

FCC 47 CFR MPE REPORT

Touchjet, Inc.

WAVE+Lily

Model Number: TW6

FCC ID: 2AJZVTW6

Prepared for:	Touchjet, Inc.
	1563 Solano Ave. #472, Berkeley, California 94707, United States
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

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Maximum Permissible Exposure

1、Applicable Standard

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.

(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

2、MPE Calculation Method

$$E \text{ (V/m)} = (30 \cdot P \cdot G)^{0.5/d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = E^2/377$$

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

$$Pd = (30 \cdot P \cdot G) / (377 \cdot d^2)$$

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

3、Conducted Power Result**3.1 Antenna 1**

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11b	2412	14.790	30.130	14 ± 1	2.5	1.778
	2437	15.290	33.806	15 ± 1	2.5	1.778
	2462	15.940	39.264	15 ± 1	2.5	1.778
IEEE 802.11g	2412	20.430	110.408	20 ± 1	2.5	1.778
	2437	20.920	123.595	20 ± 1	2.5	1.778
	2462	21.280	134.276	21 ± 1	2.5	1.778
IEEE 802.11n HT20	2412	21.060	127.644	21 ± 1	2.5	1.778
	2437	21.420	138.676	21 ± 1	2.5	1.778
	2462	21.820	152.055	21 ± 1	2.5	1.778
IEEE 802.11a	5180	12.149	16.402	12 ± 1	2.5	1.778
	5200	12.042	16.003	12 ± 1	2.5	1.778
	5240	12.001	15.853	12 ± 1	2.5	1.778
	5260	12.005	15.867	12 ± 1	2.5	1.778
	5300	11.996	15.834	11 ± 1	2.5	1.778
	5320	12.092	16.188	12 ± 1	2.5	1.778
	5500	11.090	12.853	11 ± 1	2.5	1.778
	5580	11.024	12.659	11 ± 1	2.5	1.778
	5700	10.145	10.340	10 ± 1	2.5	1.778
	5745	11.235	13.289	11 ± 1	2.5	1.778
	5785	11.005	12.604	11 ± 1	2.5	1.778
	5825	11.654	14.635	11 ± 1	2.5	1.778

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11n HT20	5180	11.915	15.542	11 ± 1	2.5	1.778
	5200	12.012	15.893	12 ± 1	2.5	1.778
	5240	11.986	15.798	11 ± 1	2.5	1.778
	5260	12.268	16.858	12 ± 1	2.5	1.778
	5300	12.452	17.587	12 ± 1	2.5	1.778
	5320	12.243	16.761	12 ± 1	2.5	1.778
	5500	11.168	13.086	11 ± 1	2.5	1.778
	5580	11.163	13.071	11 ± 1	2.5	1.778
	5700	9.738	9.415	9 ± 1	2.5	1.778
	5745	11.000	12.589	11 ± 1	2.5	1.778
	5785	10.963	12.482	10 ± 1	2.5	1.778
	5825	11.658	14.649	11 ± 1	2.5	1.778
IEEE 802.11ac VHT20	5180	12.166	16.466	12 ± 1	2.5	1.778
	5200	12.142	16.376	12 ± 1	2.5	1.778
	5240	12.362	17.227	12 ± 1	2.5	1.778
	5260	11.856	15.332	11 ± 1	2.5	1.778
	5300	11.897	15.477	11 ± 1	2.5	1.778
	5320	11.897	15.477	11 ± 1	2.5	1.778
	5500	11.007	12.610	11 ± 1	2.5	1.778
	5580	10.968	12.497	10 ± 1	2.5	1.778
	5700	9.974	9.940	9 ± 1	2.5	1.778
	5745	10.987	12.552	10 ± 1	2.5	1.778
	5785	10.369	10.887	10 ± 1	2.5	1.778
	5825	10.450	11.092	10 ± 1	2.5	1.778

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11n HT40	5190	11.461	13.999	11 ± 1	2.5	1.778
	5230	11.410	13.836	11 ± 1	2.5	1.778
	5270	12.854	19.293	12 ± 1	2.5	1.778
	5310	12.799	19.050	12 ± 1	2.5	1.778
	5510	11.739	14.925	11 ± 1	2.5	1.778
	5670	9.659	9.245	9 ± 1	2.5	1.778
	5755	11.213	13.222	11 ± 1	2.5	1.778
	5795	11.256	13.354	11 ± 1	2.5	1.778
IEEE 802.11ac VHT40	5190	11.803	15.146	11 ± 1	2.5	1.778
	5230	11.842	15.283	11 ± 1	2.5	1.778
	5270	12.398	17.370	12 ± 1	2.5	1.778
	5310	12.578	18.105	12 ± 1	2.5	1.778
	5510	11.836	15.262	11 ± 1	2.5	1.778
	5670	9.753	9.447	9 ± 1	2.5	1.778
	5755	11.144	13.014	11 ± 1	2.5	1.778
	5795	10.189	10.445	10 ± 1	2.5	1.778
IEEE 802.11ac VHT80	5210	10.976	12.520	10 ± 1	2.5	1.778
	5290	11.780	15.066	11 ± 1	2.5	1.778
	5530	10.773	11.948	10 ± 1	2.5	1.778
	5775	11.236	13.292	11 ± 1	2.5	1.778

3.2 Antenna 2

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
GFSK	2402	3.930	2.472	3 ± 1	2.5	1.778
	2441	4.930	3.112	4 ± 1	2.5	1.778
	2480	4.220	2.642	4 ± 1	2.5	1.778
8-DPSK	2402	4.090	2.564	4 ± 1	2.5	1.778
	2441	4.080	2.559	4 ± 1	2.5	1.778
	2480	3.720	2.355	3 ± 1	2.5	1.778
BLE	2402	4.500	2.818	4 ± 1	2.5	1.778
	2440	4.250	2.661	4 ± 1	2.5	1.778
	2480	4.140	2.594	4 ± 1	2.5	1.778
IEEE 802.11b	2412	19.930	98.401	19 ± 1	2.5	1.778
	2437	20.040	100.925	20 ± 1	2.5	1.778
	2462	19.880	97.275	19 ± 1	2.5	1.778
IEEE 802.11g	2412	19.690	93.111	19 ± 1	2.5	1.778
	2437	19.760	94.624	19 ± 1	2.5	1.778
	2462	19.450	88.105	19 ± 1	2.5	1.778
IEEE 802.11n HT20	2412	21.550	142.889	21 ± 1	2.5	1.778
	2437	21.690	147.571	21 ± 1	2.5	1.778
	2462	21.270	133.968	21 ± 1	2.5	1.778
IEEE 802.11a	5180	11.457	13.986	11 ± 1	2.5	1.778
	5200	11.485	14.077	11 ± 1	2.5	1.778
	5240	11.246	13.323	11 ± 1	2.5	1.778
	5260	12.124	16.308	12 ± 1	2.5	1.778
	5300	12.099	16.214	12 ± 1	2.5	1.778
	5320	12.133	16.342	12 ± 1	2.5	1.778
	5500	11.231	13.277	11 ± 1	2.5	1.778
	5580	11.635	14.571	11 ± 1	2.5	1.778
	5700	10.098	10.228	10 ± 1	2.5	1.778
	5745	11.369	13.706	11 ± 1	2.5	1.778
	5785	11.325	13.568	11 ± 1	2.5	1.778
	5825	11.689	14.754	11 ± 1	2.5	1.778

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11n HT20	5180	11.112	12.918	11 ± 1	2.5	1.778
	5200	11.147	13.023	11 ± 1	2.5	1.778
	5240	11.112	12.918	11 ± 1	2.5	1.778
	5260	11.458	13.989	11 ± 1	2.5	1.778
	5300	11.647	14.612	11 ± 1	2.5	1.778
	5320	11.728	14.887	11 ± 1	2.5	1.778
	5500	10.966	12.491	10 ± 1	2.5	1.778
	5580	10.546	11.340	10 ± 1	2.5	1.778
	5700	10.122	10.285	10 ± 1	2.5	1.778
	5745	10.998	12.583	10 ± 1	2.5	1.778
	5785	10.987	12.552	10 ± 1	2.5	1.778
	5825	11.258	13.360	11 ± 1	2.5	1.778
IEEE 802.11ac VHT20	5180	11.129	12.969	11 ± 1	2.5	1.778
	5200	11.142	13.008	11 ± 1	2.5	1.778
	5240	11.364	13.690	11 ± 1	2.5	1.778
	5260	11.852	15.318	11 ± 1	2.5	1.778
	5300	11.086	12.841	11 ± 1	2.5	1.778
	5320	11.808	15.164	11 ± 1	2.5	1.778
	5500	11.012	12.624	11 ± 1	2.5	1.778
	5580	10.864	12.201	10 ± 1	2.5	1.778
	5700	10.143	10.335	10 ± 1	2.5	1.778
	5745	10.993	12.569	10 ± 1	2.5	1.778
	5785	10.127	10.297	10 ± 1	2.5	1.778
	5825	10.658	11.636	10 ± 1	2.5	1.778

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11n HT40	5190	10.984	12.543	10 ± 1	2.5	1.778
	5230	10.958	12.468	10 ± 1	2.5	1.778
	5270	12.467	17.648	12 ± 1	2.5	1.778
	5310	12.427	17.486	12 ± 1	2.5	1.778
	5510	11.847	15.300	11 ± 1	2.5	1.778
	5670	10.203	10.479	10 ± 1	2.5	1.778
	5755	11.145	13.017	11 ± 1	2.5	1.778
	5795	10.145	10.340	10 ± 1	2.5	1.778
IEEE 802.11ac VHT40	5190	10.950	12.445	10 ± 1	2.5	1.778
	5230	10.996	12.578	10 ± 1	2.5	1.778
	5270	12.638	18.357	12 ± 1	2.5	1.778
	5310	12.585	18.134	12 ± 1	2.5	1.778
	5510	11.811	15.174	11 ± 1	2.5	1.778
	5670	9.905	9.784	9 ± 1	2.5	1.778
	5755	11.475	14.044	11 ± 1	2.5	1.778
	5795	10.289	10.688	10 ± 1	2.5	1.778
IEEE 802.11ac VHT80	5210	10.389	10.937	10 ± 1	2.5	1.778
	5290	11.723	14.870	11 ± 1	2.5	1.778
	5530	10.872	12.224	10 ± 1	2.5	1.778
	5775	10.479	11.166	10 ± 1	2.5	1.778

4、Calculated Result and Limit

4.1 Antenna 1

Mode	Target power (dBm)	Antenna gain		Power Density (S) (mW /cm2)	Limited of Power Density (S) (mW /cm2)	Test Result
		(dBi)	(Linear)			
2.4G Band						
IEEE 802.11b	16	2.5	1.778	0.01408	1	Compiles
IEEE 802.11g	22	2.5	1.778	0.05607	1	Compiles
IEEE 802.11n HT20	22	2.5	1.778	0.05607	1	Compiles
5G Band						
IEEE 802.11a	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11n HT20	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11ac VHT20	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11n HT40	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11ac VHT40	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11ac VHT80	12	2.5	1.778	0.00561	1	Compiles

4.2 Antenna 2

Mode	Target power (dBm)	Antenna gain		Power Density (S) (mW /cm2)	Limited of Power Density (S) (mW /cm2)	Test Result
		(dBi)	(Linear)			
2.4G Band						
GFSK	5	2.5	1.778	0.00112	1	Compiles
8-DPSK	5	2.5	1.778	0.00112	1	Compiles
BLE	5	2.5	1.778	0.00112	1	Compiles
IEEE 802.11b	21	2.5	1.778	0.04454	1	Compiles
IEEE 802.11g	20	2.5	1.778	0.03538	1	Compiles
IEEE 802.11n HT20	22	2.5	1.778	0.05607	1	Compiles
5G Band						
IEEE 802.11a	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11n HT20	12	2.5	1.778	0.00561	1	Compiles
IEEE 802.11ac VHT20	12	2.5	1.778	0.00561	1	Compiles
IEEE 802.11n HT40	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11ac VHT40	13	2.5	1.778	0.00706	1	Compiles
IEEE 802.11ac VHT80	12	2.5	1.778	0.00561	1	Compiles

4.3 Antenna 1+2

Mode	Power Density (S) (mW /cm ²) Antenna 1	Power Density (S) (mW /cm ²) Antenna 2	Power Density (S) (mW /cm ²) Total	Limited of Power Density (S) (mW /cm ²)	Test Result
2.4G Band					
IEEE 802.11n HT20	0.05607	0.05607	0.11214	1	Compiles
5G Band					
IEEE 802.11n HT20	0.00706	0.00561	0.01267	1	Compiles
IEEE 802.11ac VHT20	0.00706	0.00561	0.01267	1	Compiles
IEEE 802.11n HT40	0.00706	0.00706	0.01412	1	Compiles
IEEE 802.11ac VHT40	0.00706	0.00706	0.01412	1	Compiles
IEEE 802.11ac VHT80	0.00561	0.00561	0.01122	1	Compiles

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