

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 ²)	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 mW/cm^2

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, $1 mW/cm^2$. 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)
GFSK	2403	7.22
GFSK	2441	6.41
GFSK	2480	3.61
GFSK	5728	11.02
GFSK	5775	10.66
GFSK	5825	10.32

(2.4GHz)Maximum RF Power=7.22dBm+2.1dBi=9.32dBm=8.55mW
 $8.55/(4 \times 3.14 \times 400) = 0.001702$

(5GHz)Maximum RF Power=11.02dBm+2.4dBi=13.42dBm=21.98mW
 $21.98/(4 \times 3.14 \times 400) = 0.004375$

Frequency Band(MHz)	Maximum RF Power(mW)	Power Density at R = 20cm(mW/cm^2)
2403-2480	8.55	0.001702
5728-5825	21.98	0.004375

Note:

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