

FCC 47 CFR MPE REPORT

TCL Entertainment Solutions Limited

2.0 TCL• Roku TV Wireless Soundbar

Model Number: TSR1

Additional Model: TS120, TS1204, TDS1204, TS1204K, TDS1204K, FS1204, OS1204, AltoR1, Alto R, ***1204, TS7204, TS720, TDS7204, TS7204K, TDS7204K, FS7204, OS7204, AltoR7, ***7204 (“*” can be any alphanumeric character including blank for marketing differences)

FCC ID: 2ARUDTSR1

Applicant:	TCL Entertainment Solutions Limited
Address:	7/F, building 22E, 22 science park east avenue Hong Kong science park, SHATIN, N.T. ,Hong Kong China.
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 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

Mode	Frequency (MHz)	Antena	Peak output power (dBm)	Peak output power (mW)
IEEE 802.11a	5260	ant 1	13.18	20.797
		ant 2	12.16	16.444
	5300	ant 1	14.31	26.977
		ant 2	13.38	21.777
	5320	ant 1	14.87	30.690
		ant 2	13.72	23.550
	5500	ant 1	12.07	16.106
		ant 2	13.31	21.429
	5580	ant 1	13.28	21.281
		ant 2	14.87	30.690
	5700	ant 1	15.64	36.644
		ant 2	12.65	18.408
IEEE 802.11n20	5260	ant 1	13.19	20.845
		ant 2	10.66	11.641
	5300	ant 1	14.4	27.542
		ant 2	12.01	15.885
	5320	ant 1	14.32	27.040
		ant 2	12.31	17.022
	5500	ant 1	12.88	19.409
		ant 2	12.88	19.409
	5580	ant 1	13.52	22.491
		ant 2	15.25	33.497
	5700	ant 1	14.96	31.333
		ant 2	13.25	21.135
IEEE 802.11ac VHT20	5260	ant 1	13.75	23.714
		ant 2	11.28	13.428
	5300	ant 1	14.76	29.923
		ant 2	12.67	18.493
	5320	ant 1	14.74	29.785
		ant 2	13.09	20.370
	5500	ant 1	11.51	14.158
		ant 2	11.62	14.521
5580	ant 1	12.37	17.258	

		ant 2	14.08	25.586
	5700	ant 1	13.88	24.434
		ant 2	12	15.849
IEEE 802.11n HT40	5270	ant 1	13.77	23.823
		ant 2	11.36	13.677
	5310	ant 1	14.64	29.107
		ant 2	12.63	18.323
	5510	ant 1	12.07	16.106
		ant 2	12.01	15.885
	5590	ant 1	12.51	17.824
		ant 2	15.5	35.481
	5670	ant 1	13.75	23.714
		ant 2	14.21	26.363
IEEE 802.11ac VHT40	5270	ant 1	13.77	23.823
		ant 2	11.36	13.677
	5310	ant 1	14.64	29.107
		ant 2	12.63	18.323
	5510	ant 1	12.07	16.106
		ant 2	12.01	15.885
	5590	ant 1	12.51	17.824
		ant 2	15.5	35.481
	5670	ant 1	13.75	23.714
		ant 2	14.21	26.363
IEEE 802.11ac VHT80	5290	ant 1	14.4	27.542
		ant 2	12.37	17.258
	5530	ant 1	12.31	17.022
		ant 2	13.7	23.442
	5610	ant 1	12.3	16.982
		ant 2	14.92	31.046

Calculated Result and Limit

The Worst Mode	Antenna	Peak output power (dBm)	Target power (dBm)	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
					(dBi)	(Linear)			
5G Band									
IEEE 802.11a	ant 1	15.64	15 ±1	16	4.11	2.5763	0.0204	1	Complies
	ant 2	14.87	14 ±1	15	4.11	2.5763	0.0162	1	Complies
IEEE 802.11n HT20	ant 1	14.96	14 ±1	15	4.11	2.5763	0.0162	1	Complies
	ant 2	15.88	15 ±1	16	4.11	2.5763	0.0204	1	Complies
IEEE 802.11ac VHT20	ant 1	14.76	14 ±1	15	4.11	2.5763	0.0162	1	Complies
	ant 2	15.6	15 ±1	16	4.11	2.5763	0.0204	1	Complies
IEEE 802.11n HT40	ant 1	14.75	14 ±1	15	4.11	2.5763	0.0162	1	Complies
	ant 2	16.00	16 ±1	17	4.11	2.5763	0.0257	1	Complies
IEEE 802.11ac VHT40	ant 1	14.74	14 ±1	15	4.11	2.5763	0.0162	1	Complies
	ant 2	16.01	16 ±1	17	4.11	2.5763	0.0257	1	Complies
IEEE 802.11ac VHT80	ant 1	14.97	14 ±1	15	4.11	2.5763	0.0162	1	Complies
	ant 2	15.87	15 ±1	16	4.11	2.5763	0.0204	1	Complies

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
5G Band					
IEEE 802.11n HT20	0.0162	0.0204	0.0366	1	Complies
IEEE 802.11ac VHT20	0.0162	0.0204	0.0366	1	Complies
IEEE 802.11n HT40	0.0162	0.0257	0.0419	1	Complies
IEEE 802.11ac VHT40	0.0162	0.0257	0.0419	1	Complies
IEEE 802.11ac VHT80	0.0162	0.0204	0.0366	1	Complies

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	Total Ratio	Limit Ratio	Test Result
0.0011	0.2527	0.2538	1	Complies

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

End of Test Report