



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	

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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)	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
$\pi/4$ -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
IEEE 802.11n HT40	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
	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