

FCC ID: 2AYLN-N105

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: 1mW/ cm²

Antenna Type: PIFA Antenna

Antenna gain: 2.23dBi;

R=20cm

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

antenna gain Numeric= $10^{(dBi/10)}=10^{(2.23/10)}=1.67$

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	DH5	5.04	5±1	6	3.981	2.23	1.67	0.0013	1
2441		4.81	5±1	6	3.981	2.23	1.67	0.0013	1
2480		4.92	5±1	6	3.981	2.23	1.67	0.0013	1
2402	2DH5	5.42	5±1	6	3.981	2.23	1.67	0.0013	1
2441		5.35	5±1	6	3.981	2.23	1.67	0.0013	1
2480		5.34	5±1	6	3.981	2.23	1.67	0.0013	1
2402	3DH5	5.41	5±1	6	3.981	2.23	1.67	0.0013	1
2441		5.38	5±1	6	3.981	2.23	1.67	0.0013	1
2480		5.35	5±1	6	3.981	2.23	1.67	0.0013	1

Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
				tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric		
2402	GFSK	4	4±1	5	3.162	2.23	1.67	0.0011	1
2440		3.81	4±1	5	3.162	2.23	1.67	0.0011	1
2480		3.68	4±1	5	3.162	2.23	1.67	0.0011	1

2.4G WIFI:

Operation Frequency: WIFI 802.11b/g/n20: 2412-2462MHz,
802.11n40: 2422-2452MHz
Power density limited: 1mW/ cm²

Antenna Type: PIFA Antenna

Antenna gain: Ant 1 : 2.19dBi; Ant 2 : 2.23dBi

R=20cm

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

Antenna1 gain Numeric= $10^{(dBi/10)}=10^{(2.19/10)}=1.66$

Antenna2 gain Numeric= $10^{(dBi/10)}=10^{(2.23/10)}=1.67$

Antenna	Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
			(dBm)		tune-up power		Gain			
					(dBm)	(mW)	(dBi)	Numeric		
Ant 1	2412	802.11b	15.83	15±1	16	39.811	2.19	1.66	0.0131	1
Ant 1	2437		15.85	15±1	16	39.811	2.19	1.66	0.0131	1
Ant 1	2462		15.76	15±1	16	39.811	2.19	1.66	0.0131	1
Ant 2	2412	802.11b	15.78	15±1	16	39.811	2.23	1.67	0.0132	1
Ant 2	2437		15.91	15±1	16	39.811	2.23	1.67	0.0132	1
Ant 2	2462		15.86	15±1	16	39.811	2.23	1.67	0.0132	1
Ant 1	2412	802.11g	13.63	13±1	14	25.119	2.19	1.66	0.0083	1
Ant 1	2437		13.62	13±1	14	25.119	2.19	1.66	0.0083	1
Ant 1	2462		13.61	13±1	14	25.119	2.19	1.66	0.0083	1
Ant 2	2412	802.11g	13.42	13±1	14	25.119	2.23	1.67	0.0084	1
Ant 2	2437		13.49	13±1	14	25.119	2.23	1.67	0.0084	1
Ant 2	2462		13.36	13±1	14	25.119	2.23	1.67	0.0084	1
Ant 1	2412	802.11n H20	11.29	11±1	12	15.849	2.19	1.66	0.0052	1
Ant 1	2437		11.27	11±1	12	15.849	2.19	1.66	0.0052	1
Ant 1	2462		11.31	11±1	12	15.849	2.19	1.66	0.0052	1
Ant 2	2412	802.11n H20	11.48	11±1	12	15.849	2.23	1.67	0.0053	1
Ant 2	2437		11.55	11±1	12	15.849	2.23	1.67	0.0053	1
Ant 2	2462		11.39	11±1	12	15.849	2.23	1.67	0.0053	1
Ant 1	2422	802.11n H40	10.49	10±1	11	12.589	2.19	1.66	0.0041	1
Ant 1	2437		10.45	10±1	11	12.589	2.19	1.66	0.0041	1
Ant 1	2452		10.55	10±1	11	12.589	2.19	1.66	0.0041	1
Ant 2	2422	802.11n H40	10.5	10±1	11	12.589	2.23	1.67	0.0042	1
Ant 2	2437		10.58	10±1	11	12.589	2.23	1.67	0.0042	1
Ant 2	2452		10.63	10±1	11	12.589	2.23	1.67	0.0042	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: PIFA Antenna

antenna gain: Ant 1: 4.95 dBi; Ant 2: 5.31dBi

R=20cm

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

antenna 1gain Numeric= $10^{(dBi/10)}=10^{(4.95/10)}=3.13$

antenna 2gain Numeric= $10^{(dBi/10)}=10^{(5.31/10)}=3.40$

5.2G

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		
Ant1	5180	802.11a	10.75	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5200		10.63	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5240		10.68	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5180	802.11a	10.33	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5200		10.53	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5240		10.62	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5180	802.11n H20	10.8	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5200		10.62	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5240		10.62	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5180	802.11n H20	10.3	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5200		10.46	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5240		10.62	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5190	802.11n H40	10.78	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5230		10.78	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5190	802.11n H40	10.54	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5230		10.6	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5180	802.11ac20	10.76	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5200		10.68	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5240		10.62	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5180	802.11ac20	10.3	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5200		10.38	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5240		10.62	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5190	802.11ac40	10.71	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5230		10.74	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5190	802.11ac40	10.54	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5230		10.54	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5210	802.11ac80	10.46	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5210	802.11ac80	10.78	10±1	11	12.589	5.31	3.40	0.0085	1

5.3G

Antenna	Channel Freq. (MHz)	modulation	conducted power (dBm)	Tune-up power (dBm)	Max		Antenna		Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
					tune-up power		Gain			
					(dBm)	(mW)	(dBi)	Numeric		
Ant1	5260	802.11a	10.72	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5280		10.81	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5320		10.55	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5260	802.11a	10.39	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5280		10.32	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5320		10.12	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5260	802.11n H20	10.57	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5280		10.78	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5320		10.54	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5260	802.11n H20	10.34	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5280		10.26	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5320		10.14	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5270	802.11n H40	10.3	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5310		10.47	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5270	802.11n H40	10.28	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5310		10.06	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5260	802.11ac20	10.67	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5280		10.81	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5320		10.56	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5260	802.11ac20	10.32	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5280		10.29	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5320		10.06	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5270	802.11ac40	10.18	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5310		10.4	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5270	802.11ac40	10.34	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5310		10.17	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5290	802.11ac80	10.55	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5290	802.11ac80	10.53	10±1	11	12.589	5.31	3.40	0.0085	1

5.6G

Antenna	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		
Ant1	5500	802.11a	10.65	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5600		10.46	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5700		10.52	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5500	802.11a	10.52	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5600		10.54	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5700		10.38	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5500	802.11n20	10.56	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5600		10.44	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5700		10.41	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5500	802.11n20	10.57	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5600		10.58	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5700		10.33	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5510	802.11n40	10.64	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5590		10.59	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5670		10.57	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5510	802.11n40	10.64	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5590		10.7	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5670		10.58	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5500	802.11ac20	10.55	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5600		10.46	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5700		10.37	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5500	802.11ac20	10.51	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5600		10.54	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5700		10.36	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5510	802.11ac40	10.57	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5590		10.6	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5670		10.51	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5510	802.11ac40	10.65	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5590		10.61	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5670		10.52	10±1	11	12.589	5.31	3.40	0.0085	1
Ant1	5530	802.11ac80	10.84	10±1	11	12.589	4.95	3.13	0.0078	1
Ant1	5610		10.65	10±1	11	12.589	4.95	3.13	0.0078	1
Ant2	5530	802.11ac80	10.3	10±1	11	12.589	5.31	3.40	0.0085	1
Ant2	5610		10.32	10±1	11	12.589	5.31	3.40	0.0085	1

5.8G

Antenna	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		
Ant 1	5745	802.11a	10.52	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5785		10.77	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5825		10.72	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 2	5745	802.11a	10.62	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5785		10.82	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5825		10.65	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 1	5745	802.11n H20	10.5	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5785		10.75	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5825		10.72	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 2	5745	802.11n H20	10.7	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5785		10.81	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5825		10.61	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 1	5755	802.11n H40	10.54	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5795		10.72	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 2	5755	802.11n H40	10.32	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5795		10.43	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 1	5745	802.11ac20	10.47	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5785		10.83	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5825		10.64	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 2	5745	802.11ac20	10.64	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5785		10.75	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5825		10.61	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 1	5755	802.11ac40	10.4	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 1	5795		10.71	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 2	5755	802.11ac40	10.25	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 2	5795		10.43	10±1	11	12.589	5.31	3.40	0.0085	1
Ant 1	5775	802.11ac80	10.77	10±1	11	12.589	4.95	3.13	0.0078	1
Ant 2	5775	802.11ac80	10.46	10±1	11	12.589	5.31	3.40	0.0085	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 EIRP	Antenna	Separation distance (cm)	Evaluation result	Power density	Evaluation result	Power density Limits	
	(dBm)	Gain (dBi)		(mW/cm ²)	(mW/cm ²)			
Wi-Fi 2.4G + BT	15.85	2.19	20	0.007651	1	0.008344	1	PASS
	5.42	2.23	20	0.000693	1			

Signature:

Date: 2023-07-28



NAME AND TITLE (Please print or type): alex li/Manager

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