



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 2, 22 (H), 24 (E), 27
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.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2203RSU045-U6	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.

CONTENTS

Description	Page
1. General Information.....	5
1.1. Applicant.....	5
1.2. Manufacturer	5
1.3. Testing Facility.....	5
1.4. Product Information	6
1.5. Product Specification under Test.....	6
1.6. Description of Available Antennas	6
1.7. Test Methodology	7
1.8. Configuration of Tested System	7
1.9. Test Environment Condition	7
2. Test Equipment Calibration Date.....	8
3. Measurement Uncertainty	9
4. Test Result.....	10
4.1. Summary	10
4.2. Equivalent Isotropically Radiated Power Measurement.....	11
4.2.1. Test Limit	11
4.2.2. Test Procedure	11
4.2.3. Test Setting.....	11
4.2.4. Test Setup.....	12
4.2.5. Test Result.....	12
4.3. Band Edge Measurement.....	13
4.3.1. Test Limit	13
4.3.2. Test Procedure	13
4.3.3. Test Setting.....	13
4.3.4. Test Setup.....	14
4.3.5. Test Result.....	14
4.4. Conducted Spurious Emissions Measurement	15
4.4.1. Test Limit	15
4.4.2. Test Procedure	15
4.4.3. Test Setting.....	15
4.4.4. Test Setup.....	16
4.4.5. Test Result.....	16
Appendix A - Test Result	17
A.1 Equivalent Isotropically Radiated Power Test Result	17
A.2 Band Edge Test Result.....	20

A.3	Conducted Spurious Emissions Test Result	21
Appendix B - Test Setup Photograph		25
Appendix C - EUT Photograph		26

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

UTRA Specification	
Single Band	Band 2, 4, 5
Modulation	UL up to 16QAM, DL up to 64QAM
FDD Tx Frequency Range	Band II: 1850 ~ 1910MHz, Band IV: 1710 ~ 1755MHz Band V: 824 ~ 849MHz
FDD Rx Frequency Range	Band II: 1930 ~ 1990MHz, Band IV: 2110 ~ 2155MHz Band V: 869 ~ 894MHz

1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
WCDMA Band II	1850 ~ 1910	Dipole	0.25
WCDMA Band IV	1710 ~ 1755		1.47
WCDMA Band V	824 ~ 849		2.68

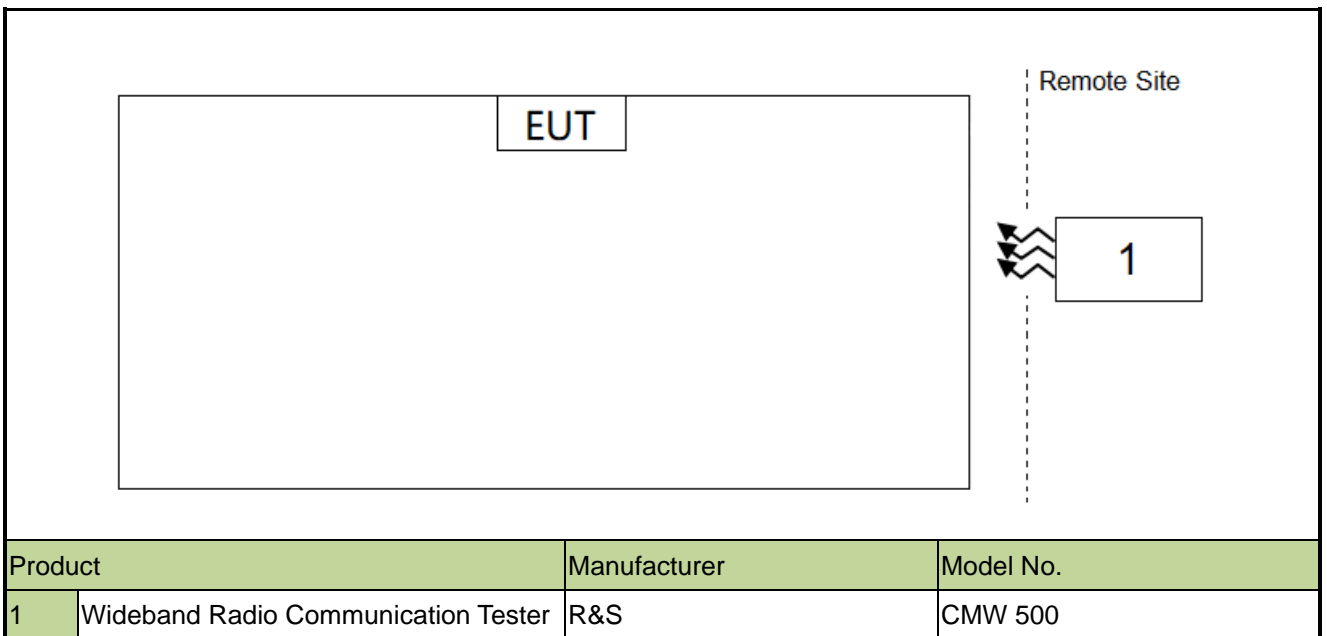
Note: The typical antennas use to calculate the ERP (EIRP).

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 22, Part 24, Part 27
- 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



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
22.913(a)(5), 27.50(d)(4) 24.232(c)	Equivalent Radiated Power, Equivalent Isotropic Radiated Power	Conducted	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		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 Channel Band Edge, Conducted Spurious Emission were presented worst-case in the test report.

4.2. Equivalent Isotropically Radiated Power Measurement

4.2.1. 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.

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:

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

where

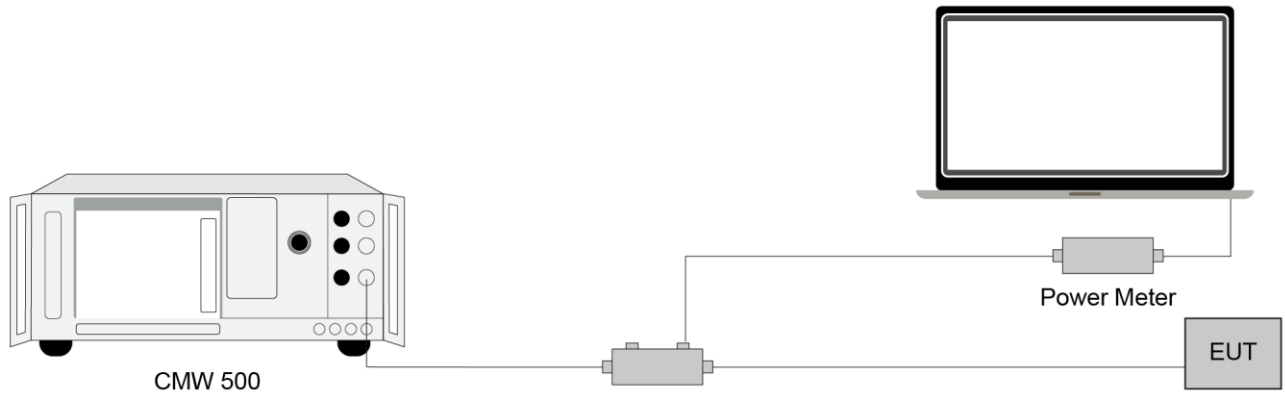
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , e.g., dBm or dBW)

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)

$$\text{ERP} = \text{EIRP} - 2.15$$

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 824 ~ 849 MHz, 1850 ~ 1910 MHz and 1710 ~ 1755 MHz, the FCC limit is $43 + 10\log_{10}(P_{\text{Watts}})$ dB below the transmitter power $P(\text{Watts})$ 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.

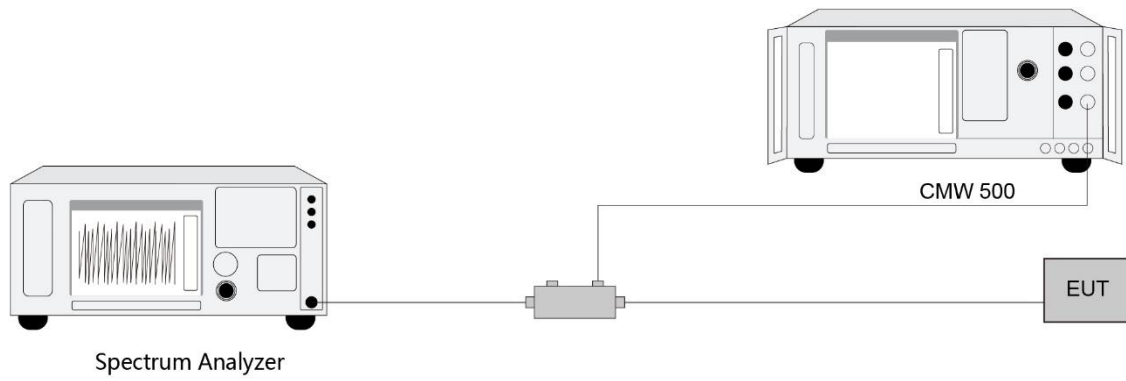
4.3.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

4.3.3. Test Setting

1. Set the analyzer frequency to low or high channel
2. $RBW \geq$ 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. $VBW \geq 3*RBW$
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. Conducted Spurious Emissions Measurement

4.4.1. 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 Low 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.

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.

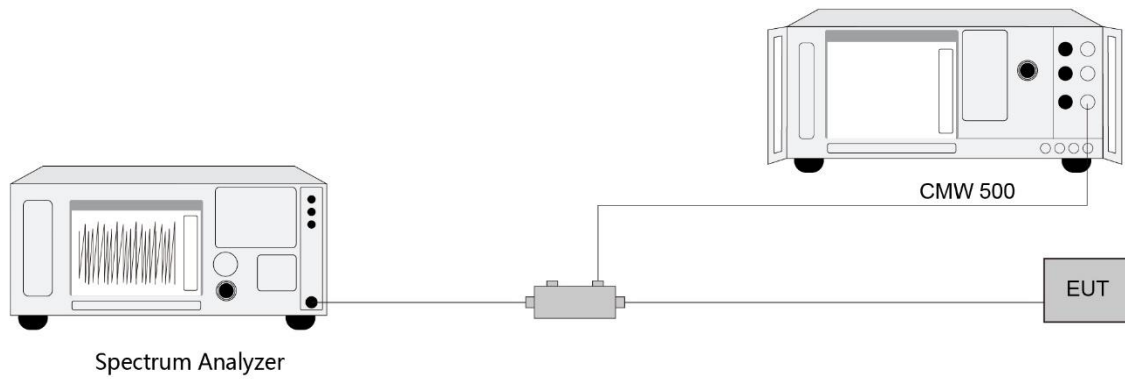
4.4.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

4.4.3. Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW $\geq 3 \cdot$ 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.6.

Appendix A - Test Result

A.1 Equivalent Isotropically Radiated Power Test Result

Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/03/21 ~ 2022/04/16	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	23.23	23.11	23.10	0.25	23.48	23.36	23.35
HSDPA	1	22.16	22.18	22.12	0.25	22.41	22.43	22.37
	2	22.10	22.15	22.13	0.25	22.35	22.40	22.38
	3	21.64	21.63	21.64	0.25	21.89	21.88	21.89
	4	21.58	21.64	21.63	0.25	21.83	21.89	21.88
HSUPA	1	22.07	22.17	22.05	0.25	22.32	22.42	22.30
	2	20.14	20.15	20.11	0.25	20.39	20.40	20.36
	3	21.09	21.13	21.09	0.25	21.34	21.38	21.34
	4	20.11	20.18	20.10	0.25	20.36	20.43	20.35
	5	21.93	21.82	21.93	0.25	22.18	22.07	22.18
Limit	33.01dBm							

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

Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/03/21 ~ 2022/04/16	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	23.06	23.19	23.21	1.47	24.53	24.66	24.68
HSDPA	1	22.08	22.18	22.18	1.47	23.55	23.65	23.65
	2	22.07	22.08	22.15	1.47	23.54	23.55	23.62
	3	21.56	21.66	21.67	1.47	23.03	23.13	23.14
	4	21.59	21.65	21.67	1.47	23.06	23.12	23.14
HSUPA	1	22.05	22.18	22.15	1.47	23.52	23.65	23.62
	2	20.10	20.15	20.13	1.47	21.57	21.62	21.60
	3	21.09	21.18	21.17	1.47	22.56	22.65	22.64
	4	20.03	20.18	20.18	1.47	21.50	21.65	21.65
	5	21.91	22.04	22.05	1.47	23.38	23.51	23.52
Limit	30.00dBm							

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

Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/03/21 ~ 2022/04/16	Test Band	WCDMA Band V

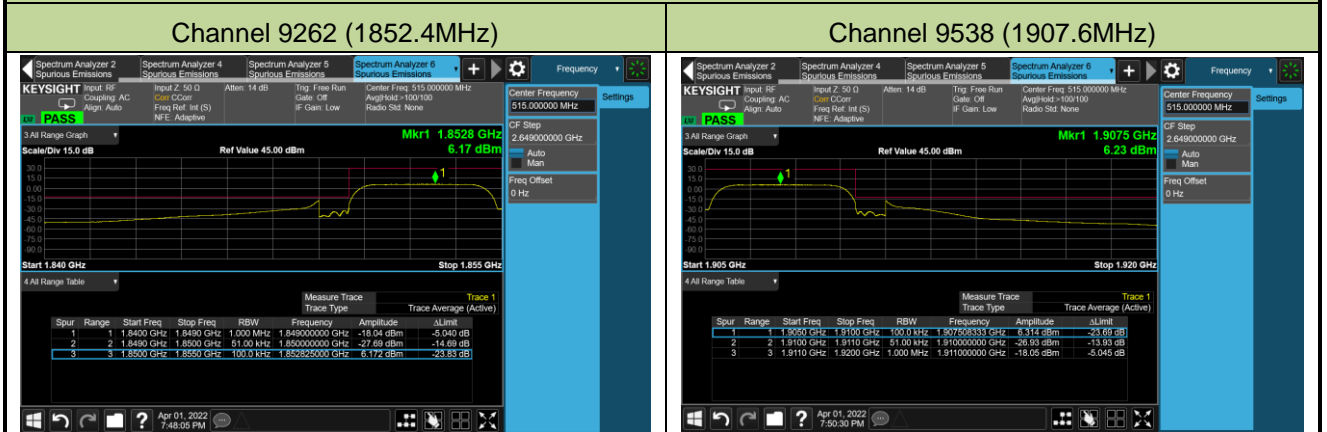
Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	ERP (dBm)		
		Band V Channel				Band V Channel		
		4132	4182	4233		4132	4182	4233
WCDMA R99	1	23.14	23.33	23.26	2.68	23.67	23.86	23.79
HSDPA	1	22.23	22.29	22.26	2.68	22.76	22.82	22.79
	2	22.21	22.32	22.24	2.68	22.74	22.85	22.77
	3	21.70	21.82	21.72	2.68	22.23	22.35	22.25
	4	21.78	21.79	21.75	2.68	22.31	22.32	22.28
HSUPA	1	22.18	22.28	22.26	2.68	22.71	22.81	22.79
	2	20.24	20.36	20.28	2.68	20.77	20.89	20.81
	3	21.22	21.31	21.24	2.68	21.75	21.84	21.77
	4	20.25	20.33	20.28	2.68	20.78	20.86	20.81
	5	22.09	22.16	22.16	2.68	22.62	22.69	22.69
Limit	38.45dBm							

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

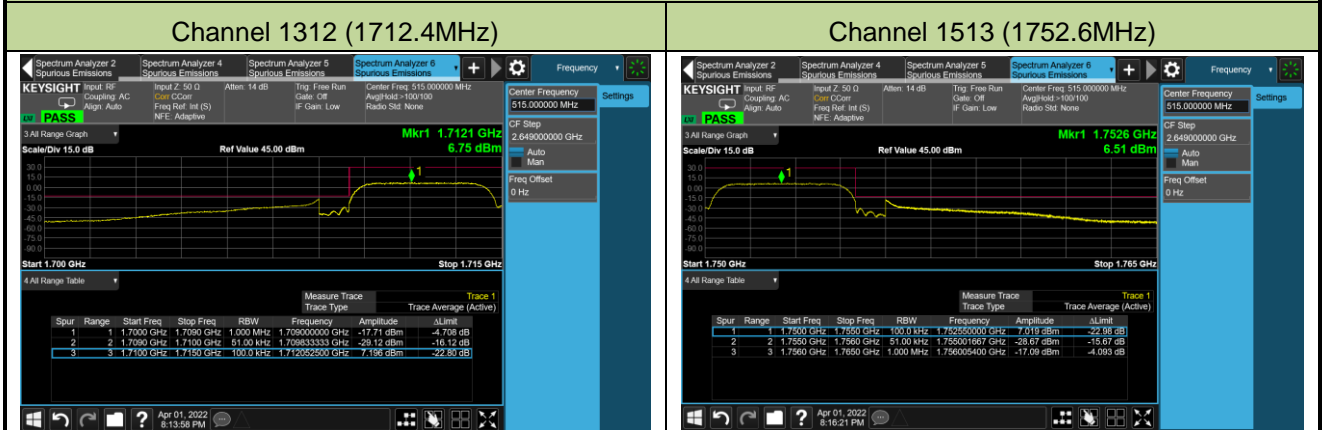
A.2 Band Edge Test Result

Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/04/01	Test Band	WCDMA Band II, IV, V

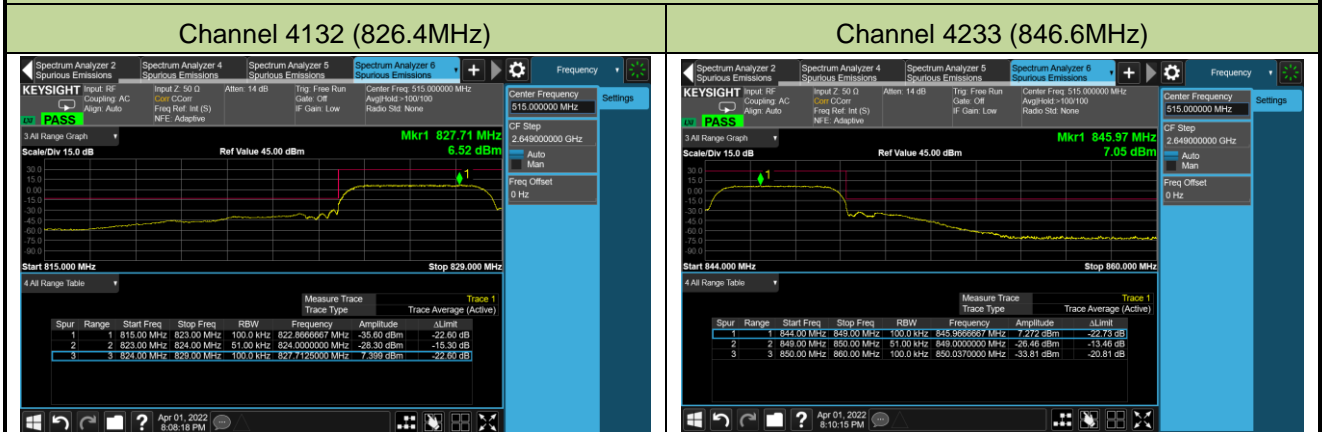
WCDMA Band II



WCDMA Band IV



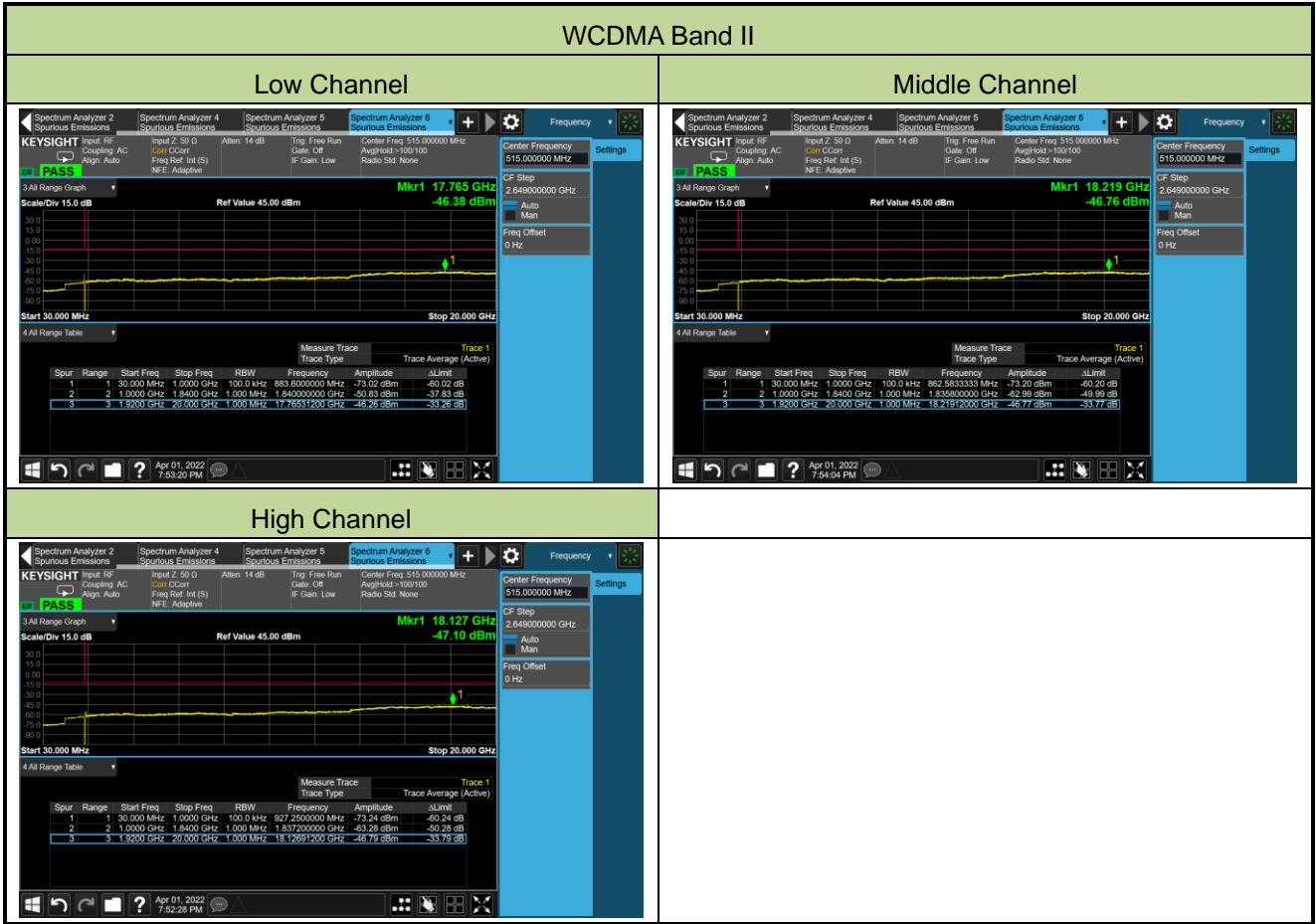
WCDMA Band V

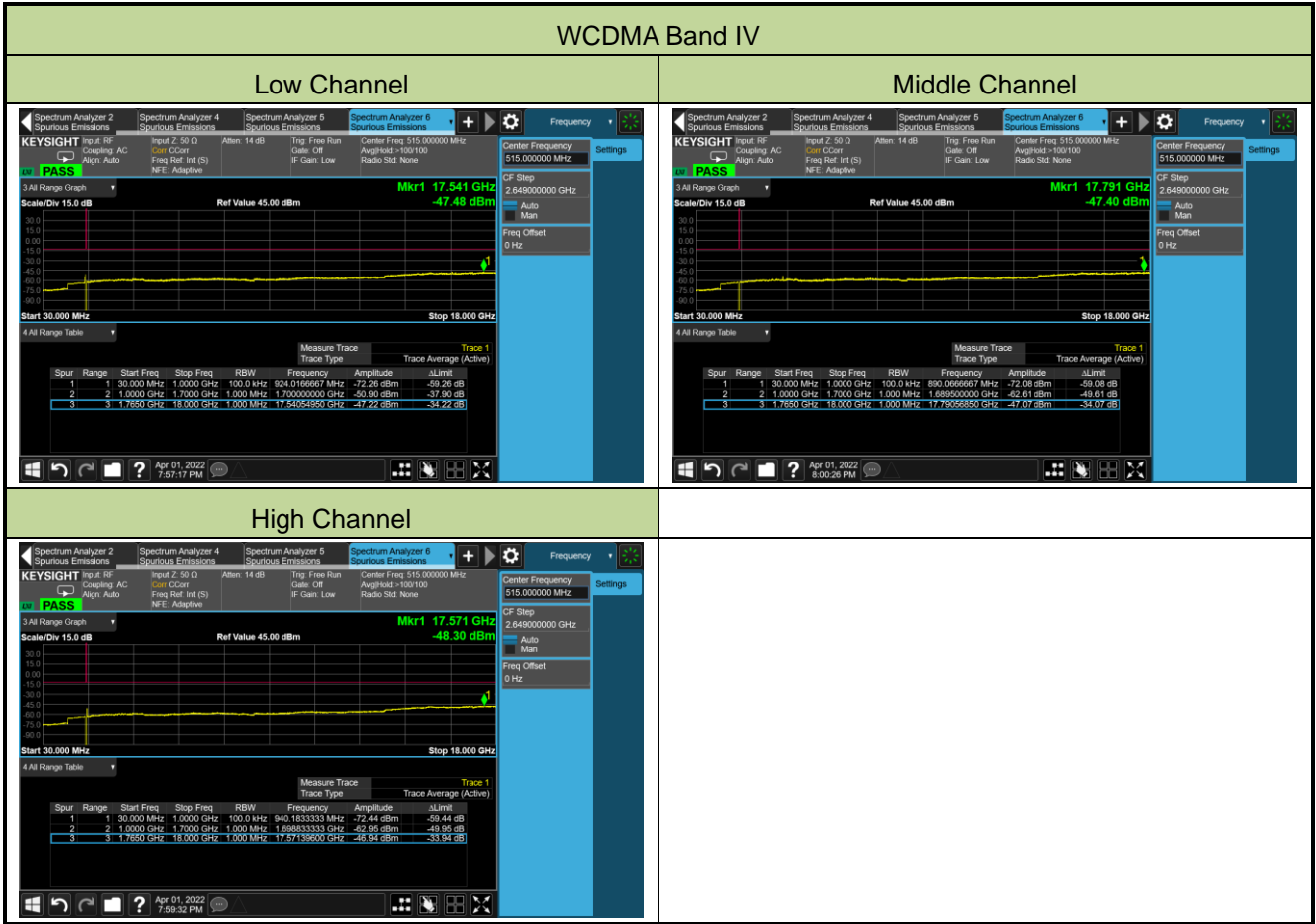


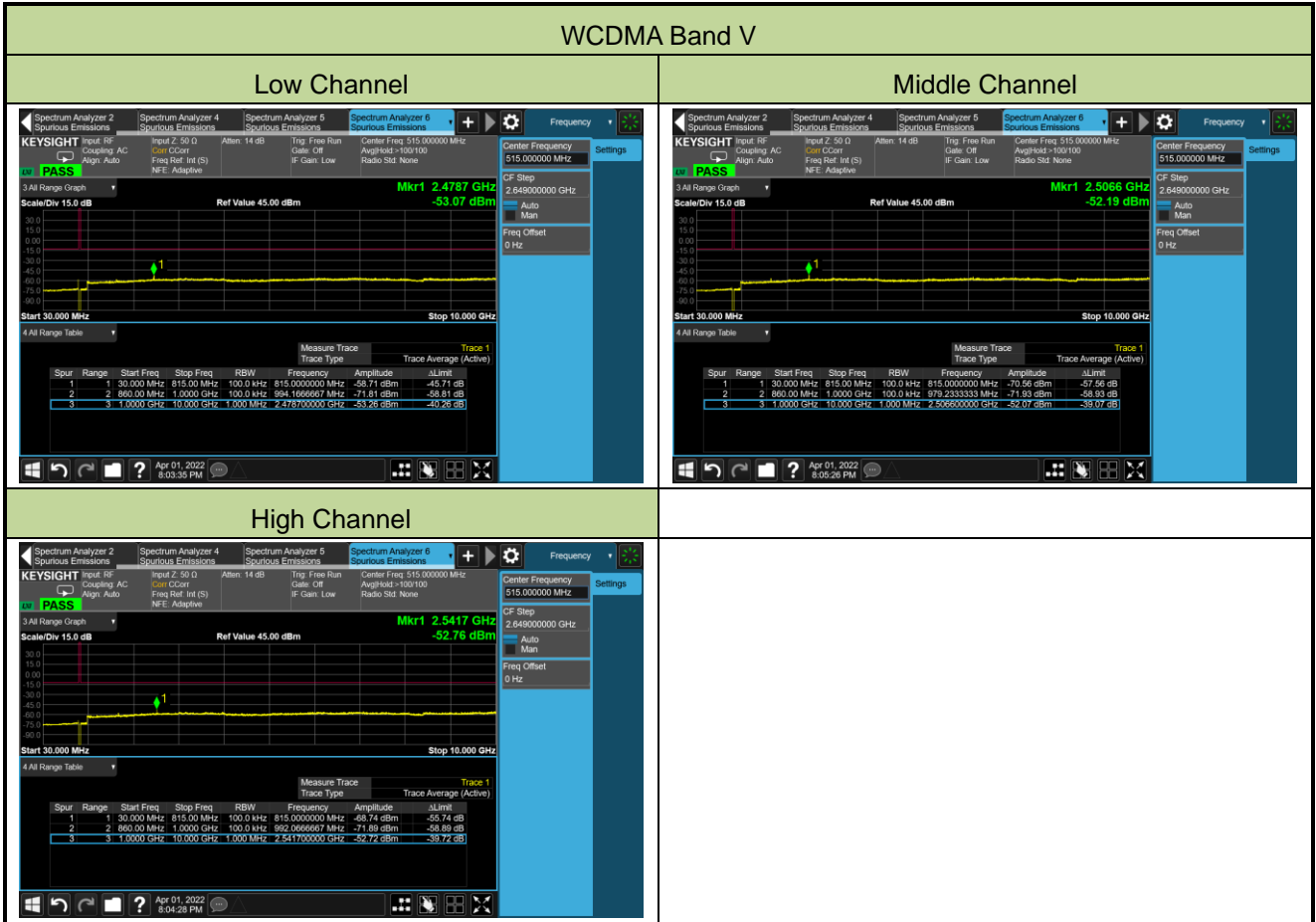
A.3 Conducted Spurious Emissions Test Result

Test Site	WZ-SR6	Test Engineer	Caitlin Chen
Test Date	2022/04/01	Test Band	WCDMA Band II, IV, V

Mode	Frequency (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
WCDMA Band II	1852.4	30 ~ 20000	-46.38	≤ -13.00	Pass
	1880.0	30 ~ 20000	-46.76	≤ -13.00	Pass
	1907.6	30 ~ 20000	-47.10	≤ -13.00	Pass
WCDMA Band IV	1712.4	30 ~ 20000	-47.48	≤ -13.00	Pass
	1732.4	30 ~ 20000	-47.40	≤ -13.00	Pass
	1752.6	30 ~ 20000	-48.30	≤ -13.00	Pass
WCDMA Band V	826.4	30 ~ 10000	-53.07	≤ -13.00	Pass
	836.4	30 ~ 10000	-52.19	≤ -13.00	Pass
	846.6	30 ~ 10000	-52.76	≤ -13.00	Pass







Appendix B - Test Setup Photograph

Refer to "2203RSU045-UT" file.

Appendix C - EUT Photograph

Refer to "2203RSU045-UE" file.

The End