

Press Release

UBC Multi-Channel Electronics

The Atacama Cosmology Telescope (ACT) uses the Multi-Channel Electronics (MCE) developed at the University of British Columbia to read-out and digitize signals, and to supply bias and feedback for the operation of the detectors and SQUID amplifiers. The MCE consists of hybrid analog/digital hardware and firmware developed for Altera FPGAs.

ACT uses 3 MCEs, one per color. Each MCE is mounted directly on the cryostat wall and is connected to twisted-pair cryogenic cables through 5 MDM connectors and in turn connected, by an optical fibre, to a single data-acquisition PC. In basic operation, one box of MCE controls the SQUID multiplexer and amplifiers, and reads the signals for one 32×33 -pixels sub-array. For ACT, row select times will be of the order one of 2.5 microsecond, so a 33 row array will be multiplexed at around 12kHz; the details depend on array properties and not on the read-out electronics. Signals are read through 14-bit, 50MHz ADCs. The MCE multiplexes the first stage SQUID bias, controls the bias and feedback of the 3 SQUID stages as well as the bolometer bias and heater. Bolometer signals are passed through a digital IIR filter and sent to the associated PC at rates consistent with the detector thermal time constant at about 400Hz.

During array setup, the MCE is used to determine the optimal operating points for the bolometers and the SQUID amplifiers by measuring their characteristics using open and closed feedback loops. During observation, the MCE uses a running PID-calculation to determine the first-stage SQUID feedback necessary to keep the whole amplification chain in a linear regime at optimal gain.

In conjunction with the MCEs, a Sync Box supplies data-valid pulses with serial numbers to the MCEs and to the telescope pointing system. This allows synchronization between the data acquisition, the pointing system, and the telescope housekeeping.

For more information, see www.physics.ubc.ca/~mce.