

FCC 47 CFR MPE REPORT

Naim Audio Limited

CI-Uniti 102

Model Number: CI-Uniti 102

FCC ID: 2ACUR-CIUNITI102

Applicant:	Naim Audio Limited
Address:	Southampton Road, Salisbury, SP1 2LN, United Kingdom
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R2409252
Date of Test:	Aug. 29, 2024~ Sep. 27, 2024
Date of Report:	Sep. 29, 2024

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, $d=0.2\text{m}$, as well as the gain of the used antenna, the RF power density can be obtained

2. Conducted Power Result

Mode	Frequency (MHz)	Antenna	Peak output power (dBm)	Peak output power (mW)	
GFSK	2402	ant 1	4.17	2.612	
	2441	ant 1	4.65	2.917	
	2480	ant 1	8.83	7.638	
π/4-DQPSK	2402	ant 1	5.69	3.707	
	2441	ant 1	7.54	5.675	
	2480	ant 1	10.27	10.641	
8-DPSK	2402	ant 1	8.08	6.427	
	2441	ant 1	8.18	6.577	
	2480	ant 1	8.72	7.447	
BLE 1M	2402	ant 1	4.89	3.083	
	2440	ant 1	5.56	3.597	
	2480	ant 1	6.23	4.198	
BLE 2M	2402	ant 1	5.32	3.404	
	2440	ant 1	6	3.981	
	2480	ant 1	6.6	4.571	
IEEE 802.11b	2412	ant 1	15.09	32.285	
		ant 2	14.51	28.249	
	2437	ant 1	15.4	34.674	
		ant 2	13.86	24.322	
	2462	ant 1	15.13	32.584	
		ant 2	14.2	26.303	
IEEE 802.11g	2412	ant 1	21.44	139.316	
		ant 2	20.23	105.439	
	2437	ant 1	21.1	128.825	
		ant 2	19.66	92.470	
	2462	ant 1	21.08	128.233	
		ant 2	19.53	89.743	
	IEEE 802.11n HT20	2412	ant 1	18.7	74.131
			ant 2	15.32	34.041
2437		ant 1	18.53	71.285	
		ant 2	14.57	28.642	
2462		ant 1	18.31	67.764	
		ant 2	14.77	29.992	

IEEE 802.11ax HE20	2412	ant 1	19.36	86.298
		ant 2	19.08	80.910
	2437	ant 1	19.73	93.972
		ant 2	19.09	81.096
	2462	ant 1	19.56	90.365
		ant 2	19.5	89.125
IEEE 802.11a	5180	ant 1	14.29	26.853
		ant 2	11.56	14.322
	5200	ant 1	14.2	26.303
		ant 2	11.25	13.335
	5240	ant 1	14.55	28.510
		ant 2	11.32	13.552
	5260	ant 1	13.68	23.335
		ant 2	10.37	10.889
	5300	ant 1	13.83	24.155
		ant 2	10.22	10.520
	5320	ant 1	13.86	24.322
		ant 2	10.14	10.328
	5500	ant 1	14.81	30.269
		ant 2	10.97	12.503
	5580	ant 1	14.82	30.339
		ant 2	11.06	12.764
	5700	ant 1	15.5	35.481
		ant 2	11.6	14.454
	5745	ant 1	15.5	35.481
		ant 2	11.73	14.894
	5785	ant 1	14.86	30.620
		ant 2	11.2	13.183
	5825	ant 1	14.63	29.040
		ant 2	11.1	12.882
IEEE 802.11n20	5180	ant 1	12.12	16.293
		ant 2	9.07	8.072
	5200	ant 1	11.95	15.668
		ant 2	8.96	7.870
	5240	ant 1	12.04	15.996
		ant 2	8.5	7.079
5260	ant 1	11.22	13.243	
	ant 2	7.6	5.754	

	5300	ant 1	11.47	14.028	
		ant 2	7.39	5.483	
	5320	ant 1	11.29	13.459	
		ant 2	7.06	5.082	
	5500	ant 1	12.36	17.219	
		ant 2	7.79	6.012	
	5580	ant 1	12.36	17.219	
		ant 2	7.82	6.053	
	5700	ant 1	13.21	20.941	
		ant 2	7.99	6.295	
	5745	ant 1	13.19	20.845	
		ant 2	8.21	6.622	
	5785	ant 1	12.69	18.578	
		ant 2	7.75	5.957	
	5825	ant 1	12.46	17.620	
		ant 2	7.92	6.194	
	IEEE 802.11ac VHT20	5180	ant 1	11.91	15.524
			ant 2	9	7.943
5200		ant 1	11.84	15.276	
		ant 2	8.88	7.727	
5240		ant 1	12.07	16.106	
		ant 2	8.59	7.228	
5260		ant 1	11.25	13.335	
		ant 2	7.57	5.715	
5300		ant 1	11.4	13.804	
		ant 2	7.27	5.333	
5320		ant 1	11.29	13.459	
		ant 2	7.07	5.093	
5500		ant 1	12.26	16.827	
		ant 2	7.5	5.623	
5580		ant 1	12.29	16.943	
		ant 2	7.66	5.834	
5700		ant 1	13.07	20.277	
		ant 2	7.8	6.026	
5745		ant 1	13.13	20.559	
		ant 2	7.97	6.266	
5785	ant 1	12.63	18.323		
	ant 2	7.62	5.781		

	5825	ant 1	12.52	17.865
		ant 2	7.87	6.124
IEEE 802.11ax HE20	5180	ant 1	9.52	8.954
		ant 2	7.44	5.546
	5200	ant 1	9.37	8.650
		ant 2	7	5.012
	5240	ant 1	10.02	10.046
		ant 2	7.22	5.272
	5260	ant 1	9.12	8.166
		ant 2	6.29	4.256
	5300	ant 1	10.52	11.272
		ant 2	6.34	4.305
	5320	ant 1	9.21	8.337
		ant 2	6.48	4.446
	5500	ant 1	9.95	9.886
		ant 2	7.3	5.370
	5580	ant 1	10.4	10.965
		ant 2	8.13	6.501
	5700	ant 1	10.87	12.218
		ant 2	8.77	7.534
	5745	ant 1	11.03	12.677
		ant 2	9.13	8.185
5785	ant 1	10.34	10.814	
	ant 2	9.15	8.222	
5825	ant 1	10.2	10.471	
	ant 2	9.09	8.110	
IEEE 802.11n HT40	5190	ant 1	12.33	17.100
		ant 2	9.19	8.299
	5230	ant 1	12.52	17.865
		ant 2	8.81	7.603
	5270	ant 1	11.57	14.355
		ant 2	7.55	5.689
	5310	ant 1	11.51	14.158
		ant 2	7.2	5.248
	5510	ant 1	12.69	18.578
		ant 2	7.76	5.970
	5550	ant 1	12.63	18.323
		ant 2	7.68	5.861

	5670	ant 1	13.52	22.491
		ant 2	8.14	6.516
	5755	ant 1	13.59	22.856
		ant 2	8.08	6.427
	5795	ant 1	13.29	21.330
		ant 2	8.08	6.427
IEEE 802.11ac VHT40	5190	ant 1	12.51	17.824
		ant 2	9.19	8.299
	5230	ant 1	12.65	18.408
		ant 2	9	7.943
	5270	ant 1	11.64	14.588
		ant 2	7.67	5.848
	5310	ant 1	11.7	14.791
		ant 2	7.25	5.309
	5510	ant 1	12.69	18.578
		ant 2	7.75	5.957
	5590	ant 1	12.78	18.967
		ant 2	7.63	5.794
	5670	ant 1	13.41	21.928
		ant 2	8.19	6.592
	5755	ant 1	13.5	22.387
		ant 2	7.91	6.180
	5795	ant 1	13.26	21.184
		ant 2	7.96	6.252
IEEE 802.11ax HE40	5190	ant 1	11.74	14.928
		ant 2	9.39	8.690
	5230	ant 1	12.25	16.788
		ant 2	9.29	8.492
	5270	ant 1	11.48	14.060
		ant 2	8.34	6.823
	5310	ant 1	11.47	14.028
		ant 2	8.45	6.998
	5510	ant 1	12.04	15.996
		ant 2	9.36	8.630
	5590	ant 1	11.79	15.101
		ant 2	9.83	9.616
	5670	ant 1	12.77	18.923
		ant 2	10.8	12.023

	5755	ant 1	12.67	18.493
		ant 2	11.19	13.152
	5795	ant 1	12.37	17.258
		ant 2	11.01	12.618
IEEE 802.11ac VHT80	5210	ant 1	12.19	16.558
		ant 2	8.98	7.907
	5290	ant 1	11.34	13.614
		ant 2	7.54	5.675
	5530	ant 1	12.51	17.824
		ant 2	8.08	6.427
	5610	ant 1	12.13	16.331
		ant 2	7.78	5.998
	5775	ant 1	13.15	20.654
		ant 2	7.67	5.848
IEEE 802.11ax HE80	5210	ant 1	12.27	16.866
		ant 2	9.93	9.840
	5290	ant 1	11.63	14.555
		ant 2	9.18	8.279
	5530	ant 1	12.64	18.365
		ant 2	10.74	11.858
	5610	ant 1	12.29	16.943
		ant 2	11.22	13.243
	5775	ant 1	13.23	21.038
		ant 2	12.08	16.144

3. Calculated Result and Limit

SISO

The Worst Mode	Ant.	Peak output power (dBm)	Target power (dBm)	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW /cm2)	Limited of Power Density (S) (mW /cm2)	Test Result
					(dBi)	(Linear)			
2.4G Band									
GFSK	ant 1	8.83	8±1	9	3.27	2.123	0.0034	1	Complies
π/4-DQPSK	ant 1	10.27	10 ±1	11	3.27	2.123	0.0053	1	Complies
8-DPSK	ant 1	8.72	8±1	9	3.27	2.123	0.0034	1	Complies
BLE1M	ant 1	6.6	6 ±1	7	3.27	2.123	0.0021	1	Complies
IEEE 802.11b	ant 1	15.4	15 ±1	16	3.27	2.123	0.0168	1	Complies
	ant 2	14.51	14 ±1	15	3.27	2.123	0.0134	1	Complies
IEEE 802.11g	ant 1	21.44	21 ±1	21	3.27	2.123	0.0532	1	Complies
	ant 2	20.23	20 ±1	21	3.27	2.123	0.0532	1	Complies
IEEE 802.11n HT20	ant 1	18.7	18 ±1	19	3.27	2.123	0.0336	1	Complies
	ant 2	15.32	15±1	16	3.27	2.123	0.0168	1	Complies
IEEE802.11ax HE20	ant 1	19.73	19 ±1	20	3.27	2.123	0.0422	1	Complies
	ant 2	19.5	19 ±1	20	3.27	2.123	0.0422	1	Complies
5G Band									
IEEE 802.11a	ant 1	15.5	15 ±1	16	4.47	2.7990	0.0222	1	Complies
	ant 2	11.73	11 ±1	12	4.47	2.7990	0.0088	1	Complies
IEEE 802.11n HT20	ant 1	13.21	13 ±1	14	4.47	2.7990	0.0140	1	Complies
	ant 2	9.07	9 ±1	10	4.47	2.7990	0.0056	1	Complies
IEEE802.11ac VHT20	ant 1	13.13	13 ±1	14	4.47	2.7990	0.0140	1	Complies
	ant 2	9	9 ±1	10	4.47	2.7990	0.0056	1	Complies
IEEE802.11ax HE20	ant 1	11.03	11 ±1	12	4.47	2.7990	0.0088	1	Complies
	ant 2	9.15	9 ±1	10	4.47	2.7990	0.0056	1	Complies
IEEE 802.11n HT40	ant 1	13.59	13 ±1	14	4.47	2.7990	0.0140	1	Complies
	ant 2	9.19	9 ±1	10	4.47	2.7990	0.0056	1	Complies
IEEE 802.11ac VHT40	ant 1	13.5	13 ±1	14	4.47	2.7990	0.0140	1	Complies
	ant 2	9.19	9 ±1	10	4.47	2.7990	0.0056	1	Complies
IEEE802.11ax HE40	ant 1	12.77	12 ±1	13	4.47	2.7990	0.0111	1	Complies
	ant 2	11.19	11 ±1	12	4.47	2.7990	0.0088	1	Complies

IEEE 802.11ac VHT80	ant 1	13.15	13 ±1	14	4.47	2.7990	0.0140	1	Complies
	ant 2	8.98	8 ±1	9	4.47	2.7990	0.0044	1	Complies
IEEE802.11ax HE80	ant 1	13.23	13 ±1	14	4.47	2.7990	0.0140	1	Complies
	ant 2	12.08	12 ±1	13	4.47	2.7990	0.0111	1	Complies

MIMO

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	0.0336	0.0168	0.0504	1	Complies
IEEE 802.11n HT40	0.0422	0.0422	0.0845	1	Complies
5G Band					
IEEE 802.11n HT20	0.0140	0.0056	0.0196	1	Complies
IEEE 802.11ac VHT20	0.0140	0.0056	0.0196	1	Complies
IEEE802.11ax HE20	0.0088	0.0056	0.0144	1	Complies
IEEE 802.11n HT40	0.0140	0.0056	0.0196	1	Complies
IEEE 802.11ac VHT40	0.0140	0.0056	0.0196	1	Complies
IEEE802.11ax HE40	0.0111	0.0088	0.0199	1	Complies
IEEE 802.11ac VHT80	0.0140	0.0044	0.0184	1	Complies
IEEE802.11ax HE80	0.0140	0.0111	0.0251	1	Complies

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	Total Ratio	Limit Ratio	Test Result
0.0053	0.0845	0.0898	1	Complies

Note: 2.4 and 5GHz bands are share an antenna, Can't both the 2.4 and 5 GHz bands operate simultaneously.

End of Test Report