

# RF Exposure evaluation

|                   |                                             |
|-------------------|---------------------------------------------|
| FCC ID            | 2BM2B-WISTERIA                              |
| Product Name      | AUDIO AMPLIFIER                             |
| Model No.         | WISTERIA                                    |
| Listed Model(s)   | Magnolia, Aliya, TIKa                       |
| Exposure category | General population/uncontrolled environment |
| EUT Type          | Production Unit                             |
| Device Type       | Mobile Device                               |

## 1. Reference

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

FCC CFR 47 part1 1.1310: Radio frequency radiation exposure limits.

FCC CFR 47 part2 2.1091: Radio frequency radiation exposure evaluation: mobile devices

## 2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

| Frequency Range(MHz)                        | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|---------------------------------------------|------------------------------|------------------------------|-------------------------------------|-------------------------|
| Limits for Occupational/Controlled Exposure |                              |                              |                                     |                         |
| 0.3 – 3.0                                   | 614                          | 1.63                         | (100) *                             | 6                       |
| 3.0 – 30                                    | 1842/f                       | 4.89/f                       | (900/f <sup>2</sup> )*              | 6                       |
| 30 – 300                                    | 61.4                         | 0.163                        | 1.0                                 | 6                       |
| 300 – 1500                                  | /                            | /                            | f/300                               | 6                       |
| 1500–100,000                                | /                            | /                            | 5                                   | 6                       |

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

| Frequency Range(MHz)                        | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|---------------------------------------------|------------------------------|------------------------------|-------------------------------------|-------------------------|
| Limits for Occupational/Controlled Exposure |                              |                              |                                     |                         |
| 0.3 – 3.0                                   | 614                          | 1.63                         | (100) *                             | 30                      |
| 3.0 – 30                                    | 824/f                        | 2.19/f                       | (180/f <sup>2</sup> )*              | 30                      |
| 30 – 300                                    | 27.5                         | 0.073                        | 0.2                                 | 30                      |
| 300 – 1500                                  | /                            | /                            | f/1500                              | 30                      |
| 1500 – 100,000                              | /                            | /                            | 1.0                                 | 30                      |

F=frequency in MHz

\*=Plane-wave equivalent power density

### 3. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

### 4. Antenna Information

FLW8189FSA7-A WiFi module can only use antennas certificated as follows provided by manufacturer;

| Antenna No. | Type of antenna: | Gain of the antenna (Max.) | Frequency range: |
|-------------|------------------|----------------------------|------------------|
| B70L        | External antenna | 1.64dBi                    | 2400-2500MHz     |

### 5. Conducted Peak Output Power

| Modulation | Packet Type | Channel | Peak Output Power (dBm) | Peak Output Power (mW) |
|------------|-------------|---------|-------------------------|------------------------|
| BLE        | 1M          | 0       | -5.12                   | 0.31                   |
|            |             | 19      | -5.77                   | 0.26                   |
|            |             | 39      | -6.64                   | 0.22                   |
|            | 2M          | 0       | -4.92                   | 0.32                   |
|            |             | 19      | -5.51                   | 0.28                   |
|            |             | 39      | -6.31                   | 0.23                   |

### 6. Manufacturing Tolerance

BLE

| 1M              |           |            |            |
|-----------------|-----------|------------|------------|
| Channel         | Channel 0 | Channel 19 | Channel 39 |
| Target (dBm)    | -5        | -5         | -6         |
| Tolerance ±(dB) | 1.0       | 1.0        | 1.0        |
| 2M              |           |            |            |
| Channel         | Channel 0 | Channel 19 | Channel 39 |
| Target (dBm)    | -4        | -5         | -6         |
| Tolerance ±(dB) | 1.0       | 1.0        | 1.0        |

## 7. Standalone MPE Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance,  $r=20\text{cm}$ , as well as the gain of the used antenna is 1.2dBi, the RF power density can be obtained.

| Mode  | Output power |       | Antenna Gain (dBi) | Antenna Gain(linear) | MPE (mW/cm <sup>2</sup> ) | MPE Limits (mW/cm <sup>2</sup> ) |
|-------|--------------|-------|--------------------|----------------------|---------------------------|----------------------------------|
|       | dBm          | mW    |                    |                      |                           |                                  |
| BLE1M | -4           | 0.398 | 1.20               | 1.32                 | 0.0001                    | 1.0000                           |
| BLE2M | -3           | 0.501 | 1.20               | 1.32                 | 0.0001                    | 1.0000                           |

Remark:

1. Output power (Peak) including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer.

## 8. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----End of the report-----