

FCC 47 CFR MPE REPORT

Audio Pro AB

MULTICONNECTED WIRELESS LOUDSPEAKER

Model Number: DRUMFIRE D-2

FCC ID: 2AGNC-D2

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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

Antenna 1

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
GFSK	2402	2.37	1.726	2±1
	2441	3.09	2.037	3±1
	2480	4.21	2.636	4±1
8-DPSK	2402	-0.37	0.918	0±1
	2441	0.11	1.026	0±1
	2480	1.15	1.303	1±1
BLE	2402	2.76	1.888	3±1
	2440	3.21	2.094	3±1
	2480	3.72	2.355	4±1
IEEE 802.11b	2412	16.54	45.082	17±1
	2437	16.56	45.290	17±1
	2462	16.91	49.091	17±1
IEEE 802.11g	2412	20.68	116.950	21±1
	2437	21.14	130.017	21±1
	2462	21.57	143.549	22±1
IEEE 802.11n HT20 (2.4G)	2412	23.29	213.304	23±1
	2437	23.51	224.388	24±1
	2462	23.91	246.037	24±1
IEEE 802.11a	5180	14.47	27.990	14±1
	5200	14.76	29.923	15±1
	5240	15.54	35.810	16±1
	5745	14.23	26.485	14±1
	5785	13.23	21.038	13±1
	5825	12.47	17.660	12±1
IEEE 802.11n HT20 (5G)	5180	13.98	25.003	14±1
	5200	11.84	15.276	12±1
	5240	12.49	17.742	12±1
	5745	13.81	24.044	14±1
	5785	12.88	19.409	13±1
	5825	12.17	16.482	12±1

IEEE 802.11ac VHT20	5180	13.98	25.003	14±1
	5200	14.47	27.990	14±1
	5240	15.02	31.769	15±1
	5745	13.98	25.003	14±1
	5785	13.00	19.953	13±1
	5825	12.12	16.293	12±1
IEEE 802.11n HT40 (5G)	5190	11.14	13.002	11±1
	5230	12.12	16.293	12±1
	5755	11.23	13.274	11±1
	5795	10.02	10.046	10±1
IEEE 802.11ac VHT40	5190	11.26	13.366	11±1
	5230	12.14	16.368	12±1
	5755	11.23	13.274	11±1
	5795	9.99	9.977	10±1
IEEE 802.11ac VHT80	5210	12.93	19.634	13±1
	5775	11.12	12.942	11±1

Antenna 2

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
IEEE 802.11b	2412	16.94	49.431	17±1
	2437	17.00	50.119	17±1
	2462	17.21	52.602	17±1
IEEE 802.11g	2412	21.05	127.350	21±1
	2437	21.64	145.881	22±1
	2462	21.52	141.906	22±1
IEEE 802.11n HT20 (2.4G)	2412	23.47	222.331	23±1
	2437	23.65	231.739	24±1
	2462	23.93	247.172	24±1
IEEE 802.11a	5180	14.54	28.445	15±1
	5200	15.48	35.318	15±1
	5240	12.54	17.947	13±1
	5745	14.61	28.907	15±1
	5785	14.12	25.823	14±1
	5825	13.23	21.038	13±1

IEEE 802.11n HT20 (5G)	5180	14.37	27.353	14±1
	5200	12.38	17.298	12±1
	5240	12.73	18.750	13±1
	5745	14.49	28.119	14±1
	5785	13.82	24.099	14±1
	5825	12.98	19.861	13±1
IEEE 802.11ac VHT20	5180	14.46	27.925	14±1
	5200	14.98	31.477	15±1
	5240	15.42	34.834	15±1
	5745	14.38	27.416	14±1
	5785	13.79	23.933	14±1
	5825	13.00	19.953	13±1
IEEE 802.11n HT40 (5G)	5190	11.95	15.668	12±1
	5230	12.51	17.824	13±1
	5755	11.76	14.997	12±1
	5795	10.96	12.474	11±1
IEEE 802.11ac VHT40	5190	11.72	14.859	12±1
	5230	12.49	17.742	12±1
	5755	11.78	15.066	12±1
	5795	10.94	12.417	11±1
IEEE 802.11ac VHT80	5210	14.00	25.119	14±1
	5775	11.26	13.366	11±1

3. Calculated Result and Limit

Bluetooth

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	2480	5	2	1.585	0.00100	1	Complies

WLAN 2.4G 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	2462	25	2	1.585	0.09971	1	Complies
2	2462	25	2	1.585	0.09971	1	Complies

WLAN 2.4G MIMO

Worst case	Channel	Target power (dBm) Antenna 1	Target power (dBm) Antenna 2	Power Density (S) (mW/cm ²) Antenna 1	Power Density (S) (mW/cm ²) Antenna 2	Total Ratio	Limit Ratio	Test Result
IEEE 802.11n HT20	2462	25	25	0.09971	0.09971	0.19942	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	5240	17	2	1.585	0.01580	1	Complies
2	5240	16	2	1.585	0.01255	1	Complies

WLAN 5G MIMO

Worst case	Channel	Target power (dBm)	Target power (dBm)	Power Density (S)	Power Density (S)	Total Ratio	Limit Ratio	Test Result
		Antenna 1	Antenna 2	(mW/cm ²) Antenna 1	(mW/cm ²) Antenna 2			
IEEE 802.11ac VHT20	5240	16	16	0.01255	0.01255	0.0251	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
0.00126	0.19942	0.20068	1	Complies

Note: 1. only the worst case was recorded.

2. 2.4G wifi & 5G wifi can't transmit simultaneously.

End of Test Report