FCC ID: 2BDVC-CB22D2USC01

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: Ceramic antenna

Antenna gain: 2.13dBi;

R=20cm

mW=10^(dBm/10)

antenna gain Numeric=10^(dBi/10)= 10^(2.13/10)=1.63

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 (mW/cm2)
2402	DH5	3.16	3±1	4	2.512	2.13	1.63	0.0008	1
2441		2.84	2±1	3	1.995	2.13	1.63	0.0006	1
2480		1.41	1±1	2	1.585	2.13	1.63	0.0005	1
2402	2DH5	4.77	5±1	6	3.981	2.13	1.63	0.0013	1
2441		4.53	4±1	5	3.162	2.13	1.63	0.0010	1
2480		3.41	3±1	4	2.512	2.13	1.63	0.0008	1
2402	3DH5	5.02	5±1	6	3.981	2.13	1.63	0.0013	1
2441		4.83	4±1	5	3.162	2.13	1.63	0.0010	1
2480		3.72	3±1	4	2.512	2.13	1.63	0.0008	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 (mW/cm2)
2402	GFSK （1M）	0.34	0±1	1	1.259	2.13	1.63	0.0004	1
2440		0.1	0±1	1	1.259	2.13	1.63	0.0004	1
2480		-1.06	-1±1	0	1.000	2.13	1.63	0.0003	1
2402	GFSK （2M）	3.47	3±1	4	2.512	2.13	1.63	0.0008	1
2440		2.96	2±1	3	1.995	2.13	1.63	0.0006	1
2480		1.67	2±1	3	1.995	2.13	1.63	0.0006	1

2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,
WIFI 802.11n HT40:2422-2452MHz
Power density limited: 1mW/ cm^2
Antenna Type: Dipole antenna
Antenna gain: 1.91dBi;
R=20cm
mW=10^(dBm/10)
antenna gain Numeric=10^(dBi/10)= 10^(1.91/10)=1.55

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2412	802.11b	16.44	16±1	17	50.119	1.91	1.55	0.0155	1
2437		16.67	16±1	17	50.119	1.91	1.55	0.0155	1
2462		16	16±1	17	50.119	1.91	1.55	0.0155	1
2412	802.11g	15.57	15±1	16	39.811	1.91	1.55	0.0123	1
2437		14.66	14±1	15	31.623	1.91	1.55	0.0098	1
2462		13.98	14±1	15	31.623	1.91	1.55	0.0098	1
2412	802.11n H20	15.26	15±1	16	39.811	1.91	1.55	0.0123	1
2437		14.47	14±1	15	31.623	1.91	1.55	0.0098	1
2462		13.77	14±1	15	31.623	1.91	1.55	0.0098	1
2422	802.11n(HT40)	15.28	15±1	16	39.811	1.91	1.55	0.0123	1
2437		14.73	14±1	15	31.623	1.91	1.55	0.0098	1
2452		14.06	14±1	15	31.623	1.91	1.55	0.0098	1

5G WIFI:

Operation Frequency: WIFI 802.11a/n(HT20): 5180-5240MHz;5260-5320MHz,5500-5700MHz,5745-5825MHz;WIFI 802.11n(HT40): 5190-5230MHz;5270-5310MHz,5510-5670MHz5755-5795MHz;
Power density limited: 1mW/cm
Antenna Type: Dipole antenna
Antenna gain:4.89dBi;
R=20cm
mW=10^(dBm/10)
antenna gain Numeric=10^(dBi/10)= 10^(4.89/10)=3.08

5.2G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm2)	Power density (mW/cm2)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5180	a	14.62	14±1	15	31.623	4.89	3.08	0.0194	1
5200	a	14.48	14±1	15	31.623	4.89	3.08	0.0194	1
5240	a	14.23	14±1	15	31.623	4.89	3.08	0.0194	1
5180	n20	14.46	14±1	15	31.623	4.89	3.08	0.0194	1
5200	n20	14.34	14±1	15	31.623	4.89	3.08	0.0194	1
5240	n20	13.99	14±1	15	31.623	4.89	3.08	0.0194	1
5190	n40	12.81	13±1	14	25.119	4.89	3.08	0.0154	1
5230	n40	14.34	14±1	15	31.623	4.89	3.08	0.0194	1

5.3G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm2)	Power density (mW/cm2)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5260	a	14.98	14±1	15	31.623	4.89	3.08	0.0194	1
5280	a	14.58	14±1	15	31.623	4.89	3.08	0.0194	1
5320	a	14.22	14±1	15	31.623	4.89	3.08	0.0194	1
5260	n20	15.05	14±1	15	31.623	4.89	3.08	0.0194	1
5280	n20	14.36	14±1	15	31.623	4.89	3.08	0.0194	1
5320	n20	14.21	14±1	15	31.623	4.89	3.08	0.0194	1
5270	n40	14.72	13±1	14	25.119	4.89	3.08	0.0154	1
5310	n40	14.31	14±1	15	31.623	4.89	3.08	0.0194	1

5.6G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm2)	Power density (mW/cm2)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5500	a	14	14±1	15	31.623	4.89	3.08	0.0194	1
5600	a	12.32	12±1	13	19.953	4.89	3.08	0.0122	1
5700	a	12.12	12±1	13	19.953	4.89	3.08	0.0122	1
5500	n20	13.9	13±1	14	25.119	4.89	3.08	0.0154	1
5600	n20	12.26	12±1	13	19.953	4.89	3.08	0.0122	1
5700	n20	11.9	12±1	13	19.953	4.89	3.08	0.0122	1
5510	n40	13.82	13±1	14	25.119	4.89	3.08	0.0154	1
5590	n40	12.56	12±1	13	19.953	4.89	3.08	0.0122	1
5670	n40	12.41	12±1	13	19.953	4.89	3.08	0.0122	1

5.8G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm2)	Power density (mW/cm2)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5745	a	11.36	11±1	12	15.849	4.89	3.08	0.0097	1
5785	a	11.54	11±1	12	15.849	4.89	3.08	0.0097	1
5825	a	11.98	11±1	12	15.849	4.89	3.08	0.0097	1
5745	n20	11.08	11±1	12	15.849	4.89	3.08	0.0097	1
5785	n20	11.33	11±1	12	15.849	4.89	3.08	0.0097	1
5825	n20	11.72	11±1	12	15.849	4.89	3.08	0.0097	1
5755	n40	11.37	11±1	12	15.849	4.89	3.08	0.0097	1
5795	n40	11.43	11±1	12	15.849	4.89	3.08	0.0097	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

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

Max. SIMULTANEOUS TRANSMISSIONS MODE

Band	SISO					MIMO		Verdict
	Max conducted Power	Antenna Gain	Separation distance (cm)	Evaluation result	Power density Limits	Evaluation result	Power density Limits	
	(dBm)	(dBi)		(mW/cm2)	(mW/cm2)			
Wi-Fi 2.4G + BT	16.67	1.91	20	0.009241	1	0.010392	1	PASS
	5.02	2.13	20	0.000632	0.549			

Signature:
Date: 2024-01-23

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