

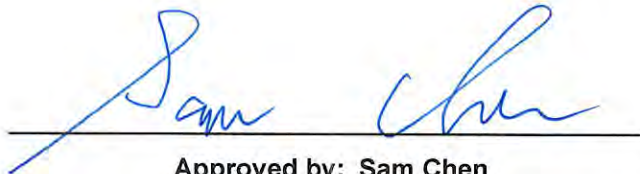


RADIO EXPOSURE TEST REPORT

FCC ID : TLZ-XH32X
Equipment : IEEE 802.11 a/b/g/n/ac/ax Wi-Fi + Bluetooth 5.3
Combo SIP Module
Brand Name : AzureWave
Model Name : AW-XH323, AW-XH325, AW-XH327
Applicant : AzureWave Technologies, Inc.
8F., No.94, Baozhong Rd. , Xindian Dist., New
Taipei City , Taiwan 231
Manufacturer : AzureWave Technologies, Inc.
8F., No.94, Baozhong Rd. , Xindian Dist., New
Taipei City , Taiwan 231
Standard : 47 CFR Part 2.1091

The product was received on Dec. 14, 2023, and testing was started from Dec. 16, 2023 and completed on Apr. 11, 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

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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: 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)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5700 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	5955-7115	802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / $\pi/4$ -DQPSK / 8DPSK) LE: GFSK



1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	ARISTOTLE	RFA-27-JP326MHF4C198	PIFA	I-PEX	Note 1
2					

Note 1:

Ant.	Port		Gain (dBi)		
	WLAN 2.4GHz / 5GHz / 6GHz	Bluetooth	WLAN 2.4GHz	WLAN 5GHz / 6GHz	Bluetooth
1	1	1	3.5	5	3.5
2	2	N/A			

Note 2: The above information was declared by manufacturer.

Note 3: Directional gain information for 2TX/2RX

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

Ex.

Directional Gain (NSS1) formula :

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

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

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

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

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

Where ;

$$2.4G\ G1 = 3.5\ dBi ; G2 = 3.5\ dBi ;$$

$$5G\ UNII-1\ G1 = 5.00\ dBi ; G2 = 5.00\ dBi ;$$

$$5G\ UNII-2A\ G1 = 5.00\ dBi ; G2 = 5.00\ dBi ;$$

$$5G\ UNII-2C\ G1 = 5.00\ dBi ; G2 = 5.00\ dBi ;$$

$$5G\ UNII-3\ G1 = 5.00\ dBi ; G2 = 5.00\ dBi ;$$

$$2.4G\ DG = 6.51\ dBi$$

$$5G\ UNII-1\ DG = 8.01\ dBi$$

$$5G\ UNII-2A\ DG = 8.01\ dBi$$

$$5G\ UNII-2C\ DG = 8.01\ dBi$$

$$5G\ UNII-3\ DG = 8.01\ dBi$$



Note 4: For 2.4GHz function:

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

Only Port 1 can be used as transmitting/receiving antenna.

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 802.11a/n/ac/ax (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

For IEEE 802.11a/n/ac/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 6GHz function:

For IEEE 802.11ax (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

For IEEE 802.11ax (2TX/2RX):

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

Port 1 and Port 2 could transmit/receive simultaneously.

For Bluetooth function (1TX/1RX):

Only Port 1 can be used as transmitting/receiving antenna.

1.3 Table for Multiple Listing

Model Name	Description
AW-XH323	All the models are identical, the different model names serve as strategies for marketing.
AW-XH325	
AW-XH327	

Note 1: From the above models, AW-XH323 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

The EUT has 3 SKUs. The difference between them lies in the software settings listed below:

SKU	TX/RX Function for WLAN	Supporting WLAN 6GHz
1	2TX/2RX	√
2	1TX/1RX	√
3	2TX/2RX	X

Note 1: From the above SKUs, SKU 2 was selected to test for all the functions, and SKU 1 was selected to test for WLAN 2.4GHz, 5GHz and 6GHz functions. Their data was recorded in this report.

Note 2: The above information was declared by manufacturer.

1.5 Accessories

N/A

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 20 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

For SKU 1:

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)
2.4G;D1D	6.51	22.49	26.85	0.50	543.250	20	B	3060.0
5.2G;D1D	8.01	21.00	26.86	0.50	544.503	20	B	3060.0
5.3G;D1D	8.01	21.15	27.01	0.50	563.638	20	B	3060.0
5.6G;D1D	8.01	21.30	27.16	0.50	583.445	20	B	3060.0
5.8G;D1D	8.01	23.81	29.67	0.50	1039.920	20	B	3060.0
6.2G;D1D	5.00	-	13.78	0.50	26.792	20	C	768.007
6.4G;D1D	5.00	-	13.75	0.50	26.607	20	C	768.007
6.7G;D1D	5.00	-	12.53	0.50	20.091	20	C	768.007
7.0G;D1D	5.00	-	13.06	0.50	22.699	20	C	768.007

For SKU 2:

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)
2.4G;D1D	3.50	21.26	22.61	0.50	204.644	20	B	3060.0
5.2G;D1D	5.00	20.48	23.33	0.50	241.546	20	B	3060.0
5.3G;D1D	5.00	19.93	22.78	0.50	212.814	20	B	3060.0
5.6G;D1D	5.00	19.54	22.39	0.50	194.536	20	B	3060.0
5.8G;D1D	5.00	20.66	23.51	0.50	251.768	20	B	3060.0
6.2G;D1D	5.00	-	14.43	0.50	31.117	20	C	768.007
6.4G;D1D	5.00	-	14.46	0.50	31.333	20	C	768.007
6.7G;D1D	5.00	-	14.79	0.50	33.806	20	C	768.007
7.0G;D1D	5.00	-	14.66	0.50	32.810	20	C	768.007
2.4G;BT-BR	3.50	7.54	8.89	0.50	8.690	20	B	3060.0
2.4G;BT-LE	3.50	6.68	8.03	0.50	7.129	20	B	3060.0

————THE END————