RF Exposure Evaluation Report

APPLICANT	:	Plume Design Inc
EQUIPMENT	:	Plume Adaptive Wifi
BRAND NAME	:	Plume Design Inc
MODEL NAME	:	B1A
FCC ID	:	2AG7G-B1A
STANDARD	:	47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Manager

Approved by: Jones Tsai / Manager

SPORTON INTERNATIONAL INC.
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)

Table of Contents

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA811726	Rev. 01	Initial issue of report	Apr. 16, 2018
FA811726	Rev. 02	Updated section 2 / 3 / 5	Apr. 18, 2018
FA811726	Rev. 03	Updated 2.4GHz WLAN Maximum Average Power of Beamforming Mode in section 3 / 5	Apr. 23, 2018

1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Plume Design Inc
Address	290 S California Ave, Palo Alto, CA94306

Manufacturer	
Company Name	Plume Design Inc
Address	290 S California Ave, Palo Alto, CA94306

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Plume Adaptive Wifi
Brand Name	Plume Design Inc
Model Name	B1A
FCC ID	2AG7G-B1A
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth LE
HW Version	DVT
EUT Stage	Production Unit
Remark : 1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description. 2. This device has six antennas and detail information as follows table:	

Antenna	Support Band
1	2.4GHz / 5.8GHz WLAN
2	2.4GHz / 5.8GHz WLAN
3	5.8GHz WLAN
4	Bluetooth LE / 5.8GHz WLAN
5	5.2GHz WLAN
6	5.2GHz WLAN

< Antenna Gain for Non-Beamforming Mode>

Antenna Gain(dBi)								
Bluetooth LE	2.4GHz WLAN		5.2GHz WLAN		5.8GHz WLAN			
Ant 4	SISO Mode Ant 1	MIMO Mode Ant 1+2	SISO Mode Ant 5	MIMO Mode Ant 5+6	SISO Mode Ant 3	MIMO Mode Ant 3+4	MIMO Mode Ant 2+3+4	MIMO Mode Ant 1+2+3+4
0.5	1.7	1.9	4	4.5	3.9	3.9	5.7	6

< Antenna Gain for Beamforming Mode>

Antenna Gain(dBi)				
2.4GHz WLAN	5.2GHz WLAN	5.8GHz WLAN		
MIMO Mode Ant 1+2	MIMO Mode Ant 5+6	MIMO Mode Ant 3+4	MIMO Mode Ant 2+3+4	MIMO Mode Ant 1+2+3+4
4.81	7.26	6.91	9.31	10.95

3. Maximum RF average output power among production units

<Non-Beamforming Mode>

Maximum Average Power (dBm)								
Bluetooth LE	2.4GHz WLAN		5.2GHz WLAN		5.8GHz WLAN			
Ant 4	SISO Mode Ant 1	MIMO Mode Ant 1+2	SISO Mode Ant 5	MIMO Mode Ant 5+6	SISO Mode Ant 3	MIMO Mode Ant 3+4	MIMO Mode Ant 2+3+4	MIMO Mode Ant 1+2+3+4
-0.5	22	25	26	28.5	26.5	28	30	28.5

<Beamforming Mode>

Maximum Average Power (dBm)				
2.4GHz WLAN	5.2GHz WLAN	5.8GHz WLAN		
MIMO Mode Ant 1+2	MIMO Mode Ant 5+6	MIMO Mode Ant 3+4	MIMO Mode Ant 2+3+4	MIMO Mode Ant 1+2+3+4
21.5	25	27	27	25

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

<Non-Beamforming Mode>

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
Bluetooth LE	0.50	-0.50	0.000	0.001	1.000	0.000	1.000	0.00020
2.4GHz WLAN SISO Mode ANT 1	1.70	22.00	23.700	0.234	234.423	0.047	1.000	0.04666
2.4GHz WLAN MIMO Mode ANT 1+2	1.90	25.00	26.900	0.490	489.779	0.097	1.000	0.09749
5.2GHz WLAN SISO Mode ANT 5	4.00	26.00	30.000	1.000	1000.000	0.199	1.000	0.19904
5.2GHz WLAN MIMO Mode ANT 5+6	4.50	28.50	33.000	1.995	1995.262	0.397	1.000	0.39715
5.8GHz WLAN SISO Mode ANT 3	3.90	26.50	30.400	1.096	1096.478	0.218	1.000	0.21825
5.8GHz WLAN MIMO Mode ANT 3+4	3.90	28.00	31.900	1.549	1548.817	0.308	1.000	0.30828
5.8GHz WLAN MIMO Mode ANT 2+3+4	5.70	30.00	35.700	3.715	3715.352	0.740	1.000	0.73952
5.8GHz WLAN MIMO Mode ANT 1+2+3+4	6.00	28.50	34.500	2.818	2818.383	0.561	1.000	0.56098

Note:

1. In the above table have assessed Bluetooth, WLAN2.4GHz and WLAN 5GHz by referring to their maximum power.

<Beamforming Mode>

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
2.4GHz WLAN MIMO Mode ANT 1+2	4.81	21.50	26.310	0.428	427.563	0.085	1.000	0.08510
5.2GHz WLAN MIMO Mode ANT 5+6	7.26	25.00	32.260	1.683	1682.674	0.335	1.000	0.33493
5.8GHz WLAN MIMO Mode ANT 3+4	6.91	27.00	33.910	2.460	2460.368	0.490	1.000	0.48972
5.8GHz WLAN MIMO Mode ANT 2+3+4	9.31	27.00	36.310	4.276	4275.629	0.851	1.000	0.85104
5.8GHz WLAN MIMO Mode ANT 1+2+3+4	10.95	25.00	35.950	3.936	3935.501	0.783	1.000	0.78334

Note:

1. In the above table have assessed WLAN2.4GHz and WLAN 5GHz by referring to their maximum power.

5.2. Collocated Power Density Calculation

Maximum Bluetooth Power Density / Limit	Maximum 2.4GHz WLAN Power Density / Limit	Maximum 5GHz WLAN Power Density / Limit	∑(Power Density / Limit) of WLAN+Bluetooth
0.00020	0.09749	0.85104	0.94873

Note:

1. ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for all radio transmitter.
2. Considering all antenna collocation of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of all collocated transmitters is compliant.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.