



RADIO EXPOSURE TEST REPORT

FCC ID : QXO-AP4000NB
Equipment : Access Point
Brand Name : Extreme Networks
Model Name : AP4000
Applicant : Extreme Networks, Inc.
2121 RDU Center Drive Morrisville North Carolina
United States 27560
Manufacturer : Extreme Networks, Inc.
2121 RDU Center Drive Morrisville North Carolina
United States 27560
Standard : 47 CFR Part 2.1091

The product was received on May 13, 2021, and testing was started from May 21, 2021 and completed on Aug. 18, 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
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Report Version : 01



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.: 151220, 151220-02.

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: Penny Kao



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	5955-7095	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)



1.2 Antenna Information

Ant.	Radio	Model Name	Antenna Type	Connector	Gain (dBi)
1	1, 2	N/A	PIFA	I-PEX	Note 1
2	1, 2	N/A	PIFA	I-PEX	
3	3	N/A	PIFA	I-PEX	
4	3	N/A	PIFA	I-PEX	
5	3	N/A	PIFA	I-PEX	
6	3	N/A	PIFA	I-PEX	

Ant.	WLAN 2.4GHz Port	WLAN 5GHz UNII 1~3 Port	Scanning radio (WLAN 2.4GHz) Port	Scanning radio (5GHz UNII 1~3) Port	Scanning radio (6E UNII 5~8) Port
1	2	2	-	-	-
2	1	1	-	-	-
3	-	-	2	2	-
4	-	-	1	1	-
5	-	-	-	-	1
6	-	-	-	-	2

Note 1: <Antenna Gain>

Ant.	Gain (dBi)													
	2.4GHz	Scanning radio (2.4GHz)	WLAN 5GHz UNII 1~3				Scanning radio (5GHz UNII 1~3)				Scanning radio (6E UNII 5~8)			
			UNII1	UNII2A	UNII2C	UNII3	UNII1	UNII2A	UNII2C	UNII3	UNII1	UNII2A	UNII2C	UNII3
1	2.62	-	2.31	2.37	2.15	1.81	-	-	-	-	-	-	-	-
2	2.61	-	1.71	1.64	1.27	1.75	-	-	-	-	-	-	-	-
3	-	5.20	-	-	-	-	5.91	5.91	5.39	5.80	-	-	-	-
4	-	5.32	-	-	-	-	5.11	5.11	5.11	5.62	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	4.34	4.56	4.56	4.50
6	-	-	-	-	-	-	-	-	-	-	4.88	5.25	5.25	5.05

<Radio 1, 2 Directional Gain>

Ant.	Radio	Item	WLAN 2.4GHz	Directional Gain(dBi)			
				WLAN 5GHz			
				UNII 1	UNII 2A	UNII 2C	UNII 3
1	1, 2	2T1S	4.72	4.87	4.3	3.39	3.69
2	1, 2	2T2S	2.62	2.31	2.37	2.15	1.81

<Radio 3 Directional Gain>

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



Ex.

Directional Gain (NSS1) formula :

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

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

$g_{j,k} = (NSS1(g1,1) + NSS1(g1,2))^2$

$DG = 10 \log[(NSS1(g1,1) + NSS1(g1,2))^2 / N_{ANT}] \Rightarrow 10 \log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}]$

Where ;

$G1 = 10$; $G2 = 10$;

2.4G $G1 = 5.20$ dBi; $G2 = 5.32$ dBi ; $DG = 8.27$ dBi

5G Band1 $G1 = 5.91$ dBi; $G2 = 5.11$ dBi; $DG = 8.53$ dBi

5G Band2 $G1 = 5.91$ dBi; $G2 = 5.11$ dBi; $DG = 8.53$ dBi

5G Band3 $G1 = 5.39$ dBi; $G2 = 5.11$ dBi; $DG = 8.26$ dBi

5G Band4 $G1 = 5.80$ dBi; $G2 = 5.62$ dBi; $DG = 8.72$ dBi

6G Band1 $G1 = 4.34$ dBi; $G2 = 4.88$ dBi; $DG = 7.62$ dBi

6G Band2 $G1 = 4.56$ dBi; $G2 = 5.25$ dBi; $DG = 7.92$ dBi

6G Band3 $G1 = 4.56$ dBi; $G2 = 5.25$ dBi; $DG = 7.92$ dBi

6G Band4 $G1 = 4.50$ dBi; $G2 = 5.05$ dBi; $DG = 7.79$ dBi

Note 2: The above information (except Radio 1, 2 gain) was declared by manufacturer.

Radio 1, 2: Maximum Directional Gain following KDB662911 D03.

Radio 3: Maximum Directional Gain following KDB662911 D01.

Note 3: The EUT has six antennas.

< Radio 1 >

For 2.4GHz:

For IEEE 802.11b/g/n/VHT/ax mode (1TX, 2TX/2RX):

For 1TX

The EUT supports the antenna with TX diversity functions.

Both Port 1 and Port 2 support transmit and receive functions, but only one of them will be used at one time.

The Port 1 generated the worst case, so it was selected to test and record in the report.

For 2TX/2RX

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

Port 1 and Port 2 could transmit/receive simultaneously.

< Radio 2 >

For 5GHz UNII 1~3:

For IEEE 802.11a/n/ac/ax mode (1TX, 2TX/2RX):

For 1TX

The EUT supports the antenna with TX diversity functions.

Both Port 1 and Port 2 support transmit and receive functions, but only one of them will be used at one time.

The Port 1 generated the worst case, so it was selected to test and record in the report.

For 2TX/2RX



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

Port 1 and Port 2 could transmit/receive simultaneously.

< Scanning radio 3 >

For 2.4GHz:

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

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 6E UNII 5~8 (1TX, 2TX/2RX):

For 1TX

The EUT supports the antenna with TX diversity functions.

Both Port 1 and Port 2 support transmit and receive functions, but only one of them will be used at one time.

The Port 2 generated the worst case, so it was selected to test and record in the report.

For 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 Radio function

Radio	WLAN 2.4GHz	5GHz UNII 1~3	Scanning radio (WLAN 2.4GHz / 5GHz UNII 1~3 / 6E UNII 5~8)
1	V (AP, Bridge, Mesh)	-	-
2	-	V AP for UNII 1~3 Bridge, Mesh for UNII 1, 3	-
3	-	-	V (AP)

Note: The above information was declared by manufacturer.

1.4 Table for EUT support function

Function
AP
Bridge
Mesh

Note: The above information was declared by manufacturer.



1.5 Accessories

Accessories
Cradle*1

1.6 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

1.7 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 44 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

For Radio 1, 2

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;G1D	2.62	27.46	30.08	0.50	30.58	1.14288	44	0.04698	1.00000
5.2G;D1D	2.31	27.39	29.70	0.50	30.20	1.04713	44	0.04304	1.00000
5.3G;D1D	2.37	23.97	26.34	0.50	26.84	0.48306	44	0.01986	1.00000
5.6G;D1D	2.15	23.92	26.07	0.50	26.57	0.45394	44	0.01866	1.00000
5.8G;D2D	1.81	28.01	29.82	0.50	30.32	1.07647	44	0.04425	1.00000

For Scanning Radio 3

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;G1D	5.32	27.17	32.49	0.50	32.99	1.99067	44	0.08182	1.00000
5.2G;D1D	5.91	26.95	32.86	0.50	33.36	2.16770	44	0.08910	1.00000
5.3G;D1D	5.53	23.82	29.35	0.50	29.85	0.96605	44	0.03971	1.00000
5.6G;D1D	5.25	23.96	29.21	0.50	29.71	0.93541	44	0.03845	1.00000
5.8G;D2D	5.80	29.50	35.30	0.50	35.80	3.80189	44	0.15627	1.00000
6.2G;D1D	7.63	-	26.29	0.50	26.79	0.47753	44	0.09500	1.00000
6.4G;D1D	5.25	-	26.33	0.50	26.83	0.48195	44	0.09588	1.00000
6.7G;D1D	7.93	-	26.28	0.50	26.78	0.47643	44	0.09478	1.00000
7.0G;D1D	7.79	-	25.15	0.50	25.65	0.36728	44	0.07307	1.00000



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
R1 2437	0.0196	0.44	30.58	28.43	0.697	3.717	Complies
R2 5200	0.0092		30.20	28.05	0.638	3.717	Complies
R3 2437	0.0196		32.99	30.84	1.213	3.717	Complies
R3 6115	0.0078		26.83	24.68	0.294	3.717	Complies
R3 5785	0.0082		35.80	33.65	2.317	3.717	Complies

Simultaneous Transmission Analysis Mode: Radio 1_2.4GHz + Radio 2_5GHz + Scanning radio 3_2.4GHz

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	0.44	30.58	28.43	0.697	3.717	0.69	<= 1
5200		30.20	28.05	0.638	3.717		
2437		32.99	30.84	1.213	3.717		

Simultaneous Transmission Analysis Mode: Radio 1_2.4GHz + Radio 2_5GHz + Scanning radio 3_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	0.44	30.58	28.43	0.697	3.717	0.98	<= 1
5200		30.20	28.05	0.638	3.717		
5785		35.80	33.65	2.317	3.717		

Simultaneous Transmission Analysis Mode: Radio 1_2.4GHz + Radio 2_5GHz + Scanning radio 3_6E

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	0.44	30.58	28.43	0.697	3.717	0.44	<= 1
5200		30.20	28.05	0.638	3.717		
6115		26.83	24.68	0.294	3.717		

Note: The above antenna gain of Scanning radio 3 was declared by manufacturer.

————THE END————