

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: External Antenna

Antenna gain: 2.5 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	9.01	9±1	10	10.000	2.50	1.78	0.0035	1
2441		9.24	9±1	10	10.000	2.50	1.78	0.0035	1
2480		9.38	9±1	10	10.000	2.50	1.78	0.0035	1
2402	2DH5	7.9	8±1	9	7.943	2.50	1.78	0.0028	1
2441		8.04	8±1	9	7.943	2.50	1.78	0.0028	1
2480		8.08	8±1	9	7.943	2.50	1.78	0.0028	1
2402	3DH5	8.63	8±1	9	7.943	2.50	1.78	0.0028	1
2441		8.63	8±1	9	7.943	2.50	1.78	0.0028	1
2480		8.62	8±1	9	7.943	2.50	1.78	0.0028	1

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density Limits
		(dBm)		tune-up power		Gain			
				(dBm)	(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)
2402	BLE 1M	6.33	6±1	7	5.012	2.50	1.78	0.0018	1
2440		6.23	6±1	7	5.012	2.50	1.78	0.0018	1
2480		6.24	6±1	7	5.012	2.50	1.78	0.0018	1
2402	BLE 2M	6.41	6±1	7	5.012	2.50	1.78	0.0018	1
2440		6.31	6±1	7	5.012	2.50	1.78	0.0018	1
2480		6.34	6±1	7	5.012	2.50	1.78	0.0018	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: External Antenna

Antenna1 gain/Antenna2 gain: 2.5 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 (mW/cm2)	Power density Limits
			(dBm)		tune-up power		Gain			(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric		
Ant 2	2412	802.11b	17.25	17±1	18	63.096	2.50	1.78	0.0223	1
Ant 2	2437		17.31	17±1	18	63.096	2.50	1.78	0.0223	1
Ant 2	2462		17.65	17±1	18	63.096	2.50	1.78	0.0223	1
Ant 2	2412	802.11g	14.27	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 2	2437		14.57	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 2	2462		14.82	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 1&2	2412	802.11n H20	14.8	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 1&2	2437		14.64	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 1&2	2462		14.79	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 1&2	2422	802.11n H40	15.11	15±1	16	39.811	2.50	1.78	0.0141	1
Ant 1&2	2437		15.1	15±1	16	39.811	2.50	1.78	0.0141	1
Ant 1&2	2452		15.27	15±1	16	39.811	2.50	1.78	0.0141	1
Ant 1&2	2412	802.11ax20	14.97	15±1	16	39.811	2.50	1.78	0.0141	1
Ant 1&2	2437		14.98	15±1	16	39.811	2.50	1.78	0.0141	1
Ant 1&2	2462		15.12	15±1	16	39.811	2.50	1.78	0.0141	1
Ant 1&2	2422	802.11ax40	14.8	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 1&2	2437		14.82	14±1	15	31.623	2.50	1.78	0.0112	1
Ant 1&2	2452		14.85	14±1	15	31.623	2.50	1.78	0.0112	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: External Antenna

Antenna Gain:

5.2G Antenna 1: 4.2 dBi; Antenna 2: 4.2 dBi

5.3G Antenna 1: 4.4 dBi; Antenna 2: 4.4 dBi

5.6G Antenna 1: 4.4 dBi; Antenna 2: 4.4 dBi

5.8G Antenna 1: 4.3 dBi; Antenna 2: 4.3 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			
					(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)	(mW/cm2)
Ant2	5180	802.11a	13.88	14±1	15	31.623	4.20	2.63	0.0165	1
Ant2	5200		14.11	14±1	15	31.623	4.20	2.63	0.0165	1
Ant2	5240		14.03	14±1	15	31.623	4.20	2.63	0.0165	1
Ant1&2	5180	802.11n H20	15.66	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5200		15.68	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5240		15.50	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5190	802.11n H40	14.09	14±1	15	31.623	4.20	2.63	0.0165	1
Ant1&2	5230		14.26	14±1	15	31.623	4.20	2.63	0.0165	1
Ant1&2	5180	802.11ac20	15.37	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5200		15.46	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5240		15.29	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5190	802.11ac40	14.13	14±1	15	31.623	4.20	2.63	0.0165	1
Ant1&2	5230		13.85	14±1	15	31.623	4.20	2.63	0.0165	1
Ant1&2	5210	802.11ac80	13.83	13±1	14	25.119	4.20	2.63	0.0131	1
Ant1&2	5180	802.11ax20	15.66	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5200		15.91	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5240		15.77	15±1	16	39.811	4.20	2.63	0.0208	1
Ant1&2	5190	802.11ax40	13.76	14±1	15	31.623	4.20	2.63	0.0165	1
Ant1&2	5230		13.77	14±1	15	31.623	4.20	2.63	0.0165	1
Ant1&2	5210	802.11ax80	13.88	13±1	14	25.119	4.20	2.63	0.0131	1
Ant1&2	5250	802.11ax160	13.41	13±1	14	25.119	4.20	2.63	0.0131	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)	(mW/cm2)
					(dBm)	(mW)	(dBi)	Numeric		
Ant2	5260	802.11a	14.19	14±1	15	31.623	4.40	2.75	0.0173	1
Ant2	5280		14.35	14±1	15	31.623	4.40	2.75	0.0173	1
Ant2	5320		14.43	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5260	802.11n H20	15.40	15±1	16	39.811	4.40	2.75	0.0218	1
Ant1&2	5280		15.53	15±1	16	39.811	4.40	2.75	0.0218	1
Ant1&2	5320		15.90	15±1	16	39.811	4.40	2.75	0.0218	1
Ant1&2	5270	802.11n H40	14.36	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5310		14.63	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5260	802.11ac20	15.82	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5280		15.96	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5320		16.31	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5270	802.11ac40	14.28	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5310		14.72	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5290	802.11ac80	14.37	13±1	14	25.119	4.40	2.75	0.0138	1
Ant1&2	5260	802.11ax20	15.99	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5280		16.16	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5320		16.59	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5270	802.11ax40	14.13	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5310		14.46	14±1	15	31.623	4.40	2.75	0.0173	1
Ant1&2	5290	802.11ax80	12.24	13±1	14	25.119	4.40	2.75	0.0138	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)
Ant2	5500	802.11a	16.20	16±1	17	50.119	4.40	2.75	0.0275	1
Ant2	5600		15.43	16±1	17	50.119	4.40	2.75	0.0275	1
Ant2	5700		15.97	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5500	802.11n H20	17.00	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5600		15.66	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5700		16.79	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5510	802.11n H40	16.98	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5590		16.08	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5670		16.64	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5500	802.11ac20	16.74	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5600		15.52	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5700		16.75	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5510	802.11ac40	16.97	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5590		16.08	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5670		16.58	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5530	802.11ac80	13.84	13±1	14	25.119	4.40	2.75	0.0138	1
Ant1&2	5610		13.08	13±1	14	25.119	4.40	2.75	0.0138	1
Ant1&2	5500	802.11ax20	16.86	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5600		15.81	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5700		15.97	16±1	17	50.119	4.40	2.75	0.0275	1
Ant1&2	5510	802.11ax40	15.64	15±1	16	39.811	4.40	2.75	0.0218	1
Ant1&2	5590		14.96	15±1	16	39.811	4.40	2.75	0.0218	1
Ant1&2	5670		15.34	15±1	16	39.811	4.40	2.75	0.0218	1
Ant1&2	5530	802.11ax80	13.68	13±1	14	25.119	4.40	2.75	0.0138	1
Ant1&2	5610		13.02	13±1	14	25.119	4.40	2.75	0.0138	1
Ant1&2	5570	802.11ax160	13.27	13±1	14	25.119	4.40	2.75	0.0138	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		
Ant2	5745	802.11a	12.48	12±1	13	19.953	4.30	2.69	0.0107	1
Ant2	5785		12.71	12±1	13	19.953	4.30	2.69	0.0107	1
Ant2	5825		12.34	12±1	13	19.953	4.30	2.69	0.0107	1
Ant1&2	5745	802.11n H20	14.14	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5785		14.66	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5825		14.62	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5755	802.11n H40	14.67	15±1	16	39.811	4.30	2.69	0.0213	1
Ant1&2	5795		15.16	15±1	16	39.811	4.30	2.69	0.0213	1
Ant1&2	5745	802.11ac20	14.25	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5785		14.69	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5825		14.64	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5755	802.11ac40	14.65	15±1	16	39.811	4.30	2.69	0.0213	1
Ant1&2	5795		15.16	15±1	16	39.811	4.30	2.69	0.0213	1
Ant1&2	5775	802.11ac80	14.78	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5745	802.11ax20	14.38	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5785		14.84	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5825		14.75	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5755	802.11ax40	14.41	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5795		14.89	14±1	15	31.623	4.30	2.69	0.0169	1
Ant1&2	5775	802.11ax80	14.62	14±1	15	31.623	4.30	2.69	0.0169	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 5.6G 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	12.5	17.78	0.0035	1	0.0310	1	PASS
	5.6G WIFI	21.4	138.04	0.0275	1			

Conclusion:

For the max result : $0.0310 \leq 1.0$, SAR is not required.

Signature:

Date: 2025-08-01



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