

FCC ID: 2AQ9Y- OPI4LTS

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

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

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.

BT:

Measurement Result

Operation Frequency: 2402MHz~2480MHz

Power density limited: $1\text{mW}/\text{cm}^2$

Antenna Type: External antenna

Antenna gain: 2dBi;

R=20cm

$\text{mW}=10^{(\text{dBm}/10)}$

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(2/10)}=1.58$

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	DH5	-7.892	-7±1	-6	0.251	2.00	1.58	0.0001	1
2441		-6.219	-7±1	-6	0.251	2.00	1.58	0.0001	1
2480		-6.613	-7±1	-6	0.251	2.00	1.58	0.0001	1
2402	2DH5	-6.002	-6±1	-5	0.316	2.00	1.58	0.0001	1
2441		-4.355	-4±1	-3	0.501	2.00	1.58	0.0002	1
2480		-4.972	-4±1	-3	0.501	2.00	1.58	0.0002	1
2402	3DH5	-5.804	-5±1	-4	0.398	2.00	1.58	0.0001	1
2441		-4.004	-4±1	-3	0.501	2.00	1.58	0.0002	1
2480		-4.492	-4±1	-3	0.501	2.00	1.58	0.0002	1

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK (1M)	3.309	4±1	5	3.162	2.00	1.58	0.0010	1
2440		3.825	4±1	5	3.162	2.00	1.58	0.0010	1
2480		4.276	4±1	5	3.162	2.00	1.58	0.0010	1
2402	GFSK (2M)	3.206	4±1	5	3.162	2.00	1.58	0.0010	1
2440		3.709	4±1	5	3.162	2.00	1.58	0.0010	1
2480		4.175	4±1	5	3.162	2.00	1.58	0.0010	1

2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n HT20: 2412-2462MHz,
 WIFI 802.11n HT40:2422-2452MHz
 Power density limited: 1mW/ cm²

Antenna Type: External antenna

Antenna gain: 2dBi;

R=20cm

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

antenna gain Numeric= $10^{(dBi/10)}=10^{(2/10)}=1.58$

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2412	802.11b	15.36	15±1	16	39.811	2.00	1.58	0.0126	1
2437		15.28	15±1	16	39.811	2.00	1.58	0.0126	1
2462		15.92	15±1	16	39.811	2.00	1.58	0.0126	1
2412	802.11g	13.42	13±1	14	25.119	2.00	1.58	0.0079	1
2437		12.67	13±1	14	25.119	2.00	1.58	0.0079	1
2462		13.15	13±1	14	25.119	2.00	1.58	0.0079	1
2412	802.11n H20	12.48	12±1	13	19.953	2.00	1.58	0.0063	1
2437		11.78	12±1	13	19.953	2.00	1.58	0.0063	1
2462		12.29	12±1	13	19.953	2.00	1.58	0.0063	1
2422	802.11n(H T40)	11.91	11±1	12	15.849	2.00	1.58	0.0050	1
2437		11.9	11±1	12	15.849	2.00	1.58	0.0050	1
2452		11.39	11±1	12	15.849	2.00	1.58	0.0050	1

5G WIFI:

Operation Frequency: WIFI 802.11a/ac/n(HT20): 5180-5240MHz;5260-5320MHz,5500-5700MHz,5745-5825MHz;WIFI 802.11ac/n(HT40): 5190-5230MHz;5270-5310MHz,5510-5670MHz5755-5795MHz; WIFI 802.11ac80:5210-5210MHz;5290-5290MHz;5530-5610MHz; 5775-5775MHz

Power density limited: 1mW/cm

Antenna Type: External antenna

Antenna gain:2dBi;

R=20cm

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

antenna gain Numeric= $10^{(dBi/10)}=10^{(2/10)}=1.58$

5.2G

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5180	802.11a	9.894	9±1	10	10.000	2.00	1.58	0.0032	1
5200		9.161	9±1	10	10.000	2.00	1.58	0.0032	1
5240		9.432	9±1	10	10.000	2.00	1.58	0.0032	1
5180	802.11ac20	10.127	10±1	11	12.589	2.00	1.58	0.0040	1
5200		9.668	10±1	11	12.589	2.00	1.58	0.0040	1
5240		10	10±1	11	12.589	2.00	1.58	0.0040	1
5190	802.11ac40	9.697	9±1	10	10.000	2.00	1.58	0.0032	1
5230		9.659	9±1	10	10.000	2.00	1.58	0.0032	1
5210	802.11ac80	9.11	9±1	10	10.000	2.00	1.58	0.0032	1
5180	802.11n H20	9.74	9±1	10	10.000	2.00	1.58	0.0032	1
5200		9.562	9±1	10	10.000	2.00	1.58	0.0032	1
5240		9.973	9±1	10	10.000	2.00	1.58	0.0032	1
5190	802.11n H40	9.571	9±1	10	10.000	2.00	1.58	0.0032	1
5230		9.525	9±1	10	10.000	2.00	1.58	0.0032	1

5.3G

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5260	802.11a	9.773	9±1	10	10.000	2.00	1.58	0.0032	1
5280		9.452	9±1	10	10.000	2.00	1.58	0.0032	1
5320		9.763	9±1	10	10.000	2.00	1.58	0.0032	1
5260	802.11ac20	9.925	9±1	10	10.000	2.00	1.58	0.0032	1
5280		9.769	9±1	10	10.000	2.00	1.58	0.0032	1
5320		9.99	9±1	10	10.000	2.00	1.58	0.0032	1
5270	802.11ac40	9.482	9±1	10	10.000	2.00	1.58	0.0032	1
5310		9.084	9±1	10	10.000	2.00	1.58	0.0032	1
5290	802.11ac80	9.482	9±1	10	10.000	2.00	1.58	0.0032	1
5260	802.11n H20	10.023	10±1	11	12.589	2.00	1.58	0.0040	1
5280		9.814	10±1	11	12.589	2.00	1.58	0.0040	1
5320		9.923	10±1	11	12.589	2.00	1.58	0.0040	1
5270	802.11n H40	9.437	9±1	10	10.000	2.00	1.58	0.0032	1
5310		9.017	9±1	10	10.000	2.00	1.58	0.0032	1

5.6G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5500	802.11a	9.581	9±1	10	10.000	2.00	1.58	0.0032	1
5600		9.568	9±1	10	10.000	2.00	1.58	0.0032	1
5700		9.294	9±1	10	10.000	2.00	1.58	0.0032	1
5500	802.11ac20	9.933	9±1	10	10.000	2.00	1.58	0.0032	1
5600		9.914	9±1	10	10.000	2.00	1.58	0.0032	1
5700		9.543	9±1	10	10.000	2.00	1.58	0.0032	1
5510	802.11ac40	8.966	9±1	10	10.000	2.00	1.58	0.0032	1
5590		9.699	9±1	10	10.000	2.00	1.58	0.0032	1
5670		9.496	9±1	10	10.000	2.00	1.58	0.0032	1
5530	802.11ac80	9.266	9±1	10	10.000	2.00	1.58	0.0032	1
5610		9.37	9±1	10	10.000	2.00	1.58	0.0032	1
5500		802.11n(HT20)	9.591	9±1	10	10.000	2.00	1.58	0.0032
5600	9.627		9±1	10	10.000	2.00	1.58	0.0032	1
5700	9.297		9±1	10	10.000	2.00	1.58	0.0032	1

5.8G

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
5745	802.11a	8.998	9±1	10	10.000	2.00	1.58	0.0032	1
5785		9.234	9±1	10	10.000	2.00	1.58	0.0032	1
5825		9.189	9±1	10	10.000	2.00	1.58	0.0032	1
5745	802.11ac20	8.995	9±1	10	10.000	2.00	1.58	0.0032	1
5785		9.618	9±1	10	10.000	2.00	1.58	0.0032	1
5825		9.613	9±1	10	10.000	2.00	1.58	0.0032	1
5755	802.11ac40	9.739	9±1	10	10.000	2.00	1.58	0.0032	1
5795		9.382	9±1	10	10.000	2.00	1.58	0.0032	1
5775	802.11ac80	9.573	9±1	10	10.000	2.00	1.58	0.0032	1
5745	802.11n H20	9.099	9±1	10	10.000	2.00	1.58	0.0032	1
5785		9.535	9±1	10	10.000	2.00	1.58	0.0032	1
5825		9.539	9±1	10	10.000	2.00	1.58	0.0032	1
5755	802.11n H40	9.738	9±1	10	10.000	2.00	1.58	0.0032	1
5795		9.331	9±1	10	10.000	2.00	1.58	0.0032	1

Signature:

Date: 2022-10-19



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