



# RADIO EXPOSURE TEST REPORT

**FCC ID** : 2AF5PQ14  
**Equipment** : AXE5400 Tri-band Mesh WiFi  
**Brand Name** : Motorola  
**Model Name** : Q14  
**Applicant** : MTRLC LLC  
275 Turnpike St., Suite 101, Canton, MA 02021  
**Manufacturer** : MTRLC LLC  
275 Turnpike St., Suite 101, Canton, MA 02021  
**Standard** : 47 CFR Part 2.1091

The product was received on Nov. 12, 2021, and testing was started from Jan. 27, 2022 and completed on May 06, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

**Sporton International Inc. Hsinchu Laboratory**

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## History of this test report

TEL : 886-3-656-9065  
FAX : 886-3-656-9085  
Report Template No.: CB-A1\_1 Ver1.1

Page Number : 3 of 11  
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## Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items          | Result (PASS/FAIL) | Remark |
|---------------|-----------------|---------------------|--------------------|--------|
| 2             | -               | Exposure evaluation | PASS               | -      |

**Declaration of Conformity:**

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by: Sam Chen**

**Report Producer: Wendy Pan**



# 1 General Description

## 1.1 EUT General Information

| RF General Information |                                                  |                                                  |                                                                                                                                                                                                |
|------------------------|--------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evaluation Mode        | Frequency Range (MHz)                            | Operating Frequency (MHz)                        | Modulation Type                                                                                                                                                                                |
| 2.4GHz WLAN            | 2400-2483.5                                      | 2412-2462                                        | 802.11b: DSSS (DBPSK, DQPSK, CCK)<br>802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)<br>VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)<br>802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) |
| 5GHz WLAN              | 5150-5250<br>5250-5350<br>5470-5725<br>5725-5850 | 5180-5250<br>5250-5320<br>5500-5720<br>5745-5825 | 802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)<br>802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)<br>802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)                                 |
| 6GHz WLAN              | 5925-7125                                        | 6115-7115                                        | 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)                                                                                                                                    |



## 1.2 Antenna Information

| Ant. | Port   |      |      | Brand           | Model Name  | Antenna Type | Connector | Gain (dBi) |
|------|--------|------|------|-----------------|-------------|--------------|-----------|------------|
|      | 2.4GHz | 5GHz | 6GHz |                 |             |              |           |            |
| 1    | 1      | -    | -    | Antenna Company | AC10244-01A | PCB Antenna  | I-PEX     | Note4      |
| 2    | 2      | -    | -    | Antenna Company | AC10244-01A | PCB Antenna  | I-PEX     |            |
| 3    | -      | 2    | -    | Antenna Company | AC10503-01A | PCB Antenna  | I-PEX     |            |
| 4    | -      | 1    | -    | Antenna Company | AC10503-01A | PCB Antenna  | I-PEX     |            |
| 5    | -      | -    | 2    | Antenna Company | AC10601-01A | PCB Antenna  | I-PEX     |            |
| 6    | -      | -    | 1    | Antenna Company | AC10601-01A | PCB Antenna  | I-PEX     |            |

Note1: The above information was declared by manufacturer.

Note2: WLAN 2.4GHz and 5GHz: Maximum Directional Gain following KDB662911 D03. The antenna report is provided in the operational description for this application.

Note3:

| Gain (dBi) |         |          |            |           |
|------------|---------|----------|------------|-----------|
| Ant.       | 2.4 GHz | 2.45 GHz | 2.4835 GHz |           |
| 1          | 2.73    | 2.56     | 2.24       |           |
| 2          | 3.7     | 3.68     | 3.69       |           |
| Gain (dBi) |         |          |            |           |
| Ant.       | 5.2 GHz | 5.3 GHz  | 5.6 GHz    | 5.785 GHz |
| 3          | 2.01    | 2.57     | 3.17       | 2.97      |
| 4          | 2.43    | 2.92     | 2.12       | 2.52      |
| Gain (dBi) |         |          |            |           |
| Ant.       | 6 GHz   |          |            |           |
| 5          | 5.5     |          |            |           |
| 6          | 5.5     |          |            |           |

Note4: The antenna gain of 6GHz was declared by manufacturer.



| Directional Gain (dBi) |         |      |          |      |            |      |           |      |
|------------------------|---------|------|----------|------|------------|------|-----------|------|
| Ant.                   | 2.4 GHz |      | 2.45 GHz |      | 2.4835 GHz |      |           |      |
|                        | 1SS     | 2SS  | 1SS      | 2SS  | 1SS        | 2SS  | 1SS       | 2SS  |
| 1                      | 4.14    | 1.23 | 3.83     | 1.42 | 3.67       |      |           | 1.33 |
| 2                      |         |      |          |      |            |      |           |      |
| Directional Gain (dBi) |         |      |          |      |            |      |           |      |
| Ant.                   | 5.2 GHz |      | 5.3 GHz  |      | 5.6 GHz    |      | 5.785 GHz |      |
|                        | 1SS     | 2SS  | 1SS      | 2SS  | 1SS        | 2SS  | 1SS       | 2SS  |
| 3                      | 3.94    | 1.06 | 3.74     | 0.74 | 4.38       | 1.41 | 4.51      | 1.57 |
| 4                      |         |      |          |      |            |      |           |      |

Note5:

**For 2.4GHz:****For IEEE 802.11b/g/n/VHT/ax mode (2TX/2RX):**

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

**For 5GHz UNII 1~3:****For IEEE 802.11a/n/ac/ax mode (2TX/2RX):**

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

**For 6GHz UNII 5~8:****For IEEE 802.11ax mode (2TX/2RX):**

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.



### 1.3 Table for EUT support function

| Function  | 2.4GHz | 5GHz | 6GHz |
|-----------|--------|------|------|
| AP Router | V      | V    | V    |
| Extender  | X      | X    | V    |
| Mesh      | X      | X    | V    |

Note1: After evaluating, AP Router was selected as representative model for the test and its data was recorded in this report.

Note2: The above information was declared by manufacturer.

### 1.4 Accessories

| Accessories                     |            |                 |                                                  |
|---------------------------------|------------|-----------------|--------------------------------------------------|
| Equipment Name                  | Brand Name | Model Name      | Rating                                           |
| Adapter                         | LEI        | MU24D1120200-A1 | INPUT: 100-240V~50/60Hz, 0.7A<br>OUTPUT: 12V, 2A |
| Other                           |            |                 |                                                  |
| RJ-45 cable, Non-shielded, 1.5m |            |                 |                                                  |

### 1.5 Applicable Standards

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

- ♦ 47 CFR Part 2.1091
- ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ 47 CFR Part 1.1307
- ♦ 47 CFR Part 1.1310

### 1.6 Testing Location

| Testing Location Information                              |                                                                                    |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|
| Test Lab. : Sporton International Inc. Hsinchu Laboratory |                                                                                    |
| Hsinchu                                                   | ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) |
| (TAF: 3787)                                               | TEL: 886-3-656-9065 FAX: 886-3-656-9085                                            |
|                                                           | Test site Designation No. TW3787 with FCC.                                         |
|                                                           | Conformity Assessment Body Identifier (CABID) TW3787 with ISCED.                   |



## 2 Maximum Permissible Exposure

### 2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | *(100)                                   | <6                                                               |
| 3.0-30                | 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

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 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                                                              |

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

### 2.2 MPE Calculation Method

The MPE was calculated at 41 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = RF output power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



## 2.3 MPE Exemption

Option (A): 1.1307(b)(3)(i)(A): Available maximum time-averaged power is < 1 mW

Option (B): 1.1307(b)(3)(i)(B): Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <= Pth.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

Option (C): 1.1307(b)(3)(i)(C): ERP is below a threshold calculated based on the distance

$R$  between the person and the antenna / radiating structure, where  $R > \lambda / 2 \pi$ .

| Single RF Sources Subject to Routine Environmental Evaluation |                       |
|---------------------------------------------------------------|-----------------------|
| RF Source frequency (MHz)                                     | Threshold ERP (watts) |
| 0.3-1.34                                                      | $1,920 R^2$ .         |
| 1.34-30                                                       | $3,450 R^2/f^2$ .     |
| 30-300                                                        | $3.83 R^2$ .          |
| 300-1,500                                                     | $0.0128 R^2 f$ .      |
| 1,500-100,000                                                 | $19.2 R^2$ .          |
| Note: R is in meters, f is in MHz.                            |                       |



## 2.4 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

| Mode     | DG (dBi) | Power (dBm) | EIRP (dBm) | Tolerance (dB) | Tune-up EIRP (dBm) | Tune-up EIRP (W) | Distance (cm) | S (mW/cm <sup>2</sup> ) | S Limit (mW/cm <sup>2</sup> ) |
|----------|----------|-------------|------------|----------------|--------------------|------------------|---------------|-------------------------|-------------------------------|
| 2.4G;D1D | 3.68     | 27.36       | 31.04      | 0.50           | 31.54              | 1.42561          | 41            | 0.06749                 | 1.00000                       |
| 5.2G;D1D | 3.94     | 24.69       | 28.63      | 0.50           | 29.13              | 0.81846          | 41            | 0.03875                 | 1.00000                       |
| 5.3G;D1D | 3.74     | 23.88       | 27.62      | 0.50           | 28.12              | 0.64863          | 41            | 0.03071                 | 1.00000                       |
| 5.6G;D1D | 4.38     | 23.83       | 28.21      | 0.50           | 28.71              | 0.74302          | 41            | 0.03517                 | 1.00000                       |
| 5.8G;D1D | 4.51     | 23.93       | 28.44      | 0.50           | 28.94              | 0.78343          | 41            | 0.03709                 | 1.00000                       |
| 6.2G;D1D | 8.51     |             | 23.07      | 0.50           | 23.57              | 0.22751          | 41            | 0.01077                 | 1.00000                       |
| 6.4G;D1D | 8.51     |             | 23.95      | 0.50           | 24.45              | 0.27861          | 41            | 0.01319                 | 1.00000                       |
| 6.7G;D1D | 8.51     |             | 24.39      | 0.50           | 24.89              | 0.30832          | 41            | 0.01460                 | 1.00000                       |
| 7.0G;D1D | 5.50     | -           | 22.87      | 0.50           | 23.37              | 0.21727          | 41            | 0.01029                 | 1.00000                       |

Note: The antenna gain of 6GHz was declared by manufacturer.

| MPE Exemption Option C |                    |       |                    |                   |                 |                   |               |
|------------------------|--------------------|-------|--------------------|-------------------|-----------------|-------------------|---------------|
| Frequency (MHz)        | $\lambda/2\pi$ (m) | R (m) | Tune-up EIRP (dBm) | Tune-up ERP (dBm) | Tune-up ERP (W) | ERP Threshold (W) | MPE Exemption |
| 2437                   | 0.0196             | 0.41  | 31.54              | 29.39             | 0.869           | 3.228             | Complies      |
| 5230                   | 0.0091             |       | 29.13              | 26.98             | 0.499           | 3.228             | Complies      |
| 6665                   | 0.0072             |       | 24.89              | 22.74             | 0.188           | 3.228             | Complies      |

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+WLAN 5GHz

| Simultaneous Transmissions Option C |       |                    |                   |                 |                   |                            |                                  |
|-------------------------------------|-------|--------------------|-------------------|-----------------|-------------------|----------------------------|----------------------------------|
| Frequency (MHz)                     | R (m) | Tune-up EIRP (dBm) | Tune-up ERP (dBm) | Tune-up ERP (W) | ERP Threshold (W) | Simultaneous Transmissions | Simultaneous Transmissions Limit |
| 2437                                | 0.41  | 31.54              | 29.39             | 0.869           | 3.228             | 0.48                       | <= 1                             |
| 5230                                |       | 29.13              | 26.98             | 0.499           | 3.228             |                            |                                  |
| 6665                                |       | 24.89              | 22.74             | 0.188           | 3.228             |                            |                                  |

————THE END————