

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 ²)	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 ²)	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 ²)	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: $Pd = (Pout * G) / (4 * pi * r^2)$

Where

Pd = power density in mW/cm², **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/cm². 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	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
2412MHz SISO(ANT 1)	20.98	125.31	0.0484	1.0	PASS
2412MHz MIMO	23.07	202.77	0.1308	1.0	PASS

Antenna gain:

ANT 1: 2.88dBi

ANT 2: 1.25dBi

MIMO: 5.11Bi

WiFi 5Gmode

Channel	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
5200 MHz (802.11ac HT20 SISO) ANT 1	15.31	33.96	0.0116	1.0	PASS
5200 MHz (802.11ac HT20 MIMO)	16.91	49.09	0.0282	1.0	PASS

Antenna gain:

ANT 1: 2.34dBi

ANT 2: 0.78dBi

MIMO: 4.61dBi

5.8G mode

Channel	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
5745 MHz (802.11ac HT20 SISO) ANT 1	12.82	19.14	0.0084	1.0	PASS
5805 MHz (802.11ac HT20 MIMO)	14.65	29.17	0.0249	1.0	PASS

Antenna gain:

ANT 1: 3.45dBi

ANT 2: 3.17dBi

MIMO: 6.32dBi

BT EDR mode

Channel	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
2402MHz	1.46	1.40	0.0003	1.0	PASS

Antenna gain: -0.28dBi

BLE mode

Channel	Max output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
2402MHz	4.88	3.08	0.0006	1.0	PASS

Antenna gain: -0.28dBi

Remark:

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

Simultaneous transmitting is not supported.