FCC ID: 2BDTM-H01

KDB447498 D01 General RF Exposure Guidance v06

Maximum Permissible Exposure (MPE)

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 (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 (V/m) $= \frac{\sqrt{30 * P * G}}{d}$ Power Density: *Pd* (W/m²) $= \frac{E^2}{377}$

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.

BT:

Measurement Result

Operation Frequency: 2402MHz~2480MHz
Power density limited: 1mW/ cm^2
Antenna Type:FPC antenna
Antenna gain:2.44dBi;
R=20cm
mW=10^(dBm/10)
antenna gain Numeric=10^(dBi/10)= 10^(2.15/10)=1.64

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Antenna Gain (dBi)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
2402	DH5	7.89	8±1	9	7.943	2.15	1.64	0.0026	1
2441		7.99	8±1	9	7.943	2.15	1.64	0.0026	1
2480		7.56	8±1	9	7.943	2.15	1.64	0.0026	1
2402	2DH5	7.85	8±1	9	7.943	2.15	1.64	0.0026	1
2441		7.9	8±1	9	7.943	2.15	1.64	0.0026	1
2480		7.54	8±1	9	7.943	2.15	1.64	0.0026	1
2402	3DH5	7.99	8±1	9	7.943	2.15	1.64	0.0026	1
2441		8.01	8±1	9	7.943	2.15	1.64	0.0026	1
2480		7.57	8±1	9	7.943	2.15	1.64	0.0026	1

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Antenna Gain (dBi)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
2402	GFSK(1M)	4.22	4±1	5	3.162	2.15	1.64	0.0010	1
2440		4.66	4±1	5	3.162	2.15	1.64	0.0010	1
2480		3.06	4±1	5	3.162	2.15	1.64	0.0010	1

2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n20: 2412-2462MHz,
802.11n40: 2422-2452MHz,
Power density limited: 1mW/ cm^2
Antenna Type: FPC antenna
antenna gain: 2.44 dBi;
R=20cm
mW=10^(dBm/10)
antenna gain Numeric=10^(dBi/10)= 10^(2.15/10)=1.64

Antenna	Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
					tune-up power		Gain			
					(dBm)	(mW)	(dBi)	Numeric		
Ant 1	2412	802.11b	16.42	16±1	17	50.119	2.15	1.64	0.0164	1
Ant 1	2437		16.61	16±1	17	50.119	2.15	1.64	0.0164	1
Ant 1	2462		16.03	16±1	17	50.119	2.15	1.64	0.0164	1
Ant 1	2412	802.11g	14.16	14±1	15	31.623	2.15	1.64	0.0103	1
Ant 1	2437		13.9	14±1	15	31.623	2.15	1.64	0.0103	1
Ant 1	2456		13.8	14±1	15	31.623	2.15	1.64	0.0103	1
Ant 1	2412	802.11n H20	12.91	13±1	14	25.119	2.15	1.64	0.0082	1
Ant 1	2437		13.27	13±1	14	25.119	2.15	1.64	0.0082	1
Ant 1	2462		12.41	13±1	14	25.119	2.15	1.64	0.0082	1
Ant 1	2422	802.11n H40	13.18	13±1	14	25.119	2.15	1.64	0.0082	1
Ant 1	2437		13.38	13±1	14	25.119	2.15	1.64	0.0082	1
Ant 1	2452		12.89	13±1	14	25.119	2.15	1.64	0.0082	1

5G WIFI:

Operation Frequency: WIFI 802.11a/n/ac(HT20): 5180-5240MHz;,5745-5825MHz;
WIFI 802.11n/ac (HT40): 5190-5230MHz; 5755-5795MHz;
WIFI 802.11ac (HT80):5210-5210MHz; 5775-5775MHz
Power density limited: 1mW/cm
Antenna Type: Internal antenna
Antenna gain 5.2G:3.46dBi; 5.8G:4.8dBi
R=20cm

5.2G

Antenna	Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
					tune-up power		Gain			
					(dBm)	(mW)	(dBi)	Numeric		
Ant 1	5180	802.11a	11.35	11±1	12.00	15.849	3.46	2.22	0.0070	1
Ant 1	5200		11.62	11±1	12.00	15.849	3.46	2.22	0.0070	1
Ant 1	5240		11.2	11±1	12.00	15.849	3.46	2.22	0.0070	1
Ant 1	5180	802.11n H20	11.01	11±1	12.00	15.849	3.46	2.22	0.0070	1
Ant 1	5200		10.61	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5240		10.88	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5190	802.11n H40	10.99	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5230		10.74	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5180	802.11ac20	11.00	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5200		10.69	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5240		10.79	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5190	802.11ac40	10.59	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5230		11.00	10±1	11.00	12.589	3.46	2.22	0.0056	1
Ant 1	5210	802.11ac80	10.79	10±1	11.00	12.589	3.46	2.22	0.0056	1

5.8G

Antenna	Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Antenna Gain (dBi)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
Ant 1	5745	802.11a	11.06	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5785		11.12	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5825		10.97	10±1	11.00	12.589	4.80	3.02	0.0076	1
Ant 1	5745	802.11n H20	10.69	10±1	11.00	12.589	4.80	3.02	0.0076	1
Ant 1	5785		11.24	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5825		11.28	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5755	802.11n H40	10.94	10±1	11.00	12.589	4.80	3.02	0.0076	1
Ant 1	5795		11.03	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5745	802.11ac20	10.97	10±1	11.00	12.589	4.80	3.02	0.0076	1
Ant 1	5785		11.31	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5825		11.19	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5755	802.11ac40	10.88	10±1	11.00	12.589	4.80	3.02	0.0076	1
Ant 1	5795		11.06	11±1	12.00	15.849	4.80	3.02	0.0095	1
Ant 1	5775	802.11ac80	10.93	10±1	11.00	12.589	4.80	3.02	0.0076	1

BT+BLE+2.4GWIFI+5GWIFI=0.0026+0.001+0.007+0.0095=0.0201＜1

Conclusion:
For the max result : 0.0201≤ 1.0 for Max Power Density, compliance RF exposure..

Signature: Alex **Date:** 2025-01-02

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