ALMA News

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Science Advisory Committee Report

The European ALMA Science Advisory Committee (ESAC) met on 23 February 2005 at ESO in Garching. On the two following days, the ALMA Science Advisory Committee (ASAC) met. In both meetings the discussions were mostly concerned with a request by the ALMA Board to consider the impact of 'rebaselining' proposals on the science that can be done with ALMA. Much of the need for rebaselining is caused by the large increases in commodity prices, such as those of steel and oil. These have led to large cost increases for ALMA. A number of possible options for savings were proposed.

The most far reaching was to reduce the number of antennas. In the bilateral ALMA project, 64 antennas are specified to achieve the primary science goals: detection in a CO or CI transition of a Milky Way galaxy at redshift $z = 3$, imaging of a protostellar disc in the nearest molecular cloud, and producing high dynamic range, high fidelity images. The effect of changing the number of antennas on these science goals was discussed thoroughly by ESAC and ASAC. The ASAC report concluded that ALMA science is driven by sensitivity and image quality. In integration time, the sensitivity varies as the square of the number of antennas. The image quality also varies as the square of the number of baselines. For a reduction to 50 operating antennas, the increase in integration time needed to reach a given sensitivity is a factor of 1.5, while a reduction to 40 operating antennas would increase the integration time by a factor of 2.3. The committee considered the effect of reducing the number of antennas on the ALMA Design Reference Science Plan (DRSP) (see *http://www.strw.leidenuniv.nl/~alma*). With 50 operating antennas, 20 % of the DRSP proposals would be difficult or impossible to achieve. With 40 operating antennas, 41 % of the DRSP proposals would be difficult or impossible to achieve, that is a substantial impact with only half of the proposals feasible. The conclusion was that an ALMA consisting of 50 antennas would still be a superb instrument while a 40-antenna ALMA would put a large fraction of anticipated programmes at risk. Thus, a 40-antenna ALMA would be qualitatively different, with longer integration times and multiple array configurations required for high-quali-

Sunrise at the Operational Support Facility (OSF) site.

ty images. See *http://www.eso.org/projects/ALMA/newsletter* for excerpts.

The ASAC report was forwarded to the Joint ALMA Office, European ALMA Board, ESO Science and Technical Committee, and ALMA Board for consideration. Presentations of the results were made at the ALMA Board, European ALMA Board and STC.

The European ALMA Regional Center

Each ALMA partner plans to establish an ALMA Regional Center (ARC). In Europe, the ARC will be structured in a distributed manner with a central node based at ESO Headquarters in Garching. This central node will provide a variety of services including user support for proposal preparation, observation preparation, and basic data analysis support.

A number of other services shall be provided by affiliated ARC nodes located at other European institutions. Chief among these services is direct face-to-face help with off-line data reduction. This structure has been approved by the ESAC, the European ALMA Board, the STC and the ESO Council.

Following approval by the ESO Council, there was a 'Call for Statements of Interest', in order to solicit proposals from organizations interested in providing science support with financing provided by national funding agencies. The deadline for responses was October 2004; there were seven responses from a Bonn-Köln-Bochum consortium, IRAM Grenoble, Bologna representing Italy, Leiden representing the Netherlands, Onsala Space Observatory representing the Nordic countries, and Manchester University representing the UK. Portugal will provide postdoctoral support to another ARC node initially for training, in order to bring expertise back to Lisbon. Other countries have expressed an interest to join nearby nodes. A number of issues were discussed at a face-to-face meeting at ESO in February 2005. The most important are summarized as follows.

First, all nodes will be open to all European astronomers involved in ALMA data reduction. Second, the most critical short-term tasks for the ARC nodes are the training of students in radio interferometry and the development of expertise with ALMA off-line processing tools based on the AIPS++ package. As soon as ALMA becomes operational, the ARC nodes will also play a very important role in user feedback to the project. The structure of the European ARC has been a point of discussion. This will be governed by an ARC Coordinating Committee (ACC), to be chaired by the ESO ARC Manager (job advertisement on the ESO web site since mid-April). The day-to-day management responsibility remains with the individual ARC nodes, but the ACC will provide strong guidance to the nodes, with a goal of keeping the same competence level, but also encouraging specialization. There were examples of specialization at specific nodes such as imaging at the highest frequencies, polarization, or imaging with extremely high dynamic range and fidelity. In addition to duties as ACC chair, the ARC Manager will be in charge of the ARC activities within the ESO Data Management Division, coordinate ARC activities with Chile-based operations and coordinate with the North America and Japan regional centers. The next step in the European ARC development will be to work out a detailed description of tasks for the ACC, including a determination of the level of commitment from the nodes, fixing the areas of expertise among the nodes and plans for hiring within the nodes. This development shall be the responsibility of the ARC Manager. We anticipate that this person will be in place sometime around 1 October 2005.

The FP6 Proposal for 'ALMA Enhancement'

In 2002, ESAC members were informed of the possibility of additional funding in conjunction with approved construction projects from the EU within Framework Programme 6. The ESAC discussed various options for such a proposal at its June 2003 meeting. The deadline for submitting a proposal, March 5, 2004, was set by the EU in December 2003. After a discussion with the ALMA Director, Massimo Tarenghi, detailed plans were made starting in January 2004. At that time the Japanese contribution had also been clarified. The decision about the choice of receiver band, ALMA Band 5, covering 163 to 211 GHz, was made about this time. The noise temperature of the band is higher than other millimetre bands because of the atmospheric water vapour line at 183 GHz. This line is also present in astronomical sources, and there is an additional line of the 18-O line of water vapour at 203 GHz. The basic argument was that ALMA 'early science' would overlap with the ESA cornerstone mission Herschel. One of the major programmes of the Herschel instruments, HIFI, is to measure water vapour transitions. The Herschel angular resolution is 13″ at best, so the analysis of sources measured with Herschel-HIFI would be enhanced by images of the 183 GHz line measured with ALMA. The initial 'ALMA Enhancement' proposal contained a number of ALMA software projects. In the version accepted for negotiation by the EU, the budget was reduced from 12.5 million Euros to 8.5 million Euros. The software applications that were included were specific to the Band 5 receivers. These were 'phase corrections using the ALMA water vapour radiometers' and 'on-the-fly interferometric mosaicing'. The 'ALMA Enhancement' initiative has been encouraged by ESAC, European ALMA Board, STC and the ALMA Board. The negotiations are ongoing. The partners in the proposal are ESO (administration and management of the proposal), Astrophysics Group, Cambridge University (phase correction of the data), IRAM Grenoble (on-the-fly interferometric mosaicing), Onsala Space Observatory (receiver construction) and University of Chile (receiver tests). The conditions set by the Joint ALMA Observatory are that the 'ALMA Enhancement' proposal is at no cost in manpower or money to the ALMA project, and does not slow the construction of ALMA.

Work on ALMA components is going on at full speed in European laboratories. **Left:** Observatoire de Bordeaux, **Centre:** Jodrell-Bank Observatory, **Right:** Rutherford Appleton Laboratory.