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	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit				RESULT
1	2412	1	16.49	1 Watt =	30.00	dBm		PASS
6	2437	1	20.03	1 Watt =	30.00	dBm		PASS
11	2462	1	**20.59**	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	13.73	1 Watt =	30.00	dBm		PASS
6	2437	1	18.75	1 Watt =	30.00	dBm		PASS
11	2462	1	**19.06**	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:	20.59	(dBm)
Max. output power including tune-up tolerancel:	114.55129	(mW)
Duty cycle:	99.64	(%)
Maximum Pav :	114.13891	(mW)
Peak Antenna gain (Maximum):	4.53	(dBi)
Peak Antenna gain (linear):	2.837919	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at predication frequency at 20 (cm) distance	0.064474	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.064474 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	18.93	1 Watt =	30.00	dBm	PASS
6	2437	6	20.29	1 Watt =	30.00	dBm	PASS
11	2462	6	**21.14**	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	9.58	1 Watt =	30.00	dBm	PASS
6	2437	6	14.37	1 Watt =	30.00	dBm	PASS
11	2462	6	**16.35**	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:	21.14	(dBm)
Max. output power including tune-up tolerancel:	130.01696	(mW)
Duty cycle:	96.84	(%)
Maximum Pav :	125.90842	(mW)
Peak Antenna gain (Maximum):	4.53	(dBi)
Peak Antenna gain (linear):	2.837919	(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	0.071	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.071 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 Main							
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit			RESULT
1	2412	MCS0	19.15	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	20.53	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	**21.19**	1 Watt =	30.00	dBm	PASS
802.11n_HT20M Main							
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit			RESULT
1	2412	MCS0	9.64	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	14.40	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	**16.05**	1 Watt =	30.00	dBm	PASS

MPE Prediction (802.11n20 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

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

Max. output power including tune-up tolerance:	21.19	(dBm)
Max. output power including tune-up tolerancel:	131.52248	(mW)
Duty cycle:	96.19	(%)
Maximum Pav :	126.51148	(mW)
Peak Antenna gain (Maximum):	4.53	(dBi)
Peak Antenna gain (linear):	2.837919	(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	0.071	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.071 mW/cm2.

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

1.5 Maximum Permissible Exposure (MPE) Evaluation

802.11n_HT40M Main							
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit			RESULT
3	2422	MCS0	21.88	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	**22.42**	1 Watt =	30.00	dBm	PASS
9	2452	MCS0	21.34	1 Watt =	30.00	dBm	PASS

MPE Prediction (802.11n_HT40 2422~2452)

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:	22.42	(dBm)
Max. output power including tune-up tolerancel:	174.58222	(mW)
Duty cycle:	95.01	(%)
Maximum Pav :	165.87056	(mW)
Peak Antenna gain (Maximum):	4.53	(dBi)
Peak Antenna gain (linear):	2.837919	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm^2)
Power density at predication frequency at 20 (cm) distance	0.093696	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.093696 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2437MHz.