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 (Main)

CH	Frequency (MHz)	Peak Power Output (dBm)	
		Data Rate	Required Limit
		1	
1	2412	21.84	0.79 Watt = 28.98 dBm
6	2437	23.83	0.79 Watt = 28.98 dBm
11	2462	21.10	0.79 Watt = 28.98 dBm

CH	Frequency (MHz)	Average Power Output (dBm)	
		Data Rate	Required Limit
		1	
1	2412	18.26	0.79 Watt = 28.98 dBm
6	2437	20.65	0.79 Watt = 28.98 dBm
11	2462	18.56	0.79 Watt = 28.98 dBm

MPE Prediction (802.11b (Aux))

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 average output power at antenna input	23.83	(dBm)
Maximum average output power at antenna input	241.5460834	(mW)
Duty cycle:	99.3	(%)
Maximum Pav :	239.8552609	(mW)
Antenna gain (typical):	7.02	(dBi)
Maximum antenna gain:	5.035006088	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.240381	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.240381mW/cm^2. This is below the uncontrolled exposure limit of 1mW/cm^2 at 2437MHz.

802.11g (Main)

CH	Frequency (MHz)	Peak Power Output (dBm)	
		Data Rate	Required Limit
		6	
1	2412	18.16	0.79 Watt = 28.98 dBm
6	2437	**23.91**	0.79 Watt = 28.98 dBm
11	2462	16.42	0.79 Watt = 28.98 dBm

CH	Frequency (MHz)	Average Power Output (dBm)	
		Data Rate	Required Limit
		6	
1	2412	15.13	0.79 Watt = 28.98 dBm
6	2437	20.51	0.79 Watt = 28.98 dBm
11	2462	13.30	0.79 Watt = 28.98 dBm

MPE Prediction (802.11g (Aux))

Prediction of MPE limit at a given distance

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

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

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 average output power at antenna input	23.91	(dBm)
Maximum average output power at antenna input	246.0367604	(mW)
Duty cycle:	96.1	(%)
Maximum Pav :	236.4413268	(mW)
Antenna gain (typical):	7.02	(dBi)
Maximum antenna gain:	5.035006088	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.236959	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.236959mW/cm2. This is below the uncontrolled exposure limit of 1mW/cm2 at 2437MHz.

802.11n_20M (MIMO Chain 0+1)

CH	Frequency (MHz)	Peak Power Output (dBm)	
		Data Rate	Required Limit
		MCS8	
1	2412	18.29	0.40 Watt = 25.97dBm
6	2437	20.76	0.40 Watt = 25.97dBm
11	2462	16.20	0.40 Watt = 25.97dBm

CH	Frequency (MHz)	Average Power Output (dBm)	
		Data Rate	Required Limit
		MCS8	
1	2412	15.08	0.40 Watt = 25.97dBm
6	2437	17.56	0.40 Watt = 25.97dBm
11	2462	13.11	0.40 Watt = 25.97dBm

MPE Prediction (802.11 n_20M (MIMO Chain 0+1))

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 average output power at antenna input	20.76	(dBm)
Maximum average output power at antenna input	119.1242008	(mW)
Duty cycle:	92.7	(%)
Maximum Pav :	110.4281341	(mW)
Antenna gain (typical):	7.02	(dBi)
Maximum antenna gain:	5.035006088	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.110670	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.110670mW/cm2. This is below the uncontrolled exposure limit of 1mW/cm2 at 2437MHz.

802.11n_40M (MIMO Chain 0+1)

CH	Frequency (MHz)	Peak Power Output (dBm)	
		Data Rate	Required Limit
		MCS8	
1	2422	14.40	0.40 Watt = 25.97dBm
6	2437	20.64	0.40 Watt = 25.97dBm
11	2452	13.64	0.40 Watt = 25.97dBm

CH	Frequency (MHz)	Average Power Output (dBm)	
		Data Rate	Required Limit
		MCS8	
1	2422	11.26	0.41 Watt = 26.11dBm
6	2437	17.20	0.41 Watt = 26.11dBm
11	2452	10.32	0.41 Watt = 26.11dBm

MPE Prediction (802.11 n_40M (MIMO Chain 0+1))

Prediction of MPE limit at a given distance

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

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

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 average output power at antenna input	20.64	(dBm)
Maximum average output power at antenna input	115.8777356	(mW)
Duty cycle:	89.9	(%)
Maximum Pav :	104.1740843	(mW)
Antenna gain (typical):	7.02	(dBi)
Maximum antenna gain:	5.035006088	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.104402	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.104402mW/cm2. This is below the uncontrolled exposure limit of 1mW/cm2 at 2437MHz.