RF TEST REPORT

Applicant	Quectel Wireless Solutions Co., Ltd.
FCC ID	XMR201707BG96
Product	Quectel BG96
Brand	Quectel
Model	BG96
Report No.	RXA1706-0199RF03R1
Issue Date	July 12, 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.

Jiangpeng Lan

Performed by: Jiangpeng Lan

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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(b)(10) /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) /27.53(f)	PASS
8	Radiates Spurious Emission	2.1053 /27.53(h) /27.53(g) /27.53(f)	PASS
Date of Testing: June 24, 2017~ July 3, 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.			

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1 Test Laboratory

1.1 Notes of the Test Report

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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 (recognition number is 428261)

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.

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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
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2 General Description of Equipment under Test

Client Information

Applicant	Quectel Wireless Solutions Co., Ltd.
Applicant address	7th Floor, Hongye Building, No. 1801 Hongmei Road, Xuhui District, Shanghai, China
Manufacturer	Quectel Wireless Solutions Co., Ltd.
Manufacturer address	7th Floor, Hongye Building, No. 1801 Hongmei Road, Xuhui District, Shanghai, China

General information

EUT Description			
Model:	BG96		
Hardware Version:	R1.0		
Software Version:	BG96MAR02A02M1G		
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 (Dipole Antenna)		
Test Mode(s):	LTE Band 4; LTE Band 12, LTE Band 13;		
Test Modulation	QPSK 16QAM;		
LTE Category	M1		
Maximum E.I.R.P./ E.R.P.	LTE Band 4: 29.98dBm LTE Band 12: 27.92dBm LTE Band 13: 27.70dBm		
Rated Power Supply Voltage:	3.8V		
Extreme Voltage:	Minimum: 3.3V Maximum: 4.3V		
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
	LTE Band 13	777 ~ 787	746 ~ 756
Note：1. The information of the EUT is declared by the manufacturer.			

Accessory equipment	
Evaluation Board	RF Cable
RS232-to-USB Cable	Antenna: Dipole Antenna
Headset	USB Cable

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2.1 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 C63.26 (2015)

KDB 971168 D01 Power Meas License Digital Systems v02r02

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3 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT lie-down stand-up position (X, Y axis)，lie-down position (Z axis),. Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, vertical 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 4/12/13:

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	O	O
	LTE 13	-	-	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	O	O
	LTE 13	-	-	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	-	-	O	O	O	O
	LTE 13	-	-	O	O	-	-	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	O	-	O
	LTE 13	-	-	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	O	O
	LTE 13	-	-	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	-	-	O	-	O	-
	LTE 13	-	-	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	O	O
	LTE 13	-	-	O	O	-	-	O	-	O	-	-	O	O	O

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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	O	O
	LTE 13	-	-	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.														

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4 Test Information

4.1 RF Power Output

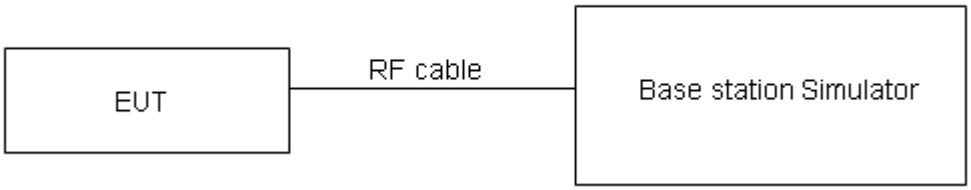
Ambient condition

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.

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Test Results

LTE TDD Band 4				AV Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19957/1710.7	20175/1732.5	20393/1754.3
1.4MHz	QPSK	1	0	22.38	22.31	22.37
		1	3	22.39	22.17	22.33
		1	5	22.28	22.27	22.36
		3	0	22.24	22.16	22.31
		3	2	22.23	22.11	22.30
		3	3	22.36	22.13	22.35
		6	0	22.13	22.09	22.23
	16QAM	1	0	21.94	22.02	22.13
		1	3	22.15	22.01	22.16
		1	5	22.16	21.93	22.35
		3	0	22.08	21.84	21.94
		3	2	22.07	21.92	21.94
		3	3	22.08	21.88	21.96
		5	0	22.06	22.03	22.21
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19965/1711.5	20175/1732.5	20385/1753.5
3MHz	QPSK	1	0	22.40	22.35	22.40
		1	3	22.42	22.22	22.37
		1	5	22.31	22.32	22.40
		3	0	22.24	22.18	22.34
		3	2	22.25	22.11	22.32
		3	3	22.36	22.14	22.35
		6	0	22.16	22.13	22.26
	16QAM	1	0	21.97	22.04	22.16
		1	3	22.18	22.06	22.20
		1	5	22.18	21.97	22.38
		3	0	22.09	21.87	21.96
		3	2	22.08	21.95	21.96
		3	3	22.08	21.90	21.99
		5	0	22.09	22.07	22.24
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19975/1712.5	20175/1732.5	20375/1752.5
5MHz	QPSK	1	0	22.37	22.33	22.36
		1	3	22.40	22.18	22.34
		1	5	22.28	22.27	22.36
		3	0	22.21	22.13	22.30
		3	2	22.23	22.07	22.27
		3	3	22.34	22.12	22.31
		6	0	22.14	22.12	22.24

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	16QAM	1	0	21.94	22.00	22.13
		1	3	22.15	22.04	22.17
		1	5	22.15	21.95	22.34
		3	0	22.07	21.83	21.93
		3	2	22.05	21.90	21.92
		3	3	22.05	21.85	21.95
		5	0	22.07	22.03	22.19
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20000/1715	20175/1732.5	20350/1750
10MHz	QPSK	1	0	22.39	22.34	22.39
		1	3	22.43	22.23	22.38
		1	5	22.30	22.31	22.39
		3	0	22.24	22.18	22.34
		3	2	22.26	22.12	22.31
		3	3	22.36	22.16	22.36
		6	0	22.22	22.14	22.28
	16QAM	1	0	21.96	22.03	22.15
		1	3	22.18	22.08	22.20
		1	5	22.18	21.97	22.37
		3	0	22.10	21.88	21.97
		3	2	22.07	21.94	21.95
		3	3	22.08	21.90	21.99
		5	0	22.10	22.08	22.23
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20025/1717.5	20175/1732.5	20325/1747.5
15MHz	QPSK	1	0	22.38	22.30	22.37
		1	3	22.41	22.22	22.35
		1	5	22.27	22.26	22.35
		3	0	22.22	22.14	22.31
		3	2	22.23	22.07	22.27
		3	3	22.33	22.13	22.32
		6	0	22.20	22.10	22.23
	16QAM	1	0	21.91	22.01	22.13
		1	3	22.16	22.05	22.18
		1	5	22.15	21.93	22.34
		3	0	22.07	21.86	21.94
		3	2	22.04	21.89	21.91
		3	3	22.06	21.86	21.96
		5	0	22.07	22.03	22.19
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20050/1720	20175/1732.5	20300/1745
20MHz	QPSK	1	0	22.35	22.26	22.34
		1	3	22.40	22.18	22.33

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		1	5	22.25	22.25	22.32
		3	0	22.19	22.09	22.27
		3	2	22.21	22.03	22.24
		3	3	22.30	22.08	22.28
		6	0	22.17	22.05	22.19
	16QAM	1	0	21.89	21.97	22.08
		1	3	22.12	22.03	22.14
		1	5	22.13	21.90	22.32
		3	0	22.04	21.82	21.91
		3	2	22.01	21.87	21.88
		3	3	22.03	21.81	21.92
		5	0	22.05	21.99	22.16
Note:1) The following testing in worst case based on the maximum RF Output Power.						

LTE FDD Band 12				AV Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23017/699.7	23095/707.5	23173/715.3
1.4MHz	QPSK	1	0	22.74	23.12	23.37
		1	3	22.80	23.24	23.23
		1	5	22.87	23.32	23.13
		3	0	23.00	23.17	23.07
		3	2	22.91	23.26	23.18
		3	3	22.96	23.22	23.13
		6	0	22.48	22.66	22.64
	16QAM	1	0	23.23	22.81	23.02
		1	3	23.64	23.16	23.17
		1	5	23.60	23.17	22.93
		3	0	23.38	22.81	22.76
		3	2	23.33	22.75	22.81
		3	3	23.35	22.74	22.83
		5	0	22.71	22.90	22.79
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23025/700.5	23095/707.5	23165/714.5
3MHz	QPSK	1	0	22.76	23.13	23.40
		1	3	22.83	23.29	23.27
		1	5	22.89	23.36	23.16
		3	0	23.03	23.22	23.11
		3	2	22.94	23.31	23.22
		3	3	22.98	23.26	23.18
		6	0	22.56	22.68	22.68
	16QAM	1	0	23.25	22.84	23.04
		1	3	23.67	23.20	23.20
		1	5	23.63	23.19	22.96

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		3	0	23.41	22.86	22.80
		3	2	23.35	22.79	22.84
		3	3	23.38	22.79	22.87
		5	0	22.74	22.95	22.83
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23035/701.5	23095/707.5	23155/713.5
5MHz	QPSK	1	0	22.75	23.09	23.38
		1	3	22.81	23.28	23.24
		1	5	22.86	23.31	23.12
		3	0	23.01	23.18	23.08
		3	2	22.91	23.26	23.18
		3	3	22.95	23.23	23.14
		6	0	22.54	22.64	22.63
	16QAM	1	0	23.20	22.82	23.02
		1	3	23.65	23.17	23.18
		1	5	23.60	23.15	22.93
		3	0	23.38	22.84	22.77
		3	2	23.32	22.74	22.80
		3	3	23.36	22.75	22.84
		5	0	22.71	22.90	22.79
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23060/704	23095/707.5	23130/711
10MHz	QPSK	1	0	22.72	23.05	23.35
		1	3	22.80	23.24	23.22
		1	5	22.84	23.30	23.09
		3	0	22.98	23.13	23.04
		3	2	22.89	23.22	23.15
		3	3	22.92	23.18	23.10
		6	0	22.51	22.59	22.59
	16QAM	1	0	23.18	22.78	22.97
		1	3	23.61	23.15	23.14
		1	5	23.58	23.12	22.91
		3	0	23.35	22.80	22.74
		3	2	23.29	22.72	22.77
		3	3	23.33	22.70	22.80
		5	0	22.69	22.86	22.76

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LTE FDD Band 13				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23205/779.5	23230/782	23255/784.5
5MHz	QPSK	1	0	23.10	23.32	23.11
		1	3	23.11	23.35	23.00
		1	5	23.07	23.40	23.05
		3	0	22.85	22.77	22.75
		3	2	22.79	22.71	22.76
		3	3	22.76	22.69	22.72
		6	0	22.80	22.68	22.67
	16QAM	1	0	23.81	23.14	23.72
		1	3	23.71	23.13	23.91
		1	5	23.86	23.00	23.87
		3	0	22.78	22.31	22.87
		3	2	22.81	22.44	22.92
		3	3	22.90	22.57	22.89
		5	0	21.84	22.19	21.93
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				/	23230/782	/
10MHz	QPSK	1	0	/	23.07	/
		1	3	/	23.13	/
		1	5	/	23.00	/
		3	0	/	23.16	/
		3	2	/	23.19	/
		3	3	/	23.20	/
		6	0	/	22.77	/
	16QAM	1	0	/	23.70	/
		1	3	/	23.79	/
		1	5	/	23.34	/
		3	0	/	23.32	/
		3	2	/	23.35	/
		3	3	/	23.38	/
		5	0	/	22.95	/

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4.2 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 ANSI C63.26 (2015) Section 5.5.2.3.
2. Above 30MHz：The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:
Power(EIRP)=PMea- PAg - Pcl + Ga
The measurement results are amend as described below:
Power(EIRP)=PMea- Pcl + Ga
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

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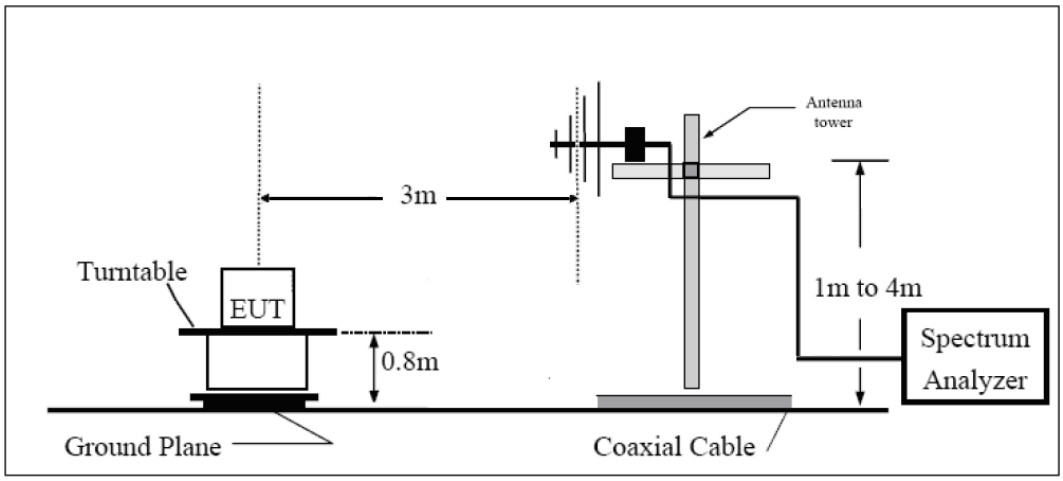
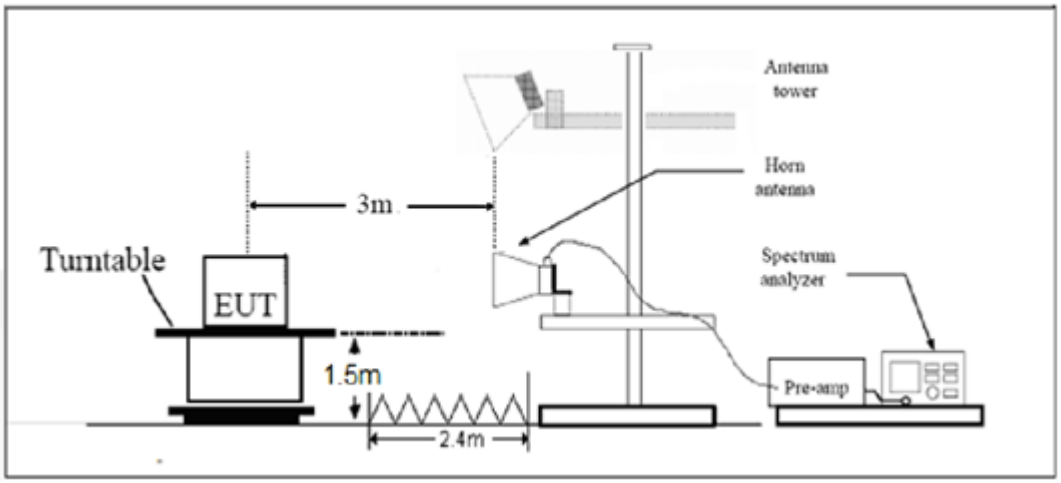
Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

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Limits

Rule Part 27.50(b) (10) specifies that “Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP”

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(b)(10)Limit (ERP)	⩽ 3 W (34.77 dBm)
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

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Test Results

LTE Band 4								
Bandwidth	Frequency (MHz)	Ant Pot (H/V)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	Conclusion
1.4MHz (QPSK)	1710.7	H	-26.70	-54.30	0.00	1.44	29.04	Pass
	1732.5	H	-26.63	-54.32	0.00	1.57	29.25	Pass
	1754.3	H	-26.30	-54.10	0.00	1.72	29.52	Pass
	1710.7	V	-28.67	-54.35	0.00	1.44	27.12	Pass
	1732.5	V	-29.08	-54.41	0.00	1.57	26.90	Pass
	1754.3	V	-29.95	-54.52	0.00	1.72	26.29	Pass
1.4MHz (16QAM)	1710.7	H	-26.02	-54.30	0.00	1.44	29.72	Pass
	1732.5	H	-25.94	-54.32	0.00	1.57	29.94	Pass
	1754.3	H	-26.61	-54.10	0.00	1.72	29.21	Pass
	1710.7	V	-28.98	-54.35	0.00	1.44	26.81	Pass
	1732.5	V	-29.38	-54.41	0.00	1.57	26.60	Pass
	1754.3	V	-30.25	-54.52	0.00	1.72	25.99	Pass
3MHz (QPSK)	1711.5	H	-26.52	-54.33	0.00	1.44	29.25	Pass
	1732.5	H	-25.90	-54.32	0.00	1.57	29.98	Pass
	1753.5	H	-26.51	-54.11	0.00	1.72	29.32	Pass
	1711.5	V	-28.89	-54.35	0.00	1.44	26.90	Pass
	1732.5	V	-29.30	-54.41	0.00	1.57	26.68	Pass
	1753.5	V	-29.82	-54.48	0.00	1.72	26.38	Pass
3MHz (16QAM)	1711.5	H	-25.82	-54.33	0.00	1.44	29.95	Pass
	1732.5	H	-26.22	-54.32	0.00	1.57	29.66	Pass
	1753.5	H	-26.82	-54.11	0.00	1.72	29.01	Pass
	1711.5	V	-29.19	-54.35	0.00	1.44	26.60	Pass
	1732.5	V	-29.63	-54.41	0.00	1.57	26.35	Pass
	1753.5	V	-30.15	-54.48	0.00	1.72	26.05	Pass
5MHz (QPSK)	1712.5	H	-26.05	-54.34	0.00	1.44	29.73	Pass
	1732.5	H	-26.70	-54.32	0.00	1.57	29.18	Pass
	1752.5	H	-26.55	-54.13	0.00	1.72	29.29	Pass
	1712.5	V	-29.08	-54.38	0.00	1.44	26.74	Pass
	1732.5	V	-29.47	-54.41	0.00	1.57	26.51	Pass
	1752.5	V	-29.74	-54.47	0.00	1.72	26.45	Pass
5MHz (16QAM)	1712.5	H	-26.37	-54.34	0.00	1.44	29.41	Pass
	1732.5	H	-26.33	-54.32	0.00	1.57	29.55	Pass
	1752.5	H	-26.84	-54.13	0.00	1.72	29.00	Pass
	1712.5	V	-29.40	-54.38	0.00	1.44	26.42	Pass
	1732.5	V	-29.77	-54.41	0.00	1.57	26.21	Pass
	1752.5	V	-30.04	-54.47	0.00	1.72	26.15	Pass
10MHz (QPSK)	1715	H	-26.72	-54.33	0.00	1.44	29.05	Pass
	1732.5	H	-26.64	-54.32	0.00	1.57	29.24	Pass
	1750	H	-26.31	-54.12	0.00	1.66	29.47	Pass

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	1715	V	-29.72	-54.32	0.00	1.44	26.04	Pass
	1732.5	V	-30.17	-54.41	0.00	1.57	25.81	Pass
	1750	V	-30.45	-54.52	0.00	1.66	25.73	Pass
10MHz (16QAM)	1715	H	-27.07	-54.33	0.00	1.44	28.70	Pass
	1732.5	H	-26.96	-54.32	0.00	1.57	28.92	Pass
	1750	H	-26.63	-54.12	0.00	1.66	29.15	Pass
	1715	V	-30.04	-54.32	0.00	1.44	25.72	Pass
	1732.5	V	-30.48	-54.41	0.00	1.57	25.50	Pass
	1750	V	-30.77	-54.52	0.00	1.66	25.41	Pass
15MHz (QPSK)	1717.5	H	-28.55	-54.35	0.00	1.49	27.28	Pass
	1732.5	H	-28.08	-54.32	0.00	1.57	27.80	Pass
	1747.5	H	-27.90	-54.17	0.00	1.66	27.93	Pass
	1717.5	V	-28.97	-54.39	0.00	1.49	26.91	Pass
	1732.5	V	-29.69	-54.41	0.00	1.57	26.29	Pass
	1747.5	V	-29.66	-54.51	0.00	1.66	26.51	Pass
15MHz (16QAM)	1717.5	H	-28.86	-54.35	0.00	1.49	26.97	Pass
	1732.5	H	-28.38	-54.32	0.00	1.57	27.50	Pass
	1747.5	H	-28.21	-54.17	0.00	1.66	27.62	Pass
	1717.5	V	-29.28	-54.39	0.00	1.49	26.60	Pass
	1732.5	V	-30.00	-54.41	0.00	1.57	25.98	Pass
	1747.5	V	-29.97	-54.51	0.00	1.66	26.20	Pass
20MHz (QPSK)	1720	H	-29.21	-54.37	0.00	1.49	26.65	Pass
	1732.5	H	-28.93	-54.32	0.00	1.57	26.95	Pass
	1745	H	-29.80	-54.23	0.00	1.63	26.06	Pass
	1720	V	-30.22	-54.44	0.00	1.49	25.71	Pass
	1732.5	V	-30.37	-54.41	0.00	1.57	25.61	Pass
	1745	V	-30.72	-54.59	0.00	1.63	25.50	Pass
20MHz (16QAM)	1720	H	-29.54	-54.37	0.00	1.49	26.32	Pass
	1732.5	H	-29.25	-54.32	0.00	1.57	26.63	Pass
	1745	H	-30.11	-54.23	0.00	1.63	25.75	Pass
	1720	V	-30.53	-54.44	0.00	1.49	25.40	Pass
	1732.5	V	-30.69	-54.41	0.00	1.57	25.29	Pass
	1745	V	-31.02	-54.59	0.00	1.63	25.20	Pass

LTE Band 12								
andwidth	**Frequency (MHz)**	**Ant Pot (H/V)**	**Rt (dBm)**	**Rs (dBm)**	**Ps (dBm)**	**Gs (dBi)**	**ERP (dBm)**	**Conclusion**
1.4MHz (QPSK)	699.7	H	-25.65	-49.12	0.00	2.04	25.51	Pass
	707.5	H	-25.33	-49.39	0.00	2.03	26.10	Pass
	715.3	H	-23.83	-49.76	0.00	1.99	27.92	Pass
	699.7	V	-23.87	-48.91	0.00	2.04	27.09	Pass
	707.5	V	-23.44	-49.12	0.00	2.03	27.71	Pass

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	715.3	V	-23.74	-49.43	0.00	1.99	27.69	Pass
1.4MHz (16QAM)	699.7	H	-25.98	-49.12	0.00	2.04	25.18	Pass
	707.5	H	-25.63	-49.39	0.00	2.03	25.80	Pass
	715.3	H	-24.15	-49.76	0.00	1.99	27.60	Pass
	699.7	V	-24.18	-48.91	0.00	2.04	26.78	Pass
	707.5	V	-23.75	-49.12	0.00	2.03	27.40	Pass
	715.3	V	-24.08	-49.43	0.00	1.99	27.35	Pass
3MHz (QPSK)	700.5	H	-25.69	-49.15	0.00	2.04	25.50	Pass
	707.5	H	-24.64	-49.39	0.00	2.03	26.79	Pass
	714.5	H	-23.94	-49.73	0.00	2.00	27.79	Pass
	700.5	V	-23.15	-48.94	0.00	2.04	27.83	Pass
	707.5	V	-23.44	-49.12	0.00	2.03	27.71	Pass
	714.5	V	-23.70	-49.37	0.00	2.00	27.67	Pass
3MHz (16QAM)	700.5	H	-26.02	-49.15	0.00	2.04	25.17	Pass
	707.5	H	-24.98	-49.39	0.00	2.03	26.45	Pass
	714.5	H	-24.26	-49.73	0.00	2.00	27.47	Pass
	700.5	V	-23.48	-48.94	0.00	2.04	27.50	Pass
	707.5	V	-23.74	-49.12	0.00	2.03	27.41	Pass
	714.5	V	-24.01	-49.37	0.00	2.00	27.36	Pass
5MHz (QPSK)	701.5	H	-25.86	-49.17	0.00	2.04	25.36	Pass
	707.5	H	-25.11	-49.39	0.00	2.03	26.32	Pass
	713.5	H	-24.42	-49.72	0.00	2.01	27.30	Pass
	701.5	V	-23.32	-48.95	0.00	2.04	27.67	Pass
	707.5	V	-23.73	-49.12	0.00	2.03	27.42	Pass
	713.5	V	-23.96	-49.35	0.00	2.01	27.40	Pass
5MHz (16QAM)	701.5	H	-26.15	-49.17	0.00	2.04	25.07	Pass
	707.5	H	-25.43	-49.39	0.00	2.03	26.00	Pass
	713.5	H	-24.74	-49.72	0.00	2.01	26.98	Pass
	701.5	V	-23.64	-48.95	0.00	2.04	27.35	Pass
	707.5	V	-24.05	-49.12	0.00	2.03	27.10	Pass
	713.5	V	-24.28	-49.35	0.00	2.01	27.08	Pass
10MHz (QPSK)	704	H	-26.59	-49.25	0.00	2.04	24.70	Pass
	707.5	H	-25.99	-49.39	0.00	2.03	25.44	Pass
	711	H	-25.70	-49.65	0.00	2.02	25.97	Pass
	704	V	-24.14	-49.00	0.00	2.04	26.90	Pass
	707.5	V	-24.12	-49.12	0.00	2.03	27.03	Pass
	711	V	-24.67	-49.33	0.00	2.02	26.67	Pass
10MHz (16QAM)	704	H	-26.89	-49.25	0.00	2.04	24.40	Pass
	707.5	H	-26.33	-49.39	0.00	2.03	25.10	Pass
	711	H	-26.01	-49.65	0.00	2.02	25.66	Pass
	704	V	-24.44	-49.00	0.00	2.04	26.60	Pass
	707.5	V	-24.43	-49.12	0.00	2.03	26.72	Pass
	711	V	-24.98	-49.33	0.00	2.02	26.36	Pass

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LTE Band 13								
Bandwidth	Frequency (MHz)	Ant Pot (H/V)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	ERP (dBm)	Conclusion
5MHz (QPSK)	779.5	H	-24.21	-49.85	0.00	2.06	27.70	Pass
	782	H	-24.78	-50.19	0.00	2.05	27.47	Pass
	784.5	H	-24.99	-50.45	0.00	2.04	27.50	Pass
	779.5	V	-26.41	-49.80	0.00	2.06	25.45	Pass
	782	V	-27.01	-49.92	0.00	2.05	24.96	Pass
	784.5	V	-27.01	-50.13	0.00	2.04	25.15	Pass
5MHz (16QAM)	779.5	H	-24.72	-50.05	0.00	2.06	27.39	Pass
	782	H	-25.09	-50.19	0.00	2.05	27.16	Pass
	784.5	H	-25.32	-50.45	0.00	2.04	27.17	Pass
	779.5	V	-26.71	-49.80	0.00	2.06	25.15	Pass
	782	V	-27.31	-49.92	0.00	2.05	24.66	Pass
	784.5	V	-27.31	-50.13	0.00	2.04	24.85	Pass
10MHz (QPSK)	782	H	-25.97	-50.75	0.00	2.07	26.86	Pass
	782	V	-27.79	-50.10	0.00	2.02	24.33	Pass
10MHz (16QAM)	782	H	-25.71	-50.22	0.00	2.04	26.55	Pass
	782	V	-28.50	-50.43	0.00	2.07	24.00	Pass

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

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4.3 Occupied Bandwidth

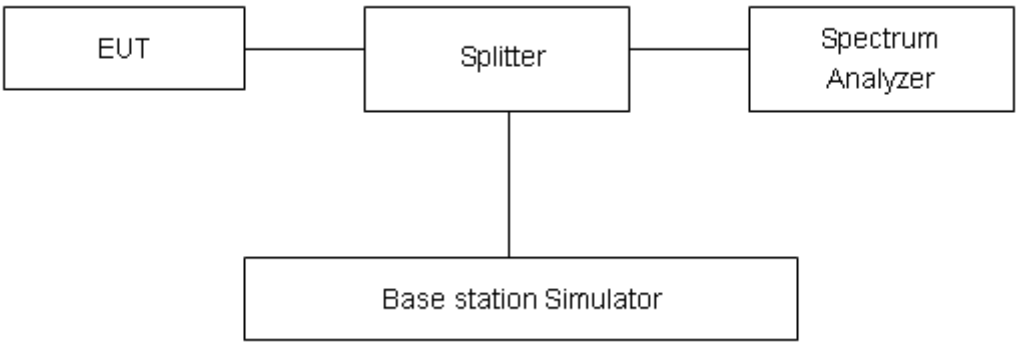
Ambient condition

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 4/12/13 .
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.

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Test Result

LTE Band 4						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	19957	1710.7	1.108	1.329
			20175	1732.5	1.118	1.345
			20393	1754.3	1.111	1.366
		3	19965	1711.5	1.150	1.643
			20175	1732.5	1.150	1.655
			20385	1753.5	1.135	1.471
		5	19975	1712.5	1.151	1.499
			20175	1732.5	1.130	1.472
			20375	1752.5	1.154	2.015
		10	20000	1715	1.179	1.769
			20175	1732.5	1.184	1.796
			20350	1750	1.188	1.932
		15	20025	1717.5	1.194	1.915
			20175	1732.5	1.196	1.894
			20325	1747.5	1.194	1.935
		20	20050	1720	1.192	1.816
			20175	1732.5	1.208	1.782
			20300	1745	1.207	1.806
	16QAM	1.4	19957	1710.7	0.948	1.312
			20175	1732.5	0.939	1.215
			20393	1754.3	0.937	1.206
		3	19965	1711.5	0.974	1.322
			20175	1732.5	0.981	1.337
			20385	1753.5	0.981	1.313
		5	19975	1712.5	0.983	1.357
			20175	1732.5	1.016	1.496
			20375	1752.5	0.996	1.410
		10	20000	1715	1.014	1.550
			20175	1732.5	1.066	1.795
			20350	1750	1.050	1.707
		15	20025	1717.5	1.088	2.074
			20175	1732.5	1.058	1.889
			20325	1747.5	1.066	1.900
		20	20050	1720	1.081	1.945
			20175	1732.5	1.113	1.862
			20300	1745	1.098	1.880

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LTE Band 12						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	23017	699.7	1.105	1.317
			23095	707.5	1.108	1.332
			23173	715.3	1.108	1.322
		3	23025	700.5	1.152	1.653
			23095	707.5	1.153	1.660
			23165	714.5	1.151	1.549
		5	23035	701.5	1.143	1.875
			23095	707.5	1.145	1.506
			23155	713.5	1.127	1.496
		10	23060	704	1.190	1.756
			23095	707.5	1.205	1.738
			23130	711	1.178	1.893
	16QAM	1.4	23017	699.7	0.950	1.191
			23095	707.5	0.939	1.195
			23173	715.3	0.948	1.203
		3	23025	700.5	0.983	1.331
			23095	707.5	0.985	1.343
			23165	714.5	0.971	1.348
		5	23035	701.5	0.991	1.376
			23095	707.5	0.976	1.423
			23155	713.5	1.004	1.494
		10	23060	704	1.029	1.528
			23095	707.5	1.084	1.731
			23130	711	1.072	1.762

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LTE Band 13						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(kHz)	-26dBc Bandwidth(kHz)
100%	QPSK	5	23205	779.5	1.144	1.828
			23230	782	1.149	1.481
			23255	784.5	1.123	1.482
		10	23230	782	1.191	1.731
			23230	782	1.178	1.721
			23230	782	1.193	1.722
	16QAM	5	23205	779.5	0.990	1.438
			23230	782	0.977	1.356
			23255	784.5	1.005	1.497
		10	23230	782	1.035	1.504
			23230	782	1.033	1.537
			23230	782	1.051	1.613

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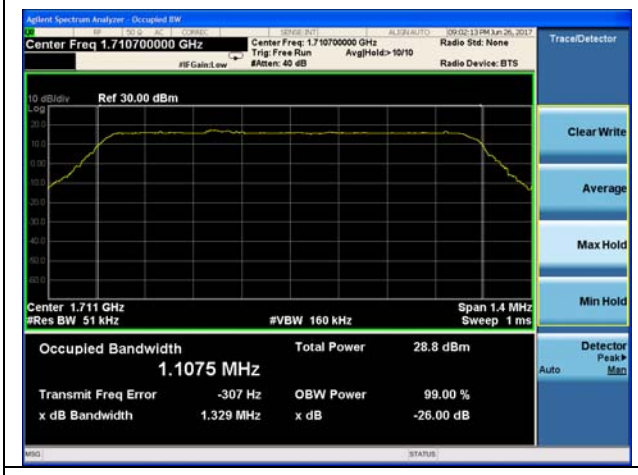
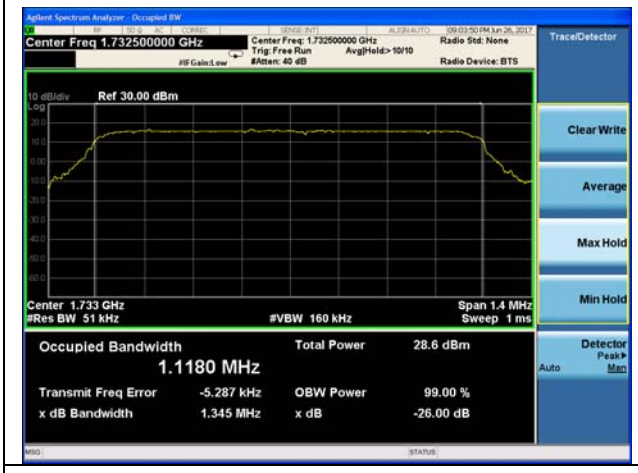
LTE Band 4 QPSK 1.4MHz CH-Low



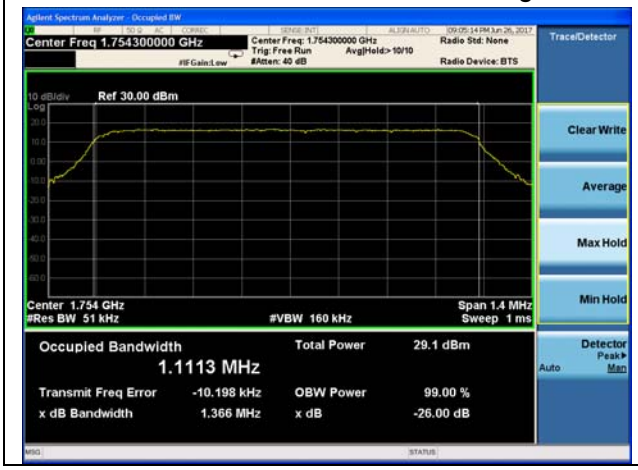
LTE Band 4 QPSK 3MHz CH-Low

LTE Band 4 QPSK 1.4MHz CH-Middle



LTE Band 4 QPSK 3MHz CH-Middle

LTE Band 4 QPSK 1.4MHz CH-High



LTE Band 4 QPSK 3MHz CH-High

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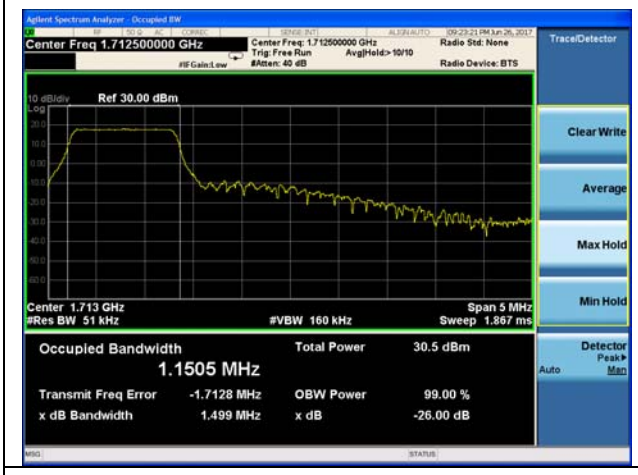
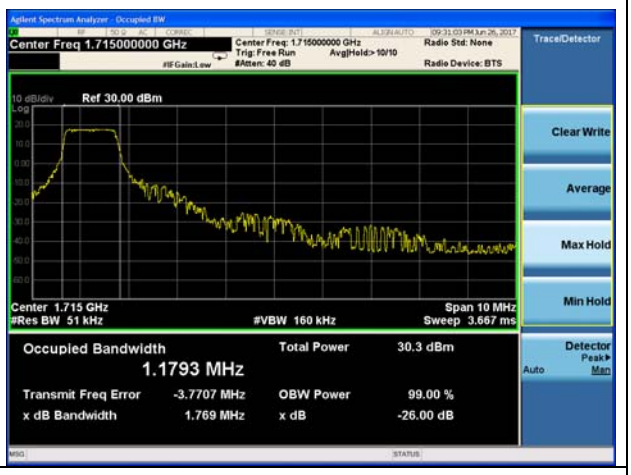
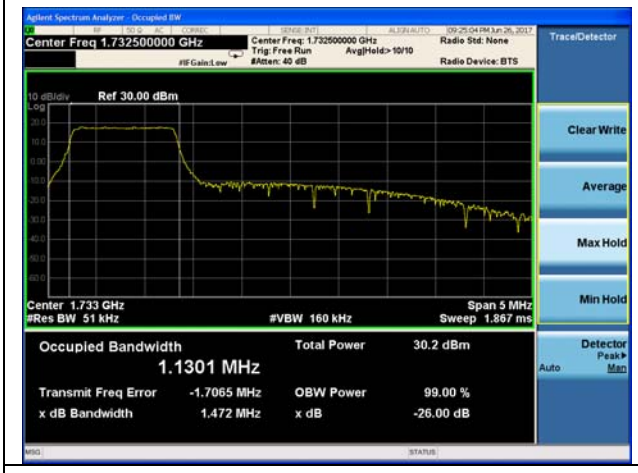
LTE Band 4 QPSK 5MHz CH-Low



LTE Band 4 QPSK 10MHz CH-Low



LTE Band 4 QPSK 5MHz CH-Middle



LTE Band 4 QPSK 10MHz CH-Middle

LTE Band 4 QPSK 5MHz CH-High

LTE Band 4 QPSK 10MHz CH-High

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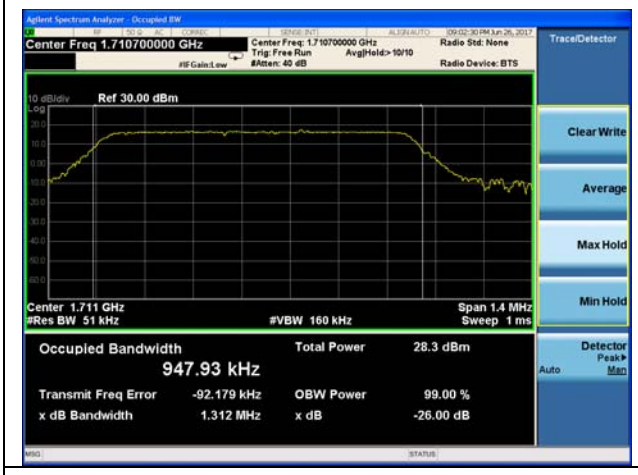
LTE Band 4 16QAM 1.4MHz CH-Low



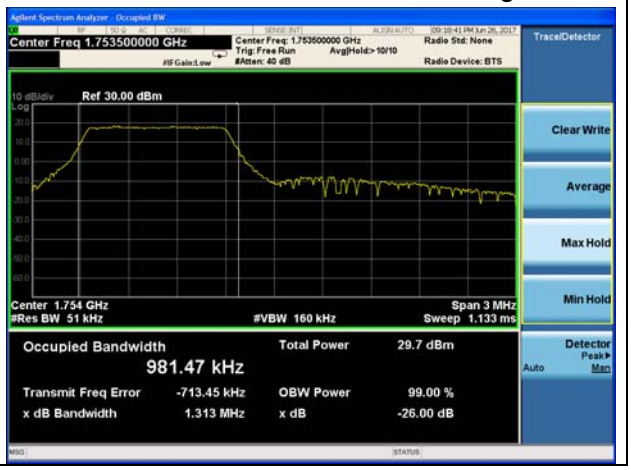
LTE Band 4 16QAM 3MHz CH-Low

LTE Band 4 16QAM 1.4MHz CH-Middle

LTE Band 4 16QAM 3MHz CH-Middle

LTE Band 4 16QAM 1.4MHz CH-High

LTE Band 4 16QAM 3MHz CH-High



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LTE Band 4 16QAM 5MHz CH-Low

LTE Band 4 16QAM 10MHz CH-Low

LTE Band 4 16QAM 5MHz CH-Middle

LTE Band 4 16QAM 10MHz CH-Middle

LTE Band 4 16QAM 5MHz CH-High

LTE Band 4 16QAM 10MHz CH-High

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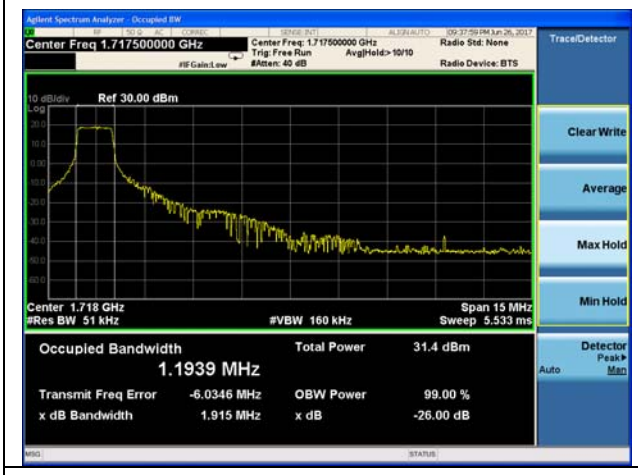
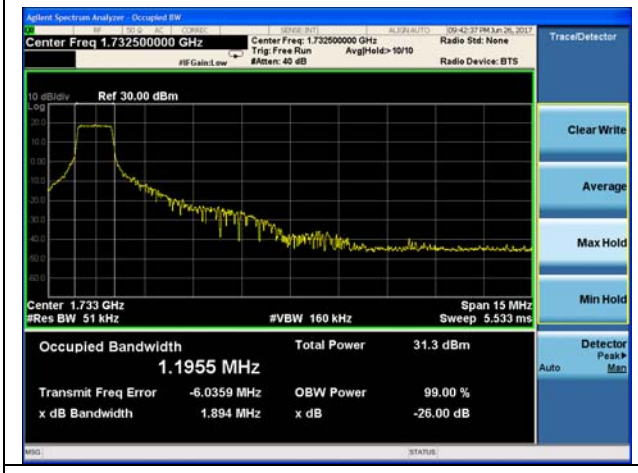
LTE Band 4 QPSK 15MHz CH-Low



LTE Band 4 QPSK 20MHz CH-Low

LTE Band 4 QPSK 15MHz CH-Middle



LTE Band 4 QPSK 20MHz CH-Middle

LTE Band 4 QPSK 15MHz CH-High

LTE Band 4 QPSK 20MHz CH-High

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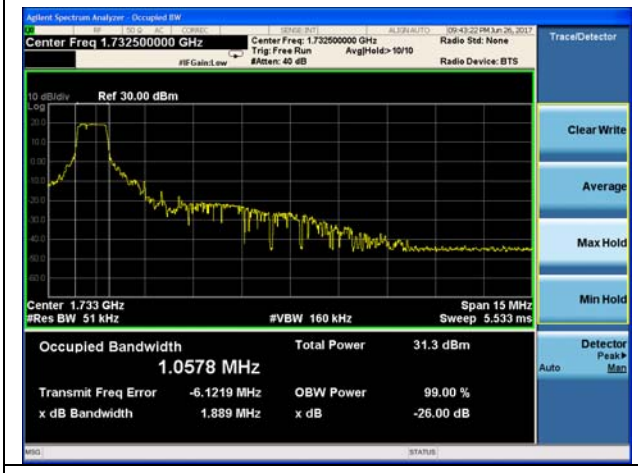
LTE Band 4 16QAM 15MHz CH-Low

LTE Band 4 16QAM 20MHz CH-Low

LTE Band 4 16QAM 15MHz CH-Middle



LTE Band 4 16QAM 20MHz CH-Middle

LTE Band 4 16QAM 15MHz CH-High

LTE Band 4 16QAM 20MHz CH-High

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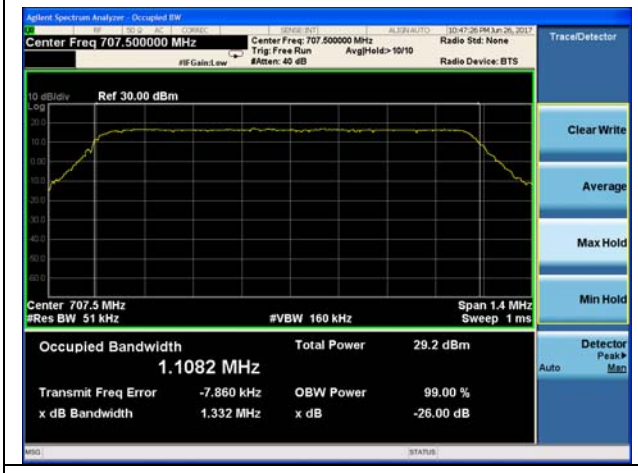
LTE Band 12 QPSK 1.4MHz CH-Low

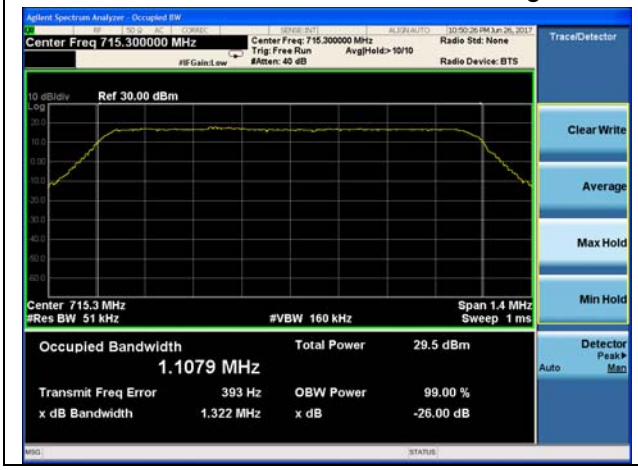
LTE Band 12 QPSK 3MHz CH-Low

LTE Band 12 QPSK 1.4MHz CH-Middle

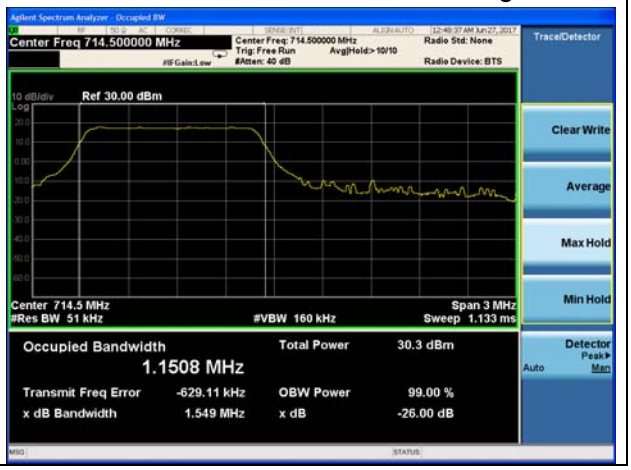


LTE Band 12 QPSK 3MHz CH-Middle

LTE Band 12 QPSK 1.4MHz CH-High



LTE Band 12 QPSK 3MHz CH-High



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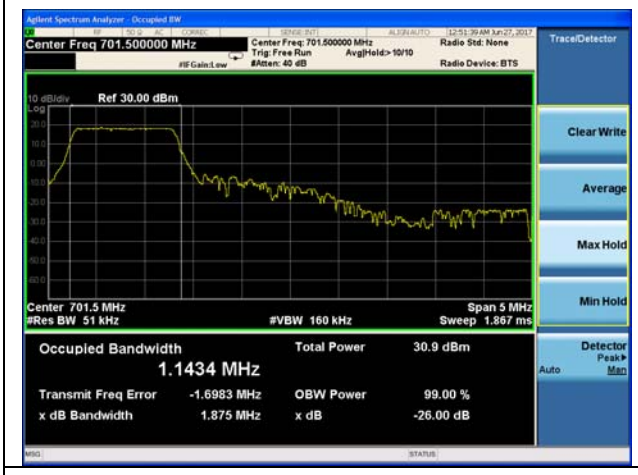
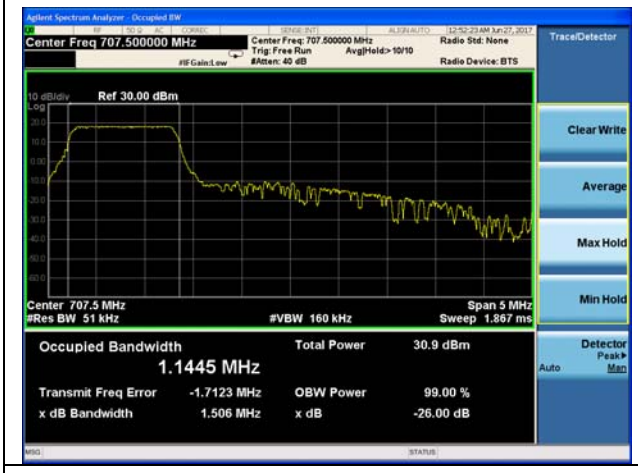
LTE Band 12 QPSK 5MHz CH-Low



LTE Band 12 QPSK 10MHz CH-Low

LTE Band 12 QPSK 5MHz CH-Middle



LTE Band 12 QPSK 10MHz CH-Middle

LTE Band 12 QPSK 5MHz CH-High

LTE Band 12 QPSK 10MHz CH-High

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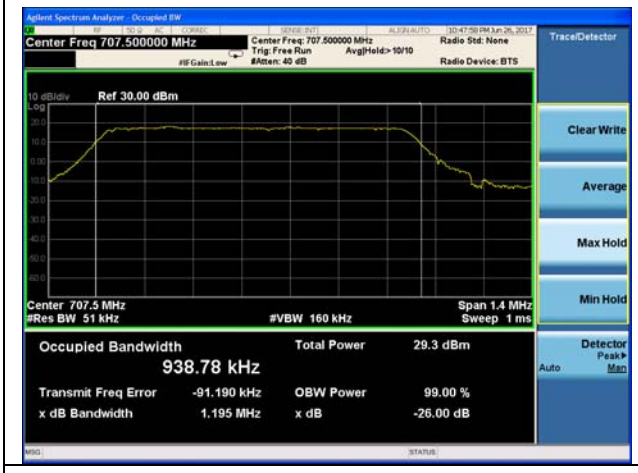
LTE Band 12 16QAM 1.4MHz CH-Low

LTE Band 12 16QAM 3MHz CH-Low

LTE Band 12 16QAM 1.4MHz CH-Middle



LTE Band 12 16QAM 3MHz CH-Middle

LTE Band 12 16QAM 1.4MHz CH-High

LTE Band 12 16QAM 3MHz CH-High

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LTE Band 12 16QAM 5MHz CH-Low

LTE Band 12 16QAM 10MHz CH-Low

LTE Band 12 16QAM 5MHz CH-Middle

LTE Band 12 16QAM 10MHz CH-Middle

LTE Band 12 16QAM 5MHz CH-High

LTE Band 12 16QAM 10MHz CH-High

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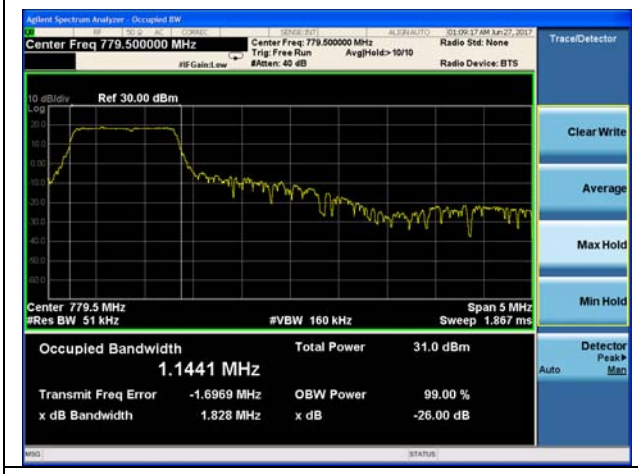
LTE Band 13 QPSK 5MHz CH-Low



LTE Band 13 QPSK 5MHz CH-Middle

LTE Band 13 QPSK 5MHz CH-High

LTE Band 13 QPSK 10MHz CH-Middle

LTE Band 13 16QAM 5MHz CH-Low

LTE Band 13 16QAM 5MHz CH-Middle

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LTE Band 13 16QAM 5MHz CH-High	LTE Band 13 16QAM 10MHz CH-Middle

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4.4 Band Edge Compliance

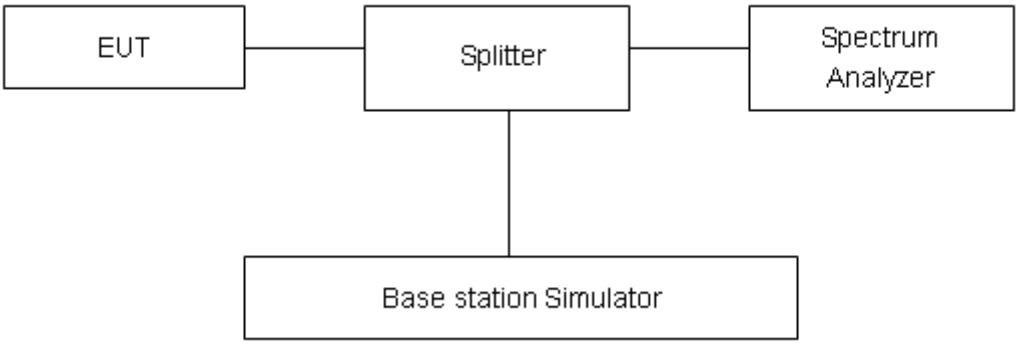
Ambient condition

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. For LTE Band 41 Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.
RBW is set to 51 kHz, VBW is set to 51 kHz for LTE Band 4/12/13 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



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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."

Part 27.53(m) (4)/ specifies that "for BRS and EBS stations. For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(4) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Example:

The limit line is derived from 43 + 10log (P) dB below the transmitter power P(Watts)

= P(W)- [43 + 10log(P)] (dB)

= [30 + 10log (P)] (dBm) - [43 + 10log(P)] (dB) = -13dBm.

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.

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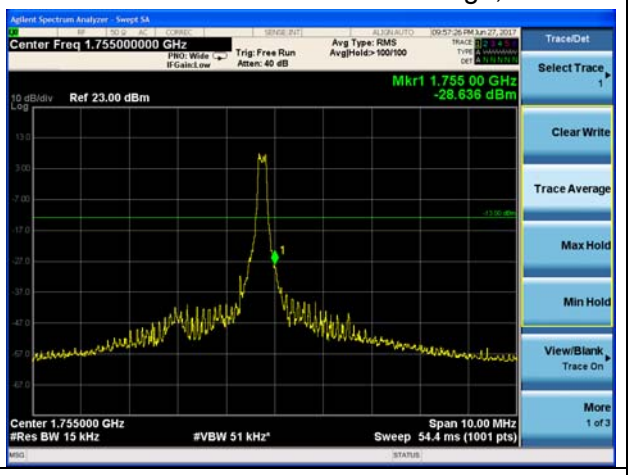
Test Result

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

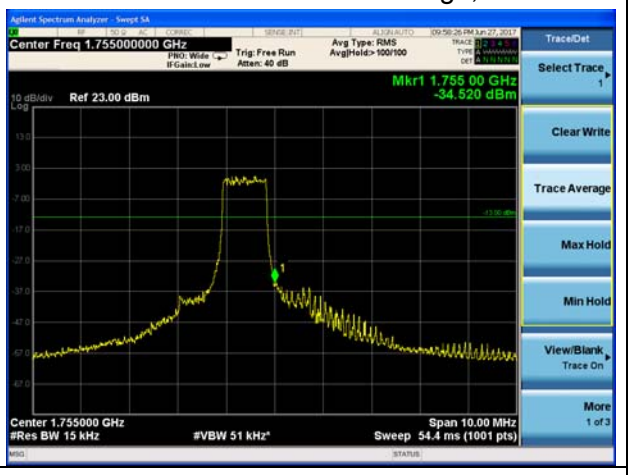
LTE Band 4 QPSK 1.4MHz CH-Low, 1 RB

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

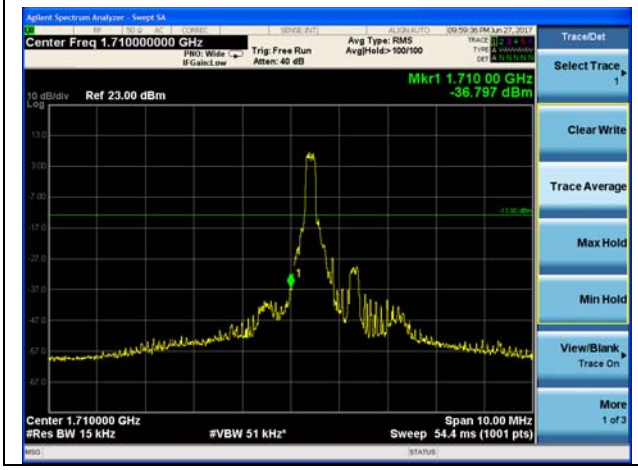


LTE Band 4 QPSK 1.4MHz CH-Low, 100%RB

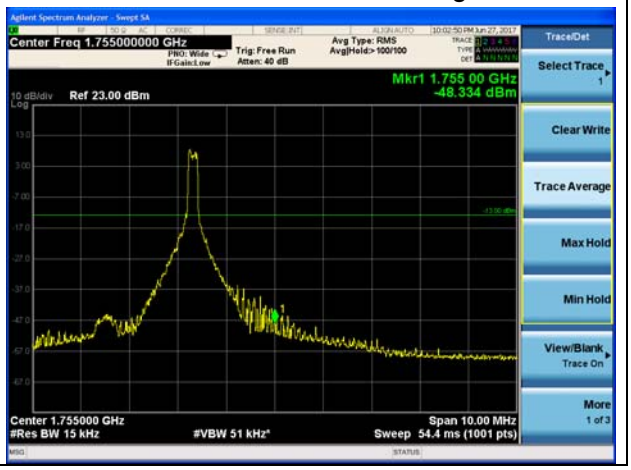
LTE Band 4 QPSK 1.4MHz CH-High, 100%RB



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



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



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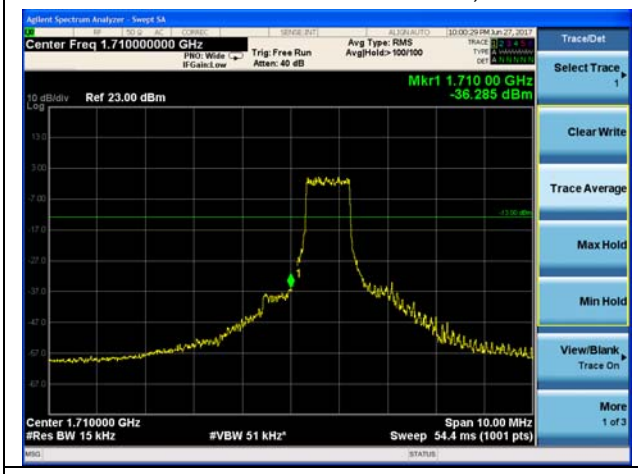
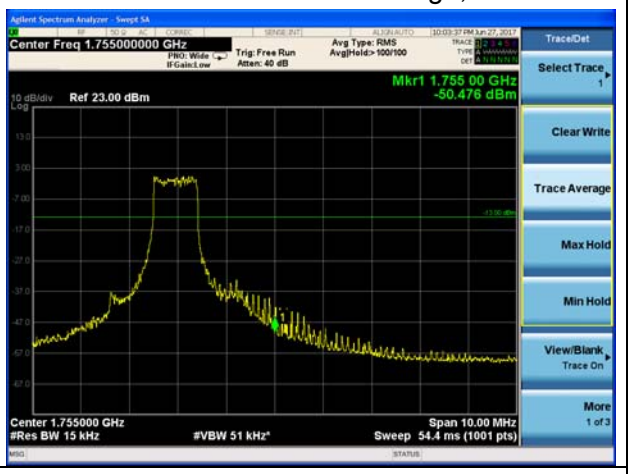
LTE Band 4 QPSK 3MHz CH-Low, 100%RB

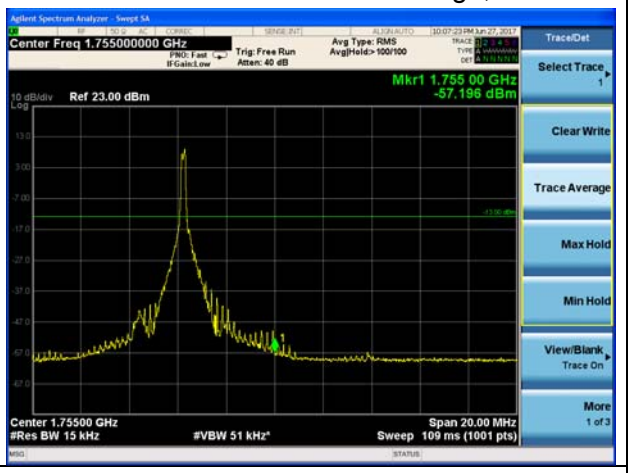


LTE Band 4 QPSK 3MHz CH-High, 100%RB

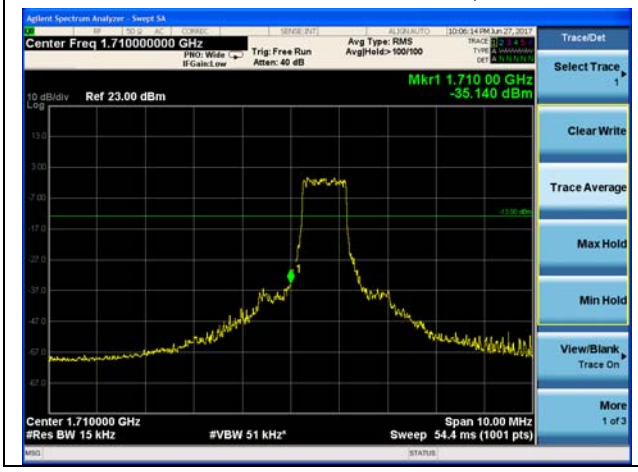


LTE Band 4 QPSK 5MHz CH-Low, 1 RB

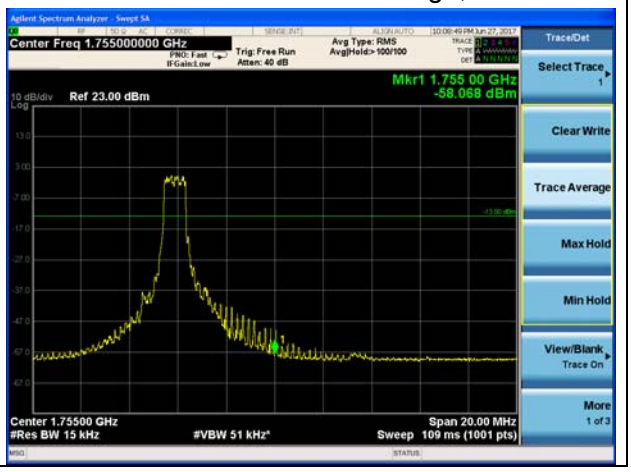
LTE Band 4 QPSK 5MHz CH-High, 1 RB



LTE Band 4 QPSK 5MHz CH-Low, 100%RB



LTE Band 4 QPSK 5MHz CH-High, 100%RB



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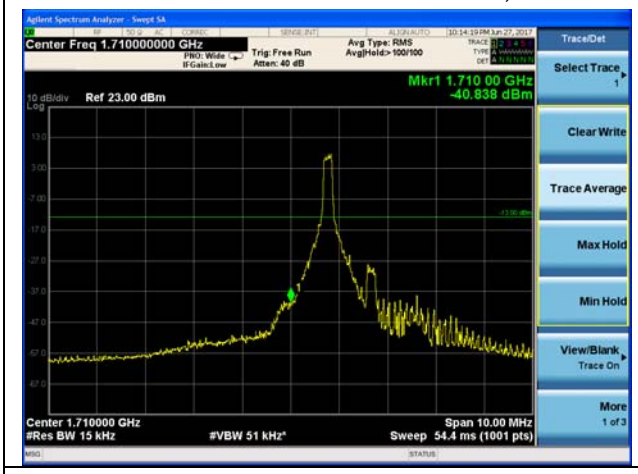
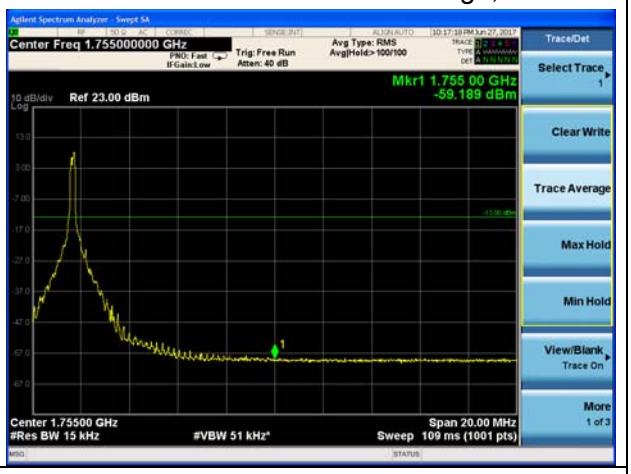
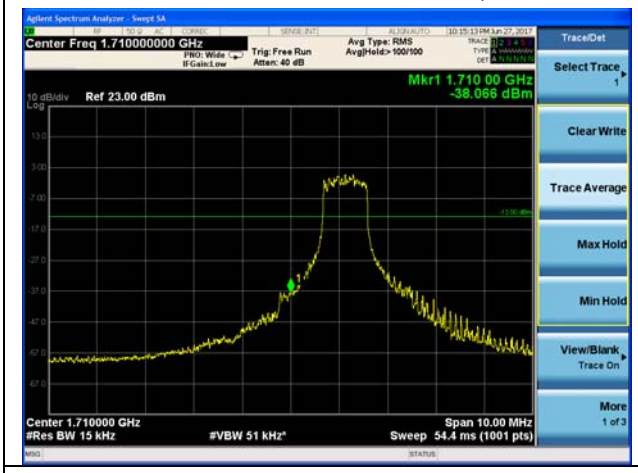
LTE Band 4 QPSK 10MHz CH-Low, 1 RB



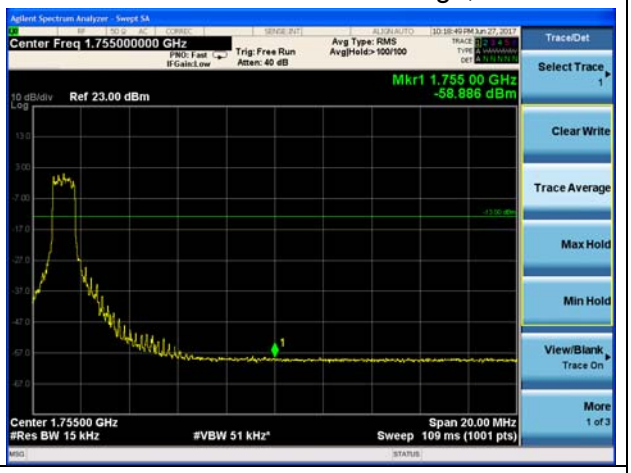
LTE Band 4 QPSK 10MHz CH-High, 1 RB



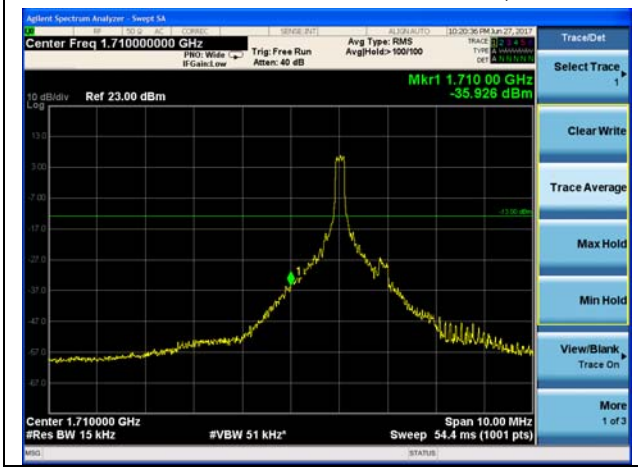
LTE Band 4 QPSK 10MHz CH-Low, 100%RB



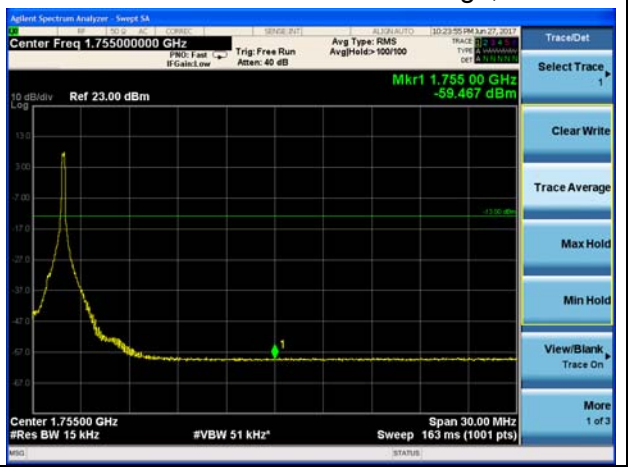
LTE Band 4 QPSK 10MHz CH-High, 100%RB



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



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



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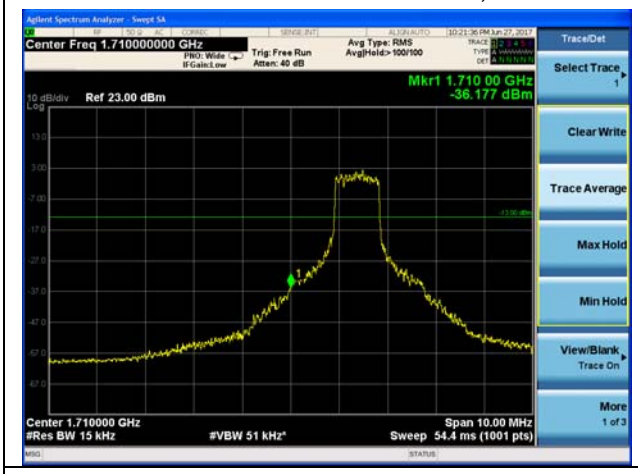
LTE Band 4 QPSK 15MHz CH-Low, 100%RB



LTE Band 4 QPSK 15MHz CH-High, 100%RB

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, 100%RB

LTE Band 4 QPSK 20MHz CH-High, 100%RB

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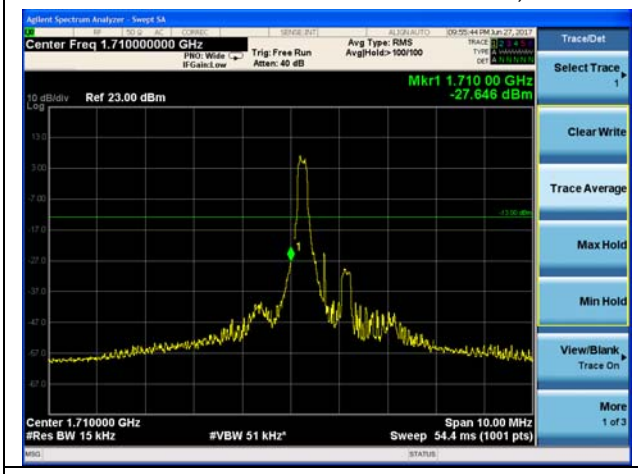
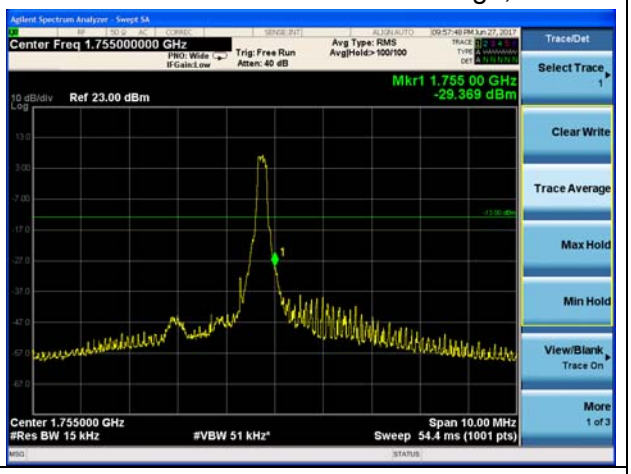
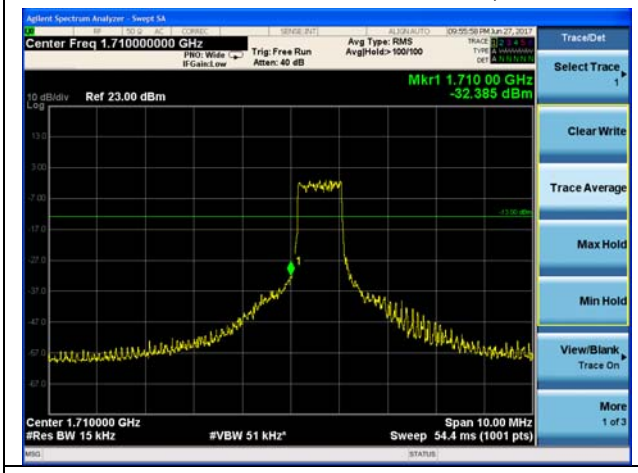
LTE Band 4 16QAM 1.4MHz CH-Low, 1 RB



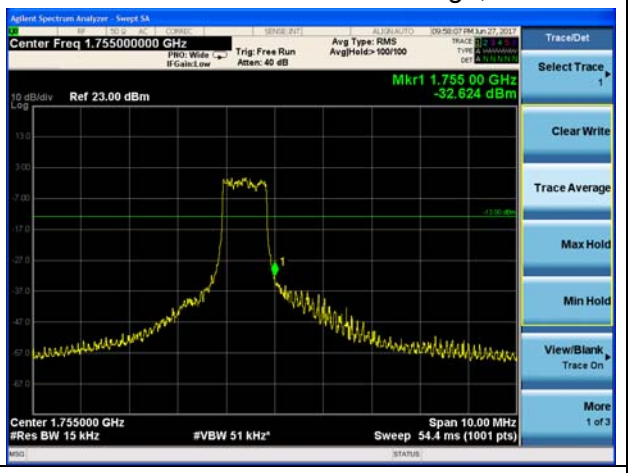
LTE Band 4 16QAM 1.4MHz CH-High, 1 RB



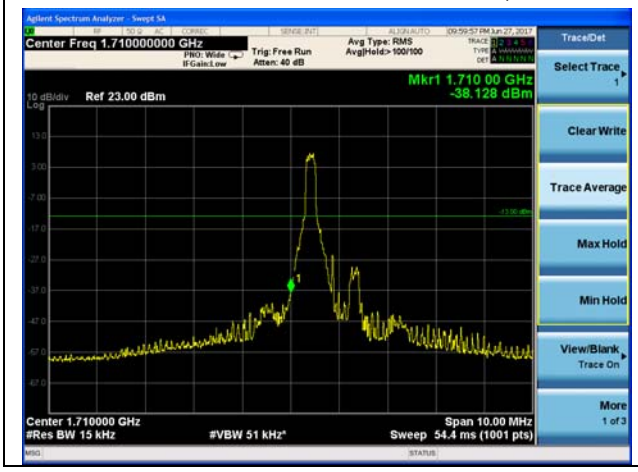
LTE Band 4 16QAM 1.4MHz CH-Low, 100%RB



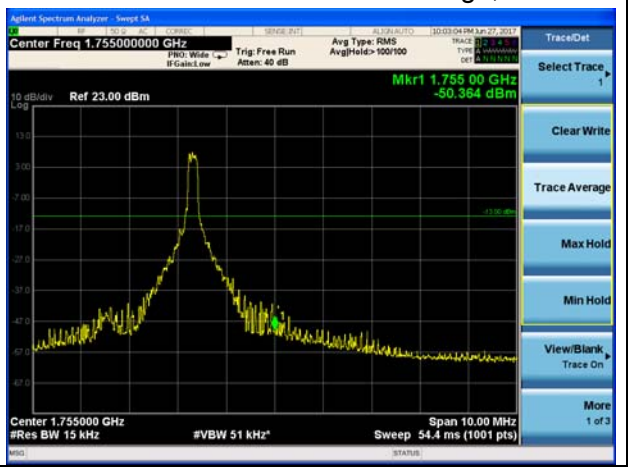
LTE Band 4 16QAM 1.4MHz CH-High, 100%RB



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



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



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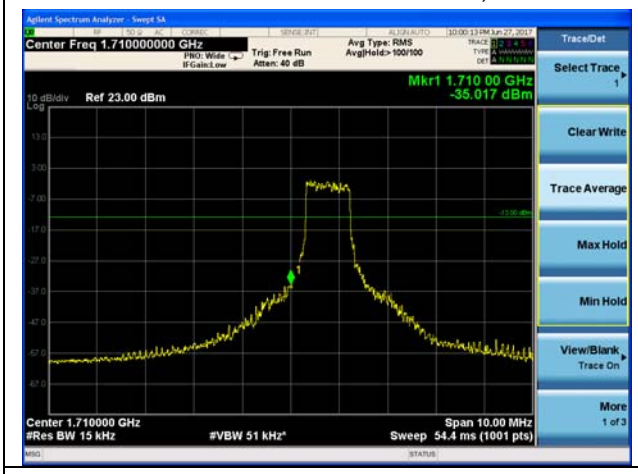
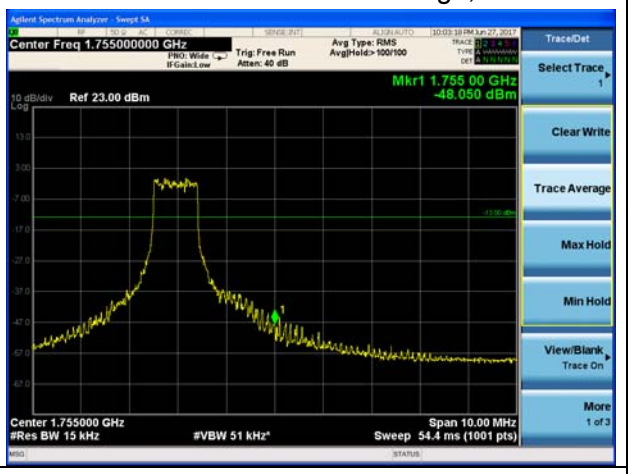
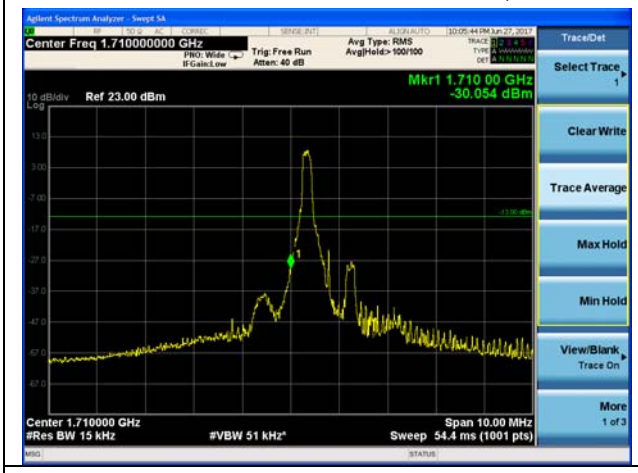
LTE Band 4 16QAM 3MHz CH-Low, 100%RB



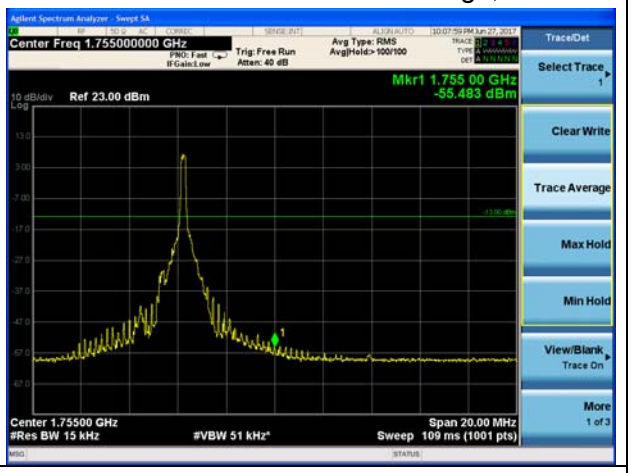
LTE Band 4 16QAM 3MHz CH-High, 100%RB



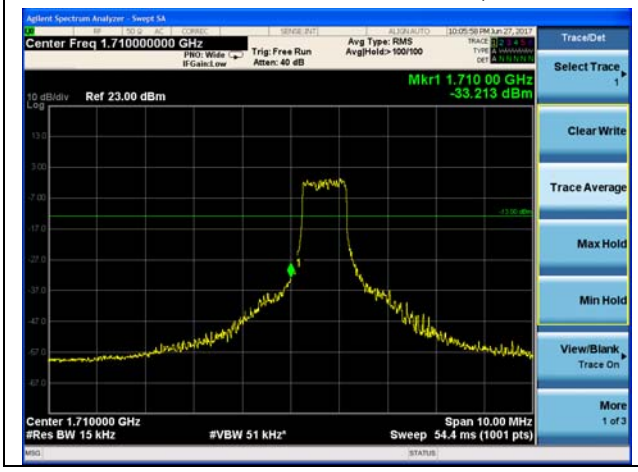
LTE Band 4 16QAM 5MHz CH-Low, 1 RB



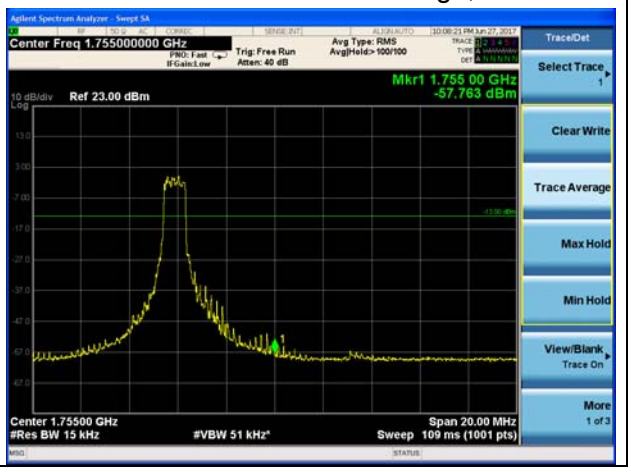
LTE Band 4 16QAM 5MHz CH-High, 1 RB



LTE Band 4 16QAM 5MHz CH-Low, 100%RB



LTE Band 4 16QAM 5MHz CH-High, 100%RB



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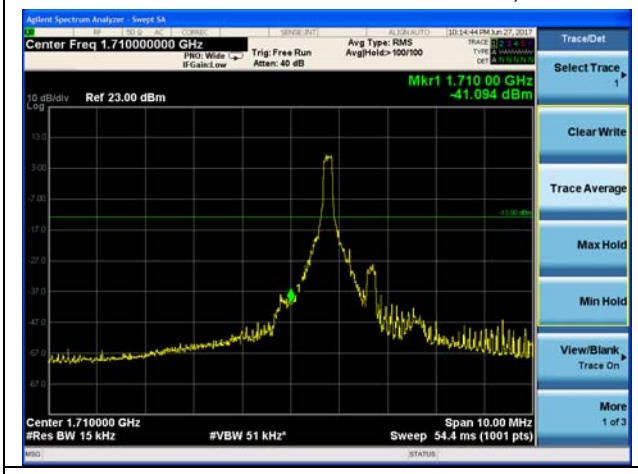
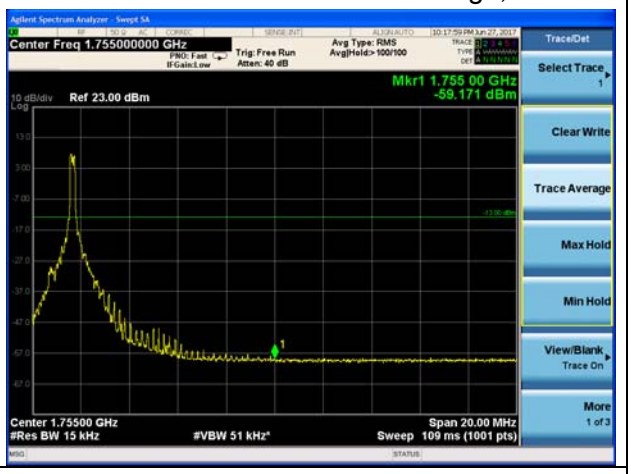
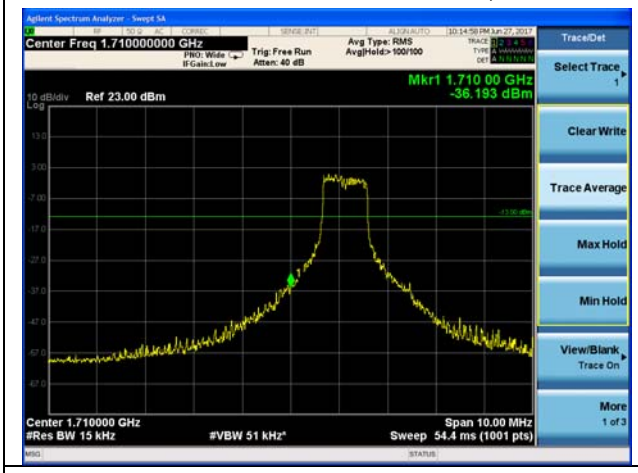
LTE Band 4 16QAM 10MHz CH-Low, 1 RB



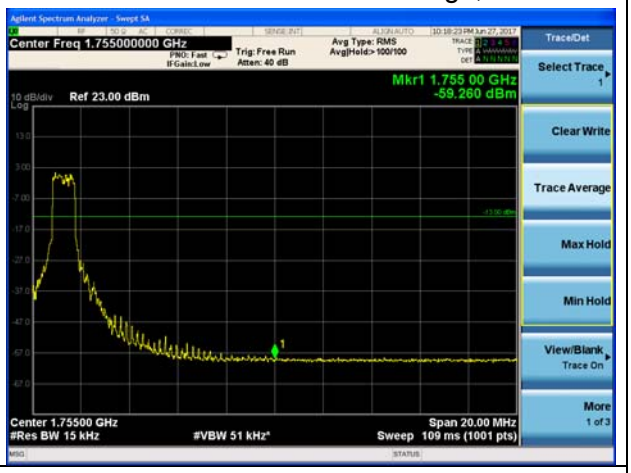
LTE Band 4 16QAM 10MHz CH-High, 1 RB



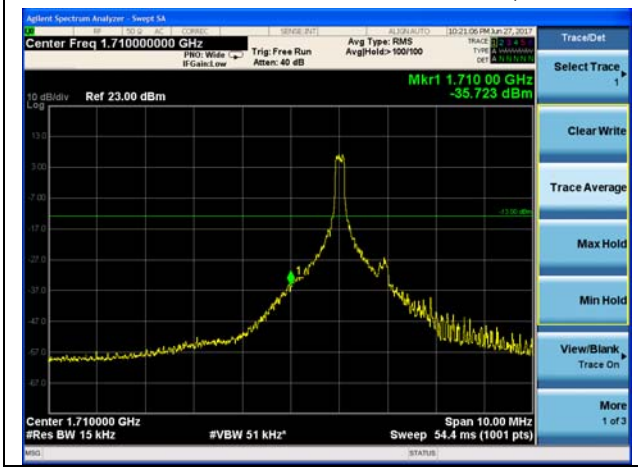
LTE Band 4 16QAM 10MHz CH-Low, 100%RB



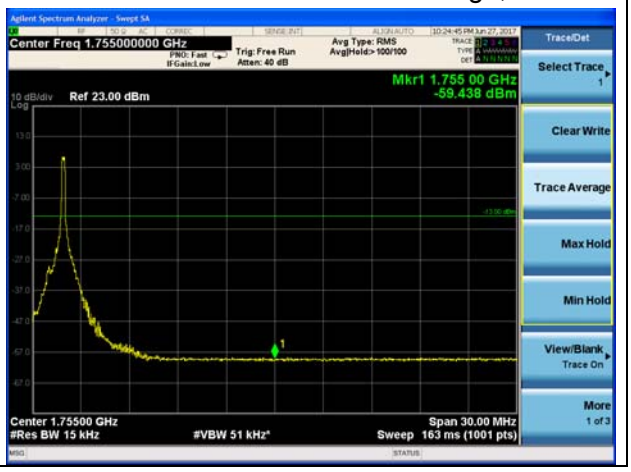
LTE Band 4 16QAM 10MHz CH-High, 100%RB



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



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



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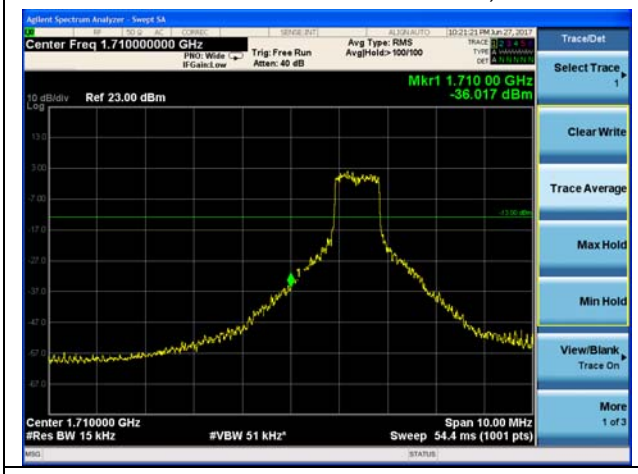
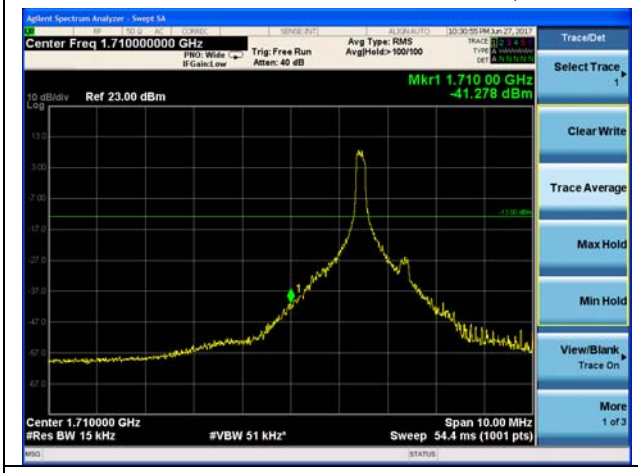
LTE Band 4 16QAM 15MHz CH-Low, 100%RB

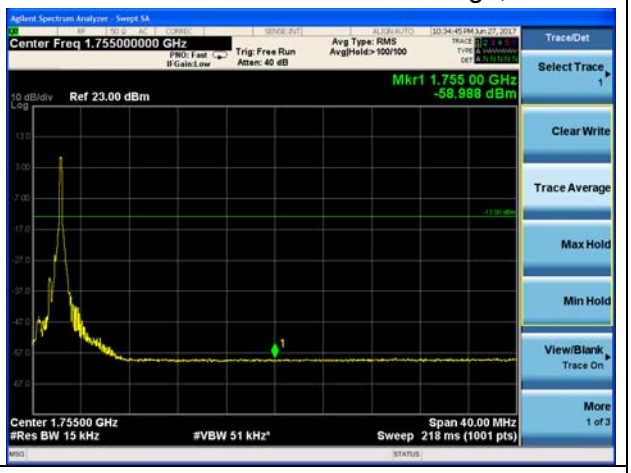


LTE Band 4 16QAM 15MHz CH-High, 100%RB

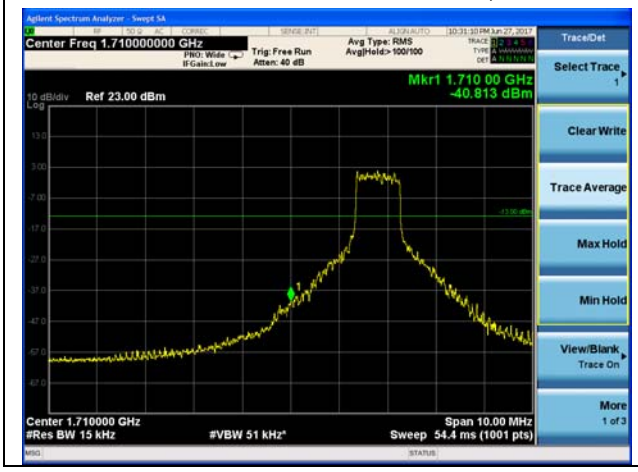
LTE Band 4 16QAM 20MHz CH-Low, 1 RB



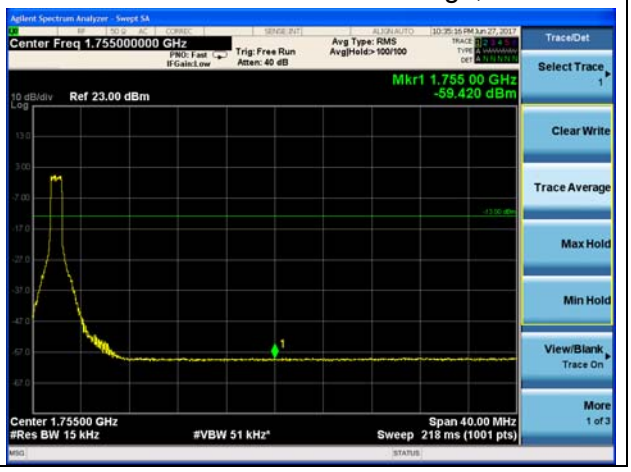
LTE Band 4 16QAM 20MHz CH-High, 1 RB



LTE Band 4 16QAM 20MHz CH-Low, 100%RB



LTE Band 4 16QAM 20MHz CH-High, 100%RB



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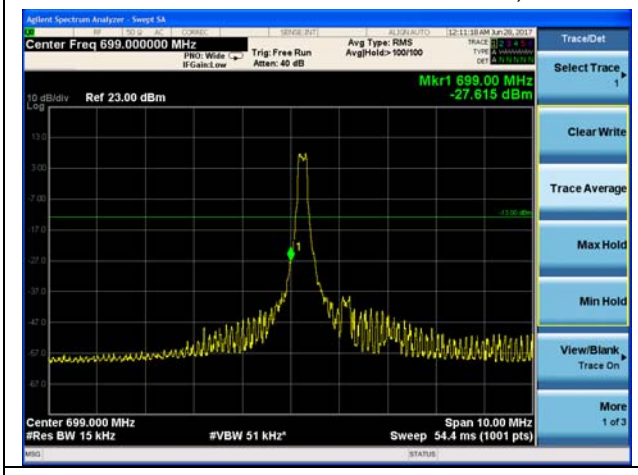
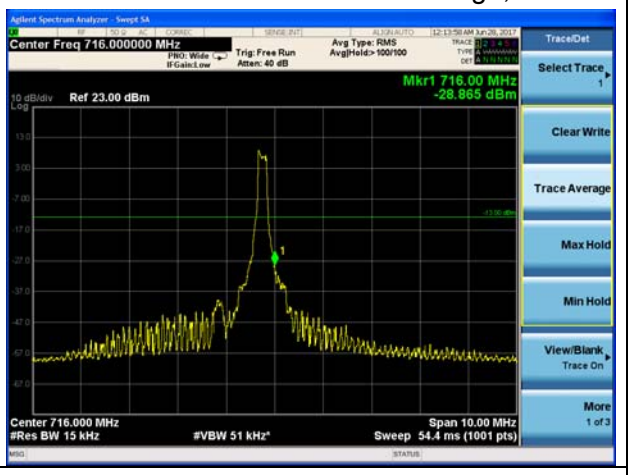
LTE Band 12 QPSK 1.4MHz CH-Low, 1 RB



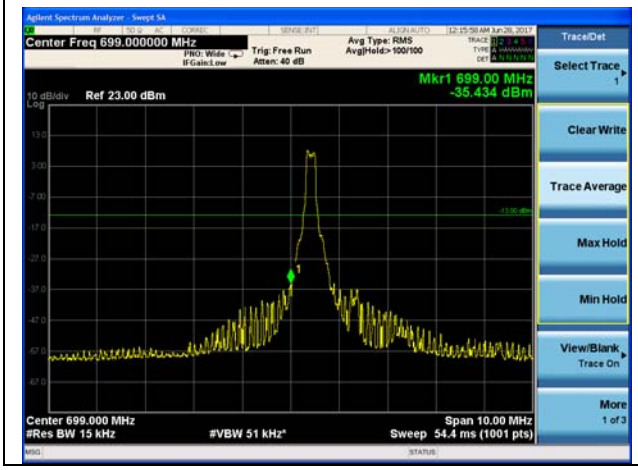
LTE Band 12 QPSK 1.4MHz CH-High, 1 RB



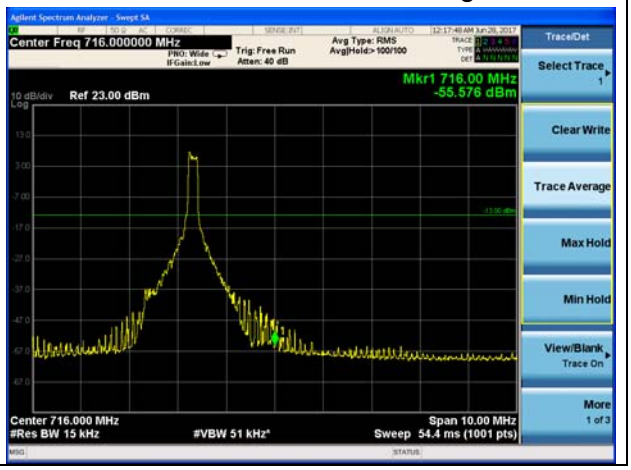
LTE Band 12 QPSK 1.4MHz CH-Low, 100%RB

LTE Band 12 QPSK 1.4MHz CH-High, 100%RB

LTE Band 12 QPSK 3MHz CH-Low, 1 RB



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



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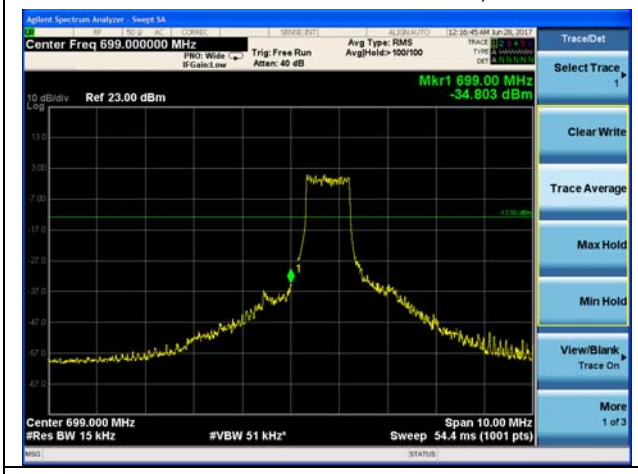
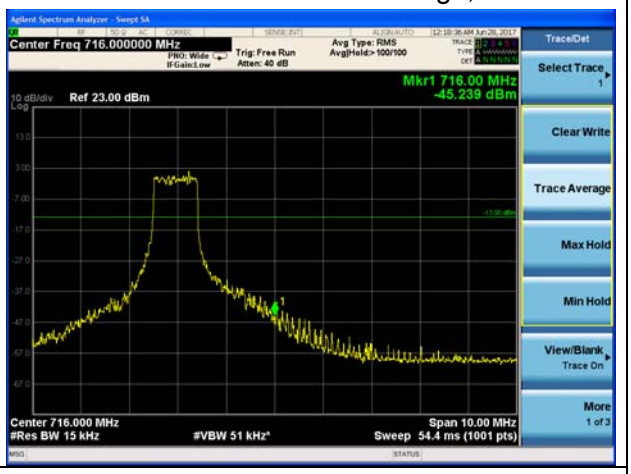
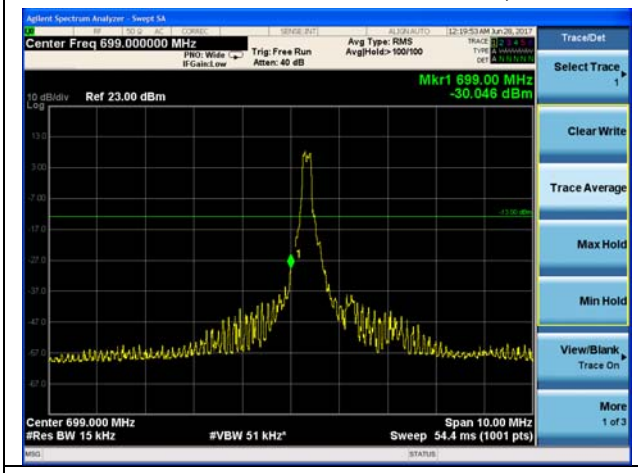
LTE Band 12 QPSK 3MHz CH-Low, 100%RB



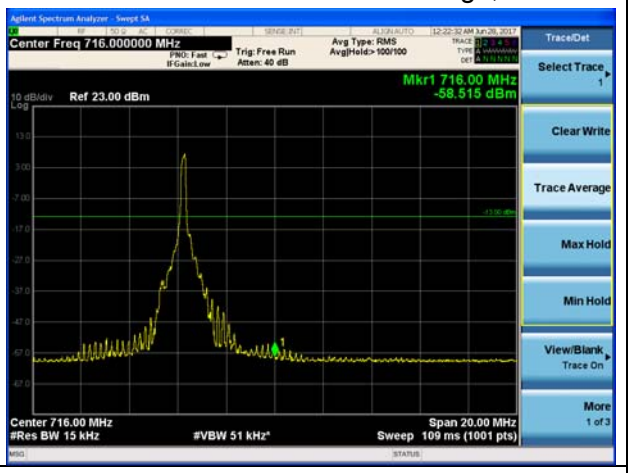
LTE Band 12 QPSK 3MHz CH-High, 100%RB



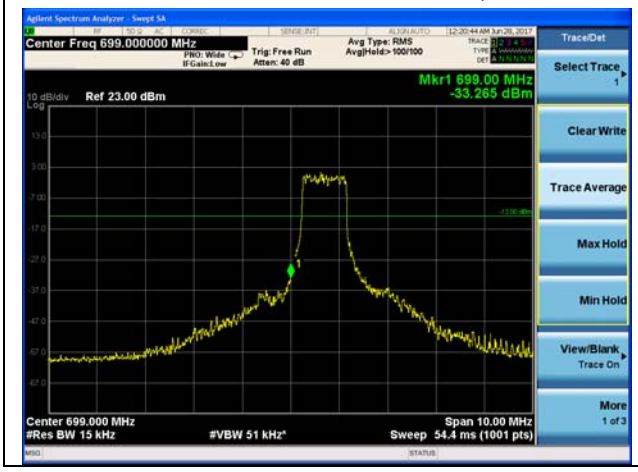
LTE Band 12 QPSK 5MHz CH-Low, 1 RB



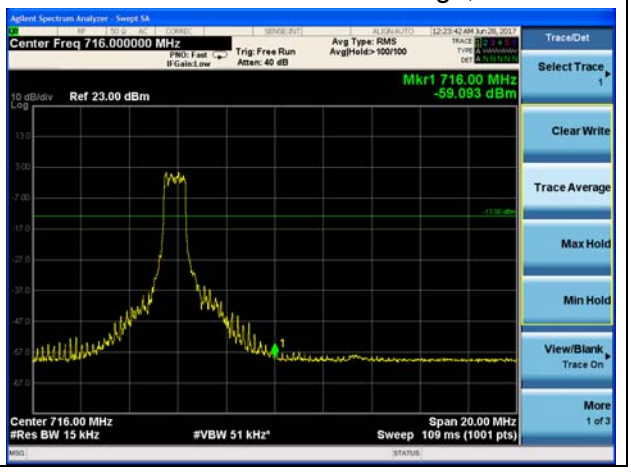
LTE Band 12 QPSK 5MHz CH-High, 1 RB



LTE Band 12 QPSK 5MHz CH-Low, 100%RB



LTE Band 12 QPSK 5MHz CH-High, 100%RB



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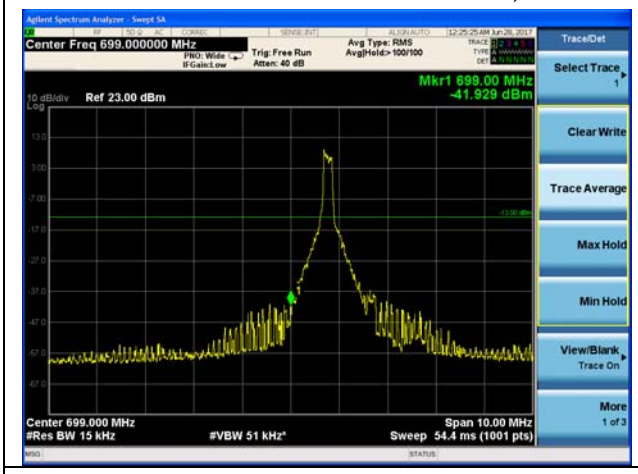
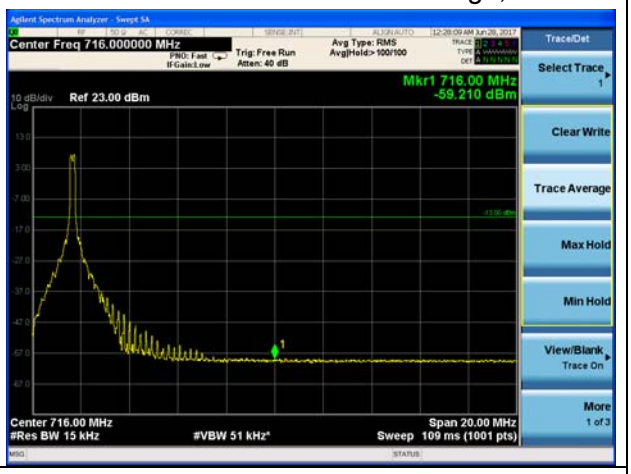
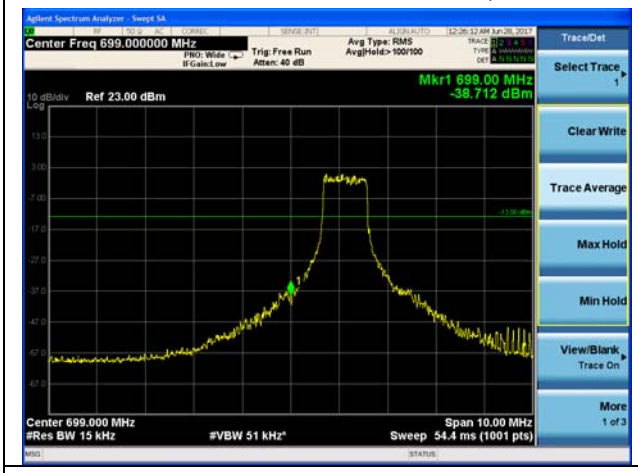
LTE Band 12 QPSK 10MHz CH-Low, 1 RB



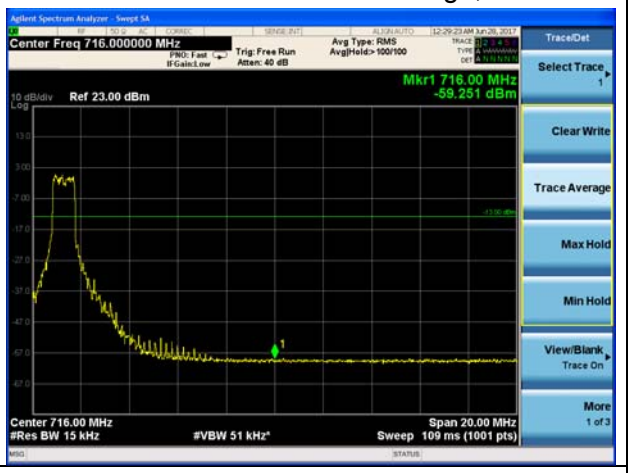
LTE Band 12 QPSK 10MHz CH-High, 1 RB



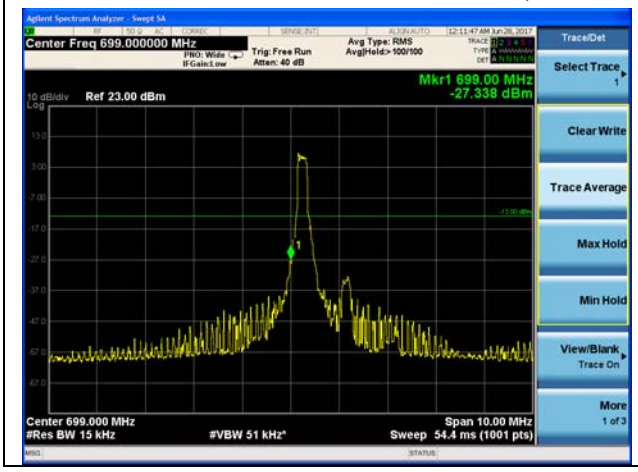
LTE Band 12 QPSK 10MHz CH-Low, 100%RB



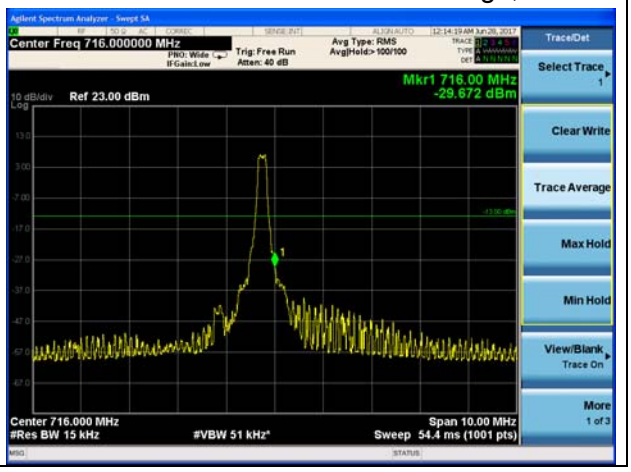
LTE Band 12 QPSK 10MHz CH-High, 100%RB



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



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



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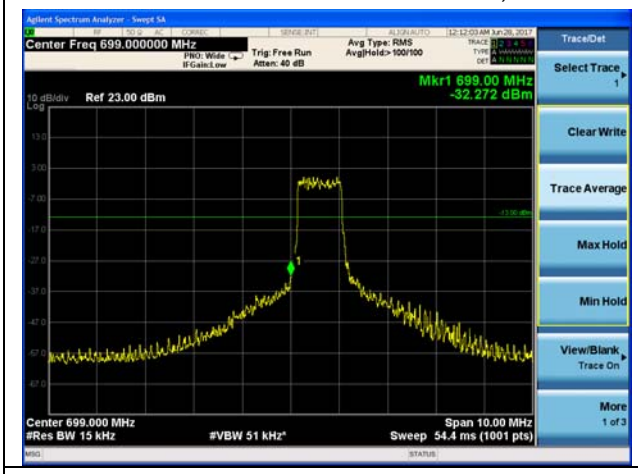
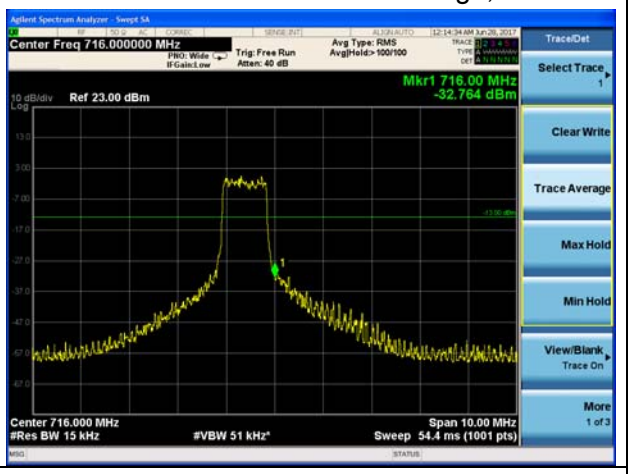
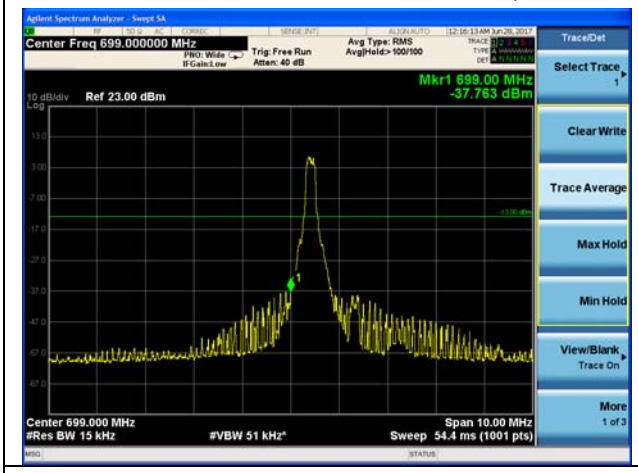
LTE Band 12 16QAM 1.4MHz CH-Low, 100%RB



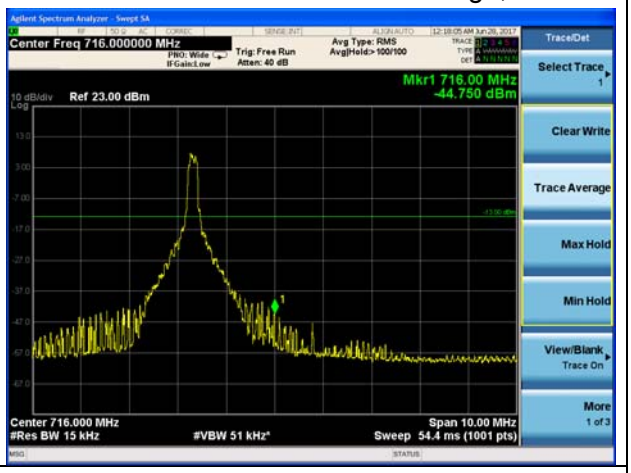
LTE Band 12 16QAM 1.4MHz CH-High, 100%RB



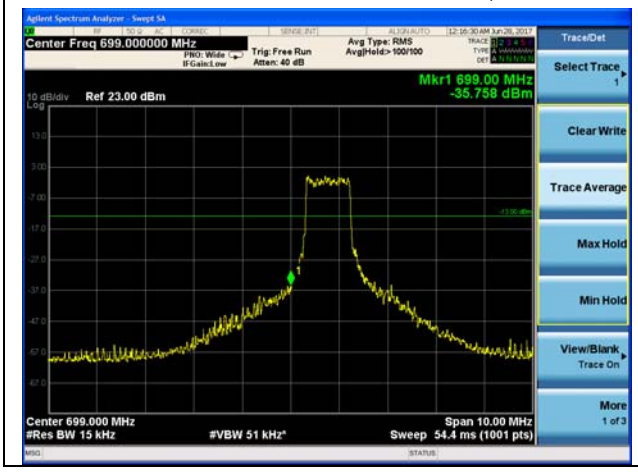
LTE Band 12 16QAM 3MHz CH-Low, 1 RB



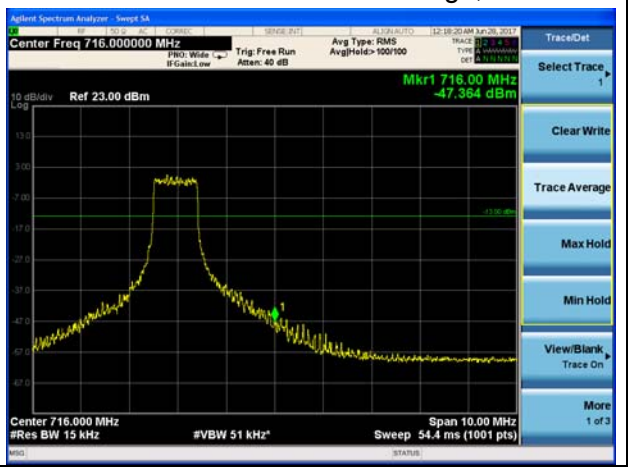
LTE Band 12 16QAM 3MHz CH-High, 1 RB



LTE Band 12 16QAM 3MHz CH-Low, 100%RB



LTE Band 12 16QAM 3MHz CH-High, 100%RB



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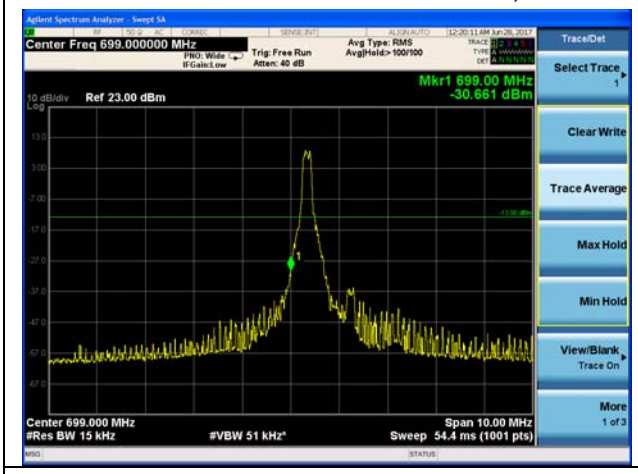
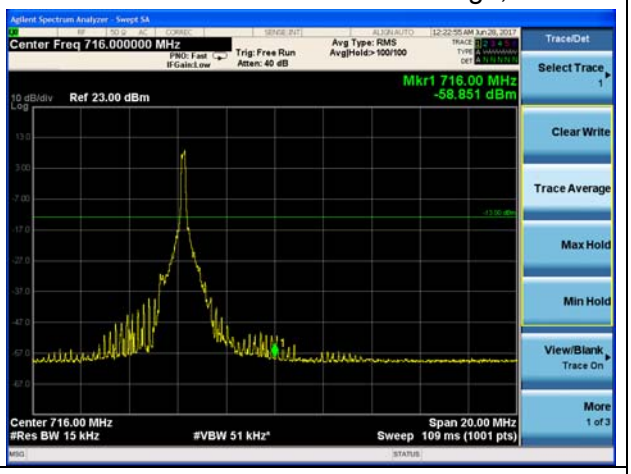
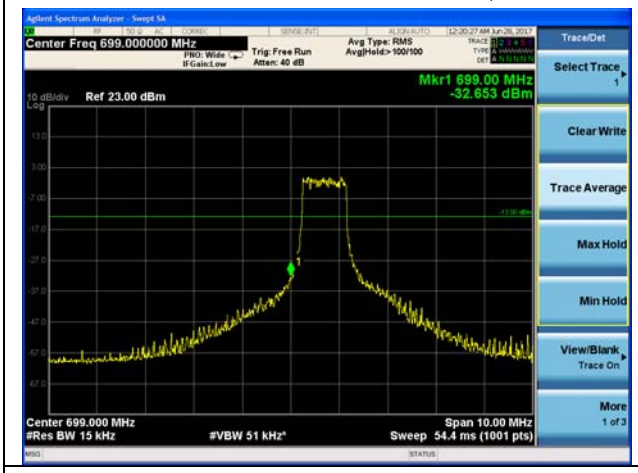
LTE Band 12 16QAM 5MHz CH-Low, 1 RB



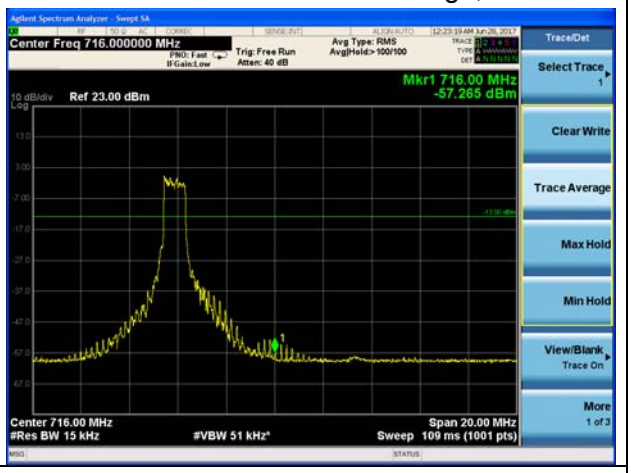
LTE Band 12 16QAM 5MHz CH-High, 1 RB



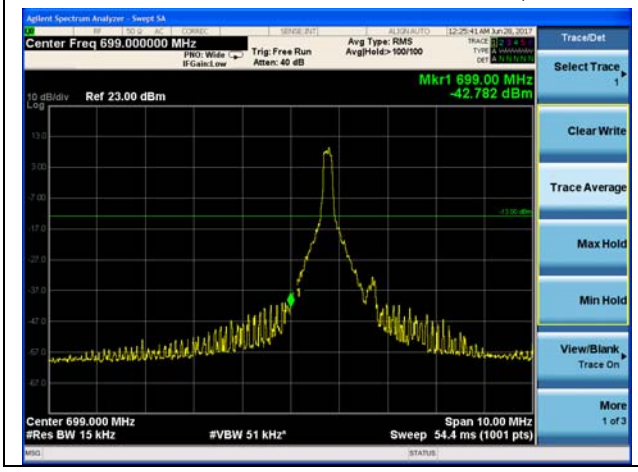
LTE Band 12 16QAM 5MHz CH-Low, 100%RB



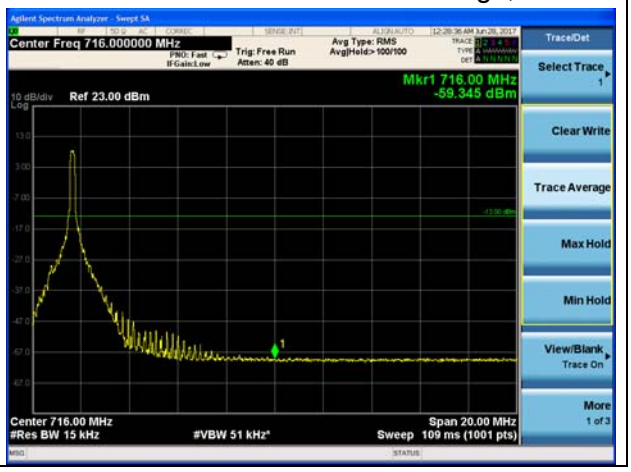
LTE Band 12 16QAM 5MHz CH-High, 100%RB



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



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



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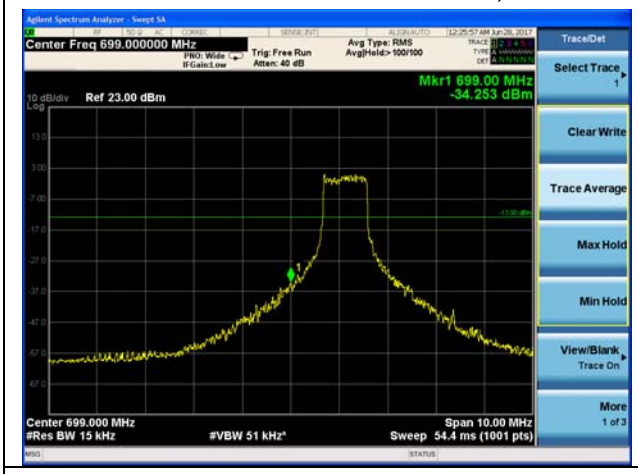
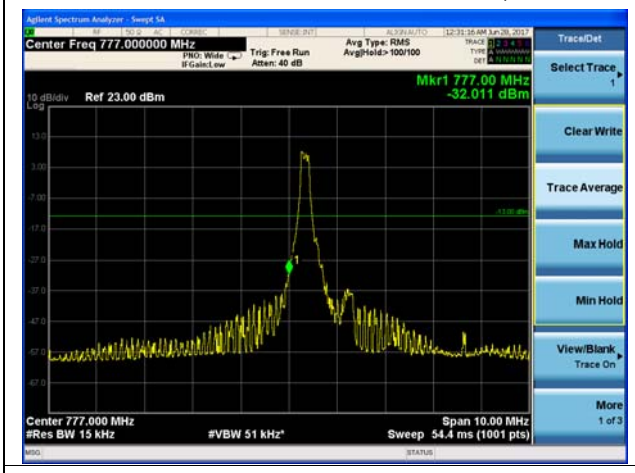
LTE Band 12 16QAM 10MHz CH-Low, 100%RB

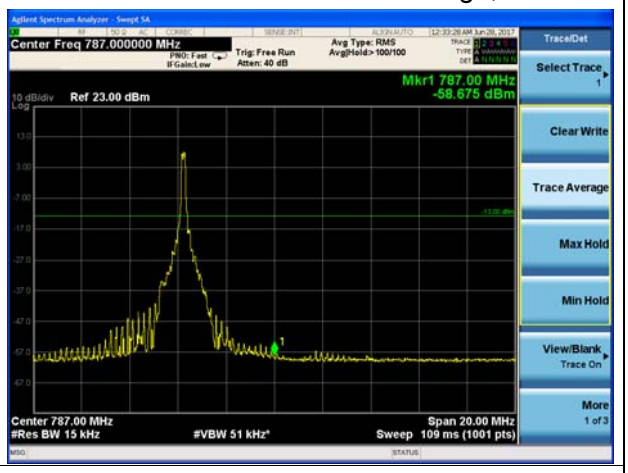


LTE Band 12 16QAM 10MHz CH-High, 100%RB

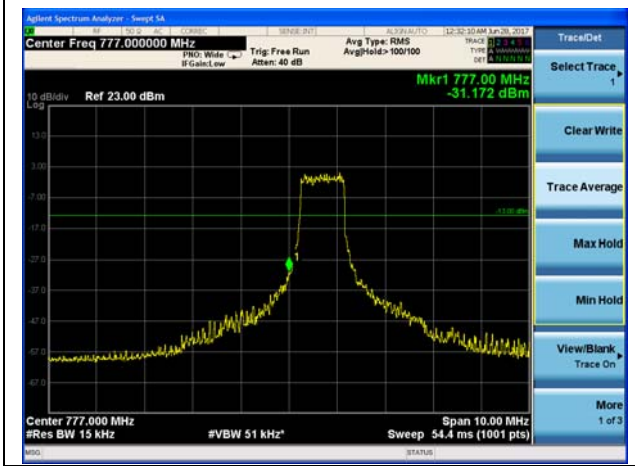
LTE Band 13 QPSK 5MHz CH-Low, 1 RB



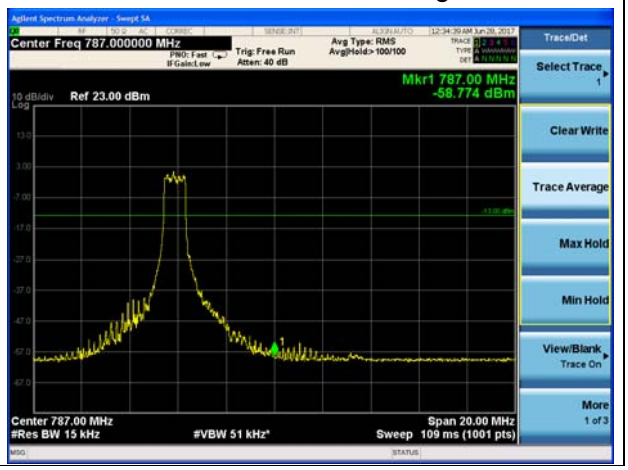
LTE Band 13 QPSK 5MHz CH-High, 1 RB



LTE Band 13 QPSK 5MHz CH-Low, 100%RB



LTE Band 13 QPSK 5MHz CH-High, 100%RB



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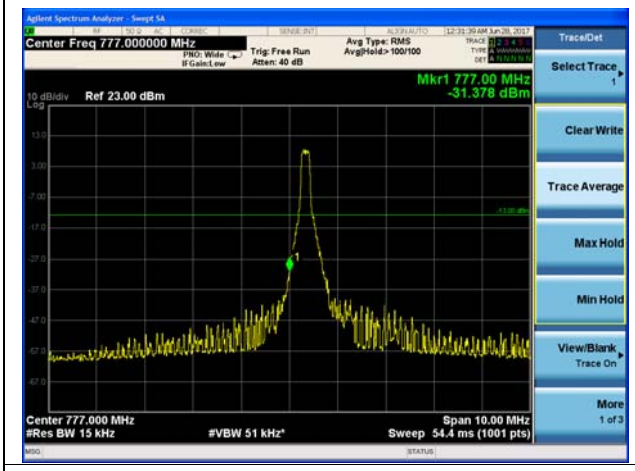
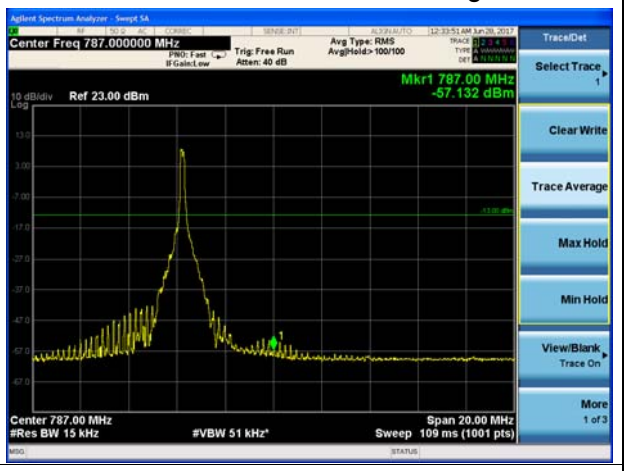
LTE Band 13 QPSK 10MHz CH- L/H, 1 RB

LTE Band 13 QPSK 10MHz CH- L/H, 100%RB

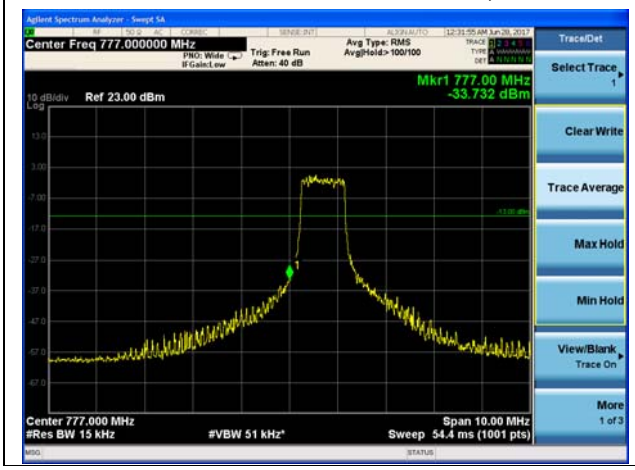
LTE Band 13 16QAM 5MHz CH-Low, 1 RB



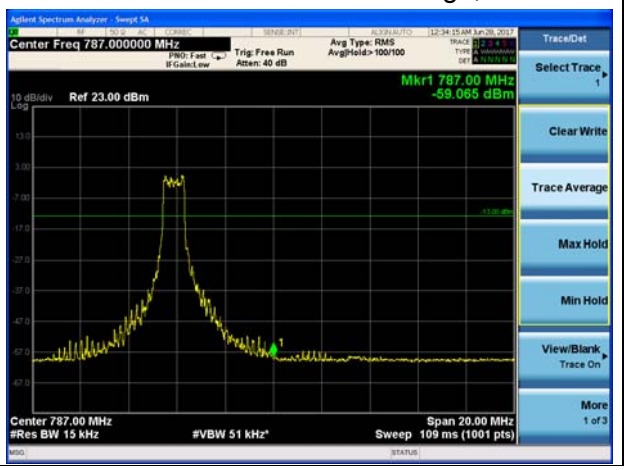
LTE Band 13 16QAM 5MHz CH-High, 1 RB



LTE Band 13 16QAM 5MHz CH-Low, 100%RB



LTE Band 13 16QAM 5MHz CH-High, 100%RB



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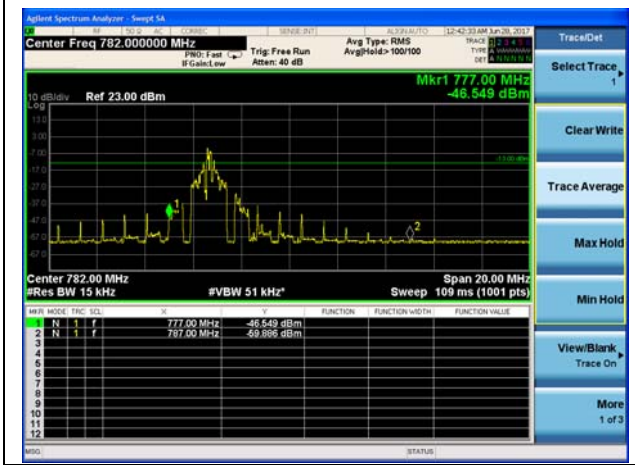
LTE Band 13 16QAM 10MHz CH- L/H, 1 RB	LTE Band 13 16QAM 10MHz CH- L/H, 100%RB
	

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4.5 Peak-to-Average Power Ratio (PAPR)

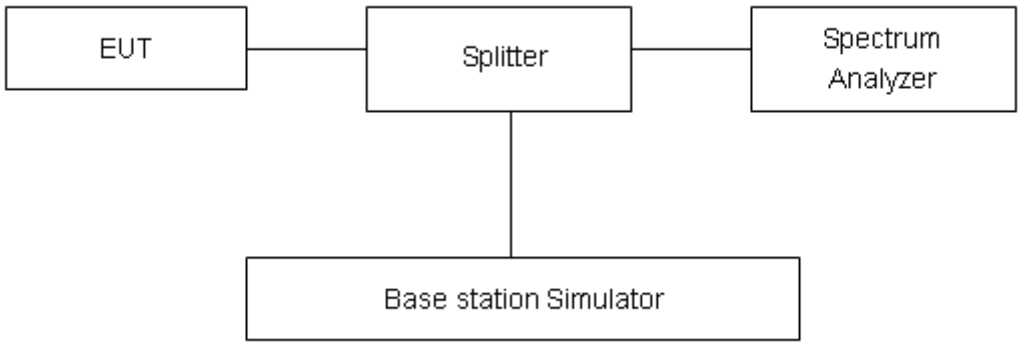
Ambient condition

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

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LTE Band 4								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	1.4	19957	1710.7	31.96	22.13	9.83	≤13	PASS
		20175	1732.5	33.37	22.09	11.28	≤13	PASS
		20393	1754.3	33.44	22.23	11.21	≤13	PASS
	3	19965	1711.5	31.88	22.16	9.72	≤13	PASS
		20175	1732.5	33.56	22.13	11.43	≤13	PASS
		20385	1753.5	32.09	22.26	9.83	≤13	PASS
	5	19975	1712.5	31.94	22.14	9.80	≤13	PASS
		20175	1732.5	32.06	22.12	9.94	≤13	PASS
		20375	1752.5	31.86	22.24	9.62	≤13	PASS
	10	20000	1715	31.79	22.22	9.57	≤13	PASS
		20175	1732.5	31.69	22.14	9.55	≤13	PASS
		20350	1750	31.89	22.28	9.61	≤13	PASS
	15	20025	1717.5	30.24	22.20	8.04	≤13	PASS
		20175	1732.5	30.77	22.10	8.67	≤13	PASS
		20325	1747.5	30.54	22.23	8.31	≤13	PASS
	20	20050	1720	30.75	22.17	8.58	≤13	PASS
		20175	1732.5	30.92	22.05	8.87	≤13	PASS
		20300	1745	31.12	22.19	8.93	≤13	PASS
16QAM	1.4	19957	1710.7	32.53	22.06	10.47	≤13	PASS
		20175	1732.5	34.13	22.03	12.10	≤13	PASS
		20393	1754.3	34.20	22.21	11.99	≤13	PASS
	3	19965	1711.5	32.51	22.09	10.42	≤13	PASS
		20175	1732.5	33.94	22.07	11.87	≤13	PASS
		20385	1753.5	32.81	22.24	10.57	≤13	PASS
	5	19975	1712.5	32.31	22.07	10.24	≤13	PASS
		20175	1732.5	32.62	22.03	10.59	≤13	PASS
		20375	1752.5	32.71	22.19	10.52	≤13	PASS
	10	20000	1715	31.15	22.10	9.05	≤13	PASS
		20175	1732.5	32.14	22.08	10.06	≤13	PASS
		20350	1750	31.87	22.23	9.64	≤13	PASS
	15	20025	1717.5	30.96	22.07	8.89	≤13	PASS
		20175	1732.5	30.68	22.03	8.65	≤13	PASS
		20325	1747.5	31.66	22.19	9.47	≤13	PASS
	20	20050	1720	30.59	22.05	8.54	≤13	PASS
		20175	1732.5	31.17	21.99	9.18	≤13	PASS
		20300	1745	30.98	22.16	8.82	≤13	PASS

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LTE Band 12								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	1.4	23017	699.7	32.45	22.48	9.97	≤13	PASS
		23095	707.5	32.63	22.66	9.97	≤13	PASS
		23173	715.3	32.75	22.64	10.11	≤13	PASS
	3	23025	700.5	32.77	22.56	10.21	≤13	PASS
		23095	707.5	32.56	22.68	9.88	≤13	PASS
		23165	714.5	34.26	22.68	11.58	≤13	PASS
	5	23035	701.5	32.64	22.54	10.10	≤13	PASS
		23095	707.5	32.27	22.64	9.63	≤13	PASS
		23155	713.5	32.24	22.63	9.61	≤13	PASS
	10	23060	704	31.83	22.51	9.32	≤13	PASS
		23095	707.5	31.88	22.59	9.29	≤13	PASS
		23130	711	31.69	22.59	9.10	≤13	PASS
16QAM	1.4	23017	699.7	33.33	22.71	10.62	≤13	PASS
		23095	707.5	34.21	22.90	11.31	≤13	PASS
		23173	715.3	33.52	22.79	10.73	≤13	PASS
	3	23025	700.5	33.37	22.74	10.63	≤13	PASS
		23095	707.5	33.51	22.95	10.56	≤13	PASS
		23165	714.5	34.84	22.83	12.01	≤13	PASS
	5	23035	701.5	32.95	22.71	10.24	≤13	PASS
		23095	707.5	33.75	22.90	10.85	≤13	PASS
		23155	713.5	33.08	22.79	10.29	≤13	PASS
	10	23060	704	32.98	22.69	10.29	≤13	PASS
		23095	707.5	32.03	22.86	9.17	≤13	PASS
		23130	711	32.54	22.76	9.78	≤13	PASS

LTE Band 13								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	5	23205	779.5	32.47	22.80	9.67	≤13	PASS
		23230	782	32.64	22.68	9.96	≤13	PASS
		23255	784.5	33.47	22.67	10.80	≤13	PASS
	10	23230	782	32.46	22.77	9.69	≤13	PASS
16QAM	5	23205	779.5	31.94	21.84	10.10	≤13	PASS
		23230	782	32.23	22.19	10.04	≤13	PASS
		23255	784.5	32.85	21.93	10.92	≤13	PASS
	10	23230	782	32.68	22.95	9.73	≤13	PASS

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4.6 Frequency Stability

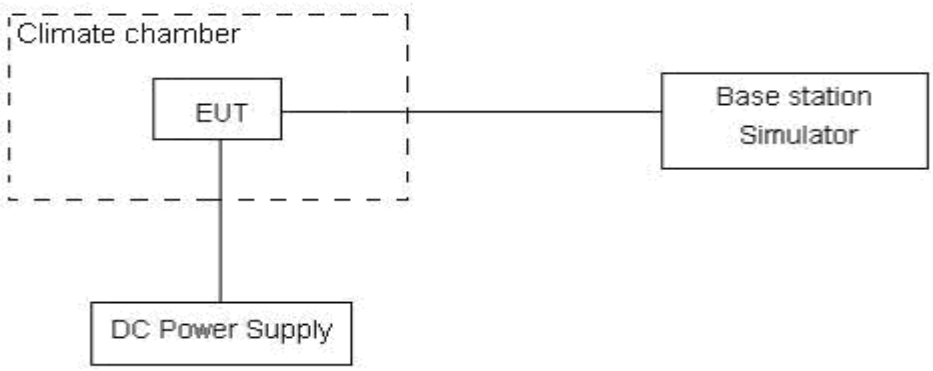
Ambient condition

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 3.3 V and 4.3 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.

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