#### 7.3. MAXIMUM PERMISSIBLE EXPOSURE

### LIMITS

\$1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Lim	its for Occupational	I/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6 8
(B) Limits	for General Populati	ion/Uncontrolled Exp	posure	
0.3–1.34 1.34–30	614 824 <i>1</i> f	1.63 2.19/f	*(100) *(180/f <sup>2</sup> )	30 30

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

#### TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
30–300 300–1500 1500–100,000	27.5	0.073	0.2 f/1500 1.0	30 30 30

f = frequency in MHz

f = frequency in MHz \* = Plane-wave equivalent power density NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occu-pational/controlled limits apply provided he or she is made aware of the potential for exposure. NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be ex-posed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposed are the exposed as a consequence of their employment may not be fully aware of the potential for

exposure or can not exercise control over their exposure.

Page 27 of 110

COMPLIANCE CERTIFICATION SERVICES DOCUMENT NO: CCSUP4031A 561F MONTEREY ROAD, MORGAN HILL, CA 95037 USA TEL: (408) 463-0885 FAX: (408) 463-0888 This report shall not be reproduced except in full, without the written approval of CCS. This document may be altered or revised by Compliance Certification Services personnel only, and shall be noted in the revision section of the document.

# CALCULATIONS

Given

 $E = \sqrt{(30 * P * G)} / d$ 

where

and

E = Field Strength in Volts/meter

P = Power in Watts

 $S = E^{2}/3770$ 

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

 $d = \sqrt{((30 * P * G) / (3770 * S))}$ 

Changing to units of Power to mW and Distance to cm, using:

P(mW) = P(W) / 1000 and d(cm) = 100 \* d(m)

yields

 $d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$  $d = 0.282 * \sqrt{(P * G / S)}$ 

where

d = distance in cm P = Power in mW G = Numeric antenna gain S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and G (numeric) = 10 ^ (G (dBi) / 10) yields  $d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$  Equation (1) where d = MPE distance in cm P = Power in dBm G = Antenna Gain in dBi $S = Power Density Limit in mW/cm^2$ 

Equation (1) and the measured peak power is used to calculate the MPE distance.

Page 28 of 110

COMPLIANCE CERTIFICATION SERVICESDOCUMENT NO: CCSUP4031A561F MONTEREY ROAD, MORGAN HILL, CA 95037 USATEL: (408) 463-0885FAX: (408) 463-0888This report shall not be reproduced except in full, without the written approval of CCS. This document may<br/>be altered or revised by Compliance Certification Services personnel only, and shall be noted in the<br/>revision section of the document.DOCUMENT NO: CCSUP4031A<br/>TEL: (408) 463-0885

# <u>LIMITS</u>

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

## RESULTS

No non-compliance noted:

Mode	<b>Power Density</b>	Output	Antenna	MPE
	Limit	Power	Gain	Distance
	(mW/cm^2)	(dBm)	(dBi)	(cm)
802.11a, 5.2 Lower Band	1.0	14.83	4.66	2.66
802.11a Turbo, 5.2 Lower Band	1.0	16.64	4.66	3.28
802.11a, 5.2 Upper Band	1.0	17.98	4.66	3.82
802.11a Turbo, 5.2 Upper Band	1.0	17.27	4.66	3.52

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

Page 29 of 110