

## RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

FCC ID: 2A5AT-P20PIUS

### EUT Specification

| EUT                               | Laser Engraver                                                                                                                                                                                                                                   |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency band (Operating)</b> | <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz<br><input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz<br><input type="checkbox"/> WLAN: 5.745GHz ~ 5825GHz<br><input type="checkbox"/> Others: BLE: 2402-2480MHz |
| <b>Device category</b>            | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)<br><input type="checkbox"/> Others _____                                                                                   |
| <b>Exposure classification</b>    | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> )<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )                                                    |
| <b>Antenna diversity</b>          | <input checked="" type="checkbox"/> Single antenna<br><input type="checkbox"/> Multiple antennas<br><input type="checkbox"/> Tx diversity<br><input type="checkbox"/> Rx diversity<br><input type="checkbox"/> Tx/Rx diversity                   |
| <b>Max. output power</b>          | 17.08dBm (0.0511W)                                                                                                                                                                                                                               |
| <b>Antenna gain (Max)</b>         | 2 dBi                                                                                                                                                                                                                                            |
| <b>Evaluation applied</b>         | <input checked="" type="checkbox"/> MPE Evaluation<br><input type="checkbox"/> SAR Evaluation                                                                                                                                                    |

Limits for Maximum Permissible Exposure(MPE)

| Frequency Range(MHz)                                         | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density(mW/cm <sup>2</sup> ) | Average Time |
|--------------------------------------------------------------|------------------------------|------------------------------|------------------------------------|--------------|
| <b>(A) Limits for Occupational/Control Exposures</b>         |                              |                              |                                    |              |
| <b>300-1500</b>                                              | --                           | --                           | <b>F/300</b>                       | <b>6</b>     |
| <b>1500-100000</b>                                           | --                           | --                           | <b>5</b>                           | <b>6</b>     |
| <b>(B) Limits for General Population/Uncontrol Exposures</b> |                              |                              |                                    |              |
| <b>300-1500</b>                                              | --                           | --                           | <b>F/1500</b>                      | <b>6</b>     |
| <b>1500-100000</b>                                           | --                           | --                           | <b>1</b>                           | <b>30</b>    |

## Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

$P_d$  = Power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in Mw

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$R$  = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE, 1mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

## Measurement Result

| Operating Mode | Channel Frequency (MHz) | Maximum output power (dBm) | Tune up tolerance (dBm) | Max. Tune up Power (dBm) | Antenna Gain (dBi) | Power density at 20cm (mW/ cm2 ) | Power density Limits (mW/cm2 ) |
|----------------|-------------------------|----------------------------|-------------------------|--------------------------|--------------------|----------------------------------|--------------------------------|
| 802.11b        | 2412                    | 16.52                      | 16.52 ± 1               | 17.52                    | 2                  | 0.0178                           | 1                              |
|                | 2437                    | 16.04                      | 16.04 ± 1               | 17.04                    | 2                  | 0.0160                           | 1                              |
|                | 2462                    | 15.94                      | 15.94 ± 1               | 16.94                    | 2                  | 0.0156                           | 1                              |
| 802.11g        | 2412                    | 16.42                      | 16.42 ± 1               | 17.42                    | 2                  | 0.0174                           | 1                              |
|                | 2437                    | 16.30                      | 16.30 ± 1               | 17.30                    | 2                  | 0.0169                           | 1                              |
|                | 2462                    | 16.66                      | 16.66 ± 1               | 17.66                    | 2                  | 0.0184                           | 1                              |
| 802.11n (HT20) | 2412                    | 16.48                      | 16.48 ± 1               | 17.48                    | 2                  | 0.0177                           | 1                              |
|                | 2437                    | 17.00                      | 17.00 ± 1               | 18.00                    | 2                  | 0.0199                           | 1                              |
|                | 2462                    | 17.08                      | 17.08 ± 1               | 18.08                    | 2                  | 0.0203                           | 1                              |
| 802.11n (HT40) | 2422                    | 14.62                      | 14.62 ± 1               | 15.62                    | 2                  | 0.0115                           | 1                              |
|                | 2437                    | 14.65                      | 14.65 ± 1               | 15.65                    | 2                  | 0.0116                           | 1                              |
|                | 2452                    | 13.80                      | 13.80 ± 1               | 14.80                    | 2                  | 0.0095                           | 1                              |