



FCC RF EXPOSURE REPORT

FCC ID: XMR2025SC682ANA

Project No. : 2502H027
Equipment : LTE Module with Wi-Fi & Bluetooth
Brand Name : QUECTEL
Test Model : SC682A-NA
Series Model : N/A
Applicant : Quectel Wireless Solutions Co., Ltd.
Address : Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233, China.
Manufacturer : Quectel Wireless Solutions Co., Ltd.
Address : Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233, China.
Date of Receipt : Mar. 05, 2025
Date of Test : Mar. 05, 2025~Mar. 25, 2025
Issued Date : Apr. 21, 2025
Report Version : R00
Test Sample : Engineering Sample No.: SH20250305144
Standard(s) : KDB 447498 D04 Interim General RF Exposure Guidance v01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc. (Shanghai).

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-6-2502H027	R00	Original Report	Apr. 21, 2025	Valid

1. TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China
 BTL's Registration Number for FCC: 964234
 BTL's Designation Number for FCC: CN1374

2. GENERAL CONCLUSION

According to FCC §1.1307 and KDB 447498 D04, the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW).

1) Option A. 1-mW Test Exemption

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

2) Option B. SAR-Based Exemption

A more comprehensive exemption, considering a variable power threshold that depends on both the separation distance and power, is provided in § 1.1307(b)(3)(i)(B). This exemption is applicable to the frequency range between 300 MHz and 6 GHz, with test separation distances between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions.

Accordingly, a RF source is considered an RF exempt device if its available maximum time-averaged (matched conducted) power or its effective radiated power (ERP), whichever is greater, are below a specified threshold. 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_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

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

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Table B2-Example Power Thresholds (mW)

Frequency (MHz)	Distance(mm)										
	mW	5	10	15	20	25	30	35	40	45	50
	300	39	65	88	110	129	148	166	184	201	217
	450	22	44	67	89	112	135	158	180	203	226
	835	9	25	44	66	90	116	145	175	207	240
	1900	3	12	26	44	66	92	122	157	195	236
	2450	3	10	22	38	59	83	111	143	179	219
	3600	2	8	18	32	49	71	96	125	158	195
	5800	1	6	14	25	40	58	80	106	136	169

3) Option C MPE-Based Exemption

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

**TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES
SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION**

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R ²
1.34	–	30	35.6 m	–	1.6 m	3,450 R ² /f ²
30	–	300	1.6 m	–	159 mm	3.83 R ²
300	–	1,500	159 mm	–	31.8 mm	0.0128 R ² f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R ²
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

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.

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

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (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 (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 (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 λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated_k = 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_k = 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.

3 RF Exposure Results

3.1 Standalone Exposure Calculations

For conservativeness, the lowest frequency of each band is used to determine the mpe limit of that band. the manufacturing configures output power so that the maximum power, after accounting for manufacturing tolerances, will never exceed the maximum power level measured. the antenna gain in the tables below is the maximum antenna gain among various channels within the specified band.

Band	Freq. (MHz)	Antenna Gain (dBi)	Max. Output Power (dBm)	EIRP/ ERP (dBm)	EIRP/ ERP Limit (dBm)	limit Power Density (S) (mW/cm ²)	Gain According to Eirp/ERP (dBi)	Gain According to PD (dBi)	Maximum Gain allowed (dBi)	Results
B2	1850.7	1.8	25	26.8	33	1	8	11.92	8.00	Pass
B4	1710.7	1.2	25	26.2	30	1	5	11.92	5.00	Pass
B5	824.7	0.3	25	23.15	38.45	0.5498	15.6	11.47	11.47	Pass
B7	2502.5	1.4	25	26.4	33	1	8	11.92	8.00	Pass
B12	699.7	-0.5	25	22.35	34.77	0.4665	11.92	10.76	10.76	Pass
B13	779.5	-0.7	25	22.15	34.77	0.5197	11.92	11.23	11.23	Pass
B14	790.5	-0.5	25	22.35	34.77	0.527	11.92	11.29	11.29	Pass
B17	706.5	-0.5	25	22.35	34.77	0.471	11.92	10.80	10.80	Pass
B25	1850.7	1.8	25	26.8	33	1	8	11.92	8.00	Pass
B26 (Part90)	814.7	0.3	25	23.15	50	0.5431	27.15	11.42	11.42	Pass
B26 (Part22)	824.7	0.3	25	23.15	38.45	0.5498	15.6	11.47	11.47	Pass
B41	2498.5	1.4	25	26.4	33	1	8	11.92	8.00	Pass
B66	1710.7	1.5	25	26.5	30	1	5	11.92	5.00	Pass
B71	665.5	-0.9	25	24.1	34.77	0.4437	11.92	10.54	10.54	Pass
BT	2402	0.47	10.5	10.97	30	1	N/A			Pass
2.4G	2412	0.47	18.5	18.97	30	1				Pass
5G	5180	1.28	17.5	18.78	30	1				Pass

Remark: "Maximum Power" comes from the largest "Tune-up" provided by the customer.

3.2 MULTIPLE SOURCES EXPOSURE CALCULATIONS

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of E2, H2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity.

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

The product also has multiple transmitters The Simultaneous Transmission Possibilities are as below.

Simultaneous Tx Combination	Configuration
1	WLAN 5GHz+Bluetooth
2	WWAN+ WLAN 2.4GHz+Bluetooth
3	WWAN+ WLAN 5GHz+Bluetooth

Band	Freq. (MHz)	Power Density (S) At R=20cm (mW/cm ²)	limit Power Density (S) (mW/cm ²)	MEs
B2	1850.7	0.0952	1	0.0952
B4	1710.7	0.0829	1	0.0829
B5	824.7	0.0411	0.5498	0.0748
B7	2502.5	0.0868	1	0.0868
B12	699.7	0.0342	0.4665	0.0733
B13	779.5	0.0326	0.5197	0.0627
B14	790.5	0.0342	0.527	0.0649
B17	706.5	0.0342	0.471	0.0726
B25	1850.7	0.0952	1	0.0952
B26 (Part90)	814.7	0.0411	0.5431	0.0757
B26 (Part22)	824.7	0.0411	0.5498	0.0748
B41	2498.5	0.0868	1	0.0868
B66	1710.7	0.0889	1	0.0889
B71	665.5	0.0511	0.4437	0.1152
BT	2402	0.0025	1	0.0025
2.4G	2412	0.0157	1	0.0157
5G	5180	0.0150	1	0.0150

The worst-case combination:

Combination	MEs	Total MEs	Limit	Conclusion
B71	0.1152	0.1334	<1	Pass
WLAN 2.4GHz	0.0157			
Bluetooth	0.0025			

End of Test Report