AirPair 24 – 50 & 100 Mbps 24GHz ISM (unlicensed) Band

Top Level Functional Description

Intended Function

- The AirPair wireless system is a short range device (SRD) which transmits 50 or 100 Mbps (full duplex) between two fixed points.

System Desciption

- The system is comprised of two receiver/transmitter units (AirPair radio terminals). These are located at the respective ends of the radio link. Each AirPair radio terminal is equipped with a fixed, high gain, directional antenna which is 30 cm, 60 cm, 90 cm or 120 cm in diameter. The smallest of these antennas (30 cm dia) provides > 33 dBi of boresite antenna gain.

Block Diagram Description – AirPair radio terminal

- Data transmit path
    - Signals from the Fast Ethernet network interface are processed by the network interface block which creates a digital transmit signal flow. This is forwarded to the modem block which adds encryption (optionally) and error correction and creates a 4, 16, 32 or 64 QAM representation of the data signal and its associated overhead information.
    - The modem drives the modulated signals in I/Q form into the first conversion stage. This stage uses a 400 MHz to 700 MHz tunable LO to up-convert the signal to within a 400 to 700 MHz IF. The tunable LO is programmed to set the correct transmitted output frequency within the 24.050 - 24.250 GHz band. The IF (400 to 700 MHz range) is then block converted by a fixed sub-harmonic LO at 12375 MHz)
    - The RF transmit signal is then amplified and filtered and passed through an Ortho-Mode Transducer (OMT). The OMT feeds the transmit signal into the antenna where it is transmitted through the highly directional antenna. This transmission is contained within the 24.050 – 24.250 GHz range.
- Data receive path
    - RF receive signals are passed from the highly directional antenna to the OMT. The OMT outputs the RF receive signal which is then amplified and filtered

    - This RF signal is block down-converted through a sub-harmonic mixing stage using a fixed LO at 12950 MHz. The first IF is in the range 1600 to 1900 MHz.
    - The first IF is down-converted using a tunable LO which is programmed (between 1460 to 1760 [or 1350 to 1650] MHz) to select the desired signal frequency. The output of this mixing is the second IF at 140 (or 250) MHz. This is then mixed with a fixed LO at 140 MHz (or 250 MHz). The output base-band I/Q signal is then passed to the modem block.
    - The modem block accepts the 4, 16 32 or 64 QAM modulated signal and demodulates the data stream. It then applies appropriate error correction (and optional decryption) and passes the resulting data stream to the network interface where the data is framed and transmitted through the Fast Ethernet 100BaseT network interface.
- Power & Grounding
    - The system employs an external, remote power module (indoor mounted) which provides -48VDC to the outdoor-mounted AirPair radio terminal. This power is fed to the to the AirPair radio terminal on its own cable or alternately on unused wires within the Fast Ethernet network interface cable.
    - The system is grounded and bonded such that the outdoor-mounted chassis of the AirPair radio terminal is at the earth ground potential of the mounting structure (i.e. a radio relay tower or roof-top lightning ground).