Maximum Permissible Exposure (MPE) Compliance Statement for the SpotCell 612 (1900MHz PCS) Outdoor Adaptive Repeater for Uncontrolled Exposure (general population) and Occupational Workers (controlled exposure).

The SpotCell 612 (PCS 1900MHz) Outdoor Adaptive Repeater equipment has been tested and the performance characterized in accordance with the MPE requirement of 47 CFR, Part 1.1310, Radiofrequency Exposure Limits for fixed installations, pursuant to 47 CFR, Part 24.52 of the FCC rules and regulation for PCS equipment and 47 CFR, Part 1.1310(b).

Since the maximum radiated composite output power of the DU and the HPCU is ≤30dBm EIRP (1 W EIRP) and the transmitters are designed for installation on utility poles at a minimum antenna height of 10ft above grade, the transmitters are excluded for a routine environmental evaluation or preparation of an EA. FCC regulation 47 CFR, Part 1.1310, Table 1 specifies that for broadband PCS, subpart E, EA evaluation is required for the following sites:

- non-building mounted antennas: height above ground level to lowest point of antenna < 10m **and** total power of all channels > 3280 W EIRP.
- building mounted antennas: total power of all channels > 3280 W EIRP.

Pursuant to 47 CFR, Part 1.1310, the power density prediction was done in accordance with the FCC Office of Engineering and Technology (OET) Bulletin 65, Edition 97-01, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields". The new adopted changes to the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields, as specified in document FCC 03-132, released on June 26, 2003 have also been implemented.

The Spotcell 612 Outdoor Adaptive repeater operates in the 1900MHz PCS band and is a low power adaptive repeater, having integral antennas built into the HPCU and DU modules. The repeater is designed to operate in an outdoor environment for installations on utility poles.

The Maximum Permissible Exposure (MPE) limit for the general public is 1mW/cm^2, averaged over 30 minutes, and for occupationally exposed persons is 5mW/cm^2, averaged over 6 minutes time for the whole 1900MHz PCS band, as specified by 47 CFR, Part 1.1310, Table 1. The SpotCell 612 complies with this limit at the following line of sight distances from the radiating antenna structure of the HPCU and the DU:

Transmitting Device	Distance at which MPE limit occurs from device for General Public	Distance at which MPE limit occurs from device for Occupational workers
DU	8.9 cm	4 cm
HPCU	8.9 cm	4 cm

Prediction Method

Uncontrolled/General Public Exposure
For the general uncontrolled population the Maximum Permissible Exposure (MPE) limit is 1mW/cm^2, as specified by 47 CFR, Part 1.1310, for the PCS frequency band.

The prediction methods used to calculate power density levels are based on worst-case far-field calculations:

$S = EIRP/(4\pi R^2)$, (1)
From Equations for Predicting RF Fields, OET, bulletin 65-, Edition 97-01, August 1997,

Where: S = power density in mW/cm^2.
EIRP = Equivalent isotropically radiated power in mW.
R = distance in cm.

Both the HPCU and the DU have a maximum composite total radiated power of 1000mW (30dBm) EIRP. Hence,

S = 1mW/cm^2.
EIRP = 1000mW.
R = 8.92cm, using the formula in (1).

Since the Spotcell 612 is deployed where the separation from the publicly accessible area is greater than 3 meters, the public is in no danger of being exposed to this limit.

Controlled/Occupational Exposure

For occupational workers, the Maximum Permissible Exposure (MPE) limit is $5mW/cm^2$, as specified by 47 CFR, Part 1.1310, Table 1.

Using equation (1) above, the distance at which the MPE limit occurs is 4cm.

Both the HPCU and the DU have radomes with a separation of 3.5 cm from the radiating elements at the point where the gain is maximum. Hence there is only 0.5 cm of separation from the housing where occupational workers could be exposed to the Maximum Permissible Exposure limit. The worst-case scenario is if some body touches the DU or HPCU while transmitting. The maximum power density at the plastic housing is:

$S = 1000mW/(4\pi 3.5^2) = 6.5mW/cm^2$ (from OET, bulletin 65, page 11).

At this power density, the maximum allowable time, T , is:

$5mW/cm^2 \times 6 \text{ minutes} = 6.5mW/cm^2 \times T$

T = 4.6 minutes

A power utility service personnel, who may be on a transient in front of the HPCU or DU while transmitting, may touch the housing of the transmitter or may linger for longer than 4.6 minutes at a distance less than 0.5cm. To prevent utility service personnel from staying longer than 4.6 minutes in front of the transmitters, at a distance less than 0.5cm, or from touching the radome for longer than 4.6 minutes, a warning label is applied on the HPCU and the DU informing installers to avoid being in front of the DU or HPCU within a distance of one meter. This is being extra-cautious.

Label Requirements

The revised section of 47 CFR, Part 1.1307 (b), subsection (iv) states that "Labels are not required on any fixed subscriber transceiver antenna if the transmitter is mounted such that persons can **never** be closer than 20cm from any part of the radiating structure and the device can be shown to comply with the MPE limits for the field strength and/or power density at a distance of 20 cm or more." Since it is likely that a utility service personnel could be within less than a 20cm of the

transmitters, the DUs and HPCUs are provided with warning labels informing individuals to avoid being within 1 meter in front of the transmitters.

Conclusion

Spotcell 612 complies with the MPE limits at distance of 8.9cm or greater from the radiating element for the general public and at distance of 4 cm or greater from the radiating element for the occupational workers. In addition, Spotcell 612 is to be deployed where the general public is not going to be within the 20 cm of approach from the HPCU or DU. The transmitters are designed for installation on utility poles. The 3.5cm separation of the radome of the HPCU or DU from the radiating element also provides additional barrier to prevent any one from getting too close to the area which exceeds the limit, which is only 0.5 cm around the DU or HPCU. Additional warning labels are also provided for utility service personnel

References:

1 – FCC OET Bulletin 65 – Evaluating Compliance with the FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, Edition 97 – 01, August 1997.

2 – FCC 03-132, Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields, Adopted: June 12, 2003, Released: June 26, 2003.

3 – 47 CFR, Part 1.1310, Radiofrequency Exposure Limits.

4 – 47 CFR, Part 1.1307, Actions that may have a significant environmental effect, for which Environmental Assessments (EA) must be prepared, part (b), (iv) – Labeling Requirement.

4 – 47 CFR, Part 24.52, RF hazards.

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