RF Exposure Report

Report No.:	SA140605E01D
FCC ID:	TLZ-CB178NF
Test Model:	AW-CB178NF, AW-CB178NF(UART)
Series Model:	AW-CB178NF-ZP
Received Date:	Feb. 14, 2014
Test Date:	June 24 to Aug. 14, 2014 and and Dec. 09, 2015
Issued Date:	Dec. 22, 2015
Applicant:	AzureWave Technologies, Inc.
Address:	8F., No.94, Baozhong Rd. , Xindian Dist., New Taipei City , Taiwan 231
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
SA140605E01D	Original release.	Dec. 22, 2015

1 Certificate of Conformity

Product:	802.11ac/a/b/g/n 2X2 MIMO WLAN & Bluetooth M.2 module
Brand:	AzureWave
Test Model:	AW-CB178NF, AW-CB178NF(UART)
Series Model:	AW-CB178NF-ZP
Sample Status:	ENGINEERING SAMPLE
Applicant:	AzureWave Technologies, Inc.
Test Date:	June 24 to Aug. 14, 2014 and and Dec. 09, 2015
Standards:	FCC Part 2 (Section 2.1093) KDB 447498 D01 General RF Exposure Guidance v06 IEEE Std C95.1-2005

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Dec. 22, 2015

Midoli Peng / Specialist

Approved by : _____ , **Date:** Dec. 22, 2015

May Chen / Manager

2 RF Exposure

2.1 Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
300-1500	…	…	F/1500	30
1500-100,000	…	…	1.0	30

F = Frequency in MHz

2.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

3 Antenna Gain

The antennas provided to the EUT, please refer to the following table:

Set 1 Antenna

Transmitter Circuit	Brand	Model	Ant. Gain (dBi) < Excluding cable loss>	Cable Loss (dB)		Net. Gain (dBi)	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
				100 mm	180 mm					
Chain (0)	TE	2118433-1	2.18	1	0.54	0.64	2400~2484	PCB	R-SMA	100+180
			2.34	1.3	0.96	0.08	5150~5850			
Chain (1)	TE	2118433-1	2.18	1	0.54	0.64	2400~2484	PCB	R-SMA	100+180
			2.34	1.3	0.96	0.08	5150~5850			

Set 2 Antenna

Transmitter Circuit	Brand	Model	Ant. Gain(dBi) <Including cable loss>	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
Chain (0)	Walsin	RFPCA310715EMLB301	3.06	2400~2500	PIFA	mini - ipex	150
			4.81	5150~5850			
Chain (1)	Walsin	RFPCA310715EMLB301	3.06	2400~2500	PIFA	mini - ipex	150
			4.81	5150~5850			

Set 3 Antenna

Transmitter Circuit	Brand	Model	Ant. Gain(dBi) <Including cable loss>	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
Chain (0)	Wistron NeWeb Corporation	81EAAX15.G12	1.02	2400~2484	PIFA	mini - ipex	254
			-1.03	5150~5850			
Chain (1)	Wistron NeWeb Corporation	81EAAX15.G12	1.02	2400~2484	PIFA	mini - ipex	563
			-1.03	5150~5850			

Set 4 Antenna

Transmitter Circuit	Brand	Model	Antenna Gain(dBi) Including 1285mm cable loss Excluding 60mm cable loss	Cable Loss (dB)		Net. Gain (dBi)	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
				1285 mm	60 mm					
Chain (0)	TE	2118406-3	0.38	NA	-0.35	0.03	2300~3800	PCB	R-SMA	1285 +60
			-0.18	NA	-0.73	-0.91	5150~5875			
Chain (1)	TE	2118406-3	0.38	NA	-0.35	0.03	2300~3800	PCB	R-SMA	1285 +60
			-0.18	NA	-0.73	-0.91	5150~5875			

Note: 1. From the above 1TX configuration mode, the worst case was found in transmission circuit on Chain (1).

4 Calculation Result Of Maximum Conducted Power

For WLAN: 15.247

802.11b

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
2412 - 2462	97.724	97.499	195.223	6.07	20	0.15713	1.00

NOTE: Directional gain = 3.06dBi + 10log(2) = 6.07dBi.

802.11g

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
2412 - 2462	363.915	374.973	738.888	6.07	20	0.59471	1.00

NOTE: Directional gain = 3.06dBi + 10log(2) = 6.07dBi.

802.11n (HT20)

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
2412 - 2462	376.704	372.392	749.096	3.06	20	0.30149	1.00

802.11n (HT40)

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
2422 - 2452	159.956	137.088	297.044	3.06	20	0.11955	1.00

For WLAN: 15.247 (2.4GHz_1TX only)

802.11n (HT20)

Frequency Band (MHz))	Conducted Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0				
2412 - 2462	376.704	3.06	20	0.15161	1.00

For WLAN: 15.407

802.11a

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
5180-5320, 5500 ~ 5580 & 5660 ~ 5700, 5745-5825	41.879	50.35	92.229	7.82	20	0.11107	1.00

NOTE: Directional gain = 4.81dBi + 10log(2) = 7.82dBi.

802.11n (VHT20)

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
5180-5320, 5500 ~ 5580 & 5660 ~ 5700, 5745-5825	43.853	52.602	96.455	4.81	20	0.05808	1.00

802.11n (VHT40)

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
5190 - 5310, 5510 - 5550 & 5670, 5755 - 5795	33.343	38.282	71.625	4.81	20	0.04313	1.00

802.11ac (VHT80)

Frequency Band (MHz)	Conducted Power (mW)		Total Max. Power Output (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 0	Chain 1					
5210 - 5290, 5530, 155	7.727	7.762	15.489	4.81	20	0.00933	1.00

For WLAN: 15.247 (5GHz_1TX only)

802.11n (VHT20)

Frequency Band (MHz)	Conducted Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
	Chain 1				
5180 - 5240, 5260 - 5320, 5500 -5580 & 5660 - 5700	52.602	4.81	20	0.03168	1.00

For BT-EDR

GFSK

Frequency Band (MHz))	Conducted Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	12.677	3.06	20	0.00510	1.00

8DPSK

Frequency Band (MHz))	Conducted Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	12.560	3.06	20	0.00505	1.00

For BT-LE

Frequency Band (MHz))	Conducted Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402 - 2480	16.406	3.06	20	0.00660	1.00

CONCLUSION:

Both of the WLAN (2.4GHz) and Bluetooth or WLAN (5GHz) and Bluetooth can transmit simultaneously, the formula of calculated the MPE is:

Condition	Technology	
1	WLAN(2.4GHz) 1TX only	BT
2	WLAN(5GHz) 1TX only	BT

For WLAN (2.4GHz_1TX only) and Bluetooth:

Therefore, the worst-case situation is 0.15161 / 1 + 0.00660 / 1 = 0.158, which is less than “1”. This confirmed that the device comply with FCC 1.1310 MPE limit.

For WLAN (5GHz_1TX only) and Bluetooth:

Therefore, the worst-case situation is 0.03168 / 1 + 0.00660 / 1 = 0.03828, which is less than “1”. This confirmed that the device comply with FCC 1.1310 MPE limit.

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