Testing Laboratory 3787

RADIO EXPOSURE TEST REPORT

FCC ID	:	MSQ-RTAX6800
Equipment	:	AX6000 Dual Band Wi-Fi Router
Brand Name	:	ASUS
Model Name	:	RT-AX88U Pro
Applicant	:	ASUSTeK COMPUTER INC. 1F., No. 15, Lide Rd., Beitou, Taipei City 112, Taiwan
Manufacturer (1)	:	Compal Networking(KunShan) CO., LTD No.520,Nan Bang RD., Economic & Technical Development Zone, KunShan,JiangSu,China
Manufacturer (2)	:	Datamax Electronics (DongGuan) Co., Ltd. Niu Shan Foreign Economic Industrial Park, Dong Cheng District, Dong Guan City, Guang Dong, China
Manufacturer (3)	:	ARCADYAN TECHNOLOGY (VIETNAM) CO., LTD. Land plot No. D4-5-6, Thang Long Industrial Park (Vinh Phuc), Thien Ke Commune, Binh Xuyen District, Vinh Phuc Province, Vietnam
Manufacturer (4)	:	Lih Rong Electronic Enterprise Co.,Ltd. No. 486, Sec. 1, Wanshou Road, Guishan District, , Taoyuan City, Taiwan
Standard	:	47 CFR Part 2.1091

The product was received on Sep. 07, 2022, and testing was started from Sep. 19, 2022 and completed on Sep. 26, 2023. 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 variant 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

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History of this test report

Report No.	Version	Description	Issued Date
FA290613-02	01	Initial issue of report	Oct. 03, 2023

Summary of Test Result

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

Conformity Assessment Condition:
1. 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/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account. 2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".
Disclaimer:
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.

Reviewed by: Sam Chen

Report Producer: Sandy Chuang

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, 1024QAM) 802.11ax: OFDM (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, 1024QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)

1.2 Antenna Information

Ant.	Port		Brand Name	Model Name	Antenna Type	Connector	Gain (dBi)
	WLAN 2.4GHz	WLAN 5GHz UNII1~UNII3					
1	2	1	PSA	RFDPA171300SBLB820	Dipole	Reversed-SMA	Note 1
2	3	4	PSA	RFDPA171300SBLB820	Dipole	Reversed-SMA	
3	1	2	PSA	RFDPA171300SBLB820	Dipole	Reversed-SMA	
4	4	3	PSA	RFDPA171300SBLB820	Dipole	Reversed-SMA	

Note 1: The directional gain is measured which follows the procedure of KDB 662911 D03.

Freq. Band (Hz)	WLAN 2.4GHz	WLAN 5GHz			
		UNII 1	UNII 2A	UNII2C	UNII3
Ant. 1 Max Gain (dBi)	2.01	2.66	2.74	3.53	3.93
Ant. 2 Max Gain (dBi)	1.25	1.8	1.59	2.37	2.6
Ant. 3 Max Gain (dBi)	1.61	2.05	1.47	2.32	2.49
Ant. 4 Max Gain (dBi)	1.81	2.7	1.47	3.17	3.83
DG [1SS] (dBi)	6.35	6.38	5.9	6.27	7.14
DG [2SS] (dBi)	3.35	3.38	2.9	3.53	4.14
DG [4SS] (dBi)	2.01	2.7	2.74	3.53	3.93

Note 2: The above information was declared by manufacturer.

Note 3:

<For WLAN 2.4GHz function>

For IEEE 802.11b/g/n/VHT/ax(4TX/4RX):

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

<For WLAN 5GHz function>

For IEEE 802.11a/n/ac/ax (4TX/4RX):

Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.

1.3 Table for Components Source Information

Source	Transformer (2.5G WAN)			Transformer Method
	Brand	Model	Rate	
Main	Broadcom	BCM54991E	2.5Gbps/1Gbps/100Mbps	SMD
Second	MAXLINEAR	GPY211	2.5Gbps/1Gbps/100Mbps/10Mbps	DIP
Third	Broadcom	BCM50991EL	2.5Gbps/1Gbps/100Mbps	N/A

Note: The above information was declared by manufacturer.

1.4 Table for EUT Combination

EUT	Transformer (2.5G WAN)	Front End Module of 2.4GHz	Transformer Method	EUT Version
1	Main	Main	Main	R2.10
2	Second	Main	Main	R2.00
3	Third	Second	Second	R3.10

Note 1: The above information was declared by manufacturer.

Note 2: Please refer to the photograph of EUT for detailed differences for Front End Module of 2.4GHz.

1.5 Table for EUT Supports Function

Function	Support Type
AP Router	Master
Bridge	Slave without radar detection
Repeater	Master
Mesh	Master

Note: The above information was declared by manufacturer.

1.6 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA290613

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
Adding the EUT 3 (The difference with EUT 2 is using the third source of Transformer (2.5G WAN), second source of Front End Module of 2.4GHz and Transformer Method of DIP (Please refer to section 1.3 and 1.4 for detail information).	RF Exposure of 2.4GHz of EUT 3

Note: The other test results based on the original report.

1.7 Accessories

Accessories				
Equipment Name	**Brand Name**	**Model Name**	**Rating**	**Power Line**
Adapter 1	AcBel	ADH011	Input: 100-240V~1.4A, 50-60Hz Output: 19.5V, 2.31A, 45.0W MAX	With the DC Power cable: Non-shielded, 1.5m
Adapter 2	AcBel	ADH011	Input: 100-240V~1.4A, 50-60Hz Output: 19.5V, 2.31A, 45.0W MAX	With the DC Power cable: Non-shielded, 1.5m
Adapter 3	DELTA	ADP-45FE F	Input: 100-240V~1.2A, 50-60Hz Output: 19.0V, 2.37A, 45.0W	With the DC Power cable: Non-shielded, 1.5m
Others				
RJ-45 cable*1: Non-Shielded, 1.5m				
Power cable*1: Non-Shielded, 0.8m				

1.8 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

1.9 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/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-3.0	614	1.63	*(100)	<6
3.0-30	1842/f	4.89/f	*(900/f²)	<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/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f²)	<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 51 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

E (V/m) $= \frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) $= \frac{E^2}{377}$

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.

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

Where

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

and

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

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 > λ / 2 π.

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^2f.
1,500-100,000	19.2R^2.
Note: R is in meters, f is in MHz.	

2.4 Calculated Result and Limit

For EUT 1, 2

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^2)	S Limit (mW/cm^2)
2.4G;D1D	6.35	29.62	35.97	0.02	35.99	3.97192	51	0.12152	1.00000
5.2G;D1D	6.38	29.58	35.96	0.03	35.99	3.97192	51	0.12152	1.00000
5.3G;D1D	5.90	23.95	29.85	0.14	29.99	0.99770	51	0.03052	1.00000
5.6G;D1D	6.27	23.69	29.96	0.03	29.99	0.99770	51	0.03052	1.00000
5.8G;D1D	7.14	28.83	35.97	0.02	35.99	3.97192	51	0.12152	1.00000

MPE Exemption Option C							
Frequency (MHz)	λ/2π (m)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.0196	0.51	35.99	33.84	2.421	4.994	Complies
5755	0.0083		35.99	33.84	2.421	4.994	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	0.51	35.99	33.84	2.421	4.994	0.97	<= 1
5755		35.99	33.84	2.421	4.994		

For EUT 3

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^2)	S Limit (mW/cm^2)
2.4G;D1D	6.35	27.83	34.18	0.50	34.68	2.93764	51	0.08988	1.00000
5.2G;D1D	6.38	29.58	35.96	0.03	35.99	3.97192	51	0.12152	1.00000
5.3G;D1D	5.90	23.95	29.85	0.14	29.99	0.99770	51	0.03052	1.00000
5.6G;D1D	6.27	23.69	29.96	0.03	29.99	0.99770	51	0.03052	1.00000
5.8G;D1D	7.14	28.83	35.97	0.02	35.99	3.97192	51	0.12152	1.00000

MPE Exemption Option C							
Frequency (MHz)	λ/2π (m)	R (m)	Tune-up EIRP (dBm)	Tune-up ERP (dBm)	Tune-up ERP (W)	ERP Threshold (W)	MPE Exemption
2437	0.0196	0.51	34.68	32.53	1.791	4.994	Complies
5755	0.0083		35.99	33.84	2.421	4.994	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	0.51	34.68	32.53	1.791	4.994	0.84	<= 1
5755		35.99	33.84	2.421	4.994		

———THE END———