

FCC 47 CFR MPE REPORT

AUDIO PRO AB

MULTICONNECTED WIRELESS LOUDSPEAKER

Model Number: A48

FCC ID: 2AGNC-A48

Applicant:	AUDIO PRO AB
Address:	Garnisonsgatan 52, 25466, Helsingborg, Sweden
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

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

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	6.06	4.0365	6±1
	2441	6.22	4.1879	6±1
	2480	6.62	4.5920	6±1
8-DPSK	2402	3.01	1.9999	3±1
	2441	3.36	2.1677	3±1
	2480	3.72	2.3550	3±1
GFSK 1M	2402	5.32	3.4041	5±1
	2440	5.93	3.9174	5±1
	2480	6.43	4.3954	6±1
IEEE 802.11b	2412	18.25	66.8344	18±1
	2437	18.44	69.8232	18±1
	2462	18.57	71.9449	18±1
IEEE 802.11g	2412	22.53	179.0606	22±1
	2437	22.78	189.6706	22±1
	2462	23.00	199.5262	23±1
IEEE 802.11n HT20 (2.4G)	2412	19.70	93.3254	19±1
	2437	20.00	100.0000	20±1
	2462	20.07	101.6249	20±1
IEEE 802.11a	5180	14.362	27.3023	14±1
	5200	14.499	28.1773	14±1
	5240	14.715	29.6142	14±1
	5260	14.735	29.7509	14±1
	5300	14.491	28.1255	14±1
	5320	14.264	26.6932	14±1
	5500	12.893	19.4670	12±1
	5580	13.357	21.6621	13±1
	5700	13.449	22.1259	13±1
	5745	13.433	22.0445	13±1
	5785	13.159	20.6966	13±1
	5825	12.958	19.7606	12±1

IEEE 802.11n HT20 (5G)	5180	12.035	15.9772	12±1
	5200	10.347	10.8318	10±1
	5240	10.478	11.1635	10±1
	5260	14.622	28.9868	14±1
	5300	14.294	26.8782	14±1
	5320	14.004	25.1420	14±1
	5500	12.813	19.1117	12±1
	5580	13.298	21.3698	13±1
	5700	13.349	21.6222	13±1
	5745	13.263	21.1982	13±1
	5785	13.054	20.2023	13±1
	5825	12.795	19.0327	12±1
IEEE 802.11ac VHT20	5180	12.023	15.9331	12±1
	5200	12.190	16.5577	12±1
	5240	12.326	17.0844	12±1
	5260	14.437	27.7779	14±1
	5300	10.596	11.4710	10±1
	5320	13.963	24.9058	13±1
	5500	12.813	19.1117	12±1
	5580	13.298	21.3698	13±1
	5700	13.349	21.6222	13±1
	5745	13.353	21.6421	13±1
	5785	12.884	19.4267	12±1
	5825	12.791	19.0152	12±1
IEEE 802.11n HT40 (5G)	5190	13.866	24.3557	13±1
	5230	14.105	25.7336	14±1
	5270	13.782	23.8891	13±1
	5310	13.663	23.2434	13±1
	5510	12.171	16.4854	12±1
	5590	12.506	17.8074	12±1
	5670	12.925	19.6110	12±1
	5755	12.945	19.7015	12±1
	5795	12.718	18.6982	12±1
IEEE 802.11ac VHT40	5190	13.778	23.8671	13±1
	5230	14.087	25.6271	14±1
	5270	13.860	24.3220	13±1
	5310	13.604	22.9298	13±1
	5510	12.093	16.1920	12±1

	5590	12.650	18.4077	12±1
	5670	12.704	18.6380	12±1
	5755	12.893	19.4670	12±1
	5795	12.662	18.4587	12±1
IEEE 802.11ac VHT80	5210	12.494	17.7582	12±1
	5290	11.546	14.2758	11±1
	5530	10.340	10.8143	10±1
	5610	10.895	12.2885	10±1
	5775	11.944	15.6459	11±1

Antenna 2

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
IEEE 802.11b	2412	18.78	75.5092	18±1
	2437	18.91	77.8037	18±1
	2462	18.98	79.0679	18±1
IEEE 802.11g	2412	23.08	203.2357	23±1
	2437	23.26	211.8361	23±1
	2462	23.35	216.2719	23±1
IEEE 802.11n HT20 (2.4G)	2412	20.25	105.9254	20±1
	2437	20.07	101.6249	20±1
	2462	20.17	103.9920	20±1
IEEE 802.11a	5180	14.758	29.9089	14±1
	5200	15.001	31.6301	15±1
	5240	15.192	33.0522	15±1
	5260	15.257	33.5506	15±1
	5300	15.093	32.3073	15±1
	5320	14.873	30.7114	14±1
	5500	13.637	23.1047	13±1
	5580	14.284	26.8164	14±1
	5700	14.335	27.1331	14±1
	5745	14.077	25.5682	14±1
	5785	13.598	22.8981	13±1
	5825	13.413	21.9432	13±1
IEEE 802.11n HT20 (5G)	5180	12.353	17.1910	12±1
	5200	10.801	12.0254	10±1
	5240	10.893	12.2829	10±1
	5260	14.851	30.5562	14±1
	5300	14.650	29.1743	14±1
	5320	14.470	27.9898	14±1
	5500	13.403	21.8927	13±1
	5580	14.101	25.7099	14±1
	5700	14.105	25.7336	14±1
	5745	13.877	24.4174	13±1
	5785	11.492	14.0994	11±1
	5825	11.170	13.0918	11±1

IEEE 802.11ac VHT20	5180	12.282	16.9122	12±1
	5200	12.629	18.3189	12±1
	5240	12.732	18.7586	12±1
	5260	14.833	30.4299	14±1
	5300	14.677	29.3562	14±1
	5320	14.426	27.7077	14±1
	5500	13.362	21.6870	13±1
	5580	14.038	25.3396	14±1
	5700	14.073	25.5447	14±1
	5745	13.826	24.1324	13±1
	5785	13.212	20.9508	13±1
	5825	13.118	20.5022	13±1
IEEE 802.11n HT40 (5G)	5190	14.220	26.4241	14±1
	5230	14.310	26.9774	14±1
	5270	14.429	27.7268	14±1
	5310	14.247	26.5889	14±1
	5510	12.890	19.4536	12±1
	5590	13.325	21.5030	13±1
	5670	13.814	24.0658	13±1
	5755	13.457	22.1666	13±1
	5795	13.005	19.9756	13±1
IEEE 802.11ac VHT40	5190	14.246	26.5828	14±1
	5230	14.306	26.9526	14±1
	5270	14.440	27.7971	14±1
	5310	14.213	26.3815	14±1
	5510	12.915	19.5659	12±1
	5590	13.329	21.5229	13±1
	5670	13.529	22.5372	13±1
	5755	13.257	21.1690	13±1
	5795	13.010	19.9986	13±1
IEEE 802.11ac VHT80	5210	11.956	15.6892	11±1
	5290	12.211	16.6380	12±1
	5530	11.185	13.1371	11±1
	5610	11.682	14.7299	11±1
	5775	11.477	14.0508	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	7	2	1.585	0.00158	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	24	2	1.585	0.0792	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	21	21	0.0397	0.0397	0.0794	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)			
2	5260	16	2	1.585	0.0126	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			
IEEE802.11ac VHT 20	5260	15	15	0.0100	0.0100	0.02	1	Complies

Bluetooth+ WLAN

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi Total Ratio	Total Ratio	Limit Ratio	Test Result
0.00158	0.0794	0.0852	1	Complies

Note: 1. only the worst case was recorded.

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

