

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 §2.1093 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

1.2 MAXIMUM PERMISSIBLE EXPOSURE (MPE) EVALUATION

802.11b

Cable loss = 0		Peak Power Output				Required Limit	
CH	Frequency (MHz)	Data Rate					
		1	2	5.5	11		
1	2412	17.31	17.27	17.21	17.15	1 Watt = 30 dBm	
6	2437	17.73	17.65	17.61	17.56	1 Watt = 30 dBm	
11	2462	17.59	17.53	17.49	17.43	1 Watt = 30 dBm	

Cable loss = 0		Average Power Output				Required Limit	
CH	Frequency (MHz)	Data Rate					
		1	2	5.5	11		
1	2412	14.90	14.86	14.83	14.79	1 Watt = 30 dBm	
6	2437	15.11	15.01	14.92	14.85	1 Watt = 30 dBm	
11	2462	15.05	15.02	14.97	14.95	1 Watt = 30 dBm	

*Note: Measured by power meter, cable loss as 11dB that offsets on the power meter.

MPE Prediction (802.11b)

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

Maximum peak output power at antenna input terminal:	17.73	(dBm)
Maximum peak output power at antenna input terminal:	59.29253246	(mW)
Duty cycle:	99.7	(%)
Maximum Pav :	59.11465486	(mW)
Antenna gain (typical):	2.82	(dBi)
Maximum antenna gain:	1.914255925	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.022524	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.022524mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2437MHz.

802.11g

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	22.26	22.19	22.11	22.05	21.99	21.89	21.82	21.79	1 Watt = 30 dBm
6	2437	22.52	22.44	22.35	22.27	22.19	22.10	22.05	22.02	1 Watt = 30 dBm
11	2462	22.48	22.42	22.35	22.27	22.22	22.13	22.07	21.98	1 Watt = 30 dBm

Cable loss = 0		Average Power Output								Required Limit	
CH	Frequency (MHz)	Data Rate									
		6	9	12	18	24	36	48	54		
1	2412	13.95	13.78	13.57	13.38	13.18	12.92	12.73	12.57	1 Watt = 30 dBm	
6	2437	14.04	13.81	13.62	13.38	13.15	12.95	12.77	12.65	1 Watt = 30 dBm	
11	2462	14.12	13.92	13.73	13.51	13.29	13.06	12.86	12.75	1 Watt = 30 dBm	

*Note: Measured by power meter, cable loss as 11dB that offsets on the power meter.

MPE Prediction (802.11g)

Prediction of MPE limit at a given distance

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

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

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

Maximum peak output power at antenna input terminal:	22.52	(dBm)
Maximum peak output power at antenna input terminal:	178.6487575	(mW)
Duty cycle:	98.6	(%)
Maximum Pav :	176.1476749	(mW)
Antenna gain (typical):	2.82	(dBi)
Maximum antenna gain:	1.914255925	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.067116	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.067116mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2437MHz.

802.11n_20M

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	22.08	21.69	21.33	20.98	20.65	20.27	19.90	19.51	1 Watt = 30 dBm
6	2437	22.09	21.75	21.39	21.00	20.62	20.27	19.92	19.71	1 Watt = 30 dBm
11	2462	22.10	21.75	21.35	20.94	20.61	20.24	19.86	19.60	1 Watt = 30 dBm

Cable loss = 0		Average Power Output								Required Limit	
CH	Frequency (MHz)	Data Rate									
		6.5	13	19.5	26	39	52	58.5	65		
1	2412	14.04	13.43	12.79	12.17	11.51	10.94	10.36	9.50	1 Watt = 30 dBm	
6	2437	14.16	13.51	12.91	12.26	11.66	11.07	10.45	9.65	1 Watt = 30 dBm	
11	2462	14.02	13.40	12.82	12.19	11.59	10.99	10.38	9.69	1 Watt = 30 dBm	

*Note: Measured by power meter, cable loss as 11dB that offsets on the power meter.

MPE Prediction (802.11 n_20M)

Prediction of MPE limit at a given distance

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

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

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

Maximum peak output power at antenna input terminal:	22.1	(dBm)
Maximum peak output power at antenna input terminal:	162.1810097	(mW)
Duty cycle:	98.3	(%)
Maximum Pav :	159.4239326	(mW)
Antenna gain (typical):	2.82	(dBi)
Maximum antenna gain:	1.914255925	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.060744	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.060744mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2462MHz.