

FCC 47 CFR MPE REPORT

Outlaw Audio, LLC

Stereo Retro Receiver

Model Number: RR2160 Mk II

FCC ID: 2AWOL-2162

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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

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11b (2.4G)	2412	18.47	70.31	18±1	2	1.58489
	2437	18.52	71.12	18±1	2	1.58489
	2462	18.51	70.96	18±1	2	1.58489
IEEE 802.11g (2.4G)	2412	23.62	230.14	23±1	2	1.58489
	2437	23.66	232.27	23±1	2	1.58489
	2462	24.20	263.03	24±1	2	1.58489
IEEE 802.11n HT20(2.4G)	2412	24.52	283.14	24±1	2	1.58489
	2437	24.55	285.10	24±1	2	1.58489
	2462	24.91	309.74	24±1	2	1.58489
IEEE 802.11a (5G)	5180	13.10	20.42	13±1	2	1.58489
	5200	12.94	19.68	12±1	2	1.58489
	5240	13.04	20.14	13±1	2	1.58489
	5260	12.99	19.91	12±1	2	1.58489
	5300	12.71	18.66	12±1	2	1.58489
	5320	12.24	16.75	12±1	2	1.58489
	5500	11.59	14.42	11±1	2	1.58489
	5580	11.89	15.45	11±1	2	1.58489
	5700	11.87	15.38	11±1	2	1.58489
	5745	11.84	15.28	11±1	2	1.58489
	5785	12.18	16.52	12±1	2	1.58489
	5825	11.72	14.86	11±1	2	1.58489
IEEE 802.11n HT20 (5G)	5180	12.81	19.10	12±1	2	1.58489
	5200	12.69	18.58	12±1	2	1.58489
	5240	12.66	18.45	12±1	2	1.58489
	5260	12.74	18.79	12±1	2	1.58489
	5300	12.27	16.87	12±1	2	1.58489
	5320	12.13	16.33	12±1	2	1.58489
	5500	11.32	13.55	11±1	2	1.58489
	5580	11.42	13.87	11±1	2	1.58489
	5700	11.45	13.96	11±1	2	1.58489
	5745	11.51	14.16	11±1	2	1.58489

	5785	11.81	15.17	11±1	2	1.58489
	5825	11.41	13.84	11±1	2	1.58489
IEEE 802.11ac VHT20	5180	12.79	19.01	12±1	2	1.58489
	5200	12.54	17.95	12±1	2	1.58489
	5240	12.60	18.20	12±1	2	1.58489
	5260	11.72	14.86	11±1	2	1.58489
	5300	12.33	17.10	12±1	2	1.58489
	5320	12.07	16.11	12±1	2	1.58489
	5500	11.27	13.40	11±1	2	1.58489
	5580	11.66	14.66	11±1	2	1.58489
	5700	11.50	14.13	11±1	2	1.58489
	5745	11.51	14.16	11±1	2	1.58489
	5785	11.80	15.14	11±1	2	1.58489
	5825	11.42	13.87	11±1	2	1.58489
IEEE 802.11n HT40 (5G)	5190	12.83	19.19	12±1	2	1.58489
	5230	12.53	17.91	12±1	2	1.58489
	5270	12.77	18.92	12±1	2	1.58489
	5310	12.17	16.48	12±1	2	1.58489
	5510	11.01	12.62	11±1	2	1.58489
	5590	11.64	14.59	11±1	2	1.58489
	5670	11.75	14.96	11±1	2	1.58489
	5755	11.69	14.76	11±1	2	1.58489
	5795	11.98	15.78	11±1	2	1.58489
IEEE 802.11ac VHT40	5190	12.66	18.45	12±1	2	1.58489
	5230	12.43	17.50	12±1	2	1.58489
	5270	12.65	18.41	12±1	2	1.58489
	5310	12.17	16.48	12±1	2	1.58489
	5510	11.02	12.65	11±1	2	1.58489
	5590	11.41	13.84	11±1	2	1.58489
	5670	11.75	14.96	11±1	2	1.58489
	5755	11.66	14.66	11±1	2	1.58489
	5795	11.98	15.78	11±1	2	1.58489
IEEE 802.11ac VHT80	5210	12.08	16.14	12±1	2	1.58489
	5290	12.02	15.92	12±1	2	1.58489
	5530	10.35	10.84	10±1	2	1.58489
	5610	10.73	11.83	10±1	2	1.58489
	5775	11.38	13.74	11±1	2	1.58489

3. Calculated Result and Limit

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	19	2	1.58489	0.02505	1	Compiles
IEEE 802.11g	25	2	1.58489	0.09971	1	Compiles
IEEE 802.11n HT20	25	2	1.58489	0.09971	1	Compiles
5G Band						
IEEE 802.11a	14	2	1.58489	0.00792	1	Compiles
IEEE 802.11n HT20	13	2	1.58489	0.00629	1	Compiles
IEEE 802.11ac VHT20	13	2	1.58489	0.00629	1	Compiles
IEEE 802.11n HT40	13	2	1.58489	0.00629	1	Compiles
IEEE 802.11ac VHT40	13	2	1.58489	0.00629	1	Compiles
IEEE 802.11ac VHT80	13	2	1.58489	0.00629	1	Compiles

End of Test Report