

FCC 47 CFR MPE REPORT

Winstars Technology Limited

WiFi 6E Tri-Band AX5400 PCI-E Adapter

Model Number: WS-WN675X3

Addition Model: WL-WN675X3, WS-WN675X3M, WL-WN675X3M,
PAX2235-WIFI-6E-CARD

FCC ID: NZ3-WN0006

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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)	Antena	Peak output power (dBm)	Peak output power (mW)
IEEE 802.11b	2412	ant 1	13.7	23.442
		ant 2	14.01	25.177
	2437	ant 1	14.04	25.351
		ant 2	14.48	28.054
	2462	ant 1	14.92	31.046
		ant 2	14.25	26.607
IEEE 802.11g	2412	ant 1	15.23	33.343
		ant 2	15.12	32.509
	2437	ant 1	15.22	33.266
		ant 2	14.69	29.444
	2462	ant 1	15.82	38.194
		ant 2	16.03	40.087
IEEE 802.11n HT20	2412	ant 1	13.32	21.478
		ant 2	13.15	20.654
	2437	ant 1	13.35	21.627
		ant 2	12.76	18.880
	2462	ant 1	13.94	24.774
		ant 2	13.88	24.434
IEEE 802.11ax HE20	2412	ant 1	12.96	19.770
		ant 2	12.51	17.824
	2437	ant 1	12.35	17.179
		ant 2	11.94	15.631
	2462	ant 1	12.84	19.231
		ant 2	13.52	22.491
IEEE 802.11n HT40	2422	ant 1	13.72	23.550
		ant 2	14.13	25.882
	2437	ant 1	13.66	23.227
		ant 2	13.18	20.797
	2452	ant 1	14.12	25.823
		ant 2	13.94	24.774
IEEE 802.11ax HE40	2422	ant 1	12.72	18.707
		ant 2	13.04	20.137

	2437	ant 1	12.30	16.982
		ant 2	11.86	15.346
	2452	ant 1	12.52	17.865
		ant 2	13.05	20.184
Mode	Frequency (MHz)	Antena	Peak output power (dBm)	Peak output power (mW)
IEEE 802.11a	5180	ant 1	14.88	30.761
		ant 2	13.69	23.388
	5200	ant 1	15.33	34.119
		ant 2	14.15	26.002
	5240	ant 1	15.04	31.915
		ant 2	13.8	23.988
	5745	ant 1	13.92	24.660
		ant 2	14.27	26.730
	5785	ant 1	13.63	23.067
		ant 2	13.75	23.714
	5825	ant 1	13.64	23.121
		ant 2	13.68	23.335
IEEE 802.11n20	5180	ant 1	9.97	9.931
		ant 2	10.31	10.740
	5200	ant 1	10.9	12.303
		ant 2	8.69	7.396
	5240	ant 1	10.84	12.134
		ant 2	8.82	7.621
	5745	ant 1	11.71	14.825
		ant 2	11.97	15.740
	5785	ant 1	11.48	14.060
		ant 2	11.18	13.122
	5825	ant 1	11.43	13.900
		ant 2	10.62	11.535
IEEE 802.11ac VHT20	5180	ant 1	10.06	10.139
		ant 2	9.4	8.710
	5200	ant 1	10.53	11.298
		ant 2	9.86	9.683
	5240	ant 1	10.72	11.803
		ant 2	9.2	8.318
	5745	ant 1	10.84	12.134

		ant 2	10.96	12.474
		ant 1	10.38	10.914
	5785	ant 2	10.61	11.508
	5825	ant 1	10.93	12.388
		ant 2	9.58	9.078
IEEE 802.11ax HE20	5180	ant 1	10.51	11.246
		ant 2	9.31	8.531
	5200	ant 1	10.42	11.015
		ant 2	9.48	8.872
	5240	ant 1	8.54	7.145
		ant 2	10.51	11.246
	5745	ant 1	10.72	11.803
		ant 2	11.32	13.552
	5785	ant 1	10.72	11.803
		ant 2	9.81	9.572
	5825	ant 1	10.46	11.117
		ant 2	9.94	9.863
Mode	Frequency (MHz)	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)
IEEE 802.11n HT40	5190	ant 1	11.61	14.488
		ant 2	10.16	10.375
	5230	ant 1	11.43	13.900
		ant 2	10.44	11.066
	5755	ant 1	11.5	14.125
		ant 2	11.69	14.757
	5795	ant 1	11.39	13.772
		ant 2	11.45	13.964
IEEE 802.11ac VHT40	5190	ant 1	11.56	14.322
		ant 2	10.9	12.303
	5230	ant 1	11.45	13.964
		ant 2	10.32	10.765
	5755	ant 1	11.55	14.289
		ant 2	11.89	15.453
	5795	ant 1	11.6	14.454
		ant 2	11.18	13.122
IEEE 802.11ax	5190	ant 1	11.8	15.136
		ant 2	9.67	9.268

HE40	5230	ant 1	11.21	13.213
		ant 2	10.2	10.471
	5755	ant 1	11.29	13.459
		ant 2	11.58	14.388
	5795	ant 1	11.5	14.125
		ant 2	11.12	12.942
IEEE 802.11ac VHT80	5210	ant 1	11.62	14.521
		ant 2	10.64	11.588
	5775	ant 1	12.03	15.959
		ant 2	11.99	15.812
IEEE 802.11ax HE80	5210	ant 1	11.03	12.677
		ant 2	10.73	11.830
	5775	ant 1	12.09	16.181
		ant 2	11.74	14.928
IEEE 802.11ac VHT160	5250	ant 1	10.34	10.814
		ant 2	9.63	9.183
IEEE 802.11ax HE160	5250	ant 1	10.58	11.429
		ant 2	9.97	9.931
Mode	Frequency (MHz)	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)
IEEE 802.11ax HE20	5955	ant 1	4.13	2.588
		ant 2	8.66	7.345
	6175	ant 1	1.84	1.528
		ant 2	3.99	2.506
	6415	ant 1	4.45	2.786
		ant 2	0.96	1.247
	6435	ant 1	7.26	5.321
		ant 2	5.27	3.365
	6475	ant 1	7.34	5.420
		ant 2	6.69	4.667
	6515	ant 1	4.87	3.069
		ant 2	6.21	4.178
	6535	ant 1	6.17	4.140
		ant 2	6.75	4.732
	6695	ant 1	6.38	4.345

		ant 2	4.09	2.564
	6855	ant 1	6.46	4.426
		ant 2	5.81	3.811
	6875	ant 1	6.21	4.178
		ant 2	6.64	4.613
	6895	ant 1	5.8	3.802
		ant 2	6.08	4.055
	6995	ant 1	6.21	4.178
		ant 2	4.26	2.667
	7115	ant 1	5.67	3.690
		ant 2	5.24	3.342
IEEE 802.11ax HE40	5965	ant 1	7.85	6.095
		ant 2	6.99	5.000
	6165	ant 1	5.52	3.565
		ant 2	6.73	4.710
	6405	ant 1	7.17	5.212
		ant 2	3.96	2.489
	6445	ant 1	7.05	5.070
		ant 2	3.72	2.355
	6485	ant 1	6.09	4.064
		ant 2	5.45	3.508
	6525	ant 1	6.02	3.999
		ant 2	6.78	4.764
	6565	ant 1	5.43	3.491
		ant 2	5.6	3.631
	6685	ant 1	5.3	3.388
		ant 2	3.73	2.360
	6845	ant 1	6.85	4.842
		ant 2	6.38	4.345
	6885	ant 1	7.22	5.272
		ant 2	8.08	6.427
	6925	ant 1	6.33	4.295
		ant 2	5.85	3.846
	6965	ant 1	6.71	4.688
		ant 2	5.73	3.741
	7085	ant 1	7.3	5.370
		ant 2	5.31	3.396

IEEE 802.11ax HE80	5985	ant 1	6.95	4.955
		ant 2	7.02	5.035
	6145	ant 1	5.22	3.327
		ant 2	6.92	4.920
	6385	ant 1	6.25	4.217
		ant 2	3.99	2.506
	6465	ant 1	4.41	2.761
		ant 2	7.22	5.272
	6545	ant 1	7.16	5.200
		ant 2	8.29	6.745
	6625	ant 1	7.42	5.521
		ant 2	6.27	4.236
	6705	ant 1	7.84	6.081
		ant 2	5.43	3.491
	6785	ant 1	8.15	6.531
		ant 2	6.25	4.217
	6865	ant 1	8.74	7.482
		ant 2	8.93	7.816
	6945	ant 1	8.81	7.603
		ant 2	7.55	5.689
	7025	ant 1	9.22	8.356
		ant 2	6.87	4.864
IEEE 802.11ax HE160	6025	ant 1	8.16	6.546
		ant 2	7.7	5.888
	6185	ant 1	7.08	5.105
		ant 2	7.67	5.848
	6345	ant 1	6.49	4.457
		ant 2	5.91	3.899
	6505	ant 1	6.18	4.150
		ant 2	6.66	4.634
	6665	ant 1	7.62	5.781
		ant 2	5.62	3.648
	6825	ant 1	8.35	6.839
		ant 2	8.33	6.808
	6985	ant 1	7.99	6.295
		ant 2	6.35	4.315

Calculated Result and Limit

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									
IEEE 802.11b	ant 1	14.92	14 ±1	15	1.59	1.442	0.0091	1	Complies
	ant 2	14.48	14 ±1	15	1.59	1.442	0.0091	1	Complies
IEEE 802.11g	ant 1	15.82	15 ±1	16	1.59	1.442	0.0114	1	Complies
	ant 2	16.03	16 ±1	17	1.59	1.442	0.0144	1	Complies
IEEE 802.11n HT20	ant 1	13.94	13 ±1	14	1.59	1.442	0.0072	1	Complies
	ant 2	13.88	13 ±1	14	1.59	1.442	0.0072	1	Complies
IEEE 802.11n HT40	ant 1	12.96	12 ±1	13	1.59	1.442	0.0057	1	Complies
	ant 2	13.52	13 ±1	14	1.59	1.442	0.0072	1	Complies
IEEE802.11ax HE20	ant 1	14.12	14 ±1	15	1.59	1.442	0.0091	1	Complies
	ant 2	14.13	14 ±1	15	1.59	1.442	0.0091	1	Complies
IEEE802.11ax HE40	ant 1	12.72	12 ±1	13	1.59	1.442	0.0057	1	Complies
	ant 2	13.05	13 ±1	14	1.59	1.442	0.0072	1	Complies
5G Band									
IEEE 802.11a	ant 1	15.33	15 ±1	16	-0.56	0.8790	0.0070	1	Complies
	ant 2	14.27	14 ±1	15	-0.56	0.8790	0.0055	1	Complies
IEEE 802.11n HT20	ant 1	11.71	11 ±1	12	-0.56	0.8790	0.0028	1	Complies
	ant 2	11.97	11 ±1	12	-0.56	0.8790	0.0028	1	Complies
IEEE802.11ac VHT20	ant 1	10.93	10 ±1	11	-0.56	0.8790	0.0022	1	Complies
	ant 2	10.96	10 ±1	11	-0.56	0.8790	0.0022	1	Complies
IEEE802.11ax HE20	ant 1	10.72	10 ±1	11	-0.56	0.8790	0.0022	1	Complies
	ant 2	11.32	11 ±1	12	-0.56	0.8790	0.0028	1	Complies
IEEE 802.11n HT40	ant 1	11.61	11 ±1	12	-0.56	0.8790	0.0028	1	Complies
	ant 2	11.69	11 ±1	12	-0.56	0.8790	0.0028	1	Complies
IEEE 802.11ac	ant 1	11.6	11 ±1	12	-0.56	0.8790	0.0028	1	Complies
	ant 2	11.89	11 ±1	12	-0.56	0.8790	0.0028	1	Complies

VHT40									
IEEE802.11ax	ant 1	11.8	11 $\pm$ 1	12	-0.56	0.8790	0.0028	1	Complies
HE40	ant 2	11.58	11 $\pm$ 1	12	-0.56	0.8790	0.0028	1	Complies
IEEE	ant 1	12.03	12 $\pm$ 1	13	-0.56	0.8790	0.0035	1	Complies
802.11ac	ant 2	11.99	11 $\pm$ 1	12	-0.56	0.8790	0.0028	1	Complies
VHT80									
IEEE802.11ax	ant 1	12.09	12 $\pm$ 1	13	-0.56	0.8790	0.0035	1	Complies
HE80	ant 2	11.74	11 $\pm$ 1	12	-0.56	0.8790	0.0028	1	Complies
IEEE	ant 1	10.34	10 $\pm$ 1	11	-0.56	0.8790	0.0022	1	Complies
802.11ac	ant 2	9.63	9 $\pm$ 1	10	-0.56	0.8790	0.0017	1	Complies
VHT1600									
IEEE802.11ax	ant 1	10.58	10 $\pm$ 1	11	-0.56	0.8790	0.0022	1	Complies
HE1600	ant 2	9.97	9 $\pm$ 1	10	-0.56	0.8790	0.0017	1	Complies
6G Band									
IEEE802.11ax	ant 1	7.34	7 $\pm$ 1	8	-0.25	0.9441	0.0012	1	Complies
HE20	ant 2	8.66	8 $\pm$ 1	9	-0.25	0.9441	0.0015	1	Complies
IEEE802.11ax	ant 1	7.85	7 $\pm$ 1	8	-0.25	0.9441	0.0012	1	Complies
HE40	ant 2	8.08	8 $\pm$ 1	9	-0.25	0.9441	0.0015	1	Complies
IEEE802.11ax	ant 1	9.22	9 $\pm$ 1	10	-0.25	0.9441	0.0019	1	Complies
HE80	ant 2	8.93	8 $\pm$ 1	9	-0.25	0.9441	0.0015	1	Complies
IEEE802.11ax	ant 1	8.35	8 $\pm$ 1	9	-0.25	0.9441	0.0015	1	Complies
HE160	ant 2	8.33	8 $\pm$ 1	9	-0.25	0.9441	0.0015	1	Complies

MIMO

Mode	Power Density (S) (mW /cm2) Antenna 0	Power Density (S) (mW /cm2) Antenna 1	Power Density (S) (mW /cm2) Total	Limited of Power Density (S) (mW /cm2)	Test Result
2.4G Band					
IEEE 802.11n HT20	0.0072	0.0072	0.0144	1	Complies
IEEE 802.11n HT40	0.0057	0.0072	0.0129	1	Complies
IEEE802.11ax HE20	0.0091	0.0091	0.0181	1	Complies
IEEE802.11ax HE40	0.0057	0.0072	0.0129	1	Complies
5G Band					
IEEE 802.11n HT20	0.0028	0.0028	0.0055	1	Complies
IEEE 802.11ac VHT20	0.0022	0.0022	0.0044	1	Complies
IEEE802.11ax HE20	0.0022	0.0028	0.0050	1	Complies
IEEE 802.11n HT40	0.0028	0.0028	0.0055	1	Complies
IEEE 802.11ac VHT40	0.0028	0.0028	0.0055	1	Complies
IEEE802.11ax HE40	0.0028	0.0028	0.0055	1	Complies
IEEE 802.11ac VHT80	0.0035	0.0028	0.0063	1	Complies
IEEE802.11ax HE80	0.0035	0.0028	0.0063	1	Complies
IEEE 802.11ac VHT160	0.0022	0.0017	0.0039	1	Complies
IEEE802.11ax HE160	0.0022	0.0017	0.0039	1	Complies
6G Band					
IEEE802.11ax HE20	0.0012	0.0015	0.0027	1	Complies
IEEE802.11ax HE40	0.0012	0.0015	0.0027	1	Complies
IEEE802.11ax HE80	0.0019	0.0015	0.0034	1	Complies
IEEE802.11ax HE160	0.0015	0.0015	0.0030	1	Complies

End of Test Report