

RF EXPOSURE EVALUATION

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(V/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	—	—	F/300	6
1500-100000	—	—	5	6
(B) Limits for General Population/ Uncontrol Exposures				
300-1500	—	—	F/1500	6
1500-100000	—	—	1	30

11.1 Friis transmission formula: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in mW

G = Numeric gain of the antenna relative to isotropic antenna

π = 3.1416

R = distance between observation point and center of the radiator in cm ($R=20$ cm)

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

11.2 Measurement Result

BT DSS

Channel Freq. (MHz)	Modulation	Conducted Power (dBm)	Tune-up Power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
2402	GFSK	3.16	2.66~4.16	4.16	2	0.0010	1
2441	GFSK	3.31	2.81~4.31	4.31	2	0.0011	1
2480	GFSK	2.41	1.91~3.41	3.41	2	0.0009	1
2402	$\pi/4$ - DQPSK	3.08	2.58~4.08	4.08	2	0.0010	1
2441	$\pi/4$ - DQPSK	3.24	2.74~4.24	4.24	2	0.0011	1
2480	$\pi/4$ - DQPSK	2.33	1.83~3.33	3.33	2	0.0009	1
2402	8DPSK	3.06	2.56~4.06	4.06	2	0.0010	1
2441	8DPSK	3.21	2.71~4.21	4.21	2	0.0010	1
2480	8DPSK	2.33	1.83~3.33	3.33	2	0.0009	1

BLE

Channel Freq. (MHz)	Modulation	Conducted Power (dBm)	Tune-up Power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
2402	GFSK	-0.81	-1.31~-0.19	-0.19	2	0.0004	1
2440	GFSK	-1.48	-1.98~-0.48	-0.48	2	0.0004	1
2480	GFSK	-2.56	-3.06~-1.56	-1.56	2	0.0009	1

2.4G

Channel Freq. (MHz)	Modulation	Conducted Power (dBm)	Tune-up Power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
2402	QPSK 802.11b	21.10	20.60~22.10	22.10	2	0.0645	1
2440		21.35	20.85~22.35	22.35	2	0.0684	1
2480		21.72	21.22~22.72	22.72	2	0.0744	1
2402	OFDM 802.11g	23.72	23.22~24.72	24.72	2	0.1180	1
2440		24.03	23.53~25.03	25.03	2	0.1267	1
2480		24.26	23.76~25.26	25.26	2	0.1336	1
2402	OFDM 802.11n	23.86	23.36~24.86	24.86	2	0.1218	1
2440		24.32	23.82~25.32	25.32	2	0.1354	1
2480		24.53	24.03~25.53	25.53	2	0.1422	1

5G

Channel Freq. (MHz)	Modulation	Conducted Power (dBm)	Tune-up Power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
5180	OFDM 802.11a	17.40	2.66~18.40	18.40	2	0.0010	1
5200		17.50	2.81~18.50	18.50	2	0.0011	1
5240		17.57	1.91~18.57	18.57	2	0.0009	1
5745		20.03	2.58~21.03	21.03	2	0.0010	1
5785		19.86	2.74~20.86	20.86	2	0.0011	1
5825		19.89	1.83~20.89	20.89	2	0.0009	1
5180	OFDM 802.11n (20MHz)	17.71	2.56~18.71	18.71	2	0.0275	1
5200		17.80	2.71~18.80	18.80	2	0.0302	1
5240		18.14	1.83~19.14	19.14	2	0.0535	1
5745		20.29	19.79~21.29	21.29	2	0.0656	1
5785		20.18	19.68~21.18	21.18	2	0.0522	1
5825		20.10	19.60~21.10	21.10	2	0.0513	1
5190	OFDM	17.27	16.77~18.27	18.27	2	0.0267	1
5230	802.11n	17.72	17.22~18.72	18.72	2	0.0296	1

5755	(40MHz)	20.05	19.55~21.05	21.05	2	0.0507	1
5795		20.02	19.52~21.02	21.02	2	0.0503	1
5180	OFDM 802.11ac (20MHz)	17.66	17.16~18.66	18.66	2	0.0292	1
5200		17.66	17.16~18.66	18.66	2	0.0292	1
5240		18.08	17.58~19.08	19.08	2	0.0322	1
5745		20.31	19.81~21.31	21.31	2	0.0538	1
5785		20.18	19.68~21.18	21.18	2	0.0522	1
5825		20.15	19.65~21.15	21.15	2	0.0519	1
5190	OFDM 802.11ac (40MHz)	17.29	16.79~18.29	18.29	2	0.0268	1
5230		17.74	17.24~18.74	18.74	2	0.0298	1
5755		20.13	19.63~21.13	21.13	2	0.0516	1
5795		20.10	19.6~21.10	21.10	2	0.0513	1
5210	OFDM 802.11ac (80MHz)	17.32	16.82~18.32	18.32	2	0.0270	1
5775		19.97	19.47~20.97	20.97	2	0.0497	1