InterAir Wireless ISP Direct Access Server
Model 2401
FCC ID: NUX-ISP2401

1. Description of System Clock Changes

The system operates using the following clocks/local oscillators (LO)/intermediate frequencies (IF):

Main Processor:	20 MHz
DSP Processor:	45 MHz
First Local Oscillator:	1493.625 to 1549.375 MHz
Second Local Oscillator:	880 MHz
Third Local Oscillator:	70 MHz
Transmit Local Oscillator:	1025 MHz
First IF:	915 MHz
Second IF:	35 MHz
Transmit IF:	110 MHz

The original system design used a 20MHz TCXO and a 50MHz VCXO. All frequencies required to drive the system processors and local oscillators were developed from these two clocks. See Figure 1. There was an integrated circuit (IC) which multiplied the 20 MHz clock by 2.5 to create the 45 MHz DSP Processor clock. This IC became obsolete and can no longer be obtained. The architecture was changed to eliminate the need for this IC as shown in Figure 2. The 50 MHz VCXO was changed to a 45 MHz VCXO. The 45 MHz output is then used to drive the DSP Processor directly. All frequencies for the clocks, LO, and IF have remained as listed above.

2. RF Board Design and Layout Changes

The RF circuit board was changed to improve the performance of the system. The RF circuit board is enclosed in a metal shield within the overall housing. The LOs on the original circuit board were being radiated within this enclosure. This energy was then coupled onto the desired signal paths and was conducted out the antenna port of the system. The LOs were also being radiated from the overall enclosure.

The 880 MHz Second LO was being coupled onto the 915 MHz IF in the transmit chain. This LO is within the filter bandwidth and was upconverted and transmitted from the system. An analysis of this problem revealed two things about the second LO design. The first is that the transmission line on the circuit board that connected the second LO to the receiver mixer was very long. The second issue was that the power on this trace was very high. This transmission line acted like an antenna and radiated the second LO throughout the RF enclosure. The design was changed to reduce this problem. The power on this trace was reduced by 20 dB by moving the amplifier from the output of the synthesizer to the input to the receiver mixer, after the long transmission line. The transmission line was changed from microstrip to co-planar waveguide and the length was cut in half by moving the location of the LO on the board. The layout was also changed in the transmit IF section to minimize the length of the trace before the upconversion stage. These changes significantly reduced the amount of radiated and conducted second LO emissions from the unit.

The 1.5 GHz First LO was also radiating from the enclosure. An analysis of this problem showed similar results to the one described above. Again, the power was reduced by 20 dB on the transmission lines that connect the first LO to the receive and transmit mixers by moving the amplifiers from the output of the synthesizer to the mixer inputs. The transmission line was again changed from microstrip to co-planar waveguide. These changes reduced the radiated emissions from the overall enclosure.