



MPE TEST REPORT

Applicant	Quectel Wireless Solutions Co., Ltd.
FCC ID	XMR202012EC25T
Product	LTE Module
Brand	Quectel
Model	EC25-T, EC25-T MINIPCIE
Marketing	Quectel EC25-T, Quectel EC25-T MINIPCIE
Report No.	R2011A0762-M1
Issue Date	December 11, 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.

Prepared by: Yu Wang

Handwritten signature of Guangchang Fan in black ink.

Approved by: Guangchang Fan

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000



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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
Post code: 201201
Country: P. R. China
Contact: Fan Guangchang
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: fanguangchang@ta-shanghai.com



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.	

EC25-T, EC25-T MINIPCIE (Report No.: R2011A0762-M1) is a variant model of EC25-AF, EC25-AF MINIPCIE (Report No.: R1806A0301-M1V3). There is no test for variant in this report. All data duplicated from the model of EC25-AF, EC25-AF MINIPCIE (Report No.: R1806A0301-M1V3). The detailed product change description please refers to following ANNEX B.

2 Description of Equipment under Test

Client Information

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

General Technologies

Model	EC25-T, EC25-T MINIPCIE
IMEI	EC25-T: 861041050000597 EC25-T MINIPCIE: 861041050001272
Hardware Version	R1.0
Software Version	EC25TFAR11A01M4G
Date of Testing:	June 29, 2018~ July 16, 2018
<p>Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.</p> <p>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.</p>	

Note: The detailed model difference description please refers to the ANNEX C.

3 Maximum conducted output power

The numeric gain (G) of the antenna with a gain specified in dB is determined by
$$\text{Numeric gain (G)} = 10^{(\text{antenna gain}/10)}$$

Band	Maximum Conducted Output Power (dBm)	
	(dBm)	(mW)
LTE Band 2	25.00	316.23
LTE Band 4	25.00	316.23
LTE Band 5	25.00	316.23
LTE Band 12	25.00	316.23
LTE Band 66	25.00	316.23
LTE Band 71	25.00	316.23

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
LTE Band 2	1.0mW/cm^2
LTE Band 4	1.0mW/cm^2
LTE Band 5	0.55mW/cm^2
LTE Band 12	0.47mW/cm^2
LTE Band 66	1.0mW/cm^2
LTE Band 71	0.45mW/cm^2



Band	Maximum Conducted Output Power (dBm)	EIRP limit (dBm)	Margin1 (dB)	Power density Limit		Margin2 (dB)	Final Margin (dB)
				(mW/cm ²)	(dBm)		
LTE Band 2	25.000	33.000	8.000	1.000	37.013	12.013	8.000
LTE Band 4	25.000	30.000	5.000	1.000	37.013	12.013	5.000
LTE Band 5	25.000	40.600	15.600	0.550	34.416	9.416	9.416
LTE Band 12	25.000	36.920	11.920	0.470	33.734	8.734	8.734
LTE Band 66	25.000	30.000	5.000	1.000	37.013	12.013	5.000
LTE Band 71	25.000	36.920	11.920	0.450	33.545	8.545	8.545

Note: 1. The Maximum allowed antenna gain per Band should be less than or equal to the Final Margin.

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	Maximum Conducted Output Power (dBm)	MAX. antenna gain (dBi)	PG		Test Result (mW/cm ²)	Limit Value (mW/cm ²)	Conclusion
			(dBm)	(mW)			
LTE Band 2	25.00	8.000	33.000	1995.262	0.397	1.000	Pass
LTE Band 4	25.00	5.000	30.000	1000.000	0.199	1.000	Pass
LTE Band 5	25.00	9.416	34.416	2764.394	0.550	0.550	Pass
LTE Band 12	25.00	8.734	33.734	2362.653	0.470	0.470	Pass
LTE Band 66	25.00	5.000	30.000	1000.000	0.199	1.000	Pass
LTE Band 71	25.00	8.545	33.545	2262.039	0.450	0.450	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: The EUT Appearance

The EUT Appearance are submitted separately.

ANNEX B: Statement of Product Change

Quectel Wireless Solutions Co., Ltd

Statement

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

Product Name: LTE Module

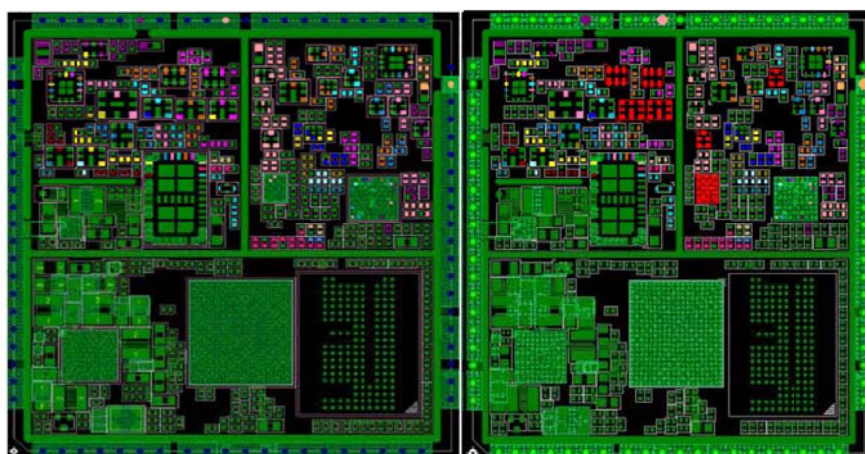
Model Number: EC25-AF, EC25-AF MINIPCIE

Variant Model: EC25-T, EC25-T MINIPCIE

Hardware Version: R1.0

Module	Category	Supported Band
EC25-AF EC25-AF MINIPCIE	CAT4	WCDMA: B2/B4/B5 LTE: B2/B4/B5/B12/B13/B14/B66/B71
EC25-T EC25-T MINIPCIE	CAT4	LTE: B2/B4/B5/B12/B66/B71

EC25-AF&EC25-AF MINIPCIE and EC25-T&EC25-T MINIPCIE share the same HW design, EC25-T&EC25-T MINIPCIE reduce B13and B14 and GPSIC on the basis of EC25-AF&EC25-AF MINIPCIE. The details are shown as following pictures and table.





Quectel Wireless Solutions Co., Ltd

Designator	EC25-AF EC25-AF MINIPCIE (Part Description)	EC25-T EC25-T MINIPCIE (Part Description)
U1102	IC RF Rx filter UNBalance B14 15dBm 1.1x0.9mm H0.5mm RO	NM
U0906	IC RF DPX LTE UNBalance B14 1.8x1.4mm H0.475mm RO	NM
U0908 U0909	IC RF TX LPF 699-960MHz 1.6x0.8mm H0.6mm RO	NM
U0805	IC RF GNSS RECEIVER WGR7640 17- VLNSP 0.4pitch 2.07x1.51mm H0.63mm RO	NM
U0806	IC RF RX filter GPS/ GLONASS /BEIDOU Balance 13dBm 1.1x0.9mm H0.5mm RO	NM
U0907	IC RF DPX LTE Unbalance B13 1.8x1.4mm H0.5mm RO	NM

EC25-T & EC25-T MINIPCIE also disabled WCDMA bands through SW.

These changes will not impact RF performance for other original LTE bands.

Your assistance on this matter is highly appreciated.

Sincerely,


Name: Jean Hu
Title: Certification Section



ANNEX C: Statement of Model Difference

Quectel Wireless Solutions Co., Ltd

Statement

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

Name: LTE Module

Parent Model: EC25-T

Variant Model: EC25-T MINIPCIE

EC25-T and EC25-T MINIPCIE are same LTE modules. They have the same frequency and use the same chipset and share the same software & hardware design.

EC25-T MINIPCIE makes up of EC25-T module and PCIe carrier board. The carrier board switches EC25-T module to follow PCI Express Mini Card standard connector protocol. No any other internal changes in EC25-T module. We hereby state that two models are identical in interior structure and components, and just connector interface is different for the marketing requirement.

Your assistance on this matter is highly appreciated.

Sincerely,

Name: Jean Hu

Title: Certification Section

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