Recoating the MLRO primary mirror

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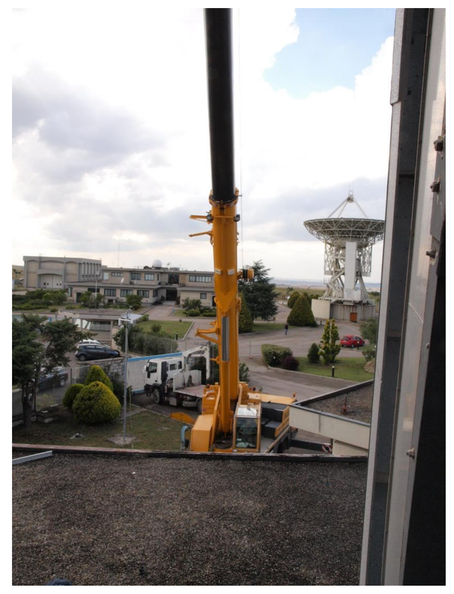
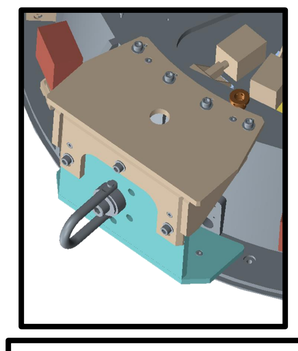
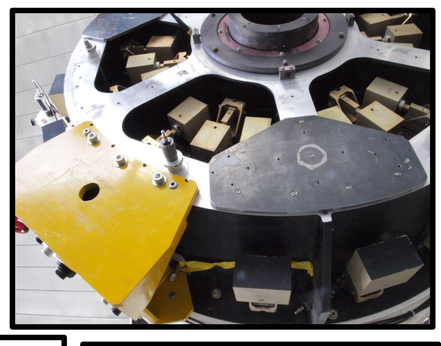
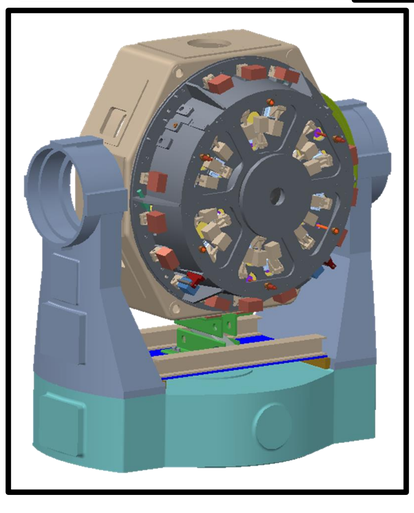
Abstract
The Matera Laser Ranging Observatory (MLRO) is based on a 1.5-meter diameter Cassegrain telescope which was built in 1995. The primary mirror had a UV-enhanced coating with a very high reflectivity; however, after 20 years, it needed a new coating. Due to the particular design of the telescope, the operation has been very carefully planned by e-Geos and, in order to avoid risks, we decided to do everything on site. L3 Communication (formerly Brashear-Contraves, the builders of the telescope) directed all aspects related to the movement of the 1-ton mirror, while ZAOT (Italy) did the recoating in a vacuum chamber which was erected at the observatory. The poster illustrates all the phases of the operation.

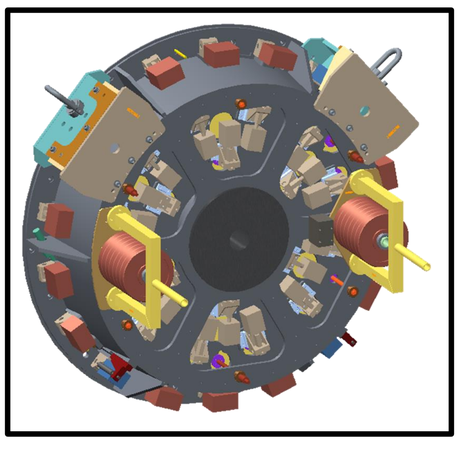
The primary mirror about to be detached from the telescope tube







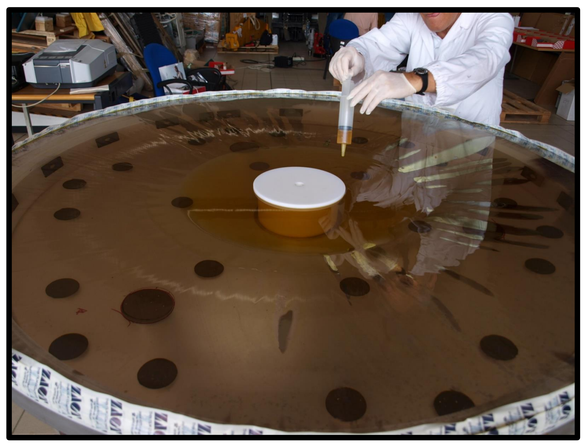


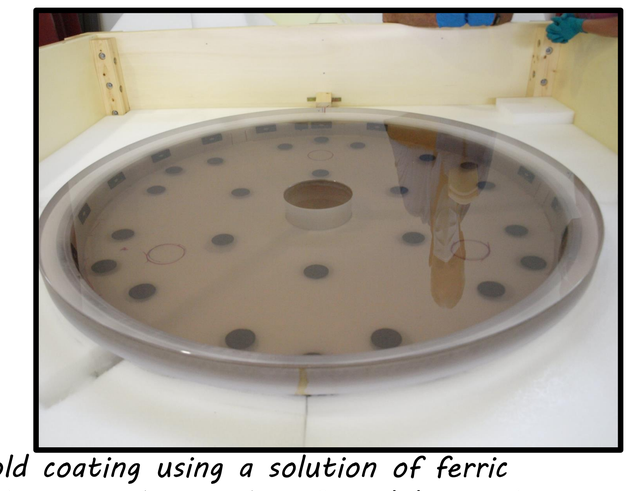


3D CAD vs reality: we had to build several tools designed by L3 to allow removal and reinstallation of the primary mirror away from their manufacturing facility.

(ABOVE) The big crane that lifted the 2.5 ton cell/mirror assembly, seen on the (LEFT) flying high in the sky and then landing on the truck that moved the precious payload to a nearby building where we had set up all facilities to perform the operation. This building is equipped with a 5-ton overhead traveling crane.

Obviously, as soon as the mirror was about to land on the truck, it started raining cats and dogs, so we had to put up our foul weather gear.





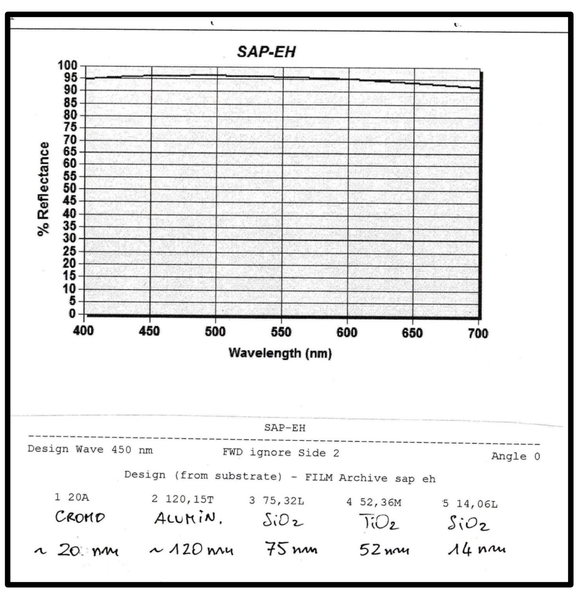
Mr. Zanoni of ZAOT chemically removing the old coating using a solution of ferric chloride. The process went very smoothly and the original optical surface did not show any defect due to aging or corrosion.

The aluminizing chamber made by ZAOT

The inverted mirror being transported into the aluminizing chamber

The newly coated mirror

Realigning the MLRO telescope



Conclusions

The recoating of the MLRO main mirror has been a long and quite stressing task, due to the mechanical complexity of the mirror/cell assembly, to the size and weight of the various parts, and to time constraints. However, we managed to complete it successfully: our SLR data as well as photometric measurements show a clear improvement in the optical efficiency.
The reflectivity of the new coating (LEFT) looks very good and we hope that it will last for a long time.