

1 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission’s guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

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802.11a Max. output power (Worst Case)

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)		RESULT
			CH 0	CH 1				
36	5180	MCS8	12.82	12.69	15.99	23.98		PASS
44	5220	MCS8	12.79	12.66	15.96	23.98		PASS
48	5240	MCS8	12.78	12.64	15.94	23.98		PASS
52	5260	MCS8	12.74	12.6	15.90	23.98	or $11+10\log(B) = 22.74$	PASS
60	5300	MCS8	12.65	12.53	15.82	23.98	or $11+10\log(B) = 22.74$	PASS
64	5320	MCS8	12.63	12.49	15.79	23.98	or $11+10\log(B) = 22.74$	PASS
100	5500	MCS8	12.75	12.61	15.91	23.98	or $11+10\log(B) = 22.34$	PASS
116	5580	MCS8	12.74	12.58	15.90	23.98	or $11+10\log(B) = 22.34$	PASS
140	5700	MCS8	12.82	12.67	15.98	23.98	or $11+10\log(B) = 22.34$	PASS
149	5745	MCS8	12.83	12.68	15.99	30		PASS
157	5785	MCS8	12.82	12.68	15.98	30		PASS
165	5825	MCS8	12.81	12.67	15.97	30		PASS

MPE Prediction (802.11a 5725~5850MHz)

Average output power at antenna input terminal:	15.99	(dBm)
Average output power at antenna input terminal:	39.719155	(mW)
Duty cycle:	97.34	(%)
Maximum Pav :	38.662625	(mW)
Peak Antenna gain (Maximum):	4.3	(dBi)
Peak Antenna gain (linear):	2.6915348	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5745	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
Power density at predication frequency at 20 (cm) distance	0.021	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.021 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 5745MHz.

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802.11n_HT40 Max. output power (Worst Case)

802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)		RESULT
			CH 0	CH 1				
38	5190	MCS8	12.59	12.37	15.92	23.98		PASS
46	5230	MCS8	12.54	12.32	15.87	23.98		PASS
54	5270	MCS8	12.63	12.44	15.98	23.98	or $11+10\log(B) = 25.95$	PASS
62	5310	MCS8	12.65	12.45	15.99	23.98	or $11+10\log(B) = 25.95$	PASS
102	5510	MCS8	12.66	12.43	15.99	23.98	or $11+10\log(B) = 25.58$	PASS
110	5550	MCS8	12.62	12.39	15.95	23.98	or $11+10\log(B) = 25.58$	PASS
134	5670	MCS8	12.64	12.41	15.97	23.98	or $11+10\log(B) = 25.58$	PASS
151	5755	MCS8	12.62	12.34	15.92	30		PASS
159	5795	MCS8	12.63	12.42	15.97	30		PASS

MPE Prediction (802.11n_HT40 5250~5350MHz)

Average output power at antenna input terminal:	15.99	(dBm)
Average output power at antenna input terminal:	39.719155	(mW)
Duty cycle:	90.56	(%)
Maximum Pav :	35.969667	(mW)
Peak Antenna gain (Maximum):	4.4	(dBi)
Peak Antenna gain (linear):	2.7542287	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5510	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
Power density at predication frequency at 20 (cm) distance	0.020	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.02 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 5510MHz.

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802.11ac_VHT80 Max. output power (Worst Case)

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1			
42	5210	MCS8	12.64	12.39	15.99	23.98	PASS
58	5290	MCS8	12.44	12.23	15.81	23.98 or $11+10\log(B) = 29.07$	PASS
106	5530	MCS8	12.56	12.3	15.91	23.98 or $11+10\log(B) = 28.65$	PASS
122	5610	MCS8	12.65	12.38	15.99	23.98 or $11+10\log(B) = 28.72$	PASS
155	5775	MCS8	12.64	12.36	15.98	30	PASS

MPE Prediction (802.11ac_VHT80 5725~5850MHz)

Average output power at antenna input terminal:	15.99	(dBm)
Average output power at antenna input terminal:	39.719155	(mW)
Duty cycle:	89.88	(%)
Maximum Pav :	35.699576	(mW)
Peak Antenna gain (Maximum):	4.4	(dBi)
Peak Antenna gain (linear):	2.7542287	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5610	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm ²)
Power density at predication frequency at 20 (cm) distance	0.020	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.02 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 5610MHz.

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