FCC Test Report

Report No.:	RF_FCC_LT19092001-CMM-001B12B17 Rev_6.0
FCC ID:	QHYRPM-A5A11-B12
Test Model:	RPM-A5A11-B12
Host Name:	RP5100 Base Band Module
Series Model:	N/A
Received Date:	10/03/2019
Test Date:	10/03/2019-10/11/2019 and 01/16/2020
Standards:	FCC Part 2, FCC Part 27
Issued Date:	01/19/2020
Applicant:	CommScope
Address:	900 Chelmsford St, Lowell, MA 01851
Issued By:	Bureau Veritas Consumer Products Services, Inc.
Lab Address:	1 Distribution Center Cir #1, Littleton, MA 01460
Test Location (1):	1 Distribution Center Cir #1, Littleton, MA 01460
FCC Registration / Designation Number:	886956/US1028

A2LA ACCREDITED
Cert No. 1627-01

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Release Control Record

Issue No.	Description	Date Issued
RF_FCC_LT19092001-CMM-001B12B17	Original	12/11/2019
RF_FCC_LT19092001-CMM-001B12B17 Rev_1.0	Updated Per TCB Review	12/16/2019
RF_FCC_LT19092001-CMM-001B12B17 Rev_2.0	Updated Per TCB Review	01/03/2020
RF_FCC_LT19092001-CMM-001B12B17 Rev_3.0	Updated Per TCB Review	01/07/2020
RF_FCC_LT19092001-CMM-001B12B17 Rev_4.0	Updated Per TCB Review	01/08/2020
RF_FCC_LT19092001-CMM-001B12B17 Rev_5.0	Updated power measurement	01/16/2020
RF_FCC_LT19092001-CMM-001B12B17 Rev_6.0	Updated EUT info and delete modulation characteristics	01/19/2020

1 Certificate of Conformity

Product:	OneCell Radio Point
Brand:	CommScope
Test Model:	RPM-A5A11-B12
Host Name:	RP5100 Base Band Module
Series Model:	N/A
Sample Status:	Sample Received in good condition
Applicant:	CommScope
Test Date:	10/03/2019-01/16/2020
Standards:	FCC Part 2, FCC Part 27

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Littleton Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** 01/16/2020

Chen Ge / Test Engineer

Approved by : _____ , **Date:** 01/16/2020

Shuo Zhang / Engineer Reviewer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1047	Modulation Characteristics	PASS	N/A
2.1046 27.50	Output Power	PASS	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	PASS	Meet the requirement of limit.
2.1049	Occupied Bandwidth	PASS	Meet the requirement of limit.
27.50	Peak To Average Ratio	PASS	Meet the requirement of limit.
2.1051 27.53	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 27.53	Radiated Spurious Emissions	PASS	Meet the requirement of limit.

Note: The report is reproduced in full content only.
The EUT is digital modulation.
All data rate QPSK, 16QAM, 64QAM and 256QAM are evaluated for output power and QPSK and 16QAM are the worst case.
Per ANSI C63.26: 2015 section 5.1.2.2, the results includes worst case modulation only.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.51dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.73dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.64dB
	6GHz ~ 18GHz	4.82dB
	18GHz ~ 40GHz	4.91dB

2.2 Test Site and Instruments

Equipment used for test during 10/03/2019-10/11/2019

Description	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
MXE EMI Receiver(1170725)	N9038A	MY51210151	05/30/2019	05/30/2020
2311 PA	PAM-103	441174	10/14/2018	10/14/2019
2111 HF Preamp	PAM-118A	551063	10/14/2018	10/14/2019
Red-Black Bilog	JB1	A091604-2	04/26/2019	04/26/2021
Red-Brown Bilog	JB1	A0032406	03/11/2019	03/11/2021
Orange Horn	3115	0004-6123	11/06/2018	11/06/2020
Yellow Horn	3115	9608-4898	08/20/2018	08/20/2020
Weather Clock	BA928	C3166-1	05/15/2018	05/15/2020
Environment chamber #14	Espec ESZ-4CA	018639B 1426	09/16/2019	09/16/2020
20dB attenuator-64	N/A	N/A	11/20/2018	11/20/2019

Equipment used for test on 01/16/2020:

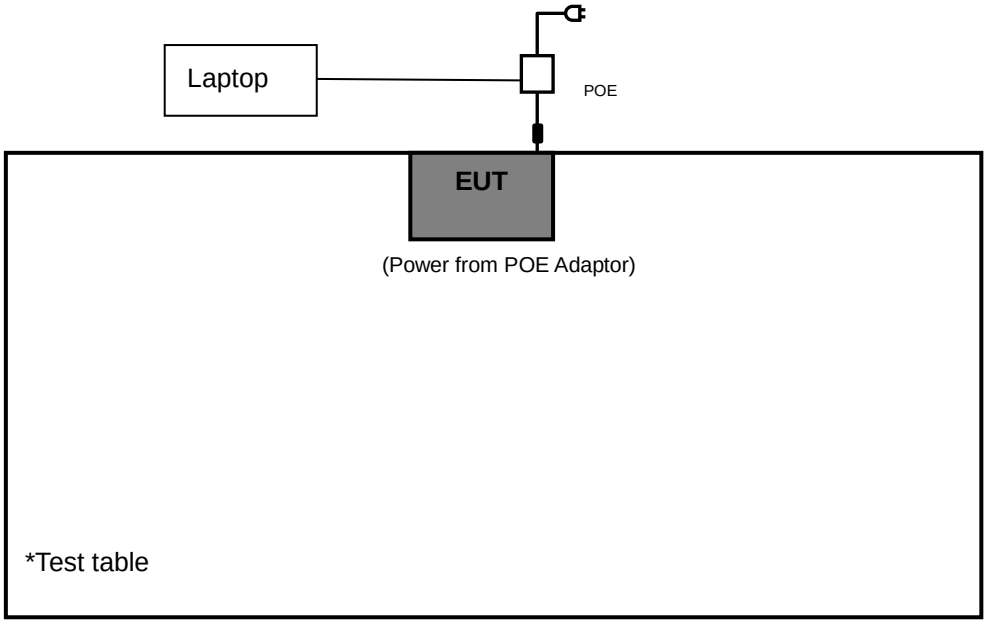
Description	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
50GHz Spectrum Analyzer	N9030B (PXA)	MY57140374	07/22/2019	07/22/2020

3 General Information

3.1 General Description of EUT

Product	OneCell Radio Point
Host Name	RP5100 Base Band Module
Host model	7778115-00
Brand	CommScope
Module Model	RPM-A5A11-B12
Test Model	RPM-A5A11-B12
Identification No. of EUT	19198000003
Series Model	N/A
Model Difference	N/A
Power Supply Rating	Input: 100-240VAC OutPut: 42-57V POE
Modulation Type	QPSK, 16QAM, 64QAM, 256QAM
Modulation Technology	OFDM
Operating Frequency	LTE band 12: 729-746MHz LTE band 17: 734-746MHz
Max. ERP Power	306mW
Antenna Type	Internal antenna
Antenna Connector	U.FL

3.1.1 CONFIGURATION OF SYSTEM UNDER TEST



Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	21deg. C, 71%RH 22deg. C, 71%RH	120Vac, 60Hz	Chen Ge
Modulation Characteristics	24deg. C, 64%RH	120Vac, 60Hz	Chen Ge
Frequency Stability	24deg. C, 64%RH	42-57Vdc	Chen Ge
Occupied Bandwidth	24deg. C, 64%RH	120Vac, 60Hz	Chen Ge
Band Edge	24deg. C, 64%RH	120Vac, 60Hz	Chen Ge
Peak To Average Ratio	24deg. C, 64%RH	120Vac, 60Hz	Chen Ge
Conducted Emission	24deg. C, 64%RH	120Vac, 60Hz	Chen Ge
Radiated Emission	21deg. C, 71%RH	120Vac, 60Hz	Chen Ge

3.2 EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

3.3 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 27

KDB 971168 D01 Power Meas License Digital Systems v02r02

ANSI/TIA/EIA-603-E 2016

ANSI 63.26-2015

NOTE: All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Per FCC Part 27.50

Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;

4.1.2 Test Procedures

EIRP / ERP Measurement:

EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

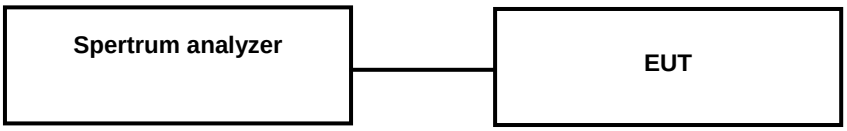
Conducted Power Measurement:

The EUT was set up for the maximum power with LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

EIRP / ERP MEASUREMENT:

CONDUCTED POWER MEASUREMENT:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.4 Test Results

Conducted Output Power

LTE Band 12						
BW	Modulation	CH	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Combined (dBm)
5 MHz	QPSK	5035	731.5	20.91	21.16	24.05
		5095	737.5	21.65	21.82	24.75
		5155	743.5	20.86	20.72	23.80
	16QAM	5035	731.5	21.30	21.32	24.32
		5095	737.5	21.82	21.88	24.86
		5155	743.5	20.97	21.06	24.03
	64QAM	5035	731.5	20.30	20.87	23.60
		5095	737.5	20.96	21.08	24.03
		5155	743.5	20.12	20.54	23.34
	256QAM	5035	731.5	21.00	20.68	23.85
		5095	737.5	21.22	21.73	24.49
		5155	743.5	20.86	20.55	23.72
10 MHz	QPSK	5060	734.0	21.68	21.60	24.65
		5095	737.5	21.88	21.81	24.86
		5130	741.0	21.49	21.40	24.46
	16QAM	5060	734.0	21.63	21.61	24.63
		5095	737.5	21.86	21.75	24.82
		5130	741.0	21.40	21.38	24.40
	64QAM	5060	734.0	21.00	20.89	23.96
		5095	737.5	21.49	21.44	24.48
		5130	741.0	21.12	21.37	24.26
	256QAM	5060	734.0	21.32	21.05	24.20
		5095	737.5	21.37	21.45	24.42
		5130	741.0	21.26	21.10	24.19
15 MHz	QPSK	5085	736.5	21.60	21.61	24.62
		5095	737.5	21.55	21.59	24.58
		5105	738.5	21.49	21.50	24.51
	16QAM	5085	736.5	21.58	21.56	24.58
		5095	737.5	21.55	21.55	24.56
		5105	738.5	21.55	21.50	24.54
	64QAM	5085	736.5	20.93	21.28	24.12
		5095	737.5	21.29	21.30	24.31
		5105	738.5	20.74	20.95	23.85
	256QAM	5085	736.5	21.56	21.12	24.36
		5095	737.5	21.22	21.20	24.22
		5105	738.5	20.82	21.22	24.04

Note:
Based on conducted power measurement, QPSK and 16QAM are the worst case modulation.

E.R.P

LTE Band 12						
BW	Modulation	CH	Frequency (MHz)	Combined (dBm)	Antenna Gain (dBi)	E.R.P (dBm)
5 MHz	QPSK	5035	731.5	24.05	4	25.90
		5095	737.5	24.75	4	26.60
		5155	743.5	23.80	4	25.65
	16QAM	5035	731.5	24.32	4	26.17
		5095	737.5	24.86	4	26.71
		5155	743.5	24.03	4	25.88
	64QAM	5085	731.5	23.60	4	25.45
		5095	737.5	24.03	4	25.88
		5105	743.5	23.34	4	25.19
	256QAM	5085	731.5	23.85	4	25.70
		5095	737.5	24.49	4	26.34
		5105	743.5	23.72	4	25.57
10 MHz	QPSK	5060	734.0	24.65	4	26.50
		5095	737.5	24.86	4	26.71
		5130	741.0	24.46	4	26.31
	16QAM	5060	734.0	24.63	4	26.48
		5095	737.5	24.82	4	26.67
		5130	741.0	24.40	4	26.25
	64QAM	5060	734.0	23.96	4	25.81
		5095	737.5	24.48	4	26.33
		5130	741.0	24.26	4	26.11
	256QAM	5060	734.0	24.20	4	26.05
		5095	737.5	24.42	4	26.27
		5130	741.0	23.96	4	25.81
15 MHz	QPSK	5085	736.5	24.62	4	26.47
		5095	737.5	24.58	4	26.43
		5105	738.5	24.51	4	26.36
	16QAM	5085	736.5	24.58	4	26.43
		5095	737.5	24.56	4	26.41
		5105	738.5	24.54	4	26.39
	64QAM	5085	736.5	24.12	4	25.97
		5095	737.5	24.31	4	26.16
		5105	738.5	23.85	4	25.7
	256QAM	5085	736.5	24.36	4	26.21
		5095	737.5	24.22	4	26.07
		5105	738.5	24.04	4	25.89

Conducted Output Power

LTE Band 17						
BW	Modulation	CH	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Combined (dBm)
5 MHz	QPSK	5755	736.5	21.49	21.49	24.50
		5790	740.0	21.67	21.70	24.70
		5825	743.5	21.34	21.41	24.38
	16QAM	5755	736.5	21.48	21.51	24.51
		5790	740.0	21.65	21.67	24.67
		5825	743.5	21.53	21.34	24.44
	64QAM	5755	736.5	20.71	21.10	23.92
		5790	740.0	20.90	21.06	23.99
		5825	743.5	20.78	21.08	23.94
	256QAM	5755	736.5	20.70	21.38	24.06
		5790	740.0	21.03	20.93	23.99
		5825	743.5	20.76	20.75	23.77
10MHz	QPSK	5790	740.0	21.62	21.62	24.63
	16QAM	5790	740.0	21.60	21.64	24.63
	64QAM	5790	740.0	20.85	21.25	24.07
	256QAM	5790	740.0	21.20	21.29	24.26

Note:
Based on conducted power measurement, QPSK and 16QAM are the worst case modulation.

E.R.P

LTE Band 17						
BW	Modulation	CH	Frequency (MHz)	Combined (dBm)	Antenna Gain (dBi)	E.R.P (dBm)
5 MHz	QPSK	5755	736.5	24.50	4	26.35
		5790	740.0	24.70	4	26.55
		5825	743.5	24.38	4	26.23
	16QAM	5755	736.5	24.51	4	26.36
		5790	740.0	24.67	4	26.52
		5825	743.5	24.44	4	26.29
	64QAM	5755	736.5	23.92	4	25.77
		5790	740.0	23.99	4	25.84
		5825	743.5	23.94	4	25.79
	256QAM	5755	736.5	24.06	4	25.91
		5790	740.0	23.99	4	25.84
		5825	743.5	23.77	4	25.62
10MHz	QPSK	5790	740.0	24.63	4	26.48
	16QAM	5790	740.0	24.63	4	26.48
	64QAM	5790	740.0	24.07	4	25.92
	256QAM	5790	740.0	24.26	4	26.11

4.2 Frequency Stability Measurement

4.2.1 Limits of Frequency Stability Measurement

The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

4.2.2 Test Procedure

a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.

b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.

c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ± 0.5℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

NOTE: The frequency error was recorded frequency error from the communication simulator.

4.2.3 Test Setup

4.2.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	Frequency Error (ppm)	Limit (ppm)
42	0	5
57	0	5

NOTE: The applicant defined the normal working voltage of the battery is from 42Vdc to 57Vdc.

Frequency Error vs. Temperature.

TEMP. (℃)	Frequency Error (ppm)	Limit (ppm)
50	0.12	5
40	0.12	5
30	0.12	5
20	0	5
10	0.13	5
0	0.23	5

4.3 Occupied Bandwidth Measurement

4.3.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.3.2 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.3.3 Test Setup

4.3.4 Test Result

LTE BAND 12

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5MHz BW, QPSK	5035	731.5	4.48	4.90
	5095	737.5	4.48	4.90
	5155	743.5	4.47	4.90
5MHz BW, 16QAM	5035	731.5	4.49	4.89
	5095	737.5	4.48	4.91
	5155	743.5	4.48	4.91
10MHz BW, QPSK	5060	734.0	8.94	9.61
	5095	737.5	8.93	9.61
	5130	741.0	8.92	9.58
10MHz BW, 16QAM	5060	734.0	8.94	9.64
	5095	737.5	8.94	9.60
	5130	741.0	8.93	9.59
15MHz BW, QPSK	5085	736.5	13.38	14.21
	5095	737.5	13.38	14.26
	5105	738.5	13.37	14.15
15MHz BW, 16QAM	5085	736.5	13.40	14.13
	5095	737.5	13.38	14.18
	5105	738.5	13.38	14.17

LTE BAND 17

Type	Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
5MHz BW, QPSK	5755	736.5	4.47	4.90
	5790	740.0	4.47	4.89
	5825	743.5	4.47	4.90
5MHz BW, 16QAM	5755	736.5	4.48	4.87
	5790	740.0	4.48	4.90
	5825	743.5	4.48	4.87
10MHz BW, QPSK	5790	740.0	8.92	9.51
10MHz BW, 16QAM	5790	740.0	8.93	9.58

LTE band 12:

5MHz, QPSK, Low Channel

5MHz, QPSK, Mid Channel

5MHz, QPSK, High Channel

5MHz, 16QAM, Low Channel

5MHz, 16QAM, Mid Channel

5MHz, 16QAM, High Channel

10MHz, QPSK, Low Channel

10MHz, QPSK, Mid Channel

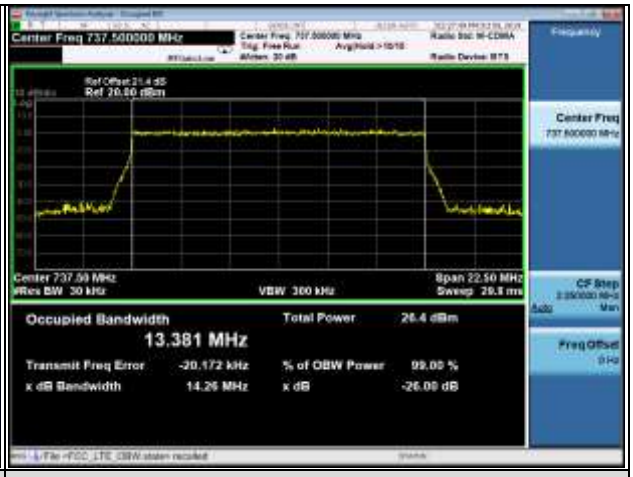
10MHz, QPSK, High Channel

10MHz, 16QAM, Low Channel

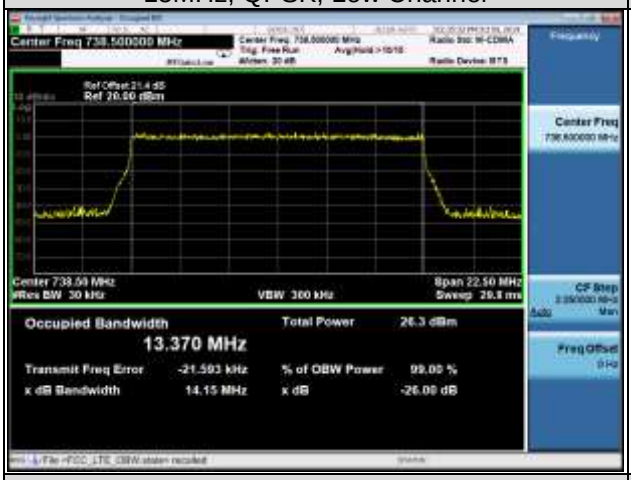
10MHz, 16QAM, Mid Channel

10MHz, 16QAM, High Channel

15MHz, QPSK, Low Channel



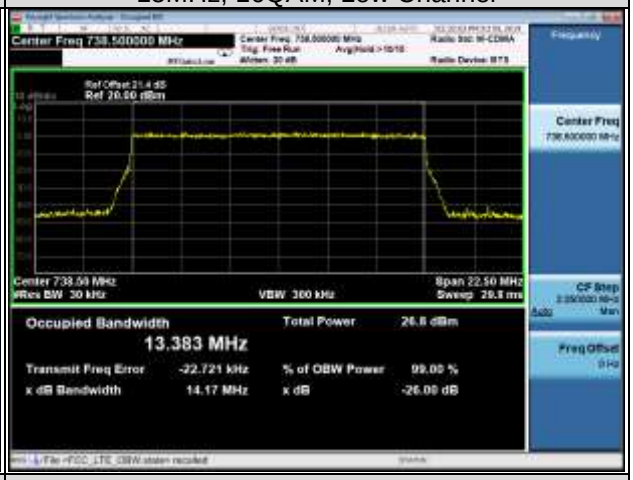
15MHz, QPSK, Mid Channel



15MHz, QPSK, High Channel

15MHz, 16QAM, Low Channel

15MHz, 16QAM, Mid Channel



15MHz, 16QAM, High Channel

LTE band 17:

5MHz, QPSK, Low Channel

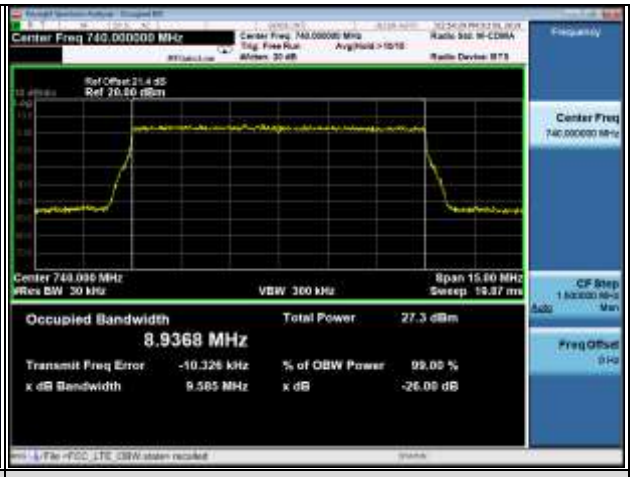
5MHz, QPSK, Mid Channel

5MHz, QPSK, High Channel

5MHz, 16QAM, Low Channel

5MHz, 16QAM, Mid Channel

5MHz, 16QAM, High Channel

	
10MHz, QPSK, Mid Channel	10MHz, 16QAM, Mid Channel

4.4 Band Edge Measurement

4.4.1 Limits of Band Edge Measurement

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.4.2 Test Setup

4.4.3 Test Procedures

a. All measurements were done at low and high operational frequency range.

b. The band edge measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer. This splitter loss, attenuator loss and cable loss are the worst loss 21 dB in the transmitted path track.

c. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz.

d. Record the max trace plot into the test report.

4.4.4 Test Results

Worst case of both chains:
LTE band 12

Type	Channel	Channel Frequency (MHz)	Measurement Band Edge (dBm)	Limit (dBm)
5MHz BW, QPSK	5035	731.5	-26.04	-13
	5155	743.5	-25.81	-13
5MHz BW, 16QAM	5035	731.5	-24.07	-13
	5155	743.5	-25.43	-13
10MHz BW, QPSK	5060	734.0	-31.37	-13
	5130	741.0	-33.57	-13
10MHz BW, 16QAM	5060	734.0	-31.43	-13
	5130	741.0	-32.32	-13
15MHz BW, QPSK	5085	736.5	−35.81	-13
	5105	738.5	−36.12	-13
15MHz BW, 16QAM	5085	736.5	−35.15	-13
	5105	738.5	-36.71	-13

LTE band 17

Type	Channel	Channel Frequency (MHz)	Measurement Band Edge (dBm)	Limit (dBm)
5MHz BW, QPSK	5755	736.5	−25.17	-13
	5825	743.5	-24.88	-13
5MHz BW, 16QAM	5755	736.5	−24.69	-13
	5825	743.5	-25.37	-13
10MHz BW, QPSK	5790	740.0	−30.50	-13
	5790	740.0	-30.07	-13
10MHz BW, 16QAM	5790	740.0	−32.49	-13
	5790	740.0	-30.45	-13

Test Plots
LTE band 12:

5MHz, QPSK, Low Channel

5MHz, QPSK, High Channel

10MHz, QPSK, Low Channel

10MHz, QPSK, High Channel

15MHz, QPSK, Low Channel

15MHz, QPSK, High Channel

5MHz, 16QAM, Low Channel

5MHz, 16QAM, High Channel

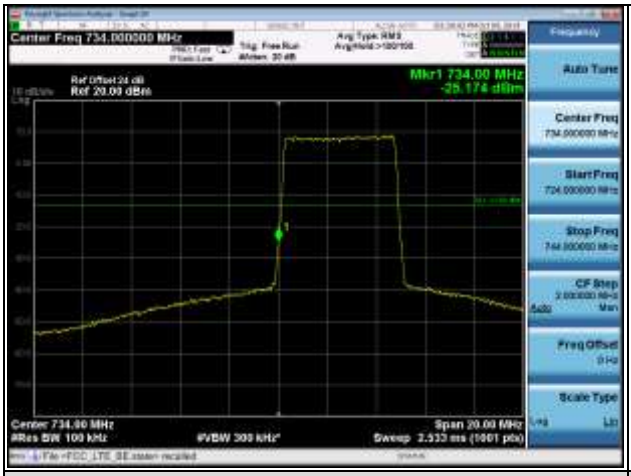
10MHz, 16QAM, Low Channel

10MHz, 16QAM, High Channel

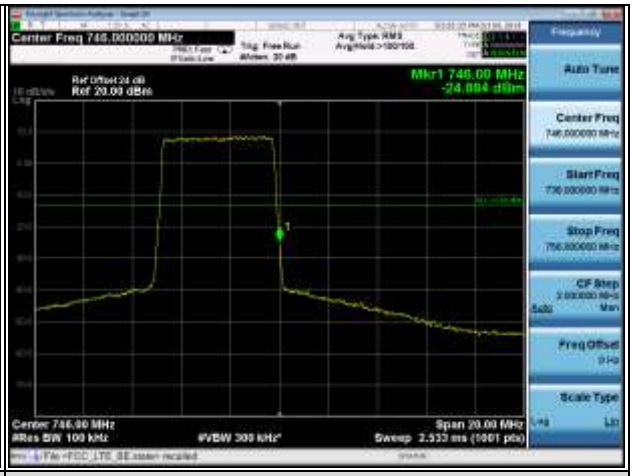
15MHz, 16QAM, Low Channel

15MHz, 16QAM, High Channel

LTE band 17:



5MHz, QPSK, Low Channel



5MHz, QPSK, High Channel

10MHz, QPSK, Mid Channel, Left side

10MHz, QPSK, Mid Channel, Right side

5MHz, 16QAM, Low Channel

5MHz, 16QAM, High Channel

	
10MHz, 16QAM, Mid Channel, Left side	10MHz, 16QAM, Mid Channel, Right side

4.5 Peak To Average Ratio

4.6.1 Limits of Peak To Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

4.5.1 Test Setup

4.6.3 Test Procedures

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.4 Test Results

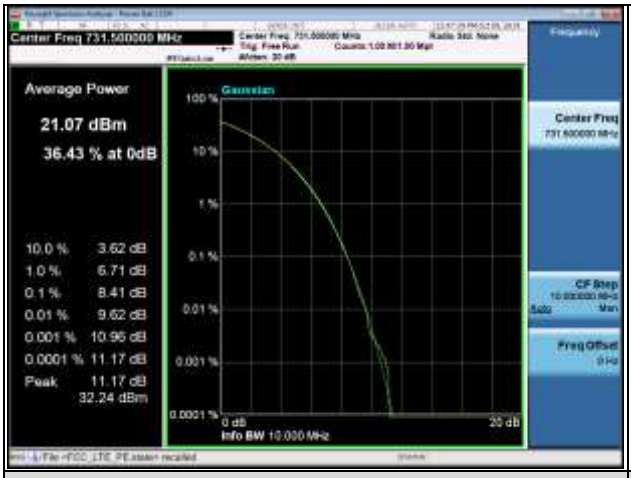
LTE band 12

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	5035	731.5	9.62	13
	5095	737.5	9.59	13
	5155	743.5	9.56	13
5MHz BW, 16QAM	5035	731.5	9.27	13
	5095	737.5	9.27	13
	5155	743.5	9.34	13
10MHz BW, QPSK	5060	734.0	9.56	13
	5095	737.5	9.48	13
	5130	741.0	9.63	13
10MHz BW, 16QAM	5060	734.0	9.70	13
	5095	737.5	9.62	13
	5130	741.0	9.72	13
15MHz BW, QPSK	5085	736.5	9.59	13
	5095	737.5	9.64	13
	5105	738.5	9.59	13
15MHz BW, 16QAM	5085	736.5	9.45	13
	5095	737.5	9.46	13
	5105	738.5	9.46	13

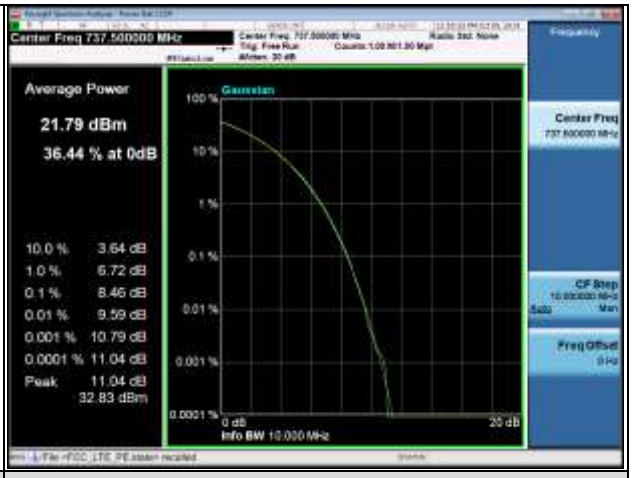
LTE band 17

Type	Channel	Frequency (MHz)	Peak-Average Ratio (dB)	Peak-Average Ratio (dB)
5MHz BW, QPSK	5755	736.5	9.56	13
	5790	740.0	9.49	13
	5825	743.5	9.56	13
5MHz BW, 16QAM	5755	736.5	9.29	13
	5790	740.0	9.36	13
	5825	743.5	9.44	13
10MHz BW, QPSK	5790	740.0	9.58	13
10MHz BW, 16QAM	5790	740.0	9.55	13

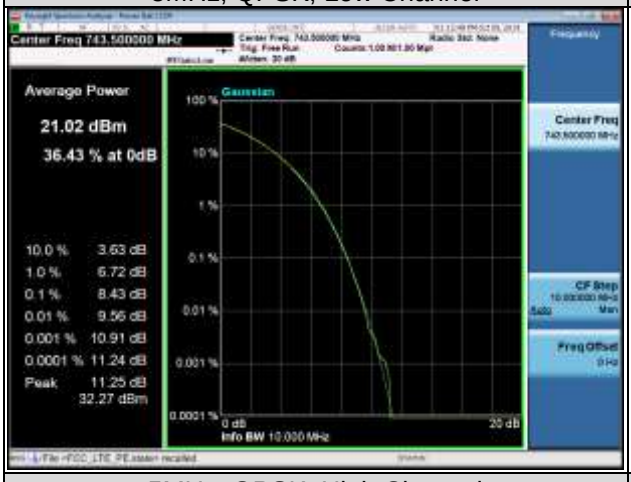
Test Plots
LTE band 12:



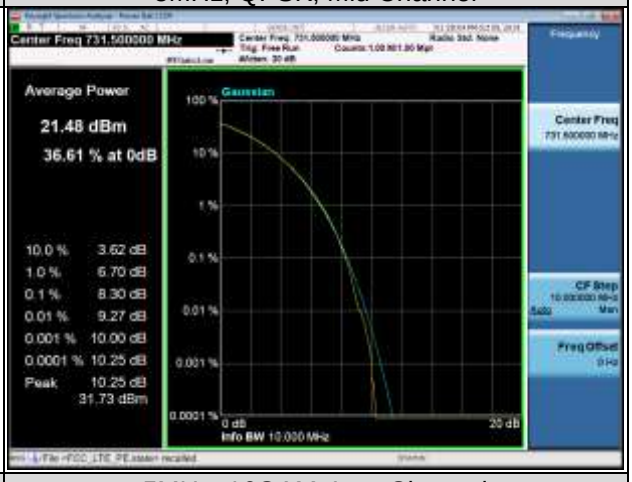
5MHz, QPSK, Low Channel



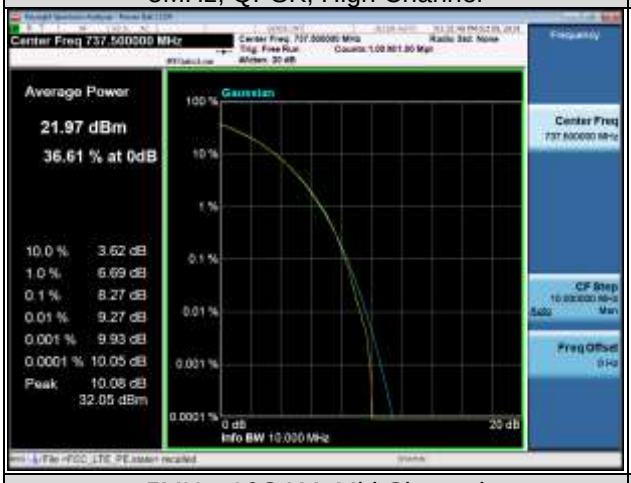
5MHz, QPSK, Mid Channel



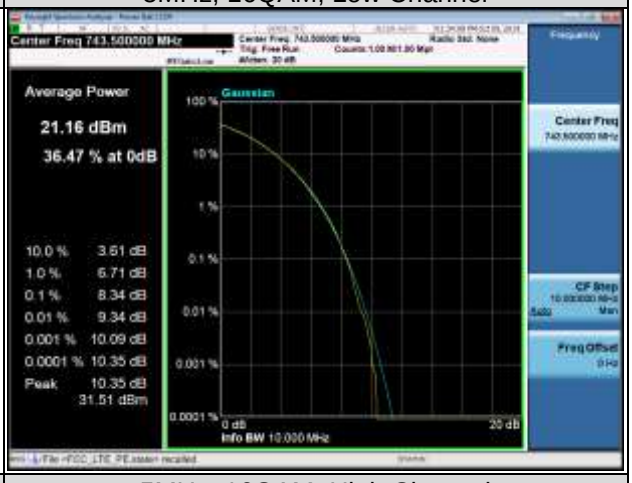
5MHz, QPSK, High Channel



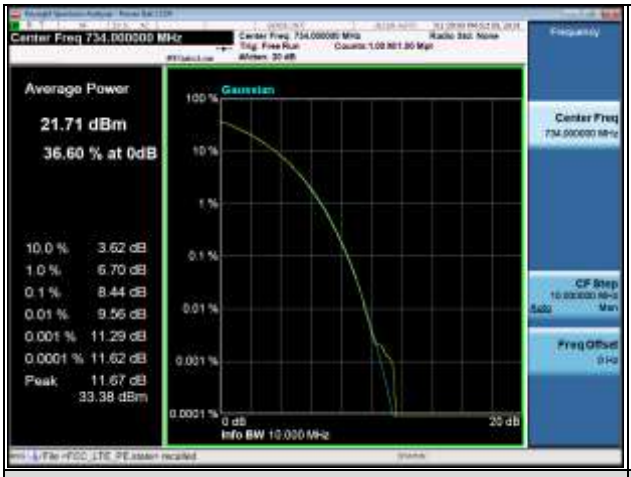
5MHz, 16QAM, Low Channel



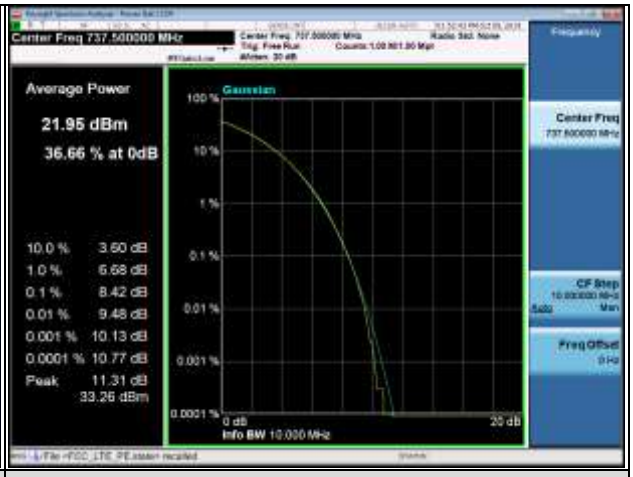
5MHz, 16QAM, Mid Channel



5MHz, 16QAM, High Channel



10MHz, QPSK, Low Channel

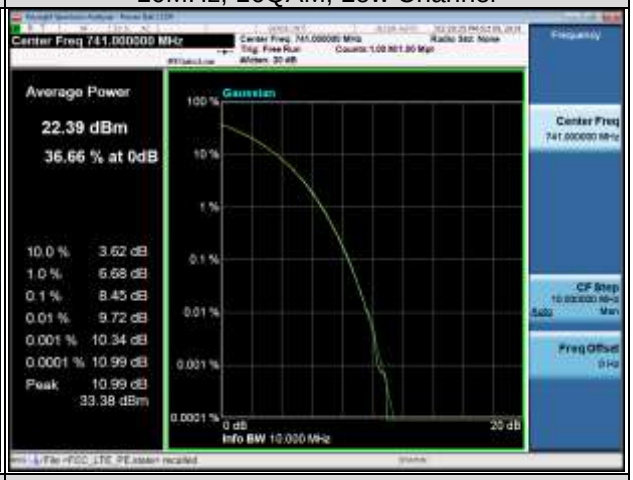


10MHz, QPSK, Mid Channel

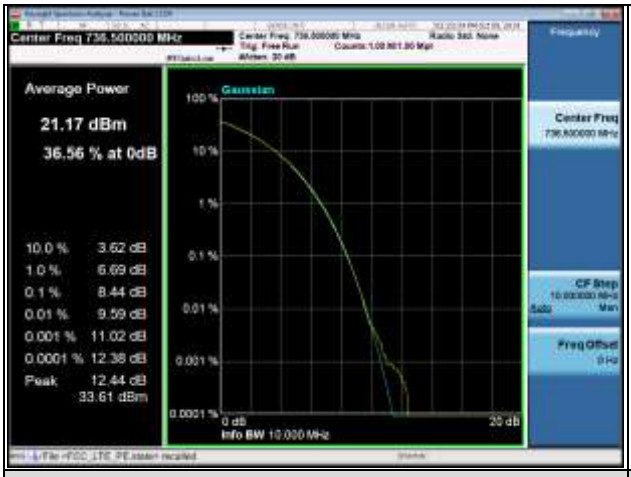
10MHz, QPSK, High Channel

10MHz, 16QAM, Low Channel

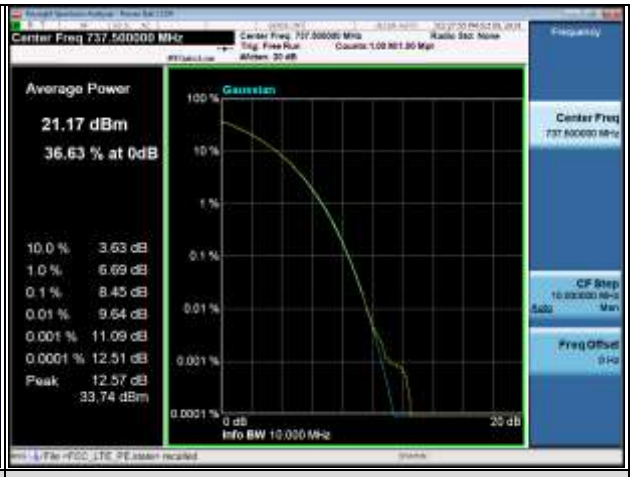
10MHz, 16QAM, Mid Channel



10MHz, 16QAM, High Channel

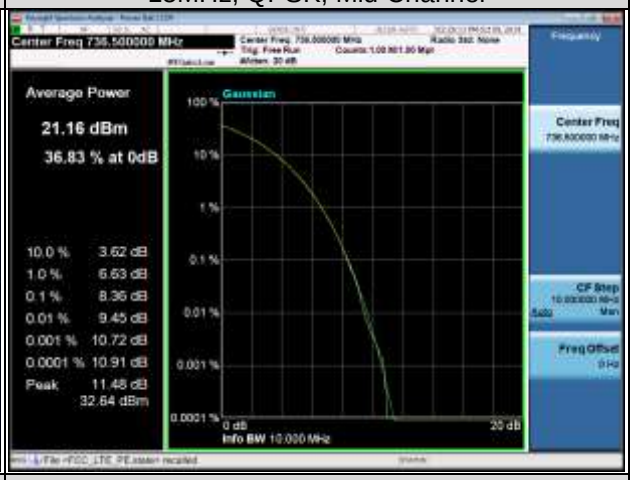


15MHz, QPSK, Low Channel

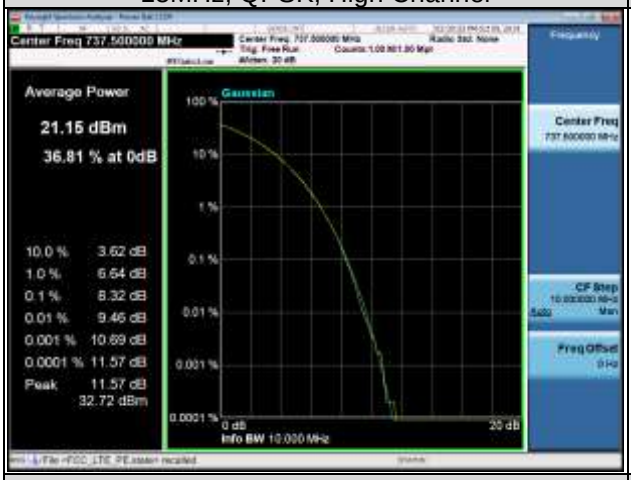


15MHz, QPSK, Mid Channel

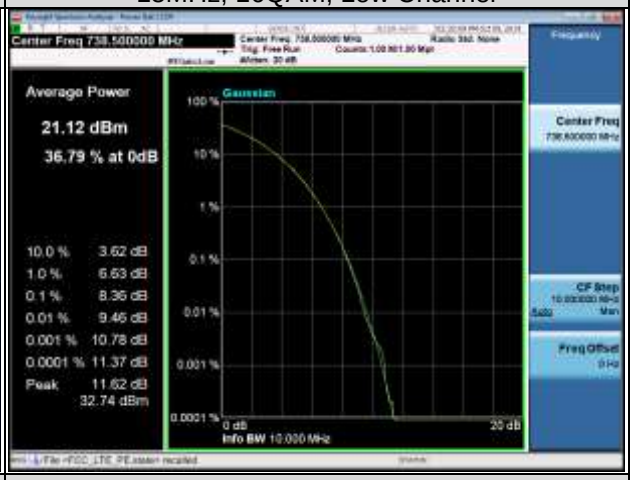
15MHz, QPSK, High Channel



15MHz, 16QAM, Low Channel

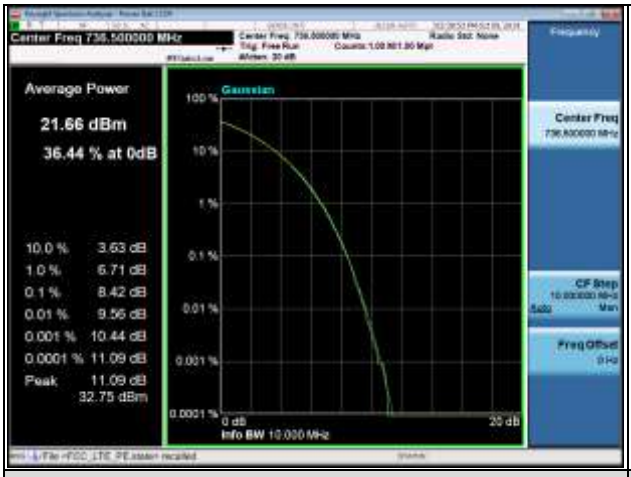


15MHz, 16QAM, Mid Channel

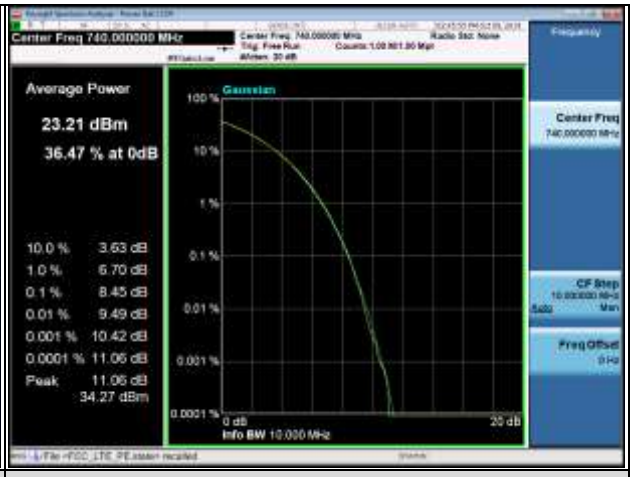


15MHz, 16QAM, High Channel

LTE band 17:

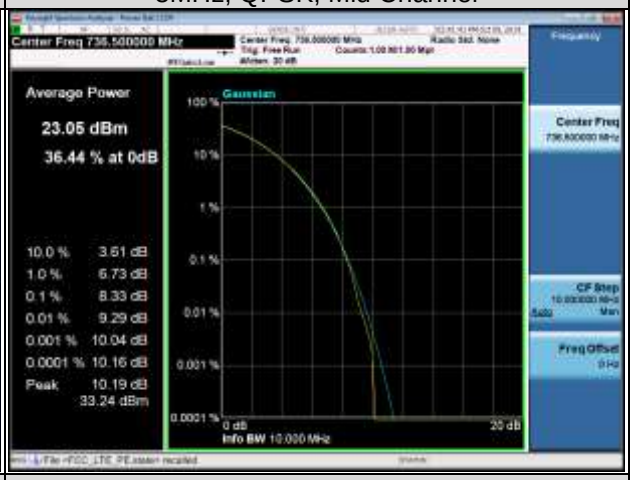


5MHz, QPSK, Low Channel

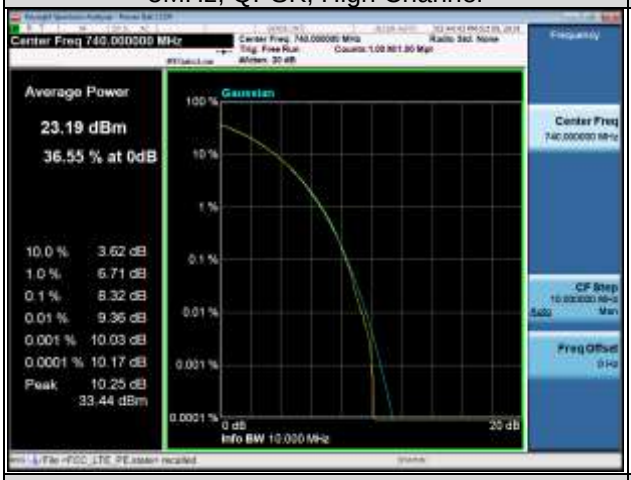


5MHz, QPSK, Mid Channel

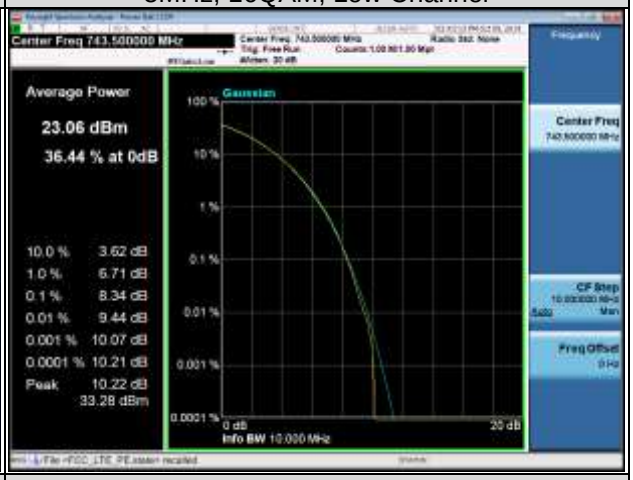
5MHz, QPSK, High Channel



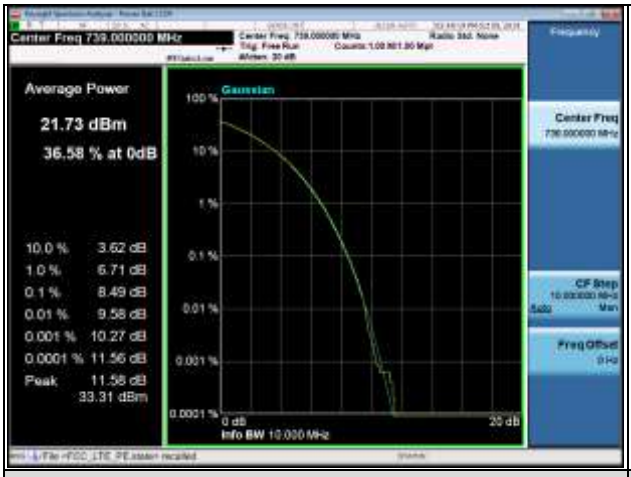
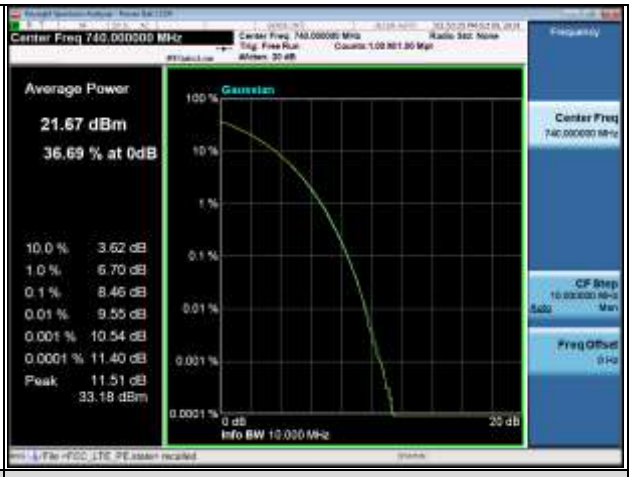
5MHz, 16QAM, Low Channel



5MHz, 16QAM, Mid Channel



5MHz, 16QAM, High Channel

	
10MHz, QPSK, Mid Channel	10MHz, 16QAM, Mid Channel

4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

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. The limit of emission equal to –13dBm.

4.6.2 Test Setup

4.6.3 Test Procedure

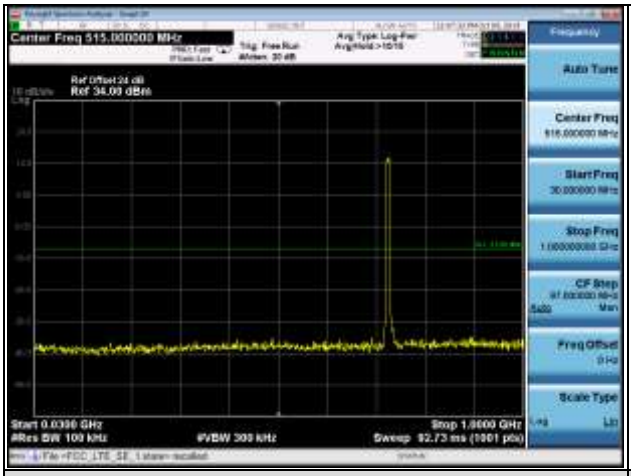
a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Agilent Spectrum Analyzer.

b. The conducted spurious emission used the power splitter via EUT RF power connector between signal generator and spectrum analyzer.

c. When the spectrum scanned from 30MHz to 8GHz, it shall be connected to the band reject filter attenuated the carried frequency. The spectrum set RB=1MHz, VB=3MHz.

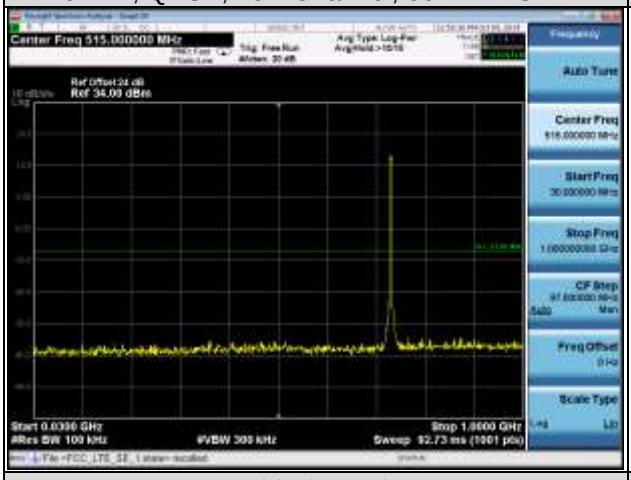
4.6.4 Test Plots

LTE band 12:



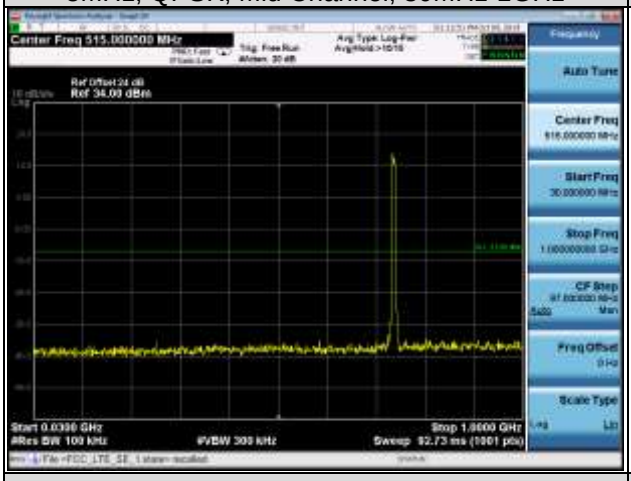
5MHz, QPSK, Low Channel, 30MHz-1GHz

5MHz, QPSK, Low Channel, 1GHz-26.5GHz



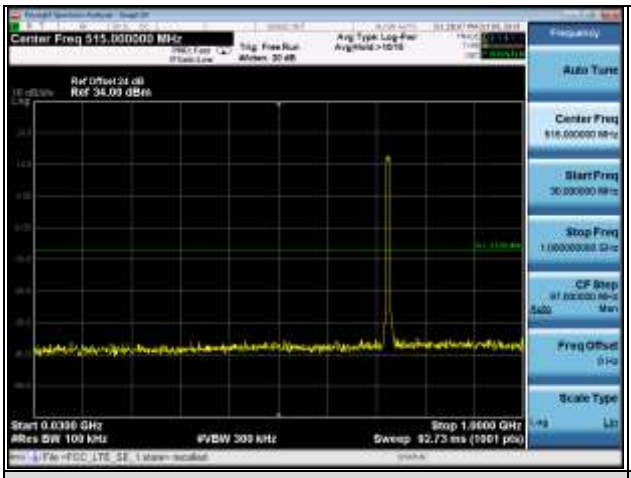
5MHz, QPSK, Mid Channel, 30MHz-1GHz

5MHz, QPSK, Mid Channel, 1GHz-26.5GHz



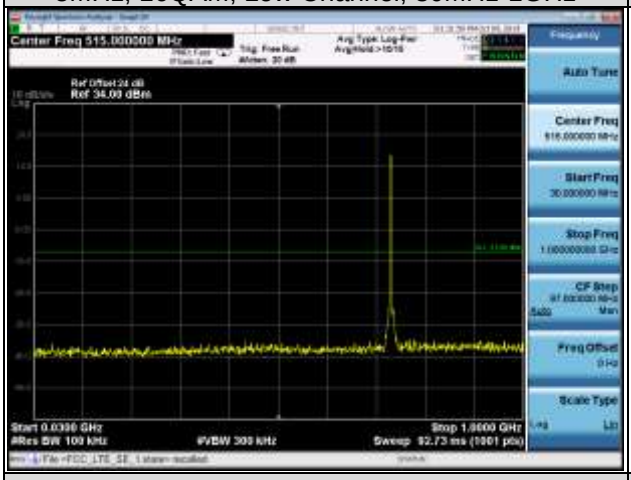
5MHz, QPSK, High Channel, 30MHz-1GHz

5MHz, QPSK, High Channel, 1GHz-26.5GHz



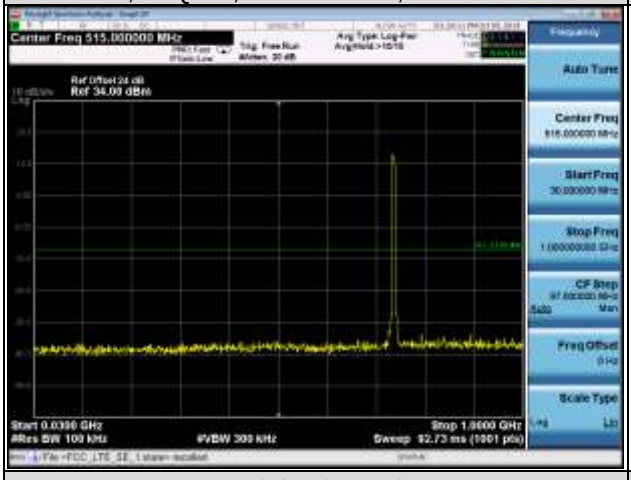
5MHz, 16QAM, Low Channel, 30MHz-1GHz

5MHz, 16QAM, Low Channel, 1GHz-26.5GHz



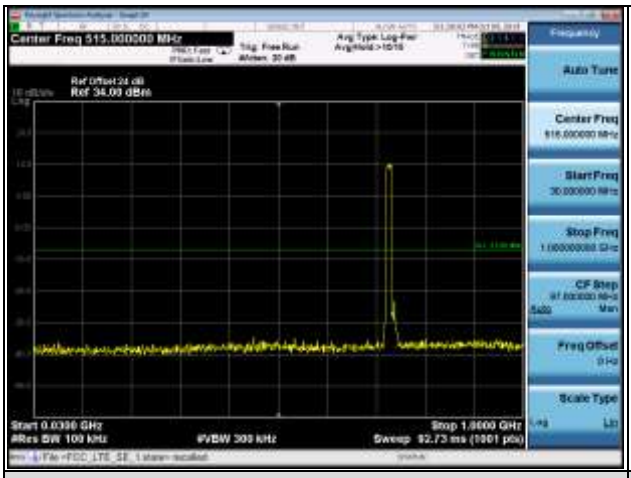
5MHz, 16QAM, Mid Channel, 30MHz-1GHz

5MHz, 16QAM, Mid Channel, 1GHz-26.5GHz



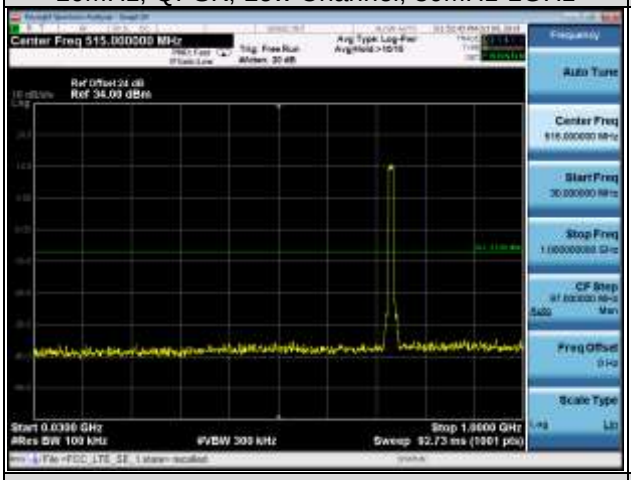
5MHz, 16QAM, High Channel, 30MHz-1GHz

5MHz, 16QAM, High Channel, 1GHz-26.5GHz



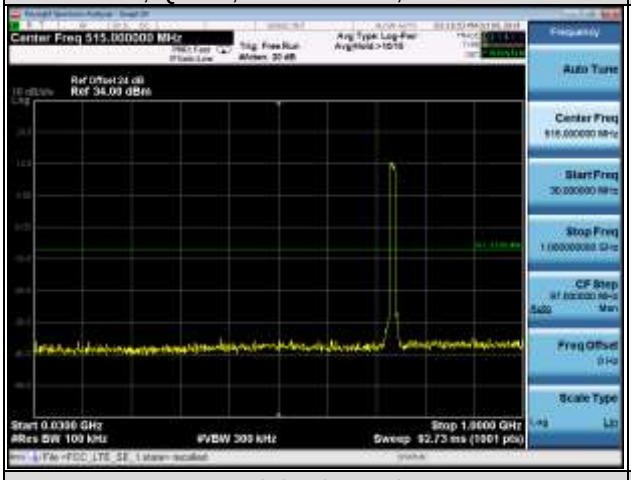
10MHz, QPSK, Low Channel, 30MHz-1GHz

10MHz, QPSK, Low Channel, 1GHz-26.50GHz



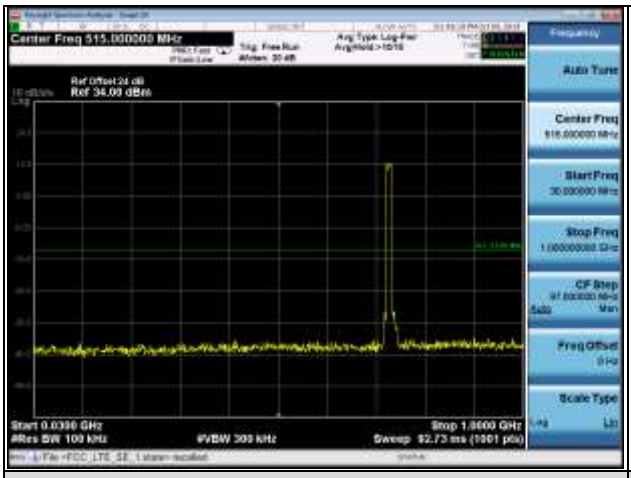
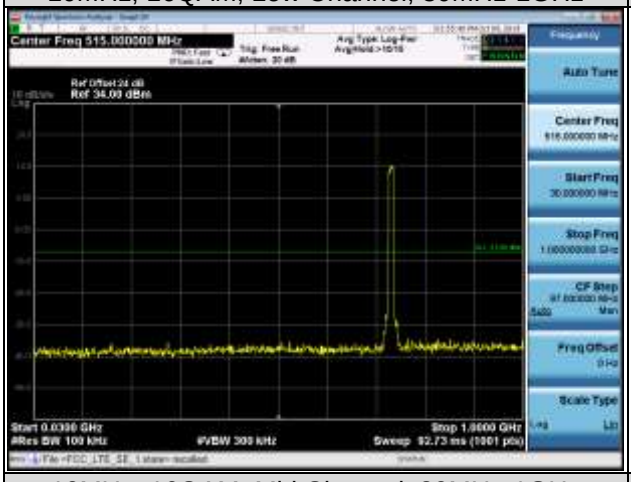
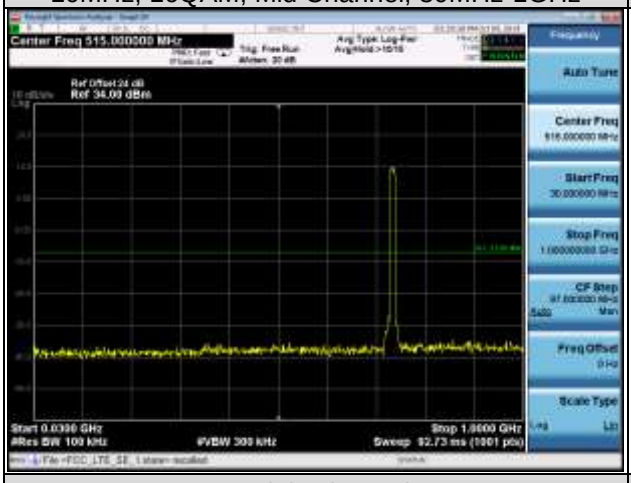
10MHz, QPSK, Mid Channel, 30MHz-1GHz

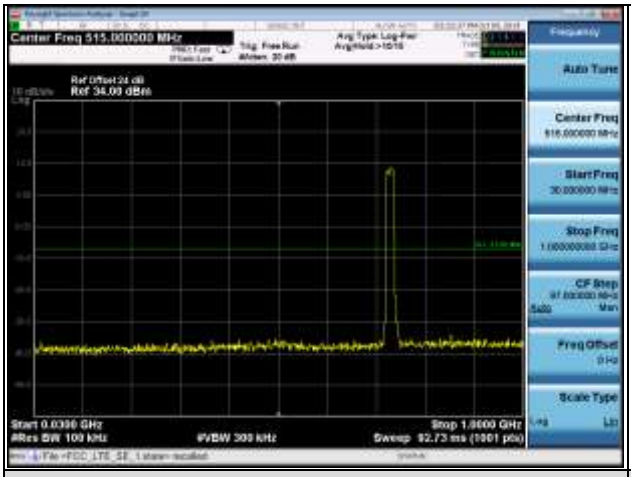
10MHz, QPSK, Mid Channel, 1GHz-26.50GHz



10MHz, QPSK, High Channel, 30MHz-1GHz

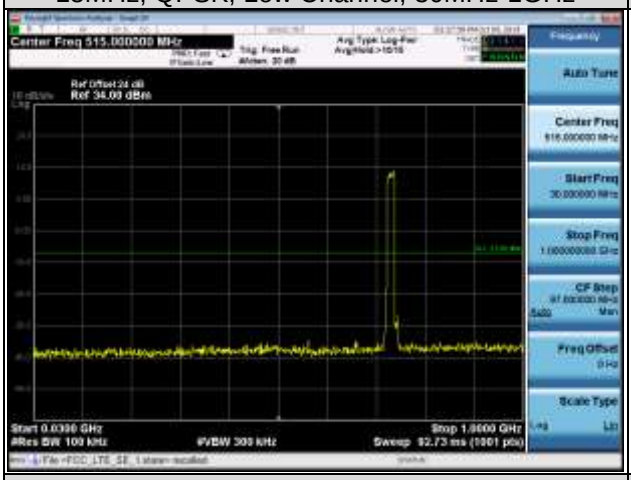
10MHz, QPSK, High Channel, 1GHz-26.50GHz

	
10MHz, 16QAM, Low Channel, 30MHz-1GHz	10MHz, 16QAM, Low Channel, 1GHz-26.50GHz
	
10MHz, 16QAM, Mid Channel, 30MHz-1GHz	10MHz, 16QAM, Mid Channel, 1GHz-26.50GHz
	
10MHz, 16QAM, High Channel, 30MHz-1GHz	10MHz, 16QAM, High Channel, 1GHz-26.50GHz



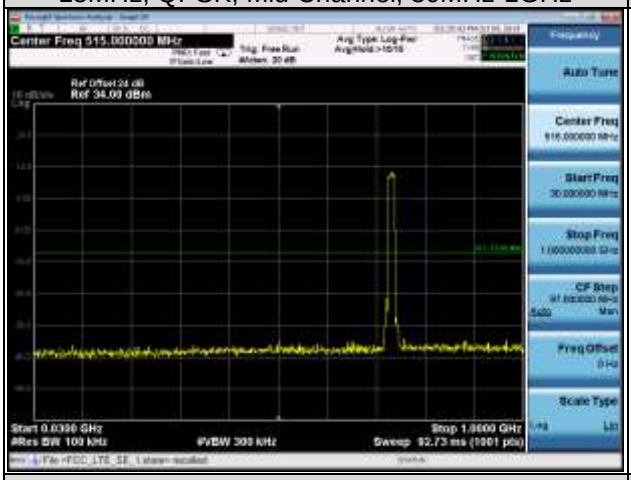
15MHz, QPSK, Low Channel, 30MHz-1GHz

15MHz, QPSK, Low Channel, 1GHz-26.50GHz



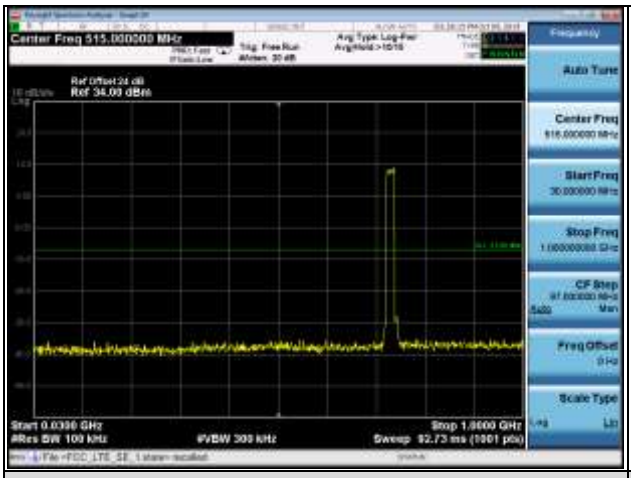
15MHz, QPSK, Mid Channel, 30MHz-1GHz

15MHz, QPSK, Mid Channel, 1GHz-26.50GHz



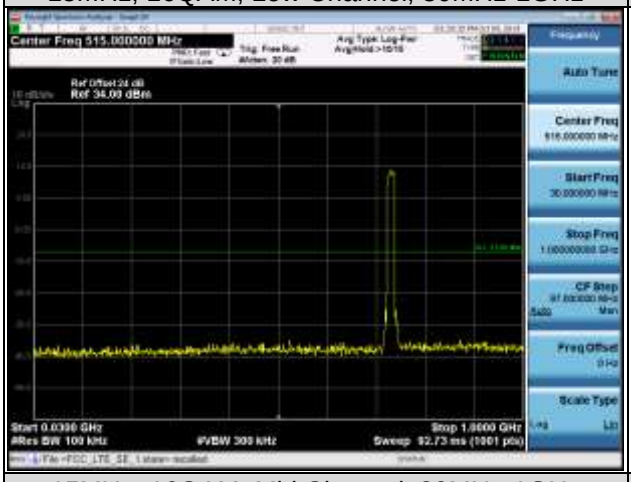
15MHz, QPSK, High Channel, 30MHz-1GHz

15MHz, QPSK, High Channel, 1GHz-26.50GHz



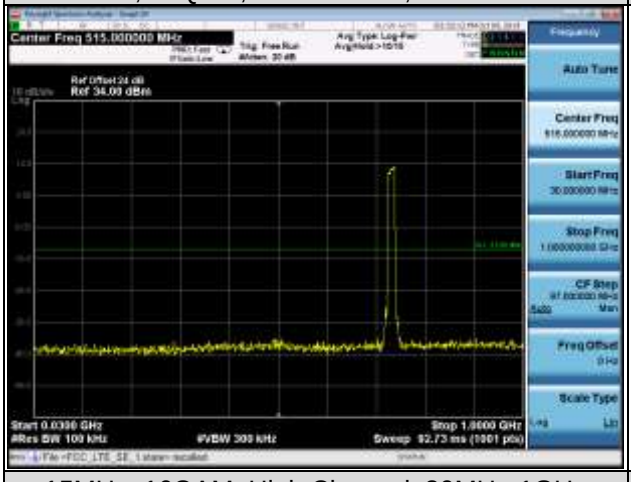
15MHz, 16QAM, Low Channel, 30MHz-1GHz

15MHz, 16QAM, Low Channel, 1GHz-26.50GHz



15MHz, 16QAM, Mid Channel, 30MHz-1GHz

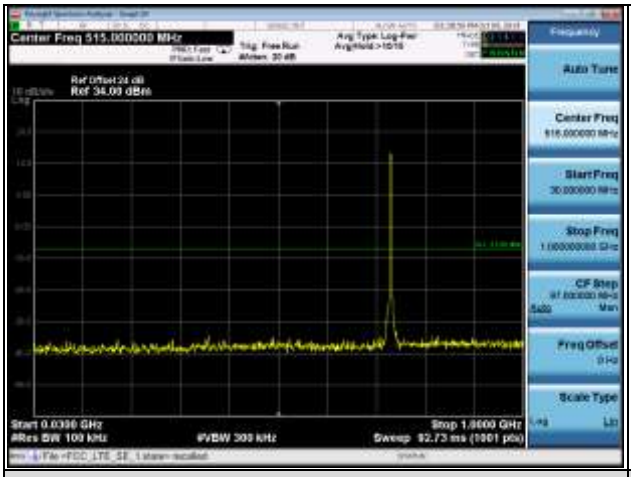
15MHz, 16QAM, Mid Channel, 1GHz-26.50GHz



15MHz, 16QAM, High Channel, 30MHz-1GHz

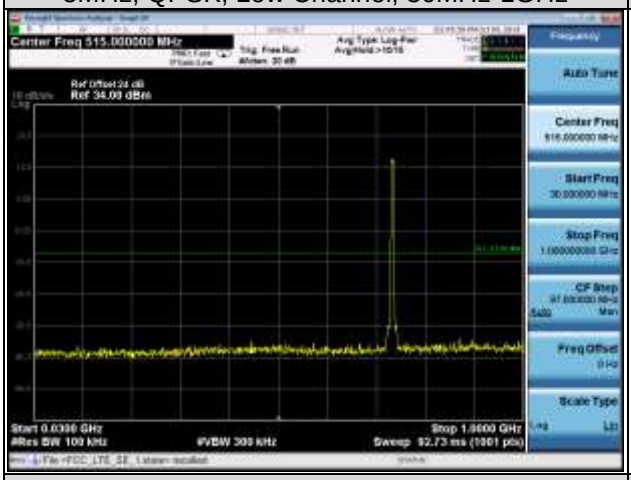
15MHz, 16QAM, High Channel, 1GHz-26.50GHz

LTE band 17:



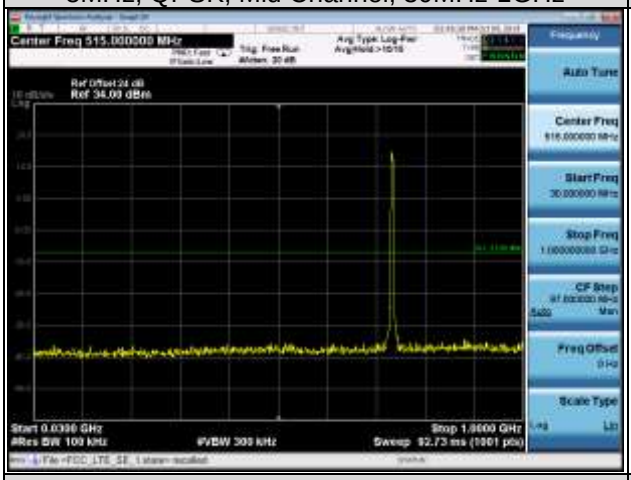
5MHz, QPSK, Low Channel, 30MHz-1GHz

5MHz, QPSK, Low Channel, 1GHz-26.5GHz



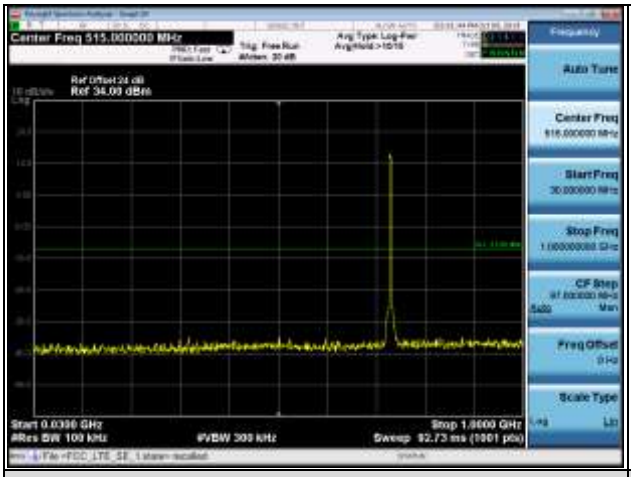
5MHz, QPSK, Mid Channel, 30MHz-1GHz

5MHz, QPSK, Mid Channel, 1GHz-26.5GHz



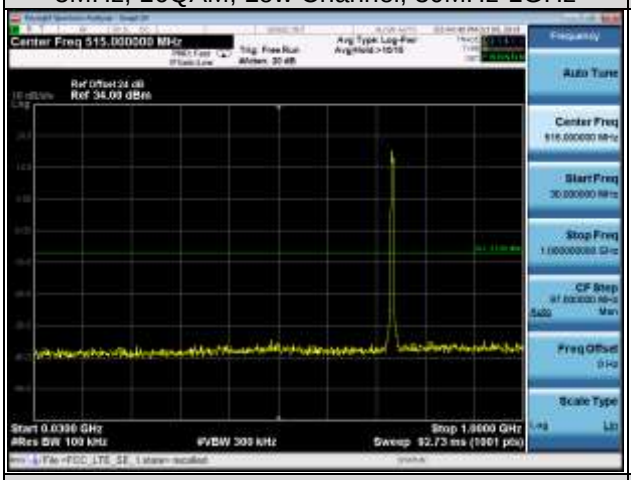
5MHz, QPSK, High Channel, 30MHz-1GHz

5MHz, QPSK, High Channel, 1GHz-26.5GHz



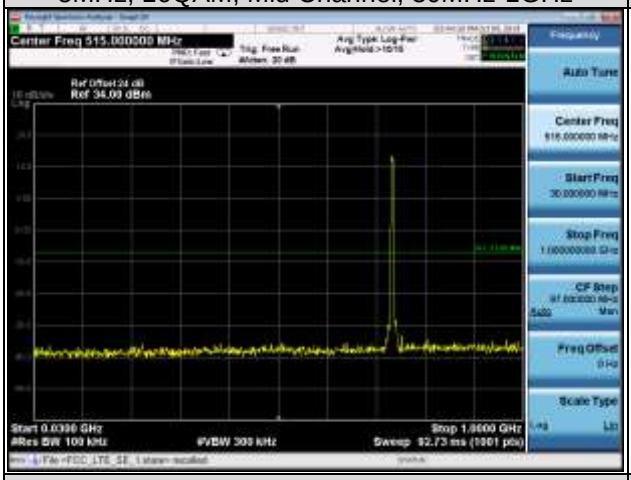
5MHz, 16QAM, Low Channel, 30MHz-1GHz

5MHz, 16QAM, Low Channel, 1GHz-26.5GHz



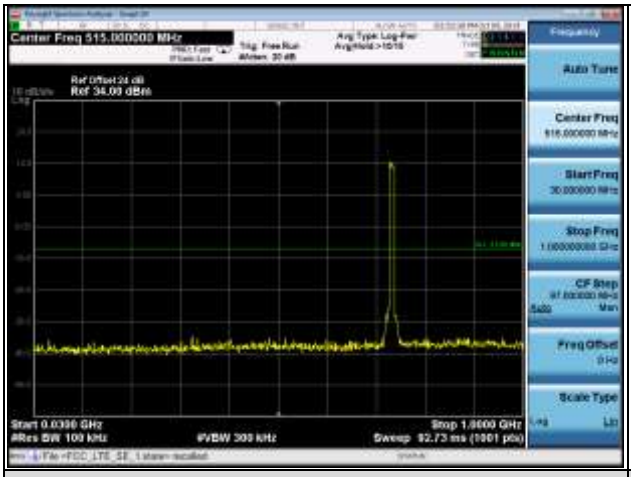
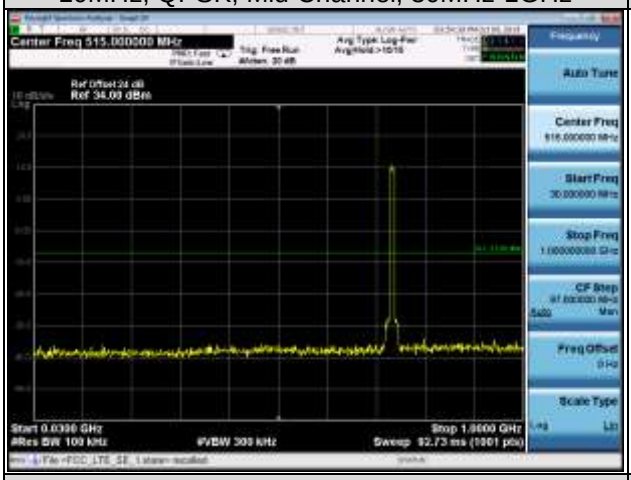
5MHz, 16QAM, Mid Channel, 30MHz-1GHz

5MHz, 16QAM, Mid Channel, 1GHz-26.5GHz



5MHz, 16QAM, High Channel, 30MHz-1GHz

5MHz, 16QAM, High Channel, 1GHz-26.5GHz

	
10MHz, QPSK, Mid Channel, 30MHz-1GHz	10MHz, QPSK, Low Channel, 1GHz-26.50GHz
	
10MHz, 16QAM, Mid Channel, 30MHz-1GHz	10MHz, 16QAM, Mid Channel, 1GHz-26.50GHz

4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

(1)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. The limit of emission equal to –13dBm

4.7.2 Test Procedure

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.

b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step a. Record the power level of S.G

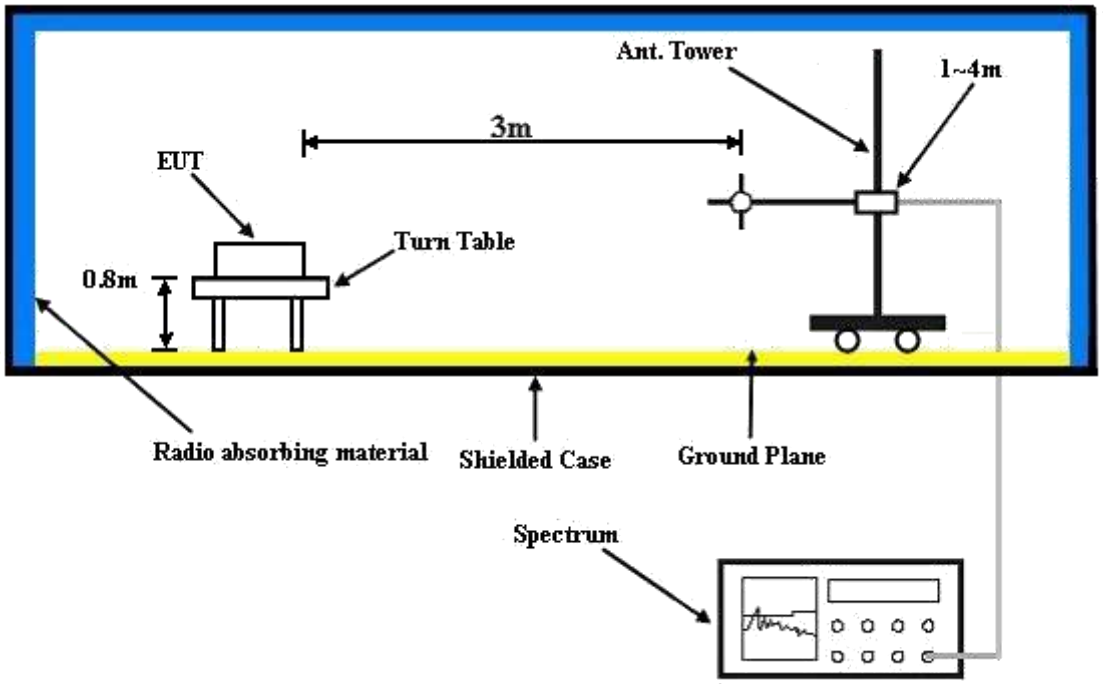
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.7.3 Deviation from Test Standard
No deviation.

4.7.4 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.7.5 Test Results

Below 1GHz

Below 1GHz Worst-case Data

Frequency Range	30 MHz ~ 1 GHz	**Operating Channel**	763MHz

Indicated			**Test Antenna**		**Substituted**						
Frequency (MHz)	**Raw (dBm)**	**Degree**	**Hgt (cm)**	**Pol (V/H)**	**Frequency (MHz)**	**Level (dBm)**	**Ant Gain (dBi)**	**Cable Loss (dB)**	**Absolute Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
63.24	-73.93	19	155	V	63.24	-68.59	0	0.25	-68.84	-13	-55.84
63.24	-75.28	214	169	H	63.24	-69.74	0	0.25	-69.99	-13	-56.99
625.77	-69.82	228	153	V	625.77	-64.47	0	0.78	-65.25	-13	-52.25
625.77	-70.31	149	200	H	625.77	-64.1	0	0.78	-64.88	-13	-51.88

Above 1GHz

LTE band 12

5MHz BW, low channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2194.5	-61.42	207	150	V	2194.5	-56.90	9.46	1.43	-48.87	-13	-35.87
2194.5	-62.4	63	207	H	2194.5	-57.88	9.46	1.43	-49.85	-13	-36.85
7521	-59.57	161	156	V	7521	-53.72	10.75	2.43	-45.4	-13	-32.4
7521	-57.59	205	158	H	7521	-51.74	10.75	2.43	-43.42	-13	-30.42

5MHz BW, mid channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2212.5	-62.44	303	219	V	2212.5	-57.9	9.45	1.43	-49.88	-13	-36.88
2212.5	-60.88	15	182	H	2212.5	-56.34	9.45	1.43	-48.32	-13	-35.32
7222	-58.54	132	166	V	7222	-52.48	10.33	2.93	-45.08	-13	-32.08
7222	-55.94	125	185	H	7222	-49.88	10.33	2.93	-42.48	-13	-29.48

5MHz BW, high channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2230.5	-61.59	199	193	V	2230.5	-57.04	9.41	1.44	-49.07	-13	-36.07
2230.5	-60.76	116	178	H	2230.5	-56.21	9.41	1.44	-48.24	-13	-35.24
7343	-53.77	104	219	V	7343	-47.7	10.47	2.81	-40.04	-13	-27.04
7343	-57.59	65	170	H	7343	-51.52	10.47	2.81	-43.86	-13	-30.86

10MHz BW, low channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2202	-63.54	195	214	V	2202	-59.01	9.47	1.43	-50.97	-13	-37.97
2202	-60.47	254	189	H	2202	-55.94	9.47	1.43	-47.9	-13	-34.9
7011	-56.31	21	201	V	7011	-50.48	10.42	2.86	-42.92	-13	-29.92
7011	-54.17	241	212	H	7011	-48.34	10.42	2.86	-40.78	-13	-27.78

10MHz BW, mid channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2212.5	-59.76	18	172	V	2212.5	-55.22	9.45	1.43	-47.2	-13	-34.2
2212.5	-60.89	29	216	H	2212.5	-56.35	9.45	1.43	-48.33	-13	-35.33
7371	-53.88	224	212	V	7371	-47.87	10.52	2.69	-40.04	-13	-27.04
7371	-56.57	63	151	H	7371	-50.56	10.52	2.69	-42.73	-13	-29.73

10MHz BW, high channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2223	-60.7	156	202	V	2223	-56.16	9.42	1.44	-48.18	-13	-35.18
2223	-62.61	282	178	H	2223	-58.07	9.42	1.44	-50.09	-13	-37.09
7890	-55.5	16	154	V	7890	-49.75	10.89	2.53	-41.39	-13	-28.39
7890	-57.4	64	182	H	7890	-51.65	10.89	2.53	-43.29	-13	-30.29

15MHz BW, low channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2209.5	-61.92	318	217	V	2209.5	-57.39	9.45	1.43	-49.37	-13	-36.37
2209.5	-61.83	44	195	H	2209.5	-57.3	9.45	1.43	-49.28	-13	-36.28
7554	-56.55	200	164	V	7554	-50.71	10.87	2.44	-42.28	-13	-29.28
7554	-55.07	12	192	H	7554	-49.23	10.87	2.44	-40.8	-13	-27.8

15MHz BW, mid channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2212.5	-60.96	339	196	V	2212.5	-56.42	9.45	1.43	-48.4	-13	-35.4
2212.5	-64.14	72	204	H	2212.5	-59.6	9.45	1.43	-51.58	-13	-38.58
7920	-53.05	353	162	V	7920	-47.31	10.84	2.54	-39.01	-13	-26.01
7920	-59.66	159	155	H	7920	-53.92	10.84	2.54	-45.62	-13	-32.62

15MHz BW, high channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2215.5	-60.93	314	163	V	2215.5	-56.39	9.44	1.43	-48.38	-13	-35.38
2215.5	-60.92	1	182	H	2215.5	-56.38	9.44	1.43	-48.37	-13	-35.37
7263	-57.08	162	176	V	7263	-50.98	10.37	2.95	-43.56	-13	-30.56
7263	-58.4	115	210	H	7263	-52.3	10.37	2.95	-44.88	-13	-31.88

LTE band 17

5MHz BW, low channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2209.5	-61.72	184	187	V	2209.5	-57.19	9.45	1.43	-49.17	-13	-36.17
2209.5	-63.39	44	165	H	2209.5	-58.86	9.45	1.43	-50.84	-13	-37.84
7411	-54.2	120	168	V	7411	-48.27	10.57	2.53	-40.23	-13	-27.23
7411	-54.85	50	165	H	7411	-48.92	10.57	2.53	-40.88	-13	-27.88

5MHz BW, mid channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2220	-59.18	44	179	V	2220	-54.64	9.43	1.43	-46.64	-13	-33.64
2220	-62.73	275	206	H	2220	-58.19	9.43	1.43	-50.19	-13	-37.19
7042	-57.96	15	167	V	7042	-52.1	10.42	2.87	-44.55	-13	-31.55
7042	-60.19	46	169	H	7042	-54.33	10.42	2.87	-46.78	-13	-33.78

5MHz BW, high channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2230.5	-61.66	23	159	V	2230.5	-57.11	9.41	1.44	-49.14	-13	-36.14
2230.5	-62.32	327	212	H	2230.5	-57.77	9.41	1.44	-49.8	-13	-36.8
7162	-55.73	283	184	V	7162	-49.74	10.35	2.91	-42.3	-13	-29.3
7162	-56.93	288	210	H	7162	-50.94	10.35	2.91	-43.5	-13	-30.5

10MHz BW, mid channel, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Hgt (cm)	Pol (V/H)	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
2220	-58.23	108	209	V	2220	-53.69	9.43	1.43	-45.69	-13	-32.69
2220	-60.75	314	175	H	2220	-56.21	9.43	1.43	-48.21	-13	-35.21
7642	-57.23	264	159	V	7642	-51.41	11.04	2.46	-42.83	-13	-29.83
7642	-55.75	298	186	H	7642	-49.93	11.04	2.46	-41.35	-13	-28.35

REMARKS:

1. Absolute level (dBm) = Level (dBm) + Ant Gain(dBi) – Cable Loss(dB)
2. Margin value = Absolute level – Limit value.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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