RF Exposure Report

Report No.:	SABFBE-WTW-P21070951
FCC ID:	YAW529027
Test Model:	PVS6
Received Date:	2021/7/27
Test Date:	2021/8/25
Issued Date:	2021/12/8
Applicant:	SunPower Corporation
Address:	1414 Harbour Way South Suite 1901, Richmond, CA 94804, 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
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
SABFBE-WTW-P21070951	Original release.	2021/12/8

1 Certificate of Conformity

Product:	SunPower Monitoring System with PVS6
Brand:	SUNPOWER
Test Model:	PVS6
Sample Status:	Engineering sample
Applicant:	SunPower Corporation
Test Date:	2021/8/25
Standards:	FCC Part 2 (Section 2.1091)
	KDB 447498 D01 General RF Exposure Guidance v06

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 : Vivian Huang , **Date:** 2021/12/8

Vivian Huang / Specialist

Approved by : , **Date:** 2021/12/8

Clark Lin / Technical 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 25 cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

WLAN							
Ant No.	Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency rang (GHz)	Antenna type	Connector type
1	Chain 0 (Including BT)	airgain	65-031-212002B	2.2	2.4~2.4835	PCB	I-PEX
				3.8	5.15~5.25		
				4.2	5.725~5.85		
2	Chain 1 (WLAN use only)	airgain	65-031-212003B	4.2	2.4~2.4835	PCB	I-PEX
				4.1	5.15~5.25		
				4.8	5.725~5.85		

Zigbee						
Ant No.	Brand	Model	Antenna Gain (dBi)	Frequency rang (GHz)	Antenna type	Connector type
3	airgain	65-031-212004B	4.8	2.4~2.4835	PCB	I-PEX

LTE						
Ant No.	Brand	Model	Antenna Gain (dBi)	Frequency rang (MHz)	Antenna type	Connector type
4	airgain	65-031-212001B	2.7	1920~1980	PCB	I-PEX
				1850~1910		
				1710~1785		
				1710~1755		
				824 ~ 849		
				880~915		
				698~716		
				777~787		
				815 ~ 830		
				830 ~ 845		
				832 ~ 862		
				814 ~ 849		
				703 ~ 748		
				1880 ~ 1920		

*The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.5 Calculation Result

All data except LTE data, was copied from the original test report (Report No.: SA180803E05A).

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	762.15	6.27	25	0.41110	1
WLAN 5GHz (U-NII-1)	5240	199.38	6.96	25	0.12606	1
WLAN 5GHz (U-NII-3)	5745	268.355	7.52	25	0.19303	1
Bluetooth	2440	5.26	2.20	25	0.00111	1
Zigbee	2405	42.17	4.80	25	0.01621	1
LTE <Worst band>	699.7	110	2.70	25	0.02608	0.46647

NOTE:
WLAN 2.4GHz: Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20})^2$ / 2] = 6.27dBi
WLAN 5GHz (U-NII-1): Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20})^2$ / 2] = 6.96
WLAN 5GHz (U-NII-3): Directional gain = 10 log[$(10^{G0/20} + 10^{G1/20})^2$ / 2] = 7.52
LTE: Limit of Power Density = F/1500

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 + Zigbee + LTE = 0.41110 / 1 + 0.00111 / 1 + 0.01621 / 1 + 0.02608 / 0.46647 = 0.48433

WLAN 5GHz + Bluetooth + Zigbee + LTE = 0.19303 / 1 + 0.00111 / 1 + 0.01621 / 1 + 0.02608 **/** 0.46647 = 0.26626

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

Appendix

LTE module
MPE Evaluation for FCC ID: XMR2020BG95M1

Operation Mode	Evaluation Frequency (MHz)	The Worst Case		Max Avg. Power		Directional Gain	Power Density (mW/cm^2)		Ratio
		Channel Number	Freq. (MHz)	mW	dBm	dBi	Value	Limit	
LTE (Band 2)	1850.7-1909.3	18607	1850.7	123	20.90	2.70	0.02916	1	0.02916
LTE (Band 4)	1710.7-1754.3	19957	1710.7	120	20.79	2.70	0.02845	1	0.02845
LTE (Band 12)	699.7-715.3	23017	699.7	110	20.41	2.70	0.02608	0.46647	0.05591

*Distance = 25 cm

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