

## RF Exposure limits, contents

Table NT0-1, Sections A to G, RF Exposure Limits.

Figure NT0-1, RF Field Strength and Power Density Limits.

Figure NT0-2, Antenna Main Beam Exposure Levels.

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**Section A:**

Estimated distances to meet RF power density guidelines in the main beam of a typical 3-element "triband" Yagi for the 14, 21 and 28 MHz amateur radio bands. Calculations include the EPA ground reflection factor of 2.56

Frequency: 14 MHz  
 Antenna gain: 6.5 dbi  
 Controlled limit: 4.59 mW/cm<sup>2</sup>  
 Uncontrolled limit: 0.92 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	4.6'	10.3'
500	10.3'	23.1'
1000	14.6'	32.7'
1500	17.9'	40'

Frequency: 21 MHz  
 Antenna gain: 7 dbi  
 Controlled limit: 2.04 mW/cm<sup>2</sup>  
 Uncontrolled limit: 0.408 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	7.3'	16.4'
500	16.4'	36.7'
1000	23.2'	51.9'
1500	26.4'	63.6'

Frequency: 28 MHz  
 Antenna gain: 8 dbi  
 Controlled limit: 1.15 mW/cm<sup>2</sup>  
 Uncontrolled limit: 0.23 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	11'	24.5'
500	24.5'	54.9'
1000	34.7'	77.6'
1500	42.5'	95.1'

**Section B:**

Estimated distances to meet RF power density guidelines with an omnidirectional HF quarter wave vertical or ground plane antenna (estimated gain, 1 dbi). Calculations include the EPA ground reflection factor of 2.56

Frequency: 3.5 MHz  
 Controlled limit: 73.5 mW/cm<sup>2</sup>  
 Uncontrolled limit: 14.7 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	0.6'	1.4'
500	1.4'	3.1'
1000	1.9'	4.3'
1500	2.4'	5.3'

Frequency: 14 MHz  
 Controlled limit: 4.59 mW/cm<sup>2</sup>  
 Uncontrolled limit: 0.918 mW/cm<sup>2</sup>

Frequency: 7 MHz  
 Controlled limit: 18.37 mW/cm<sup>2</sup>  
 Uncontrolled limit: 3.67 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	1.2'	2.7'
500	2.7'	6.1'
1000	3.9'	8.7'
1500	4.7'	10.6'

Frequency: 21 MHz  
 Controlled limit: 2.04 mW/cm<sup>2</sup>  
 Uncontrolled limit: 0.408 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	2.5'	3.5'
500	5.5'	12.3'
1000	7.8'	17.3'
1500	9.5'	21.2'

power (watts)	controlled limit	uncontrolled limit
100	3.7'	8.2'
500	8.2'	18.4'
1000	11.6'	26'
1500	14.2'	31.9'

Frequency: 28 MHz

Controlled limit: 1.15 mW/cm<sup>2</sup>

Uncontrolled limit: 0.23 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	4.9'	11'
500	11'	24.3'
1000	15.5'	34.7'
1500	19'	42.5'

### Section C:

Estimated distances to meet RF power density guidelines with a horizontal half wave dipole (estimated gain, 2 dbi). Calculations include the EPA ground reflection factor of 2.56

Frequency: 3.5 MHz

Controlled limit: 73.5 mW/cm<sup>2</sup>

Uncontrolled limit: 14.7 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	0.7'	1.5'
500	1.5'	3.4'
1000	2.2'	4.9'
1500	2.7'	6'

Frequency: 7 MHz

Controlled limit: 18.37 mW/cm<sup>2</sup>

Uncontrolled limit: 3.67 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	1.4'	3.1'
500	3.1'	6.9'
1000	4.3'	9.7'
1500	5.3'	11.9'

Frequency: 14 MHz

Controlled limit: 4.59 mW/cm<sup>2</sup>

Uncontrolled limit: 0.918 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	2.8'	6.2'
500	6.2'	13.8'
1000	8.7'	19.5'
1500	10.7'	23.8'

Frequency: 21 MHz

Controlled limit: 2.04 mW/cm<sup>2</sup>

Uncontrolled limit: 0.408 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	4.1'	9.2'
500	9.2'	20.6'
1000	13'	29.2'
1500	16'	35.7'

Frequency: 28 MHz

Controlled limit: 1.15 mW/cm<sup>2</sup>

Uncontrolled limit: 0.23 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
100	5.5'	12.3'
500	12.3'	27.5'
1000	17.4'	38.9'
1500	21.3'	47.7'

### **Section D:**

Estimated distances to meet RF power density guidelines with a VHF quarter wave ground plane or mobile whip antenna (estimated gain, 1 dbi). Calculations include the EPA ground reflection factor of 2.56

Frequency: 146 MHz

Controlled limit: 1 mW/cm<sup>2</sup>

Uncontrolled limit: 0.2 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
10	1.7'	3.7'
50	3.7'	8.3'
150	6.4'	14.4'

### **Section E:**

Estimated distances to meet RF power density guidelines in the main beam of a UHF 5/8 ground-plane or whip antenna (estimated gain, 4 dbi). Calculations include the EPA ground reflection factor of 2.56

Frequency: 446 MHz

Controlled limit: 1.49 mW/cm<sup>2</sup>

Uncontrolled limit: 0.3 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
10	1.9'	4.3'
50	4.3'	9.6'
150	7.5'	16.7'

### **Section F:**

Estimated distances to meet RF power density guidelines in the main beam of a 17-element Yagi on a five wavelength boom designed for weak signal communications on the 144 MHz amateur radio band (estimated gain, 16.8 dbi). Calculations include the EPA ground reflection factor of 2.56

Frequency: 144 MHz

Controlled limit: 1 mW/cm<sup>2</sup>

Uncontrolled limit: 0.2 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
10	10.2'	22.9'
100	32.4'	72.4'
300	72.4'	162'
1500	125.5'	288.6'

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### **Section G:**

Estimated distances to meet RF power density guidelines in the main beam of an array of eight 17-element Yagis with five wavelength booms designed for earth-moon-earth ("moonbounce") communications on the 144 MHz amateur radio band (estimated gain, 24 dbi). Calculations include the EPA ground reflection factor of 2.56

Frequency: 144 MHz

Controlled limit: 1 mW/cm<sup>2</sup>

Uncontrolled limit: 0.2 mW/cm<sup>2</sup>

power (watts)	controlled limit	uncontrolled limit
150	90.9'	203.3'
300	166'	371.1'
1500	287.4'	642.7'

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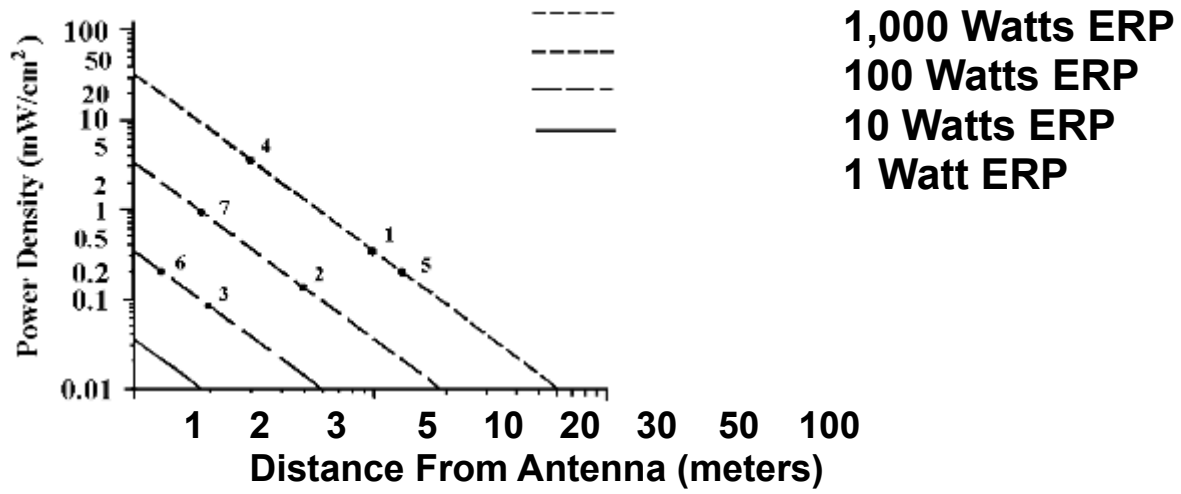
**(A) Limits for Occupational/Controlled Exposure**

(MHz)	Strength (V/M)	Strength (A/m)	(mW/cm <sup>2</sup> )	(minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30-300	61.4	0.163	1.0	6
300-1500	----	----	f/300	6
1500-100,000	----	----	5	6
f=frequency in MHz	*=Plane-wave equivalent power density			

**(B) Limits for General Population/Uncontrolled Exposure**

(MHz)	Strength (V/M)	Strength (A/m)	(mW/cm <sup>2</sup> )	(minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30-300	27.5	0.073	9	30
300-1500	----	----	f/1500	30
1500-100,000	----	----	1.0	30
f=frequency in MHz	*=Plane-wave equivalent power density			

Main beam Exposure (With reflection)



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