



RADIO EXPOSURE TEST REPORT

FCC ID : TLZ-XM666

Equipment : IEEE 802.11 a/b/g/n/ac/ax Wireless LAN 1T1R and BLE/802.15.4 Solution Family 12 x 12 LGA Module

Brand Name : AzureWave

Model Name : AW-XM646G-SUR,AW-XM646G-USB,AW-XM646F-SUR, AW-XM646F-USB,AW-XM646C-SUR,AW-XM646C-USB, AW-XM646B-SUR,AW-XM646B-USB

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 Feb. 21, 2025, and testing was started from Mar. 21, 2025 and completed on Jun. 09, 2025. 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

[illegible]



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.: 521124

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: Vicky Huang



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)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850 5725-5895	5180-5250 5250-5320 5500-5720 5745-5825 5845-5885	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) 802.11ax: OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Bluetooth	2400-2483.5	2402-2480	LE: GFSK
Thread	2400-2483.5	2405-2480	O-QPSK

1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
						WLAN 2.4GHz, Bluetooth and Thread	WLAN 5GHz
1	1	ARISTOTLE	RFA-27-JP326MHF4C198	PIFA Antenna	I-PEX	3.5	5

Note 1: The above information was declared by manufacturer.

Note 2: **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 5GHz function:

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

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

For Bluetooth/Thread function (1TX/1RX):

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



1.3 Table for Multiple Listing

The difference for each model is shown as below:

EUT	Model Name	WLAN 2.4G	WLAN 5G	Bluetooth	802.15.4	Interface
1	AW-XM646G-SUR	V	V	V	V	SUR
2	AW-XM646G-USB	V	V	V	V	USB
-	AW-XM646F-SUR	V	V	V	X	SUR
-	AW-XM646F-USB	V	V	V	X	USB
-	AW-XM646C-SUR	V	X	V	V	SUR
-	AW-XM646C-USB	V	X	V	V	USB
-	AW-XM646B-SUR	V	X	V	X	SUR
-	AW-XM646B-USB	V	X	V	X	USB
Description						
In addition to the differences mentioned above, there are differences in marketing strategy.						

Note 1: From the above EUT, EUT 1 for other and EUT 2 for WLAN 5G were 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 Accessories

N/A

1.5 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

1.6 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 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

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_{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

Summary

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	3.50	21.52	22.87	0.50	217.270	20	B	3060.0	0.0710
5.2G;D1D	5.00	22.74	25.59	0.50	406.443	20	B	3060.0	0.1329
5.3G;D1D	5.00	22.32	25.17	0.50	368.978	20	B	3060.0	0.1206
5.6G;D1D	5.00	21.28	24.13	0.50	290.402	20	B	3060.0	0.0949
5.8G;D1D	5.00	22.43	25.28	0.50	378.443	20	B	3060.0	0.1237
5.81G;D1D	5.00	22.35	25.20	0.50	371.535	20	B	3060.0	0.1215
2.4G;BT-LE	3.50	12.73	14.08	0.50	28.708	20	B	3060.0	0.0094
2.4G;D1D Thread	3.50	12.46	13.81	0.50	26.977	20	B	3060.0	0.0088

Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+Bluetooth

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
2.4G;G1D	3.50	21.52	22.87	0.50	217.270	20	B	3060.0	0.0710
2.4G;BT-LE	3.50	12.73	14.08	0.50	28.708	20	B	3060.0	0.0094
Sum TL Ratio_B	0.0804								
Ratio Limit	1								

Simultaneous Transmission Analysis Mode: WLAN 5GHz+Bluetooth

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
5.2G;D1D	5.00	22.74	25.59	0.50	406.443	20	B	3060.0	0.1329
2.4G;BT-LE	3.50	12.73	14.08	0.50	28.708	20	B	3060.0	0.0094
Sum TL Ratio_B	0.1423								
Ratio Limit	1								

————THE END————