

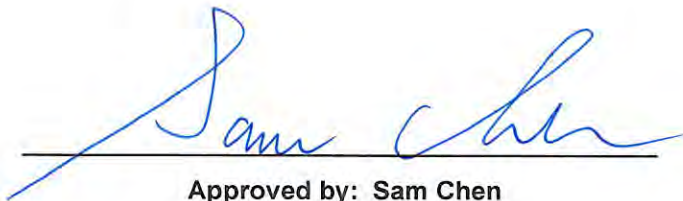


RADIO EXPOSURE TEST REPORT

FCC ID : MSQ-RTAX7500
Equipment : Wireless Dual Band WiFi 6 Router
Brand Name : ASUS
Model Name : RT-AX1800S V2, RT-AX3000S
Applicant : ASUSTeK COMPUTER INC.
1F., No. 15, Lide Rd., Beitou, Taipei City 112, Taiwan
Standard : 47 CFR Part 2.1091

The product was received on Sep. 28, 2023, and testing was started from Jan. 20, 2024 and completed on Feb. 27, 2024. 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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Photographs of EUT v01



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/manufacture 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: Muse Chan



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	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

Set	Ant.	Port		Brand	Model Name	Antenna Type	Connector	Gain (dBi)
		2.4GHz	5GHz					
1	1	1	N/A	RF Link	U00T01S039N04305	PCB	MHF Plug	Note 1
	2	2	1		U00T01S039N04308		MHF Plug	
	3	N/A	2		U00T01S039N04306		MHF Plug	
	4	N/A	3		U00T01S039N04307		MHF Plug	
2	1	-	N/A		U00T01S016N04814		MHF Plug	
	2	-	-		U00T01S016N04817		MHF Plug	
	3	N/A	-		U00T01S016N04815		MHF Plug	
	4	N/A	-		U00T01S016N04816		MHF Plug	

Note 1:

Set	Ant.	Gain (dBi)				
		WLAN 2.4GHz	WLAN 5GHz			
			UNII 1	UNII 2A	UNII 2C	UNII 3
1 & 2	1	2.57	N/A	N/A	N/A	N/A
	2	2.55	2.54	2.45	2.50	2.57
	3	N/A	2.64	2.64	2.56	2.91
	4	N/A	2.84	2.76	2.94	2.82

Note 2: The above information was declared by manufacturer.

Note 3: The EUTs have two sets of antenna. The differences between set 1 and set 2 are just the length and design of the exterior, so only set 1 was selected to test all the test items.

Note 4: Directional gain information

Type	Maximum Output Power	Power Spectral Density
Non-BF	Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left[\sum_{k=1}^{N_{ANT}} \xi_{j,k} \right]^2}{N_{ANT}} \right]$
BF	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left[\sum_{k=1}^{N_{ANT}} \xi_{j,k} \right]^2}{N_{ANT}} \right]$	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left[\sum_{k=1}^{N_{ANT}} \xi_{j,k} \right]^2}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula :

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ANT}} \left[\sum_{k=1}^{N_{ANT}} \xi_{j,k} \right]^2}{N_{ANT}} \right]$$

$$NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2) = 10^{G2/20} ; NSS1(g1,2) = 10^{G3/20} ; NSS1(g1,2) = 10^{G4/20}$$

$$g_{j,k} = (Nss1(g1,1) + Nss1(g1,2) + Nss1(g1,3) + Nss1(g1,4))^2$$

$$DG = 10 \log[(Nss1(g1,1) + Nss1(g1,2) + Nss1(g1,3) + Nss1(g1,4))^2 / N_{ANT}] \Rightarrow 10$$

$$\log[(10^{G1/20} + 10^{G2/20} + 10^{G3/20} + 10^{G4/20})^2 / N_{ANT}]$$

Where ;

$$2.4G \ G1 = 2.57 \text{ dBi} ; G2 = 2.55 \text{ dBi} ;$$

$$5G \ \text{UNII-1} \ G1 = 2.54 \text{ dBi} ; G2 = 2.64 \text{ dBi} ; G3 = 2.84 \text{ dB}$$

$$5G \ \text{UNII-2A} \ G1 = 2.45 \text{ dBi} ; G2 = 2.64 \text{ dBi} ; G3 = 2.76 \text{ dB}$$

$$5G \ \text{UNII-2C} \ G1 = 2.50 \text{ dBi} ; G2 = 2.56 \text{ dBi} ; G3 = 2.94 \text{ dB}$$

$$5G \ \text{UNII-3} \ G1 = 2.57 \text{ dBi} ; G2 = 2.91 \text{ dBi} ; G3 = 2.82 \text{ dB}$$

$$2.4G \ DG = 5.57 \text{ dBi}$$

$$5G \ \text{UNII-1} \ DG = 7.54 \text{ dBi}$$

$$5G \ \text{UNII-2A} \ DG = 7.39 \text{ dBi}$$

$$5G \ \text{UNII-2C} \ DG = 7.44 \text{ dB}$$

$$5G \ \text{UNII-3} \ DG = 7.54 \text{ dBi}$$

Note 5: For 2.4GHz function:

For IEEE 802.11 b/g/n/VHT/ax (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 function:

For IEEE 802.11 a/n/ac/ax (3TX/3RX):

Port 1~3 can be used as transmitting/receiving antenna.

Port 1~3 could transmit/receive simultaneously.



1.3 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Description
RT-AX1800S V2	All the models are identical, the different model names served as strategy for marketing.
RT-AX3000S	

Note 1: From the above models, model: RT-AX1800S V2 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

1.4 Table for EUT Information

EUT	Equipped Antenna
EUT 1	Set 1
EUT 2	Set 2

Note 1: From the above, EUT 1 was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

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 Accessories

Accessories			
Equipment Name	Brand Name	Model Name	Rating
Adapter 1	Frecom	F18L10-120150SPAU	Input: 100-240V~50/60Hz, 0.6A Output: 12.0V, 1.5A, 18.0W
Adapter 2	AMC	AD-0181200150US-1	Input: 100-240V~50/60Hz,0.6A Output: 12V, 1.5A
Others			
RJ-45 cable 1*1: Black, Non-shielded, 1.5m			
RJ-45 cable 2*1: Blue, Non-shielded, 1m			

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/ cm ²)	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/ cm ²)	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 47 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 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	19.2R 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)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	5.57	28.50	31.92	0.50	1745.822	47	C	4241.3	0.4118
5.2G;D1D	7.45	28.30	33.60	0.24	2421.029	47	C	4241.3	0.5710
5.3G;D1D	7.39	22.56	27.80	0.04	608.135	47	C	4241.3	0.1434
5.6G;D1D	7.44	22.46	27.75	0.09	608.135	47	C	4241.3	0.1434
5.8G;D1D	7.54	28.43	33.82	0.02	2421.029	47	C	4241.3	0.5710

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

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;D1D	5.57	28.50	31.92	0.50	1745.822	47	C	4241.3	0.4118
5.8G;D1D	7.54	28.43	33.82	0.02	2421.029	47	C	4241.3	0.5710
Sum TL Ratio_C	0.9828	-	-	-	-	-	-	-	-
Ratio Limit	1	-	-	-	-	-	-	-	-

Note: The above antenna gain was declared by manufacturer.

—————THE END—————