

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)	Output Power (mW)
IEEE 802.11b	2412	13.47	22.23
IEEE 802.11b	2437	13.62	23.01
IEEE 802.11b	2462	13.74	23.66
IEEE 802.11g	2412	12.08	16.14
IEEE 802.11g	2437	12.23	16.71
IEEE 802.11g	2462	12.37	17.26
IEEE 802.11n(20M)	2412	6.98	4.99
IEEE 802.11n(20M)	2437	7.24	5.30
IEEE 802.11n(20M)	2462	7.40	5.50
IEEE 802.11n(40M)	2422	5.94	3.93
IEEE 802.11n(40M)	2437	6.03	4.01
IEEE 802.11n(40M)	2462	6.15	4.12

The Max Conducted Peak Output Power is 23.66mW in lowest channel
The Antenna Gain is 3dBi.

For FCC:

According to the formula $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

$$(23.66 \cdot 3) / (4 \cdot 3.14 \cdot 400) = 0.014128$$

Frequency Band(MHz)	Maximum RF Power(mW)	Power Density at R = 20cm(mW/cm ²)
2412-2462	23.66	0.014128

Note:

The power density P_d (4th column) at a distance of 20 cm calculated from the transmission formula is far below the limit of 1 mW/cm².