


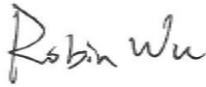
SPOT CHECK REPORT

FCC PART 2 & 22 & 24 & 27

FCC ID: XMR2021EM121RGL
Application: Quectel Wireless Solutions Company Limited
Application Type: Certification
Product: LTE-A Cat 12 M.2 Module
Model No.: EM121R-GL
Brand Name: Quectel
FCC Rule Part(s): Part 2, 22 (H), 24 (E), 27
Test Procedure(s): ANSI C63.26: 2015
Test Date: April 28, 2021 ~ May 18, 2021

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
2104RSU063-U6	Rev. 01	Initial Report	05-30-2021	Valid

Note: This application for certification is leveraging the data reuse procedures from KDB 484596 based on reference FCC ID: XMR2020EM120RGL to cover variant FCC ID: XMR2021EM121RGL.

CONTENTS

Description	Page
1. GENERAL INFORMATION	4
1.1. Applicant	4
1.2. Manufacturer	4
1.3. Testing Facility	4
1.4. Product Information	5
1.5. Radio Specification under Test	5
1.6. Description of Available Antennas.....	5
1.7. Test Methodology	6
1.8. EMI Suppression Device(s)/Modifications.....	6
1.9. Configuration of Tested System.....	6
1.10. Test Environment Condition.....	6
2. TEST EQUIPMENT CALIBRATION DATE.....	7
3. MEASUREMENT UNCERTAINTY	8
4. TEST RESULT	9
4.1. Summary.....	9
4.2. Equivalent Isotropically Radiated Power Measurement	10
4.2.1. Test Limit	10
4.2.2. Test Procedures Used	10
4.2.3. Test Setting.....	10
4.2.4. Test Setup	11
4.2.5. Test Result.....	12
4.3. Conducted Spurious Emissions.....	15
4.3.1. Test Limit	15
4.3.2. Test Procedure Used	15
4.3.3. Test Setting.....	15
4.3.4. Test Setup	16
4.3.5. Test Result.....	17
5. CONCLUSION	19
Appendix A - Test Setup Photograph	20
Appendix B - EUT Photograph.....	21
Appendix C - Reference Test Report	22

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

<input checked="" type="checkbox"/>	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
<input type="checkbox"/>	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
<input type="checkbox"/>	Test Site - MRT Taiwan Laboratory
	Laboratory Location (Taiwan)
	No. 38, Fuxing 2 nd 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 12 M.2 Module
Model No.:	EM121R-GL
Brand Name:	Quectel
IMEI:	862718050001670
Operating Temperature:	-25 ~ 75 °C
Power Type:	3.1 ~ 4.4Vdc, typical 3.7Vdc
UMTS Specification	
Single Band:	Band 2, 4, 5
Modulation:	Uplink up to 16QAM, Downlink up to 64QAM
E-UTRA Specification	
Single Band:	Band 2, 4, 5, 7, 12, 13, 14, 25, 26, 30, 38, 41, 48, 66
Uplink CA Band:	Intra-Band CA_41C
Modulation:	Uplink up to 64QAM, Downlink up to 256QAM

1.5. Radio Specification under Test

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

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.

1.6. 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.

1.7. Test Methodology

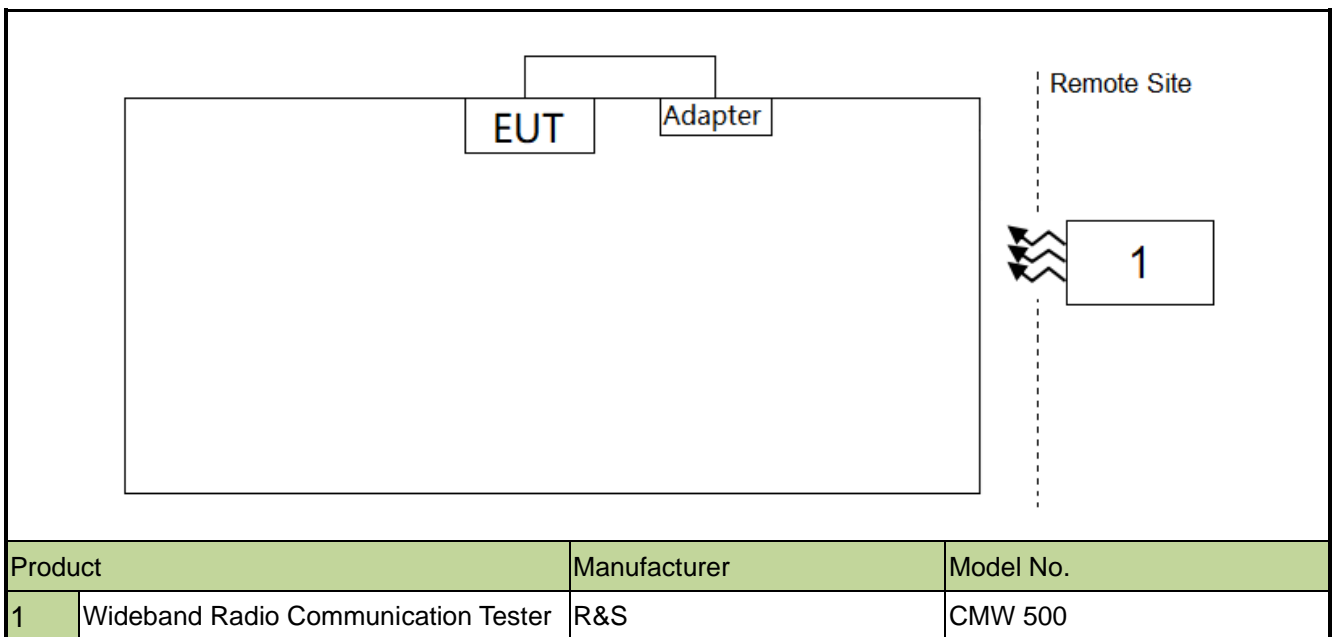
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 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

1.8. EMI Suppression Device(s)/Modifications

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

1.9. Configuration of Tested System



1.10. Test Environment Condition

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

2. TEST EQUIPMENT CALIBRATION DATE

Conducted Test Equipment (WZ-SR6, WZ-TR3)

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2022/04/13
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2021/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2022/04/13
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2021/11/07
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2021/11/18
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
True RMS Clamp Meter	Fluke	319	MRTSUE06080	1 year	2022/05/05
Directional Coupler	Agilent	87301D	MRTSUE06082	1 year	2022/03/08
Dual Directional Coupler	Agilent	7778D	MRTSUE06083	1 year	2022/03/24
Attenuator	MVE	6dB	MRTSUE06534	1 year	2021/12/12
Attenuator	MVE	10dB	MRTSUE06543	1 year	2021/12/12
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2021/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2021/08/08

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 Limit	Test Condition	Test Result	Reference
22.913(a)(5)	Equivalent Radiated Power (Band II)	< 7 Watts Max ERP	Conducted	Pass	Section 4.2
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band IV)	< 1 Watts Max EIRP		Pass	Section 4.2
24.232(c)	Equivalent Isotropic Radiated Power (Band V)	< 2 Watts Max EIRP		Pass	Section 4.2
2.1051, 22.917(a), 27.53(h)	Spurious Emission	< $43 + 10\log_{10}(P_{\text{Watts}})$		Pass	Section 4.3

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) The difference compared with the original report is only different GNSS Bands. Output power and conducted spurious emissions verification worst test refer to original 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 Procedures Used

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:

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

where

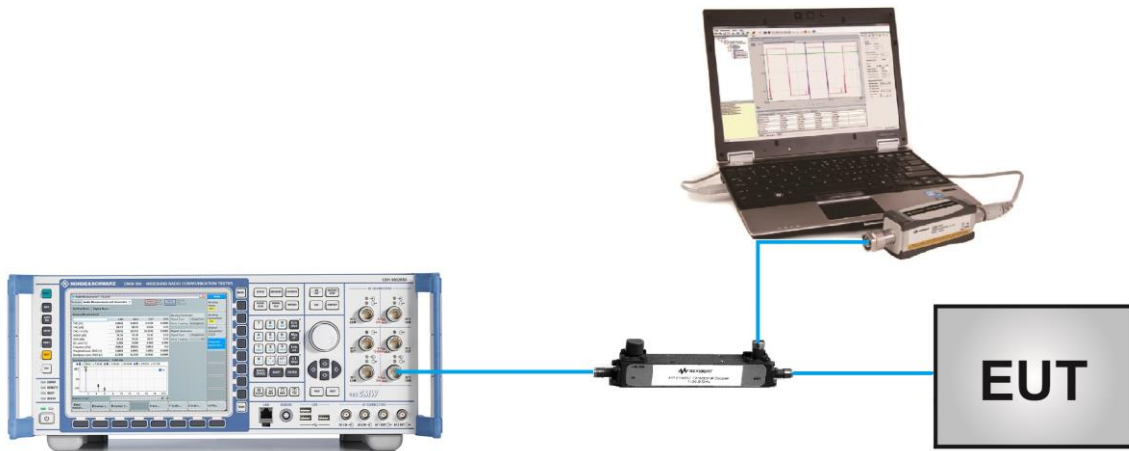
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , e.g., dBm or dBW)

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

Product	LTE-A Cat 12 M.2 Module	Test Site	WZ-SR6
Test Engineer	Larry Yan	Test Date	2021/01/18
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	22.62	23.51	23.48	1.15	23.77	24.66	24.63
HSDPA	1	22.63	22.58	22.52	1.15	23.78	23.73	23.67
	2	22.60	22.55	22.45	1.15	23.75	23.70	23.60
	3	22.14	22.01	21.96	1.15	23.29	23.16	23.11
	4	22.13	22.02	22.03	1.15	23.28	23.17	23.18
HSUPA	1	22.57	22.53	22.47	1.15	23.72	23.68	23.62
	2	20.56	20.56	20.41	1.15	21.71	21.71	21.56
	3	21.58	21.37	21.43	1.15	22.73	22.52	22.58
	4	20.62	20.55	20.44	1.15	21.77	21.70	21.59
	5	20.65	22.60	22.60	1.15	21.80	23.75	23.75
Limit	33.01dBm							

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

Product	LTE-A Cat 12 M.2 Module	Test Site	WZ-SR6
Test Engineer	Larry Yan	Test Date	2021/01/18
Test Band	WCDMA Band IV		

Mode	3GPP Subtest	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		Band II Channel				Band II Channel		
		1313	1450	1512		1313	1450	1512
WCDMA R99	1	22.28	22.36	22.35	-0.50	21.78	21.86	21.85
HSDPA	1	21.32	21.37	21.38	-0.50	20.82	20.87	20.88
	2	21.32	21.38	21.38	-0.50	20.82	20.88	20.88
	3	20.65	20.69	20.86	-0.50	20.15	20.19	20.36
	4	20.81	20.86	20.64	-0.50	20.31	20.36	20.14
HSUPA	1	21.29	21.39	21.44	-0.50	20.79	20.89	20.94
	2	19.26	19.38	19.43	-0.50	18.76	18.88	18.93
	3	20.19	20.35	20.45	-0.50	19.69	19.85	19.95
	4	19.32	19.41	19.33	-0.50	18.82	18.91	18.83
	5	21.26	21.42	21.43	-0.50	20.76	20.92	20.93
Limit	30.00dBm							

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

Product	LTE-A Cat 12 M.2 Module	Test Site	WZ-SR6
Test Engineer	Candy Luo	Test Date	2021/01/18
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	23.46	23.48	23.38	1.85	23.16	23.18	23.08
HSDPA	1	22.48	22.48	22.38	1.85	22.18	22.18	22.08
	2	22.44	22.52	22.44	1.85	22.14	22.22	22.14
	3	21.97	22.00	21.89	1.85	21.67	21.70	21.59
	4	22.00	22.00	21.89	1.85	21.70	21.70	21.59
HSUPA	1	22.49	22.61	22.45	1.85	22.19	22.31	22.15
	2	20.44	20.45	20.34	1.85	20.14	20.15	20.04
	3	21.46	21.56	21.47	1.85	21.16	21.26	21.17
	4	20.40	20.48	20.36	1.85	20.10	20.18	20.06
	5	22.43	22.59	22.32	1.85	22.13	22.29	22.02
Limit	38.45dBm							

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

4.3. Conducted Spurious Emissions

4.3.1. 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.

4.3.2. Test Procedure Used

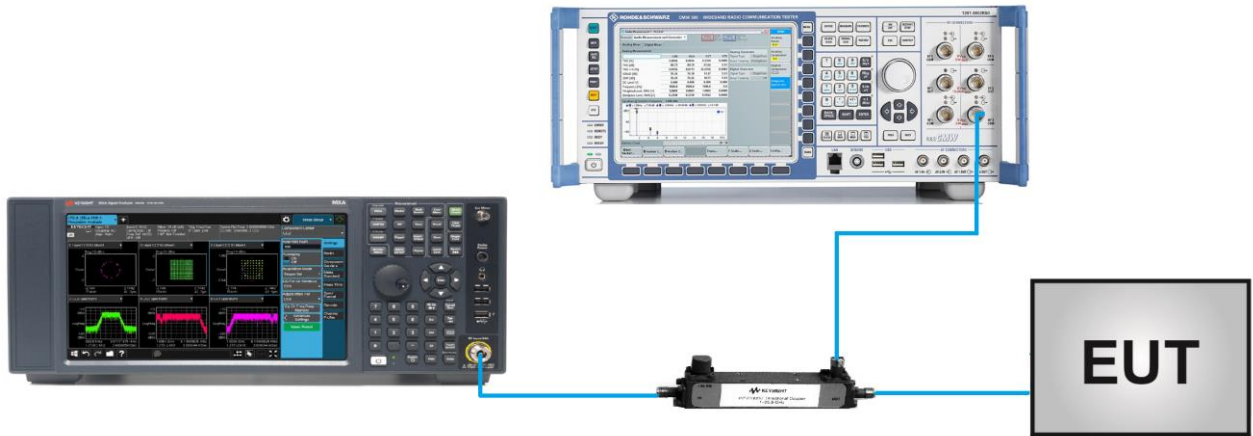
ANSI C63.26-2015 - Section 5.7

4.3.3. 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.

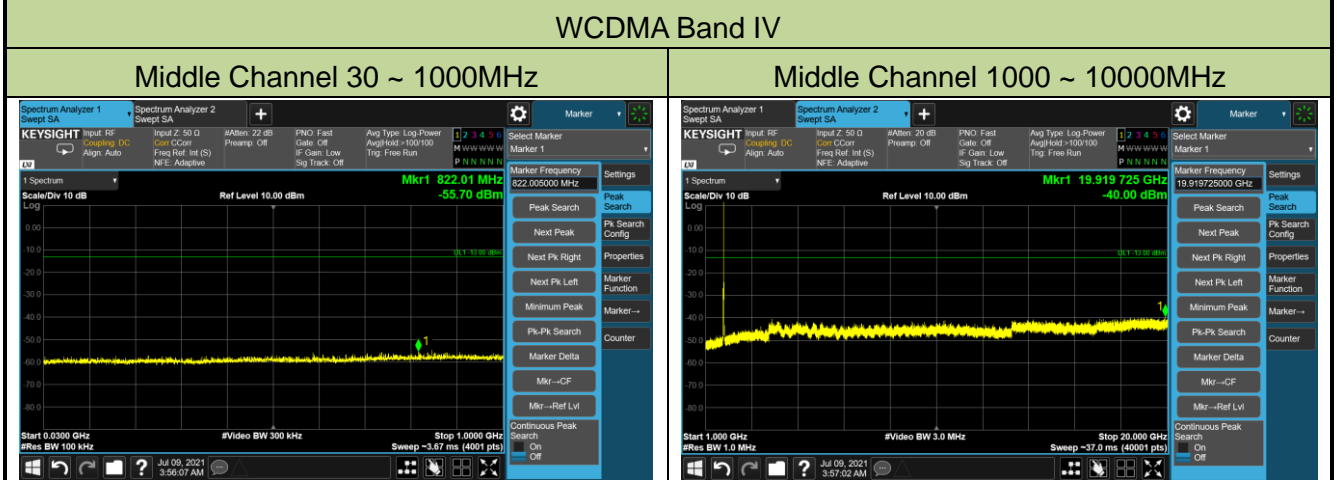
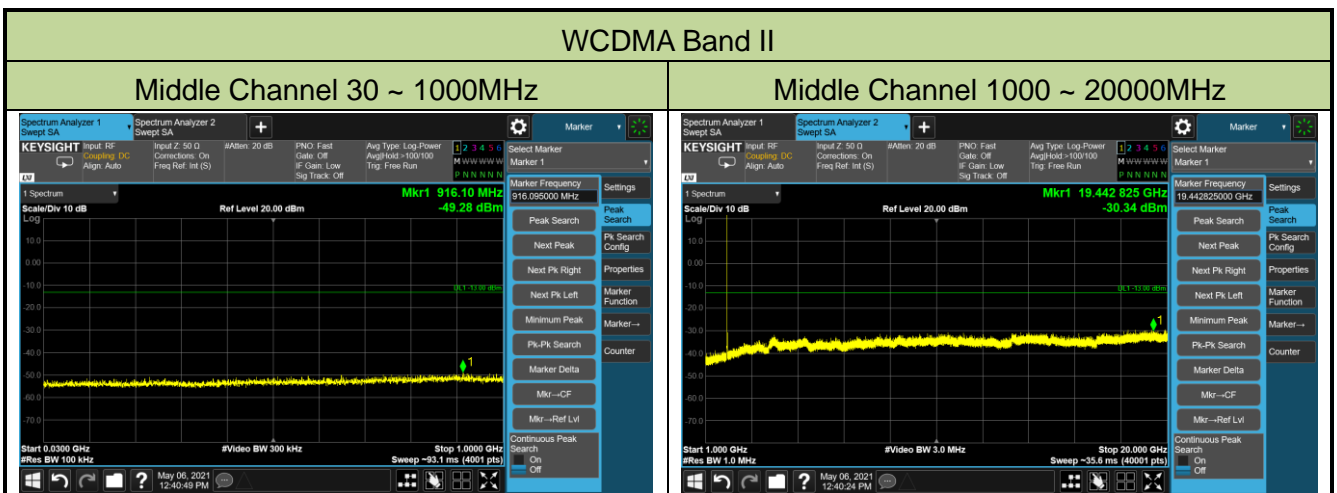
4.3.4. Test Setup

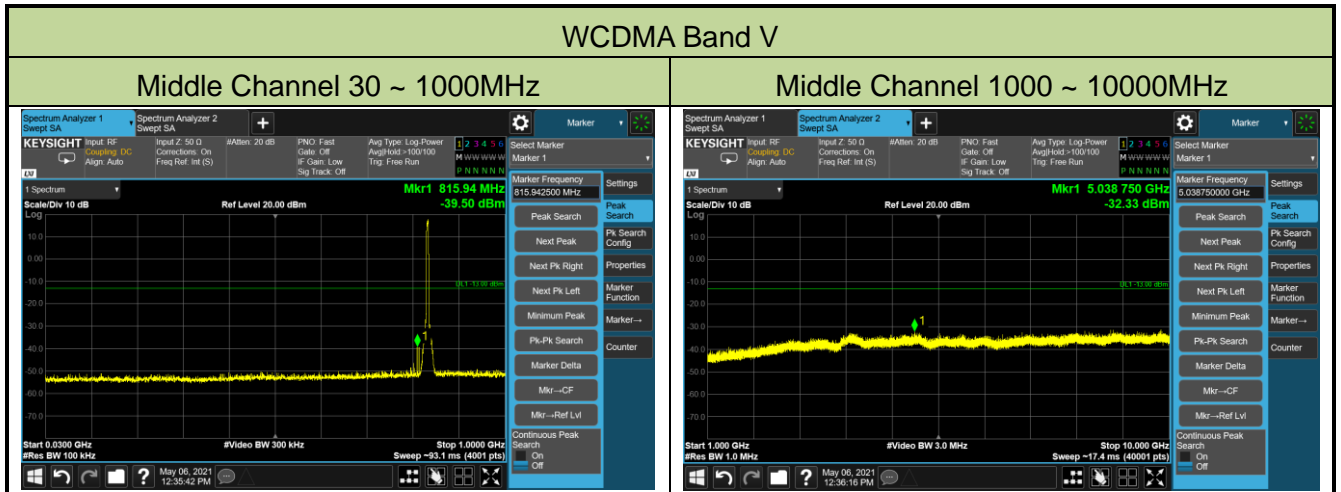


4.3.5. Test Result

Product	LTE-A Cat 12 M.2 Module	Test Site	WZ-SR6
Test Engineer	Eric Xu	Test Date	2021/05/06
Test Band	WCDMA Band II, IV, V		

Mode	Frequency (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
WCDMA Band II	1880.0	30 ~ 1000	-49.28	≤ -13.00	Pass
		1000 ~ 20000	-30.34	≤ -13.00	Pass
WCDMA Band IV	1732.4	30 ~ 1000	-55.70	≤ -13.00	Pass
		1000 ~ 20000	-40.00	≤ -13.00	Pass
WCDMA Band V	836.4	30 ~ 1000	-39.50	≤ -13.00	Pass
		1000 ~ 10000	-32.33	≤ -13.00	Pass





5. 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 "2104RSU063-UT" file.

Appendix B - EUT Photograph

Refer to "2104RSU063-UE" file.

Appendix C - Reference Test Report