



FCC 47 CFR MPE REPORT

Jiangmen Dascom Computer Peripherals Co.,Ltd.

Card printer

Model Number: DC-4100

Additional Model: DC-4100+, DC-4100Pro, DC-4100Ultra

FCC ID: Z7ODC4100

Applicant:	Jiangmen Dascom Computer Peripherals Co.,Ltd.
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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 & KDB 447498 D04 V01 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)	Peak output power (dBm)	Peak output power (mW)
GFSK	2402	5.8	3.802
	2441	5.95	3.936
	2480	5.69	3.707
$\pi/4$ -DQPSK	2402	4.49	2.812
	2441	4.62	2.897
	2480	4.27	2.673
8-DPSK	2402	4.84	3.048
	2441	4.87	3.069
	2480	4.62	2.897
BLE 1M	2402	2.54	1.795
	2440	2.67	1.849
	2480	2.43	1.750
BLE 2M	2402	2.69	1.858
	2440	2.79	1.901
	2480	2.56	1.803
IEEE 802.11b	2412	18.94	78.343
	2437	19.1	81.283
	2462	19.06	80.538
IEEE 802.11g	2412	17.84	60.814
	2437	18.08	64.269
	2462	17.98	62.806
IEEE 802.11n HT20	2412	18.05	63.826
	2437	18.26	66.988
	2462	18.23	66.527
IEEE 802.11n HT40	2422	18.24	66.681
	2437	18.27	67.143
	2452	18.26	66.988
IEEE 802.11a	5180	12.22	16.672
	5200	12.64	18.365
	5240	12.26	16.827
	5260	12.21	16.634
	5300	12.25	16.788
	5320	12.3	16.982

	5500	12.17	16.482
	5580	12.28	16.904
	5700	12.27	16.866
	5745	11.56	14.322
	5785	11.73	14.894
	5825	11.5	14.125

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)
IEEE 802.11n HT20	5180	12.49	17.742
	5200	12.92	19.588
	5240	12.46	17.620
	5260	12.31	17.022
	5300	12.41	17.418
	5320	12.35	17.179
	5500	12.91	19.543
	5580	12.81	19.099
	5700	13.1	20.417
	5745	12.09	16.181
	5785	12.09	16.181
	5825	11.86	15.346
IEEE 802.11ac VHT20	5180	12.56	18.030
	5200	12.95	19.724
	5240	12.51	17.824
	5260	12.37	17.258
	5300	12.36	17.219
	5320	12.4	17.378
	5500	12.84	19.231
	5580	12.99	19.907
	5700	13.02	20.045
	5745	12.14	16.368
	5785	12.13	16.331
	5825	11.93	15.596

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)
IEEE 802.11n HT40	5190	12.59	18.155
	5230	12.67	18.493
	5270	12.41	17.418
	5310	12.53	17.906
	5510	13.01	19.999
	5550	13.37	21.727
	5670	12.94	19.679
	5755	12.38	17.298
	5795	12.2	16.596
IEEE 802.11ac VHT40	5190	12.86	19.320
	5230	12.92	19.588
	5270	12.49	17.742
	5310	12.59	18.155
	5510	13.06	20.230
	5550	13.22	20.989
	5670	12.97	19.815
	5755	12.64	18.365
	5795	12.26	16.827
IEEE 802.11ac VHT80	5210	13.37	21.727
	5290	12.69	18.578
	5530	13.48	22.284
	5610	13.85	24.266
	5775	12.9	19.498

3. Calculated Result and Limit

Mode	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	5.95	5±1	6	1	1.259	0.00100	1	Complies
π/4-DQPSK	4.62	4±1	5	1	1.259	0.00079	1	Complies
8-DPSK	4.87	4±1	5	1	1.259	0.00079	1	Complies
BLE 1M	2.67	2±1	3	1	1.259	0.00050	1	Complies
BLE 2M	2.79	2±1	3	1	1.259	0.00050	1	Complies
IEEE 802.11b	19.1	19±1	20	1	1.259	0.02505	1	Complies
IEEE 802.11g	18.08	18±1	19	1	1.259	0.01989	1	Complies
IEEE 802.11n HT20	18.26	18±1	19	1	1.259	0.01989	1	Complies
IEEE 802.11n HT40	18.27	18±1	19	1	1.259	0.01989	1	Complies
5G Band								
IEEE 802.11a	12.64	12±1	13	1	1.259	0.00500	1	Complies
IEEE 802.11n HT20	13.1	13±1	14	1	1.259	0.00629	1	Complies
IEEE802.11acVHT20	13.02	13±1	14	1	1.259	0.00629	1	Complies
IEEE 802.11n HT40	13.37	13±1	14	1	1.259	0.00629	1	Complies
IEEE802.11acVHT40	13.22	13±1	14	1	1.259	0.00629	1	Complies
IEEE802.11acVHT80	13.85	13±1	14	1	1.259	0.00629	1	Complies

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

For RFID-1 13.56MHz

$$\text{Limit} = 180/13.56 = 13.27 \text{ mW/cm}^2$$

$$\text{Field strength} = 46.14 \text{ dBuV/m@3m}$$

$$P = \{ [10^{(46.14/20)} / 10^6 * 3]^2 / 30 \} * 1000 \text{ mW} = 0.0000123 \text{ mW}$$

$$P_d = 2.45 * 10^{-9} \text{ mW/cm}^2 < 13.27 \text{ mW/cm}^2$$

For RFID-2 13.56MHz

$$\text{Limit} = 180/13.56 = 13.27 \text{ mW/cm}^2$$

$$\text{Field strength} = 62.19 \text{ dBuV/m@3m}$$

$$P = \{ [10^{(62.19/20)} / 10^6 * 3]^2 / 30 \} * 1000 \text{ mW} = 0.0004967 \text{ mW}$$

$$P_d = 9.88 * 10^{-8} \text{ mW/cm}^2 < 13.27 \text{ mW/cm}^2$$

BT+WIFI+RFID

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	MAX Power Density (S) (mW/cm ²) RFID-1	MAX Power Density (S) (mW/cm ²) RFID-2	Total Ratio	Limit Ratio	Test Result
0.001	0.02505	$2.45 * 10^{-9}$	$9.88 * 10^{-8}$	0.02605	1	Complies

End of Test Report