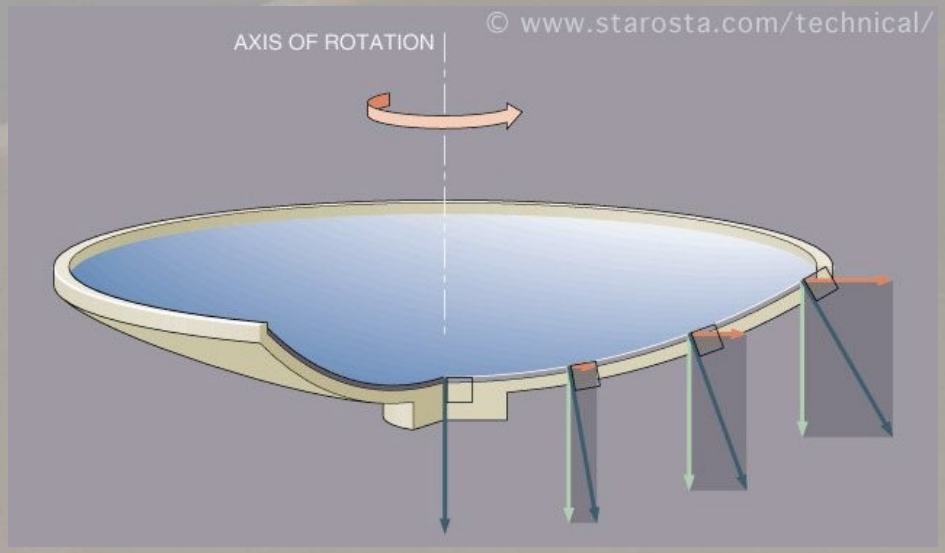
The International Liquid Mirror Telescope :

First mercury test report

Summary

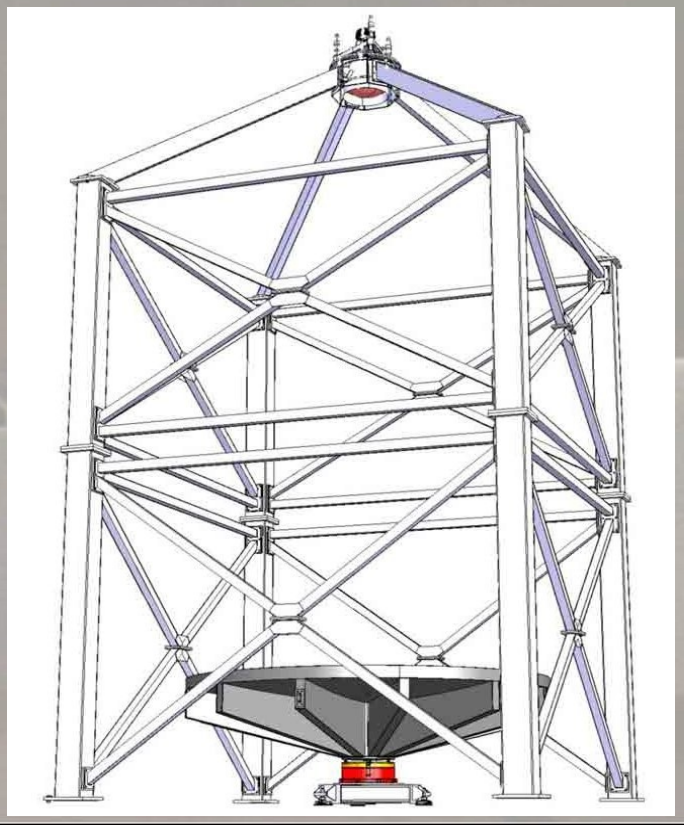
- Basics on Liquid Mirror Telescopes
- The ILMT
- Possible LMT's defects
- Interest of the Mercury tests
- Wave detection Method
- Report of the Mercury tests
- Conclusions

Basics on Liquid Mirror Telescopes



- Rotating fluid → parabola
- Reflective fluid (Mercury) → Parabolic Mirror

- Liquid Mirror Telescope :
  - Liquid Mirror
  - Camera at focal point

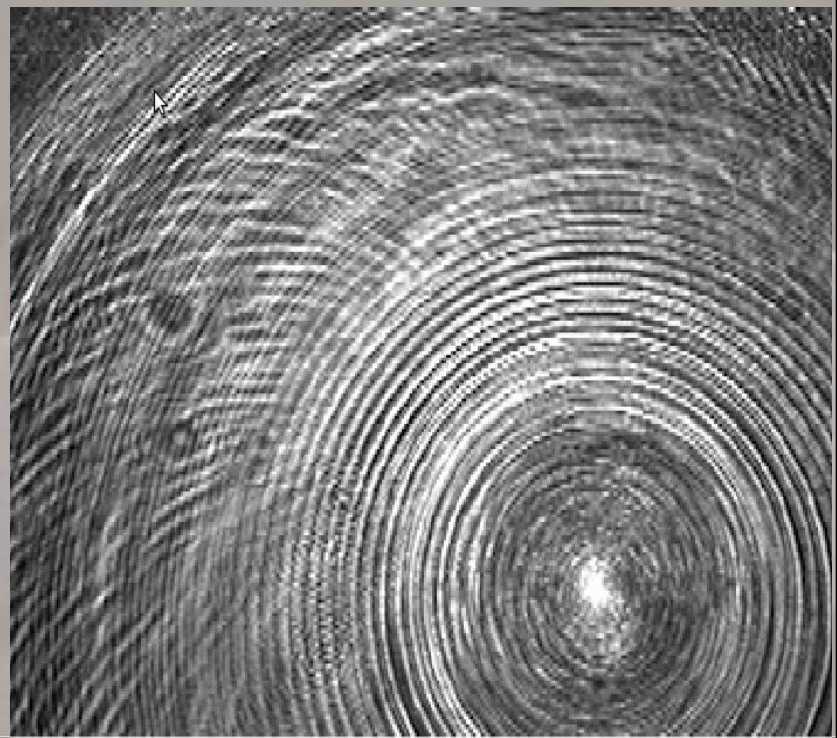


The ILMT

- 4m diameter, built in Liège
- collaboration of astronomers from Canada,India, ROB and Ulg
- Will be Installed in India (Devasthal Observatory)
- Present Status:
  - Building : Designed
  - Camera : ordered
  - Corrector : lenses are being coated
  - Software in development
  - Dish : to be tested

Possible LMT's defects

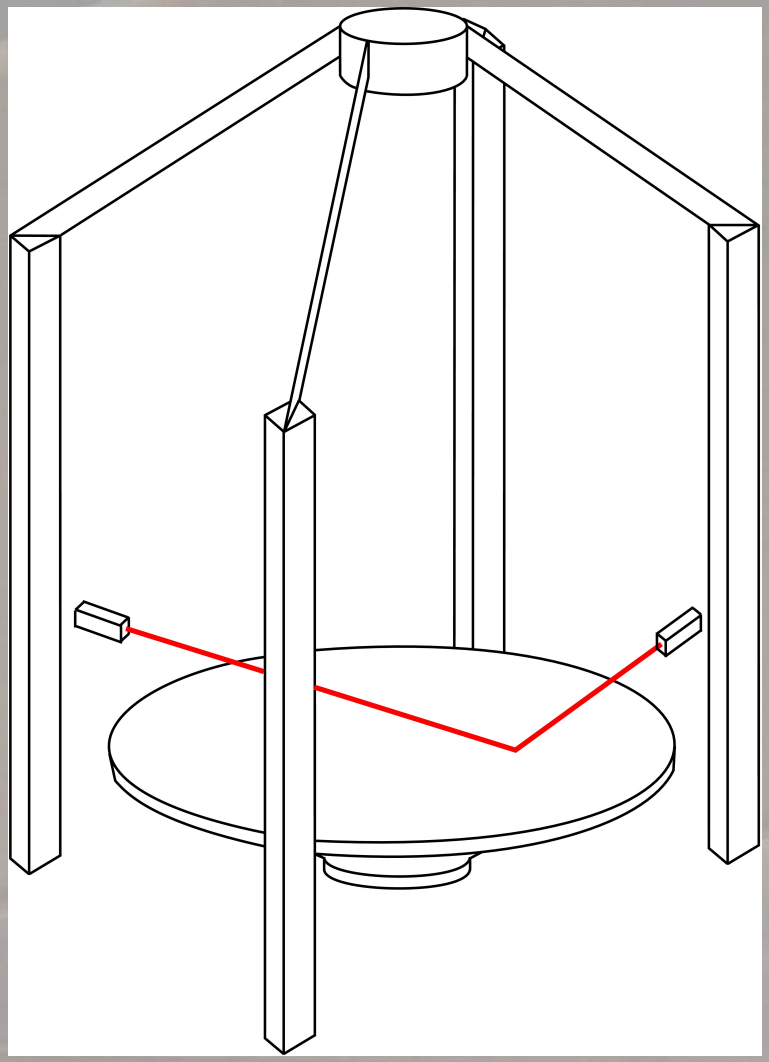
- Optical quality may be affected by wavelets
  - Transient wavelets: gust of wind, flies, …
  - Stationary wavelets: spiral and concentric
- The spiral wavelets
  - Wind induced pattern
  - Instabilities in the air-Mercury interface
  - Solution : Mylar film
- Mylar diffracts → Is it worth it ?
- Reducing the mercury thickness
  - Reduces the waves amplitude
  - Increases the damping



Why doing Mercury tests?

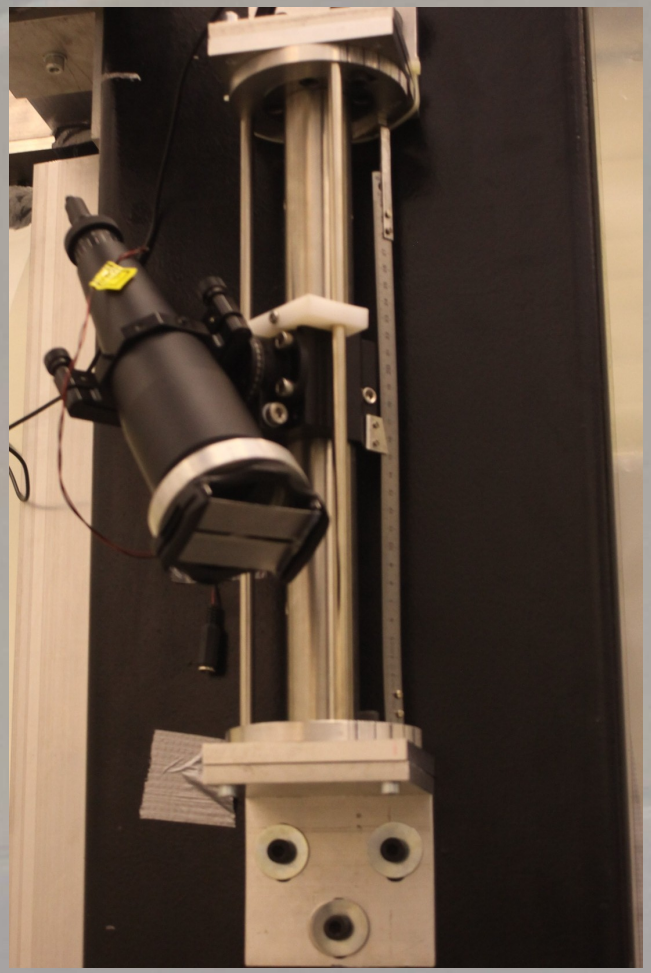
- Is it possible to close the mercury layer?
- How thin can we make the mercury layer?
- Are there waves?
- Spiral: sufficiently suppressed? Mylar?

Wave detection method



- Laser reflected on the mercury
- If wavelets :
  - ➔ slope modification at impact point
  - ➔ deflection of reflected ray

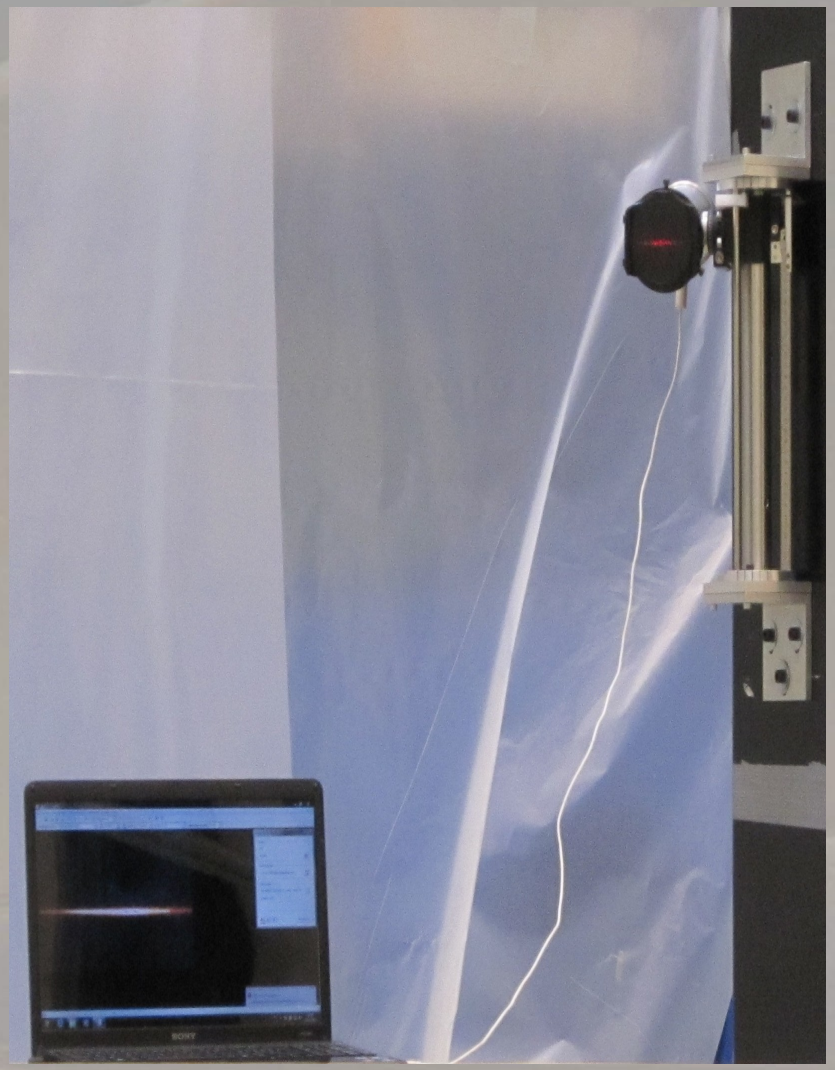
Detection method: the emitter



- Emitter :
  - Laser pen
  - Beam expender
  - 2 blades
- Vertical translation + rotation mount

  → select the impact radius!

Detection method: the detector



- Detector : CMOS camera
- Vertical translation + rotation mount

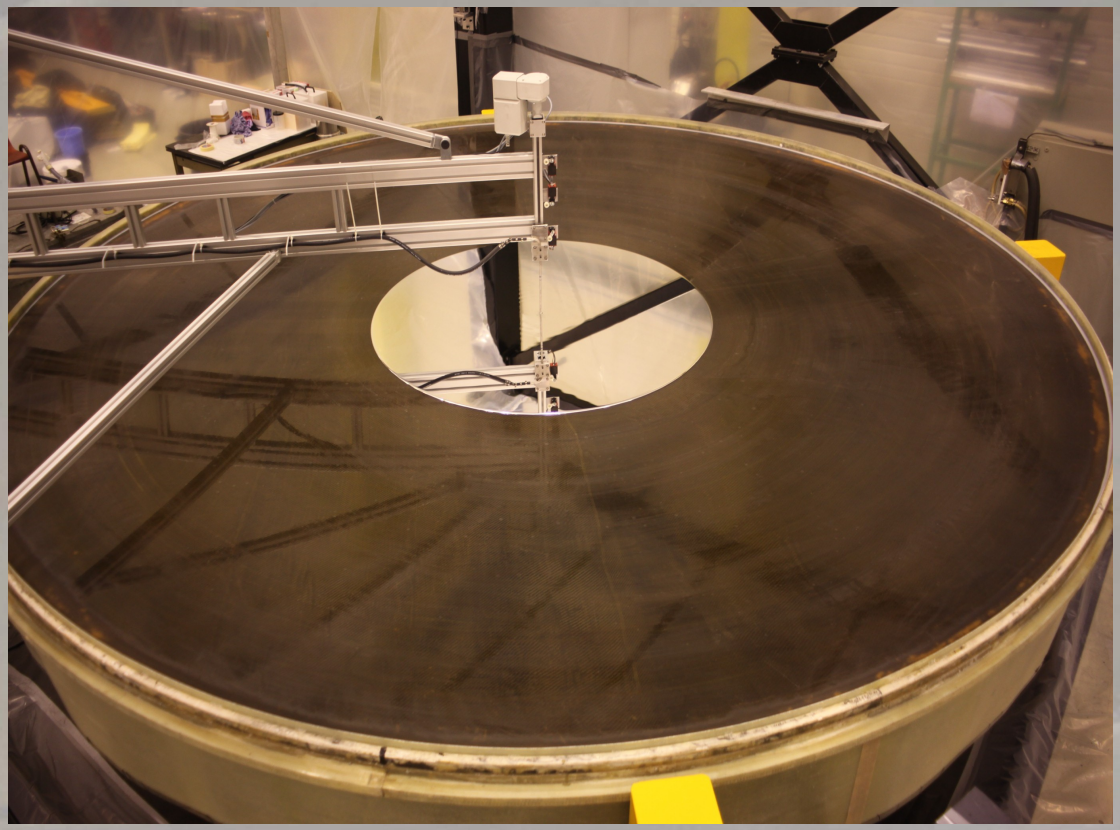
  → intercept the reflected beam
- In each frame :

  detection of the line...
- Fit the line evolution as a function of:
  - Amplitude
  - Wavelength
  - Frequency
  - ...

Before spinning the mirror...

… getting the astronomer ready!

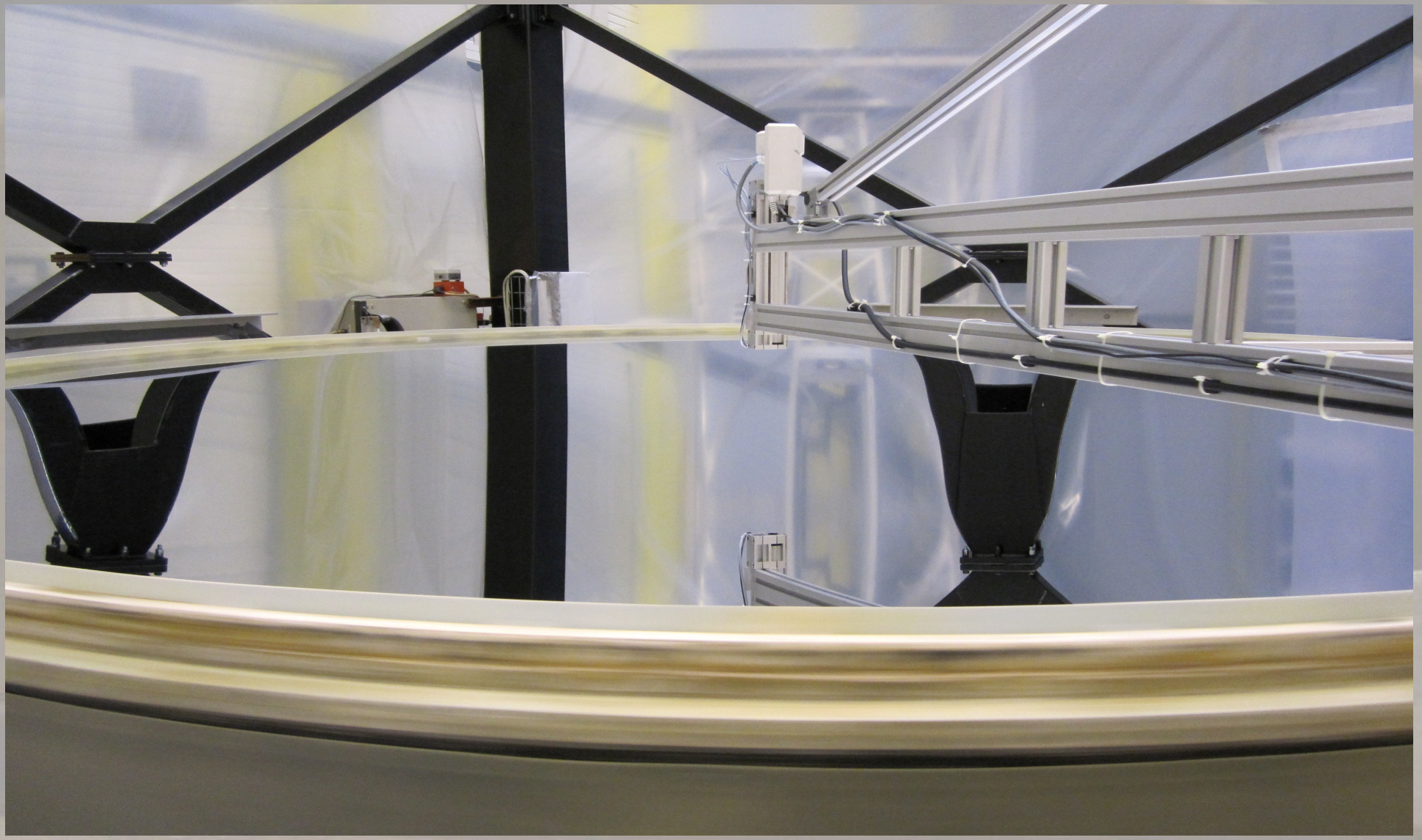
Before spinning the mirror



- Pumping the mercury into the dish

Launching the mirror

And finally....



Conclusions

- We were able to close the mercury layer with a 3mm layer
- Thickness of 2mm was reachable
- Spiral waves were present at 3mm and 2mm
- Still treating the videos...

- New tests need to be done to achieve 1mm!