CARMA
(Combined Array for Research in Millimeter-wave Astronomy)

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CARMA is the merger of two university-based arrays, the Caltech OVRO array and the Berkeley-Illinois-Maryland Association array, at a new site in the Inyo Mountains in eastern California. The new site is at an elevation of 2200 m. Tipper data showed that the median 225 GHz opacity was 0.18 in winter 2002.

With 15 antennas and 105 baselines, CARMA will provide excellent snapshot imaging capability. The most extended antenna configuration, with baselines up to 2 km, provides a 0.15″ synthesized beam at 230 GHz. As a heterogeneous array, with both 10.4-m and 6.1-m antennas, CARMA will take advantage of new imaging strategies to map extended sources. Operating CARMA in conjunction with the eight 3.5-m antennas of the University of Chicago SZ array, at the same site, offers the opportunity to produce high fidelity images of even larger sources.

Receivers cover the 80-116 GHz and 215-270 GHz bands. The I.F. bandwidth is 4 GHz. The correlator is based on the OVRO Cobra design, which uses field programmable gate arrays rather than custom correlator chips. The FPGAs can be reprogrammed to obtain new spectral line correlator modes, and can be replaced to upgrade performance as more advanced FPGAs become available.

All communication between the antennas and control building is via optical fiber. A roundtrip phase monitor developed at BIMA tracks the electrical delays through the fiber to an accuracy of 0.1 picosecond, making it feasible to transmit local oscillator reference signals through standard, non-temperature-compensated fiber. Water vapor radiometers at 22 GHz will be used to compensate for atmospheric phase fluctuations. The array is operated with a heterogeneous set of computers communicating via CORBA libraries. Data will be transmitted in near real-time to the NCSA data archive at the University of Illinois for archiving and pipeline processing.

OVRO and BIMA antennas will be moved to the new site in 2004. Combined operations will begin in 2005.