RF EXPOSURE REPORT

REPORT NO.:	SA140605E01
MODEL NO.:	AW-CB178NF(UART), AW-CB178NF
FCC ID:	TLZ-CB178NF
RECEIVED:	Feb. 14, 2014
TESTED:	Aug. 14, 2014
ISSUED:	Sep. 26, 2014

APPLICANT:	AzureWave Technologies, Inc.
ADDRESS:	8 F., No. 94, Baozhong Rd., Xindian,Taipei, Taiwan 231

ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
LAB ADDRESS :	No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.
TEST LOCATION (1):	No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, 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.

This report should not be used by the client to claim product certification, approval, or endorsement by any government agencies.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SA140605E01	Original release	Sep. 26, 2014

1. CERTIFICATION

PRODUCT:	802.11ac/a/b/g/n 2X2 MIMO WLAN & Bluetooth M.2 module
BRAND NAME:	AzureWave
MODEL NO.:	AW-CB178NF(UART), AW-CB178NF
TEST SAMPLE:	ENGINEERING SAMPLE
APPLICANT:	AzureWave Technologies, Inc.
TESTED DATE:	Aug. 14, 2014
STANDARDS:	FCC Part 2 (Section 2.1091)
	KDB 447498 D03
	IEEE C95.1

The above equipment (Model: AW-CB178NF) 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:** Sep. 26, 2014
(Midoli Peng, Specialist)

Approved by : _____ , **Date:** Sep. 26, 2014
(May Chen, Manager)

2. RF EXPOSURE LIMIT

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

3. 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

4. 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**.

5. 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)	Microsoft	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)	Microsoft	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			

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

6. CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

For WLAN: 15.247 (2.4GHz)

802.11b

FREQUENCY (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 (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 (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 (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 (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: 15.247 (5GHz)

802.11a

FREQUENCY (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					
5745 - 5825	149.624	232.274	381.898	7.82	20	0.45991	1.00

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

802.11n (VHT20)

FREQUENCY (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					
5745 - 5825	187.932	199.067	386.999	4.81	20	0.23304	1.00

802.11n (VHT40)

FREQUENCY (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					
5755 - 5795	159.588	209.411	368.999	4.81	20	0.22221	1.00

802.11ac (VHT80)

FREQUENCY (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					
5775	115.878	140.605	256.483	4.81	20	0.15445	1.00

For WLAN: 15.247 (5GHz_1TX only)

802.11a

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm^2)	LIMIT (mW/cm^2)
	CHAIN 1				
5745 - 5825	232.274	4.81	20	0.13987	1.00

For WLAN: 15.407

802.11a

FREQUENCY (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 - 5240, 5260 - 5320, 5500 -5580 & 5660 - 5700	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 (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 - 5240, 5260 - 5320, 5500 -5580 & 5660 - 5700	43.853	52.602	96.455	4.81	20	0.05808	1.00

802.11n (VHT40)

FREQUENCY (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 - 5230, 5270 - 5310, 5510 - 5550 & 5670	33.343	38.282	71.625	4.81	20	0.04313	1.00

802.11ac (VHT80)

FREQUENCY (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	7.727	7.762	15.489	4.81	20	0.00933	1.00

For WLAN: 15.407 (5GHz_1TX only)

802.11ac (VHT20)

FREQUENCY (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 Bluetooth:

GFSK

FREQUENCY (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 (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

BT-LE (GFSK)

FREQUENCY (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:

All 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 0.13987 / 1 + 0.00660 / 1 = 0.146, which is less than “1”. This confirmed that the device comply with FCC 1.1310 MPE limit.

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