

THE FIRST LIGHT OF THE FIRST VLT AUXILIARY TELESCOPE

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AND THE AT1 ASSEMBLY AND COMMISSIONING TEAM
EUROPEAN SOUTHERN OBSERVATORY

ON JANUARY 24TH, THE FIRST AUXILIARY TELESCOPE (AT1) OBTAINED ITS FIRST IMAGE OF THE PARANAL SKY. THIS WAS A LONG AWAITED EVENT WHICH MARKED THE BIRTH OF A NEW GENERATION OF TELESCOPES AT PARANAL. THIS ARTICLE GIVES A BRIEF DESCRIPTION OF THE BUSY BUT EXCITING PERIOD OF ON-SITE RE-ASSEMBLY AND COMMISSIONING.

ON JANUARY 24TH AROUND 23h Local Time, the first Auxiliary Telescope (AT1) obtained its first image of the exceptional Paranal sky. This event happened precisely on the date that had been scheduled back in April 2003 when ESO took over the main activities on AT1 for its European tests, followed by the transport from AMOS (Belgium) to Paranal (Chile) and finally the re-assembly and commissioning at Paranal. This achievement was the result of a prompt packing by AMOS and the high dedication of the ESO ATS team both in Garching and Paranal.

This article gives a brief description of this busy but exciting phase starting from the delivery of AT1 in Liège last September.

TRANSPORT FROM EUROPE TO CHILE

On September 4th 2003, the AT1 was provisionally accepted in Liège. The transport from Europe to Chile, under ESO responsibility, could start. However, in mid-August when the very last details of the transport were being settled, 'Bad News #1' arrived. The sea transport company suddenly decided to refuse the AT1 cargo for unclear technical-commercial reasons linked to the breakage last year during transport (by another company) of the primary mirror of the VLT Survey Telescope (VST). After an intense search for a backup solution, a so-called 'charter vessel' was selected. These vessels take cargo on demand and at short notice (only one other cargo was taken together with AT1). This choice limited the schedule impact to a minimum, provided an even better controlled transport but resulted, of course, in a significant additional cost remaining however in the original budget estimated for transport.

THE AT1 ASSEMBLY AND COMMISSIONING TEAM

The persons listed below constituted the core team for the assembly and commissioning of AT1. They are those who made all this happened.

From Garching:

Mechanics, integration leader, handling: M. Kraus

Electronics: J.M. Moresmau, M. Duchateau, M. Dimmler, A. van Kesteren

Software: K. Wirenstrand, P. Duhoux, R. Karban

Optics: F. Gonte, D. Bonaccini

From Paranal:

Management: R. Tamai

Mechanics: V. Heinz, J.C. Palacio, E. Flores, L. Roa

Optics: S. Guisard, S. Del Burgo, P. Giordano

Electronics: J. Osorio, J. P. Haddad, G. Hudepohl

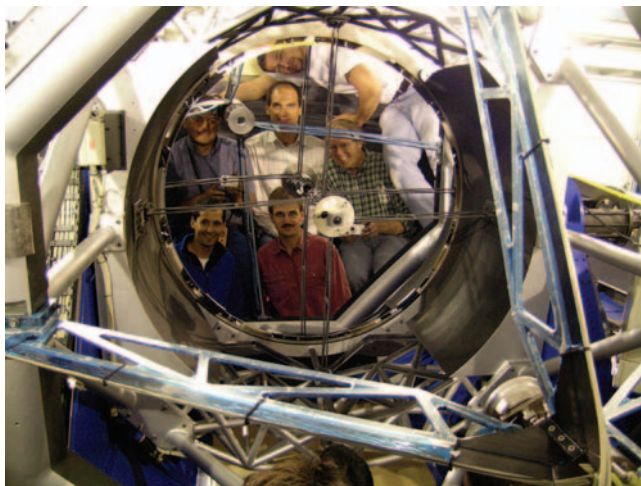
Software: I. Muñoz, J. Argomedo

For a list of the key persons involved in the design and development of the Auxiliary Telescope, the reader is referred to the previous article in *The Messenger* (Koehler et al. 2002).



The VLT Auxiliary Telescope no. 1 is trucked to the top of the Paranal mountain.

The Paranal Integration Team feels relieved after the first mounting of the primary mirror (M1) inside the telescope early December 2003. All mirrors were delivered silver-coated except M1, which was coated with aluminium by ESO, using the VLT coating plant on Paranal (photo: P. Giordano).



The transport started with the pickup at AMOS on September 12th. It went very smoothly ... and slowly in its last part: the truck convoy that brought AT1 from Antofagasta harbor to Paranal adapted their speed to the actual conditions of the 'old Pan Americana' dirt road and had to make an unforeseen overnight stop in the desert. On October 22th, AT1 arrived safely on Paranal.

ASSEMBLY AND INTEGRATION

At the end of October came 'Bad News #2': a key member of the ESO assembly team was reassigned on short notice to an important project for two weeks. This delayed the start of the assembly and integration of AT1 to November 7th. Thanks to the hard work of the Garching and Paranal integration teams, who also had to solve various small difficulties typical of the first-time installation of such a complex system, the assembly could be finished on schedule by early December. During that time, the M1 primary mirror was aluminized for the first time using the VLT coating plant. Functional tests of each of the many sub-systems could then be carried out by the Garching Software team, who left the mountain shortly before Christmas.

During the Christmas break, 'Bad News #3' arrived: the foam inside thermal insulation panels used to protect the inner volume where the Telescope sits, had inflated, resulting in some breakage of their metallic frame! In addition, small cracks started to appear on the enclosure at the interface between the enclosure shells made of fiber glass and a non-structural piece made of plastic that holds the enclosure seals responsible for air and water tightness. Investigations at AMOS on samples in a vacuum chamber indicated that the foam expansion was due to the reduced air pressure at Paranal. The cracks on the enclosure seal supports are possibly due to the low humidity and are still under monitoring. In early January, an on-site

examination by AMOS concluded that neither problems had affected the structural capacity and the functionality of AT1 and that, after quick temporary repairs, the commissioning activities could therefore proceed. A definitive repair on AT1 and solutions to avoid the problems on AT2 to AT4 are being worked out.

MOVE TO THE OBSERVATORY TOP

On January 12th, with only four days delay with respect to the original planning, the first move of an AT from the Mirror Maintenance Building (MMB) to the Observatory platform could start. For this move, the completely assembled AT was attached to an ESO-developed handling tool that lifts the complete AT and loads it onto a rented hydraulic trailer pulled by a truck. The day started around 7h at the MMB and was a rather intense day for the nerves of the proj-

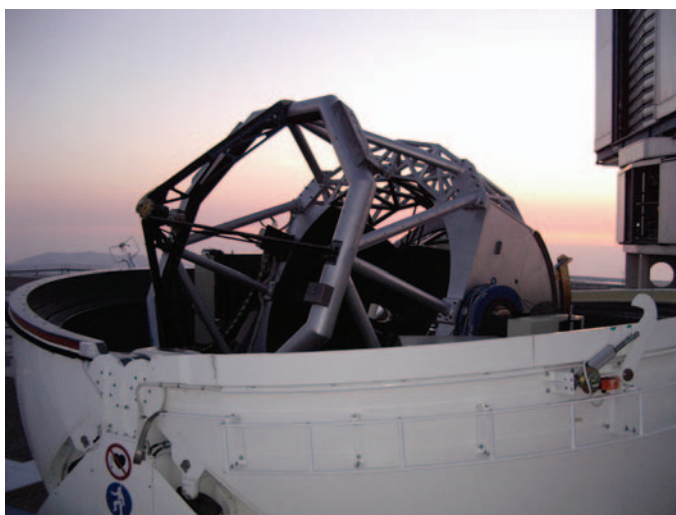
ect engineers, in particular when the 33 tons of the complete AT and what it represents in terms of cost and development effort started to be lifted for the first time by the four lifting legs. The next delicate operation was the drive to the top that required the road to be closed and that took about 2 hours. After some iteration to adjust the position of the truck over the rails, the AT was finally lowered onto its rail network between UT3 and UT4, not far from the VST. A last moment of suspense was the first crossing over the Delay Line Tunnel, whose carrying capacity is now fully exploited after the AT mass has significantly increased from the original estimates of 1991 used for the civil engineering design of the Paranal infrastructures.

COMMISSIONING

The commissioning program started on January 13th with tests of the 'Relocation' process during which the AT is moved from one observing station to another. The excellent repeatability of the telescope position after a relocation (<0.1mm lateral and vertical and <10 arcsec angular) had already been measured in Europe as part of the acceptance tests. These values were confirmed with the AT stations in place at Paranal. This characteristic is particularly important for such a movable telescope in order to avoid lengthy optical re-alignment after a 'relocation'. Indeed, the only necessary fine alignment will be done remotely from the control room at the beginning of the observing night.

The rest of the commissioning program was then carried out up to the planned date of 18 February 2004 when the VLTI building and Paranal engineers had to be freed for the integration and commissioning activities of the VLTI instrument AMBER.

Most of the tests could be carried out successfully except a few for which the fail-



"Little" AT1 in front of UT1 ANTU (photo: F. Gonté).

ure of the measuring equipment or problems with a particular subsystem prevented reaching a definite conclusion. This was the case for the final verification of the Optical Path Length (OPL) stability and of the daytime air conditioning module. These tests, that are meant as a final verification of performance already checked in Europe, will have to be performed in a second phase of commissioning. Another open point is the final adjustment of the M1 radial support that is needed to remove a residual optical aberration (astigmatism) that varies with the telescope altitude angle from <math><10\text{nm}</math> wave front error RMS at Zenith to about 200nm at

On the other hand, it was confirmed that the other performance aspects of the telescope such as pointing, tracking, field stabilization, are excellent. Worth noting is also the fact that only one night out of 26 was lost due to a technical problem, namely the failure of a standard ESO electronic board.

All in all, and in spite of the need for a second commissioning phase to fine tune a few elements, the commissioning of AT1 can be considered very satisfactory. It has proven that the system is healthy and has already reached a level of performance and reliability rarely reached so quickly after installation by any other telescope.

THE NEAR FUTURE

The immediate next step will be the testing by ESO of AT2 in Liège during April-May 2004. This will include tests on the sky if the Belgian weather permits! AT2 will then be packed by AMOS and shipped to Chile by ESO where it will arrive in August 2004 for re-assembly and commissioning. In the meantime, a slot for a second commissioning period of AT1 at Paranal will be defined in line with the availability of engineering resources both at ESO-Garching and ESO-Paranal.

The VLTI first fringes with two Auxiliary Telescopes are currently scheduled for the (European) 2004 fall, therefore...stay tuned!

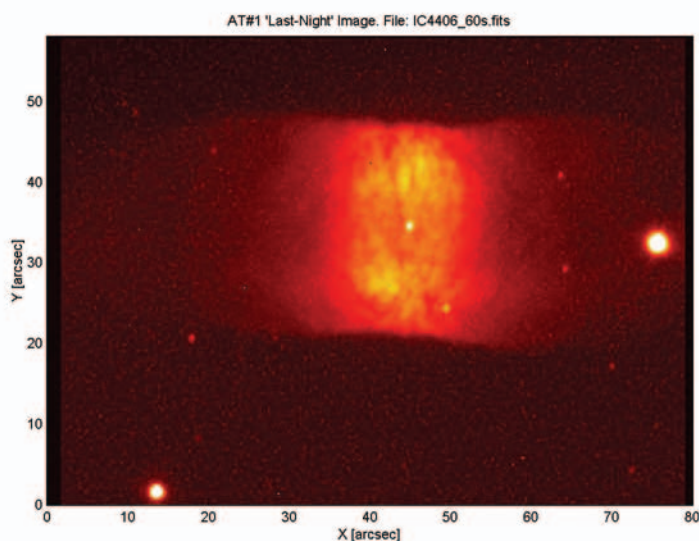
REFERENCE

Koehler B. et al., 2002, The Auxiliary Telescopes for the VLTI: a status report, *The Messenger*, 110, 21.

ESO Press Release 01/04, First Auxiliary Telescope for the VLT Interferometer Installed at Paranal, <http://www.eso.org/outreach/press-rel/pr-2004/pr-01-04.html>.



First Light celebration picture. From left to right: Ph. Duhoux, F. Gonté, R. Gilmozzi, B. Koehler, V. Heinz, S. Guisard. (Photo: S. Guisard)



First Light image: Planetary Nebula NGC 3132. Magnitude 9.2. $T_{\text{exp}} = 10$ sec.



The enlarged telescope family with a VLTI Siderostat (foreground), the first VLTI Auxiliary Telescope (next to the VLTI building), three of the four Unit Telescopes and the VST enclosure (background). Photo: P. Kervella.