RF TEST REPORT

Applicant	Quectel Wireless Solutions Co., Ltd
FCC ID	XMR201807EG91NA
Product	LTE Module
Brand	Quectel
Model	EG91-NA
Report No.	R1805A0250-R3
Issue Date	July 12, 2018

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

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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)/27.53(f) /27.53(c)	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	2.1051/27.53(h) /27.53(g) /27.53(f)	PASS
Date of Testing: May 25, 2018 ~ June 27, 2018			
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

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.

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.

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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
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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 200233, China
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

General information

EUT Description			
Model	EG91-NA		
IMEI	862831030088426		
Hardware Version	R1.0		
Software Version	EG91NAFBR05A03M4G		
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)	WCDMA Band IV; LTE Band 4; LTE Band 12, LTE Band 13;		
Test Modulation	(WCDMA)QPSK; (LTE)QPSK 16QAM;		
HSDPA UE Category	24		
HSUPA UE Category	6		
DC-HSDPA UE Category	24		
LTE Category	1		
Maximum E.I.R.P./ E.R.P.	WCDMA Band IV:	24.11dBm	
	LTE Band 4:	25.23dBm	
	LTE Band 12:	19.44dBm	
	LTE Band 13:	22.55Bm	
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)
	WCDMA Band IV	1710 ~ 1755	2110 ~ 2155
	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. 2. For LTE, 16QAM only supports 25%RB.			

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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-E (2016)

KDB 971168 D01 Power Meas License Digital Systems v03r01

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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 position) 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 WCDMA/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 WCDMA Band IV:

	Test items	**Modes/Modulation**
		WCDMA Band IV
Conducted Test cases	RF power output	RMC HSDPA/HSUPA DC-HSDPA
	Occupied Bandwidth	RMC
	Band Edge Compliance	RMC
	Peak-to-Average Power Ratio	RMC
	Frequency Stability	RMC
	Spurious Emissions at Antenna Terminals	RMC
Radiated Test cases	Effective Isotropic Radiated power	RMC
	Radiates Spurious Emission	RMC

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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	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
Occupied Bandwidth	LTE 4	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
	LTE 13	-	-	O	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	O
	LTE 12	O	O	O	O	-	-	O	O	O	-	O	O	O	O
	LTE 13	-	-	O	O	-	-	O	O	O	-	O	O	O	O
Frequency Stability	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
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
Radiates Spurious Emission	LTE 4	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	O
Note	1. The mark “O” means that this configuration is chosen for testing. 2. The mark “-” means that this configuration is not testing. 3. For LTE, 16QAM only supports 25%RB.														

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5 Test Case Results

5.1 RF Power Output

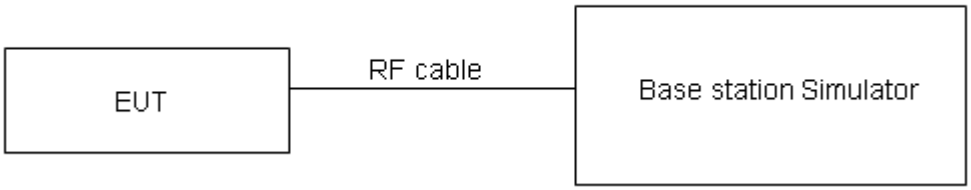
Ambient condition

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.

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Test Results

WCDMA Band IV		AV Conducted Power(dBm)		
		Channel 1312	Channel 1413	Channel 1513
		1712.4 (MHz)	1732.6 (MHz)	1752.6(MHz)
RMC	12.2k	23.57	23.56	23.51
	64k	23.43	23.50	23.38
	144k	23.42	23.40	23.37
	384k	23.41	23.39	23.36
HSDPA	Sub - Test 1	23.27	23.25	23.26
	Sub - Test 2	23.25	23.28	23.32
	Sub - Test 3	22.89	22.79	22.86
	Sub - Test 4	22.83	22.74	22.80
HSUPA	Sub - Test 1	23.32	23.25	23.30
	Sub - Test 2	22.84	22.81	22.80
	Sub - Test 3	23.32	23.31	23.27
	Sub - Test 4	23.31	23.29	23.36
	Sub - Test 5	23.26	23.16	23.25
DC-HSDPA	Sub - Test 1	23.44	23.43	23.38
	Sub - Test 2	23.42	23.42	23.37
	Sub - Test 3	22.91	22.91	22.86
	Sub - Test 4	22.90	22.90	22.85

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LTE 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	23.94	24.08	23.88
		1	2	24.02	24.12	24.05
		1	5	24.13	24.25	23.87
		3	0	24.07	23.93	23.92
		3	2	23.93	23.86	23.96
		3	3	24.03	23.83	24.02
		6	0	23.06	22.95	22.98
	16QAM	1	0	23.39	23.01	22.93
		1	2	23.48	23.49	23.12
		1	5	23.51	22.67	23.05
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19965/1711.5	20175/1732.5	20385/1753.5
3MHz	QPSK	1	0	24.02	24.03	24.03
		1	7	24.05	24.30	24.21
		1	14	23.91	24.06	23.81
		8	0	22.88	22.94	23.03
		8	4	22.85	22.87	22.96
		8	7	22.70	22.98	22.89
		15	0	22.79	23.06	22.93
	16QAM	1	0	22.89	22.67	23.60
		1	7	22.85	23.00	23.73
		1	14	22.69	22.94	23.49
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				19975/1712.5	20175/1732.5	20375/1752.5
5MHz	QPSK	1	0	23.99	24.01	23.99
		1	13	24.03	24.26	24.18
		1	24	23.88	24.01	23.77
		12	0	22.85	22.89	22.99
		12	6	22.83	22.83	22.91
		12	13	22.68	22.96	22.85
		25	0	22.77	23.05	22.91
	16QAM	1	0	22.86	22.63	23.57
		1	13	22.82	22.98	23.70
		1	24	22.66	22.92	23.45
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20000/1715	20175/1732.5	20350/1750
10MHz	QPSK	1	0	24.01	24.02	24.02
		1	25	24.06	24.31	24.22
		1	49	23.90	24.05	23.80
		25	0	22.88	22.94	23.03

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		25	13	22.86	22.88	22.95
		25	25	22.70	23.00	22.90
		50	0	22.85	23.07	22.95
	16QAM	1	0	22.88	22.66	23.59
		1	25	22.85	23.02	23.73
		1	49	22.69	22.94	23.48
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20025/1717.5	20175/1732.5	20325/1747.5
15MHz	QPSK	1	0	24.00	23.98	24.00
		1	38	24.04	24.30	24.19
		1	74	23.87	24.00	23.76
		36	0	22.86	22.90	23.00
		36	18	22.83	22.83	22.91
		36	39	22.67	22.97	22.86
		75	0	22.83	23.03	22.90
	16QAM	1	0	22.83	22.64	23.57
		1	38	22.83	22.99	23.71
		1	74	22.66	22.90	23.45
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20050/1720	20175/1732.5	20300/1745
20MHz	QPSK	1	0	23.97	23.94	23.97
		1	50	24.03	24.26	24.17
		1	99	23.85	23.99	23.73
		50	0	22.83	22.85	22.96
		50	25	22.81	22.79	22.88
		50	50	22.64	22.92	22.82
		100	0	22.80	22.98	22.86
	16QAM	1	0	22.81	22.60	23.52
		1	50	22.79	22.97	23.67
		1	99	22.64	22.87	23.43

LTE 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	23.76	23.95	23.57
		1	2	23.67	23.83	23.68
		1	5	23.81	23.91	23.53
		3	0	23.74	23.76	23.78
		3	2	23.58	23.71	23.69
		3	3	23.69	23.81	23.64
		6	0	22.70	22.78	22.83

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	16QAM	1	0	23.53	23.16	22.71
		1	2	23.83	23.07	22.68
		1	5	23.63	22.90	22.60
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23025/700.5	23095/707.5	23165/714.5
3MHz	QPSK	1	0	23.92	23.75	23.64
		1	7	24.23	23.94	23.82
		1	14	23.51	23.73	23.65
		8	0	22.86	22.98	22.87
		8	4	22.99	23.03	22.68
		8	7	22.85	22.89	22.97
		15	0	22.85	22.93	22.99
	16QAM	1	0	22.59	23.27	22.84
		1	7	22.55	23.73	23.28
		1	14	22.58	23.36	22.68
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23035/701.5	23095/707.5	23155/713.5
5MHz	QPSK	1	0	23.91	23.71	23.62
		1	13	24.21	23.93	23.79
		1	24	23.48	23.68	23.61
		12	0	22.84	22.94	22.84
		12	6	22.96	22.98	22.64
		12	13	22.82	22.86	22.93
		25	0	22.83	22.89	22.94
	16QAM	1	0	22.54	23.25	22.82
		1	13	22.53	23.70	23.26
		1	24	22.55	23.32	22.65
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				23060/704	23095/707.5	23130/711
10MHz	QPSK	1	0	23.88	23.67	23.59
		1	25	24.20	23.89	23.77
		1	49	23.46	23.67	23.58
		25	0	22.81	22.89	22.80
		25	13	22.94	22.94	22.61
		25	25	22.79	22.81	22.89
		50	0	22.80	22.84	22.90
	16QAM	1	0	22.52	23.21	22.77
		1	25	22.49	23.68	23.22
		1	49	22.53	23.29	22.63

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LTE 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	23.73	23.60	23.61
		1	13	23.64	23.75	23.95
		1	24	23.58	23.74	23.82
		12	0	22.81	22.69	22.81
		12	6	22.65	22.71	22.83
		12	13	22.74	22.76	22.96
		25	0	22.76	22.78	22.89
	16QAM	1	0	22.88	22.86	22.46
		1	13	22.49	22.81	22.64
		1	24	23.12	22.65	22.56
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				/	23230/782	/
10MHz	QPSK	1	0	/	23.61	/
		1	25	/	23.77	/
		1	49	/	23.73	/
		25	0	/	22.71	/
		25	13	/	22.73	/
		25	25	/	22.82	/
		50	0	/	22.74	/
	16QAM	1	0	/	22.98	/
		1	25	/	23.23	/
		1	49	/	23.01	/

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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 D01 v03r01 Section 5.8 and ANSI/TIA-603-E (2016).

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.)

The RB allocation refers to section 5.1, using the maximum output power configuration.

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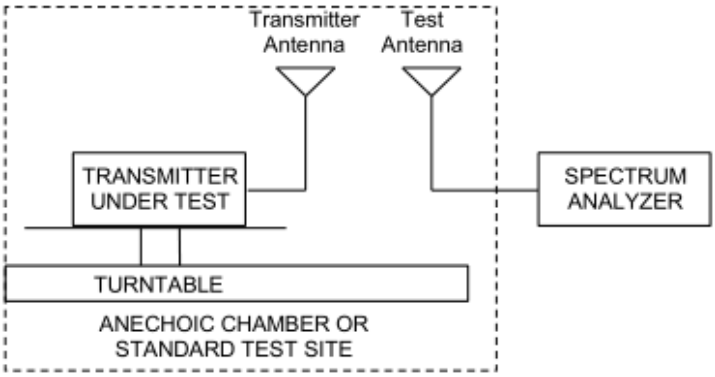
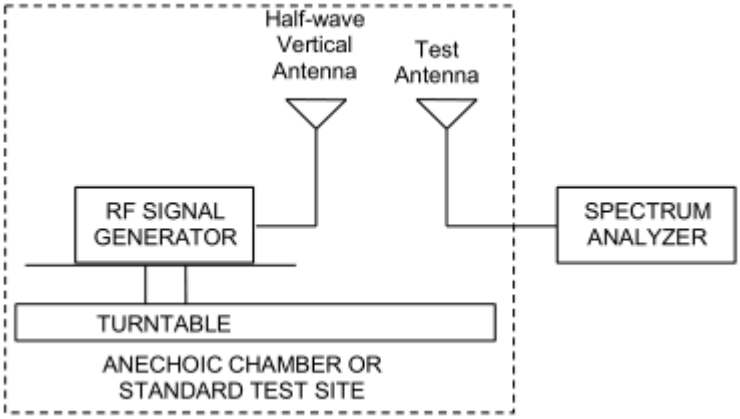
Test setup





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.

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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	⩽ 3 W (34.77 dBm)
Part 27.50(c)(10)Limit	⩽ 3 W (34.77 dBm)
Part 27.50(d)(4)Limit	⩽ 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

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	Channel	Frequency (MHz)	Polarization	EIRP (dBm)	Limit (dBm)	Conclusion
WCDMA Band IV	Low	1712.4	Horizontal	23.69	30	Pass
	Mid	1732.6	Horizontal	24.00	30	Pass
	High	1752.6	Horizontal	24.11	30	Pass

LTE Band 4						
Bandwidth	Channel	Frequency (MHz)	Polarization	EIRP (dBm)	Limit (dBm)	Conclusion
1.4 MHz (QPSK)	Low	1710.7	Horizontal	25.13	30	Pass
	Mid	1732.5	Horizontal	24.61	30	Pass
	High	1754.3	Horizontal	24.64	30	Pass
3 MHz (QPSK)	Low	1711.5	Horizontal	25.08	30	Pass
	Mid	1732.5	Horizontal	24.49	30	Pass
	High	1753.5	Horizontal	24.48	30	Pass
5 MHz (QPSK)	Low	1712.5	Horizontal	25.22	30	Pass
	Mid	1732.5	Horizontal	24.61	30	Pass
	High	1752.5	Horizontal	24.70	30	Pass
10 MHz (QPSK)	Low	1715	Horizontal	25.12	30	Pass
	Mid	1732.5	Horizontal	24.50	30	Pass
	High	1750	Horizontal	24.51	30	Pass
15 MHz (QPSK)	Low	1717.5	Horizontal	25.19	30	Pass
	Mid	1732.5	Horizontal	24.63	30	Pass
	High	1747.5	Horizontal	24.73	30	Pass
20 MHz (QPSK)	Low	1720	Horizontal	25.23	30	Pass
	Mid	1732.5	Horizontal	24.79	30	Pass
	High	1745	Horizontal	24.66	30	Pass
1.4 MHz (16QAM)	Low	1710.7	Horizontal	25.01	30	Pass
	Mid	1732.5	Horizontal	24.13	30	Pass
	High	1754.3	Horizontal	24.21	30	Pass
3 MHz (16QAM)	Low	1711.5	Horizontal	24.83	30	Pass
	Mid	1732.5	Horizontal	24.21	30	Pass
	High	1753.5	Horizontal	24.31	30	Pass
5 MHz (16QAM)	Low	1712.5	Horizontal	24.94	30	Pass
	Mid	1732.5	Horizontal	24.32	30	Pass
	High	1752.5	Horizontal	24.55	30	Pass
10 MHz (16QAM)	Low	1715	Horizontal	24.76	30	Pass
	Mid	1732.5	Horizontal	24.31	30	Pass
	High	1750	Horizontal	24.08	30	Pass

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15 MHz (16QAM)	Low	1717.5	Horizontal	25.02	30	Pass
	Mid	1732.5	Horizontal	24.31	30	Pass
	High	1747.5	Horizontal	24.48	30	Pass
20 MHz (16QAM)	Low	1720	Horizontal	24.78	30	Pass
	Mid	1732.5	Horizontal	24.35	30	Pass
	High	1745	Horizontal	24.29	30	Pass

LTE Band 12						
Bandwidth	**Channel**	**Frequency (MHz)**	**Polarization**	**ERP (dBm)**	**Limit (dBm)**	**Conclusion**
1.4 MHz (QPSK)	Low	699.7	Horizontal	18.88	34.77	Pass
	Mid	707.5	Horizontal	19.23	34.77	Pass
	High	715.3	Horizontal	19.26	34.77	Pass
3 MHz (QPSK)	Low	700.5	Horizontal	19.04	34.77	Pass
	Mid	707.5	Horizontal	19.39	34.77	Pass
	High	714.5	Horizontal	19.44	34.77	Pass
5 MHz (QPSK)	Low	701.5	Horizontal	18.79	34.77	Pass
	Mid	707.5	Horizontal	19.22	34.77	Pass
	High	713.5	Horizontal	18.99	34.77	Pass
10 MHz (QPSK)	Low	704	Horizontal	18.69	34.77	Pass
	Mid	707.5	Horizontal	19.11	34.77	Pass
	High	711	Horizontal	19.08	34.77	Pass
1.4 MHz (16QAM)	Low	699.7	Horizontal	18.53	34.77	Pass
	Mid	707.5	Horizontal	18.82	34.77	Pass
	High	715.3	Horizontal	19.03	34.77	Pass
3 MHz (16QAM)	Low	700.5	Horizontal	18.62	34.77	Pass
	Mid	707.5	Horizontal	18.90	34.77	Pass
	High	714.5	Horizontal	18.88	34.77	Pass
5 MHz (16QAM)	Low	701.5	Horizontal	18.64	34.77	Pass
	Mid	707.5	Horizontal	18.90	34.77	Pass
	High	713.5	Horizontal	18.74	34.77	Pass
10 MHz (16QAM)	Low	704	Horizontal	18.49	34.77	Pass
	Mid	707.5	Horizontal	18.77	34.77	Pass
	High	711	Horizontal	18.84	34.77	Pass

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LTE Band 13						
Bandwidth	**Channel**	**Frequency (MHz)**	**Polarization**	**ERP (dBm)**	**Limit (dBm)**	**Conclusion**
5MHz (QPSK)	Low	779.5	Horizontal	22.11	34.77	Pass
	Mid	782	Horizontal	22.03	34.77	Pass
	High	784.5	Horizontal	22.36	34.77	Pass
10MHz (QPSK)	Mid	782	Horizontal	22.55	34.77	Pass
5MHz (16QAM)	Low	779.5	Horizontal	21.86	34.77	Pass
	Mid	782	Horizontal	21.72	34.77	Pass
	High	784.5	Horizontal	21.94	34.77	Pass
10MHz (16QAM)	Mid	782	Horizontal	22.47	34.77	Pass

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5.3 Occupied Bandwidth

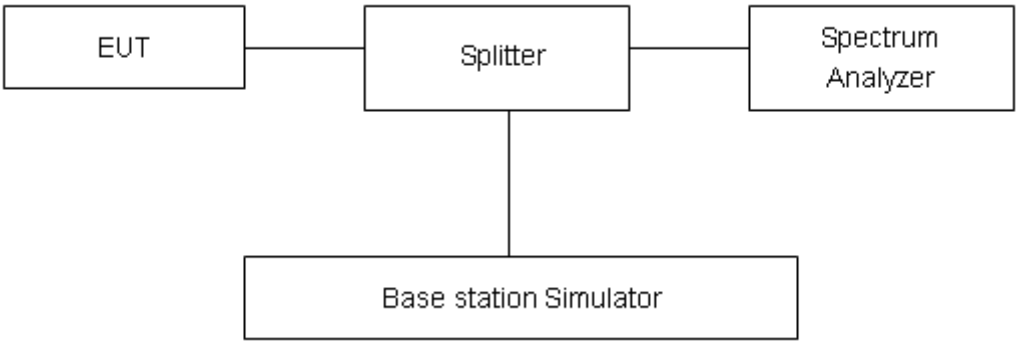
Ambient condition

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 WCDMA Band IV.
RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 4/12 (1.4MHz).
RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 4/12 (3MHz).
RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 4/12/13 (5MHz).
RBW is set to 300 kHz, VBW is set to 1MHz for LTE Band 4/12/13 (10MHz).
RBW is set to 300 kHz, VBW is set to 1MHz for LTE Band 4 (15MHz/20MHz).
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

Mode	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
WCDMA Band IV (RMC)	1312	1712.4	4.1211	4.659
	1413	1732.6	4.1166	4.670
	1513	1752.6	4.1172	4.682

LTE Band 4						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	19957	1710.7	1.1274	1.3370
			20175	1732.5	1.1077	1.3150
			20393	1754.3	1.1108	1.3350
		3	19965	1711.5	2.7345	3.0400
			20175	1732.5	2.7353	3.0640
			20385	1753.5	2.7424	3.0340
		5	19975	1712.5	4.5308	5.0300
			20175	1732.5	4.5140	4.9760
			20375	1752.5	4.5177	5.0220
		10	20000	1715	9.0214	10.0400
			20175	1732.5	9.0081	10.0200
			20350	1750	9.0092	10.0800
		15	20025	1717.5	13.4740	14.7000
			20175	1732.5	13.4380	14.5600
			20325	1747.5	13.4310	14.6100
		20	20050	1720	17.8960	19.2100
			20175	1732.5	17.9110	19.0400
			20300	1745	17.8610	19.3600
	16QAM	1.4	19957	1710.7	0.3272	0.4604
			20175	1732.5	0.3229	0.4644
			20393	1754.3	0.3144	0.4702
		3	19965	1711.5	0.4026	0.5520
			20175	1732.5	0.4055	0.5578
			20385	1753.5	0.4075	0.5416
		5	19975	1712.5	0.4913	0.6869
			20175	1732.5	0.4934	0.6827
			20375	1752.5	0.4789	0.6779
		10	20000	1715	0.8854	1.2250
			20175	1732.5	0.8542	1.1550

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			20350	1750	0.8818	1.1890
		15	20025	1717.5	1.1618	1.5790
			20175	1732.5	1.1293	1.5530
			20325	1747.5	1.1097	1.5420
		20	20050	1720	1.2408	1.7520
			20175	1732.5	1.2067	1.6770
			20300	1745	1.2187	1.7130

LTE Band 12						
RB	**Modulation**	**Bandwidth (MHz)**	**Channel**	**Frequency (MHz)**	**99% Power Bandwidth(MHz)**	**-26dBc Bandwidth(MHz)**
100%	QPSK	1.4	23017	699.7	1.1165	1.3150
			23095	707.5	1.1136	1.3350
			23173	715.3	1.1154	1.3190
		3	23025	700.5	2.7422	3.0590
			23095	707.5	2.7444	3.0520
			23165	714.5	2.7392	3.0720
		5	23035	701.5	4.5137	5.0130
			23095	707.5	4.5160	4.9720
			23155	713.5	4.5174	5.0130
		10	23060	704	9.0155	10.1000
			23095	707.5	9.0102	10.0300
			23130	711	9.0204	9.9670
	16QAM	1.4	23017	699.7	0.3314	0.4775
			23095	707.5	0.3212	0.4597
			23173	715.3	0.3138	0.4574
		3	23025	700.5	0.4025	0.5570
			23095	707.5	0.4097	0.5657
			23165	714.5	0.4048	0.5427
		5	23035	701.5	0.4960	0.7097
			23095	707.5	0.4936	0.7157
			23155	713.5	0.4699	0.6754
		10	23060	704	0.8933	1.2160
			23095	707.5	0.8720	1.2100
			23130	711	0.8918	1.2210

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LTE Band 13						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	5	23205	779.5	4.4928	4.9500
			23230	782	4.5330	5.0620
			23255	784.5	4.5082	4.9480
		10	23230	782	9.0350	10.0500
	16QAM	5	23205	779.5	0.4991	0.7263
			23230	782	0.4698	0.6870
			23255	784.5	0.4875	0.6893
		10	23230	782	0.9025	1.2680

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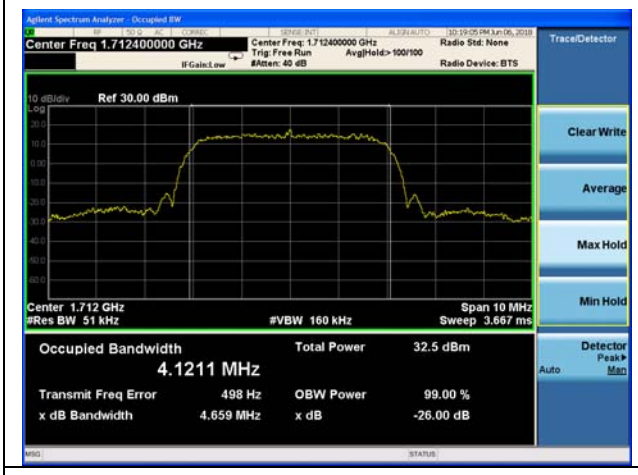
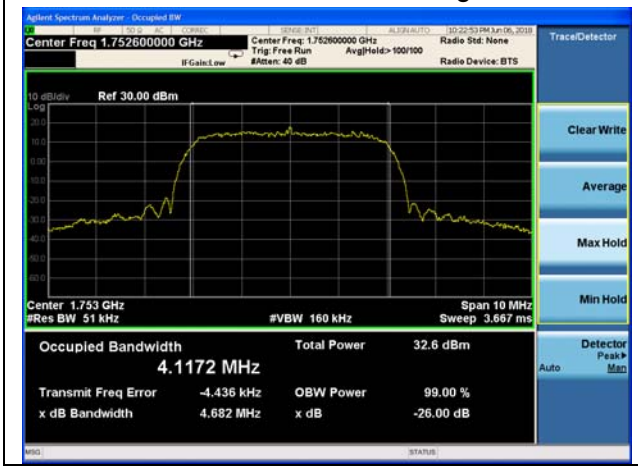
WCDMA Band IV CH-Low



WCDMA Band IV CH Middle

WCDMA Band IV CH High



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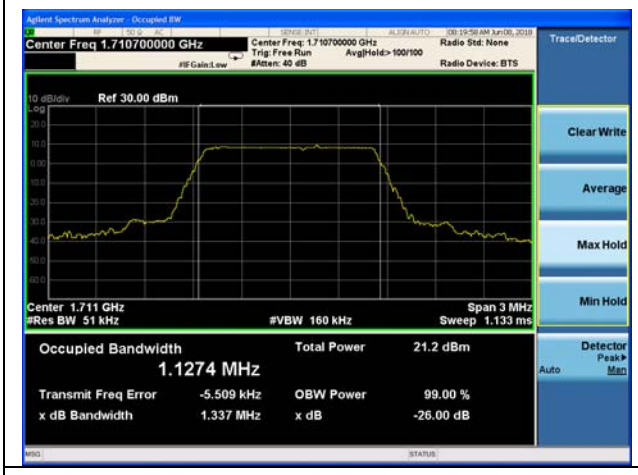
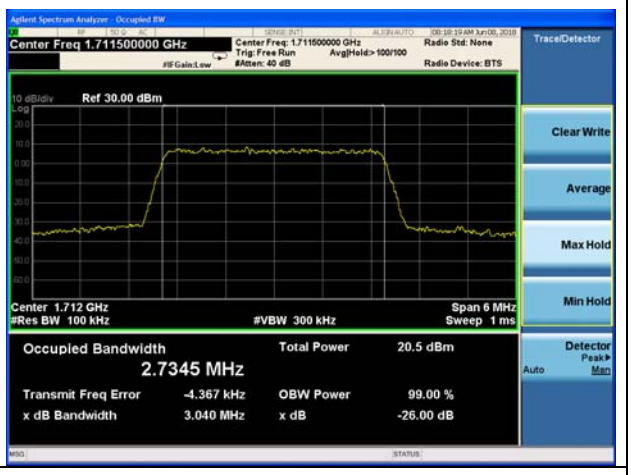
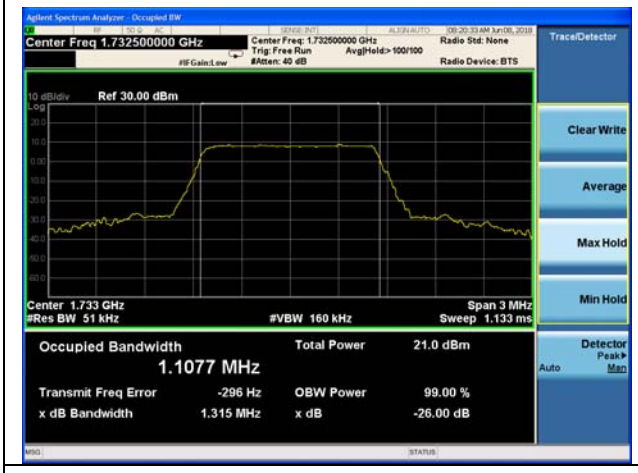
LTE Band 4 QPSK 1.4MHz CH-Low



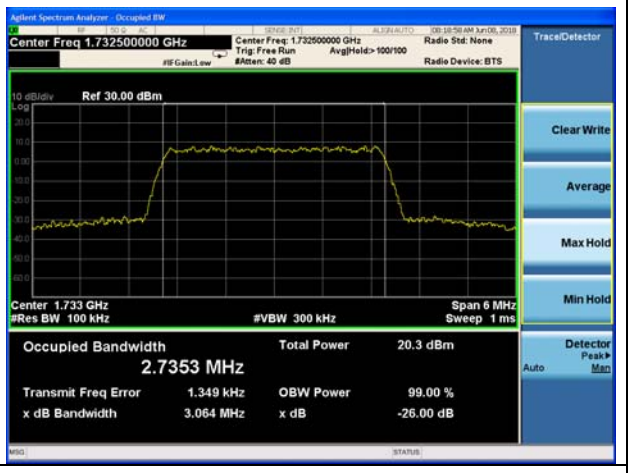
LTE Band 4 QPSK 3MHz CH-Low



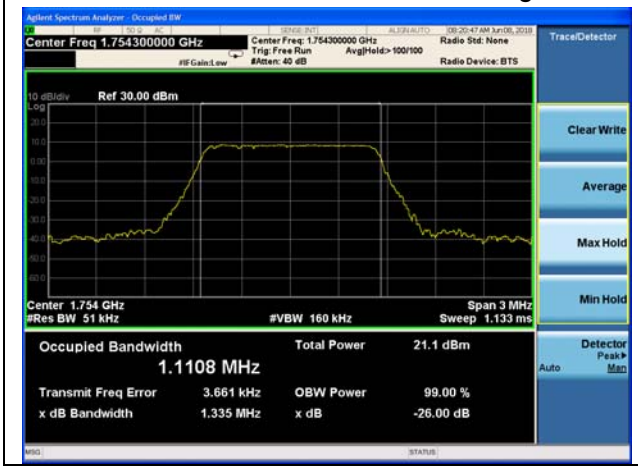
LTE Band 4 QPSK 1.4MHz CH-Middle



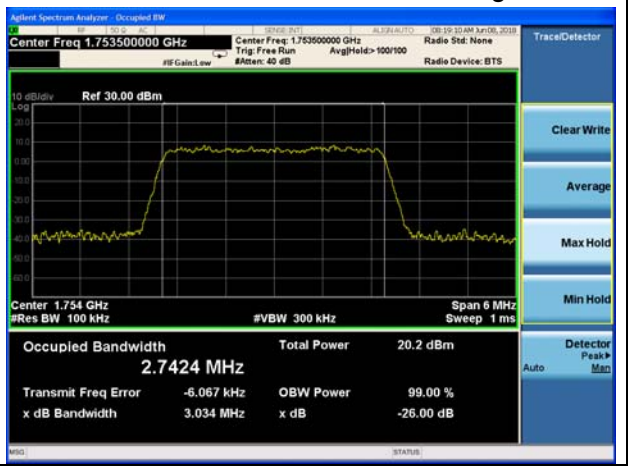
LTE Band 4 QPSK 3MHz CH-Middle



LTE Band 4 QPSK 1.4MHz CH-High



LTE Band 4 QPSK 3MHz CH-High



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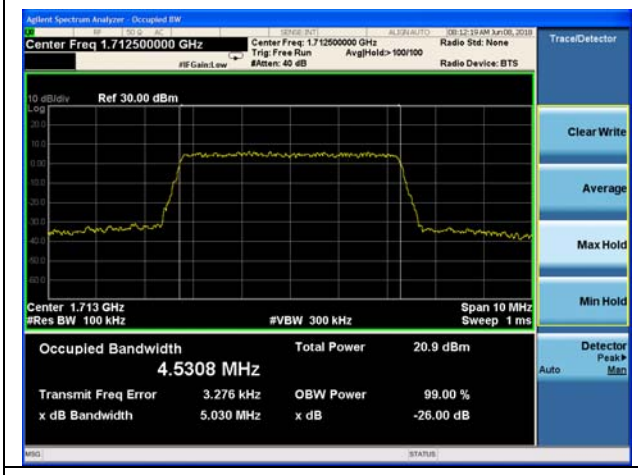
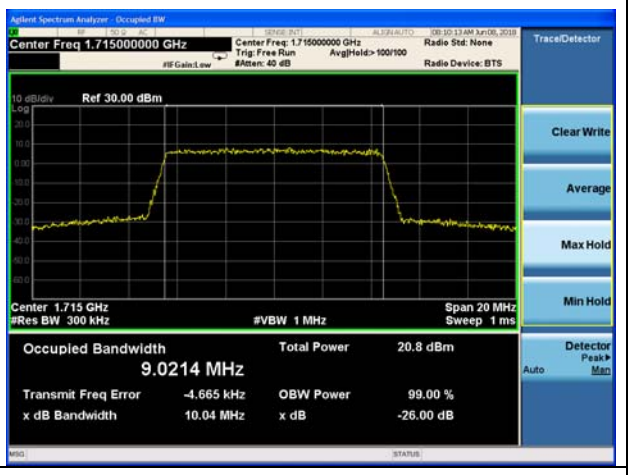
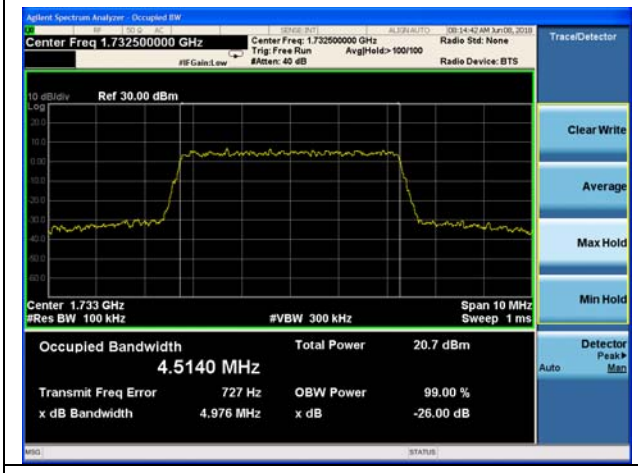
LTE Band 4 QPSK 5MHz CH-Low



LTE Band 4 QPSK 10MHz CH-Low

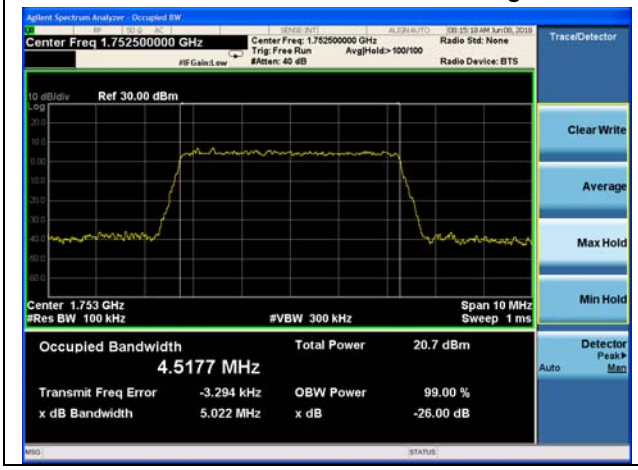


LTE Band 4 QPSK 5MHz CH-Middle



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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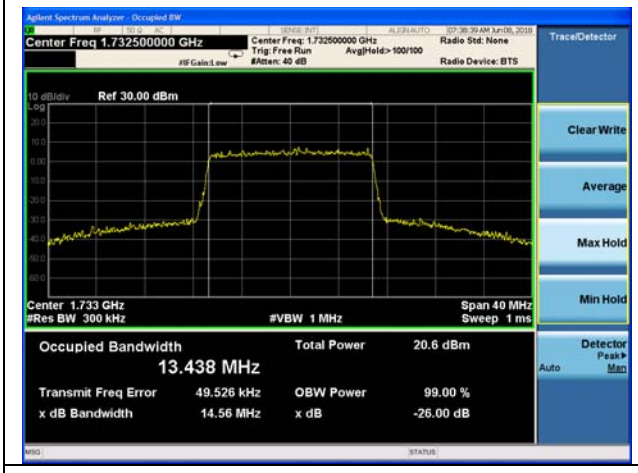
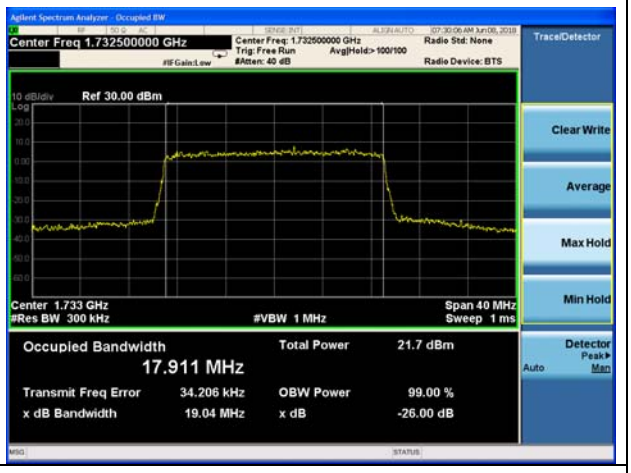
LTE Band 4 QPSK 15MHz CH-Low

LTE Band 4 QPSK 20MHz CH-Low

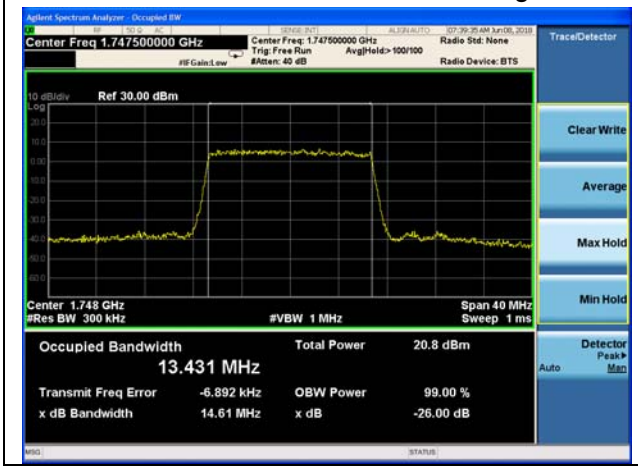
LTE Band 4 QPSK 15MHz CH-Middle



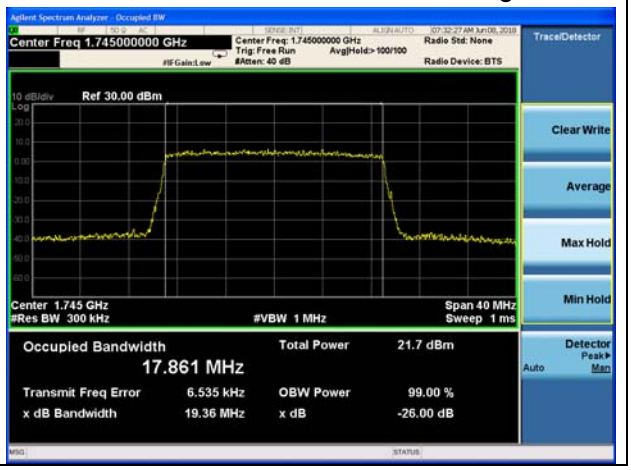
LTE Band 4 QPSK 20MHz CH-Middle



LTE Band 4 QPSK 15MHz CH-High



LTE Band 4 QPSK 20MHz CH-High



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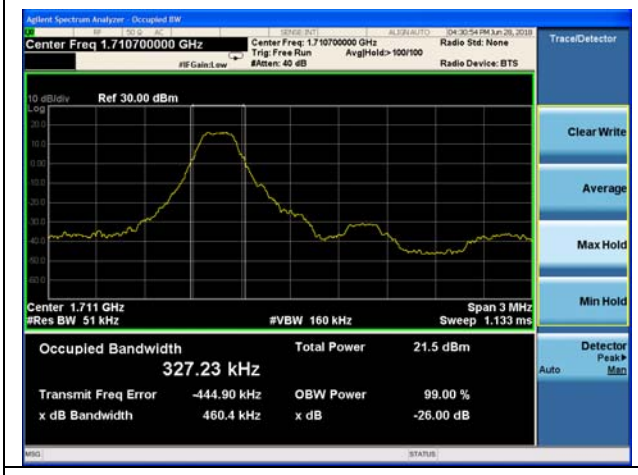
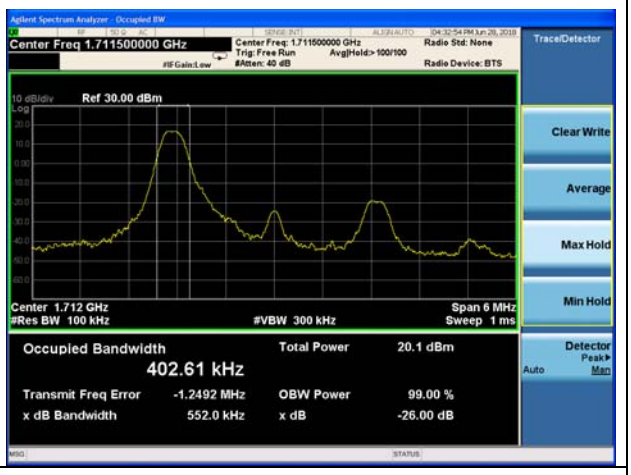
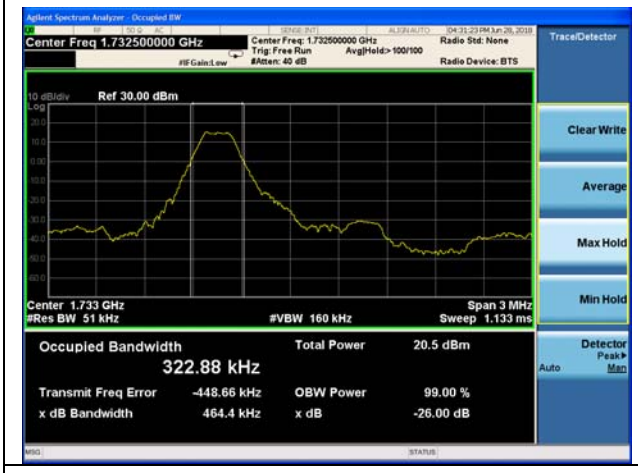
LTE Band 4 16QAM 1.4MHz CH-Low



LTE Band 4 16QAM 3MHz CH-Low

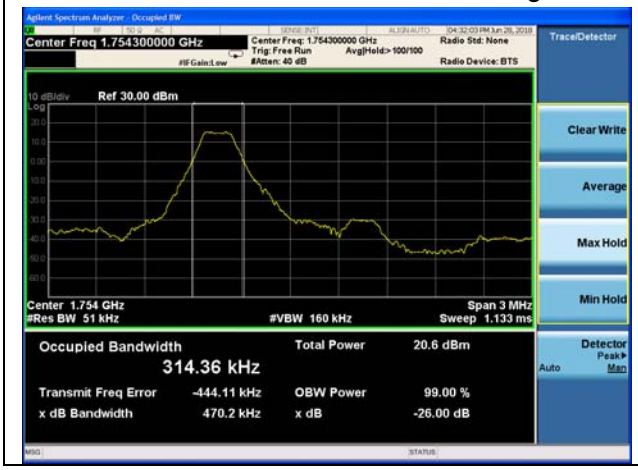


LTE Band 4 16QAM 1.4MHz CH-Middle

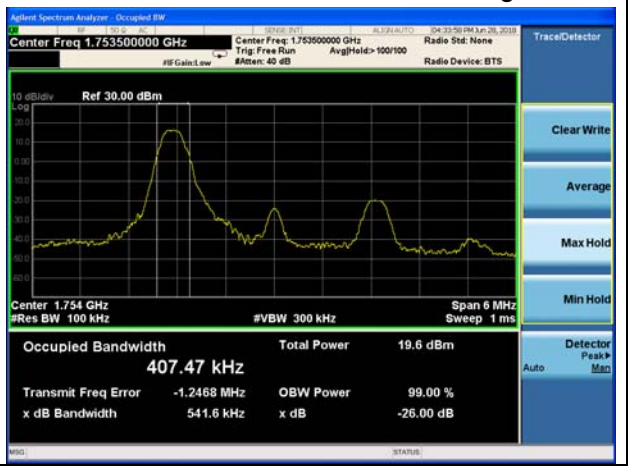


LTE Band 4 16QAM 3MHz CH-Middle

LTE Band 4 16QAM 1.4MHz CH-High



LTE Band 4 16QAM 3MHz CH-High



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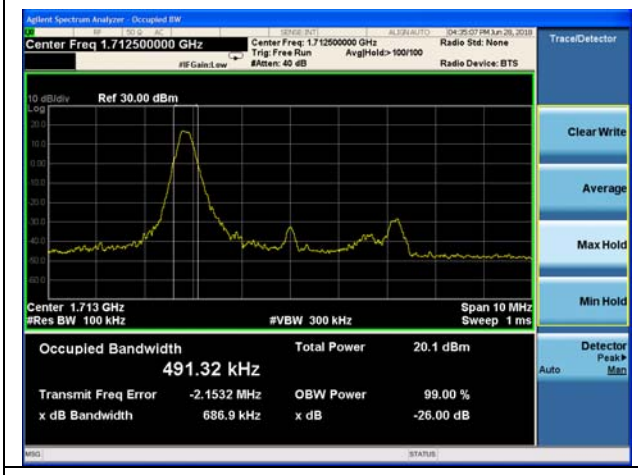
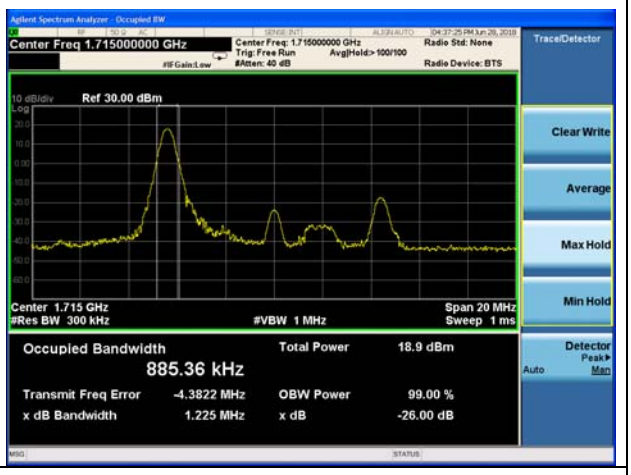
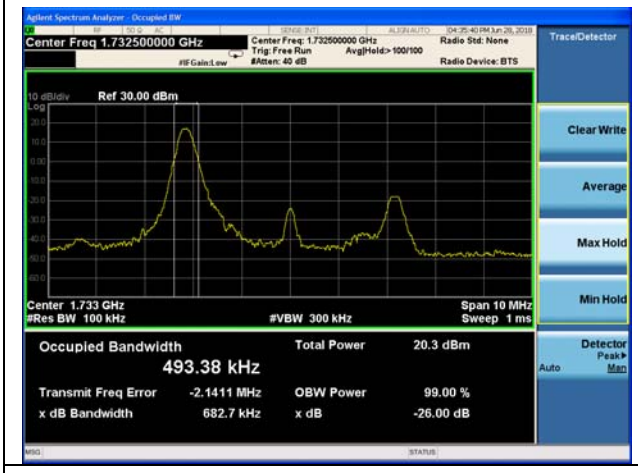
LTE Band 4 16QAM 5MHz CH-Low



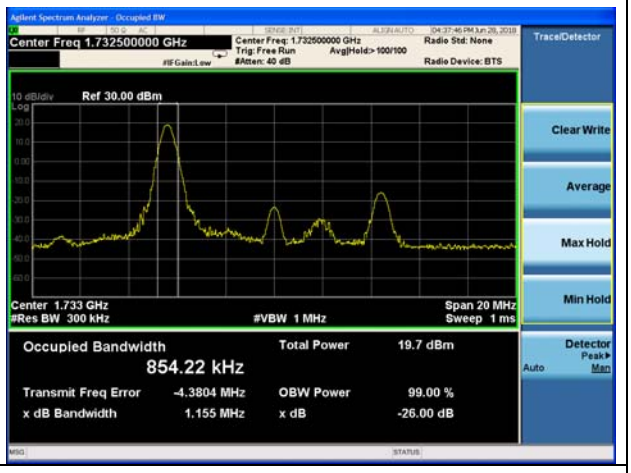
LTE Band 4 16QAM 10MHz CH-Low



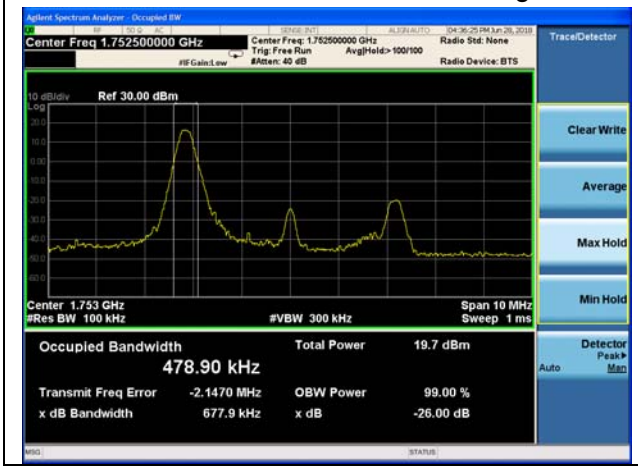
LTE Band 4 16QAM 5MHz CH-Middle



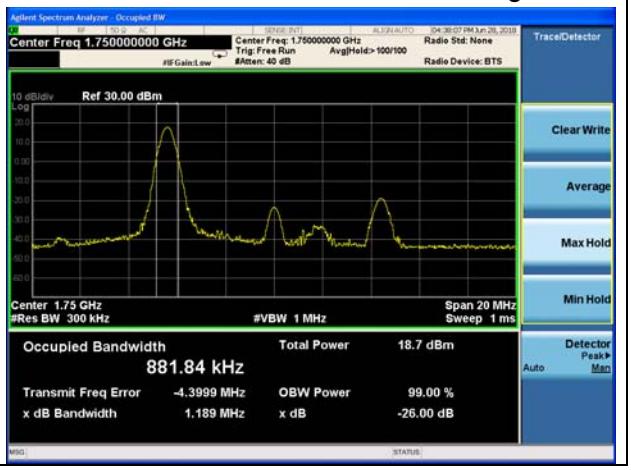
LTE Band 4 16QAM 10MHz CH-Middle



LTE Band 4 16QAM 5MHz CH-High



LTE Band 4 16QAM 10MHz CH-High



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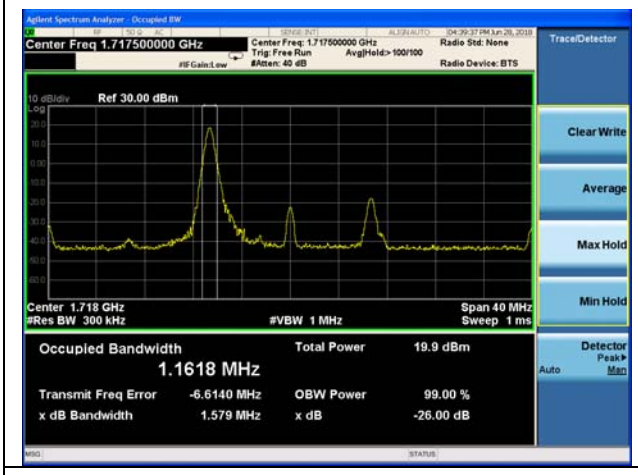
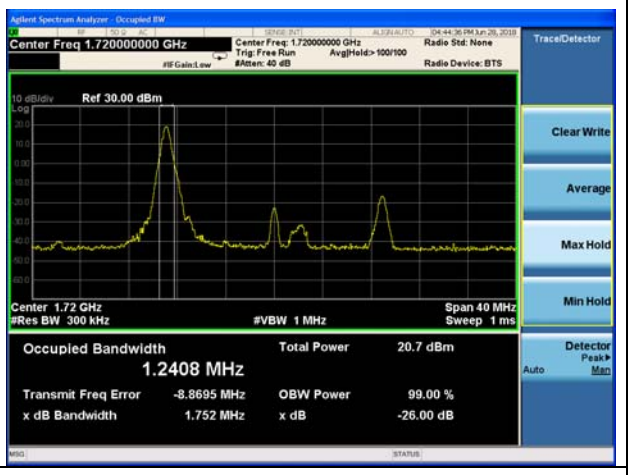
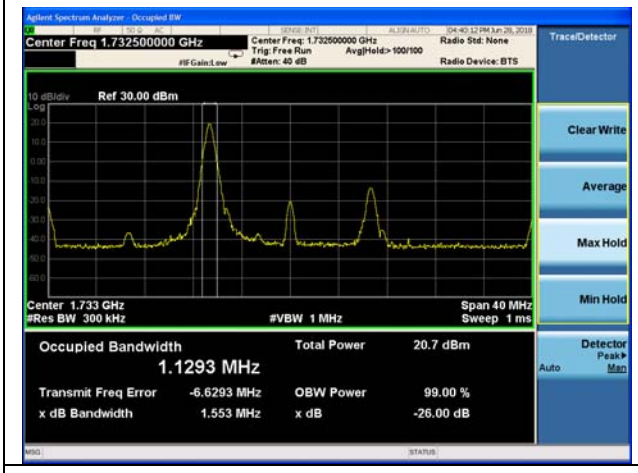
LTE Band 4 16QAM 15MHz CH-Low



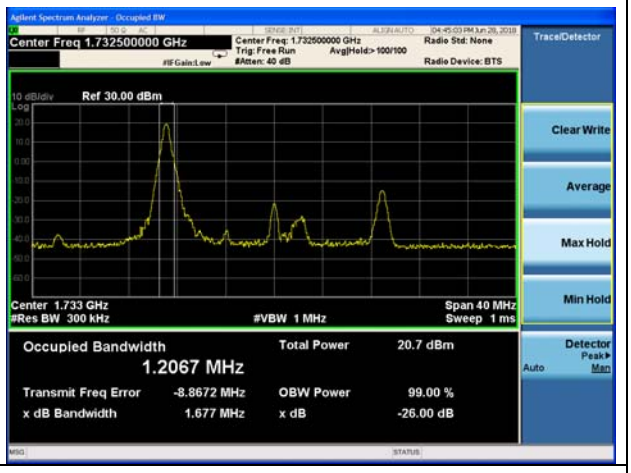
LTE Band 4 16QAM 20MHz CH-Low



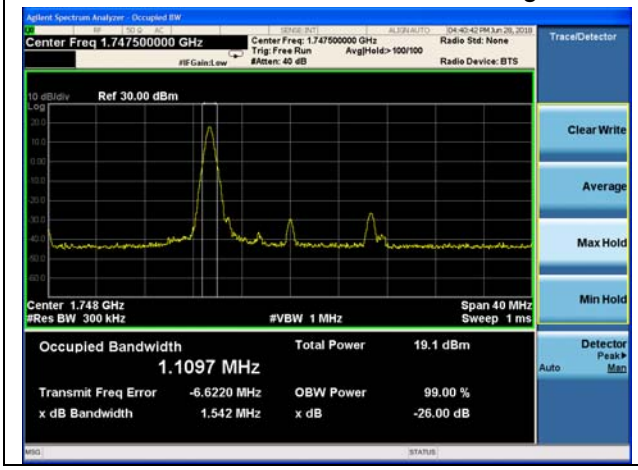
LTE Band 4 16QAM 15MHz CH-Middle



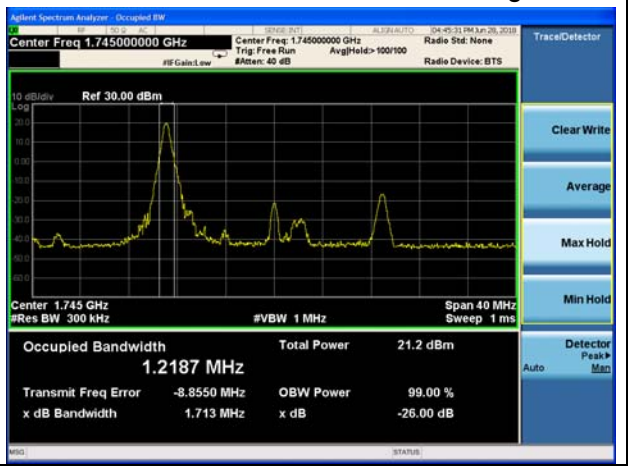
LTE Band 4 16QAM 20MHz CH-Middle



LTE Band 4 16QAM 15MHz CH-High



LTE Band 4 16QAM 20MHz CH-High



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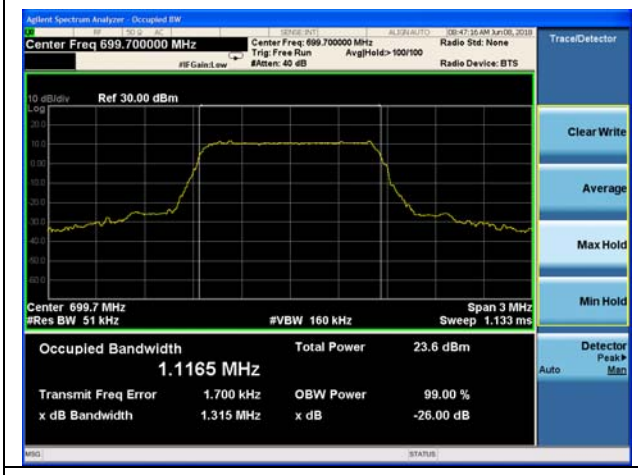
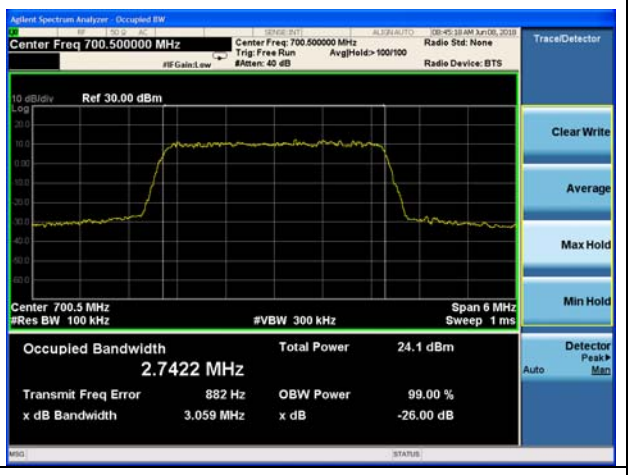
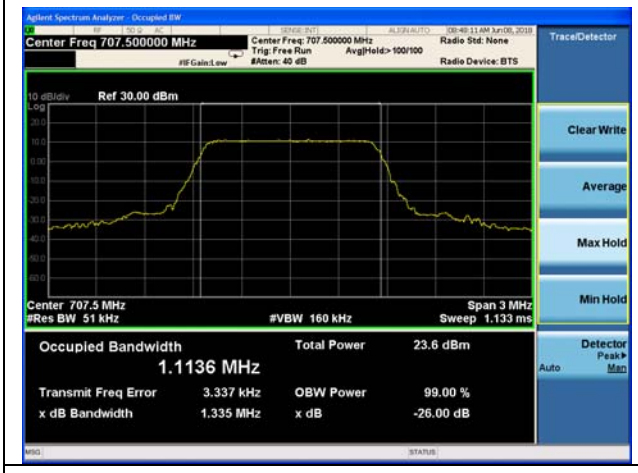
LTE Band 12 QPSK 1.4MHz CH-Low



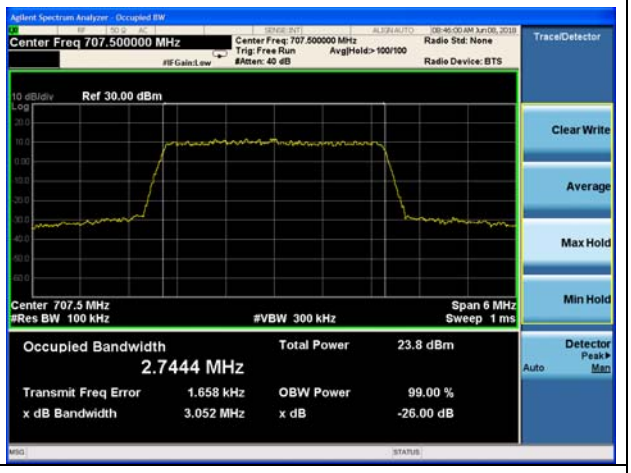
LTE Band 12 QPSK 3MHz CH-Low



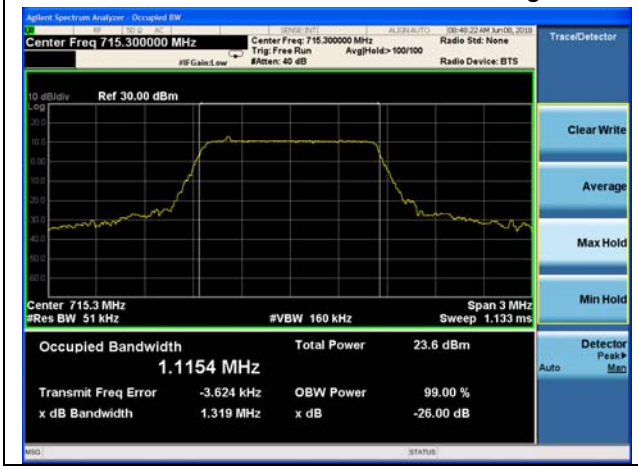
LTE Band 12 QPSK 1.4MHz CH-Middle



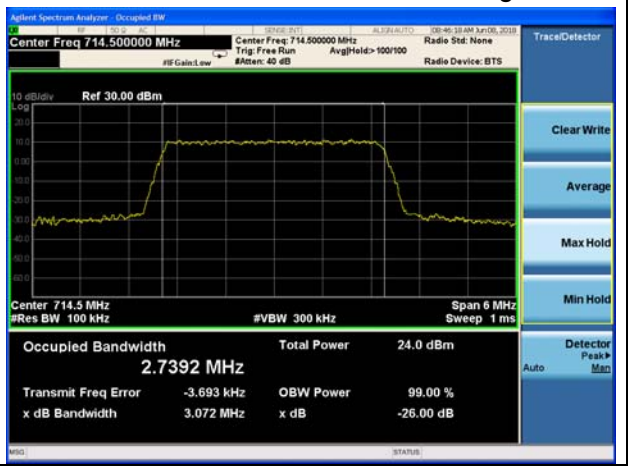
LTE Band 12 QPSK 3MHz CH-Middle



LTE Band 12 QPSK 1.4MHz CH-High



LTE Band 12 QPSK 3MHz CH-High



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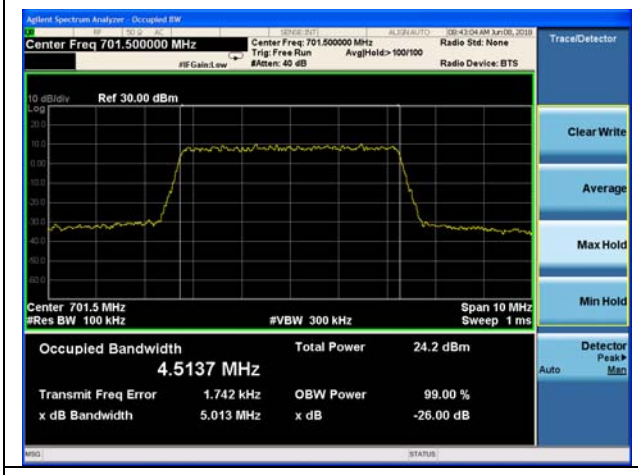
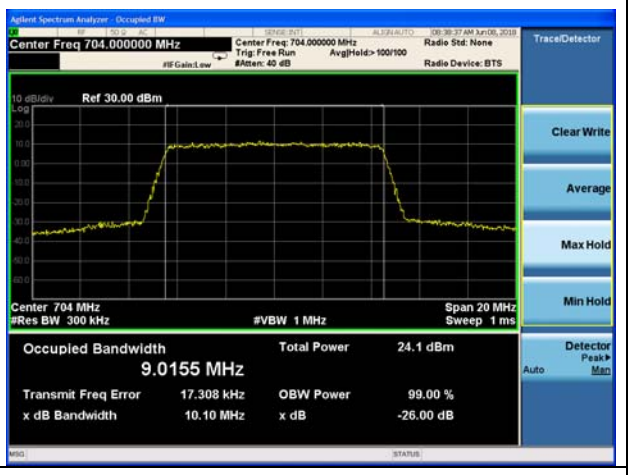
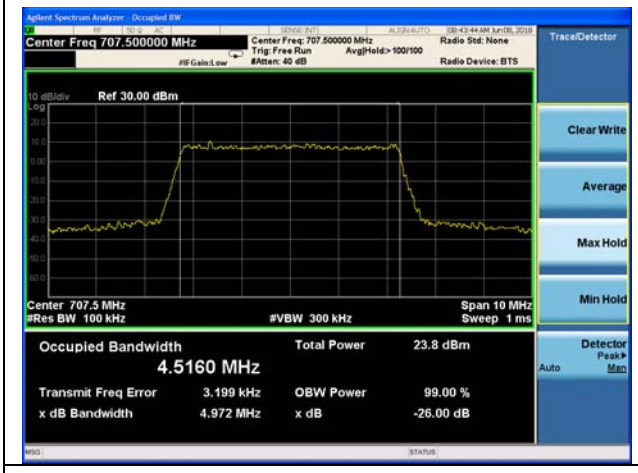
LTE Band 12 QPSK 5MHz CH-Low



LTE Band 12 QPSK 10MHz CH-Low

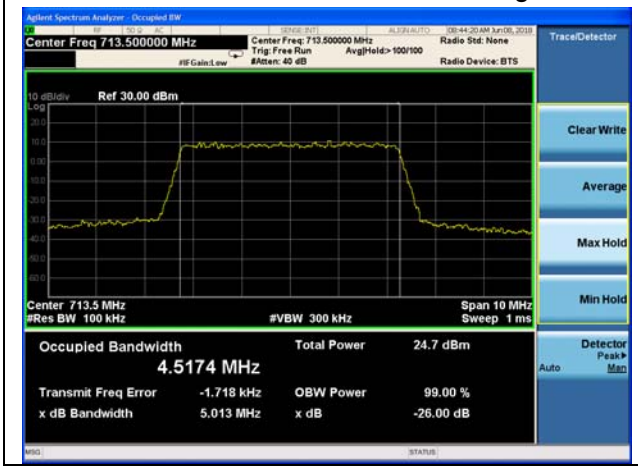


LTE Band 12 QPSK 5MHz CH-Middle

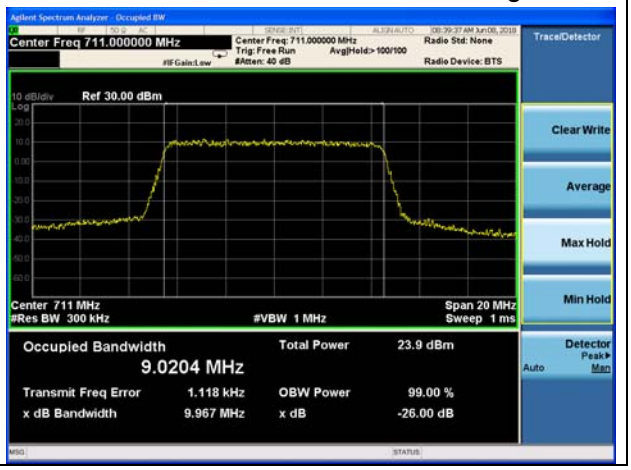


LTE Band 12 QPSK 10MHz CH-Middle

LTE Band 12 QPSK 5MHz CH-High



LTE Band 12 QPSK 10MHz CH-High



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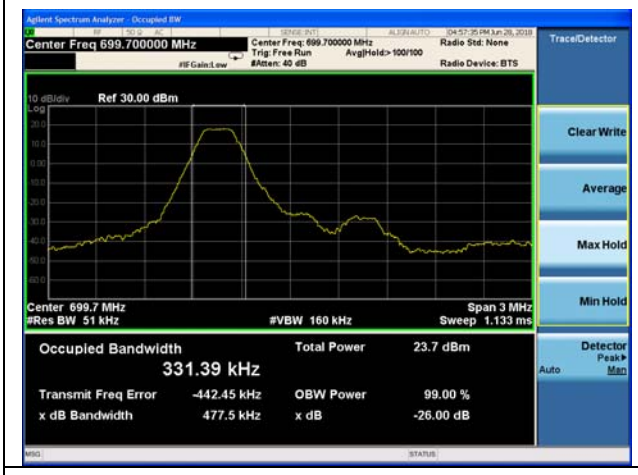
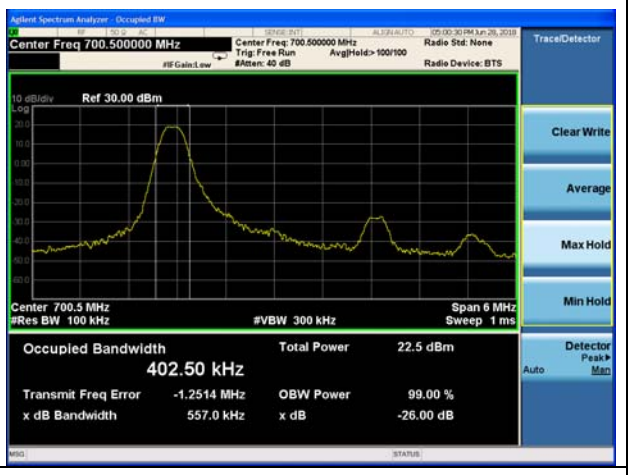
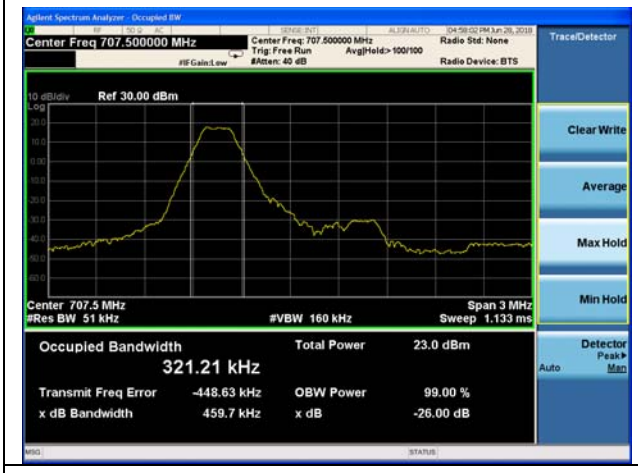
LTE Band 12 16QAM 1.4MHz CH-Low



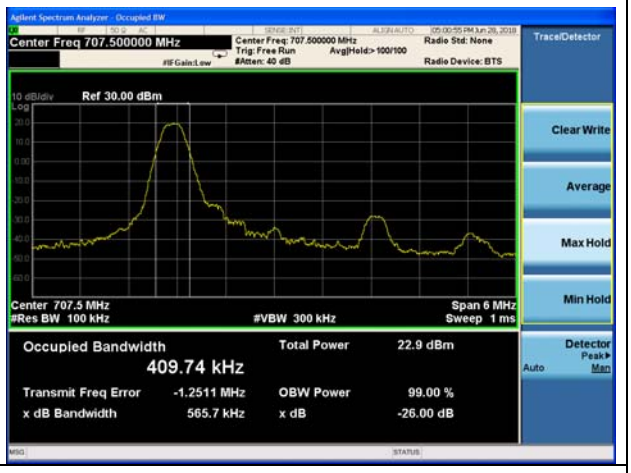
LTE Band 12 16QAM 3MHz CH-Low



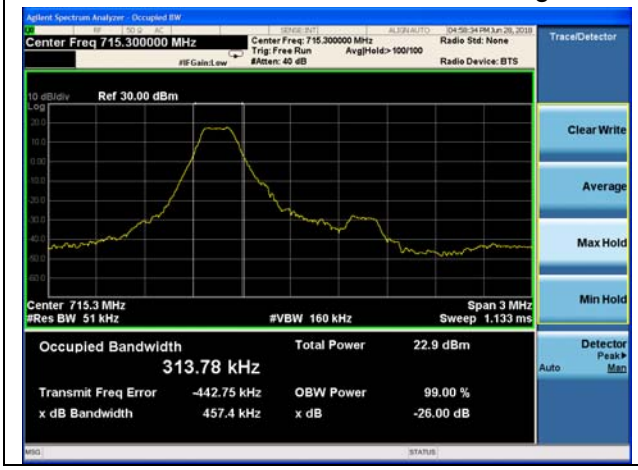
LTE Band 12 16QAM 1.4MHz CH-Middle



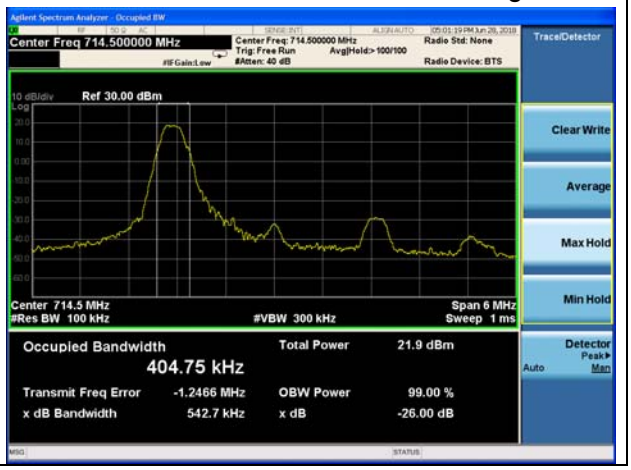
LTE Band 12 16QAM 3MHz CH-Middle



LTE Band 12 16QAM 1.4MHz CH-High



LTE Band 12 16QAM 3MHz CH-High



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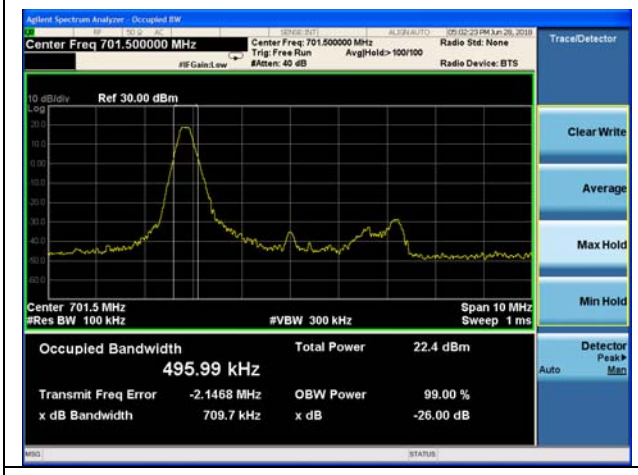
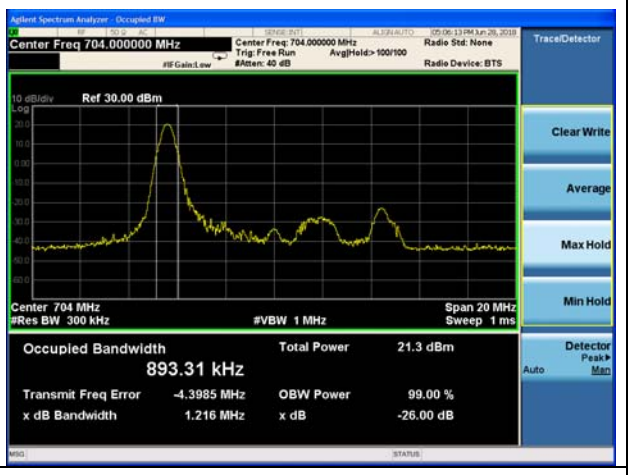
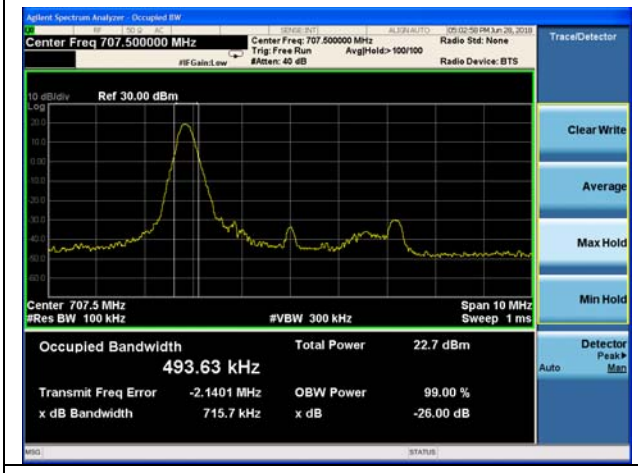
LTE Band 12 16QAM 5MHz CH-Low



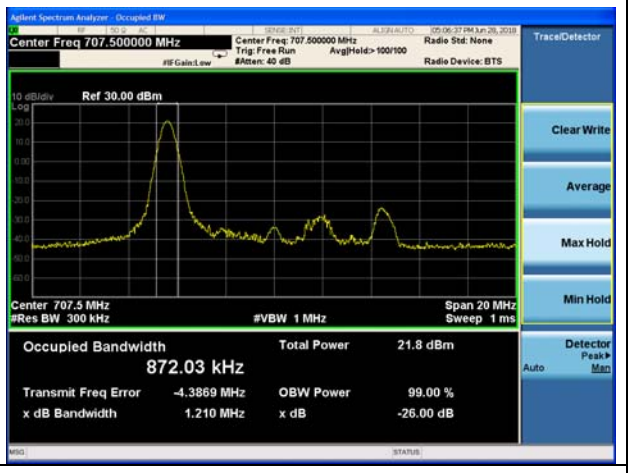
LTE Band 12 16QAM 10MHz CH-Low



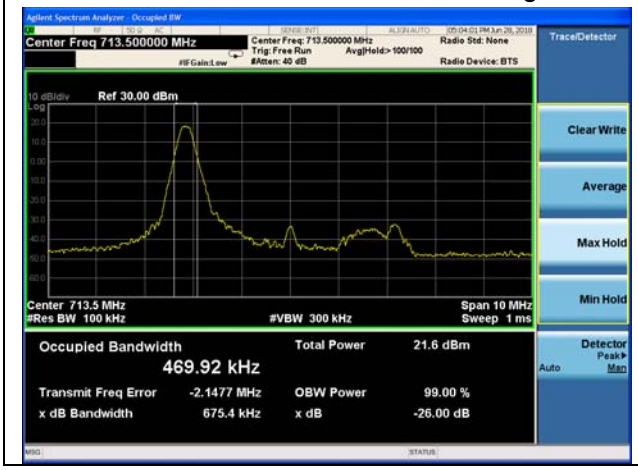
LTE Band 12 16QAM 5MHz CH-Middle



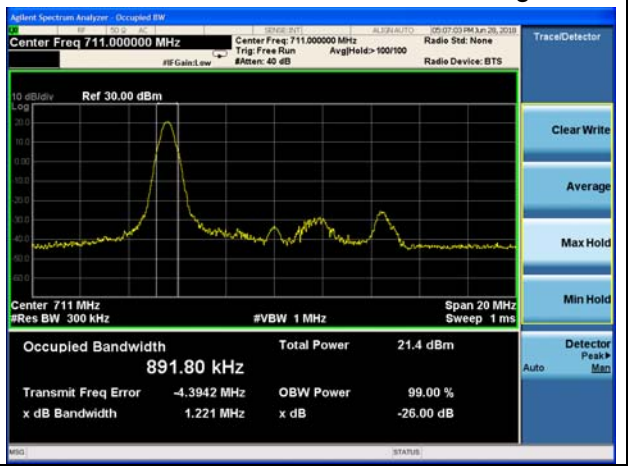
LTE Band 12 16QAM 10MHz CH-Middle



LTE Band 12 16QAM 5MHz CH-High



LTE Band 12 16QAM 10MHz CH-High



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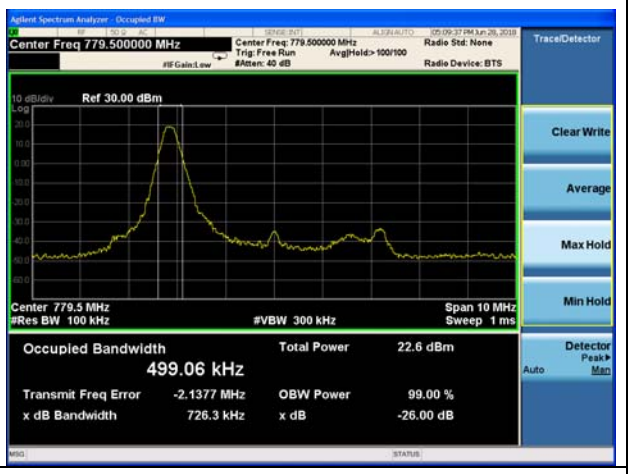
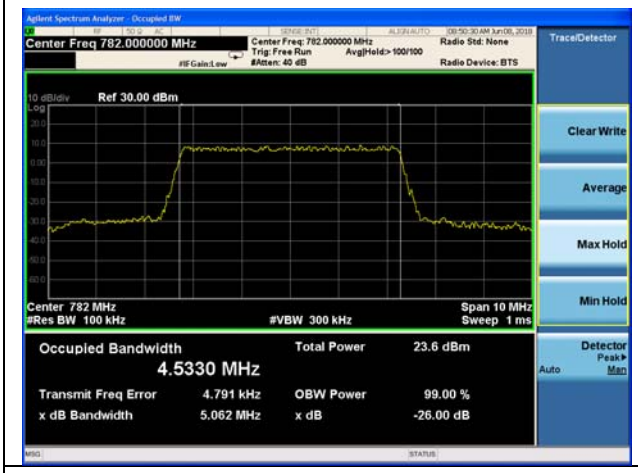
LTE Band 13 QPSK 5MHz CH-Low

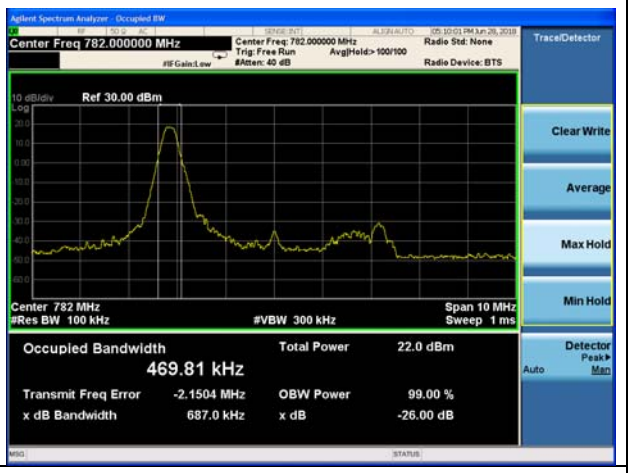
LTE Band 13 16QAM 5MHz CH-Low



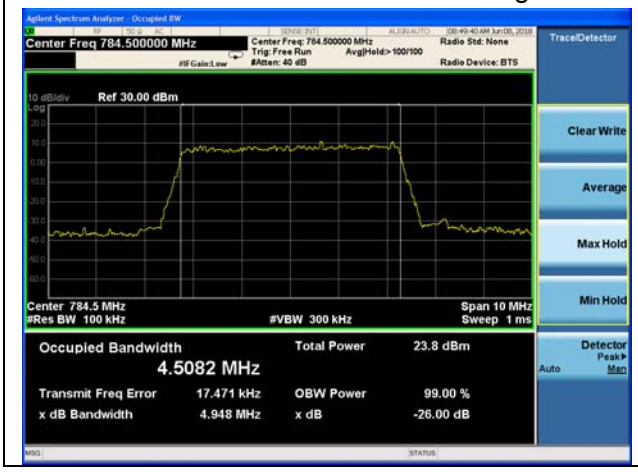
LTE Band 13 QPSK 5MHz CH-Middle



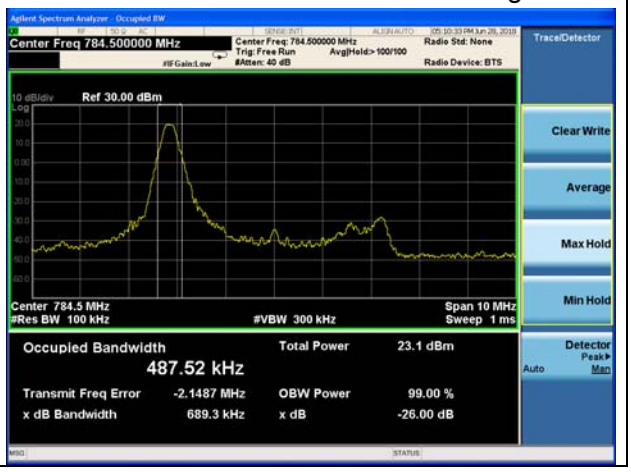
LTE Band 13 16QAM 5MHz CH-Middle



LTE Band 13 QPSK 5MHz CH-High



LTE Band 13 16QAM 5MHz CH-High



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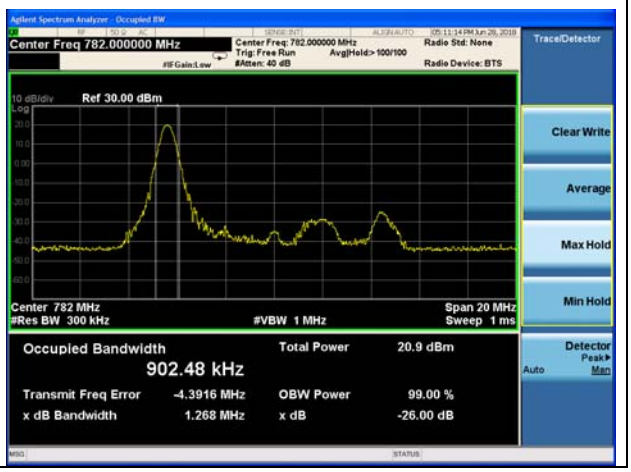
LTE Band 13 QPSK 10MHz CH-Middle	LTE Band 13 16QAM 10MHz CH-Middle
	

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5.4 Band Edge Compliance

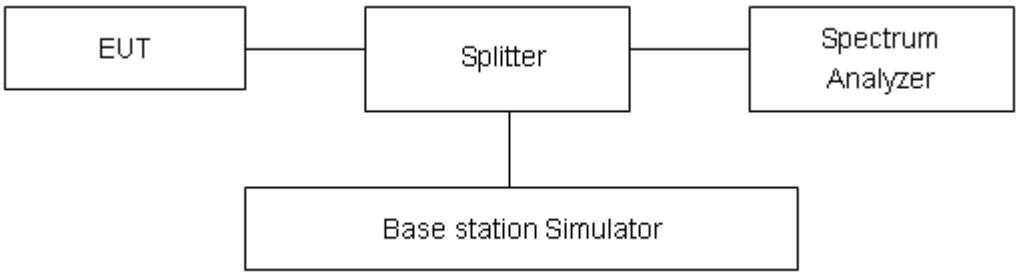
Ambient condition

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 D01 v03r01 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 WCDMA Band IV.
RBW is set to 15 kHz, VBW is set to 51 kHz for LTE Band 4 (1.4MHz).
RBW is set to 30 kHz, VBW is set to 100 kHz for LTE Band 4 (3MHz).
RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 4 (5MHz).
RBW is set to 100 kHz, VBW is set to 300kHz for LTE Band 4 (10MHz).
RBW is set to 150 kHz, VBW is set to 510 kHz for LTE Band 4(15MHz).
RBW is set to 200 kHz, VBW is set to 620 kHz for LTE Band 4(20MHz)
RBW is set to 100 kHz, VBW is set to 300kHz for LTE Band 12(1.4MHz/3MHz/5MHz/10MHz).
RBW is set to 10 kHz, VBW is set to 30 kHz for LTE Band 13 (763MHz~775MHz).
RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 13 (775MHz~777MHz).
RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 13 (787MHz~793MHz).
RBW is set to 10 kHz, VBW is set to 30 kHz for LTE Band 13 (793MHz~805MHz).
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) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Part 27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;
(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;
(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

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.

WCDMA Band IV CH-Low	WCDMA Band IV CH-High

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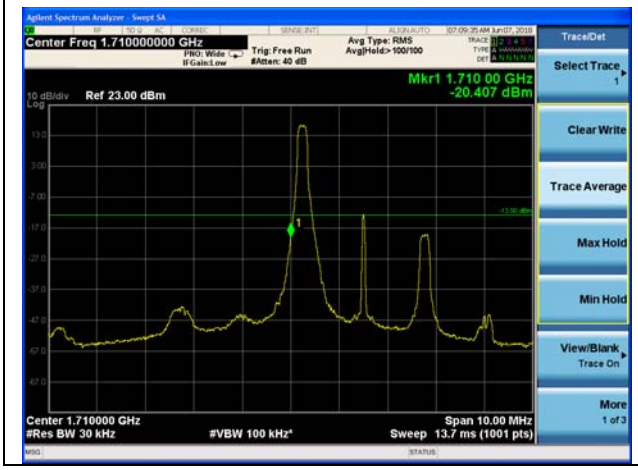
LTE Band 4 QPSK 1.4MHz CH-Low, 1 RB

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

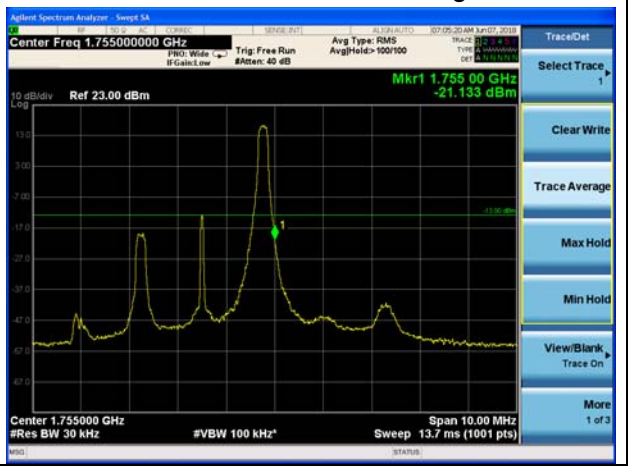
LTE Band 4 QPSK 1.4MHz CH-Low, 100%RB

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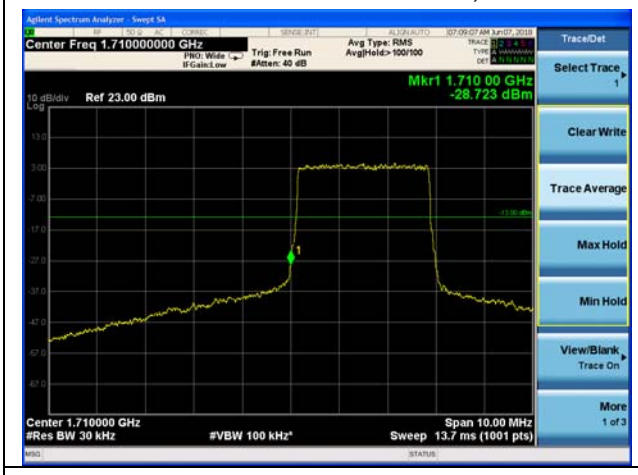
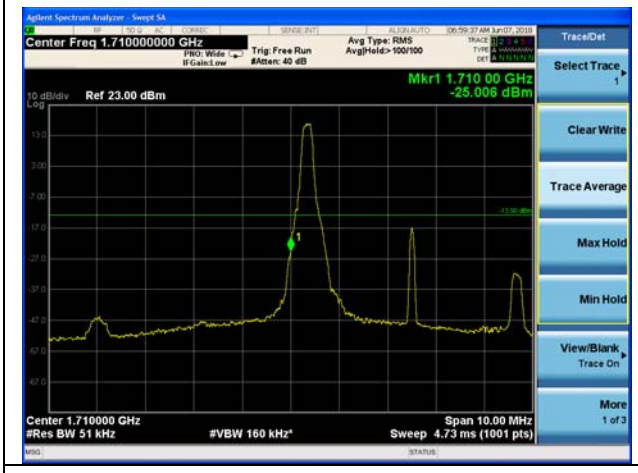
LTE Band 4 QPSK 3MHz CH-Low, 100%RB

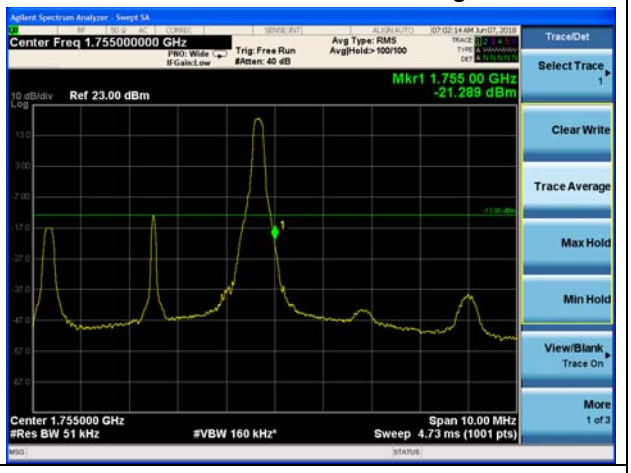


LTE Band 4 QPSK 3MHz CH-High, 100%RB

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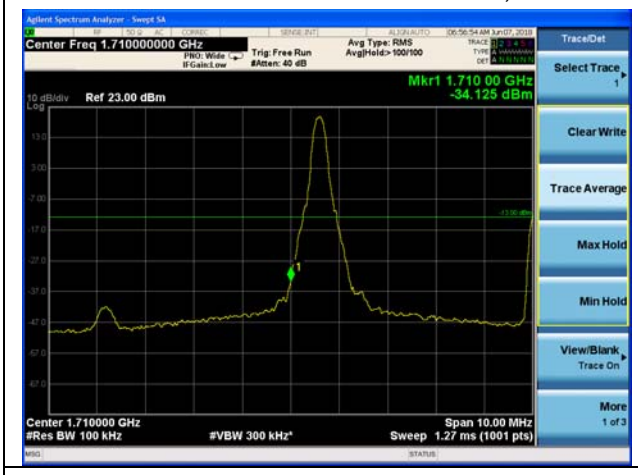
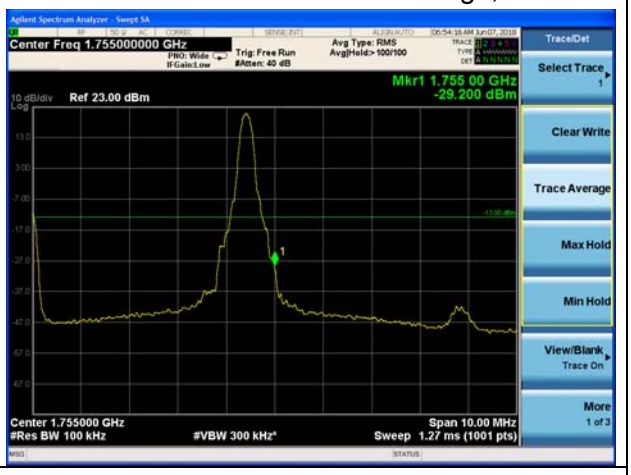
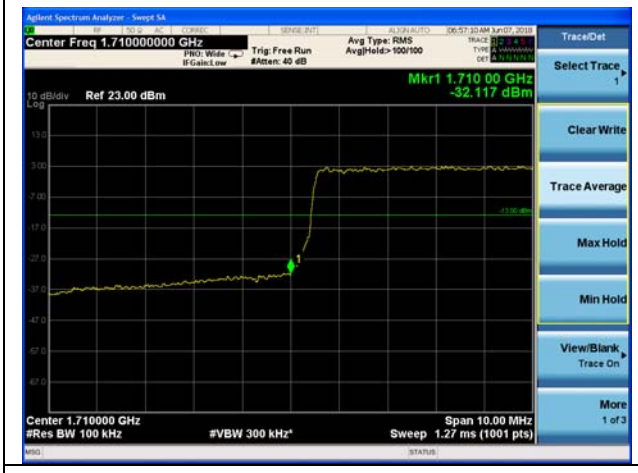
LTE Band 4 QPSK 10MHz CH-Low, 1 RB



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

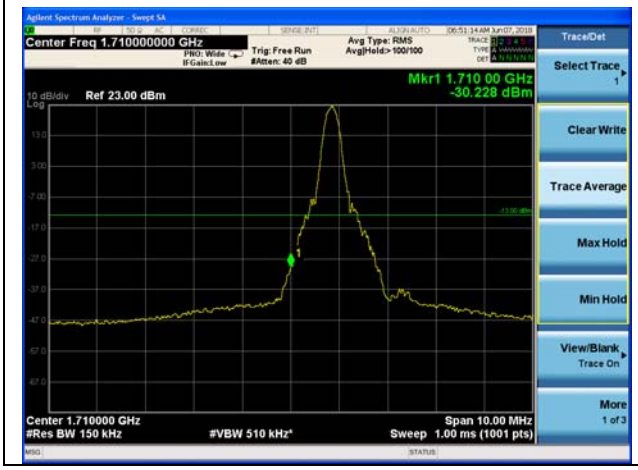


LTE Band 4 QPSK 10MHz CH-Low, 100%RB



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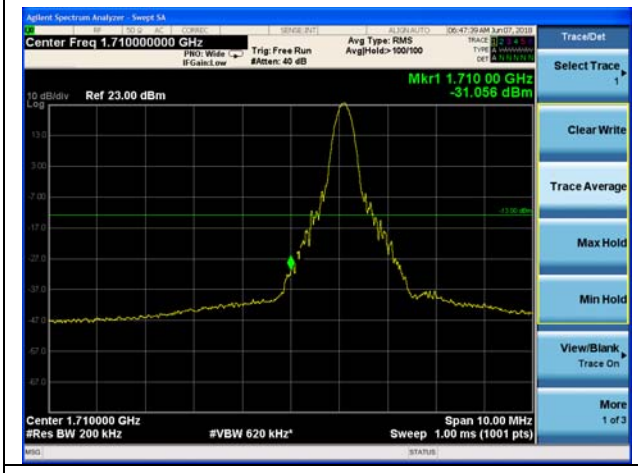
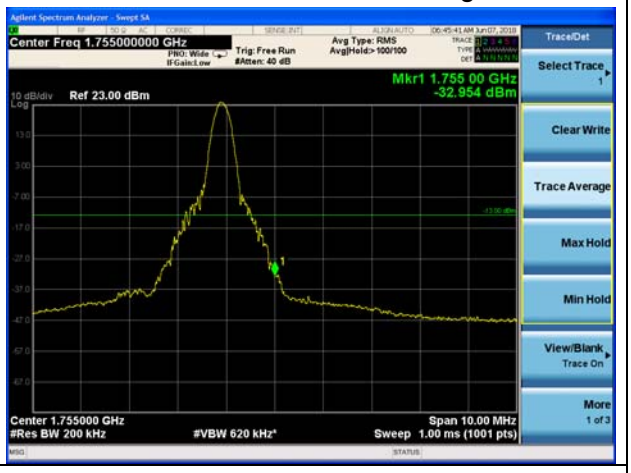
LTE Band 4 QPSK 15MHz CH-Low, 100%RB

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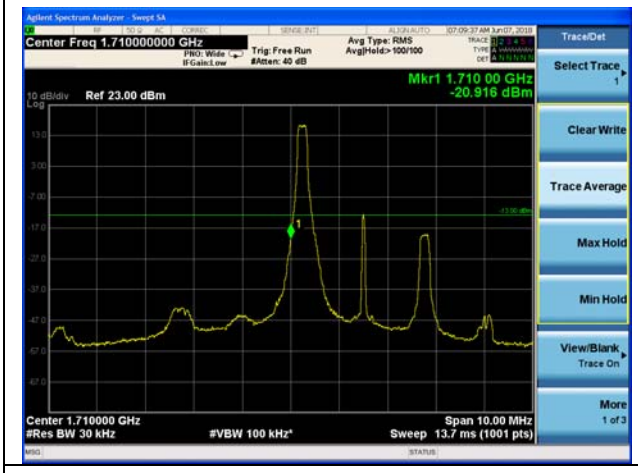
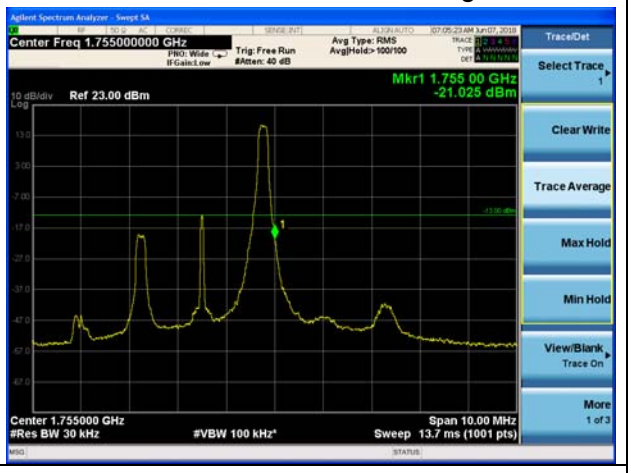
LTE Band 4 16QAM 1.4MHz CH-Low, 1 RB

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

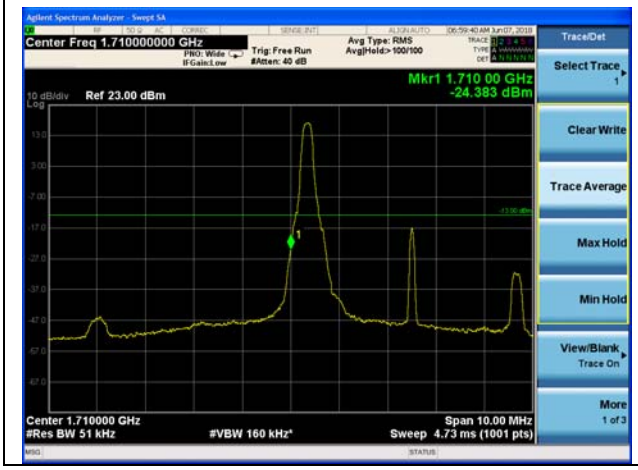
LTE Band 4 16QAM 3MHz CH-Low, 1 RB



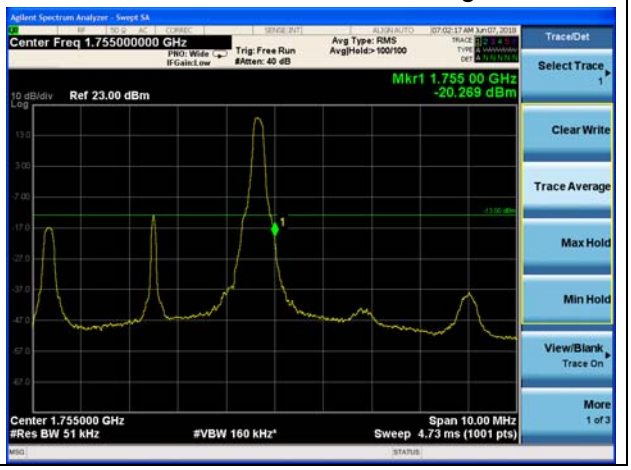
LTE Band 4 16QAM 3MHz CH-High, 1 RB



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



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



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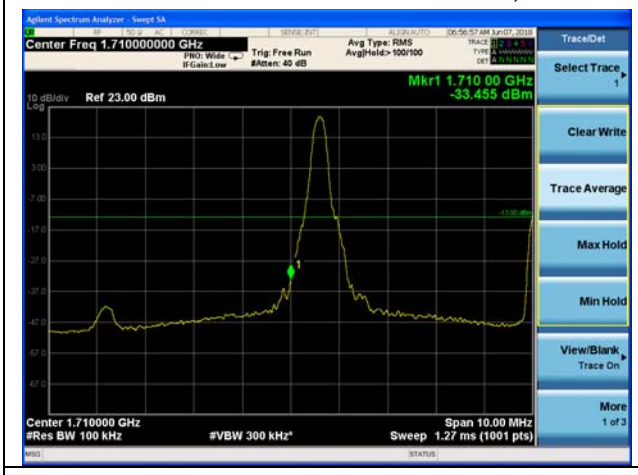
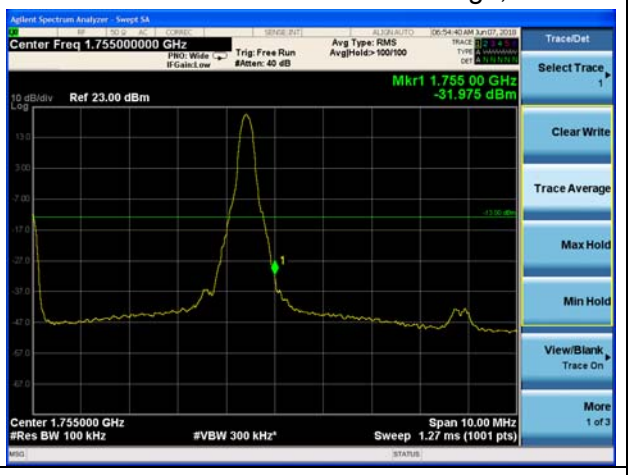
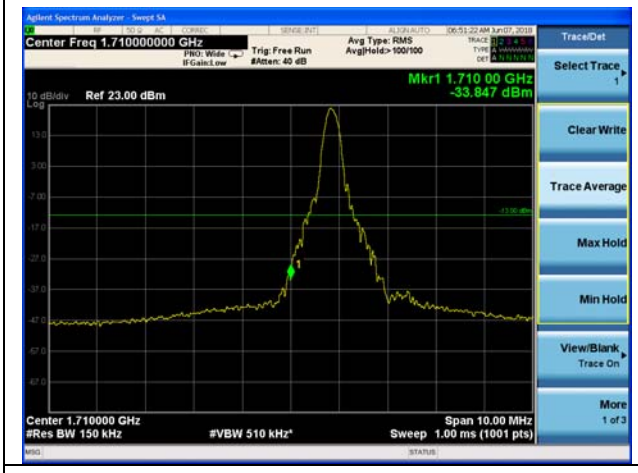
LTE Band 4 16QAM 10MHz CH-Low, 1 RB



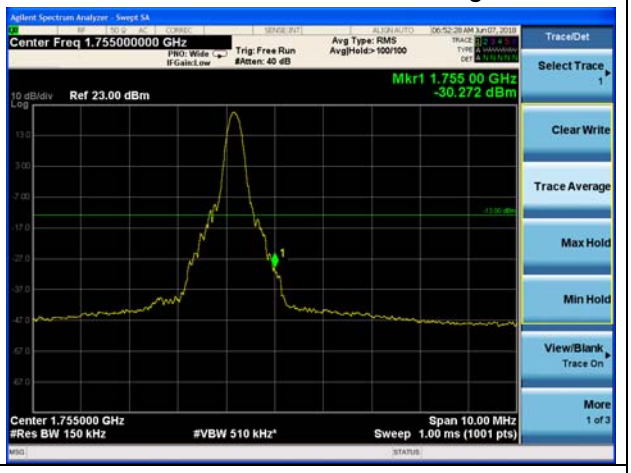
LTE Band 4 16QAM 10MHz CH-High, 1 RB



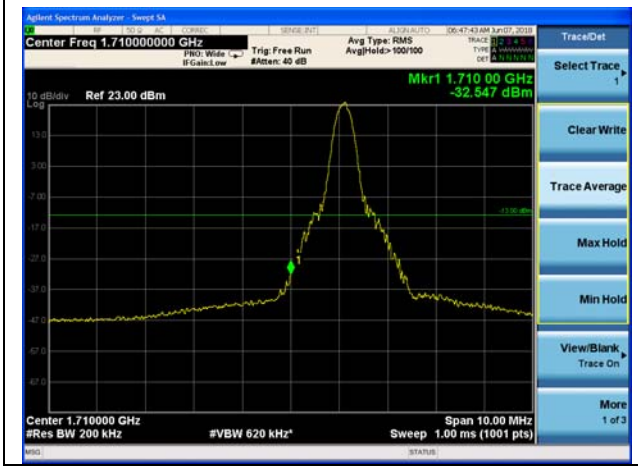
LTE Band 4 16QAM 15MHz CH-Low, 1 RB



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



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



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

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