

RF Exposure

Reference: CFR 47 FCC Part 2.1093
CFR 47 FCC Part 15.245

The user's manual for this device states:

"avoid holding the radar unit while the radar is activated and maintain 20 cm from the device"

The user would activate the radar while holding the device in their hand, and then place it on the ground. While the device is being held, it is considered portable. When it is on the ground and the 20cm separation is maintained, it is considered *mobile*.

When device under consideration is considered *portable*, and is therefore defined under FCC Part 2.1093 (b):

(b) For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

And Section (d)

(d) ... Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in §1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

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TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) 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
300-1,500			f/1500	30
1,500-100,000			1.0	30

The limit for a transmitter operating at 24,110 MHz for general population/uncontrolled exposure is 1 mW/cm²

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Total for *mobile* (> 20cm) use:

Occupational/Controlled	0
General Population/uncontrolled	1

Transmitter	Frequency	Antenna Gain	Power	Power +10% for tolerance	Power Density	Limit	% of limit	Highest	Total	Type
	MHz	numerical	mW		mW/cm ²	mW/cm ²	Percent of limit			
1	2402	0.507	1.91	2.10	0.00021	1.0000	0.02%	1	0.02%	PK/conducted
1	2440	0.507	1.77	1.94	0.00020	1.0000	0.02%			PK/conducted
1	2480	0.507	1.71	1.88	0.00019	1.0000	0.02%			PK/conducted
2	24200	1	4.64	5.10	0.00102	1.0000	0.10%	1	0.10%	radiated
TOTAL									0.12%	

Distance	20	cm
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PASS?	YES
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Occupational/Controlled	0
General Population/uncontrolled	1

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Although the Field Disturbance Sensor (FDS) is intended to only operate while on the ground and the user is instructed to maintain 20cm of separation from the device while the FDS is operating, the Bluetooth radio may operate while the device is hand held or in the pocket, and for Bluetooth operation, the device could be considered as Portable.

Evaluation for portable use with 5mm separation:

Lowest Channel

f(GHz) = 2.402

Power = 2.80 dBm conducted Antenna gain = 0.507 dBi 0.41 dB added for 10% power tolerance

EIRP + 10% tolerance = 3.72 dBm = 2.36 mW, round to nearest mW = 2 mW

$[2 \text{ mW}] / [5.00 \text{ mm}] \cdot [\sqrt{2.402}] = 0.62 \text{ Limit} = 3.0$ **EXEMPT**

Middle Channel

f(GHz) = 2.441

Power = 2.47 dBm conducted Antenna gain = 0.507 dBi 0.41 dB added for 10% power tolerance

EIRP + 10% tolerance = 3.39 = 2.18 mW, rounded to nearest mW = 2 mW

$[2 \text{ mW}] / [5.00 \text{ mm}] \cdot [\sqrt{2.440}] = 0.62 \text{ Limit} = 3.0$ **EXEMPT**

Highest Channel

f(GHz) = 2.480

Power = 2.33 dBm conducted Antenna gain = 0.507 dBi 0.41 dB added for 10% power tolerance

EIRP + 10% tolerance = 3.25 = 2.11 mW, rounded to nearest mW = 2 mW

$[2 \text{ mW}] / [5.00 \text{ mm}] \cdot [\sqrt{2.480}] = 0.63 \text{ Limit} = 3.0$ **EXEMPT**