



MPE TEST REPORT

Applicant Quectel Wireless Solutions Co., Ltd.

FCC ID XMR201707BG96

Product Quectel BG96

Brand Quectel

Model BG96

Report No. R2003A0151-M1

Issue Date August 18, 2020

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.

Handwritten signature of Yu Wang in black ink.

Performed by: Yu Wang

Handwritten signature of Guangchang Fan in black ink.

Approved by: Guangchang Fan

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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 electromagnetic emissions measurements.



1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
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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	7th Floor, Hongye Building, No. 1801 Hongmei Road, Xuhui District, Shanghai, China
Manufacturer	Quectel Wireless Solutions Co., Ltd.
Manufacturer address	7th Floor, Hongye Building, No. 1801 Hongmei Road, Xuhui District, Shanghai, China

General Technologies

Model	BG96
IMEI	864508030012063
Hardware Version	R1.0
Software Version	BG96MAR02A09M1G
Date of Testing	April 2, 2020~ August 12, 2020
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.	

BG96 (Report No: R2003A0151-M1) is a variant model of BG96 (Report No: RXA1706-0199MPE). All test items are tested in this report. The detailed product change description please refers to the Statement letter_BG96.

3 Maximum conducted 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		Burst Turn up Power(dBm)	Division Factors (dB)	Time-Averaged Tune up Power (dBm)
GSM 850	GSM	33.000	-9.03	23.970
GSM 1900	GSM	30.000	-9.03	20.970

Note:

Division Factors

To average the power, the division factor is as follows:

1Txslot = 1 transmit time slot out of 8 time slots

=> conducted power divided by (8/1) => -9.03 dB

Band	Maximum Conducted Output Power (dBm)	
	(dBm)	(mW)
GSM 850	23.970	249.459
GSM 1900	20.970	125.026
LTE Band 2	24.000	251.189
LTE Band 4	23.000	199.526
LTE Band 5	24.000	251.189
LTE Band 12	24.000	251.189
LTE Band 13	24.000	251.189
LTE Band 26	24.000	251.189
NB-IOT Band 2	25.000	316.228
NB-IOT Band 4	25.000	316.228
NB-IOT Band 5	25.000	316.228
NB-IOT Band 12	25.000	316.228
NB-IOT Band 13	25.000	316.228

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 300~1500 MHz is $f/1500$, for 1500~100,000MHz is 1.0. So

Band	The maximum permissible exposure (mW/cm ²)
GSM 850	0.566
GSM 1900	1.000
LTE Band 2	1.000
LTE Band 4	1.000
LTE Band 5	0.566
LTE Band 12	0.477
LTE Band 13	0.525
LTE Band 26	0.566
NB-IOT Band 2	1.000
NB-IOT Band 4	1.000
NB-IOT Band 5	0.566
NB-IOT Band 12	0.477
NB-IOT Band 13	0.525

Band	Maximum Conducted Output Power (dBm)	EIRP limit (dBm)	Margin1 (dB)	Power density Limit		Margin2 (dB)	Final Margin (dB)
				(mW/cm ²)	(dBm)		
GSM850	23.970	40.600	16.630	0.566	34.541	10.571	10.571
GSM1900	20.970	33.000	12.030	1.000	37.013	16.043	12.030
LTE Band 2	24.000	33.000	9.000	1.000	37.013	13.013	9.000
LTE Band 4	23.000	30.000	7.000	1.000	37.013	14.013	7.000
LTE Band 5	24.000	40.600	16.600	0.566	34.541	10.541	10.541
LTE Band 12	24.000	36.920	12.920	0.477	33.798	9.798	9.798
LTE Band 13	24.000	36.920	12.920	0.525	34.214	10.214	10.214
LTE Band 26	24.000	40.600	16.600	0.566	34.541	9.541	9.541
NB-IOT Band 2	25.000	33.000	8.000	1.000	37.013	12.013	8.000
NB-IOT Band 4	25.000	30.000	5.000	1.000	37.013	12.013	5.000
NB-IOT Band 5	25.000	40.600	15.600	0.566	34.541	9.541	9.541
NB-IOT Band 12	25.000	36.920	11.920	0.477	33.798	8.798	8.798
NB-IOT Band 13	25.000	36.920	11.920	0.525	34.214	9.214	9.214

Note: 1. The Maximum allowed antenna gain per Band should be less than or equal to the **Final Margin** which is the allowable maximum gain value to comply with limits for maximum permissible exposure (MPE).
2. The Final Margin is determined and selected to the worst-case of Margin1 and Margin2.
3. Margin1=EIRP Limit(dBm)-Maximum Conducted Power (dBm). EIRP limit reference standard part22/ part24/part27and part90 for each band, EIRP = ERP + 2.15 (dB).
4. Margin2=Power density Limit(dBm)-Maximum Conducted Power (dBm). Power density Limit(dBm): The max. obtained by MPE with 20cm.

IMPORTANT NOTE: To comply with the FCC RF exposure compliance requirements, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. No change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device.

**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	PG (mW)	Test Result (mW/cm ²)	Limit Value (mW/cm ²)	Conclusion
GSM850	2845.116	0.566	0.566	Pass
GSM1900	1995.262	0.397	1.000	Pass
LTE Band 2	1995.262	0.397	1.000	Pass
LTE Band 4	1000.000	0.199	1.000	Pass
LTE Band 5	2845.116	0.566	0.566	Pass
LTE Band 12	2397.728	0.477	0.477	Pass
LTE Band 13	2638.761	0.525	0.525	Pass
LTE Band 26	2259.956	0.450	0.566	Pass
NB-IOT Band 2	1995.262	0.397	1.000	Pass
NB-IOT Band 4	1000.000	0.199	1.000	Pass
NB-IOT Band 5	2845.116	0.566	0.566	Pass
NB-IOT Band 12	2397.728	0.477	0.477	Pass
NB-IOT Band 13	2638.761	0.525	0.525	Pass
Note: R = 20cm $\pi = 3.1416$				

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

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