FCC 47 CFR MPE REPORT

Linkplay Technoiogy lnc

WiiM Sub Pro Smart Subwoofer

Model Number: SUB001

FCC ID: 2BABF-SUB001

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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 (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ 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

Mode	Frequency (MHz)	Antenna	Peak output power (dBm)	Peak output power (mW)
BLE 1M	2402	ant 1	7.93	6.209
	2440	ant 1	7.89	6.152
	2480	ant 1	6.68	4.656
BLE 2M	2402	ant 1	8.48	7.047
	2440	ant 1	8.41	6.934
	2480	ant 1	7.19	5.236
IEEE 802.11b	2412	ant 1	16.91	49.091
		ant 2	17.04	50.582
	2437	ant 1	17.39	54.828
		ant 2	17.06	50.816
	2462	ant 1	17.07	50.933
		ant 2	17.1	51.286
IEEE 802.11g	2412	ant 1	18.08	64.269
		ant 2	18.13	65.013
	2437	ant 1	18.36	68.549
		ant 2	18.24	66.681
	2462	ant 1	18.33	68.077
		ant 2	18.33	68.077
IEEE 802.11n HT20	2412	ant 1	17.92	61.944
		ant 2	18.07	64.121
	2437	ant 1	18.11	64.714
		ant 2	18.29	67.453
	2462	ant 1	18.28	67.298
		ant 2	18.35	68.391
IEEE 802.11ax HE20	2412	ant 1	19.1	81.283
		ant 2	19.14	82.035
	2437	ant 1	19.34	85.901
		ant 2	19.4	87.096
	2462	ant 1	19.27	84.528
		ant 2	19.33	85.704
IEEE 802.11a	5180	ant 1	15.73	37.411
		ant 2	15.58	36.141
	5200	ant 1	15.67	36.898
		ant 2	15.99	39.719
	5240	ant 1	14.62	28.973

		ant 2	15.13	32.584
	5260	ant 1	14.03	25.293
		ant 2	16.43	43.954
	5300	ant 1	15.23	33.343
		ant 2	15.11	32.434
	5320	ant 1	14.91	30.974
		ant 2	15.88	38.726
	5500	ant 1	17.46	55.719
		ant 2	17.3	53.703
	5580	ant 1	16.74	47.206
		ant 2	17.33	54.075
	5700	ant 1	17.55	56.885
		ant 2	16.81	47.973
	5745	ant 1	18.72	74.473
		ant 2	18.51	70.958
	5785	ant 1	18.31	67.764
		ant 2	18.7	74.131
	5825	ant 1	17.59	57.412
		ant 2	18	63.096
IEEE 802.11n20	5180	ant 1	17.49	56.105
		ant 2	17.74	59.429
	5200	ant 1	17.96	62.517
		ant 2	18.12	64.863
	5240	ant 1	16.88	48.753
		ant 2	17.54	56.754
	5260	ant 1	16.47	44.361
		ant 2	17.35	54.325
	5300	ant 1	16.12	40.926
		ant 2	16.07	40.458
	5320	ant 1	15.76	37.670
		ant 2	15.95	39.355
	5500	ant 1	17.46	55.719
		ant 2	17.25	53.088
	5580	ant 1	16.75	47.315
		ant 2	17.13	51.642
	5700	ant 1	17.56	57.016
		ant 2	16.96	49.659
	5745	ant 1	18.97	78.886
		ant 2	18.78	75.509

	5785	ant 1	18.24	66.681
		ant 2	18.74	74.817
	5825	ant 1	17.67	58.479
		ant 2	18.02	63.387
IEEE 802.11ac VHT20	5180	ant 1	17.84	60.814
		ant 2	17.86	61.094
	5200	ant 1	18.1	64.565
		ant 2	18.26	66.988
	5240	ant 1	16.88	48.753
		ant 2	17.52	56.494
	5260	ant 1	16.79	47.753
		ant 2	17.34	54.200
	5300	ant 1	16.22	41.879
		ant 2	16.19	41.591
	5320	ant 1	15.71	37.239
		ant 2	15.95	39.355
	5500	ant 1	17.43	55.335
		ant 2	17.17	52.119
	5580	ant 1	16.78	47.643
		ant 2	17.47	55.847
	5700	ant 1	17.34	54.200
		ant 2	16.7	46.774
	5745	ant 1	18.8	75.858
		ant 2	18.54	71.450
	5785	ant 1	18.3	67.608
		ant 2	18.56	71.779
	5825	ant 1	17.5	56.234
		ant 2	18.02	63.387
IEEE 802.11ax HE20	5180	ant 1	18.79	75.683
		ant 2	18.68	73.790
	5200	ant 1	19	79.433
		ant 2	19.12	81.658
	5240	ant 1	18.17	65.615
		ant 2	18.56	71.779
	5260	ant 1	17.7	58.884
		ant 2	18.54	71.450
	5300	ant 1	17.3	53.703
		ant 2	17.24	52.966
	5320	ant 1	17.02	50.350

		ant 2	17.23	52.845
	5500	ant 1	18.73	74.645
		ant 2	18.47	70.307
	5580	ant 1	18.02	63.387
		ant 2	18.49	70.632
	5700	ant 1	18.78	75.509
		ant 2	17.99	62.951
	5745	ant 1	17.99	62.951
		ant 2	17.7	58.884
	5785	ant 1	17.25	53.088
		ant 2	17.7	58.884
	5825	ant 1	16.57	45.394
		ant 2	16.99	50.003
IEEE 802.11n HT40	5190	ant 1	18.21	66.222
		ant 2	18.18	65.766
	5230	ant 1	17.49	56.105
		ant 2	17.97	62.661
	5270	ant 1	16.19	41.591
		ant 2	16.89	48.865
	5310	ant 1	15.53	35.727
		ant 2	15.68	36.983
	5510	ant 1	17.29	53.580
		ant 2	16.94	49.431
	5550	ant 1	17.15	51.880
		ant 2	17.13	51.642
	5670	ant 1	16.61	45.814
		ant 2	16.64	46.132
	5755	ant 1	18.52	71.121
		ant 2	18.54	71.450
	5795	ant 1	17.97	62.661
		ant 2	18.28	67.298
IEEE 802.11ac VHT40	5190	ant 1	17.94	62.230
		ant 2	18.06	63.973
	5230	ant 1	17.28	53.456
		ant 2	17.82	60.534
	5270	ant 1	16.07	40.458
		ant 2	16.76	47.424
	5310	ant 1	15.81	38.107
		ant 2	15.75	37.584

	5510	ant 1	17.22	52.723
		ant 2	17.07	50.933
	5590	ant 1	17.13	51.642
		ant 2	17.1	51.286
	5670	ant 1	16.59	45.604
		ant 2	16.52	44.875
	5755	ant 1	18.68	73.790
		ant 2	18.5	70.795
	5795	ant 1	17.86	61.094
		ant 2	18.32	67.920
IEEE 802.11ax HE40	5190	ant 1	16.81	47.973
		ant 2	17.04	50.582
	5230	ant 1	16.21	41.783
		ant 2	16.78	47.643
	5270	ant 1	14.73	29.717
		ant 2	15.32	34.041
	5310	ant 1	14.24	26.546
		ant 2	14.25	26.607
	5510	ant 1	18.45	69.984
		ant 2	18.14	65.163
	5590	ant 1	18.17	65.615
		ant 2	18.21	66.222
	5670	ant 1	17.71	59.020
		ant 2	17.65	58.210
	5755	ant 1	16.96	49.659
		ant 2	17.11	51.404
	5795	ant 1	16.52	44.875
		ant 2	16.65	46.238
IEEE 802.11ac VHT80	5210	ant 1	18.16	65.464
		ant 2	18.57	71.945
	5290	ant 1	16.35	43.152
		ant 2	16.44	44.055
	5530	ant 1	17.68	58.614
		ant 2	17.58	57.280
	5610	ant 1	16.7	46.774
		ant 2	16.75	47.315
	5775	ant 1	18.1	64.565
		ant 2	18.2	66.069
IEEE	5210	ant 1	17.04	50.582

802.11ax HE80		ant 2	17.16	52.000
	5290	ant 1	14.79	30.130
		ant 2	15.02	31.769
	5530	ant 1	16.07	40.458
		ant 2	15.93	39.174
	5610	ant 1	15.23	33.343
		ant 2	15.27	33.651
	5775	ant 1	16.36	43.251
		ant 2	16.4	43.652
IEEE 802.11ax HE20	5955	ant 1	14.52	28.314
		ant 2	15.42	34.834
	6175	ant 1	15	31.623
		ant 2	15.32	34.041
	6415	ant 1	14.76	29.923
		ant 2	15.94	39.264
IEEE 802.11ax HE40	5965	ant 1	15.48	35.318
		ant 2	15.82	38.194
	6165	ant 1	14.68	29.376
		ant 2	15.66	36.813
	6405	ant 1	15.33	34.119
		ant 2	15.87	38.637
IEEE 802.11ax HE80	5985	ant 1	14.12	25.823
		ant 2	15.41	34.754
	6145	ant 1	14.94	31.189
		ant 2	15.9	38.905
	6385	ant 1	15.1	32.359
		ant 2	15.67	36.898

3. Calculated Result and Limit

The Worst Mode	Antenna	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									
BLE 1M	ant 1	7.93	7±1	8	2.2	1.660	0.0021	1	Complies
BLE 2M	ant 1	8.48	8 ±1	9	2.2	1.660	0.0026	1	Complies
IEEE 802.11b	ant 1	17.39	17 ±1	18	2.2	1.660	0.0208	1	Complies
	ant 2	17.1	17 ±1	18	2.7	1.862	0.0234	1	Complies
IEEE 802.11g	ant 1	18.36	18 ±1	19	2.2	1.660	0.0262	1	Complies
	ant 2	18.33	18 ±1	19	2.7	1.862	0.0294	1	Complies
IEEE 802.11n HT20	ant 1	18.28	18 ±1	19	2.2	1.660	0.0262	1	Complies
	ant 2	18.35	18±1	19	2.7	1.862	0.0294	1	Complies
IEEE 802.11n HT40	ant 1	19.34	19 ±1	20	2.2	1.660	0.0330	1	Complies
	ant 2	19.4	19 ±1	20	2.7	1.862	0.0370	1	Complies
IEEE802.11ax HE20	ant 1	17.39	17 ±1	18	2.2	1.660	0.0208	1	Complies
	ant 2	17.1	17 ±1	18	2.7	1.862	0.0234	1	Complies
5G Band									
IEEE 802.11a	ant 1	18.72	18 ±1	19	2.7	1.8621	0.0294	1	Complies
	ant 2	18.7	18 ±1	19	2.1	1.6218	0.0256	1	Complies
IEEE 802.11n HT20	ant 1	18.97	18 ±1	19	2.7	1.8621	0.0294	1	Complies
	ant 2	18.78	18 ±1	19	2.1	1.6218	0.0256	1	Complies
IEEE802.11ac VHT20	ant 1	18.8	18 ±1	19	2.7	1.8621	0.0294	1	Complies
	ant 2	18.56	18 ±1	19	2.1	1.6218	0.0256	1	Complies
IEEE802.11ax HE20	ant 1	19	19 ±1	20	2.7	1.8621	0.0370	1	Complies
	ant 2	19.12	19 ±1	20	2.1	1.6218	0.0323	1	Complies
IEEE 802.11n HT40	ant 1	18.52	18 ±1	19	2.7	1.8621	0.0294	1	Complies
	ant 2	18.54	18 ±1	19	2.1	1.6218	0.0256	1	Complies
IEEE 802.11ac	ant 1	18.68	18±1	19	2.7	1.8621	0.0294	1	Complies

VHT40	ant 2	18.5	18 ±1	19	2.1	1.6218	0.0256	1	Complies
IEEE802.11ax HE40	ant 1	18.45	18 ±1	19	2.7	1.8621	0.0294	1	Complies
	ant 2	18.21	18 ±1	19	2.1	1.6218	0.0256	1	Complies
IEEE 802.11ac VHT80	ant 1	18.16	18 ±1	19	2.7	1.8621	0.0294	1	Complies
	ant 2	18.57	18 ±1	19	2.1	1.6218	0.0256	1	Complies
IEEE802.11ax HE80	ant 1	17.04	17 ±1	18	2.7	1.8621	0.0234	1	Complies
	ant 2	17.16	17 ±1	18	2.1	1.6218	0.0204	1	Complies
6G Band									
IEEE802.11ax HE20	ant 1	15	15 ±1	16	2.5	1.7783	0.0141	1	Complies
	ant 2	15.94	15 ±1	16	3.2	2.0893	0.0165	1	Complies
IEEE802.11ax HE40	ant 1	15.48	15 ±1	16	2.5	1.7783	0.0141	1	Complies
	ant 2	15.87	15 ±1	16	3.2	2.0893	0.0165	1	Complies
IEEE802.11ax HE80	ant 1	15.1	15 ±1	16	2.5	1.7783	0.0141	1	Complies
	ant 2	15.9	15 ±1	16	3.2	2.0893	0.0165	1	Complies

BT+WIFI				
MAX Power Density (S) (mW/cm^2) Bluetooth	MAX Power Density (S) (mW/cm^2) WiFi	Total Ratio	Limit Ratio	Test Result
0.0026	0.037	0.0396	1	Complies

End of Test Report