



# 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**

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

TEL : 886-3-656-9065  
FAX : 886-3-656-9085  
Report Template No.: CB-A1\_1 Ver1.1

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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)<br>802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)<br>VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)<br>802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) |
| 5GHz WLAN              | 5150-5250<br>5250-5350<br>5470-5725<br>5725-5850<br>5725-5895 | 5180-5250<br>5250-5320<br>5500-5720<br>5745-5825<br>5815-5885 | 802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)<br>802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)<br>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          | WLAN          | WLAN          | WLAN          | WLAN          | WLAN          | WLAN          | Bluetooth |
|      | 2.4GHz        | 5GHz          | 5GHz          | 5GHz          | 5GHz          | 5GHz          | 5GHz          |           |
|      | 2400~2500 MHz | 5150~5250 MHz | 5251~5300 MHz | 5301~5490 MHz | 5491~5725 MHz | 5726~5835 MHz | 5836~5930 MHz |           |
| 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.<br>For power measurements on IEEE 802.11 devices<br>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<br>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 ISCED. |                                                                                    |



## 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 <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | *(100)                                   | <6                                                               |
| 3.0-30                | 1842/f                            | 4.89/f                            | *(900/f <sup>2</sup> )                   | <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 <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | *(100)                                   | <30                                                              |
| 1.34-30               | 824/f                             | 2.19/f                            | *(180/f <sup>2</sup> )                   | <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:

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

**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, <= P<sub>th</sub>.

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

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

| Mode       | DG<br>(dBi) | Power<br>(dBm) | EIRP<br>(dBm) | Tolerance<br>(dB) | Tune-up<br>EIRP<br>(dBm) | Distance<br>(cm) | S<br>(mW/cm <sup>2</sup> ) | S Limit<br>(mW/cm <sup>2</sup> ) | Option | TL EIRP<br>(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<br>(dBi) | Power<br>(dBm) | EIRP<br>(dBm) | Tolerance<br>(dB) | Tune-up EIRP<br>(dBm) | Distance<br>(cm) | S<br>(mW/cm <sup>2</sup> ) | Limit<br>(mW/cm <sup>2</sup> ) | Option | TL EIRP<br>(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————