RF SPOT CHECK REPORT

FCC ID:	XMR2022EM060KGL
Application:	Quectel Wireless Solutions Company Limited
Product:	LTE-A Cat 6 M.2 Module
Model No.:	EM060K-GL
Brand Name:	Quectel
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	Part 90 Subpart R
Result:	Complies
Test Date:	2022-03-22 ~ 2022-04-23

Reviewed By: Sunny Sun

Approved By: Robin Wu

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.26-2015. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
2203RSU045-U3	Rev. 01	Initial Report	06-16-2022	Valid

Note: EM060K-GL and EM120K-GL support the same bands, use the same chips, share the same software and hardware design, and the differences are category and DL MIMO. This report is based on FCC ID "XMR2022EM120KGL" to spot check EIRP, Band Edge, Conducted Spurious Emission test items.

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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
		☐R-20141	☐G-20134	☐C-20103	☐T-20104
☐	**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		

1.4. Product Information

Product Name	LTE-A Cat 6 M.2 Module
Model No.	EM060K-GL
Brand Name	Quectel
IMEI	867228050008597
UTRA Specification	Band 2, 4, 5
E-UTRA Specification	FDD Band: 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 66, 71 TDD Band: 38, 41, 46
GNSS Specification	GPS, GLONASS, Bei Dou, Galileo
Supply Voltage	3.135 ~ 4.4Vdc, typical 3.7Vdc
Operating Temperature:	-25 ~ 75 °C
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Product Specification under Test

E-UTRA Specification	
Single Band	FDD Band: 14
Modulation	UL up to 64QAM, DL up to 256QAM
FDD T_X Frequency Range	Band 14: 788 ~ 798 MHz
FDD R_X Frequency Range	Band 14: 758 ~ 768 MHz

1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	MaxPeak Gain (dBi)
LTE Band 2	1850 ~ 1910	Dipole	0.25
LTE Band 4	1710 ~ 1755		1.47
LTE Band 5	824 ~ 849		2.68
LTE Band 7	2500 ~ 2570		0.55
LTE Band 12	699 ~ 716		-0.20
LTE Band 13	777 ~ 787		1.54
LTE Band 14	788 ~ 798		2.42
LTE Band 17	704~ 716		-0.20
LTE Band 25	1850 ~ 1915		0.25
LTE Band 26	814~849		2.87
LTE Band 30	2305 ~ 2315		-3.06
LTE Band 38	2570 ~ 2620		-0.23
LTE Band 41	2496 ~ 2690		0.78
LTE Band 66	1710 ~ 1780		1.47
LTE Band 71	663 ~ 698		1.22

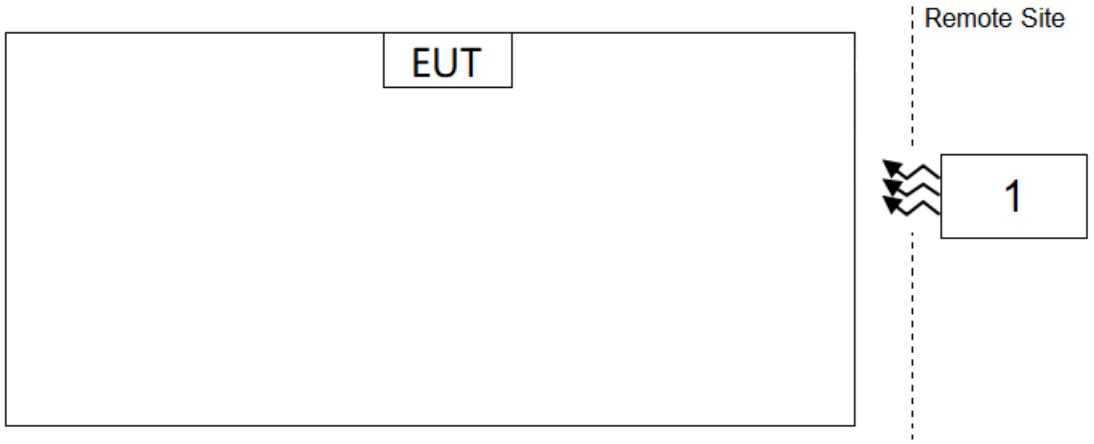
Note: The typical antennas use to calculate the ERP (EIRP).

1.7. Test Methodology

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

- ANSI C63.26:2015
- FCC CFR 47 Part 90
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP

1.8. Configuration of Tested System



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

1.9. Test Environment Condition

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

2. Test Equipment Calibration Date

Instrument	Manufacturer	Model No.	Asset No.	Last Cali. Date	Cali. Due Date	Test Site
Thermohygrometer	testo	608-H1	MRTSUE06362	1 year	2023/2/15	WZ-SR6
Shielding Room	HUAMING	WZ-SR6	MRTSUE06443	/	/	WZ-SR6
Signal Analyzer	Keysight	N9020B	MRTSUE06583	1 year	2022/10/10	WZ-SR6
Signal Generator	Keysight	N5173B	MRTSUE06606	1 year	2022/11/29	WZ-SR6
Radio Communication Analyzer	Anritsu	MT8821C	MRTSUE06960	1 year	2022/7/1	WZ-SR6
Radio Communication Test Station	Anritsu	MT8000A	MRTSUE06961	1 year	2022/7/1	WZ-SR6
Signal Analyzer	Keysight	N9010B	MRTSUE07028	1 year	2022/12/9	SIP-SR1
Attenuator	SHX	SMA10-3dB-18G	MRTSUE06695	1 year	2023-03-02	WZ
Directional Coupler	narda	4226-20	MRTSUE06065	1 year	2023-03-17	WZ
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2023-03-07	WZ

3. 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.

Conducted Spurious Emissions
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

4. Test Result

4.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
90.542(a)(7)	Equivalent Radiated Power	Conducted	Pass
2.1051, 90.543(e)(2)(3)	Band Edge		Pass
2.1051, 90.210(n)	Emission Mask		Pass
2.1051, 90.543(e)(3)	Spurious Emission		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 ofthe 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 worst-case in the test report.

4.2. Equivalent Isotropically Radiated Power Measurement

4.2.1. Test Limit

Control stations and mobile stations transmitting in the 758-768 MHz band and the788-798 MHz band are limited to 30 watts ERP.

4.2.2. Test Procedure

ANSI C63.26-2015 - Section 5.2

4.2.3. 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

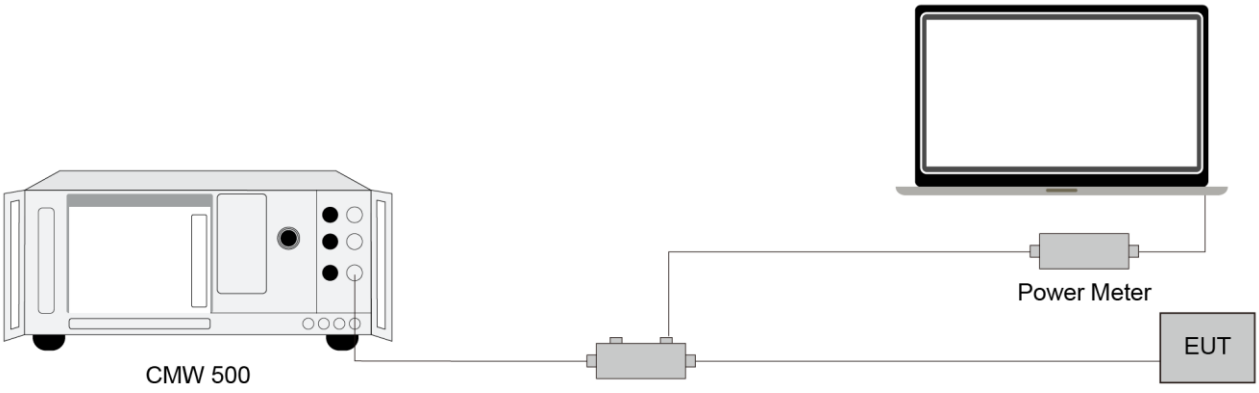
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

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

4.2.4. Test Setup



4.2.5. Test Result

Refer to Appendix A.3.

4.3. Band Edge Measurement

4.3.1. Test Limit

For operations in the 758-768 MHz and the 788-798 MHz bands, 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 all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(2) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, byat least 43 + 10 log (P) dB.

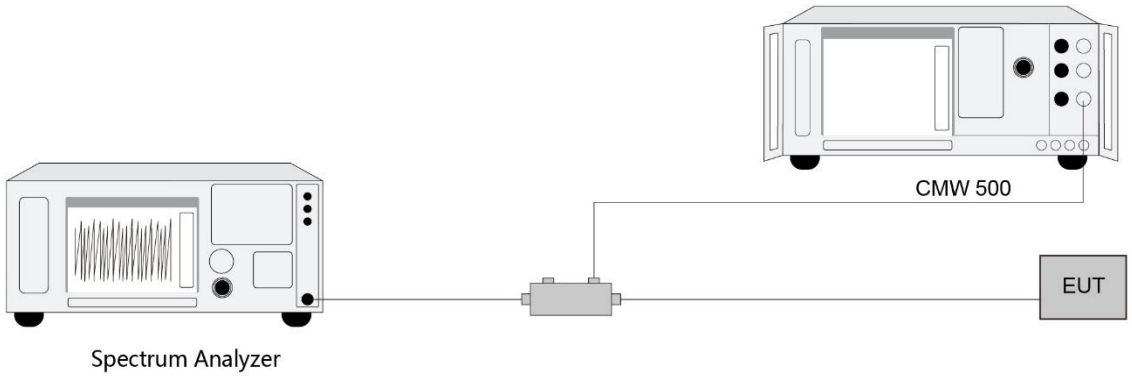
4.3.2. Test Procedure

ANSI C63.26-2015 - Section5.7

4.3.3. 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.

4.3.4. Test Setup



4.3.5. Test Result

Refer to Appendix A.4.

4.4. Emisson Mask Measurement

4.4.1. Test Limit

Emission Mask B.For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

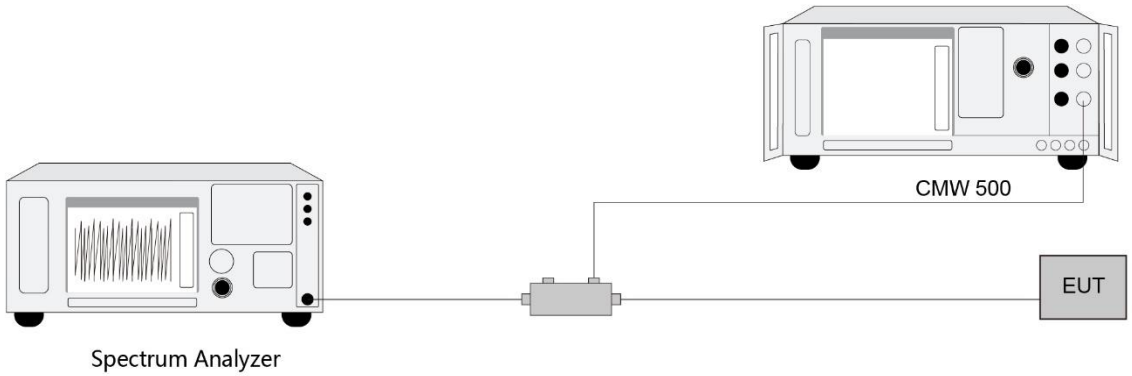
4.4.2. Test Procedure

ANSI C63.26-2015 - Section5.7

4.4.3. 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.

4.4.4. Test Setup



4.4.5. Test Result

Refer to Appendix A.5.

4.5. Conducted Spurious Emissions Measurement

4.5.1. 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 10th 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.

On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

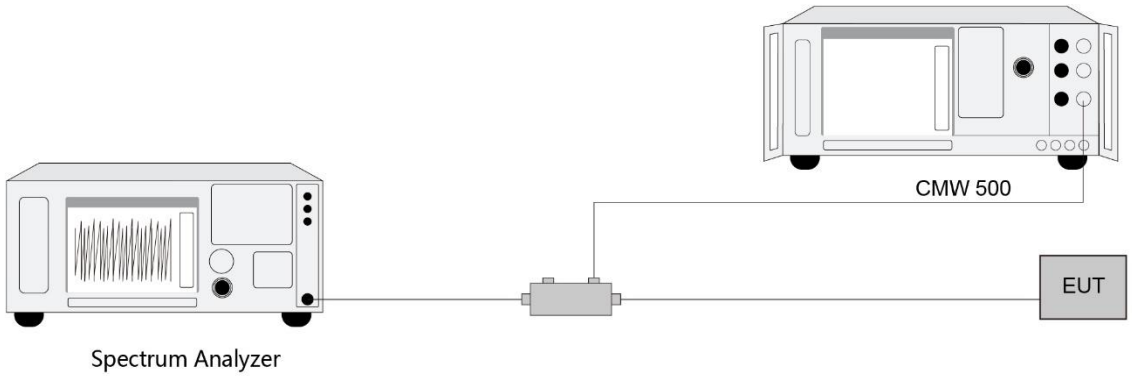
4.5.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

4.5.3. 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.

4.5.4. Test Setup



4.5.5. Test Result

Refer to Appendix A.6.

Appendix A - Test Result

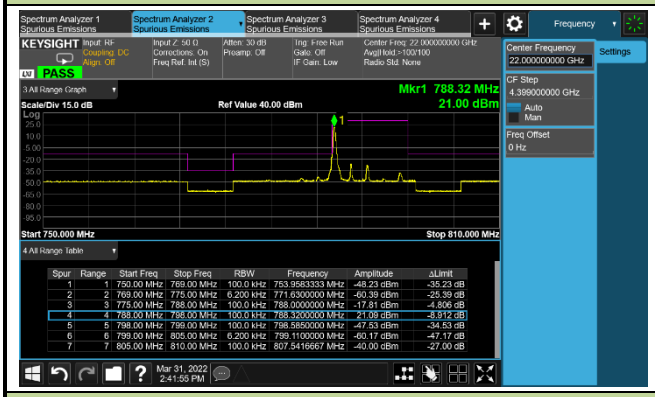
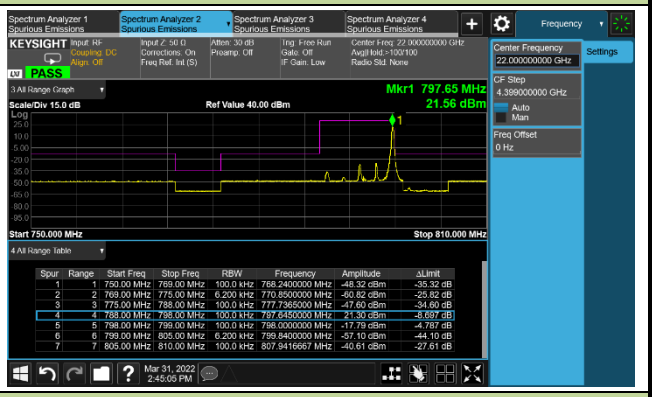
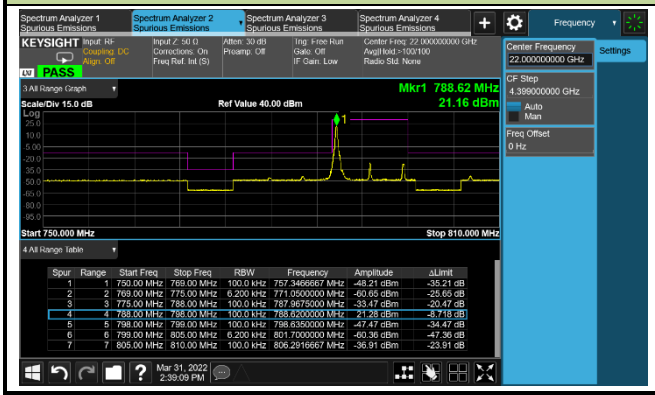
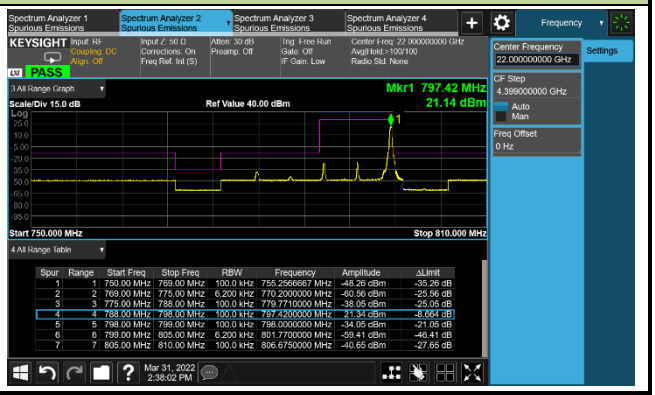
A.1 Equivalent Isotropically Radiated Power Test Result

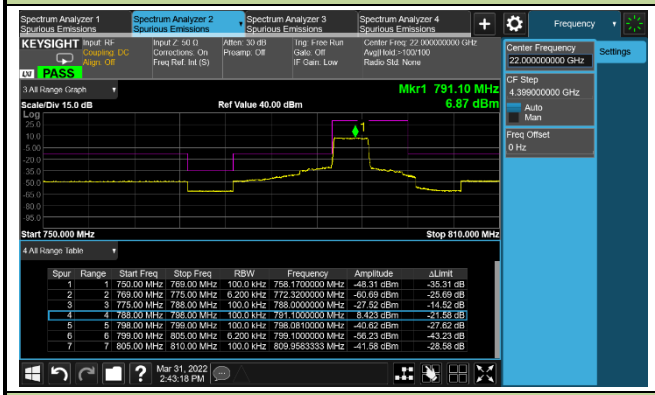
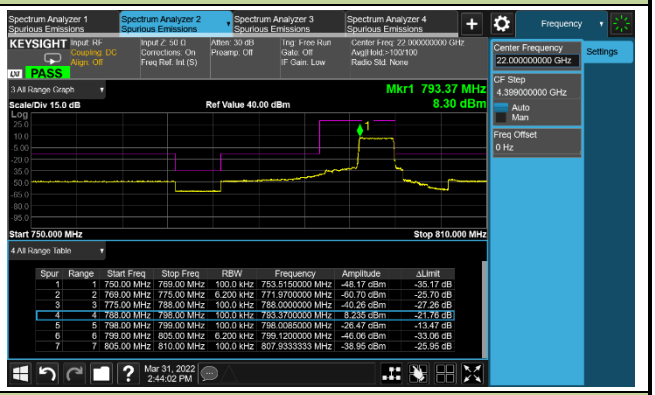
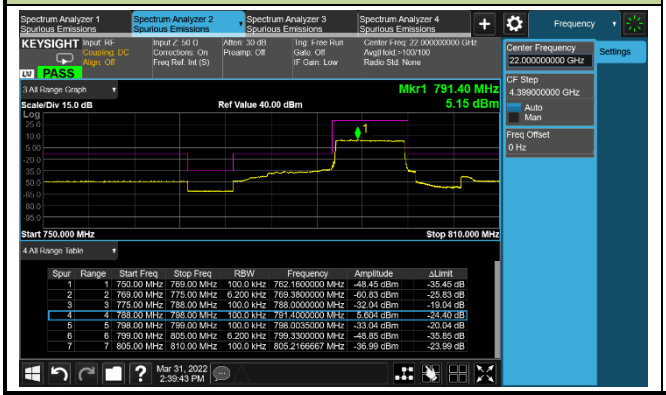
Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/03/25	Test Band	Band 14

Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	ERP (dBm)	Limit (dBm)
QPSK						
790.5	5	1	0	22.89	23.16	<44.77
793.0				22.85	23.12	<44.77
795.5				22.87	23.14	<44.77
790.5	5	1	12	22.86	23.13	<44.77
793.0				22.82	23.09	<44.77
795.5				22.85	23.12	<44.77
790.5	5	1	24	22.85	23.12	<44.77
793.0				22.83	23.10	<44.77
795.5				22.80	23.07	<44.77
790.5	5	25	0	21.99	22.26	<44.77
793.0				22.01	22.28	<44.77
795.5				21.93	22.20	<44.77
793.0	10	1	0	22.87	23.14	<44.77
793.0			24	22.84	23.11	<44.77
793.0			49	22.77	23.04	<44.77
793.0	10	50	0	22.00	22.27	<44.77
Note: The ERP (dBm) = Output Power (dBm) + Antenna Gain (dBi) - 2.15						

A.2 Band Edge Test Result

Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/03/31	Test Band	Band 14

5MHz Channel Bandwidth 1RB	
Lower ACP	Upper ACP
	
10MHz Channel Bandwidth 1RB	
Lower ACP	Upper ACP
	

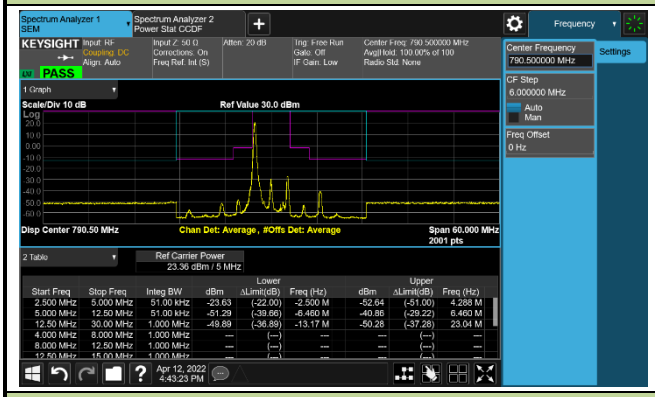
5MHz Channel Bandwidth Full RB	
Lower ACP	Upper ACP
	
10MHz Channel Bandwidth Full RB	
Middle ACP	
	

A.3 Emisson Mask Test Result

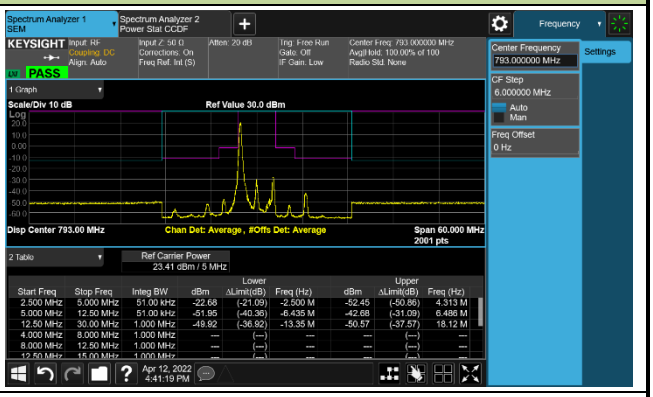
Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/04/12	Test Band	Band 14

5MHz Channel Bandwidth 1RB@0

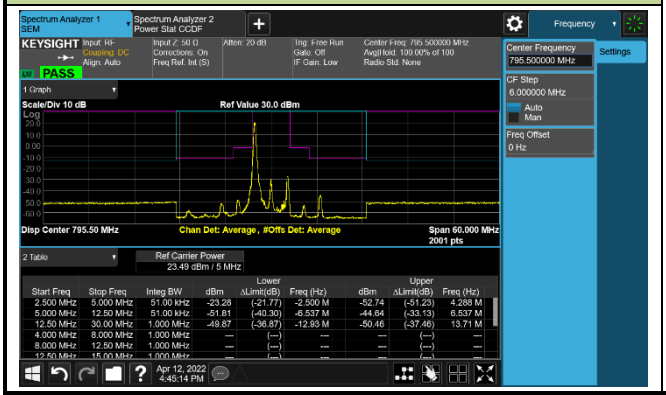
Low Channel



Middle Channel

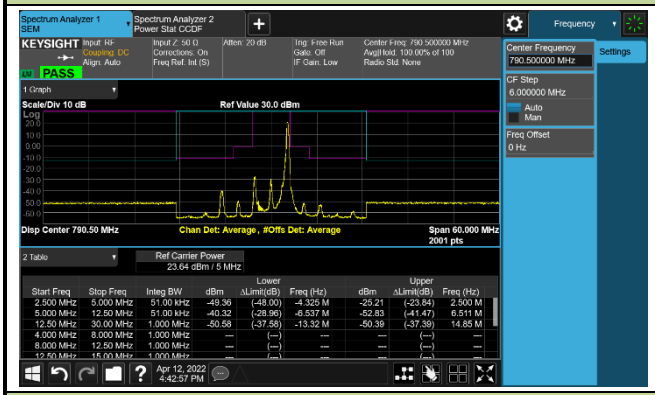


High Channel

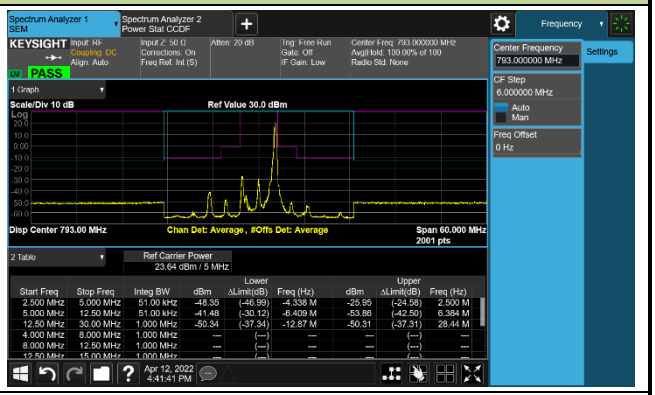


5MHz Channel Bandwidth 1RB@24

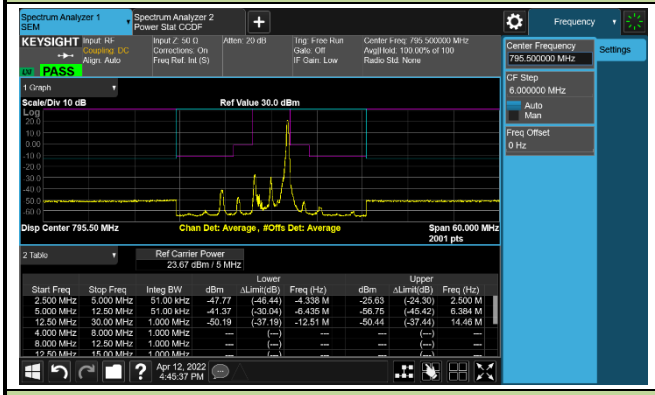
Low Channel



Middle Channel

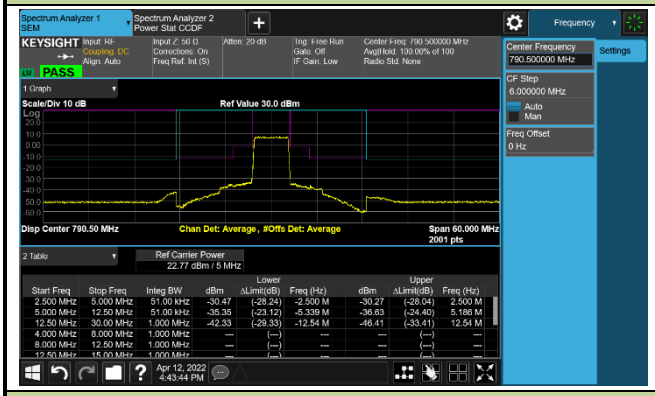


High Channel

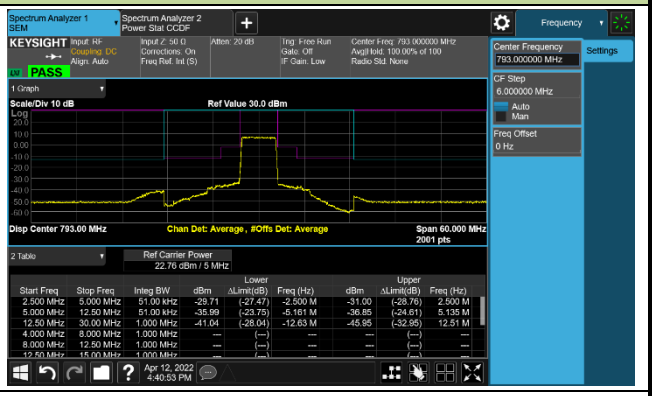


5MHz Channel Bandwidth Full RB

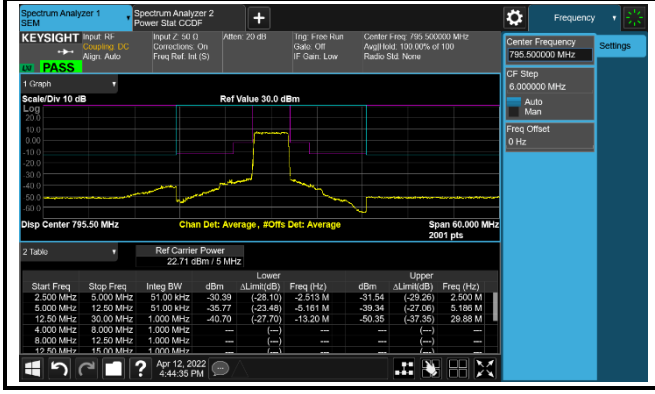
Low Channel

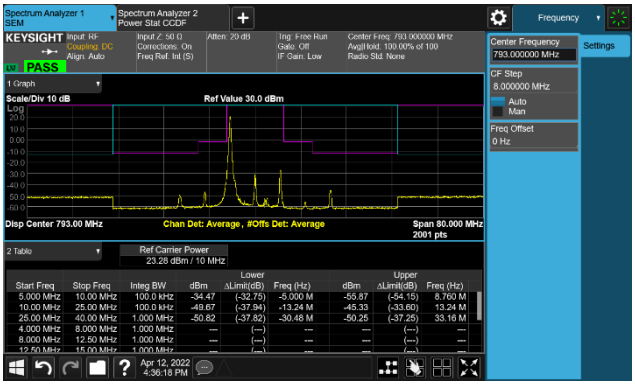
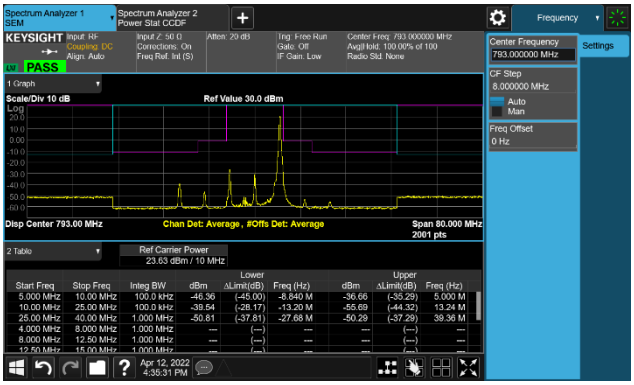
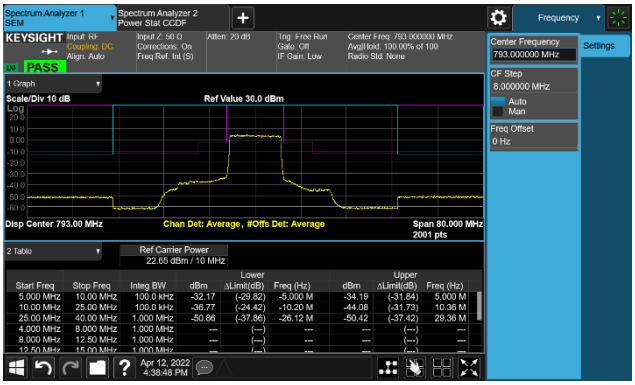


Middle Channel



High Channel



10MHz Channel Bandwidth 1RB@0	10MHz Channel Bandwidth 1RB@49
	
10MHz Channel Bandwidth Full RB	
	

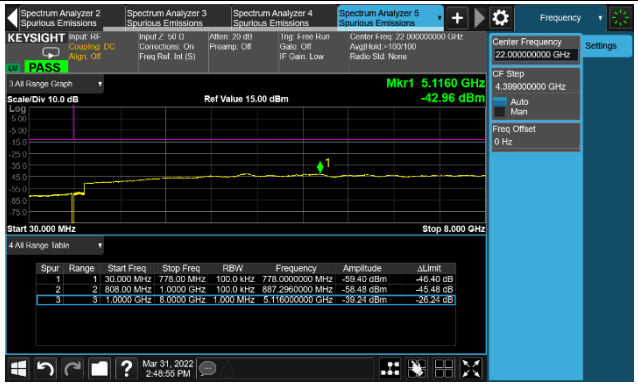
A.4 Conducted Supurious Emissions Test Result

Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/03/31	Test Band	Band 14

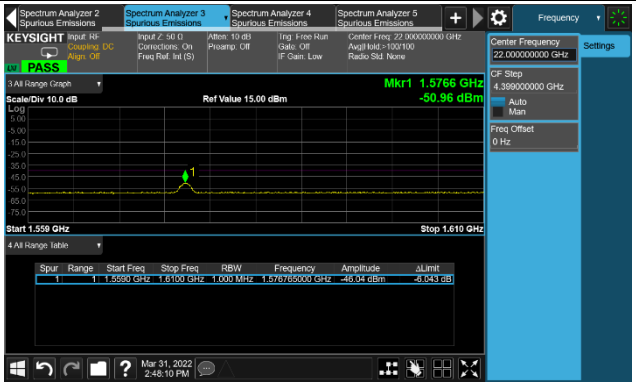
Frequency (MHz)	Channel Bandwidth (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
QPSK					
790.5	5	30 ~ 10000	-42.96	≤ -13.00	Pass
793.0	5	30 ~ 10000	-44.26	≤ -13.00	Pass
795.5	5	30 ~ 10000	-42.73	≤ -13.00	Pass
793.0	10	30 ~ 10000	-43.31	≤ -13.00	Pass

5MHz Channel Bandwidth

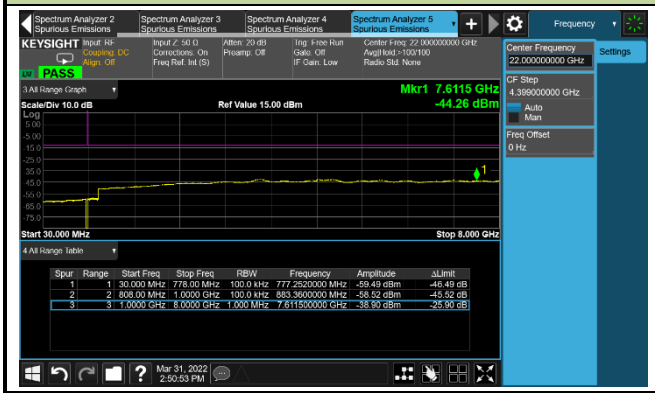
Low Channel



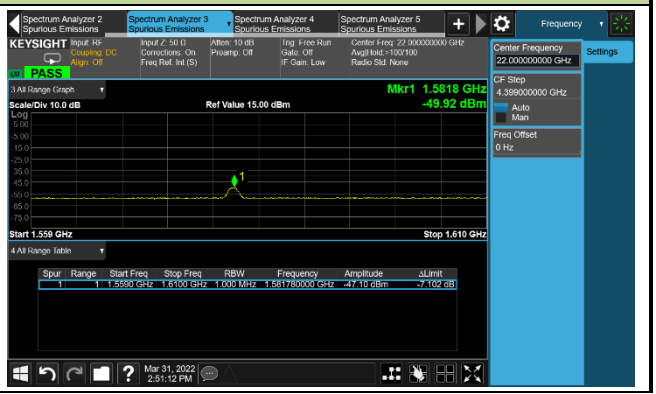
1559MHz-1610MHz

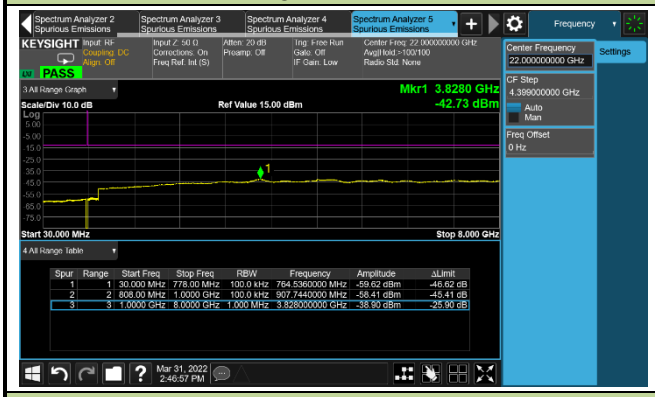
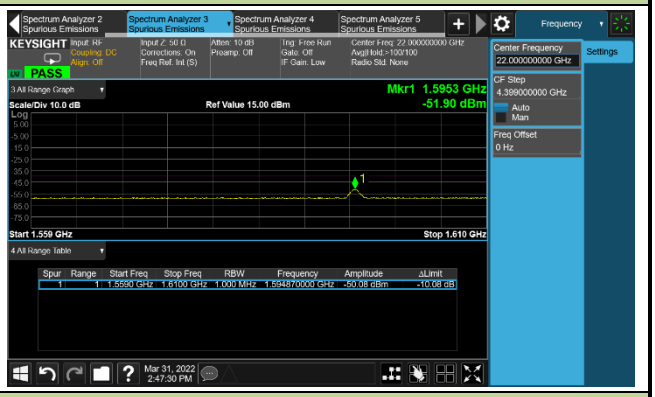


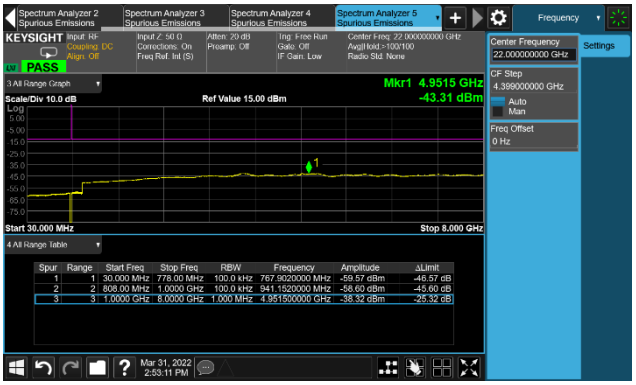
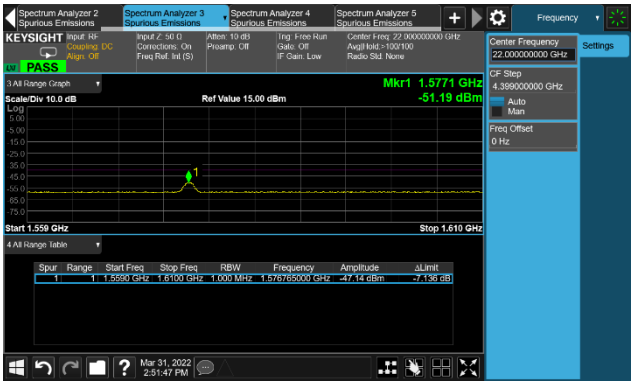
Middle Channel



1559MHz-1610MHz



High Channel	1559MHz-1610MHz
	

10MHz Channel Bandwidth	
Low Channel	1559MHz-1610MHz
	

Appendix B - Test Setup Photograph

Refer to “2203RSU045-UT” file.

Appendix C - EUT Photograph

Refer to “2203RSU045-UE” file.

The End