The Atacama Large Millimeter Array (ALMA) is a group of 64 radio-telescope antennas that will work together to study the universe from a high mountain site in the Atacama Desert of Chile. ALMA is funded by an international partnership among the United States, Europe, and Japan. It may include more countries in the future.

What is millimeter wavelength astronomy?

Objects that astronomers study, like stars and galaxies, give off many different kinds of light in addition to visible light. Some examples of these are radio waves, infrared waves, X-rays and gamma rays. But most of the energy in the universe is present in the millimeter portion of the spectrum. The millimeter waves that carry this energy are more energetic than radio waves, and less energetic than infrared waves (see diagram below). Until now, the abundant millimeter wavelength “light” has not been studied with the crisp resolution that ALMA will provide.

What will ALMA study?

- Cosmology - the age of the universe, its size and structure
- The formation of galaxies (like the Milky Way) at the earliest times in cosmic history
- New planets forming around young stars in our Galaxy
- The birth of new stars in spinning clouds of gas and dust
- The Sun, comets and asteroids of our solar system

How will ALMA work?

Cosmic millimeter waves are reflected from the surface of each dish up to the subreflector above the dish’s center. From there they are guided down into a receiver inside the telescope. There the signals are digitized and sent along underground fiber-optic cables to a large signal processor in the control building. This specialized computer called a correlator will combine all of the data from the 64 antennas to make a super-sharp image.

Who will use the telescope?

Scientists from all over the world will use ALMA. They will compete for observing time by submitting proposals, which will be judged by a group of their peers on the basis of scientific merit.

A High Priority

Both in 1991 and 2000, committees of the U.S. National Research Council (the operating arm of the National Academy of Sciences and Engineering) endorsed ALMA as one of the highest priority new observatories to be built. Similar committees in such ALMA partner countries as Canada, the United Kingdom, France, and the Netherlands have stated that they too view the construction of ALMA with priority.

Building ALMA

ALMA is an international collaboration. Partners from North America include the United States (National Science Foundation, through its NRAO facility operated by Associated Universities, Inc.) and the Canadian National Research Council. European partners include the European Southern Observatory, the Centre National de la Recherche Scientifique (France), the Max-Planck Gesellschaft (Germany), the Netherlands Foundation for Research in Astronomy, the United Kingdom Particle Physics and Astronomy Research Council, Instituto Geográfico Nacional and Ministerio de Ciencia y Tecnología (Spain) and the Swedish National Science Research Council. Japan is a partner in ALMA through the National Astronomical Observatory of Japan. Chile, as host nation for ALMA, participates in the project through its presence on the ALMA Coordinating Committee and by making available the superb astronomical site in the Atacama Altiplano.
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