

FCC 47 CFR MPE REPORT

SHENGZHEN ZHOUGUANG TECHNOLOGY CO.LTD

Interactive collaboration board

Model Number: S55T02DUS, S75T02CUS

Additional Model: S55T0****, S75T02DUS, S75T0****(* can be any alphanumeric character including blank for marketing differences)

FCC ID: 2BB4N-ST02DUS

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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

NXP-88W8997

Mode	Frequency (MHz)	Antenna	Peak output power (dBm)	Peak output power (mW)
GFSK	2402	ant 1	5.54	3.581
	2441	ant 1	5.6	3.631
	2480	ant 1	5.22	3.327
$\pi/4$ -DQPSK	2402	ant 1	5.19	3.304
	2441	ant 1	4.98	3.148
	2480	ant 1	4.66	2.924
8-DPSK	2402	ant 1	5.51	3.556
	2441	ant 1	5.31	3.396
	2480	ant 1	5.02	3.177
BLE 1M	2402	ant 1	5.69	3.707
	2440	ant 1	5.52	3.565
	2480	ant 1	5.21	3.319
IEEE 802.11b	2412	ant 1	19.19	82.985
		ant 2	17.87	61.235
	2437	ant 1	19.14	82.035
		ant 2	18.03	63.533
	2462	ant 1	19.26	84.333
		ant 2	18.72	74.473
IEEE 802.11g	2412	ant 1	20.7	117.490
		ant 2	21.53	142.233
	2437	ant 1	20.84	121.339
		ant 2	21.72	148.594
	2462	ant 1	20.88	122.462
		ant 2	22.39	173.380
IEEE 802.11n HT20	2412	ant 1	18.62	72.778
		ant 2	17.99	62.951
	2437	ant 1	18.96	78.705
		ant 2	18.29	67.453
	2462	ant 1	19.15	82.224
		ant 2	18.93	78.163
IEEE 802.11n HT40	2422	ant 1	19.1	81.283
		ant 2	18.28	67.298

	2437	ant 1	19.12	81.658
		ant 2	18.5	70.795
	2452	ant 1	19.11	81.470
		ant 2	18.82	76.208
IEEE 802.11a	5180	ant 1	18.6	72.444
		ant 2	18.83	76.384
	5200	ant 1	19.23	83.753
		ant 2	18.63	72.946
	5240	ant 1	18.5	70.795
		ant 2	18.42	69.502
	5260	ant 1	18.13	65.013
		ant 2	18.93	78.163
	5300	ant 1	18.1	64.565
		ant 2	18.83	76.384
	5320	ant 1	17.81	60.395
		ant 2	18.76	75.162
	5500	ant 1	18.55	71.614
		ant 2	19.05	80.353
	5580	ant 1	18.47	70.307
		ant 2	19.17	82.604
	5700	ant 1	19.35	86.099
		ant 2	18.95	78.524
	5745	ant 1	18.45	69.984
		ant 2	19.1	81.283
	5785	ant 1	17.53	56.624
		ant 2	17.66	58.345
	5825	ant 1	17.45	55.590
		ant 2	18.74	74.817
IEEE 802.11n20	5180	ant 1	14.48	28.054
		ant 2	15.23	33.343
	5200	ant 1	15.47	35.237
		ant 2	15.39	34.594
	5240	ant 1	14.24	26.546
		ant 2	15.12	32.509
	5260	ant 1	14.04	25.351
		ant 2	14.94	31.189
	5300	ant 1	13.48	22.284
		ant 2	14.8	30.200

		5320	ant 1	13.23	21.038
			ant 2	14.73	29.717
		5500	ant 1	15.3	33.884
			ant 2	16.03	40.087
		5580	ant 1	15.12	32.509
			ant 2	16.34	43.053
		5700	ant 1	16.2	41.687
			ant 2	15.95	39.355
		5745	ant 1	16	39.811
			ant 2	16.19	41.591
		5785	ant 1	15.08	32.211
			ant 2	15.62	36.475
		5825	ant 1	14.07	25.527
			ant 2	15.67	36.898
IEEE 802.11ac VHT20	5180		ant 1	14.6	28.840
			ant 2	15.1	32.359
	5200		ant 1	15.43	34.914
			ant 2	15.28	33.729
	5240		ant 1	14.4	27.542
			ant 2	14.96	31.333
	5260		ant 1	14.22	26.424
			ant 2	15.27	33.651
	5300		ant 1	14.21	26.363
			ant 2	15.4	34.674
	5320		ant 1	13.92	24.660
			ant 2	15.32	34.041
	5500		ant 1	14.73	29.717
			ant 2	15.27	33.651
	5580		ant 1	14.7	29.512
			ant 2	15.76	37.670
	5700		ant 1	15.76	37.670
			ant 2	15.5	35.481
	5745		ant 1	15.56	35.975
			ant 2	15.5	35.481
	5785		ant 1	14.59	28.774
			ant 2	14.92	31.046
	5825		ant 1	13.59	22.856
			ant 2	14.98	31.477

IEEE 802.11n HT40	5190	ant 1	14.7	29.512
		ant 2	15.27	33.651
	5230	ant 1	14.5	28.184
		ant 2	15.08	32.211
	5270	ant 1	14.35	27.227
		ant 2	15.71	37.239
	5310	ant 1	14.27	26.730
		ant 2	15.53	35.727
	5510	ant 1	14.73	29.717
		ant 2	15.33	34.119
	5590	ant 1	15.13	32.584
		ant 2	15.88	38.726
	5670	ant 1	15.68	36.983
		ant 2	15.62	36.475
	5755	ant 1	15.5	35.481
		ant 2	15.5	35.481
	5795	ant 1	14.28	26.792
		ant 2	14.91	30.974
IEEE 802.11ac VHT40	5190	ant 1	14.88	30.761
		ant 2	15.35	34.277
	5230	ant 1	14.44	27.797
		ant 2	15.22	33.266
	5270	ant 1	14.28	26.792
		ant 2	15.66	36.813
	5310	ant 1	14.15	26.002
		ant 2	15.46	35.156
	5510	ant 1	14.64	29.107
		ant 2	15.13	32.584
	5590	ant 1	15	31.623
		ant 2	15.92	39.084
	5670	ant 1	15.57	36.058
		ant 2	15.53	35.727
	5755	ant 1	15.32	34.041
		ant 2	15.57	36.058
	5795	ant 1	14.03	25.293
		ant 2	14.86	30.620
IEEE 802.11ac	5210	ant 1	15.62	36.475
		ant 2	16.27	42.364

VHT80	5290	ant 1	14.85	30.549
		ant 2	16.14	41.115
	5530	ant 1	15.29	33.806
		ant 2	16.26	42.267
	5610	ant 1	16	39.811
		ant 2	16.59	45.604
	5775	ant 1	15.48	35.318
		ant 2	15.98	39.628

3. Calculated Result and Limit

3.1. SISO(NXP-88W8997)

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									
GFSK	ant 1	5.60	5±1	6	1.72	1.486	0.0012	1	Complies
π/4-DQPSK	ant 1	5.19	5±1	6	1.72	1.486	0.0012	1	Complies
8-DPSK	ant 1	5.51	5±1	6	1.72	1.486	0.0012	1	Complies
BLE	ant 1	5.69	5±1	6	1.72	1.486	0.0012	1	Complies
IEEE 802.11b	ant 1	19.26	19±1	20	1.72	1.486	0.0296	1	Complies
	ant 2	18.72	18±1	19	1.72	1.486	0.0235	1	Complies
IEEE 802.11g	ant 1	20.88	20±1	21	1.72	1.486	0.0372	1	Complies
	ant 2	22.39	22±1	23	1.72	1.486	0.0590	1	Complies
IEEE 802.11n HT20	ant 1	19.15	19±1	20	1.72	1.486	0.0296	1	Complies
	ant 2	18.93	18±1	19	1.72	1.486	0.0235	1	Complies
IEEE 802.11n HT40	ant 1	19.12	19±1	20	1.72	1.486	0.0296	1	Complies
	ant 2	18.82	18±1	19	1.72	1.486	0.0235	1	Complies
5G Band									
IEEE 802.11a	ant 1	19.35	19±1	20	2.57	1.807	0.0360	1	Complies
	ant 2	19.17	19±1	20	2.57	1.807	0.0360	1	Complies
IEEE 802.11n HT20	ant 1	16.2	16±1	17	2.57	1.807	0.0180	1	Complies
	ant 2	16.34	16±1	17	2.57	1.807	0.0180	1	Complies
IEEE802.11ac VHT20	ant 1	15.76	15±1	16	2.57	1.807	0.0143	1	Complies
	ant 2	15.76	15±1	16	2.57	1.807	0.0143	1	Complies
IEEE 802.11n HT40	ant 1	15.68	15±1	16	2.57	1.807	0.0143	1	Complies
	ant 2	15.88	15±1	16	2.57	1.807	0.0143	1	Complies
IEEE 802.11ac VHT40	ant 1	15.57	15±1	16	2.57	1.807	0.0143	1	Complies
	ant 2	15.92	15±1	16	2.57	1.807	0.0143	1	Complies
IEEE 802.11ac VHT80	ant 1	16	16±1	17	2.57	1.807	0.0180	1	Complies
	ant 2	16.59	16±1	17	2.57	1.807	0.0180	1	Complies

3.2. MIMO(NXP-88W8997)

Mode	Power Density (S) (mW /cm ²) Antenna 0	Power Density (S) (mW /cm ²) Antenna 1	Power Density (S) (mW /cm ²) Total	Limited of Power Density (S) (mW /cm ²)	Test Result
2.4G Band					
IEEE 802.11n HT20	0.0296	0.0235	0.0530	1	Complies
IEEE 802.11n HT40	0.0296	0.0235	0.0530	1	Complies
5G Band					
IEEE 802.11n HT20	0.0180	0.0180	0.0360	1	Complies
IEEE 802.11ac VHT20	0.0143	0.0143	0.0286	1	Complies
IEEE 802.11n HT40	0.0143	0.0143	0.0286	1	Complies
IEEE 802.11ac VHT40	0.0143	0.0143	0.0286	1	Complies
IEEE 802.11ac VHT80	0.0180	0.0180	0.0360	1	Complies

3.3. BT+WIFI(NXP-88W8997)

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	Total Ratio	Limit Ratio	Test Result
0.0012	0.0530	0.0542	1	Complies

3.4. BT+WIFI(WXT14R2201)

MAX Power Density (S) (mW/cm ²) Bluetooth	MAX Power Density (S) (mW/cm ²) WiFi	Total Ratio	Limit Ratio	Test Result
0.00770	0.43783	0.44553	1	Complies

MAX Power Density (S) (mW/cm ²) (NXP-88W8997)	MAX Power Density (S) (mW/cm ²) (WXT14R2201)	Total Ratio	Limit Ratio	Test Result
0.0542	0.44553	0.49973	1	Complies

Note: WXT14R2201 is the model used for the reference module, and its corresponding FCC ID for the reference module is: TX2-RTL8852BE

NXP-88W8997 is the module applied for in this request, and its corresponding FCC ID is: 2BB4N-ST02DUS

End of Test Report