# RF EXPOSURE EVALUATION REPORT

| | | |
|---|---|---|
| FCC ID | : | 2AG7G-C1A |
| Equipment | : | Plume PowerPod |
| Brand Name | : | Plume Design Inc |
| Model Name | : | C1A |
| Applicant | : | Plume Design Inc<br>290 S California Ave, Suite 200, Palo Alto, CA 94306, USA |
| Manufacturer | : | Plume Design Inc<br>290 S 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 INTERNATIONAL 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***

*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

# Table of Contents

**1. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) ..... 4**
**2. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS ..... 5**
**3. RF EXPOSURE LIMIT INTRODUCTION ..... 6**
**4. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION ..... 7**
4.1. Standalone Power Density Calculation ..... 7
4.2. Collocated Power Density Calculation ..... 7

# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FA912813A | Rev. 01 | Initial issue of report | Apr. 23, 2019 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# 1. Description of Equipment Under Test (EUT)

| Product Feature & Specification | |
|---|---|
| **EUT Type** | Plume PowerPod |
| **Brand Name** | Plume Design Inc |
| **Model Name** | C1A |
| **FCC ID** | 2AG7G-C1A |
| **Wireless Technology and Frequency Range** | WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz |
| **Mode** | 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80<br>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.

**< Antenna Gain for Non-Beamforming Mode>**

| Peak antenna gain(dBi) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Bluetooth LE | 2.4GHz WLAN | | | 5GHz WLAN | | | | | | |
| Ant 2 | SISO Mode Ant 1 | SISO Mode Ant 2 | MIMO Mode Ant 1+2 | SISO Mode Ant 1 | MIMO Mode Ant 2 | SISO Mode Ant 3 | MIMO Mode Ant 4 | MIMO Mode Ant 1+2 | MIMO Mode Ant 1+2+3 | MIMO Mode Ant 1+2+3+4 |
| 0.4 | 1.8 | 0.4 | 1 | 3.6 | 4.4 | 3.1 | 3.8 | 1.1 | 2.7 | 2 |

**< Antenna Gain for Beamforming Mode>**

| Peak antenna gain(dBi) | | | |
|---|---|---|---|
| 2.4GHz WLAN | 5GHz WLAN | | |
| MIMO Mode Ant 1+2 | MIMO Mode Ant 1+2 | MIMO Mode Ant 1+2+3 | MIMO Mode Ant 1+2+3+4 |
| 0.12 | 0.29 | 0.82 | 1.18 |

**Reviewed by: Jason Wang**

**Report Producer: Wan Liu**

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

**<Non-Beamforming Mode>**

| Maximum Average Power (dBm) | | | | | | |
|---|---|---|---|---|---|---|
| Bluetooth LE | 2.4GHz WLAN | | 5GHz WLAN | | | |
| Ant 2 | SISO Mode Ant 1 | MIMO Mode Ant 1+2 | SISO Mode Ant 1 | MIMO Mode Ant 1+2 | MIMO Mode Ant 1+2+3 | MIMO Mode Ant 1+2+3+4 |
| -2 | 22.5 | 25.5 | 22.5 | 26 | 27.5 | 28.5 |

**<Beamforming Mode>**

| Maximum Average Power (dBm) | | | |
|---|---|---|---|
| 2.4GHz WLAN | 5GHz WLAN | | |
| MIMO Mode Ant 1+2 | MIMO Mode Ant 1+2 | MIMO Mode Ant 1+2+3 | MIMO Mode Ant 1+2+3+4 |
| 25 | 26.5 | 28 | 26.5 |

## 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 LE | 2402.0 | 0.40 | -2.00 | -1.600 | 0.001 | 0.692 | 0.000 | 1.000 | 0.000138 |
| 2.4GHz WLAN SISO Mode ANT1 | 2412.0 | 1.80 | 22.50 | 24.300 | 0.269 | 269.153 | 0.054 | 1.000 | 0.053574 |
| 2.4GHz WLAN MIMO Mode ANT1+2 | 2412.0 | 1.00 | 25.50 | 26.500 | 0.447 | 446.684 | 0.089 | 1.000 | 0.088910 |
| 5GHz WLAN SISO Mode ANT1 | 5180.0 | 3.60 | 22.50 | 26.100 | 0.407 | 407.380 | 0.081 | 1.000 | 0.081087 |
| 5GHz WLAN MIMO Mode ANT1+2 | 5180.0 | 1.10 | 26.00 | 27.100 | 0.513 | 512.861 | 0.102 | 1.000 | 0.102082 |
| 5GHz WLAN MIMO Mode ANT1+2+3 | 5180.0 | 2.70 | 27.50 | 30.200 | 1.047 | 1047.129 | 0.208 | 1.000 | 0.208425 |
| 5GHz WLAN MIMO Mode ANT1+2+3+4 | 5180.0 | 2.00 | 28.50 | 30.500 | 1.122 | 1122.018 | 0.223 | 1.000 | 0.223332 |

**Note:**

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

**<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 |
|---|---|---|---|---|---|---|---|---|---|
| 2.4GHz WLAN MIMO Mode ANT1+2 | 2412.0 | 0.12 | 25.00 | 25.120 | 0.325 | 325.087 | 0.065 | 1.000 | 0.064707 |
| 5GHz WLAN MIMO Mode ANT1+2 | 5180.0 | 0.29 | 26.50 | 26.790 | 0.478 | 477.529 | 0.095 | 1.000 | 0.095050 |
| 5GHz WLAN MIMO Mode ANT1+2+3 | 5180.0 | 0.82 | 28.00 | 28.820 | 0.762 | 762.079 | 0.152 | 1.000 | 0.151688 |
| 5GHz WLAN MIMO Mode ANT1+2+3+4 | 5180.0 | 1.18 | 26.50 | 27.680 | 0.586 | 586.138 | 0.117 | 1.000 | 0.116668 |

**Note:**

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

## 4.2. 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 |
|---|---|---|---|
| 0.000138 | 0.088910 | 0.223332 | 0.312380 |

**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.