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Prototype of the FORS Multiple-Object Spectroscopy Unit Under Test

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Two Focal Reducer and Spectrograph Instruments (FORS) are foreseen for the Cassegrain foci of the VLT telescope units 1 and 3. The FORS instruments will provide imaging, spectroscopy, polarimetry and spectropolarimetry observing modes in the 330 to 1100 nm wavelength options. A detailed description of the FORS instruments is given by I. Appenzeller and G. Rupprecht in *The Messenger* No. **67**, pp. 18–21, 1992.

The slit unit of the instrument is a crucial device for the quality of the spectroscopic observations with FORS. It is the instrument part located in the Cassegrain focus of the VLT in front of the optical train (collimator, grisms, filters, camera) of the instrument. Besides a long-slit mask the FORS slit unit will contain the multiple-object spectroscopy unit (MOS) for simultaneous spectroscopy of up to 19 different objects in the telescope field of view. The MOS unit will also be used to generate a strip mask for the polarimetric imaging mode. Consequently, the full-size MOS unit will consist of a row of 19 pairs of opposite slitlets. During multiple-object spectroscopy each pair of opposite slitlets will form a 22 arcsec long slit of adjustable width. The slits can be moved independently in one direction in the VLT Cassegrain focus surface. In order to match best an observer selected constellation of objects in the field of view by the MOS unit slit pattern, a combination of linear positioning of the slits and instrument rotation around the optical axis will be used. When switching FORS to imaging mode, the slitlets will move to their park positions and clear up the Cassegrain focal plane.

Since the mechanical properties and the accurate positioning of the slitlets are very important issues for the multiple-object spectroscopy and the polarimetric observations with FORS, a prototype of the most critical parts of the MOS unit was manufactured in the course of the on-going final design work for the FORS contract between ESO and the VIC consortium (Landessternwarte Heidelberg, Universitäts-Sternwarte Göttingen, Universitäts-Sternwarte München). Coming from the mechanical workshops in Göttingen the MOS prototype (Fig. 1) arrived in München in December 1992 for the electronics installation and for performance tests.

The central part of the MOS prototype consists of 6 slitlets arranged in two opposite rows in the 208×208 mm wide focal area (Fig. 2). By adequate linear positioning of a pair of opposite slitlets, a single slit of a user-defined width can be formed and positioned at a suitable location in the focal area. The 12-mm length of the individual slits corresponds to 22.5 arcsec in the FORS field of view at the VLT. The slitblade itself is carried by a 250-mm-long support arm which is movable over the full length of the instruments's field of view. On both sides of the focal area the guiding and drive system for the movable slitlets is mounted to a very stiff rectangular platform of about 1 m length which provides a reference for measurements of the MOS prototype with micron range accuracy (Fig. 1). In order to allow for the simulation of the different orientations of FORS with respect to gravity (i.e. the telescope elevation and the rotation of the Cassegrain adaptor around the opti-

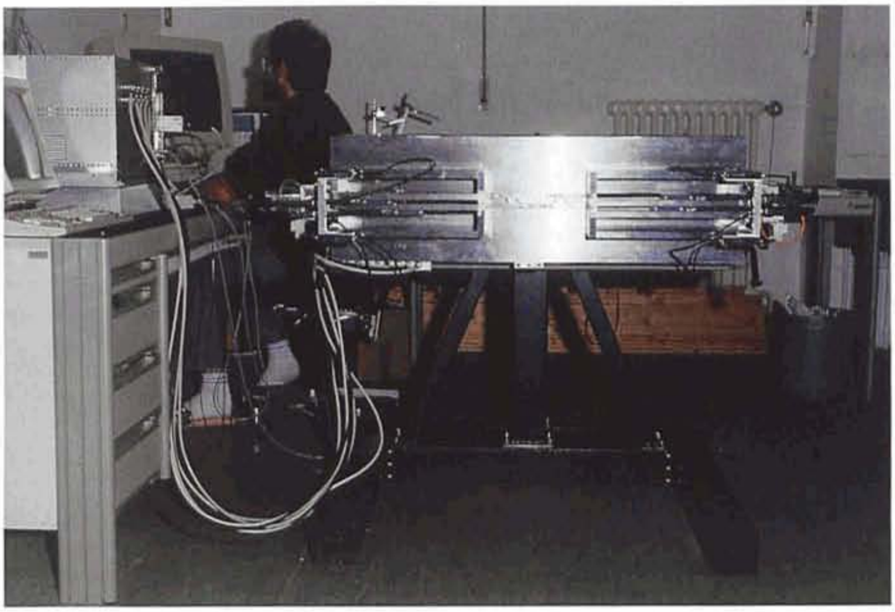

Figure 1: *The MOS unit prototype in its support stand. The MOS unit is pointing to a horizontal position. The rack for the control electronics stands on the desk on the left-hand side of the MOS prototype. The tests are operated by a HP workstation in the background of the laboratory. (Photo by M. Pfeiffer, USM.)*

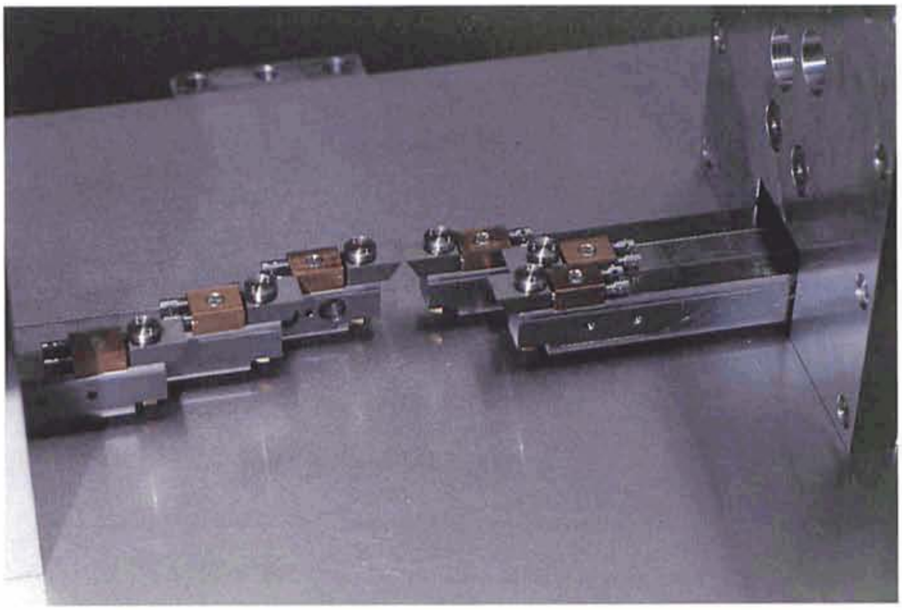

Figure 2: *View of the focal area of the MOS unit prototype with its 6 slitlets. The upper slitlet pair is forming a narrow slit while the slitlets of the two other pairs are in wide separation. (Photo by M. Pfeiffer, USM.)*

cal telescope axis), the prototype is attached to a support stand with two rotation axes (Fig. 1). The control electronics of the prototype is installed in a separate rack. During the tests the prototype is controlled by a VME based local control unit prototype with motor test software running under VXWORKS.

The MOS prototype will be used to check the design principles of the MOS unit by practical tests, to verify mechanical specifications and to identify necessary design modifications. The tests have already been started with measurements of the mechanical bending of the slitlet carrier arms and guiding system and of the accuracy of the slitlet positioning. In a second step a reliability test will be performed which simulates 10 years of MOS unit operations by a comparable number of reconfigurations of the slitlets in a one-month prototype test period (it is assumed that during spectroscopic observations with FORS the slitlets will be reconfigured typically once every 30 minutes). Finally, tests with colliding slitlet pairs shall verify the manufacturing quality and safety of the slitblades in the case of unfavourable malfunctions of the unit control.

LITE: the Large Imaging Telescope

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It was realized very early in the development of the ESO 16-metre equivalent Very Large Telescope (VLT) that wide-field imaging would be too complicated and costly to be implemented on the VLT itself and should therefore be done with a smaller telescope.

Accompanying imaging observations are essential for the optimal use of the VLT. Let us take an example. For large-scale structure studies, the VLT allows to measure redshifts in a 30-arcmin field of view of galaxies of magnitude 23 or even fainter. They are too faint to be reliably detected on Schmidt plates, so the input observation catalogue must be obtained from deep CCD imaging. In this example, outstanding image quality is needed to make a clear separation between faint galaxies and stars. The VLT will have in its imaging mode a 7-arcmin field and is not useable for obtaining such images. The best compromise is a middle-size telescope of about 2.5 m diameter and equipped with a wide-field CCD camera.

These considerations led the French astronomical community to propose the construction of such a special telescope. The definition of this project, now referred to as the Large Imaging Telescope (LITE), started in spring 1992 with the establishment of a consortium of several French laboratories, including Observatoire de Meudon, Institut d'Astrophysique de Paris, Observatoire Midi-Pyrénées, Observatoire de Besançon, Observatoire de Marseille, and led by the Department of Astrophysics and Particle Physics in Saclay. At the same time, a German group from Sonneberg Observatory, Tautenburg Observatory and the Institute of Astrophysics in Potsdam were working on a project of a second-generation Schmidt telescope to pursue the type of research which has long been done at these institutes. Richard West and Ray Wilson of ESO, who were aware of both projects, acted as the go-betweens of the two groups who, in a meeting held at the ESO headquarters in Garching in December 1992, decided to join their efforts. The telescope is the responsibility of the German group, whereas the CCD camera and its acquisition system will be designed and constructed in France.

While this project was originally designed for observations of mainly cosmological interest, it has the technical capabilities to cover a much broader range of astrophysical problems. The consortium is now working on several programmes.

Galactic structure study will take advantage of the deep images obtained for extragalactic purposes, with the addition of the observations of selected galactic fields, in particular in the thick disk region. The main emphasis is the study of the low-mass star luminosity function. On a 10-year time scale, we