

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: $Pd = (P_{out} * G) / (4 * \pi * r^2)$

Where

Pd = power density in mW/cm², **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

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

Bluetooth BR+EDR

Channel	Frequency (MHz)	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	2402	-0.997	0.79	0.0002	1.0	PASS
	2441	-1.801	0.66	0.0001	1.0	PASS
	2480	-3.043	0.50	0.0001	1.0	PASS
π/4DQPSK	2402	1.163	1.31	0.0003	1.0	PASS
	2441	0.246	1.06	0.0002	1.0	PASS
	2480	-1.056	0.78	0.0002	1.0	PASS
8DPSK	2402	1.256	1.34	0.0003	1.0	PASS
	2441	0.324	1.08	0.0002	1.0	PASS
	2480	-0.957	0.80	0.0002	1.0	PASS

Remark: BT antenna gain= -2.3dBi

WiFi2.4G

Channel	Frequency (MHz)	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	2412	4.54	2.84	0.0006	1.0	PASS
	2437	4.02	2.52	0.0005	1.0	PASS
	2462	3.54	2.26	0.0004	1.0	PASS
802.11g	2412	2.54	1.79	0.0004	1.0	PASS
	2437	1.63	1.46	0.0003	1.0	PASS
	2462	1.21	1.32	0.0003	1.0	PASS
802.11n(HT20)	2412	-0.25	0.94	0.0002	1.0	PASS
	2437	-1.21	0.76	0.0002	1.0	PASS
	2462	-1.65	0.68	0.0001	1.0	PASS
802.11n(HT40)	2422	-3.24	0.47	0.0001	1.0	PASS
	2437	-4.25	0.38	0.0001	1.0	PASS
	2452	-4.65	0.34	0.0001	1.0	PASS

Remark: WIFI antenna gain= -2.3dBi

BT antenna and WiFi antenna cannot transmit simultaneously.