

## 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 :** Wendy Wu, **Date:** July 13, 2018

Wendy Wu / Specialist

**Approved by :** May Chen, **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 <sup>2</sup> )	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 <sup>2</sup> )*	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<sup>2</sup>

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	Connector 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 <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
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 =  $2.98\text{dBi} + 10\log(2) = 5.99\text{dBi}$

2. 5GHz: Directional gain =  $5.16\text{dBi} + 10\log(2) = 8.17\text{dBi}$

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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