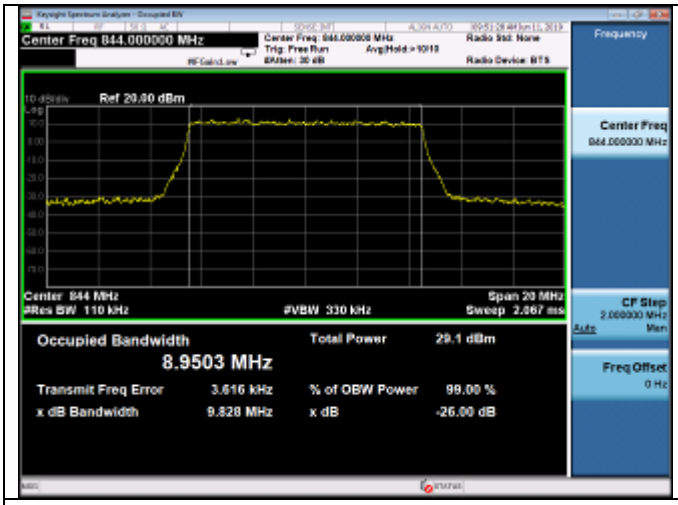
LTE FDD Band 5-3MHz Channel Bandwidth	
QPSK	*16QAM*
	
15RB#0	*15RB#0*
Low Channel	
	
15RB#0	*15RB#0*
Middle Channel	

	
15RB#0	*15RB#0*
High Channel	

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

	
25RB#0	*25RB#0*
Middle Channel	
	
25RB#0	*25RB#0*
High Channel	

LTE FDD Band 5-10MHz Channel Bandwidth	
QPSK	16QAM
	
50RB#0	50RB#0
Low Channel	
	
50RB#0	50RB#0
Middle Channel	

	
50RB#0	*50RB#0*
High Channel	

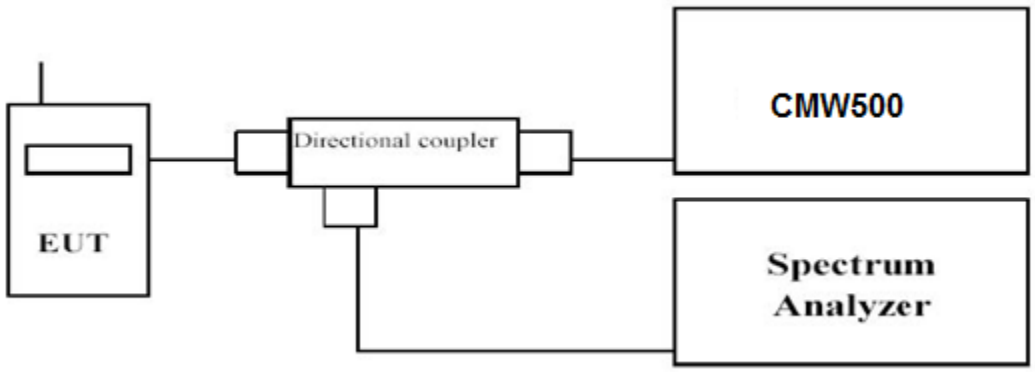
4.4 Band Edge compliance

LIMIT

According to Part §22.917 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.

TEST CONFIGURATION



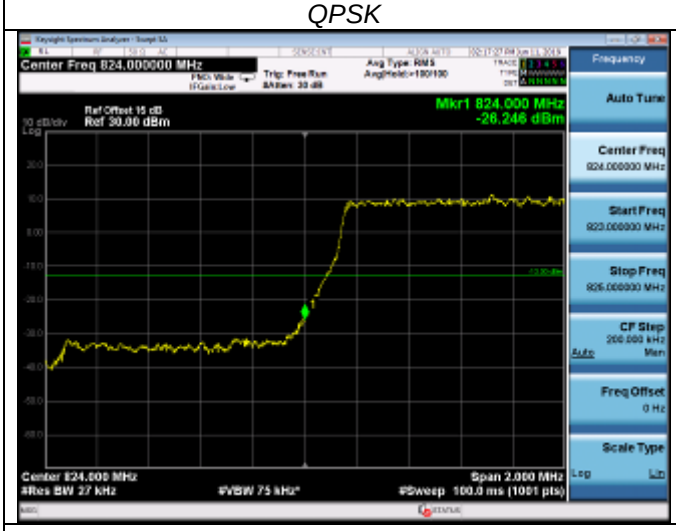
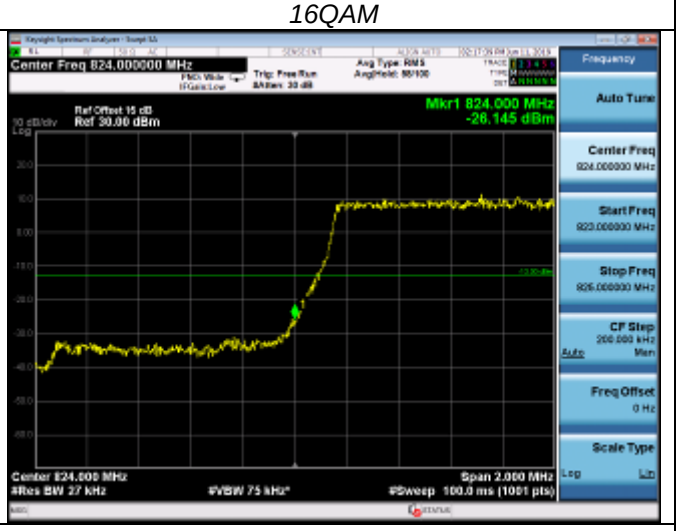
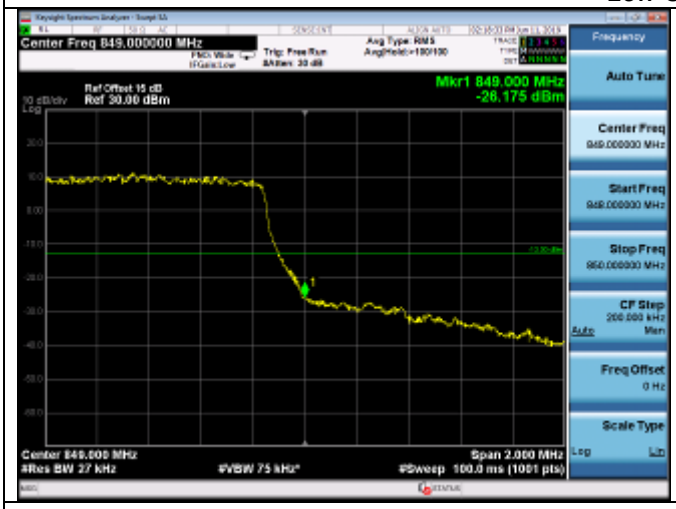
TEST PROCEDURE

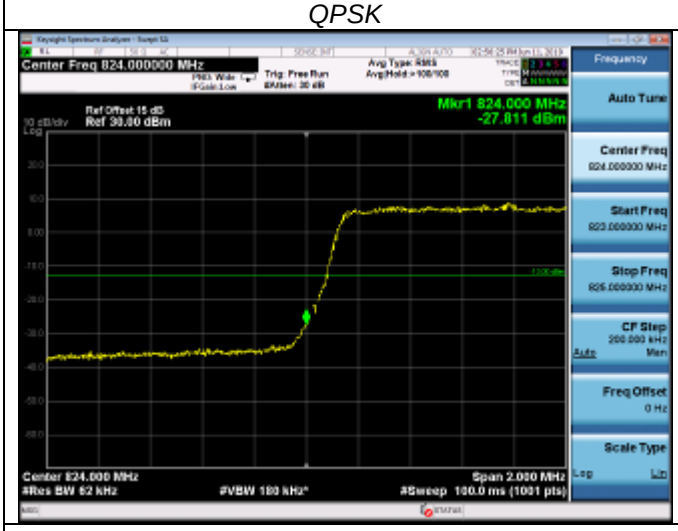
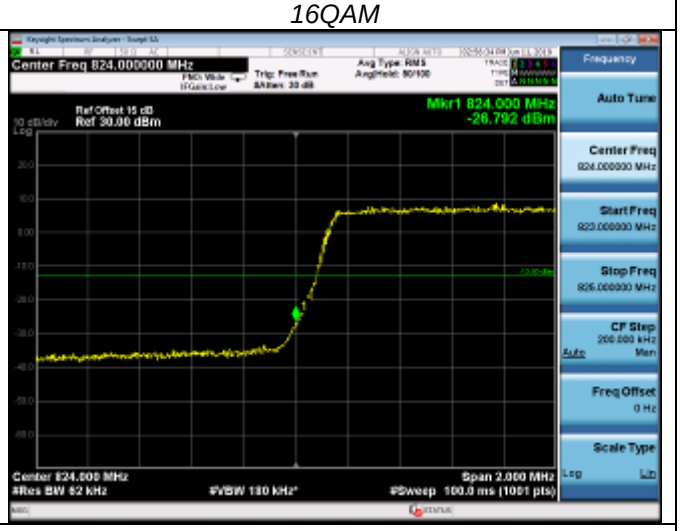
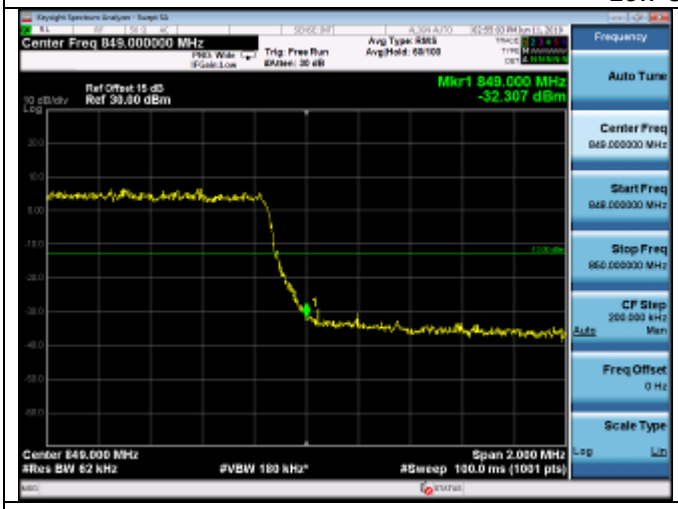
1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels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

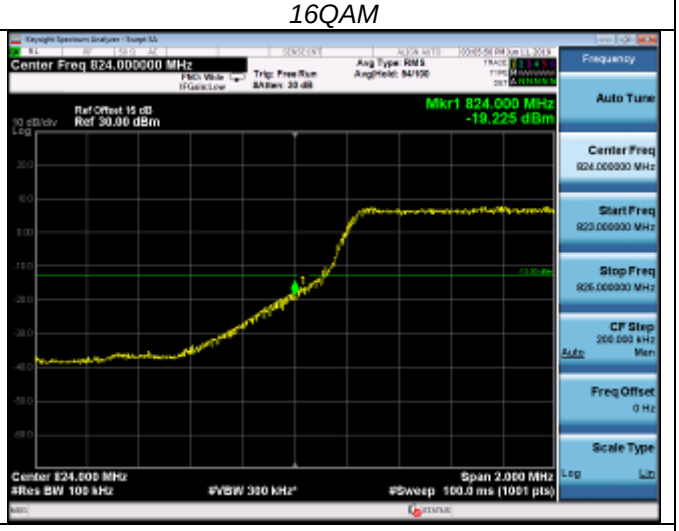
TEST RESULTS

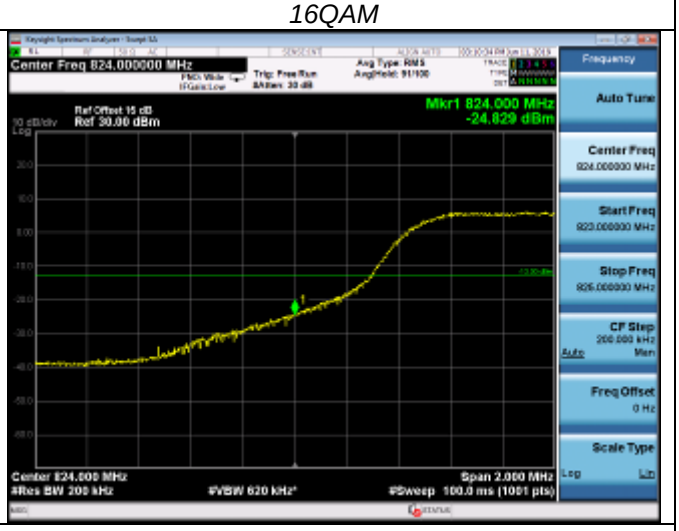
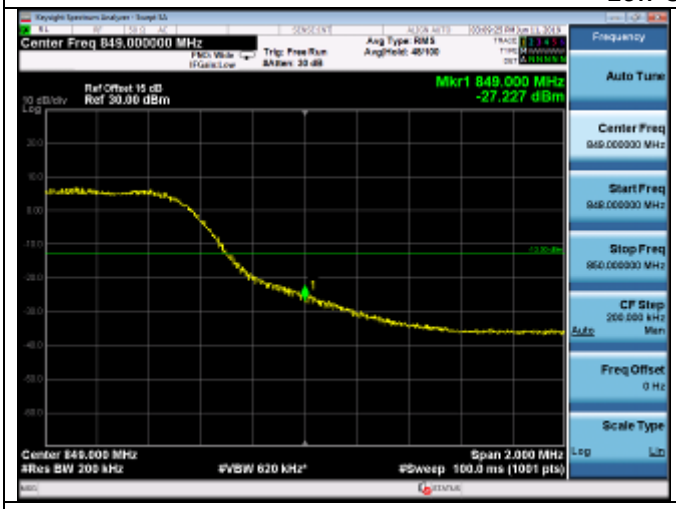
Remark:

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5. recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

LTE FDD Band 5-1.4MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
High Channel	

LTE FDD Band 5-3MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
High Channel	

LTE FDD Band 5-5MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
High Channel	

LTE FDD Band 5-10MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
1RB#0	1RB#0
Low Channel	
	
1RB#0	1RB#0
High Channel	

4.5 Spurious Emission

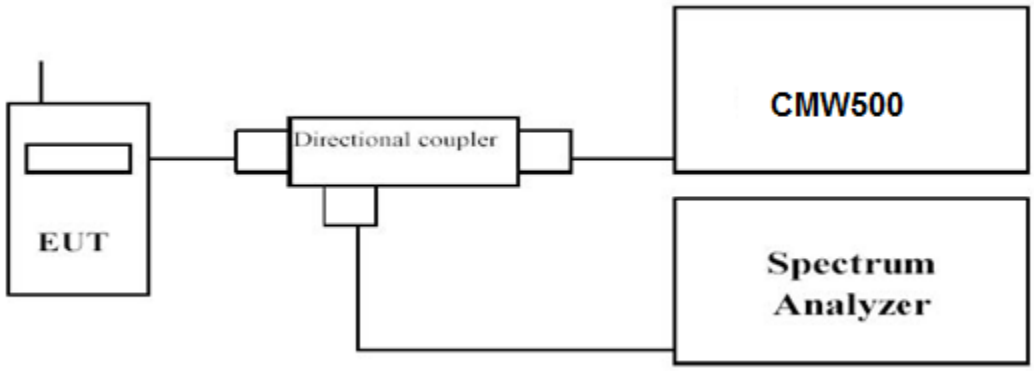
LIMIT

According to Part §22.917 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.

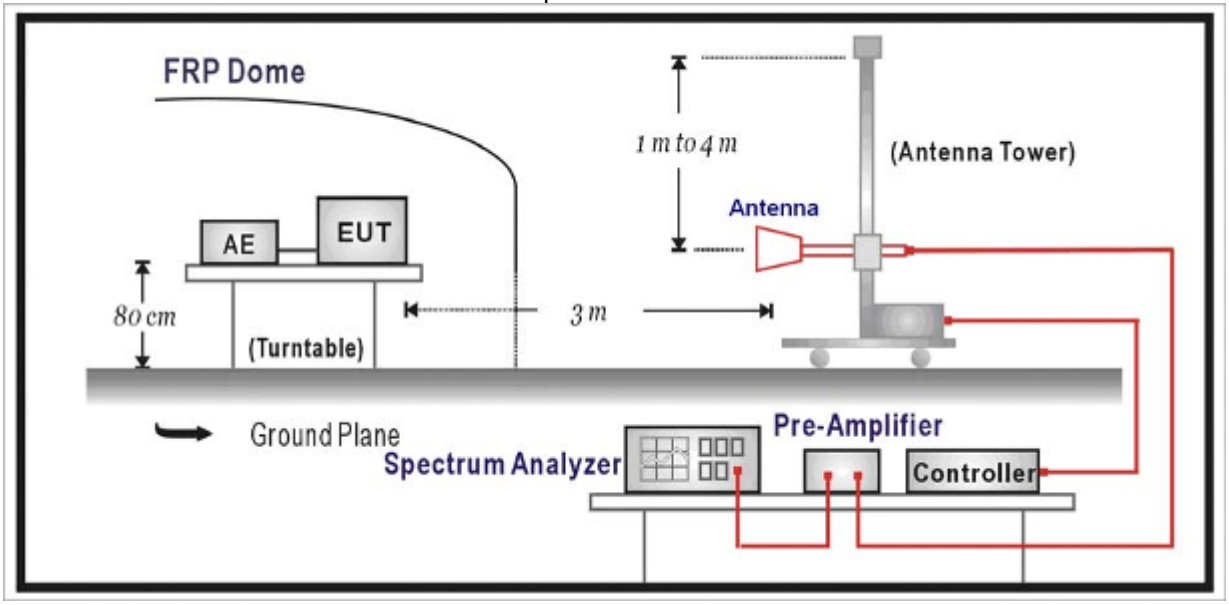
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. 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.

TEST CONFIGURATION

Conducted Spurious Measurement:



Radiated Spurious Measurement:



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603E

Conducted Spurious Measurement:

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

Radiated Spurious Measurement:

a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
c. The output of the test antenna shall be connected to the measuring receiver.
d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
f. The transmitter shall then be rotated through 360°in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
h. The maximum signal level detected by the measuring receiver shall be noted.
i. The transmitter shall be replaced by a substitution antenna.

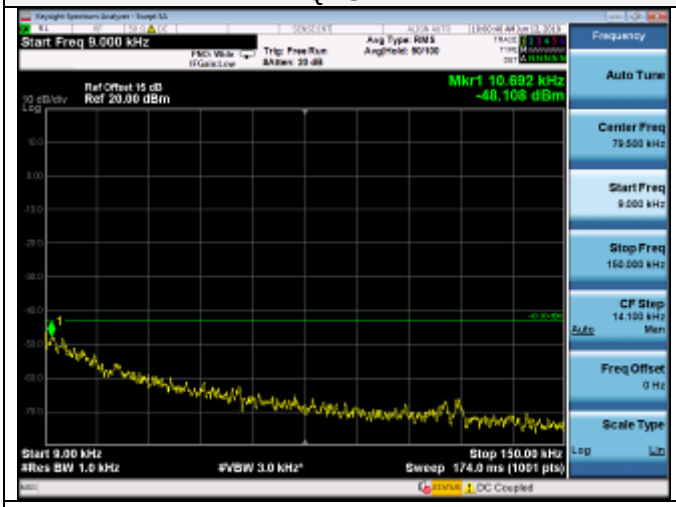
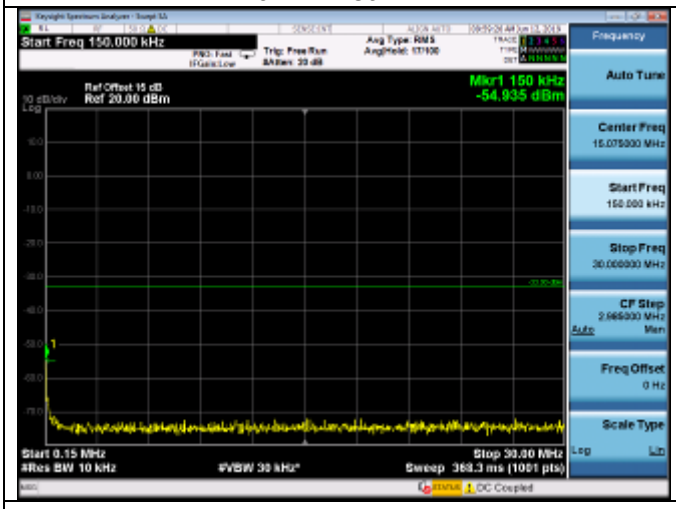
j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
k. The substitution antenna shall be connected to a calibrated signal generator.
l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
q. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for Part 22 and 1MHz for Part 24. The frequency range was checked up to 10th harmonic.
r. Test site anechoic chamber refer to ANSI C63.

TEST RESULTS

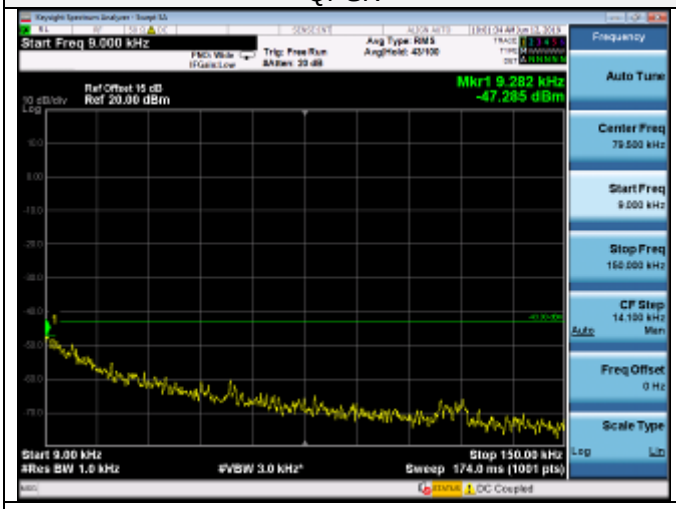
Remark:

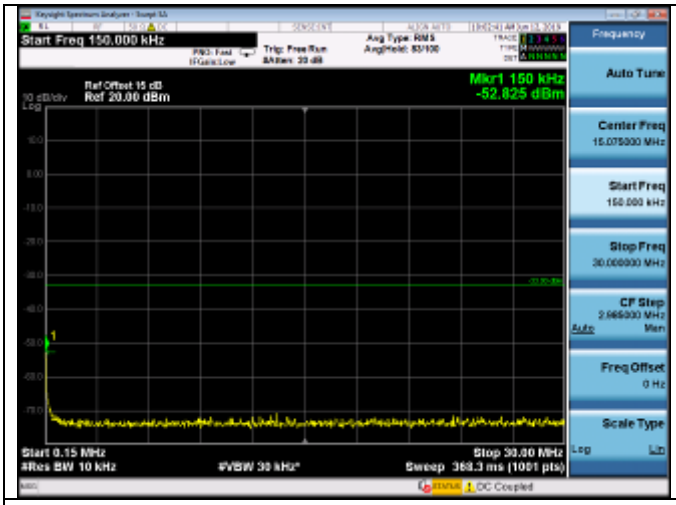
We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5. recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

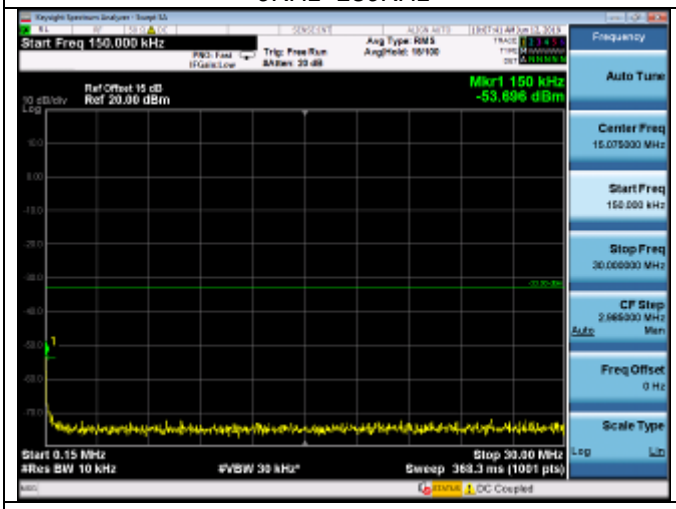
Conducted Measurement:

LTE FDD Band 5-1.4MHz Channel Bandwidth	
Low Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*
	
150KHz~30MHz	*150KHz~30MHz*

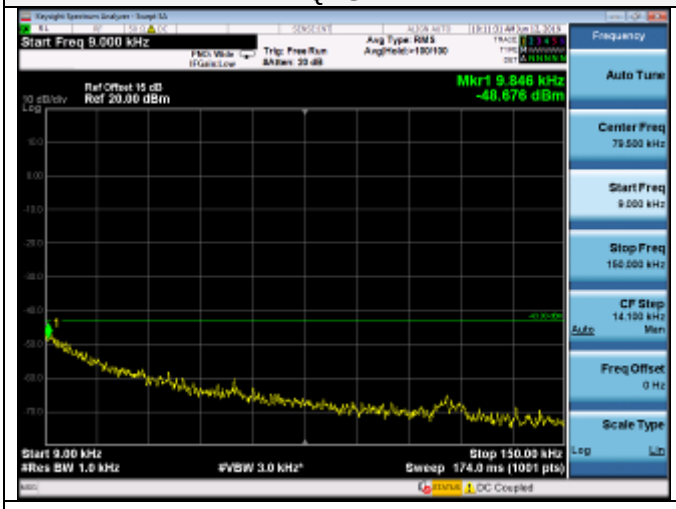
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

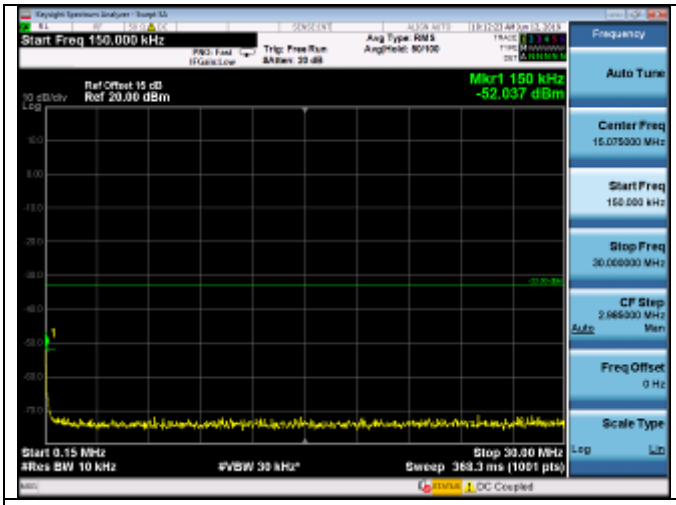
LTE FDD Band 5-1.4MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*

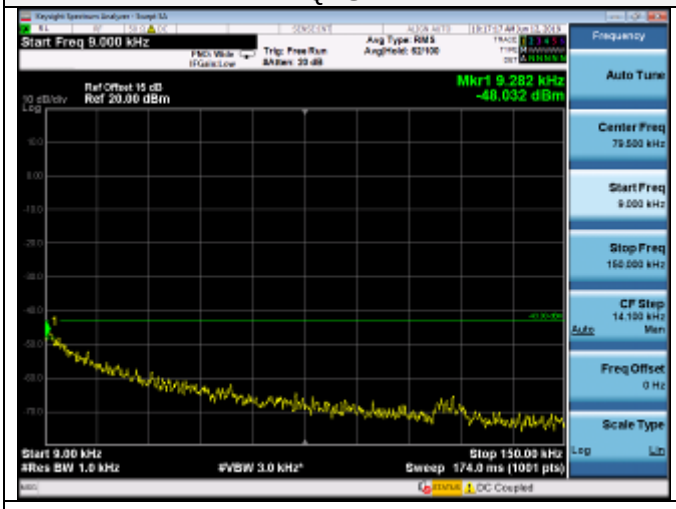
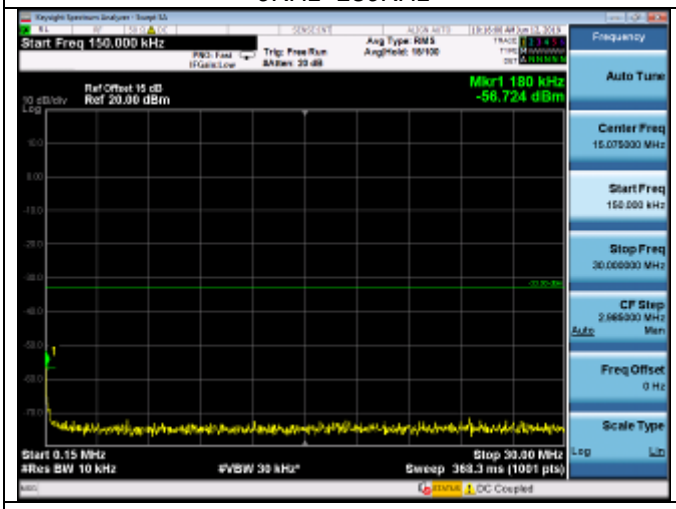
	
150KHz~30MHz	*150KHz~30MHz*
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

LTE FDD Band 5-1.4MHz Channel Bandwidth	
High Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*
	
150KHz~30MHz	*150KHz~30MHz*

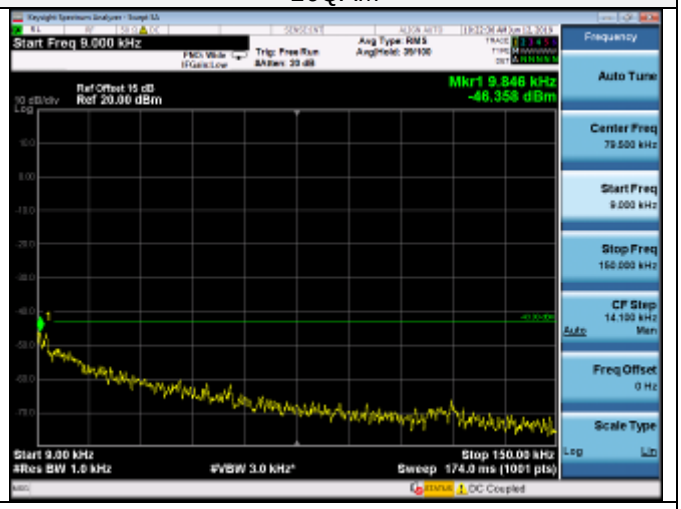
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

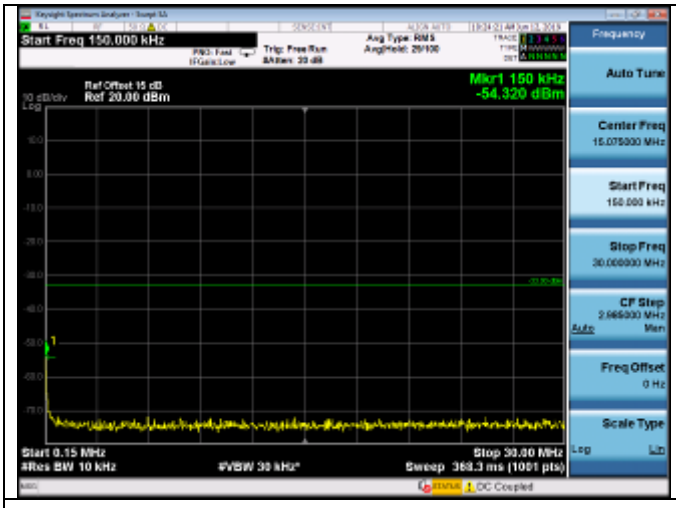
LTE FDD Band 5-3MHz Channel Bandwidth	
Low Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*

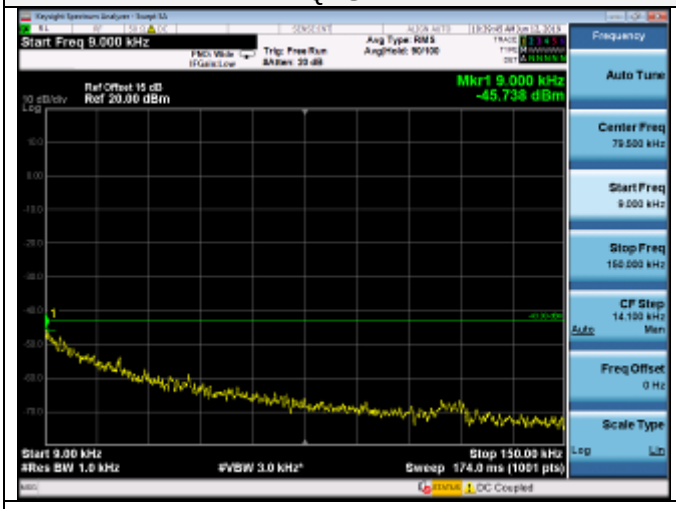
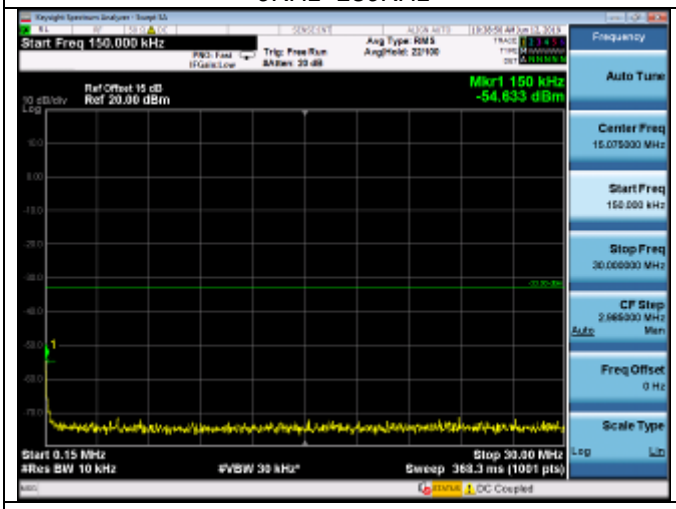
	
150KHz~30MHz	*150KHz~30MHz*
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

LTE FDD Band 5-3MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*
	
150KHz~30MHz	*150KHz~30MHz*

	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

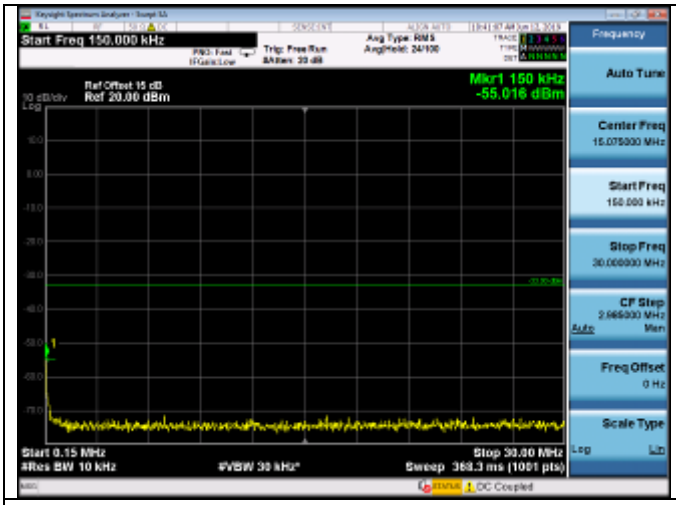
LTE FDD Band 5-3MHz Channel Bandwidth	
High Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*

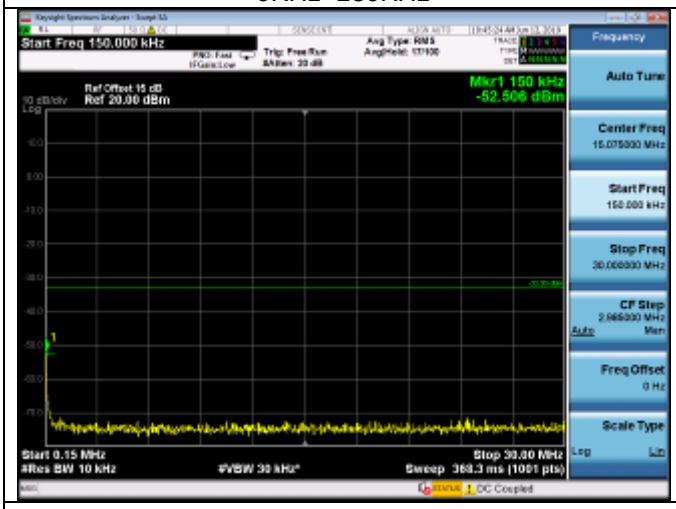
	
150KHz~30MHz	*150KHz~30MHz*
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

LTE FDD Band 5-5MHz Channel Bandwidth	
Low Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*
	
150KHz~30MHz	*150KHz~30MHz*

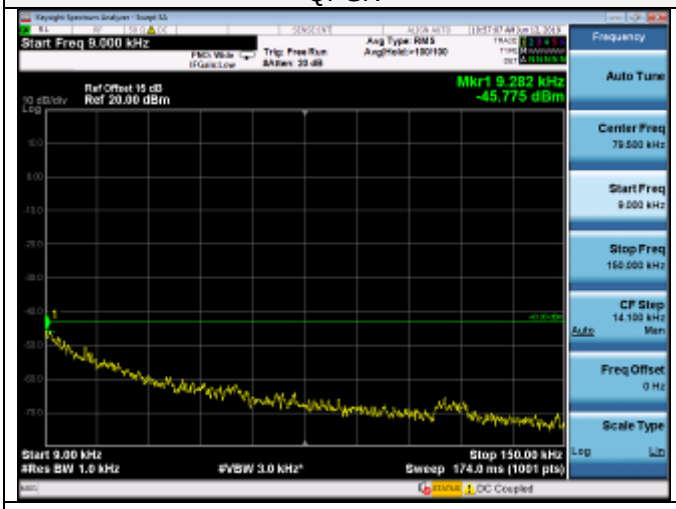
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

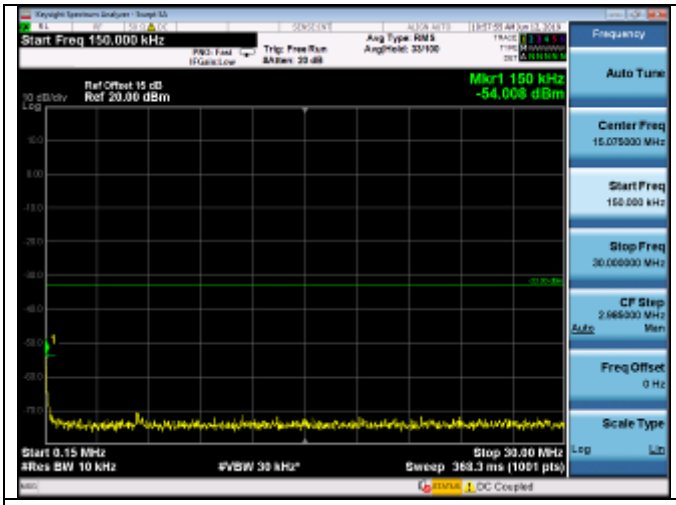
LTE FDD Band 5-5MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*

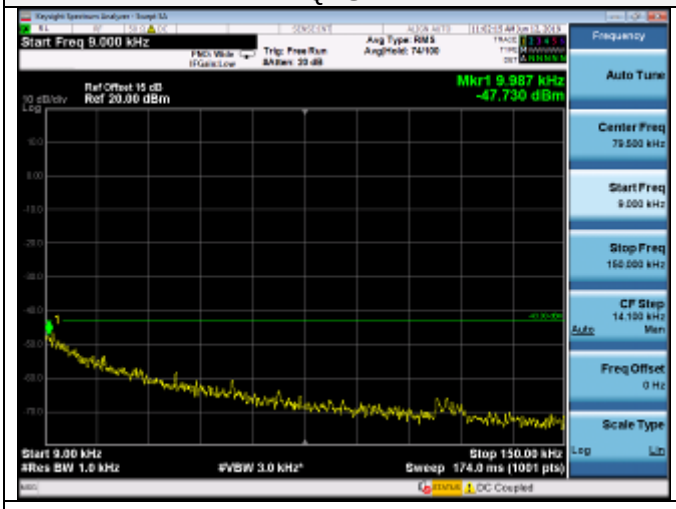
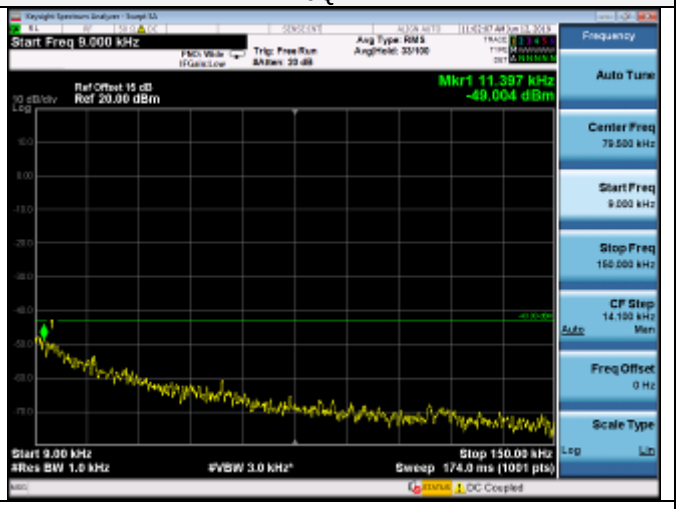
	
150KHz~30MHz	*150KHz~30MHz*
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

LTE FDD Band 5-5MHz Channel Bandwidth	
High Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*
	
150KHz~30MHz	*150KHz~30MHz*

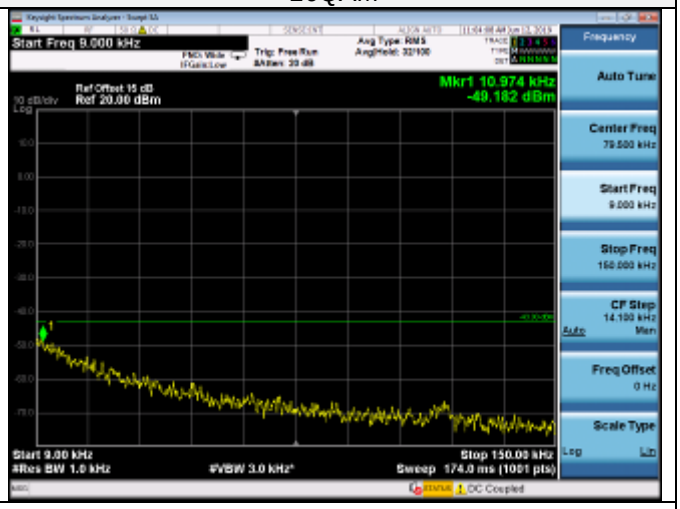
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

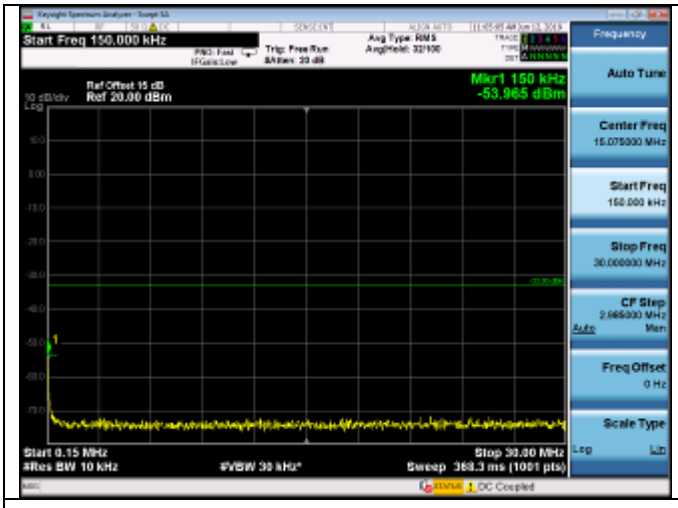
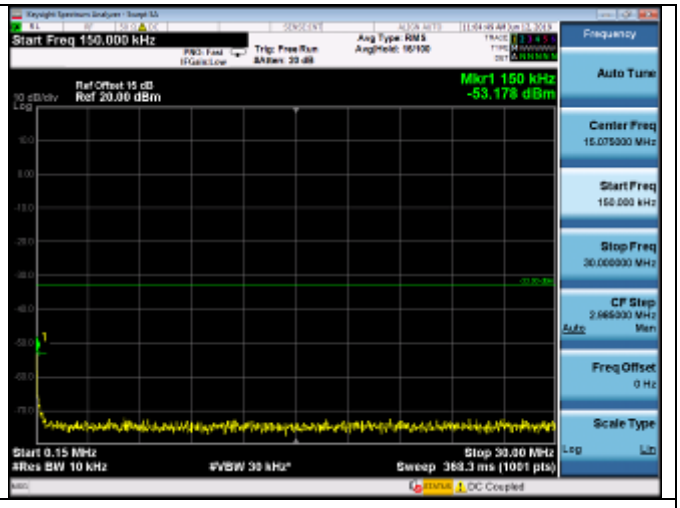
LTE FDD Band 5-10MHz Channel Bandwidth	
Low Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*

	
150KHz~30MHz	*150KHz~30MHz*
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

LTE FDD Band 5-10MHz Channel Bandwidth	
Middle Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*
	
150KHz~30MHz	*150KHz~30MHz*

	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

LTE FDD Band 5-10MHz Channel Bandwidth	
High Channel	
QPSK	*16QAM*
	
9KHz~150KHz	*9KHz~150KHz*

	
150KHz~30MHz	*150KHz~30MHz*
	
30MHz~26.5GHz	*30MHz~26.5GHz*
1RB#0	*1RB#0*

Radiated Measurement:

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5 @ QPSK*

2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB) +G_a(dBi)*

3. *We were not recorded other points as values lower than limits.*

4. *Margin = Limit - EIRP*

LTE FDD Band 5_Channel Bandwidth 1.4MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1649.4	-44.63	3.00	3.00	9.58	-34.25	-13.00	21.25	H
2474.1	-47.39	3.03	3.00	10.72	-38.14	-13.00	25.14	H
1649.4	-43.96	3.00	3.00	9.68	-33.61	-13.00	20.61	V
2474.1	-46.98	3.03	3.00	10.72	-37.28	-13.00	24.28	V

LTE FDD Band 5_Channel Bandwidth 1.4MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.0	-44.63	3.00	3.00	9.61	-35.36	-13.00	22.36	H
2509.5	-47.39	3.03	3.00	10.77	-39.25	-13.00	26.25	H
1673.0	-43.96	3.00	3.00	9.61	-34.45	-13.00	21.45	V
2509.5	-46.98	3.03	3.00	10.77	-38.51	-13.00	25.51	V

LTE FDD Band 5_Channel Bandwidth 1.4MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1696.6	-44.63	3.00	3.00	9.77	-34.25	-13.00	21.25	H
2544.9	-47.39	3.03	3.00	10.89	-38.69	-13.00	25.69	H
1696.6	-43.96	3.00	3.00	9.77	-33.87	-13.00	20.87	V
2544.9	-46.98	3.03	3.00	10.89	-37.51	-13.00	24.51	V

LTE FDD Band 5_Channel Bandwidth 3MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1651.0	-44.63	3.00	3.00	9.58	-35.05	-13.00	22.05	H
2476.5	-47.39	3.03	3.00	10.72	-39.24	-13.00	26.24	H
1651.0	-43.96	3.00	3.00	9.68	-33.41	-13.00	20.41	V
2476.5	-46.98	3.03	3.00	10.72	-37.59	-13.00	24.59	V

LTE FDD Band 5_Channel Bandwidth 3MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.0	-44.63	3.00	3.00	9.61	-34.22	-13.00	21.22	H
2509.5	-47.39	3.03	3.00	10.77	-38.37	-13.00	25.37	H
1673.0	-43.96	3.00	3.00	9.61	-33.54	-13.00	20.54	V
2509.5	-46.98	3.03	3.00	10.77	-37.98	-13.00	24.98	V

LTE FDD Band 5_Channel Bandwidth 3MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1695.0	-44.63	3.00	3.00	9.77	-35.50	-13.00	22.50	H
2542.5	-47.39	3.03	3.00	10.89	-38.75	-13.00	25.75	H
1695.0	-43.96	3.00	3.00	9.77	-33.69	-13.00	20.69	V
2542.5	-46.98	3.03	3.00	10.89	-37.51	-13.00	24.51	V

LTE FDD Band 5_Channel Bandwidth 5MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1653.0	-44.63	3.00	3.00	9.58	-34.33	-13.00	21.33	H
2479.5	-47.39	3.03	3.00	10.72	-38.27	-13.00	25.27	H
1653.0	-43.96	3.00	3.00	9.68	-33.69	-13.00	20.69	V
2479.5	-46.98	3.03	3.00	10.72	-37.54	-13.00	24.54	V

LTE FDD Band 5_Channel Bandwidth 5MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.0	-44.63	3.00	3.00	9.61	-34.68	-13.00	21.68	H
2509.5	-47.39	3.03	3.00	10.77	-38.47	-13.00	25.47	H
1673.0	-43.96	3.00	3.00	9.61	-33.66	-13.00	20.66	V
2509.5	-46.98	3.03	3.00	10.77	-37.31	-13.00	24.31	V

LTE FDD Band 5_Channel Bandwidth 5MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1693.0	-44.63	3.00	3.00	9.77	-34.45	-13.00	21.45	H
2539.5	-47.39	3.03	3.00	10.89	-38.69	-13.00	25.69	H
1693.0	-43.96	3.00	3.00	9.77	-33.42	-13.00	20.42	V
2539.5	-46.98	3.03	3.00	10.89	-37.78	-13.00	24.78	V

LTE FDD Band 5_Channel Bandwidth 10MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1658.0	-44.63	3.00	3.00	9.58	-34.32	-13.00	21.32	H
2487.0	-47.39	3.03	3.00	10.72	-38.48	-13.00	25.48	H
1658.0	-43.96	3.00	3.00	9.68	-33.56	-13.00	20.56	V
2487.0	-46.98	3.03	3.00	10.72	-37.37	-13.00	24.37	V

LTE FDD Band 5_Channel Bandwidth 10MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.0	-44.63	3.00	3.00	9.61	-34.50	-13.00	21.50	H
2509.5	-47.39	3.03	3.00	10.77	-38.21	-13.00	25.21	H
1673.0	-43.96	3.00	3.00	9.61	-33.78	-13.00	20.78	V
2509.5	-46.98	3.03	3.00	10.77	-37.62	-13.00	24.62	V

LTE FDD Band 5_Channel Bandwidth 10MHz_QPSK_ High Channel

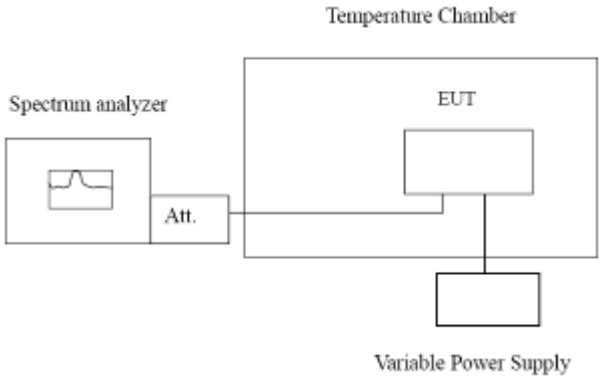
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance	G_a Antenna Gain(dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1688.0	-44.63	3.00	3.00	9.77	-34.48	-13.00	21.48	H
2532.0	-47.39	3.03	3.00	10.89	-39.25	-13.00	26.25	H
1688.0	-43.96	3.00	3.00	9.77	-33.98	-13.00	20.98	V
2532.0	-46.98	3.03	3.00	10.89	-38.11	-13.00	25.11	V

4.6 Frequency Stability under Temperature & Voltage Variations

LIMIT

According to §22.917, §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 603E

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 -20℃.
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 -20℃ 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 -20℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements

9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

Frequency Stability under Voltage Variations:

Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

TEST RESULTS

Remark:

We tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case LTE Band 5, 1.4MHz bandwidth (worst case of all bandwidths)

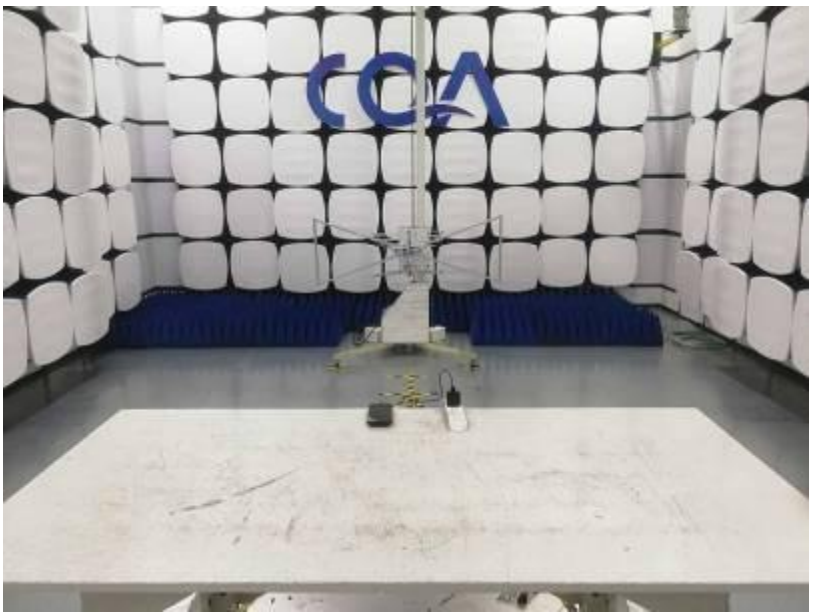
Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
3.5V	-6.74	-1.48	-0.00806	-0.00177	2.50
4.2V	6.98	-7.21	0.00834	-0.00862	2.50
4.5V	5.55	7.84	0.00663	0.00937	2.50

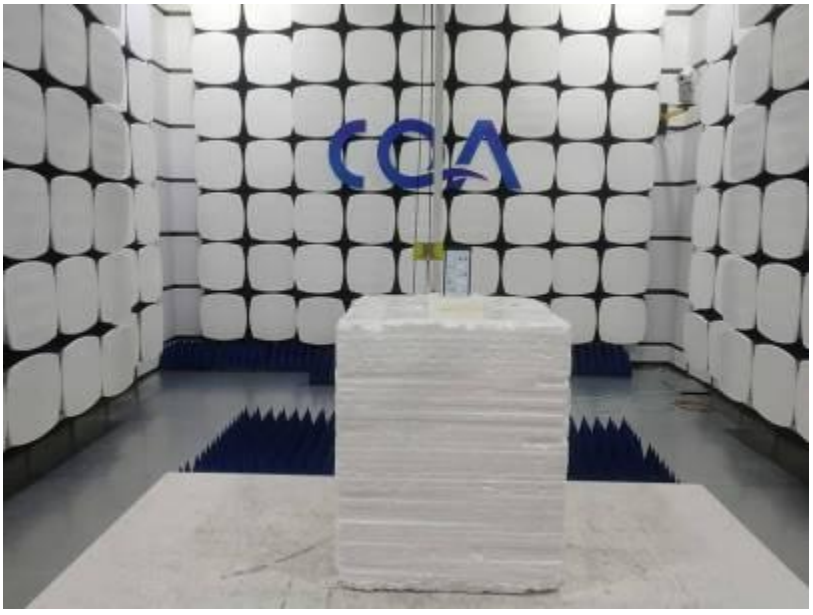
Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
-20°	3.57	-7.03	0.00427	-0.00840	2.50
-10°	4.15	6.09	0.00496	0.00728	2.50
0°	-4.32	3.30	-0.00516	0.00395	2.50
10°	9.31	7.81	0.01113	0.00934	2.50
20°	3.85	-9.76	0.00460	-0.01167	2.50
30°	8.95	1.94	0.01070	0.00232	2.50
40°	1.97	-7.49	0.00236	-0.00895	2.50
50°	-6.68	2.89	-0.00799	0.00345	2.50

5 Test Setup Photos of the EUT



30MHz~1GHz



Above 1GHz

6 Photos of the EUT

Please refer to the report No: CQASZ20190500014EX-01

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