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ESO, CNRS and MPI Sign Agreement on Enhancement of the VLT Interferometer

On December 18, 1992, a ceremony took place at the ESO Headquarters during which an important tripartite agreement was signed that will significantly enhance the scientific possibilities of the Very Large Telescope.

After a period of intense negotiations, Dr. A. Berroir (Director of CNRS-INSU), Dr. W. Hasenclever (General Secretary of the MPI) and Prof. H. van der Laan (ESO Director General) on behalf of their respective organizations put their signatures on a contract which will permit the construction of a third 1.8-metre movable telescope for the VLT Interferometer (VLTI). This took place in the presence of several important guests, including Prof. P. Léna, French delegate to the ESO Council and actively involved in the ESO interferometric programme, and Dr. G. Preiß and Mr. D. von Staden from the Max-Planck Society. Several ESO staff members were also present.

In his introduction, Prof. van der Laan mentioned the history of interferometry, from the early work in the radio domain

Figure 1: *Signing ceremony at the ESO Headquarters (from left to right): Prof. P. Léna, member of the ESO Council; Dr. A. Berroir, Director of CNRS-INSU; Prof. H. van der Laan, Director General of ESO; Dr. W. Hasenclever, MPG General Secretary; Dr. G. Preiß, MPG; Mr. D. von Staden, MPG.*

to the great opportunities with modern optical arrays. He specifically stated the unanimous support of the VLTI project by the ESO Scientific and Technical Committee (STC) and was followed by the manager of the VLT project, Prof. M. Tarenghi, who likened the VLTI with an astronomer's dream coming true. Nobody knows for sure which new discoveries will be made with this absolutely unique instrument in the future.

The representatives of ESO's German and French partners spoke about the not so easy task of finding money for such a project in these days of limited ressources, but also how happy they were to bless a truly European undertaking of this dimension. Both Dr. Hasenclever and Dr. Berroir were sure that the new instrument would be of enormous interest to the scientific communities in their respective countries and they were looking forward to the implementation of the new facility at Paranal.

Figure 2: *Discussing the project (from left to right): Prof. H. van der Laan, Director General of ESO; Dr. A. Berroir, Director of CNRS-INSU; Dr. W. Hasenclever, MPG General Secretary, and Prof. M. Tarenghi, VLT Programme Manager.*

Prof. Léna reminded those present of the fact that although the medical science has proven that it is possible to dream a complete dream in just a few seconds, in this case, it has taken European astronomers almost 20 years to realize this particular dream. He congratulated all involved, scientists and engineers, with the excellent preparations, which have finally born fruit. He briefly compared the VLT with other large telescope projects and concluded that it is exactly the great and unique interferometric possibilities which lets ESO's project stand out among the others. As an astronomer, he was looking forward to participate in some of the most important scientific tasks to be undertaken with the VLTI, including the study of proto-planetary systems and the centre of the Milky Way.

The photos from the ceremony were taken by ESO photographer H.-H. Heyer.

The Editor

The VLT Main Structure

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The VLT Programme

During the development of the project the VLT programme was broken down into several subsystems, each of them with clearly identifiable functional requirements and interfaces with the other parts of the project. These subsystems would have lately been contracted to ESO member countries' industrial firms for design and construction. The unit 8-m telescope main structure is one of these subsystems.

The Main Structure

The main structure is a telescope without mirrors and field derotator.

In Figure 1 the items which compose the main structure are indicated. The major components are:

- the telescope steel structure (tube and fork),
- the motors which make it move around the altitude and azimuth axes (drives),
- the angular measurement system which gives the position of the two axes (encoders),
- the supporting system of the telescope (hydrostatic bearings),
- the cooling system used to cool the different power sources placed on the telescope,
- all the equipment which provide safety functions (brakes, locking device to lock the telescope in defined positions for maintenance, emergency stop buttons system),
- the auxiliary systems to monitor the temperature of the steel structure to model the thermal displacements of the attached mirror units,
- the equipment to access the different parts of the structure for maintenance or operations,
- the dummies simulating the inertia characteristics of the mirror units.

The Functional Requirements

Like any instrument of measure, a telescope, once its modes of use are defined according to the scientific needs, must reduce to the minimum acceptable the induced disturbance to the measurements it has to perform.

When the modes of use are different, and imply contradictory requirements, and all of them must be implemented in the same telescope, an accurate evaluation at system level has to be done in order to define the best combination of parameters which characterize the design and which can be clearly specified to a subcontractor, who has to design a part of the complete system without knowing the top level requirements. At the same time, in order to proceed in parallel with the design of the other subsystems, all the interface requirements and boundary conditions have to be defined. This was the job performed at ESO. To derive the functional requirements which would have been specified for the main structure we have started from the following basic requirements:

1. pointing better than 1″
2. tracking better than 0.05″ (both under a wind speed of 18 m/s max. with wind gusts up to 27 m/s)
3. stability of the secondary mirror after chopping of 0.2″ peak to valley with a chopping amplitude of 1′ at 5 Hz and 80 % duty cycle (infrared mode)
4. stability of the Optical Path Distance within 14 nm for an integration time of 10 ms, 50 nm for an integration time of 48 ms and 225 nm for an integration time of 290 ms under a wind speed of 10 m/s (interferometric mode)
5. stability of the position of the altitude and the azimuth axes during the rotation of the telescope
6. stability of the attachment points of the instrumentation during the rotation of the telescope
7. stability of the alignment of the mirror units (primary, secondary and tertiary) within a relative displacement between the mirrors which will not cause a displacement of the image in the Nasmyth focal plane higher than the blind pointing requirement. Because the differential displacement of the mirrors due to the main structure is only one of the contributions to the displacement of the image in the focal plane (others are the deformation inside the mirror units themselves), we required that the contribution of the main structure should not be higher than 0.″3