TEST REPORT

Application No.:	SEWA2204000008RG
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:	5G Sub-6 GHz M.2 Module
Model No.:	RM520N-GL
Trade Mark:	Quectel
FCC ID:	XMR2022RM520NGL
Standards:	47 CFR Part 2.1091 FCC KDB 447498 D01 v06
Date of Receipt:	2022/4/14
Date of Issue:	2022/7/11
Test Result:	**PASS***

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Panta Sun

Panta Sun
Wireless Laboratory Manager

1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2022/7/11		Original

Prepared By		Weller Liu **(Weller Liu) / Test Supervisor**
Checked By		Well Wei **(Well Wei) / Reviewer**

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Contents

2 General Information

2.1 Client Information

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

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

2.3 General Description of EUT

EUT Description:	5G Sub-6 GHz M.2 Module		
Model No.:	RM520N-GL		
Trade Mark:	Quectel		
Hardware Version:	R1.0		
Software Version:	RM520NGLAAR01A06M4G		
Antenna Type:	☒ External, ☐ Integrated		
Frequency Bands:	Band	TX	RX
	UMTS Band II	1850 to 1910 MHz	1930 to 1990 MHz
	UMTS Band IV	1710 to 1755 MHz	2110 to 2155 MHz
	UMTS Band V	824 to 849 MHz	869 to 894 MHz
	LTE Band 2	1850 to 1910 MHz	1930 to 1990 MHz
	LTE Band 4	1710 to 1755 MHz	2110 to 2155 MHz
	LTE Band 5	824 to 849 MHz	869 to 894 MHz
	LTE Band 7	2500 to 2570 MHz	2620 to 2690 MHz
	LTE Band 12	699 to 716 MHz	729 to 746 MHz
	LTE Band 13	777 to 787 MHz	746 to 756 MHz
	LTE Band 14	788 to 798 MHz	758 to 768 MHz
	LTE Band 17	704 to 716 MHz	734 to 746 MHz
	LTE Band 25	1850 to 1915MHz	1930 to 1995 MHz
	LTE Band 26 (814 to 824 MHz)	814 to 824MHz	859 to 869 MHz
	LTE Band 26 (824 to 849 MHz)	824 to 849 MHz	869 to 894 MHz
	LTE Band 30	2305 to 2315 MHz	2350 to 2360 MHz
	LTE Band 38	2570 to 2620 MHz	2570 to 2620 MHz
	LTE Band 41	2496 to 2690MHz	2496 to 2690MHz
	LTE Band 42	3450 to 3500 MHz	3450 to 3500 MHz
	LTE Band 43	3700 to 3800 MHz	3700 to 3800 MHz
	LTE Band 48	3550 to 3700 MHz	3550 to 3700 MHz
	LTE Band 66	1710 to 1780 MHz	2110 to 2180 MHz
	LTE Band 71	663 to 698 MHz	617 to 652 MHz
	NR Band n2	1850 to 1910 MHz	1930 to 1990 MHz
	NR Band n5	824 to 849 MHz	869 to 894 MHz

	NR Band n7	2500 to 2570 MHz	2620 to 2690 MHz
	NR Band n12	699 to 716 MHz	729 to 746 MHz
	NR Band n13	777 to 787 MHz	746 to 756 MHz
	NR Band n14	788 to 798 MHz	758 to 768 MHz
	NR Band n25	1850 to 1915MHz	1930 to 1995 MHz
	NR Band n26 (814 to 824 MHz)	814 to 824MHz	859 to 869 MHz
	NR Band n26 (824 to 849 MHz)	824 to 849 MHz	869 to 894 MHz
	NR Band n30	2305 to 2315 MHz	2350 to 2360 MHz
	NR Band n38	2570 to 2620 MHz	2570 to 2620 MHz
	NR Band n41	2496 to 2690 MHz	2496 to 2690 MHz
	NR Band n48	3550 to 3700 MHz	3550 to 3700 MHz
	NR Band n66	1710 to 1780 MHz	2110 to 2180 MHz
	NR Band n70	1695 to 1710 MHz	1995 to 2020 MHz
	NR Band n71	663 to 698 MHz	617 to 652 MHz
	NR Band n77	3700 to 3980 MHz	3700 to 3980 MHz
		3450 to 3550 MHz	3450 to 3550 MHz
	NR Band n78	3700 to 3800 MHz	3700 to 3800 MHz
		3450 to 3550 MHz	3450 to 3550 MHz
	GNSS (BDS+ Galileo+ GLONASS+ GPS+ SBAS)	N/A	1559-1610
	CA: UL CA_2C; UL CA_5B; UL CA_7C; UL CA_38C; UL CA_41C; UL CA_43C; UL CA_66C; UL CA_66B; UL CA_48C; UL CA_42C; UL CA_2A-4A; UL CA_2A-5A; UL CA_2A-7A; UL CA_2A-12A; UL CA_2A-13A; UL CA_2A-30A; UL CA_2A-66A; UL CA_4A-5A; UL CA_4A-7A; UL CA_4A-12A; UL CA_4A-13A; UL CA_4A-30A; UL CA_5A-7A; UL CA_5A-30A; UL CA_5A-66A; UL CA_12A-30A; UL CA_12A-66A; UL CA_13A-66A; UL CA_14A-30A; ENDC:		

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	DC_13A_n66A;DC_5A_n2A;DC_14A_n2A;DC_30A_n2A;DC_2A_n5A; DC_30A_n5A;DC_66A_n5A;DC_2A_n12A;DC_66A_n12A;DC_2A_n66A; DC_5A_n66A;DC_12A_n66A;DC_14A_n66A;DC_30A_n66A;DC_12A_n2A; DC_66A_n2A;DC_71A_n2A;DC_12A_n41A;DC_71A_n66A;DC_2A_n71A DC_66A_n71A;DC_66A_n25A;DC_25A_n41A;DC_12A_n78A;DC_13A_n78A DC_25A_n78A;DC_12A_n77A;DC_13A_n77A;DC_14A_n77A;DC_26A_n78A DC_2A_n78A;DC_26A_n41A;DC_2A_n41A;DC_7A_n5A;DC_38A_n78A DC_7A_n71A;DC_41A_n78A;DC_5A_n7A;DC_12A_n7A;DC_66A_n7A DC_13A_n2A;DC_48A_n5A;DC_48A_n66A;DC_7A_n66A;DC_2A_n48A DC_5A_n48A;DC_13A_n48A;DC_66A_n48A;DC_4A_n78A;DC_20A_n77A DC_5A_n78A;DC_4A_n41A;DC_66A_n38A;DC_2A_n38A;DC_12A_n38A DC_4A_n38A;DC_5A_n38A;DC_66A_n78A;DC_12A_n25A;DC_25A_n77A DC_2A_n77A;DC_71A_n78A;DC_71A_n38A;DC_13A_n7A;DC_5A_n41A DC_66A_n41A;DC_2A_n7A;DC_7A_n2A;DC_5A_n40A;DC_30A_n77A DC_41A_n77A;DC_7A_n78A;DC_48A_n25A;DC_66A_n28A;DC_71A_n41A DC_28A_n66A;DC_30A_n12A;DC_2A_n14A;DC_30A_n14A;DC_66A_n14A DC_2A_n30A;DC_5A_n30A;DC_12A_n30A;DC_14A_n30A;DC_66A_n30A DC_71A_n7A;DC_7A_n12A;DC_5A_n77A;DC_66A_n77A;DC_71A_n77A DC_4A_n2A;DC_7A_n25A;DC_71A_n25A;DC_5A_n25A;DC_26A_n25A DC_4A_n7A;DC_13A_n25A;DC_7A_n77A;DC_48A_n71A;DC_48A_n12A NR UL CA: n25A-n41A;n41A-n66A;n41A-n71A;n7A-n78A;n5A-n78A n66A-n78A;n7A-n77A;n2A-n77A;n5A-n77A;n66A-n77A n30A-n77A;n48A-n66A;n2A-n48A;n5A-n48A;n48A-n70A n48A-n71A;n71A-n77A;n71A-n78A;n25A-n78A;n38A-n66A n25A-n48A;n25A-n77A;n25A-n38A;n13A-n77A			
Antenna Gain*:	☒Provided by client			
	WCDMA Band II:	0.91dBi	WCDMA Band IV:	1.47dBi
	WCDMA Band V:	2.68dBi		
	LTE Band 2:	0.91dBi(Ant0)	LTE Band 4:	-1.47dBi(Ant0)

	LTE Band 5:	2.68dBi(Ant0)	LTE Band 7:	0.55dBi(Ant0)
	LTE Band 12:	-0.2dBi(Ant0)	LTE Band 13:	1.54dBi(Ant0)
	LTE Band 14:	2.42dBi(Ant0)	LTE Band 17:	-0.2dBi(Ant0)
	LTE Band 25:	0.25dBi(Ant0)	LTE Band 26:	2.87dBi(Ant0)
	LTE Band 30:	-5.7dBi(Ant0)	LTE Band 38:	-0.23dBi(Ant0)
	LTE Band 41:	0.78dBi(Ant0)	LTE Band 42:	-6.1dBi(Ant0)
	LTE Band 43:	-6.1dBi(Ant0)	LTE Band 66:	-1.47dBi(Ant0)
	LTE Band 71:	1.22dBi(Ant0)	LTE CA_2C:	0.91dBi(Ant0)
	LTE Band 48:	-6.10dBi(Ant0)	LTE CA_48C:	-6.10dBi(Ant0)
	LTE CA_5B:	2.68dBi(Ant0)	LTE CA_7C:	0.55dBi(Ant0)
	LTE CA_38C:	-0.23dBi(Ant0)	LTE CA_41C:	0.78dBi(Ant0)
	LTE CA_43C:	-6.1dBi(Ant0)	LTE CA_66B:	-1.47dBi(Ant0)
	LTE CA_66C:	-1.47dBi(Ant0)		
	n2:	0.25dBi (Ant0)	n5:	2.68dBi (Ant0)
	n7:	0.55dBi (Ant0)	n12:	-0.2dBi (Ant0)
	n13:	1.54dBi (Ant0)	n14:	2.42dBi (Ant0)
	n25:	0.25dBi (Ant0)	n26:	2.87dBi (Ant0)
	n30:	-5.7dBi (Ant0)	n38 MIMO:	-0.23dBi (Ant0); -0.23dBi (Ant2)
	n41 MIMO:	0.78dBi (Ant0); 0.78dBi (Ant2)	n66:	1.47dBi (Ant0)
	n48 MIMO:	-6.10dBi (Ant0) -6.10dBi (Ant2)	n70:	1.3dBi (Ant2)
	n71:	1.22dBi (Ant0)	n77 MIMO:	-6.1dBi (Ant0); -6.1dBi (Ant2)
	n78 MIMO:	-6.1dBi (Ant0); -6.1dBi (Ant2)		

Note: *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, SGS is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
Remark:

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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.

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/cm2)	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/f2)	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/f2)	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

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

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 id 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 where the MPE limit is reached.

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.
* Indicates PSD

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/cm2)	Limit (mW/cm2)	Gain according to EIRP (dBi)	Gain according to Pd (dBi)	Max Gain Allowed (dBi)	conclusion
WCDMA B2	1852.4	0.91	25.00	25.91	33.00	316.2278	0.0776	1.0000	8.00	12.01	8.00	Pass
WCDMA B4	1712.4	1.47	25.00	26.47	30.00	316.2278	0.0883	1.0000	5.00	12.01	5.00	Pass
WCDMA B5	826.4	2.68	25.00	25.53	38.45	316.2278	0.1166	0.5509	15.60	9.42	9.42	Pass
LTE B2/CA_2C/n2	1880	0.91	25.00	25.91	33.00	316.2278	0.0776	1.0000	8.00	12.01	8.00	Pass
LTE B4	1710.7	-1.47	25.00	23.53	30.00	316.2278	0.0448	1.0000	5.00	12.01	5.00	Pass
LTE B5/CA_5B/n5	824.70	2.68	25.00	25.53	38.45	316.2278	0.1166	0.5498	15.60	9.41	9.41	Pass
LTE B7/CA_7C/n7	2502.50	0.55	25.00	25.55	33.00	316.2278	0.0714	1.0000	8.00	12.01	8.00	Pass
LTE B12/n12	699.70	-0.20	25.00	22.65	34.77	316.2278	0.0601	0.4665	11.92	8.70	8.70	Pass
LTE B13/n13	779.50	1.54	25.00	24.39	34.77	316.2278	0.0897	0.5197	11.92	9.16	9.16	Pass
LTE B14/n14	790.5	2.42	25.00	25.27	34.77	316.2278	0.1098	0.5270	11.92	9.23	9.23	Pass
LTE B17	706.5	-0.20	25.00	22.65	34.77	316.2278	0.0601	0.4710	11.92	8.74	8.74	Pass
LTE B25/n25	1850.7	0.25	25.00	25.25	33.00	316.2278	0.0666	1.0000	8.00	12.01	8.00	Pass
LTE B26/n26(814-824)	814.7	2.87	25.00	25.72		316.2278	0.1218	0.5431		9.36	9.36	Pass
LTE B26/n26(824-849)	824.7	2.87	25.00	25.72	38.45	316.2278	0.1218	0.5498	15.60	9.41	9.41	Pass
LTE B30/n30*	2307.5	-5.7	25.00	19.30	23.98	316.2278	0.0169	1.0000	-1.02	12.01	-1.02	Pass
LTE B38/n38/CA_38C	2572.5	-0.23	28.00	27.77	33.00	630.9573	0.1191	1.0000	1.99	9.01	1.99	Pass
LTE B48/n48/CA_48C*	3550	-6.1	25.00	18.90	23.00	316.2278	0.0154	1.0000	-5.01	12.01	-5.01	Pass
LTE B41/CA_41C/n41	2498.5	0.78	28.00	28.78	33.00	630.9573	0.1502	1.0000	1.99	9.01	1.99	Pass
LTE B42/42C(3450-3550)	3452.5	-6.1	28.00	21.90	30.00	630.9573	0.0308	1.0000	2.00	9.01	2.00	Pass
LTE B43(3700-3800)	3702.5	-6.1	28.00	21.90	30.00	630.9573	0.0308	1.0000	2.00	9.01	2.00	Pass
LTE B66/n66	1710.7	-1.47	25.00	23.53	30.00	316.2278	0.0448	1.0000	5.00	12.01	5.00	Pass
NR Band n70	1997.5	1.3	25.00	26.30	30.00	316.2278	0.0849	1.0000	5.00	12.01	5.00	Pass
LTE B71/n71	665.5	1.22	25.00	24.07	34.77	316.2278	0.0833	0.4437	11.92	8.48	8.48	Pass
NR Band n77	3455.01	-6.1	28.00	21.90	30.00	630.9573	0.0308	1.0000	-1.01	9.01	-1.01	Pass
NR Band n78	3455.01	-6.1	28.00	21.90	30.00	630.9573	0.0308	1.0000	-1.01	9.01	-1.01	Pass

Due to the EUT support NR ENDC and CA
Both LTE and NR/LTE band can transmit simultaneously, the formula of the calculated the MPE is:

$$\sum_{i=1}^{n} \frac{S_{E_i}(duty\,factor)}{MPE_{E_i}} < 1$$

NOTE The corresponding MEs must be expressed in terms of power density in the above summation
Therefore, the worst-case(CA_5B) situation is 0.212+0.212=0.424,which is less than “1”， this confirmed that the device comply with MPE limit.

The End