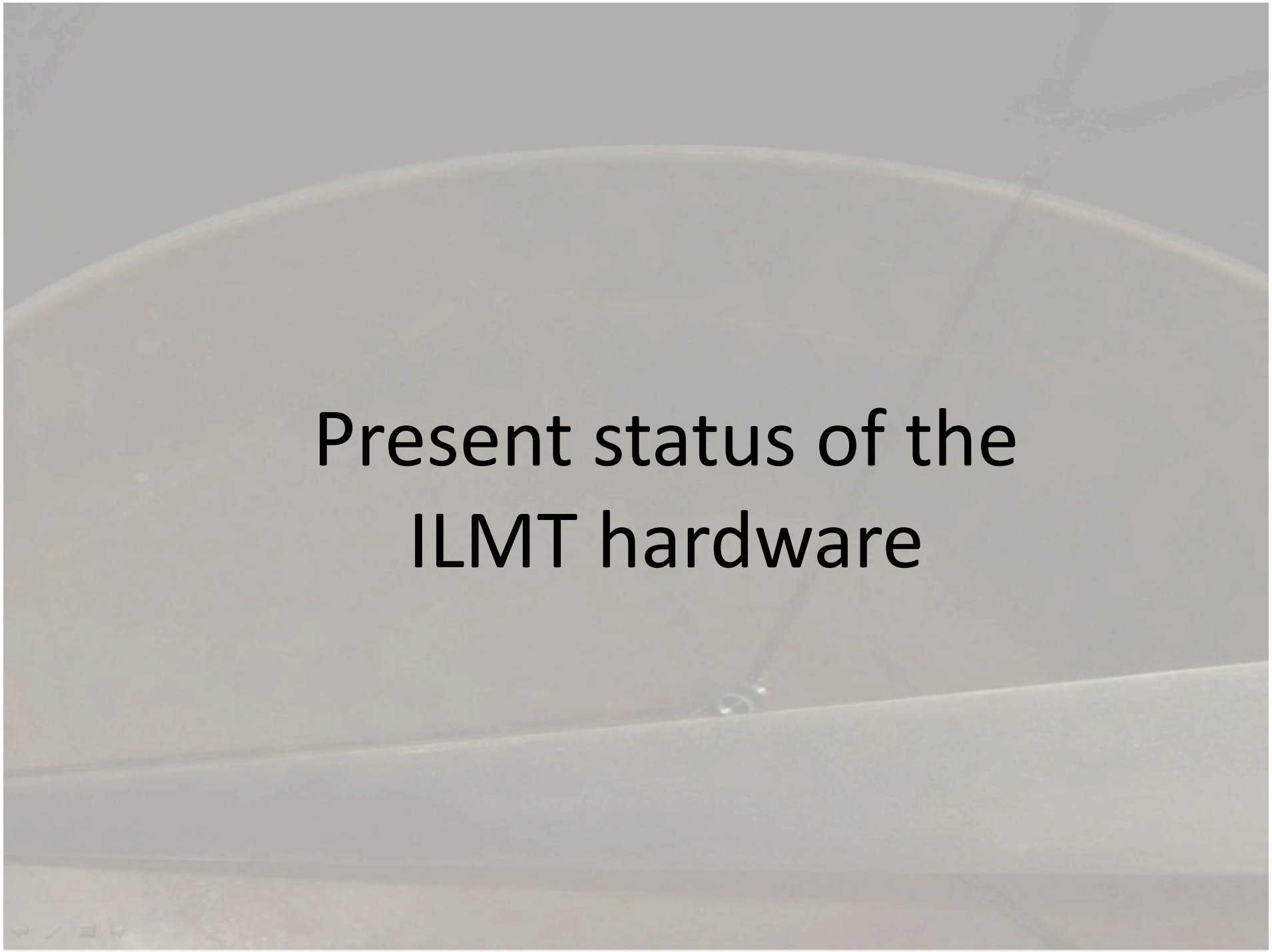
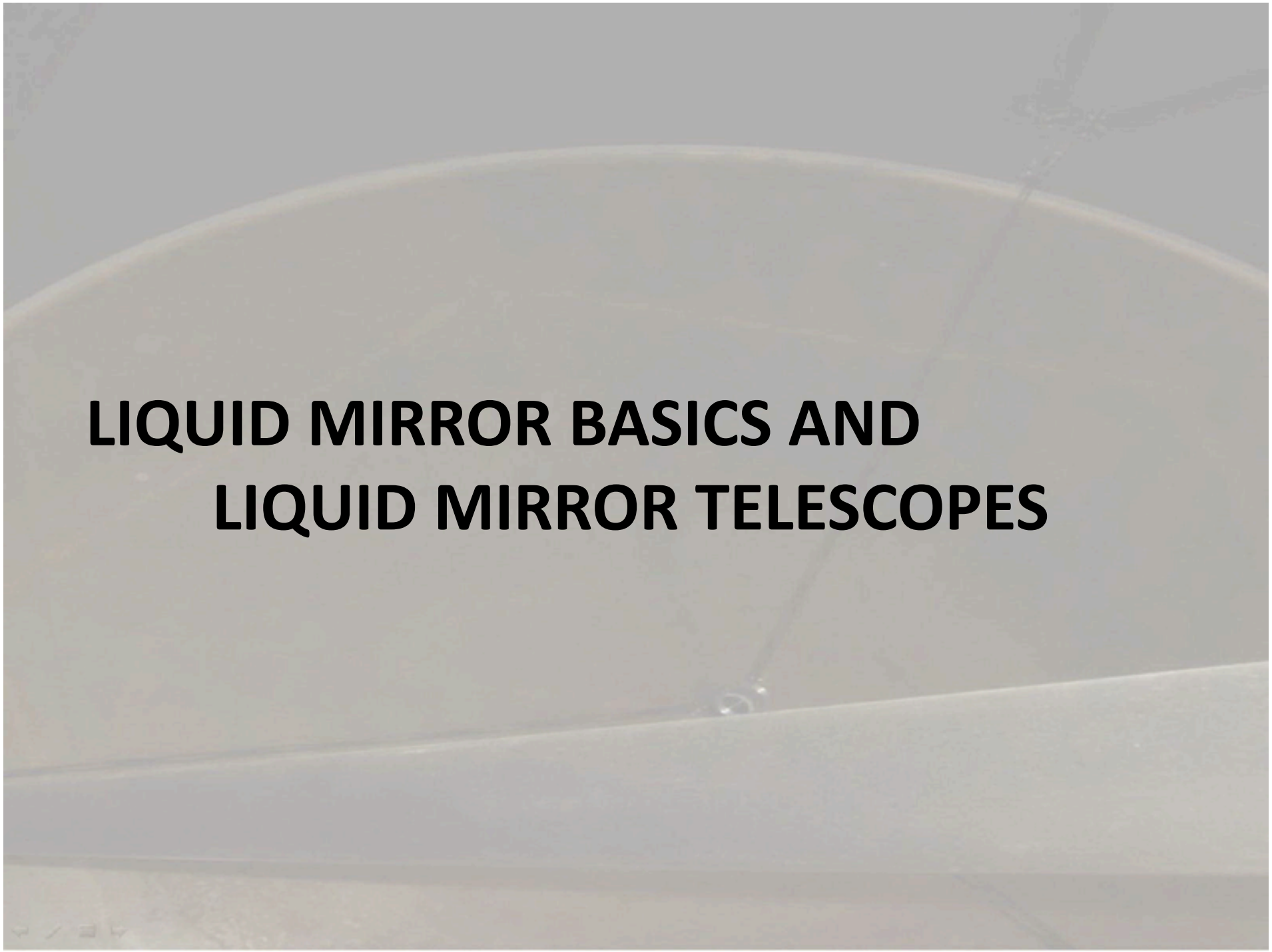

Present status of the
ILMT hardware

Groups involved and Financial supports

P.I.: Prof. J. Surdej (ULg)
Project managers: Prof. S. Habraken & Prof. J.-P. Swings (ULg)
Team members: A.Magette, J.Poëls, P.Bartzak, F. Finet
In collaboration with:
- AMOS & CSL
- Royal Observatory of Belgium
- Canadian Universities
- ARIES (Aryabhatta Research Institute of Observational Sciences)

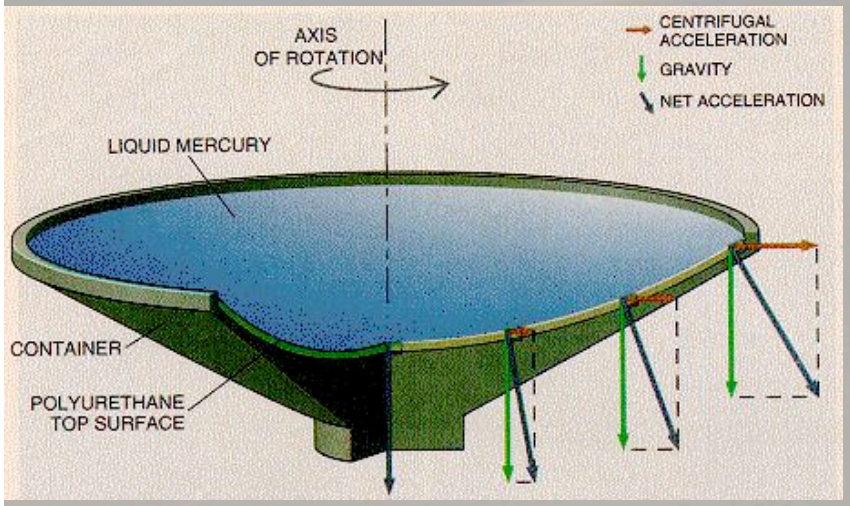
Financial support :

•Communauté française de Belgique
•ARC
•Région Wallonne
•FNRS – FRFC
•ULg



LIQUID MIRROR BASICS AND LIQUID MIRROR TELESCOPES

Liquid mirror basics

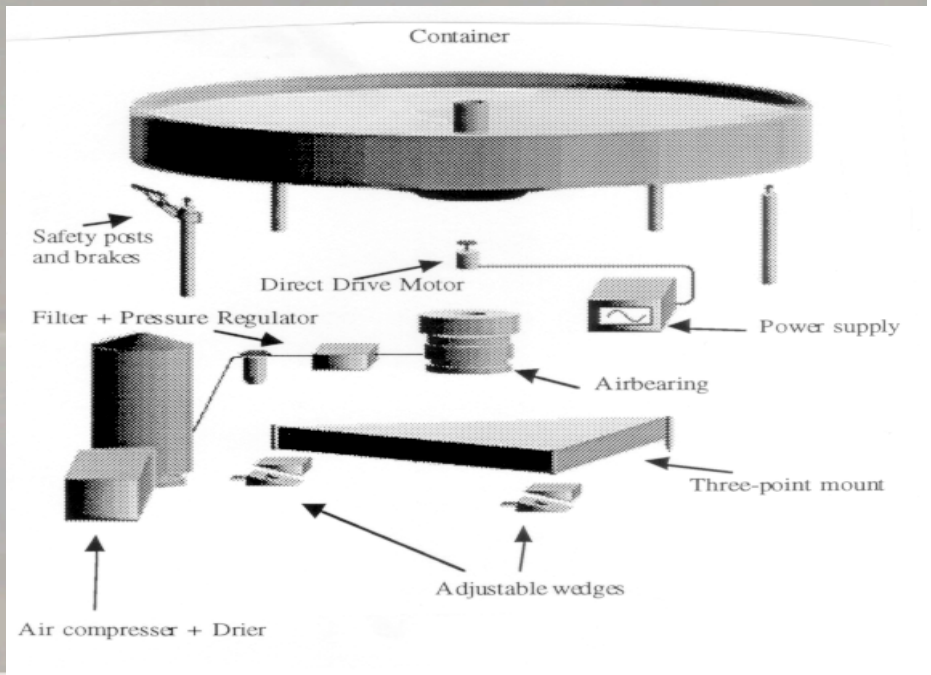


- Rotating container with liquid **Hg**
- Forces acting:
  - Gravity : constant
  - Centrifugal : proportional to $\omega^2 x$

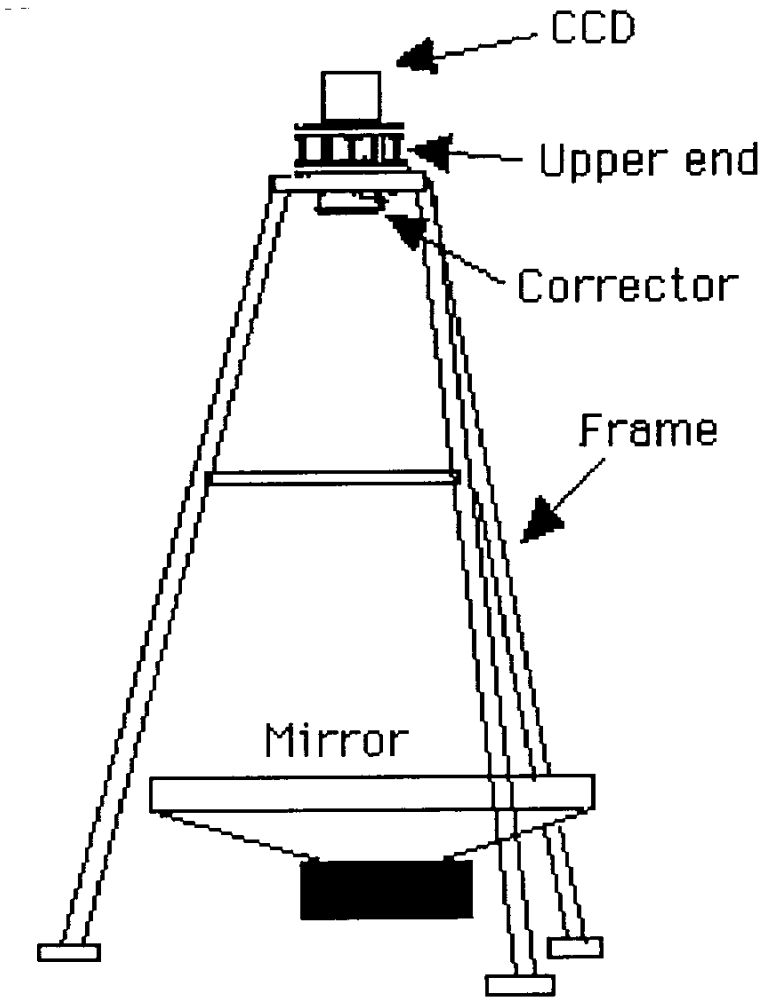
→ Parabolic surface

In practice:

- Drive motor
- Air bearing
- Feedback systems for
  - Preventing axial precession
  - Stability of rotation velocity



From Liquid Mirror to Telescope



Liquid Mirror Telescope:

- LM as primary mirror
- CCD camera at focal point

LMT particularities :

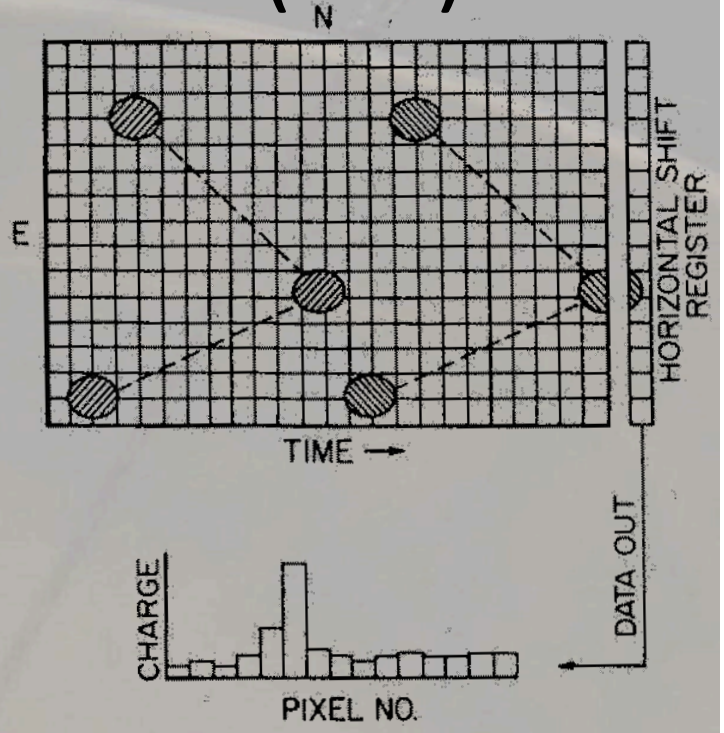
- zenithal pointing only
- Parabola shaped mirror =>
  - perfect optical system on axis
  - Corrector for off axis imaging
- Imaging same strip every night :

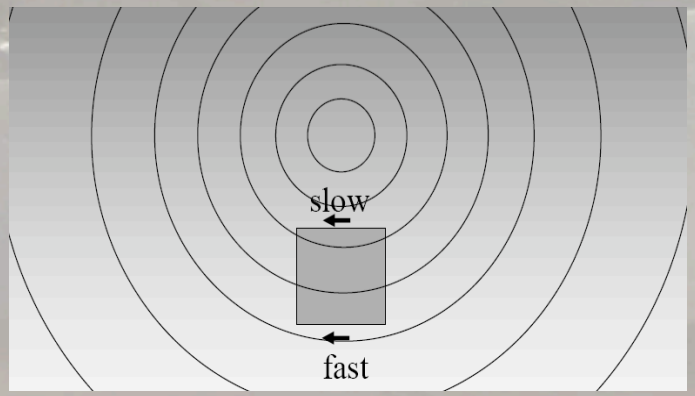
Co-addition of images!

- Necessity of a new imaging mode

Imaging :CCD Camera using Time delayed Integration (TDI)

- **Zenithal pointing** implies:
  - Objects in the FOV fixed by earth rotation
  - Stars are in constant motion
  - Barely the same sky strip every night
- **Star tracking**: charge displacement on the CCD
  - Direct imaging
  - Integration : fixed by FOV width (90 sec)
- **TDI Distortion** :
  - star trajectory curvature
  - variable transit velocity (N-S)





→ **Specific Corrector**

Advantages and drawbacks of LMT's

1) Advantages :

- very cheap technology (LMT costs 1/20 of equivalent classical telescope)
- dedicated to specific astrophysical projects
- Seeing and transparency are optimal at Zenith
- possibility of images co-addition

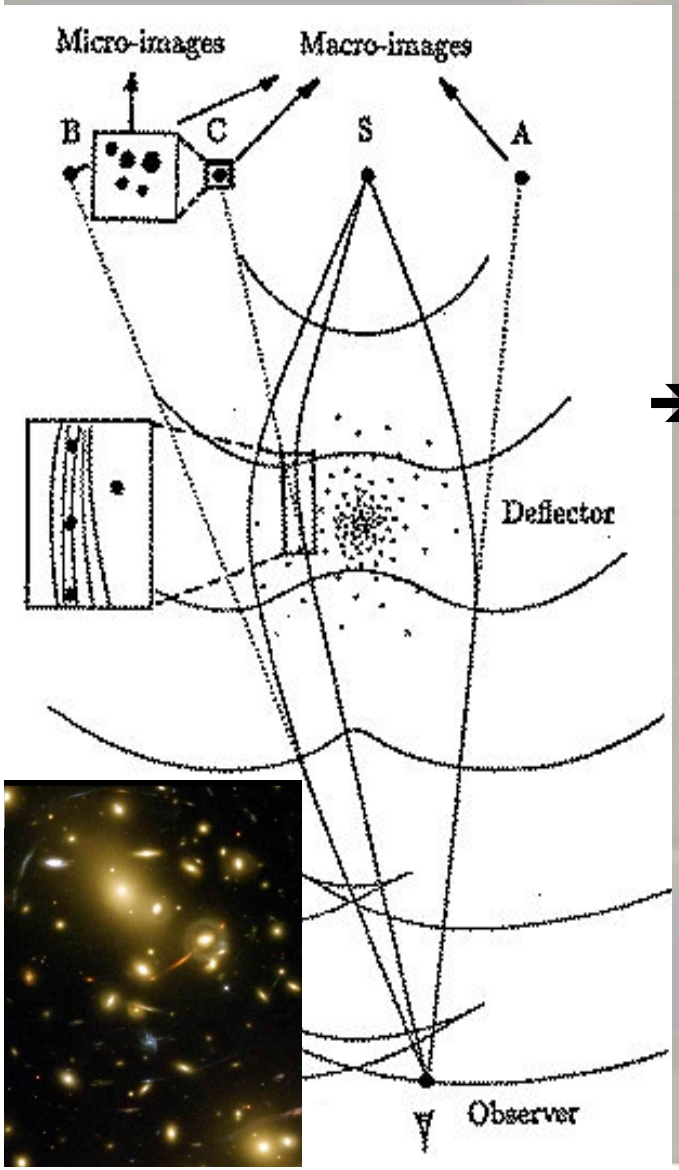
2) Drawbacks :

- Zenithal observation only
- short integration time (90 sec)
- huge amount of data to treat (~ 15 Gbytes of data / night).

Science drivers of the ILMT

- ILMT is a unique instrument allowing a very deep survey of a narrow sky band
  - Image co-addition: improves S/N ratio every night
  - Image subtraction: astrometric and photometric variability studies
- ILMT is a unique project entirely dedicated to variability survey
  - Supernovae : Canadian team
  - Gravitational lenses : Liège team

Science drivers of the ILMT



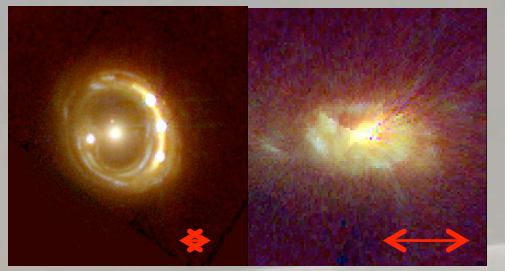
Mirages gravitationnels

Les rayons lumineux se déplacent suivant les géodésiques de l'espace courbé par le champ de gravitation.

→ Déformation du front d'onde → Mirage

I. Effet microlentille

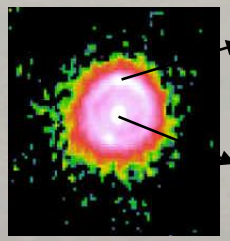
Loupe → structure du quasar



II. Délais temporels

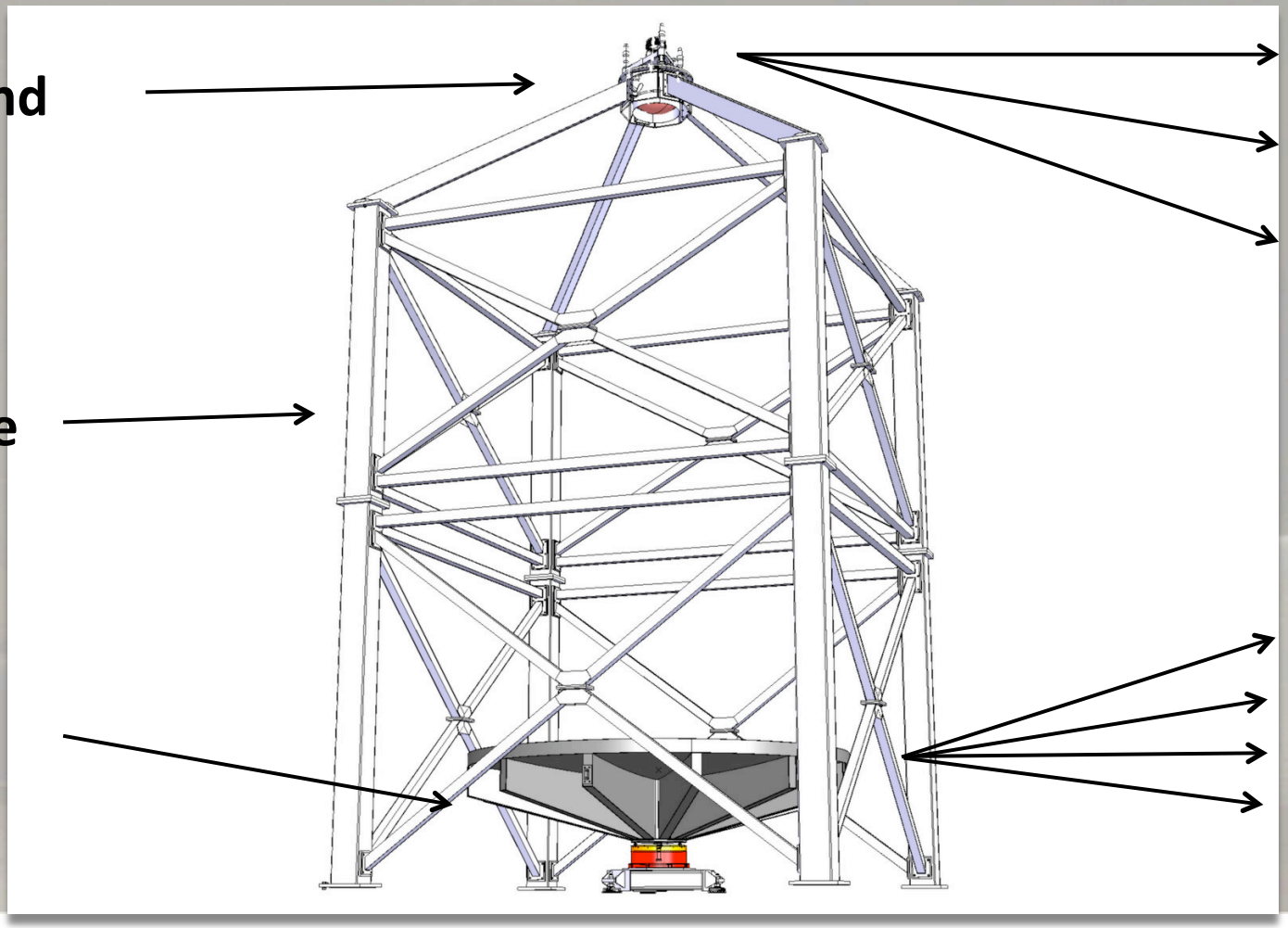
Objet variable → Δt

- Distribution de masse
- H_0



ILMT HARDWARE PRESENT STATUS

Hardware components of the ILMT



Primary mirror status

- Air bearing (Amos):
  - Structure finished
  - Status: testing phase
  - Recently done:
    - Pressure tests in load conditions
    - Tilt resistance tests

Air-bearing and motor

- Rotation system (Amos):
  - Structure :finished
  - status : testing phase
  - Recently done:
    - Tests on the Stability of the rotation velocity (unloaded)

Primary mirror status

- Container (Amos):
  - Structure finished
  - Recently done :
    - Modification of the Air bearing interface
    - Security Ring avoiding dish tilt excess
  - Spin casting in preparation

Container

Corrector and Camera Status

- TDI and aberration Corrector (AMOS):
  - Design: finished
  - Mechanical structure holding the lenses: finished
  - Lenses : in construction
- CCD Camera (CSL):
  - On going discussions with CSL for a 4Kx4K CCD camera
  - CCD 2Kx2K (from the 2mLMT (CSL)) available for tests

Structure and Dome Status

- Structure holding the corrector (AMOS):
  - Finished
- Dome (Indians):
  - ARIES has found a contractor
  - ARIES-Amos collaboration for plans
  - Site chosen: Devhastal (India)

What is still to be done

- Primary mirror : spin casting of the container
- Corrector:
  - Lenses polishing
  - Assembling
- CCD Camera: design and construction
- Dome : design and construction

End

Thank you for your attention

Science with the ILMT

Workshop de Marseille 1997 : “Science with LMTs”,

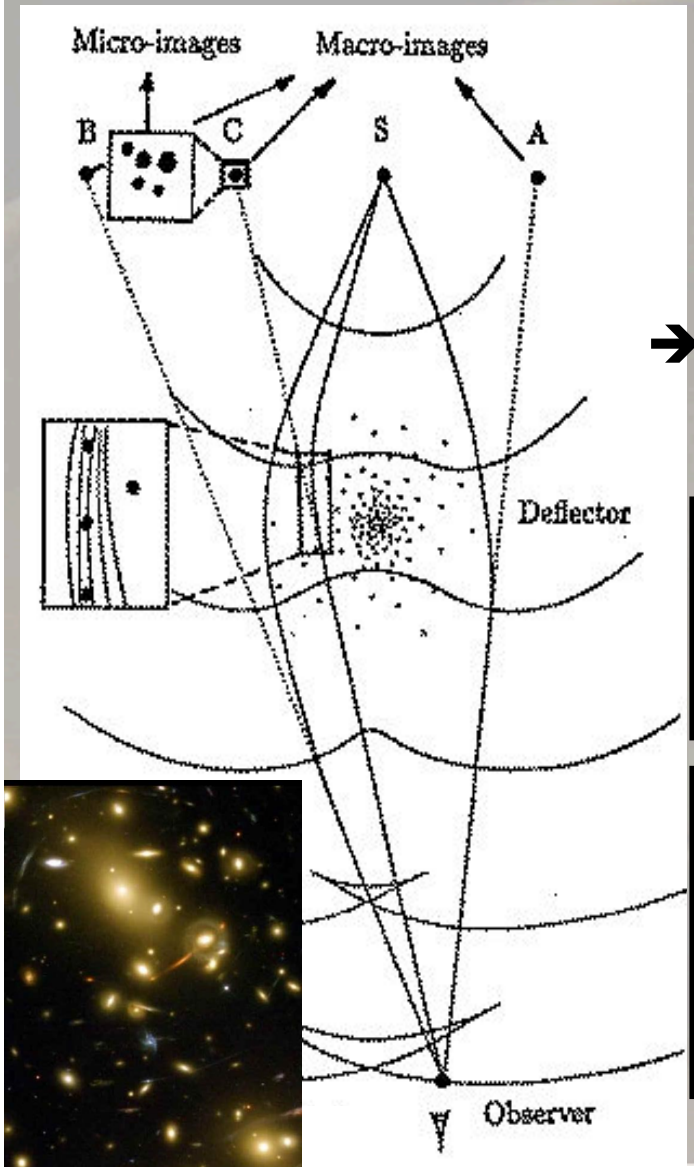
Le télescope à miroir liquide est un instrument unique qui permet d’effectuer un survey profond d’un bande de ciel.

→ Etude de variabilité (photométrique / astrométrique)

→ Une importante variété d’objet peu être étudiée.

1) **Recherche et suivi de supernovae (cosmologie)**
2) **Etude de mirages gravitationnels (cosmologie, lentille,…)**
3) Recherche de quasars,
4) Etude d’objets variables, (RR Lyrae, AGN,…)
5) Détection de naines blanches, brunes,… (parallaxe)
6) Recherche de cibles pour les grands télescope (VLT, …)
7) …

The ILMT and Science...



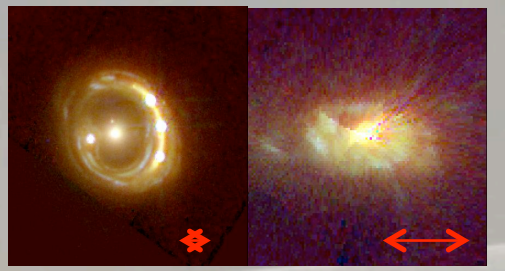
Mirages gravitationnels

Les rayons lumineux se déplacent suivant les géodésiques de l'espace courbé par le champ de gravitation.

→ Déformation du front d'onde → Mirage

I. Effet microlentille

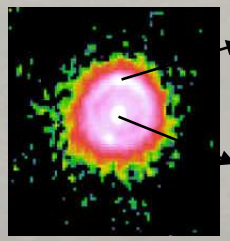
Loupe → structure du quasar



II. Délais temporels

Objet variable → Δt

- Distribution de masse
- H_0



Anneau d'Einstein

Noyau de la galaxie déflectrice

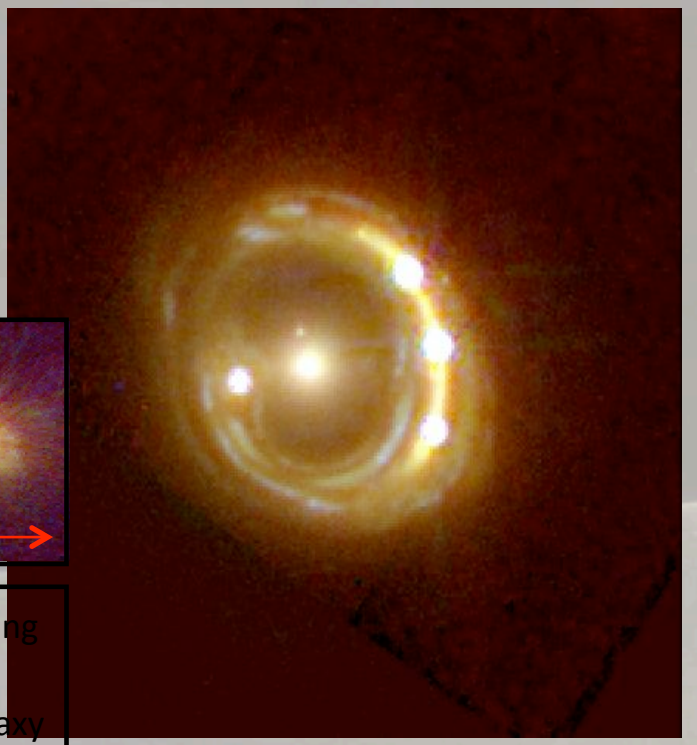
Science drivers

The Liquid Mirror Telescope is a unique instrument, allowing a deep survey of a strip of sky.

→ Various objects can be studied

- **Unique survey projects**

→ Supernovae : Canadian team
→ Gravitational lenses : Liège team



I. Micro lensing effect
→ Structure of the quasar

II. Time delays
→ Lens mass distribution