

# FCC ID: NOI-SA1P02

## KDB447498 D01 General RF Exposure Guidance v06

### Maximum Permissible Exposure (MPE)

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)

| Frequency range (MHz)                                          | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|----------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposure</b>         |                               |                               |                                     |                          |
| 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                        |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                          |
| 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

### MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

BLE:

## Measurement Result

Operation Frequency: 2402MHz~2480MHz

Power density limited: 1mW/ cm<sup>2</sup>

Antenna Type:PCB antenna

Antenna gain:1.99dBi;

R=20cm

mW=10<sup>^(dBi/10)</sup>

antenna gain Numeric=10<sup>^(dBi/10)</sup>= 10<sup>^(1.99/10)</sup>=1.58

| Channel<br>Freq. (MHz) | modulation | conducted<br>power | Tune-up<br>power (dBm) | Max           |       | Antenna |         | Evaluation<br>result | Power<br>density |
|------------------------|------------|--------------------|------------------------|---------------|-------|---------|---------|----------------------|------------------|
|                        |            | (dBm)              |                        | tune-up power |       | Gain    |         |                      |                  |
|                        |            |                    |                        | (dBm)         | (mW)  | (dBi)   | Numeric |                      |                  |
| 2402                   | BLE1M      | -1.93              | -2±1                   | -1            | 0.794 | 1.99    | 1.58    | 0.0002               | 1                |
| 2440                   |            | -2                 | -2±1                   | -1            | 0.794 | 1.99    | 1.58    | 0.0002               | 1                |
| 2480                   |            | -2.1               | -2±1                   | -1            | 0.794 | 1.99    | 1.58    | 0.0002               | 1                |

## 2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,

WIFI 802.11n HT40:2422-2452MHz

Power density limited: 1mW/ cm<sup>2</sup>

Antenna Type: PCB antenna

WIFI antenna gain: 1.99dBi;

R=20cm

mW=10<sup>^(dBi/10)</sup>

antenna gain Numeric=10<sup>^(dBi/10)</sup>= 10<sup>^(1.99/10)</sup>=1.58

| Channel<br>Freq.<br>(MHz) | modulation     | conducted<br>power | Tune-up<br>power | Max           |      | Antenna | Evaluation result<br>at 20cm | Power<br>density<br>Limits |
|---------------------------|----------------|--------------------|------------------|---------------|------|---------|------------------------------|----------------------------|
|                           |                | (dBm)              | (dBm)            | tune-up power |      | Gain    | Power<br>density(mW/cm2)     | (mW/cm2)                   |
|                           |                |                    |                  | (dBm)         | (mW) | Numeric |                              |                            |
| 2412                      | 802.11b        | 8.97               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2437                      |                | 8.98               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2462                      |                | 8.7                | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2412                      | 802.11g        | 8.33               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2437                      |                | 8.43               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2462                      |                | 8.23               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2412                      | 802.11n<br>H20 | 8.33               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2437                      |                | 8.23               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |
| 2462                      |                | 8.06               | 8±1              | 9             | 7.94 | 1.58    | 0.00250                      | 1                          |

## Conclusion:

For the max result : 0.0025≤ 1.0 for Max Power Density, compliance RF exposure..

Note:BT and WIFI 2.4G do not support simultaneous transmission.

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Signature:

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