



RF Exposure Evaluation Declaration

FCC ID: XMR2021RM502QGL
Application: Quectel Wireless Solutions Company Limited

Application Type: Certification
Product: 5G Sub-6 GHz M.2 Module
Model No.: RM502Q-GL
Brand Name: Quectel
Test Procedure(s): KDB 447498 D01v06
Test Date: February 05 ~ May 18, 2021

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.

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Revision History

Report No.	Version	Description	Issue Date	Note
2101RSU049-U8	Rev. 01	Initial Report	05-22-2021	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

☒	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 FCC: CN1166 VCCI: R-20025, G-20034, C-20020, T-20020
☐	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 FCC: CN1284
☐	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

1.4. Product Information

Product Name	5G Sub-6 GHz M.2 Module
Model No.	RM502Q-GL
Brand Name	Quectel
Operating Temperature	-30 ~ 70 °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_48C, CA_66C
HPUE Band	Band 41
Modulation	UL & DL up to 256QAM
5G NR Specification	
SA Band	n2, n7, n5, n12, n25, n41, n66, n71, n77
SA UL MIMO Band	n41, n77
EN-DC Band	DC_25A_n41A, DC_26A_n41A, DC_2A_n41A, DC_66A_n41A DC_4A_n41A, DC_2A_n77A, DC_7A_n77A, DC_12A_n77A, DC_41A_n77A, DC_66A_n77A
HPUE Band	n41, n77 (SA & UL MIMO)
SCS for NR cell	FDD Band: 15kHz; TDD Band: 30kHz
Modulation	UL & DL up to 256QAM

2. RF Exposure Evaluation

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

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d 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.

2.2. Test Result of RF Exposure Evaluation

Product	5G Sub-6 GHz 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	-1.02	23.98	0.0497	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	1.0000
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 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	3.00	28.00	0.1255	0.4693	0.2674
LTE B25	1850 ~ 1915	25.00	8.00	33.00	0.3969	1.0000	0.3969
LTE B26	814 ~ 849	25.00	3.00	28.00	0.1255	0.5427	0.2313
LTE B30	2305 ~ 2315	25.00	-1.02	23.98	0.0497	1.0000	0.0497
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	1.0000	0.0397
LTE B66	1710 ~ 1780	25.00	5.00	30.00	0.1989	1.0000	0.1989
LTE B71	663 ~ 698	25.00	3.00	28.00	0.1255	0.4420	0.2839
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	3.00	28.00	0.1255	0.4660	0.2693
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	3.00	28.00	0.1255	0.4420	0.2839
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)
EN-DC Mode			
0.3696 + 0.3696	0.1989	0.0199	0.9580
MIMO Mode			
0.3696 + 0.3696	0.1989	0.0199	0.9580

Note:

1. For colocation analysis, Band 41 or n41 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 5G NR EN-DC & MIMO + 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 “2101RSU049-UE” file.