

## FCC ID : 2BEA6TPC101

### 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)

#### Limits for Maximum Permissible Exposure (MPE)

Table 1 to § 1.1310(e)(1)—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> ) | Averaging time (minutes) |
|----------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (i) 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                       |
| 300-1,500                                                |                               |                               | f/300                               | <6                       |
| 1,500-100,000                                            |                               |                               | 5                                   | <6                       |
| (ii) Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
| 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.

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

Where

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

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

$G$  = Numeric gain of the antenna relative to isotropic antenna

$\pi$  = 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.

RF Exposure Information: The radiated output power of this device meets the limits of FCC/IC radio frequency exposure limits. This device should be operated with a minimum separation distance of 20cm (8 inches) between the equipment and a person's body.

## 11.2 Measurement Result

BT

Antenna gain: 3.40 dBi

| Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 6.78                 | 5 to 7              | 7                       | 2.19                 | 0.00218                                 | 1                                          |

BLE:

Antenna gain: 3.40 dBi

| Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 5.95                 | 4 to 6              | 6                       | 2.19                 | 0.00173                                 | 1                                          |

WiFi 2.4G

Antenna gain: 3.40 dBi

| Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 18.40                | 17 to 19            | 19                      | 2.19                 | 0.03457                                 | 1                                          |

## WiFi 5G

Antenna gain: 8.3 dBi

| Frequency band  | Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|-----------------|----------------------|---------------------|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|
| 5150MHz-5250MHz | 14.66                | 13 to15             | 15                      | 6.76                 | 0.04253                                 | 1                                          |
| 5250MHz-5350MHz | 15.01                | 14 to 16            | 16                      | 6.76                 | 0.05355                                 | 1                                          |
| 5470MHz-5725MHz | 15.01                | 14 to 16            | 16                      | 6.76                 | 0.05355                                 | 1                                          |
| 5725MHz-5850MHz | 14.88                | 13 to 15            | 15                      | 6.76                 | 0.04253                                 | 1                                          |

## NFC(13.56MHz)

| Operation Mode          | Channel Number       | Channel Frequency (MHz)                 | Emission Level(dBuV/m)                     | EIRP (dBm) | Max power (mW) |
|-------------------------|----------------------|-----------------------------------------|--------------------------------------------|------------|----------------|
| RFID                    | 1                    | 13.56                                   | 46.52                                      | -48.71     | 0              |
| Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |            |                |
| 0                       | 1                    | 0.00020                                 | *(180/f2)                                  |            |                |

$$EIRP[dBm] = E[dBuV/m] + 20 \log(d[meters]) - 104.77$$

WIFI and Bluetooth support for simultaneous delivery:

## MAX RF EXPOSURE EVALUATION

| WIFI2.4G (mW/cm <sup>2</sup> ) | BT (mW/cm <sup>2</sup> ) | Summation of Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|--------------------------------|--------------------------|------------------------------------------------------|--------------------------------------------|
| 0.03457                        | 0.00218                  | 0.03675                                              | 1                                          |

| WIFI5G (mW/cm <sup>2</sup> ) | BT (mW/cm <sup>2</sup> ) | Summation of Evaluation result (mW/cm <sup>2</sup> ) | Power density Limits (mW/cm <sup>2</sup> ) |
|------------------------------|--------------------------|------------------------------------------------------|--------------------------------------------|
| 0.05355                      | 0.00218                  | 0.05573                                              | 1                                          |

| WIFI2.4G<br>(mW/cm <sup>2</sup> ) | BLE<br>(mW/cm <sup>2</sup> ) | Summation of Evaluation result<br>(mW/cm <sup>2</sup> ) | Power density Limits<br>(mW/cm <sup>2</sup> ) |
|-----------------------------------|------------------------------|---------------------------------------------------------|-----------------------------------------------|
| 0.03457                           | 0.00173                      | 0.06914                                                 | 1                                             |

| WIFI5G<br>(mW/cm <sup>2</sup> ) | BLE<br>(mW/cm <sup>2</sup> ) | Summation of Evaluation result<br>(mW/cm <sup>2</sup> ) | Power density Limits<br>(mW/cm <sup>2</sup> ) |
|---------------------------------|------------------------------|---------------------------------------------------------|-----------------------------------------------|
| 0.05355                         | 0.00173                      | 0.05528                                                 | 1                                             |

