

12 Maximum Permissible Exposure (MPE)

12.1 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

12.2 Maximum Permissible Exposure (MPE) Evaluation

The worst case of Average power: refer to section 6.5 for detail measurement data.

802.11b

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	19.24	16.84	30
6	2437	19.83	17.53	
11	2462	19.23	16.92	

MPE Prediction (802.11b)

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

Maximum average output power at antenna input	17.53	(dBm)
Maximum Average output power at antenna input	56.6239289	(mW)
Duty cycle:	100	(%)
Maximum Pav :	56.6239289	(mW)
Antenna gain (typical):	-5.2	(dBi)
Maximum antenna gain:	0.301995172	(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)	0.0034037	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0034037 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 2437MHz.

The worst case of Average power: refer to section 6.5 for detail measurement date.

802.11a_HT20(5G)

Channel		Frequency (MHz)	Output Chain (dBm)		Combine Output Power (dBm)	Limit(dBm)
			Chain A	chain B		
AN HT20	149	5745	6.91	11.69	12.94	30
	157	5785	7.12	10.52	12.15	30
	165	5825	7.11	9.67	11.59	30

MPE Prediction (802.11a)

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

Maximum average output power at antenna input	12.94	(dBm)
Maximum Average output power at antenna input	19.6788629	(mW)
Duty cycle:	100	(%)
Maximum Pav :	19.6788629	(mW)
Antenna gain (typical):	5.9	(dBi)
Maximum antenna gain:	3.89045145	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5745	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0152388	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0152388 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm² at 5745MHz.