RF Exposure Report

Report No.:	SA140407E07C
FCC ID:	TLZ-CM389NF
Test Model:	AW-CM389NF
Received Date:	Aug. 20, 2015
Test Date:	Sep. 11, 2015
Issued Date:	Sep. 18, 2015
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.
Test Location (3):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
SA140407E07C	Original release.	Sep. 18, 2015

1 Certificate of Conformity

Product:	IEEE 802.11 2X2 MIMO a/b/g/n/ac Wireless LAN + Bluetooth + NFC NGFF Module
Brand:	AzureWave
Test Model:	AW-CM389NF
Sample Status:	ENGINEERING SAMPLE
Applicant:	AzureWave Technologies, Inc.
Test Date:	Sep. 11, 2015
Standards:	FCC Part 2 (Section 2.1091) KDB 447498 D03 IEEE C95.1

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:** Sep. 18, 2015

Claire Kuan / Specialist

Approved by : _____ , **Date:** Sep. 18, 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**.

2.4 Antenna Gain

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

For WLAN / BT used (Set 1 antenna)								
Antenna No.	Transmitter Circuit	Brand	Model	Antenna Gain(dBi) < including cable loss>	Frequency range (MHz to MHz)	Antenna Type	Connecter Type	Cable Length (cm)
1	Chain (0)	MAG.LAYERS	MSA-4008-25GC1-A1	2.98	2400~2500	PIFA	i-pex(MHF)	15
				5.16	4900~5900			
2	Chain (1)	MAG.LAYERS	MSA-4008-25GC1-A1	2.98	2400~2500	PIFA	i-pex(MHF)	15
				5.16	4900~5900			
For WLAN / BT used (Set 2 antenna)								
Antenna No.	Transmitter Circuit	Brand	Model	Antenna Gain(dBi) < including cable loss>	Frequency range (MHz to MHz)	Antenna Type	Connecter Type	Cable Length (cm)
3	Main Antenna Chain 0	Wistron Neweb Corporation	DC33001KT00 (81EAAL15.G92)	1.54	2400~2500	PIFA	i-pex(MHF)	36.3
				1.26	5150~5850			
4	Aux Antenna Chain 1	Wistron Neweb Corporation	DC33001KT10 (81EAAL15.G75)	0.63	2400~2500	PIFA	i-pex(MHF)	59.3
				1.84	5150~5850			
For NFC used								
Antenna No.	Brand		Model	Antenna Gain(dBi)	Frequency range (MHz)	Antenna Type	Connecter Type	Cable Length (cm)
5	Marvell		30X40X4T_PCB	0.5	13.56	PCB	i-pex(MHF)	N/A

3 Calculation Result of Maximum Conducted Power

The data (Except WLAN: 5180-5240MHz & 5745-5825MHz) was copied from the original test report (Report No.: SA140407E07)

For WLAN:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2412-2462	694.376	5.99	20	0.54869	1
5180-5240	70.939	8.17	20	0.09260	1
5260-5320, 5500-5580 & 5660-5700	76.001	5.16	20	0.04961	1
5745-5825	57.636	8.17	20	0.07524	1

NOTE:
2.4GHz: Directional gain = 2.98dBi + 10log(2) = 5.99dBi.
5GHz (5150-5250MHz): Directional gain = 5.16dBi + 10log(2) = 8.17dBi.
5GHz (5260-5320, 5500-5580 & 5660-5700MHz): Directional gain = 5.16dBi
5GHz (5725-5850MHz): Directional gain = 5.16dBi + 10log(2) = 8.17dBi.

For Bluetooth:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2402-2480	8.61	2.98	20	0.0034	1

For NFC (RFID):

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
13.56	0.00055	0.5	20	0.1×10^{-6}	0.9789

Note: Limit of Power Density=$180/f^2$

$E=\sqrt{(30*P*G)}/D$

$P*G=(E*D)^2/30$

E(dBuV/m)=62.6

D(m)= 3

P*G(mW)=0.00055

Conclusion:

Both of the Bluetooth, WLAN and NFC can transmit simultaneously, the formula of calculated the MPE is:

$CPD_1 / LPD_1 + CPD_2 / LPD_2 + ……etc. < 1$

CPD = Calculation power density

LPD = Limit of power density

For WLAN (2.4G), Bluetooth and NFC:

Therefore, the worst-case situation is 0.54869 / 1 + 0.0034 / 1 + (0.1×10^{-6}) / 0.9789 = 0.552, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

For WLAN (5G), Bluetooth and NFC:

Therefore, the worst-case situation is 0.04961 / 1 + 0.0034 / 1 + (0.1×10^{-6}) / 0.9789 = 0.053, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

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