Section 9

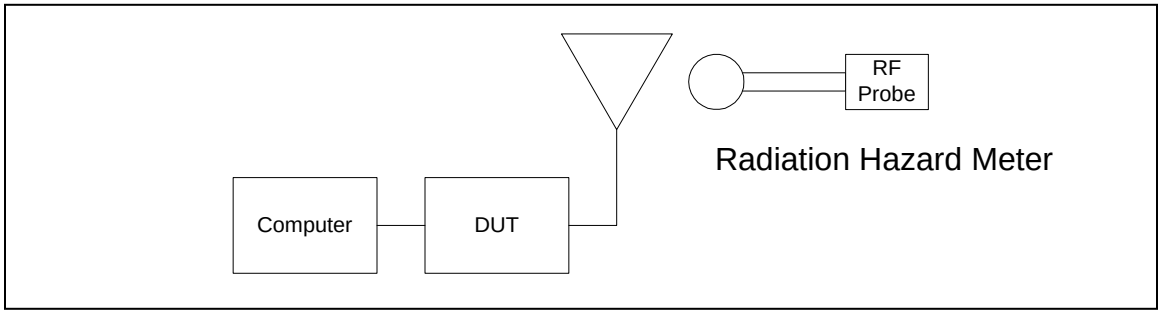
RF Exposure Information

TABLE OF CONTENTS

Radio Frequency Radiation Exposure Evaluation

FCC Rules:	1.1307, 1.1310, 2.1091, 27.52
IC Rules:	RSS-Gen, RSS-102, RSS-193 clause 5.4, Health Canada Safety Code 6
FCC Requirement:	< 1mW/cm^2 General Population / Uncontrolled Exposure
IC Requirement:	< 10 W/m^2 General Public
Standard:	IEEE Std C95.3 – 2002 FCC OET Bulletin 65
Procedure:	The NextNet Wireless, Inc. Expedience system operates as a Time Division Duplex (TDD) product with a Time Division Multiplex (TDM) frame structure. The RSU-2510-SV and RSU-2510-SH Residential Subscriber Unit are able to transmit a time division duplex (TDD) signal up to a 14.29 % transmit duty cycle. To measure the RF Exposure, the RSU transmitter is enabled in a test mode that transmits random data at the 2 watt power level into the antenna. Measurements are performed at the low, mid, and high channels of each channel bandwidth, using the maximum transmitter duty cycle and both antenna polarizations and 4-QAM modulation.
Conditions:	Frequency = 2499, 2593, 2687 MHz Temperature = 25ºC Supply Voltage = 120 VAC / 60 Hz Nominal To DUT Power Supply

Set-Up:



General Information

The NextNet Wireless Expedience RSU-2510-S operates at a maximum of 2 watts (33 dBm) average power while transmitting in the 2496-2690 MHz band. The RSU-2510-S has a maximum transmit duty cycle of 14.29 % and is based on a TDM frame (see test information at end of this report).

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

14.29% Transmit Duty Cycle:
Pmax = Ptx(dBm) + G(antenna(dBi)) - 10*log(duty cycle)(dB)
Pmax = 33 + 13 - 10*log(0.1429) = 33 + 13 - 8.45
Pmax = 37.55 dBm EIRP = 5.688 Watts EIRP < 1640 Watts EIRP

The horizontally polarized antenna has 12.2 dBi of gain. Therefore, the maximum radiated transmit power would be:

14.29% Transmit Duty Cycle:
Pmax = Ptx(dBm) + G(antenna(dBi)) - 10*log(duty cycle)(dB)
Pmax = 33 + 12.2 - 10*log(0.1429) = 33 + 12.2 - 8.45
Pmax = 36.75 dBm EIRP = 4.7315 Watts EIRP < 1640 Watts EIRP

Calculations:

The following calculations can be used to determine the 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.

$S = EIRP/4\pi R^2$
or
$R = (EIRP/4\pi S)^{0.5}$

2496-2690 MHz Band:

$S=1\ mW/cm^2$	R=20 cm
EIRP = 5.688 W	EIRP = 5.688 W
EIRP = 5688 mW	EIRP = 5688 mW
$S = 1\ mW/cm^2$	R = 20 cm
$R = (5688/(4*\pi*1))^{0.5}$	$S = 5688/(4*pi*20^2)$
R = 21.2753 cm	$S = 1.1316\ mW/cm^2$

Calculated safe distance from the transmitting antenna is 21.27 cm for a point source radiation element, or the maximum field strength for a point source radiation element at 20 cm would be 1.1316 mW/cm^2. The NextNet Wireless RSU uses a four element patch array antenna. The RF power supplied to each patch is one quarter the total power that would be supplied to a single radiating antenna as described in Bulletin 65. Because the transmitted power is distributed over a larger area, the actual signal at 20 cm will be less than the calculated value. A measurement of the signal strength at 20 cm is detailed below. The measured values of S have been adjusted to include the current calibration factor of the radiation hazard meter.

Test Results:

RSU Vertically Polarized Antenna		
Channel Frequency (MHz)	Channel Bandwidth (MHz)	Max S (mW/cm^2)
2499	6.0	0.70
2593	6.0	0.60
2687	6.0	0.42

RSU Vertically Polarized Antenna		
Channel Frequency (MHz)	Channel Bandwidth (MHz)	Max S (mW/cm^2)
2499	5.5	0.61
2593	5.5	0.54
2687	5.5	0.36

RSU Horizontally Polarized Antenna		
Channel Frequency (MHz)	Channel Bandwidth (MHz)	Max S (mW/cm^2)
2499	6.0	0.47
2593	6.0	0.56
2687	6.0	0.59

RSU Horizontally Polarized Antenna		
Channel Frequency (MHz)	Channel Bandwidth (MHz)	Max S (mW/cm^2)
2499	5.5	0.43
2593	5.5	0.55
2687	5.5	0.55

Test Conclusion: The NextNet Wireless, Inc., Expedience, RSU-2510-SV and RSU-2510-SH Residential Subscriber Unit is below the limits for RF Exposure as detailed in FCC 47CFR1.1310 and Industry Canada RSS-102 requirements.

The following information is included in the literature shipped with the RSU-2510-S:

FCC / INDUSTRY CANADA INFORMATION

NOTICE: This equipment has been tested and found to comply with the Radio Frequency Radiation Exposure Limits detailed below. A minimum of 20 centimetres (8 inches) separation between the RSU and the operator and all other persons should be maintained.

This product complies with the requirements for Radio Frequency Radiation Hazard as defined in the FCC rules 47CFR1.1307 and 47CFR2.1091 and Industry Canada Standard RSS-102. Additional information about Radio Frequency Radiation Exposure can be found on the FCC web site (www.fcc.gov) and the Canada web site (http://canada.gc.ca/).

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

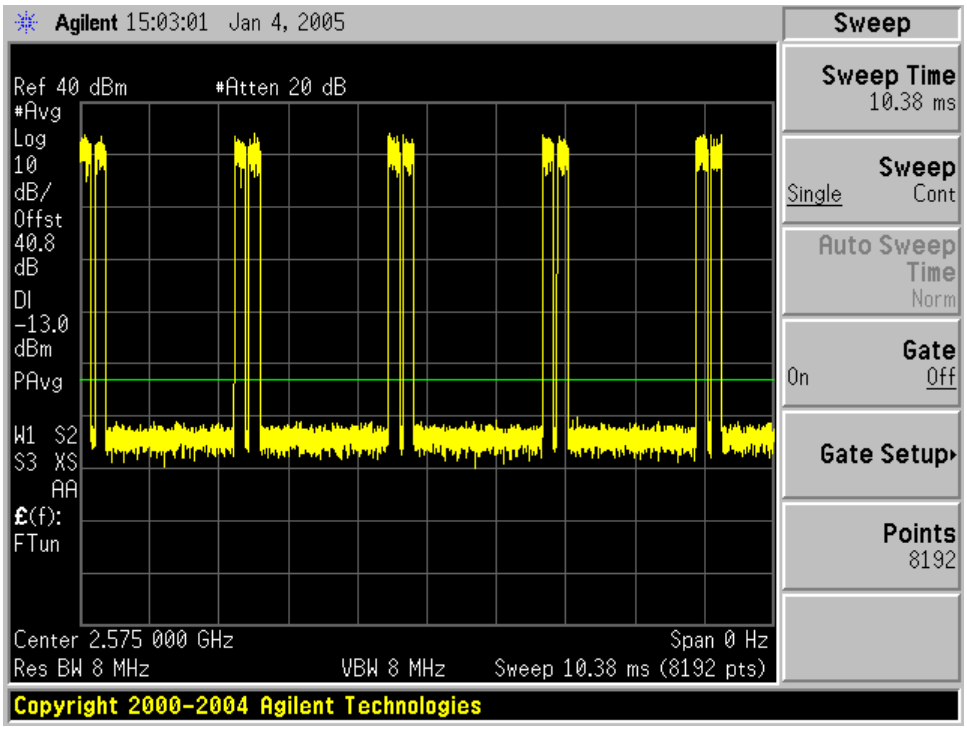
NOTE 1 to Table 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 to Table 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

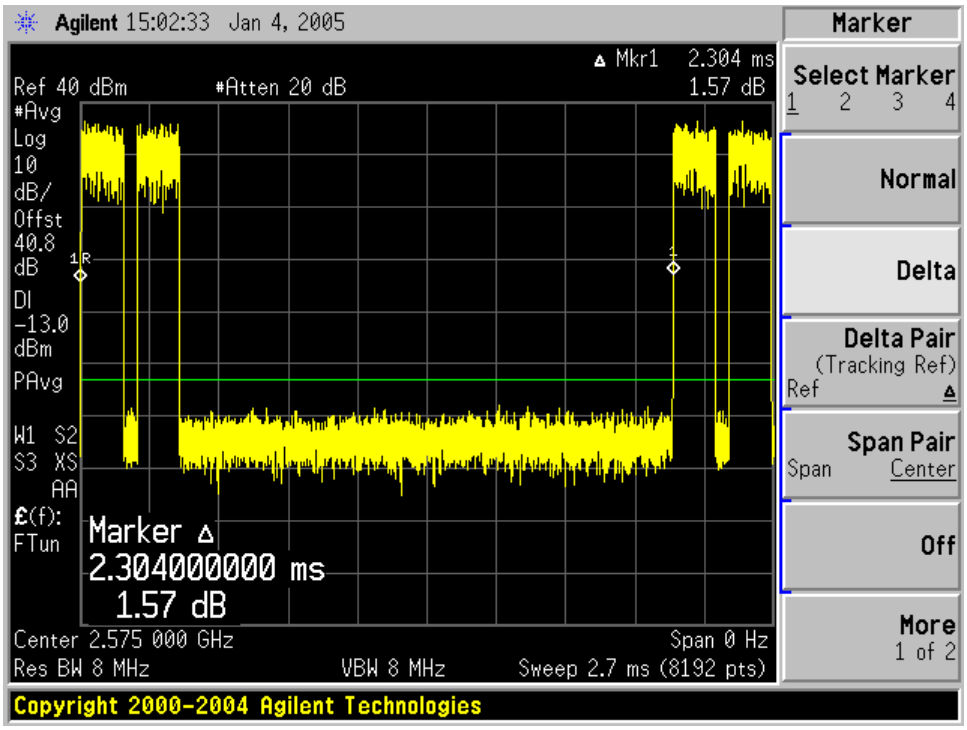
The following information is located on the RSU-2510-S product:

To comply with FCC radio frequency exposure rules, 47CFR1.1307 and 1.1310, a minimum separation of 20 cm (8 inches) is required between this device and all persons.

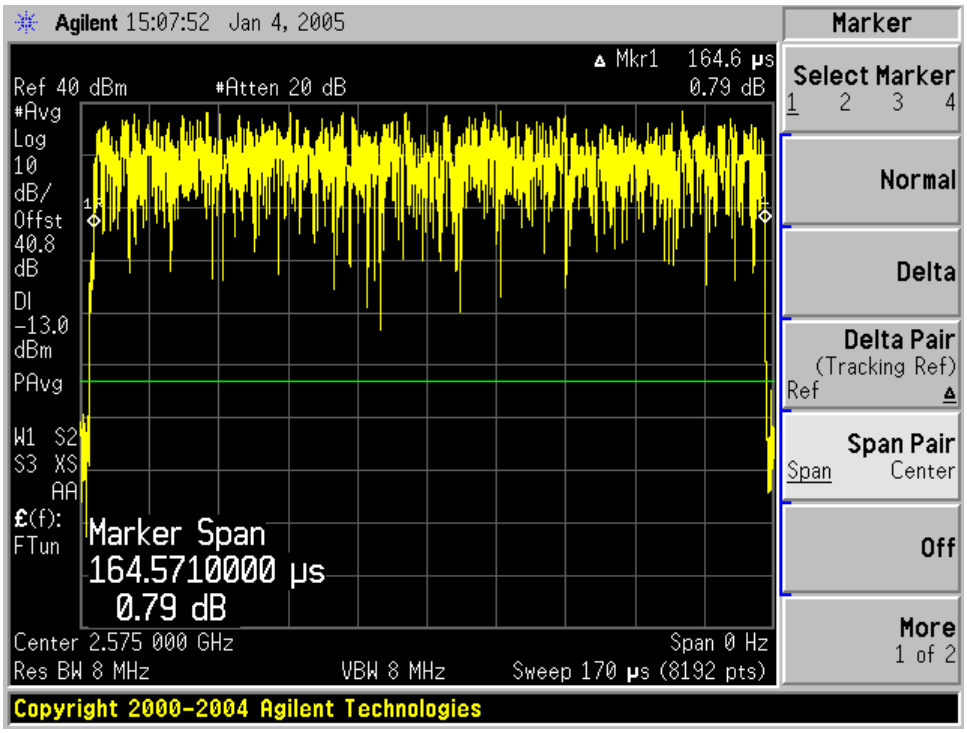
Verification of the maximum transmit duty cycle is shown below.



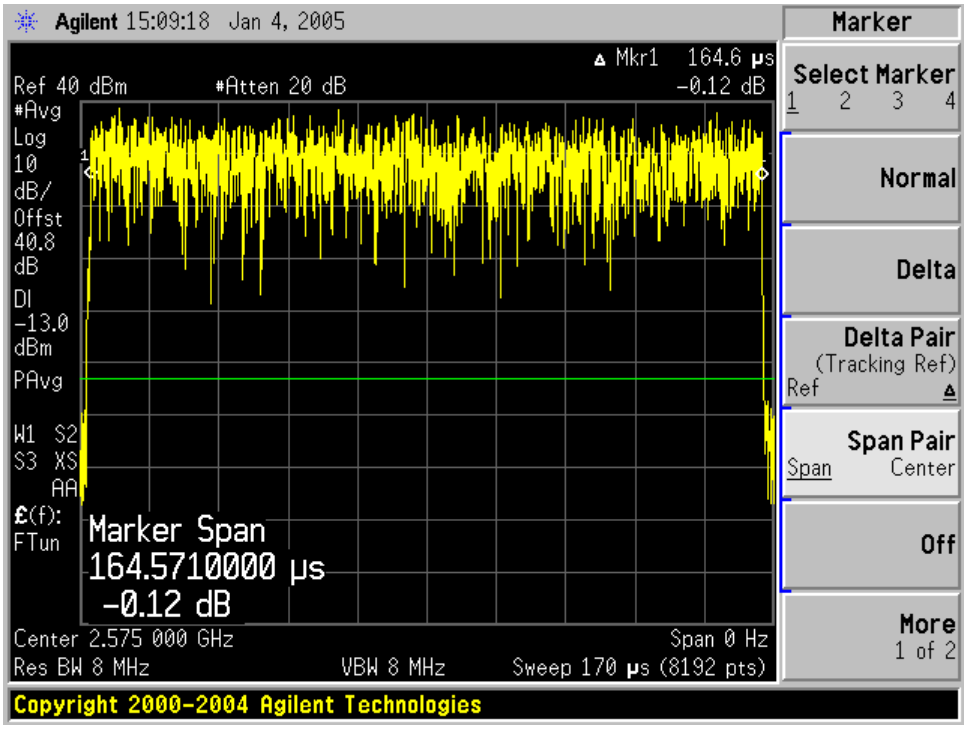
Wide time sweep of transmitter at maximum duty cycle (14.29%)



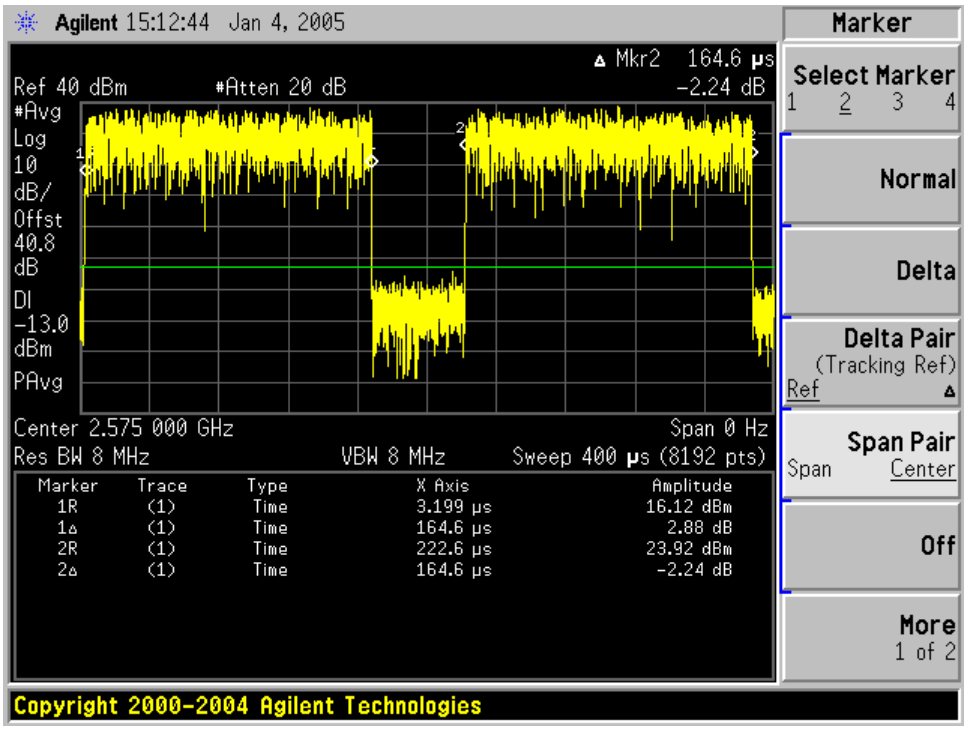
Time measurement between one complete transmit cycle is 2.304 msec.



TX pulse number 1 on time = 164.6 usec.



TX pulse number 2 on time = 164.6 usec



TX pulse 1 and 2

Transmit duty cycle = total time transmitting / time between repetition
Transmit duty cycle = (164.6 usec + 164.6 usec) / 2.304 msec
Transmit duty cycle = 329.2 usec / 2.304 msec = .14288 or 14.288 %