



MPE TEST REPORT

Applicant Quectel Wireless Solutions Co., Ltd

FCC ID XMR201808EC25AF

Product LTE Module

Brand Quectel

Model EC25-AF; EC25-AF MINIPCI-E

Report No. R1806A0301-M1V3

Issue Date August 2, 2018

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.

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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

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

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.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

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.
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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 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.	

2 Description of Equipment under Test

Client Information

Applicant	Quectel Wireless Solutions Co., Ltd
Applicant address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

General Technologies

Model	EC25-AF; EC25-AF MINIPCIE
IMEI	866834040000767
Hardware Version	R1.0
Software Version	EC25AFFAR07A02M4G
Date of Testing:	June 29, 2018~ July 16, 2018

The series model number is: EC25-AF MINIPCIE. The difference of these models are have different marketing requirement.

Accessory equipment	
Evaluation Board	RF Cable
RS232-to-USB Cable	Antenna: Dipole Antenna
Headset	DC 5V Adaptor

3 Maximum conducted output power (measured)

Band	Maximum Conducted Output Power (dBm)	
	(dBm)	(mW)
WCDMA II	25.00	316.23
WCDMA IV	25.00	316.23
WCDMA V	25.00	316.23
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 13	25.00	316.23
LTE Band 14	25.00	316.23
LTE Band 66	25.00	316.23
LTE Band 71	25.00	316.23

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
WCDMA II	1.0mW/cm ²
WCDMA IV	1.0mW/cm ²
WCDMA V	0.55mW/cm ²
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 13	0.52mW/cm ²
LTE Band 14	0.53mW/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)		
WCDMA II	25.000	33.000	8.000	1.000	37.013	12.013	8.000
WCDMA IV	25.000	30.000	5.000	1.000	37.013	12.013	5.000
WCDMA V	25.000	40.600	15.600	0.550	34.416	9.416	9.416
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 13	25.000	36.920	11.920	0.520	34.173	9.173	9.173
LTE Band 14	25.000	36.920	11.920	0.530	34.255	9.255	9.255
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)			
WCDMA II	25.00	8.000	33.000	1995.262	0.397	1.000	Pass
WCDMA IV	25.00	5.000	30.000	1000.000	0.199	1.000	Pass
WCDMA V	25.00	9.416	34.416	2764.394	0.550	0.550	Pass
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 13	25.00	9.173	34.173	2613.966	0.520	0.520	Pass
LTE Band 14	25.00	9.255	34.255	2663.790	0.530	0.530	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.