



FCC 47 CFR MPE REPORT

Linkplay Technology Inc

WiiM Sound; WiiM Sound Lite

Model Number: SPK001

Additional Model: SPK002

FCC ID: 2BABF-SPK001

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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	9.38	8.670
	2441	ant 1	9.87	9.705
	2480	ant 1	8.82	7.621
$\pi/4$ -DQPSK	2402	ant 1	8.81	7.603
	2441	ant 1	9.2	8.318
	2480	ant 1	8.5	7.079
8-DPSK	2402	ant 1	9.18	8.279
	2441	ant 1	9.62	9.162
	2480	ant 1	8.77	7.534
BLE 1M	2402	ant 1	9.55	9.016
	2440	ant 1	9.71	9.354
	2480	ant 1	8.79	7.568
BLE 2M	2402	ant 1	9.84	9.638
	2440	ant 1	10.06	10.139
	2480	ant 1	9.08	8.091
IEEE 802.11b	2412	ant 1	14.66	29.242
		ant 2	15.13	32.584
	2437	ant 1	14.93	31.117
		ant 2	15.56	35.975
	2462	ant 1	14.97	31.405
		ant 2	15.78	37.844
IEEE 802.11g	2412	ant 1	19.41	87.297
		ant 2	19.84	96.383
	2437	ant 1	19.76	94.624
		ant 2	20.16	103.753
	2462	ant 1	19.76	94.624
		ant 2	20.48	111.686
IEEE 802.11n HT20	2412	ant 1	19.5	89.125
		ant 2	20.95	124.451
	2437	ant 1	19.67	92.683
		ant 2	20.19	104.472
	2462	ant 1	19.75	94.406
		ant 2	20.66	116.413
IEEE	2412	ant 1	21.02	126.474

802.11ax HE20	2437	ant 2	21.56	143.219
		ant 1	21.24	133.045
		ant 2	21.9	154.882
2462	ant 1	21.34	136.144	
		ant 2	22.16	164.437
IEEE 802.11a	5180	ant 1	14.95	31.261
		ant 2	13.07	20.277
	5200	ant 1	15.23	33.343
		ant 2	13.71	23.496
	5240	ant 1	14.58	28.708
		ant 2	14.27	26.730
	5260	ant 1	14.39	27.479
		ant 2	14.41	27.606
	5300	ant 1	13.55	22.646
		ant 2	14.42	27.669
	5320	ant 1	13.06	20.230
		ant 2	14.51	28.249
	5500	ant 1	14.92	31.046
		ant 2	11.82	15.205
	5580	ant 1	14.04	25.351
		ant 2	13.33	21.528
	5700	ant 1	14.24	26.546
		ant 2	14.69	29.444
	5745	ant 1	15.55	35.892
		ant 2	15.25	33.497
	5785	ant 1	15.1	32.359
		ant 2	14.74	29.785
	5825	ant 1	14.58	28.708
		ant 2	14.34	27.164
IEEE 802.11n20	5180	ant 1	13.78	23.878
		ant 2	12.99	19.907
	5200	ant 1	14.12	25.823
		ant 2	14	25.119
	5240	ant 1	14.06	25.468
		ant 2	12.72	18.707
	5260	ant 1	14.62	28.973
		ant 2	12.69	18.578
	5300	ant 1	14.32	27.040
		ant 2	13.01	19.999

		5320	ant 1	14.31	26.977
			ant 2	12.71	18.664
		5500	ant 1	13.7	23.442
			ant 2	12.82	19.143
		5580	ant 1	13.04	20.137
			ant 2	13.04	20.137
		5700	ant 1	13.86	24.322
			ant 2	13.21	20.941
		5745	ant 1	15.36	34.356
			ant 2	14.8	30.200
		5785	ant 1	15.01	31.696
			ant 2	14.63	29.040
		5825	ant 1	14.56	28.576
			ant 2	14.51	28.249
IEEE 802.11ac VHT20		5180	ant 1	14.91	30.974
			ant 2	12.95	19.724
		5200	ant 1	15.33	34.119
			ant 2	13.7	23.442
		5240	ant 1	14.44	27.797
			ant 2	14.09	25.645
		5260	ant 1	14.26	26.669
			ant 2	14.37	27.353
		5300	ant 1	13.44	22.080
			ant 2	14.36	27.290
		5320	ant 1	12.95	19.724
			ant 2	14.54	28.445
		5500	ant 1	14.54	28.445
			ant 2	12.15	16.406
		5580	ant 1	13.89	24.491
			ant 2	13.29	21.330
		5700	ant 1	14.15	26.002
			ant 2	14.65	29.174
		5745	ant 1	15.51	35.563
			ant 2	15.11	32.434
		5785	ant 1	14.95	31.261
			ant 2	14.75	29.854
		5825	ant 1	14.47	27.990
			ant 2	14.2	26.303
IEEE		5180	ant 1	13.83	24.155

802.11ax HE20		ant 2	14.15	26.002
	5200	ant 1	14.06	25.468
		ant 2	14.68	29.376
	5240	ant 1	14.37	27.353
		ant 2	14.18	26.182
	5260	ant 1	14.63	29.040
		ant 2	13.93	24.717
	5300	ant 1	14.57	28.642
		ant 2	13.76	23.768
	5320	ant 1	14.57	28.642
		ant 2	13.96	24.889
	5500	ant 1	14.12	25.823
		ant 2	14.34	27.164
	5580	ant 1	14.58	28.708
		ant 2	14.21	26.363
	5700	ant 1	14.2	26.303
		ant 2	14.06	25.468
	5745	ant 1	15.27	33.651
		ant 2	15.41	34.754
	5785	ant 1	15.04	31.915
		ant 2	15.23	33.343
	5825	ant 1	14.66	29.242
		ant 2	15.25	33.497
IEEE 802.11n HT40	5190	ant 1	15.89	38.815
		ant 2	13.33	21.528
	5230	ant 1	15.35	34.277
		ant 2	13.98	25.003
	5270	ant 1	14.34	27.164
		ant 2	14.23	26.485
	5310	ant 1	13.32	21.478
		ant 2	14.25	26.607
	5510	ant 1	14.51	28.249
		ant 2	12.09	16.181
	5550	ant 1	13.97	24.946
		ant 2	13.43	22.029
	5670	ant 1	13.62	23.014
		ant 2	14.52	28.314
	5755	ant 1	15.74	37.497
		ant 2	15.21	33.189

	5795	ant 1	15.2	33.113
		ant 2	14.93	31.117
IEEE 802.11ac VHT40	5190	ant 1	15.61	36.392
		ant 2	13.69	23.388
	5230	ant 1	15.09	32.285
		ant 2	14.68	29.376
	5270	ant 1	14.25	26.607
		ant 2	14.7	29.512
	5310	ant 1	13.21	20.941
		ant 2	14.29	26.853
	5510	ant 1	14.56	28.576
		ant 2	13.96	24.889
	5590	ant 1	14.11	25.763
		ant 2	14.06	25.468
	5670	ant 1	13.84	24.210
		ant 2	14.14	25.942
	5755	ant 1	15.64	36.644
		ant 2	15.76	37.670
	5795	ant 1	15.23	33.343
		ant 2	15.44	34.995
IEEE 802.11ax HE40	5190	ant 1	14.7	29.512
		ant 2	14.78	30.061
	5230	ant 1	14.8	30.200
		ant 2	14.88	30.761
	5270	ant 1	14.8	30.200
		ant 2	13.97	24.946
	5310	ant 1	14.55	28.510
		ant 2	13.83	24.155
	5510	ant 1	14.19	26.242
		ant 2	14.19	26.242
	5590	ant 1	14.59	28.774
		ant 2	14.12	25.823
	5670	ant 1	13.81	24.044
		ant 2	13.92	24.660
	5755	ant 1	15.71	37.239
		ant 2	15.55	35.892
	5795	ant 1	15.32	34.041
		ant 2	15.43	34.914
IEEE	5210	ant 1	14.31	26.977

802.11ac VHT80	5290	ant 2	14.24	26.546
		ant 1	13.98	25.003
		ant 2	13.04	20.137
	5530	ant 1	13.7	23.442
		ant 2	13.53	22.542
	5610	ant 1	13.81	24.044
		ant 2	13.36	21.677
	5775	ant 1	14.33	27.102
		ant 2	14.36	27.290
IEEE 802.11ax HE80	5210	ant 1	14.15	26.002
		ant 2	14.45	27.861
	5290	ant 1	14.18	26.182
		ant 2	12.99	19.907
	5530	ant 1	13.73	23.605
		ant 2	13.75	23.714
	5610	ant 1	13.75	23.714
		ant 2	13.4	21.878
	5775	ant 1	14.37	27.353
		ant 2	14.48	28.054
IEEE 802.11ax HE20	5955	ant 1	6.35	4.315
		ant 2	6.36	4.325
	6175	ant 1	8.79	7.568
		ant 2	5.38	3.451
	6415	ant 1	5.96	3.945
		ant 2	6.45	4.416
	6435	ant 1	5.34	3.420
		ant 2	6.68	4.656
	6475	ant 1	4.87	3.069
		ant 2	5.89	3.882
	6515	ant 1	5.3	3.388
		ant 2	6.96	4.966
	6535	ant 1	4.06	2.547
		ant 2	5.27	3.365
	6695	ant 1	6.82	4.808
		ant 2	6.89	4.887
	6855	ant 1	6.03	4.009
		ant 2	6.41	4.375
	6875	ant 1	5.21	3.319
		ant 2	7	5.012

		6895	ant 1	6.72	4.699
			ant 2	6.84	4.831
		6995	ant 1	4.92	3.105
			ant 2	5.6	3.631
		7115	ant 1	3.75	2.371
			ant 2	4.54	2.844
IEEE 802.11ax HE40	5965		ant 1	8.89	7.745
			ant 2	9.17	8.260
	6165		ant 1	7.05	5.070
			ant 2	7.75	5.957
	6405		ant 1	7.27	5.333
			ant 2	7.68	5.861
	6445		ant 1	6.43	4.395
			ant 2	7.68	5.861
	6485		ant 1	8.96	7.870
			ant 2	7.18	5.224
	6525		ant 1	6.04	4.018
			ant 2	7.76	5.970
	6565		ant 1	5.91	3.899
			ant 2	6.58	4.550
	6685		ant 1	7.68	5.861
			ant 2	7.56	5.702
	6845		ant 1	5.4	3.467
			ant 2	7.61	5.768
	6885		ant 1	7.22	5.272
			ant 2	9.01	7.962
	6925		ant 1	8.25	6.683
			ant 2	7.82	6.053
	6965		ant 1	7.56	5.702
			ant 2	7.37	5.458
	7085		ant 1	6.01	3.990
			ant 2	7.05	5.070
IEEE 802.11ax HE80	5985		ant 1	7.77	5.984
			ant 2	7.58	5.728
	6145		ant 1	6.3	4.266
			ant 2	7.1	5.129
	6385		ant 1	8.28	6.730
			ant 2	8.47	7.031
		6465	ant 1	7.49	5.610

		ant 2	8.74	7.482
	6545	ant 1	6.85	4.842
		ant 2	7.76	5.970
	6625	ant 1	8.58	7.211
		ant 2	8.6	7.244
	6705	ant 1	8.93	7.816
		ant 2	9.71	9.354
	6785	ant 1	7.16	5.200
		ant 2	9.15	8.222
	6865	ant 1	8.01	6.324
		ant 2	9.46	8.831
	6945	ant 1	10.62	11.535
		ant 2	10.85	12.162
	7025	ant 1	10.13	10.304
		ant 2	10.16	10.375

3. Calculated Result and Limit

3.1. SISO

The Worst Mode	Antenna	Peak output power (dBm)	Target power (dBm)	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)	Test Result
					(dBi)	(Linear)			
2.4G Band									
GFSK	ant 1	9.87	9±1	10	3.46	2.218	0.0044	1	Complies
π/4-DQPSK	ant 1	9.2	9 ±1	10	3.46	2.218	0.0044	1	Complies
8-DPSK	ant 1	9.62	9±1	10	3.46	2.218	0.0044	1	Complies
BLE	ant 1	10.06	10 ±1	11	3.46	2.218	0.0056	1	Complies
IEEE 802.11b	ant 1	14.97	14 ±1	15	3.46	2.218	0.0140	1	Complies
	ant 2	15.78	15 ±1	16	3.46	2.218	0.0176	1	Complies
IEEE 802.11g	ant 1	19.76	19 ±1	20	3.46	2.218	0.0441	1	Complies
	ant 2	20.48	20 ±1	21	3.46	2.218	0.0556	1	Complies
IEEE 802.11n HT20	ant 1	19.75	19 ±1	20	3.46	2.218	0.0441	1	Complies
	ant 2	20.95	20±1	21	3.46	2.218	0.0556	1	Complies
IEEE802.11ax HE20	ant 1	21.34	21 ±1	22	3.46	2.218	0.0699	1	Complies
	ant 2	22.16	22 ±1	23	3.46	2.218	0.0880	1	Complies
5G Band									
IEEE 802.11a	ant 1	15.55	15 ±1	16	2.67	1.8493	0.0146	1	Complies
	ant 2	15.25	15 ±1	16	2.67	1.8493	0.0146	1	Complies
IEEE 802.11n HT20	ant 1	15.36	15 ±1	16	2.67	1.8493	0.0146	1	Complies
	ant 2	14.8	14 ±1	16	2.67	1.8493	0.0146	1	Complies
IEEE802.11ac VHT20	ant 1	15.51	15 ±1	16	2.67	1.8493	0.0146	1	Complies
	ant 2	15.11	15 ±1	16	2.67	1.8493	0.0146	1	Complies

IEEE802.11a x HE20	ant 1	15.27	15 ±1	16	2.67	1.8493	0.0146	1	Complies
	ant 2	15.41	15 ±1	16	2.67	1.8493	0.0146	1	Complies
IEEE 802.11n HT40	ant 1	15.89	15 ±1	16	2.67	1.8493	0.0146	1	Complies
	ant 2	15.21	15 ±1	16	2.67	1.8493	0.0146	1	Complies
IEEE 802.11ac VHT40	ant 1	15.64	15±1	16	2.67	1.8493	0.0146	1	Complies
	ant 2	15.76	15 ±1	16	2.67	1.8493	0.0146	1	Complies
IEEE802.11a x HE40	ant 1	15.71	15 ±1	16	2.67	1.8493	0.0146	1	Complies
	ant 2	15.55	15 ±1	16	2.67	1.8493	0.0146	1	Complies
IEEE 802.11ac VHT80	ant 1	14.33	14 ±1	15	2.67	1.8493	0.0116	1	Complies
	ant 2	14.36	14 ±1	15	2.67	1.8493	0.0116	1	Complies
IEEE802.11a x HE80	ant 1	14.37	14 ±1	15	2.67	1.8493	0.0116	1	Complies
	ant 2	14.48	14 ±1	15	2.67	1.8493	0.0116	1	Complies
6G Band									
IEEE802.11a x HE20	ant 1	8.79	8 ±1	9	3.51	2.2439	0.0035	1	Complies
	ant 2	7	7±1	8	3.51	2.2439	0.0028	1	Complies
IEEE802.11a x HE40	ant 1	8.96	8 ±1	9	3.51	2.2439	0.0035	1	Complies
	ant 2	9.17	9±1	10	3.51	2.2439	0.0045	1	Complies
IEEE802.11a x HE80	ant 1	10.62	10 ±1	11	3.51	2.2439	0.0056	1	Complies
	ant 2	10.85	10 ±1	11	3.51	2.2439	0.0056	1	Complies

3.2. BT+WIFI

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	Total Ratio	Limit Ratio	Test Result
0.0056	0.0880	0.0936	1	Complies

Note: WiFi 2.4G/5GHz/6GHz bands are share an antenna, Cann't both the 2.4G/5GHz/6GHz bands operate simultaneously.

End of Test Report