

# 1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

---

## 1.1 General Information

### Client Information

|                          |                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------|
| Applicant:               | PIN GENIE, INC. DBA LOCKLY                                                             |
| Address of applicant:    | 676 Transfer Rd., St. Paul, MN 55114                                                   |
| Manufacturer:            | Smart Electronic Industrial (Dong Guan) Co., Ltd.                                      |
| Address of manufacturer: | Qing Long Road, Long Jian Tian Village, Huang Jiang Town, Dong Guan, Guang Dong, China |

### General Description of EUT:

|                  |                     |
|------------------|---------------------|
| Product Name:    | Lockly Vision Elite |
| Trade Name:      | LOCKLY              |
| Model No.:       | PGD798NV            |
| Adding Model(s): | /                   |
| Rated Voltage:   | Battery:DC3.7V      |
| FCC ID:          | 2ASIVPGD798NV       |
| Equipment Type:  | Fixed               |

### Technical Characteristics of EUT:

#### 2.4GHz

|                       |                      |
|-----------------------|----------------------|
| Frequency Range:      | 2403.01-2471.01MHz   |
| RF Output Power:      | 19.27dBm (Conducted) |
| Modulation:           | GFSK                 |
| Quantity of Channels: | 18                   |
| Channel Separation:   | 4MHz                 |
| Type of Antenna:      | Integral Antenna     |
| Antenna Gain:         | 2.0dBi               |
| Frequency Range:      | 2403.01-2471.01MHz   |
| RF Output Power:      | 19.27dBm (Conducted) |

#### Bluetooth

|                       |                      |
|-----------------------|----------------------|
| Bluetooth Version:    | V5.0 (BLE mode)      |
| Frequency Range:      | 2402-2480MHz         |
| RF Output Power:      | -4.91dBm (Conducted) |
| Data Rate:            | 1Mbps                |
| Modulation:           | GFSK                 |
| Quantity of Channels: | 40                   |
| Channel Separation:   | 2MHz                 |
| Type of Antenna:      | FPC Antenna          |
| Antenna Gain:         | 3.4dBi               |

## 1.2 Standard Applicable

According to § 1.1307(b)(1) and KDB 447498 D01 General RF Exposure Guidance v06, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

### (a) Limits for Occupational / Controlled Exposure

| Frequency range<br>(MHz) | Electric Field<br>Strength (E)<br>(V/m) | Magnetic Field<br>Strength (H)<br>(A/m) | Power Density<br>(S) (mW/cm <sup>2</sup> ) | Averaging Times<br>  E   <sup>2</sup> ,   H   <sup>2</sup> or<br>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                                                                            |
| 1500-100000              | /                                       | /                                       | 5                                          | 6                                                                            |

### (b) Limits for General Population / Uncontrolled Exposure

| Frequency range<br>(MHz) | Electric Field<br>Strength (E)<br>(V/m) | Magnetic Field<br>Strength (H)<br>(A/m) | Power Density<br>(S) (mW/cm <sup>2</sup> ) | Averaging Times<br>  E   <sup>2</sup> ,   H   <sup>2</sup> or<br>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                                                                           |
| 1500-100000              | /                                       | /                                       | 1                                          | 30                                                                           |

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

### 1.3 MPE Calculation Method

$$S = (30 * P * G) / (377 * R^2)$$

S = power density (in appropriate units, e.g., mw/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator,  
the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

### 1.4 MPE Calculation Result

For 2.4GHz

Maximum Tune-Up output power: 19.27(dBm)

Maximum peak output power at antenna input terminal: 84.53(mW)

Prediction distance: >20(cm)

Prediction frequency: 2403.01 (MHz)

Antenna gain: 2.0 (dBi)

Directional gain (numeric gain): 1.58

The worst case is power density at prediction frequency at 20cm: 0.027(mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

For Bluetooth

Maximum Tune-Up output power: -4.91 (dBm)

Maximum peak output power at antenna input terminal: 0.32(mW)

Prediction distance: >20(cm)

Prediction frequency: 2480(MHz)

Antenna gain: 3.4 (dBi)

Directional gain (numeric gain): 2.19

The worst case is power density at prediction frequency at 20cm: 0.0001(mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

2.4G and BT simultaneous transmission:  $0.027(\text{mw}/\text{cm}^2) + 0.0001(\text{mw}/\text{cm}^2) = \underline{0.0271(\text{mw}/\text{cm}^2)}$

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

Result: Pass