

**RF Exposure Evaluation****Limits**

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)
(A) Limits for Occupational/Controlled Exposures				
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
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

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

Where

**Pd** = power density in mW/cm<sup>2</sup>, **Pout** = 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

Pd is the limit of MPE, 1 mW/cm<sup>2</sup>. 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.

**Test Procedure**

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

## Test Result of RF Exposure Evaluation

### WIFI 2.4G

Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
2437MHz 802.11b SISO	24.96	313.33	0.0966	1.0	PASS
2437MHz 802.11n (HT40)MIMO	25.97	395.37	0.2383	1.0	PASS

Ant 1 gain=1.91dBi, Ant 2 gain =1.71dBi

MIMO ANT gain = $10 \times \log[(1.91/20 + 1.71/20)2/2] = 4.82 \text{dBi}$

### BT EDR

Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
2480MHz	10.87	12.22	0.0042	1.0	PASS

antenna gain=2.41dBi

### BLE

Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
2480MHz	3.87	2.44	0.0008	1.0	PASS

antenna gain=2.41dBi

Simultaneous Transmission:

WIFI+BT EDR: 0.2425<1

WIFI+BLE: 0.2391<1

The max power density is less than MPE exempt limit, so it is compliance.