

## FCC 47 CFR MPE REPORT

ION Audio, LLC

bluetooth speaker

Model Number: PATHFINDER™ 320°

Additional Model: iPA159, PATHFINDER\*\*\*\*\*, iPA159\*\*\*\*\*  
(\* can be 0-9, A-Z or blank)

FCC ID: 2AB3E-IPA159

|                          |                                                                     |
|--------------------------|---------------------------------------------------------------------|
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|                          |                                                                     |
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|                 |                       |
|-----------------|-----------------------|
| Report Number:  | ESTE-R2112356         |
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| Date of Report: | Dec. 31, 2021         |

## Maximum Permissible Exposure

### 1. Applicable Standards

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

#### 1.1. Limits for Maximum Permissible Exposure (MPE)

##### (a) 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 <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                  | 6                                                                      |
| 3.0-30                | 1842/f                            | 4.89/f                            | (900/f)*                                | 6                                                                      |
| 30-300                | 61.4                              | 0.163                             | 1.0                                     | 6                                                                      |
| 300-1500              |                                   |                                   | F/300                                   | 6                                                                      |
| 1500-10000            |                                   |                                   | 5                                       | 6                                                                      |

##### (b) 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 <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                  | 30                                                                     |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f)*                                | 30                                                                     |
| 30-300                | 27.5                              | 0.073                             | 0.2                                     | 30                                                                     |
| 300-1500              |                                   |                                   | F/1500                                  | 30                                                                     |
| 1500-10000            |                                   |                                   | 1.0                                     | 30                                                                     |

Note: f=frequency in MHz; \*Plane-wave equivalent power density

## 1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric Field (V/m)

P = Peak RF output Power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

## 2. Conducted Power Result

| Mode   | Frequency (MHz) | Peak output power (dBm) | Peak output power (mW) | Target power (dBm) | Antenna gain |          |
|--------|-----------------|-------------------------|------------------------|--------------------|--------------|----------|
|        |                 |                         |                        |                    | (dBi)        | (Linear) |
| GFSK   | 2402            | 8.10                    | 6.457                  | 8±1                | 3.38         | 2.178    |
|        | 2441            | 6.12                    | 4.093                  | 6±1                | 3.38         | 2.178    |
|        | 2480            | 3.63                    | 2.307                  | 3±1                | 3.38         | 2.178    |
| 8-DPSK | 2402            | 8.09                    | 6.442                  | 8±1                | 3.38         | 2.178    |
|        | 2441            | 6.09                    | 4.064                  | 6±1                | 3.38         | 2.178    |
|        | 2480            | 3.63                    | 2.307                  | 3±1                | 3.38         | 2.178    |
| BLE    | 2402            | 7.79                    | 6.012                  | 7±1                | 3.38         | 2.178    |
|        | 2440            | 5.82                    | 3.819                  | 5±1                | 3.38         | 2.178    |
|        | 2480            | 3.32                    | 2.148                  | 3±1                | 3.38         | 2.178    |

## 3. Calculated Result and Limit

| Mode      | Target power (dBm) | Antenna gain |          | Power Density (S) (mW/cm <sup>2</sup> ) | Limited of Power Density (S) (mW/cm <sup>2</sup> ) | Test Result |
|-----------|--------------------|--------------|----------|-----------------------------------------|----------------------------------------------------|-------------|
|           |                    | (dBi)        | (Linear) |                                         |                                                    |             |
| 2.4G Band |                    |              |          |                                         |                                                    |             |
| GFSK      | 9                  | 3.38         | 2.178    | 0.00344                                 | 1                                                  | Complies    |
| 8-DPSK    | 9                  | 3.38         | 2.178    | 0.00344                                 | 1                                                  | Complies    |
| BLE       | 8                  | 3.38         | 2.178    | 0.00273                                 | 1                                                  | Complies    |

**End of Test Report**