# RF Exposure Evaluation

## *FCC ID: 2AUOX-EL-A*

## 1. Client Information

| | | |
|---|---|---|
| **Applicant** | : | smartDIYs Co.,Ltd |
| **Address** | : | 3611-20,IINO, Minami-Alps City, Yamanashi, 400-0222 JAPAN |
| **Manufacturer** | : | smartDIYs Co.,Ltd |
| **Address** | : | 3611-20,IINO, Minami-Alps City, Yamanashi, 400-0222 JAPAN |

## 2. General Description of EUT

| | | | |
|---|---|---|---|
| **EUT Name** | : | Etcher Laser | |
| **Models No.** | : | EL-A,EL | |
| **Model Difference** | : | All these models are in the same PCB, layout and electrical circuit, the only difference is the model name | |
| **Product Description** | : | Operation Frequency: | **2.4G:**<br>802.11b/g/n(HT20): 2412MHz~2462MHz<br>802.11n(HT40): 2422MHz~2452MHz<br>Bluetooth 4.2: 2402MHz~2480MHz |
| | | Modulation Type: | 802.11b: DSSS(CCK, DQPSK, DBPSK)<br>802.11g/n: OFDM(BPSK,QPSK,16QAM, 64QAM)<br>BLE: GFSK<br>BT:GFSK (1 Mbps)<br>Pi/4-DQPSK (2 Mbps)<br>8-DPSK (3 Mbps) |
| **Power Supply** | | DC Voltage Supply from AC/DC Adapter | |
| **Power Rating** | | AC/DC Adapter: WT1205000<br>Input: 100~240V/50~60Hz 1.6A<br>Output: 12V 5A | |
| **Software Version** | | V1.0.0 | |
| **Hardware Version** | | V1.0.0 | |
| **Connecting I/O Port(S)** | | Please refer to the User's Manual | |
| **Remark** | | The antenna gain provided by the applicant, the verified for the RF conduction test provided by TOBY test lab. | |

**Note:** More test information about the EUT please refer the RF Test Report.



1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, China
*Tel: +86 75526509301 Fax: +86 75526509195*

# MPE Calculations for WIFI

## 1. Antenna Gain:

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| | Model | Frequency Range |
|---|---|---|
| PCB Ant: | N/A | 2400~2483.5MHz |
| | | 3.7dBi |

## 2. EUT Operation Condition:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

## 3. Exposure Evaluation:

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 the 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. Test Result:

**2.4G WIFI&BLE**

| Mode | Conducted Power(max) (dBm) | Turn-up Power (dB) | Max tune up power (dBm) [P] | ANT Gain (dBi) [G] | Distance (cm) [R] | Power Density ($mW/cm^2$) [S] | Limit of Power Density ($mW/cm^2$) (S) |
|---|---|---|---|---|---|---|---|
| BLE | -0.768 | 0±1 | 1 | 3.7 | 20 | 0.0006 | 1 |
| 802.11B | 17.62 | 17±1 | 18 | 3.7 | 20 | 0.0294 | 1 |
| 802.11G | 15.17 | 15±1 | 16 | 3.7 | 20 | 0.0186 | 1 |
| 802.11N(HT20) | 12.80 | 13±1 | 14 | 3.7 | 20 | 0.0117 | 1 |
| 802.11N(HT40) | 11.60 | 11±1 | 12 | 3.7 | 20 | 0.0074 | 1 |

## BT BER+EDR

| Mode | Conducted Power(max) (dBm) | Turn-up Power (dB) | Max tune up power (dBm) [P] | ANT Gain (dBi) Numeric [G] | Distance (cm) [R] | Power Density ($mW/cm^2$) [S] |
|---|---|---|---|---|---|---|
| GFSK | 4.148 | 4±1 | 5 | 3.7 | 20 | 0.00147 |
| Pi/4-DQPSK | 3.793 | 4±1 | 5 | 3.7 | 20 | 0.00147 |
| 8-DPSK | 3.879 | 4±1 | 5 | 3.7 | 20 | 0.00147 |

| The worst RF Exposure Evaluation | | | |
|---|---|---|---|
| Worst Calculation Value | | Total Calculation Value | Threshold Value |
| 2.4WiFi Mode | Bluetooth Mode | | |
| 0.0294 | 0.00147 | 0.03087 | 1.0 |

## 5. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

**Limits for General Population/ Uncontrolled Exposure**

| Frequency Range (MHz) | Power density ($mW/cm^2$) |
|---|---|
| 300-1,500 | F/1500 |
| 1,500-100,000 | 1.0 |

For BT&BLE:2402~2480 MHz
For WIFI: 802.11b/g/n(HT20): 2412MHz~2462MHz
802.11n(HT40): 2422MHz~2452MHz

MPE limit S: $1mW/cm^2$
The MPE is calculated as ***0.03087mW / cm2 < limit 1mW / cm²***. So, RF exposure limit warning or SAR test are not required.

The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b).

The RF Exposure Information page from the manual is included here for reference.

**Note**

For a more detailed features description, please refer to the RF Test Report.

**-----END OF REPORT-----**