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 §2.1093 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 (worst case)

802.11g Main						
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	6	23.06	202.30	1 Watt = 30.00 dBm	PASS
6	2437	6	23.15	206.54	1 Watt = 30.00 dBm	PASS
11	2462	6	**23.46**	**221.82**	1 Watt = 30.00 dBm	PASS
802.11g Main						
CH	Freq. (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit	RESULT
1	2412	6	14.92	31.05	1 Watt = 30.00 dBm	PASS
6	2437	6	14.97	31.41	1 Watt = 30.00 dBm	PASS
11	2462	6	**15.46**	**35.16**	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:	15.46	(dBm)
Max. output power including tune-up tolerancel:	35.15604405	(mW)
Duty cycle:	89.64	(%)
Maximum Pav :	31.51387789	(mW)
Peak Antenna gain (Maximum):	3.82	(dBi)
Peak Antenna gain (linear):	2.409905429	(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)	0.015	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.015 mW/cm2.

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

Maximum Permissible Exposure (MPE) Evaluation (worst case)

802.11n_HT20M MIMO								
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
1	2412	MCS8	21.64	21.22	**24.45**	278.32	1 Watt = 29.17 dBm	PASS
6	2437	MCS8	21.35	21.30	24.34	271.35	1 Watt = 29.17 dBm	PASS
11	2462	MCS8	21.12	21.01	24.08	255.60	1 Watt = 29.17 dBm	PASS
802.11n_HT20M MIMO								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
1	2412	MCS8	12.62	12.31	**15.48**	35.30	1 Watt = 29.17 dBm	PASS
6	2437	MCS8	12.22	12.32	15.28	33.73	1 Watt = 29.17 dBm	PASS
11	2462	MCS8	12.52	12.31	15.43	34.89	1 Watt = 29.17 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

MIMO Gain: 3.82+3.01=6.83dBi

Max. output power including tune-up tolerancel:	15.48	(dBm)
Max. output power including tune-up tolerancel:	35.31831698	(mW)
Duty cycle:	80.87	(%)
Maximum Pav :	28.56192294	(mW)
Peak Antenna gain (Maximum):	6.83	(dBi)
Peak Antenna gain (linear):	4.819477976	(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)	0.027	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.027 mW/cm2.

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

Maximum Permissible Exposure (MPE) Evaluation (worst case)

802.11n_HT40M MIMO								
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
3	2422	MCS8	22.19	22.04	25.13	325.53	1 Watt = 29.17 dBm	PASS
6	2437	MCS8	22.17	22.29	25.24	334.25	1 Watt = 29.17 dBm	PASS
9	2452	MCS8	22.35	22.24	**25.31**	339.29	1 Watt = 29.17 dBm	PASS
802.11n_HT40M MIMO								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
3	2422	MCS8	12.87	12.31	**15.61**	36.39	1 Watt = 29.17 dBm	PASS
6	2437	MCS8	12.61	12.35	15.49	35.42	1 Watt = 29.17 dBm	PASS
9	2452	MCS8	12.66	12.43	15.56	35.95	1 Watt = 29.17 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

MIMO Gain: 3.28+3.01=6.83dBi

Max. output power including tune-up tolerancel:	15.61	(dBm)
Max. output power including tune-up tolerancel:	36.39150361	(mW)
Duty cycle:	68.49	(%)
Maximum Pav :	24.92454082	(mW)
Peak Antenna gain (Maximum):	6.83	(dBi)
Peak Antenna gain (linear):	4.819477976	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2422	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.024	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.024 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2422MHz.