

FCC 47 CFR MPE REPORT

Hui Zhou Gaoshengda Technology Co.,LTD

WIFI+BT Module

Model Number: WKXT01M2501

FCC ID: 2AC23-WKXT01

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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

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

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	6.55	4.5186	6±1
	2441	6.39	4.3551	6±1
	2480	6.34	4.3053	6±1
8-DPSK	2402	8.60	7.2444	8±1
	2441	8.50	7.0795	8±1
	2480	8.44	6.9823	8±1
GFSK 1M	2402	5.84	3.8371	5±1
	2440	6.05	4.0272	6±1
	2480	5.91	3.8994	5±1
IEEE 802.11b	2412	17.50	56.2341	17±1
	2437	17.62	57.8096	17±1
	2462	17.60	57.5440	17±1
IEEE 802.11g	2412	22.27	168.6553	22±1
	2437	22.31	170.2159	22±1
	2462	22.67	184.9269	22±1
IEEE 802.11n HT20 (2.4G)	2412	22.28	169.0441	22±1
	2437	22.27	168.6553	22±1
	2462	22.61	182.3896	22±1
IEEE 802.11n HT40 (2.4G)	2422	22.65	184.0772	22±1
	2437	22.69	185.7804	22±1
	2452	22.80	190.5461	22±1
IEEE 802.11ax HE 20(2.4G)	2412	22.47	176.6038	22±1
	2437	22.40	173.7801	22±1
	2462	22.52	178.6488	22±1
IEEE 802.11ax HE 40(2.4G)	2422	22.57	180.7174	22±1
	2437	22.63	183.2314	22±1
	2452	22.62	182.8100	22±1
IEEE	5180	13.839	24.2047	13±1

802.11a	5200	14.002	25.1304	14±1
	5240	14.284	26.8164	14±1
	5260	15.359	34.3479	15±1
	5300	15.565	36.0164	15±1
	5320	15.663	36.8383	15±1
	5500	15.044	31.9448	15±1
	5580	15.373	34.4588	15±1
	5700	15.948	39.3369	15±1
	5745	15.819	38.1856	15±1
	5785	15.921	39.0931	15±1
	5825	15.946	39.3188	15±1
IEEE 802.11n HT20 (5G)	5180	10.300	10.7152	10±1
	5200	10.503	11.2279	10±1
	5240	10.752	11.8905	10±1
	5260	14.693	29.4646	14±1
	5300	14.936	31.1602	14±1
	5320	15.003	31.6446	15±1
	5500	15.428	34.8980	15±1
	5580	15.748	37.5664	15±1
	5700	16.363	43.2813	16±1
	5745	13.536	22.5736	13±1
	5785	13.673	23.2970	13±1
IEEE 802.11ac VHT20	5180	10.318	10.7597	10±1
	5200	10.488	11.1892	10±1
	5240	10.742	11.8631	10±1
	5260	12.287	16.9317	12±1
	5300	12.480	17.7011	12±1
	5320	12.537	17.9349	12±1
	5500	13.019	20.0401	13±1
	5580	13.344	21.5973	13±1
	5700	13.912	24.6150	13±1
	5745	11.787	15.0904	11±1
	5785	11.910	15.5239	11±1
5825	12.053	16.0435	12±1	
IEEE 802.11ax HE 20	5180	9.217	8.3503	9±1
	5200	9.355	8.6199	9±1
	5240	9.634	9.1918	9±1

	5260	12.779	18.9627	12±1
	5300	12.914	19.5614	12±1
	5320	12.955	19.7469	12±1
	5500	13.364	21.6970	13±1
	5580	13.658	23.2167	13±1
	5700	14.282	26.8040	14±1
	5745	14.500	28.1838	14±1
	5785	14.598	28.8270	14±1
	5825	14.695	29.4781	14±1
IEEE 802.11n HT40 (5G)	5190	12.146	16.3908	12±1
	5230	12.447	17.5671	12±1
	5270	12.691	18.5823	12±1
	5310	13.920	24.6604	13±1
	5510	14.427	27.7141	14±1
	5590	14.779	30.0538	14±1
	5670	15.201	33.1207	15±1
	5755	15.575	36.0994	15±1
IEEE 802.11ac VHT40	5190	12.611	18.2432	12±1
	5230	12.906	19.5254	12±1
	5270	13.177	20.7826	13±1
	5310	13.863	24.3388	13±1
	5510	14.381	27.4221	14±1
	5590	14.713	29.6006	14±1
	5670	15.128	32.5687	15±1
	5755	15.497	35.4568	15±1
IEEE 802.11ax HE 40	5190	11.690	14.7571	11±1
	5230	11.970	15.7398	11±1
	5270	12.196	16.5806	12±1
	5310	11.547	14.2791	11±1
	5510	12.057	16.0583	12±1
	5590	12.366	17.2425	12±1
	5670	12.775	18.9452	12±1
	5755	13.140	20.6063	13±1
	5795	13.208	20.9315	13±1
IEEE	5210	13.563	22.7143	12±1

802.11ac VHT80	5290	12.236	16.7340	12±1
	5530	12.786	18.9933	13±1
	5610	13.154	20.6728	13±1
	5775	13.861	24.3276	14±1
IEEE 802.11ax HE 80	5210	12.598	18.1886	12±1
	5290	11.356	13.6647	11±1
	5530	12.000	15.8489	12±1
	5610	12.350	17.1791	12±1
	5775	13.046	20.1651	13±1

Antenna 2

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
IEEE 802.11b	2412	17.27	53.3335	17±1
	2437	17.30	53.7032	17±1
	2462	17.22	52.7230	17±1
IEEE 802.11g	2412	22.52	178.6488	22±1
	2437	22.47	176.6038	22±1
	2462	22.47	176.6038	22±1
IEEE 802.11n HT20 (2.4G)	2412	22.46	176.1976	22±1
	2437	22.45	175.7924	22±1
	2462	22.35	171.7908	22±1
IEEE 802.11n HT40 (2.4G)	2422	22.37	172.5838	22±1
	2437	22.31	170.2159	22±1
	2452	22.30	169.8244	22±1
IEEE 802.11ax HE 20	2412	22.29	169.4338	22±1
	2437	22.23	167.1091	22±1
	2462	22.03	159.5879	22±1
IEEE 802.11ax HE 40	2422	22.40	173.7801	22±1
	2437	22.35	171.7908	22±1
	2452	22.32	170.6082	22±1
IEEE 802.11a	5180	12.428	17.4904	12±1
	5200	12.638	18.3569	12±1
	5240	13.023	20.0586	13±1
	5260	15.178	32.9458	15±1
	5300	15.346	34.2452	15±1
	5320	15.394	34.6258	15±1
	5500	15.493	35.4242	15±1
	5580	15.909	38.9852	15±1
	5700	16.510	44.7713	16±1
	5745	14.163	26.0795	14±1
	5785	14.314	27.0023	14±1
5825	14.408	27.5931	14±1	
IEEE 802.11n	5180	9.974	9.9403	9±1
	5200	10.172	10.4040	10±1

HT20 (5G)	5240	10.443	11.0739	10±1
	5260	14.199	26.2966	14±1
	5300	14.407	27.5867	14±1
	5320	14.480	28.0543	14±1
	5500	14.893	30.8532	14±1
	5580	15.238	33.4041	15±1
	5700	15.835	38.3266	15±1
	5745	15.974	39.5731	15±1
	5785	16.061	40.3738	16±1
	5825	16.127	40.9921	16±1
IEEE 802.11ac VHT20	5180	10.255	10.6047	10±1
	5200	10.376	10.9044	10±1
	5240	10.690	11.7220	10±1
	5260	12.201	16.5997	12±1
	5300	12.336	17.1238	12±1
	5320	12.348	17.1712	12±1
	5500	12.857	19.3063	12±1
	5580	13.145	20.6300	13±1
	5700	13.727	23.5885	13±1
	5745	13.924	24.6831	13±1
	5785	14.005	25.1478	14±1
	5825	14.127	25.8643	14±1
IEEE 802.11ax HE 20	5180	8.826	7.6313	8±1
	5200	8.954	7.8596	8±1
	5240	9.238	8.3907	9±1
	5260	12.213	16.6456	12±1
	5300	12.331	17.1041	12±1
	5320	12.379	17.2942	12±1
	5500	12.770	18.9234	12±1
	5580	13.080	20.3236	13±1
	5700	13.753	23.7301	13±1
	5745	13.968	24.9345	13±1
	5785	14.059	25.4624	14±1
	5825	14.139	25.9358	14±1
IEEE 802.11n HT40 (5G)	5190	11.744	14.9417	11±1
	5230	12.097	16.2069	12±1
	5270	12.290	16.9434	12±1
	5310	13.398	21.8675	13±1

	5510	13.969	24.9402	13±1
	5590	14.239	26.5399	14±1
	5670	14.725	29.6825	14±1
	5755	15.064	32.0922	15±1
	5795	15.120	32.5087	15±1
IEEE 802.11ac VHT40	5190	12.612	18.2474	12±1
	5230	12.904	19.5164	12±1
	5270	13.092	20.3798	13±1
	5310	13.871	24.3837	13±1
	5510	14.367	27.3338	14±1
	5590	14.706	29.5529	14±1
	5670	15.119	32.5012	15±1
	5755	15.504	35.5140	15±1
IEEE 802.11ax HE 40	5795	15.557	35.9501	15±1
	5190	11.245	13.3199	11±1
	5230	11.553	14.2988	11±1
	5270	11.766	15.0176	11±1
	5310	12.278	16.8966	12±1
	5510	12.776	18.9496	12±1
	5590	13.080	20.3236	13±1
	5670	13.522	22.5009	13±1
IEEE 802.11ac VHT80	5755	13.932	24.7286	13±1
	5795	14.010	25.1768	14±1
	5210	12.951	19.7288	12±1
	5290	11.756	14.9830	11±1
	5530	12.384	17.3141	12±1
IEEE 802.11ax HE 80	5610	12.841	19.2353	12±1
	5775	13.524	22.5113	13±1
	5210	12.137	16.3569	12±1
	5290	11.049	12.7321	11±1
	5530	11.615	14.5044	11±1
	5610	12.068	16.0990	12±1
	5775	12.765	18.9017	12±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	8-DPSK	2402	9	2.8	1.905	0.003	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 802.11g	2412	23	1.5	1.413	0.0561	1	Complies
2	IEEE 802.11g	2462	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	2452	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	16	4.8	3.020	0.0239	1	Complies
2	5700	17	4.8	3.020	0.0301	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 40	5700	17	16	0.0239	0.0301	0.054	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
0.0030	0.1122	0.1152	1	Complies

Note: 2.4 and 5GHz bands are share an antenna, Can't both the 2.4 and 5 GHz bands operate simultaneously.

End of Test Report