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.

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This is a Mobile device, the MPE is required.

FCC: 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

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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[6] 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.

Tune-Up Power and Tolerance:

WLAN: 1TX, 1RX

Wi-Fi	Frequency Range (MHz)	Channels	Average Tune-Up Power	Modulation Technology
802.11b	2412 – 2472(DTS)	13	Channel 1-11 20.0 dBm (AV) Channel 12-13 6.0 dBm (AV)	DSSS
802.11g	2412 – 2472(DTS)	13	Channel 1-11 15.0 dBm (AV) Channel 12-13 3.0 dBm (AV)	DSSS, OFDM
802.11n	HT20 2412 – 2472(DTS)	13		OFDM
	HT40 2422 – 2462(DTS)	9	Channel 3-9 12.0 dBm (AV) Channel 10-11 2.0 dBm (AV)	
Power Tolerance:		+/- 1 dBm		

FCC: 2.4GHz mode: 802.11 b mode

Maximum Permissible Exposure (MPE) Evaluation: The worst case of Average power

Power measurement: refer to Prt15.247 and RSS 210 report fro details.

802.11b

Cable loss = 0	Output Power		Limit (dBm)
CH	Detector		
	PK (dBm)	AV (dBm)	
1 (CH Low)	22.15	20.21	30
7 (CH Mid)	21.88	19.82	
11	21.72	19.5	
12	11.11	6.85	
13 (CH High)	10.69	6.42	

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

	CH 1-11	CH 12/13	
Tune-Up power at antenna input terminal:	20.00	6.00	(dBm)
Tune-Up power at antenna input terminal:	100.00	3.98	(mW)
Tune-Up power Tolerance:	1.00	1.00	dB
Duty cycle:	100.00	100.00	(%)
Maximum Pav :	125.89	5.01	(mW)
Antenna gain (typical):	-0.33	-0.33	(dBi)
Maximum antenna gain:	0.93	0.93	(numeric)
Prediction distance:	20.00	20.00	(cm)
MPE limit for uncontrolled exposure at prediction frequency:	1.00	1.00	(mW/cm^2)
Power density at predication frequency at 20 (cm) distance	0.0232	0.0009	(mW/cm^2)

Measurement Result:

The worst power density is 0.0232 mW/cm^2 which is less than 1 mW/cm^2.

IC EIRP/Conducted Power level: 802.11 b mode

	CH 1-11 2462	CH 12/13 2472	MHz
Tune-UP power at antenna input terminal:	20	6	(dBm)
Tune-Up power Tolerance:	1	1	dB
Duty cycle:	100	100	(%)
Antenna gain (typical):	-0.33	-0.33	(dBi)
Conducted Power:	125.893	5.012	mW
Conducted Power:	0.12589	0.00501	W
EIRP:	116.681	4.645	mW
EIRP:	0.11668	0.00465	W
EIRP Limit	2.722	2.729	W

Measurement Result:

The Conducted Power level is 0.12589 W which less than RSS102 section 2.5.2 Exemption Limits (2.722/2.729 W) above 300 MHz and below 6 GHz condition .

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