

## Appendix 11. RF Exposure Requirement

### 1. Limits

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> )	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	-	-	F/1500	6
1500-100,000	-	-	1	30

F= Frequency in MHz

Friis Formula

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

Where

$P_d$  = power density in  $\text{mW/cm}^2$

$P_{out}$  = 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

$P_d$  is the limit of MPE,  $1 \text{ mW/cm}^2$ . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

### 2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 23°C and 42% RH.

### 3. Test Result of RF Exposure Evaluation

Operating mode	Frequency	RF Output Power(dBm)
BDR(GFSK)	2402	1.7
BDR(GFSK)	2441	1.9
BDR(GFSK)	2480	2.1
EDR( $\pi/4$ -DQPSK)	2402	-1.5
EDR( $\pi/4$ -DQPSK)	2441	-1.2
EDR( $\pi/4$ -DQPSK)	2480	-1.0
EDR(8DPSK)	2402	-1.5
EDR(8DPSK)	2441	-1.2
EDR(8DPSK)	2480	-1.0
BLE(GFSK)	2402	5.4
BLE(GFSK)	2440	5.5
BLE(GFSK)	2480	5.6

Maximum RF Power=5.6dBm+2.0dBi=7.6dBm=5.75mW

$5.75/(4*3.14*400)=0.00114$

Frequency Band(MHz)	Maximum RF Power(mW)	Power Density at R = 20cm( $mW/cm^2$ )
2402-2480	5.75	0.00114

#### Note:

The power density  $P_d$  (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of  $1 mW/cm^2$ .