

RF EXPOSURE EVALUATION

According to FCC 1.1310 and KDB 447498 D01 V06, 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)

According to FCC2.1091

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 Exposure				
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
300-1,500			f/300	6
1,500-100,000			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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

Measurement Result

BT:

Operation Frequency: 2402MHz~2480MHz

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna gain: 4.21 dBi;

R=20cm

mW=10^{^(dBm/10)}

antenna gain Numeric=10^{^(dBi/10)}

BT

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	4.93	4±1	5	3.162	4.21	2.64	0.0017	1
2441		4.15	4±1	5	3.162	4.21	2.64	0.0017	1
2480		3.04	3±1	4	2.512	4.21	2.64	0.0013	1
2402	π/4-DQPSK	4.33	4±1	5	3.162	4.21	2.64	0.0017	1
2441		4.22	4±1	5	3.162	4.21	2.64	0.0017	1
2480		4.27	4±1	5	3.162	4.21	2.64	0.0017	1
2402	8-DPSK	4.63	4±1	5	3.162	4.21	2.64	0.0017	1
2441		4.44	4±1	5	3.162	4.21	2.64	0.0017	1
2480		4.51	4±1	5	3.162	4.21	2.64	0.0017	1

BLE:

Operation Frequency: 2402-2480MHz,

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna gain: 4.21 dBi;

R=20cm

mW=10^{^(dBm/10)}

Mode	Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
			(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric		
BLE	2402	GFSK	1.76	1±1	2	1.585	4.21	2.64	0.0008	1
	2440		0.86	1±1	2	1.585	4.21	2.64	0.0008	1
	2480		1.17	1±1	2	1.585	4.21	2.64	0.0008	1
BLE 2M	2402	GFSK	1.71	1±1	2	1.585	4.21	2.64	0.0008	1
	2440		0.84	1±1	2	1.585	4.21	2.64	0.0008	1
	2480		1.13	1±1	2	1.585	4.21	2.64	0.0008	1

2.4G WIFI

Operation Frequency:

WIFI 802.11b/g/n/ax HT20: 2412-2462MHz, n/axHT40:2422-2452MHz

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna 0 gain/Antenna 1 gain: 4.21dBi;

R=20cm

mW=10^{^(dBm/10)}

Antenna gain Numeric=10^{^(dBi/10)}

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		(mW/cm2)
2412	11b	15.15	15±1	16	39.811	4.21	2.64	0.0209	1
2437		14.75	14±1	15	31.623	4.21	2.64	0.0166	1
2462		14.16	14±1	15	31.623	4.21	2.64	0.0166	1
2412	11g	13.67	13±1	14	25.119	4.21	2.64	0.0132	1
2437		14.29	14±1	15	31.623	4.21	2.64	0.0166	1
2462		13.76	13±1	14	25.119	4.21	2.64	0.0132	1
2412	11n20	11.78	11±1	12	15.849	4.21	2.64	0.0083	1
2437		12.21	12±1	13	19.953	4.21	2.64	0.0105	1
2462		11.56	11±1	12	15.849	4.21	2.64	0.0083	1
2422	11n40	11.74	11±1	12	15.849	4.21	2.64	0.0083	1
2437		12.59	12±1	13	19.953	4.21	2.64	0.0105	1
2452		12.22	12±1	13	19.953	4.21	2.64	0.0105	1
2412	11ax20	11.85	11±1	12	15.849	4.21	2.64	0.0083	1
2437		12.4	12±1	13	19.953	4.21	2.64	0.0105	1
2462		11.64	11±1	12	15.849	4.21	2.64	0.0083	1
2422	11ax40	11.82	11±1	12	15.849	4.21	2.64	0.0083	1
2437		12.93	12±1	13	19.953	4.21	2.64	0.0105	1
2452		12.39	12±1	13	19.953	4.21	2.64	0.0105	1

5G WIFI

Operation Frequency: WIFI 802.11a/ac/n(HT20)/ ax(HT20): 5180-5240MHz;WIFI

802.11ac/n(HT40)/ ax(HT40): 5190-5230MHz;

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna Gain: 4.13 dBi

R=20cm

mW=10^{^(dBm/10)}

antenna gain Numeric=10^{^(dBi/10)}

5.2G

Channel Freq. (MHz)	modulation	conducted power	Tune-up pow er (dBm)	Max		Antenna		Evaluation result	Pow er density Limits
		(dBm)		tune-up pow er		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
5180	802.11a	11.51	11±1	12	15.849	4.13	2.59	0.0082	1
5200		11.45	11±1	12	15.849	4.13	2.59	0.0082	1
5240		12.11	12±1	13	19.953	4.13	2.59	0.0103	1
5180	802.11n H20	10.97	10±1	11	12.589	4.13	2.59	0.0065	1
5200		11.32	11±1	12	15.849	4.13	2.59	0.0082	1
5240		11.87	11±1	12	15.849	4.13	2.59	0.0082	1
5190	802.11n H40	11.25	11±1	12	15.849	4.13	2.59	0.0082	1
5230		11.99	11±1	12	15.849	4.13	2.59	0.0082	1
5180	802.11ac 20	11.14	11±1	12	15.849	4.13	2.59	0.0082	1
5200		11.35	11±1	12	15.849	4.13	2.59	0.0082	1
5240		11.99	11±1	12	15.849	4.13	2.59	0.0082	1
5190	802.11ac 40	11.27	11±1	12	15.849	4.13	2.59	0.0082	1
5230		11.83	11±1	12	15.849	4.13	2.59	0.0082	1
5180	802.11ax 20	11.12	11±1	12	15.849	4.13	2.59	0.0082	1
5200		11.19	11±1	12	15.849	4.13	2.59	0.0082	1
5240		11.67	11±1	12	15.849	4.13	2.59	0.0082	1
5190	802.11ax 40	11.37	11±1	12	15.849	4.13	2.59	0.0082	1
5230		10.85	10±1	11	12.589	4.13	2.59	0.0065	1

5.8G

Operation Frequency: WIFI 802.11a/ac/n(HT20)/ ax(HT20): 5745-5825MHz;WIFI

802.11ac/n(HT40)/ ax(HT40): 5755-5795MHz;

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna Gain: 4.13 dBi

R=20cm

mW=10^{^(dBm/10)}

antenna gain Numeric=10^{^(dBi/10)}

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			
				(dBm)	(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)
5745	802.11a	11.19	11±1	12	15.849	4.13	2.59	0.0082	1
5785		11.16	11±1	12	15.849	4.13	2.59	0.0082	1
5825		11.17	11±1	12	15.849	4.13	2.59	0.0082	1
5745	802.11n H20	11.27	11±1	12	15.849	4.13	2.59	0.0082	1
5785		11.04	11±1	12	15.849	4.13	2.59	0.0082	1
5825		11.17	11±1	12	15.849	4.13	2.59	0.0082	1
5755	802.11n H40	11.59	11±1	12	15.849	4.13	2.59	0.0082	1
5795		11.15	11±1	12	15.849	4.13	2.59	0.0082	1
5745	802.11ac 20	11.19	11±1	12	15.849	4.13	2.59	0.0082	1
5785		11.04	11±1	12	15.849	4.13	2.59	0.0082	1
5825		10.91	10±1	11	12.589	4.13	2.59	0.0065	1
5755	802.11ac 40	11.47	11±1	12	15.849	4.13	2.59	0.0082	1
5795		11.59	11±1	12	15.849	4.13	2.59	0.0082	1
5745	802.11ax 20	11.39	11±1	12	15.849	4.13	2.59	0.0082	1
5785		11.39	11±1	12	15.849	4.13	2.59	0.0082	1
5825		11.11	11±1	12	15.849	4.13	2.59	0.0082	1
5755	802.11ax 40	11.85	11±1	12	15.849	4.13	2.59	0.0082	1
5795		11.3	11±1	12	15.849	4.13	2.59	0.0082	1

SIMULTANEOUS TRANSMISSIONS

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE. To comply with the MPE, the fraction of the MPE in terms of E^2 , H^2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

Worst case is Simultaneous Transmissions for 2.4G Wi-Fi +BT

Band	Mode	Standalone	Standalone	Simultaneous		Verdict
		Evaluation result	Power density Limits	Evaluation result	Limit	
		(mW/cm2)	(mW/cm2)	raio		
2.4G Wi-Fi+BT	BT	0.0017	1	0.0226	1	PASS
	2.4G WIFI	0.0209	1			

Conclusion:

For the max result : $0.0251 \leq 1.0$, SAR is not required.

Signature:

Date: 2026-09-30



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