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Federal Communications Commission

Maximum Permissible Exposure Assessment

for the

Metricom WCS Wired Access Point

In accordance with
FCC REPORT AND ORDER 96-326
Adopted: August 1, 1996

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Background:

Metricom has developed the second generation of its Microcellular Data Network (MCDN). In a broad sense this new network operates in a similar fashion to the current Metricom MCDN, (which is used to provide the Ricochet Wireless data service in the metropolitan areas of San Francisco, San Jose, Seattle and Washington D.C.) The most notable difference between the previous MCDN and the new MCDN is the speed of the network.

The WCS WAP is used to transmit data to the network radios (FCC ID GNW24000) in the MCDN network. There are four separate transmitters in the WCS WAP, each transmitter will be connected to an antenna pointing in a different direction. IE:, North, East South and West. Since the RF fields will not be additive in this case, only one transmitter is used in the calculations.

MPE Calculations.

The operating environment for the WCS WAPS will be in controlled environments such as commercial building rooftops and commercial antenna structures where only authorized personnel have access. The definitions of controlled and uncontrolled environments are included below from the FCC Report and Order 96-326:

> B. Definitions of Controlled and Uncontrolled Environments
>
> 35. The 1992 ANSI/IEEE guidelines specify two sets of exposure limits based on the "environment" in which the exposure takes place. These environments are classified as either "controlled" or "uncontrolled." **Controlled environments are defined as locations where "there is exposure that may be incurred by persons who are aware of the potential for exposure as a concomitant of employment, by other cognizant persons, or as the incidental result of transient passage through areas where analysis shows the exposure levels may be above [the exposure and induced current levels permitted for uncontrolled environment but not those permitted for controlled environments]."** Uncontrolled environments are defined as "locations where there is the exposure of individuals who have no knowledge or control of their exposure. The exposures may occur in living quarters or workplaces where there are no expectations that the exposure levels may exceed [the exposure and induced current levels permitted for uncontrolled environments]."

Duty Cycle correction: Even though the duty cycle of the WCS WAP source-based, to yield a worst case MPE distance, a duty cycle of 100 % is used in the following MPE calculations. From Part 2(d)(2) of the FCC Report and Order 96-326, General Rules and Regulations:

> (2) Time-averaging provisions may not be used in determining typical exposure levels for devices intended for use by consumers in general population/uncontrolled environments as defined in 1.1310 of this chapter. **However, "source-based" time-averaging based on an inherent property or duty-cycle of a device is allowed.** An example of this is the determination of exposure from a device that uses digital technology such as a time-division multiple-access (TDMA) scheme for transmission of a signal. In general, maximum average power levels must be used to determine compliance.

Fixed, Occupational/Controlled Environment:
Spec: 2.3 GHz: 5.0 mW/cm^2

Exposure (mW/cm^2) = (Pout (mW) *Duty Cycle*(Antenna Gain(as a ratio) / (4*PI* Radius^2(cm)* Cable Loss * Filter Loss)))

Solving the above for Radius

$$\text{Radius} = \sqrt{\frac{\text{Pout(mw)*Duty Cycle*(Antenna Gain(as a ratio, Rel to Isotropic)}}{\textit{Exposure (mW/cm}^2\textit{) * 4 * Pi * Cable Loss (ratio)* Filter Loss (ratio)}}}$$

2.3 GHz MPE Distance Calculation:

$$\text{MPE Distance} = \sqrt{\frac{50{,}000 * 1 * 63.095}{5.0 * 4 * Pi * 1.584 * 1.412}} \Rightarrow \sqrt{\frac{3.1547\ X10^6}{140.530}} \Rightarrow \textbf{149.828 cm}$$

MPE Distance: 5.20 feet.

Conclusion:

The WCS WAPS will be installed at commercial communication sites. Only professional communications systems workers will have access to these sites. Therefore, these individuals will be familiar with the hazards of RF exposure. Metricom will place “Notice” , “Warning” and “Caution” signs up at each site to warn workers that if they are within the MPE distance from the antenna and therefore their exposure may be exceeding the FCC’s guidelines.

Table 1. Limits for Maximum Permissible Exposure (MPE)

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

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Averaging Time (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f2)*	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**

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Averaging Time (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f2)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

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 occupational/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 exposed, or in which persons that are 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.