



# MPE TEST REPORT

|                   |                                     |
|-------------------|-------------------------------------|
| <b>Applicant</b>  | Quectel Wireless Solutions Co., Ltd |
| <b>FCC ID</b>     | XMR202008EC25AFXD                   |
| <b>Product</b>    | LTE Module                          |
| <b>Brand</b>      | Quectel                             |
| <b>Model</b>      | EC25-AFXD; EC25-AFXD MINIPCIE       |
| <b>Report No.</b> | R2203A0238-M1                       |
| <b>Issue Date</b> | April 11, 2022                      |

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.

*Fangying Wei*

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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  |
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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 $\Omega$            |
| Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards. |                           |

## 2 Description of Equipment under Test

### Client Information

|                             |  |
|-----------------------------|--|
| <b>Applicant</b>            | Quectel Wireless Solutions Co., Ltd  |
| <b>Applicant address</b>    | Building 5, Shanghai Business Park Phase III (Area B), No.1016<br>Tianlin Road, Minhang District, Shanghai, China 200233 |
| <b>Manufacturer</b>         | Quectel Wireless Solutions Co., Ltd  |
| <b>Manufacturer address</b> | Building 5, Shanghai Business Park Phase III (Area B), No.1016<br>Tianlin Road, Minhang District, Shanghai, China 200233 |

### General Technologies

|   |                               |
|---|-------------------------------|
| <b>Model</b>  | EC25-AFXD; EC25-AFXD MINIPCIE |
| <b>IMEI</b>   | 868105040004549               |
| <b>Hardware Version</b>   | R1.0                          |
| <b>Software Version</b>   | EC25AFXDGAR07A01M1G           |
| <b>Date of Testing:</b>   | 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> |                               |

The series model number is: EC25-AFXD; EC25-AFXD

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           |

**EC25-AFXD; EC25-AFXD MINIPCIE (Report No.: R2203A0238-M1) is a variant model of EC25-AFXD; EC25-AFXD MINIPCIE (Report No.: R2007A0434-M1). Test values duplicated from Original for variant. There is no test for variant in this report. The detailed product change description please refers to the ANNEX C.**

**EC25-AFXD; EC25-AFXD MINIPCIE (Report No.: R2007A0434-M1) is a variant model of EC25-AFX; EC25-AFX MINIPCIE (Report No.: R1907A0408-M1V1). Test values duplicated from Original for variant. There is no test for variant in this report. The detailed product change description please refers to the ANNEX B.**

### 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<br>(MHz)                                | Electric Field<br>Strength<br>(V/m) | Magnetic Field<br>Strength<br>(A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | Averaging Time<br>(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 <sup>2</sup> )                 | 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 <sup>2</sup> )                 | 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 <sup>2</sup>            |
| WCDMA IV    | 1.0mW/cm <sup>2</sup>            |
| WCDMA V     | 0.55mW/cm <sup>2</sup>           |
| LTE Band 2  | 1.0mW/cm <sup>2</sup>            |
| LTE Band 4  | 1.0mW/cm <sup>2</sup>            |
| LTE Band 5  | 0.55mW/cm <sup>2</sup>           |
| LTE Band 12 | 0.47mW/cm <sup>2</sup>           |
| LTE Band 13 | 0.52mW/cm <sup>2</sup>           |
| LTE Band 14 | 0.53mW/cm <sup>2</sup>           |
| LTE Band 66 | 1.0mW/cm <sup>2</sup>            |
| LTE Band 71 | 0.45mW/cm <sup>2</sup>           |



| Band  | Maximum Conducted Output Power (dBm) | EIRP limit (dBm) | Margin1 (dB) | Power density Limit   |        | Margin2 (dB) | Final Margin (dB) |
|---|--------------------------------------|------------------|--------------|-----------------------|--------|--------------|-------------------|
|   |                                      |                  |              | (mW/cm <sup>2</sup> ) | (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             |
| <p>Note: 1. The Maximum allowed antenna gain per Band should be less than or equal to the Final Margin.</p> <p>2. The Final Margin is determined and selected to the worst-case of Margin1 and Margin2.</p> <p>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).</p> <p>4. Margin2=Power density Limit(dBm)-Maximum Conducted Power (dBm). Power density Limit(dBm): The max. obtained by MPE with 20cm.</p> |                                      |                  |              |                       |        |              |                   |

**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/cm<sup>2</sup>)

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 <sup>2</sup> ) | Limit Value (mW/cm <sup>2</sup> ) | 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 $\pi$ = 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: Product Change Description 1

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Quectel Wireless Solutions Co., Ltd.

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# Statement

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

**Name:** LTE Module

**Parent Model:** EC25-AFX

**Variant Model:** EC25-AFXD, EC25-AFXD MINIPCIE

EC25-AFX, EC25-AFXD and EC25-AFXD MINIPCIE are all LTE modules. They use the same chipset, support same bands and share the same software & hardware design. The only difference is EC25-AFXD and EC25-AFXD MINIPCIE are data only modules which is configured by firmware based on EC25-AFX.


Following details are the difference of these modules.

| Module                          | Frequency bands   | Capability          |
|---------------------------------|---|---------------------|
| EC25-AFX<br>EC25-AFX MINIPCIE   | FDD:<br>B2/B4/B5/B12/B13/B14/B66/B71<br>WCDMA: B2/B4/B5 | Cat.4<br>Data&Voice |
| EC25-AFXD<br>EC25-AFXD MINIPCIE | FDD:<br>B2/B4/B5/B12/B13/B14/B66/B71<br>WCDMA: B2/B4/B5 | Cat.4<br>Data Only  |

Meanwhile, EC25-AFXD MINIPCIE makes up of EC25-AFXD module and PCIe carrier board. The carrier board switches EC25-AFXD module to follow PCI Express Mini Card 1.2 standard connector protocol. No any other internal changes in EC25-AFXD 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



## **ANNEX C: Product Change Description 2**

The Product Change Description are submitted separately.