RF TEST REPORT

Applicant	Shanghai MobileTek Communication Ltd.
FCC ID	2AK9DL600A
Product	IOT module
Model	L600A
Report No.	RXA1709-0329RF02
Issue Date	November 15, 2017

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2017)/ FCC CFR47 Part 27C (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Jiangpeng Lan	*Approved by: Kai Xu*

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000

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Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	27.50(d)(4) /27.50(c)(10)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	27.53(h) /27.53(g)	PASS
5	Peak-to-Average Power Ratio	27.50(d)/KDB971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 27.54	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 27.53(h) /27.53(g)	PASS
8	Radiates Spurious Emission	2.1053 /27.53(h) /27.53(g)	PASS
Date of Testing: October 10, 2017~ October 29, 2017 and November 13, 2017 ~ November 14, 2017			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard.			

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above. This report must not be used by the client to claim product certification, approval, or endorsement by any government agencies.

1.2 Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

2 General Description of Equipment under Test

Client Information

Applicant	Shanghai MobileTek Communication Ltd.
Applicant address	Free Trade Zone No. 33, No. 17 building 6H Xiya Road Shanghai, China
Manufacturer	Shanghai MobileTek Communication Ltd.
Manufacturer address	Free Trade Zone No. 33, No. 17 building 6H Xiya Road Shanghai, China

General information

EUT Description			
Model:	L600A		
Product IMEI:	866908030000332		
Hardware Version:	V1		
Software Version:	L600v02.01b03		
Power Supply:	External power supply		
Antenna Type:	The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Rod antenna)		
Test Mode(s):	LTE Band 4; LTE Band 12		
Test Modulation	(LTE)QPSK,16QAM		
LTE Category	M1		
Maximum E.I.R.P./ E.R.P.	LTE Band 4:	23.94dBm	
	LTE Band 12:	25.53dBm	
Rated Power Supply Voltage:	3.8V		
Extreme Voltage:	Minimum: 3.4V Maximum: 4.2V		
Extreme Temperature:	Lowest: -40°C Highest: +85°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	LTE Band 4	1710 ~ 1755	2110 ~ 2155
	LTE Band 12	699 ~ 716	729 ~ 746
Note：1. The information of the EUT is declared by the manufacturer.			

Accessory equipment	
Evaluation Board	RF Cable
Adapter	Antenna: Rod antenna
Micro USB Cable	/

3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

FCC CFR47 Part 2 (2017)

FCC CFR47 Part 27C (2017)

ANSI/TIA-603-D (2010)

KDB 971168 D01 Power Meas License Digital Systems v02r02

4 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.
Subsequently, only the worst case emissions are reported.
The following testing in LTE is set based on the maximum RF Output Power.
The following testing in different Bandwidth is set to detailin the following table:

Test modes are chosen to be reported as the worst case configuration below for LTE Band 4/12:

Test items	Modes	Bandwidth (MHz)						Modulation		RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	LTE 4	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	LTE 12	-	-	O	O	-	-	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	LTE 4	O	O	O	O	O	O	O	O	-	-	O	O	O	O
	LTE 12	-	-	O	O	-	-	O	O	-	-	O	O	O	O
Occupied Bandwidth	LTE 4	O	O	O	O	O	O	O	O	-	-	O	O	O	O
	LTE 12	-	-	O	O	-	-	O	O	-	-	O	-	O	-
Band Edge Compliance	LTE 4	O	O	O	O	O	O	O	O	O	-	O	O	-	O
	LTE 12	-	-	O	O	-	-	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	LTE 4	O	O	O	O	O	O	O	O	-	-	O	O	O	O
	LTE 12	-	-	O	O	-	-	O	O	-	-	O	O	O	O
Frequency Stability	LTE 4	O	O	O	O	O	O	O	O	-	-	O	-	O	-
	LTE 12	-	-	O	O	-	-	O	O	-	-	O	-	O	-
Spurious Emissions at Antenna Terminals	LTE 4	O	O	O	O	O	O	O	-	O	-	-	O	O	O
	LTE 12	-	-	O	O	-	-	O	-	O	-	-	O	O	O
Radiates Spurious Emission	LTE 4	O	O	O	O	O	O	O	-	O	-	-	O	O	O
	LTE 12	-	-	O	O	-	-	O	-	O	-	-	O	O	O
Note	1. The mark “O” means that this configuration is chosen for testing. 2. The mark “-” means that this configuration is not testing.														

5 Test Information

5.1 RF Power Output

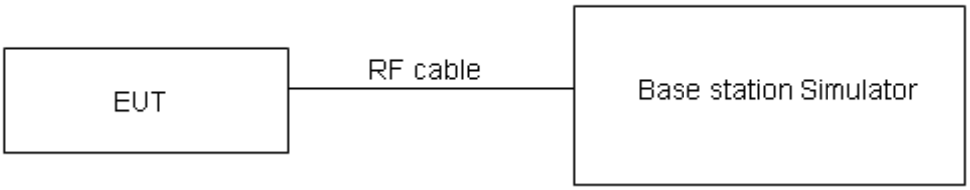
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=0.4 dB.

Test Results

Mode	Bandwidth	Channel/ Frequency(MHz)	RB	Index	Conducted Power (dBm)	
					QPSK	16QAM
Band 4	1.4MHz	19957/1710.7	1#0	0	22.18	22.39
			6#0	0	22.55	21.82
		20175/1732.5	1#0	0	22.31	21.96
			6#0	0	20.57	20.50
		20393/1754.3	1#5	0	22.42	21.75
			6#0	0	20.65	20.64
	3MHz	19965/1711.5	1#0	0	22.22	21.55
			6#0	0	20.43	20.57
		20175/1732.5	1#0	0	22.33	21.89
			6#0	0	20.59	20.51
		20385/1753.5	1#5	1	22.23	21.70
			6#0	1	20.65	20.83
	5MHz	19975/1712.5	1#0	0	22.29	22.82
			6#0	0	21.55	20.70
		20175/1732.5	1#0	0	22.54	22.64
			6#0	0	21.75	20.59
		20375/1752.5	1#5	3	22.70	22.59
			6#0	3	21.81	20.91
	10MHz	20000/1715	1#0	0	22.28	22.84
			4#0	0	22.55	21.61
		20175/1732.5	1#0	0	22.26	22.55
			4#0	0	22.69	21.41
		20350/1750	1#5	7	22.48	22.76
			4#2	7	22.82	21.65
	15MHz	20025/1717.5	1#0	0	22.39	22.84
			6#0	0	22.46	22.70
		20175/1732.5	1#0	0	22.25	22.62
			6#0	0	22.42	22.57
		20325/1747.5	1#5	11	22.50	22.79
			6#0	11	22.69	22.82
	20MHz	20050/1720	1#0	0	22.33	22.76
			6#0	0	22.51	22.57
		20175/1732.5	1#0	0	22.09	22.55
			6#0	0	22.42	22.44
		20300/1745	1#5	15	22.59	22.88
			6#0	15	22.78	22.83

Mode	Bandwidth	Channel/ Frequency(MHz)	RB	Index	Conducted Power (dBm)	
					QPSK	16QAM
Band 12	1.4MHz	23017/699.7	1#0	0	22.47	22.31
			6#0	0	21.03	21.02
		23095/707.5	1#0	0	22.25	21.95
			6#0	0	20.49	20.58
		23173/715.3	1#5	0	22.46	22.18
			6#0	0	20.81	20.81
	3MHz	23025/700.5	1#0	0	22.56	22.19
			6#0	0	21.08	21.02
		23095/707.5	1#0	0	22.15	21.77
			6#0	0	20.53	20.52
		23165/714.5	1#5	1	22.81	22.46
			6#0	1	21.40	21.37
	5MHz	23035/701.5	1#0	0	22.65	23.16
			6#0	0	22.03	21.35
		23095/707.5	1#0	0	22.05	22.85
			6#0	0	21.25	20.61
		23155/713.5	1#5	3	23.68	23.25
			6#0	3	22.96	21.31
	10MHz	23060/704	1#0	0	22.67	23.20
			4#0	0	21.96	22.21
		23095/707.5	1#0	0	22.21	22.96
			4#0	0	21.46	21.72
		23130/711	1#5	7	22.61	23.21
			4#2	7	21.18	22.01

5.2 Effective Isotropic Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI/TIA-603-D-2010.

a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.

b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).

c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.

d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:ERP (dBm) = LVL (dBm) + LOSS (dB)

f) The maximum ERP is the maximum value determined in the preceding step.

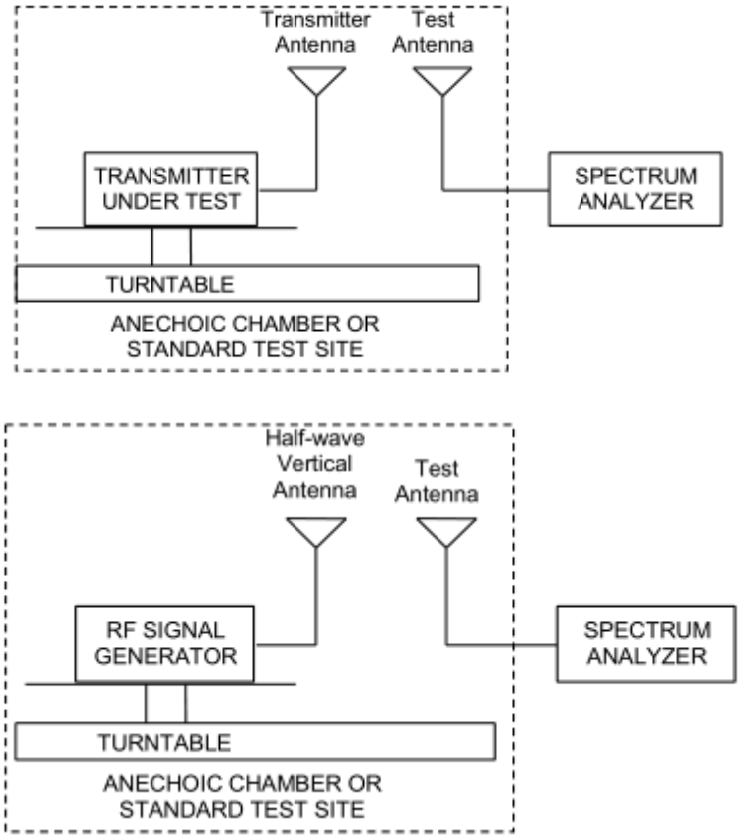
g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g.transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:

ERP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBd)

where:dBd refers to gain relative to an ideal dipole.

EIRP (dBm) = ERP (dBm) + 2.15 (dB.)

Test setup



Note: Area side: 2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

Limits

Rule Part 27.50(c) (10) specifies that “Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP”

Rule Part 27.50(d) (4) specifies that “Fixed, mobile and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP”

Part 27.50(c)(10)Limit (ERP)	≤ 3 W (34.77 dBm)
Part 27.50(d)(4)Limit (EIRP)	≤ 1 W (30 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 1.19 dB

Test Results

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

Mode	Bandwidth	Modulation	Channel/ Frequency (MHz)	Polarization	RB	Index	Output power (dBm)	Losses (dBm)	Ant gain (dBi)	EIRP (dBm)	EIRP (W)
Band4	1.4MHz	QPSK	19957 1710.7	H	1#0	0	-32.52	-54.30	1.44	23.22	0.21
			20175/1732.5	H	1#2	0	-35.25	-54.32	1.57	20.63	0.12
			20393/1754.3	H	1#5	0	-34.54	-54.10	1.72	21.28	0.13
		16QAM	19957 1710.7	H	1#0	0	-32.79	-54.35	1.44	23.00	0.20
			20175/1732.5	H	1#2	0	-35.63	-54.41	1.57	20.35	0.11
			20393/1754.3	H	1#5	0	-35.24	-54.52	1.72	21.00	0.13
	3MHz	QPSK	19965/1711.5	H	1#0	0	-33.41	-54.33	1.44	22.36	0.17
			20175/1732.5	H	1#5	0	-32.95	-54.32	1.57	22.93	0.20
			20385/1753.5	H	1#5	1	-32.58	-54.11	1.72	23.25	0.21
		16QAM	19965/1711.5	H	1#0	0	-33.74	-54.35	1.44	22.05	0.16
			20175/1732.5	H	1#5	0	-33.38	-54.41	1.57	22.60	0.18
			20385/1753.5	H	1#5	1	-33.20	-54.48	1.72	23.00	0.20
	5MHz	QPSK	19975/1712.5	H	1#0	0	-32.15	-54.34	1.44	23.62	0.23
			20175/1732.5	H	1#5	1	-33.61	-54.32	1.57	22.28	0.17
			20375/1752.5	H	1#5	3	-34.18	-54.13	1.72	21.66	0.15
		16QAM	19975/1712.5	H	1#0	0	-32.52	-54.38	1.44	23.30	0.21
			20175/1732.5	H	1#5	1	-33.98	-54.41	1.57	22.00	0.16
			20375/1752.5	H	1#5	3	-34.89	-54.47	1.72	21.30	0.13
	10MHz	QPSK	20000/1715	H	4#0	0	-31.83	-54.33	1.44	23.94	0.25
			20175/1732.5	H	4#2	3	-33.74	-54.32	1.57	22.14	0.16
			20350/1750	H	4#2	7	-32.94	-54.12	1.66	22.84	0.19
		16QAM	20000/1715	H	4#0	0	-32.14	-54.32	1.44	23.62	0.23
			20175/1732.5	H	4#2	3	-34.03	-54.41	1.57	21.95	0.16
			20350/1750	H	4#2	7	-33.63	-54.52	1.66	22.55	0.18
	15MHz	QPSK	20025/1717.5	H	1#0	0	-32.15	-54.35	1.49	23.69	0.23
			20175/1732.5	H	1#5	5	-32.97	-54.32	1.57	22.91	0.20
			20325/1747.5	H	1#5	11	-33.33	-54.17	1.66	22.50	0.18
		16QAM	20025/1717.5	H	1#0	0	-32.53	-54.39	1.49	23.35	0.22
			20175/1732.5	H	1#5	5	-33.38	-54.41	1.57	22.60	0.18
			20325/1747.5	H	1#5	11	-33.97	-54.51	1.66	22.20	0.17
	20MHz	QPSK	20050/1720	H	6#0	0	-33.15	-54.37	1.49	22.71	0.19
			20175/1732.5	H	6#0	7	-32.13	-54.32	1.57	23.76	0.24
			20300/1745	H	6#0	15	-32.57	-54.23	1.63	23.28	0.21
		16QAM	20050/1720	H	6#0	0	-33.53	-54.44	1.49	22.40	0.17
			20175/1732.5	H	6#0	7	-32.53	-54.41	1.57	23.45	0.22
			20300/1745	H	6#0	15	-33.22	-54.59	1.63	23.00	0.20

Mode	Bandwidth	Modulation	Channel/ Frequency (MHz)	Polarization	RB	Index	Output power (dBm)	Losses (dBm)	Ant gain (dBi)	EIRP (dBm)	EIRP (W)
Band12	1.4MHz	QPSK	23017/699.7	H	1#0	0	-28.84	-49.12	2.04	22.32	0.17
			23095/707.5	H	1#2	0	-27.55	-49.39	2.03	23.88	0.24
			23173/715.3	H	1#5	0	-26.87	-49.76	1.99	24.88	0.31
		16QAM	23017/699.7	H	1#0	0	-28.96	-48.91	2.04	22.00	0.16
			23095/707.5	H	1#2	0	-27.60	-49.12	2.03	23.55	0.23
			23173/715.3	H	1#5	0	-26.88	-49.43	1.99	24.55	0.29
	3MHz	QPSK	23025/700.5	H	1#0	0	-29.01	-49.15	2.04	22.18	0.17
			23095/707.5	H	1#5	0	-29.36	-49.39	2.03	22.07	0.16
			23165/714.5	H	1#5	1	-28.42	-49.73	2.00	23.31	0.21
		16QAM	23025/700.5	H	1#0	0	-28.98	-48.94	2.04	22.00	0.16
			23095/707.5	H	1#5	0	-29.40	-49.12	2.03	21.75	0.15
			23165/714.5	H	1#5	1	-28.37	-49.37	2.00	23.00	0.20
	5MHz	QPSK	23035/701.5	H	1#0	0	-27.28	-49.17	2.04	23.94	0.25
			23095/707.5	H	1#5	1	-26.77	-49.39	2.03	24.66	0.29
			23155/713.5	H	1#5	3	-27.06	-49.72	2.01	24.67	0.29
		16QAM	23035/701.5	H	1#0	0	-27.34	-48.95	2.04	23.65	0.23
			23095/707.5	H	1#5	1	-26.85	-49.12	2.03	24.30	0.27
			23155/713.5	H	1#5	3	-27.08	-49.35	2.01	24.28	0.27
	10MHz	QPSK	23060/704	H	4#0	0	-26.59	-49.25	2.04	24.71	0.30
			23095/707.5	H	4#2	3	-26.37	-49.39	2.03	25.06	0.32
			23130/711	H	4#2	7	-26.14	-49.65	2.02	25.53	0.36
		16QAM	23060/704	H	4#0	0	-26.54	-49.00	2.04	24.50	0.28
			23095/707.5	H	4#2	3	-26.40	-49.12	2.03	24.75	0.30
			23130/711	H	4#2	7	-26.19	-49.33	2.02	25.15	0.33

Note: 1. EIRP= E.R.P+2.15

5.3 Occupied Bandwidth

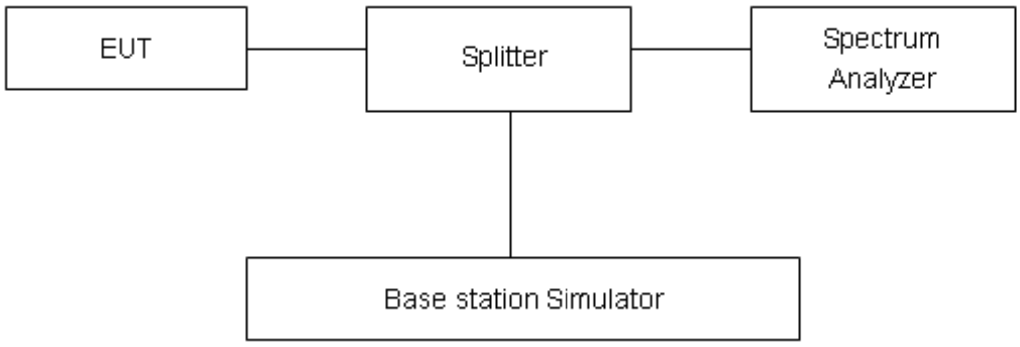
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.
RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 4/12.
99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

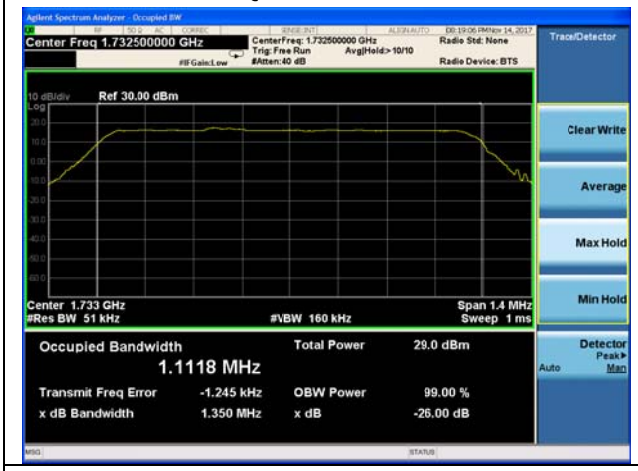
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=624Hz.

Test Result

Mode	Bandwidth	Modulation	Channel/ Frequency (MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
Band 4	1.4MHz	QPSK	20175/1732.5	6#0	0	1.1118	1.350
		16QAM	20175/1732.5	6#0	0	0.9532	1.332
	3MHz	QPSK	20175/1732.5	6#0	0	1.1903	2.014
		16QAM	20175/1732.5	6#0	0	0.9883	1.341
	5MHz	QPSK	20175/1732.5	6#0	0	1.1655	1.953
		16QAM	20175/1732.5	6#0	0	1.1409	2.120
	10MHz	QPSK	20175/1732.5	6#0	0	1.2515	2.351
		16QAM	20175/1732.5	6#0	0	1.1315	1.956
	15MHz	QPSK	20175/1732.5	6#0	0	1.2445	2.164
		16QAM	20175/1732.5	6#0	0	1.1002	1.725
	20MHz	QPSK	20175/1732.5	6#0	0	1.2282	1.994
		16QAM	20175/1732.5	6#0	0	1.1275	1.985

Mode	Bandwidth	Modulation	Channel/ Frequency (MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
Band 12	1.4MHz	QPSK	23095/707.5	6#0	0	1.1107	1.361
		16QAM	23095/707.5	6#0	0	0.9465	1.400
	3MHz	QPSK	23095/707.5	6#0	0	1.1673	1.875
		16QAM	23095/707.5	6#0	0	0.9888	1.345
	5MHz	QPSK	23095/707.5	6#0	0	1.1571	1.757
		16QAM	23095/707.5	6#0	0	0.9997	1.298
	10MHz	QPSK	23095/707.5	6#0	0	1.2091	1.806
		16QAM	23095/707.5	6#0	0	1.0386	1.529

LTE Band 4 QPSK 1.4MHz CH-Middle



LTE Band 4 16QAM 1.4MHz CH-Middle

LTE Band 4 QPSK 3MHz CH-Middle

LTE Band 4 16QAM 3MHz CH-Middle

LTE Band 4 QPSK 5MHz CH-Middle

LTE Band 4 16QAM 5MHz CH-Middle

LTE Band 4 QPSK 10MHz CH-Middle

LTE Band 4 16QAM 10MHz CH-Middle

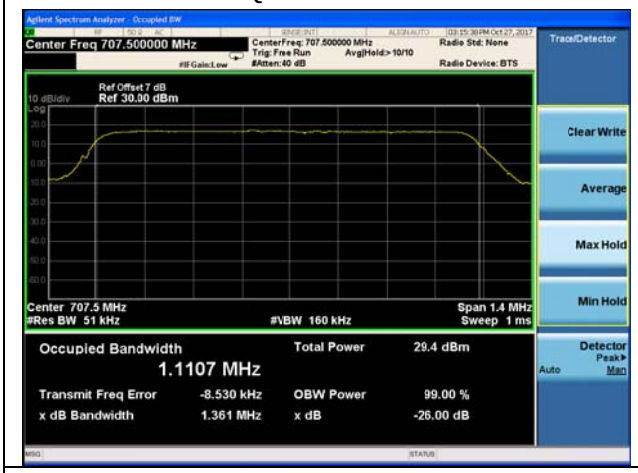
LTE Band 4 QPSK 15MHz CH-Middle

LTE Band 4 16QAM 15MHz CH-Middle

LTE Band 4 QPSK 20MHz CH-Middle

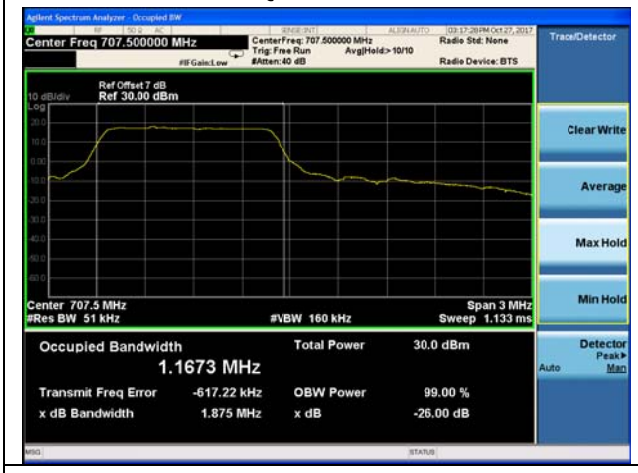
LTE Band 4 16QAM 20MHz CH-Middle

LTE Band 12 QPSK 1.4MHz CH- Middle



LTE Band 12 16QAM 1.4MHz CH- Middle

LTE Band 12 QPSK 3MHz CH- Middle



LTE Band 12 16QAM 3MHz CH- Middle

LTE Band 12 QPSK 5MHz CH- Middle

LTE Band 12 16QAM 5MHz CH- Middle

LTE Band 12 QPSK 10MHz CH- Middle

LTE Band 12 16QAM 10MHz CH- Middle

5.4 Band Edge Compliance

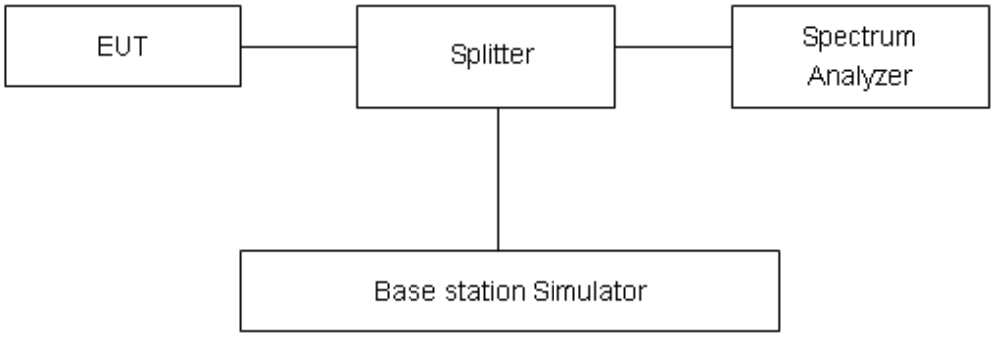
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured.
The testing follows KDB 971168 v02r02 Section 6.0
1.The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured.
3. RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 4/12 on spectrum analyzer.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. Checked that all the results comply with the emission limit line.

Test Setup



Limits

Rule Part 27.53(h)/ specifies that " for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB"
Part 27.53(g) specifies that " For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power(P) within the licensed band(s) of operation, measured in watts, by at least 43+10 log10(P) dB."

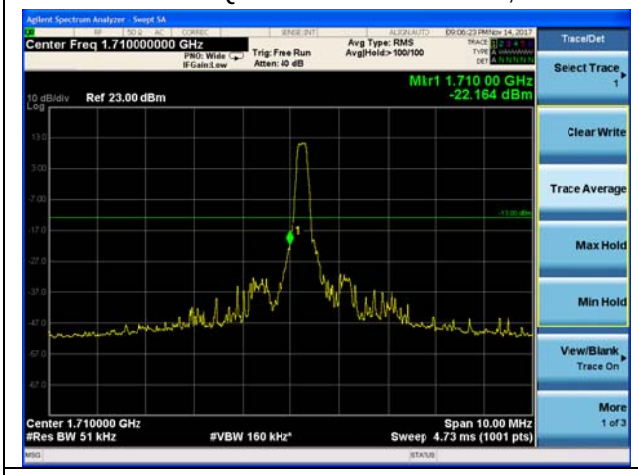
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U=0.684dB.

Test Result

All the test traces in the plots shows the test results clearly.

LTE Band 4 QPSK 1.4MHz CH-Low, 1 RB

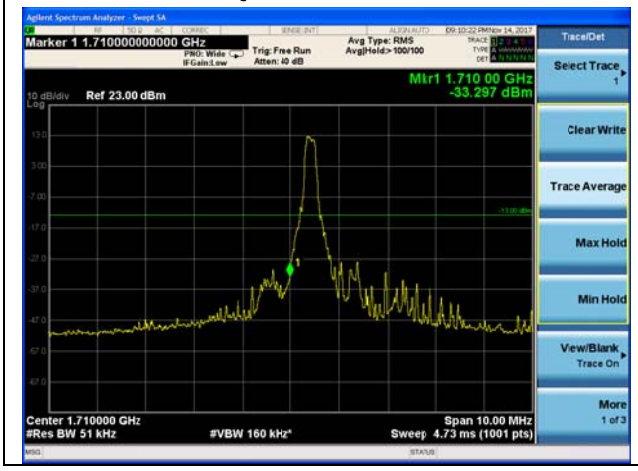


LTE Band 4 QPSK 1.4MHz CH-High, 1 RB

LTE Band 4 QPSK 1.4MHz CH-Low, 6RB

LTE Band 4 QPSK 1.4MHz CH-High, 6RB

LTE Band 4 QPSK 3MHz CH-Low, 1 RB



LTE Band 4 QPSK 3MHz CH-High, 1 RB

LTE Band 4 QPSK 3MHz CH-Low, 6RB

LTE Band 4 QPSK 3MHz CH-High, 6RB

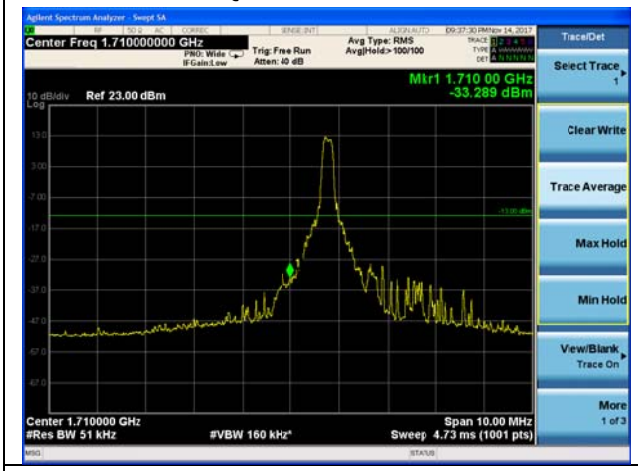
LTE Band 4 QPSK 5MHz CH-Low, 1 RB

LTE Band 4 QPSK 5MHz CH-High, 1 RB

LTE Band 4 QPSK 5MHz CH-Low, 6RB

LTE Band 4 QPSK 5MHz CH-High, 6RB

LTE Band 4 QPSK 10MHz CH-Low, 1 RB

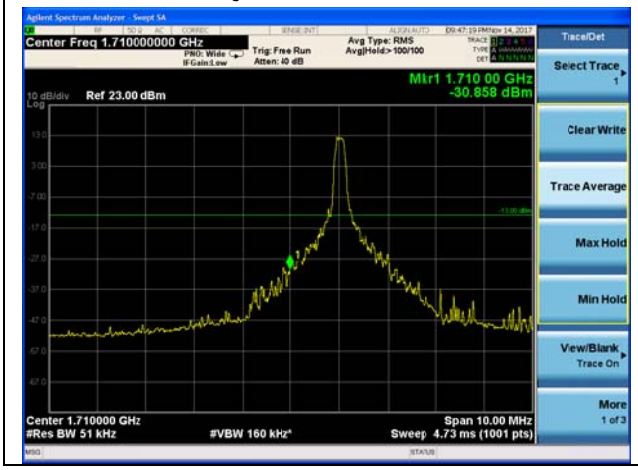


LTE Band 4 QPSK 10MHz CH-High, 1 RB

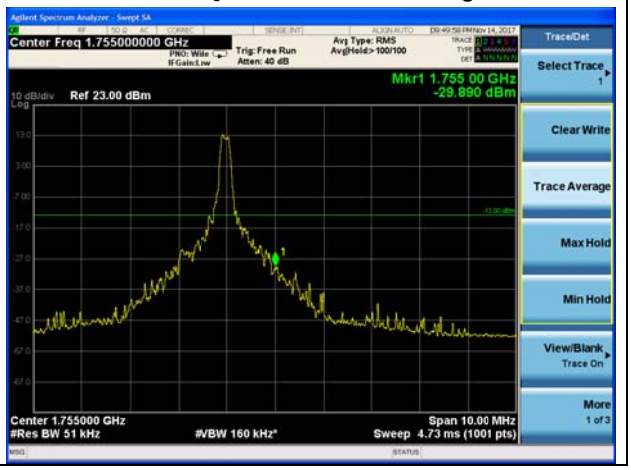
LTE Band 4 QPSK 10MHz CH-Low, 6RB

LTE Band 4 QPSK 10MHz CH-High, 6RB

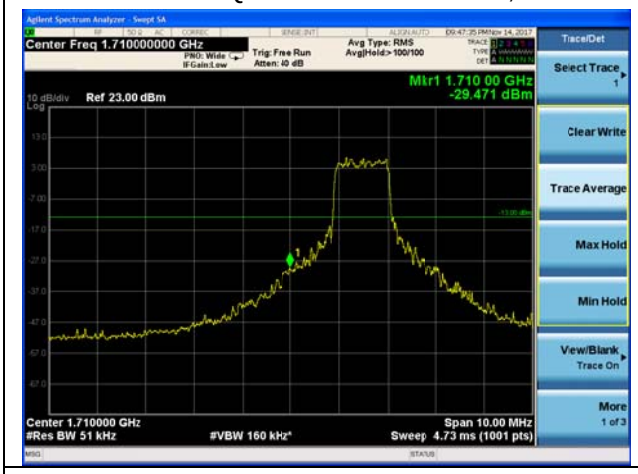
LTE Band 4 QPSK 15MHz CH-Low, 1 RB



LTE Band 4 QPSK 15MHz CH-High, 1 RB

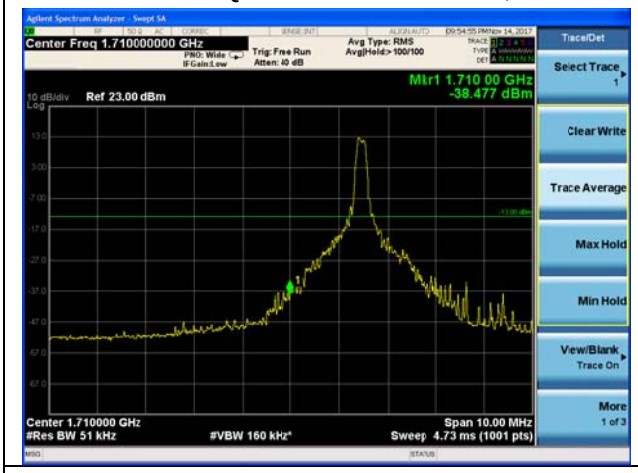


LTE Band 4 QPSK 15MHz CH-Low, 6RB



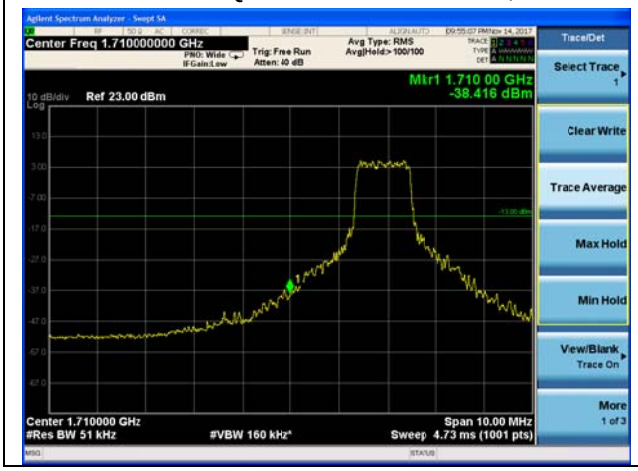
LTE Band 4 QPSK 15MHz CH-High, 6RB

LTE Band 4 QPSK 20MHz CH-Low, 1 RB



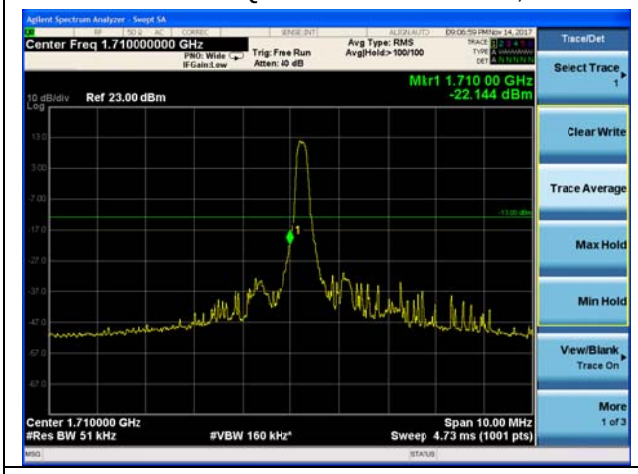
LTE Band 4 QPSK 20MHz CH-High, 1 RB

LTE Band 4 QPSK 20MHz CH-Low, 6RB



LTE Band 4 QPSK 20MHz CH-High, 6RB

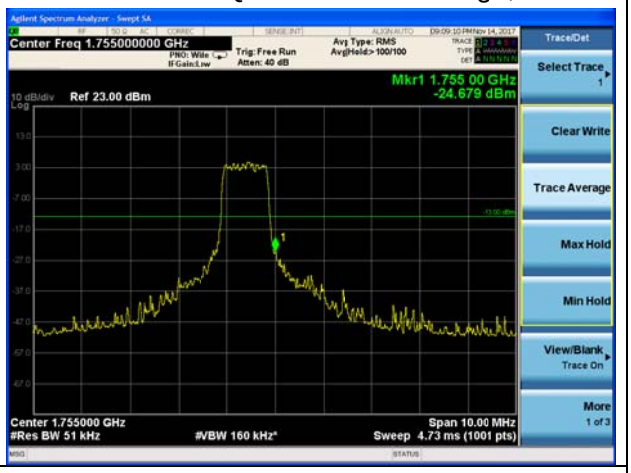
LTE Band 4 16QAM 1.4MHz CH-Low, 1 RB



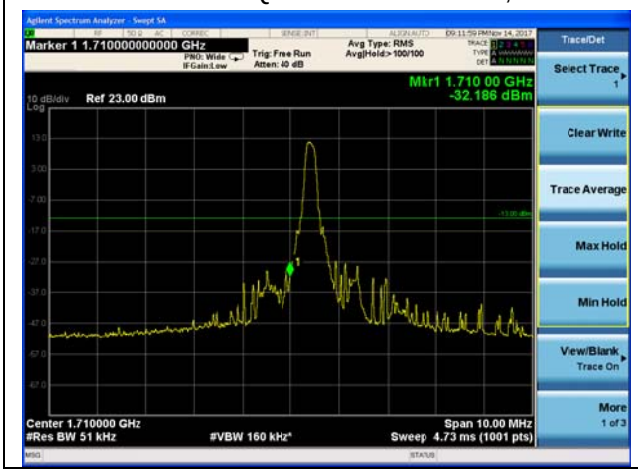
LTE Band 4 16QAM 1.4MHz CH-High, 1 RB

LTE Band 4 16QAM 1.4MHz CH-Low, 6RB

LTE Band 4 16QAM 1.4MHz CH-High, 6RB

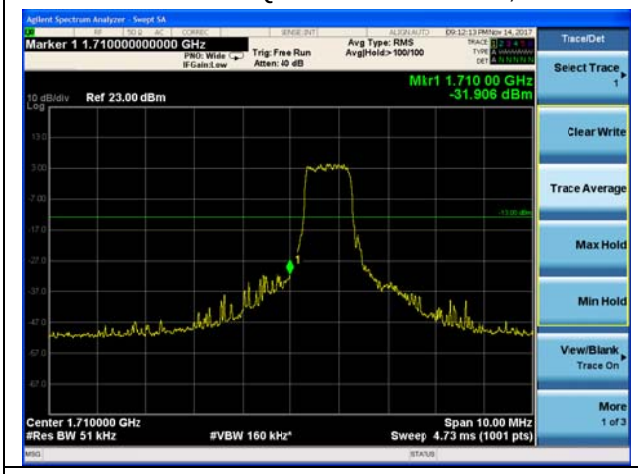


LTE Band 4 16QAM 3MHz CH-Low, 1 RB



LTE Band 4 16QAM 3MHz CH-High, 1 RB

LTE Band 4 16QAM 3MHz CH-Low, 6RB

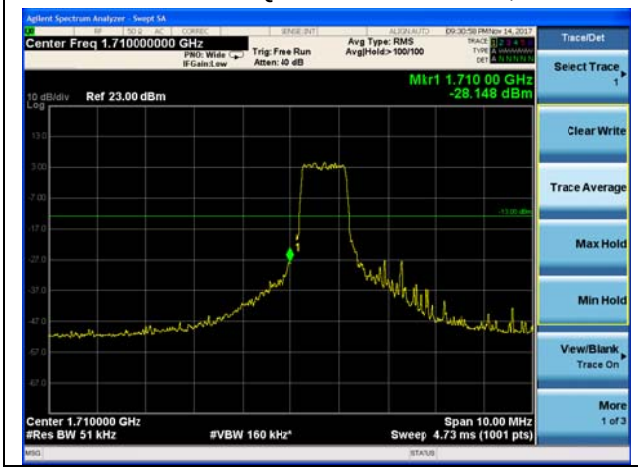


LTE Band 4 16QAM 3MHz CH-High, 6RB

LTE Band 4 16QAM 5MHz CH-Low, 1 RB

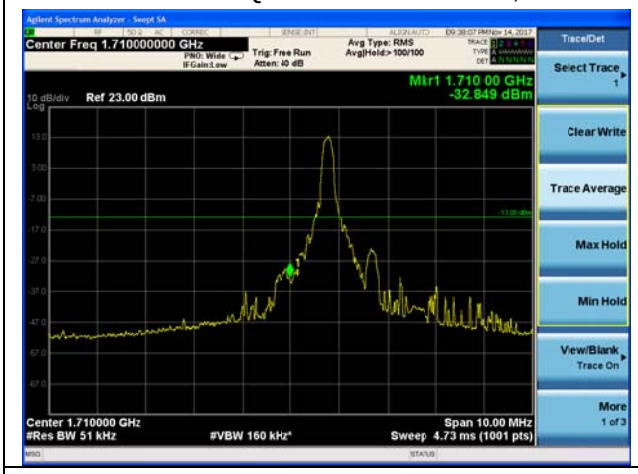
LTE Band 4 16QAM 5MHz CH-High, 1 RB

LTE Band 4 16QAM 5MHz CH-Low, 6RB



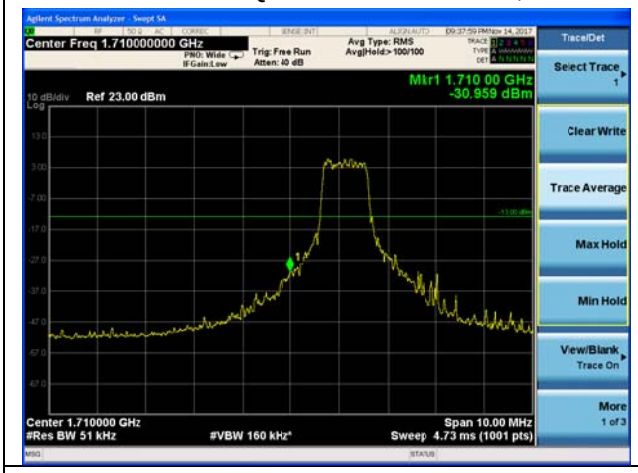
LTE Band 4 16QAM 5MHz CH-High, 6RB

LTE Band 4 16QAM 10MHz CH-Low, 1 RB



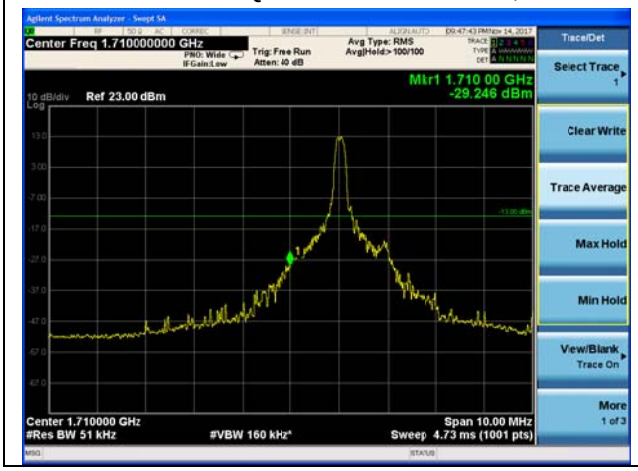
LTE Band 4 16QAM 10MHz CH-High, 1 RB

LTE Band 4 16QAM 10MHz CH-Low, 6RB



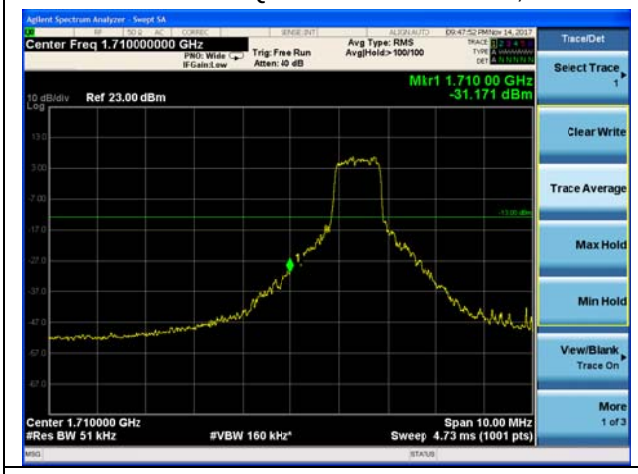
LTE Band 4 16QAM 10MHz CH-High, 6RB

LTE Band 4 16QAM 15MHz CH-Low, 1 RB



LTE Band 4 16QAM 15MHz CH-High, 1 RB

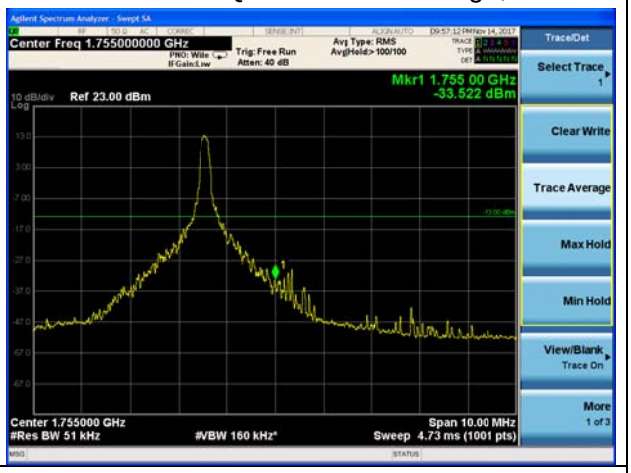
LTE Band 4 16QAM 15MHz CH-Low, 6RB



LTE Band 4 16QAM 15MHz CH-High, 6RB

LTE Band 4 16QAM 20MHz CH-Low, 1 RB

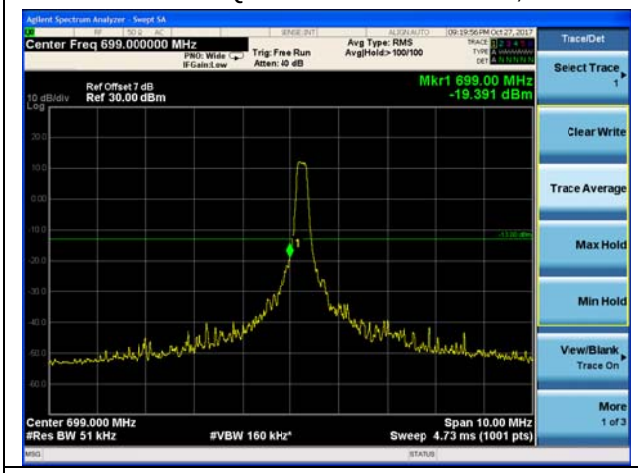
LTE Band 4 16QAM 20MHz CH-High, 1 RB



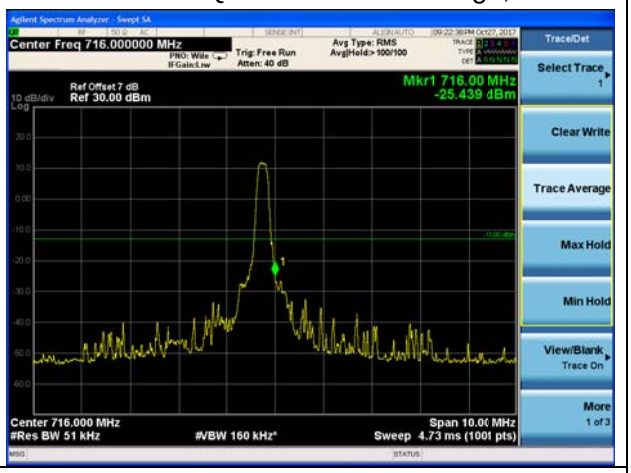
LTE Band 4 16QAM 20MHz CH-Low, 6RB

LTE Band 4 16QAM 20MHz CH-High, 6RB

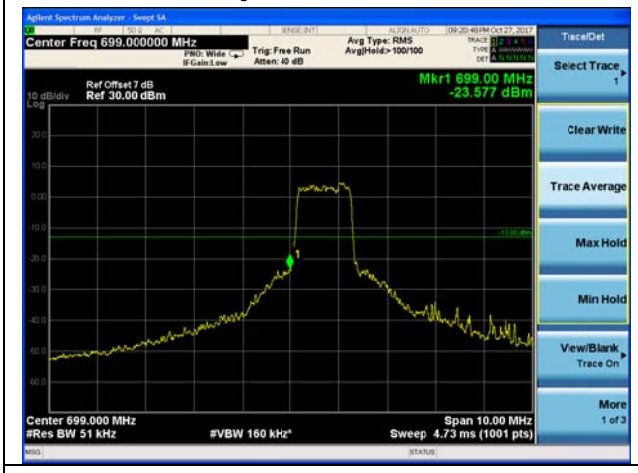
LTE Band 12 QPSK 1.4MHz CH-Low, 1 RB



LTE Band 12 QPSK 1.4MHz CH-High, 1 RB

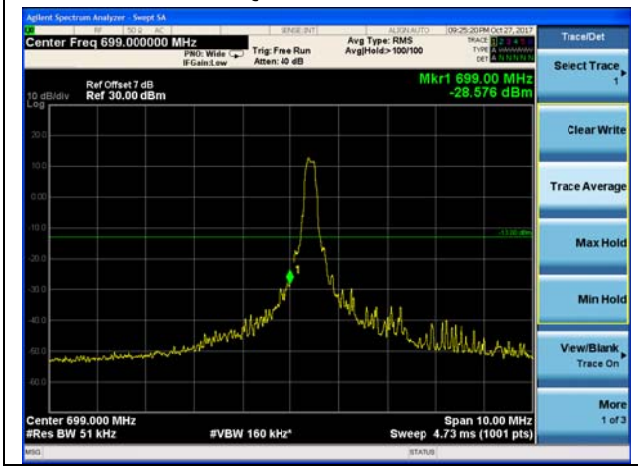


LTE Band 12 QPSK 1.4MHz CH-Low, 6RB

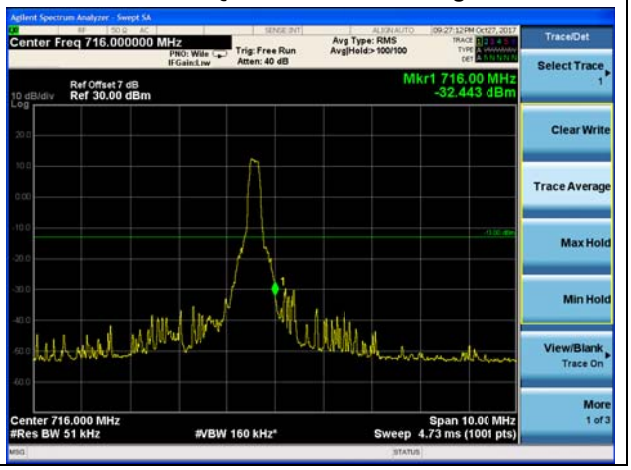


LTE Band 12 QPSK 1.4MHz CH-High, 6RB

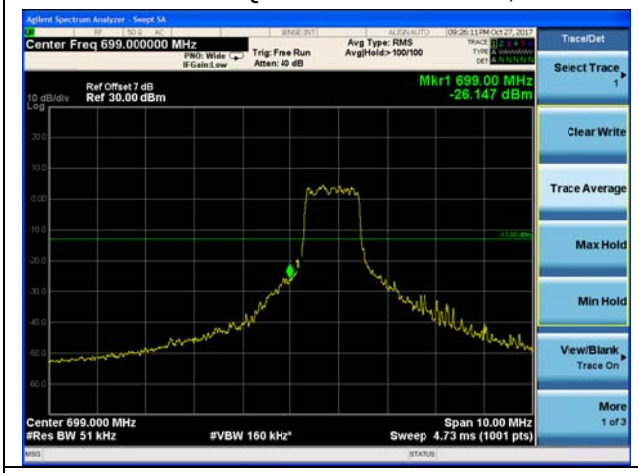
LTE Band 12 QPSK 3MHzCH-Low, 1 RB



LE Band 12 QPSK 3MHz CH-High, 1 RB

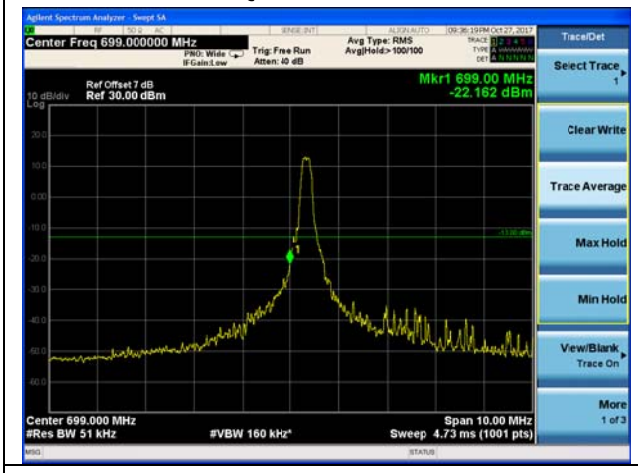


LTE Band 12 QPSK 3MHz CH-Low, 6RB

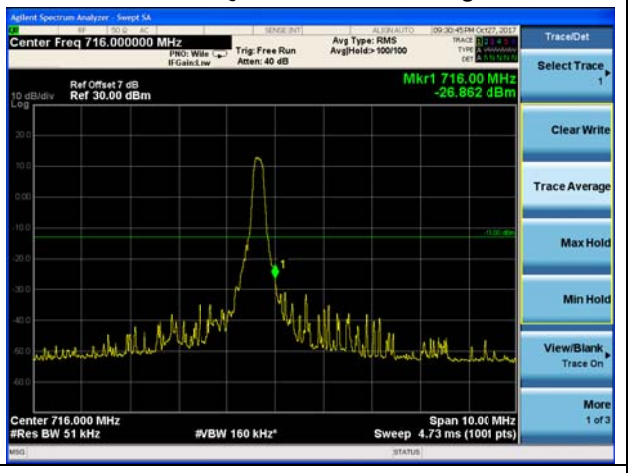


LTE Band 12 QPSK 3MHz CH-High, 6RB

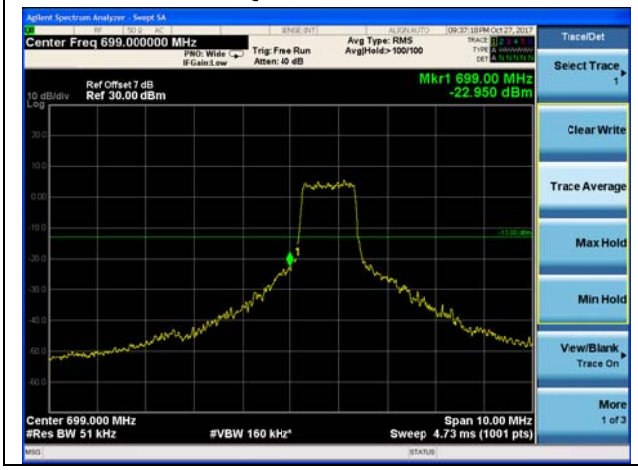
LTE Band 12 QPSK 5MHz CH-Low, 1 RB



LTE Band 12 QPSK 5MHz CH-High, 1 RB

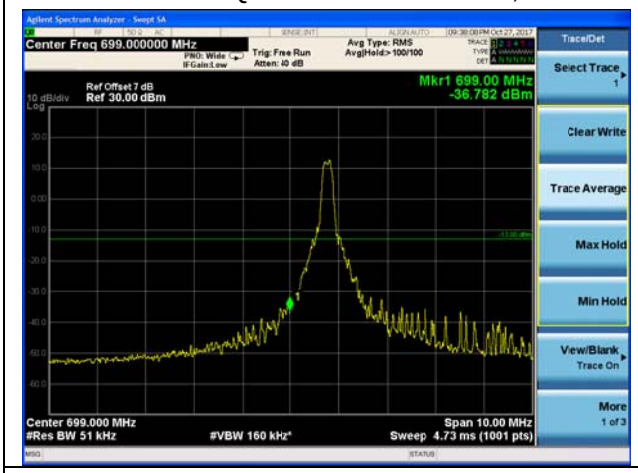


LTE Band 12 QPSK 5MHz CH-Low, 6RB



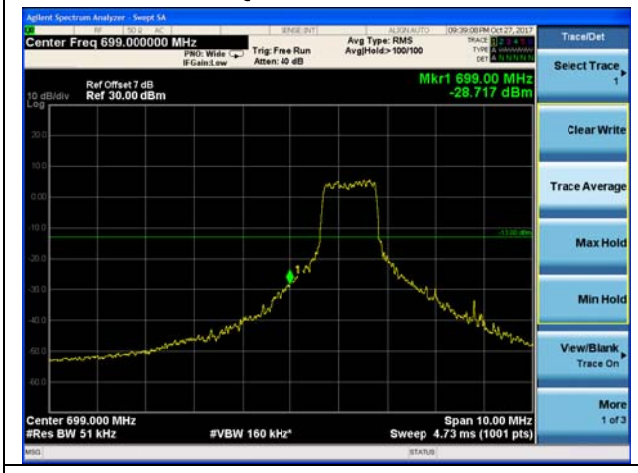
LTE Band 12 QPSK 5MHz CH-High, 6RB

LTE Band 12 QPSK 10MHz CH-Low, 1 RB

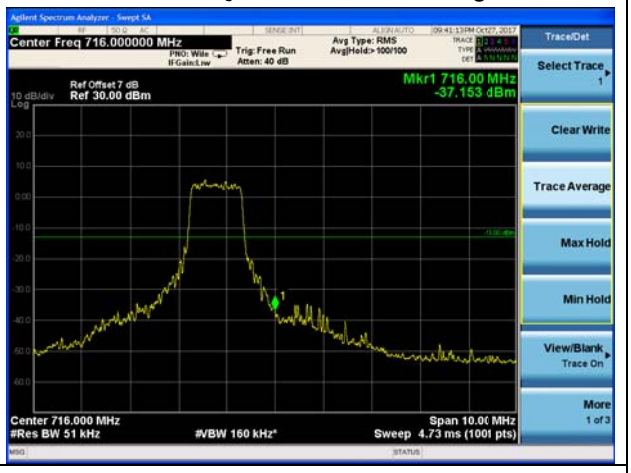


LTE Band 12 QPSK 10MHz CH-High, 1 RB

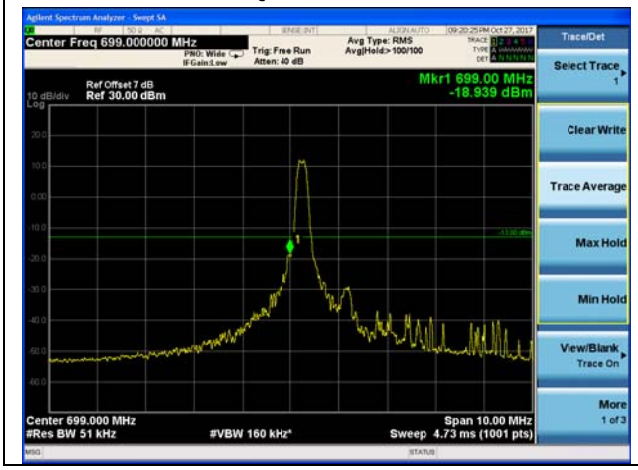
LTE Band 12 QPSK 10MHz CH-Low, 6RB



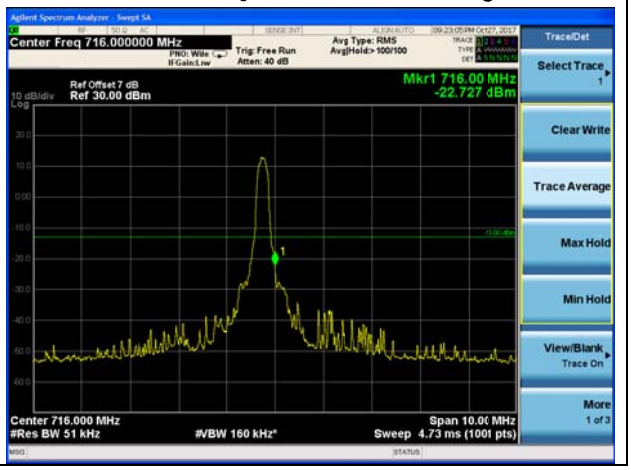
LTE Band 12 QPSK 10MHz CH-High, 6RB



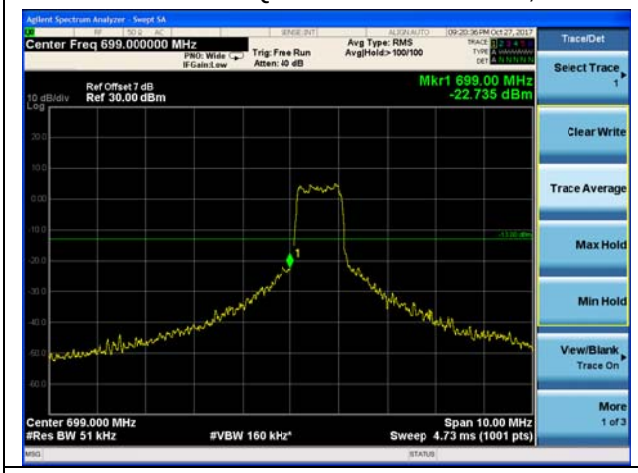
LTE Band 12 16QAM 1.4MHz CH-Low, 1 RB



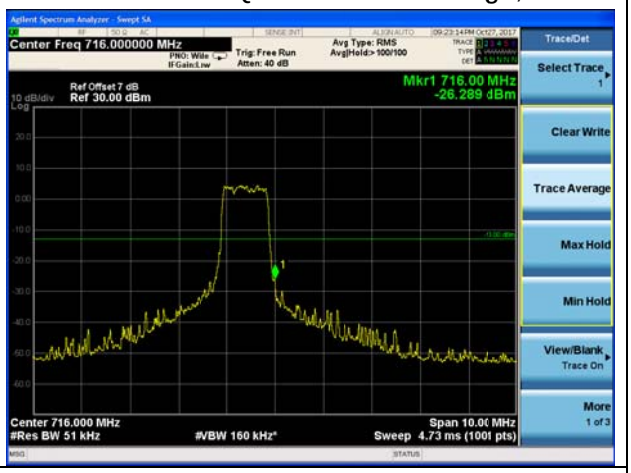
LTE Band 12 16QAM 1.4MHz CH-High, 1 RB



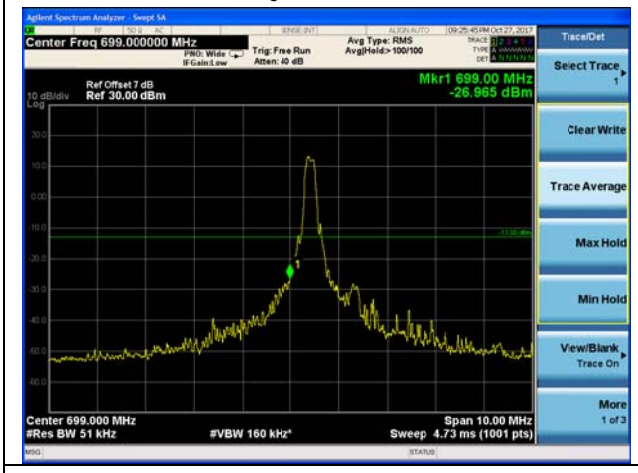
LTE Band 12 16QAM 1.4MHz CH-Low, 6RB



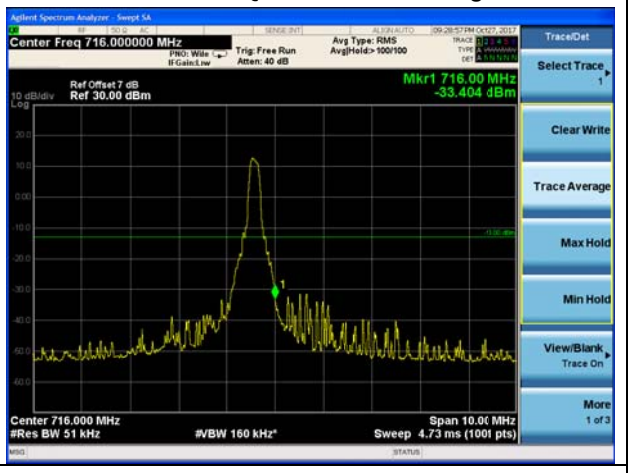
LTE Band 12 16QAM 1.4MHz CH-High, 6RB



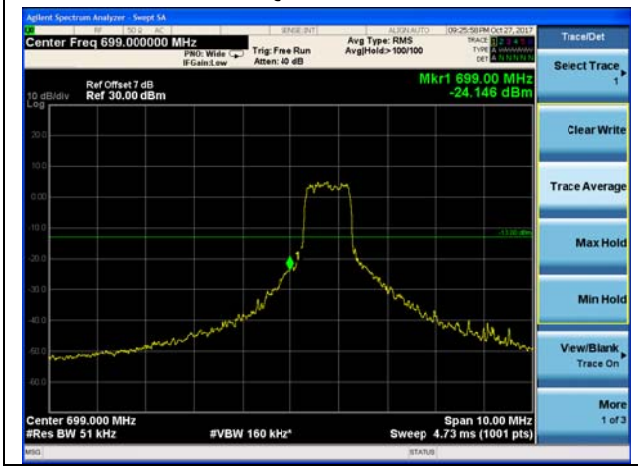
LTE Band 12 16QAM 3MHz CH-Low, 1 RB



LTE Band 12 16QAM 3MHz CH-High, 1 RB

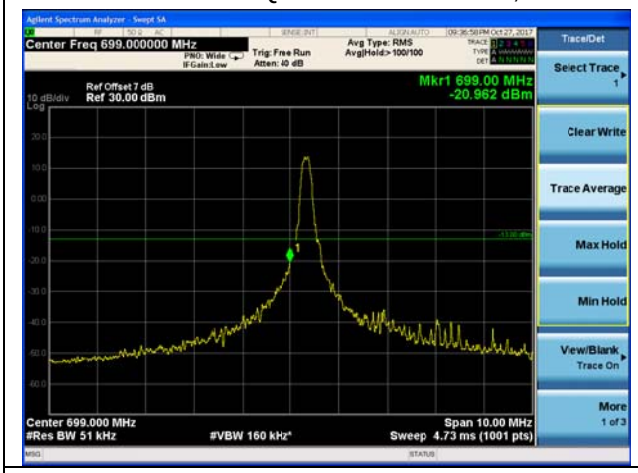


LTE Band 12 16QAM 3MHz CH-Low, 6RB

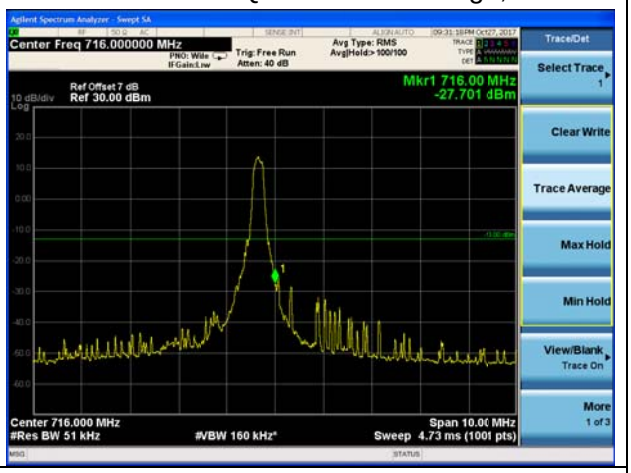


LTE Band 12 16QAM 3MHz CH-High, 6RB

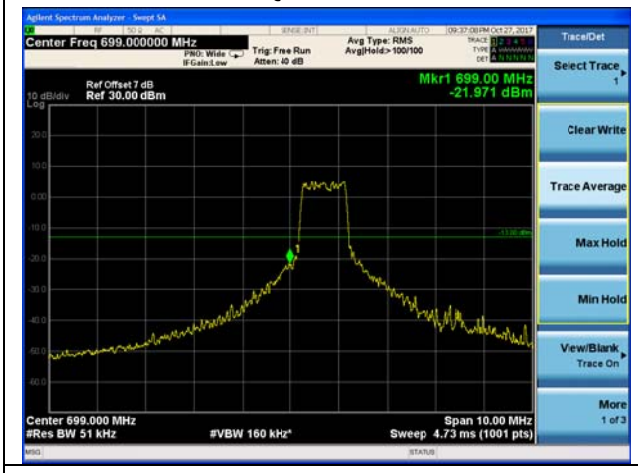
LTE Band 12 16QAM 5MHz CH-Low, 1 RB



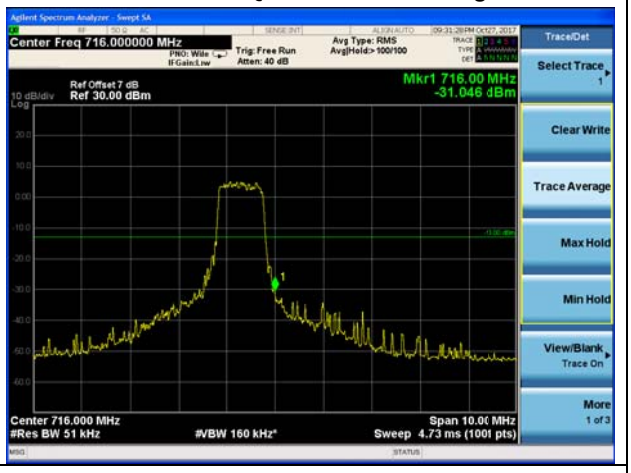
LTE Band 12 16QAM 5MHz CH-High, 1 RB



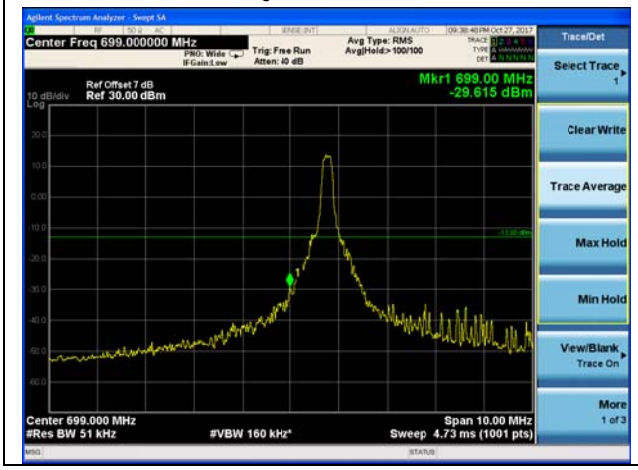
LTE Band 12 16QAM 5MHz CH-Low, 6RB



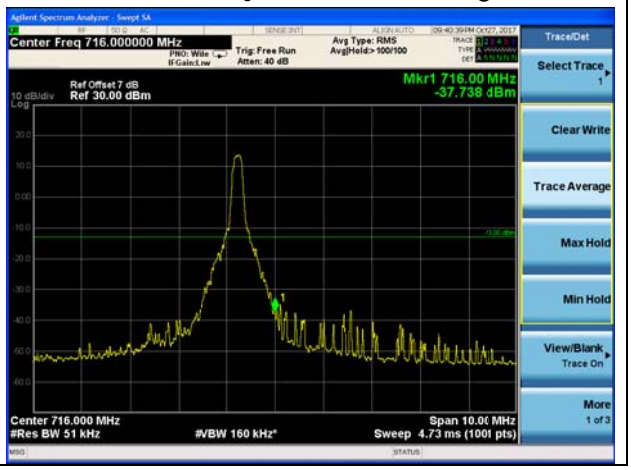
LTE Band 12 16QAM 5MHz CH-High, 6RB

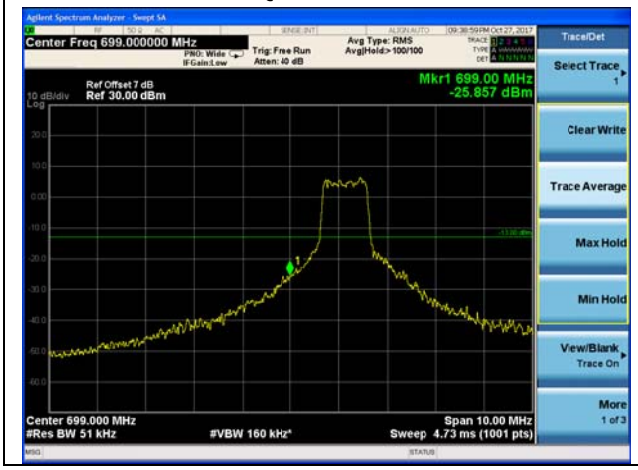


LTE Band 12 16QAM 10MHz CH-Low, 1 RB



LTE Band 12 16QAM 10MHz CH-High, 1 RB



LTE Band 12 16QAM 10MHz CH-Low, 6RB	LTE Band 12 16QAM 10MHz CH-High, 6RB
	

5.5 Peak-to-Average Power Ratio (PAPR)

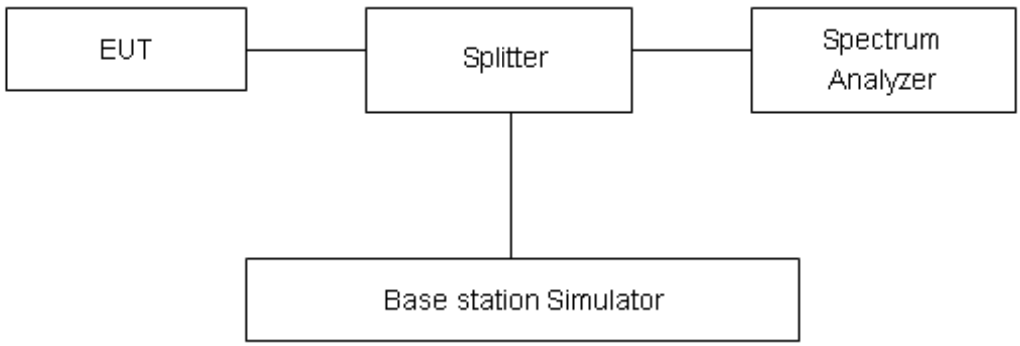
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (*e.g.*, dBm). Determine the PAPR from:
PAPR (dB) = PPk (dBm) - PAvg (dBm).

Test Setup



Limits

Rule Part 27.50(d)(5) Equipment employed must be authorized in accordance with the provisions of 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. 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.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for thenormal distribution is with the coverage factor k = 2, U= 0.4 dB.

Test Results

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
Band 4	1.4MHz	QPSK	20175/1732.5	31.76	22.31	9.45
		16QAM	20175/1732.5	31.93	21.96	9.97
	3MHz	QPSK	20175/1732.5	29.83	22.33	7.50
		16QAM	20175/1732.5	32.49	21.89	10.60
	5MHz	QPSK	20175/1732.5	31.62	22.54	9.08
		16QAM	20175/1732.5	32.70	22.64	10.06
	10MHz	QPSK	20175/1732.5	31.32	22.26	9.06
		16QAM	20175/1732.5	32.23	22.55	9.68
	15MHz	QPSK	20175/1732.5	32.55	22.25	10.30
		16QAM	20175/1732.5	32.18	22.62	9.56
	20MHz	QPSK	20175/1732.5	31.27	22.09	9.18
		16QAM	20175/1732.5	32.62	22.55	10.07

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
Band 12	1.4MHz	QPSK	23095/707.5	32.32	22.25	10.07
		16QAM	23095/707.5	32.61	21.95	10.66
	3MHz	QPSK	23095/707.5	32.38	22.15	10.23
		16QAM	23095/707.5	32.23	21.77	10.46
	5MHz	QPSK	23095/707.5	31.68	22.05	9.63
		16QAM	23095/707.5	33.65	22.85	10.80
	10MHz	QPSK	23095/707.5	31.33	22.21	9.12
		16QAM	23095/707.5	33.11	22.96	10.15

5.6 Frequency Stability

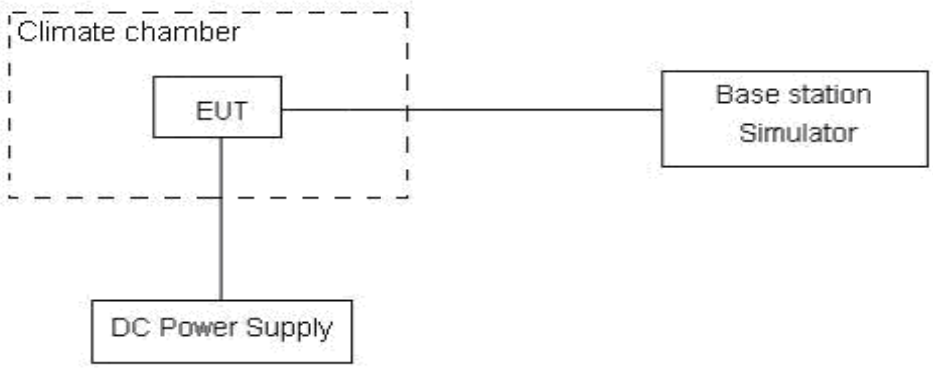
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. Frequency Stability (Temperature Variation)
   The temperature inside the climate chamber is varied from -40°C to +85°C in 10°C step size.
   (1)With all power removed, the temperature was decreased to -10°C and permitted to stabilize for three hours.
   (2)Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.
   (3) Repeat the above measurements at 10°C increments from -40°C to +85°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.
2. Frequency Stability (Voltage Variation)
   The frequency stability shall be measured with variation of primary supply voltage as follows:
   (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
   (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.
   This transceiver is specified to operate with an input voltage of between 3.4 V and 4.2 V, with a nominal voltage of 3.8V.

Test setup



Limits

No specific frequency stability requirements in part 27.54

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor k = 3,U=0.01ppm.

Test Result

Mode	Bandwidth	Channel/ Frequency (MHz)	Test status	Frequency Stability (ppm)	
				QPSK	16QAM
Band4	1.4MHz	20175/1732.5	-40°C/Normal Voltage	0.00169	-0.01229
		20175/1732.5	-30°C/Normal Voltage	0.00351	-0.00735
		20175/1732.5	-20°C/Normal Voltage	0.00017	-0.01443
		20175/1732.5	-10°C/Normal Voltage	0.00241	-0.00417
		20175/1732.5	0°C/Normal Voltage	0.00245	-0.01399
		20175/1732.5	10°C/Normal Voltage	0.00073	-0.01180
		20175/1732.5	20°C/Normal Voltage	0.00162	-0.00532
		20175/1732.5	30°C/Normal Voltage	0.00700	-0.01106
		20175/1732.5	40°C/Normal Voltage	0.00231	-0.00361
		20175/1732.5	50°C/Normal Voltage	0.00343	-0.01526
		20175/1732.5	60°C/Normal Voltage	0.00228	-0.00554
		20175/1732.5	70°C/Normal Voltage	0.00151	-0.01001
		20175/1732.5	80°C/Normal Voltage	0.00283	-0.01116
		20175/1732.5	85°C/Normal Voltage	0.00289	-0.00596
		20175/1732.5	20°C/Minimum Voltage	0.00209	-0.00450
		20175/1732.5	20°C/Maximum Voltage	0.00245	-0.00634
	3MHz	20175/1732.5	-40°C/Normal Voltage	0.00402	-0.01067
		20175/1732.5	-30°C/Normal Voltage	0.00584	-0.00573
		20175/1732.5	-20°C/Normal Voltage	0.00251	-0.01281
		20175/1732.5	-10°C/Normal Voltage	0.00474	-0.00255
		20175/1732.5	0°C/Normal Voltage	0.00478	-0.01238
		20175/1732.5	10°C/Normal Voltage	0.00306	-0.01018
		20175/1732.5	20°C/Normal Voltage	0.00395	-0.00370
		20175/1732.5	30°C/Normal Voltage	0.00933	-0.00944
		20175/1732.5	40°C/Normal Voltage	0.00464	-0.00199
		20175/1732.5	50°C/Normal Voltage	0.00576	-0.01365
		20175/1732.5	60°C/Normal Voltage	0.00306	-0.00588
		20175/1732.5	70°C/Normal Voltage	0.00442	-0.01017
		20175/1732.5	80°C/Normal Voltage	0.00481	-0.00498
		20175/1732.5	85°C/Normal Voltage	0.00520	-0.00368
		20175/1732.5	20°C/Minimum Voltage	0.00442	-0.00288
		20175/1732.5	20°C/Maximum Voltage	0.00478	-0.00472
	5MHz	20175/1732.5	-40°C/Normal Voltage	0.00075	-0.00900
		20175/1732.5	-30°C/Normal Voltage	0.00257	-0.00406
		20175/1732.5	-20°C/Normal Voltage	-0.00077	-0.01115
		20175/1732.5	-10°C/Normal Voltage	0.00147	-0.00088
		20175/1732.5	0°C/Normal Voltage	0.00151	-0.01071
		20175/1732.5	10°C/Normal Voltage	-0.00021	-0.00851
		20175/1732.5	20°C/Normal Voltage	0.00068	-0.00203
		20175/1732.5	30°C/Normal Voltage	0.00605	-0.00777