

## ALMA Prototype Antennas

Jeffrey S. Kingsley\*  
National Radio Astronomy Observatory  
Stefano Stanghellini  
European Southern Observatory  
Nobuharu Ukita  
National Astronomical Observatory Japan

The Atacama Large Millimeter Array (ALMA) project has procured high performance prototype antennas for evaluation. These revolutionary telescopes will operate at millimeter and submillimeter wavelengths to comprise an array of individual antennas each 12 meters in diameter that work together to make precision images of astronomical objects. The goal of the ALMA Project is an array of 64 antennas that can be reconfigured as needed over an area 10 kilometers in diameter so as to give the array a zoom-lens capability. The site is located in the Andes Mountains of northern Chile at 5,000 meters elevation.

Specifications for these transportable antennas are very demanding, that include sub-arcsecond pointing with high surface accuracy and stringent path length stability. The unique specification of the antennas is the fast switch capabilities that can change antenna position by 1.5 degrees in 1.5 seconds with an accuracy of 3 arcseconds peak pointing error. A fast-switching capability is imposed by the need to rapidly and repeatedly calibrate the phase of the array. The unenclosed antennas make extensive use of carbon fiber reinforced plastic (CFRP) technology in order to maintain a stable parabolic surface in the harsh thermal and wind environment characteristics of the ALMA site. Advance metrology systems are also incorporated into the designs in order to meet the pointing requirements. These antennas must also have the ability to perform full solar observations.

Currently the prototype type antennas are undergoing evaluation and testing at the NRAO VLA site in New Mexico. A selection will be made in 2004 for production of the antennas that will be manufactured and sent to the ALMA site in Chile to compose the array. The design and construction of these antennas have been optimized for quantity production and to operate at the high altitude site. The current status and comparison of the 12-meter prototype antennas and designs will be reviewed.