RF TEST REPORT

Applicant	Quectel Wireless Solutions Co., Ltd
FCC ID	XMR201910BG95M3
Product	LTE Cat M1 & Cat NB2 & EGPRS Module
Brand	Quectel
Marketing	Quectel BG95-M3
Model	BG95-M3
Report No.	R2003A0152-R3V1
Issue Date	October 15, 2020

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2019)/ FCC CFR47 Part 27C (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Peng Tao

Prepared by: Peng Tao

Kai Xu

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

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

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

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

TABLE OF CONTENT

1 Test Laboratory 5
1.1 Notes of the Test Report 5
1.2 Test facility 5
1.3 Testing Location 5
2 General Description of Equipment under Test 6
3 Applied Standards 8
4 Test Configuration 9
5 Test Case Results 11
5.1 RF Power Output 11
5.2 Effective Isotropic Radiated Power 16
5.3 Occupied Bandwidth 23
5.4 Band Edge Compliance 33
5.5 Peak-to-Average Power Ratio (PAPR) 65
5.6 Frequency Stability 68
5.7 Spurious Emissions at Antenna Terminals 72
5.8 Radiates Spurious Emission 101
6 Main Test Instruments 111

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Version	Revision description	Issue Date
Rev.0	/	May 22, 2020
Rev.1	Update information in Page 6	October 15, 2020
Note This revised report (Report No. R2003A0152-R3V1) supersedes and replaces the previously issued report (Report No. R2003A0152-R3). Please discard or destroy the previously issued report and dispose of it accordingly.		

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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) /27.50(h)(2)	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) /27.53(c)	PASS
8	Radiates Spurious Emission	2.1053 /27.53(h) /27.53(g) /27.53(f) /27.53(c)	PASS
Date of Testing: August 20, 2019 ~ September 5, 2019			
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. All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

There is no test for BG95-M3 in this report(Report No.:R2003A0152-R3V1).All test values duplicated from the BG95-M3 report (Report No. : R1907A0446-R3V1). The detailed product change description please refers to the *Statement letter*.

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1 Test Laboratory

1.1 Notes of the Test Report

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1.2 Test facility

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.

A2LA (Certificate Number: 3857.01)

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

1.3 Testing Location

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

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2 General Description of Equipment under Test

Client Information

Applicant	Quectel Wireless Solutions Co., Ltd
Applicant address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

General information

EUT Description			
Model	BG95-M3		
IMEI	864475040001736		
Hardware Version	R2.1		
Software Version	BG95M3LAR02A03		
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)		
Antenna Gain	LTE Band 4: 1.9dBi LTE Band 12: 4.0dBi LTE Band 13: 4.5dBi LTE Band 66: 2.0dBi LTE Band 85: 4.0dBi		
Test Mode(s)	LTE Band 4/12/13/14/66/85		
Test Modulation	(LTE)QPSK 16QAM		
LTE Category	M1		
Maximum E.I.R.P	LTE Band 4:	22.73dBm	
	LTE Band 66:	22.20dBm	
Maximum E.R.P.	LTE Band 12:	22.31dBm	
	LTE Band 13:	22.88dBm	
	LTE Band 85	23.25dBm	
Rated Power Supply Voltage:	3.8V		
Extreme Voltage	Minimum: 3.3V Maximum: 4.3V		
Extreme Temperature	Lowest: -40°C Highest: +85°C		
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

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	LTE Band 66	1710 ~ 1780	2110 ~ 2180
	LTE Band 85	698 ~ 716	728 ~ 746
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.			

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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 27C (2019)

ANSI C63.26 (2015)

Reference standard:

FCC CFR47 Part 2 (2019)

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 (X axis, horizontal polarization) and the worst case was recorded.

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

Test modes are chosen to be reported as the worst case configuration below for LTE Band 4/12/13/66/85:

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
	LTE 66	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	LTE 85	-	-	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
	LTE 66	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	LTE 85	-	-	O	O	-	-	O	O	O	O	O	O	O	O
Occupied Bandwidth	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	-
	LTE 66	O	O	O	O	O	O	O	O	-	-	O	-	O	-
	LTE 85	-	-	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
	LTE 66	O	O	O	O	O	O	O	O	O	-	O	O	-	O
	LTE 85	-	-	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	-
	LTE 12	-	-	O	O	O	O	O	O	-	-	O	-	O	-
	LTE 13	-	-	O	O	-	-	O	O	-	-	O	-	O	-

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	LTE 66	O	O	O	O	O	O	O	O	-	-	O	-	O	-
	LTE 85	-	-	O	O	-	-	O	O	-	-	O	-	O	-
Frequency Stability	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
	LTE 66	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	LTE 85	-	-	O	O	-	-	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
	LTE 66	O	O	O	O	O	O	O	-	O	-	-	O	O	O
	LTE 85	-	-	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
	LTE 66	O	O	O	O	O	O	O	-	O	-	-	O	O	O
	LTE 85	-	-	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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5 Test Case Results

5.1 RF Power Output

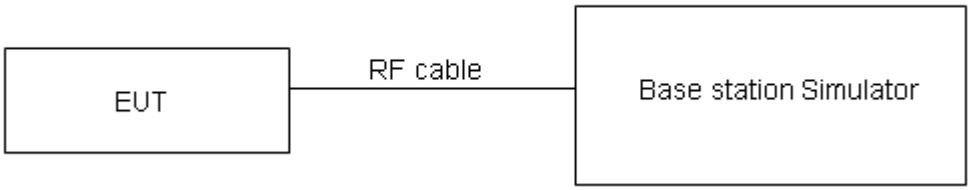
Ambient condition

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

LTE Band 4	Channel/ Frequency(MHz)	Index	RB# RBstart	Conducted Power (dBm)	
				QPSK	16QAM
1.4MHz	19957/1710.7	0	1#0	20.83	19.76
		0	6#0	18.78	19.04
	20175/1732.5	0	1#0	20.57	19.62
		0	6#0	18.52	18.54
	20393/1754.3	0	1#5	19.92	19.75
		0	6#0	18.63	18.48
3MHz	19965/1711.5	0	1#0	20.41	20.02
		0	6#0	18.71	18.78
	20175/1732.5	0	1#0	20.32	19.37
		0	6#0	18.71	18.94
	20385/1753.5	1	1#5	20.15	19.15
		1	6#0	18.81	19.01
5MHz	19975/1712.5	0	1#0	20.39	20.51
		0	6#0	19.81	19.91
	20175/1732.5	0	1#0	20.28	20.39
		0	6#0	19.73	19.67
	20375/1752.5	3	1#5	20.11	20.17
		3	6#0	19.72	19.69
10MHz	20000/1715	0	1#0	20.38	20.49
		0	4#0	20.27	20.14
	20175/1732.5	0	1#0	20.16	20.24
		0	4#0	20.12	19.98
	20350/1750	7	1#5	19.94	20.07
		7	4#2	20.04	19.91
15MHz	20025/1717.5	0	1#0	20.33	20.48
		0	6#0	20.27	20.42
	20175/1732.5	0	1#0	20.16	20.31
		0	6#0	20.12	20.24
	20325/1747.5	11	1#5	19.97	20.11
		11	6#0	20.04	20.11
20MHz	20050/1720	0	1#0	20.32	20.46
		0	6#0	20.19	20.36
	20175/1732.5	0	1#0	20.24	20.38
		0	6#0	20.09	20.21
	20300/1745	15	1#5	20.11	20.14
		15	6#0	20.11	20.16

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LTE Band 12	Channel/ Frequency(MHz)	Index	RB# RBstart	Conducted Power (dBm)	
				QPSK	16QAM
1.4MHz	23017/699.7	0	1#0	20.02	19.76
		0	6#0	18.64	18.62
	23095/707.5	0	1#0	19.85	19.73
		0	6#0	18.51	18.42
	23173/715.3	0	1#5	20.46	19.32
		0	6#0	18.56	19.03
3MHz	23025/700.5	0	1#0	20.25	19.76
		0	6#0	18.69	18.61
	23095/707.5	0	1#0	20.22	20.01
		0	6#0	18.47	18.58
	23165/714.5	1	1#5	20.21	19.81
		1	6#0	18.55	18.63
5MHz	23035/701.5	3	1#0	20.19	20.39
		0	6#0	19.67	19.82
	23095/707.5	0	1#0	20.01	20.21
		0	6#0	19.60	19.73
	23155/713.5	0	1#5	19.96	20.19
		3	6#0	19.61	19.77
10MHz	23060/704	3	1#0	20.21	20.41
		0	4#0	20.23	20.07
	23095/707.5	0	1#0	20.16	20.30
		0	4#0	20.07	19.95
	23130/711	4	1#5	19.91	20.13
		7	4#2	20.15	19.90

LTE Band 13	Channel/ Frequency(MHz)	Index	RB# RBstart	Conducted Power (dBm)	
				QPSK	16QAM
5MHz	23205/779.5	0	1#0	20.18	20.53
		0	6#0	19.95	20.03
	23230/782	0	1#0	20.31	19.91
		0	6#0	19.81	20.02
	23255/784.5	3	1#5	20.02	20.43
		3	6#0	19.82	19.84
10MHz	23230/782	0	1#0	20.11	20.53
		0	4#0	19.84	19.57

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LTE Band 66	Channel/ Frequency(MHz)	Index	RB# RBstart	Conducted Power (dBm)	
				QPSK	16QAM
1.4MHz	131979/1710.7	0	1#0	20.18	19.66
		0	6#0	18.38	18.49
	132322/1745	0	1#0	19.80	19.47
		0	6#0	18.34	18.08
	132665/1779.3	0	1#5	19.61	19.78
		0	6#0	18.50	18.33
3MHz	131987/1711.5	0	1#0	19.97	19.57
		0	6#0	18.32	18.25
	132322/1745	0	1#0	19.80	19.55
		0	6#0	18,20	18.12
	132657/1778.5	1	1#5	19.84	19.69
		1	6#0	18.52	18.35
5MHz	131997/1712.5	0	1#0	19.89	20.20
		0	6#0	19.35	19.36
	132322/1745	0	1#0	19.73	20.04
		0	6#0	19.18	19.29
	132647/1777.5	0	1#5	19.84	20.11
		3	6#0	19.55	19.57
10MHz	132022/1715	3	1#0	19.95	20.15
		0	4#0	19.88	19.79
	132022/1745	0	1#0	19.76	19.99
		0	4#0	19.83	19.58
	132622/1775	4	1#5	19.70	20.02
		7	4#2	19.87	19.81
15MHz	132047/1717.5	3	1#0	19.92	20.18
		0	6#0	19.84	19.87
	132322/1745	0	1#0	19.73	20.02
		0	6#0	19.79	19.83
	132597/1772.5	8	1#5	19.85	20.09
		11	6#0	19.94	19.95
20MHz	132072/1720	3	1#0	19.90	20.19
		0	6#0	19.81	19.94
	132322/1745	0	1#0	19.86	20.08
		0	6#0	19.82	19.91
	132572/1770	12	1#5	19.49	19.65
		15	6#0	19.52	19.67

LTE Band 85	Channel/	Index	RB#	Conducted Power (dBm)

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	Frequency(MHz)		RBstart	QPSK	16QAM
5MHz	134027/700.5	0	1#0	20.70	20.63
		0	6#0	20.46	20.54
	134092/707	0	1#0	21.18	20.71
		0	6#0	20.74	20.70
	134157/713.5	3	1#5	21.16	20.64
		3	6#0	20.71	20.63
10MHz	134052/703	0	1#0	20.91	20.37
		0	4#0	20.55	20.74
	134092/707	0	1#0	21.15	20.59
		0	4#0	21.08	21.29
	134132/711	0	1#5	21.28	20.62
		0	4#2	21.27	21.40

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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 C63.26 (2015).

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:

EIRP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBi)

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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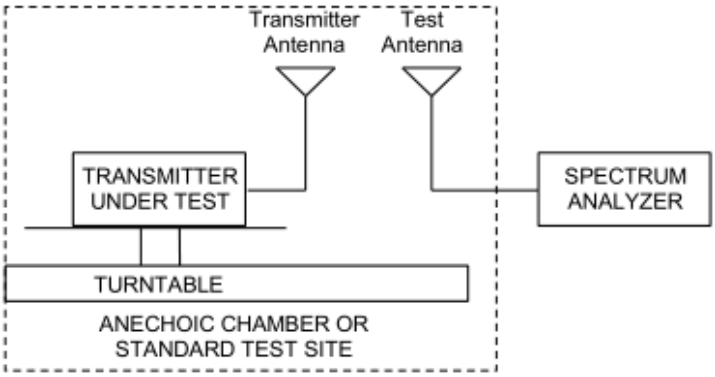
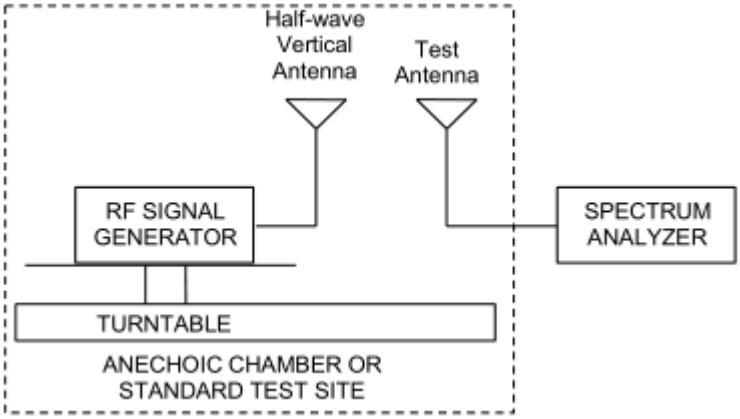
Test setup





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.

LTE Band 4							
Mode	Channel/ Frequency(MHz)	Index	RB# RBstart	EIRP(dBm)		Limit (dBm)	Conclusion
				QPSK	16QAM		
1.4MHz	19957/1710.7	0	1#0	22.73	21.66	30	Pass
		0	6#0	20.68	20.94	30	Pass
	20175/1732.5	0	1#0	22.47	21.52	30	Pass
		0	6#0	20.42	20.44	30	Pass
	20393/1754.3	0	1#5	21.82	21.65	30	Pass
		0	6#0	20.53	20.38	30	Pass
3MHz	19965/1711.5	0	1#0	22.31	21.92	30	Pass
		0	6#0	20.61	20.68	30	Pass
	20175/1732.5	0	1#0	22.22	21.27	30	Pass
		0	6#0	20.61	20.84	30	Pass
	20385/1753.5	1	1#5	22.05	21.05	30	Pass
		1	6#0	20.71	20.91	30	Pass
5MHz	19975/1712.5	0	1#0	22.29	22.41	30	Pass
		0	6#0	21.71	21.81	30	Pass
	20175/1732.5	0	1#0	22.18	22.29	30	Pass
		0	6#0	21.63	21.57	30	Pass
	20375/1752.5	3	1#5	22.01	22.07	30	Pass
		3	6#0	21.62	21.59	30	Pass
10MHz	20000/1715	0	1#0	22.28	22.39	30	Pass
		0	4#0	22.17	22.04	30	Pass
	20175/1732.5	0	1#0	22.06	22.14	30	Pass
		0	4#0	22.02	21.88	30	Pass
	20350/1750	7	1#5	21.84	21.97	30	Pass
		7	4#2	21.94	21.81	30	Pass
15MHz	20025/1717.5	0	1#0	22.23	22.38	30	Pass
		0	6#0	22.17	22.32	30	Pass
	20175/1732.5	0	1#0	22.06	22.21	30	Pass
		0	6#0	22.02	22.14	30	Pass
	20325/1747.5	11	1#5	21.87	22.01	30	Pass
		11	6#0	21.94	22.01	30	Pass
20MHz	20050/1720	0	1#0	22.22	22.36	30	Pass
		0	6#0	22.09	22.26	30	Pass
	20175/1732.5	0	1#0	22.14	22.28	30	Pass
		0	6#0	21.99	22.11	30	Pass
	20300/1745	15	1#5	22.01	22.04	30	Pass
		15	6#0	22.01	22.06	30	Pass

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LTE Band 12							
Mode	Channel/ Frequency(MHz)	Index	RB# RBstart	ERP(dBm)		Limit (dBm)	Conclusion
				QPSK	16QAM		
1.4MHz	20407/824.7	0	1#0	21.87	21.61	34.77	Pass
		0	6#0	20.49	20.47	34.77	Pass
	20525/836.5	0	1#0	21.70	21.58	34.77	Pass
		0	6#0	20.36	20.27	34.77	Pass
	20643/848.3	0	1#5	22.31	21.17	34.77	Pass
		0	6#0	20.41	20.88	34.77	Pass
3MHz	20415/825.5	0	1#0	22.10	21.61	34.77	Pass
		0	6#0	20.54	20.46	34.77	Pass
	20525/836.5	0	1#0	22.07	21.86	34.77	Pass
		0	6#0	20.32	20.43	34.77	Pass
	20635/847.5	1	1#5	22.06	21.66	34.77	Pass
		1	6#0	20.40	20.48	34.77	Pass
5MHz	20425/826.5	0	1#0	22.04	22.24	34.77	Pass
		0	6#0	21.52	21.67	34.77	Pass
	20525/836.5	0	1#0	21.86	22.06	34.77	Pass
		0	6#0	21.45	21.58	34.77	Pass
	20625/846.5	3	1#5	21.81	22.04	34.77	Pass
		3	6#0	21.46	21.62	34.77	Pass
10MHz	20450/829	0	1#0	22.06	22.26	34.77	Pass
		0	4#0	22.08	21.92	34.77	Pass
	20525/836.5	0	1#0	22.01	22.15	34.77	Pass
		0	4#0	21.92	21.80	34.77	Pass
	20600/844	7	1#5	21.76	21.98	34.77	Pass
		7	4#2	22.00	21.75	34.77	Pass

LTE Band 13							
Mode	Channel/ Frequency(MHz)	Index	RB# RBstart	ERP(dBm)		Limit (dBm)	Conclusion
				QPSK	16QAM		
5MHz	23205/779.5	0	1#0	22.53	22.88	34.77	Pass
		0	6#0	22.30	22.38	34.77	Pass
	23230/782	0	1#0	22.66	22.26	34.77	Pass
		0	6#0	22.16	22.37	34.77	Pass
	23255/784.5	3	1#5	22.37	22.78	34.77	Pass
		3	6#0	22.17	22.19	34.77	Pass
10MHz	23230/782	0	1#0	22.46	22.88	34.77	Pass
		0	4#0	22.19	21.92	34.77	Pass

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LTE Band 66							
Mode	Channel/ Frequency(MHz)	Index	RB# RBstart	EIRP(dBm)		Limit (dBm)	Conclusion
				QPSK	16QAM		
1.4MHz	131979/1710.7	0	1#0	22.18	21.66	30	Pass
		0	6#0	20.38	20.49	30	Pass
	132322/1745	0	1#0	21.80	21.47	30	Pass
		0	6#0	20.34	20.08	30	Pass
	132665/1779.3	0	1#5	21.61	21.78	30	Pass
		0	6#0	20.50	20.33	30	Pass
3MHz	131987/1711.5	0	1#0	21.97	21.57	30	Pass
		0	6#0	20.32	20.25	30	Pass
	132322/1745	0	1#0	21.80	21.55	30	Pass
		0	6#0	20.20	20.12	30	Pass
	132657/1778.5	1	1#5	21.84	21.69	30	Pass
		1	6#0	20.52	20.35	30	Pass
5MHz	131997/1712.5	0	1#0	21.89	22.20	30	Pass
		0	6#0	21.35	21.36	30	Pass
	132322/1745	0	1#0	21.73	22.04	30	Pass
		0	6#0	21.18	21.29	30	Pass
	132647/1777.5	0	1#5	21.84	22.11	30	Pass
		3	6#0	21.55	21.57	30	Pass
10MHz	132022/1715	3	1#0	21.95	22.15	30	Pass
		0	4#0	21.88	21.79	30	Pass
	132022/1745	0	1#0	21.76	21.99	30	Pass
		0	4#0	21.83	21.58	30	Pass
	132622/1775	4	1#5	21.70	22.02	30	Pass
		7	4#2	21.87	21.81	30	Pass
15MHz	132047/1717.5	3	1#0	21.92	22.18	30	Pass
		0	6#0	21.84	21.87	30	Pass
	132322/1745	0	1#0	21.73	22.02	30	Pass
		0	6#0	21.79	21.83	30	Pass
	132597/1772.5	8	1#5	21.85	22.09	30	Pass
		11	6#0	21.94	21.95	30	Pass
20MHz	132072/1720	3	1#0	21.90	22.19	30	Pass
		0	6#0	21.81	21.94	30	Pass
	132322/1745	0	1#0	21.86	22.08	30	Pass
		0	6#0	21.82	21.91	30	Pass
	132572/1770	12	1#5	21.49	21.65	30	Pass
		15	6#0	21.52	21.67	30	Pass

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LTE Band 85							
Mode	Channel/ Frequency(MHz)	Index	RB# RBstart	ERP(dBm)		Limit (dBm)	Conclusion
				QPSK	16QAM		
5MHz	134027/700.5	0	1#0	22.55	22.48	34.77	Pass
		0	6#0	22.31	22.39	34.77	Pass
	134092/707	0	1#0	23.03	22.56	34.77	Pass
		0	6#0	22.59	22.55	34.77	Pass
	134157/713.5	3	1#5	23.01	22.49	34.77	Pass
		3	6#0	22.56	22.48	34.77	Pass
10MHz	134052/703	0	1#0	22.76	22.22	34.77	Pass
		0	4#0	22.40	22.59	34.77	Pass
	134092/707	0	1#0	23.00	22.44	34.77	Pass
		0	4#0	22.93	23.14	34.77	Pass
	134132/711	0	1#5	23.13	22.47	34.77	Pass
		0	4#2	23.12	23.25	34.77	Pass

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5.3 Occupied Bandwidth

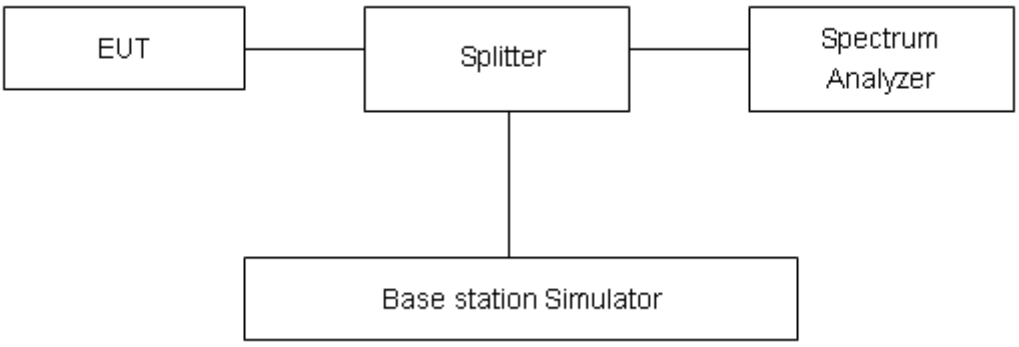
Ambient condition

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 51kHz, VBW is set to 160kHz for LTE Band 4/12/13/66/85.
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	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
Band4	1.4MHz	QPSK	20175/1732.5	6#0	0	1.1058	1.360
		16QAM	20175/1732.5	6#0	0	0.9424	1.163
	3MHz	QPSK	20175/1732.5	6#0	0	1.1136	1.366
		16QAM	20175/1732.5	6#0	0	0.9489	1.178
	5MHz	QPSK	20175/1732.5	6#0	0	1.1134	1.342
		16QAM	20175/1732.5	6#0	0	0.9512	1.192
	10MHz	QPSK	20175/1732.5	6#0	0	1.1214	1.333
		16QAM	20175/1732.5	6#0	0	0.9693	1.257
	15MHz	QPSK	20175/1732.5	6#0	0	1.1320	1.343
		16QAM	20175/1732.5	6#0	0	0.9645	1.177
	20MHz	QPSK	20175/1732.5	6#0	0	1.1201	1.333
		16QAM	20175/1732.5	6#0	0	0.9528	1.182

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
Band12	1.4MHz	QPSK	23095/707.5	6#0	0	1.1075	1.359
		16QAM	23095/707.5	6#0	0	0.945	1.209
	3MHz	QPSK	23095/707.5	6#0	0	1.1097	1.401
		16QAM	23095/707.5	6#0	0	0.9535	1.199
	5MHz	QPSK	23095/707.5	6#0	0	1.1131	1.377
		16QAM	23095/707.5	6#0	0	0.9546	1.337
	10MHz	QPSK	23095/707.5	6#0	0	1.1221	1.341
		16QAM	23095/707.5	6#0	0	0.9983	1.453

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
Band13	5MHz	QPSK	23230/782	6#0	0	1.1136	1.341
		16QAM	23230/782	6#0	0	0.9551	1.226
	10MHz	QPSK	23230/782	6#0	0	1.1174	1.332
		16QAM	23230/782	6#0	0	0.9625	1.25

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Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
Band66	1.4MHz	QPSK	132322/1745	6#0	0	1.0999	1.334
		16QAM	132322/1745	6#0	0	0.9458	1.16
	3MHz	QPSK	132322/1745	6#0	0	1.1125	1.369
		16QAM	132322/1745	6#0	0	0.9451	1.223
	5MHz	QPSK	132322/1745	6#0	0	1.1115	1.329
		16QAM	132322/1745	6#0	0	0.9483	1.226
	10MHz	QPSK	132322/1745	6#0	0	1.1198	1.329
		16QAM	132322/1745	6#0	0	0.9711	1.195
	15MHz	QPSK	132322/1745	6#0	0	1.1237	1.357
		16QAM	132322/1745	6#0	0	0.953	1.245
	20MHz	QPSK	132322/1745	6#0	0	1.130	1.363
		16QAM	132322/1745	6#0	0	0.9683	1.55

Mode	Bandwidth	Modulation	Channel/ Frequency(MHz)	RB	Index	Bandwidth(MHz)	
						99% Power	-26dBc
Band85	5MHz	QPSK	134092/707	6#0	0	1.1172	1.349
		16QAM	134092/707	6#0	0	0.9484	1.195
	10MHz	QPSK	134092/707	6#0	0	1.1197	1.376
		16QAM	134092/707	6#0	0	0.9917	1.399

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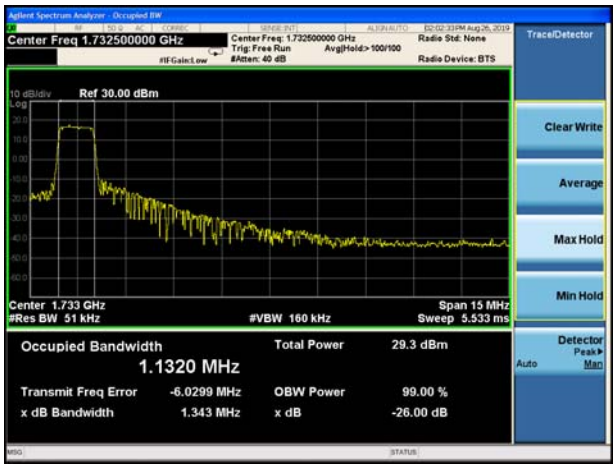
LTE Band 4 QPSK 1.4MHz CH-Middle

LTE Band 4 QPSK 3MHz CH-Middle

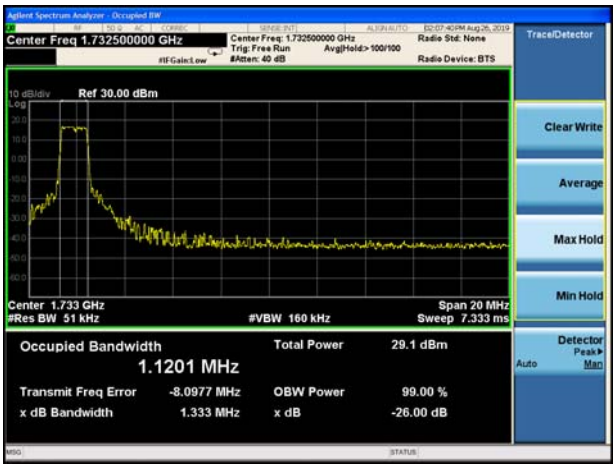
LTE Band 4 QPSK 5MHz CH-Middle

LTE Band 4 QPSK 10MHz CH-Middle

LTE Band 4 QPSK 15MHz CH-Middle



LTE Band 4 QPSK 20MHz CH-Middle



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LTE Band 4 16QAM 1.4MHz CH-Middle

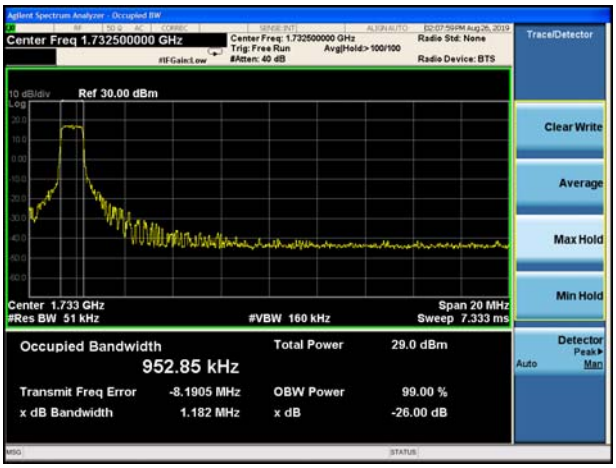
LTE Band 4 16QAM 3MHz CH-Middle

LTE Band 4 16QAM 5MHz CH-Middle

LTE Band 4 16QAM 10MHz CH-Middle

LTE Band 4 16QAM 15MHz CH-Middle

LTE Band 4 16QAM 20MHz CH-Middle



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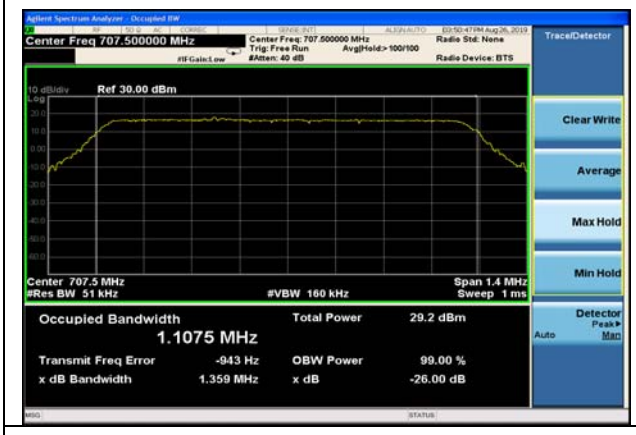
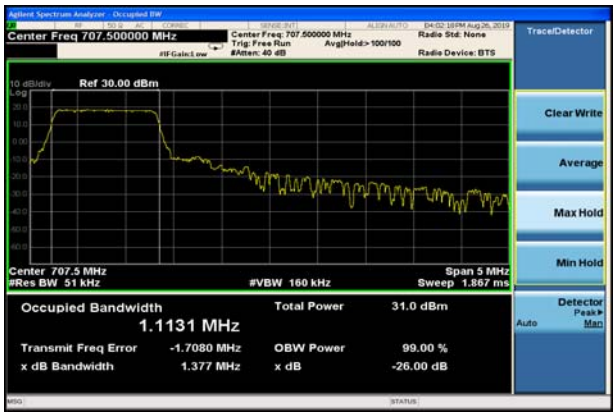
LTE Band 12 QPSK 1.4MHz CH-Middle

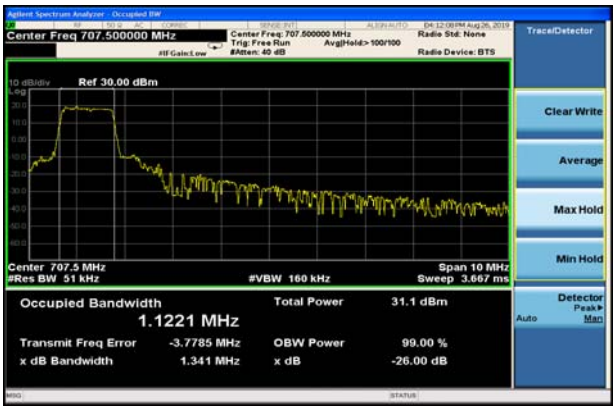


LTE Band 12 QPSK 3MHz CH-Middle

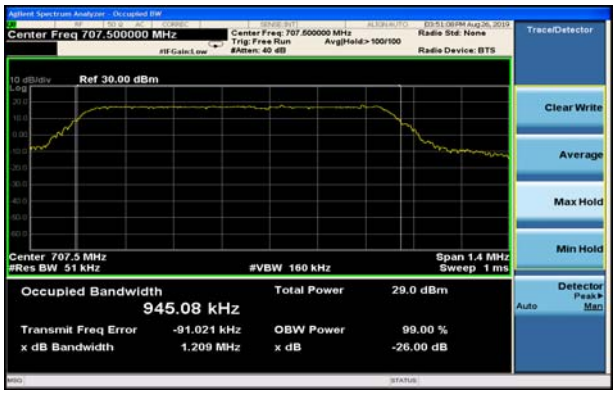
LTE Band 12 QPSK 5MHz CH-Middle



LTE Band 12 QPSK 10MHz CH-Middle



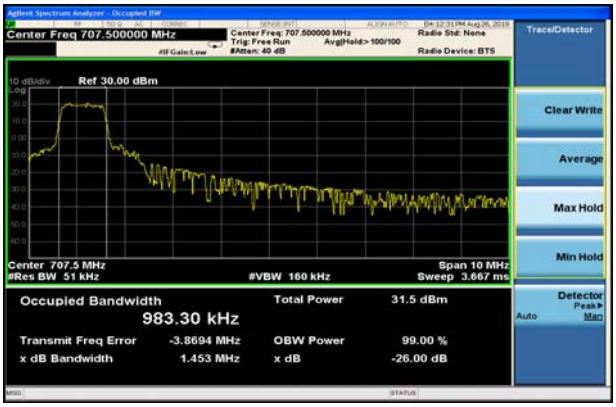
LTE Band 12 16QAM 1.4MHz CH-Middle



LTE Band 12 16QAM 3MHz CH-Middle

LTE Band 12 16QAM 5MHz CH-Middle

LTE Band 12 16QAM 10MHz CH-Middle



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LTE Band 13 QPSK 5MHz CH-Middle

LTE Band 13 QPSK 10MHz CH-Middle

LTE Band 13 16QAM 5MHz CH-Middle

LTE Band 13 16QAM 10MHz CH-Middle

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LTE Band 66 QPSK 1.4MHz CH-Middle

LTE Band 66 QPSK 3MHz CH-Middle

LTE Band 66 QPSK 5MHz CH-Middle

LTE Band 66 QPSK 10MHz CH-Middle

LTE Band 66 QPSK 15MHz CH-Middle

LTE Band 66 QPSK 20MHz CH-Middle

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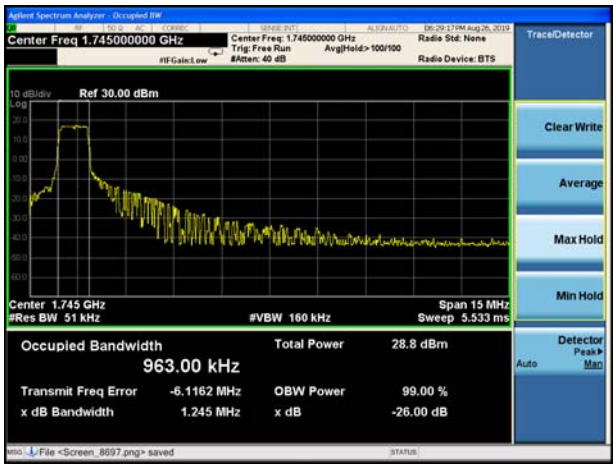
LTE Band 66 16QAM 1.4MHz CH-Middle

LTE Band 66 16QAM 3MHz CH-Middle

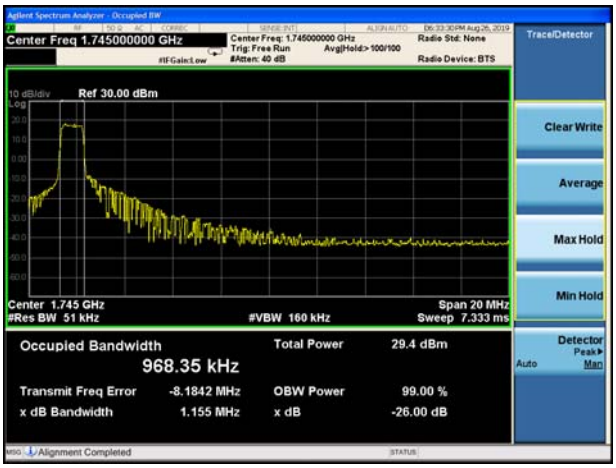
LTE Band 66 16QAM 5MHz CH-Middle

LTE Band 66 16QAM 10MHz CH-Middle

LTE Band 66 16QAM 15MHz CH-Middle



LTE Band 66 16QAM 20MHz CH-Middle



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LTE Band 85 QPSK 5MHz CH-Middle

LTE Band 85 QPSK 10MHz CH-Middle

LTE Band 85 16QAM 5MHz CH-Middle

LTE Band 85 16QAM 10MHz CH-Middle

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5.4 Band Edge Compliance

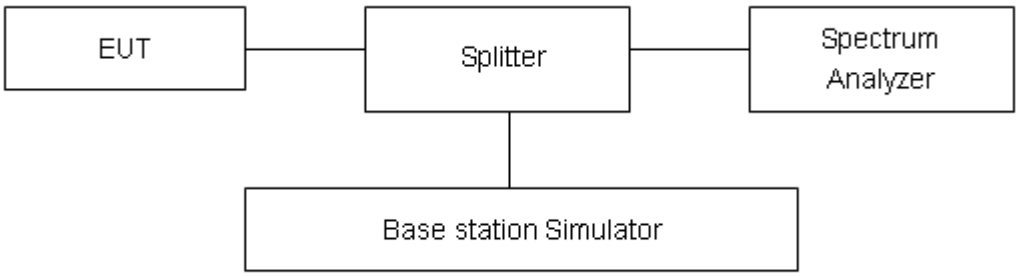
Ambient condition

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
The EUT was connected to spectrum analyzer and system simulator via a power divider.
The band edges of low and high channels for the highest RF powers were measured.
RBW is set to 51kHz, VBW is set to 160kHz for LTE Band 4/12/13/66/85.
on spectrum analyzer.
Set spectrum analyzer with RMS detector.
The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Checked that all the results comply with the emission limit line.

Test Setup



Limits

Rule Part 27.53(i) By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2305 and 2320 MHz.

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"

Rule Part 27.53(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any

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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.

Rule 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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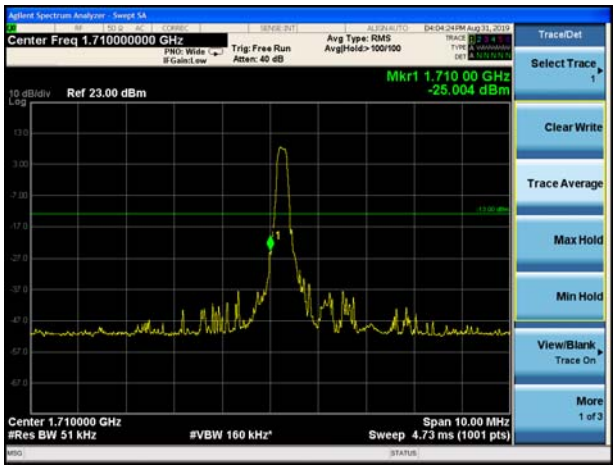
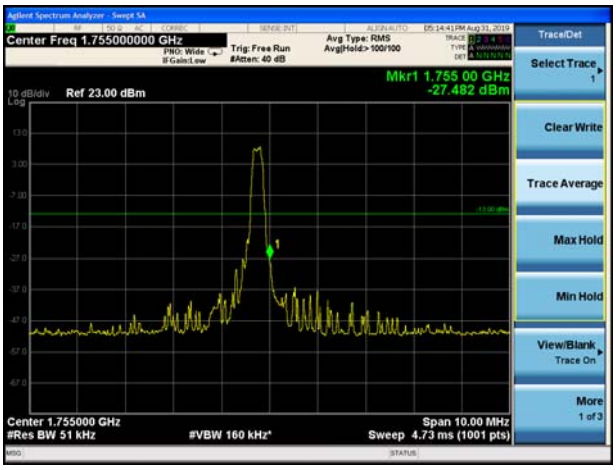
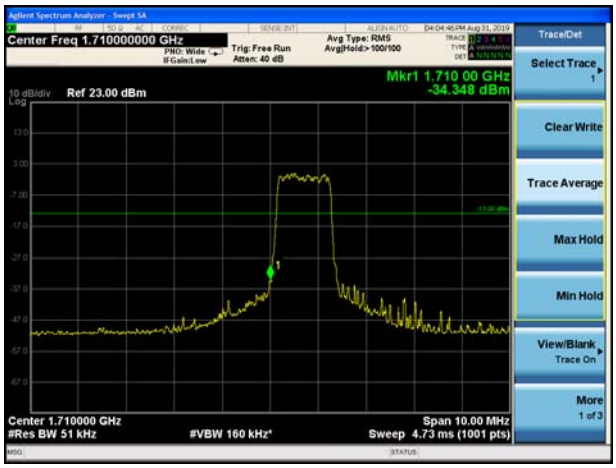
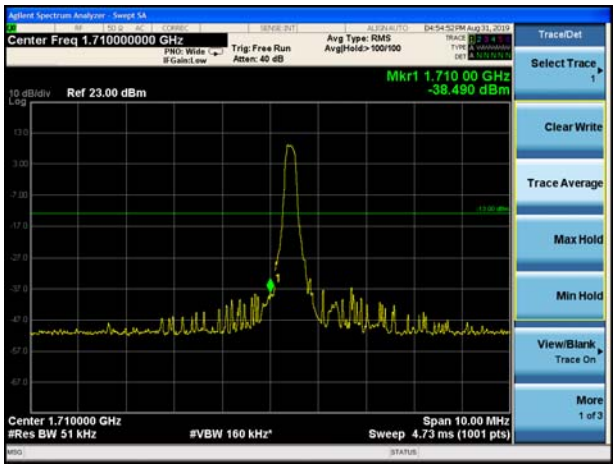
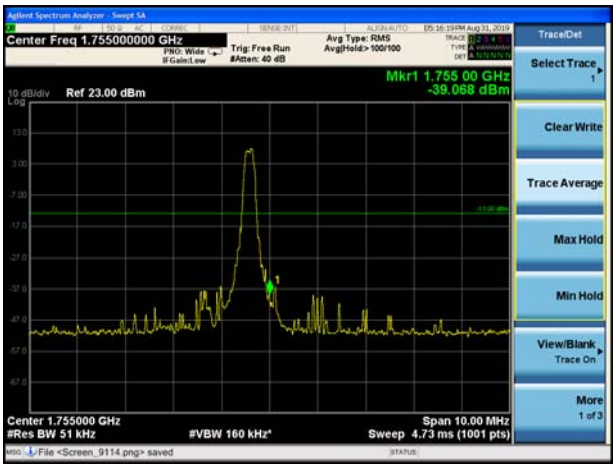
Test Result

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

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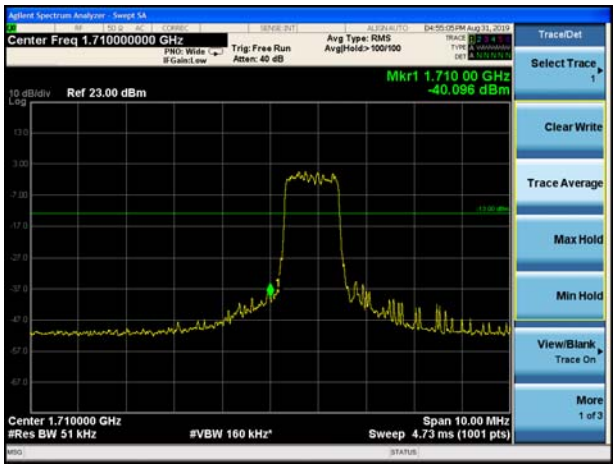
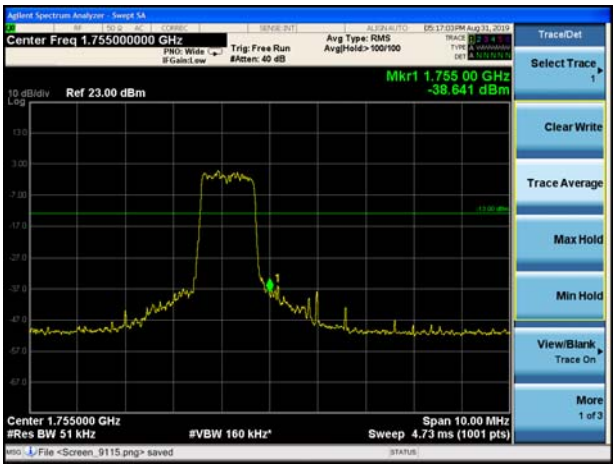
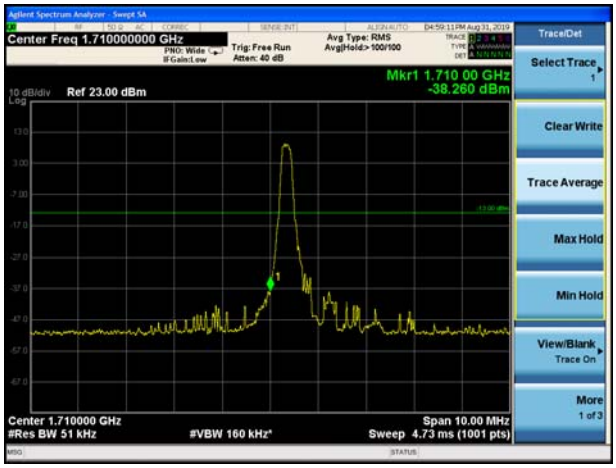
LTE Band 4 QPSK 3MHz CH-Low, 100%RB



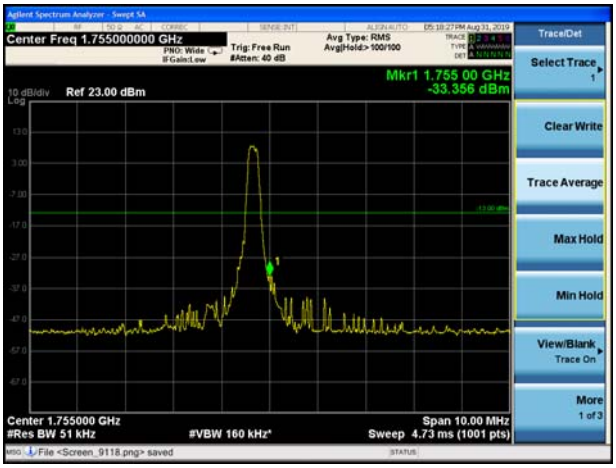
LTE Band 4 QPSK 3MHz CH-High, 100%RB



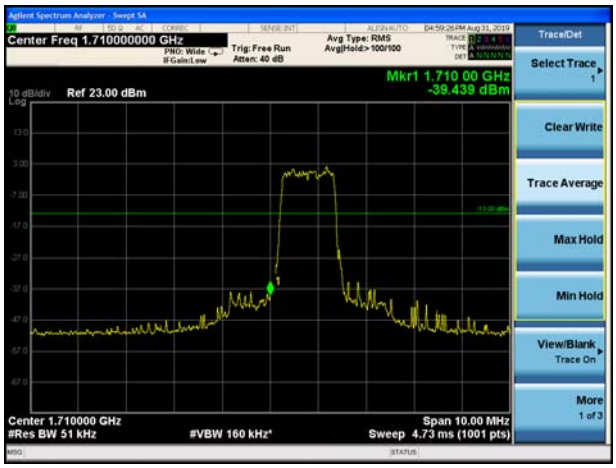
LTE Band 4 QPSK 5MHz CH-Low, 1 RB



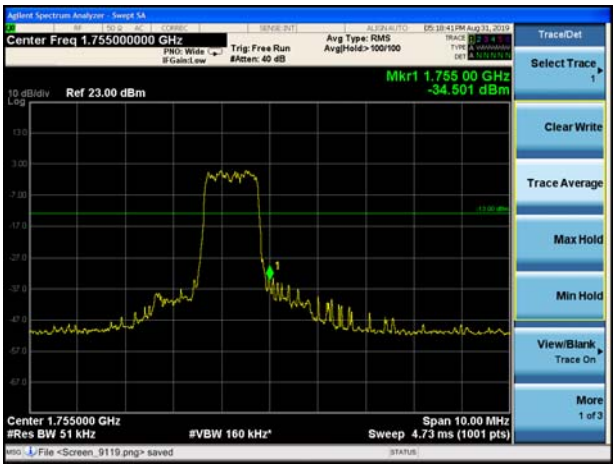
LTE Band 4 QPSK 5MHz CH-High, 1 RB



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



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



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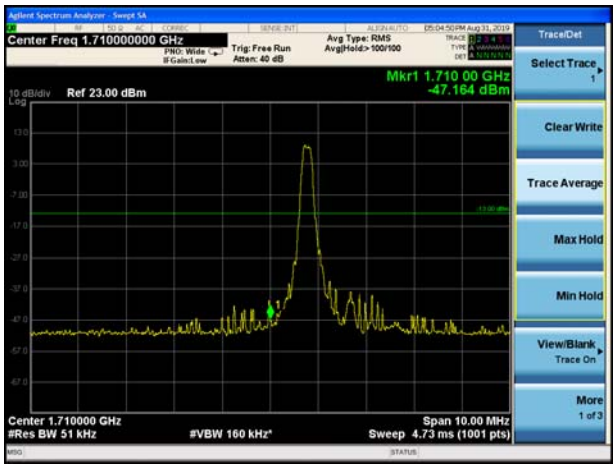
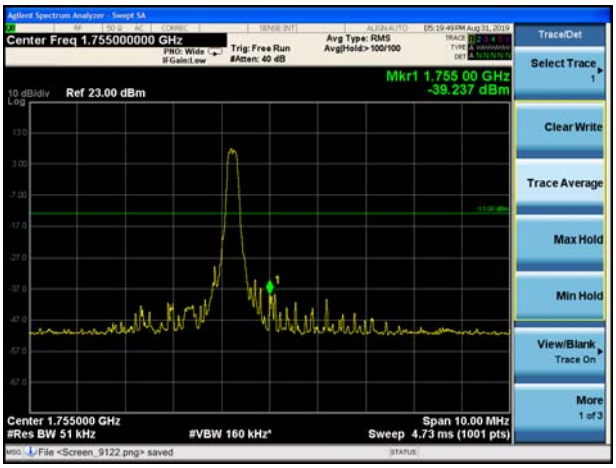
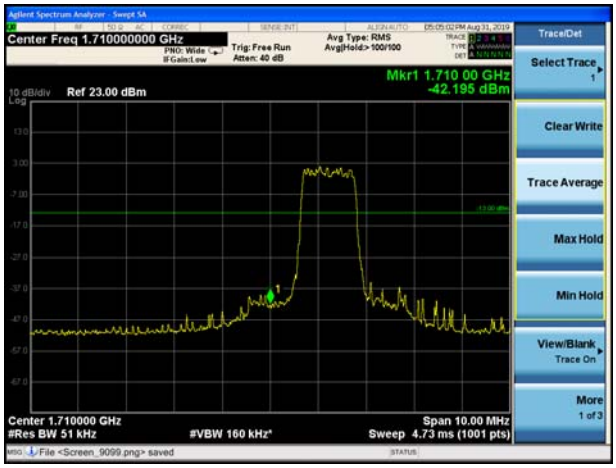
LTE Band 4 QPSK 10MHz CH-Low, 1 RB



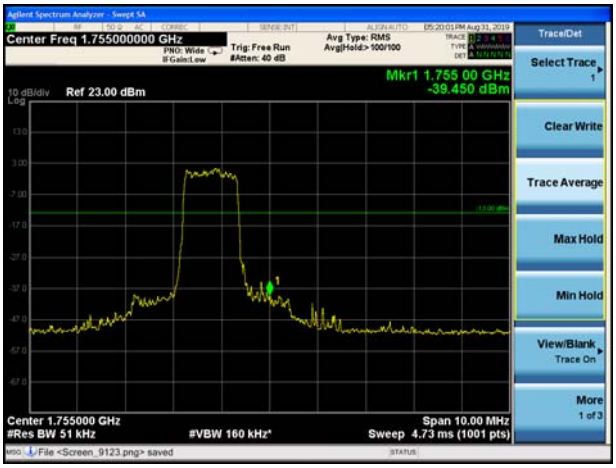
LTE Band 4 QPSK 10MHz CH-High, 1 RB



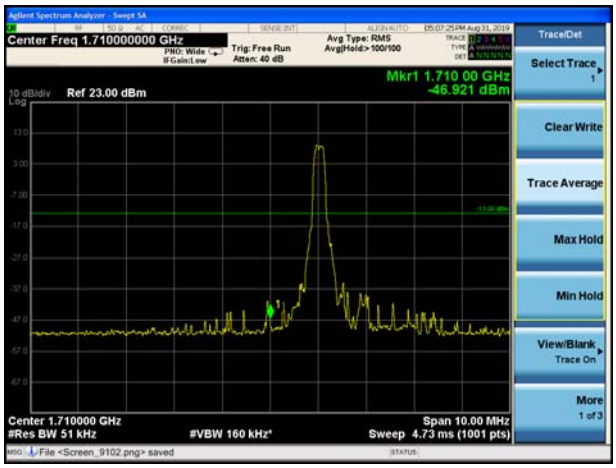
LTE Band 4 QPSK 10MHz CH-Low, 100%RB



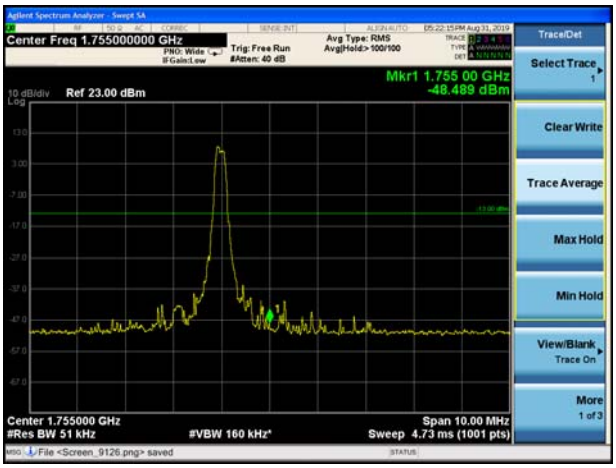
LTE Band 4 QPSK 10MHz CH-High, 100%RB



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



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



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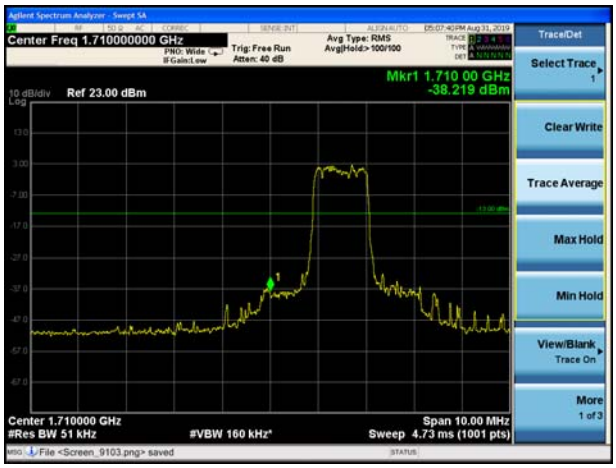
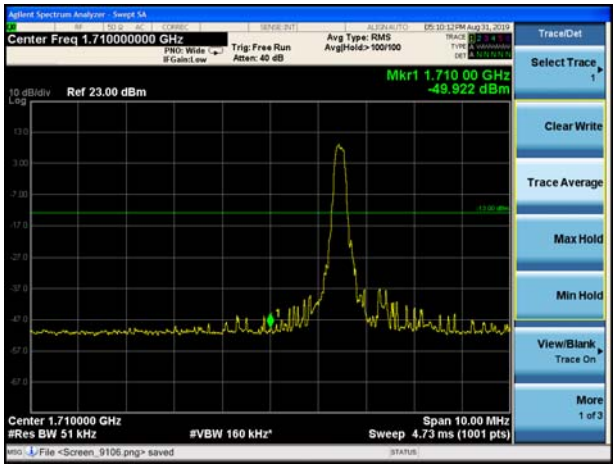
LTE Band 4 QPSK 15MHz CH-Low, 100%RB

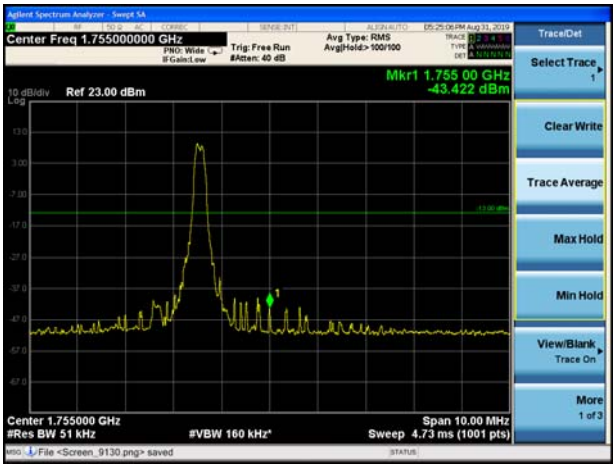


LTE Band 4 QPSK 15MHz CH-High, 100%RB

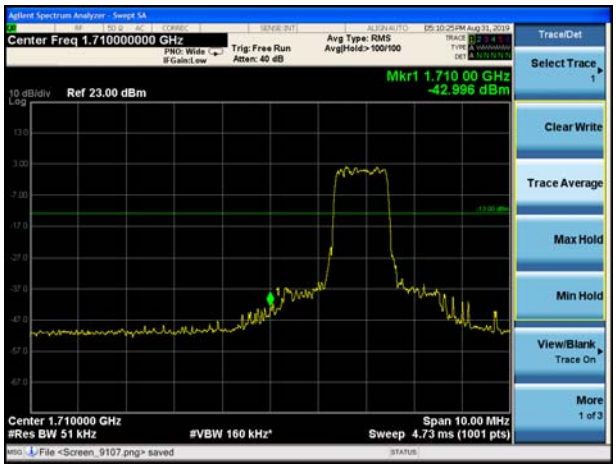
LTE Band 4 QPSK 20MHz CH-Low, 1 RB



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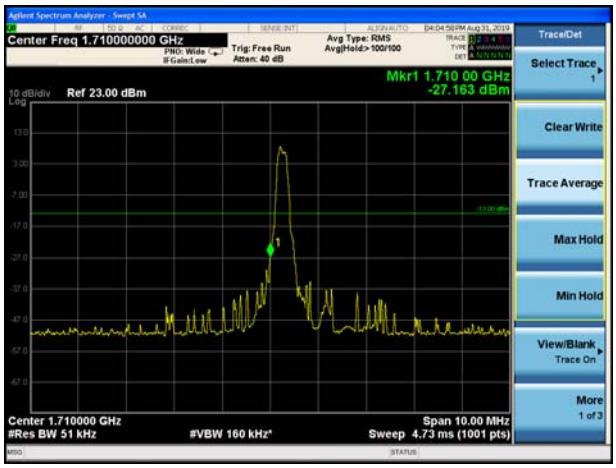
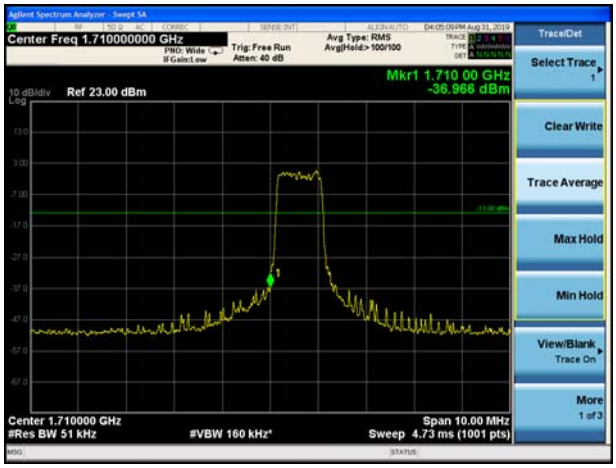
LTE Band 4 16QAM 1.4MHz CH-Low, 1 RB

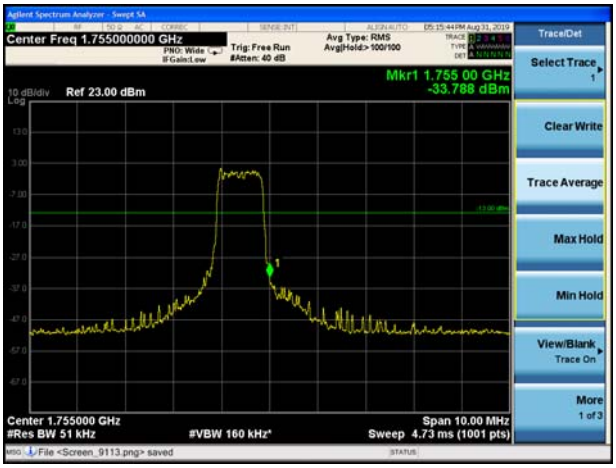


LTE Band 4 16QAM 1.4MHz CH-High, 1 RB

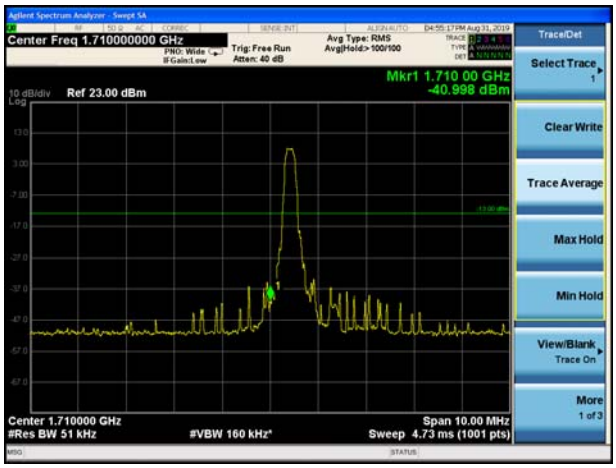
LTE Band 4 16QAM 1.4MHz CH-Low, 100%RB



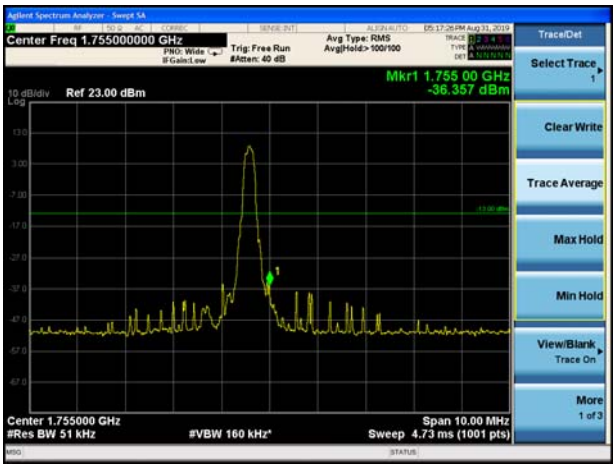
LTE Band 4 16QAM 1.4MHz CH-High, 100%RB



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



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



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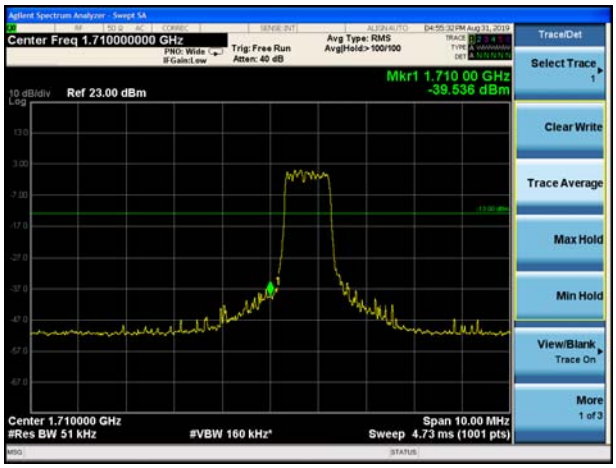
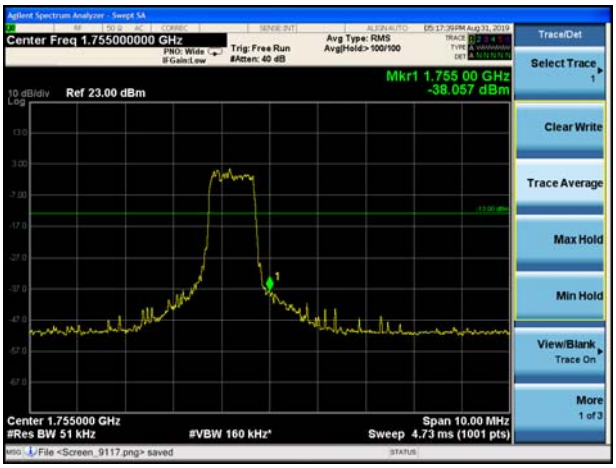
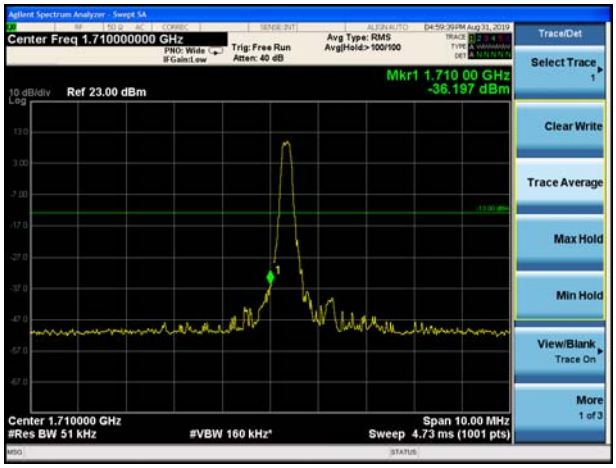
LTE Band 4 16QAM 3MHz CH-Low, 100%RB



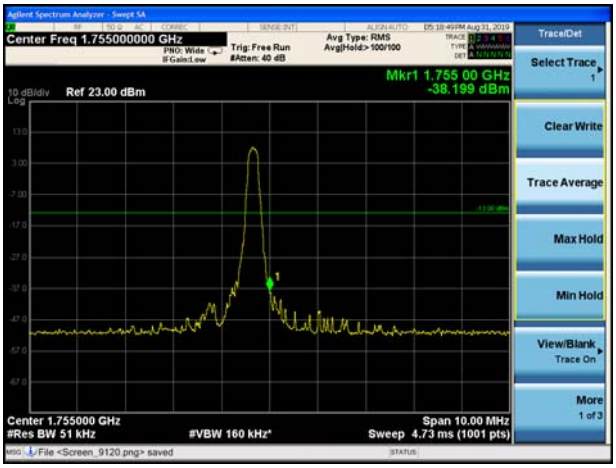
LTE Band 4 16QAM 3MHz CH-High, 100%RB



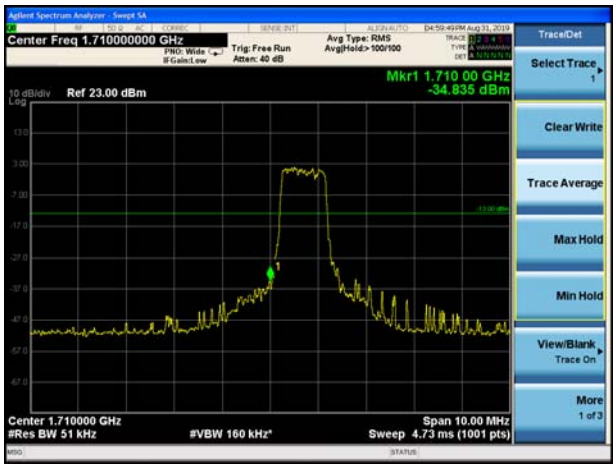
LTE Band 4 16QAM 5MHz CH-Low, 1 RB



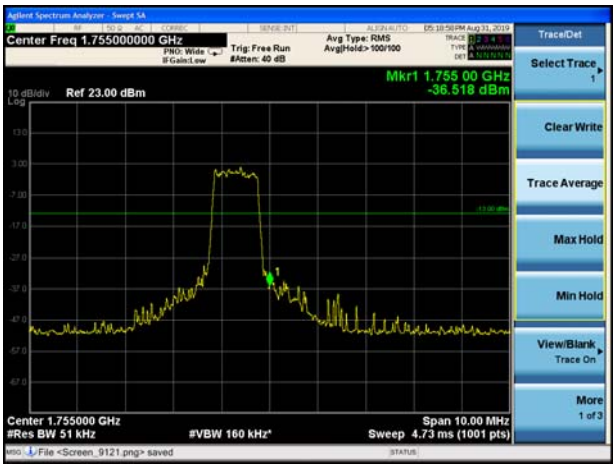
LTE Band 4 16QAM 5MHz CH-High, 1 RB



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



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



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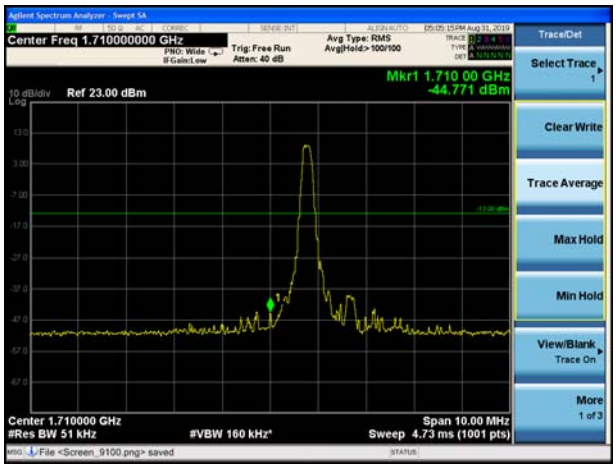
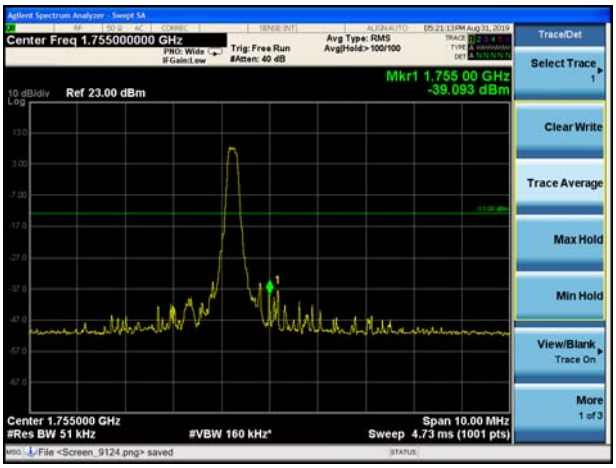
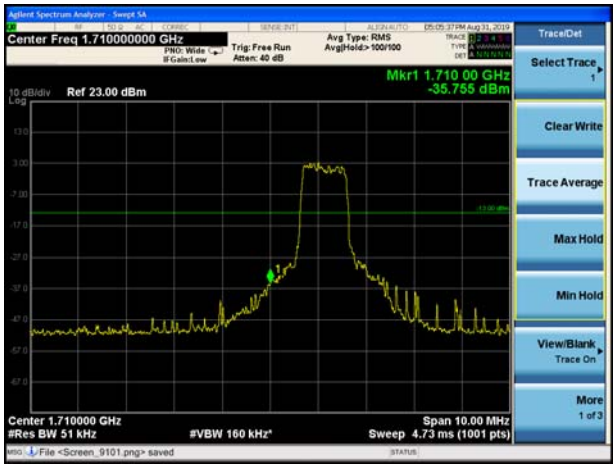
LTE Band 4 16QAM 10MHz CH-Low, 1 RB



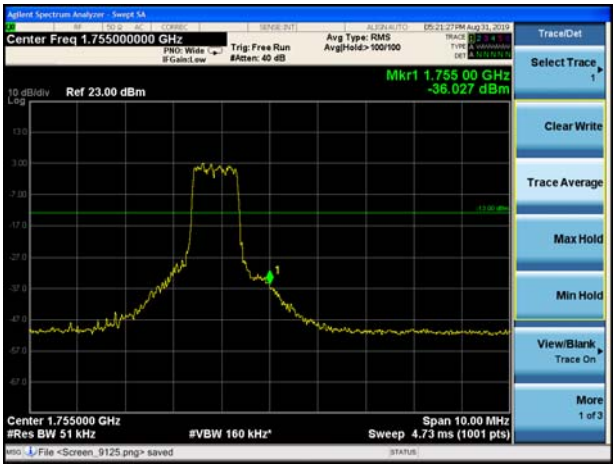
LTE Band 4 16QAM 10MHz CH-High, 1 RB



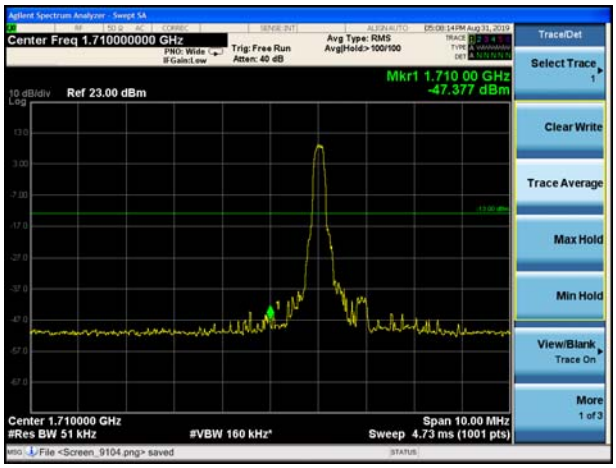
LTE Band 4 16QAM 10MHz CH-Low, 100%RB



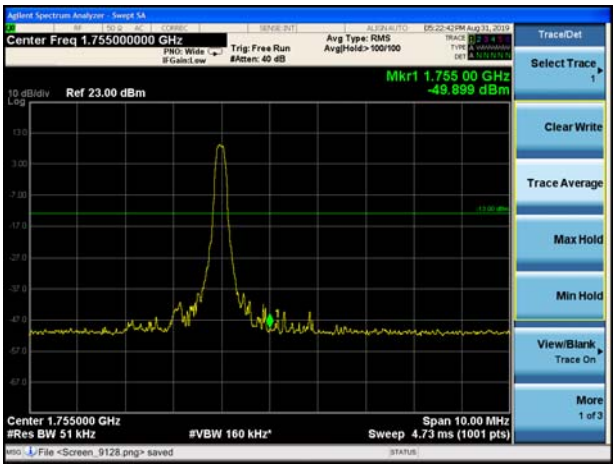
LTE Band 4 16QAM 10MHz CH-High, 100%RB



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



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



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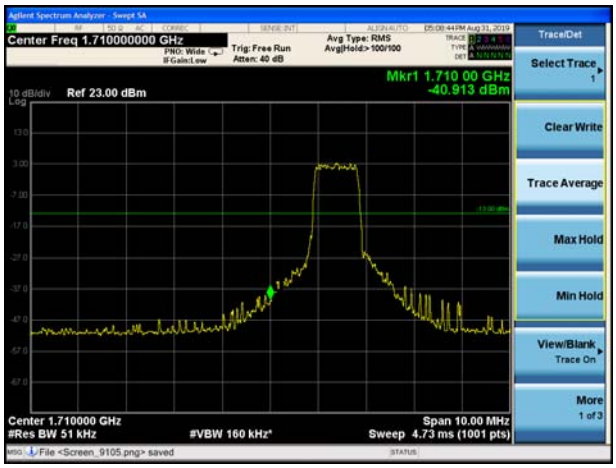
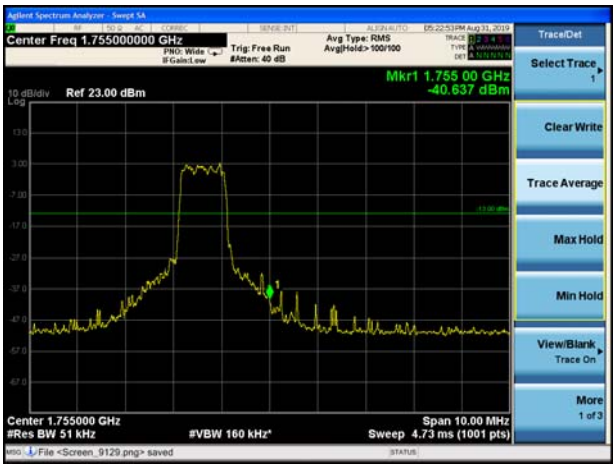
LTE Band 4 16QAM 15MHz CH-Low, 100%RB

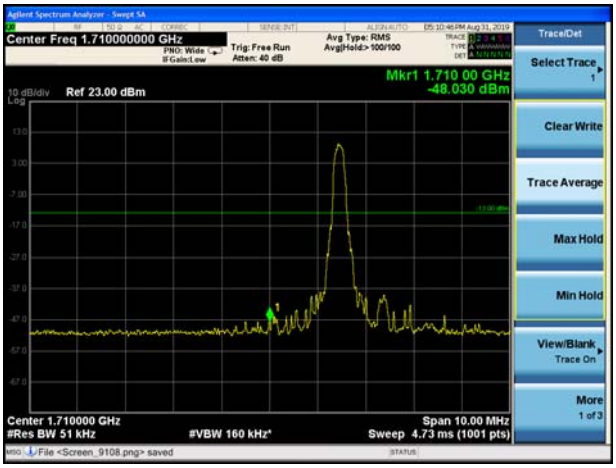


LTE Band 4 16QAM 15MHz CH-High, 100%RB

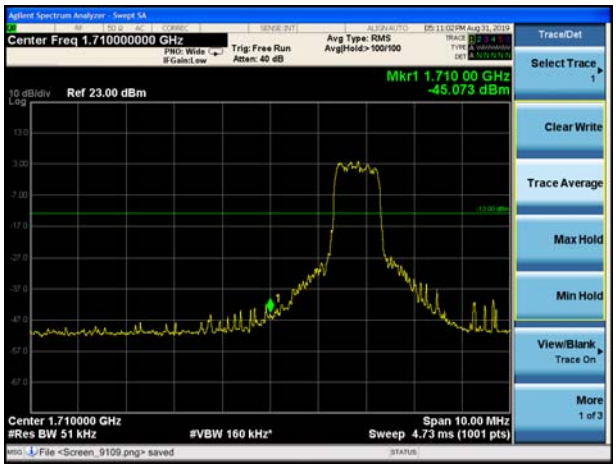


LTE Band 4 16QAM 20MHz CH-Low, 1 RB

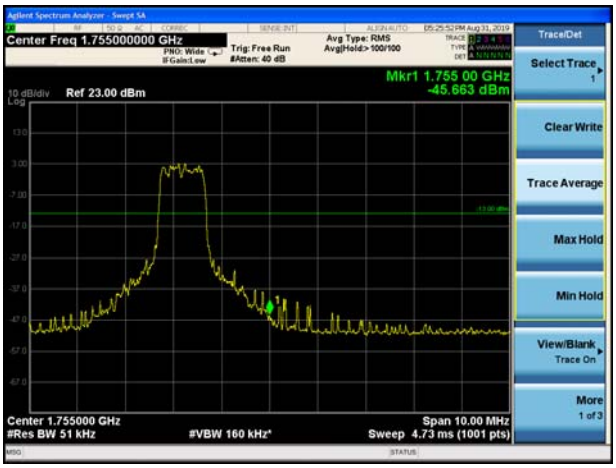
LTE Band 4 16QAM 20MHz CH-High, 1 RB



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



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



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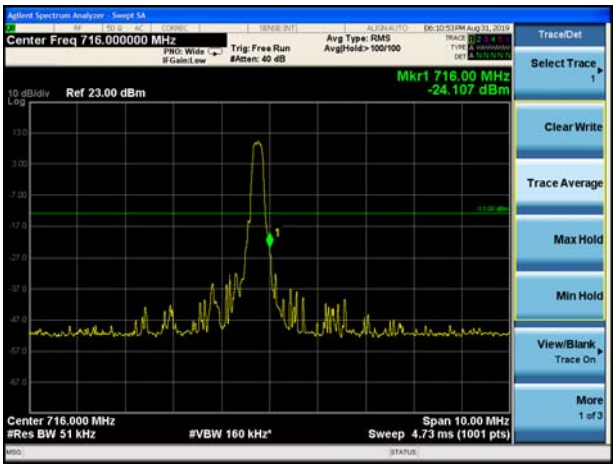
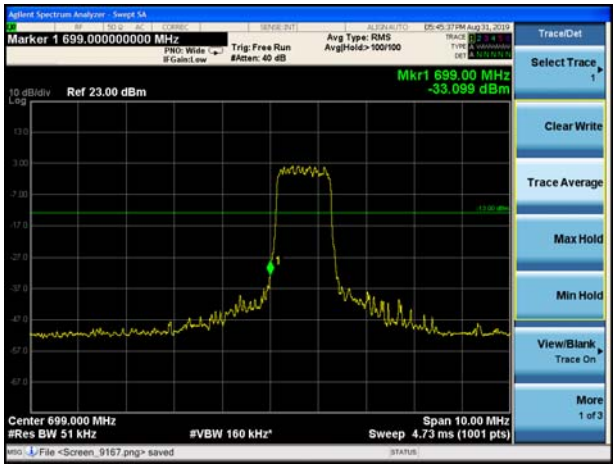
LTE Band 12 QPSK 1.4MHz CH-Low, 1 RB

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

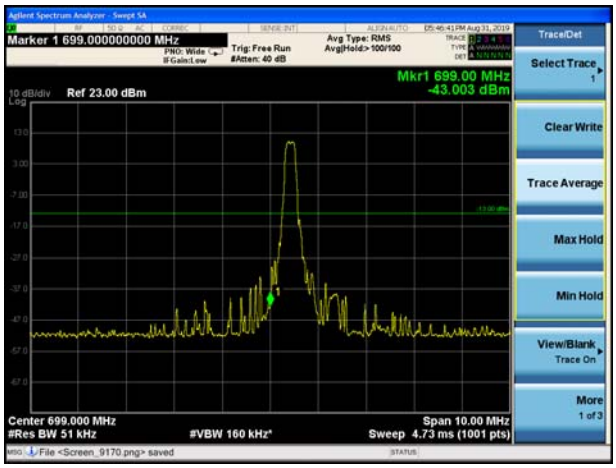


LTE Band 12 QPSK 1.4MHz CH-Low, 100%RB

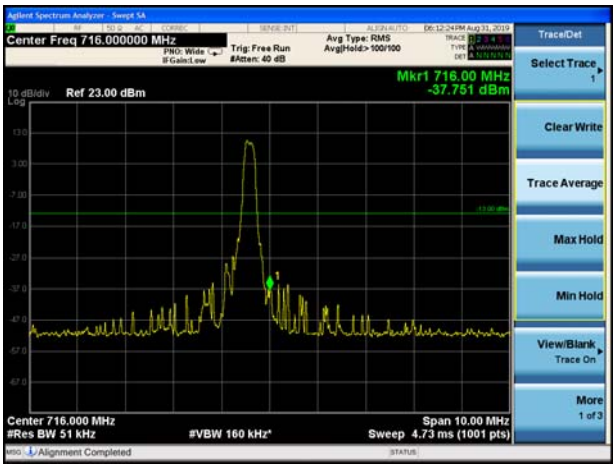


LTE Band 12 QPSK 1.4MHz CH-High, 100%RB

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



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



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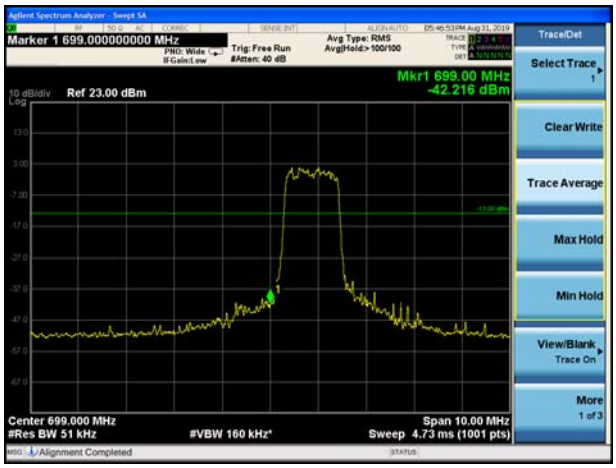
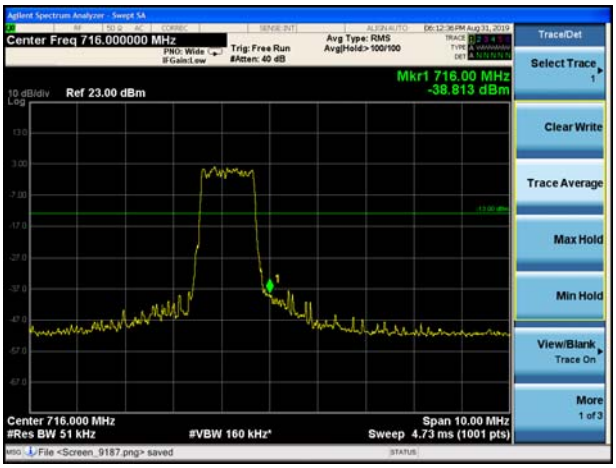
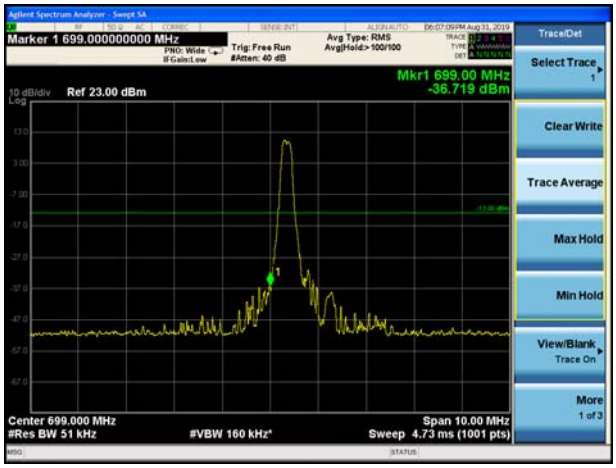
LTE Band 12 QPSK 3MHz CH-Low, 100%RB



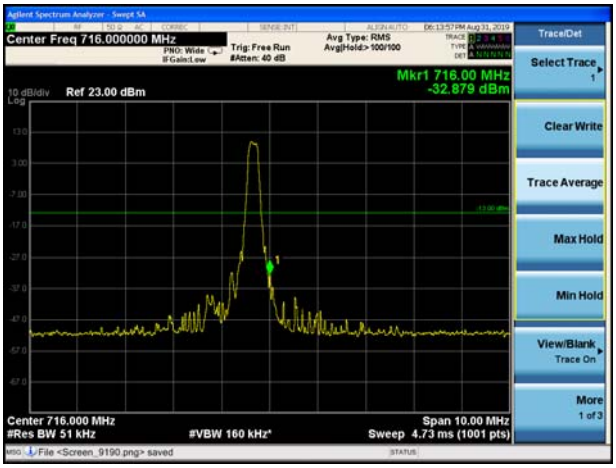
LTE Band 12 QPSK 3MHz CH-High, 100%RB



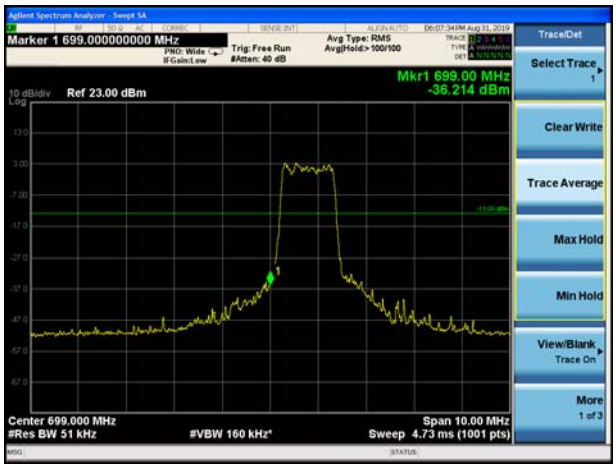
LTE Band 12 QPSK 5MHz CH-Low, 1 RB



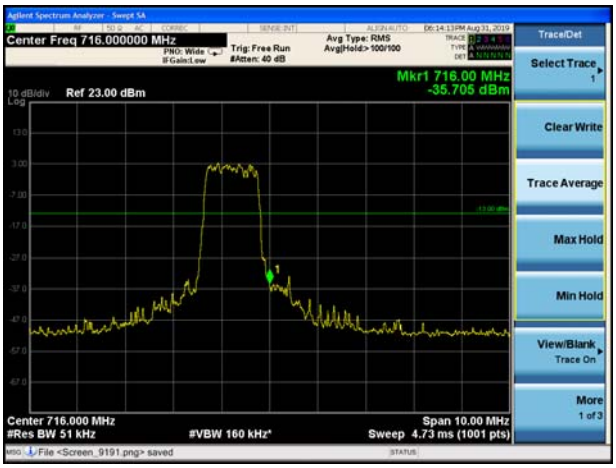
LTE Band 12 QPSK 5MHz CH-High, 1 RB



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



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



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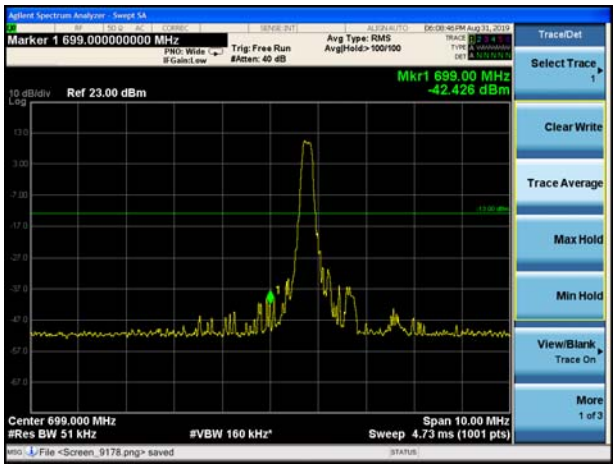
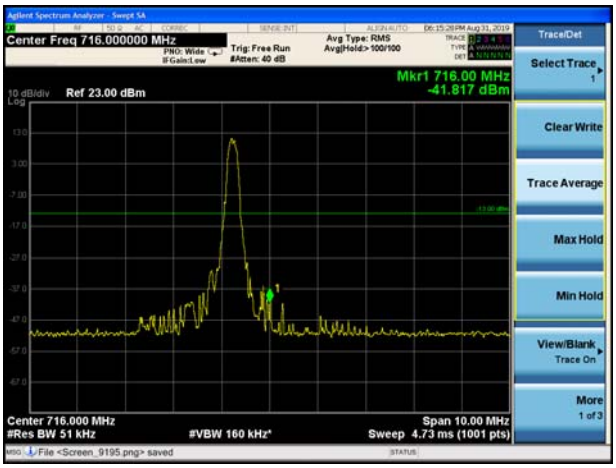
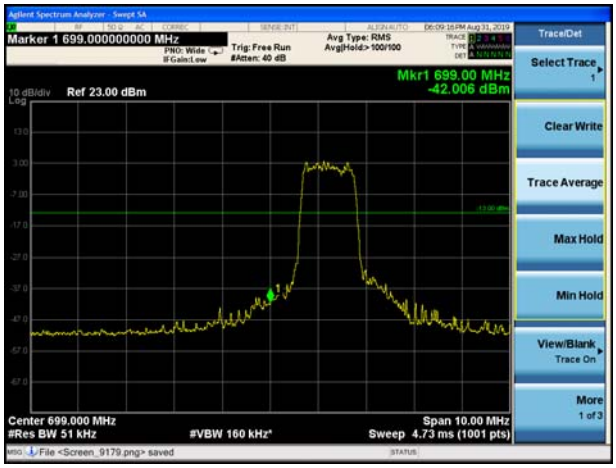
LTE Band 12 QPSK 10MHz CH-Low, 1 RB



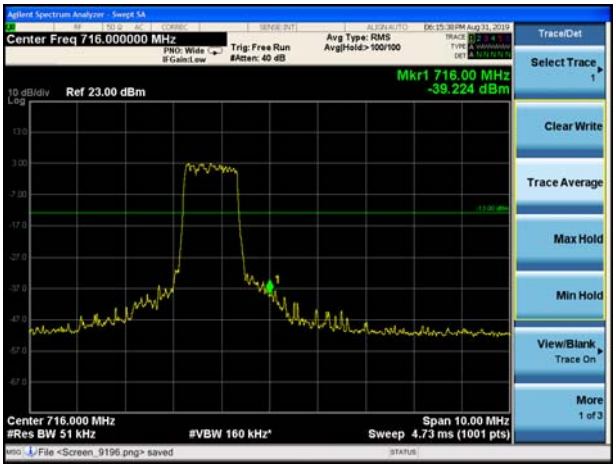
LTE Band 12 QPSK 10MHz CH-High, 1 RB



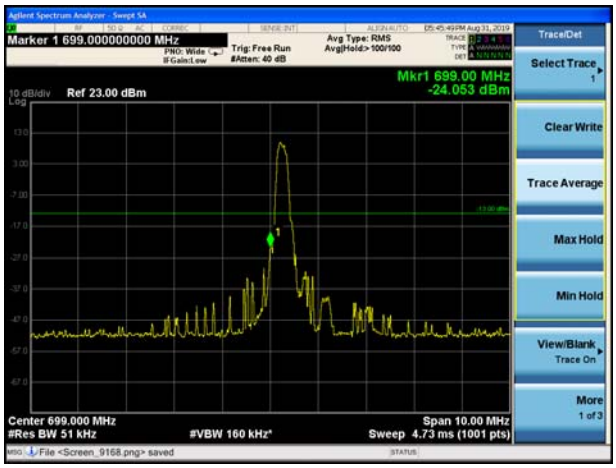
LTE Band 12 QPSK 10MHz CH-Low, 100%RB



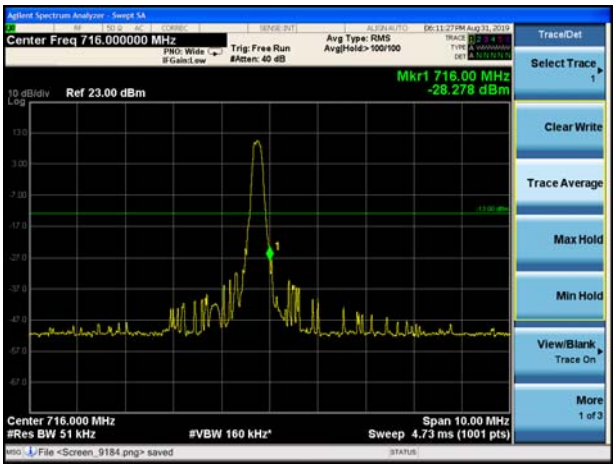
LTE Band 12 QPSK 10MHz CH-High, 100%RB



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



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



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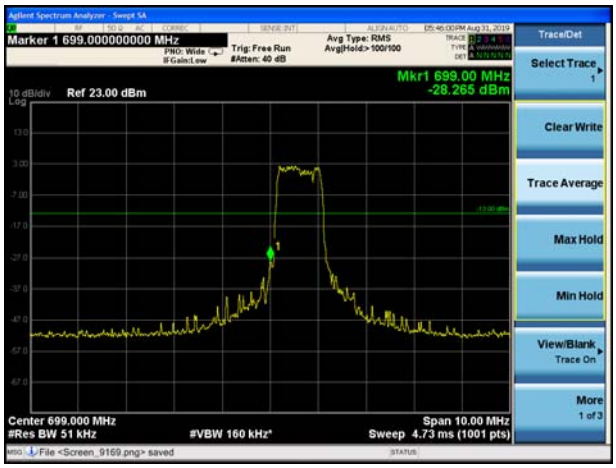
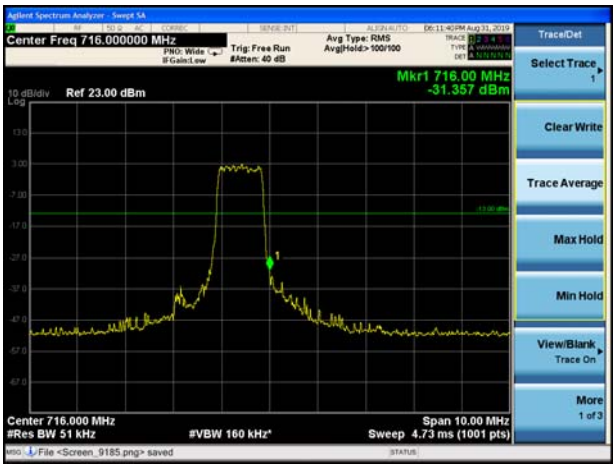
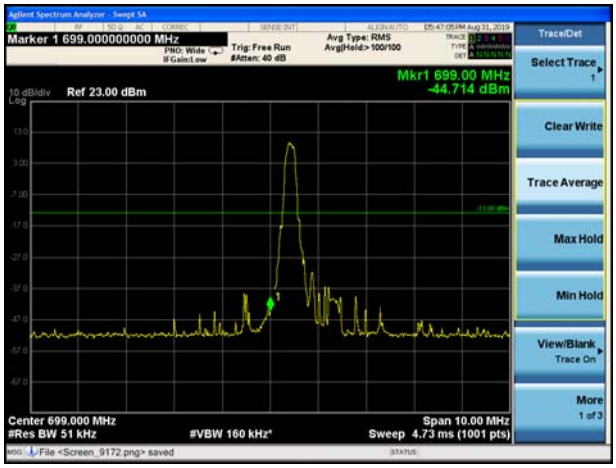
LTE Band 12 16QAM 1.4MHz CH-Low, 100%RB



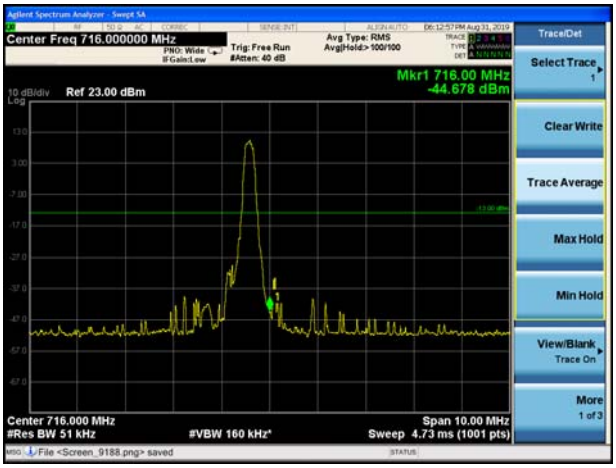
LTE Band 12 16QAM 1.4MHz CH-High, 100%RB



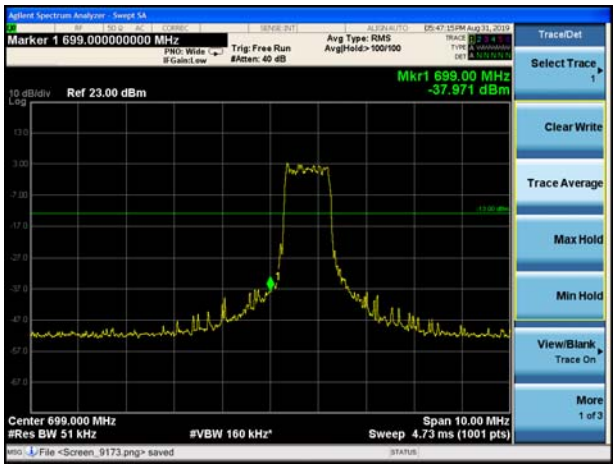
LTE Band 12 16QAM 3MHz CH-Low, 1 RB



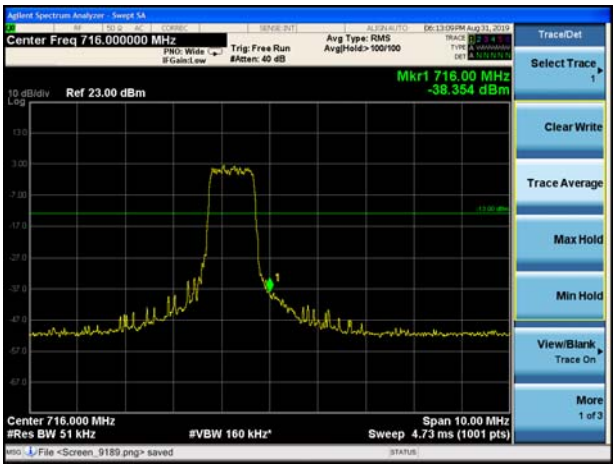
LTE Band 12 16QAM 3MHz CH-High, 1 RB



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



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



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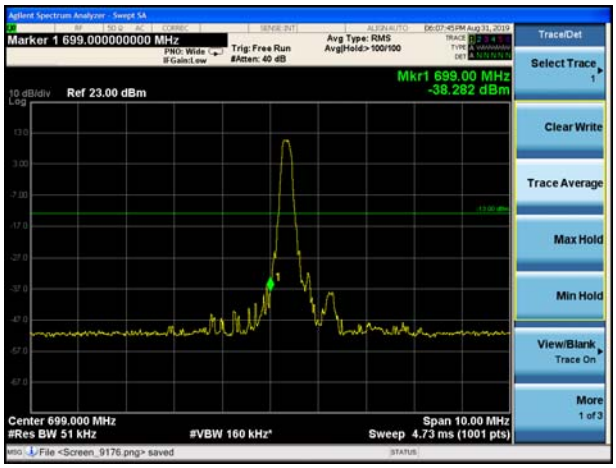
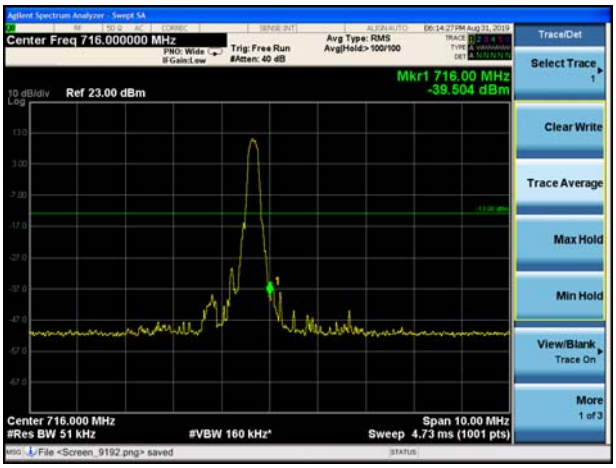
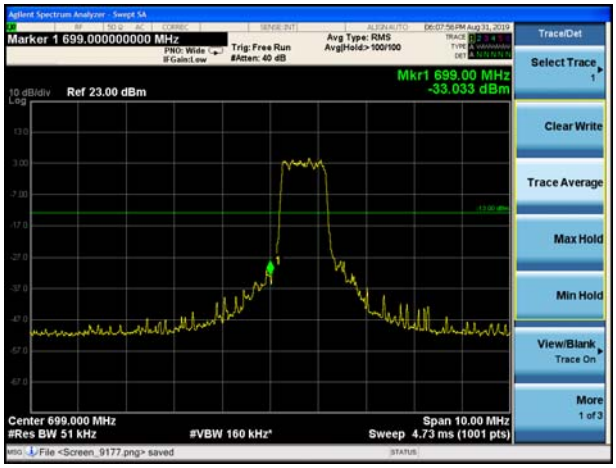
LTE Band 12 16QAM 5MHz CH-Low, 1 RB



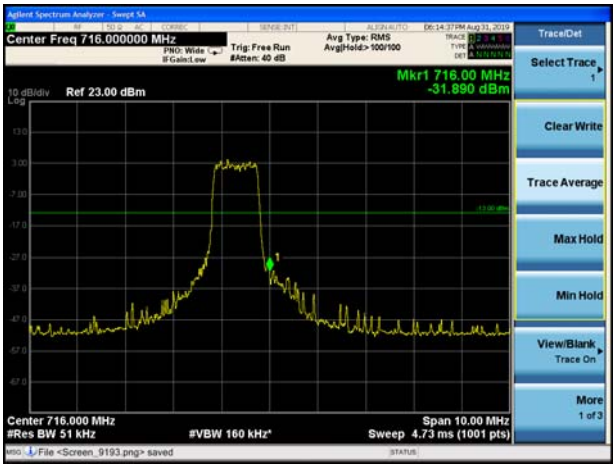
LTE Band 12 16QAM 5MHz CH-High, 1 RB



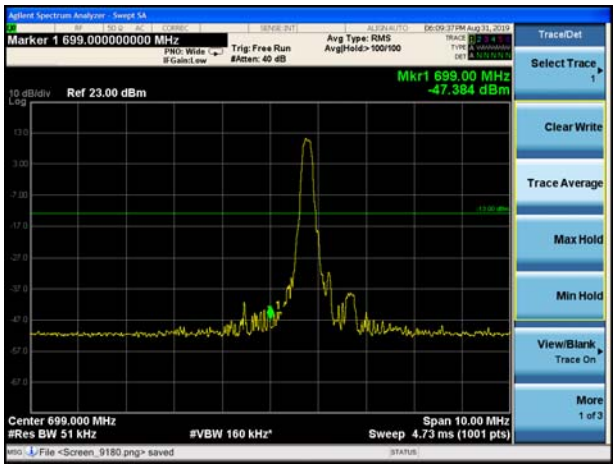
LTE Band 12 16QAM 5MHz CH-Low, 100%RB



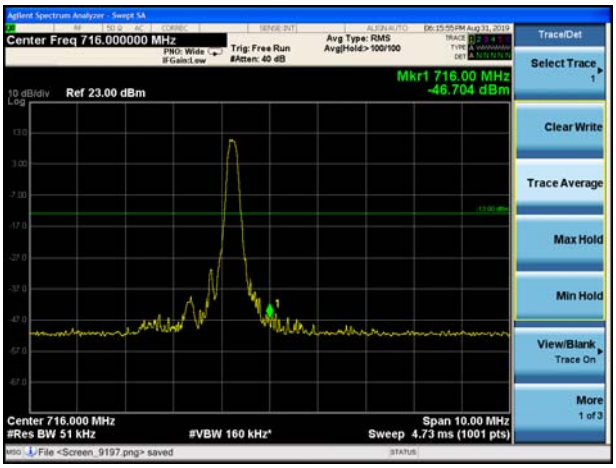
LTE Band 12 16QAM 5MHz CH-High, 100%RB



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



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



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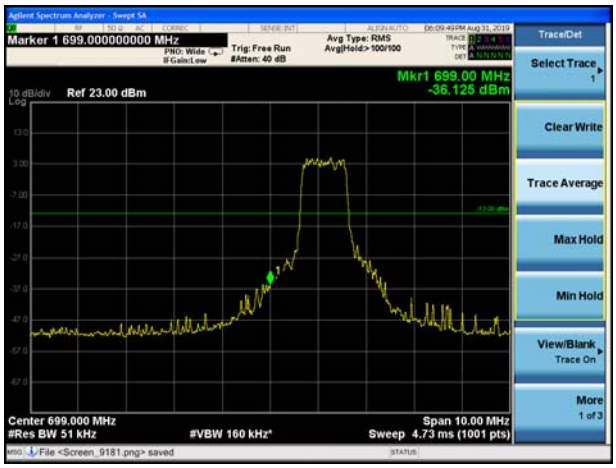
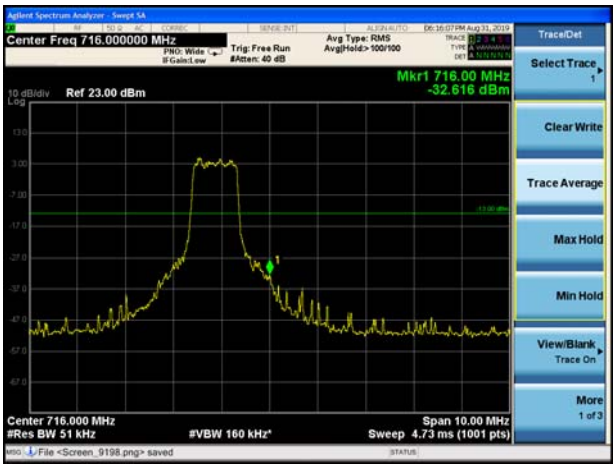
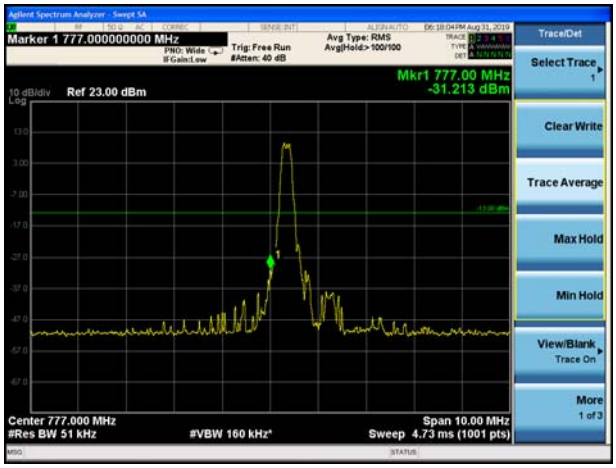
LTE Band 12 16QAM 10MHz CH-Low, 100%RB



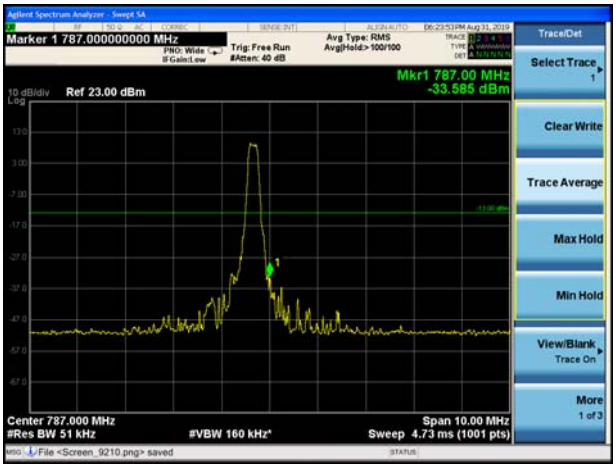
LTE Band 12 16QAM 10MHz CH-High, 100%RB



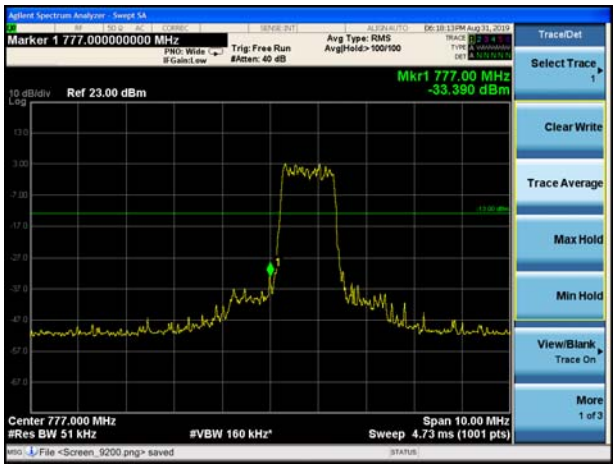
LTE Band 13 QPSK 5MHz CH-Low, 1 RB



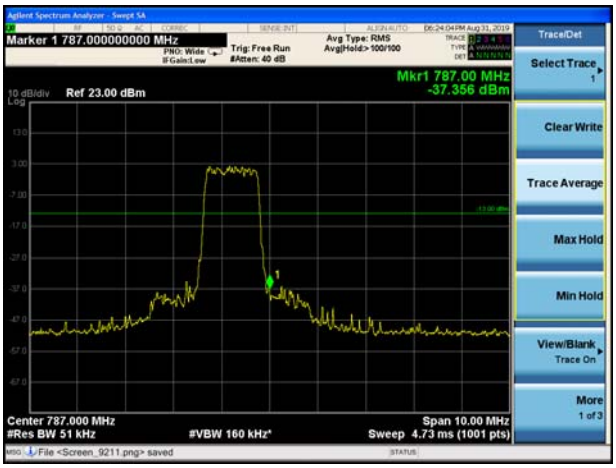
LTE Band 13 QPSK 5MHz CH-High, 1 RB



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



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



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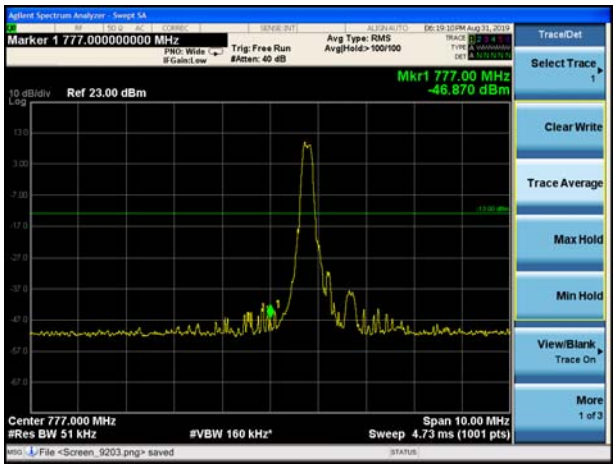
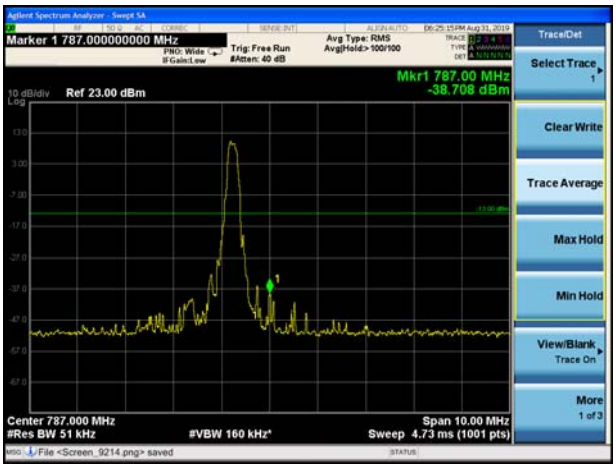
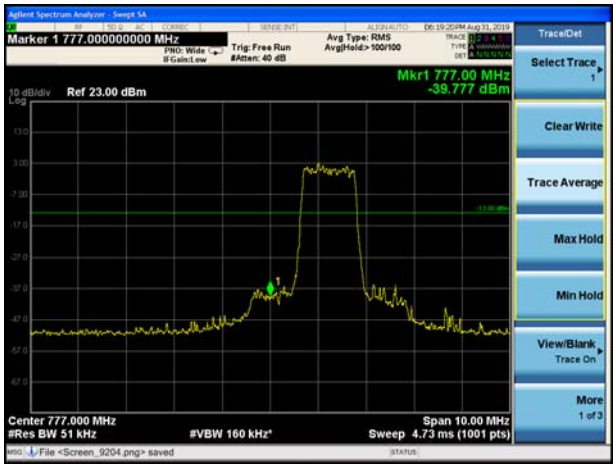
LTE Band 13 QPSK 10MHz CH-Low, 1 RB



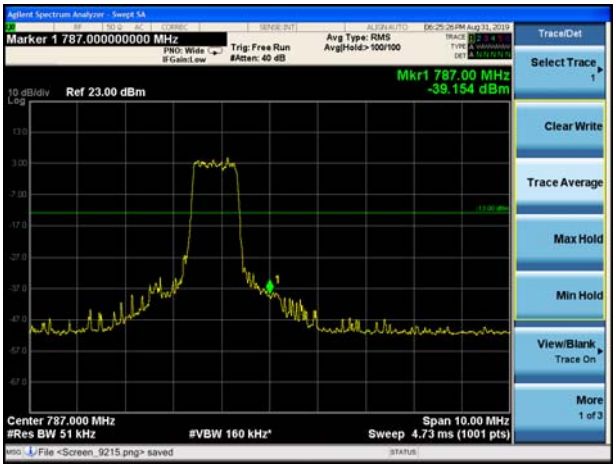
LTE Band 13 QPSK 10MHz CH-High, 1 RB



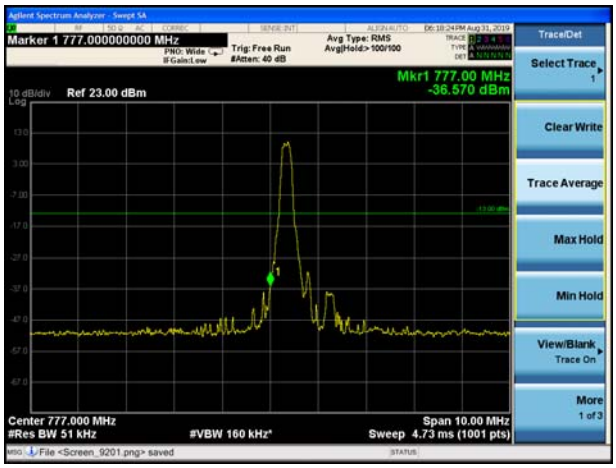
LTE Band 13 QPSK 10MHz CH-Low, 100%RB



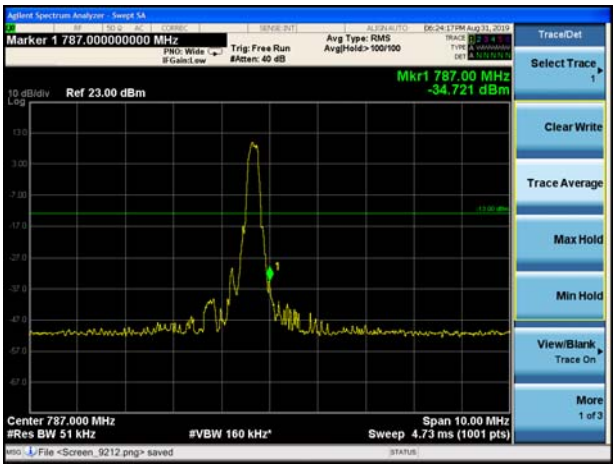
LTE Band 13 QPSK 10MHz CH- High, 100%RB



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



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



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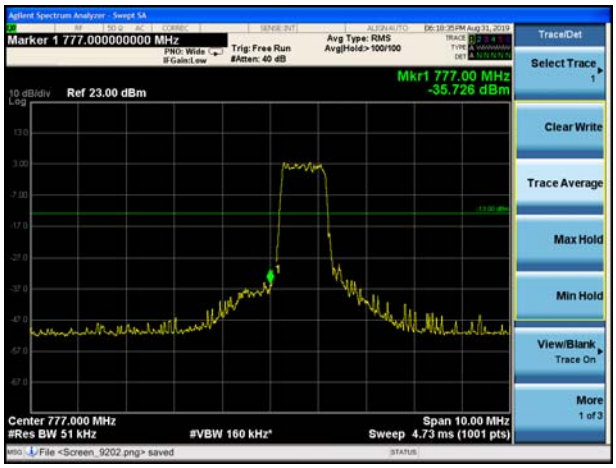
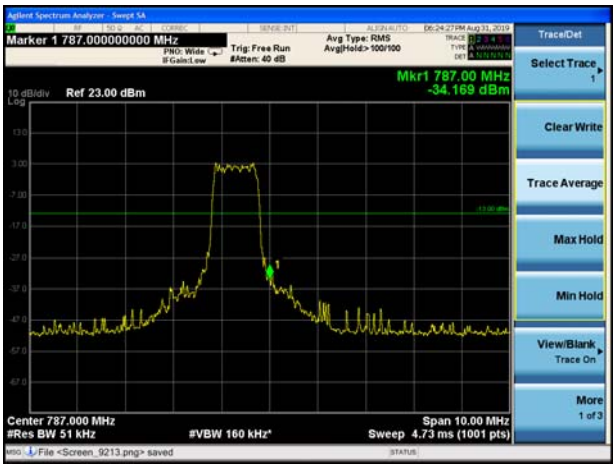
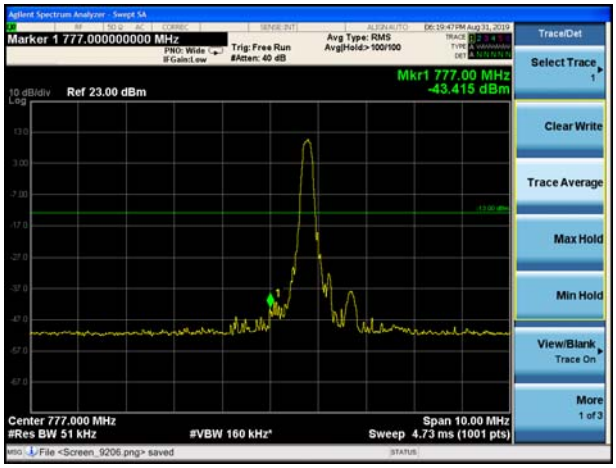
LTE Band 13 16QAM 5MHz CH-Low, 100%RB



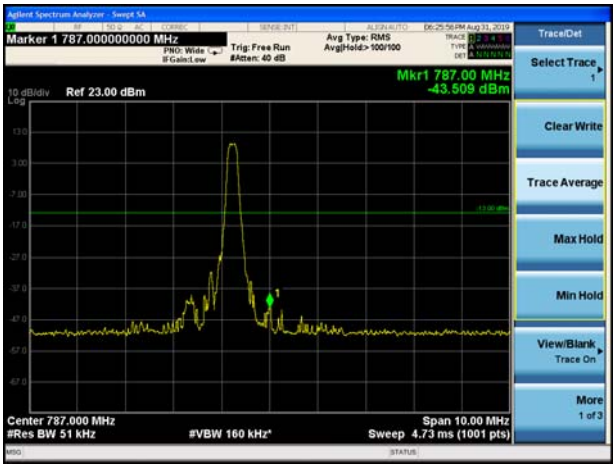
LTE Band 13 16QAM 5MHz CH- High, 100%RB



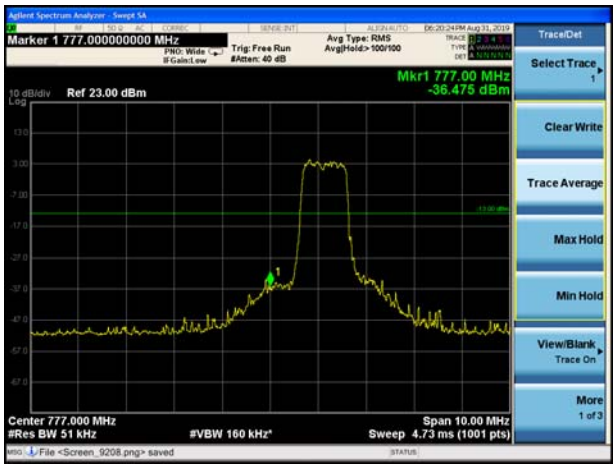
LTE Band 13 16QAM 10MHz CH-Low, 1 RB



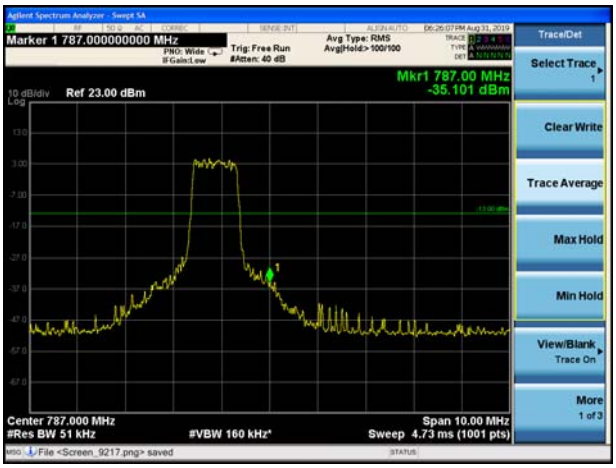
LTE Band 13 16QAM 10MHz CH-High, 1 RB



LTE Band 13 16QAM 10MHz CH-Low, 100%RB



LTE Band 13 16QAM 10MHz CH- High, 100%RB



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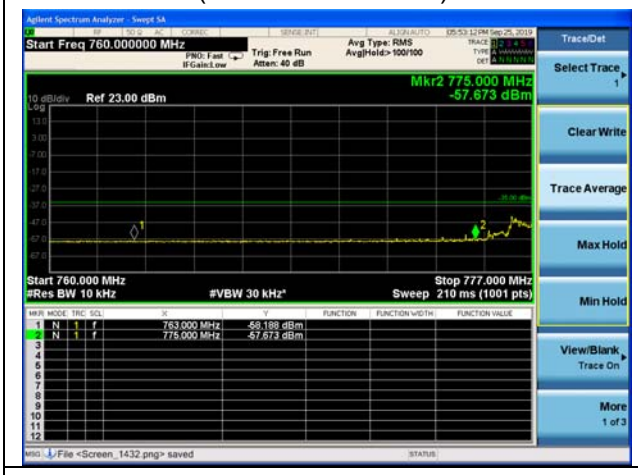
LTE Band 13 QPSK 5MHz CH-Low, 1 RB (763MHz ~775MHz)

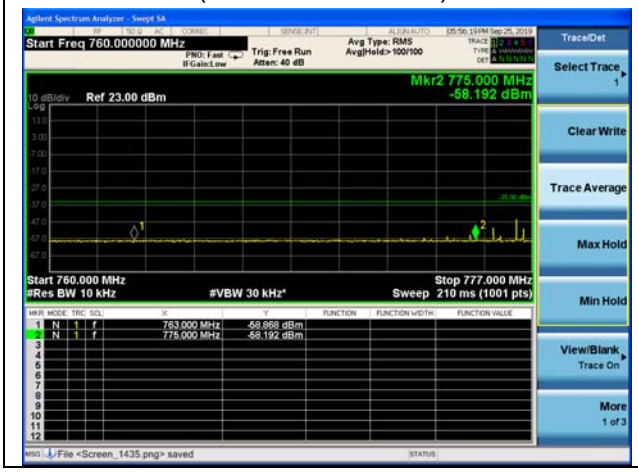
LTE Band 13 QPSK 5MHz CH-Low, 1 RB (793MHz ~805MHz)

LTE Band 13 QPSK 5MHz CH-Low, 100%RB (763MHz ~775MHz)



LTE Band 13 QPSK 5MHz CH-Low, 100%RB (793MHz ~805MHz)

LTE Band 13 QPSK 10MHz CH-Low, 1 RB (763MHz ~775MHz)



LTE Band 13 QPSK 10MHz CH-Low, 1 RB (793MHz ~805MHz)

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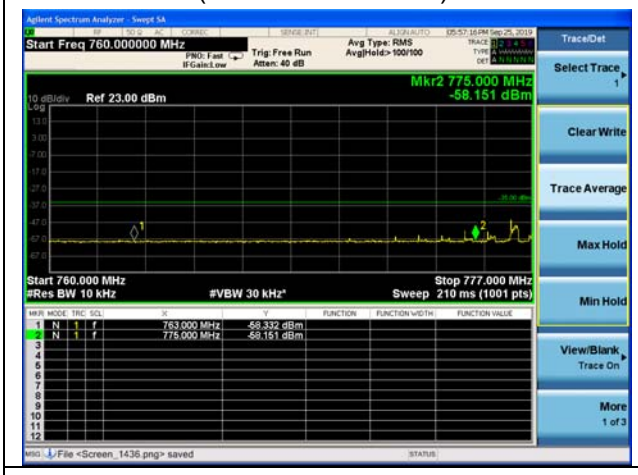
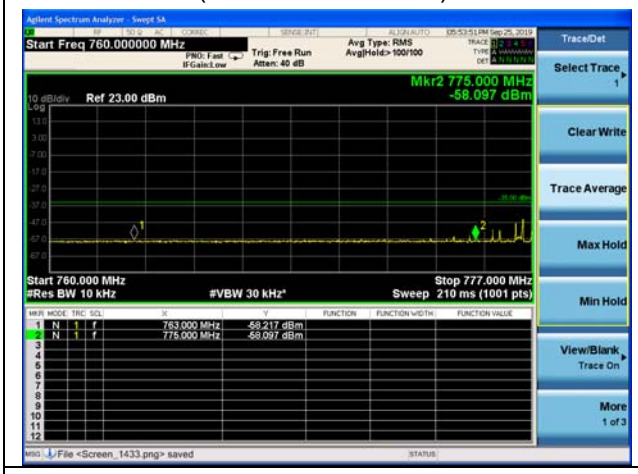
LTE Band 13 QPSK 10MHz CH-Low, 100%RB (763MHz ~775MHz)



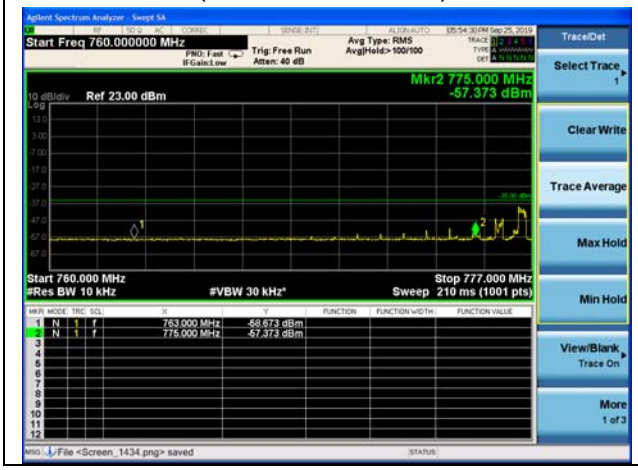
LTE Band 13 QPSK 10MHz CH-Low, 100%RB (793MHz ~805MHz)

LTE Band 13 16QAM 5MHz CH-Low, 1 RB (763MHz ~775MHz)

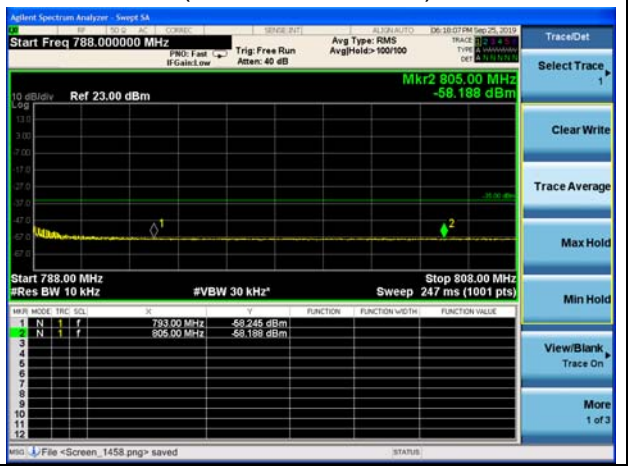


LTE Band 13 16QAM 5MHz CH-Low, 1 RB (793MHz ~805MHz)

LTE Band 13 16QAM 5MHz CH-Low, 100%RB (763MHz ~775MHz)



LTE Band 13 16QAM 5MHz CH-Low, 100%RB (793MHz ~805MHz)



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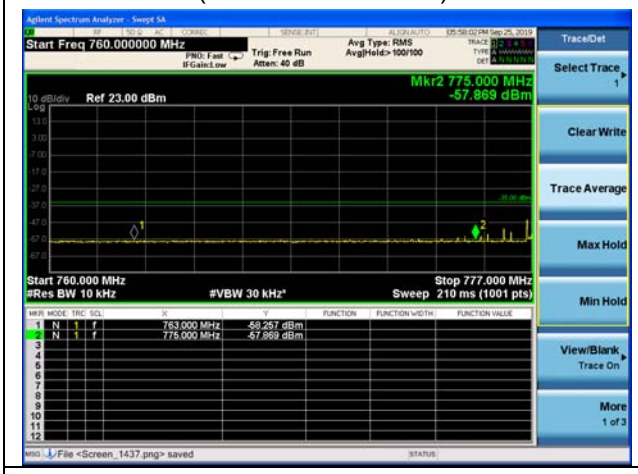
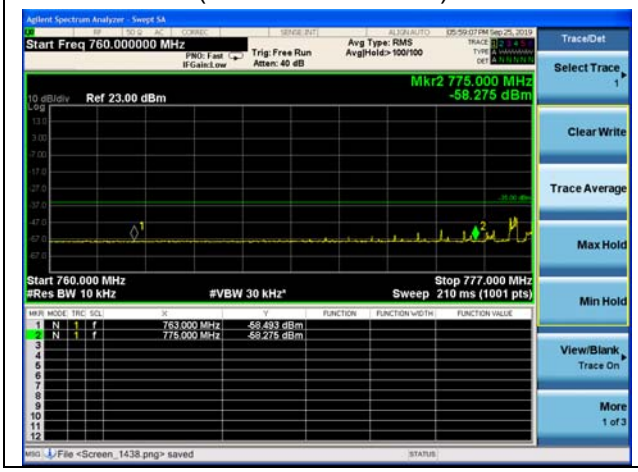
LTE Band 13 16QAM 10MHz CH-Low, 1 RB (763MHz ~775MHz)

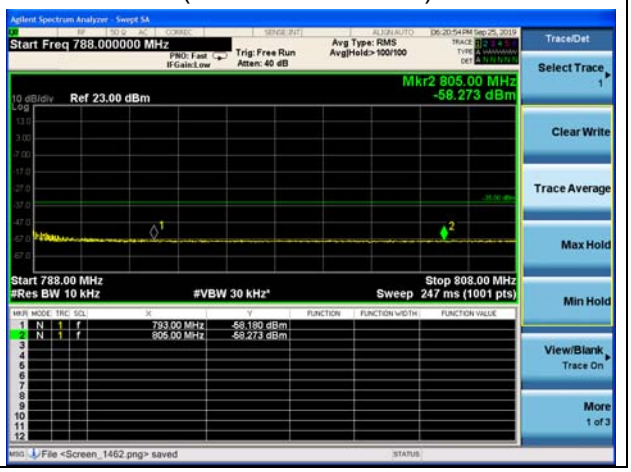


LTE Band 13 16QAM 10MHz CH-Low, 1 RB (793MHz ~805MHz)

LTE Band 13 16QAM 10MHz CH-Low, 100%RB (763MHz ~775MHz)



LTE Band 13 16QAM 10MHz CH-Low, 100%RB (793MHz ~805MHz)



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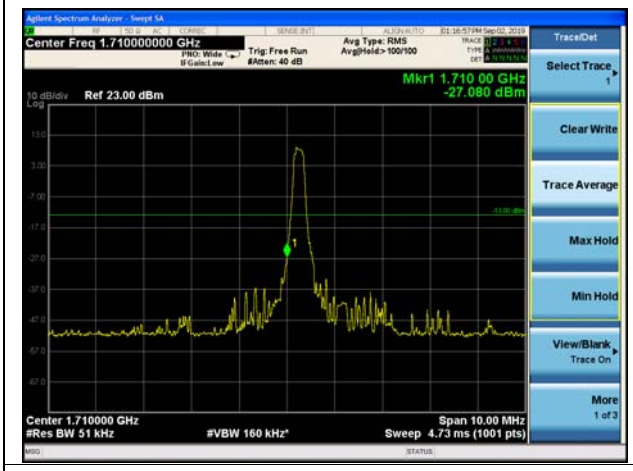
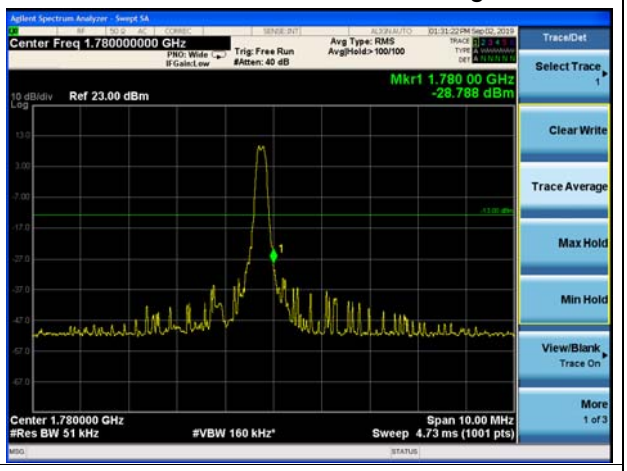
LTE Band 66 QPSK 1.4MHz CH-Low, 1 RB



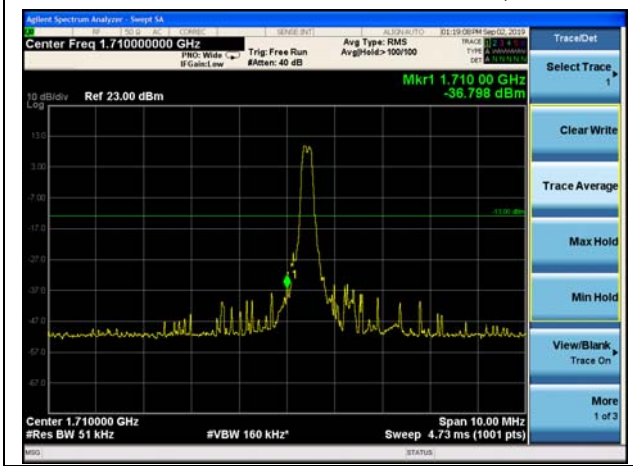
LTE Band 66 QPSK 1.4MHz CH-High, 1 RB



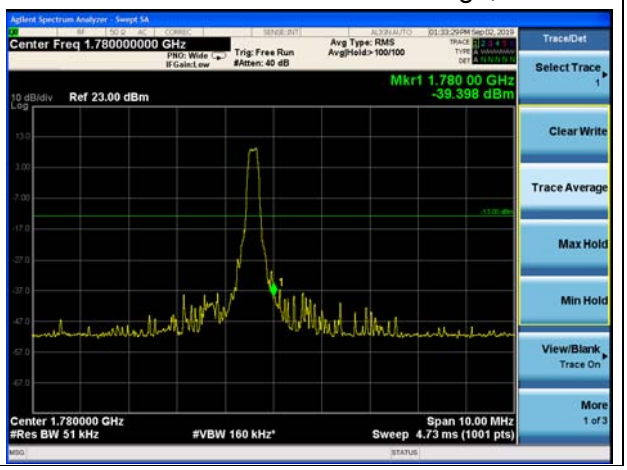
LTE Band 66 QPSK 1.4MHz CH-Low, 100%RB

LTE Band 66 QPSK 1.4MHz CH-High, 100%RB

LTE Band 66 QPSK 3MHz CH-Low, 1 RB



LTE Band 66 QPSK 3MHz CH-High, 1 RB



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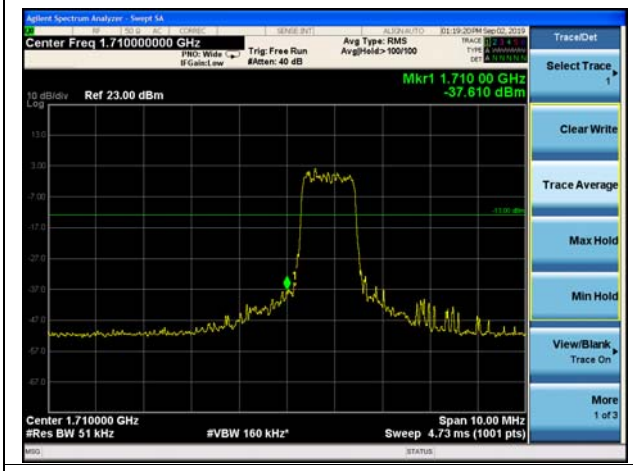
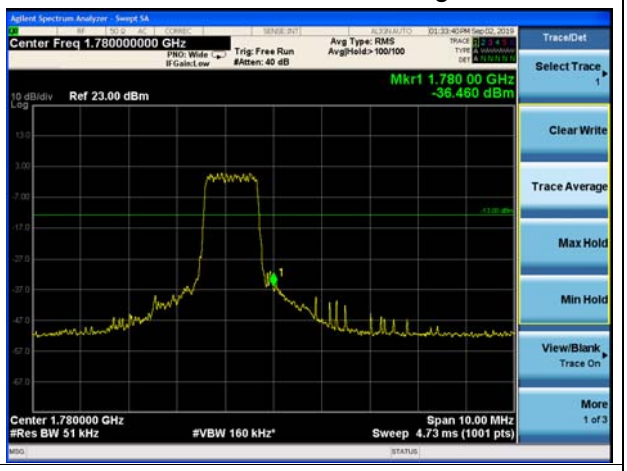
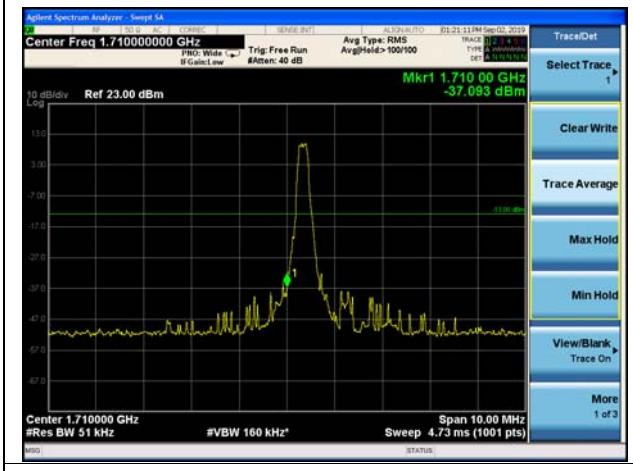
LTE Band 66 QPSK 3MHz CH-Low, 100%RB



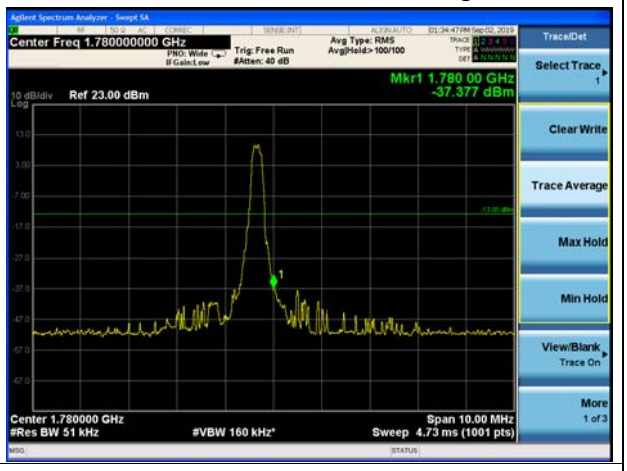
LTE Band 66 QPSK 3MHz CH-High, 100%RB



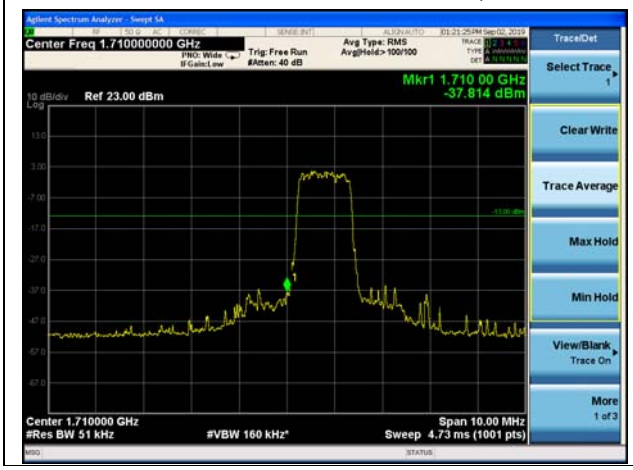
LTE Band 66 QPSK 5MHz CH-Low, 1 RB



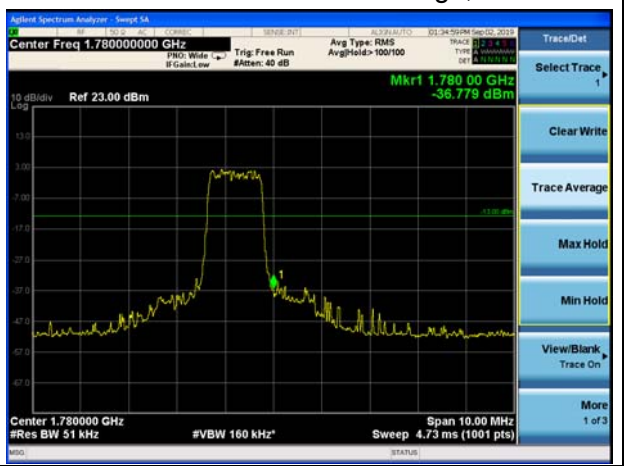
LTE Band 66 QPSK 5MHz CH-High, 1 RB



LTE Band 66 QPSK 5MHz CH-Low, 100%RB



LTE Band 66 QPSK 5MHz CH-High, 100%RB



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