

FCC 47 CFR MPE REPORT

PDi Communication Systems, Inc.

WiFi Module

Model Number: WB800D

FCC ID: 2AL3T-WB800D

Applicant:	PDi Communication Systems, Inc.
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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

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

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)	Peak output power (dBm)	Peak output power (mW)
GFSK	2402	7.36	5.445
	2441	7.35	5.433
	2480	6.85	4.842
$\pi/4$ -DQPSK	2402	7.53	5.662
	2441	7.28	5.346
	2480	6.83	4.819
8-DPSK	2402	7.76	5.970
	2441	7.52	5.649
	2480	7.21	5.260
BLE 1M	2402	7.84	6.081
	2440	7.43	5.534
	2480	7.22	5.272
BLE 2M	2402	7.92	6.194
	2440	7.68	5.861
	2480	7.42	5.521
IEEE 802.11b	2412	19.21	83.368
	2437	18.91	77.804
	2462	18.91	77.804
IEEE 802.11g	2412	21.65	146.218
	2437	21.87	153.815
	2462	21.69	147.571
IEEE 802.11n HT20	2412	21.79	151.008
	2437	21.9	154.882
	2462	21.67	146.893
IEEE 802.11n HT40	2422	21.33	135.831
	2437	21.96	157.036
	2452	21.95	156.675
IEEE 802.11ax HE20	2412	23.31	214.289
	2437	23.35	216.272
	2462	23.12	205.116
IEEE 802.11ax HE40	2422	22.45	175.792
	2437	23.12	205.116
	2452	23.05	201.837
IEEE 802.11a	5180	7.56	5.702

	5200	6.94	4.943
	5240	7.61	5.768
	5260	7.58	5.728
	5300	7.75	5.957
	5320	7.33	5.408
	5500	9.39	8.690
	5580	9.23	8.375
	5700	7.88	6.138
	5745	9.56	9.036
	5785	7.47	5.585
	5825	6.1	4.074
IEEE 802.11n HT20	5180	6.63	4.603
	5200	6.86	4.853
	5240	7.61	5.768
	5260	7.51	5.636
	5300	7.52	5.649
	5320	7.16	5.200
	5500	9.51	8.933
	5580	9.27	8.453
	5700	7.87	6.124
	5745	9.59	9.099
	5785	7.34	5.420
	5825	5.98	3.963
IEEE 802.11ac VHT20	5180	6.52	4.487
	5200	6.81	4.797
	5240	7.22	5.272
	5260	7.64	5.808
	5300	7.43	5.534
	5320	7.3	5.370
	5500	9.2	8.318
	5580	9.24	8.395
	5700	7.87	6.124
	5745	9.85	9.661
	5785	7.48	5.598
	5825	6.08	4.055
	5180	8.19	6.592
	5200	7.73	5.929
	5240	8.41	6.934

IEEE 802.11ax HE20	5260	8.68	7.379
	5300	8.69	7.396
	5320	8.26	6.699
	5500	10.71	11.776
	5580	10.25	10.593
	5700	9.32	8.551
	5745	10.1	10.233
	5785	8.04	6.368
	5825	6.9	4.898
IEEE 802.11n HT40	5190	6.9	4.898
	5230	7.36	5.445
	5270	7.8	6.026
	5310	7.79	6.012
	5510	9.83	9.616
	5550	8.97	7.889
	5670	8.79	7.568
	5755	9.53	8.974
	5795	7.47	5.585
IEEE 802.11ac VHT40	5190	6.72	4.699
	5230	7.58	5.728
	5270	7.81	6.039
	5310	7.72	5.916
	5510	9.98	9.954
	5550	9.28	8.472
	5670	8.63	7.295
	5755	9.34	8.590
	5795	7.4	5.495
IEEE 802.11ax HE40	5190	7.41	5.508
	5230	8.62	7.278
	5270	8.62	7.278
	5310	8.64	7.311
	5510	10.26	10.617
	5550	9.79	9.528
	5670	9.36	8.630
	5755	10.12	10.280
	5795	8.11	6.471

3. Calculated Result and Limit

Mode	Peak output power (dBm)	Target power (dBm)	MAX Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
				(dBi)	(Linear)			
2.4G Band								
GFSK	7.36	8±1	9	4.82	3.034	0.0048	1	Complies
$\pi/4$ -DQPSK	7.53	7±1	8	4.82	3.034	0.0038	1	Complies
8-DPSK	7.76	7±1	8	4.82	3.034	0.0038	1	Complies
BLE 1M	7.84	7±1	8	4.82	3.034	0.0038	1	Complies
BLE 2M	7.92	7±1	8	4.82	3.034	0.0038	1	Complies
IEEE 802.11b	19.21	19 ±1	20	4.82	3.034	0.0604	1	Complies
IEEE 802.11g	21.87	21 ±1	22	4.82	3.034	0.0957	1	Complies
IEEE 802.11n HT20	21.9	21 ±1	22	4.82	3.034	0.0957	1	Complies
IEEE 802.11n HT40	21.96	21±1	22	4.82	3.034	0.0957	1	Complies
IEEE 802.11ax HE20	23.35	23±1	24	4.82	3.034	0.1516	1	Complies
IEEE 802.11ax HE40	23.12	23±1	24	4.82	3.034	0.1516	1	Complies
5G Band								
IEEE 802.11a	9.56	9 ±1	10	4.62	2.8973	0.0058	1	Complies
IEEE 802.11n HT20	9.59	9 ±1	10	4.62	2.8973	0.0058	1	Complies
IEEE802.11ac VHT20	9.85	9 ±1	10	4.62	2.8973	0.0058	1	Complies
IEEE802.11ax HE20	10.71	10 ±1	11	4.62	2.8973	0.0073	1	Complies
IEEE 802.11n HT40	9.83	9 ±1	10	4.62	2.8973	0.0058	1	Complies
IEEE802.11ac VHT40	9.98	9 ±1	10	4.62	2.8973	0.0058	1	Complies
IEEE802.11ax HE40	10.26	10 ±1	11	4.62	2.8973	0.0073	1	Complies

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	Total Ratio	Limit Ratio	Test Result
0.0048	0.1516	0.1564	1	Complies

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

End of Test Report