

RF EXPOSURE EVALUATION

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)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

11.1 Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} =output power to antenna in mW

G = Numeric gain of the antenna relative to isotropic antenna

π =3.1416

R = distance between observation point and center of the radiator in 20cm

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

11.2 Measurement Result

WIFI 5G antenna A:

Channel Freq. (MHz)	modulation	conducted power (mW)	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
5180	11a	48.98	16.90	15dBm to 17dBm	17	2.82	0.02812	<1
5200	11a	48.75	16.88	15dBm to 17dBm	17	2.82	0.02812	<1
5240	11a	40.93	16.12	15dBm to 17dBm	17	2.82	0.02812	<1
5260	11a	40.27	16.05	15dBm to 17dBm	17	2.82	0.02812	<1
5280	11a	44.06	16.44	15dBm to 17dBm	17	2.82	0.02812	<1
5320	11a	38.82	15.89	15dBm to 17dBm	17	2.82	0.02812	<1
5500	11a	45.19	16.55	15dBm to 17dBm	17	2.82	0.02812	<1
5600	11a	45.81	16.61	15dBm to 17dBm	17	2.82	0.02812	<1
5700	11a	42.17	16.25	15dBm to 17dBm	17	2.82	0.02812	<1
5745	11a	45.39	16.57	15dBm to 17dBm	17	2.82	0.02812	<1
5785	11a	48.31	16.84	15dBm to 17dBm	17	2.82	0.02812	<1
5825	11a	41.50	16.18	15dBm to 17dBm	17	2.82	0.02812	<1
5180	11n(VHT20)	38.11	15.81	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5200	11n(VHT20)	38.11	15.81	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5240	11n(VHT20)	32.06	15.06	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5260	11n(VHT20)	31.77	15.02	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5280	11n(VHT20)	34.67	15.40	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5320	11n(VHT20)	32.43	15.11	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5500	11n(VHT20)	35.56	15.51	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5600	11n(VHT20)	35.40	15.49	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5700	11n(VHT20)	32.51	15.12	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5745	11n(VHT20)	35.32	15.48	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5785	11n(VHT20)	36.81	15.66	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5825	11n(VHT20)	30.69	14.87	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5180	11ac(VHT20)	41.88	16.22	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5200	11ac(VHT20)	40.36	16.06	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5240	11ac(VHT20)	35.40	15.49	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5260	11ac(VHT20)	34.12	15.33	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5280	11ac(VHT20)	36.56	15.63	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5320	11ac(VHT20)	33.81	15.29	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5500	11ac(VHT20)	38.73	15.88	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5600	11ac(VHT20)	39.63	15.98	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5700	11ac(VHT20)	36.31	15.60	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5745	11ac(VHT20)	37.93	15.79	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5785	11ac(VHT20)	41.50	16.18	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5825	11ac(VHT20)	34.75	15.41	14.5dBm to 16.5dBm	16.5	2.82	0.02506	<1
5190	11n(VHT40)	33.04	15.19	14dBm to 16dBm	16	2.82	0.02233	<1
5230	11n(VHT40)	27.04	14.32	14dBm to 16dBm	16	2.82	0.02233	<1
5270	11n(VHT40)	28.38	14.53	14dBm to 16dBm	16	2.82	0.02233	<1
5310	11n(VHT40)	28.25	14.51	14dBm to 16dBm	16	2.82	0.02233	<1
5510	11n(VHT40)	34.20	15.34	14dBm to 16dBm	16	2.82	0.02233	<1
5590	11n(VHT40)	32.89	15.17	14dBm to 16dBm	16	2.82	0.02233	<1
5670	11n(VHT40)	26.12	14.17	14dBm to 16dBm	16	2.82	0.02233	<1
5755	11n(VHT40)	30.27	14.81	14dBm to 16dBm	16	2.82	0.02233	<1
5795	11n(VHT40)	32.21	15.08	14dBm to 16dBm	16	2.82	0.02233	<1
5190	11ac(VHT40)	34.59	15.39	14dBm to 16dBm	16	2.82	0.02233	<1
5230	11ac(VHT40)	28.64	14.57	14dBm to 16dBm	16	2.82	0.02233	<1
5270	11ac(VHT40)	29.79	14.74	14dBm to 16dBm	16	2.82	0.02233	<1
5310	11ac(VHT40)	29.11	14.64	14dBm to 16dBm	16	2.82	0.02233	<1
5510	11ac(VHT40)	33.50	15.25	14dBm to 16dBm	16	2.82	0.02233	<1
5590	11ac(VHT40)	32.58	15.13	14dBm to 16dBm	16	2.82	0.02233	<1
5670	11ac(VHT40)	27.42	14.38	14dBm to 16dBm	16	2.82	0.02233	<1
5755	11ac(VHT40)	30.27	14.81	14dBm to 16dBm	16	2.82	0.02233	<1
5795	11ac(VHT40)	32.14	15.07	14dBm to 16dBm	16	2.82	0.02233	<1
5210	11ac(VHT80)	37.67	15.76	14dBm to 16dBm	16	2.82	0.02233	<1
5290	11ac(VHT80)	38.82	15.89	14dBm to 16dBm	16	2.82	0.02233	<1
5530	11ac(VHT80)	37.41	15.73	14dBm to 16dBm	16	2.82	0.02233	<1
5610	11ac(VHT80)	37.67	15.76	14dBm to 16dBm	16	2.82	0.02233	<1
5775	11ac(VHT80)	38.02	15.80	14dBm to 16dBm	16	2.82	0.02233	<1

WIFI 5G antenna B:

Channel Freq. (MHz)	modulation	conducted power (mW)	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
5180	11a	47.32	16.75	15dBm to 17dBm	17	2.82	0.02812	<1
5200	11a	45.08	16.54	15dBm to 17dBm	17	2.82	0.02812	<1
5240	11a	45.08	16.54	15dBm to 17dBm	17	2.82	0.02812	<1
5260	11a	46.03	16.63	15dBm to 17dBm	17	2.82	0.02812	<1
5280	11a	47.42	16.76	15dBm to 17dBm	17	2.82	0.02812	<1
5320	11a	44.16	16.45	15dBm to 17dBm	17	2.82	0.02812	<1
5500	11a	38.73	15.88	15dBm to 17dBm	17	2.82	0.02812	<1
5600	11a	38.28	15.83	15dBm to 17dBm	17	2.82	0.02812	<1
5700	11a	36.56	15.63	15dBm to 17dBm	17	2.82	0.02812	<1
5745	11a	37.58	15.75	15dBm to 17dBm	17	2.82	0.02812	<1
5785	11a	38.37	15.84	15dBm to 17dBm	17	2.82	0.02812	<1
5825	11a	39.45	15.96	15dBm to 17dBm	17	2.82	0.02812	<1
5180	11n(VHT20)	38.82	15.89	15dBm to 17dBm	17	2.82	0.02812	<1
5200	11n(VHT20)	36.90	15.67	15dBm to 17dBm	17	2.82	0.02812	<1
5240	11n(VHT20)	36.90	15.67	15dBm to 17dBm	17	2.82	0.02812	<1
5260	11n(VHT20)	37.76	15.77	15dBm to 17dBm	17	2.82	0.02812	<1
5280	11n(VHT20)	35.48	15.50	15dBm to 17dBm	17	2.82	0.02812	<1
5320	11n(VHT20)	36.06	15.57	15dBm to 17dBm	17	2.82	0.02812	<1
5500	11n(VHT20)	37.67	15.76	15dBm to 17dBm	17	2.82	0.02812	<1
5600	11n(VHT20)	36.81	15.66	15dBm to 17dBm	17	2.82	0.02812	<1
5700	11n(VHT20)	34.91	15.43	15dBm to 17dBm	17	2.82	0.02812	<1
5745	11n(VHT20)	36.22	15.59	15dBm to 17dBm	17	2.82	0.02812	<1
5785	11n(VHT20)	38.64	15.87	15dBm to 17dBm	17	2.82	0.02812	<1
5825	11n(VHT20)	39.26	15.94	15dBm to 17dBm	17	2.82	0.02812	<1
5180	11ac(VHT20)	50.00	16.99	15dBm to 17dBm	17	2.82	0.02812	<1
5200	11ac(VHT20)	48.75	16.88	15dBm to 17dBm	17	2.82	0.02812	<1
5240	11ac(VHT20)	48.87	16.89	15dBm to 17dBm	17	2.82	0.02812	<1
5260	11ac(VHT20)	48.75	16.88	15dBm to 17dBm	17	2.82	0.02812	<1
5280	11ac(VHT20)	47.42	16.76	15dBm to 17dBm	17	2.82	0.02812	<1
5320	11ac(VHT20)	45.50	16.58	15dBm to 17dBm	17	2.82	0.02812	<1
5500	11ac(VHT20)	33.04	15.19	15dBm to 17dBm	17	2.82	0.02812	<1
5600	11ac(VHT20)	39.54	15.97	15dBm to 17dBm	17	2.82	0.02812	<1
5700	11ac(VHT20)	37.93	15.79	15dBm to 17dBm	17	2.82	0.02812	<1
5745	11ac(VHT20)	39.54	15.97	15dBm to 17dBm	17	2.82	0.02812	<1
5785	11ac(VHT20)	40.83	16.11	15dBm to 17dBm	17	2.82	0.02812	<1
5825	11ac(VHT20)	40.74	16.10	15dBm to 17dBm	17	2.82	0.02812	<1
5190	11n(VHT40)	31.33	14.96	14dBm to 16dBm	16	2.82	0.02233	<1
5230	11n(VHT40)	29.24	14.66	14dBm to 16dBm	16	2.82	0.02233	<1
5270	11n(VHT40)	31.33	14.96	14dBm to 16dBm	16	2.82	0.02233	<1
5310	11n(VHT40)	30.27	14.81	14dBm to 16dBm	16	2.82	0.02233	<1
5510	11n(VHT40)	27.42	14.38	14dBm to 16dBm	16	2.82	0.02233	<1
5590	11n(VHT40)	25.64	14.09	14dBm to 16dBm	16	2.82	0.02233	<1
5670	11n(VHT40)	27.48	14.39	14dBm to 16dBm	16	2.82	0.02233	<1
5755	11n(VHT40)	33.50	15.25	14dBm to 16dBm	16	2.82	0.02233	<1
5795	11n(VHT40)	34.99	15.44	14dBm to 16dBm	16	2.82	0.02233	<1
5190	11ac(VHT40)	32.43	15.11	14dBm to 16dBm	16	2.82	0.02233	<1
5230	11ac(VHT40)	30.27	14.81	14dBm to 16dBm	16	2.82	0.02233	<1
5270	11ac(VHT40)	33.34	15.23	14dBm to 16dBm	16	2.82	0.02233	<1
5310	11ac(VHT40)	32.28	15.09	14dBm to 16dBm	16	2.82	0.02233	<1
5510	11ac(VHT40)	27.86	14.45	14dBm to 16dBm	16	2.82	0.02233	<1
5590	11ac(VHT40)	25.94	14.14	14dBm to 16dBm	16	2.82	0.02233	<1
5670	11ac(VHT40)	28.71	14.58	14dBm to 16dBm	16	2.82	0.02233	<1
5755	11ac(VHT40)	33.27	15.22	14dBm to 16dBm	16	2.82	0.02233	<1
5795	11ac(VHT40)	34.83	15.42	14dBm to 16dBm	16	2.82	0.02233	<1
5210	11ac(VHT80)	34.99	15.44	14dBm to 16dBm	16	2.82	0.02233	<1
5290	11ac(VHT80)	35.65	15.52	14dBm to 16dBm	16	2.82	0.02233	<1
5530	11ac(VHT80)	34.83	15.42	14dBm to 16dBm	16	2.82	0.02233	<1
5610	11ac(VHT80)	34.99	15.44	14dBm to 16dBm	16	2.82	0.02233	<1
5775	11ac(VHT80)	35.48	15.50	14dBm to 16dBm	16	2.82	0.02233	<1

WIFI 5G antenna A+B:

Channel Freq. (MHz)	modulation	conducted power (mW)	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
5180	11n(VHT20)	76.91	18.86	18dBm to 20dBm	20	5.64	0.11220	<1
5200	11n(VHT20)	74.99	18.75	18dBm to 20dBm	20	5.64	0.11220	<1
5240	11n(VHT20)	69.02	18.39	18dBm to 20dBm	20	5.64	0.11220	<1
5260	11n(VHT20)	69.50	18.42	18dBm to 20dBm	20	5.64	0.11220	<1
5280	11n(VHT20)	70.15	18.46	18dBm to 20dBm	20	5.64	0.11220	<1
5320	11n(VHT20)	68.55	18.36	18dBm to 20dBm	20	5.64	0.11220	<1
5500	11n(VHT20)	73.28	18.65	18dBm to 20dBm	20	5.64	0.11220	<1
5600	11n(VHT20)	72.28	18.59	18dBm to 20dBm	20	5.64	0.11220	<1
5700	11n(VHT20)	67.45	18.29	18dBm to 20dBm	20	5.64	0.11220	<1
5745	11n(VHT20)	71.61	18.55	18dBm to 20dBm	20	5.64	0.11220	<1
5785	11n(VHT20)	75.51	18.78	18dBm to 20dBm	20	5.64	0.11220	<1
5825	11n(VHT20)	69.98	18.45	18dBm to 20dBm	20	5.64	0.11220	<1
5180	11ac(VHT20)	76.91	18.86	18dBm to 20dBm	20	5.64	0.11220	<1
5200	11ac(VHT20)	74.99	18.75	18dBm to 20dBm	20	5.64	0.11220	<1
5240	11ac(VHT20)	69.02	18.39	18dBm to 20dBm	20	5.64	0.11220	<1
5260	11ac(VHT20)	69.50	18.42	18dBm to 20dBm	20	5.64	0.11220	<1
5280	11ac(VHT20)	70.15	18.46	18dBm to 20dBm	20	5.64	0.11220	<1
5320	11ac(VHT20)	68.55	18.36	18dBm to 20dBm	20	5.64	0.11220	<1
5500	11ac(VHT20)	73.28	18.65	18dBm to 20dBm	20	5.64	0.11220	<1
5600	11ac(VHT20)	72.28	18.59	18dBm to 20dBm	20	5.64	0.11220	<1
5700	11ac(VHT20)	67.45	18.29	18dBm to 20dBm	20	5.64	0.11220	<1
5745	11ac(VHT20)	71.61	18.55	18dBm to 20dBm	20	5.64	0.11220	<1
5785	11ac(VHT20)	75.51	18.78	18dBm to 20dBm	20	5.64	0.11220	<1
5825	11ac(VHT20)	69.98	18.45	18dBm to 20dBm	20	5.64	0.11220	<1
5190	11n(VHT40)	64.42	18.09	17dBm to 19dBm	19	5.64	0.08913	<1
5230	11n(VHT40)	56.23	17.50	17dBm to 19dBm	19	5.64	0.08913	<1
5270	11n(VHT40)	59.70	17.76	17dBm to 19dBm	19	5.64	0.08913	<1
5310	11n(VHT40)	58.48	17.67	17dBm to 19dBm	19	5.64	0.08913	<1
5510	11n(VHT40)	61.66	17.90	17dBm to 19dBm	19	5.64	0.08913	<1
5590	11n(VHT40)	58.48	17.67	17dBm to 19dBm	19	5.64	0.08913	<1
5670	11n(VHT40)	53.58	17.29	17dBm to 19dBm	19	5.64	0.08913	<1
5755	11n(VHT40)	63.83	18.05	17dBm to 19dBm	19	5.64	0.08913	<1
5795	11n(VHT40)	67.14	18.27	17dBm to 19dBm	19	5.64	0.08913	<1
5190	11ac(VHT40)	66.99	18.26	17dBm to 19dBm	19	5.64	0.08913	<1
5230	11ac(VHT40)	58.88	17.70	17dBm to 19dBm	19	5.64	0.08913	<1
5270	11ac(VHT40)	63.10	18.00	17dBm to 19dBm	19	5.64	0.08913	<1
5310	11ac(VHT40)	61.38	17.88	17dBm to 19dBm	19	5.64	0.08913	<1
5510	11ac(VHT40)	61.38	17.88	17dBm to 19dBm	19	5.64	0.08913	<1
5590	11ac(VHT40)	58.48	17.67	17dBm to 19dBm	19	5.64	0.08913	<1
5670	11ac(VHT40)	56.10	17.49	17dBm to 19dBm	19	5.64	0.08913	<1
5755	11ac(VHT40)	63.53	18.03	17dBm to 19dBm	19	5.64	0.08913	<1
5795	11ac(VHT40)	66.99	18.26	17dBm to 19dBm	19	5.64	0.08913	<1
5210	11ac(VHT80)	72.61	18.61	17dBm to 19dBm	19	5.64	0.08913	<1
5290	11ac(VHT80)	74.47	18.72	17dBm to 19dBm	19	5.64	0.08913	<1
5530	11ac(VHT80)	72.28	18.59	17dBm to 19dBm	19	5.64	0.08913	<1
5610	11ac(VHT80)	72.61	18.61	17dBm to 19dBm	19	5.64	0.08913	<1
5775	11ac(VHT80)	73.45	18.66	17dBm to 19dBm	19	5.64	0.08913	<1

WIFI 2.4G antenna A:

Channel Freq. (MHz)	modulation	conducted power (mW)	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
2.412	11b	47.86	16.80	16dBm to 18dBm	18	2.29	0.02875	<1
2.437	11b	44.87	16.52	16dBm to 18dBm	18	2.29	0.02875	<1
2.462	11b	56.36	17.51	16dBm to 18dBm	18	2.29	0.02875	<1
2.412	11g	28.71	14.58	14dBm to 16dBm	16	2.29	0.01814	<1
2.437	11g	25.59	14.08	14dBm to 16dBm	16	2.29	0.01814	<1
2.462	11g	30.69	14.87	14dBm to 16dBm	16	2.29	0.01814	<1
2.412	11n HT20	31.92	15.04	14dBm to 16dBm	16	2.29	0.01814	<1
2.437	11n HT20	27.29	14.36	14dBm to 16dBm	16	2.29	0.01814	<1
2.462	11n HT20	30.62	14.86	14dBm to 16dBm	16	2.29	0.01814	<1
2.422	11n HT40	32.89	15.17	14dBm to 16dBm	16	2.29	0.01814	<1
2.437	11n HT40	32.28	15.09	14dBm to 16dBm	16	2.29	0.01814	<1
2.452	11n HT40	34.04	15.32	14dBm to 16dBm	16	2.29	0.01814	<1

WIFI antenna B:

Channel Freq. (MHz)	modulation	conducted power (mW)	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
2.412	11b	51.29	17.10	15.5dBm to 17.5dBm	17.5	2.29	0.02562	<1
2.437	11b	41.30	16.16	15.5dBm to 17.5dBm	17.5	2.29	0.02562	<1
2.462	11b	36.73	15.65	15.5dBm to 17.5dBm	17.5	2.29	0.02562	<1
2.412	11g	26.92	14.30	14dBm to 16dBm	16	2.29	0.01814	<1
2.437	11g	27.04	14.32	14dBm to 16dBm	16	2.29	0.01814	<1
2.462	11g	26.00	14.15	14dBm to 16dBm	16	2.29	0.01814	<1
2.412	11n HT20	35.16	15.46	14dBm to 16dBm	16	2.29	0.01814	<1
2.437	11n HT20	28.31	14.52	14dBm to 16dBm	16	2.29	0.01814	<1
2.462	11n HT20	26.79	14.28	14dBm to 16dBm	16	2.29	0.01814	<1
2.422	11n HT40	38.46	15.85	14dBm to 16dBm	16	2.29	0.01814	<1
2.437	11n HT40	32.28	15.09	14dBm to 16dBm	16	2.29	0.01814	<1
2.452	11n HT40	30.20	14.80	14dBm to 16dBm	16	2.29	0.01814	<1

WIFI antenna A+B:

Channel Freq. (MHz)	modulation	conducted power (mW)	conducted power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain Numeric	Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
2.412	11n HT20	67.14	18.27	17dBm to 19dBm	19	4.58	0.07238	<1
2.437	11n HT20	55.59	17.45	17dBm to 19dBm	19	4.58	0.07238	<1
2.462	11n HT20	57.41	17.59	17dBm to 19dBm	19	4.58	0.07238	<1
2.422	11n HT40	71.29	18.53	17dBm to 19dBm	19	4.58	0.07238	<1
2.437	11n HT40	64.57	18.10	17dBm to 19dBm	19	4.58	0.07238	<1
2.452	11n HT40	64.27	18.08	17dBm to 19dBm	19	4.58	0.07238	<1

WIFI 5G +WIFI 2.4G MAX RF EXPOSURE EVALUATION

Max WIFI 2.4G band Evaluation result (mW/cm2)	Max WIFI 5G band Evaluation result (mW/cm2)	Summation of Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
0.07238	0.11220	0.15202	<1