

RF Exposure Information

Radio Frequency Radiation Exposure Evaluation

Rule Part Number: 1.1307, 1.1310, 2.1091

1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

TABLE 1—TRANSMITTERS, FACILITIES AND OPERATIONS SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

Multipoint Distribution Service (subpart K of part 21).	Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1640 W EIRP Building-mounted antennas: power > 1640 W EIRP MDS licensees are required to attach a label to subscriber transceiver or transverter antennas that: (1) provides adequate notice regarding potential radio frequency safety hazards, e.g., information regarding the safe minimum separation distance required between users and transceiver antennas; and (2) references the applicable FCC-adopted limits for radio frequency exposure specified in § 1.1310.
Experimental, auxiliary, and special broadcast and other program distributional services (part 74).	Subpart I: non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1640 W EIRP Building-mounted antennas: power > 1640 W EIRP ITFS licensees are required to attach a label to subscriber transceiver or transverter antennas that: (1) provides adequate notice regarding potential radio frequency safety hazards, e.g., information regarding the safe minimum separation distance required between users and transceiver antennas; and (2) references the applicable FCC-adopted limits for radio frequency exposure specified in § 1.1310.

1.1310 Radio frequency radiation exposure limits.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
1500–100,000	5	6
(B) Limits for General Population/Uncontrolled Exposure				
1500–100,000	1.0	30

f = frequency in MHz

Radio Frequency Radiation Exposure Evaluation

§ 2.1091 Radio Frequency radiation exposure evaluation: mobile devices.

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular § 1.1307(b).

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily relocated, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

(d) The limits to be used for evaluation are specified in § 1.1310 of this chapter. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/un-controlled exposure. (1) For purposes of analyzing mobile transmitting devices under the occupational/ controlled criteria specified in § 1.1310 of this chapter, time-averaging provisions of the guidelines may be used in conjunction with typical maximum duty factors to determine maximum likely exposure levels. (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.

Calculations:

The information contained in 1.1307(b)(1) Table 1 indicates that an RF Exposure label be attached to the transmitting antenna for equipment operating in the MDS and ITFS bands that exceed 1640 Watts EIRP. The NextNet Wireless Expedience system operates at a maximum of 2 watts (33dBm) average power while transmitting. The Customer Premise Equipment (CPE) has two modes of transmit duty cycle. The maximum transmit duty cycle of these two modes are 7.14 % and 9.09 % and are based on a TDM frame.

Radio Frequency Radiation Exposure Evaluation

The vertically polarized antenna for the transmitting signal has 13 dBi of gain. Therefore the maximum radiated transmit power would be:

7.14 % Transmit duty cycle:

$$P_{max} = P_{tx} + G(\text{antenna}) - 10 \cdot \log(\text{duty cycle})$$

$$P_{max} = 33 + 13 - 10 \cdot \log(.0714)$$

$$P_{max} = 33 + 13 - 11.46$$

$$P_{max} = 34.54 \text{ dBim} = 2.844 \text{ Watts EIRP} < 1640 \text{ Watts EIRP}$$

9.09 % Transmit duty cycle:

$$P_{max} = P_{tx} + G(\text{antenna}) - 10 \cdot \log(\text{duty cycle})$$

$$P_{max} = 33 + 13 - 10 \cdot \log(.0909)$$

$$P_{max} = 33 + 13 - 10.41$$

$$P_{max} = 35.59 \text{ dBim} = 3.622 \text{ Watts EIRP} < 1640 \text{ Watts EIRP}$$

The horizontally polarized antenna for the transmitting signal has 11 dBi of gain. Therefore the maximum transmitting power would be:

7.14 % Transmit duty cycle:

$$P_{max} = P_{tx} + G(\text{antenna}) - 10 \cdot \log(\text{duty cycle})$$

$$P_{max} = 33 + 11 - 10 \cdot \log(.0714)$$

$$P_{max} = 33 + 11 - 11.46$$

$$P_{max} = 32.54 \text{ dBim} = 1.795 \text{ Watts EIRP} < 1640 \text{ Watts EIRP}$$

9.09 % Transmit duty cycle:

$$P_{max} = P_{tx} + G(\text{antenna}) - 10 \cdot \log(\text{duty cycle})$$

$$P_{max} = 33 + 11 - 10 \cdot \log(.0909)$$

$$P_{max} = 33 + 11 - 10.41$$

$$P_{max} = 33.59 \text{ dBim} = 2.285 \text{ Watts EIRP} < 1640 \text{ Watts EIRP}$$

The above calculations indicate that an RF Exposure label on the transmitting antenna is not required.

Radio Frequency Radiation Exposure Evaluation

Calculations: The following calculations will be used to determine the minimum distance from the transmitting antenna that must be maintained to ensure that the exposure limit as defined in Table 1 of part 1.1310 (B) Limits for General Population/Uncontrolled Exposure. The formula for the following calculations are found in the OET Bulletin 65, edition 97-01 August 1997, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields". The maximum power level from the previous calculations will be used.

$$S = \text{EIRP}/4\pi R^2$$

or

$$R = (\text{EIRP}/4\pi S)^{0.5}$$

$$\text{EIRP} = 3.622 \text{ W} \quad \text{EIRP} = 3622 \text{ mW} \quad \text{EIRP}$$

$$S = 1 \text{ mW/cm}^2$$

$$R = 16.98 \text{ cm}$$

Calculated safe distance from transmitting antenna is 16.98 cm.

Notices: The "Installing and using your CPE device" manual instructs the user/operator to maintain at least 20 centimeters or 8 inches separation from the antenna and all surrounding people.

Radio Frequency Radiation Exposure Evaluation

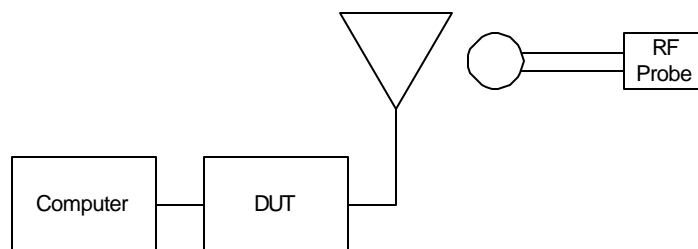
Test Procedure: The NextNet Wireless, Inc. Expedience system operates as a Time Division Duplex (TDD) product with a Time Division Multiplex (TDM) frame structure. The Customer Premise Equipment (CPE) is able to transmit on one time slot (164.571 usec) for a 2.304 msec frame and two time slots for a 3.621 msec frame. This results in a transmitter duty cycle for the CPE of $0.164571/2.304$ or 7.14 % and $2*0.164571/3.621$ or 9.09 %. To measure the RF Exposure, the CPE transmitter is enabled in a test mode that transmits random data at the 2 watt power level into the antenna. Measurements will be performed at the low, mid, and high channels, both duty cycles, and both antenna polarizations.

Test Conditions: Frequency = 2503, 2593, 2686 MHz
 Temperature = 25°C
 Supply Voltage = 120 Vac

Test Equipment:

DUT	NextNet Wireless CPE #6
Computer	Dell Latitude LM Model: TS30GI FCC ID: IIRTS30GH S/N: 6497346BYK7274A
Power Supply	GlobTek, Inc. Model: GT-21089-1815-T3 S/N: 0109029311
Radiation Hazard Meter	General Microwave Corporation RAHAM Model 3 Cal Date: 01-16-2001 Cal Due: 01-15-2002

Test Set-Up:



Radio Frequency Radiation Exposure Evaluation

Test Results: Vertically Polarized Antenna

7.14 % duty Cycle

At 20 cm away from the case of the CPE, the highest RF Exposure reading was measured to be 0.27 mW/cm^2 at 2593 MHz.

9.09 % Duty Cycle

At 20 cm away from the case of the CPE, the highest RF Exposure reading was measured to be 0.31 mW/cm^2 at 2593 MHz.

Horizontally Polarized Antenna

7.14 % Duty Cycle

At 20 cm away from the case of the CPE, the highest RF Exposure reading was measured to be 0.19 mW/cm^2 at 2503 MHz.

9.09 % Duty Cycle

At 20 cm away from the case of the CPE, the highest RF Exposure reading was measured to be 0.25 mW/cm^2 at 2503 MHz.

Test Conclusion: The NextNet Wireless, Inc., Expedience, Customer Premise Equipment is well below the limits of RF Exposure for a mobile device.