

1. 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

According to RSS 102 issue 5.

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Maximum Permissible Exposure (MPE) Evaluation

2.4GHz mode: BLE

The worst case: refer to FCC test report for detail measurement date.

Power measurement:

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
Low	-7.37	0.00018	1
Mid	-6.66	0.00022	1
High	-6.36	0.00023	1

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P_G}{4\pi R^2}$$

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 output power at antenna input terminal:	-6.36	(dBm)
Maximum output power at antenna input terminal:	0.231206479	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	0.291071712	(mW)
Antenna gain (typical):	-2.82	(dBi)
Maximum antenna gain:	0.522396189	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0000303	(mW/cm ²)

Measurement Result:

The predicted power density level at 20 cm is 0.0000303 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

802.11b

Cable loss = 0	Output Power		Limit (dBm)
CH	Detector		
	PK (dBm)	AV (dBm)	
Low	16.79	14.52	30.00
Mid	16.34	14.05	
High	16.16	13.83	

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P}{4\pi R^2}$$

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 output power at antenna input terminal:	16.79	(dBm)
Maximum output power at antenna input terminal:	47.75292737	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	60.11737375	(mW)
Antenna gain (typical):	0.9	(dBi)
Maximum antenna gain:	1.230268771	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0147214	(mW/cm ²)

Measurement Result:

The predicted power density level at 20 cm is 0.0147214 mW/cm².. This is below the uncontrolled exposure limit of 1 mW/cm².

5150MHz – 5350MHz Mode:

The worst case of Average power a mode: refer to FCC test report for detail measurement date.

Power measurement:

802.11a

Mode	Channel	power (dBm)	limit(dBm)	result
802.11a	5180	11.91	23.97	pass
	5260	11.49	23.97	pass
	5320	11.37	23.97	pass

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P}{4\pi R^2}$$

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 output power at antenna input terminal:	11.91	(dBm)
Maximum output power at antenna input terminal:	15.5238701	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	19.54339456	(mW)
Antenna gain (typical):	3.8	(dBi)
Maximum antenna gain:	2.398832919	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0093315	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0093315 mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

5470MHz – 5725MHz Mode:

The worst case of Average power a mode: refer to FCC test report for detail measurement date.

Power measurement:

802.11a

Mode	Channel	power (dBm)	limit(dBm)	result
802.11a	5500	10.11	23.97	pass
	5600	11.06	23.97	pass
	5700	13.67	23.97	pass

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P}{4\pi R^2}$$

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 output power at antenna input terminal:	13.67	(dBm)
Maximum output power at antenna input terminal:	23.28091258	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	29.30893245	(mW)
Antenna gain (typical):	3.8	(dBi)
Maximum antenna gain:	2.398832919	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0139943	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0139943mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

5725MHz – 5850MHz Mode:

The worst case of Average power a mode: refer to FCC test report for detail measurement date.

Power measurement:

802.11a

Mode	Channel	power (dBm)	limit(dBm)	result
802.11n HT20	5745	13.35	30	pass
	5785	13.36	30	pass
	5825	13.16	30	pass

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P}{4\pi R^2}$$

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 output power at antenna input terminal:	13.36	(dBm)
Maximum output power at antenna input terminal:	21.67704105	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	27.28977783	(mW)
Antenna gain (typical):	3.8	(dBi)
Maximum antenna gain:	2.398832919	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.0130302	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.0130302mW/cm². This is below the uncontrolled exposure limit of 1 mW/cm².

~ End of Report ~