

Announcement

First European ALMA Antenna Handed Over to Joint ALMA Observatory

21 April 2011

The first European antenna for the Atacama Large Millimeter/submillimeter Array (ALMA) project has just been handed over to the Joint ALMA Observatory. The antenna, which has a dish 12 metres in diameter and weighs about 95 tonnes, was moved from the Site Erection Facility where it was assembled and tested, to the observatory's Operations Support Facility (OSF).

Although this was only a short trip between two adjacent sites at an altitude of 2900 metres in the foothills of the Chilean Andes, the move is nevertheless very important.

"This move was just a short trip for this antenna, but it marks a big step for the project. This milestone is the result of many years of hard work by the engineering teams of the AEM Consortium [1] and by the ESO staff involved in following up the design, and the construction and testing activities in Chile," says Stefano Stanghellini, the ALMA Antenna Project Manager at ESO.

The team at ALMA will now integrate the antenna into the growing observatory, where it joins other antennas provided by the project's North American and East Asian ALMA partners. There will be a total of 66 ALMA antennas when construction is complete, forming a single giant telescope that observes the cosmos using millimetre and submillimetre wavelengths of light. At the OSF the new antenna will be equipped with the extremely sensitive detectors needed to measure these faint signals, together with cooling systems and other electronics, in a process that will take up to three months. Then it will be moved up to the Chajnantor plateau at 5000 metres altitude, where the ALMA telescope will operate. Chajnantor's extreme dryness and altitude offer excellent conditions for observing millimetre and submillimetre waves from space, which would otherwise be absorbed by the Earth's atmosphere.

ALMA is the most powerful telescope available to astronomers studying the cool Universe — the molecular gas and tiny dust grains from which stars, planetary systems, galaxies and even life are formed. ALMA will provide new, much-needed insights into the formation of stars and planets, and will reveal distant galaxies in the early Universe, which we see as they were over ten billion years ago.

Thanks to their state-of-the-art technology, the 12-metre ALMA dishes have reflector panels manufactured and aligned to a precision well below the thickness of a human hair, and can be pointed precisely enough to pick out a golf ball at a distance of 15 kilometres. Such accuracy is hard to achieve, especially in the conditions under which ALMA must operate. At an altitude of 5000 metres, the dishes will face strong winds and harsh sunlight, all without the safe haven of a protective dome. The temperature can also drop well below freezing, approaching -20 degrees Celsius. As it is difficult to perform inspections and maintenance at such a high altitude, the antennas must be able to perform flawlessly for extended periods.

The European antenna dishes have replicated nickel panels — made with a process based on that used for X-ray satellite mirrors — with a skin approximately 0.6 mm thick, bonded to an aluminium honeycomb core. A special rhodium coating on the nickel surface, just 200 nm thick, provides protection against the environment and reduces the absorption of heat by the panels. This is vital, as the expansion and contraction of the dish material caused by temperature changes would adversely affect the accuracy of the antennas. The antennas use direct-drive motors, and much of their moving structure is made from very strong but lightweight carbon-fibre-reinforced plastic. As a result, they are able to move both rapidly and precisely.

ALMA, an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ESO is the European partner in ALMA.

Twenty-five European ALMA antennas, including this one, are being provided by ESO through a contract with the European AEM Consortium. ALMA will also have 25 antennas provided by North America, and 16 by East Asia.

Notes

[1] The AEM Consortium is composed of Thales Alenia Space, European Industrial Engineering, and MT-Mechatronics.

Links

- More information about ALMA from ESO(/public/teles-instr/alma.html)
- More information about the ALMA antennas(/public/teles-instr/alma/antennas.html)
- The Joint ALMA Observatory website(<http://www.almaobservatory.org/>)

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