

## MPE Calculation : WLAN(2.4GHz)

| RF function or Mode | Frequency range (MHz) |   |         | Max Target Power (dBm) | ANT Gain (dBi) | Maximum EIRP (dBm) | Maximum EIRP (mW) | Maximum power density (mW/cm <sup>2</sup> ) | Requirement (mW/cm <sup>2</sup> ) |
|---------------------|-----------------------|---|---------|------------------------|----------------|--------------------|-------------------|---------------------------------------------|-----------------------------------|
| 802.11b             | 2412.00               | ~ | 2462.00 | 17.20                  | 4.67           | 21.87              | 153.816           | 0.031                                       | 1.000                             |
| 802.11g             | 2412.00               | ~ | 2462.00 | 13.50                  | 4.67           | 18.17              | 65.615            | 0.014                                       | 1.000                             |
| 802.11n(HT20)       | 2412.00               | ~ | 2462.00 | 13.50                  | 4.67           | 18.17              | 65.615            | 0.014                                       | 1.000                             |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user.

The MPE sample calculation for this exposure is shown below.

$$\begin{aligned}
 S &= \text{EIRP} / (4 R^2 \pi) \\
 &= 153.816 / (4 \times 20^2 \times \pi) \\
 &= 0.031 \text{ mW/cm}^2
 \end{aligned}$$

## - Note

S= Maximum power density(mW/cm<sup>2</sup>)

EIRP= Equivalent Isotropic Radiated Power(mW)

R= Distance to the center of the radiation of the antenna(20

## ▪ Limits for General Population/Uncontrolled Exposure

| Frequency range (MHz) |   |         | Electric Field strength (V/m) | Magnetic field strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averageing time (minutes) |
|-----------------------|---|---------|-------------------------------|-------------------------------|-------------------------------------|---------------------------|
| 0.3                   | ~ | 1.34    | 614                           | 1.63                          | *100                                | 30                        |
| 1.34                  | ~ | 30      | 824/f                         | 2.19 / f                      | *180 / f <sup>2</sup>               | 30                        |
| 30                    | ~ | 300     | 27.5                          | 0.073                         | 0.2                                 | 30                        |
| 300                   | ~ | 1,500   |                               |                               | f / 1500                            | 30                        |
| 1,500                 | ~ | 100,000 |                               |                               | 1.0                                 | 30                        |

f = frequency in MHz \* = Plane-wave equivalent power density

**Conclusion :** The exposure condition of this device is compliant with FCC

## MPE Calculation : WLAN(5GHz)

| RF function or Mode       | Frequency range (MHz) |   |         | Max Target Power (dBm) | ANT Gain (dBi) | Maximum EIRP (dBm) | Maximum EIRP (mW) | Maximum power density (mW/cm <sup>2</sup> ) | Requirement (mW/cm <sup>2</sup> ) |
|---------------------------|-----------------------|---|---------|------------------------|----------------|--------------------|-------------------|---------------------------------------------|-----------------------------------|
| 802.11a/n(HT20)/ac(VHT20) | 5180.00               | ~ | 5240.00 | 13.50                  | 2.89           | 16.39              | 43.552            | 0.009                                       | 1.000                             |
| 802.11n(HT40)/ac(VHT40)   | 5190.00               | ~ | 5230.00 | 9.70                   | 2.89           | 12.59              | 18.156            | 0.004                                       | 1.000                             |
| 802.11ac(80)              | 5210.00               | ~ | 5210.00 | 9.00                   | 2.89           | 11.89              | 15.453            | 0.004                                       | 1.000                             |
| 802.11a/n(HT20)/ac(VHT20) | 5260.00               | ~ | 5320.00 | 13.50                  | 2.89           | 16.39              | 43.552            | 0.009                                       | 1.000                             |
| 802.11n(HT40)/ac(VHT40)   | 5270.00               | ~ | 5310.00 | 9.70                   | 2.89           | 12.59              | 18.156            | 0.004                                       | 1.000                             |
| 802.11ac(80)              | 5290.00               | ~ | 5290.00 | 10.00                  | 2.89           | 12.89              | 19.454            | 0.004                                       | 1.000                             |
| 802.11a/n(HT20)/ac(VHT20) | 5500.00               | ~ | 5720.00 | 13.20                  | 2.51           | 15.71              | 37.240            | 0.008                                       | 1.000                             |
| 802.11n(HT40)/ac(VHT40)   | 5510.00               | ~ | 5710.00 | 8.00                   | 2.51           | 10.51              | 11.247            | 0.003                                       | 1.000                             |
| 802.11ac(80)              | 5530.00               | ~ | 5690.00 | 8.00                   | 2.51           | 10.51              | 11.247            | 0.003                                       | 1.000                             |
| 802.11a/n(HT20)/ac(VHT20) | 5745.00               | ~ | 5825.00 | 13.00                  | 5.78           | 18.78              | 75.510            | 0.016                                       | 1.000                             |
| 802.11n(HT40)/ac(VHT40)   | 5755.00               | ~ | 5795.00 | 8.00                   | 5.78           | 13.78              | 23.879            | 0.005                                       | 1.000                             |
| 802.11ac(80)              | 5775.00               | ~ | 5775.00 | 8.00                   | 5.78           | 13.78              | 23.879            | 0.005                                       | 1.000                             |
|                           |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                           |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                           |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                           |                       | ~ |         |                        |                |                    |                   |                                             |                                   |

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user.

The MPE sample calculation for this exposure is shown below.

$$\begin{aligned}
 S &= \text{EIRP} / (4 R^2 \pi) \\
 &= 75.51 / (4 \times 20^2 \times \pi) \\
 &= 0.016 \text{ mW/cm}^2
 \end{aligned}$$

## - Note

S= Maximum power density(mW/cm<sup>2</sup>)

EIRP= Equivalent Isotropic Radiated Power(mW)

R= Distance to the center of the radiation of the antenna(20

## ▪ Limits for General Population/Uncontrolled Exposure

| Frequency range (MHz) | Electric Field strength (V/m) | Magnetic field strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averageing time (minutes) |
|-----------------------|-------------------------------|-------------------------------|-------------------------------------|---------------------------|
| 0.3 ~ 1.34            | 614                           | 1.63                          | *100                                | 30                        |
| 1.34 ~ 30             | 824/f                         | 2.19 / f                      | *180 / f <sup>2</sup>               | 30                        |
| 30 ~ 300              | 27.5                          | 0.073                         | 0.2                                 | 30                        |
| 300 ~ 1,500           |                               |                               | f / 1500                            | 30                        |
| 1,500 ~ 100,000       |                               |                               | 1.0                                 | 30                        |

f = frequency in MHz \* = Plane-wave equivalent power density

**Conclusion : The exposure condition of this device is compliant with FCC**

## MPE Calculation : Bluetooth

| RF function or Mode | Frequency range (MHz) |   |         | Max Target Power (dBm) | ANT Gain (dBi) | Maximum EIRP (dBm) | Maximum EIRP (mW) | Maximum power density (mW/cm <sup>2</sup> ) | Requirement (mW/cm <sup>2</sup> ) |
|---------------------|-----------------------|---|---------|------------------------|----------------|--------------------|-------------------|---------------------------------------------|-----------------------------------|
| Bluetooth(1Mbps)    | 2402.00               | ~ | 2480.00 | 1.30                   | 2.46           | 3.76               | 2.377             | 0.001                                       | 1.000                             |
| Bluetooth(2/3Mbps)  | 2402.00               | ~ | 2480.00 | 0.00                   | 2.46           | 2.46               | 1.762             | 0.001                                       | 1.000                             |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |
|                     |                       | ~ |         |                        |                |                    |                   |                                             |                                   |

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user.

The MPE sample calculation for this exposure is shown below.

$$\begin{aligned}
 S &= \text{EIRP} / (4 R^2 \pi) \\
 &= 2.377 / (4 \times 20^2 \times \pi) \\
 &= 0.001 \text{ mW/cm}^2
 \end{aligned}$$

### - Note

S= Maximum power density(mW/cm<sup>2</sup>)

EIRP= Equivalent Isotropic Radiated Power(mW)

R= Distance to the center of the radiation of the antenna(20

### ▪ Limits for General Population/Uncontrolled Exposure

| Frequency range (MHz) |   |         | Electric Field strength (V/m) | Magnetic field strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averageing time (minutes) |
|-----------------------|---|---------|-------------------------------|-------------------------------|-------------------------------------|---------------------------|
| 0.3                   | ~ | 1.34    | 614                           | 1.63                          | *100                                | 30                        |
| 1.34                  | ~ | 30      | 824/f                         | 2.19 / f                      | *180 / f <sup>2</sup>               | 30                        |
| 30                    | ~ | 300     | 27.5                          | 0.073                         | 0.2                                 | 30                        |
| 300                   | ~ | 1,500   |                               |                               | f / 1500                            | 30                        |
| 1,500                 | ~ | 100,000 |                               |                               | 1.0                                 | 30                        |

f = frequency in MHz \* = Plane-wave equivalent power density

**Conclusion :** The exposure condition of this device is compliant with FCC

## RF Exposure Compliance for simultaneous operations

### ▪ Configurations for simultaneous operations

- **Configuration 1:** 2.4GHz WLAN + Bluetooth
- **Configuration 2:** 5GHz WLAN + Bluetooth

Note: Above configuration was declared from applicant.

### ▪ Configurations for simultaneous operations

| RF function or mode                   | 2.4GHz WLAN | 5GHz WLAN | Bluetooth | $\Sigma$ of MPE ratios |
|---------------------------------------|-------------|-----------|-----------|------------------------|
| Power Density (mW/cm <sup>2</sup> )   | 0.031       | 0.016     | 0.001     |                        |
| Requirement (mW/cm <sup>2</sup> )     | 1.000       | 1.000     | 1.000     |                        |
| MPE ratio (Power Density/Requirement) | 0.031       | 0.016     | 0.001     |                        |
| Configuration 1 (MPE ratio)           | 0.031       |           | 0.001     | 0.032                  |
| Configuration 2 (MPE ratio)           |             | 0.016     | 0.001     | 0.017                  |

Note: The maximum power density in each RF function was used for above table.

▪ Requirement =  $\Sigma$  of MPE ratios  $\leq 1$

**Conclusion :** The exposure condition of this device is compliant with FCC rules.