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Report No.: 2401RSU047-U4 Report Version: V01 Issue Date: 2024-03-18

# **RF Exposure Evaluation Declaration**

FCC ID: XMR2023RG520NNA

**Applicant:** Quectel Wireless Solutions Co., Ltd

**Product:** 5G Sub-6 GHz LGA Module

Model No.: RG520N-NA

**Brand Name:** Quectel

FCC Rule Part(s): FCC Part 2.1091

**Result:** Complies

**Evaluation Date:** 2024-03-05

Approved By:

Robin Wu

Sunny Sun

Accredited

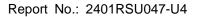
Testing Laboratory
CERTIFICATE #3628.01

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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Template Version:0.1 1 of 10





# **Revision History**

Report No.	Version	Description	Issue Date	Note
2401RSU047-U4	V01	Initial Report	2024-03-18	Valid

Note: This report is prepared for FCC Class II permissive supplement to FCC ID: XMR2023RG520NNA enable LTE band 42/43 & 5G NR n70 and 15MHz Bandwidth of n48 via SW.



# **CONTENTS**

Des	cription		Page
1.	Gene	ral Information	4
	1.1.	Applicant	4
	1.2.	Manufacturer	4
	1.3.	Testing Facility	4
	1.4.	Product Information	5
	1.5.	Antenna Details	5
	1.6.	Device Classification	5
	1.7.	Applied Standards	5
2.	RF E	xposure Evaluation	6
	2.1.	Test Limits	6
	2.2.	MPE Exemptions	7
	2.3.	Calculated Result	10



### 1. General Information

### 1.1. Applicant

Quectel Wireless Solutions Co., Ltd

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

#### 1.2. Manufacturer

Quectel Wireless Solutions Co., Ltd

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

# 1.3. Testing Facility

$\boxtimes$	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	ı Town, Suzhou Indu	strial Park, China		
	Laboratory Accre	ditations					
	A2LA: 3628.01		CNAS	: L10551			
	FCC: CN1166		ISED:	CN0001			
	VCCI:	□R-20025	□G-20034	□C-20020	□T-20020		
	VCCI.	□R-20141	□G-20134	□C-20103	□T-20104		
	Test Site - MRT S	henzhen Laborat	ory				
	Laboratory Location (Shenzhen)						
	1G, Building A, Jur	nxiangda Building,	Zhongshanyuan Roa	d West, Nanshan Di	strict, Shenzhen,		
	China						
	Laboratory Accreditations						
	A2LA: 3628.02		CNAS	: L10551			
	FCC: CN1284 ISED: CN0105						
	Test Site – MRT Taiwan Laboratory						
	Laboratory Location (Taiwan)						
	No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)						
	Laboratory Accreditations						
	TAF: 3261						
	FCC: 291082, TW	3261	ISED:	TW3261			



#### 1.4. Product Information

Product Name	5G Sub-6 GHz LGA Module	
Model No.	RG520N-NA	
Brand Name	Quectel	
IMEI	Conducted Measurement 1: 863109050294995	
	Conducted Measurement 2: 863109050298111	
	Conducted Measurement 3: 863109050295893	
	Radiated Measurement: 863109050298590	
2CDD Charification	LTE Band 2/4/5/7/12/13/14/17/25/26/29/30/38/41/42/43/46/48/66/71	
3GPP Specification	NR SA/NSA Band n2/5/7/12/13/14/25/26/29/30/38/41/48/66/70/71/77/78	
Temperature Operating Range	-30 ~ 75 °C	
Power Supply Rating 3.3 ~ 4.4Vdc, typical 3.8Vdc		
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall		

Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.

#### 1.5. Antenna Details

Technology	Frequency Range (MHz)	Antenna Type	MaxPeak Gain (dBi)
LTE Band 42	3450 ~ 3550	3450 ~ 3550	
LTE Band 43	3700 ~ 3800	<u></u>	0.58
NR n48	3550 ~ 3700	Dipole	0.58
NR n70	1695 ~ 1710		1.37

Note 1: All antenna information (Antenna type and Peak Gain) is provided by the manufacturer.

Note 2: The typical antennas used to calculate the ERP (EIRP).

#### 1.6. Device Classification

According to the user manual, the antenna of this device is at least 20cm away from the body of the user, this device is classified as a Mobile Device. So, the RF exposure evaluation requirements of § 2.1091 for mobile device exposure conditions subject to MPE limits.

#### 1.7. Applied Standards

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

• FCC Part 2.1091 & KDB 447498 D04 Interim General RF Exposure Guidance v01



# 2. RF Exposure Evaluation

#### 2.1. Test 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	Electric Field	Magnetic Field	Power Density	Average Time	
(MHz)	Strength (V/m)	Strength (A/m)	(mW/cm <sup>2</sup> )	(Minutes)	
	(A) Limits fo	r Occupational/ Contro	l Exposures		
0.3-3.0	614	1.63	*(100)	≤6	
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	<6	
30-300	61.4	0.163	1.0	<6	
300-1,500	-		f/300	<6	
1,500-100,000	1		5	<6	
(B) Limits for General Population/ Uncontrolled Exposures					
0.3-1.34	614	1.63	*(100)	<30	
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	<30	
30-300	27.5	0.073	0.2	<30	
300-1,500	1		f/1500	<30	
1,500-100,000			1.0	<30	

f= frequency in MHz. \* = Plane-wave equivalent power density.



#### 2.2. MPE Exemptions

**For single RF sources** (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph §1.1307(b)(2) of this section): A single RF source is exempt if:

**(Option A)** The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A) of this section.

Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A);

**(Option B)** Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P is given by:

$$P th(mW) = \{ERP_{20cm}(d / 20cm)^x d \le 20cm\}$$

$$P th(mW) = \{ERP_{20cm} 20cm < d \le 40cm\}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right)$$
 and f is in GHz;

and

$$ERP_{20cm}(mW) = \{2040f \ 0.3GHz \le f < 1.5GHz\}$$

$$ERP_{20cm}(mW) = \{3060 \ 1.5GHz \le f \le 6GHz \$$

(Option C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).



Table 1 to §1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1920R <sup>2</sup>
1.34-30	3450R <sup>2</sup> /f <sup>2</sup>
30-300	3.83R <sup>2</sup>
300-1,500	0.0128R <sup>2</sup> f
1,500-100,000	19.2R <sup>2</sup>

For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph §1.1307(b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \le 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for  $P_{th}$ , including existing exempt transmitters and those being added.

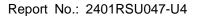
b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph 1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

 $P_i$  = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

 $P_{th,i}$  = the exemption threshold power ( $P_{th}$ ) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

 $ERP_j$  = the ERP of fixed, mobile, or portable RF source j.





 $ERP_{th,j}$  = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least  $\lambda/2\pi$  according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.

**Evaluated**<sub>k</sub> = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

**Exposure Limit**<sub>k</sub> = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.



Report No.: 2401RSU047-U4

#### 2.3. Calculated Result

Product	5G Sub-6 GHz LGA Module
Test Item	RF Exposure Evaluation

# For single RF source, Option B

Test Mode	Frequency Band (MHz)	MAX Tune-up Power (dBm)	R (m)	ERP (mW)	Thresholds ERP (mW)
LTE Band 42	3450 ~ 3550	28	0.20	439.5	3060
LTE Band 43	3700 ~ 3800	28	0.20	439.5	3060
NR n48	3550 ~ 3700	25	0.20	220.3	3060
NR n70	1695 ~ 1710	25	0.20	264.2	3060

### Remark:

- 1. Tune-up power was declared by manufacturer.
- 2. R is from user manual
- 3. The Max ERP (dBm) = Max Conducted Total Power (dBm) + Antenna Gain (dBi) 2.15.

The device qualifies for RF exposure test exemption.