

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

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Maximum Permissible Exposure (MPE) Evaluation (worst case)

802.11b Main						
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	1	18.99	79.25	1 Watt = 30.00 dBm	PASS
6	2437	1	19.47	88.51	1 Watt = 30.00 dBm	PASS
11	2462	1	19.35	86.10	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	15.62	36.48	1 Watt = 30.00 dBm	PASS
6	2437	1	15.87	38.64	1 Watt = 30.00 dBm	PASS
11	2462	1	15.79	37.93	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:	15.87	(dBm)
Max. output power including tune-up tolerancel:	38.636698	(mW)
Duty cycle:	98.75	(%)
Maximum Pav :	38.153739	(mW)
Peak Antenna gain (Maximum):	4.06	(dBi)
Peak Antenna gain (linear):	2.5468303	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.019	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.019 mW/cm².

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

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Maximum Permissible Exposure (MPE) Evaluation

802.11g Main						
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	6	21.03	126.77	1 Watt = 30.00 dBm	PASS
6	2437	6	20.97	125.03	1 Watt = 30.00 dBm	PASS
11	2462	6	21.22	132.43	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	11.97	15.74	1 Watt = 30.00 dBm	PASS
6	2437	6	11.95	15.67	1 Watt = 30.00 dBm	PASS
11	2462	6	11.73	14.89	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:	11.97	(dBm)
Max. output power including tune-up tolerancel:	15.739829	(mW)
Duty cycle:	93.15	(%)
Maximum Pav :	14.66165	(mW)
Peak Antenna gain (Maximum):	4	(dBi)
Peak Antenna gain (linear):	2.5118864	(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)	0.007	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.007 mW/cm².

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

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Maximum Permissible Exposure (MPE) Evaluation

802.11n_HT20M MIMO								
CH	Frequency (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	20.40	19.71	23.08	203.19	1 Watt = 28.93 dBm	PASS
6	2437	MCS8	20.50	19.89	23.22	209.70	1 Watt = 28.93 dBm	PASS
11	2462	MCS8	20.96	20.38	23.69	233.88	1 Watt = 28.93 dBm	PASS

802.11n_HT20M MIMO								
CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Output include tune up tolerance	Max. Output include tune up tolerance	Limit	RESULT
			CH 0	CH 1				
1	2412	MCS8	11.03	10.25	13.67	23.27	1 Watt = 28.93 dBm	PASS
6	2437	MCS8	10.92	10.16	13.57	22.73	1 Watt = 28.93 dBm	PASS
11	2462	MCS8	11.09	10.47	13.80	24.00	1 Watt = 28.93 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: 4.06+3.01=7.07dBi

Max. output power including tune-up tolerancel:	13.80	(dBm)
Max. output power including tune-up tolerancel:	23.988329	(mW)
Duty cycle:	86.84	(%)
Maximum Pav :	20.831465	(mW)
Peak Antenna gain (Maximum):	7.07	(dBi)
Peak Antenna gain (linear):	5.0933087	(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)	0.021	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.021 mW/cm².

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

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