



RF Test Report

Applicant: Quectel Wireless Solutions Co., Ltd.
Address: Building 5, Shanghai Business Park Phase III (Area B), No.1016
Tianlin Road, Minhang District, Shanghai, China, 200233
Product: LTE Module
Model No.: EC21-A
Brand Name: QUECTEL
FCC ID: XMR201606EC21A
Standards: 47 CFR Part 2.1091
FCC KDB 447498 D01 v06
Report No.: PD20240066RF02
Issue Date: 2024/05/31
Test Result: PASS *

* The above equipment has been tested and compliance with the requirement of the relative standards by Hefei Panwin Technology Co., Ltd.

Reviewed By: Jerry Zhang

Approved By: Alec Yang

Hefei Panwin Technology Co., Ltd.

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Revision History

Report No.	Version	Description	Issue Date	Note
PD20240066RF02	1	Initial Report	2024/05/31	Valid

Remark:

- We, Hefei Panwin Technology Co., Ltd., would like to declare that the tested sample has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Hefei Panwin Technology Co., Ltd., the test report shall not be reproduced except in full.

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1 Test Laboratory

1.1 Notes of the Test Report

This report is invalid without signature of auditor and approver or with any alterations. The report shall not be partially reproduced without written approval of the testing company. Entrusted test results are only responsible for incoming samples. If there is any objection to the testing report, it shall be raised to the testing company within 15 days from the date of receiving the report. In the test results, "NA" means "not applicable", and the test items marked with "Δ" are subcontracted projects.

1.2 Testing Laboratory

Company Name	Hefei Panwin Technology Co., Ltd.
Address	Floor 1, Zone E, Plant 2#, Mingzhu Industrial Park, No.106 Chuangxin Avenue, High-tech Zone, Hefei City, Anhui Province, China
Telephone	+86-0551-63811775
Post Code	230031

2 General Description of Equipment under Test

2.1 Details of Application

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

2.2 Details of EUT

Product	LTE Module
Model	EC21-A
Series Model	EC21-A MINIPCIE
Model Difference(s)	Only the connector interface is different for the marketing requirement.
Hardware Version	R2.0
Software Version	EC21AFAR05A07M4G
SN	Conducted: Radiated:
Antenna Type	☒ External ☐ Integrated
Note: The declared of product specification for EUT and/or Antenna presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.	

3 Test Condition

3.1 Laboratory Environment

Temperature	Min.= 20℃, Max.=30℃
Relative Humidity	Min.= 25%, Max.=75%
Ground System Resistance	< 1 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.	

4 Maximum Permissible Exposure (MPE)

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Table 1 to § 1.1310(e)(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)
(i) Limits for Occupational/Controlled Exposure				
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
300–1,500	--	--	f/300	<6
1,500–100,000	--	--	5	<6
(ii) 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
300–1,500	--	--	f/1500	<30
1,500–100,000	--	--	1.0	<30
f = frequency in MHz. * = Plane-wave equivalent power density.				

The transmitter is using external antennas that operate at 20 cm or more from nearby persons. The maximum permitted level is calculated using the general equation:

$$S = PG / 4\pi R^2$$

Where:

S = power density (in appropriate units, e.g. Wm²)

P = power input to the antenna (in appropriate units, e.g., W)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., m)

Solve S, the power density at 20 cm is shown in Appendix A, so the limit is kept.

Appendix A – Test Results

A.1 Maximum Measured Conducted Output Power and Antenna Gain

Band	TX Freq. (MHz)	Maximum conducted output power (dBm)	Maximum Antenna Gain (dBi)
WCDMA Band II	1850 to 1910	25.00	1.59
WCDMA Band IV	1710 to 1755	25.00	2.00
WCDMA Band V	824 to 849	25.00	2.13
LTE Band 2	1850 to 1910	25.00	1.59
LTE Band 4	1710 to 1755	25.00	2.00
LTE Band 12	699 to 716	25.00	3.26

A.2 Test Results of Maximum Permissible Exposure

Band	Frequency (MHz)	Maximum Power (dBm)	Antenna Gain (dBi)	FCC EIRP Limit (dBm)	FCC MPE Result (mW/cm ²)	MPE Limit (mW/cm ²)	Ant Gain to Meet FCC MPE limit (dBi)	Ant Gain to Meet FCC ERP/EIRP limit (dBi)	Max Gain Allowed (dBi)
WCDMA Band II	1850.0	25.00	1.59	33.01	0.0907	1.0000	12.0	8.0	8.0
WCDMA Band IV	1710.0	25.00	2.00	30.00	0.0997	1.0000	12.0	5.0	5.0
WCDMA Band V	824.0	25.00	2.13	40.60	0.1027	0.5493	9.4	13.5	9.4
LTE Band 2	1850.0	25.00	1.59	33.01	0.0907	1.0000	12.0	8.0	8.0
LTE Band 4	1710.0	25.00	2.00	30.00	0.0997	1.0000	12.0	5.0	5.0
LTE Band 12	699.0	25.00	3.26	36.92	0.1333	0.4660	8.7	9.8	8.7

Note 1: For mobile or fixed location transmitters, minimum separation distance is 20cm, even if calculations indicate EMF distance is less.

Note 2: For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

Note 3: Chose the maximum RF output tune up power of all antennas among same frequency WWAN bands and the maximum antenna gain to perform MPE calculation conservatively.

Appendix B – The EUT Appearance

Refer to “Attachment A.1: External Photograph” and “ Attachment A.2: Internal Photograph” file.

***** End of the Report *****