

# RF Exposure evaluation

|                      |                                                                 |
|----------------------|-----------------------------------------------------------------|
| FCC ID               | 2BLOE-TYD-BZY-001                                               |
| Product Name         | Octopus Ocean Projection Lamp                                   |
| Model/Type reference | TYD-BZY-001, TYD-BZY-002, TYD-BZY-003, TYD-BZY-004, TYD-BZY-005 |
| 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

$$S=PG/4\pi R^2$$

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: |
|-------------|------------------|----------------------------|------------------|
| 2.4G ANT    | PCB antenna      | -0.58dBi                   | 2400-2500MHz     |

### 5. Conducted Peak Output Power

| Modulation    | Packet Type | Channel | Peak Output Power (dBm) | Peak Output Power (mW) |
|---------------|-------------|---------|-------------------------|------------------------|
| GFSK          | DH5         | 0       | 4.13                    | 2.59                   |
|               |             | 39      | 4.14                    | 2.59                   |
|               |             | 78      | 3.51                    | 2.24                   |
| $\pi/4$ DQPSK | 2-DH5       | 0       | 4.93                    | 3.11                   |
|               |             | 39      | 4.75                    | 2.98                   |
|               |             | 78      | 4.38                    | 2.74                   |
| 8DPSK         | 3-DH5       | 0       | 5.19                    | 3.30                   |
|               |             | 39      | 4.31                    | 2.70                   |
|               |             | 78      | 3.85                    | 2.43                   |

## 6. Manufacturing Tolerance

BR/EDR

| DH5                  |           |            |            |
|----------------------|-----------|------------|------------|
| Channel              | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm)         | 4         | 4          | 4          |
| Tolerance $\pm$ (dB) | 1.0       | 1.0        | 1.0        |
| 2DH5                 |           |            |            |
| Channel              | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm)         | 4         | 4          | 4          |
| Tolerance $\pm$ (dB) | 1.0       | 1.0        | 1.0        |
| 3DH5                 |           |            |            |
| Channel              | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm)         | 5         | 4          | 4          |
| Tolerance $\pm$ (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  $-0.58\text{dBi}$ , the RF power density can be obtained.

| Mode | Output power |       | Antenna Gain (dBi) | Antenna Gain(linear) | MPE ( $\text{mW}/\text{cm}^2$ ) | MPE Limits ( $\text{mW}/\text{cm}^2$ ) |
|------|--------------|-------|--------------------|----------------------|---------------------------------|----------------------------------------|
|      | dBm          | mW    |                    |                      |                                 |                                        |
| DH5  | 5            | 3.162 | -0.58              | 0.87                 | 0.0006                          | 1.0000                                 |
| 2DH5 | 5            | 3.162 | -0.58              | 0.87                 | 0.0006                          | 1.0000                                 |
| 3DH5 | 6            | 3.981 | -0.58              | 0.87                 | 0.0007                          | 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-----