Testing Laboratory 3787

RADIO EXPOSURE TEST REPORT

FCC ID	:	MSQ-RTAX4Q00
Equipment	:	AX11000 Tri Band WiFi Router
Brand Name	:	ASUS
Model Name	:	XT12
Applicant	:	ASUSTeK COMPUTER INC. 1F., No. 15, Lide Rd., Beitou, Taipei 112, Taiwan
Manufacturer (1)	:	Compal Networking (KunShan) Co., LTD. No. 520, Nanbang Rd., Economic & Technical Development Zone Kunshan, Jiangsu Province China
Manufacturer (2)	:	ARCADYAN TECHNOLOGY (VIETNAM) CO., LTD. Ba Thien Industrial Park, Ba Hien commune, Binh Xuyen district, Vinh Phuc Province
Standard	:	47 CFR Part 2.1091

The product was received on Jul. 21, 2021, and testing was started from Jul. 21, 2021 and completed on Apr. 07, 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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History of this test report

Report No.	Version	Description	Issued Date
FA170127-01	01	Initial issue of report	Apr. 18, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-
Note: Reference to Sporton Project No.: 170127 and 0D2518.				

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:
1. The test configuration, test mode and test software were written in this test report are declared by the manufacturer. 2. 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: Jessie Wei

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: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850 5725-5895	5180-5250 5250-5320 5500-5720 5745-5825 5815-5885	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)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / π/4-DQPSK / 8DPSK) LE: GFSK

1.2 Antenna Information

Ant.	2.4GHz Port	5GHz Port		Blue tooth	Brand Name	Model Name	Antenna Type	Connector	Gain (dBi)
		UNII 1~2A	UNII 2C~4						
1	-	-	1	-	WALSIN	RFDPA110521IM5B901	Dipole	I-PEX	Note 1
2	-	-	2	-	WALSIN	RFDPA110517IM5B901	Dipole	I-PEX	
3	-	-	3	-	WALSIN	RFDPA110521IM5B903	Dipole	I-PEX	
4	-	-	4	-	WALSIN	RFDPA110521IM5B902	Dipole	I-PEX	
5	1	1	-	-	WALSIN	RFDPA200513IMLB901	Dipole	I-PEX	
6	2	2	-	-	WALSIN	RFDPA200513IMLB902	Dipole	I-PEX	
7	3	3	-	-	WALSIN	RFDPA200509IMLB901	Dipole	I-PEX	
8	4	4	-	-	WALSIN	RFDPA200509IMLB902	Dipole	I-PEX	
9	-	-	-	1	YAGEO	ANT3216A063R2400A	Chip	N/A	

Note 1:

Ant.	Gain (dBi)						
	2.4GHz	UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 4	Bluetooth
1	-	-	-	2.6	2.39	1.98	-
2	-	-	-	2.44	1.96	2.12	-
3	-	-	-	1.68	1.72	1.22	-
4	-	-	-	3.09	2.53	2.47	-
5	1.67	2.63	2.74	-	-	-	-
6	1.19	2.82	2.9	-	-	-	-
7	2.93	3.2	2.73	-	-	-	-
8	2.12	3.87	3.16	-	-	-	-
9	-	-	-	-	-		1.69
Max Gain (dBi)	2.93	3.87	3.16	3.09	2.53	2.47	-
DG (4T1S) (dBi)	6.34	5.31	5.97	6.05	6.09	5.91	-
DG (4T2S) (dBi)	3.34	3.87	3.16	3.09	3.09	2.91	-
DG (4T4S) (dBi)	0.37	0.09	0.26	0.06	0.19	0.03	-

Note 2: The above information was declared by manufacturer.

Note 3: WLAN 2.4GHz/5GHz: The directional gain is measured which follows the procedure of KDB 662911 D03. The antenna report is provided in the operational description for this application.

Note 4: **For 2.4GHz function:**
For IEEE 802.11 b/g/n/VHT/ax mode (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 5GHz function:
For IEEE 802.11a/n/ac/ax mode (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 Bluetooth Function (1TX/1RX):
Only Port 1 can be used as transmitting/receiving antenna.

1.3 Table for Components Source Information

Items	Main Source	Second Source
Transceiver (2.5G LAN)	Brand Name: MAXLINEAR Model Name: GPY211	Brand Name: Broadcom Model Name: BCM50991

Note: The above information was declared by manufacturer.

1.4 Table for EUT Information

EUT	Transceiver (2.5G LAN)
EUT 1	Main Source (2500 / 1000 / 100 /10 Mbps)
EUT 2	Second Source (2500 / 1000 / 100 Mbps)

Note: After evaluating, EUT 1 was selected to test and recorded in the test report.

1.5 Table for EUT supports function

Function	Supports type
AP Router	Master
Bridge	Slave without radar detection
Repeater	Master
Mesh	Master

Note1: After evaluating, only AP Router was selected to test and record in the report.
Note2: The above information was declared by manufacturer.Accessories

1.6 Accessories

Accessories				
Equipment Name	**Brand Name**	**Model Name**	**Rating**	**DC cable**
Adapter 1	DELTA	ADP-45FE F	INPUT: 100-240V~1.2A, 50-60Hz OUTPUT: 19.0V, 2.37A, 45.0W	Non-shielded, 1.5m
Adapter 2	AcBel	ADH011	INPUT: 100-240V~1.4A, 50-60Hz OUTPUT: 19.5V, 2.31A, 45.0W MAX.	Non-shielded, 1.5m
Others				
Power cable*2: Non-shielded, 0.9m				
RJ-45 cable*1: Non-shielded, 1.5m				

1.7 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

1.8 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/f^2)	<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/f^2)	<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 62 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

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	6.34	29.64	35.98	0.01	35.99	3.97192	62	0.08222	1.00000
5.2G;D1D	5.31	29.91	35.22	0.50	35.72	3.73250	62	0.07727	1.00000
5.3G;D1D	5.97	23.94	29.91	0.08	29.99	0.99770	62	0.02275	1.00000
5.6G;D1D	6.05	23.92	29.97	0.02	29.99	0.99770	62	0.02307	1.00000
5.8G;D1D	6.09	29.76	35.85	0.14	35.99	3.97192	62	0.08222	1.00000
5.81G;D1D	2.91	32.78	35.69	0.30	35.99	3.97192	62	0.08222	1.00000
2.4G;BT-EDR	1.69	5.64	7.33	0.50	7.83	0.00607	62	0.00013	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	0.62	35.99	33.84	2.421	7.380	Complies
5230	0.0091		35.72	33.57	2.275	7.380	Complies
5260	0.0091		29.99	27.84	0.608	7.380	Complies
5510	0.0087		29.99	27.84	0.608	7.380	Complies
5795	0.0082		35.99	33.84	2.421	7.380	Complies
5855	0.0081		35.99	33.84	2.421	7.380	Complies
2480	0.0192		7.83	5.68	0.004	7.380	Complies

Simultaneous Transmission Analysis Mode:

WLAN 2.4GHz + WLAN 5GHz (UNII 1~UNII 2A) + WLAN 5GHz (UNII 2C~UNII 4) + Bluetooth

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	0.62	35.99	33.84	2.421	7.380	0.96	<= 1
5230		35.72	33.57	2.275	7.380		
5795		35.99	33.84	2.421	7.380		
2480		7.83	5.68	0.004	7.380		

———THE END———