



## RF Exposure Evaluation Declaration

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**FCC ID:** XMR2020EM120RG2

**Application:** Quectel Wireless Solutions Company Limited

**Application Type:** Certification

**Product:** LTE-A Cat 12 M.2 Module

**Model No.:** EM120R-GL

**Brand Name:** Quectel

**FCC Classification:** PCS Licensed Transmitter (PCB)

**Test Procedure(s):** KDB 447498 D01v06

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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

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## Revision History

| Report No.    | Version | Description    | Issue Date | Note  |
|---------------|---------|----------------|------------|-------|
| 2101RSU061-U6 | Rev. 01 | Initial Report | 02-04-2021 | Valid |
|               |         |                |            |       |

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

## 2. PRODUCT INFORMATION

### 2.1. Equipment Description

|                        |                                                         |
|------------------------|---------------------------------------------------------|
| Product Name:          | LTE-A Cat 12 M.2 Module                                 |
| Model No.:             | EM120R-GL                                               |
| Brand Name:            | Quectel                                                 |
| LTE Specification      |                                                         |
| Single Band:           | Band 2, 4, 5, 7, 12, 13, 14, 25, 26, 30, 38, 41, 48, 66 |
| Intra-Band:            | CA_41C                                                  |
| Category:              | Category 16                                             |
| UMTS Specification     |                                                         |
| Single Band:           | Band 2, 5                                               |
| Category:              | Category 6                                              |
| Operating Temperature: | -25 ~ 75 °C                                             |
| Power Type:            | 3.1 ~ 4.4Vdc, typical 3.7Vdc                            |

### 3. RF Exposure Evaluation

#### 3.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

| Frequency Range (MHz)                                     | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time (Minutes) |
|-----------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| (A) Limits for Occupational/ Control Exposures            |                               |                               |                                     |                        |
| 300-1500                                                  | --                            | --                            | f/300                               | 6                      |
| 1500-100,000                                              | --                            | --                            | 5                                   | 6                      |
| (B) Limits for General Population/ Uncontrolled Exposures |                               |                               |                                     |                        |
| 300-1500                                                  | --                            | --                            | f/1500                              | 30                     |
| 1500-100,000                                              | --                            | --                            | 1                                   | 30                     |

f= Frequency in MHz

Calculation Formula:  $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

G = gain of antenna in linear scale

$\pi$  = 3.1416

r = distance between observation point and center of the radiator in cm

$P_d$  is the limit of MPE, 1mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

### 3.2. Test Result of RF Exposure Evaluation

|           |                                     |
|-----------|-------------------------------------|
| Product   | LTE-A Cat 12 M.2 Module             |
| Test Item | Standalone Power Density Evaluation |

| Test Mode | Frequency Band (MHz) | Maximum Conducted Power (dBm) | Antenna Gain (dBi) | ERP (EIRP) (dBm) | Power Density at 20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) |
|-----------|----------------------|-------------------------------|--------------------|------------------|---------------------------------------------|-----------------------------|
| WCDMA B2  | 1850 ~ 1910          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |
| WCDMA B4  | 1710 ~ 1755          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |
| WCDMA B5  | 824 ~ 849            | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 0.5493                      |
| LTE B2    | 1850 ~ 1910          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |
| LTE B4    | 1710 ~ 1755          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |
| LTE B5    | 824 ~ 849            | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 0.5493                      |
| LTE B7    | 2500 ~ 2570          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |
| LTE B12   | 699 ~ 716            | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 0.4660                      |
| LTE B13   | 777 ~ 787            | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 0.5180                      |
| LTE B14   | 788 ~ 798            | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 0.5253                      |
| LTE B25   | 1850 ~ 1915          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |
| LTE B26   | 814 ~ 849            | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 0.5427                      |
| LTE B30   | 2305 ~ 2315          | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 1.0000                      |
| LTE B38   | 2570 ~ 2620          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |
| LTE B41   | 2496 ~ 2690          | 26.50                         | 6.50               | 33.00            | 0.3969                                      | 1.0000                      |
| LTE B48   | 3550 ~ 3700          | 25.00                         | 5.00               | 30.00            | 0.1989                                      | 1.0000                      |
| LTE B66   | 1710 ~ 1780          | 25.00                         | 8.00               | 33.00            | 0.3969                                      | 1.0000                      |

|           |                                     |
|-----------|-------------------------------------|
| Product   | LTE-A Cat 12 M.2 Module             |
| Test Item | Collocated Power Density Evaluation |

| Test Mode    | Frequency Band<br>(MHz) | Maximum<br>Conducted<br>Power (dBm) | Antenna<br>Gain<br>(dBi) | ERP<br>(EIRP)<br>(dBm) | Power Density at<br>20cm<br>(mW/cm <sup>2</sup> ) | Limit<br>(mW/<br>cm <sup>2</sup> ) | Power<br>Density /<br>Limit |
|--------------|-------------------------|-------------------------------------|--------------------------|------------------------|---------------------------------------------------|------------------------------------|-----------------------------|
| WCDMA B2     | 1850 ~ 1910             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| WCDMA B4     | 1710 ~ 1755             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| WCDMA B5     | 824 ~ 849               | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 0.5493                             | 0.3621                      |
| LTE B2       | 1850 ~ 1910             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| LTE B4       | 1710 ~ 1755             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| LTE B5       | 824 ~ 849               | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 0.5493                             | 0.3621                      |
| LTE B7       | 2500 ~ 2570             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| LTE B12      | 699 ~ 716               | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 0.4660                             | 0.4268                      |
| LTE B13      | 777 ~ 787               | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 0.5180                             | 0.3840                      |
| LTE B14      | 788 ~ 798               | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 0.5253                             | 0.3786                      |
| LTE B25      | 1850 ~ 1915             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| LTE B26      | 814 ~ 849               | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 0.5427                             | 0.3665                      |
| LTE B30      | 2305 ~ 2315             | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 1.0000                             | 0.1989                      |
| LTE B38      | 2570 ~ 2620             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| LTE B41      | 2496 ~ 2690             | 26.50                               | 6.50                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| LTE B48      | 3550 ~ 3700             | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 1.0000                             | 0.1989                      |
| LTE B66      | 1710 ~ 1780             | 25.00                               | 8.00                     | 33.00                  | 0.3969                                            | 1.0000                             | 0.3969                      |
| Wi-Fi 2.4GHz | 2412 ~ 2462             | 20.00                               | 5.00                     | 25.00                  | 0.0629                                            | 1.0000                             | 0.0629                      |
| Wi-Fi 5GHz   | 5150 ~ 5825             | 25.00                               | 5.00                     | 30.00                  | 0.1989                                            | 1.0000                             | 0.1989                      |
| Bluetooth    | 2402 ~ 2480             | 15.00                               | 5.00                     | 20.00                  | 0.0199                                            | 1.0000                             | 0.0199                      |

| WWAN<br>Power Density / Limit | Wi-Fi<br>Power Density / Limit | Bluetooth<br>Power Density / Limit | $\Sigma$ (Power Density /<br>Limit) |
|-------------------------------|--------------------------------|------------------------------------|-------------------------------------|
| 0.4268                        | 0.1989                         | 0.0199                             | 0.6456                              |

Note:

1. For colocation analysis, LTE Band 12 is chosen for summation due to the highest (power density / limit) among all WWAN wireless modes.
2.  $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter / antenna included in the simultaneous transmission) / (corresponding MPE limit)], for WWAN + Wi-Fi + Bluetooth.
3. Considering the WWAN module collocation with the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant.



## Conclusion

Based on 47 CFR § 2.1091 and FCC KDB 447498 D01 v06, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per technology as follow table:

| Device                  | Band         | Frequency Band (MHz) | Maximum Conducted Power (dBm) | Maximum Antenna Gain (dBi) |
|-------------------------|--------------|----------------------|-------------------------------|----------------------------|
| EM120R-GL               | WCDMA B2     | 1850 ~ 1910          | 25.00                         | 8.00                       |
|                         | WCDMA B4     | 1710 ~ 1755          | 25.00                         | 8.00                       |
|                         | WCDMA B5     | 824 ~ 849            | 25.00                         | 5.00                       |
|                         | LTE B2       | 1850 ~ 1910          | 25.00                         | 8.00                       |
|                         | LTE B4       | 1710 ~ 1755          | 25.00                         | 8.00                       |
|                         | LTE B5       | 824 ~ 849            | 25.00                         | 5.00                       |
|                         | LTE B7       | 2500 ~ 2570          | 25.00                         | 8.00                       |
|                         | LTE B12      | 699 ~ 716            | 25.00                         | 5.00                       |
|                         | LTE B13      | 777 ~ 787            | 25.00                         | 5.00                       |
|                         | LTE B14      | 788 ~ 798            | 25.00                         | 5.00                       |
|                         | LTE B25      | 1850 ~ 1915          | 25.00                         | 8.00                       |
|                         | LTE B26      | 814 ~ 849            | 25.00                         | 5.00                       |
|                         | LTE B30      | 2305 ~ 2315          | 25.00                         | 5.00                       |
|                         | LTE B38      | 2570 ~ 2620          | 25.00                         | 8.00                       |
|                         | LTE B41      | 2496 ~ 2690          | 26.50                         | 6.50                       |
|                         | LTE B48      | 3550 ~ 3700          | 25.00                         | 5.00                       |
|                         | LTE B66      | 1710 ~ 1780          | 25.00                         | 8.00                       |
| Collocated Transmitters | Wi-Fi 2.4GHz | 2412 ~ 2462          | 20.00                         | 5.00                       |
|                         | Wi-Fi 5GHz   | 5150 ~ 5825          | 25.00                         | 5.00                       |
|                         | Bluetooth    | 2402 ~ 2480          | 15.00                         | 5.00                       |

The End

## **Appendix A - EUT Photograph**

Refer to "2101RSU061-UE" file.