

Testing Laboratory
3787

RADIO EXPOSURE TEST REPORT

FCC ID : TLZ-AM510
Equipment : IEEE 802.11 1X1 a/b/g/n Wireless LAN + Bluetooth
5.1 Combo 12 x 12 LGA Module
Brand Name : AzureWave
Model Name : AW-AM510 ; AW-AM510-I
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 Mar. 15, 2021, and testing was started from Mar. 16, 2021 and completed on Apr. 20, 2021. 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 variant 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.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1 General Description	5
1.1 EUT General Information	5
1.2 Antenna Information	5
1.3 Antenna Trace Layout	6
1.4 Table for Multiple Listing	6
1.5 Table for Permissive Change	7
1.6 Accessories	7
1.7 Applicable Standards	7
1.8 Testing Location	7
2 Maximum Permissible Exposure	8
2.1 Limit of Maximum Permissible Exposure	8
2.2 MPE Calculation Method	8
2.3 MPE Exemption	9
2.4 Calculated Result and Limit.....	10

Photographs of EUT v01



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
Issued Date : Feb. 05, 2025
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)
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)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / $\pi/4$ -DQPSK / 8DPSK) LE: GFSK

1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	Molex	1461531050	Dipole	I-PEX	Note 1
2	1	MAG. LAYERS	MSA-4008-25GC1-A2	PIFA	I-PEX	Note 1
3	1	LYNwave	5-PP005421	PIFA	I-PEX	Note 1
4	1	California Eastern Laboratories	Dual-Band Planar Antenna 0033	Split Ring	N/A	Note 1

Note 1:

Ant.	Antenna Gain (dBi)		
	WLAN 2.4GHz	WLAN 5GHz	Bluetooth
1	3.20	4.25	3.20
2	2.98	5.16	2.98
3	2.90	4.30	2.90
4	1.00	4.40	1.00

Note 2: The above information was declared by manufacturer.

Note 3: **<For conducted test>**

2.4GHz and Bluetooth

Only the higher gain antenna "Ant. 1" was tested and recorded in the report.

5GHz

Only the higher gain antenna "Ant. 2" was tested and recorded in the report.



Note 4: <For WLAN 2.4GHz>

For IEEE 802.11b/g/n mode (1TX/1RX)

Only Port 1 can be used as transmitting/receiving.

<For WLAN 5GHz>

For IEEE 802.11a/n mode (1TX/1RX)

Only Port 1 can be used as transmitting/receiving.

<For Bluetooth> (1TX/1RX)

Only Port 1 can be used as transmitting/receiving.

1.3 Antenna Trace Layout

Type of Antenna Trace Layout	Antenna
1	Ant. 1~3
2	Ant. 4

Note: The above information was declared by manufacturer.

1.4 Table for Multiple Listing

Model Name	Operating Temperature
AW-AM510	0~70°C
AW-AM510-I	-40~85°C

Note 1: From the above models, model: AW-AM510 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.



1.5 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA131001.

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Add the Split Ring antenna with new type of antenna trace layout (Please refer to section 1.2 and 1.3, Ant. 4 for detailed information.) 2. Add new type of antenna trace layout, type 2, only for Ant. 4. 3. Remove model "AW-AM510MA". 4. Revise the information in Table for Multiple Listing (Please refer to section 1.4 for detailed information.)	After evaluation, it does not need to re-test.
5. Recalculate RF Exposure to meet the latest standard.	RF Exposure.

1.6 Accessories

N/A

1.7 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

1.8 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:

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

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

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	3.20	22.66	23.71	0.50	263.633	20	B	3060.0	0.0862
5.2G;D1D	5.16	16.27	19.28	0.50	95.060	20	B	3060.0	0.0311
5.3G;D1D	5.16	19.99	23.00	0.50	223.872	20	B	3060.0	0.0732
5.6G;D1D	5.16	19.53	22.54	0.50	201.372	20	B	3060.0	0.0658
5.8G;D1D	5.16	20.11	23.12	0.50	230.144	20	B	3060.0	0.0752
2.4G;BT-EDR	3.20	5.71	6.76	0.50	5.321	20	B	3060.0	0.0017
2.4G;BT-LE	3.20	8.59	9.64	0.50	10.328	20	B	3060.0	0.0034

Simultaneous Transmission Analysis Mode:

Test Mode 1: 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	3.20	22.66	23.71	0.50	263.633	20	B	3060.0	0.0862
2.4G;BT-LE	3.20	8.59	9.64	0.50	10.328	20	B	3060.0	0.0034
Sum TL Ratio_B	0.0896								
Ratio Limit	1								

Test Mode 2: WLAN 5GHz + Bluetooth

Mode	DG (dBi)	Power (dBm)	ERP (dBm)	Tolerance (dB)	Tune-up ERP (mW)	Distance (cm)	Option	TL ERP (mW)	TL Ratio
5.8G;D1D	5.16	20.11	23.12	0.50	230.144	20	B	3060.0	0.0752
2.4G;BT-LE	3.20	8.59	9.64	0.50	10.328	20	B	3060.0	0.0034
Sum TL Ratio_B	0.0786								
Ratio Limit	1								

Note: The above antenna gain was declared by manufacturer.

—THE END—