

## SPOT CHECK REPORT

### FCC PART 90

**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 90 Subpart S

**Test Procedure(s):** ANSI C63.26: 2015

**Test Date:** April 28, 2021 ~ May 18, 2021

Reviewed By:

*Sunny Sun*

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Sunny Sun

Approved By:

*Robin Wu*

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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-U4	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.

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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

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

FDD Tx Frequency Range:	Band 26: 814 ~ 824 MHz
FDD Rx Frequency Range:	Band 26: 859 ~ 869 MHz

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.

Note 3: LTE band 26 transmit frequency for part 90 rule is 814 ~ 824MHz and part 22 rule is 824 ~ 849MHz. ERP over 15MHz bandwidth complies the ERP limit line of part 22 rule, therefore ERP of the partial frequency spectrum which falls within part 22 also complies.

## 1.6. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
LTE Band 2	1850 ~ 1910	Dipole	1.15
LTE Band 4	1710 ~ 1755		-0.50
LTE Band 5	824 ~ 849		1.85
LTE Band 7	2500 ~ 2570		1.32
LTE Band 12	699 ~ 716		-2.43
LTE Band 13	777 ~ 787		-0.10
LTE Band 14	788 ~ 798		2.40
LTE Band 25	1850 ~ 1915		1.15
LTE Band 26	814 ~ 849		1.85
LTE Band 30	2305 ~ 2315		-3.64
LTE Band 38	2570 ~ 2620		0.93
LTE Band 41	2496 ~ 2690		0.93
LTE Band 48	3550 ~ 3700		-3.37
LTE Band 66	1710 ~ 1780		-0.50

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

## 1.7. Test Methodology

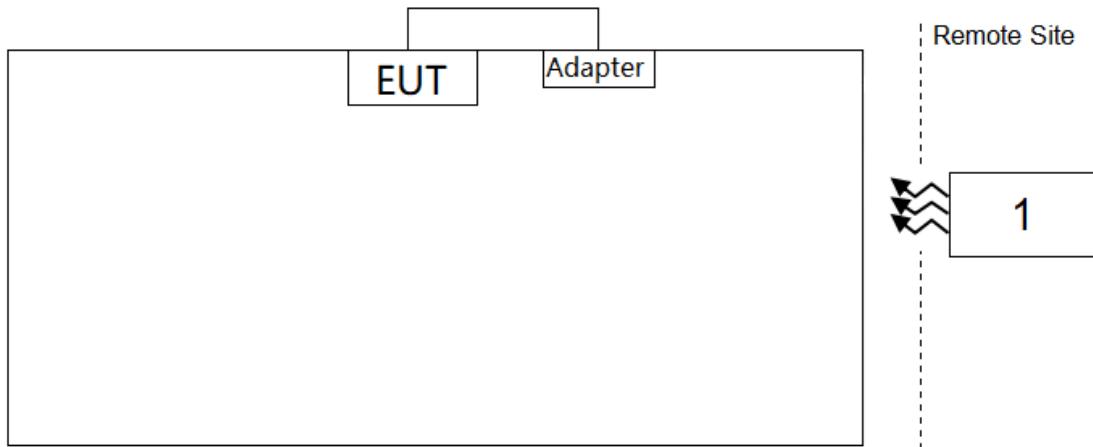
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC CFR 47 Part 90
- 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



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

## 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% ( $U=2U_c(y)$ ): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_c(y)$ ): 1.13dB

## 4. TEST RESULT

### 4.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
90.635	Conducted Output Power	< 100W	Conducted	Pass	Section 4.2
2.1051, 90.691(a)	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. Conducted Output Power Measurement

### 4.2.1. Test Limit

The maximum output power of the transmitter for mobile stations is 100 watts (20dBw).

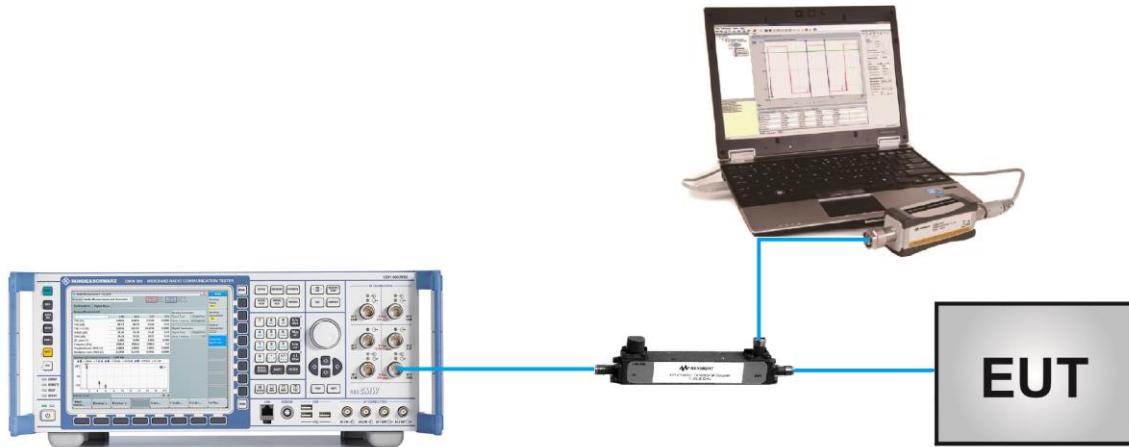
### 4.2.2. Test Procedures Used

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.

### 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	2021/04/28	

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
<b>QPSK</b>							
26697	814.7	1.4	1	0	23.27	0.2123	< 100
26740	819.0				23.26	0.2118	< 100
26783	823.3				23.27	0.2123	< 100
26697	814.7	1.4	1	2	23.33	0.2153	< 100
26740	819.0				23.37	0.2173	< 100
26783	823.3				23.33	0.2153	< 100
26697	814.7	1.4	1	6	23.29	0.2133	< 100
26740	819.0				23.29	0.2133	< 100
26783	823.3				23.29	0.2133	< 100
26697	814.7	1.4	6	0	22.34	0.1714	< 100
26740	819.0				22.43	0.1750	< 100
26783	823.3				22.45	0.1758	< 100
26705	815.5	3	1	0	23.25	0.2113	< 100
26740	819.0				23.35	0.2163	< 100
26775	822.5				23.25	0.2113	< 100
26705	815.5	3	1	7	23.40	0.2188	< 100
26740	819.0				23.48	0.2228	< 100
26775	822.5				23.41	0.2193	< 100
26705	815.5	3	1	14	23.33	0.2153	< 100
26740	819.0				23.40	0.2188	< 100
26775	822.5				23.38	0.2178	< 100
26705	815.5	3	15	0	22.43	0.1750	< 100
26740	819.0				22.56	0.1803	< 100
26775	822.5				22.51	0.1782	< 100

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	Output Power (W)	Limit (W)
QPSK							
26715	816.5	5	1	0	23.13	0.2056	< 100
26740	819.0				23.38	0.2178	< 100
26765	821.5				23.27	0.2123	< 100
26715	816.5	5	1	12	23.45	0.2213	< 100
26740	819.0				23.43	0.2203	< 100
26765	821.5				23.43	0.2203	< 100
26715	816.5	5	1	24	23.16	0.2070	< 100
26740	819.0				23.28	0.2128	< 100
26765	821.5				23.37	0.2173	< 100
26715	816.5	5	25	0	22.40	0.1738	< 100
26740	819.0				22.69	0.1858	< 100
26765	821.5				22.42	0.1746	< 100
26740	819.0	10	1	0	23.45	0.2213	< 100
			1	24	23.35	0.2163	< 100
			1	49	23.36	0.2168	< 100
			50	0	22.16	0.1644	< 100
26765	821.5	15	1	0	23.64	0.2312	< 100
			1	36	23.63	0.2307	< 100
			1	74	23.66	0.2323	< 100
			75	0	22.56	0.1803	< 100

## 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 lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> 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.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

### 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  $\geq 3 \times$  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.

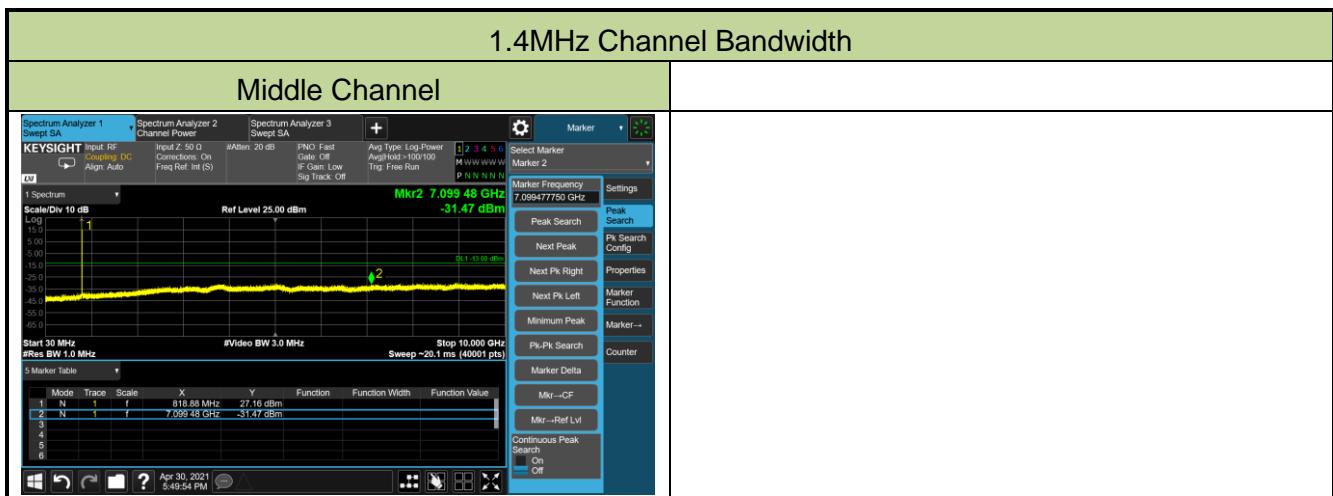
#### 4.3.4. Test Setup



#### 4.3.5. Test Result

Product	LTE-A Cat 12 M.2 Module	Test Site	WZ-SR6
Test Engineer	Cloud Guo	Test Date	2021/04/30

Channel	Frequency (MHz)	Channel Bandwidth (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)	Result
QPSK						
26740	819.0	1.4	30 ~ 10000	-31.47	≤ -13.00	Pass



## 5. CONCLUSION

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

## Appendix A - Test Setup Photograph

Refer to "2104RSU063-UT" file.

## Appendix B - EUT Photograph

Refer to "2104RSU063-UE" file.

## Appendix C - Reference Test Report