



RF MPE Report

Applicant: Quectel Wireless Solutions Company Limited
Address: Building 5, Shanghai Business Park Phase III (Area B), No.1016
Tianlin Road, Minhang District, Shanghai, China 200233
Product: 5G Sub-6 GHz LGA Module
Model No.: RG525F-NA
Brand Name: QUECTEL
FCC ID: XMR2023RG525FNA
Standards: 47 CFR Part 2.1091
FCC KDB 447498 D01 v06
Report No.: PD20240089-R3C
Issue Date: 2024/08/26
Test Result: PASS *

* Testing performed at Hefei Panwin Technology Co., Ltd. on the above equipment indicates the product meets the requirements of the relevant standards.

Reviewed By: Charlie Wang

Approved By: Alec Yang

Hefei Panwin Technology Co., Ltd.

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Revision History

Report No.	Version	Description	Issue Date	Note
PD20240089-R3C	01	Initial Report	2024/08/26	Valid

Remark:

- The samples tested have been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and have been proven to meet the applicable limit requirements.

CONTENTS

1 Test Laboratory	4
1.1 Notes of the Test Report	4
1.2 Testing Laboratory	4
2 General Description of Equipment under Test	4
2.1 Details of Application	4
2.2 Details of EUT	5
3 Test Condition	6
3.1 Laboratory Environment	6
4 Maximum Permissible Exposure (MPE)	7
ANNEX A: RF Exposure Evaluation	8
ANNEX B: The EUT Appearance	13

1 Test Laboratory

1.1 Notes of the Test Report

This report is invalid without signature of auditor and approver or with any alterations. The report shall not be partially reproduced without written approval of the testing company. Entrusted test results are only responsible for incoming samples. If there is any objection to the testing report, it shall be raised to the testing company within 15 days from the date of receiving the report. In the test results, "NA" means "not applicable", and the test items marked with "Δ" are subcontracted projects.

1.2 Testing Laboratory

Company Name	Hefei Panwin Technology Co., Ltd.
Address	Floor 1, Zone E, Plant 2#, Mingzhu Industrial Park, No.106 Chuangxin Avenue, High-tech Zone, Hefei City, Anhui Province, China
Telephone	+86-0551-63811775
Post Code	230031

2 General Description of Equipment under Test

2.1 Details of Application

Applicant	Quectel Wireless Solutions Company Limited
Applicant Address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer	Quectel Wireless Solutions Company Limited
Manufacturer Address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

2.2 Details of EUT

Product	5G Sub-6 GHz LGA Module
Model	RG525F-NA
Hardware Version	R1.0
Software Version	RG525FNAEAR05A01M4G
Antenna Type	<input checked="" type="checkbox"/> External <input type="checkbox"/> Integrated
<p>Note: The declared of product specification for EUT and/or Antenna presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.</p>	

3 Test Condition

3.1 Laboratory Environment

Temperature	Min.= 20°C, Max.=30°C
Relative Humidity	Min.= 25%, Max.=75%
Ground System Resistance	< 1 Ω

Ambient noise is checked and found very low and in compliance with requirement of standards.

Reflection of surrounding objects is minimized and in compliance with requirement of standards.

4 Maximum Permissible Exposure (MPE)

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Table 1 to § 1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)				
Frequency Range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	*(100)	≤6
3.0–30	1842/f	4.89/f	*(900/f ²)	<6
30–300	61.4	0.163	1.0	<6
300–1,500	--	--	f/300	<6
1,500–100,000	--	--	5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	<30
1.34–30	824/f	2.19/f	*(180/f ²)	<30
30–300	27.5	0.073	0.2	<30
300–1,500	--	--	f/1500	<30
1,500–100,000	--	--	1.0	<30
f = frequency in MHz. * = Plane-wave equivalent power density.				

The transmitter is using external antennas that operate at 20 cm or more from nearby persons. The maximum permitted level is calculated using the general equation:

$$S = PG / 4\pi R^2$$

Where:

S = power density (in appropriate units, e.g. Wm²)

P = power input to the antenna (in appropriate units, e.g., W)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., m)

Solve S, the power density at 20 cm is shown in Appendix A, so the limit is kept.

----- THE END -----

ANNEX A: RF Exposure Evaluation

Maximum Measured Conducted Output Power and Antenna Gain

Band	TX Freq. (MHz)	Maximum conducted output power (dBm)	Maximum Antenna Gain (dBi)
LTE Band 2	1850 to 1910	25.00	1.37
LTE Band 4	1710 to 1755	25.00	1.37
LTE Band 5	824 to 849	25.00	1.20
LTE Band 7	2500 to 2570	25.00	1.75
LTE Band 12	699 to 716	25.00	-2.60
LTE Band 13	777 to 787	25.00	-0.50
LTE Band 14	788 to 798	25.00	0.00
LTE Band 17	704 to 716	25.00	-1.50
LTE Band 25	1850 to 1915	25.00	1.37
LTE Band 26	814 to 849	25.00	1.20
LTE Band 30	2305 to 2315	22.00	1.10
LTE Band 38	2570 to 2620	28.00	1.60
LTE Band 41	2496 to 2690	28.00	1.80
LTE Band 42	3450 to 3550	28.00	0.95
LTE Band 43	3700 to 3800	28.00	0.60
LTE Band 48	3550 to 3700	22.00	0.60
LTE Band 66	1710 to 1780	25.00	1.37
LTE Band 71	663 to 698	25.00	-2.60
NR Band n2	1850 to 1910	25.00	1.37
NR Band n5	824 to 849	25.00	1.20
NR Band n7	2500 to 2570	25.00	1.75
NR Band n12	699 to 716	25.00	-2.60
NR Band n13	777 to 787	25.00	-0.50
NR Band n14	788 to 798	25.00	0.00
NR Band n25	1850 to 1915	25.00	1.37
NR Band n26	814 to 849	25.00	1.20
NR Band n30	2305 to 2315	22.00	1.10
NR Band n38	2570 to 2620	28.00	1.60
NR Band n41	2496 to 2690	28.00	1.80
NR Band n48	3550 to 3700	22.00	0.60
NR Band n66	1710 to 1780	25.00	1.37

NR Band n70	1695 to 1710	25.00	0.60
NR Band n71	663 to 698	25.00	-2.60
NR Band n77	3450 to 3550 3700 to 3980	28.00	0.60
NR Band n78	3450 to 3550 3700 to 3800	28.00	0.60

Test Results of Maximum Permissible Exposure

Band	Frequency (MHz)	Maximum Power (dBm)	Antenna Gain (dBi)	FCC ERP/EIRP Limit(W)	FCC MPE Result (mW/cm ²)	MPE Limit (mW/cm ²)	FCC MPE Result / FCC MPE Limit Ratio	Ant Gain to Meet FCC MPE limit (dBi)	Ant Gain to Meet FCC ERP/EIRP limit (dBi)	Max Gain Allowed (dBi)
LTE Band 2	1850.0	25.00	1.37	2.000	0.0862	1.0000	0.0862	12.0	8.0	8.0
LTE Band 4	1710.0	25.00	1.37	1.000	0.0862	1.0000	0.0862	12.0	5.0	5.0
LTE Band 5	824.0	25.00	1.20	7.000	0.0829	0.5493	0.1510	9.4	13.5	9.4
LTE Band 7	2500.0	25.00	1.75	2.000	0.0941	1.0000	0.0941	12.0	8.0	8.0
LTE Band 12	699.0	25.00	-2.60	3.000	0.0346	0.4660	0.0742	8.7	9.8	8.7
LTE Band 13	777.0	25.00	-0.50	3.000	0.0561	0.5180	0.1082	9.2	9.8	9.2
LTE Band 14	788.0	25.00	0.00	3.000	0.0629	0.5253	0.1198	9.2	9.8	9.2
LTE Band 17	704.0	25.00	-1.50	3.000	0.0445	0.4693	0.0949	8.7	9.8	8.7
LTE Band 25	1850.0	25.00	1.37	2.000	0.0862	1.0000	0.0862	12.0	8.0	8.0
LTE Band 26	814.0	25.00	1.20	7.000	0.0829	0.5427	0.1528	9.4	13.5	9.4
LTE Band 30	2305.0	22.00	1.10	0.250	0.0406	1.0000	0.0406	15.0	2.0	2.0
LTE Band 38	2570.0	28.00	1.60	2.000	0.1814	1.0000	0.1814	9.0	5.0	5.0
LTE Band 41	2496.0	28.00	1.80	2.000	0.1900	1.0000	0.1900	9.0	5.0	5.0
LTE Band 42	3450.0	28.00	0.95	1.000	0.1562	1.0000	0.1562	9.0	2.0	2.0
LTE Band 43	3700.0	28.00	0.60	1.000	0.1441	1.0000	0.1441	9.0	2.0	2.0
LTE Band 48	3550.0	22.00	0.60	0.200	0.0362	1.0000	0.0362	15.0	1.0	1.0
LTE Band 66	1710.0	25.00	1.37	1.000	0.0862	1.0000	0.0862	12.0	5.0	5.0
LTE Band 71	663.0	25.00	-2.60	3.000	0.0346	0.4420	0.0782	8.5	9.8	8.5
NR Band n2	1850.0	25.00	1.37	2.000	0.0862	1.0000	0.0862	12.0	8.0	8.0
NR Band n5	824.0	25.00	1.20	7.000	0.0829	0.5493	0.1510	9.4	13.5	9.4
NR Band n7	2500.0	25.00	1.75	2.000	0.0941	1.0000	0.0941	12.0	8.0	8.0
NR Band n12	699.0	25.00	-2.60	3.000	0.0346	0.4660	0.0742	8.7	9.8	8.7
NR Band n13	777.0	25.00	-0.50	3.000	0.0561	0.5180	0.1082	9.2	9.8	9.2
NR Band n14	788.0	25.00	0.00	3.000	0.0629	0.5253	0.1198	9.2	9.8	9.2
NR Band n25	1850.0	25.00	1.37	2.000	0.0862	1.0000	0.0862	12.0	8.0	8.0
NR Band n26	814.0	25.00	1.20	7.000	0.0829	0.5427	0.1528	9.4	13.5	9.4
NR Band n30	2305.0	22.00	1.10	0.250	0.0406	1.0000	0.0406	15.0	2.0	2.0
NR Band n38	2570.0	28.00	1.60	2.000	0.1814	1.0000	0.1814	9.0	5.0	5.0
NR Band n41	2496.0	28.00	1.80	2.000	0.1900	1.0000	0.1900	9.0	5.0	5.0
NR Band n48	3550.0	22.00	0.60	0.200	0.0362	1.0000	0.0362	15.0	1.0	1.0
NR Band n66	1710.0	25.00	1.37	1.000	0.0862	1.0000	0.0862	12.0	5.0	5.0
NR Band n70	1695.0	25.00	0.60	1.000	0.0722	1.0000	0.0722	12.0	5.0	5.0
NR Band n71	663.0	25.00	-2.60	3.000	0.0346	0.4420	0.0782	8.5	9.8	8.5
NR Band n77/n78	3450.0	28.00	0.60	1.000	0.1441	1.0000	0.1441	9.0	2.0	2.0
NR Band n77	3700.0	28.00	0.60	1.000	0.1441	1.0000	0.1441	9.0	2.0	2.0
NR Band n78	3700.0	28.00	0.60	1.000	0.1441	1.0000	0.1441	9.0	2.0	2.0

Note 1: For mobile or fixed location transmitters, minimum separation distance is 20cm, even if calculations indicate EMF distance is less.

Note 2: For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

Note 3: Chose the maximum RF output tune up power of all antennas among same frequency WWAN bands and the maximum antenna gain to perform MPE calculation conservatively.

Collocated Power Density Calculation

WWAN LTE Worst case situation	WWAN NR Worst case situation	Σ Worst case situation of WWAN LTE + WWAN NR
0.1900	0.1900	0.3800

Note:

1. For collocation analysis, LTE band 41 is chosen for summation due to the highest (power density/limit) among all LTE modes.
2. For collocation analysis, NR n41 is chosen for summation due to the highest (power density/limit) among all NR modes.
3. 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 LTE+ WWAN NR.
4. Considering the WWAN LTE module collocation with the WWAN NR transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant.

ANNEX B: The EUT Appearance

The EUT Appearance (internal and external photographs) are submitted separately.