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 §2.1091 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

1.2 Maximum Permissible Exposure (MPE) Evaluation

802.11b Main								
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit				RESULT
1	2412	1	18.92	1 Watt =	30.00	dBm		PASS
6	2437	1	18.90	1 Watt =	30.00	dBm		PASS
11	2462	1	19.02	1 Watt =	30.00	dBm		PASS
802.11b Main								
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit				RESULT
1	2412	1	15.60	1 Watt =	30.00	dBm		PASS
6	2437	1	15.52	1 Watt =	30.00	dBm		PASS
11	2462	1	15.63	1 Watt =	30.00	dBm		PASS

MPE Prediction (802.11b 2412~2462)

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

Max. output power including tune-up tolerancel:	19.02	(dBm)
Max. output power including tune-up tolerancel:	79.799469	(mW)
Duty cycle:	98.91	(%)
Maximum Pav :	78.929655	(mW)
Peak Antenna gain (Maximum):	1.93	(dBi)
Peak Antenna gain (linear):	1.5595525	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
PE limit for uncontrolled exposure at prediction frequ	1	(mW/cm2)
r density at predication frequency at 20 (cm) distance	0.025	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.025 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2462MHz.

1.3 Maximum Permissible Exposure (MPE) Evaluation

802.11g Main							
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit			RESULT
1	2412	6	20.77	1 Watt =	30.00	dBm	PASS
6	2437	6	21.09	1 Watt =	30.00	dBm	PASS
11	2462	6	21.35	1 Watt =	30.00	dBm	PASS
802.11g Main							
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit			RESULT
1	2412	6	11.95	1 Watt =	30.00	dBm	PASS
6	2437	6	11.67	1 Watt =	30.00	dBm	PASS
11	2462	6	11.64	1 Watt =	30.00	dBm	PASS

MPE Prediction (802.11g 2412~2462)

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

Max. output power including tune-up tolerancel:	21.35	(dBm)
Max. output power including tune-up tolerancel:	136.45831	(mW)
Duty cycle:	93.25	(%)
Maximum Pav :	127.24738	(mW)
Peak Antenna gain (Maximum):	1.93	(dBi)
Peak Antenna gain (linear):	1.5595525	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
limit for uncontrolled exposure at prediction frequency:	1	(mW/cm2)
er density at predication frequency at 20 (cm) distance	0.040	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.04 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2462MHz.

1.4 Maximum Permissible Exposure (MPE) Evaluation

802.11n_HT20M MIMO									
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit		RESULT
			CH 0	CH 1					
1	2412	MCS8	20.80	20.65	**23.74**	236.37	1 Watt = 30.00 dBm		PASS
6	2437	MCS8	20.86	19.98	23.45	221.44	1 Watt = 30.00 dBm		PASS
11	2462	MCS8	20.93	20.08	23.54	225.74	1 Watt = 30.00 dBm		PASS
802.11n_HT20M MIMO									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit		RESULT
			CH 0	CH 1					
1	2412	MCS8	11.31	11.07	14.52	26.31	1 Watt = 30.00 dBm		PASS
6	2437	MCS8	11.42	10.98	14.53	26.40	1 Watt = 30.00 dBm		PASS
11	2462	MCS8	11.55	11.26	**14.73**	27.65	1 Watt = 30.00 dBm		PASS

MPE Prediction (802.11n20 2412~2462)(MIMO)

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

MIMO gain= G+(10 logN)= 4.02+3.01= 7.03dBi

Max. output power including tune-up tolerance:	23.74	(dBm)
Max. output power including tune-up tolerancel:	236.59197	(mW)
Duty cycle:	92.96	(%)
Maximum Pav :	219.9359	(mW)
Peak Antenna gain (Maximum):	1.93	(dBi)
Peak Antenna gain (linear):	1.5595525	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
limit for uncontrolled exposure at prediction frequency:	1	(mW/cm2)
er density at predication frequency at 20 (cm) distance	0.068	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.068 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2412MHz.