First Light for the VLT Laser Guide Star Facility

On 28 January 2006 a laser beam of several watts was launched from Yepun, the fourth 8.2-m Unit Telescope of the Very Large Telescope, producing an artificial star, 90 km up in the atmosphere. It will enable the VLT's adaptive optics system to measure and correct the atmosphere's blurring effect.

This was the culmination of five years of collaborative work by a team of scientists and engineers from ESO and the Max-Planck Institutes for Extraterrestrial Physics in Garching and for Astronomy in Heidelberg, Germany. After more than a month of integration on-site with the invaluable support of the Paranal Observatory staff, the VLT Laser Guide Star Facility saw First Light and propagated into the sky a 50-cm-wide, vivid, beautifully yellow beam.

"This event tonight marks the beginning of the Laser Guide Star adaptive optics era for ESO's present and future telescopes", said Domenico Bonaccini Calia, Head of the Laser Guide Star group at ESO and LGSF Project Manager.

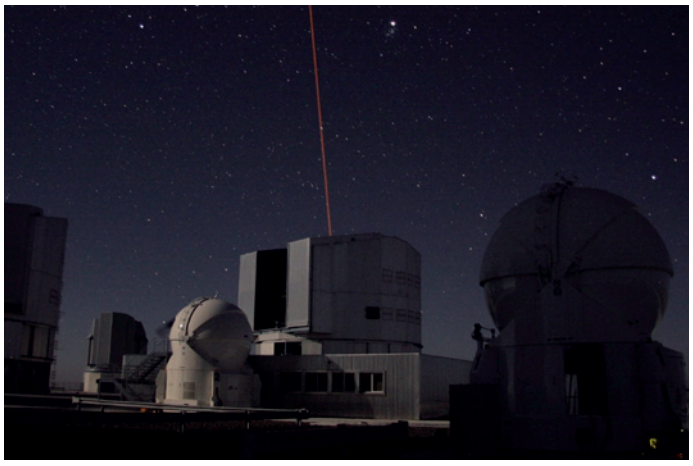
Normally, the achievable image sharpness of a ground-based telescope is limited by the effect of atmospheric turbulence. This drawback can be surmounted with adaptive optics, allowing the telescope to produce images that are as sharp as if taken from space. This means that finer details in astronomical objects can be studied, and also that fainter objects can be observed. In order to work, adaptive optics needs a nearby reference star that has to be relatively bright, thereby limiting the area of the sky that can be surveyed. To overcome this limitation, astronomers use a powerful laser that creates an artificial star, where and when they need it.

The laser beam, shining at a well-defined wavelength, makes the layer of sodium atoms that is present in Earth's atmosphere at an altitude of 90 kilometres glow. The laser is hosted in a dedicated laboratory under the platform of Yepun. A custom-made fibre carries the high-power laser to the launch telescope situated on top of the large Unit Telescope.

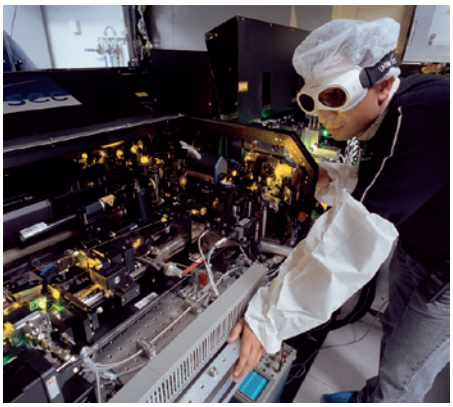
Twelve days of tests followed the First Light of the Laser Guide Star (LGS), during which the LGS was used to improve the resolution of astronomical images obtained with the two adaptive optics instruments in use on Yepun: the NAOS-CONICA imager and the SINFONI spectrograph.

In the early hours of 9 February, the LGS was used together with the SINFONI instrument, and in the early morning of 10 February, it was used with the NAOS-CONICA system.

"To have succeeded in such a short time is an outstanding feat and is a tribute to all those who have together worked so hard over the last few years", said Richard Davies, Project Manager for the laser source development at the Max-Planck Institute for Extraterrestrial Physics.



An artificial star above Paranal.



Photos: H. Zodet (top) and S. Oberti (bottom), ESO

The Laser Guide Star Laboratory.

A second phase of commissioning takes place this spring to optimise the operations and refine the performance. The experience gained with this Laser Guide Star is also a key milestone in the design of a next-generation Extremely Large Telescope in the 30- to 60-metre range now under study by ESO together with the European astronomical community.

The Laser Guide Star Facility is a collaborative project between ESO, the Max-Planck Institute for Extraterrestrial Physics in Garching, Germany (MPE) and the Max-Planck Institute for Astronomy in Heidelberg, Germany (MPIA). The team members are Domenico Bonaccini Calia, Wolfgang Hackenberg, Martin Cullum, Martin Dimmler, Ivan Guidolin, Constanza Araujo Hauck, Erik Allaert, Dan Popovic, Mauro Comin, Marco Quattri, Enzo Brunetto, Franz Koch, Armin Silber, Jose Luis Alvarez, Mario Tapia, Eduardo Bendek, Jutta Quentin, Gerhard Fischer, Massimo Tarenghi, Guy Monnet, and Roberto Gilmozzi (ESO), Richard Davies, Sebastian Rabien, Thomas Ott, Reinhard Genzel, Stefan Kellner, Stefan Huber, Wieland Zaglauer, Armin Goldbrunner, and Jianlang Li (MPE), and Stefan Hippler, Udo Neumann, David Butler, Ralf-Rainer Rohloff, and Bernhard Grimm (MPIA). Members of ESO's Adaptive Optics team also participated in First Light: Markus Kasper, Stefan Ströbele, Enrico Fedrigo, Rob Donaldson, Sylvain Oberti, and Christian Sönke.

(Based on ESO Press Release 07/06)