

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	18.12	18.01	17.92	15.79	1 Watt = 30 dBm
6	2437	18.23	18.14	18.01	17.90	1 Watt = 30 dBm
11	2462	18.17	18.04	17.89	17.78	1 Watt = 30 dBm
Cable loss = 0		Average Power Output				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	15.02	14.92	14.85	14.79	1 Watt = 30 dBm
6	2437	15.11	15.03	14.96	14.84	1 Watt = 30 dBm
11	2462	15.09	14.99	14.91	14.83	1 Watt = 30 dBm

**Note: Measured by power meter, cable loss as 12dB 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:	18.23	(dBm)
Maximum peak output power at antenna input terminal:	66.52731562	(mW)
Duty cycle:	100	(%)
Maximum Pav :	66.52731562	(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)	0.009659	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.009659mW/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	21.30	21.16	21.04	20.91	20.80	20.69	20.54	20.42	1 Watt = 30 dBm
6	2437	21.75	21.62	21.49	21.36	21.24	21.11	21.01	20.89	1 Watt = 30 dBm
11	2462	21.53	21.42	21.33	21.21	21.05	20.91	20.78	20.64	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	13.08	13.01	12.93	12.85	12.77	12.71	12.64	12.58	1 Watt = 30 dBm
6	2437	14.06	13.97	13.92	13.81	13.73	13.64	13.55	13.48	1 Watt = 30 dBm
11	2462	13.14	13.04	12.95	12.87	12.81	12.75	12.68	12.60	1 Watt = 30 dBm

**Note: Measured by power meter, cable loss as 12dB 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:	21.75	(dBm)
Maximum peak output power at antenna input terminal:	149.6235656	(mW)
Duty cycle:	100	(%)
Maximum Pav :	149.6235656	(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)	0.021725	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.021725mW/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
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
1	2412	20.95	20.83	20.72	20.61	20.48	20.36	20.24	20.11	1 Watt = 30 dBm
6	2437	20.60	20.48	20.36	20.25	20.14	20.00	19.88	19.74	1 Watt = 30 dBm
11	2462	21.03	20.94	20.86	20.71	20.58	20.46	20.32	20.21	1 Watt = 30 dBm
Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
1	2412	10.89	10.81	10.73	10.64	10.56	10.49	10.42	10.35	1 Watt = 30 dBm
6	2437	11.02	10.94	10.87	10.79	10.71	10.63	10.55	10.49	1 Watt = 30 dBm
11	2462	12.01	11.93	11.82	11.74	11.67	11.59	11.51	11.43	1 Watt = 30 dBm

**Note: Measured by power meter, cable loss as 12dB 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:	21.03	(dBm)
Maximum peak output power at antenna input terminal:	126.7651866	(mW)
Duty cycle:	100	(%)
Maximum Pav :	126.7651866	(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)	0.018406	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.018406mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2462MHz.