

FCC ID: 2A8WC-S400-0101

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.

2.4G:

Operation Frequency: 2420-2460MHz,

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

Antenna Type: PCB Antenna

antenna gain: 3.58 dBi;

R=20cm

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

antenna gain Numeric= $10^{(\text{dBi}/10)}=10^{(3.58/10)}=2.28$

Antenna	Mode	Channel Freq. (MHz)	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		
Ant 1	10M	2420	14.75	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	10M	2420	14.67	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	10M	2440	14.62	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	10M	2440	14.95	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	10M	2460	14.38	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	10M	2460	15.07	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	20M	2420	14.68	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	20M	2420	14.95	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	20M	2440	14.63	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	20M	2440	14.4	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	20M	2460	14.45	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	20M	2460	14.26	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	40M	2420	13.95	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	40M	2420	14.18	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	40M	2440	13.91	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	40M	2440	13.91	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 1	40M	2460	13.88	14.5±1	15.5	35.481	3.58	2.28	0.0161	1
Ant 2	40M	2460	14	14.5±1	15.5	35.481	3.58	2.28	0.0161	1

5.8G WIFI:

Operation Frequency: WIFI 802.11a/ac/n(HT20):5745-5825MHz;
WIFI 802.11ac/n(HT40): 5755-5795MHz; WIFI 802.11ac80: 5775-5775MHz

Power density limited: 1mW/cm

Antenna Type: PCB Antenna

antenna gain:3dBi;

R=20cm

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

antenna gain Numeric= $10^{(dBi/10)}=10^{(3/10)}=2$

Antenna	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		
Ant 1	5745	802.11a	9.76	9±1	10	10.000	3.00	2.00	0.0040	1
Ant 1	5785		8.96	9±1	10	10.000	3.00	2.00	0.0040	1
Ant 1	5825		8.93	9±1	10	10.000	3.00	2.00	0.0040	1

5.8G:

Operation Frequency: 5.8G(10M/20M): 5740-5820MHz;5.8G(40M): 5760-5820MHz

Power density limited: 1mW/cm

Antenna Type: PCB Antenna

antenna gain:3.61dBi;

R=20cm

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

antenna gain Numeric= $10^{(dBi/10)}=10^{(3.61/10)}=2.30$

Antenna	Mode	Channel Freq. (MHz)	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		
Ant 1	10M	5740	12.54	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	10M	5740	12.58	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	10M	5780	12.48	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	10M	5780	11.94	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	10M	5820	12.73	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	10M	5820	12.51	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	20M	5740	11.98	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	20M	5740	11.81	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	20M	5780	12.2	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	20M	5780	11.79	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	20M	5820	12.03	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	20M	5820	12.02	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	40M	5760	12.3	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	40M	5760	12.39	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	40M	5780	12.13	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	40M	5780	12.5	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 1	40M	5820	12.07	12±1	13	19.953	3.61	2.30	0.0091	1
Ant 2	40M	5820	12.87	12±1	13	19.953	3.61	2.30	0.0091	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	Antenna	SISO					MIMO		Verdict
		tune-up power	Antenna	Separation distance (cm)	Evaluation result	Power density	Evaluation result	Power density Limits	
		(dBm)	Gain (dBi)		(mW/cm ²)	(mW/cm ²)			
2.4G	Ant1	15.5	3.58	20	0.016096	1	0.036161	1	PASS
	Ant2	15.5	3.58	20	0.016096	1			
5.8G WIFI	Ant1	10	3	20	0.003969	1	0.022197	1	PASS
5.8G	Ant1	13	3.61	20	0.009114	1			
	Ant2	13	3.61	20	0.009114	1			
5.8G WIFI	Ant1	10	3	20	0.003969	1			

Conclusion:

For the max result : $0.036161 \leq 1 \text{ mW/cm}^2$ for Power density, compliance with RF exposure.

Note: This product does not support 2.4G band and 5G band simultaneous delivery.

Signature:

Date: 2022-11-09



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