

FCC §15.247 (i), §2.1091 – RF Exposure

FCC ID: 2BU96-TSD81

Applied procedures / limit

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

Note: f is frequency in MHz

* = Power density limit is applicable at frequencies greater than 100 MHz

Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz

* = Plane-wave equivalent power density

MPE PREDICTION

Predication of MPE limit at a given distance, Equation from 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, R=20cm

Test Result of RF Exposure Evaluation

	Modes& Channel Freq. (MHz)	Tune up Produce power	Maximu m peak output power (dBm)	Output power to antenna (mW)	Antenna Gain (numeric)	Power Density (S) (mW/ cm2)	Limit (mW / cm2)	Result
433.93MHz	ASK	-21±1	-20	0.0100	0.3192 (-4.96dBi)	0.0000006	0.3	Pass
315MHz	ASK	-26±1	-25	0.0032	1.2589 (1dBi)	0.0000008	0.2	Pass

433.93MHz: Note: dbm=dbuv/m-95.2-2.15=71.15-95.2-2.15=-26.2dBm(ERP), so the conduct peak power=-26.2-(-4.96) =-21.24dBm

315MHz: Note: dbm=dbuv/m-95.2-2.15=71.66-95.2-2.15=-25.69dBm(ERP), so the conduct peak power=-25.69-1=-26.69dBm

433.93MHz+315MHz supported simultaneous transmission:

$$\begin{aligned} 433.93\text{MHz}+315\text{MHz: } \sum \text{MPE Ratio} &= 0.0000006/0.3+0.0000008/0.2 \\ &= 0.000006 \leq 1, \text{ So passed.} \end{aligned}$$