FCC ID: 2A9TGHV40

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: 3.25 dBi;

R=20cm

mW=10^(dBm/10)

antenna gain Numeric=10^(dBi/10)= 10^(3.25/10)=2.11

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	5.47	5±1	6	3.981	3.25	2.11	0.0017	1
2441		4.16	5±1	6	3.981	3.25	2.11	0.0017	1
2480		3.99	4±1	5	3.162	3.25	2.11	0.0013	1
2402	2DH5	7.53	7±1	8	6.310	3.25	2.11	0.0027	1
2441		7.04	7±1	8	6.310	3.25	2.11	0.0027	1
2480		5.64	6±1	7	5.012	3.25	2.11	0.0021	1
2402	3DH5	8.08	8±1	9	7.943	3.25	2.11	0.0033	1
2441		7.63	8±1	9	7.943	3.25	2.11	0.0033	1
2480		6.37	7±1	8	6.310	3.25	2.11	0.0027	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)	5.34	5±1	6	3.981	3.25	2.11	0.0017	1
2440		5.74	5±1	6	3.981	3.25	2.11	0.0017	1
2480		5.94	5±1	6	3.981	3.25	2.11	0.0017	1
2402	GFSK(2M)	5.4	5±1	6	3.981	3.25	2.11	0.0017	1
2440		5.78	5±1	6	3.981	3.25	2.11	0.0017	1
2480		5.99	5±1	6	3.981	3.25	2.11	0.0017	1

2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n20/n40: 2412-2462MHz, 2422-2452MHz,
Power density limited: 1mW/ cm^2
Antenna Type: FPC Antenna
antenna gain: 3.25 dBi;
R=20cm
mW=10^(dBm/10)
antenna gain Numeric=10^(dBi/10)= 10^(3.25/10)=2.11

Antenna	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		
Ant 1	2412	b	15.04	15±1	16	39.811	3.25	2.11	0.0167	1
Ant 2	2412	b	15.36	15±1	16	39.811	3.25	2.11	0.0167	1
Ant 1	2437	b	14.62	15±1	16	39.811	3.25	2.11	0.0167	1
Ant 2	2437	b	14.97	15±1	16	39.811	3.25	2.11	0.0167	1
Ant 1	2462	b	14.75	15±1	16	39.811	3.25	2.11	0.0167	1
Ant 2	2462	b	14.73	15±1	16	39.811	3.25	2.11	0.0167	1
Ant 1	2412	g	12.91	13±1	14	25.119	3.25	2.11	0.0106	1
Ant 2	2412	g	13.06	13±1	14	25.119	3.25	2.11	0.0106	1
Ant 1	2437	g	12.55	13±1	14	25.119	3.25	2.11	0.0106	1
Ant 2	2437	g	12.51	13±1	14	25.119	3.25	2.11	0.0106	1
Ant 1	2462	g	12.42	13±1	14	25.119	3.25	2.11	0.0106	1
Ant 2	2462	g	12.18	13±1	14	25.119	3.25	2.11	0.0106	1
Ant 1	2412	n20	11.93	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 2	2412	n20	12.05	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 1	2437	n20	11.76	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 2	2437	n20	11.53	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 1	2462	n20	11.54	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 2	2462	n20	11.32	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 1	2422	n40	12.67	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 2	2422	n40	12.55	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 1	2437	n40	11.97	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 2	2437	n40	11.74	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 1	2452	n40	11.85	12±1	13	19.953	3.25	2.11	0.0084	1
Ant 2	2452	n40	11.61	12±1	13	19.953	3.25	2.11	0.0084	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: FPC Antenna
antenna gain:4.17dBi;
R=20cm
mW=10^(dBm/10)
antenna gain Numeric=10^(dBi/10)= 10^(4.17/10)=2.61

5.2G

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 (mW/cm2)
Ant 1	5180	a	9.03	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5180	a	9.47	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5200	a	9.64	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5200	a	9.6	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5240	a	9.14	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5240	a	9.19	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5180	ac20	8.83	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5180	ac20	9.48	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5200	ac20	9.48	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5200	ac20	9.46	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5240	ac20	9.03	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5240	ac20	9	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5190	ac40	9.6	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5190	ac40	9.3	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5230	ac40	9.32	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5230	ac40	9.15	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5210	ac80	8.71	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5210	ac80	9.39	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5180	n20	8.85	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5180	n20	9.5	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5200	n20	9.52	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5200	n20	9.52	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5240	n20	9.04	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5240	n20	9.08	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5190	n40	9.6	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5190	n40	9.22	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5230	n40	9.31	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5230	n40	9.26	9±1	10	10.000	4.17	2.61	0.0052	1

5.3G

Antenna	Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
					tune-up power		Gain		(mW/cm2)	(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric		
Ant 1	5260	a	9.48	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5260	a	9.07	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5280	a	9.14	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5280	a	8.98	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5320	a	9.83	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5320	a	9.94	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5260	ac20	9.38	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5260	ac20	9.07	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5280	ac20	9.01	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5280	ac20	8.83	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5320	ac20	9.65	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5320	ac20	9.92	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5270	ac40	9.2	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5270	ac40	9.64	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5310	ac40	9.09	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5310	ac40	9.05	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5290	ac80	9.67	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5290	ac80	9.39	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5260	n20	9.35	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5260	n20	9.05	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5280	n20	9.02	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5280	n20	8.78	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5320	n20	9.7	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5320	n20	9.87	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5270	n40	9.25	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5270	n40	9.63	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5310	n40	9.1	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5310	n40	9.03	9±1	10	10.000	4.17	2.61	0.0052	1

5.6G

Antenna	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		
Ant 1	5500	a	9.79	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5500	a	8.97	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5600	a	9.76	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5600	a	9.36	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5700	a	9.29	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5700	a	9.1	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5500	ac20	9.76	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5500	ac20	8.89	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5600	ac20	9.58	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5600	ac20	9.32	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5700	ac20	9.27	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5700	ac20	8.93	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5510	ac40	8.87	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5510	ac40	8.79	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5590	ac40	8.89	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5590	ac40	9.51	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5670	ac40	9.3	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5670	ac40	8.73	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5530	ac80	8.49	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5530	ac80	9.22	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5610	ac80	8.52	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5610	ac80	8.7	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5500	n20	9.7	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5500	n20	8.92	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5600	n20	9.54	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5600	n20	9.33	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5700	n20	9.31	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5700	n20	8.94	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5510	n40	8.66	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5510	n40	8.86	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5590	n40	8.94	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5590	n40	9.52	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5670	n40	9.43	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5670	n40	8.77	9±1	10	10.000	4.17	2.61	0.0052	1

5.8G

Antenna	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		
Ant 1	5745	a	8.82	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5745	a	9.09	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5785	a	8.89	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5785	a	9.11	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5825	a	8.98	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5825	a	9.33	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5745	ac20	8.66	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5745	ac20	8.94	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5785	ac20	8.84	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5785	ac20	8.94	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5825	ac20	8.84	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5825	ac20	9.29	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5755	ac40	9.56	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5755	ac40	9.65	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5795	ac40	9.02	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5795	ac40	9.17	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5775	ac80	8.17	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5775	ac80	8.24	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5745	n20	8.68	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5745	n20	8.98	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5785	n20	8.76	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5785	n20	8.96	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5825	n20	8.91	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5825	n20	9.32	9±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5755	n40	9.46	7±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5755	n40	9.64	7±1	10	10.000	4.17	2.61	0.0052	1
Ant 1	5795	n40	9.09	8±1	10	10.000	4.17	2.61	0.0052	1
Ant 2	5795	n40	9.09	8±1	10	10.000	4.17	2.61	0.0052	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 (dBm)	Antenna Gain (dBi)	Separation distance (cm)	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)	Evaluation result	Power density Limits	
Wi-Fi 2.4G N20	Ant1	13	3.25	20	0.008389	1	0.016778	1	PASS
	Ant2	13	3.25	20	0.008389	1			
Wi-Fi 5.2G n20	Ant1	10	4.17	20	0.005197	1	0.010394	1	PASS
	Ant2	10	4.17	20	0.005197	1			
Wi-Fi 5.3G AC20	Ant1	10	4.17	20	0.005197	1	0.010394	1	PASS
	Ant2	10	4.17	20	0.005197	1			
Wi-Fi 5.6G AC20	Ant1	10	4.17	20	0.005197	1	0.010394	1	PASS
	Ant2	10	4.17	20	0.005197	1			
Wi-Fi 5.8G AC20	Ant1	10	4.17	20	0.005197	1	0.010394	1	PASS
	Ant2	10	4.17	20	0.005197	1			

Conclusion:
For the max result : 0.016778≤ 1mW/ 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: 2023-03-15

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