FCC 47 CFR MPE REPORT

AUDIO PRO AB

MULTICONNECTED WIRELESS LOUDSPEAKER

Model Number: A15

FCC ID: 2AGNC-A15

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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.o	30

Note: f=frequency in MHz; *Plane-wave equivalent power density

1.2. MPE Calculation Method

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

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	3.40	2.188	3±1
	2441	3.65	2.317	4±1
	2480	3.80	2.399	4±1
8-DPSK	2402	-0.26	0.942	0±1
	2441	0.31	1.074	0±1
	2480	0.39	1.094	0±1
BLE	2402	2.76	1.888	3±1
	2440	3.40	2.188	3±1
	2480	3.50	2.239	4±1
IEEE 802.11b	2412	16.74	47.206	17±1
	2437	16.76	47.424	17±1
	2462	16.85	48.417	17±1
IEEE 802.11g	2412	21.04	127.057	21±1
	2437	21.05	127.350	21±1
	2462	21.30	134.896	21±1
IEEE 802.11n HT20 (2.4G)	2412	23.91	246.037	24±1
	2437	23.65	231.739	24±1
	2462	24.08	255.859	24±1
IEEE 802.11a	5180	14.32	27.040	14±1
	5200	14.82	30.339	15±1
	5240	15.48	35.318	15±1
	5745	14.31	26.977	14±1
	5785	13.31	21.429	13±1
	5825	12.46	17.620	12±1
IEEE 802.11n HT20 (5G)	5180	13.97	24.946	14±1
	5200	12.23	16.711	12±1
	5240	12.60	18.197	13±1
	5745	14.02	25.235	14±1
	5785	13.16	20.701	13±1
	5825	12.33	17.100	12±1

IEEE 802.11ac VHT20	5180	13.99	25.061	14±1
	5200	14.74	29.785	15±1
	5240	15.36	34.356	15±1
	5745	13.89	24.491	14±1
	5785	13.08	20.324	13±1
	5825	12.31	17.022	12±1
IEEE 802.11n HT40 (5G)	5190	12.91	19.543	13±1
	5230	13.70	23.442	14±1
	5755	16.31	42.756	16±1
	5795	14.66	29.242	15±1
IEEE 802.11ac VHT40	5190	12.83	19.187	13±1
	5230	13.17	20.749	13±1
	5755	16.21	41.783	16±1
	5795	14.72	29.648	15±1
IEEE 802.11ac VHT80	5210	15.74	37.497	16±1

Antenna 2

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)
IEEE 802.11b	2412	16.79	47.753	17±1
	2437	17.09	51.168	17±1
	2462	17.19	52.360	17±1
IEEE 802.11g	2412	21.32	135.519	21±1
	2437	21.31	135.207	21±1
	2462	21.87	153.815	22±1
IEEE 802.11n HT20 (2.4G)	2412	23.58	228.034	24±1
	2437	23.67	232.809	24±1
	2462	24.22	264.241	24±1
IEEE 802.11a	5180	15.25	33.497	15±1
	5200	15.60	36.308	16±1
	5240	15.81	38.107	16±1
	5745	14.82	30.339	15±1
	5785	14.34	27.164	14±1
	5825	13.32	21.478	13±1
IEEE 802.11n HT20 (5G)	5180	15.08	32.211	15±1
	5200	12.71	18.664	13±1
	5240	13.17	20.749	13±1
	5745	14.70	29.512	15±1
	5785	14.21	26.363	14±1
	5825	13.17	20.749	13±1
IEEE 802.11ac VHT20	5180	15.10	32.359	15±1
	5200	15.44	34.995	15±1
	5240	15.65	36.728	16±1
	5745	14.65	29.174	15±1
	5785	14.26	26.669	14±1
	5825	13.15	20.654	13±1
IEEE 802.11n HT40 (5G)	5190	14.36	27.290	14±1
	5230	14.28	26.792	14±1
	5755	16.94	49.431	17±1
	5795	15.63	36.559	16±1

IEEE 802.11ac VHT40	5190	13.68	23.335	14±1
	5230	14.04	25.351	14±1
	5755	16.96	49.659	17±1
	5795	15.62	36.475	16±1
IEEE 802.11ac VHT80	5210	16.67	46.452	17±1
	5775	15.19	33.037	15±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	5755	17	2	1.585	0.01580	1	Complies
2	5755	18	2	1.585	0.01989	1	Complies

WLAN 5G 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 HT40	5755	17	18	0.01580	0.01989	0.03569	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
0.00100	0.19942	0.20042	1	Complies

Note: 1. only the worst case was recorded.

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

End of Test Report