The ALMA Data Transmission System

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The ALMA Data Transmission System, or DTS, transmits 3-bit digitized intermediate frequency (IF) astronomical data signals from an antenna to a centrally located correlator. The digitized IF data is divided equally across four almost identical transmission elements. Each element formats the parallel data from an IF digitizer for serial transmission over three 10 Gb/s optical fiber channels. A total of twelve serial channels for each antenna are multiplexed onto a single 120 Gb/s serial stream. This stream is demultiplexed and converted back into parallel data at the receiver elements prior to being transferred to the correlator.

The Virtual Parallel Bus system is defined by a channel signaling protocol. This protocol is based upon a 160-bit frame structure using line coding employing scrambling techniques. Each frame consists of a first frame marker, or metaframe bit, a synchronization word, a sequence word, the payload, and a checksum. Modulo-2 addition of the frame with a pseudo random pattern scrambles the data to provide adequate recovery timing information and a reduction of any low frequency content which may compromise the timing recovery.

By taking advantage of current telecommunications industry standards, Commercial Off The Shelf (COTS) components are used throughout the ALMA DTS.