

Report No.: SEWM2212000291RG02
 Rev.: 01
 Page: 1 of 8

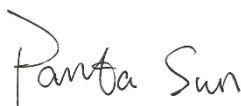
TEST REPORT

Application No.: SEWM2212000291RG
Applicant: Quectel Wireless Solutions Co., Ltd.
Address of Applicant: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China, 200233
Manufacturer: Quectel Wireless Solutions Co., Ltd.
Address of Manufacturer: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China, 200233
EUT Description: LTE Module
Model No.: EM05-G
Trade Mark: Quectel
FCC ID: XMR2022EM05G
Standards: 47 CFR Part 2.1091
 FCC KDB 447498 D01 v06
Date of Receipt: 2021/04/12
Date of Issue: 2022/12/05

Test Result:	PASS*
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* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Panta Sun
 Wireless Laboratory Manager



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Rev.: 01

Page: 2 of 8

1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022/12/05		Original

Prepared By		 <hr/> (Nick Hu) / Test Engineer
Checked By		 <hr/> (Well Wei) / Reviewer



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Contents

1	Version	2
2	General Information	4
2.1	Client Information	4
2.2	Test Facility	4
2.3	General Description of EUT	5
3	RF Exposure Evaluation	6
3.1	RF Exposure Compliance Requirement	6
3.1.1	Limits	6
3.1.2	Test Procedure	7
3.1.3	EUT RF Exposure Evaluation	7
3.1.4	Exposure calculations for multiple sources	7



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2 General Information

2.1 Client Information

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

2.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 6336.01)**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

• **FCC –Designation Number: CN1312**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.

Designation Number: CN1312.

Test Firm Registration Number: 717327



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2.3 General Description of EUT

EUT Description:	LTE Module
Model No.:	EM05-G
Trade Mark:	Quectel
Hardware Version:	R1.0
Software Version:	EM05GFAR07A05M1G
Antenna Type:	ANT1: External Antenna ANT2: PIFA Antenna
Antenna Gain:	WCDMA Band II: 1.59dBi (ANT1); 3.07dBi (ANT2);
	WCDMA Band IV: 1.94dBi (ANT1); 3.38dBi (ANT2);
	WCDMA Band V: 2.29dBi (ANT1); 3.96dBi (ANT2);
	LTE Band 2: 1.59dBi (ANT1); 3.07dBi (ANT2);
	LTE Band 4: 1.94dBi (ANT1); 3.38dBi (ANT2);
	LTE Band 5: 2.29dBi (ANT1); 3.96dBi (ANT2);
	LTE Band 7: 2.68dBi (ANT1); 3.15dBi (ANT2);
	LTE Band 12: 2.26dBi (ANT1); 3.60dBi (ANT2)
	LTE Band 13: 4.45dBi (ANT1); 3.55dBi (ANT2);
	LTE Band 14: 3.65dBi (ANT1); 3.55dBi (ANT2);
	LTE Band 25: 1.59dBi (ANT1); 3.07dBi (ANT2);
	LTE Band 26: 2.53dBi (ANT1); 3.96dBi (ANT2);
	LTE Band 38: 2.06dBi (ANT1); 3.22dBi (ANT2);
	LTE Band 41: 2.68dBi (ANT1); 3.31dBi (ANT2);
	LTE Band 66: 1.94dBi (ANT1); 3.70dBi (ANT2);
LTE Band 71: 1.66dBi (ANT1); 3.07dBi (ANT2);	
Note:	The antenna gain are derived from the gain information report provided by the manufacturer.
Remark:	As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.



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3 RF Exposure Evaluation

3.1 RF Exposure Compliance Requirement

3.1.1 Limits

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
3.0-30	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

RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules. The emissions should be within the limits at 300kHz in Table 1 of 1.1310(use the 300kHz limits for 150kHz:614V/m,1.63A/m).

Friis Formula

$$\text{Friis transmission formula: } Pd = (\text{Pout} * G) / (4 * \text{Pi} * R^2)$$

Where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.



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3.1.2 Test Procedure

Software provided by client enabled the EUT to transmit data at lowest, middle and highest channel individually

3.1.3 EUT RF Exposure Evaluation

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.0 / 2.0 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

This confirmed that the device comply with MPE limit.

Operating Band	Frequency (MHz)	Antenna Gain (dBi)	Max Conducted Average Output Power (dBm)	Output Power to Antenna (dBm)	EIRP(ERP) Limit (dBm)	Output Power to Antenna (mw)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Gain according to EIRP (dBi)	Gain according to Pd (dBi)	Max Gain Allowed (dBi)	MAX Power Density	conclusion
WCDMA B2	1852.4	3.07	25.50	28.57	33.00	354.8134	0.1431	1.0000	7.50	11.51	7.50	0.3969	Pass
WCDMA B4	1712.4	3.38	25.50	28.88	30.00	354.8134	0.1537	1.0000	4.50	11.51	4.50	0.1989	Pass
WCDMA B5	826.4	3.96	25.50	27.31	38.45	354.8134	0.1757	0.5509	15.10	8.92	8.92	0.5505	Pass
LTE B2	1880	3.07	25.50	28.57	33.00	354.8134	0.1431	1.0000	7.50	11.51	7.50	0.3969	Pass
LTE B4	1710.7	3.38	25.50	28.88	30.00	354.8134	0.1537	1.0000	4.50	11.51	4.50	0.1989	Pass
LTE B5	824.70	3.96	25.50	27.31	38.45	354.8134	0.1757	0.5498	15.10	8.91	8.91	0.5492	Pass
LTE B7	2502.50	3.15	25.50	28.65	33.00	354.8134	0.1458	1.0000	7.50	11.51	7.50	0.3969	Pass
LTE B12	699.70	3.60	25.50	26.95	34.77	354.8134	0.1617	0.4665	11.42	8.20	8.20	0.4664	Pass
LTE B13	779.50	3.55	25.50	26.90	34.77	354.8134	0.1599	0.5197	11.42	8.66	8.66	0.5185	Pass
LTE B14	790.5	3.55	25.50	26.90	34.77	354.8134	0.1599	0.5270	11.42	8.73	8.73	0.5269	Pass
LTE B25	1850.7	3.07	25.50	28.57	33.00	354.8134	0.1431	1.0000	7.50	11.51	7.50	0.3969	Pass
LTE B26(824-849)	824.7	3.96	25.50	27.31	38.45	354.8134	0.1757	0.5498	15.10	8.91	8.91	0.5492	Pass
LTE B38	2572.5	3.22	25.50	28.72	33.00	354.8134	0.1482	1.0000	7.50	11.51	7.50	0.3969	Pass
LTE B41	2498.5	3.32	25.50	28.82	33.00	354.8134	0.1516	1.0000	7.50	11.51	7.50	0.3969	Pass
LTE B66	1710.7	3.70	25.50	29.20	30.00	354.8134	0.1655	1.0000	4.50	11.51	4.50	0.1989	Pass
LTE B71	665.5	3.07	25.50	26.42	34.77	354.8134	0.1431	0.4437	11.42	7.98	7.98	0.4433	Pass
WLNA2.4GHz	2412	5.00	23.00	28.00		199.5262	0.1255	1.0000					
WLNA5GHz	5180	5.00	23.00	28.00		199.5262	0.1255	1.0000					
Bluetooth	2402	5.00	23.00	28.00		199.5262	0.1255	1.0000					

Note

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN is less than or equal to 28dBm and for Bluetooth is less than or equal to 28dBm.
2. A maximum antenna gain of 5dBi for WLAN/BT has been assumed for all collocated antennas.



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3.1.4 Exposure calculations for multiple sources

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. That is

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

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

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) WWAN + WLAN + Bluetooth
0.5505	0.1255	0.1255	0.8015

Note: Considering the WWAN module collocation with the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant.

---End of Report---



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