MEASUREMENT REPORT

FCC ID:	XMR2023EM160RGL
Application:	Quectel Wireless Solutions Co., Ltd
Product:	LTE-A Cat 16 M.2 Module
Model No.:	EM160R-GL
Brand Name:	QUECTEL
FCC Rule Part(s):	Part 2, 22, 24, 27
Result:	Complies
Test Date:	2020-06-12 ~ 2020-08-17

Reviewed By: Sunny Sun

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2306RSU048-U6	Rev. 01	Initial Report	2023-07-14	Valid

Note: This report is based on MRT report “2009RSU020”, FCC ID: XMR2020EM160RGL updating FCC ID.

CONTENTS

Description Page

1. GENERAL INFORMATION 5

1.1. Applicant 5
1.2. Manufacturer 5
1.3. Testing Facility 5

2. PRODUCT INFORMATION 6

2.1. Equipment Description 6
2.2. Product Specification Subjective to this Report 6
2.3. Description of Available Antennas 7
2.4. EMI Suppression Device(s)/Modifications 7
2.5. Maximum Power, Frequency Tolerance, and Emission Designator 7
2.6. Configuration of Tested System 8
2.7. Test Environment Condition 8

3. TEST EQUIPMENT CALIBRATION DATE 9

4. MEASUREMENT UNCERTAINTY 11

5. TEST RESULT 12

5.1. Summary 12
5.2. Occupied Bandwidth 13
5.2.1. Test Limit 13
5.2.2. Test Procedure 13
5.2.3. Test Setting 13
5.2.4. Test Setup 13
5.2.5. Test Result 14
5.3. Frequency Stability Measurement 17
5.3.1. Test Limit 17
5.3.2. Test Procedures Used 17
5.3.3. Test Setting 17
5.3.4. Test Setup 18
5.3.5. Test Result 19
5.4. Equivalent Isotropically Radiated Power Measurement 22
5.4.1. Test Limit 22
5.4.2. Test Procedures Used 22
5.4.3. Test Setting 22
5.4.4. Test Setup 23
5.4.5. Test Result 24

5.5. Band Edge Measurement 27
5.5.1. Test Limit 27
5.5.2. Test Procedure Used 27
5.5.3. Test Setting 27
5.5.4. Test Setup 28
5.5.5. Test Result 29
5.6. Peak to Average Ratio 30
5.6.1. Test Limit 30
5.6.2. Test Procedure Used 30
5.6.3. Test Setting 30
5.6.4. Test Setup 30
5.6.5. Test Result 31
5.7. Conducted Spurious Emissions 34
5.7.1. Test Limit 34
5.7.2. Test Procedure Used 34
5.7.3. Test Setting 34
5.7.4. Test Setup 35
5.7.5. Test Result 36

6. CONCLUSION 40

Appendix A - Test Setup Photograph 41

Appendix B - EUT Photograph 42

1. GENERAL INFORMATION

1.1. Applicant

Quectel Wireless Solutions Company Limited
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

1.2. Manufacturer

Quectel Wireless Solutions Company Limited
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

1.3. Testing Facility

☒	**Test Site - MRT Suzhou Laboratory**	
	Laboratory Location (Suzhou - Wuzhong)	
	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China	
	Laboratory Location (Suzhou - SIP)	
	4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China	
	Laboratory Accreditations	
	A2LA: 3628.01	CNAS: L10551
	FCC: CN1166	ISED: CN0001
	VCCI: R-20025, G-20034, C-20020, T-20020	
☐	**Test Site - MRT Shenzhen Laboratory**	
	Laboratory Location (Shenzhen)	
	1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China	
	Laboratory Accreditations	
	A2LA: 3628.02	CNAS: L10551
	FCC: CN1284	ISED: CN0105
☐	**Test Site - MRT Taiwan Laboratory**	
	Laboratory Location (Taiwan)	
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)	
	Laboratory Accreditations	
	TAF: L3261-190725	
	FCC: 291082, TW3261	ISED: TW3261

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	LTE-A Cat 16 M.2 Module
Model No.:	EM160R-GL
Brand Name:	Quectel
IMEI:	86292050003514
WCDMA Band:	Band II, Band IV, Band V
Single Band:	Band 2, 4, 5, 7, 12, 13, 14, 25, 26, 30, 38, 41, 48, 66
Intra-Band:	CA_41C
Category:	Category 16
Operating Temperature:	-25 ~ 75 °C
Power Type:	3.1 ~ 4.4Vdc, typical 3.7Vdc

2.2. Product Specification Subjective to this Report

T_X Frequency Range:	Band II: 1850 ~ 1910MHz, Band IV: 1710 ~ 1755MHz Band V: 824 ~ 849MHz
R_X Frequency Range:	Band II: 1930 ~ 1990MHz, Band IV: 2110 ~ 2155MHz Band V: 869 ~ 894MHz
Type of Modulation:	QPSK, 16QAM (DL only)

Note 1: For other features of this EUT, test report will be issued separately.

Note 2: The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

2.3. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
WCDMA Band II	1850 ~ 1910	Dipole	1.15
WCDMA Band IV	1710 ~ 1755		-0.50
WCDMA Band V	824 ~ 849		1.85

Note: All antenna information (Antenna type and Peak Gain) is provided by the manufacturer.

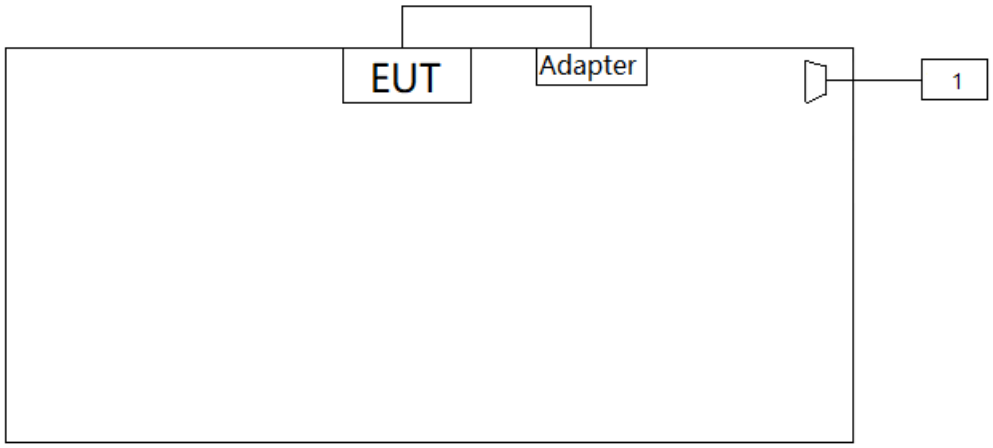
2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.5. Maximum Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Modulation	Maximum Power (W)	Frequency Tolerance (ppm)	Emission Designator
Part 24	WCDMA Band II RMC 12.2Kbps	BPSK	0.2588	0.0048	4M15F9W
Part 27	WCDMA Band IV RMC 12.2Kbps	BPSK	0.2667	0.0030	4M15F9W
Part 22	WCDMA Band V RMC 12.2Kbps	BPSK	0.3119	0.0020	4M14F9W

2.6. Configuration of Tested System



Product		Manufacturer	Model No.
1	Wideband Radio Communication Tester	R&S	CMW 500

2.7. Test Environment Condition

Ambient Temperature	15°C~35°C
Relative Humidity	20%RH ~75%RH

3. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2021/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2020/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
EMC Cable	HUBER+SUHNER	SF126-2M	MRTSUE06732	1 year	2021/04/11
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2021/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2021/08/01
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/10
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2020/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2020/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2021/02/23
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
EMC Cable	HUBER+SUHNER	SF126-2M	MRTSUE06733	1 year	2021/04/10
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2020/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/15
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2021/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/15
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2020/11/18
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
True RMS Clamp Meter	Fluke	319	MRTSUE06080	1 year	2021/05/06
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2021/03/25
Attenuator	MVE	6dB	MRTSUE06534	1 year	2020/12/12
Attenuator	MVE	10dB	MRTSUE06543	1 year	2020/12/12
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2020/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/08/08

Software	Version	Function
EMI Software	V3	EMI Test Software

4. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Radiated Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 9kHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 9kHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.15dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%

5. TEST RESULT

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Test Result
2.1049	Occupied Bandwidth	Conducted	Pass
2.1055, 22.355 24.235, 27.54	Frequency Stability		Pass
22.913(a)(5), 27.50(d)(4) 24.232(c)	Equivalent (Isotropic) Radiated Power		Pass
2.1051, 22.917(a) 24.238(a), 27.53(h)	Band Edge		Pass
2.1051, 22.917(a) 24.238(a), 27.53(h)	Spurious Emission		
24.232(d), 27.50(d)(5)	Peak to Average Ratio		Pass

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Channel Band Edge, Radiated & Conducted Spurious Emission were presented in the test report.

5.2. Occupied Bandwidth

5.2.1.Test Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

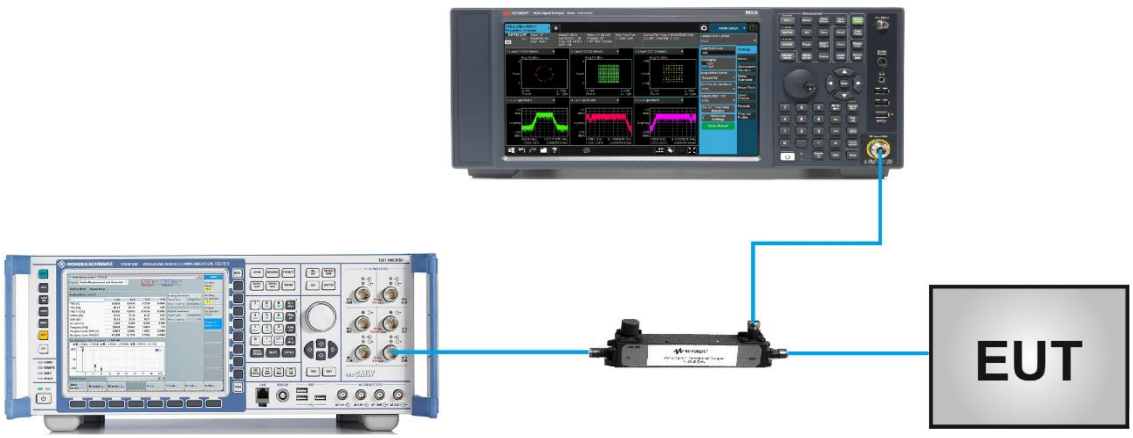
5.2.2.Test Procedure

ANSI C63.26-2015 - Section 5.4

5.2.3.Test Setting

1. Set center frequency to the nominal EUT channel center frequency
2. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

5.2.4.Test Setup



5.2.5.Test Result

Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/06/23	Test Site	SR6
Test Band	WCDMA Band II		

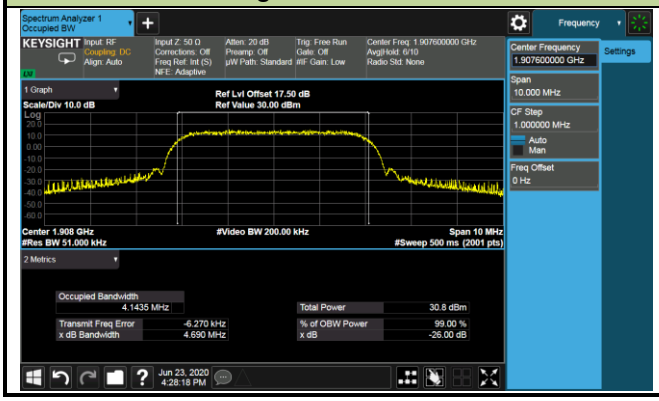
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Lowest	1852.4	4.66	4.15
Middle	1880.0	4.70	4.15
Highest	1907.6	4.69	4.14

99% Bandwidth

Lowest Channel

Middle Channel

Highest Channel

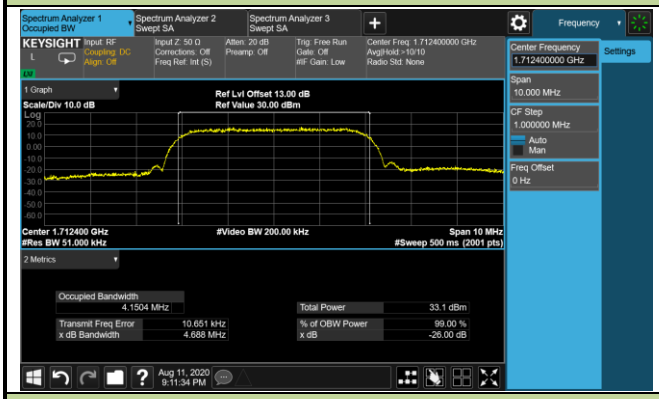


Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/08/12	Test Site	SR6
Test Band	WCDMA Band IV		

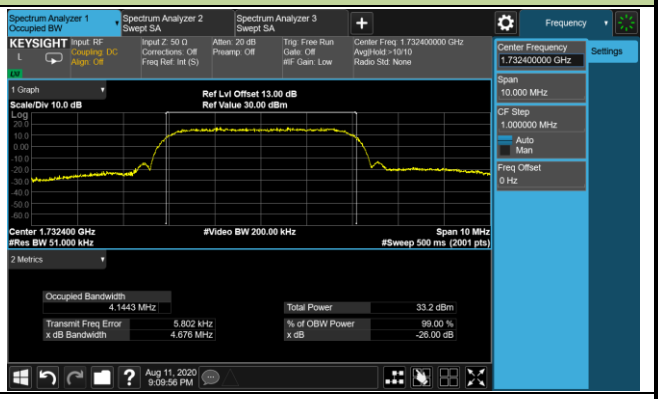
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Lowest	1712.4	4.69	4.15
Middle	1732.4	4.68	4.14
Highest	1752.6	4.67	4.15

99% Bandwidth

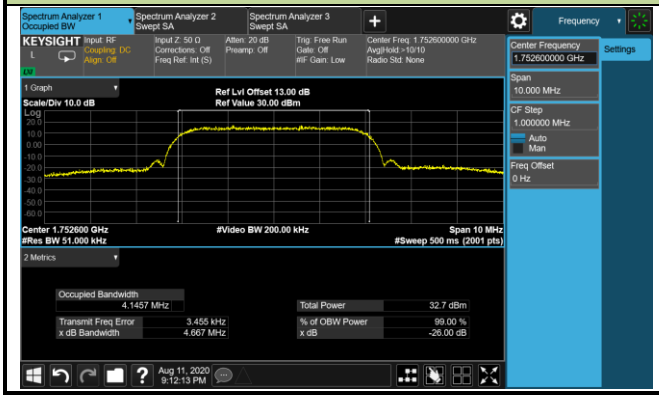
Lowest Channel



Middle Channel



Highest Channel



Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/06/23	Test Site	SR6
Test Band	WCDMA Band V		

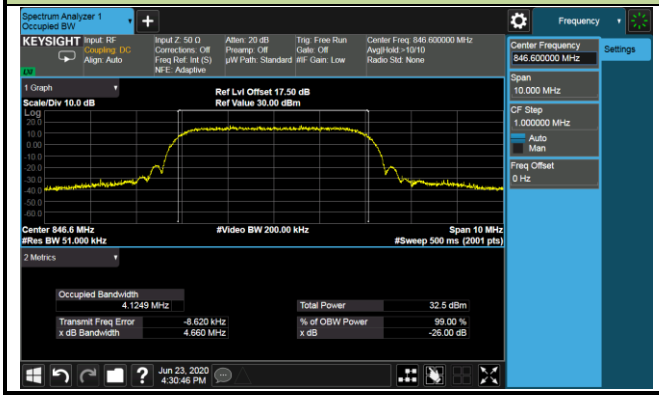
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
Lowest	826.4	4.69	4.14
Middle	836.4	4.68	4.14
Highest	846.6	4.66	4.12

99% Bandwidth

Lowest Channel

Middle Channel

Highest Channel



5.3. Frequency Stability Measurement

5.3.1.Test Limit

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

5.3.2.Test Procedures Used

ANSI C63.26-2015 - Section 5.6

5.3.3.Test Setting

Frequency Stability Under Temperature Variations:

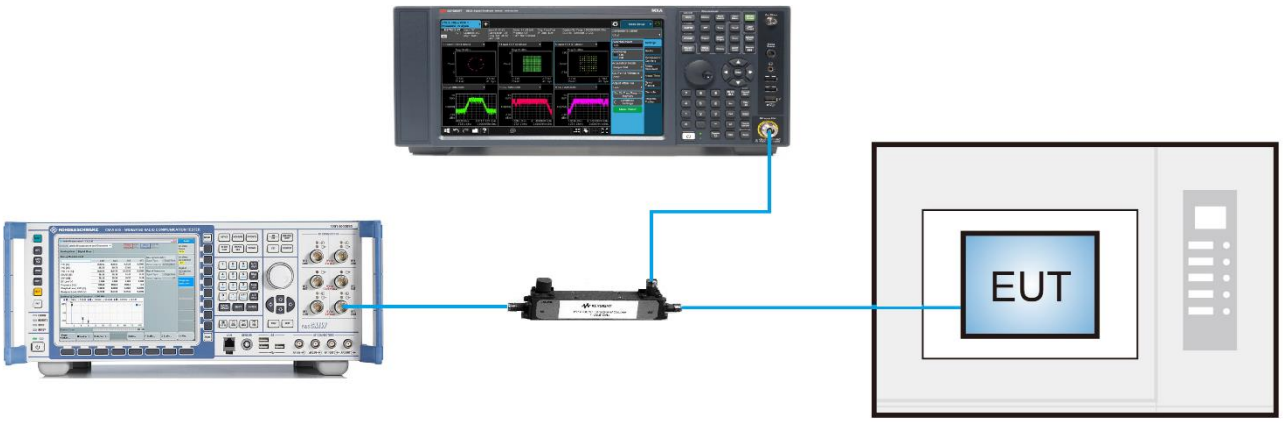
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, recordthe maximum frequency change.

5.3.4.Test Setup



5.3.5.Test Result

Product	LTE-A Cat 16 M.2 Module	Temperature	-30 ~ 50°C
Test Engineer	Candy Luo	Relative Humidity	52%
Test Site	TR3	Test Date	2020/06/25
Test Band	WCDMA Band II		

Voltage (%)	Power (VDC)	Temp (°C)	Frequency Tolerance (ppm)
100%	3.7	- 30	-0.0029
		- 20	-0.0022
		- 10	-0.0029
		0	0.0007
		+ 10	-0.0024
		+ 20 (Ref)	-0.0031
		+ 30	-0.0027
		+ 40	-0.0027
		+ 50	-0.0048
115%	4.2	+ 20	-0.0028
85%	3.1	+ 20	-0.0024

Product	LTE-A Cat 16 M.2 Module	Temperature	-30 ~ 50°C
Test Engineer	Candy Luo	Relative Humidity	52%
Test Site	TR3	Test Date	2020/06/25
Test Band	WCDMA Band IV		

Voltage (%)	Power (VDC)	Temp (°C)	Frequency Tolerance (ppm)
100%	3.7	- 30	0.0024
		- 20	0.0023
		- 10	0.0029
		0	0.0022
		+ 10	0.0017
		+ 20 (Ref)	0.0026
		+ 30	0.0029
		+ 40	0.0028
		+ 50	0.0027
115%	4.2	+ 20	0.0022
85%	3.1	+ 20	0.0030

Product	LTE-A Cat 16 M.2 Module	Temperature	-30 ~ 50°C
Test Engineer	Candy Luo	Relative Humidity	52%
Test Site	TR3	Test Date	2020/06/25
Test Band	WCDMA Band V		

Voltage (%)	Power (VDC)	Temp (°C)	Frequency Tolerance (ppm)
100%	3.7	- 30	0.0014
		- 20	0.0020
		- 10	0.0015
		0	0.0018
		+ 10	0.0015
		+ 20 (Ref)	0.0005
		+ 30	0.0009
		+ 40	0.0018
		+ 50	-0.0014
115%	4.2	+ 20	0.0011
85%	3.1	+ 20	0.0009

5.4. Equivalent Isotropically Radiated Power Measurement

5.4.1.Test Limit

Band 2:

Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

Band 4:

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

Band 5:

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

5.4.2.Test Procedures Used

ANSI C63.26-2015 - Section 5.2

5.4.3.Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

ERP or EIRP = $P_{Meas} + G_T$

where

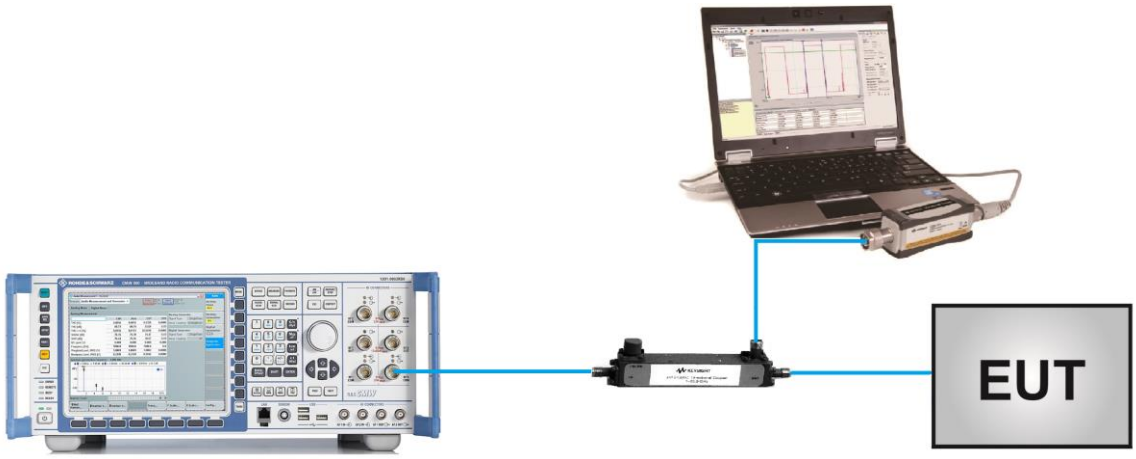
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

ERP = EIRP -2.15

5.4.4.Test Setup



5.4.5.Test Result

Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/08/27	Test Site	SR6
Test Band	WCDMA Band II		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		Band II Channel				Band II Channel		
		9262	9400	9538		9262	9400	9538
WCDMA R99	1	24.13	24.12	24.07	1.15	25.28	25.27	25.22
HSDPA	1	23.09	23.06	23.23	1.15	24.24	24.21	24.38
	2	23.01	22.94	23.07	1.15	24.16	24.09	24.22
	3	22.67	22.70	22.72	1.15	23.82	23.85	23.87
	4	22.74	22.62	22.61	1.15	23.89	23.77	23.76
HSUPA	1	23.05	23.06	23.07	1.15	24.20	24.21	24.22
	2	23.15	23.19	23.23	1.15	24.30	24.34	24.38
	3	22.64	22.71	22.62	1.15	23.79	23.86	23.77
	4	22.98	23.03	23.06	1.15	24.13	24.18	24.21
	5	22.68	22.53	22.55	1.15	23.83	23.68	23.70
HSDPA	1	22.91	22.92	23.04	1.15	24.06	24.07	24.19
	2	22.84	22.76	22.87	1.15	23.99	23.91	24.02
	3	22.52	22.54	22.58	1.15	23.67	23.69	23.73
	4	22.57	22.45	22.43	1.15	23.72	23.60	23.58
Limit	33.01dBm							

Note: The EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi)

Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/08/27	Test Site	SR6
Test Band	WCDMA Band IV		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		Band IV Channel				Band IV Channel		
		1312	1412	1513		1312	1412	1513
WCDMA R99	1	24.26	24.15	24.17	-0.5	23.76	23.65	23.67
HSDPA	1	24.15	24.18	24.20	-0.5	23.65	23.68	23.70
	2	24.16	24.17	24.21	-0.5	23.66	23.67	23.71
	3	24.16	24.15	24.20	-0.5	23.66	23.65	23.70
	4	24.14	24.16	24.20	-0.5	23.64	23.66	23.70
HSUPA	1	23.05	23.01	23.12	-0.5	22.55	22.51	22.62
	2	23.31	23.29	23.15	-0.5	22.81	22.79	22.65
	3	23.32	23.54	23.40	-0.5	22.82	23.04	22.90
	4	23.48	23.58	23.43	-0.5	22.98	23.08	22.93
	5	23.50	23.26	23.38	-0.5	23.00	22.76	22.88
HSDPA	1	24.00	24.01	24.05	-0.5	23.50	23.51	23.55
	2	23.98	23.98	24.01	-0.5	23.48	23.48	23.51
	3	23.98	23.97	24.05	-0.5	23.48	23.47	23.55
	4	24.00	24.01	24.02	-0.5	23.50	23.51	23.52
Limit	30.00dBm							

Note: The EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi)

Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/08/27	Test Site	SR6
Test Band	WCDMA Band V		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	ERP (dBm)		
		Band V Channel				Band V Channel		
		4132	4182	4233		4132	4182	4233
WCDMA R99	1	24.87	24.89	24.94	1.85	24.57	24.59	24.64
HSDPA	1	23.95	23.87	23.91	1.85	23.65	23.57	23.61
	2	23.87	23.90	24.93	1.85	23.57	23.60	24.63
	3	23.42	23.37	23.33	1.85	23.12	23.07	23.03
	4	23.29	23.31	23.15	1.85	22.99	23.01	22.85
HSUPA	1	24.00	23.91	23.92	1.85	23.70	23.61	23.62
	2	24.07	24.13	24.03	1.85	23.77	23.83	23.73
	3	23.39	23.51	23.54	1.85	23.09	23.21	23.24
	4	23.98	24.01	23.96	1.85	23.68	23.71	23.66
	5	23.57	23.47	23.72	1.85	23.27	23.17	23.42
HSDPA	1	23.78	23.68	23.77	1.85	23.48	23.38	23.47
	2	23.69	23.74	24.74	1.85	23.39	23.44	24.44
	3	23.25	23.20	23.17	1.85	22.95	22.90	22.87
	4	23.16	23.15	23.01	1.85	22.86	22.85	22.71
Limit	38.45dBm							

Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) – 2.15

5.5. Band Edge Measurement

5.5.1.Test Limit

22.917(a), 24.238 (a), 27.53 (h)

For operations in the 824 ~ 849 MHz, 1850 ~ 1910 MHz, 1930 ~ 1990 MHz, 698 ~ 746 MHz and 1710 ~ 1755 MHz, the FCC limit is 43 + 10log10(P[$_{Watts}$]) dB below the transmitter power P(Watts) in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

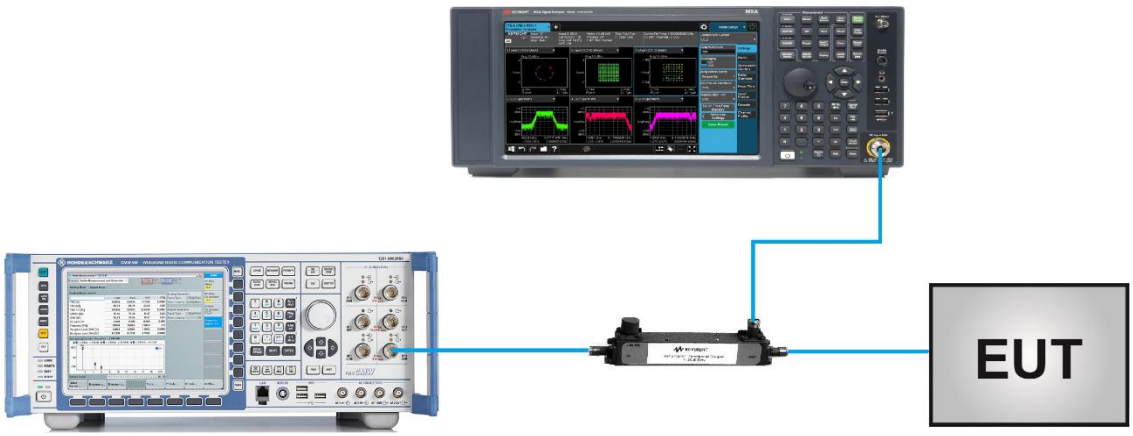
5.5.2.Test Procedure Used

ANSI C63.26-2015 - Section 5.7

5.5.3.Test Setting

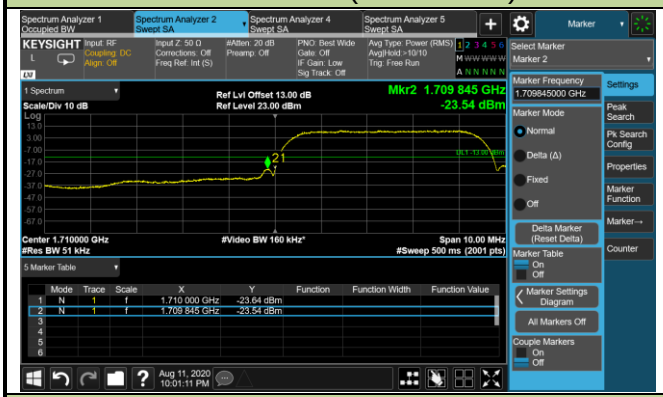
1. Set the analyzer frequency to low or high channel
2. RBW ≥ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW narrower than the specified reference bandwidth can be used (generally limited to no less than 1% of the OBW), provided that a subsequent integration is performed over the full required measurement bandwidth. This integration should be performed using the spectrum analyzer’s band power functions.
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

5.5.4.Test Setup



5.5.5.Test Result

Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/06/23	Test Site	SR6
Test Band	Band 2, 4, 5	Test Result	Pass

WCDMA Band II	
Channel 9262 (1852.4MHz)	Channel 9538 (1907.6MHz)
	
WCDMA Band IV	
Channel 1312 (1712.4MHz)	Channel 1513 (1752.6MHz)
	
WCDMA Band V	
Channel 4132 (826.4MHz)	Channel 4233 (846.6MHz)
	

5.6. Peak to Average Ratio

5.6.1.Test Limit

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

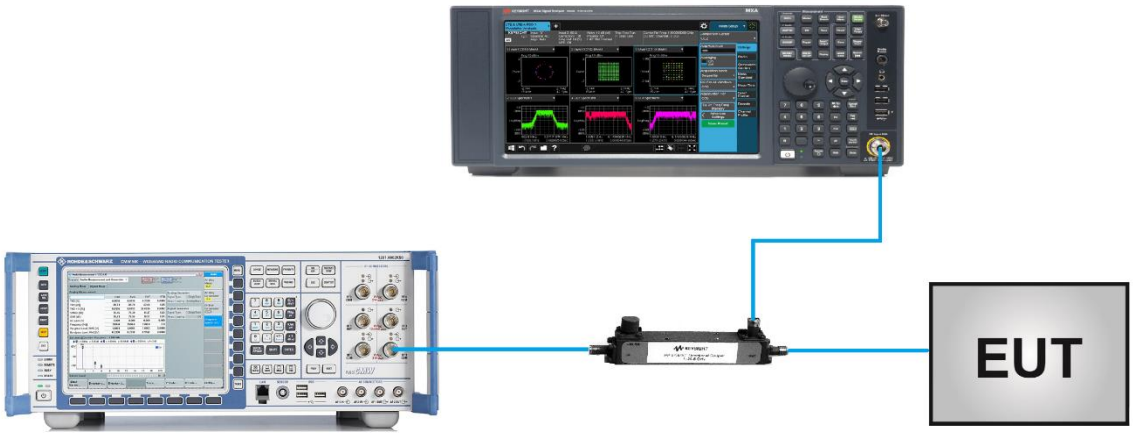
5.6.2.Test Procedure Used

ANSI C63.26-2015 - Section 5.2.3.4 (CCDF).

5.6.3.Test Setting

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

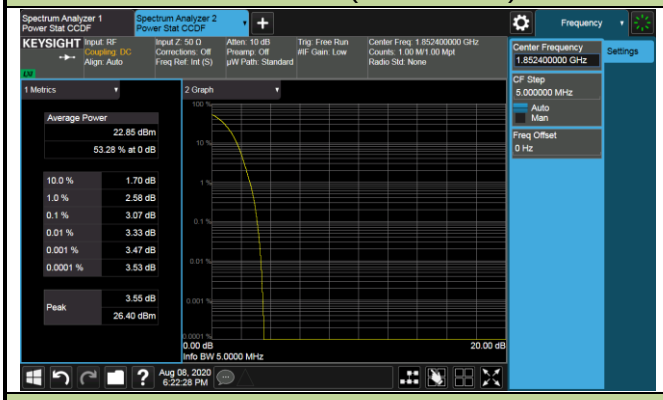
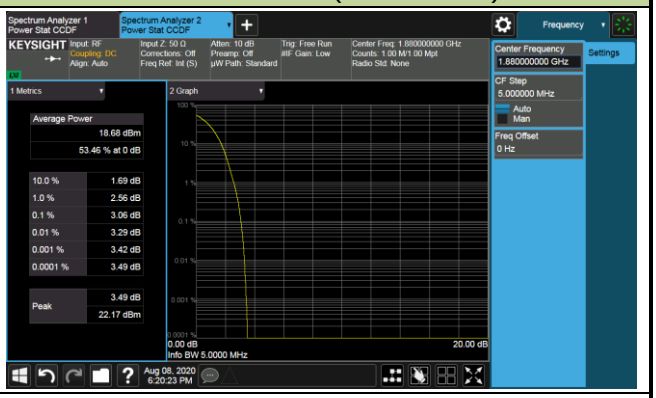
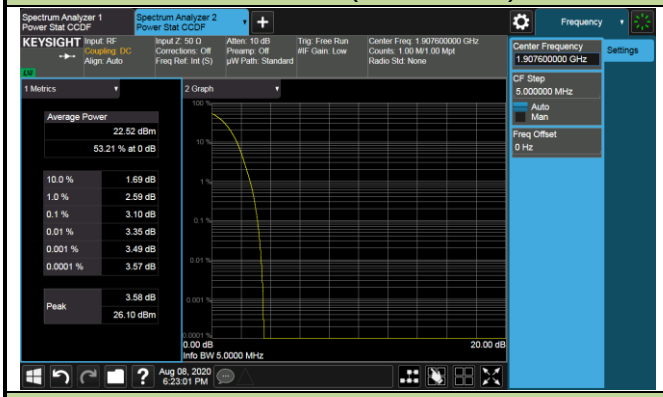
5.6.4.Test Setup

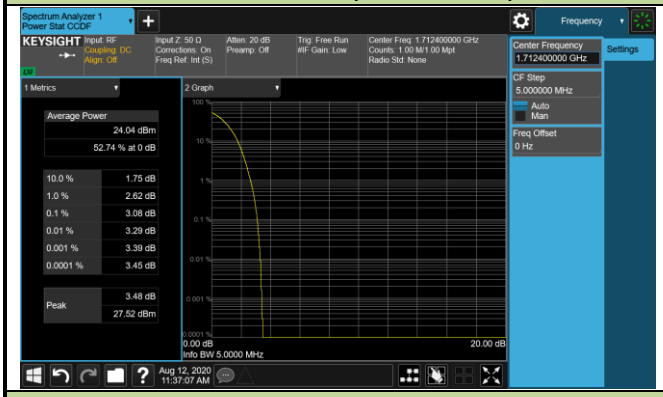
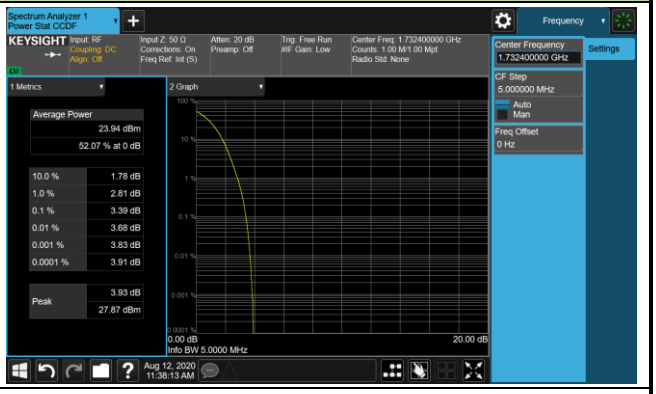
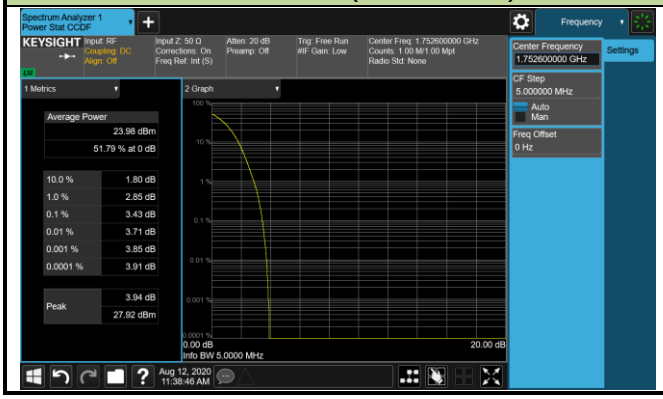


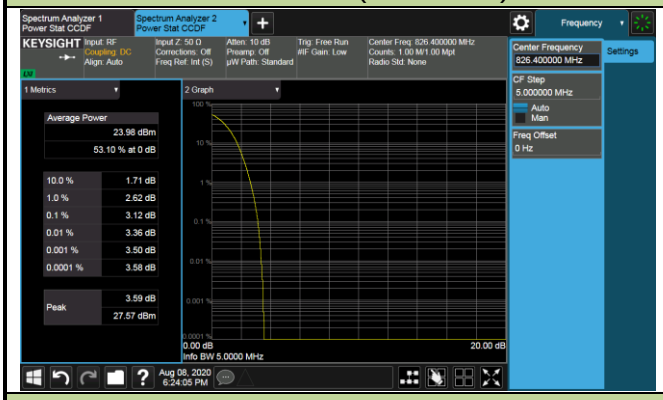
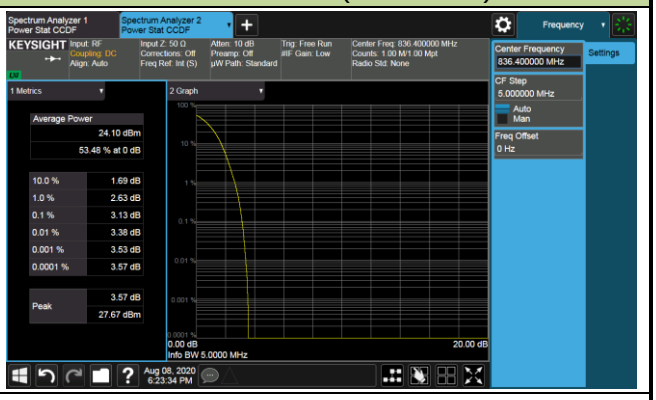
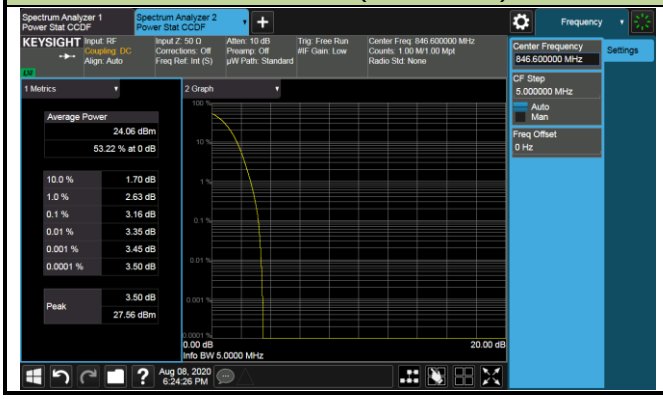
5.6.5.Test Result

Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/06/19	Test Site	SR6
Test Band	Band II, IV, V	Test Result	Pass

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	Peak to Average Ratio (dB)	Limit (dB)	Result
Band II					
9262	1852.5	5	3.07	≤ 13.00	Pass
9400	1880.0	5	3.06	≤ 13.00	Pass
9538	1907.6	5	3.35	≤ 13.00	Pass
Band IV					
1312	1712.4	5	3.08	≤ 13.00	Pass
1412	1732.4	5	3.39	≤ 13.00	Pass
1513	1752.6	5	3.43	≤ 13.00	Pass
Band V (Report Only)					
4132	826.4	5	3.12	≤ 13.00	Pass
4183	836.4	5	3.13	≤ 13.00	Pass
4233	846.6	5	3.16	≤ 13.00	Pass

WCDMA Band II	
Channel 9262 (1852.4MHz)	Channel 9400 (1880.0MHz)
	
Channel 9538 (1907.6MHz)	
	

WCDMA Band IV	
Channel 1312 (1712.4MHz)	Channel 1412 (1732.4MHz)
	
Channel 1513 (1752.6MHz)	
	

WCDMA Band V	
Channel 4132 (826.4MHz)	Channel 4183 (836.4MHz)
	
Channel 4233 (846.6MHz)	
	

5.7. Conducted Spurious Emissions

5.7.1.Test Limit

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10^{th} harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

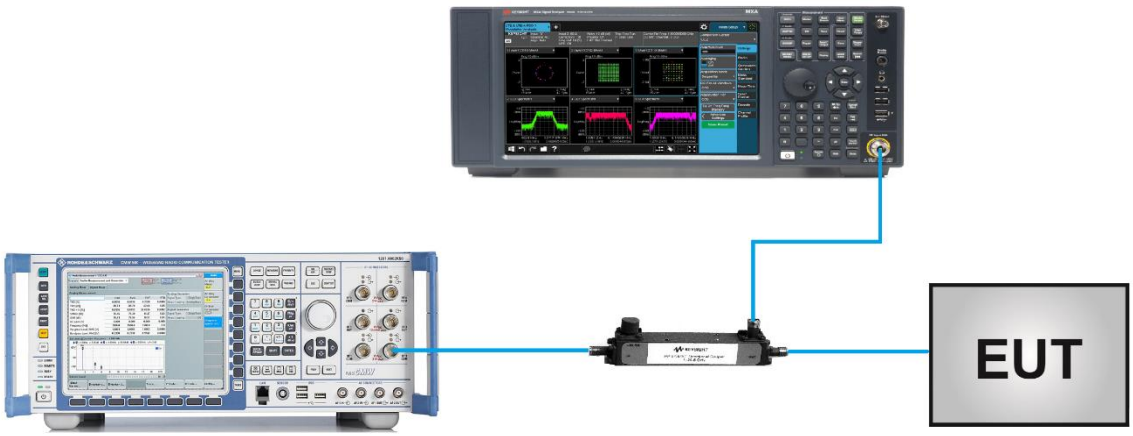
5.7.2.Test Procedure Used

ANSI C63.26-2015 - Section 5.7

5.7.3.Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power.
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

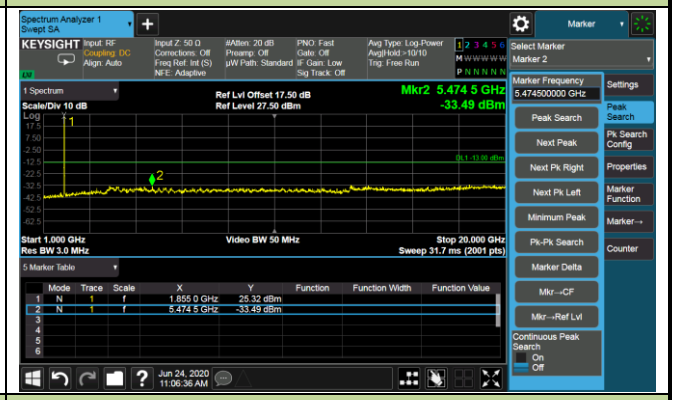
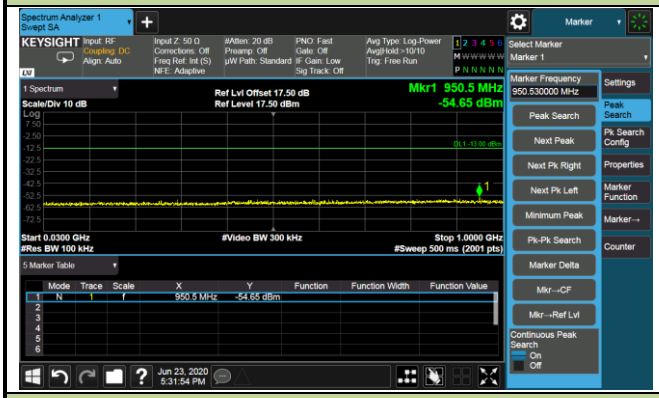
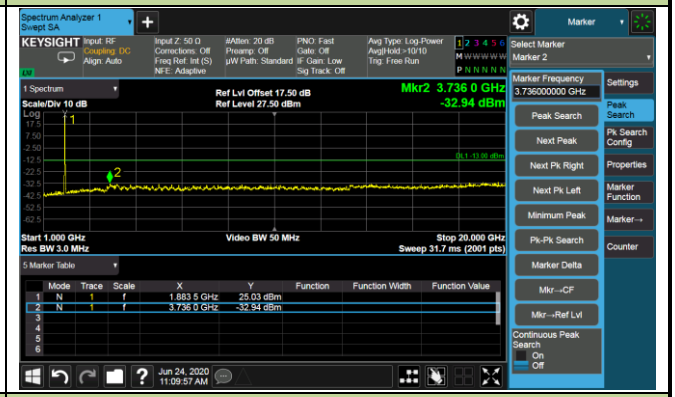
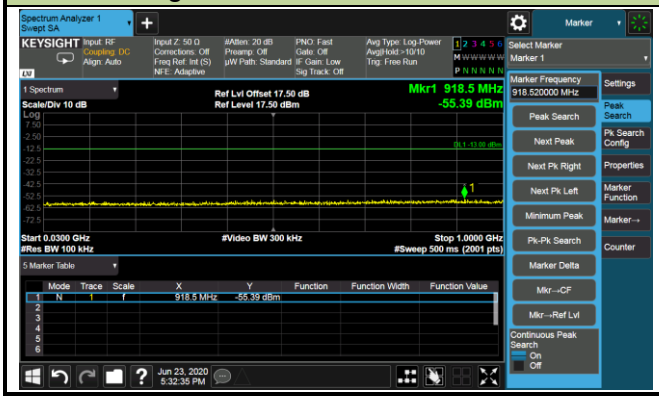
5.7.4.Test Setup

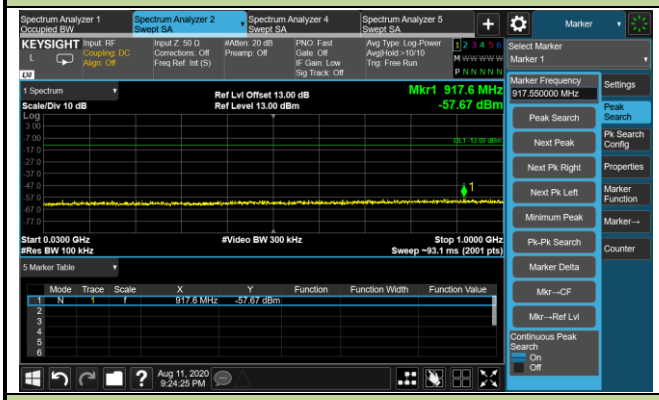
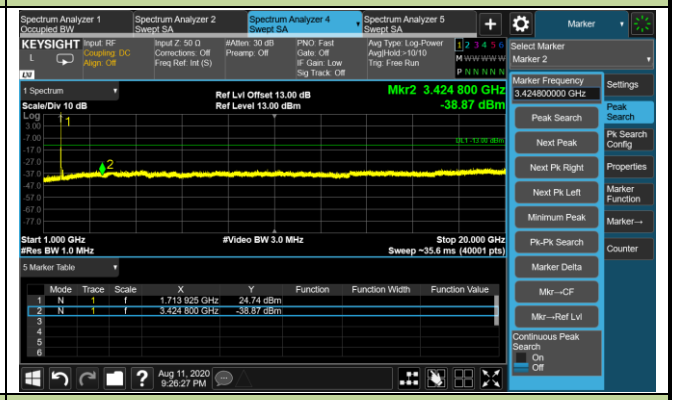
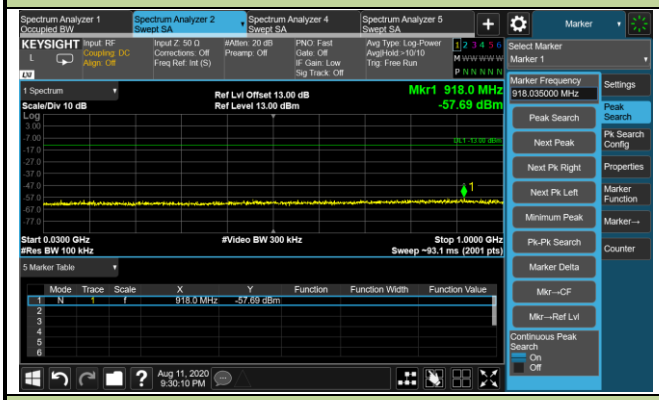
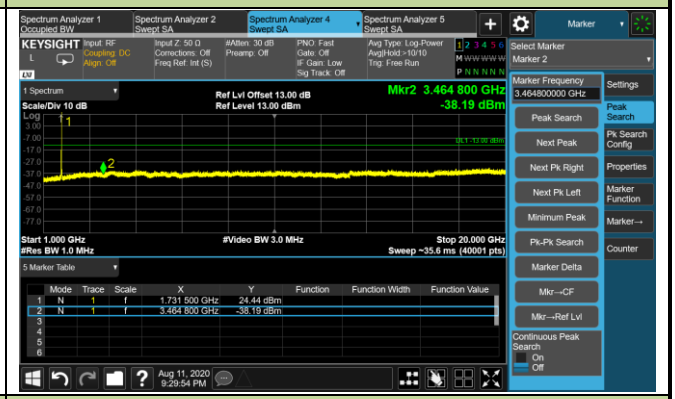
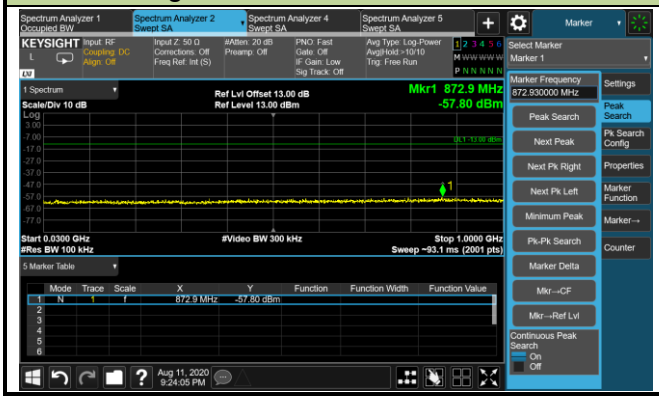


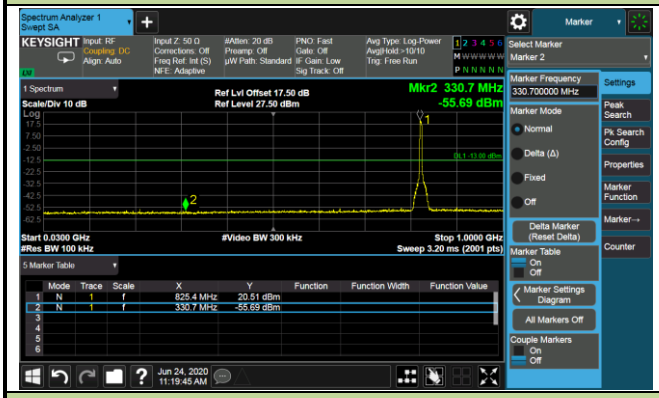
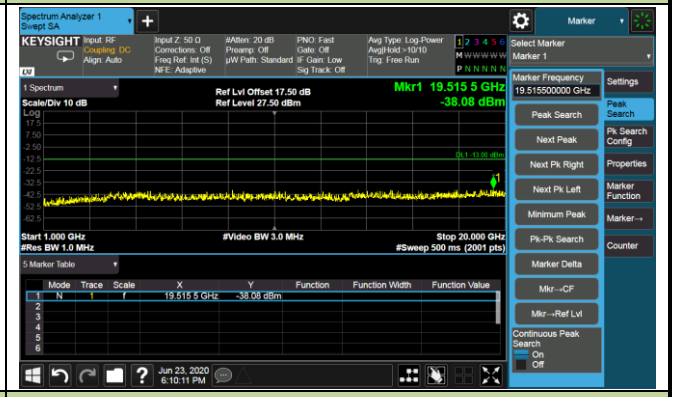
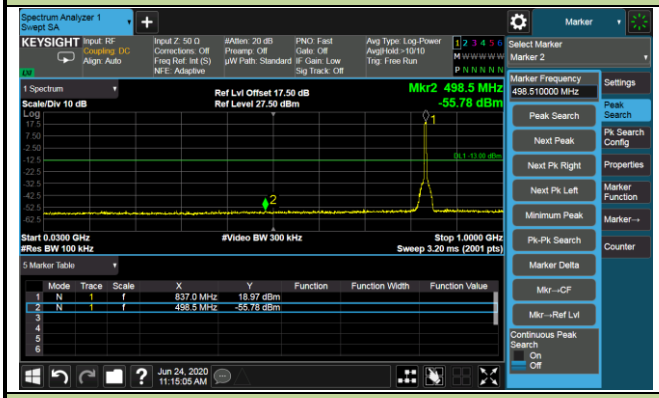
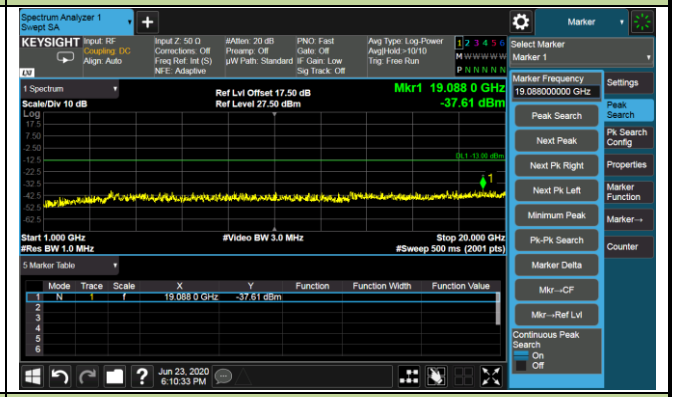
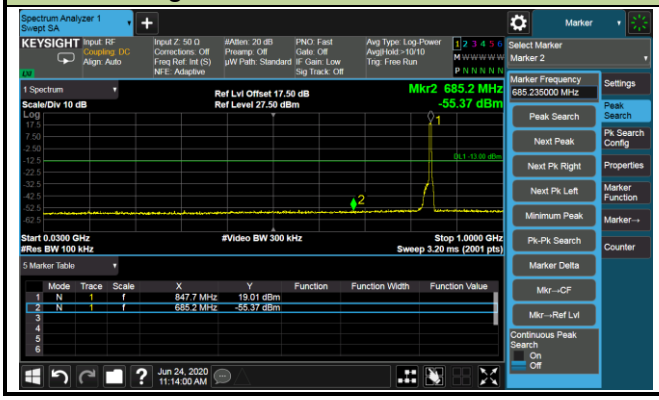
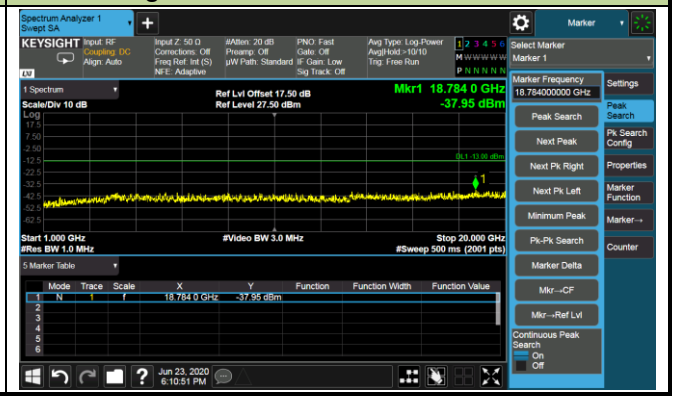
5.7.5.Test Result

Product	LTE-A Cat 16 M.2 Module	Test Engineer	Candy Luo
Test Date	2020/06/23	Test Site	SR6
Test Band	Band II, IV, V	Test Result	Pass

Mode	Frequency (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
WCDMA Band II	1852.4	30 ~ 1000	-55.22	≤ -13.00	Pass
		1000 ~ 20000	-33.49	≤ -13.00	Pass
	1880.0	30 ~ 1000	-54.65	≤ -13.00	Pass
		1000 ~ 20000	-32.94	≤ -13.00	Pass
	1907.6	30 ~ 1000	-55.39	≤ -13.00	Pass
		1000 ~ 20000	-33.51	≤ -13.00	Pass
WCDMA Band IV	1712.4	30 ~ 1000	-57.67	≤ -13.00	Pass
		1000 ~ 20000	-38.87	≤ -13.00	Pass
	1732.4	30 ~ 1000	-57.69	≤ -13.00	Pass
		1000 ~ 20000	-38.19	≤ -13.00	Pass
	1752.6	30 ~ 1000	-57.80	≤ -13.00	Pass
		1000 ~ 20000	-37.85	≤ -13.00	Pass
WCDMA Band V	826.4	30 ~ 1000	-55.69	≤ -13.00	Pass
		1000 ~ 10000	-38.08	≤ -13.00	Pass
	836.4	30 ~ 1000	-55.78	≤ -13.00	Pass
		1000 ~ 10000	-37.61	≤ -13.00	Pass
	846.6	30 ~ 1000	-55.37	≤ -13.00	Pass
		1000 ~ 10000	-37.95	≤ -13.00	Pass

WCDMA Band II	
Lowest Channel 30-1000MHz	Lowest Channel 1000-20000MHz
	
Middle Channel 30-1000MHz	Middle Channel 1000-20000MHz
	
Highest Channel 30-1000MHz	Highest Channel 1000-20000MHz
	

WCDMA Band IV	
Lowest Channel 30-1000MHz	Lowest Channel 1000-20000MHz
	
Middle Channel 30-1000MHz	Middle Channel 1000-20000MHz
	
Highest Channel 30-1000MHz	Highest Channel 1000-20000MHz
	

WCDMA Band V	
Lowest Channel 30-1000MHz	Lowest Channel 1000-10000MHz
	
Middle Channel 30-1000MHz	Middle Channel 1000-10000MHz
	
Highest Channel 30-1000MHz	Highest Channel 1000-10000MHz
	

6. CONCLUSION

The data collected relate only the item(s) tested and show that unit is compliance with FCC Rules.

The End

Appendix A - Test Setup Photograph

Refer to “2306RSU048-UT” file.

Appendix B - EUT Photograph

Refer to “2306RSU048-UE” file.