ALMA News

Tom Wilson (ESO)

Antenna procurement

The antennas are the largest single item in the ALMA budget. Thus the status of antenna procurement is of the highest importance for the project. Associated Universities Inc/NRAO have been given ALMA Board approval and permission by the US National Science Foundation to procure their antennas. On July 11, they signed a contract with VertexRSI for up to 32 antennas for ALMA. ESO is moving ahead with its antenna procurement as quickly as possible. The Joint ALMA Office is leading the rebaselining (a re-assessment of project costs). This is proceeding at full speed. There will be discussions of both the rebaselining and antenna procurement issues at the next meetings of the ESO Council to be held in September.

New European Project Manager

Hans Rykaczewski is the new European ALMA Project Manager and Head of the ESO ALMA Division. He studied physics in Aachen. He completed a doctoral thesis on searches for new quark flavours at the Deutsches Elektronen Synchrotron DESY in Hamburg. In 1984, he moved to M.I.T. and was delegated to CERN for working on the design and construction of the L3 detector which was installed and taking data at CERN's Large Electron Positron Collider, LEP. There he was responsible for the timely fabrication of several subdetector elements, like magnet, calorimeter systems and the precision muon spectrometer. Since 1989 he has held a position as Scientific Associate at the Laboratory for High Energy Physics of the Eidgenössische Technische Hochschule (ETH) in Zürich. He was intensively involved in many scientific and managerial issues concerning the L* Experiment at the Superconducting Super Collider, SSC, and the proposed Lepton-Photon-Precision-Physics (L3P) Experiment for the Large Hadron Collider, LHC, at CERN. Since the beginning of 1994, he took over important scientific, organisational and financial responsibilities for the Compact Muon Solenoid (CMS) experiment. He was engaged in many areas of the construction of the lead tungstate crystal detector and was deeply involved in the organisation of the construction of the CMS Magnet.

Hans Rykaczewski joined ESO in July 2005 and is very much looking forward to helping in making ALMA a success, in fruitful collaboration with the international partners in this project.

Progress for the ALMA Front Ends

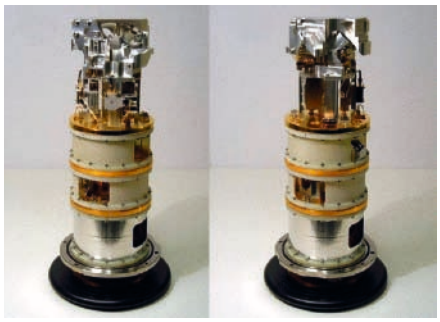
The most important factors that determine ALMA sensitivity are the transmission of the astronomical signals through the earth's atmosphere, the effective collecting area, and the quality of the first stage of the receivers, that is, the Front Ends. The quality of Front Ends depends on their stability and noise temperature. That is, they should not introduce any systematic errors, and should add the smallest possible amount of noise. The ALMA Front Ends show noise temperatures that are 3 to 5 times the limit determined by quantum mechanics. In recent months the ALMA Front End Integrated Project Team (IPT) has shown several important signs of concrete progress towards the construction of receivers for the ALMA project.

On July 6 and 7, 2005 the FE IPT sucessfully completed its delta Preliminary Design Review (PDR). The review meeting was held at ESO Headquarters in Garching, Germany. The review panel, chaired by the European ALMA System Engineering & Integration IPT Lead, Christoph Haupt, consisted of experts both internal to the project as well as noted receiver experts from Australia and the USA. Based on documentation made available in preparation of the meeting and the presentations at the meeting the review panel came to a unanimous decision that the Front End design was well beyond the PDR status. The reviewers also provided valuable constructive criticism that will be taken into account in finalising the ALMA receiver design. The success of this design review was very much due to the joint efforts made by the FE IPT sub-system engineers, Hans Rudolf (ESO) and Kamaljeet Saini (NRAO), and the support they received from others within the FE IPT.

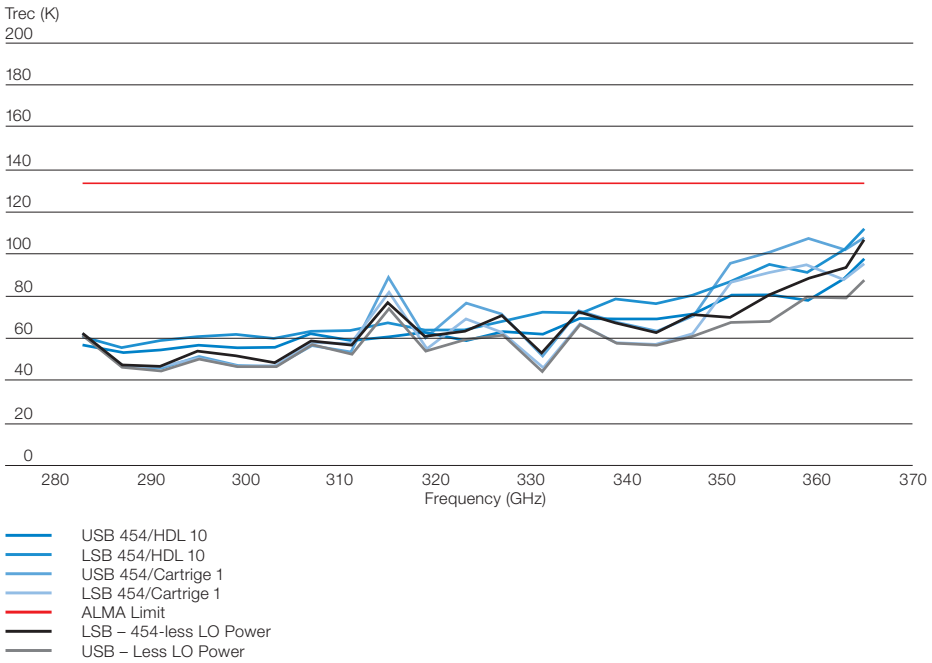
That the ALMA FE IPT makes progress is also shown in a more tangible manner in that important assemblies are nearing the completion of their construction. At IRAM in Grenoble, France, the first pre-production unit of the Band 7 Cartridge, covering the frequency range from 275 GHz to 373 GHz, is currently undergoing extensive testing to both verify the design and this first unit itself. Noise measurements on the completed unit, using the first local oscillator delivered by NRAO, show exceptionally good performance. The results are much better than the requirements (see graph).

The first Band 9 pre-production cartridge, covering the frequency range from 610 GHz to 720 GHz, has also been copleted (see picture) and is undergoing extensive testing at NOVA/SRON in Groningen, The Netherlands. Following the Front Ends, one must have Intermediate Frequency amplifiers to increase the power to the desired value. These IF amplifiers must also have low noise and high stability. The present tests are being done with IF amplifiers having a bandwidth of 4 to 8 GHz. The final IF amplifiers will cover the required band from 4 to 12 GHz. These were recently delivered by Yebes Observatory in Spain and will be mounted in the Band 9 cartridge shortly.

ALMA receiver cartridges.



Cartridge 1 Trec Measurements



In summary it can be stated that the receiver noise temperatures achieved on the Band 7 and 9 cartridges are likely the best in the world over these wide frequency bands in the sub-millimetre range. Until recently the standard practice was to use mechanical tuners in the receivers to obtain the optimum noise performance. The quality of the ALMA Band 7 and 9 receivers become even more remarkable when one takes into account that both Band 7 and 9 receivers use no mechanical tuning. The combination of modern, state-of-the-art design technology, well-equipped laboratories and last, but definitely not least, very skilled and dedicated staff at both IRAM and NOVA/SRON have been crucial for this success. (Contributed by Gie Han Tan, see also Tan et al. 2004, The Messenger 118, 18.)

Construction progress

The excavations for the Operations Support Facility (OSF) buildings are now progressing very well. The two levels of the future building are now clearly discernible. In addition, construction of the road between the OSF and the Array Operations Site at 5 000 m has moved up to the higher and more difficult part of the road at an altitude of 4 000 m. (Photo credits: Jörg Eschwey, see also his article next page.)