FCC ID: 9900RT

Operational Description

Alcatel 9900 LMDS Terminal Station

This is a summary of the operational description for the Alcatel 9900 LMDS Terminal Station transmitter as required for type certification under FCC Part 101.

System Overview

The Alcatel 9900 is a Local Multipoint Distribution System (LMDS) that provides transport of packet data and telephony services between a central hub (base station) and multiple subscribers (terminal stations). The system operates in the 28000-28350 MHz and 29100-29250 MHz LMDS bands for downstream communications (hub to subscriber). The system operates in the 27500-28000 LMDS band for upstream communications (subscriber to hub).

The base station is composed of two units, an indoor Digital Base Station (DBS) and an outdoor Radio Base Station (RBS). The DBS receives digital ATM and E1/T1 signals and modulates them to an IF TDM signal that is sent to the RBS. The RBS converts the IF signal to the downstream RF transmit frequency. The RBS receives burst TDMA signals from the terminal stations and converts them to IF receive signals. The DBS demodulates the IF signals and generates to digital data to be returned on the ATM and E1/T1 ports. Each RBS provides service for one quadrant of the LMDS cell. Each DBS provides support for up to four RBS transceivers for full cell coverage.

The terminal station is also composed of two units, an indoor Network Termination (NT) and an outdoor Radio Termination (RT). The RT receives the RF signal from the base station and converts it to the receive IF frequency. The NT demodulates the IF signal and recovers the digital data to be provided to the subscriber interfaces. The NT also receives the digital data from the subscriber interfaces and modulates it into the transmit IF signal. This signal is only generated for specific time periods as authorized by the base station. The transmit IF signals are converted to the upstream RF frequency by the RT and transmitted as a narrow beam signal to the base station.

Terminal Station Receiver Description

The terminal station must first lock to its assigned base station to receive configuration provisioning. The terminal station transmitter is inhibited until the signal is locked and this information is received.

The waveguide diplexer in the RT directs the receive RF signals to receive LNA. The receive signals are amplified by the LNA and mixed to the receive IF frequency. This frequency varies depending on the assigned RF channel. The mixer LO is synthesized from a VCO that is phase-locked to a free-running 13 MHz TXCO. The IF signals are amplified by a programmable fixed gain amplifier to compensate for RF path distance and IF cable losses. This gain is programmed into the RT during installation.

The NT receives the IF signals and demodulates them. Information about the receive signal level and frequency error is retained and used to adjust the transmit IF power and frequency. The digital data packets from the demodulator are buffered and routed as needed to the subscriber Ethernet and E1/T1 interface ports.

Terminal Station Transmitter Description

The NT receives Ethernet packet data and E1/T1 telephony data and multiplexes it together into a TDMA data packet. Reed-Solomon error correction is added to the TDMA data. The data packets are only generated during time periods that have been assigned by the base station. No data is transmitted when the receiver is not locked to the base station. The data packets are then Viterbi encoded and QPSK modulated to generate a 43 MHz IF signal at 5.375 Mbaud. The I/Q modulator uses digital shaping filters with an α of 0.25. This results in a 6.72 MHz full power bandwidth signal. The actual IF frequency is offset to correct for LO error in the RT. This error is determined from the frequency error in the receive IF signal and from commands from the base station. The modulator IF is then mixed to a second IF frequency of 520-700 Mhz. The IF frequency varies depending on the assigned RF channel of the terminal station. The IF signal is amplified by a variable gain amplifier to correct for path fading. The gain level is determined by a combination of the error detected in the receive signal level and commands from the base station. The signal is sent on a coaxial cable to the RT along with 24 VDC for power and internal sub-carriers for RT communication.

The RT filters the transmit IF signal to isolate it from the receive IF signal and then amplifies it using programmable fixed gain stages to compensate for cable and path distance losses. This gain is programmed into the RT during installation. It is then filtered and mixed to the final RF transmit frequency using the same LO as the receive section. The RF transmit signal is sent through a waveguide diplexer to an integral antenna. This is a 3° parabolic antenna that has 34.5 dB of gain.