RF EXPOSURE EVALUATION REPORT

FCC ID	:	2AG7G-A2A
Equipment	:	Plume Pod
Brand Name	:	Plume Design Inc
Model Name	:	A2A
Applicant	:	Plume Design Inc 290 South California Ave, Suite 200, Palo Alto, CA 94306, USA
Manufacturer	:	Plume Design Inc 290 South California Ave, Suite 200, Palo Alto, CA 94306, USA
Standard	:	47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC has been evaluated in accordance with 47 CFR Part 2.1091 for the device and pass the limit.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERTIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Cona Huang

Approved by: Cona Huang / Deputy Manager

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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History of this test report

Report No.	Version	Description	Issued Date
FA860135	Rev. 01	Initial issue of report	Nov. 01, 2018
FA860135	Rev. 02	Added 5.3GHz / 5.5GHz WLAN.	Nov. 08, 2018

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Plume Pod
Brand Name	Plume Design Inc
Model Name	A2A
FCC ID	2AG7G-A2A
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/VHT20/VHT40/VHT80 Bluetooth LE
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.

Reviewed by: Jason Wang

Report Producer: Wan Liu

2. Maximum RF average output power among production units

<Non-beamforming mode>

Band / Mode	Average Power (dBm)
	LE
	GFSK
Bluetooth	-1

	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit (dBm)	MIMO Tune-Up Limit (dBm)
2.4GHz WLAN	802.11b	1	2412	20.50	21.50
		6	2437	20.50	24.00
		11	2462	20.50	23.00
	802.11g	1	2412	14.50	18.00
		2	2417	18.00	19.00
		6	2437	20.50	23.00
		10	2457	19.00	19.00
		11	2462	15.50	19.00
	802.11n-HT20	1	2412	14.00	17.00
		2	2417	18.00	19.50
		6	2437	21.00	22.50
		10	2457	18.00	18.50
		11	2462	15.00	18.50
	802.11n-HT40	3	2422	12.50	15.50
		4	2427	14.50	15.50
		6	2437	16.00	18.50
		9	2452	13.00	15.50

	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit (dBm)	MIMO Tune-Up Limit (dBm)
5.2GHz WLAN	802.11a	36	5180	18.00	20.00
		40	5200	17.00	20.00
		44	5220	17.00	20.00
		48	5240	18.00	20.00
	802.11n-HT20	36	5180	18.00	20.00
		40	5200	17.00	20.00
		44	5220	20.00	20.00
		48	5240	19.00	20.00
	802.11n-HT40	38	5190	16.00	20.00
		46	5230	21.50	23.00
	802.11ac-VHT20	36	5180	18.00	20.00
		40	5200	17.00	20.00
		44	5220	20.00	20.00
		48	5240	19.00	20.00
	802.11ac-VHT40	38	5190	16.00	18.00
		46	5230	21.50	23.00
	802.11ac-VHT80	42	5210	15.00	17.00

	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit (dBm)	MIMO Tune-Up Limit (dBm)
5.3GHz WLAN	802.11a	52	5260	20.50	21.00
		56	5280	20.50	21.00
		60	5300	19.00	20.00
		64	5320	18.00	19.00
	802.11n-HT20	52	5260	20.50	21.50
		56	5280	20.50	21.50
		60	5300	20.10	21.50
		64	5320	18.00	19.00
	802.11n-HT40	54	5270	20.00	21.50
		62	5310	16.00	17.00
	802.11ac-VHT20	52	5260	20.50	21.50
		56	5280	20.50	21.50
		60	5300	20.10	21.50
		64	5320	18.00	19.00
	802.11ac-VHT40	54	5270	20.00	21.50
		62	5310	16.00	17.00
	802.11ac-VHT80	58	5290	14.00	15.00

	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit (dBm)	MIMO Tune-Up Limit (dBm)
5.5GHz WLAN	802.11a	100	5500	15.00	17.00
		116	5580	13.00	15.00
		124	5620	13.00	15.00
		132	5660	13.00	15.00
		140	5700	13.00	15.00
		144	5720	13.00	15.00
	802.11n-HT20	100	5500	14.00	17.00
		116	5580	13.00	16.00
		124	5620	13.50	16.00
		132	5660	13.50	16.00
		140	5700	13.50	16.00
		144	5720	13.00	16.50
	802.11n-HT40	102	5510	17.00	19.00
		110	5550	16.00	18.00
		126	5630	16.00	18.00
		134	5670	16.00	18.00
		142	5710	15.00	20.00
	802.11ac-VHT20	100	5500	14.00	17.00
		116	5580	13.00	16.00
		124	5620	13.50	16.00
		132	5660	13.50	16.00
		140	5700	13.50	16.00
		144	5720	13.00	13.00
	802.11ac-VHT40	102	5510	17.00	19.00
		110	5550	16.00	18.00
		126	5630	16.00	18.00
		134	5670	16.00	18.00
		142	5710	15.00	20.00
	802.11ac-VHT80	106	5530	16.00	15.00
		122	5610	17.00	19.00
		138	5690	17.00	20.00

	Mode	Channel	Frequency (MHz)	SISO ANT 1 Tune-Up Limit (dBm)	MIMO Tune-Up Limit (dBm)
5.8GHz WLAN	802.11a	149	5745	13.00	14.00
		157	5785	13.00	14.00
		165	5825	13.00	14.00
	802.11n-HT20	149	5745	13.50	15.00
		157	5785	13.50	16.00
		165	5825	14.50	15.00
	802.11n-HT40	151	5755	15.50	16.00
		159	5795	17.00	16.00
	802.11ac-VHT20	149	5745	13.50	15.00
		157	5785	13.50	16.00
		165	5825	14.50	15.00
	802.11ac-VHT40	151	5755	15.50	16.00
		159	5795	17.00	16.00
	802.11ac-VHT80	155	5775	19.00	21.50

<Beamforming mode>

	Mode	Channel	MIMO Tune-Up Limit (dBm)
5.2GHz WLAN	802.11a	36	14.00
		40	14.00
		44	14.00
		48	14.00
	802.11n-HT20	36	15.50
		40	15.50
		44	15.50
		48	15.50
	802.11n-HT40	38	15.50
		46	15.50
	802.11ac-VHT20	36	15.50
		40	15.50
		44	15.50
		48	15.50
	802.11ac-VHT40	38	15.50
		46	15.50
	802.11ac-VHT80	42	15.50

	Mode	Channel	MIMO Tune-Up Limit (dBm)
5.3GHz WLAN	802.11a	52	21.00
		56	21.00
		60	19.00
		64	18.00
	802.11n-HT20	52	21.00
		56	21.00
		60	21.00
		64	21.00
	802.11n-HT40	54	21.00
		62	20.00
	802.11ac-VHT20	52	21.00
		56	21.00
		60	21.00
		64	21.00
	802.11ac-VHT40	54	21.00
		62	20.00
	802.11ac-VHT80	58	21.00

	Mode	Channel	MIMO Tune-Up Limit (dBm)
5.5GHz WLAN	802.11a	100	17.00
		116	17.00
		124	17.00
		132	17.00
		140	15.00
		144	19.00
	802.11n-HT20	100	18.00
		116	18.00
		124	18.00
		132	18.00
		140	15.00
		144	19.00
	802.11n-HT40	102	20.00
		110	18.00
		126	18.00
		134	17.00
		142	19.00
	802.11ac-VHT20	100	18.00
		116	18.00
		124	18.00
		132	18.00
		140	15.00
		144	19.00
	802.11ac-VHT40	102	20.00
		110	18.00
		126	18.00
		134	17.00
		142	19.00
	802.11ac-VHT80	106	21.00
		122	21.00
		138	20.00

	Mode	Channel	MIMO Tune-Up Limit (dBm)
5.8GHz WLAN	802.11a	149	14.00
		157	13.00
		165	14.00
	802.11n-HT20	149	14.00
		157	14.00
		165	14.00
	802.11n-HT40	151	17.00
		159	17.00
	802.11ac-VHT20	149	14.00
		157	14.00
		165	14.00
	802.11ac-VHT40	151	17.00
		159	17.00
	802.11ac-VHT80	155	23.00

3. 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

4. Radio Frequency Radiation Exposure Evaluation

4.1. Standalone Power Density Calculation

<Non-beamforming mode>

Band	Frequency (MHz)	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	2402.0	1.23	-1.00	0.230	0.001	1.054	0.0002	1.000	0.0002
2.4GHz WLAN	2412.0	1.75	24.00	25.750	0.376	375.837	0.0748	1.000	0.0748
5GHz WLAN	5180.0	2.44	23.00	25.440	0.350	349.945	0.0697	1.000	0.0697

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

<Beamforming mode>

Band	Frequency (MHz)	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
5GHz WLAN	5180.0	5.22	23.00	28.220	0.664	663.743	0.1321	1.000	0.1321

Note:

1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
2. This device supports Beamforming for WLAN 5GHz only; therefore, in the table above which consider maximum directional Gain 5.22dBi for Beamforming mode.
3. In the above table has assessed WLAN 5GHz by referring to the maximum antenna gain and maximum power.

4.2. Collocated Power Density Calculation

WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WLAN+Bluetooth
0.1321	0.0002	0.1323

Note:

1. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WLAN + Bluetooth.
2. 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 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.