The Secondary Unit of the VLT Approaches Delivery

S. STANGHELLINI, G. JANDER, A. MICHEL, A. VAN KESTEREN, M. DUCHATEAU, W. ANSORGE, ESO

There has been significant progress in the manufacture of the first secondary mirror unit of the VLT since the last report in *The Messenger* (No. 86, December 1996). During the first months of 1997, tests of the various subassemblies (focusing, centring, chopping and sky-baffle mechanisms) were completed and final integration was achieved in the clean assembly room of Dornier Satellitensysteme in Friedrichshafen, Germany. The systematic tests performed prior to final integration, including tests of the electronics and software integration tests were helpful for early detection and elimination of error sources affecting performance of the M2 Unit.

Before the end of April 1997 the Mandatory Inspection Point meeting which was held between Dornier and ESO, as foreseen in the contract, formally concluded the manufacturing and integration activities and opened the acceptance test phase, structured in four distinct steps. The first step is related to Electromagnetic Compatibility. The second step is the testing of the software. The third step checks in depth the kinematic and the thermal performance of the unit, taking also into account the environmental conditions foreseen on site. The final step is constituted by the dynamic and stability testing.

As per today the Electromechanical Unit has undergone the Electromagnetic Compatibility test and the Software tests. The electromagnetic compatibility tests, which were performed in the anechoic chamber of Dornier (see Fig. 1), showed the ability of the unit to perform properly in the electromagnetic environment expected in the telescope. Similarly good results were also obtained during the software tests.

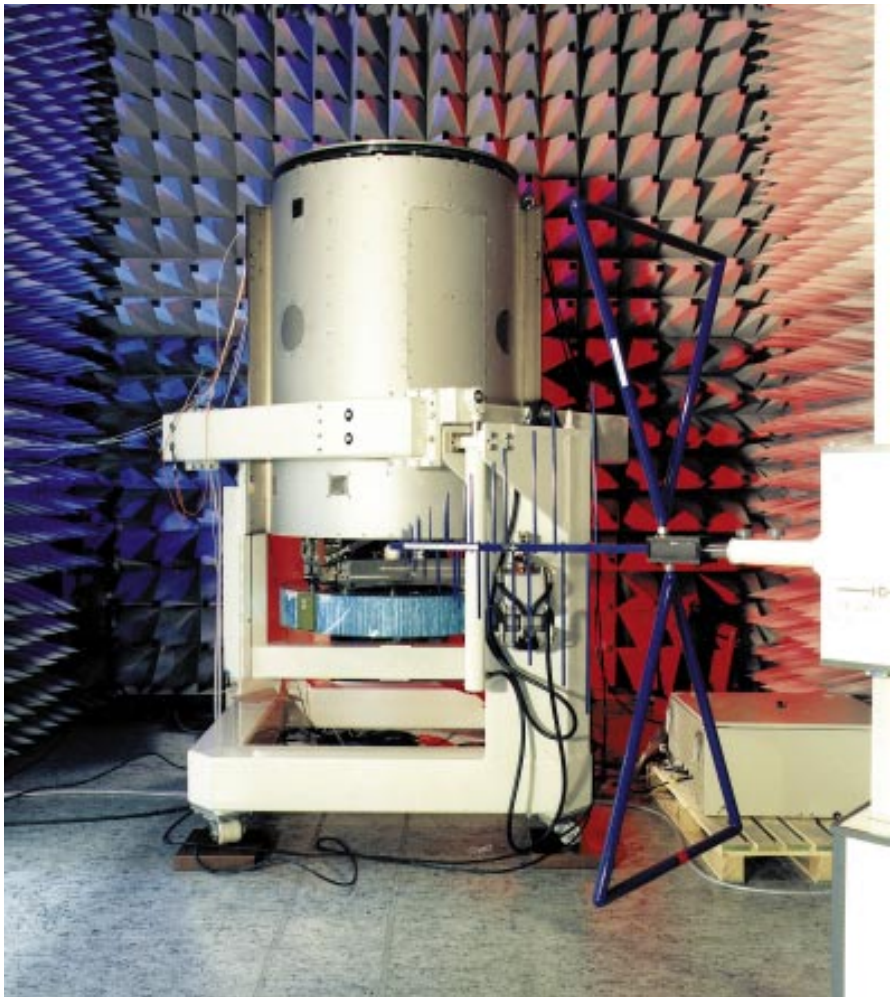

Figure 1: The M2 Unit equipped with the M2 dummy in the anechoic chamber of Dornier. (Photo Dornier).

At the time of writing, the kinematic and thermal tests have started. The tests shall demonstrate the ability of the M2 Unit to position the secondary mirror along the five controlled degrees of freedom with the required accuracy. These tests are performed with a dummy secondary mirror. Some of the kinematic performances have been already demonstrated at ambient temperature. The M2 Unit is now being cooled and maintained at a temperature near 0° C while the kinematic functions are operated. During the thermal tests the temperature of both critical internal parts and the external skin is monitored.

Figure 2: The Beryllium secondary mirror during polishing at REOSC Optique.

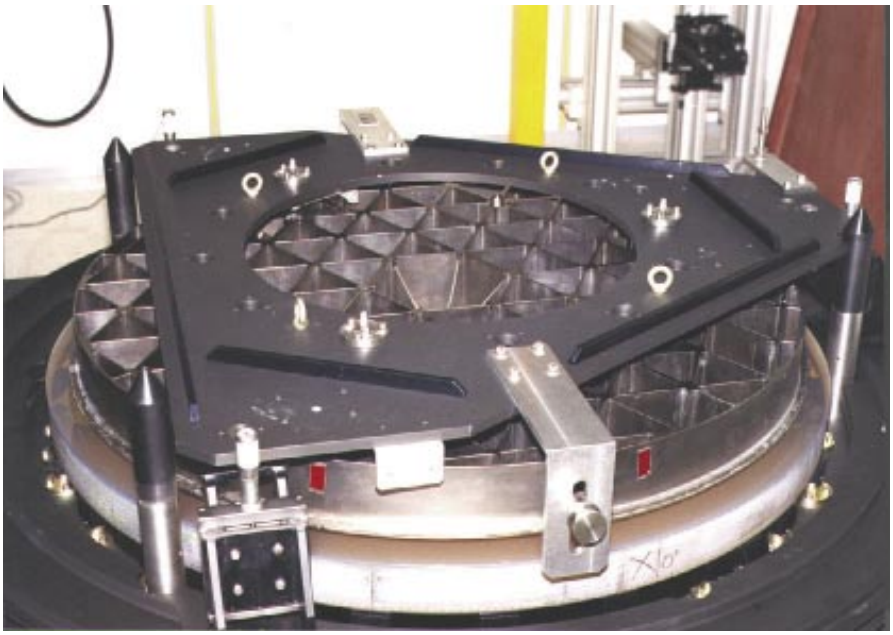

Figure 3: The secondary mirror mounted in the optical test set-up. Below the mirror the Zerodur matrix used for optical testing is visible.

In the meantime, polishing of the first of the four Beryllium secondaries at REOSC Optique in Paris is well progressing. The final polishing is almost completed with the optical quality approaching the specified Central Intensity Ratio. During the polishing, intermediate testing was done by means of a matrix test set-up (see Figs. 2 and 3), after integration of the mirror in its final Titanium cell. At carefully chosen intervals during the polishing, the mirror was submitted to thermal cycling to reduce internal stress and obtain a long-term optical stability. The remaining tasks ahead are related to the cutting of the external edge of the mirror, necessary because in its final dimensions the secondary is undersized and defines the pupil of the telescope. After the cutting, the optical figure will be verified to see if a final polishing retouch is necessary. These activities are expected to be completed during the summer.

Subsequently, the mirror will be shipped to Dornier where it will be integrated into the electromechanical unit. At this point, the fourth and last step of the M2 Unit tests will start in a set-up simulating the telescope spider. The purpose is to verify that there is no structural interaction between the M2 Unit and the telescope structure since this could lead to reduced chopping performance. The M2 Unit is expected to be delivered in late summer in time for the integration in the telescope on Cerro Paranal.

S. Stanghellini
sstanghe@eso.org

The VLT Mirror Coating Unit Ready for Shipment

M. SCHNEERMANN and M. GROESSL, ESO

In August 1995, the European Southern Observatory signed a contract with Linde AG, Germany, for the supply of the coating unit for the VLT mirrors. Together with their main subcontractors, BOC Coating Technology, UK, and Deggendorfer Werft, Germany, Linde meanwhile completed the development, construction and pre-commissioning of the coating unit in Deggendorf. On the 14th of May 1997, the preliminary acceptance review meeting took place, and it was concluded that the coating unit is fully capable of producing aluminium coating on the VLT mirrors with the specified quality.

The coating unit (see pictures of the coating unit inside the facilities of Deggendorfer Werft, located directly at the Danube river) is a large vacuum chamber with a diameter of 9.4 metres and a volume of about 122 m^3. The high vacuum is generated by 8 cryo-pumps which are located on top of the vacuum chamber. The chamber is divided into two halves by a horizontal flange sealed by O-rings (see Fig. 2). The mirror is loaded into the lower half of the chamber onto a whiffle-tree support system with

Figure 1: The coating unit for the VLT mirror substrates at Deggendorfer Werft premises. The circular platform on top of the chamber provides personal access to the cryo-pumps, feedthrough, vacuum gauges, etc. located on top of the chamber.