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MPE Calculation for DigiCell® ANYNET

The FCC requires that the calculated MPE be equal to or less than a given limit dependent on frequency at a distance of 20 cm from a device to the body of a user.

The transmitter operation for the DigiCell® ANYNET covers GSM850 and PCS1900 operating bands.

The unit can operate with a choice of two external antennae for a) direct connection (+3dBi max. gain) and b) magnetic mount with 3 meter connecting lead (+3.5dBi max. gain with 2.8dB cable loss).

The equation for the MPE calculation is given in OET Bulletin 65, page 19 as:

$$S = EIRP/4 \pi R^2$$

Where S = Power density

EIRP = Effective Isotropically Radiated Power (EIRP = P x G)

R = distance to the centre of radiation of the antenna

For the DigiCell® ANYNET @ GSM 850

Transmitter frequency range = 824MHz to 849MHz

Values Output power: +32.8dBm measured ERP max with standard antenna

ie: ERP = 1905mW

EIRP = 1.64 x ERP

For a GPRS transmit duty cycle of 25%

EIRP = 1.64 x 1905 x 0.25 = 781mW

R = 20cm

Calculation

$S = EIRP/4 \pi R^2$

$S = 781 /(12.56 \times 20^2)$

$S = 0.155$ mW/cm^2

Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for GSM850

$S = f/1500$ mW/cm^2 (f = operating frequency)

$S = 824/1500 = 0.549$ mW/cm^2 (DigiCell® ANYNET @ GSM 850 worst case)

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For the DigiCell® ANYNET @ PCS 1900

Transmitter frequency range = 1850MHz to 1910MHz

Values Output power: +28.4dBm measured EIRP max with standard antenna

ie: EIRP = 691.8mW

For a GPRS transmit duty cycle of 25%

EIRP = 691.8 x 0.25 = 172.95mW

R = 20cm

Calculation

$S = EIRP/4 \pi R^2$

$S = 172.95/(12.56 \times 20^2)$

$S = 0.034$ mW/cm^2

Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for PCS1900

S = 1.0 mW/cm^2 (DigiCell® ANYNET @ GSM 1900)

Alternative magnetic mount antenna considerations

The alternative antenna has a specified maximum gain of +3.5dBi with 2.8db connecting cable loss.

Considering a 0dB cable loss worst case (ie: +3.5dBi antenna gain), the 25% duty cycle EIRP for the DigiCell® ANYNET @ GSM 850 is 874mW.

For this higher power level the MPE is then calculated as 0.174 mW/cm^2.

This remains within the 0.549 mW/cm^2 requirement as calculated above from table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for GSM850 worst case.

Conclusion

The MPE value of the DigiCell® ANYNET at 20 cm meets the RF exposure limits.