

Present ILMT status (November 25, 2007)

1. Generalities

The International Liquid Mirror Telescope will be made of three main components, a primary rotating mirror, a focal structure and an upper-end. These components are themselves composed of many elements.

The mirror consists of a container of parabolic inner shape resting on an air-bearing coupled to a motor, all of this laying on a three point support. The mercury will be spread out in the container. It will act as a liquid reflecting coating.

The focal structure is quite simple as it does not have to be mobile since the mirror cannot be tilted. It thus simply consists of a vertical structure combined with a spider structure designed to support the upper-end as well as all the alignment mechanisms.

The upper-end is made of a five-lens optical corrector, a 2K x 2K (hopefully a 4K x 4K) CCD camera working in TDI (Time Delay Integration) mode with its control electronic and cooling system and of the alignment mechanisms of the camera and corrector.

The description of the elements which have already been constructed, as well as the list of those which are currently under construction, is presented hereafter. Most of those elements have been constructed in Liège (Belgium) either at AMOS (Advanced Optical and Mechanical System) or at CSL (Centre Spatial de Liège – Liège Space Center). The funding mainly comes from the “Communauté française” of Belgium, the “Région wallonne”, the “Fonds National de la Recherche Scientifique”, the University of Liège and the Royal Observatory of Belgium.

2. Status of the project

Design

All the designs are finished. This includes the design of the liquid mirror (i.e. the container, the air bearing, the drive system and the support tripod), the design of the mechanical structure of the telescope, the designs of the corrector, of the CCD camera and of the housing.

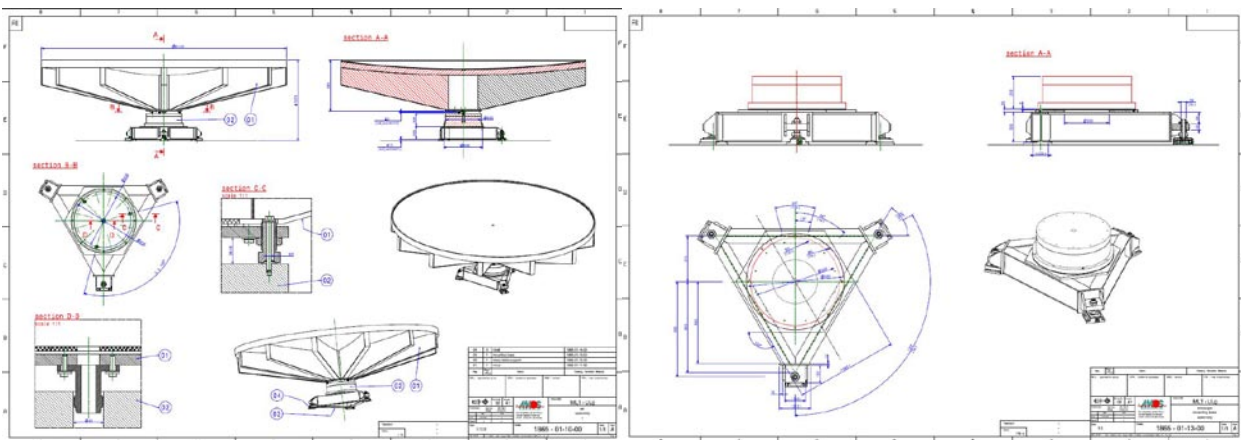


Fig 1: Left : turn-table design ; Right bearing design: The bowl, air-bearing and the three point support are visible on those pictures.

Mirror

Many of the designed elements have already been constructed, including :

The liquid mirror container, illustrated in figure 2. The container, also called “bowl”, will be filled with liquid mercury and rotated at a constant speed to form the primary mirror of the telescope. The free surface of a liquid in rotation takes a parabolic shape under the constant pull of gravity and the centrifugal acceleration. Such a surface is ideal for telescope purpose as it focuses all the rays from a paraxial beam at the same point (the focus).



Fig 2: container of the future ILMT.

The bowl shown in figure 2 has still to be covered with a layer of polyurethane in order to achieve a shape as near as possible to the final mercury shape. This layer is deposited by spin casting. This process allows to give a good final shape to the polyurethane layer.



Fig 3: The air bearing resting on its three point mount.

Moreover, this container must fulfill strict specifications of rigidity, temperature stability, etc. in order to guarantee a final shape as perfect as possible.

The air bearing, with the support mounting and the motor are also ready. They are shown in figure 3. These elements have to support the container full of mercury.

Structure

The structure is shown in figure 4. It aims at supporting the telescope upper-end and its alignment mechanism. This structure is very simple as the telescope is always vertical. It simply consists in a vertical structure combined with a spider. This structure is now complete.



Fig 4: The vertical structure and the spider

Upper-end

The mechanical elements of the corrector (barrel) are ready and have been assembled for testing and then disassembled waiting for the lenses. This part of the corrector is very important as the relative position of the lenses is very important to ensure a good correction.

The lenses of the corrector are ordered. Those lenses are very complicated to manufacture, mainly because of their size.

The CCD camera (2K x 2K, or hopefully 4K x 4K) and all its subsystems are still under studies.

Building

The building has been designed but is not constructed yet. It will be only once the implementation site of the ILMT will be selected (see the location section for more details). The building is also quite simple, as it only needs an opening roof since the telescope is zenithal. The funding has already been obtained for the construction of the dome.

Assembly

The elements of the table have been assembled but the polyurethane has not been spin casted yet. Indeed, before proceeding to this step, it is very important to be absolutely certain that the rotation will be stable enough during the operation to ensure that the finale shape of the bowl is as perfect as possible.

Tests

The rotation table has been tested for rotation.

The mirror has to be tested with mercury in the bowl.

Location

The site where the ILMT will be installed has not been selected yet. It is important to note that the corrector has to be designed for a specific latitude. The corrector currently under construction is designed for a latitude of $29^{\circ}30'$ either north or south. The possible locations are the ESO observatory of La Silla ($29^{\circ}30'$ South) in Chile and the observatory of Devasthal in the north-east of India ($29^{\circ}30'$ North). Both sites present good seeing quality. Those latitudes allow to observe about 90 square degrees of extragalactic sky. Moreover at those latitudes one of the galactic poles is observable.

Negotiations concerning the selection of the site are currently in hand.