RF Exposure Report

Report No.:	SA161216E08C
FCC ID:	UAY-W8997-M1216
Test Model:	W8997-M1216
Received Date:	June 18, 2018
Test Date:	July 10, 2018
Issued Date:	July 13, 2018
Applicant:	Marvell Semiconductor, Inc.
Address:	5488 Marvell Lane, Santa Clara CA95054 USA
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:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
SA161216E08C	Original release.	July 13, 2018

1   Certificate of Conformity

Product: IEEE 802.11 2X2 MU-MIMO ac/a/b/g/n Wireless LAN + Bluetooth NGFF Module

Brand: Marvell

Test Model: W8997-M1216

Sample Status: ENGINEERING SAMPLE

Applicant: Marvell Semiconductor, Inc.

Test Date: July 10, 2018

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.1-1992

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:**   _____July 13, 2018_____

Wendy Wu / Specialist

Approved by : _____,   **Date:**   _____July 13, 2018_____

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				
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

f = Frequency in MHz ; *Plane-wave equivalent power density

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

Antenna Set.	Brand	Model	Chain No.	Antenna Net. Gain(dBi)	Frequency range (MHz)	Antenna Type	Connecter Type
1	MAG.LAYERS	MSA-4008-25GC1-A1	Chain 0(Aux)	2.98	2400~2500	PIFA	i-pex(MHF)
				5.16	4900~5900		
			Chain 1(Main)	2.98	2400~2500		
				5.16	4900~5900		
2	Bondale	G-RA0K10090176-1436B	Chain 0(Aux)	1.9	2400~2500	Dipole	RP-SMA
				3.6	4900~5800		
			Chain 1(Main)	1.9	2400~2500		
				3.6	4900~5800		
3	San Jose	UEN-201	Chain 0(Aux)	2.4	2400~2500	Dipole	RP-SMA
				4.4	4900~5800		
			Chain 1(Main)	2.4	2400~2500		
				4.4	4900~5800		

2.5 Calculation Result of Maximum Conducted Power

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WLAN 2.4GHz	2437	918.001	5.99	20	0.72539	1
WLAN UNII-1	5240	147.595	8.17	20	0.19266	1
WLAN UNII-2A	5260	144.557	8.17	20	0.18870	1
WLAN UNII-2C	5580	123.471	8.17	20	0.16117	1
WLAN UNII-3	5785	193.443	8.17	20	0.25251	1
BT-EDR	2402	4.436	2.98	20	0.00175	1
BT-LE	2402	2.667	2.98	20	0.00105	1

NOTE:

1. 2.4GHz: Directional gain = 2.98dBi + 10log(2) = 5.99dBi
2. 5GHz: Directional gain = 5.16dBi + 10log(2) = 8.17dBi
3. The Max. Power = Max. tune up power

Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + Bluetooth = 0.72539 / 1 + 0.00175 / 1 = 0.72714

WLAN 5GHz + Bluetooth = 0.25251 / 1 + 0.00175 / 1 = 0.25426

Therefore the maximum calculations of above situations are less than the "1" limit.

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