

FCC 47 CFR MPE REPORT

Hui Zhou Gaoshengda Technology Co., Ltd

WIFI+BT Module

Model Number: WKCT27M2501

FCC ID: 2AC23-WKCT27

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Maximum Permissible Exposure

1. Applicable Standards

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

1.1. Limits for Maximum Permissible Exposure (MPE)

(a) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-10000			5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-10000			1.0	30

Note: f=frequency in MHz; *Plane-wave equivalent power density

1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric Field (V/m)

P = Peak 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

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak 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

2. Conducted Power Result

Antenna 1

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
GFSK	2402	4.51	2.8249	4 ± 1
	2441	3.15	2.0654	3 ± 1
	2480	1.36	1.3677	1 ± 1
8-DPSK	2402	4.28	2.6792	4 ± 1
	2441	2.97	1.9815	2 ± 1
	2480	1.17	1.3092	1 ± 1
GFSK 1M	2402	4.02	2.5235	4 ± 1
	2440	2.71	1.8664	2 ± 1
	2480	0.88	1.2246	0 ± 1
IEEE 802.11b	2412	17.12	51.5229	17 ± 1
	2437	17.38	54.7016	17 ± 1
	2462	17.17	52.1195	17 ± 1
IEEE 802.11g	2412	22.83	191.8669	22 ± 1
	2437	22.83	191.8669	22 ± 1
	2462	22.83	191.8669	22 ± 1
IEEE 802.11n HT20 (2.4G)	2412	22.65	184.0772	22 ± 1
	2437	22.47	176.6038	22 ± 1
	2462	22.50	177.8279	22 ± 1
IEEE 802.11n HT40 (2.4G)	2422	22.63	183.2314	22 ± 1
	2437	22.46	176.1976	22 ± 1
	2452	22.48	177.0109	22 ± 1
IEEE 802.11a	5180	12.121	16.2967	12 ± 1
	5200	12.222	16.6802	12 ± 1
	5240	11.846	15.2968	11 ± 1
	5260	12.441	17.5428	12 ± 1
	5300	12.492	17.7501	12 ± 1
	5320	12.465	17.6401	12 ± 1
	5500	12.882	19.4178	12 ± 1
	5580	13.151	20.6586	13 ± 1
	5700	13.767	23.8067	13 ± 1
	5745	11.490	14.0929	11 ± 1

	5785	11.536	14.2430	11 ± 1
	5825	11.551	14.2922	11 ± 1
IEEE 802.11n HT20 (5G)	5180	10.483	11.1764	10 ± 1
	5200	10.609	11.5054	10 ± 1
	5240	10.853	12.1703	10 ± 1
	5260	10.915	12.3453	10 ± 1
	5300	12.747	18.8235	12 ± 1
	5320	12.722	18.7154	12 ± 1
	5500	13.156	20.6824	13 ± 1
	5580	13.517	22.4750	13 ± 1
	5700	11.098	12.8766	11 ± 1
	5745	11.254	13.3475	11 ± 1
	5785	11.345	13.6301	11 ± 1
	5825	11.429	13.8963	11 ± 1
IEEE 802.11ac VHT20	5180	10.573	11.4104	10 ± 1
	5200	10.685	11.7085	10 ± 1
	5240	10.903	12.3112	10 ± 1
	5260	11.443	13.9412	11 ± 1
	5300	11.430	13.8995	11 ± 1
	5320	11.529	14.2200	11 ± 1
	5500	11.860	15.3462	11 ± 1
	5580	12.226	16.6955	12 ± 1
	5700	12.802	19.0634	12 ± 1
	5745	10.553	11.3580	10 ± 1
	5785	10.563	11.3841	10 ± 1
	5825	10.699	11.7463	10 ± 1
IEEE 802.11n HT40 (5G)	5190	11.847	15.3003	11 ± 1
	5230	12.092	16.1883	12 ± 1
	5270	12.293	16.9551	12 ± 1
	5310	12.364	17.2346	12 ± 1
	5510	12.900	19.4984	13 ± 1
	5590	13.173	20.7635	13 ± 1
	5670	13.605	22.9351	13 ± 1
	5755	14.012	25.1884	14 ± 1
	5795	14.043	25.3688	14 ± 1

IEEE 802.11ac VHT40	5190	11.841	15.2792	11 ± 1
	5230	12.163	16.4551	12 ± 1
	5270	12.219	16.6686	12 ± 1
	5310	12.379	17.2942	12 ± 1
	5510	12.817	19.1293	12 ± 1
	5590	13.227	21.0233	13 ± 1
	5670	13.602	22.9192	13 ± 1
	5755	13.962	24.9000	13 ± 1
	5795	14.109	25.7573	14 ± 1
IEEE 802.11ac VHT80	5210	12.476	17.6848	12 ± 1
	5290	12.878	19.3999	12 ± 1
	5530	13.436	22.0597	13 ± 1
	5610	13.789	23.9276	13 ± 1
	5775	14.470	27.9898	14 ± 1

Antenna 2

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
IEEE 802.11b	2412	17.41	55.0808	17±1
	2437	17.82	60.5341	17±1
	2462	17.75	59.5662	17±1
IEEE 802.11g	2412	22.51	178.2379	22±1
	2437	22.36	172.1869	22±1
	2462	22.61	182.3896	22±1
IEEE 802.11n HT20 (2.4G)	2412	22.58	181.1340	22±1
	2437	22.39	173.3804	22±1
	2462	22.77	189.2344	22±1
IEEE 802.11n HT40 (2.4G)	2422	22.33	171.0015	22±1
	2437	22.46	176.1976	22±1
	2452	22.40	173.7801	22±1
IEEE 802.11a	5180	12.539	17.9432	12±1
	5200	12.748	18.8278	12±1
	5240	12.975	19.8381	12±1
	5260	13.201	20.8978	13±1
	5300	13.388	21.8172	13±1
	5320	13.398	21.8675	13±1
	5500	13.845	24.2382	13±1
	5580	14.219	26.4180	14±1
	5700	14.710	29.5801	14±1
	5745	13.160	20.7014	13±1
	5785	13.221	20.9942	13±1
	5825	13.209	20.9363	13±1
IEEE 802.11n HT20 (5G)	5180	10.726	11.8195	10±1
	5200	10.895	12.2885	10±1
	5240	11.086	12.8410	11±1
	5260	12.021	15.9258	12±1
	5300	12.102	16.2256	12±1
	5320	12.248	16.7803	12±1
	5500	12.598	18.1886	12±1

	5580	12.884	19.4267	12 ± 1
	5700	12.093	16.1920	12 ± 1
	5745	12.288	16.9356	12 ± 1
	5785	12.422	17.4663	12 ± 1
	5825	12.530	17.9061	12 ± 1
IEEE 802.11ac VHT20	5180	11.335	13.5988	11 ± 1
	5200	11.406	13.8229	11 ± 1
	5240	11.636	14.5747	11 ± 1
	5260	12.053	16.0435	12 ± 1
	5300	12.234	16.7263	12 ± 1
	5320	12.167	16.4702	12 ± 1
	5500	12.629	18.3189	13 ± 1
	5580	12.925	19.6110	13 ± 1
	5700	13.487	22.3203	13 ± 1
	5745	12.355	17.1989	12 ± 1
	5785	12.339	17.1356	12 ± 1
	5825	12.489	17.7378	12 ± 1
IEEE 802.11n HT40 (5G)	5190	11.277	13.4184	11 ± 1
	5230	11.611	14.4911	11 ± 1
	5270	11.758	14.9899	11 ± 1
	5310	11.848	15.3038	11 ± 1
	5510	12.381	17.3021	12 ± 1
	5590	12.686	18.5609	12 ± 1
	5670	13.079	20.3189	13 ± 1
	5755	13.432	22.0394	13 ± 1
	5795	13.581	22.8087	13 ± 1
IEEE 802.11ac VHT40	5190	11.361	13.6804	11 ± 1
	5230	11.541	14.2594	11 ± 1
	5270	11.801	15.1391	11 ± 1
	5310	11.895	15.4703	11 ± 1
	5510	12.344	17.1554	12 ± 1
	5590	12.678	18.5268	12 ± 1
	5670	13.155	20.6776	13 ± 1
	5755	13.523	22.5061	13 ± 1
	5795	13.593	22.8718	13 ± 1

IEEE 802.11ac VHT80	5210	12.912	19.5524	12 ± 1
	5290	13.237	21.0717	13 ± 1
	5530	13.843	24.2270	13 ± 1
	5610	14.201	26.3087	14 ± 1
	5775	14.898	30.8887	14 ± 1

3. Calculated Result and Limit

Bluetooth

Antenna	MODE	Channel	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
				(dBi)	(Linear)			
1	GFSK	2402	5	2.8	1.905	0.0012	1	Complies

WLAN 2.4G SISO

Antenna	MODE	Channel	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
				(dBi)	(Linear)			
1	IEEE	2462	23	1.5	1.413	0.0561	1	Complies
2	802.11g	2462	23	1.5	1.413	0.0561	1	Complies

WLAN 2.4G MIMO

Worst case	Channel	Target power (dBm) Antenna 1	Target power (dBm) Antenna 2	Power Density (S) (mW/cm ²) Antenna 1	Power Density (S) (mW/cm ²) Antenna 2	Total Ratio	Limit Ratio	Test Result
IEEE 802.11n HT20	2462	23	23	0.0561	0.0561	0.1122	1	Complies

WLAN 5G SISO

Antenna	Channel	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
			(dBi)	(Linear)			
1	5700	14	4.8	3.020	0.0095	1	Complies
2	5700	15	4.8	3.020	0.0120	1	Complies

WLAN 5G MIMO

Worst case	Channel	Target power (dBm)	Target power (dBm)	Power Density (S)	Power Density (S)	Total Ratio	Limit Ratio	Test Result
		Antenna 1	Antenna 2	(mW/cm ²) Antenna 1	(mW/cm ²) Antenna 2			
IEEE802.11ac VHT 80	5775	15	15	0.0190	0.0190	0.038	1	Complies

Bluetooth+ WLAN

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	Total Ratio	Limit Ratio	Test Result
0.0012	0.1122	0.1134	1	Complies

End of Test Report