

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 §2.1091 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 (BLE)

PCB Antenna

Maximum output power at antenna input terminal:	8.49	(dBm)
Maximum output power at antenna input terminal:	7.063175543	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	8.892011179	(mW)
Antenna gain (typical):	0.34	(dBi)
Maximum antenna gain:	1.081433951	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0019140	(mW/cm ²)

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

Measurement Result:

The predicted power density level at 20 cm is 0.0019140 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

Maximum Permissible Exposure (MPE) Evaluation

Dipole Antenna

Maximum output power at antenna input terminal:	8.49	(dBm)
Maximum output power at antenna input terminal:	7.063175543	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	8.892011179	(mW)
Antenna gain (typical):	6	(dBi)
Maximum antenna gain:	3.981071706	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0070461	(mW/cm ²)

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

Measurement Result:

The predicted power density level at 20 cm is 0.0070461 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

Maximum Permissible Exposure (MPE) Evaluation (Zigbee)

PCB Antenna

Maximum output power at antenna input terminal:	8.43	(dBm)
Maximum output power at antenna input terminal:	6.966265141	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	8.770008211	(mW)
Antenna gain (typical):	0.34	(dBi)
Maximum antenna gain:	1.081433951	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0018878	(mW/cm ²)

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

Measurement Result:

The predicted power density level at 20 cm is 0.0018878 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

Maximum Permissible Exposure (MPE) Evaluation

Dipole Antenna

Maximum output power at antenna input terminal:	8.43	(dBm)
Maximum output power at antenna input terminal:	6.966265141	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	8.770008211	(mW)
Antenna gain (typical):	6	(dBi)
Maximum antenna gain:	3.981071706	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0069494	(mW/cm ²)

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

Measurement Result:

The predicted power density level at 20 cm is 0.0069494 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

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