



RADIO EXPOSURE TEST REPORT

FCC ID : 2AU6R03993
Equipment : Security Router
Brand Name : ZYXEL
Model Name : SCR 60AX
Applicant : Zyxel Networks Corporation
No.2 Industry East RD. IX, Hsinchu Science Park,
Hsinchu 30075, Taiwan, R.O.C
Manufacturer : Zyxel Networks Corporation
No.2 Industry East RD. IX, Hsinchu Science Park,
Hsinchu 30075, Taiwan, R.O.C
Standard : 47 CFR Part 2.1091

The product was received on Jul. 12, 2023, and testing was started from Aug. 24, 2023 and completed on Oct. 27, 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 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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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: 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 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) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Bluetooth	2400-2483.5	2402-2480	LE: GFSK



1.2 Antenna Information

Ant.	Port			Brand	Model Name	Antenna Type	Connector	Gain (dBi)
	2.4GHz	5GHz	Bluetooth					
1	1	-	-	PSA	WA-P-LA-06-008	PCB	I-PEX	Note1
2	2	-	-	PSA	WA-P-LA-05-015	PCB	I-PEX	
3	-	1	-	PSA	WA-P-LC-02-086	PCB	I-PEX	
4	-	2	-	PSA	WA-P-LC-03-025	PCB	I-PEX	
5	3	3	-	PSA	WA-P-LB-11-003	PCB	I-PEX	
6	4	4	-	PSA	WA-P-LB-01-323	PCB	I-PEX	
7	-	-	1	PSA	BT	Printed	N/A	

Note1:

Ant.	Gain (dBi)								
	WLAN 2.4GHz 2400~2500 MHz	WLAN 5GHz 5150~5250 MHz	WLAN 5GHz 5251~5300 MHz	WLAN 5GHz 5301~5490 MHz	WLAN 5GHz 5491~5725 MHz	WLAN 5GHz 5726~5835 MHz	WLAN 5GHz 5836~5930 MHz	Bluetooth	
	1	2.74	-	-	-	-	-		-
2	3.65	-	-	-	-	-	-		-
3	-	4.46	4.54	4.26	4.07	4.07	4.01	-	
4	-	4.44	4.33	4.26	4.63	4.58	4.61	-	
5	3.44	4.51	4.60	4.60	4.15	4.61	4.57	-	
6	3.61	4.36	3.83	3.88	4.01	4.38	4.22	-	
7	-	-	-	-	-	-	-	1.93	

Note2: The above information was declared by manufacturer.

For 2.4GHz function:

For IEEE 802.11b/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):

Port 1 can be used as transmitting/receiving antenna.

Port 1 could transmit/receive simultaneously.



Note 3: 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	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ant}} \left[\sum_{k=1}^{N_{ant}} g_{j,k} \right]^2}{N_{ANT}} \right]$
BF	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ant}} \left[\sum_{k=1}^{N_{ant}} g_{j,k} \right]^2}{N_{ANT}} \right]$	$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{ant}} \left[\sum_{k=1}^{N_{ant}} g_{j,k} \right]^2}{N_{ANT}} \right]$

Ex.

Directional Gain (NSS1) formula :

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

$$NSS1(g1,1) = 10^{G1/20} ; NSS1(g1,2) = 10^{G2/20} ; NSS1(g1,3) = 10^{G3/20} ; NSS1(g1,4) = 10^{G4/20}$$

$$g_{j,k} = (NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2$$

$$DG = 10 \log[(NSS1(g1,1) + NSS1(g1,2) + NSS1(g1,3) + NSS1(g1,4))^2 / N_{ANT}] => 10$$

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

Where ;

$$2.4G \ G1= 2.74 \text{ dBi} ; G2= 3.65 \text{ dBi} ; G3= 3.44 \text{ dBi} ; G4= 3.61 \text{ dBi}$$

$$5G \ \text{UNII-1} \ G1 = 4.46 \text{ dBi}; G2 = 4.44 \text{ dBi}; G3 = 4.51 \text{ dBi}; G4 = 4.36 \text{ dBi}$$

$$5G \ \text{UNII-2A} \ G1 = 4.54 \text{ dBi}; G2 = 4.33 \text{ dBi}; G3 = 4.60 \text{ dBi}; G4 = 3.83 \text{ dBi}$$

$$5G \ \text{UNII-2C} \ G1 = 4.07 \text{ dBi}; G2 = 4.63 \text{ dBi}; G3 = 4.15 \text{ dBi}; G4 = 4.01 \text{ dBi}$$

$$5G \ \text{UNII-3} \ G1 = 4.07 \text{ dBi}; G2 = 4.58 \text{ dBi}; G3 = 4.61 \text{ dBi}; G4 = 4.38 \text{ dBi}$$

$$5G \ \text{UNII-4} \ G1 = 4.01 \text{ dBi}; G2 = 4.61 \text{ dBi}; G3 = 4.57 \text{ dBi}; G4 = 4.22 \text{ dBi}$$

$$2.4G \ DG = 9.39 \text{ dBi}$$

$$5G \ \text{UNII-1} \ DG = 10.46 \text{ dBi}$$

$$5G \ \text{UNII-2A} \ DG = 10.35 \text{ dBi}$$

$$5G \ \text{UNII-2C} \ DG = 10.24 \text{ dB}$$

$$5G \ \text{UNII-3} \ DG = 10.43 \text{ dBi}$$

$$5G \ \text{UNII-4} \ DG = 10.38 \text{ dBi}$$



1.3 Accessories

Accessories				
No.	Equipment Name	Brand Name	Model Name	Rating
1	Adapter	APD	WA-36W12R	Input: 100-240V~, 50-60Hz, 0.9A Max Output: 12.0V, 3.0A, 36.0W
Other				
Plug*1				

1.4 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

1.5 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 51 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)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm2)	S Limit (mW/cm2)	Option	TL EIRP (dBm)	TL Ratio
2.4G;D1D	9.39	26.47	35.86	0.13	35.99	51	0.12152	1.00000	C	39.133	0.485
5.2G;D1D	10.46	25.08	35.54	0.45	35.99	51	0.12152	1.00000	C	39.133	0.4850
5.3G;D1D	10.35	19.53	29.88	0.11	29.99	51	0.03052	1.00000	C	39.133	0.1218
5.6G;D1D	10.24	19.66	29.90	0.09	29.99	51	0.03052	1.00000	C	39.133	0.1218
5.81G;D1D	10.38	25.51	35.89	0.10	35.99	51	0.12152	1.00000	C	39.133	0.4850
2.4G;BT-LE	1.93	13.51	15.44	0.5	15.94	51	0.0012	1.00000	C	39.133	0.0048

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

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm2)	Limit (mW/cm2)	Option	TL EIRP (dBm)	TL Ratio
5.81G;D1D	10.38	25.51	35.89	0.10	35.99	51	0.12152	1.00000	C	39.133	0.4850
2.4G;D1D	9.39	26.47	35.86	0.13	35.99	51	0.12152	1.00000	C	39.133	0.4850
Sum TL Ratio_C	0.97										
Ratio Limit	1										

Note: The above antenna gain was declared by manufacturer.

—————THE END—————