

# **FCC ID : 2AYVYFMWRJ03A9**

## **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)

According to KDB 447498 D01 v06 RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES

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>    |

### **11.1 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

$G$ = 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.

### **11.2 Measurement Result**

BLE

Antenna gain: 2.29dBi

| Mode   | Channel Freq. (MHz) | Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2 ) |
|--------|---------------------|----------------------|---------------------|-------------------------|----------------------|-----------------------------|--------------------------------|
| BLE 1M | 2402                | -3.77                | -3±1                | -2                      | 1.6943               | 0.0002                      | 1                              |
| BLE 1M | 2440                | -3.53                | -3±1                | -2                      | 1.6943               | 0.0002                      | 1                              |
| BLE 1M | 2480                | -2.51                | -3±1                | -2                      | 1.6943               | 0.0002                      | 1                              |
| BLE 2M | 2402                | -3.78                | -3±1                | -2                      | 1.6943               | 0.0002                      | 1                              |
| BLE 2M | 2440                | -3.55                | -3±1                | -2                      | 1.6943               | 0.0002                      | 1                              |
| BLE 2M | 2480                | -2.49                | -3±1                | -2                      | 1.6943               | 0.0002                      | 1                              |

SRD2.4G

Antenna1 gain: 2.8dBi

Antenna2 gain: 2.8dBi

| Mode  | Antenna | Channel Freq. (MHz) | Measured power (dBm) | Tune-up power (dBm) | Max tune-up power (dBm) | Antenna Gain Numeric | Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2 ) |
|-------|---------|---------------------|----------------------|---------------------|-------------------------|----------------------|-----------------------------|--------------------------------|
| BPSK  | Ant1    | 2406                | 23.71                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2406                | 23.80                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2438                | 23.62                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2438                | 24.08                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2470                | 23.84                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2470                | 24.76                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
| QPSK  | Ant1    | 2406                | 23.85                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2406                | 24.44                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2438                | 23.73                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2438                | 24.41                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2470                | 23.99                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2470                | 24.56                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
| 16QAM | Ant1    | 2406                | 21.94                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2406                | 21.82                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | total   | 2406                | 24.89                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2438                | 21.83                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2438                | 21.71                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | total   | 2438                | 24.78                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2470                | 22.06                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2470                | 22.12                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
| 64QAM | total   | 2470                | 25.10                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2406                | 22.07                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2406                | 21.77                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | total   | 2406                | 24.93                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2438                | 21.85                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2438                | 21.80                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | total   | 2438                | 24.84                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant1    | 2470                | 22.13                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | Ant2    | 2470                | 22.17                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |
|       | total   | 2470                | 25.16                | 23±2                | 25                      | 1.9055               | 0.1199                      | 1                              |

## MAX RF EXPOSURE EVALUATION

| SRD2.4G | BLE    | Summation of Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2 ) |
|---------|--------|------------------------------------------|--------------------------------|
| 0.1199  | 0.0002 | 0.1201                                   | <1                             |