

FCC MPE Report

Applicant : Plume Design, Inc.
 Product Name : SuperPod with WiFi 6E
 Trade Name : Plume Design, Inc.
 Model Number : M1A
 Applicable Standard : 47 CFR § 2.1091
 Received Date : Dec. 12, 2022
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Issued by

Approved By : _____

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Note:

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Revision History

Version	Issued Date	Revisions	Revised By
00	Jan. 11, 2024	Initial Issue	Rowan Hsieh

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1. General Information

1.1 Reference Applicable Standard

Standard	Description	Version
IEC TR 63170	Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz	Edition 1.0 2018-08
IEEE C95.1	American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York.	1992
47 CFR § 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.	-
47 CFR § 1.1310	Radiofrequency radiation exposure limits.	-

1.2 Testing Location

Lab Name: Eurofins E&E Wireless Taiwan Co., Ltd.

Site Address: No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.)

Site Address: No. 2, Wuquan 5th Rd. Wugu Dist., New Taipei City, Taiwan (R.O.C.)

2. Description of Equipment under Test (EUT)

Applicant	Plume Design, Inc. 325 Lytton Ave., Palo Alto, CA 94301, United States
Product Name	SuperPod with WiFi 6E
Trade Name	Plume Design, Inc.
Model Number	M1A
FCC ID	2AG7G-M1A
Use Distance	25 cm

Note:

The above information of DUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Antenna list:

Ant.	Ant. Type	Gain (dBi)								
		2.4 GHz	5 GHz				6 GHz			
			Band 1	Band 2-A	Band 2-C	Band 3	Band 5	Band 6	Band 7	Band 8
1	IFA Antenna	---	3.60	3.50	4.20	4.30	---	---	---	---
2	IFA Antenna	---	2.90	3.40	4.30	4.30	---	---	---	---
3	IFA Antenna	---	2.30	2.30	3.20	3.30	---	---	---	---
4	IFA Antenna	---	2.40	2.90	3.10	2.00	---	---	---	---
5	IFA Antenna	---	---	---	---	---	5.50	5.20	6.20	5.90
6	IFA Antenna	-0.70	---	---	---	---	4.10	3.70	4.40	4.60
7	IFA Antenna	2.20	---	---	---	---	4.40	3.40	4.00	5.00
8	IFA Antenna	---	---	---	---	---	4.50	4.50	4.30	5.00

2.1 RF Specification

Wi-Fi 2.4G				
Support type:	<input checked="" type="checkbox"/> 802.11b	<input checked="" type="checkbox"/> 802.11g	<input checked="" type="checkbox"/> 802.11n	<input checked="" type="checkbox"/> 802.11ax
Support bandwidth:	<input checked="" type="checkbox"/> 20 MHz	<input checked="" type="checkbox"/> 40 MHz		
Wi-Fi 5G				
Operation Band:	<input checked="" type="checkbox"/> U-NII-1	<input checked="" type="checkbox"/> U-NII-2A	<input checked="" type="checkbox"/> U-NII-2C	<input type="checkbox"/> U-NII-3
Support type:	<input checked="" type="checkbox"/> 802.11a	<input checked="" type="checkbox"/> 802.11n	<input checked="" type="checkbox"/> 802.11ac	<input checked="" type="checkbox"/> 802.11ax
Support bandwidth:	<input checked="" type="checkbox"/> 20 MHz	<input checked="" type="checkbox"/> 40 MHz	<input checked="" type="checkbox"/> 80 MHz	<input type="checkbox"/> 160 MHz
Wi-Fi 6E				
Operation Band:	<input checked="" type="checkbox"/> U-NII-5			
Support type:	<input checked="" type="checkbox"/> 802.11a	<input checked="" type="checkbox"/> 802.11n	<input checked="" type="checkbox"/> 802.11ac	<input checked="" type="checkbox"/> 802.11ax
Support bandwidth:	<input checked="" type="checkbox"/> 20 MHz	<input checked="" type="checkbox"/> 40 MHz	<input checked="" type="checkbox"/> 80 MHz	<input checked="" type="checkbox"/> 160 MHz
Bluetooth				
Support type:	<input type="checkbox"/> BR	<input type="checkbox"/> EDR	<input checked="" type="checkbox"/> BLE-1 Mbps	<input checked="" type="checkbox"/> BLE-2 Mbps
Matter (SRD)				
Operation Frequency	2405 – 2480 MHz			
Modulation	O-QPSK			

3. RF Exposure Limit

For devices that operate at larger distances from persons, where there are minimal RF coupling interactions between a device and the user or nearby persons, RF exposure compliance using maximum permissible exposure (MPE) limits is applied. The limits for MPE is listed as below:

Limits for General Population / Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
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 / 1,500	30
1,500-100,000	-	-	1.0	30
Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842 / f	4.89 / f	(900 / f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	-	-	F / 300	6
1,500-100,000	-	-	5	6

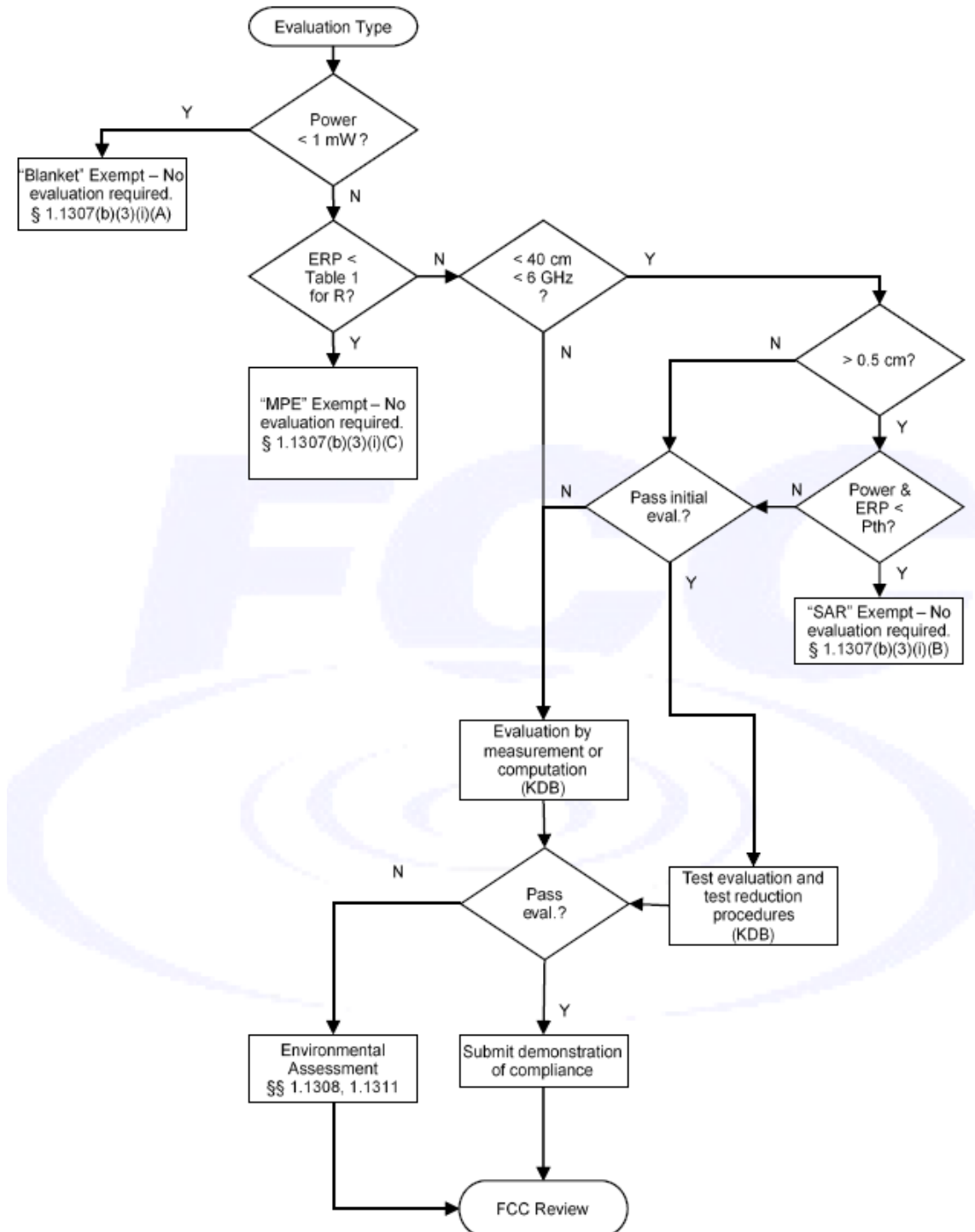
f = frequency in MHz. * = Plane-wave equivalent power density.

4. RF Exposure Assessment

4.1 Exemption Evaluation

Exemption evaluation was performed according to the appendix A and B in KDB447498 D04.

The General Sequence for Determination of Procedure demonstrated in Figure A.1 of KDB447498 D04 was applied.



4.2 Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled “Radiofrequency radiation exposure limits”, generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as “a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter’s radiating structure(s) and the body of the user or nearby persons.”

Exposure evaluation

$$S_{eip} = \frac{EIRP}{4\pi d^2} = \frac{PG}{4\pi d^2} \left(W / m^2 \right)$$

Where

S: is the input power (W);

G: is the antenna gain;

d : is the distance between antennas and evaluation point (m).

5. Maximum Transmitting Mode Evaluation

Antenna transmission description
WLAN 2.4 GHz : 1Tx (Diversity) / 2Tx (MIMO) WLAN 5 GHz : 1Tx (Diversity) / 4Tx (MIMO) WLAN 6 GHz : 1Tx (Diversity) / 4Tx (MIMO) Bluetooth : 1Tx (Diversity) Matter : 1Tx (Diversity)

6. Result

Band	Frequency (MHz)	Conducted Power (dBm) [P]	ANT Gain (dBi)	Numeric Gain [G]	Power with Duty cycle (mW) [P]x[G]	Power Density (mW/cm ²) [S]	Standalone Limit (mW/cm ²)	Evaluated / Exposure Limit
WLAN 2.4 GHz	2412 - 2472	29.79	2.20	1.66	1581.64	0.31	1.00	0.31
WLAN 5.2 GHz	5180 - 5240	27.42	3.60	2.29	1264.26	0.25	1.00	0.25
WLAN 5.3 GHz	5260 - 5320	23.26	3.50	2.24	474.51	0.09	1.00	0.09
WLAN 5.6 GHz	5470 - 5725	23.90	4.30	2.69	660.32	0.13	1.00	0.13
WLAN 5.8 GHz	5725 - 5850	27.78	4.30	2.69	1613.44	0.32	1.00	0.32
U-NII 5	5925 - 6425	22.23	5.50	3.55	593.24	0.12	1.00	0.12
U-NII 6	6425 - 6525	20.64	5.20	3.31	383.56	0.08	1.00	0.08
U-NII 7	6525 - 6875	20.88	6.20	4.17	510.66	0.10	1.00	0.10
U-NII 8	6875 - 7125	21.52	5.90	3.89	552.01	0.11	1.00	0.11
Bluetooth	2402 - 2480	17.72	2.34	1.71	101.16	0.02	1.00	0.02
Matter	2405 - 2480	16.93	1.15	1.30	64.11	0.01	1.00	0.01

Note:

1. The calculation uses the minimum distance defined by the regulations of 20 cm, which is more conservative than the actual use distance of the product.
2. The maximum power and gain were applied to evaluate MPE.
3. The device operating IEEE 802.11 n/ac/ax mode is 2Tx/4Tx MIMO/STBC/CDD.

MAX MPE: 0.32 mW/cm²

Simultaneous Transmitting :

WLAN 2.4 GHz + WLAN 5 GHz + WLAN 6 GHz + Bluetooth

TER: 0.77

7. Conclusion

The result shows that this device is compliance with the exposure limits in 47 CFR §1.1310.

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