

MPE TEST REPORT

Applicant Quectel Wireless Solutions Co., Ltd.

FCC ID XMR2023FGS060N

Product Wi-Fi , Bluetooth & 802.15.4 Module

Brand Quectel

Model FGS060N

Report No. R2304A0500-M1

Issue Date November 24, 2023

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC 47 CFR Part 1 1.1310**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA Technology (Shanghai) Co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test Facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: Building 3, No.145, Jintang Rd, Pudong Shanghai, P.R.China
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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 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.	

2 Description of Equipment Under Test

Client Information

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

General Technologies

Model	FGS060N		
SN	E1Y23EC27000023		
Hardware Version	R1.0		
Software Version	NA		
Frequency	Band	Tx (MHz)	Rx (MHz)
	Bluetooth	2400 ~ 2483.5	2400 ~ 2483.5
	Bluetooth LE	2400 ~ 2483.5	2400 ~ 2483.5
	Thread	2400 ~ 2483.5	2400 ~ 2483.5
	Wi-Fi 2.4G	2400 ~ 2483.5	2400 ~ 2483.5
	Wi-Fi 5G (U-NII-1)	5150 ~ 5250	5150 ~ 5250
	Wi-Fi 5G (U-NII-2A)	5250 ~ 5350	5250 ~ 5350
	Wi-Fi 5G (U-NII-2C)	5470 ~ 5600 5650 ~ 5725	5470 ~ 5600 5650 ~ 5725
	Wi-Fi 5G (U-NII-3)	5725 ~ 5850	5725 ~ 5850
Date of Testing	June 2, 2023 ~ November 21, 2023		
Date of Sample Received	May 31, 2023		

Note:

1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.
2. All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.

3 Maximum Output Power (Measured) and Antenna Gain

The numeric gain (G) of the antenna with a gain specified in dB is determined by

Numeric gain (G)= $10^{(antenna\ gain/10)}$

Band	Maximum Output Power (Measured)		Antenna Gain (dBi)	Numeric Gain
	(dBm)	(mW)		
Wi-Fi 2.4G	16.18	41.495	0.73	1.183
Wi-Fi 5G	15.93	39.174	1.14	1.300
Bluetooth	3.89	2.449	0.73	1.183
Bluetooth LE	2.83	1.919	0.73	1.183
Thread	4.73	2.972	0.73	1.183

4 Test Result

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following.

TABLE 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)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500 .....	.....	.....	f/300	6
1500-100,000 .....	.....	.....	5	6
(B) 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
300-1500 .....	.....	.....	f/1500	30
1500-100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Note1. Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

Note2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

The maximum permissible exposure for 1500~100,000MHz is 1.0. So

Band	The Maximum Permissible Exposure (mW/cm ²)
Wi-Fi 2.4GHz	1.000
Wi-Fi 5GHz	1.000
Bluetooth	1.000
Bluetooth LE	1.000
Thread	1.000

RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the conducted power, considering maximum power and antenna gain. The formula shown in KDB 447498 D01 is used in the calculation.

Equation from KDB 447498 D01 General RF Exposure Guidance v06 (10/23/2015) is:

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

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = Time-average maximum tune up procedure (in appropriate units, e.g., mW)

G = the numeric gain of the antenna

R = distance to the center of radiation of the antenna (20 cm = limit for MPE)

Band	Maximum Tune up (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)	PG (mW)	Result (mW/cm ²)	Limit Value (mW/cm ²)	The MPE ratio
Wi-Fi 2.4GHz	16.18	0.73	16.910	49.091	0.0098	1.000	0.0098
Wi-Fi 5GHz	15.93	1.14	17.070	50.933	0.0101	1.000	0.0101
Bluetooth	3.89	0.73	4.620	2.897	0.0006	1.000	0.0006
Bluetooth LE	2.83	0.73	3.560	2.270	0.0005	1.000	0.0005
Thread	4.73	0.73	5.460	3.516	0.0007	1.000	0.0007

Note: R = 20cm
 $\pi = 3.1416$
The MPE ratio = Mac Result ÷ Limit Value

So the simultaneous transmitting antenna pairs as below:

\sum of MPE ratios = Wi-Fi 2.4GHz Antenna + Wi-Fi 5GHz Antenna + Bluetooth Antenna + Thread Antenna = 0.0098 + 0.0101 + 0.0006 + 0.0007 = 0.0212 < 1

Note: For transmitters, minimum separation distance is 20cm, even if calculations indicate MPE distance is less.

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

*****END OF REPORT*****