RADIO EXPOSURE TEST REPORT

FCC ID	:	TLZ-CB511
Equipment	:	IEEE 802.11 a/b/g/n/ac WLAN 2T2R with Bluetooth 5.0 Combo Module
Brand Name	:	AzureWave
Model Name	:	AW-CB511NF-BPF, AW-CB511NF, AW-CB511MA
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 Sep. 03, 2021, and testing was started from Sep. 04, 2021 and completed on Dec. 06, 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 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

Report No.	Version	Description	Issued Date
FA170220	01	Initial issue of report	Mar. 28, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:
1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results. 2. The measurement uncertainty please refer to report "Measurement Uncertainty".
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Sandy Chuang

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	2412-2472	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) VHT: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / π/4-DQPSK / 8DPSK) LE: GFSK

1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Antenna Gain(dBi)		
						WLAN 2.4GHz	WLAN 5GHz	Bluetooth
1	1	NVIDIA	320-1929-000	PIFA	I-PEX MHF4-L	4.3	5.4	4.3
2	2	NVIDIA	320-1929-000	PIFA	I-PEX MHF4-L	4.3	5.4	-

Note 1: The above information was declared by manufacturer.

<WLAN 2.4GHz Function>

For IEEE 802.11b/g/n/VHT mode (1TX/2RX):

The EUT supports 1TX/2RX function, and it supports TX diversity function.

Both Port 1 and Port 2 could be used as transmitting antenna, but only one of them will be used at one time. Port 1 and Port 2 could receive simultaneously.

Both Port 1 and Port 2 are selected to test.

For IEEE 802.11b/g/n/VHT mode (2TX/2RX):

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

Port 1 and Port 2 could transmit/receive simultaneously.

<WLAN 5GHz Function>

For IEEE 802.11a/n/ac mode (1TX/2RX):

The EUT supports 1TX/2RX function, and it supports TX diversity function.

Both Port 1 and Port 2 could be used as transmitting antenna, but only one of them will be used at one time. Port 1 and Port 2 could receive simultaneously.

Both Port 1 and Port 2 are selected to test.

For IEEE 802.11a/n/ac mode (2TX/2RX):

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

Port 1 and Port 2 could transmit/receive simultaneously.

<Bluetooth Function> (1TX/1RX)

Only Port 1 can be used as transmitting/receiving.

Note 2: Directional gain information

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

Ex.

Directional Gain (NSS1) formula : $Directional Gain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$

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

$g_{j,k}$ =(Nss1(g1,1) + Nss1(g1,2))^2

DG = 10 log[(Nss1(g1,1) + Nss1(g1,2))^2 / N_{ANT}] => 10 log[($10^{G1/20}$ + $10^{G2/20}$)^2 / N_{ANT}]

Where ;

G1 = Ant 1 Gain ; G2 = Ant 2 Gain

2.4GHz DG = 7.31 dBi

5 GHz U-NII-1 DG = 8.41 dBi

5 GHz U-NII-2A DG = 8.41 dBi

5 GHz U-NII-2C DG = 8.41 dBi

5 GHz U-NII-3 DG = 8.41 dBi

1.3 Table for EUT Type

EUT	Power IC Source	Brand Name	Model Name	Part No.	Location
1	Main	uPI	RE0108ADD6-18	XC6223H1819R-G	U11
2	Second	MicrOne	ME6211C18U4AG-N	RE0108ADD6-18WDFN-6L	

Note 1: EUT 1 has been evaluated as the worst EUT, so it was selected to test.
Note 2: The above information was declared by manufacturer.

1.4 Table for Multiple Listing

Model Name	Description
AW-CB511NF-BPF	All the models are identical; different models serve as marketing strategy.
AW-CB511NF	
AW-CB511MA	

Note: From the above models, model: AW-CB511NF-BPF (EUT 1) was selected as representative model for the test and its data was recorded in this report.

1.5 Accessories

N/A

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 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/ cm²)	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/ cm²)	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 (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

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 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)
2.4G;G1D	4.30	22.85	27.15	0.50	27.65	0.58210	20	0.11581	1.00000
5.2G;D1D	8.41	19.93	28.34	0.50	28.84	0.76560	20	0.15231	1.00000
5.3G;D1D	8.41	20.24	28.65	0.50	29.15	0.82224	20	0.16358	1.00000
5.6G;D1D	8.41	20.80	29.21	0.50	29.71	0.93541	20	0.18609	1.00000
5.8G;D1D	8.41	20.04	28.45	0.50	28.95	0.78524	20	0.15622	1.00000
2.4G;BT-BR	4.30	11.10	15.40	0.50	15.90	0.03890	20	0.00774	1.00000
2.4G;BT-LE	4.30	10.95	15.25	0.50	15.75	0.03758	20	0.00748	1.00000

Simultaneous Transmission Analysis Mode:
EUT 1 <2.4GHz + Bluetooth>

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)	Ratio (S/Limit)
2.4G;G1D	4.30	22.85	27.15	0.50	27.65	0.58210	20	0.11580	1.00000	0.11580
2.4G;BT-BR	4.30	11.10	15.40	0.50	15.90	0.03890	20	0.00774	1.00000	0.00774
									Sum Ratio	0.12354
									Ratio Limit	1

EUT 1 <5GHz + Bluetooth>

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm^2)	S Limit (mW/cm^2)	Ratio (S/Limit)
5.6G;D1D	8.41	20.80	29.21	0.50	29.71	0.93541	20	0.18609	1.00000	0.18609
2.4G;BT-BR	4.30	11.10	15.40	0.50	15.90	0.03890	20	0.00774	1.00000	0.00774
									Sum Ratio	0.19383
									Ratio Limit	1

Note: The above antenna gain was declared by manufacturer.

———THE END———