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 §2.1091 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

International Standards Laboratory **Report Number: ISL-12LR164MPE**

Maximum Permissible Exposure (MPE) Evaluation

802.11 b mode

Conducted Power result:

802.11b

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	19.22	16.84	30
6	2437	19.14	16.78	
11	2462	19.21	16.81	

MPE Prediction (802.11b) with the max antenna gain 4 dBi

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:	19.22	(dBm)
Maximum peak output power at antenna input terminal:	83.56030182	(mW)
Duty cycle:	100	(%)
Maximum Pav :	83.56030182	(mW)
Antenna gain (typical):	3	(dBi)
Maximum antenna gain:	1.995262315	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0331857	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.033 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2 at 2412MHz.

802.11 g mode

Conducted Power result:

802.11g

Cable loss = 0		Output Power		Limit (dBm)
		Detector		
CH	Frequency (MHz)	PK (dBm)	AV (dBm)	
1	2412	22.88	13.58	
6	2437	22.54	13.12	30
11	2462	23.05	13.84	

MPE Prediction (802.11g) with the max antenna gain 4 dBi

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:	23.05	(dBm)
Maximum peak output power at antenna input terminal:	201.8366364	(mW)
Duty cycle:	100	(%)
Maximum Pav :	201.8366364	(mW)
Antenna gain (typical):	3	(dBi)
Maximum antenna gain:	1.995262315	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0801586	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.080 mW/cm2. This is below the uncontrolled exposure limit of 1 mW/cm2 at 2462MHz.

802.11 N 20MHz mode

Conducted Power result:

802.11N 20MHz

Cable loss = 0		Output Power		Limit (dBm)
		Detector		
CH	Frequency (MHz)	PK (dBm)	AV (dBm)	
1	2412	23.14	14.11	
6	2437	23.07	14.02	30
11	2462	23.24	14.17	

MPE Prediction (802.11n_20M) with the max antenna gain 4 dBi

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:	23.24	(dBm)
Maximum peak output power at antenna input terminal:	210.862815	(mW)
Duty cycle:	100	(%)
Maximum Pav :	210.862815	(mW)
Antenna gain (typical):	3	(dBi)
Maximum antenna gain:	1.995262315	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0837434	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.084 mW/cm2. This is below the uncontrolled exposure limit of 1 mW/cm2 at 2462MHz.

802.11 N 40MHz mode

Conducted Power result:

802.11N 40MHz

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
3	2422	23.22	14.21	
6	2437	23.14	14.15	30
9	2452	23.08	14.10	

MPE Prediction (802.11n_40M) with the max antenna gain 4 dBi

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:	23.22	(dBm)
Maximum peak output power at antenna input terminal:	209.8939884	(mW)
Duty cycle:	100	(%)
Maximum Pav :	209.8939884	(mW)
Antenna gain (typical):	3	(dBi)
Maximum antenna gain:	1.995262315	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2422	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0833586	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.083 mW/cm2. This is below the uncontrolled exposure limit of 1 mW/cm2 at 2422MHz.