



# RADIO EXPOSURE TEST REPORT

**FCC ID** : 2AF5PQ14

**Equipment** : AXE5400 Tri-band Mesh WiFi

**Brand Name** : Motorola

**Model Name** : Q14

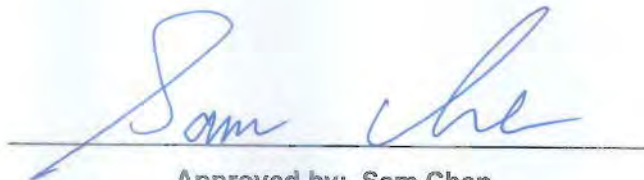
**Applicant** : MTRLC LLC  
275 Turnpike St., Suite 101, Canton, MA 02021

**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**

No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



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<b>Photographs of EUT v01</b>	





## 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) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5250 5250-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 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 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 ISED.





## 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:

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

**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 <sup>2</sup> .
1.34-30	3,450 R <sup>2</sup> /f <sup>2</sup> .
30-300	3.83 R <sup>2</sup> .
300-1,500	0.0128 R <sup>2</sup> f.
1,500-100,000	19.2R <sup>2</sup> .

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—————