

RF Exposure Evaluation Declaration

FCC ID: XMR2020RM510QGL

Application: Quectel Wireless Solutions Company Limited

Application Type: Certification

Product: 5G Sub-6 GHz & mmWave M.2 Module

Model No.: RM510Q-GL

Brand Name: Quectel

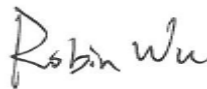
Test Procedure(s): KDB 447498 D01v06

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.

Revision History

Report No.	Version	Description	Issue Date	Note
2012RSU045-U8	Rev. 01	Initial Report	03-03-2021	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"/>	<p>Test Site - MRT Suzhou Laboratory</p> <p>Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China</p> <p>Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China</p> <p>Laboratory Accreditations</p> <p>A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: R-20025, G-20034, C-20020, T-20020</p>
<input type="checkbox"/>	<p>Test Site - MRT Shenzhen Laboratory</p> <p>Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China</p> <p>Laboratory Accreditations</p> <p>A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105</p>
<input type="checkbox"/>	<p>Test Site - MRT Taiwan Laboratory</p> <p>Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)</p> <p>Laboratory Accreditations</p> <p>TAF: L3261-190725 FCC: 291082, TW3261 ISED: TW3261</p>

2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name:	5G Sub-6 GHz & mmWave M.2 Module
Model No.:	RM510Q-GL
Brand Name:	Quectel
IMEI:	867034040010481, 867034040011117
Operating Temperature:	-20 ~ 60 °C
Power Type:	3.135 ~ 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, 17, 25, 26, 30, 38, 41, 48, 66, 71
Intra-Band:	CA_2C, CA_5B, CA_7C, CA_38C, CA_41C, CA_66C
Modulation:	UL & DL up to 256QAM
5G NR FR1 Specification	
SA Band:	n2, n5, n7, n12, n25, n41, n66, n71, n77
SA UL MIMO Band:	n41
EN-DC Band:	DC_5A_n2A, DC_12A_n2, DC_13A_n2A, DC_2A_n5A DC_30A_n5A, DC_66A_n5A, DC_5A_n7A, DC_12A_n7A DC_2A_n12A, DC_12A_n25A, DC_2A_n41A, DC_25A_n41A DC_26A_n41A, DC_66A_n41A, DC_5A_n66A, DC_12A_n66A DC_13A_n66A, DC_14A_n66A, DC_71A_n66A, DC_2A_n71A DC_7A_n71A, DC_66A_n71A
HPUE Band:	n41, n77
SCS for NR cell:	FDD Band: 15kHz; TDD Band: 30kHz
Modulation:	UL & DL up to 256QAM
5G NR FR2 Specification	
Band:	n260, n261
SCS for NR cell:	120kHz

Note: The module without passive antenna.

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 ²)	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	6
1500-100,000	--	--	1	30

f= Frequency in MHz

Calculation Formula: $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

Pd = power density in mW/cm²

Pout = 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

Pd is the limit of MPE, 1mW/cm². 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	5G Sub-6 GHz & mmWave M.2 Module
Test Item	RF Exposure Evaluation

Test Mode	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	ERP (EIRP) (dBm)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
WCDMA B2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000
WCDMA B4	1710 ~ 1755	25.00	5.00	30.00	0.1989	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	5.00	30.00	0.1989	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 B17	704 ~ 716	25.00	5.00	30.00	0.1989	0.4693
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	28.00	5.00	33.00	0.3969	1.0000
LTE B41	2496 ~ 2690	28.00	5.00	33.00	0.3969	1.0000
LTE B48	3550 ~ 3700	25.00	-2.00	23.00	0.0397	0.6988
LTE B66	1710 ~ 1780	25.00	5.00	30.00	0.1989	1.0000
LTE B71	663 ~ 698	25.00	5.00	30.00	0.1989	0.4420

Test Mode	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	ERP (EIRP) (dBm)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
n2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000
n5	824 ~ 849	25.00	5.00	30.00	0.1989	0.5493
n7	2500 ~ 2570	25.00	8.00	33.00	0.3969	1.0000
n12	699 ~ 716	25.00	5.00	30.00	0.1989	0.4660
n25	1850 ~ 1915	25.00	8.00	33.00	0.3969	1.0000
n41	2496 ~ 2690	28.00	5.00	33.00	0.3969	1.0000
n66	1710 ~ 1780	25.00	5.00	30.00	0.1989	1.0000
n71	663 ~ 698	25.00	5.00	30.00	0.1989	0.4420
n77	3700 ~ 3980	28.00	5.00	33.00	0.3969	1.0000

Product	5G Sub-6 GHz & mmWave M.2 Module
Test Item	Collocated Power Density Evaluation

Test Mode	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	ERP (EIRP) (dBm)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WCDMA B2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000	0.3969
WCDMA B4	1710 ~ 1755	25.00	5.00	30.00	0.1989	1.0000	0.1989
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	5.00	30.00	0.1989	1.0000	0.1989
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 B17	704 ~ 716	25.00	5.00	30.00	0.1989	0.4693	0.4238
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	28.00	5.00	33.00	0.3969	1.0000	0.3969
LTE B41	2496 ~ 2690	28.00	5.00	33.00	0.3969	1.0000	0.3969
LTE B48	3550 ~ 3700	25.00	-2.00	23.00	0.0397	0.6988	0.0568
LTE B66	1710 ~ 1780	25.00	5.00	30.00	0.1989	1.0000	0.1989
LTE B71	663 ~ 698	25.00	5.00	30.00	0.1989	0.4420	0.4500
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

Test Mode	Frequency Band (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	ERP (EIRP) (dBm)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
n2	1850 ~ 1910	25.00	8.00	33.00	0.3969	1.0000	0.3969
n5	824 ~ 849	25.00	5.00	30.00	0.1989	0.5493	0.3621
n7	2500 ~ 2570	25.00	8.00	33.00	0.3969	1.0000	0.3969
n12	699 ~ 716	25.00	5.00	30.00	0.1989	0.4660	0.4268
n25	1850 ~ 1915	25.00	8.00	33.00	0.3969	1.0000	0.3969
n41	2496 ~ 2690	28.00	5.00	33.00	0.3969	1.0000	0.3969
n66	1710 ~ 1780	25.00	5.00	30.00	0.1989	1.0000	0.1989
n71	663 ~ 698	25.00	5.00	30.00	0.1989	0.4420	0.4500
n77	3700 ~ 3980	28.00	5.00	33.00	0.3969	1.0000	0.3969

WWAN Power Density / Limit	Wi-Fi Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit)
0.4500	0.1989	0.0199	0.6688

Note:

1. For collocation analysis, n71 is chosen for summation due to the highest (power density / limit) among all WWAN wireless modes.
2. Σ (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.

————— The End —————

Appendix A - EUT Photograph

Refer to "2012RSU045-UE" file.