

15. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

15.1 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

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15.2 Maximum Permissible Exposure (MPE) Evaluation

Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5180	9.79	9.528	23.98
5220	8.26	6.699	23.98
5240	7.62	5.781	23.98

MPE Prediction (802.11a 5150~5250)

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	9.79	(dBm)
Maximum average output power at antenna input	9.5279616	(mW)
Duty cycle:	98.2	(%)
Maximum Pav :	9.3564583	(mW)
Antenna gain (Maximum):	3.71	(dBi)
Antenna gain (linear):	2.3496328	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5180	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0043758	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0043758mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 5180MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5180	12.68	18.555	23.26
5220	13.15	20.675	23.26
5240	11.94	15.614	23.26

MPE Prediction (802.11n HT20 5150~5250)

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	12.68	(dBm)
Maximum average output power at antenna input	18.535316	(mW)
Duty cycle:	96.4	(%)
Maximum Pav :	17.868045	(mW)
Antenna gain (Maximum):	6.72	(dBi)
Antenna gain (linear):	4.6989411	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5180	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0167120	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0167120mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 5180MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5190	13.71	23.484	23.26
5230	12.26	16.808	23.26

MPE Prediction (802.11n HT40 5150~5250)

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	12.26	(dBm)
Maximum average output power at antenna input	16.826741	(mW)
Duty cycle:	78.8	(%)
Maximum Pav :	13.259472	(mW)
Antenna gain (Maximum):	6.72	(dBi)
Antenna gain (linear):	4.6989411	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5230	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0124016	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0124016mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 5230MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5745	7.52	5.649	30
5785	8.63	7.295	30
5825	9.27	8.453	30

MPE Prediction (802.11a 5725~5850)

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	9.27	(dBm)
Maximum average output power at antenna input	8.4527885	(mW)
Duty cycle:	98.2	(%)
Maximum Pav :	8.3006383	(mW)
Antenna gain (Maximum):	5.02	(dBi)
Antenna gain (linear):	3.1768741	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5825	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0052488	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.052488mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 5825MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5745	11.67	14.694	27.97
5785	12.53	17.920	27.97
5825	13.22	21.004	27.97

MPE Prediction (802.11n HT20 5725~5850)

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	12.53	(dBm)
Maximum average output power at antenna input	17.906059	(mW)
Duty cycle:	96.4	(%)
Maximum Pav :	17.26144	(mW)
Antenna gain (Maximum):	8.03	(dBi)
Antenna gain (linear):	6.3533093	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5785	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0218287	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0218287mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 5785MHz.

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Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (dBm)
5755	11.66	14.649	27.97
5795	12.01	15.886	27.97

MPE Prediction (802.11n HT40 5725~5850)

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	12.01	(dBm)
Maximum average output power at antenna input	15.885467	(mW)
Duty cycle:	78.8	(%)
Maximum Pav :	12.517748	(mW)
Antenna gain (Maximum):	8.03	(dBi)
Antenna gain (linear):	6.3533093	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5795	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0158298	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0158298mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 5795MHz.

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