

1 MAXIMUM PERMISSIBLE EXPOSURE (MPE) 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 §2.1093 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

802.11a Max. output power

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CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	13.52	22.491	23.98	PASS
44	5220	14.06	25.468	23.98	PASS
48	5240	14.02	25.235	23.98	PASS
52	5260	13.91	24.604	23.98 or $11+10\log(B) = 23.20$	PASS
60	5300	13.57	22.751	23.98 or $11+10\log(B) = 23.22$	PASS
64	5320	13.87	24.378	23.98 or $11+10\log(B) = 23.22$	PASS
100	5500	15.53	35.727	23.98 or $11+10\log(B) = 23.23$	PASS
116	5580	15.23	33.343	23.98 or $11+10\log(B) = 23.22$	PASS
140	5700	14.14	25.942	23.98 or $11+10\log(B) = 23.21$	PASS

MPE Prediction (802.11a 5150~5250)

Max. output power including tune-up tolerancel:	14.06	(dBm)
Max. output power including tune-up tolerancel:	25.468303	(mW)
Duty cycle:	97	(%)
Maximum Pav :	24.704253	(mW)
Peak Antenna gain (Maximum):	5.6	(dBi)
Peak Antenna gain (linear):	3.6307805	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5220	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.018	(mW/cm ²)
Measurement Result		
The predicted power density level at 20 cm is 0.018 mW/cm ² .		
This is below the uncontrolled exposure limit of 1 mW/cm ² at 5220MHz.		

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MPE Prediction (802.11a 5250~5350)

Average output power at antenna input terminal:	13.91	(dBm)
Average output power at antenna input terminal:	24.603676	(mW)
Duty cycle:	97	(%)
Maximum Pav :	23.865566	(mW)
Peak Antenna gain (Maximum):	5.9	(dBi)
Peak Antenna gain (linear):	3.8904514	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5260	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.018	(mW/cm^2)
Measurement Result		
The predicted power density level at 20 cm is 0.018 mW/cm2.		
This is below the uncontrolled exposure limit of 1 mW/cm2 at 5260MHz.		

MPE Prediction (802.11a 5470~5725)

Average output power at antenna input terminal:	15.53	(dBm)
Average output power at antenna input terminal:	35.727284	(mW)
Duty cycle:	95	(%)
Maximum Pav :	33.94092	(mW)
Peak Antenna gain (Maximum):	4.7	(dBi)
Peak Antenna gain (linear):	2.9512092	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5500	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	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 5500MHz.		

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802.11n_HT20M (MIMO) Max. output power

CH	Frequency (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
		CHAIN 0	CHAIN 1				
36	5180	9.78	11.7	13.86	24.297	21.37	PASS
44	5220	10.04	11.55	13.87	24.381	21.37	PASS
48	5240	10.07	11.5	13.85	24.288	21.37	PASS
52	5260	10.49	11.38	13.97	24.935	21.07 or $11+10\log(B) = 23.49$	PASS
60	5300	9.64	10.9	13.33	21.507	21.07 or $11+10\log(B) = 23.48$	PASS
64	5320	9.75	11.45	13.69	23.404	21.07 or $11+10\log(B) = 23.48$	PASS
100	5500	10.54	12.03	14.36	27.283	22.27 or $11+10\log(B) = 23.51$	PASS
116	5580	10.21	13.49	15.16	32.831	22.27 or $11+10\log(B) = 23.48$	PASS
140	5700	8.9	13.08	14.48	28.086	22.27 or $11+10\log(B) = 23.48$	PASS

MPE Prediction (802.11n_HT20 5150~5250)

MIMO gain= $G+(10 \log N)= 5.6+3.01= 8.61\text{dBm}$

Average output power at antenna input terminal:	13.87	(dBm)
Average output power at antenna input terminal:	24.378108	(mW)
Duty cycle:	97	(%)
Maximum Pav :	23.646765	(mW)
Peak Antenna gain (Maximum):	8.61	(dBi)
Peak Antenna gain (linear):	7.2610596	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5220	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.034	(mW/cm ²)
Measurement Result		
The predicted power density level at 20 cm is 0.034 mW/cm ² .		
This is below the uncontrolled exposure limit of 1 mW/cm ² at 5220MHz.		

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MPE Prediction (802.11n_HT20 5250~5350)

MIMO gain= $G+(10 \log N)= 5.9+3.01= 8.91\text{dBm}$

Average output power at antenna input terminal:	13.97	(dBm)
Average output power at antenna input terminal:	24.945947	(mW)
Duty cycle:	97	(%)
Maximum Pav :	24.197569	(mW)
Peak Antenna gain (Maximum):	8.91	(dBi)
Peak Antenna gain (linear):	7.7803655	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5260	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.037	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.037 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 5260MHz.

MPE Prediction (802.11n_HT20 5470~5725)

MIMO gain= $G+(10 \log N)= 4.7+3.01= 7.71\text{dBm}$

Average output power at antenna input terminal:	15.16	(dBm)
Average output power at antenna input terminal:	32.809529	(mW)
Duty cycle:	95	(%)
Maximum Pav :	31.169053	(mW)
Peak Antenna gain (Maximum):	7.71	(dBi)
Peak Antenna gain (linear):	5.9020108	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5580	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.037	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.037 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 5580MHz.

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802.11n_HT40M (MIMO) Max. output power

CH	Frequency (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
		CHAIN 0	CHAIN 1				
38	5190	9.14	12.27	13.99	25.069	21.37	PASS
46	5230	9.6	12.16	14.08	25.564	21.37	PASS
54	5270	9.94	11.79	13.97	24.964	21.07 or $11+10\log(B) = 26.59$	PASS
62	5310	9.11	11.34	13.38	21.761	21.07 or $11+10\log(B) = 26.59$	PASS
110	5550	10.04	13.00	14.78	30.045	22.27 or $11+10\log(B) = 26.60$	PASS
134	5670	8.93	13.55	14.84	30.463	22.27 or $11+10\log(B) = 26.60$	PASS

MPE Prediction (802.11n_HT40 5150~5250)

MIMO gain= $G+(10 \log N)=5.6+3.01=8.61\text{dBm}$

Average output power at antenna input terminal:	14.08	(dBm)
Average output power at antenna input terminal:	25.585859	(mW)
Duty cycle:	97	(%)
Maximum Pav :	24.818283	(mW)
Peak Antenna gain (Maximum):	8.61	(dBi)
Peak Antenna gain (linear):	7.2610596	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5230	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.036	(mW/cm ²)
Measurement Result		
The predicted power density level at 20 cm is 0.036 mW/cm ² .		
This is below the uncontrolled exposure limit of 1 mW/cm ² at 5230MHz.		

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MPE Prediction (802.11n_HT40 5250~5350)

MIMO gain= $G+(10 \log N)= 5.9+3.01= 8.91\text{dBm}$

Average output power at antenna input terminal:	13.97	(dBm)
Average output power at antenna input terminal:	24.945947	(mW)
Duty cycle:	97	(%)
Maximum Pav :	24.197569	(mW)
Peak Antenna gain (Maximum):	8.91	(dBi)
Peak Antenna gain (linear):	7.7803655	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5270	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.037	(mW/cm ²)
Measurement Result		
The predicted power density level at 20 cm is 0.037 mW/cm ² .		
This is below the uncontrolled exposure limit of 1 mW/cm ² at 5270MHz.		

MPE Prediction (802.11n_HT40 5470~5725)

MIMO gain= $G+(10 \log N)= 4.7+3.01= 7.71\text{dBm}$

Average output power at antenna input terminal:	14.84	(dBm)
Average output power at antenna input terminal:	30.47895	(mW)
Duty cycle:	95	(%)
Maximum Pav :	28.955002	(mW)
Peak Antenna gain (Maximum):	7.71	(dBi)
Peak Antenna gain (linear):	5.9020108	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5670	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.034	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.034 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 5670MHz.

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