# VLTI First Fringes with Two Auxiliary Telescopes at Paranal

*The Very Large Telescope Interferometer (VLTI) at Paranal Observatory had another extension of its already impressive capabilities by combining interferometrically the light from two relocatable 1.8-m Auxiliary Telescopes in February 2005. This achievement heralds an era of new scientific discoveries. Both Auxiliary Telescopes will be offered from October 1, 2005 to the community of astronomers for routine observations, together with the MIDI instrument. By the end of 2006, Paranal will be home to four operational ATs that may be placed at 30 different positions and thus be combined in a very large number of ways (baselines). This will enable the VLTI to operate with enormous flexibility and, in particular, to obtain extremely sharp images of celestial objects.*

Bertrand Koehler and the AT Assembly and Commissioning team, ESO

**AT Assembly and Commissioning team**

**From Garching**

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A list of the other key persons involved in the design and development of the Auxiliary Telescope, can be found the article: The Auxiliary Telescopes for the VLTI: a status report, The Messenger 110, page 21.

The VLT was designed from the beginning with the use of interferometry as a major goal. The VLT Interferometer (VLTI) combines light captured by two 8.2-m VLT Unit Telescopes, dramatically increasing the spatial resolution and showing fine details of a large variety of celestial objects. The VLTI is arguably the world's most advanced optical device of this type. It has already demonstrated its powerful capabilities by addressing several key scientific issues, many of them summarized most recently in the last issue of The Messenger (No. 119, 2005, page 36) and presented at the workshop " The power of optical/IR interferometry" (this issue, page 48).

However, most of the time the large Unit Telescopes are used for other research purposes in a standalone way. They are therefore only available for interferometric observations during a limited number of nights every year. Thus, in order to exploit the VLTI each night and to achieve its full potential, some other (smaller), dedicated telescopes were included into the overall VLT concept. These telescopes are known as the VLTI Auxiliary Telescopes (ATs) and have 1.8 m diameter primary mirrors.

The Auxiliary Telescopes are fully autonomous, ultra-compact, and very high-precision telescopes that can be moved around and placed on any of the 30 observing stations built for them on the VLT observatory platform. From these positions, their light beams are fed into the same common VLTI focal point via a complex system of reflecting mirrors mounted in underground tunnels. The possibility to move the ATs and thus to perform observations with a large number of different configurations ensures a great degree of flexibility, unique for an optical interferometer of this size and crucial for its exceptional scientific capability. Taking also into account the four 8.2-m VLT Unit Telescopes, no less than 254 independent pairings of two telescopes (baselines), different in length and/or orientation, are available. Moreover, while the largest possible distance between two 8.2-m telescopes is about 130 metres, the maximal distance between two ATs may reach 200 metres. As the achievable image sharpness increases with telescope separation, interferometric observations with the ATs placed at the extreme positions will therefore yield sharper images than is possible by combining light from the large telescopes alone. All of this will enable the VLTI to obtain exceedingly sharp and complete images of celestial objects.

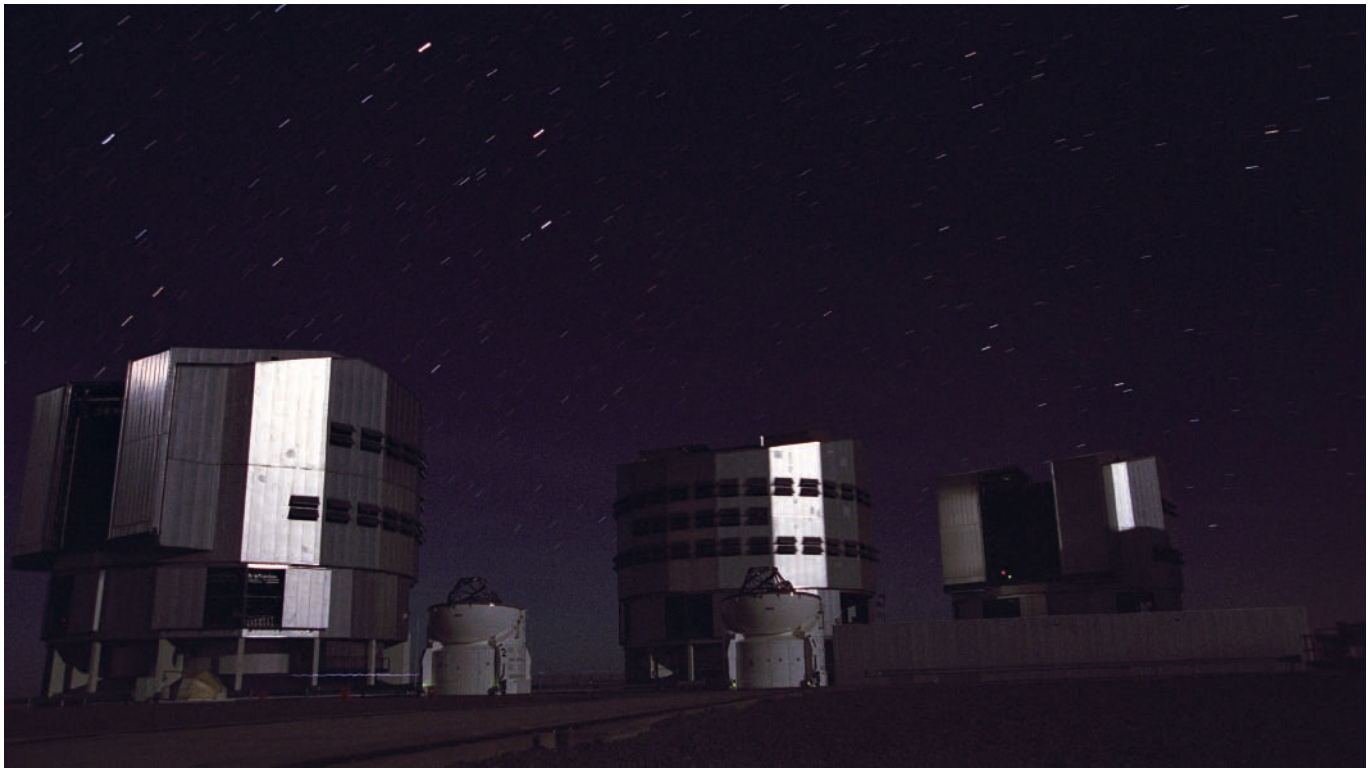
The Auxiliary Telescopes are built by the company AMOS in Liège (Belgium) as 'turnkey' telescopes meeting very stringent requirements imposed by optical interferometry. To give a few examples: i) after being relocated to a new position, the telescope is repositioned to a precision better than one tenth of a millimetre, ii) the image of the star is stabilized to better than thirty milli-arcsec, iii) the path followed by the light inside the telescope after reflections on eleven mirrors is stable to better than a few nanometers. These telescopes are technological marvels weighting 33 tons, with very compact composite enclosures, complete with all necessary electronics, an air-conditioning system and cooling liquid for thermal control, compressed air for enclosure seals, a hydraulic plant for opening the dome shells, etc. Each AT is also fitted with a 'Transporter' that lifts the telescope and relocates it from one station to another in a semi automatic way in about one hour with no more than two operators.

Auxiliary Telescope No. 1 (AT1) was installed on the observatory's platform in January 2004 (see The Messenger 115, page 15). Now, one year later, the second of the four to be delivered, has been integrated into the VLTI (see Figure 1).

After two months of re-assembly and one week of basic verification and alignment on the Auxiliary Telescope No. 2 (AT2), AT1 and AT2 were ready to be coupled around midnight during the night of February 2–3, 2005. The 'search' for fringes could start. It took in fact only five minutes to find the precise position of the Delay Line for which the "First Fringes" could successfully be captured with the VINCI test instrument (see Figure 2). Four nights later this exercise was repeated successfully with the mid-infrared science instrument MIDI.

In parallel, activities in Europe at the company AMOS were proceeding at a good pace. At the time of writing, the extensive acceptance test programme of the third telescope (AT3) has been successfully completed and the telescope is being packed. It will be shipped in mid-June and arrive on Paranal early August 2005. The fourth AT is currently in assembly phase with a delivery in Europe scheduled for early 2006.

Figure 1: One year after AT1 was installed on Paranal, its brother AT2 (on the left) joins to form the first VLTI baseline with Auxiliary Telescopes. Photo by Frédéric Gonté.



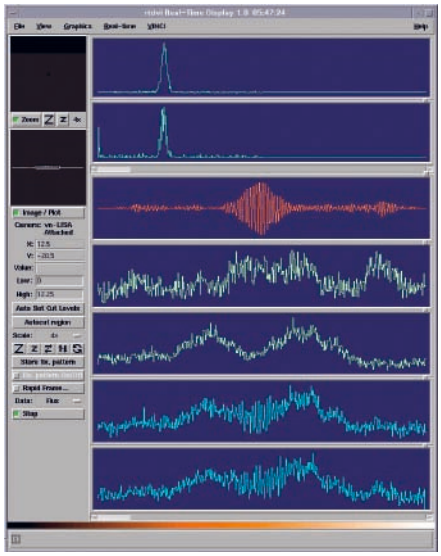


Figure 2: **Left:** The real-time display of the VINCI instrument showing the very first fringes (3rd row) obtained with AT1 and AT2 on February 2–3, 2005. **Right:** The happy team after having obtained the first fringes in the VLTI Control Room on Paranal.