

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

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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

Bluetooth Antenna

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
GFSK	2480	4.99	3.1550	4 ± 1	2.5	1.778
8-DPSK	2480	1.65	1.4622	1 ± 1	2.5	1.778
BLE	2480	5.24	3.3420	5 ± 1	2.5	1.778

WiFi Antenna 0

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11b	2412	19.10	81.2831	19 ± 1	2.5	1.778
IEEE 802.11g	2412	25.19	330.3695	25 ± 1	2.5	1.778
IEEE 802.11n HT20	2412	24.77	299.9163	24 ± 1	2.5	1.778
IEEE 802.11n HT40	2422	25.27	336.5116	25 ± 1	2.5	1.778
IEEE 802.11a	5240	13.11	20.4644	13 ± 1	4.11	2.576
IEEE 802.11n HT20	5240	14.96	31.3329	14 ± 1	4.11	2.576
IEEE 802.11ac VHT20	5240	14.72	29.6483	14 ± 1	4.11	2.576
IEEE 802.11n HT40	5755	14.75	30.4089	14 ± 1	4.11	2.576
IEEE 802.11ac VHT40	5755	14.74	24.8886	14 ± 1	4.11	2.576
IEEE 802.11ac VHT80	5210	14.97	30.4089	14 ± 1	4.11	2.576

WiFi Antenna 1

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11b	2412	19.01	79.6159	19 ± 1	2.5	1.778
IEEE 802.11g	2412	25.50	354.8134	25 ± 1	2.5	1.778
IEEE 802.11n HT20	2412	24.58	287.0781	24 ± 1	2.5	1.778
IEEE 802.11n HT40	2422	24.96	313.3286	24 ± 1	2.5	1.778
IEEE 802.11a	5745	13.94	24.7742	13 ± 1	4.11	2.576
IEEE 802.11n HT20	5745	15.88	36.3915	15 ± 1	4.11	2.576
IEEE 802.11ac VHT20	5745	15.60	36.3078	15 ± 1	4.11	2.576
IEEE 802.11n HT40	5755	16.00	40.0867	16 ± 1	4.11	2.576
IEEE 802.11ac VHT40	5755	16.01	39.9945	16 ± 1	4.11	2.576
IEEE 802.11ac VHT80	5775	15.87	38.9942	15 ± 1	4.11	2.576

Calculated Result and Limit

WiFi Antenna 0

Mode	Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
		(dBi)	(Linear)			
2.4G Band						
GFSK	4.99	2.5	1.778	0.0011	1	Complies
8-DPSK	1.65	2.5	1.778	0.0005	1	Complies
BLE	5.24	2.5	1.778	0.0012	1	Complies
IEEE 802.11b	19.25	2.5	1.778	0.0298	1	Complies
IEEE 802.11g	25.19	2.5	1.778	0.1169	1	Complies
IEEE 802.11n HT20	24.69	2.5	1.778	0.1042	1	Complies
IEEE 802.11n HT40	25.27	2.5	1.778	0.1190	1	Complies
5G Band						
IEEE 802.11a	13.11	4.11	2.576	0.0105	1	Complies
IEEE 802.11n HT20	14.96	4.11	2.576	0.0161	1	Complies
IEEE 802.11ac VHT20	14.72	4.11	2.576	0.0152	1	Complies
IEEE 802.11n HT40	14.83	4.11	2.576	0.0156	1	Complies
IEEE 802.11ac VHT40	14.79	4.11	2.576	0.0154	1	Complies
IEEE 802.11ac VHT80	14.97	4.11	2.576	0.0161	1	Complies

WiFi Antenna 1

Mode	Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
		(dBi)	(Linear)			
2.4G Band						
IEEE 802.11b	19.01	2.5	1.778	0.0282	1	Complies
IEEE 802.11g	25.50	2.5	1.778	0.1255	1	Complies
IEEE 802.11n HT20	24.58	2.5	1.778	0.1016	1	Complies
IEEE 802.11n HT40	24.96	2.5	1.778	0.1108	1	Complies
5G Band						
IEEE 802.11a	13.94	4.11	2.576	0.0127	1	Complies
IEEE 802.11n HT20	15.61	4.11	2.576	0.0187	1	Complies
IEEE 802.11ac VHT20	15.60	4.11	2.576	0.0186	1	Complies
IEEE 802.11n HT40	16.03	4.11	2.576	0.0205	1	Complies
IEEE 802.11ac VHT40	16.02	4.11	2.576	0.0205	1	Complies
IEEE 802.11ac VHT80	15.91	4.11	2.576	0.0200	1	Complies

WiFi Antenna 0+1

Mode	Power Density (S) (mW/cm ²) Antenna 0	Power Density (S) (mW/cm ²) Antenna 1	Power Density (S) (mW/cm ²) Total	Limited of Power Density (S) (mW/cm ²)	Test Result
2.4G Band					
IEEE 802.11n HT20	0.1042	0.1016	0.2058	1	Complies
IEEE 802.11n HT40	0.1190	0.1108	0.2298	1	Complies
5G Band					
IEEE 802.11n HT20	0.0161	0.0127	0.0288	1	Complies
IEEE 802.11ac VHT20	0.0152	0.0187	0.0339	1	Complies
IEEE 802.11n HT40	0.0156	0.0186	0.0342	1	Complies
IEEE 802.11ac VHT40	0.0154	0.0205	0.0359	1	Complies
IEEE 802.11ac VHT80	0.0161	0.0205	0.0366	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