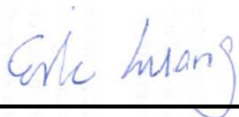


# RF Exposure Evaluation Report

APPLICANT : Plume Design Inc  
EQUIPMENT : Plume Pod  
BRAND NAME : Plume Design Inc  
MODEL NAME : A1A  
MARKETING NAME : Plume Adaptive WiFi  
IC : 21185-A1A  
STANDARD : IC RSS-102 Issue 5

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with IC RSS-102 Issue 5, 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 / Deputy 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.)



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**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
CA6O0801-02	Rev. 01	Initial issue of report	Nov. 04, 2016
CA6O0801-02	Rev. 02	Re-evaluated the collocated power density calculation in section 5.2	Nov. 11, 2016



## **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	200 California Ave, STE200, Palo Alto, CA 94306, USA

Manufacturer	
Company Name	Plume Design Inc
Address	200 California Ave, STE200, Palo Alto, CA 94306, USA

## **2. Description of Equipment Under Test (EUT)**

Product Feature & Specification	
EUT Name	Plume Pod
EUT Type	Adaptive Wifi System Device
Brand Name	Plume Design Inc
Model Name	A1A
Marketing Name	Plume Adaptive WiFi
IC	21185-A1A
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	· 802.11a/b/g/n/ac HT20/HT40/VHT80 · Bluetooth BR/EDR/LE
HW Version	DVT
Hardware Version Identification Number (HVIN)	A1A
Product Marketing Name (PMN)	Plume Adaptive WiFi
EUT Stage	Production Unit

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

### 3. Maximum RF average output power among production units

Mode / Band	Average Power (dBm)			
	BR / EDR			LE
	1Mbps	2Mbps	3Mbps	
2.4 GHz Bluetooth	1	1	1	4

2.4GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11b	CH 1	2412	1Mbps	22.5
		CH 6	2437		23.0
		CH 11	2462		24.5
	802.11g	CH 1	2412	6Mbps	17.5
		CH 6	2437		24.0
		CH 11	2462		20.5
	802.11n-HT20	CH 1	2412	MCS8	17.0
		CH 6	2437		24.0
		CH 11	2462		21.0
	802.11n-HT40	CH 3	2422	MCS8	14.5
		CH 6	2437		19.0
		CH 9	2452		18.0

5.2GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 36	5180	6Mbps	14.5
		CH 44	5220		14.5
		CH 48	5240		14.5
	802.11n-HT20	CH 36	5180	MCS0	14.5
		CH 44	5220		14.5
		CH 48	5240		14.5
	802.11n-HT40	CH 38	5190	MCS0	17.5
		CH 46	5230		17.5
	802.11ac-VHT80	CH 42	5210	MCS0	15.0

5.3GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 52	5260	6Mbps	21.0
		CH 60	5300		20.5
		CH 64	5320		20.0
	802.11n-HT20	CH 52	5260	MCS0	21.5
		CH 60	5300		22.0
		CH 64	5320		20.5
	802.11n-HT40	CH 54	5270	MCS0	22.5
		CH 62	5310		16.0
	802.11ac-VHT80	CH 58	5290	MCS0	13.5

5.5GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 100	5500	6Mbps	20.5
		CH 116	5580		21.0
		CH 140	5700		19.0
		CH 144	5720		22.5
	802.11n-HT20	CH 100	5500	MCS0	21.0
		CH 116	5580		21.5
		CH 140	5700		18.5
		CH 144	5720		22.5
	802.11n-HT40	CH 102	5510	MCS0	17.5
		CH 110	5550		22.5
		CH 134	5670		20.0
		CH 142	5710		23.5
	802.11ac-VHT80	CH 106	5530	MCS0	15.0
		CH 122	5610		20.0
		CH 138	5690		23.5

5.8GHz WLAN ANT 1+2	Mode	Channel	Frequency (MHz)	Data Rate	Tune-Up Limit
	802.11a	CH 149	5745	MCS0	19.5
		CH 157	5785		22.0
		CH 165	5825		22.0
	802.11n-HT20	CH 149	5745	MCS0	19.0
		CH 157	5785		21.5
		CH 165	5825		21.5
	802.11n-HT40	CH 151	5755	MCS0	18.0
		CH 159	5795		21.5
	802.11ac-VHT80	CH 155	5775	MCS0	15.5

**Note:** The Max Average Power for WLAN 2.4GHz/5GHz within the table are for MIMO mode.

#### 4. RF Exposure Limit Introduction

IC has adopted the RF field strength limits established in Health Canada's RF exposure guideline. The limits are shown in Table 4 below per RSS-102.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>-21</sup>	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> <sup>0.5</sup>	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> <sup>0.25</sup>	0.1540/ <i>f</i> <sup>0.25</sup>	8.944/ <i>f</i> <sup>0.5</sup>	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> <sup>0.3417</sup>	0.008335 <i>f</i> <sup>0.3417</sup>	0.02619 <i>f</i> <sup>0.6834</sup>	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> <sup>1.2</sup>
150000-300000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616000/ <i>f</i> <sup>1.2</sup>
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

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**

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (W/m <sup>2</sup> )	Limit (W/m <sup>2</sup> )	Power Density / Limit
Bluetooth	2402	2.9	4.00	6.900	0.005	4.898	0.010	5.351	0.002
2.4GHz WLAN	2462	2.9	24.50	27.400	0.550	549.541	1.094	5.442	0.201
5.5GHz WLAN	5180	3.2	17.50	20.700	0.117	117.490	0.234	9.047	0.026
5.3GHz WLAN	5260	4.1	22.50	26.600	0.457	457.088	0.910	9.142	0.100
5.5GHz WLAN	5500	3.9	23.50	27.400	0.550	549.541	1.094	9.425	0.116
5.8GHz WLAN	5745	3.2	22.00	25.200	0.331	331.131	0.659	9.710	0.068

**Note:** For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

### **5.2. Collocated Power Density Calculation**

< Bluetooth transmit simultaneously with 5GHz WLAN >

Bluetooth Power Density / Limit	5GHz WLAN Power Density / Limit	$\Sigma$ (Power Density / Limit) of WLAN+Bluetooth
0.002	0.116	0.118

<2.4GHz WLAN transmit simultaneously with 5GHz WLAN >

2.4GHz WLAN Power Density / Limit	5GHz WLAN Power Density / Limit	$\Sigma$ (Power Density / Limit) of WLAN+Bluetooth
0.201	0.116	0.317

**Note:**

- For this device, Bluetooth can transmit simultaneously with 5GHz WLAN, and 2.4GHz WLAN can transmit simultaneously with 5GHz WLAN, however Bluetooth cannot transmit simultaneously with 2.4GHz WLAN.
- $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for Bluetooth + 5GHz WLAN and 2.4GHz WLAN + 5GHz WLAN.
- Considering the WLAN module collocation with the Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant

### **Conclusion:**

According to IC RSS-102 Issue 5, the RF exposure analysis concludes that the RF Exposure is IC compliant.