



# FCC RADIO TEST REPORT

FCC ID : 2AJN7-TP00159AL  
Equipment : Notebook Computer  
Brand Name : Lenovo  
Model Name : TP00159A, TP00159B  
Applicant : LC Future Center Limited Taiwan Branch  
7F., No.780, Beian Rd., Zhongshan Dist., Taipei  
104, Taiwan  
Manufacturer : LCFC (HeFei) Electronics Technology Co., Ltd.  
No. 3188-1, Yungu Road (Hefei Export  
Processing Zone), Hefei Economics &  
Technology Development Area, Anhui, CHINA  
Standard : FCC 47 CFR Part 2, 22(H), 24(E), 27(L)

Equipment: Quectel EM061K-GL tested inside of Lenovo Notebook Computer.

The product was received on Nov. 13, 2023 and testing was performed from Nov. 13, 2023 to Nov. 17, 2023. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

**Sporton International Inc. EMC & Wireless Communications Laboratory**



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## History of this test report

| Report No.   | Version | Description                                                                                                                                | Issue Date    |
|--------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| FG3N1049-01B | 01      | Initial issue of report                                                                                                                    | Jan. 03, 2024 |
| FG3N1049-01B | 02      | Revise Equipment, Summary note and Antenna Information<br>This report is an updated version, replacing the report issued on Jan. 03, 2024. | Feb. 07, 2024 |
|              |         |                                                                                                                                            |               |
|              |         |                                                                                                                                            |               |
|              |         |                                                                                                                                            |               |
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|              |         |                                                                                                                                            |               |
|              |         |                                                                                                                                            |               |
|              |         |                                                                                                                                            |               |
|              |         |                                                                                                                                            |               |

## Summary of Test Result

| Report Clause | Ref Std. Clause                                     | Test Items                                                                          | Result (PASS/FAIL) | Remark   |
|---------------|-----------------------------------------------------|-------------------------------------------------------------------------------------|--------------------|----------|
| 3.2           | §2.1046                                             | Conducted Output Power                                                              | Pass               | -        |
|               | §22.913 (a)(5)                                      | Effective Radiated Power (WCDMA Band V)                                             |                    |          |
|               | §24.232 (c)                                         | Equivalent Isotropic Radiated Power (WCDMA Band II)                                 |                    |          |
|               | §27.50 (d)(4)                                       | Equivalent Isotropic Radiated Power (WCDMA Band IV)                                 |                    |          |
| -             | §24.232 (d)                                         | Peak-to-Average Ratio                                                               | -                  | See Note |
| -             | §2.1049<br>§22.917 (b)<br>§24.238 (b)<br>§27.53 (g) | Occupied Bandwidth (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)                   | -                  | See Note |
| -             | §2.1051<br>§22.917 (a)<br>§24.238 (a)<br>§27.53 (g) | Band Edge Measurement (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)                | -                  | See Note |
| -             | §2.1051<br>§22.917 (a)<br>§24.238 (a)<br>§27.53 (g) | Conducted Emission (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)                   | -                  | See Note |
| -             | §2.1055<br>§22.355<br>§24.235<br>§27.54             | Frequency Stability Temperature & Voltage                                           | -                  | See Note |
| -             | §2.1053<br>§22.917 (a)<br>§24.238 (a)<br>§27.53 (h) | Field Strength of Spurious Radiation (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV) | -                  | See Note |

**Note:**

- For host device, Effective Radiated Power and Equivalent Isotropic Radiated Power are verified and complies with the limit in this test report.
- For host device, the Conducted Output Power is no difference after compared to module (Model: EM061K-GL)
- The measurement evaluation of Radiation Spurious Emission is based on the module report measurement results, with the worst case from module report. The measurement results of RSE are included in the Sporton report: FG3N1049-01A.

**Conformity Assessment Condition:**

The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.

**Disclaimer:**

1. The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.
2. The purpose of different model name is for marketing segmentation.

**Reviewed by: Sheng Kuo**

**Report Producer: Clio Lo**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

| Product Feature                 |                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment                       | Notebook Computer                                                                                                                                                                          |
| Brand Name                      | Lenovo                                                                                                                                                                                     |
| Model Name                      | TP00159A, TP00159B                                                                                                                                                                         |
| FCC ID                          | 2AJN7-TP00159AL                                                                                                                                                                            |
| Sample 1                        | EUT with ATC Antenna                                                                                                                                                                       |
| Sample 2                        | EUT with AWAN Antenna                                                                                                                                                                      |
| Integrated WLAN Module          | Brand Name: Intel<br>Model Name: AX211D2W<br>FCC ID: PD9AX211D2                                                                                                                            |
| Integrated WLAN Module          | Brand Name: Intel<br>Model Name: BE200D2W<br>FCC ID: PD9BE200D2                                                                                                                            |
| Integrated NFC Module           | Brand Name: Foxconn<br>Model Name: T77H747                                                                                                                                                 |
| EUT supports Radios application | WCDMA/HSPA/LTE/GNSS/NFC<br>WLAN 11a/b/g/n HT20/HT40<br>WLAN 11ac VHT40/VHT80/VHT160<br>WLAN 11ax HE20/HE40/HE80/HE160<br>WLAN 11be EHT20/ EHT40/EHT80/EHT160/EHT320<br>Bluetooth BR/EDR/LE |
| EUT Stage                       | Production Unit                                                                                                                                                                            |

**Remark:**

1. The above EUT's information was declared by manufacturer.
2. Equipment: Quectel EM061K-GL tested inside of Lenovo Notebook Computer.

| Antenna Information |              |             |                |                                                                        |
|---------------------|--------------|-------------|----------------|------------------------------------------------------------------------|
| Main Antenna        | Manufacturer | ATC         | Peak gain(dBi) | WCDMA Band II : -1.41<br>WCDMA Band IV : -0.25<br>WCDMA Band V : -0.22 |
|                     | Part number  | DC330022K70 | Type           | PIFA                                                                   |
|                     | Manufacturer | AWAN        | Peak gain(dBi) | WCDMA Band II : -1.41<br>WCDMA Band IV : -0.25<br>WCDMA Band V : -0.22 |
|                     | Part number  | DC330022H70 | Type           | PIFA                                                                   |

**Remark:** The above EUT's information was declared by manufacturer. Please refer to Disclaimer in report summary.

## 1.2 Product Specification of Equipment Under Test

| Product Specification is subject to this standard |                                                                                                                        |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Tx Frequency</b>                               | <b>WCDMA:</b><br>Band V: 826.4 MHz ~ 846.6 MHz<br>Band II: 1852.4 MHz ~ 1907.6 MHz<br>Band IV: 1712.4 MHz ~ 1752.6 MHz |
| <b>Rx Frequency</b>                               | <b>WCDMA:</b><br>Band V: 871.4 MHz ~ 891.6 MHz<br>Band II: 1932.4 MHz ~ 1987.6 MHz<br>Band IV: 2112.4 MHz ~ 2152.6 MHz |
| <b>Maximum Output Power to Antenna</b>            | <b>WCDMA:</b><br>Band V: 23.42 dBm<br>Band II: 23.53 dBm<br>Band IV: 23.56 dBm                                         |
| <b>Type of Modulation</b>                         | WCDMA: BPSK (Uplink)<br>HSDPA: 16QAM (Downlink)<br>HSUPA: 16QAM (Uplink)                                               |

## 1.3 Modification of EUT

No modifications made to the EUT during the testing.

## 1.4 Testing Location

|                              |                                                                     |
|------------------------------|---------------------------------------------------------------------|
| <b>Test Site</b>             | Sporton International Inc. EMC & Wireless Communications Laboratory |
| <b>Test Site Location</b>    | No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333               |
| <b>Test Site No.</b>         | <b>Sporton Site No.</b>                                             |
|                              | TH03-HY                                                             |
| <b>Test Engineer</b>         | HaoEn Zhang                                                         |
| <b>Temperature (°C)</b>      | 21.5~22.3                                                           |
| <b>Relative Humidity (%)</b> | 52.1~53.6                                                           |

FCC Designation No.: TW1190

## 1.5 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ ANSI C63.26-2015
- ♦ ANSI / TIA-603-E
- ♦ FCC 47 CFR Part 2, 22(H), 24(E), 27(L)
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.



## 2 Test Configuration of Equipment Under Test

### 2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Test modes are chosen to be reported as the worst case configuration below:

| Test Modes    |                     |
|---------------|---------------------|
| Band          | Conducted TCs       |
| WCDMA Band V  | ■ RMC 12.2Kbps Link |
| WCDMA Band II | ■ RMC 12.2Kbps Link |
| WCDMA Band IV | ■ RMC 12.2Kbps Link |

### 2.2 Frequency List of Low/Middle/High Channels

| Frequency List |                        |        |        |         |
|----------------|------------------------|--------|--------|---------|
| Band           | Channel/Frequency(MHz) | Lowest | Middle | Highest |
| WCDMA Band V   | Channel                | 4132   | 4182   | 4233    |
|                | Frequency              | 826.4  | 836.4  | 846.6   |
| WCDMA Band II  | Channel                | 9262   | 9400   | 9538    |
|                | Frequency              | 1852.4 | 1880.0 | 1907.6  |
| WCDMA Band IV  | Channel                | 1312   | 1413   | 1513    |
|                | Frequency              | 1712.4 | 1732.6 | 1752.6  |

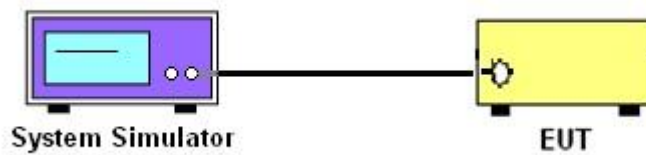
### 3 Conducted Test Result

#### 3.1 Measuring Instruments

Please refer to the measuring equipment list in this test report.

##### 3.1.1 Test Setup

##### 3.1.2 Conducted Output Power



##### 3.1.3 Test Result of Conducted Test

Please refer to Appendix A.

## 3.2 Conducted Output Power and ERP/EIRP

### 3.2.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for WCDMA Band V

The EIRP of mobile transmitters must not exceed 2 Watts for WCDMA Band II

The EIRP of mobile transmitters must not exceed 1 Watts for WCDMA Band IV

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$ ,  $ERP = EIRP - 2.15$ , where

$P_T$  = transmitter output power in dBm

$G_T$  = gain of the transmitting antenna in dBi

$L_C$  = signal attenuation in the connecting cable between the transmitter and antenna in dB

### 3.2.2 Test Procedures

1. The transmitter output port is connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select the lowest, middle, and the highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.



## 4 List of Measuring Equipment

| Instrument             | Brand Name      | Model No.                               | Serial No. | Characteristics                                           | Calibration Date | Test Date                       | Due Date      | Remark              |
|------------------------|-----------------|-----------------------------------------|------------|-----------------------------------------------------------|------------------|---------------------------------|---------------|---------------------|
| Base Station (Measure) | Anritsu         | MT8821C                                 | 6201664755 | LTE FDD/TDD(with 4), LTE-4CC DLCA/2CC ULCA, CatM1/NB1/NB2 | Jul. 18, 2023    | Nov. 13, 2023~<br>Nov. 17, 2023 | Jul. 17, 2024 | Conducted (TH03-HY) |
| Spectrum Analyzer      | Rohde & Schwarz | FSV40                                   | 101908     | 10Hz~40GHz                                                | Sep. 11, 2023    | Nov. 13, 2023~<br>Nov. 17, 2023 | Sep. 10, 2024 | Conducted (TH03-HY) |
| Coupler                | Warison         | 20dB 25W S<br>MA Directional<br>Coupler | #B         | 1-18GHz                                                   | Jan. 06, 2023    | Nov. 13, 2023~<br>Nov. 17, 2023 | Jan. 05, 2024 | Conducted (TH03-HY) |

**Appendix A. Test Results of Conducted Test****Conducted Output Power(Average power) & ERP / EIRP**

| WCDMA Band V Maximum Average Power [dBm] (GT - LC = -0.22 dB) |          |       |       |           |         |
|---------------------------------------------------------------|----------|-------|-------|-----------|---------|
| Channel                                                       | 4132     | 4182  | 4233  | ERP (dBm) | ERP (W) |
| Frequency                                                     | 826.4    | 836.4 | 846.6 |           |         |
| RMC 12.2K                                                     | 23.33    | 23.42 | 23.37 | 21.05     | 0.1274  |
| HSDPA Subtest-1                                               | 22.22    | 22.28 | 22.21 |           |         |
| HSDPA Subtest-2                                               | 22.20    | 22.20 | 22.22 |           |         |
| HSDPA Subtest-3                                               | 21.69    | 21.72 | 21.70 |           |         |
| HSDPA Subtest-4                                               | 21.73    | 21.72 | 21.77 |           |         |
| HSUPA Subtest-1                                               | 22.25    | 22.23 | 22.21 |           |         |
| HSUPA Subtest-2                                               | 20.17    | 20.30 | 20.22 |           |         |
| HSUPA Subtest-3                                               | 21.28    | 21.25 | 21.10 |           |         |
| HSUPA Subtest-4                                               | 20.23    | 20.30 | 20.22 |           |         |
| HSUPA Subtest-5                                               | 22.10    | 22.10 | 22.20 |           |         |
| Limit                                                         | ERP < 7W |       |       | Result    | Pass    |

| WCDMA Band II Maximum Average Power [dBm] (GT - LC = -1.41 dB) |           |       |        |            |          |
|----------------------------------------------------------------|-----------|-------|--------|------------|----------|
| Channel                                                        | 9262      | 9400  | 9538   | EIRP (dBm) | EIRP (W) |
| Frequency                                                      | 1852.4    | 1880  | 1907.6 |            |          |
| RMC 12.2K                                                      | 23.23     | 23.46 | 23.53  | 22.12      | 0.1629   |
| HSDPA Subtest-1                                                | 22.06     | 22.03 | 22.18  |            |          |
| HSDPA Subtest-2                                                | 22.03     | 22.05 | 22.20  |            |          |
| HSDPA Subtest-3                                                | 21.55     | 21.51 | 21.75  |            |          |
| HSDPA Subtest-4                                                | 21.53     | 21.52 | 21.69  |            |          |
| HSUPA Subtest-1                                                | 22.02     | 22.01 | 22.19  |            |          |
| HSUPA Subtest-2                                                | 20.01     | 20.02 | 20.12  |            |          |
| HSUPA Subtest-3                                                | 21.06     | 21.07 | 21.11  |            |          |
| HSUPA Subtest-4                                                | 20.06     | 20.11 | 20.18  |            |          |
| HSUPA Subtest-5                                                | 22.02     | 22.01 | 22.00  |            |          |
| Limit                                                          | EIRP < 2W |       |        | Result     | Pass     |

| WCDMA Band IV Maximum Average Power [dBm] (GT - LC = -0.25 dB) |           |        |        |            |          |
|----------------------------------------------------------------|-----------|--------|--------|------------|----------|
| Channel                                                        | 1312      | 1413   | 1513   | EIRP (dBm) | EIRP (W) |
| Frequency                                                      | 1712.4    | 1732.6 | 1752.6 |            |          |
| RMC 12.2K                                                      | 23.53     | 23.50  | 23.56  | 23.31      | 0.2143   |
| HSDPA Subtest-1                                                | 22.09     | 22.27  | 22.22  |            |          |
| HSDPA Subtest-2                                                | 22.14     | 22.19  | 22.17  |            |          |
| HSDPA Subtest-3                                                | 21.66     | 21.69  | 21.66  |            |          |
| HSDPA Subtest-4                                                | 21.67     | 21.67  | 21.69  |            |          |
| HSUPA Subtest-1                                                | 22.15     | 22.17  | 22.18  |            |          |
| HSUPA Subtest-2                                                | 20.04     | 20.07  | 20.25  |            |          |
| HSUPA Subtest-3                                                | 21.14     | 21.22  | 21.17  |            |          |
| HSUPA Subtest-4                                                | 20.02     | 20.26  | 20.27  |            |          |
| HSUPA Subtest-5                                                | 22.01     | 22.20  | 22.00  |            |          |
| Limit                                                          | EIRP < 1W |        |        | Result     | Pass     |