



RADIO EXPOSURE TEST REPORT

FCC ID : I88EE6510-10

Equipment : Tri-Band Wireless BE18000 10G Ethernet Gateway

Brand Name : ZYXEL

Model Name : EE6510-10

Applicant : Zyxel Communications Corporation
No.2 Industry East RD. IX, Hsinchu Science Park,
Hsinchu 30075, Taiwan

Manufacturer : Zyxel Communications 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 May 30, 2024, and testing was started from May 30, 2024 and completed on Nov. 18, 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: Rex Liao

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

Page Number : 3 of 10
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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	-

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: Sophia Shiung



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) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)
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) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)
6GHz WLAN	5925-7125	5955-7115	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) 802.11be: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM)



1.2 Antenna Information

Ant.	Antenna Position	Port			Brand	Model Name	Ant. Type	Connector	Gain (dBi)
		WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz					
1	2G Ant1	1	-	-	INPAQ	RFPCA351506IMAB401	PCB	I-Pex	Note 1
2	2G Ant2	2	-	-	INPAQ	RFPCA351510IMAB401	PCB	I-Pex	
3	2G Ant3	3	-	-	INPAQ	RFPCA351511IMAB404	PCB	I-Pex	
4	5G Ant1	-	1	-	INPAQ	RFPCA201022IM5B901	PCB	I-Pex	
5	5G Ant2	-	2	-	INPAQ	RFPCA201022IM5B902	PCB	I-Pex	
6	5G Ant3	-	3	-	INPAQ	RFPCA201027IM5B903	PCB	I-Pex	
7	5G Ant4	-	4	-	INPAQ	RFPCA201026IM5B903	PCB	I-Pex	
8	6G Ant1	-	-	1	INPAQ	RFDPA100510IM6B902	TUBE	I-Pex	
9	6G Ant2	-	-	2	INPAQ	RFDPA100509IM6B902	TUBE	I-Pex	
10	6G Ant3	-	-	3	INPAQ	RFDPA100509IM6B903	TUBE	I-Pex	
11	6G Ant4	-	-	4	INPAQ	RFDPA100509IM6B904	TUBE	I-Pex	

Note 1:

Ant.	Antenna Gain (dBi)										
	WLAN 2.4GHz			WLAN 5GHz				WLAN 6GHz			
	2.4G	2.45G	2.4835G	UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
1	4.6	4.82	4.21	-	-	-	-	-	-	-	-
2	2.28	2.32	2.08	-	-	-	-	-	-	-	-
3	3.99	3.32	3.68	-	-	-	-	-	-	-	-
4	-	-	-	2.08	2.09	2.45	2.12	-	-	-	-
5	-	-	-	2.02	2.11	2.64	2.51	-	-	-	-
6	-	-	-	2.12	2.31	3.78	3.46	-	-	-	-
7	-	-	-	3.42	4.1	4.6	4.37	-	-	-	-
8	-	-	-	-	-	-	-	2.67	3.01	3.78	3.22
9	-	-	-	-	-	-	-	3.25	4.65	2.61	4.19
10	-	-	-	-	-	-	-	3.91	2.75	2.19	2.95
11	-	-	-	-	-	-	-	2.99	2.38	3.08	2.28

Item	Antenna Gain (dBi)										
	WLAN 2.4GHz			WLAN 5GHz				WLAN 6GHz			
	2.4G	2.45G	2.4835G	UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
3T1S	5.3	4.85	4.71	-	-	-	-	-	-	-	-
3T2S	4.6	4.82	4.21	-	-	-	-	-	-	-	-
3T3S	4.6	4.82	4.21	-	-	-	-	-	-	-	-
4T1S	-	-	-	3.55	4.37	5.13	4.9	6.77	5.29	6.49	5.08
4T2S	-	-	-	3.42	4.1	4.6	4.37	3.91	4.65	3.78	4.19
4T4S	-	-	-	3.42	4.1	4.6	4.37	3.91	4.65	3.78	4.19

Note 2: The above information (except for the antenna gain and directional gain) was declared by manufacturer.

Note 3: The antenna gain and directional gain are measured which follow the procedure of KDB 662911 D03.

Note 4: **For 2.4GHz function:****For IEEE 802.11 b/g/n/VHT/ax/be (3TX/3RX):**

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

Port 1~3 could transmit/receive simultaneously.



For 5GHz function:

For IEEE 802.11a/n/ac/ax/be (4TX/4RX):

Port 1~4 can be used as transmitting/receiving antenna.

Port 1~4 could transmit/receive simultaneously.

For 6GHz function:

For IEEE 802.11ax/be (4TX/4RX):

Port 1~4 can be used as transmitting/receiving antenna.

Port 1~4 could transmit/receive simultaneously.

1.3 Accessories

Accessories			
Equipment Name	Brand Name	Model Name	Rating
Adapter 1	MOSO	MSS-V3500WR120-042A0-US	Input: 100-240V~50/60Hz, 1.2A max. Output: 12V, 3.5A
Adapter 2	DVE	DSA-36PFN-12FUS 120300	Input: 100-240V~50/60Hz, 1.0A Output: +12.0V, 3.0A, 36.0W
Others			
RJ-45 cable: Non-shielded, 1m			

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 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 50 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

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_{th}.

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

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 (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	4.82	29.87	32.54	0.50	2013.724	50	C	4800.0	0.4197
5.2G;D1D	3.55	29.94	31.34	0.50	1527.566	50	C	4800.0	0.3184
5.3G;D1D	4.37	23.89	26.11	0.50	458.142	50	C	4800.0	0.0955
5.6G;D1D	5.13	23.96	26.94	0.50	554.626	50	C	4800.0	0.1156
5.8G;D1D	4.90	29.95	32.70	0.50	2089.296	50	C	4800.0	0.4354
6.2G;D1D	6.77	-	26.52	0.50	503.501	50	C	4800.0	0.1049
6.4G;D1D	5.29	-	26.59	0.50	511.682	50	C	4800.0	0.1066
6.7G;D1D	6.49	-	25.86	0.50	432.514	50	C	4800.0	0.0901
7.0G;D1D	5.08	-	23.69	0.50	262.422	50	C	4800.0	0.0547

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz + WLAN 5GHz + WLAN 6GHz

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	4.82	29.87	32.54	0.50	2013.724	50	C	4800.0	0.4197
5.8G;D1D	4.90	29.95	32.70	0.50	2089.296	50	C	4800.0	0.4354
6.4G;D1D	5.29	-	26.59	0.50	511.682	50	C	4800.0	0.1066
Sum TL Ratio_C	0.9617								
Ratio Limit	1								

————THE END————