

RF EXPOSURE EVALUATION

According to FCC 1.1310 and KDB 447498 D01 V06, 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

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

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.

Measurement Result

BT:

Operation Frequency: 2402MHz~2480MHz

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna gain: 3.79 dBi;

R=20cm

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

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

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2402	DH5	4.06	3.5±1	4.5	2.818	3.79	2.39	0.0013	1
2441		3.56	3.5±1	4.5	2.818	3.79	2.39	0.0013	1
2480		2.8	3.5±1	4.5	2.818	3.79	2.39	0.0013	1
2402	2DH5	6.2	6±1	7	5.012	3.79	2.39	0.0024	1
2441		5.74	6±1	7	5.012	3.79	2.39	0.0024	1
2480		5.05	6±1	7	5.012	3.79	2.39	0.0024	1
2402	3DH5	6.71	6±1	7	5.012	3.79	2.39	0.0024	1
2441		6.26	6±1	7	5.012	3.79	2.39	0.0024	1
2480		5.58	6±1	7	5.012	3.79	2.39	0.0024	1

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			(mW/cm2)
				(dBm)	(mW)	(dBi)	Numeric		
2402	BLE 1M	4.29	4±1	5	3.162	3.79	2.39	0.0015	1
2440		3.76	4±1	5	3.162	3.79	2.39	0.0015	1
2480		3.03	4±1	5	3.162	3.79	2.39	0.0015	1
2402	BLE 2M	4.33	4±1	5	3.162	3.79	2.39	0.0015	1
2440		3.82	4±1	5	3.162	3.79	2.39	0.0015	1
2480		3.04	4±1	5	3.162	3.79	2.39	0.0015	1

2.4G WIFI

Operation Frequency:

WIFI 802.11b/g/n HT20/ax20: 2412-2462MHz,

WIFI 802.11n HT40/ax40:2422-2452MHz

Power density limited: 1mW/ cm²

Antenna Type: FPC Antenna

Antenna 0 gain/Antenna 1 gain: 3.79 dBi;

R=20cm

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

Antenna gain Numeric=10^{^(dBi/10)}

Antenna	Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits	
			(dBm)		tune-up power		Gain			(mW/cm2)	(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric			
ANT 0	2412	802.11b	13.19	13±1	14	25.119	3.79	2.39	0.0120	1	
ANT 0	2437		13.49	13±1	14	25.119	3.79	2.39	0.0120	1	
ANT 0	2462		13.13	13±1	14	25.119	3.79	2.39	0.0120	1	
Ant 1	2412		14.42	14±1	15	31.623	3.79	2.39	0.0151	1	
Ant 1	2437		14.35	14±1	15	31.623	3.79	2.39	0.0151	1	
Ant 1	2462		14.04	14±1	15	31.623	3.79	2.39	0.0151	1	
ANT 0	2412	802.11g	12.75	12±1	13	19.953	3.79	2.39	0.0095	1	
ANT 0	2437		11.27	12±1	13	19.953	3.79	2.39	0.0095	1	
ANT 0	2462		10.73	11±1	12	15.849	3.79	2.39	0.0075	1	
Ant 1	2412		12.22	12±1	13	19.953	3.79	2.39	0.0095	1	
Ant 1	2437		12.46	12±1	13	19.953	3.79	2.39	0.0095	1	
Ant 1	2462		11.94	12±1	13	19.953	3.79	2.39	0.0095	1	
Ant 0&1	2412	802.11n H20	12.91	12±1	13	19.953	3.79	2.39	0.0095	1	
Ant 0&1	2437		12.46	12±1	13	19.953	3.79	2.39	0.0095	1	
Ant 0&1	2462		12.29	12±1	13	19.953	3.79	2.39	0.0095	1	
Ant 0&1	2422	802.11n H40	11.76	11±1	12	15.849	3.79	2.39	0.0075	1	
Ant 0&1	2437		11.9	11±1	12	15.849	3.79	2.39	0.0075	1	
Ant 0&1	2452		11.5	11±1	12	15.849	3.79	2.39	0.0075	1	
Ant 0&1	2412	802.11ax20	11.55	11±1	12	15.849	3.79	2.39	0.0075	1	
Ant 0&1	2437		11.24	11±1	12	15.849	3.79	2.39	0.0075	1	
Ant 0&1	2462		10.8	11±1	12	15.849	3.79	2.39	0.0075	1	
Ant 0&1	2422	802.11ax40	10.71	10±1	11	12.589	3.79	2.39	0.0060	1	
Ant 0&1	2437		10.98	10±1	11	12.589	3.79	2.39	0.0060	1	
Ant 0&1	2452		10.5	10±1	11	12.589	3.79	2.39	0.0060	1	

5G WIFI

802.11a/n20/ac/ax20: 5180-5240MHz,5260-5320MHz,5500-5700MHz,5745-5825MHz

802.11n/ac/ax40:5190-5230MHz,5270-5310MHz,5510-5670MHz,5755-5795MHz

Power density limited: 1mW/cm

Antenna Type: FPC Antenna

Antenna Gain:

Antenna 0: 1.88 dBi; Antenna 1: 1.88 dBi

R=20cm

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

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

5.2G

Antenna	Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
			(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric		
ANT0	5180	802.11a	13.69	13±1	14	25.119	1.88	1.54	0.0077	1
ANT0	5200		13.6	13±1	14	25.119	1.88	1.54	0.0077	1
ANT0	5240		12.88	13±1	14	25.119	1.88	1.54	0.0077	1
Ant1	5180		13.01	13±1	14	25.119	1.88	1.54	0.0077	1
Ant1	5200		12.98	13±1	14	25.119	1.88	1.54	0.0077	1
Ant1	5240		12.58	13±1	14	25.119	1.88	1.54	0.0077	1
Ant0&1	5180	802.11n H20	15.79	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5200		15.76	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5240		15.51	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5190	802.11n H40	12.85	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5230		12.87	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5180	802.11ac20	15.83	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5200		15.92	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5240		15.54	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5190	802.11ac40	12.84	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5230		12.17	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5210	802.11ac80	13.04	13±1	14	25.119	1.88	1.54	0.0077	1
Ant0&1	5180	802.11ax20	15.36	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5200		14.43	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5240		14.17	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5190	802.11ax40	11.81	11±1	12	15.849	1.88	1.54	0.0049	1
Ant1&2	5230		11.26	11±1	12	15.849	1.88	1.54	0.0049	1
Ant1&2	5210	802.11ax80	12.93	12±1	13	19.953	1.88	1.54	0.0061	1

5.3G

Antenna	Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
			(dBm)		tune-up power		Gain			(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric		
ANT0	5260	802.11a	13.61	13±1	14	25.119	1.88	1.54	0.0077	1
ANT0	5280		13.13	13±1	14	25.119	1.88	1.54	0.0077	1
ANT0	5320		12.92	13±1	14	25.119	1.88	1.54	0.0077	1
Ant1	5260		13.40	13±1	14	25.119	1.88	1.54	0.0077	1
Ant1	5280		13.42	13±1	14	25.119	1.88	1.54	0.0077	1
Ant1	5320		12.85	13±1	14	25.119	1.88	1.54	0.0077	1
Ant0&1	5260	802.11n H20	16.32	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5280		15.93	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5320		15.57	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5270	802.11n H40	12.94	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5310		12.65	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5260	802.11ac20	16.07	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5280		15.96	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5320		16.03	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5270	802.11ac40	13.20	13±1	14	25.119	1.88	1.54	0.0077	1
Ant0&1	5310		13.04	13±1	14	25.119	1.88	1.54	0.0077	1
Ant0&1	5290	802.11ac80	12.75	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5260	802.11ax20	15.30	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5280		14.86	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5320		14.80	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5270	802.11ax40	12.37	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5310		12.20	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5290	802.11ax80	12.93	12±1	13	19.953	1.88	1.54	0.0061	1

5.6G

Antenna	Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
			(dBm)		tune-up power		Gain			
					(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)	(mW/cm2)
ANT0	5500	802.11a	14.18	14±1	15	31.623	1.88	1.54	0.0097	1
ANT0	5600		11.99	12±1	13	19.953	1.88	1.54	0.0061	1
ANT0	5700		12.79	12±1	13	19.953	1.88	1.54	0.0061	1
Ant1	5500		12.33	12±1	13	19.953	1.88	1.54	0.0061	1
Ant1	5600		12.51	12±1	13	19.953	1.88	1.54	0.0061	1
Ant1	5700		12.96	12±1	13	19.953	1.88	1.54	0.0061	1
Ant0&1	5500	802.11n H20	15.56	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5600		14.50	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5700		15.70	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5510	802.11n H40	14.32	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5590		13.44	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5670		14.26	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5500	802.11ac20	15.14	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5600		14.52	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5700		15.72	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5510	802.11ac40	13.86	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5590		13.41	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5670		14.08	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5530	802.11ac80	14.27	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5610		13.53	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5500	802.11ax20	14.91	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5600		13.98	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5700		14.61	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5510	802.11ax40	13.55	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5590		13.15	14±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5670		14.01	14±1	15	31.623	1.88	1.54	0.0097	1
Ant1&2	5530	802.11ax80	14.37	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5610		13.63	14±1	15	31.623	4.40	2.75	0.0173	1

5.8G

Antenna	Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density limits
			(dBm)		tune-up power		Gain		(mW/cm2)	(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric		
ANT0	5745	802.11a	14.4	14±1	15	31.623	1.88	1.54	0.0097	1
ANT0	5785		14.47	14±1	15	31.623	1.88	1.54	0.0097	1
ANT0	5825		14.41	14±1	15	31.623	1.88	1.54	0.0097	1
Ant1	5745		15.50	15±1	16	39.811	1.88	1.54	0.0122	1
Ant1	5785		14.89	15±1	16	39.811	1.88	1.54	0.0122	1
Ant1	5825		14.76	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5745	802.11n H20	16.91	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5785		16.91	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5825		16.86	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5755	802.11n H40	15.78	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5795		15.92	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5745	802.11ac20	16.97	17±1	18	63.096	1.88	1.54	0.0194	1
Ant0&1	5785		16.88	17±1	18	63.096	1.88	1.54	0.0194	1
Ant0&1	5825		17.01	17±1	18	63.096	1.88	1.54	0.0194	1
Ant0&1	5755	802.11ac40	15.87	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5795		15.88	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5775	802.11ac80	15.34	15±1	15	31.623	1.88	1.54	0.0097	1
Ant0&1	5745	802.11ax20	16.69	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5785		16.43	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5825		16.46	16±1	17	50.119	1.88	1.54	0.0154	1
Ant0&1	5755	802.11ax40	15.57	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5795		15.86	15±1	16	39.811	1.88	1.54	0.0122	1
Ant0&1	5775	802.11ax80	15.36	15±1	16	39.811	1.88	1.54	0.0122	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

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

Worst case is Simultaneous Transmissions for 5.8G Wi-Fi +BT

Band	Mode	EIRP (dBm)	EIRP (mW)	Standalone	Standalone	Simultaneous		Verdict
				Evaluation result	Power density Limits	Evaluation result	Limit	
				(mW/cm2)	(mW/cm2)	raio		
5.6G Wi-Fi+BT	BT	10.79	11.99	0.0024	1	0.0217	1	PASS
	5.8G WIFI	19.88	97.27	0.0194	1			

Conclusion:

For the max result : $0.0217 \leq 1.0$, SAR is not required.

Signature:

Date: 2026-01-27



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