

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				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	18.49	18.36	18.19	18.07	1 Watt = 30 dBm
6	2437	18.72	18.57	18.44	18.30	1 Watt = 30 dBm
11	2462	18.87	18.74	18.59	18.45	1 Watt = 30 dBm
Cable loss = 0		Average Power Output				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	15.39	15.24	15.08	14.92	1 Watt = 30 dBm
6	2437	15.62	15.47	15.33	15.17	1 Watt = 30 dBm
11	2462	15.79	15.65	15.52	15.40	1 Watt = 30 dBm

**Note: Measured by power meter, cable loss as 11.952dB 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:	18.87	(dBm)
Maximum peak output power at antenna input terminal:	77.09034691	(mW)
Duty cycle:	100	(%)
Maximum Pav :	77.09034691	(mW)
Antenna gain (typical):	-1.37	(dBi)
Maximum antenna gain:	0.72945751	(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)	0.011193	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.011193mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2462MHz.

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	20.87	20.74	20.61	20.49	20.35	20.23	20.09	19.95	1 Watt = 30 dBm
6	2437	21.51	21.38	21.26	21.12	21.00	20.87	20.72	20.55	1 Watt = 30 dBm
11	2462	21.29	21.14	21.00	20.87	20.73	20.59	20.46	20.33	1 Watt = 30 dBm
Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	13.47	13.33	13.19	13.05	12.91	12.77	12.65	12.52	1 Watt = 30 dBm
6	2437	14.57	14.42	14.28	14.14	14.01	13.88	13.74	13.59	1 Watt = 30 dBm
11	2462	13.65	13.51	13.37	13.23	13.10	12.97	12.83	12.69	1 Watt = 30 dBm

**Note: Measured by power meter, cable loss as 12.109dB 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

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

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:	21.51	(dBm)
Maximum peak output power at antenna input terminal:	141.579378	(mW)
Duty cycle:	100	(%)
Maximum Pav :	141.579378	(mW)
Antenna gain (typical):	-1.37	(dBi)
Maximum antenna gain:	0.72945751	(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)	0.020557	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.020557mW/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	20.29	20.17	20.05	19.91	19.76	19.62	19.51	19.38	1 Watt = 30 dBm
6	2437	20.57	20.45	20.29	20.14	20.02	19.88	19.75	19.64	1 Watt = 30 dBm
11	2462	20.74	20.62	20.48	20.34	20.17	20.04	19.86	19.72	1 Watt = 30 dBm
Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	12.00	11.86	11.73	11.59	11.45	11.33	11.19	11.05	1 Watt = 30 dBm
6	2437	12.14	12.00	11.86	11.73	11.59	11.44	11.30	11.15	1 Watt = 30 dBm
11	2462	12.29	12.15	12.01	11.87	11.75	11.64	11.50	12.36	1 Watt = 30 dBm

**Note: Measured by power meter, cable loss as 12.146dB 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

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

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:	20.74	(dBm)
Maximum peak output power at antenna input terminal:	118.5768748	(mW)
Duty cycle:	100	(%)
Maximum Pav :	118.5768748	(mW)
Antenna gain (typical):	-1.37	(dBi)
Maximum antenna gain:	0.72945751	(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)	0.017217	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.17217mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2462MHz.