



# MPE TEST REPORT

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

**FCC ID**        XMR2020BG95M1

**Product**        LTE Cat M1 Module

**Brand**          Quectel

**Marketing**      Quectel BG95-M1

**Model**          BG95-M1

**Report No.**     R1907A0450-M1V2

**Issue Date**    March 12, 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.

*Performed by: Yu Wang*

*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.

### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

### 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 $\Omega$
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

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

### General Technologies

<b>Model</b>	BG95-M1
<b>IMEI</b>	864622040009090
<b>Hardware Version</b>	R2.1
<b>Software Version</b>	BG95M1LAR02A02
<b>Date of Testing:</b>	August 20, 2019 ~ September 5, 2019

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.

**Note: This revised report (Report No.: R1907A0450-M1V2) supersedes and replaces the previously issued report (Report No.: R1907A0450-M1V1). Please discard or destroy the previously issued report and dispose of it accordingly.**

**BG95-M1 (Report No.: R1907A0450-M1V2) is a variant model of BG95-M3 (Report No.: R1907A0446-M1). Test values duplicated from Original for variant. There is no test for variant in this report. The detailed product change description please refers to the ANNEX A.**

### 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)= $10^{(\text{antenna gain}/10)}$

Band	Maximum Conducted Output Power (dBm)	
	(dBm)	(mW)
LTE Band 2	22.000	158.489
LTE Band 4	22.000	158.489
LTE Band 5	22.000	158.489
LTE Band 12	22.000	158.489
LTE Band 13	22.000	158.489
LTE Band 14	22.000	158.489
LTE Band 25	22.000	158.489
LTE Band 26	22.000	158.489
LTE Band 66	22.000	158.489
LTE Band 85	22.000	158.489

## 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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )
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 14	0.532
LTE Band 25	1.000
LTE Band 26	0.566
LTE Band 66	1.000
LTE Band 85	0.477





Band	Maximum Conducted Output Power (dBm)	EIRP limit (dBm)	Margin1 (dB)	Power density Limit		Margin2 (dB)	Final Margin (dB)
				(mW/cm <sup>2</sup> )	(dBm)		
LTE Band 2	22.000	33.000	11.000	1.000	37.013	15.013	11.000
LTE Band 4	22.000	30.000	8.000	1.000	37.013	15.013	8.000
LTE Band 5	22.000	40.600	18.600	0.566	34.541	12.541	12.541
LTE Band 12	22.000	36.920	14.920	0.477	33.798	11.798	11.798
LTE Band 13	22.000	36.920	14.920	0.525	34.214	12.214	12.214
LTE Band 14	22.000	36.920	14.920	0.532	34.272	12.272	12.272
LTE Band 25	22.000	33.000	11.000	1.000	37.013	15.013	11.000
LTE Band 26	22.000	40.600	18.600	0.566	34.541	12.541	12.541
LTE Band 66	22.000	30.000	8.000	1.000	37.013	15.013	8.000
LTE Band 85	22.000	36.920	14.920	0.477	33.798	11.798	11.798

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/cm<sup>2</sup>)

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 <sup>2</sup> )	Limit Value (mW/cm <sup>2</sup> )	Conclusion
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 14	2674.238	0.532	0.532	Pass
LTE Band 25	1995.262	0.397	1.000	Pass
LTE Band 26	2845.116	0.566	0.566	Pass
LTE Band 66	1000.000	0.199	1.000	Pass
LTE Band 85	2397.728	0.477	0.477	Pass
Note: R = 20cm π = 3.1416				

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



## ANNEX A : Product Change Description

Quectel Wireless Solutions Co., Ltd

### Statement

We Quectel Wireless Solutions Co., Ltd declare the following models.

**Product Name:** Cat M1 Module

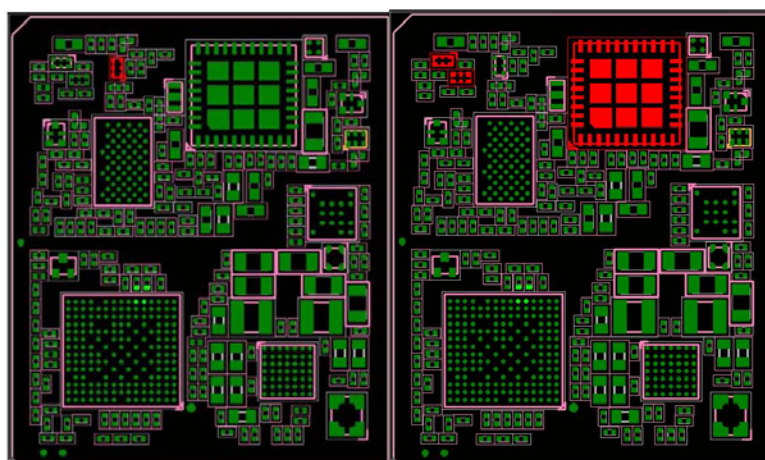
**Model Number:** BG95-M3, BG95-M1

**Hardware Version:** R2.1

Module	Category	Supported Band
BG95-M3	CatM1/NB-IoT/ GSM/GPRS/EGPRS	<b>Cat M1:</b>  LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/ B14/B18/B19/B20/B25/B26/B27/ B28/B66/B85  <b>Cat NB2:</b>  LTE-FDD:B1/B2/B3/B4/B5/B8/B12/B13/ B18/B19/B20/B25/B26/ B28/B66/B71/B85  <b>GSM/GPRS/ EGPRS:</b> 850/900/1800/1900MHz
BG95-M1	CatM1	<b>Cat M1:</b>  LTE-FDD:B1/B2/B3/B4/B5/B8/B12/B13/ B14/B18/B19/B20/B25/B26/ B27/B28/B66/B85

BG95-M1 and BG95-M3 share the same HW design, BG95-M1 only do removal of the component for GSM/GPRS/EGPRS on the hardware network according to the model requirement of the product definition, and BG95-M1 disable NB by SW on the basis of BG95-M3.

Quectel Wireless Solutions Co., Ltd



BG95-M3

BG95-M1

Designator	BG95-M3 (Part Description)	BG95-M1 (Part Description)
U602	NA	IC RF THIN-FILM Directional Coupler 450MHz-3800MHz 1.0x0.5mm H0.3mm RO
U603	IC RF SWITCH SP10T + GSM Qualband 5.3x5.5mm H0.905mm RO	NA
U502	IC RF LOW PASS FILTER 698-960MHz 1.0x0.5mm H0.4mm RO	NA
U504	IC RF TX LPF 1695-2180MHz 1.0x0.5mm H0.5mm RO	NA

The change will not impact RF performance of Cat M1 .

Your assistance on this matter is highly appreciated.

Sincerely,

Name: Jean Hu 

Title: Certification Section

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