14 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

14.1 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

Maximum Permissible Exposure (MPE) Evaluation

802.11b Main								
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	1	**19.52**	**89.54**	1 Watt =	30.00	dBm	PASS
6	2437	1	19.36	86.30	1 Watt =	30.00	dBm	PASS
11	2462	1	19.16	82.41	1 Watt =	30.00	dBm	PASS
802.11b Main								
CH	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit			RESULT
1	2412	1	**17.45**	**55.59**	1 Watt =	30.00	dBm	PASS
6	2437	1	17.42	55.21	1 Watt =	30.00	dBm	PASS
11	2462	1	17.25	53.09	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:	17.45	(dBm)
Max. output power including tune-up tolerancel:	55.590426	(mW)
Duty cycle:	98.19	(%)
Maximum Pav :	54.584239	(mW)
Peak Antenna gain (Maximum):	0.78	(dBi)
Peak Antenna gain (linear):	1.1967405	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.013	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.013 mW/cm2.

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

802.11g Main								
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	6	**23.44**	**220.80**	1 Watt =	30.00	dBm	PASS
6	2437	6	23.17	207.49	1 Watt =	30.00	dBm	PASS
11	2462	6	22.9	194.98	1 Watt =	30.00	dBm	PASS
802.11g Main								
CH	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit			RESULT
1	2412	6	**14.46**	**27.93**	1 Watt =	30.00	dBm	PASS
6	2437	6	14.35	27.23	1 Watt =	30.00	dBm	PASS
11	2462	6	14.19	26.24	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:	14.46	(dBm)
Max. output power including tune-up tolerancel:	27.925438	(mW)
Duty cycle:	91.25	(%)
Maximum Pav :	25.481963	(mW)
Peak Antenna gain (Maximum):	0.78	(dBi)
Peak Antenna gain (linear):	1.1967405	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.006	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.006 mW/cm2.

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

802.11n_HT20M Main								
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	MCS0	**23.4**	**218.78**	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	23.22	209.89	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	23.26	211.84	1 Watt =	30.00	dBm	PASS
802.11n_HT20M Main								
CH	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit			RESULT
1	2412	MCS0	14.42	27.67	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	14.22	26.42	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	**14.48**	**28.05**	1 Watt =	30.00	dBm	PASS

MPE Prediction (802.11n_HT20 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:	14.48	(dBm)
Max. output power including tune-up tolerancel:	28.054336	(mW)
Duty cycle:	95.5	(%)
Maximum Pav :	26.791891	(mW)
Peak Antenna gain (Maximum):	0.78	(dBi)
Peak Antenna gain (linear):	1.1967405	(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)	0.006	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.006 mW/cm2.

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

802.11n_HT40M Main								
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
3	2422	MCS0	23.1	204.17	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	22.98	198.61	1 Watt =	30.00	dBm	PASS
9	2452	MCS0	**23.15**	**206.54**	1 Watt =	30.00	dBm	PASS
802.11n_HT40M Main								
CH	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit			RESULT
3	2422	MCS0	14.26	26.67	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	14.25	26.61	1 Watt =	30.00	dBm	PASS
9	2452	MCS0	**14.48**	**28.05**	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:	14.48	(dBm)
Max. output power including tune-up tolerancel:	28.05433638	(mW)
Duty cycle:	80.92	(%)
Maximum Pav :	22.701569	(mW)
Peak Antenna gain (Maximum):	0.78	(dBi)
Peak Antenna gain (linear):	1.196740531	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2452	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.005	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.005 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2452MHz.