

FCC 47 CFR MPE REPORT

Hui Zhou Gaoshengda Technology Co., Ltd

WIFI Module

Model Number: WKC12R2501

FCC ID: 2AC23-WKC12

Applicant:	Hui Zhou Gaoshengda Technology Co.,LTD
Address:	NO.75 Zhongkai Development Area, Huizhou, Guangdong, China
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R2201238
Date of Test:	Dec. 17, 2021~Jan. 18, 2022
Date of Report:	Jan. 21, 2022

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

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

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)
IEEE 802.11b	2412	17.18	52.2396	17±1
	2437	17.10	51.2861	17±1
	2462	17.07	50.9331	17±1
IEEE 802.11g	2412	22.50	177.8279	22±1
	2437	22.04	159.9558	22±1
	2462	22.09	161.8080	22±1
IEEE 802.11n HT20 (2.4G)	2412	22.66	184.5015	22±1
	2437	22.46	176.1976	22±1
	2462	22.25	167.8804	22±1
IEEE 802.11n HT40 (2.4G)	2422	22.72	187.0682	22±1
	2437	22.12	162.9296	22±1
	2452	22.29	169.4338	22±1
IEEE 802.11a	5180	10.337	10.8069	10±1
	5200	10.149	10.3490	10±1
	5240	10.234	10.5536	10±1
	5260	14.205	26.3330	14±1
	5300	14.081	25.5918	14±1
	5320	13.997	25.1015	13±1
	5500	12.593	18.1677	12±1
	5580	12.661	18.4544	13±1
	5700	13.147	20.6395	13±1
	5745	15.204	33.1436	15±1
	5785	15.100	32.3594	15±1
5825	15.074	32.1662	15±1	
IEEE 802.11n HT20 (5G)	5180	8.506	7.0892	8±1
	5200	8.448	6.9952	8±1
	5240	8.497	7.0746	8±1
	5260	14.111	25.7691	14±1
	5300	13.998	25.1073	13±1
	5320	13.942	24.7856	13±1
	5500	12.558	18.0219	12±1

	5580	12.590	18.1552	12±1
	5700	13.040	20.1372	13±1
	5745	13.839	24.2047	13±1
	5785	13.740	23.6592	13±1
	5825	13.745	23.6865	13±1
IEEE 802.11ac VHT20	5180	10.175	10.4112	10±1
	5200	10.299	10.7127	10±1
	5240	10.567	11.3946	10±1
	5260	10.677	11.6869	10±1
	5300	10.777	11.9591	10±1
	5320	10.832	12.1116	10±1
	5500	11.250	13.3352	11±1
	5580	11.573	14.3648	11±1
	5700	12.158	16.4361	12±1
	5745	12.373	17.2703	12±1
	5785	12.454	17.5954	12±1
	5825	12.527	17.8937	12±1
IEEE 802.11n HT40 (5G)	5190	10.120	10.2802	10±1
	5230	10.385	10.9270	10±1
	5270	10.571	11.4051	10±1
	5310	10.753	11.8932	10±1
	5510	11.209	13.2099	11±1
	5590	11.547	14.2791	11±1
	5670	11.943	15.6423	11±1
	5755	12.296	16.9668	12±1
	5795	12.378	17.2902	12±1
IEEE 802.11ac VHT40	5190	10.858	12.1843	10±1
	5230	11.033	12.6853	11±1
	5270	11.181	13.1250	11±1
	5310	11.255	13.3506	11±1
	5510	11.691	14.7605	11±1
	5590	12.014	15.9001	12±1
	5670	12.402	17.3860	12±1
	5755	12.760	18.8799	12±1
	5795	12.819	19.1382	12±1

IEEE 802.11ac VHT80	5210	11.181	13.1250	11±1
	5290	10.887	12.2659	10±1
	5530	11.270	13.3968	11±1
	5610	11.860	15.3462	11±1
	5775	12.940	19.6789	12±1

Antenna 2

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
IEEE 802.11b	2412	17.49	56.1048	17±1
	2437	17.78	59.9791	17±1
	2462	17.89	61.5177	17±1
IEEE 802.11g	2412	22.42	174.5822	22±1
	2437	22.33	171.0015	22±1
	2462	22.33	171.0015	22±1
IEEE 802.11n HT20 (2.4G)	2412	22.6	181.9701	22±1
	2437	22.48	177.0109	22±1
	2462	22.50	177.8279	22±1
IEEE 802.11n HT40 (2.4G)	2422	22.42	174.5822	22±1
	2437	22.27	168.6553	22±1
	2452	22.28	169.0441	22±1
IEEE 802.11a	5180	8.425	6.9582	8±1
	5200	8.362	6.8580	8±1
	5240	8.576	7.2044	8±1
	5260	15.349	34.2689	15±1
	5300	15.181	32.9686	15±1
	5320	15.083	32.2329	15±1
	5500	12.929	19.6291	12±1
	5580	12.952	19.7333	12±1
	5700	13.415	21.9533	13±1
	5745	15.030	31.8420	15±1
	5785	14.949	31.2536	14±1
5825	14.938	31.1745	14±1	
IEEE 802.11n HT20 (5G)	5180	7.350	5.4325	7±1
	5200	7.333	5.4113	7±1
	5240	7.560	5.7016	7±1
	5260	14.677	29.3562	14±1
	5300	14.632	29.0536	14±1
	5320	14.495	28.1514	14±1
	5500	14.799	30.1926	14±1
	5580	15.100	32.3594	15±1

	5700	11.960	15.7036	11±1
	5745	12.034	15.9735	12±1
	5785	12.092	16.1883	12±1
	5825	12.160	16.4437	12±1
IEEE 802.11ac VHT20	5180	9.723	9.3821	9±1
	5200	9.871	9.7073	9±1
	5240	10.149	10.3490	10±1
	5260	10.232	10.5487	10±1
	5300	10.356	10.8543	10±1
	5320	10.429	11.0382	11±1
	5500	11.503	14.1351	11±1
	5580	11.710	14.8252	11±1
	5700	12.274	16.8811	12±1
	5745	12.467	17.6482	12±1
	5785	12.537	17.9349	12±1
	5825	12.600	18.1970	12±1
IEEE 802.11n HT40 (5G)	5190	10.597	11.4736	10±1
	5230	10.747	11.8768	10±1
	5270	10.886	12.2631	10±1
	5310	10.996	12.5777	10±1
	5510	11.455	13.9798	11±1
	5590	11.783	15.0765	11±1
	5670	12.173	16.4930	12±1
	5755	12.552	17.9970	12±1
IEEE 802.11ac VHT40	5795	12.607	18.2264	12±1
	5190	10.542	11.3292	10±1
	5230	10.822	12.0837	10±1
	5270	11.004	12.6009	11±1
	5310	11.119	12.9390	11±1
	5510	11.593	14.4311	11±1
	5590	11.917	15.5489	11±1
	5670	12.331	17.1041	12±1
	5755	12.710	18.6638	12±1
5795	12.781	18.9714	12±1	

IEEE 802.11ac VHT80	5210	11.124	12.9539	11±1
	5290	11.452	13.9701	11±1
	5530	12.000	15.8489	12±1
	5610	12.350	17.1791	12±1
	5775	13.039	20.1326	13±1

3. Calculated Result and Limit

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 802.11g	2412	23	1.5	1.413	0.0561	1	Complies
2		2412	23	1.5	1.413	0.0561	1	Complies

WLAN 2.4G MIMO

Worst case	Channel	Target power (dBm)	Target power (dBm)	Power Density (S) (mW/cm ²)	Power Density (S) (mW/cm ²)	Total Ratio	Limit Ratio	Test Result
		Antenna 1	Antenna 2	Antenna 1	Antenna 2			
IEEE 802.11n HT40	2422	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	5745	16	4.8	3.020	0.0239	1	Complies
2	5300	16	4.8	3.020	0.0239	1	Complies

WLAN 5G MIMO

Worst case	Channel	Target power (dBm)	Target power (dBm)	Power Density (S) (mW/cm ²)	Power Density (S) (mW/cm ²)	Total Ratio	Limit Ratio	Test Result
		Antenna 1	Antenna 2	Antenna 1	Antenna 2			
IEEE802.11n HT 20	5260	15	15	0.0190	0.0190	0.038	1	Complies

End of Test Report