de Paris, Laserdot, LEP and ESO-La Silla who have contributed to the design, construction and test of this instrument. In particular, we are thankful to Sen Wang and Pierre Gigan of the Observatoire de Paris for the optical and electronic integration performed during this run.

References

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ADONIS – a User Friendly Adaptive Optics System for the 3.6-m Telescope

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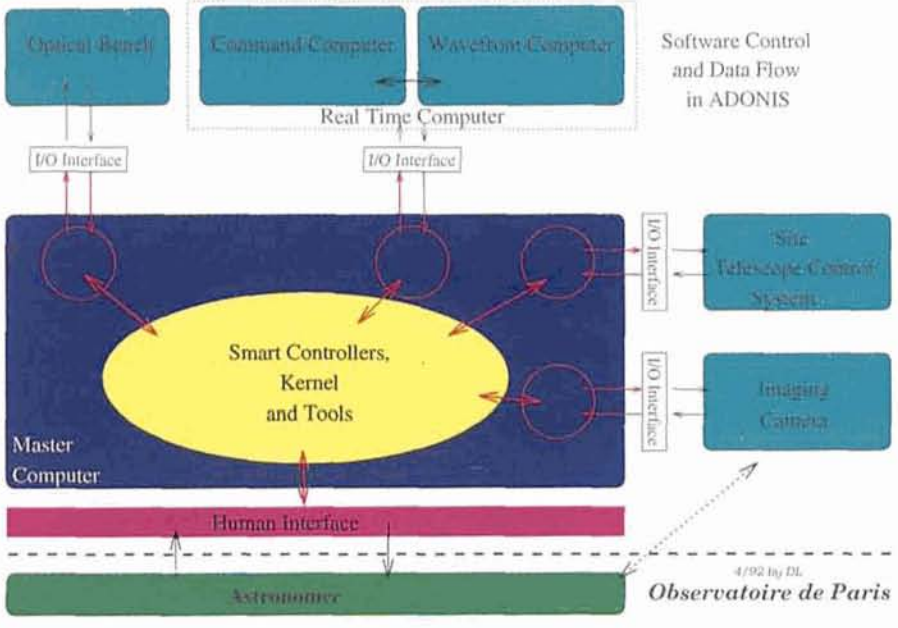
Last November a contract was signed between ESO and the Observatoire de Paris for the "design, development, manufacturing and installation at the ESO 3.6-m telescope at La Silla-Chile of the COME-ON+ upgraded to a user-friendly instrument called ADONIS". ADONIS stands for ADaptive Optics Near Infrared System.

This represents the third phase in the development of the VLT adaptive optics prototype. The very first version, COME-ON, constructed by the consortium ESO – Observatoire de Paris – ONERA – Laserdot, has already achieved routinely diffraction limited images in the near infrared on the ESO 3.6-m telescope (Rousset et al. 1990, *Astron. Astrophys.* **230**, L29; Rigaut et al. 1991, *Astron. Astrophys.* **250**, 280).

During five observing runs in 1990–1991 COME-ON obtained significant astrophysical results such as the determination of the rotation axis of the asteroid Ceres (Saint-Pé et al. *Icarus*, submitted), the first direct images of a disk-like structure around the young star Z CMa (Malbet et al., *The Messenger* No. **66** and *Astron. Astrophys.*, in press) and the images of Eta Car, showing a very complex structure (*Physics Today*, April 92).

A first upgrade of COME-ON, called COME-ON+, was recently tested on the 3.6-m telescope. The efficiency and performances of the instrument have increased significantly (see the report on page 50). However, COME-ON+ remains a prototype, its operation procedures are complex and a qualified team is required to operate the whole system in an efficient way.

In fact, several parameters have to be optimized (number of corrected modes, band-pass, choice of wavefront sensor) according to astronomical requirements (wavelength of observation, magnitude of object) and external inputs such as atmospheric turbulence (amplitude and temporal spectrum), magnitude, spectral type and angular distance of the reference star. This has led to the necessity of implementing an automated system which will do the settings and optimization much better and with greater regularity, thus helping the observer to take the basic operation decisions in an efficient way with respect to the more efficient use of telescope time.



To perform this, a smart software control system will be generated, with interfaces (data acquisition or direct control) with all subsystems such as optomechanical bench, real-time computer, infrared camera, telescope control system, site sensors (seeing, meteo), databases and user interface (see figure).

In addition, a dedicated 128×128 infrared imaging camera, covering the 1–5-μm region, will be installed to take full advantage of this powerful adaptive optics system. Two interchangeable scales (0.035"/pixel and 0.1"/pixel) are selectable to match the diffraction patterns respectively in J (1.2 μm) and L (3.6) bands.

ADONIS will also offer the possibility to accommodate many different imaging devices, for instance the Nicmos camera of the MPI/MPE Garching which will already be used on COME-ON-PLUS in April 1993. Moreover, the possibility for visiting observers to bring along special equipment will be possible by the definition of a simple and open interface on the output F/45 beam. An ADONIS interface manual will be published for this purpose.

ADONIS should progressively become available to the community during the period 1993–1995. In addition to the scientific use at La Silla, ADONIS will

bring a substantial gain in optimizing the operation of an adaptive optics system, particularly important for the VLT prospect. ADONIS continues to rely on the collaborative action with ONERA and Laserdot which made the success of its predecessors. The continuing adaptive optics development programme is currently the only one which is solely dedicated for nighttime astronomy and which has produced significant astrophysical results.

Nonlinearity Problems with Generation-3 CCD Controllers

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Introduction

At present, there are 20 CCDs from five manufacturers running under three different control systems in use at La Silla. Recently, during an observing run at the 2.2-m telescope, a nonlinearity in the response of CCD #8 was discovered (Remy et al., 1992). This short article is intended to describe the problem, set limits on its first possible occurrence, inform the reader about its solution and request contacts from interested parties.

The Problem

During the observing run of 27.2.1992 to 1.3.1992 at the 2.2-m telescope with EFOSC2, with observers Surdej et al. for Key Programme 2-003-43K, a nonlinearity in the CCD response was found. The effect shows up as a feature in the plot of signal variance versus mean signal (the transfer curve, Janesick et al., 1987). For a properly functioning system this plot should be a straight line in the photon shot noise dominated regime whose slope is the inverse of the system conversion factor in electrons per ADU. Figure 1 shows the nonlinear behaviour. A similar feature is also present in the linearity curve for the CCD (mean counts versus integration time), with a total excursion from linearity of 4 % peak-to-peak.

Investigation of the problem revealed that the fault was with the analogue to digital converter board in the Gen3 system, not the CCDs themselves. These boards replaced the previous model boards because of their lower noise performance. Replacing the new boards with the old cured the problem. Figure 2 shows the same plot as Figure 1, but after installing the old boards which have all been in place since 6.4.1992. Since the old boards were originally replaced in 1986, we must also determine when the nonlinearity first appeared and which CCDs were affected.

Which Systems Have Been Affected?

Only instruments using Gen3 systems have been affected. There were 4 such

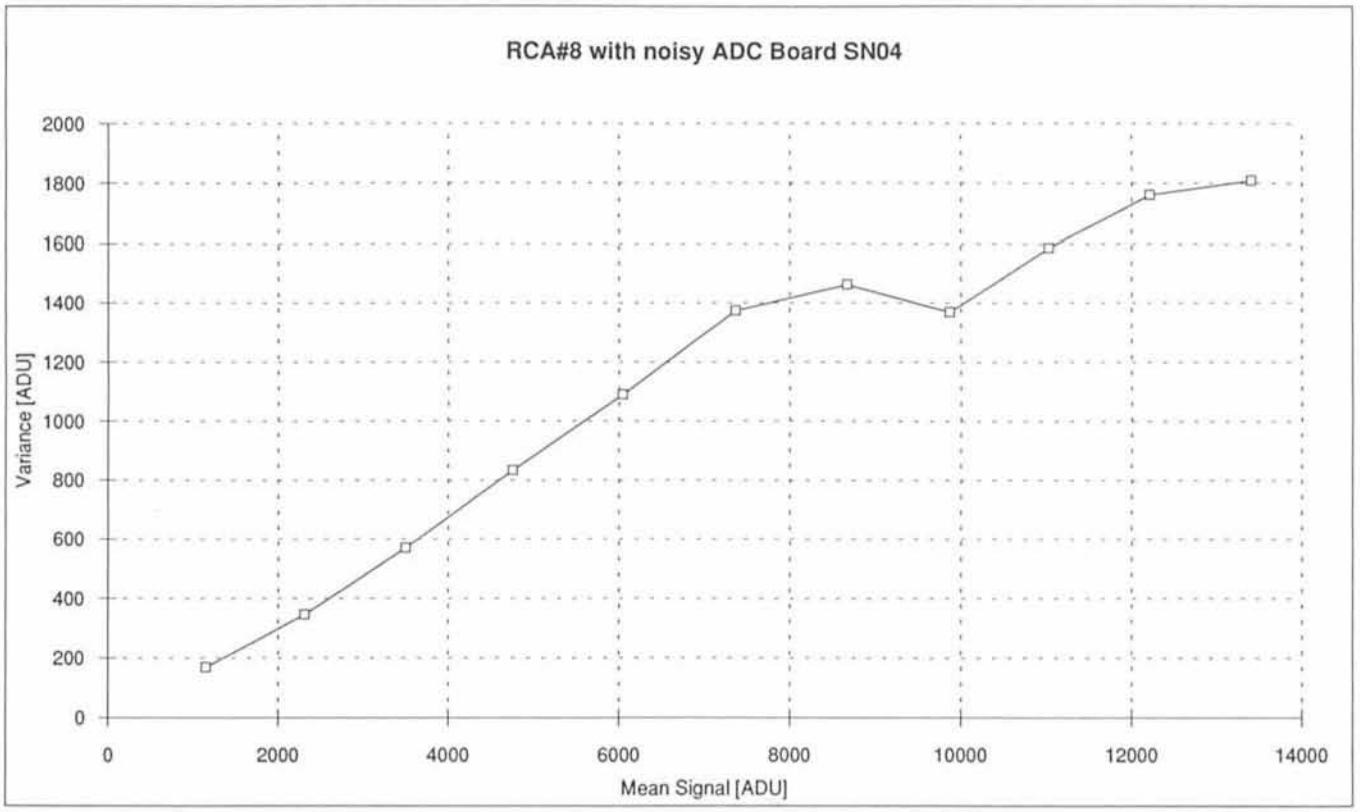

Figure 1.