

FCC ID : 2ACWIWA55UF

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: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

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 cm

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the nd 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/cm ²)	Power density Limits (mW/cm ²)
5180	11a	14.52	11.62	10dBm to 12dBm	12	4.66	0.01469	1
5220	11a	14.00	11.46	10dBm to 12dBm	12	4.66	0.01469	1
5240	11a	14.55	11.63	10dBm to 12dBm	12	4.66	0.01469	1
5745	11a	7.66	8.84	7.5dBm to 9.5dBm	9.5	3.26	0.00578	1
5785	11a	8.07	9.07	7.5dBm to 9.5dBm	9.5	3.26	0.00578	1
5825	11a	6.07	7.83	7.5dBm to 9.5dBm	9.5	3.26	0.00578	1
5180	11n(VHT20)	32.36	15.10	14dBm to 16dBm	16	4.66	0.03691	1
5220	11n(VHT20)	32.51	15.12	14dBm to 16dBm	16	4.66	0.03691	1
5240	11n(VHT20)	32.06	15.06	14dBm to 16dBm	16	4.66	0.03691	1

5745	11n(VHT20)	25.70	14.10	13dBm to 15dBm	15	3.26	0.02051	1
5785	11n(VHT20)	27.48	14.39	13dBm to 15dBm	15	3.26	0.02051	1
5825	11n(VHT20)	20.61	13.14	13dBm to 15dBm	15	3.26	0.02051	1
5180	11ac(VHT20)	14.93	11.74	10dBm to 12dBm	12	4.66	0.01469	1
5220	11ac(VHT20)	15.28	11.84	10dBm to 12dBm	12	4.66	0.01469	1
5240	11ac(VHT20)	15.00	11.76	10dBm to 12dBm	12	4.66	0.01469	1
5745	11ac(VHT20)	9.18	9.63	8dBm to 10dBm	10	3.26	0.00649	1
5785	11ac(VHT20)	9.55	9.80	8dBm to 10dBm	10	3.26	0.00649	1
5825	11ac(VHT20)	7.38	8.68	8dBm to 10dBm	10	3.26	0.00649	1
5190	11n(VHT40)	14.06	11.48	10dBm to 12dBm	12	4.66	0.01469	1
5230	11n(VHT40)	13.87	11.42	10dBm to 12dBm	12	4.66	0.01469	1
5755	11n(VHT40)	7.91	8.98	8dBm to 10dBm	10	3.26	0.00649	1
5795	11n(VHT40)	7.43	8.71	8dBm to 10dBm	10	3.26	0.00649	1
5190	11ac(VHT40)	5.30	7.24	6dBm to 8dBm	8	4.66	0.00585	1
5230	11ac(VHT40)	5.13	7.10	6dBm to 8dBm	8	4.66	0.00585	1
5755	11ac(VHT40)	2.93	4.67	4dBm to 6dBm	6	3.26	0.00258	1
5795	11ac(VHT40)	2.76	4.41	4dBm to 6dBm	6	3.26	0.00258	1
5210	11ac(VHT80)	5.05	7.03	6dBm to 8dBm	8	4.66	0.00585	1
5775	11ac(VHT80)	2.96	4.71	4dBm to 6dBm	6	3.26	0.00258	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	14.29	11.55	10dBm to 12dBm	12	4.66	0.01469	1
5220	11a	14.09	11.49	10dBm to 12dBm	12	4.66	0.01469	1
5240	11a	14.39	11.58	10dBm to 12dBm	12	4.66	0.01469	1
5745	11a	7.85	8.95	7.5dBm to 9.5dBm	9.5	3.26	0.00578	1
5785	11a	7.52	8.76	7.5dBm to 9.5dBm	9.5	3.26	0.00578	1
5825	11a	6.32	8.01	7.5dBm to 9.5dBm	9.5	3.26	0.00578	1
5180	11n(VHT20)	31.99	15.05	14dBm to 16dBm	16	4.66	0.03691	1
5220	11n(VHT20)	32.14	15.07	14dBm to 16dBm	16	4.66	0.03691	1
5240	11n(VHT20)	31.84	15.03	14dBm to 16dBm	16	4.66	0.03691	1
5745	11n(VHT20)	25.76	14.11	13dBm to 15dBm	15	3.26	0.02051	1
5785	11n(VHT20)	27.10	14.33	13dBm to 15dBm	15	3.26	0.02051	1
5825	11n(VHT20)	20.99	13.22	13dBm to 15dBm	15	3.26	0.02051	1
5180	11ac(VHT20)	14.29	11.55	10dBm to 12dBm	12	4.66	0.01469	1
5220	11ac(VHT20)	15.52	11.91	10dBm to 12dBm	12	4.66	0.01469	1
5240	11ac(VHT20)	14.72	11.68	10dBm to 12dBm	12	4.66	0.01469	1
5745	11ac(VHT20)	9.66	9.85	8dBm to 10dBm	10	3.26	0.00649	1
5785	11ac(VHT20)	9.64	9.84	8dBm to 10dBm	10	3.26	0.00649	1
5825	11ac(VHT20)	7.40	8.69	8dBm to 10dBm	10	3.26	0.00649	1
5190	11n(VHT40)	13.24	11.22	10dBm to 12dBm	12	4.66	0.01469	1
5230	11n(VHT40)	13.77	11.39	10dBm to 12dBm	12	4.66	0.01469	1
5755	11n(VHT40)	7.98	9.02	8dBm to 10dBm	10	3.26	0.00649	1
5795	11n(VHT40)	7.83	8.94	8dBm to 10dBm	10	3.26	0.00649	1
5190	11ac(VHT40)	5.14	7.11	6dBm to 8dBm	8	4.66	0.00585	1
5230	11ac(VHT40)	5.20	7.16	6dBm to 8dBm	8	4.66	0.00585	1
5755	11ac(VHT40)	3.10	4.91	4dBm to 6dBm	6	3.26	0.00258	1
5795	11ac(VHT40)	2.86	4.56	4dBm to 6dBm	6	3.26	0.00258	1
5210	11ac(VHT80)	5.14	7.11	6dBm to 8dBm	8	4.66	0.00585	1
5775	11ac(VHT80)	2.94	4.69	4dBm to 6dBm	6	3.26	0.00258	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)	64.42	18.09	18dBm to 20dBm	20	9.31	0.18522	1
5200	11n(VHT20)	64.71	18.11	18dBm to 20dBm	20	9.31	0.18522	1
5240	11n(VHT20)	63.97	18.06	18dBm to 20dBm	20	9.31	0.18522	1
5745	11n(VHT20)	51.52	17.12	16dBm to 18dBm	18	6.51	0.08172	1
5785	11n(VHT20)	54.58	17.37	16dBm to 18dBm	18	6.51	0.08172	1
5825	11n(VHT20)	41.59	16.19	16dBm to 18dBm	18	6.51	0.08172	1
5180	11ac(VHT20)	29.24	14.66	14dBm to 16dBm	16	9.31	0.07374	1
5200	11ac(VHT20)	30.83	14.89	14dBm to 16dBm	16	9.31	0.07374	1
5240	11ac(VHT20)	29.72	14.73	14dBm to 16dBm	16	9.31	0.07374	1
5745	11ac(VHT20)	18.84	12.75	11dBm to 13dBm	13	6.51	0.02584	1
5785	11ac(VHT20)	19.19	12.83	11dBm to 13dBm	13	6.51	0.02584	1
5825	11ac(VHT20)	27.29	14.36	6dBm to 8dBm	8	6.51	0.00817	1
5190	11n(VHT40)	27.67	14.42	14dBm to 16dBm	16	9.31	0.07374	1
5230	11n(VHT40)	15.89	12.01	11dBm to 13dBm	13	6.51	0.02584	1
5755	11n(VHT40)	15.28	11.84	11dBm to 13dBm	13	6.51	0.02584	1
5795	11n(VHT40)	27.29	14.36	14dBm to 16dBm	16	9.31	0.07374	1
5190	11ac(VHT40)	10.45	10.19	13dBm to 15dBm	15	9.31	0.05857	1
5230	11ac(VHT40)	10.33	10.14	13dBm to 15dBm	15	9.31	0.05857	1
5755	11ac(VHT40)	6.03	7.80	10dBm to 12dBm	12	6.51	0.02053	1
5795	11ac(VHT40)	5.62	7.50	10dBm to 12dBm	12	6.51	0.02053	1
5210	11ac(VHT80)	10.19	10.08	10dBm to 12dBm	12	9.31	0.02935	1
5775	11ac(VHT80)	5.90	7.71	6dBm to 8dBm	8	6.51	0.00817	1

WIFI 2.4G antenna A:

Channel Freq. (MHz)	modulation	conducted power (mW)	EIRP (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	73.62	18.67	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11b	67.14	18.27	17dBm to 19dBm	19	2.86	0.04520	1
2.462	11b	74.30	18.71	17dBm to 19dBm	19	2.86	0.04520	1
2.412	11g	68.55	18.36	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11g	72.61	18.61	17dBm to 19dBm	19	2.86	0.04520	1
2.462	11g	70.63	18.49	17dBm to 19dBm	19	2.86	0.04520	1
2.412	11n HT20	67.92	18.32	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11n HT20	71.29	18.53	17dBm to 19dBm	19	2.86	0.04520	1
2.462	11n HT20	70.79	18.50	17dBm to 19dBm	19	2.86	0.04520	1
2.422	11n HT40	78.52	18.95	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11n HT40	64.71	18.11	17dBm to 19dBm	19	2.86	0.04520	1
2.452	11n HT40	62.52	17.96	17dBm to 19dBm	19	2.86	0.04520	1

WIFI antenna B:

Channel Freq. (MHz)	modulation	conducted power (mW)	EIRP (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	73.79	18.68	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11b	67.30	18.28	17dBm to 19dBm	19	2.86	0.04520	1
2.462	11b	73.28	18.65	17dBm to 19dBm	19	2.86	0.04520	1
2.412	11g	69.50	18.42	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11g	73.96	18.69	17dBm to 19dBm	19	2.86	0.04520	1
2.462	11g	71.29	18.53	17dBm to 19dBm	19	2.86	0.04520	1
2.412	11n HT20	68.87	18.38	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11n HT20	72.44	18.60	17dBm to 19dBm	19	2.86	0.04520	1
2.462	11n HT20	71.78	18.56	17dBm to 19dBm	19	2.86	0.04520	1
2.422	11n HT40	63.24	18.01	17dBm to 19dBm	19	2.86	0.04520	1
2.437	11n HT40	65.61	18.17	17dBm to 19dBm	19	2.86	0.04520	1
2.452	11n HT40	63.53	18.03	17dBm to 19dBm	19	2.86	0.04520	1

WIFI antenna A+B:

Channel Freq. (MHz)	modulation	conducted power (mW)	EIRP (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	136.77	21.36	20dBm to 22dBm	22	5.72	0.18035	1
2.437	11n HT20	143.88	21.58	20dBm to 22dBm	22	5.72	0.18035	1
2.462	11n HT20	142.56	21.54	20dBm to 22dBm	22	5.72	0.18035	1
2.422	11n HT40	141.91	21.52	20dBm to 22dBm	22	5.72	0.18035	1
2.437	11n HT40	130.32	21.15	20dBm to 22dBm	22	5.72	0.18035	1
2.452	11n HT40	126.18	21.01	20dBm to 22dBm	22	5.72	0.18035	1

BT DSS

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)
2402	GFSK	1.18	0.732	0dBm to 2dBm	2	2.86	0.00090	1
2441	GFSK	1.32	1.207	0dBm to 2dBm	2	2.86	0.00090	1
2480	GFSK	1.39	1.419	0dBm to 2dBm	2	2.86	0.00090	1
2402	π /4 -DQPSK	0.70	-1.534	-2dBm to 0dBm	0	2.86	0.00057	1
2441	π /4-DQPSK	0.95	-0.225	0dBm to 2dBm	2	2.86	0.00090	1
2480	π /4-DQPSK	1.04	0.189	0dBm to 2dBm	2	2.86	0.00090	1
2402	8DPSK	0.79	-1.045	-2dBm to 0dBm	0	2.86	0.00057	1
2441	8DPSK	1.08	0.315	0dBm to 2dBm	2	2.86	0.00090	1
2480	8DPSK	1.21	0.814	0dBm to 2dBm	2	2.86	0.00090	1

BT DTS

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)
2402	GFSK	1.28	1.084	0dBm to 2dBm	2	2.86	0.00090	1
2440	GFSK	1.26	1.013	0dBm to 2dBm	2	2.86	0.00090	1
2480	GFSK	1.46	1.631	0dBm to 2dBm	2	2.86	0.00090	1

WIFI 5G +WIFI 2.4G +BT+BLE MAX RF EXPOSURE EVALUATION

Max WIFI 2.4G band Evaluation result (mW/cm2)	Max WIFI 5G band Evaluation result (mW/cm2)	Max BT Evaluation result (mW/cm2)	Max BLE Evaluation result (mW/cm2)	Summation of Evaluation result (mW/cm2)	Power density Limits (mW/cm2)
0.18522	0.18035	0.00090	0.00090	0.36737	<1