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Subject: MPE Compliance Statement for Spotcell™ 2500Xe

Maximum Permissible Exposure (MPE) Compliance Statement for the SpotCell™ 2500Xe for Uncontrolled Exposure.

The SpotCell™ 2500Xe is a Dual Band adaptive transceiver in the 800MHz Cellular Band and the 1900MHz PCS band for indoor signal enhancement. The PCS band can also be configured to transmit either in one band or in two split PCS bands. This Adaptive Repeater equipment has been tested and the performance characterized in accordance with the MPE requirement of CFR 47, Part 1.1310, Radiofrequency Exposure Limits for fixed installations, pursuant to CFR 47, Part 24.52 of the FCC rules and regulation for PCS equipment and CFR 47, Part 1.1310(b) and CFR 47 Part 22.

Environmental Assessment (EA) Evaluation

For fixed transmitters, CFR 47, Part 1.1307 (b) requires evaluation of Environmental Assessment if the particular transmitter would cause human exposure to levels of radio frequency radiation in excess of the limits in 1.1310.

FCC regulation CFR 47, Part 1.1307, 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.

FCC regulation CFR 47, Part 1.1307, Table 1 species that for Cellular Radiotelephone Services (subpart H of part 22), 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 > 1640 W EIRP.
- Building-mounted-antennas: total power of all channels > 1640 W EIRP.

Since the maximum radiated composite output power of the Spot-cell 2500Xe Coverage Unit is 16dBm EIRP (+10dBm from each adaptive processor, each with a maximum antenna gain of +3dBi) and the CU is mounted on walls where no one will be within a 20cm approach, the CU is excluded for a routine environmental evaluation or preparation of an EA. The customer manual has instructions whereby installers are required to install the CU in places where no one will be within a 20cm approach.

The Donor Unit has a maximum composite radiated output power of 30dBm EIRP on the Cell band and 30dBm EIRP on the PCS band for a total composite power of +33dBm. Hence the DU is excluded from EA evaluation.

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Section I – Human Exposure Compliance Statement for Spotcell™ 2500Xe CU

Pursuant to CFR 47, Part 1.1310, both the 800MHz cellular band transmitter and the 1900MHz PCS band transmitter of the Spotcell 2500Xe CU are subject to the radio frequency radiation requirement of Table 1. 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™ 2500Xe CU In-door Adaptive repeater operates in both the 1900MHz PCS band and the 800MHz Cellular band simultaneously and is a low power adaptive repeater, having a wide band integral antenna built into the CU module.

The Maximum Permissible Exposure (MPE) limit for the general public is 0.6mW/cm^2 (f/1500, f = 894MHz) for the Cellular transmitter and a maximum of 1mW/cm^2 for the PCS 1900MHz band over 30 minutes. For occupationally exposed persons, the MPE limit is 3mW/cm^2 for the Cellular band and 5mW/cm^2 for the PCS 1900MHz band, averaged over 6 minutes time, as specified by CFR 47, Part 1.1310, Table 1. Since the Cellular band contributes 50% of the radiated power and the remaining 50% is contributed by the PCS band, only 50% of the cellular power density exposure limit is used for the MPE calculation. Only 50% of the exposure limit for the PCS is used to calculate the MPE statement for PCS band.

The power density at 20cm from the SpotCell™ 2500Xe CU is in the Cell band is:

RF input at antenna port = 10dBm = 10mW.

Max Gain of Antenna used = 3dBi.

EIRP = 13dBm = 20mW.

R = 20cm.

Limit = 50% of 0.6mW/cm^2 = 0.3mW/cm^2

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S = Power density = EIRP/(4πR^2) = 20mW/(4π*20cm*20cm) = 0.004mW/cm^2

Max allowable Antenna Gain = 10log ((0.3mW/cm^2 * 4*π*20cm*20cm)/10mW)) = 21.79dBi

Safety Margin = 21.79dB – 3dB = 18.79dB.

The power density at 20cm from the SpotCell™ 2500Xe CU in the PCS band is:

RF input into the antenna = 10mW

PCS band Max Gain of antenna = 3dBi

EIRP = 20mW = 13dBm .

R = 20cm.

Limit at 20cm = 50% of 1mW/cm^2 = 0.5mW/cm^2

S = Power Density = EIRP/(4πR^2) = 20mW/(4π*20cm*20cm) = 0.004mW/cm^2

Maximum allowable antenna gain = 10log ((0.5mW/cm^2 * 4*π*20cm*20cm)/10mW)) = 24dBi.

Safety Margin = 24dBi – 3dB= 21dB.

Since the Spotcell™ 2500Xe CU is deployed where no one will be within a 20cm of approach, the general public is in no danger of being exposed to this limit.

Label Requirements

The revised section of CFR 47, 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 the CU is deployed on fixed places where no one comes within the 20cm approach, no RF warning labels are required.

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The customer manual has deployment instructions whereby installers are required to install the CU in places where on one will be within a 20cm approach of the radiating elements.

SECTION II – Human Exposure Compliance Statement for Spotcell™ 2500Xe Donor Unit

The DU is a dual band transmitter that radiates RF signals to the base station in both the 800MHz Cellular Band and the 1900MHz PCS band. The ADM has an integral, directional, wide band antenna.

Antenna gain in the PCS band = 12dBi.
Antenna gain in the Cellular band = 10dBi.
Maximum composite conducted RF power in the PCS band = 18dBm.
Maximum composite conducted RF power in the Cellular band = 20dBm.
Maximum composite radiated output power in the PCS band = +30dBm.
Maximum composite radiated output power in the Cellular Band = +30dBm.
Total maximum composite radiated output power = +33.0dBm.

By assigning 50% of radiated output power to the Cell band and 50% of radiated power to the PCS band, and by using 50% of the exposure limit for each band, the power density at 20cm from the DU in the Cell band is:

RF input at antenna port = 20dBm = 100mW.

Max Gain of Antenna used = 10dBi.

EIRP = 30dBm = 1000mW.

R = 20cm.

Limit = 50% of 0.6mW/cm^2 = 0.3mW/cm^2

S = Power density = EIRP/($4\pi R^2$) = 1000mW/(4π*20cm*20cm) = 0.1989mW/cm^2

Max allowable Antenna Gain = 10log ((0.3mW/cm^2 * $4*\pi$*20cm*20cm)/100mW)) = 11.8dBi

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Safety Margin = 11.8dBi – 10dB = 1.8dB.

The power density at 20cm from the DU in the PCS band is:

RF input into the antenna = 63.09mW (18dBm)

PCS band Max Gain of antenna = 12dBi

EIRP = 1000mW = 30.00dBm.

R = 20cm.

Limit at 20cm = 50% of 1mW/cm^2 = 0.5mW/cm^2

S = Power Density = EIRP/(4πR^2) = 1000mW/(4π*20cm*20cm) = 0.1989mW/cm^2

Maximum allowable antenna gain = 10log ((0.5mW/cm^2 * 4*π*20cm*20cm)/63mW)) = 16dBi.

Safety Margin = 16dBi – 12dB= 4dB.

Since the DU is going to be installed where no one will be within 20cm of approach, the general public is in no danger of being exposed to the maximum exposure limit.

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 the DU is deployed on fixed places where no one comes within the 20cm approach, no RF warning labels are required.

Conclusion

Spotcell™ 2500Xe complies with the MPE limits at distance of 20cm from the radiating element on the both the downlink transmission (CU) and the uplink transmission (DU).

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The customer manual has deployment instructions whereby installers are required to install the CU and the DU in places where on one will be within a 20cm approach of the radiating elements.

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.

5 – 47 CFR, Part 24.52, RF hazards.

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