October 28, 2004
RE: FCC ID: PHX-OSU2400A_ATCB001810
Attention: Tim Blom

I have a few comments on this Application. Please note that further comments may arise in response to answers provided to the questions below.

1. Please note that the frequency stated on the 731 for a part 15 device must be the operating frequency range of that device. Please note that means that you must clearly identify the lowest and highest operating frequency of the device for Part 15. Please provide a 731 that clearly identifies these frequencies.

Reply: An updated Form 731 has been uploaded.

2. FYI - Please note that the power listed on the grant and thus approved for this device is the power actually measured during testing, not the 27.16dBm listed at the top of page 9 of the report. Consequently, the 731 is incorrect and should state 494mW as the 15.247 power and not 520mW. It is this 494mW that will be listed on the grant.

Reply: An updated Form 731 has been uploaded.

3. Please note that the Block diagram indicates that the device operates over the full range of 2400 to 2686MHz. Please note that this is not possible. Please provide a block diagram specifically addressing the part 15 device and one specifically addressing the part 21 device. Alternately, please address the specific frequency ranges for the individual rule parts specified. While they may be in the same document, you must clearly identify the transmitter and operating frequencies for the specific rule parts.

Reply: New block diagram uploaded in Exhibit 4a Block Diagrams.

4. Please note that this device appears more than sufficiently large to contain the required 2 condition statement of part 15.19. Consequently, this statement must be on the product not in the manual. Please provide a sample label with this required statement. Alternately, please explain how the exemption of section 15.19(a)(5) applies to this transmitter. Please note that size would not appear to be a valid reason.

Reply: The two part label information is included in the updated Exhibit 1a ID Label – Location document.

5. Please note that the operational description would indicate that the device could transmit over the full range of 2400 to 2686MHz. Please provide evidence that the device only transmits in the allowed bands for the rule parts for which certification is being applied and that it does not operate in the restricted band between 2483.5 and 2500MHz. Please explain how the device is restricted from operating in the disallowed frequency bands. Please also justify the use of this device in under Part 74 (i.e. how or for what purpose is the device used under Subpart I of part 74?).

Reply: The channel plan for this product is contained in the software that is loaded when the product is manufactured and is not accessible by the end user. The channel plan does not allow the center frequency and modulation bandwidth to go below 2401 MHz or above 2479 MHz for the ISM band. The channel plan for the MMDS/ITFS spectrum is 2500 – 2686 MHz. This device operates in the ITFS spectrum (47 CFR Part 74) as allowed by FCC rules.

6. Please note that Public Notice DA-02-2138 is a test procedure specifically for UNII devices under 15.407. Please note that DTS transmitters under 15.247 should use FCC publication 558074 “New Guidance on Measurements for Digital Transmission Systems in Section 15.247”. While the test methods are very similar for peak power measurements, the correct reference for 15.247 devices should be maintained.

Reply: Revised Exhibit 6A Test Report2 uploaded.

7. Please note that while digital device radiated emissions may be measured using CISPR limits and test methods, radiated spurious emissions in the restricted bands for 15.247 devices is not a digital device measurement and cannot be performed in accordance with CSIPR22 limits. They must necessarily be performed to 15.209 limits. Reference to the proper limits applicable for specific rule parts needs to be consistent. Of primary concern is the fact that these radiated emissions are not confused with digital device emissions and that the transmitter characteristics and test methods are not confused or intermixed with digital device test methods. Please confirm that CISPR 22 test methods were not inappropriately used to measure intentional radiator spurious emissions in the restricted bands and that proper DTS intentional radiated test methods (not digital device test methods) were properly followed.

Reply: Revised Exhibit 6A Test Report2 uploaded.

8. Please note that ANSI C63.4 1992 is not the appropriate test method. Please note that it has bee more than a year since the FCC has mandated ANCI C63.4 2001 and the latest revision of C63.4 (2003) is now expected. Please provide evidence that ANSI C63.4 2001 has been properly incorporated in the testing of the part 15.247 device.

Reply: Revised Exhibit 6A Test Report2 uploaded.

9. Please note that 15.247 devices are Frequency Hopping SS or digitally modulated. Your report and documentation mentions the use of ‘other modulation’ techniques. Please verify that only the approved technology specified in the 15.247 frequency range is used.

Reply: The NextNet Wireless system utilizes Orthogonal Frequency Division Multiplex (OFDM) modulation which is a method of digital modulation in which a data stream is split into multiple narrow band channels of contiguous but different frequencies. The FCC has ruled in FCC 01-158 that OFDM is a suitable modulation format for devices compliant to 47 CFR 15.247 using digital modulation. Each of the discrete frequencies that make up the OFDM modulated signal are modulated with a 4, 16, or 64 Quadrature Amplitude Modulation (QAM) format which has also been recognized by the FCC as a digital modulating function as described in ANSI C63.17-1998.

10. Please note that your specified separation distance in the manual is listed as 20cm. The safe distance calculated in your MPE report is 25.29cm. Measured MPE at 20 cm was also performed to show that the 20 cm separation distance was sufficient. However, the MPE test procedure does not explain much about the actual test performed. The procedure simply states that the probe was set 20cm away from the EUT. While some assumptions can be made about projected exposure, nothing was provided to address the probe positioning in the field. Was the probe moved within the field to establish if the worse case MPE was measured? What steps were taken to insure that the worse case MPE was determined? What steps were taken to insure that proximity of the probe to the EUT was not a factor causing lower readings than actually generated? Please explain.

Reply: Measurement of the MPE is performed by placement of the probe at 20 cm from the front radiating antenna surface or 20 cm from any other surface of the product. The probe location is adjusted around the surface of the product while maintaining 20 cm of distance to ensure that the maximum MPE reading is measured. The equipment used by NextNet Wireless to verify MPE compliance is the General Microwave Corporation RAHAM Model 3 Isotropic Broadband Electromagnetic Radiation Hazard Meter. The MPE measurement of the NextNet Wireless OSU-2500-AV product was performed per IEEE Standard C95.3-2002 for measurements performed at 20 cm from the radiating element. The IEEE Standard C95.3-2002 indicates that the worst case error is no greater than 10% when the following worst case conditions are present:

a) The detector (load) impedance is low, with respect to the antenna's source impedance, i.e., the detector draws a relatively high RF current from the receiving antenna.

- The NextNet Wireless MPE measurement instrument has a relatively high impedance for each of the thermocouple elements in the probe (>16 Kohms)

b) The perturbing object (passive re-radiator) may have any scattering cross section, i.e., its size can be much greater than several wavelengths at the frequency being measured. Small scatterers will introduce lower measurement errors.

- The MPE test is setup such that any reflected component of the main beam of the transmitted signal would have at least 40 dB of path loss (all potential reflectors are 1 meter or more away from the test setup).

c) The dipole electrical length is less than or equal to 0.4 wavelengths tip-to-tip.

- From the IEEE Standard C95.3-2002 the dipole electrical length can be estimated. "Since a survey probe has antennas that are physically smaller than the dielectric radome or other physical object surrounding them, the size of the radome can be used to approximate the maximum size of the antennas within. Thus, the diameter of the spherical radome can be used as a worst-case estimate of the size of the enclosed antennas." This measurement is found to be 6.95 cm. The wavelength within this frequency range is approximately 12 cm. This gives a wavelength ratio of 6.95/12 = 0.58 as a maximum value.

d) The distance between the probe and the perturbing object is greater than 20 cm at 300 MHz (0.2 wavelengths), and greater than 2 cm (0.2 wavelengths) at 3000 MHz.

- The MPE measurement is performed at 20 cm between the frequencies of 2400 MHz and 2686 MHz or 10 times the worst case distance cited in the IEEE Standard C95.3-2002.

11. Please note that the table on page 3 of the part 21/74 report states that the conducted power of the device is 1.932W. The test procedure mentions the use of an analyzer, attenuators and a switch. However, nothing was mentioned about any cable loss that may have been in the measurement system. For example, if a cable with 1dB loss was used, the device fails the maximum 2Watt limit. Please provide the cable loss information in the test setup, and please verify that the inclusion of the cable loss does not cause the device to exceed the limit.

Reply: The external attenuators and the coaxial cable were measured prior to testing. The attenuation of the attenuators and coax was measured to be 41.2 dB. This value was entered into the relative offset level of the spectrum analyzer and is therefore included in the measurements that require absolute power readings. This information has been included in the revised Exhibit 6B Test Report2 that has been uploaded.

12. Please note that the EIRP/ERP of a licensed device needs to be measured using the antenna substitution method in accordance with the acceptable test procedures and should not be calculated. While the calculated EIRP shows that the expected measured EIRP would still be below the limits, it is the measured EIRP that is to be considered. Please provide information on how the EIRP of the device was measured using the proper antenna substitution method as prescribed by the FCC.

Reply: The radiation characteristics of the antenna included with the OSU-2400-AV product was previously measured and is known with respect to an ideal half wave dipole such that the antenna gain in dBi was known. As per TIA-603-B 2.2.17.2.1 and 2.2.17.2.3, the EIRP was calculated to show compliance using the known characteristics of the OSU-2400-AV antenna. Output power is measured at the connector on the pc board. Antenna gain measurements include the loss in the coax used to connect the antenna to the pc board. A sample calculation as detailed in TIA-603-B is shown below:

ERP(dBm) = Output power (dBm) – Losses (dB) + Antenna Gain (dBd)
dBd = gain relative to an ideal dipole = dBi – 2.15dB

ERP (dBm) = 33 – 0 + (14.5 – 2.15) = 33 + 12.35 = 45.35 dBm

Parts 21/74 call out the EIRP (dBW)
EIRP (dBm) = ERP (dBm) + 2.15 (dB) = 45.35 dBm + 2.15 dB = 47.5 dBim
EIRP(W) = .001*(10^(EIRP(dBm)/10)) = 0.001*(10^(47.5/10)) = 56.2341 Watts
EIRP (dBW) = 10log(EIRP(W)) = 10*log(56.2341) = 17.5 dBW

13. Please note that you have incorrectly used ANSI C63.4 as a test method for measuring radiated spurious emissions of a licensed device (see page 41 ‘ details of test procedures’ of exhibit 6B). Please explain and please provide evidence that proper licensed device test methodology has been used (i.e. antenna substitution for EIRP values).

Reply: Revised Exhibit 6B Test Report2 uploaded.

14. Please note that the test procedures for radiated emissions described on page 41 of the exhibit 6B is not correct for licensed devices (i.e. it lists QP values below 1GHz and average values above 1GHz, etc). Please provide acceptable licensed device test procedures for radiated spurious emission including antenna substitution procedures and substitution antenna gain information.

Reply: Revised Exhibit 6B Test Report2 uploaded.

15. In relation to item 14, please also note that the section in this procedure dealing with antenna substitution states that you used dipoles below 1GHz, but test data shown on page 39 of exhibit 6B states the gain is -6.2dBi. The typical gain of a dipole is 2.14dBi. Please explain why this dipole is 8dB less than expected.

Reply: The dipoles used come with built-in attenuators to provide height independent impedance matching of the dipoles. While it is true that an ideal lossless half-wave dipole has a gain of 2.15 dBi, the Schwarzbeck antenna (model: VHAP, S/N: 177) used for substitution verification differs from an ideal lossless dipole by 1.64 dB according to the manufacturer. Therefore, 2.15 - 10 dB (internal pad) + 1.64 = -6.21 dBi.