3-6 Charlton Business Park
Crudwell Road
Malmesbury
Wiltshire
SN16 9RU

Telephone: 01666 828700
Facsimile: 01666 828701

21st August 2003

To Whom it may Concern:

RE: Maximum Permissible Exposure Evaluation for the IPWireless Node B Model: HZ operating in the 2.5GHz frequency band under 47CFR 21 and 74.

Background

The IPWireless Node B Model: HZ is a Wireless Broadband Base Station operating under 47CFR21 Subpart K and 47CFR74 Subpart I. IPWireless Inc, is the manufacturer of the base station but not necessarily the end user, the actual antenna that is used with the base station is determined by the end user. The RF exposure calculations in this document assume an antenna with very high gain is used with the base station and this is representative of the upper range of practical antennae that maybe used.

Applicable Limits for RF Exposure

The limits for RF exposure are defined in 47CFR1.1310. These limits are defined for various frequency ranges and types of environment the device maybe used in. For the IPWireless Node B Model: HZ operating in the 2.5GHz band the applicable limit is 5mW/cm^2 for the occupational exposure category, additional calculations are provided to evaluate the RF exposure performance if the Node B Model: HZ is installed in locations where the occupational limits do not apply.

The minimum distance from the Node B Model: HZ antenna required to ensure the power density has been attenuated to the MPE limit is calculated using the equation below.

MPE distance (cm) = SQRT ((EIRP*source based duty cycle)/(MPE limit*4*π))

MPE Evaluation

The Node B Model: HZ has a maximum output power of +34dBm, using a maximum antenna gain of 20dBi, this yields an EIRP of +54dBm (+24dBW). The Node B operates using a 12MHz channel bandwidth, so the channel power is a 6MHz MMDS channel is +21dBW. For the purposes of the MPE distance calculation, the 12MHz channel power of +24dBW EIRP is used.

47CFR2.1091 (d) (2) specifies that source based time averaging is allowed in calculating the MPE distance. The IPWireless Node B Model: HZ utilises a TDD based radio interface that is suitable for the application of source based averaging. The normal operating configuration has 2/3rd of the timeslots available assigned to transmit and the remaining 1/3rd assigned to receive. In normal use the base station does not transmit at full power all of the time as power control is applied but since this situation could occur, power control is not considered in the MPE distance calculation.

MPE Calculation for Occupational Limits

MPE Distance Calculation

Antenna Gain	20 dBi
Line Loss	0 dBi
Antenna Gain Ratio	100
Node B Model HZ Output Power	34 dBm
	2511.89 mW
Maximum EIRP (12MHz Channel)	251188.64 mW
MPE Limit from 1.1310 (Occupational/Controlled Exposure)	5 mW/cm^2

Minimum Distance to meet MPE Limit (100% Duty Cycle)	**63.23 cm** **24.87 inches**

Sourced Based Duty Cycle Adjustment

Total Timeslots in Frame	15
Timeslots for Transmit	10
Timeslots for Receive	5
Percentage time transmitting in Tx timeslot	100 %
Power Control Attenuation	0 dB
Duty Cycle Correction Factor	66.67 %

Minimum Distance to meet MPE Limit (66.67% Duty Cycle)	**51.63 cm** **20.31 inches**

MPE Calculation for General Public Limits

MPE Distance Calculation

Antenna Gain	20 dBi
Line Loss	0 dBi
Antenna Gain Ratio	100
Node B Model HZ Output Power	34 dBm

	2511.89 mW
Maximum EIRP (12MHz Channel)	251188.64 mW
MPE Limit from 1.1310 Un-controlled/General Public Limit	1 mw/cm^2

Minimum Distance to meet MPE Limit (100% Duty Cycle)	**141.38 cm** **55.62 inches**

Sourced Based Duty Cycle Adjustment

Total Timeslots in Frame	15
Timeslots for Transmit	10
Timeslots for Receive	5
Percentage time transmitting in Tx timeslot	100%
Power Control Attenuation	0 dB
Duty Cycle Correction Factor	66.67%

Minimum Distance to meet MPE Limit (66.67% Duty Cycle)	**115.44 cm** **45.41 inches**

Conclusion

The distance calculations above show that the MPE limit for the occupational/controlled exposure environment is only exceeded at distances of less than 51.6cm from the antenna, additionally the calculation for the uncontrolled environment for the general public shows that the limit is only exceeded at distances of less than 116cm from the antenna. The calculation was made with the following assumptions.

1. The antenna feeder loss is 0dB.

2. Source based averaging has been applied.

3. The Node B is operating at maximum power (normally, power control will result in a lower average power than maximum power)

IPWireless do not provide this equipment with an antenna. The purchase, a licencee of radio channels in the 2500-2686MHz band is responsible for placing a label on the antenna providing adequate information regarding the MPE distance calculated for the specific site configuration and including a reference to the applicable FCC rules.