

# MONALISA at ATF2

David Urner

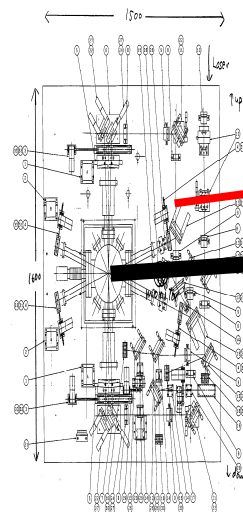
Paul Coe

Matthew Warden

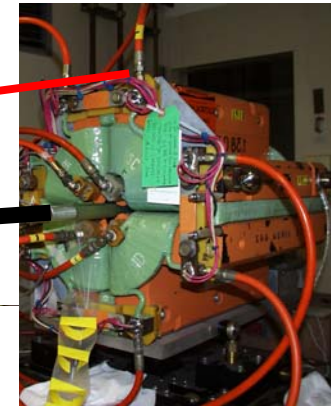
Armin Reichold

Oxford University

# Goal of MONALISA Installation at ATF2



**CSM(Compact Straightness Monitor)  
using interferometers**

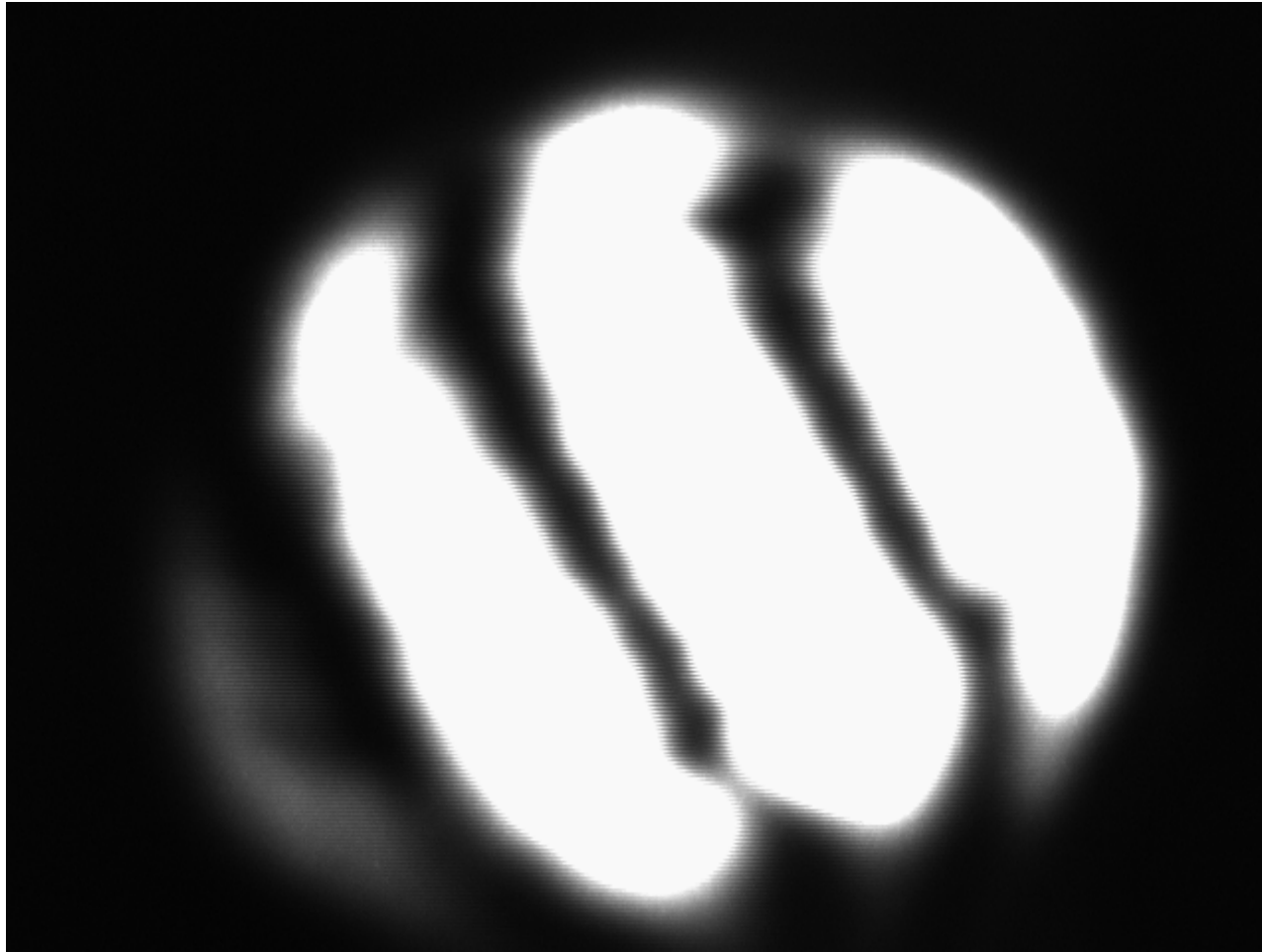


- Monitor the relative motion between final focus quadrupole and the Shintake Monitor.
  - This avoids a false increase of the measured beam spot caused by motion of the Shintake monitor.

# Interferometers

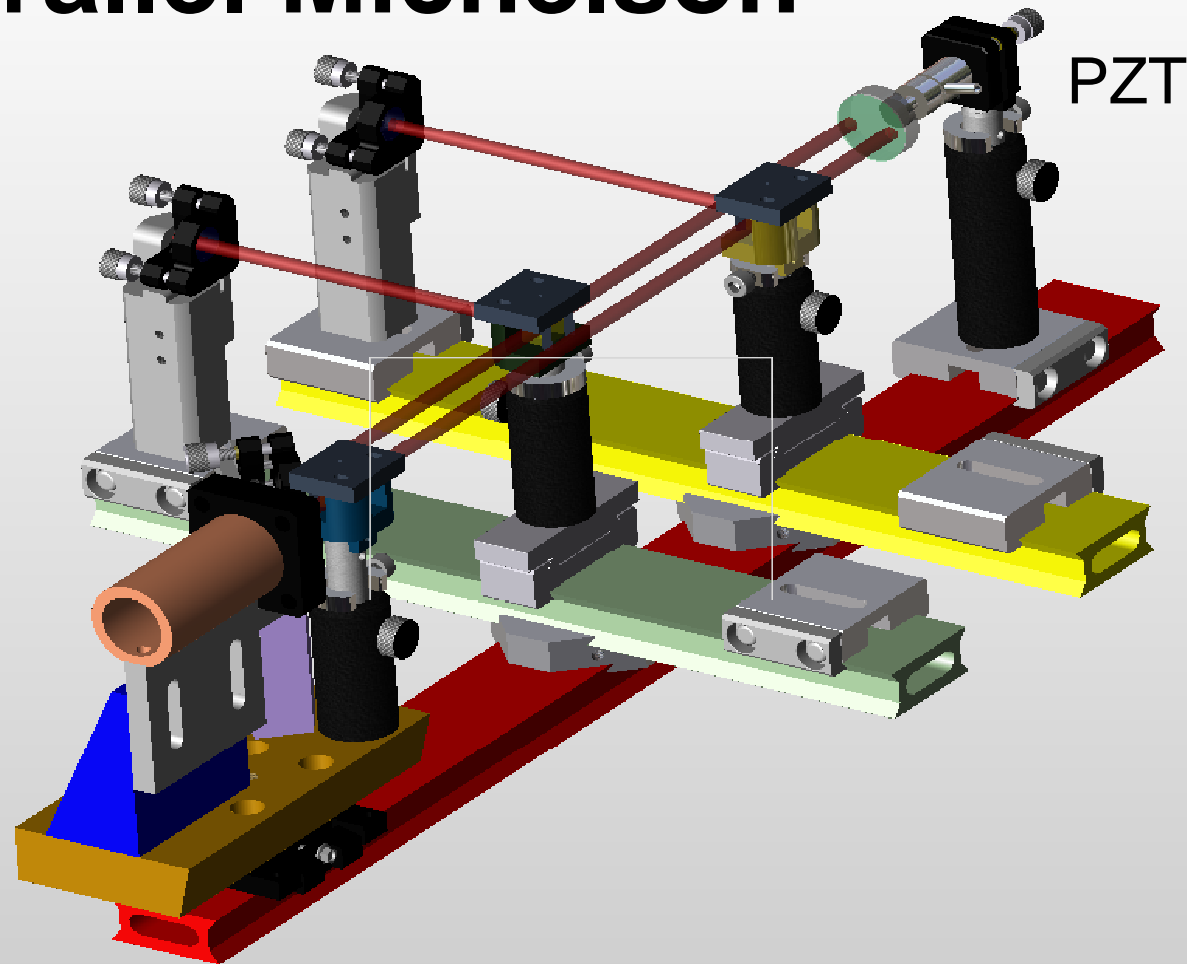
- Need 2 tools, both with nm type resolutions over order 10m.
  - Straightness Monitor measuring motion perpendicular to line of sight. Main tool to measure the relative motion of objects (magnets)
  - Distance metre:
    - Easier to build
    - Required to solve fundamental questions regarding laser quality.
    - Can also provide perpendicular measurements if several measurements are combined to do triangulation. Hence we also need order  $1\mu\text{m}$  absolute distance measurements to understand the geometry.
- Setup at Oxford up and running
  - Parallel Michelson to understand laser beam
    - Also currently used as Reference
  - Analysis and readout software in place
  - Distance metre head prototype shows promising results.

Tuning laser results  
in sweeping motion as well



ESI (Frequency Scanning

## Parallel Michelson

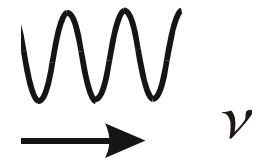
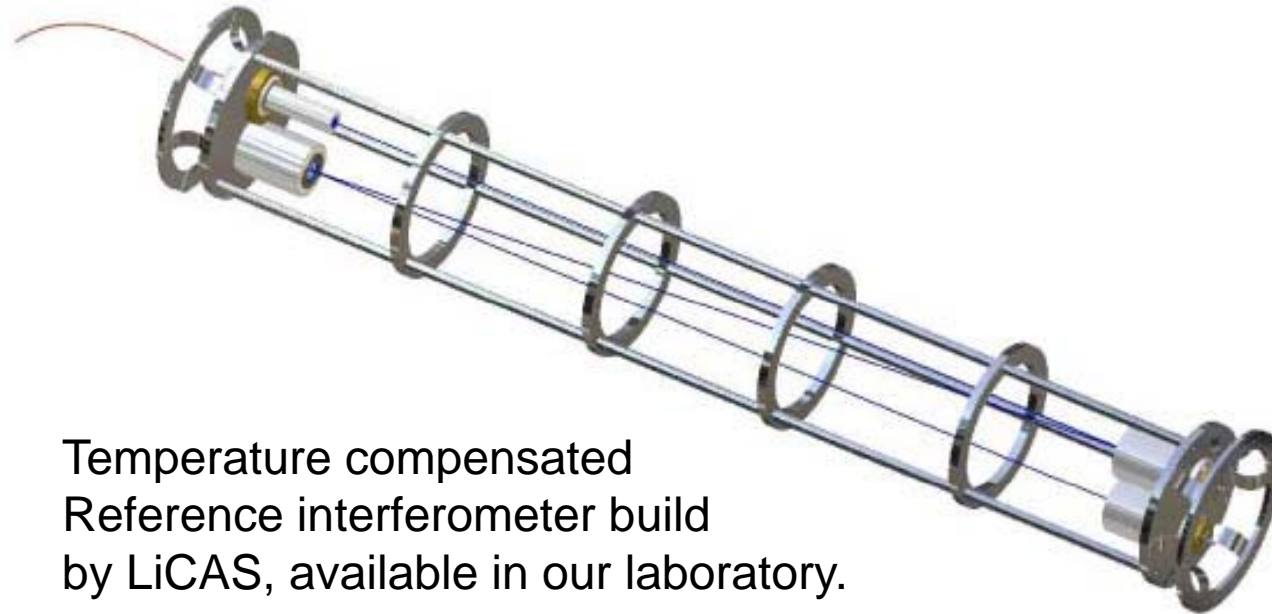


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# FSI (Frequency Scanning Interferometry)

TU  
LA  
v



ENCE  
OMETER

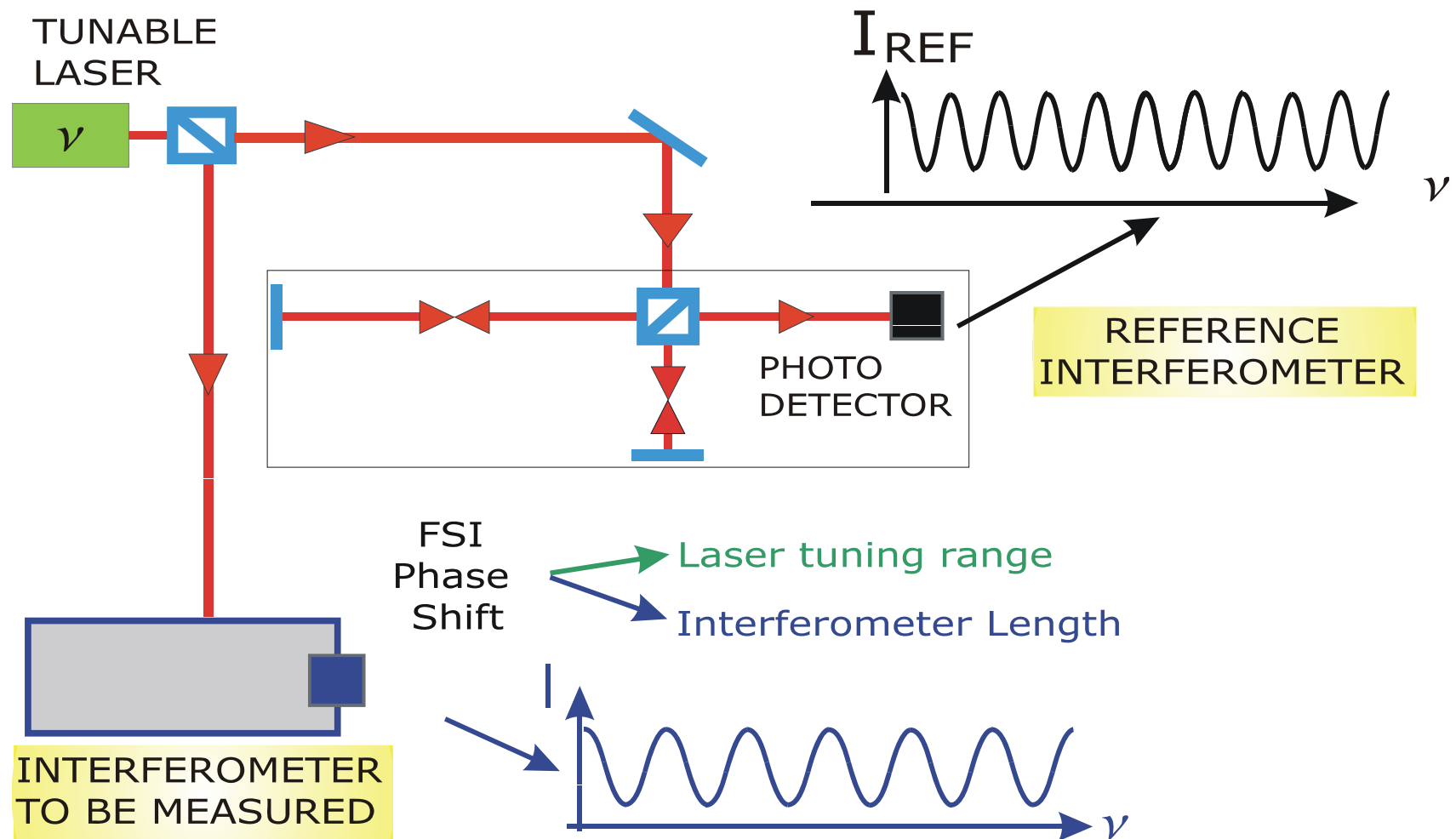
Temperature compensated  
Reference interferometer build  
by LiCAS, available in our laboratory.



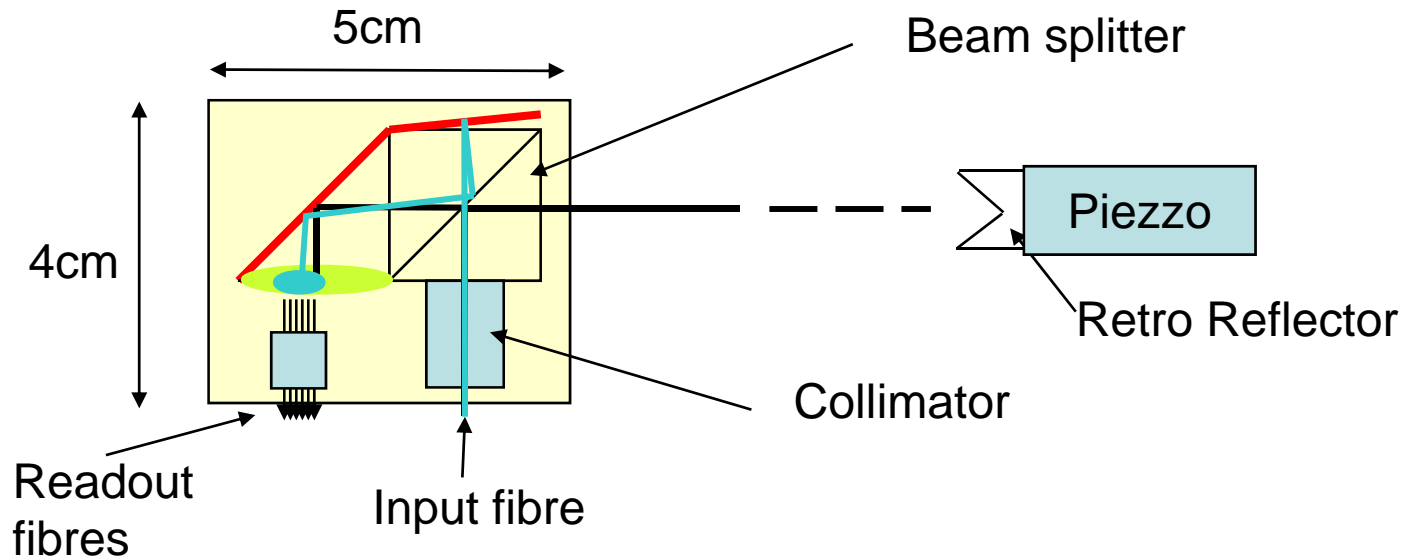
INT  
TO



# FSI (Frequency Scanning Interferometry)



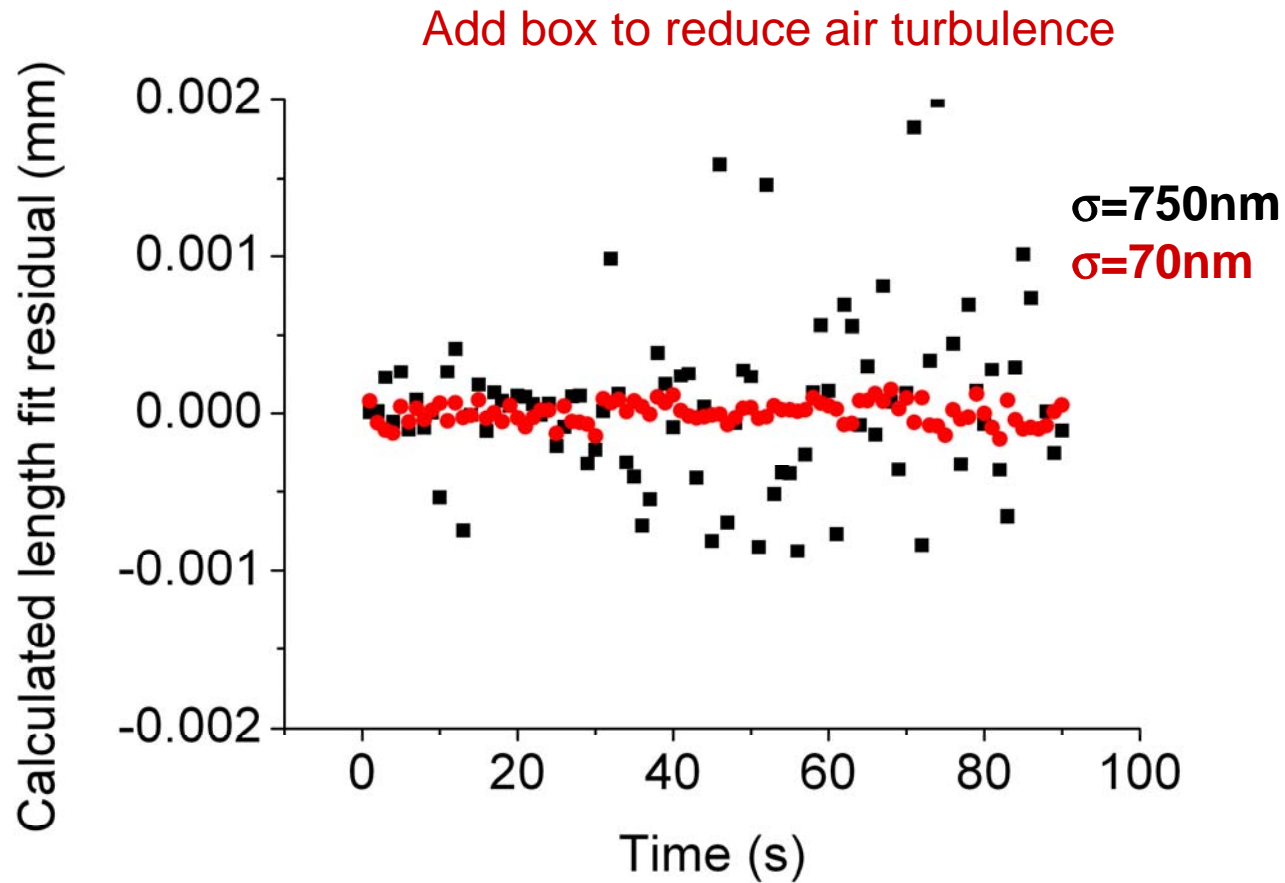
# Compact Interferometer head



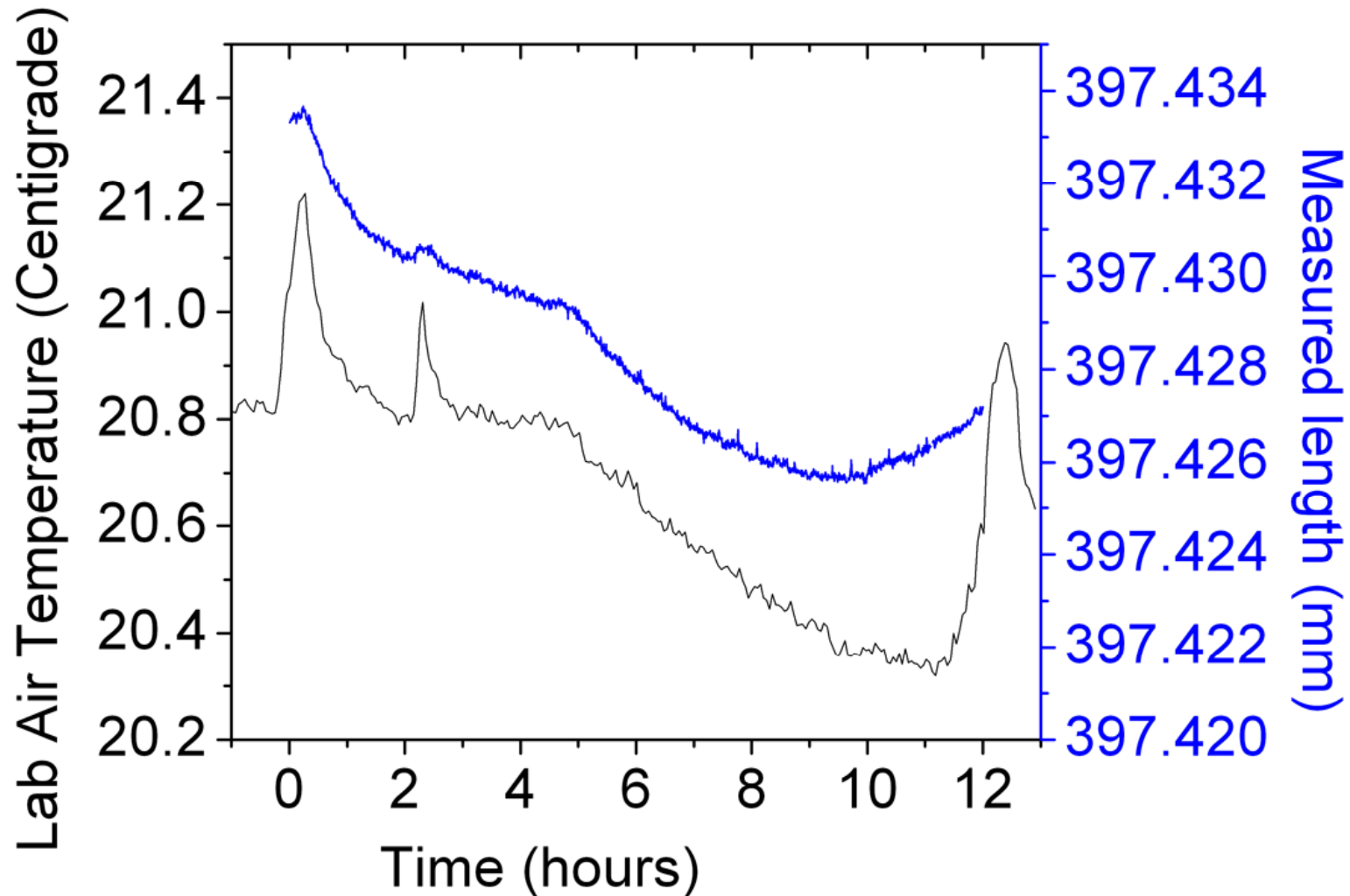
- Shown here using 2cm optics
- 1cm optics likely to work. According to Zemax simulation diffraction should not be a problem. (tests underway)
- Use thin film production facility at Oxford to generate 0.2 degree angle for mirror on beam splitter cube.



# Prototype Interferometre: 400mm OPD: FSI – Mode

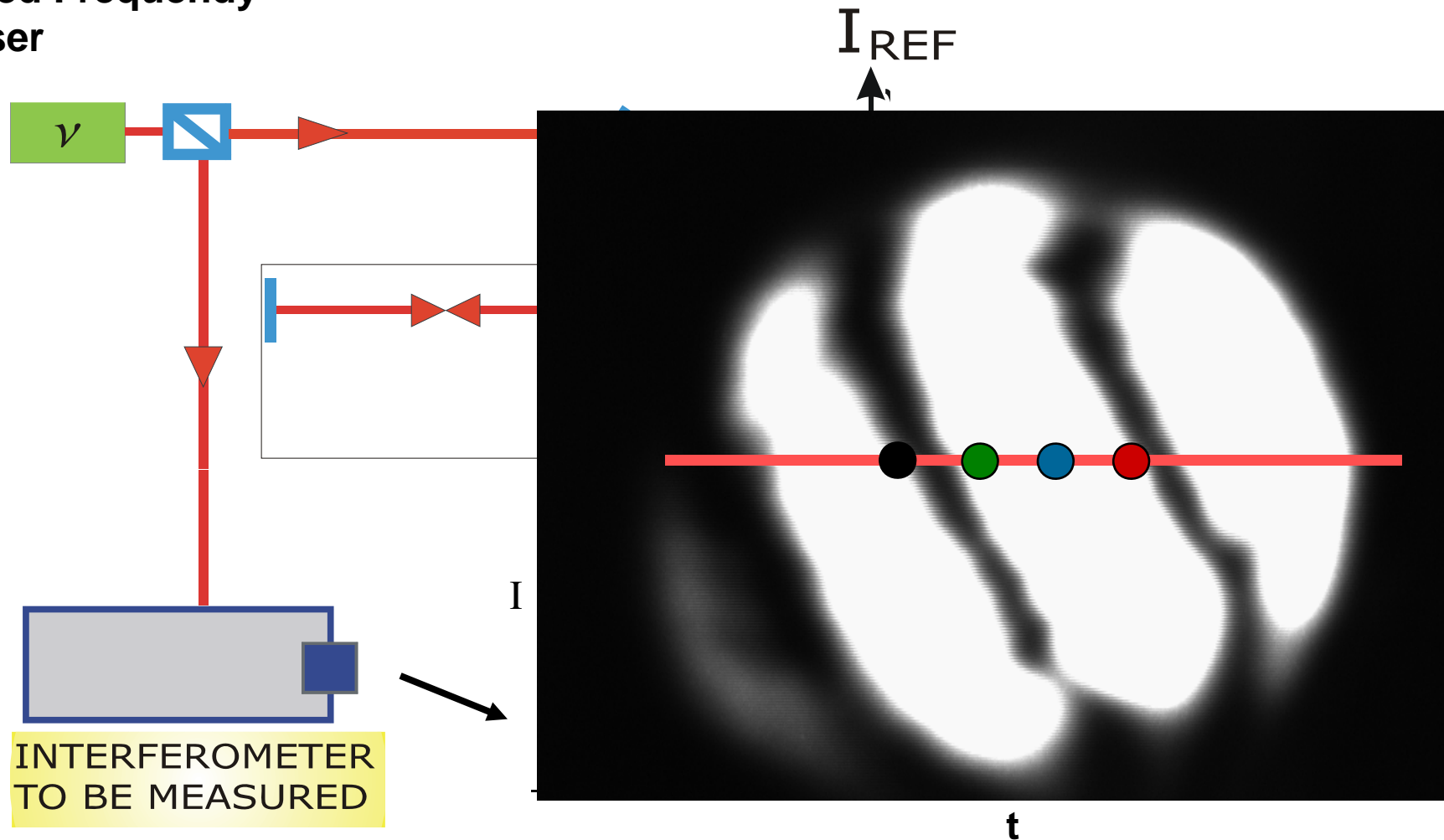


# Temperature/Expansion Correlation

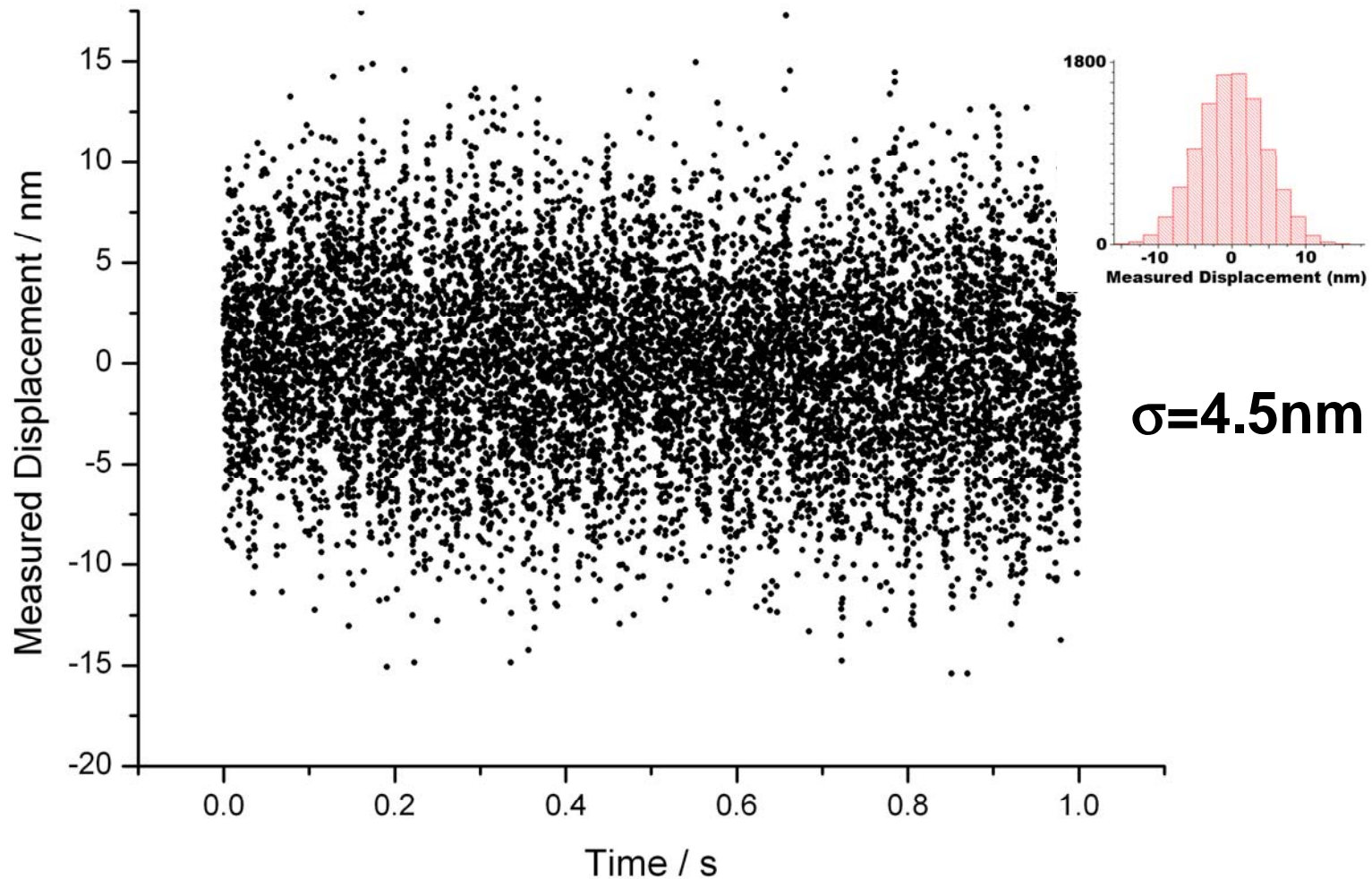


# Fixed Frequency Interferometer

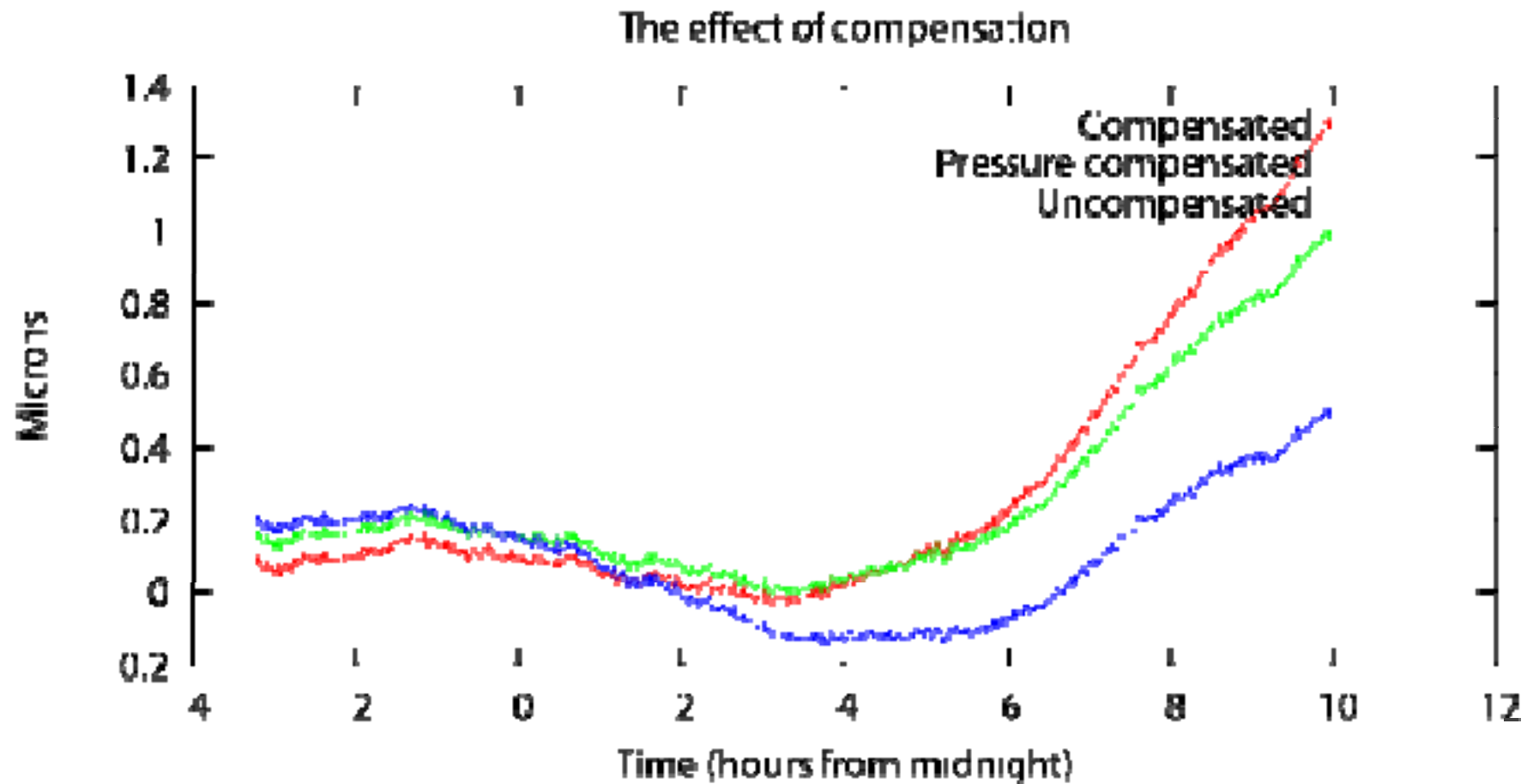
Fixed Frequency  
Laser



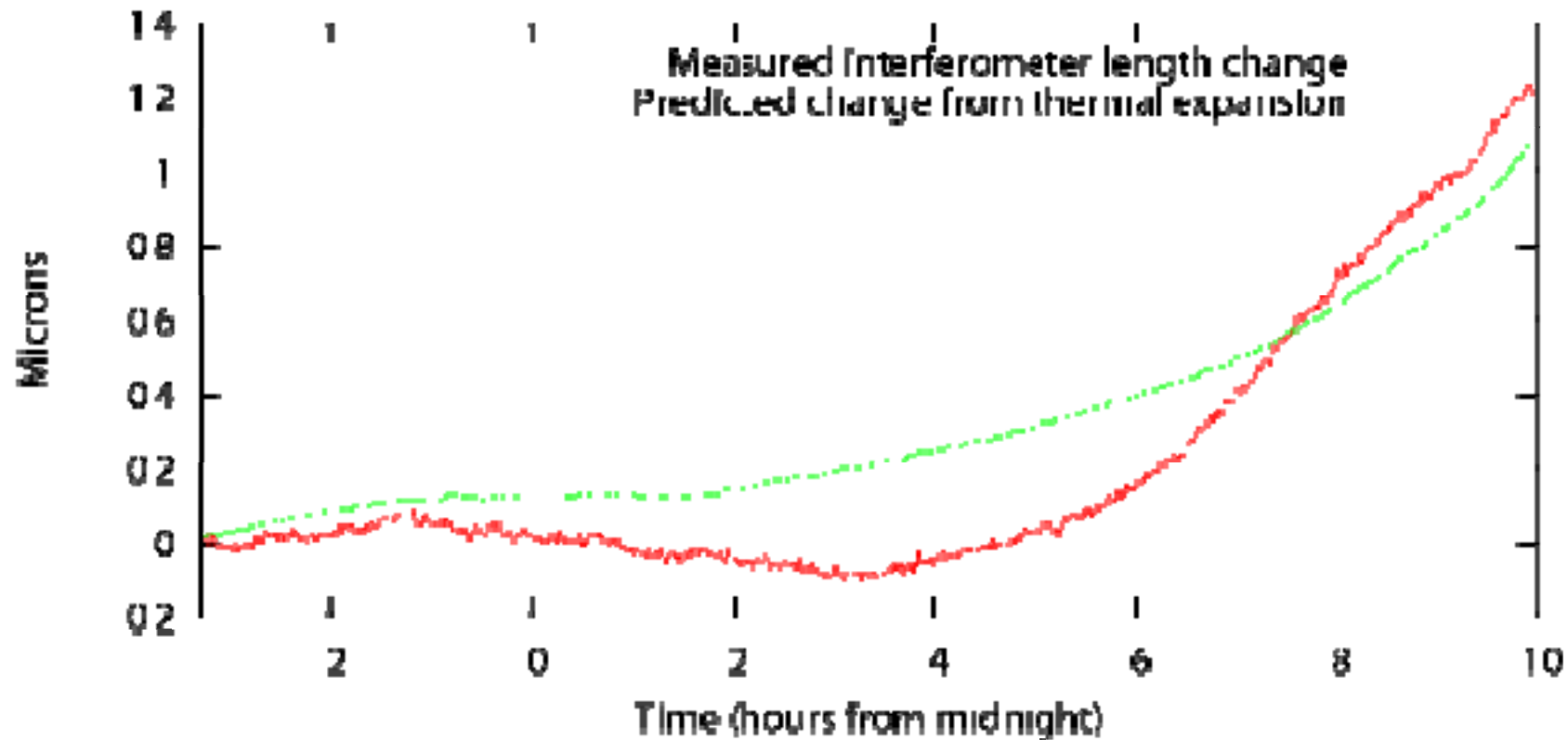
# Prototype Interferometre: 400mm OPD: Fixed Freq. Mode



# Long Term Performance and Pressure/Temperature Dependence

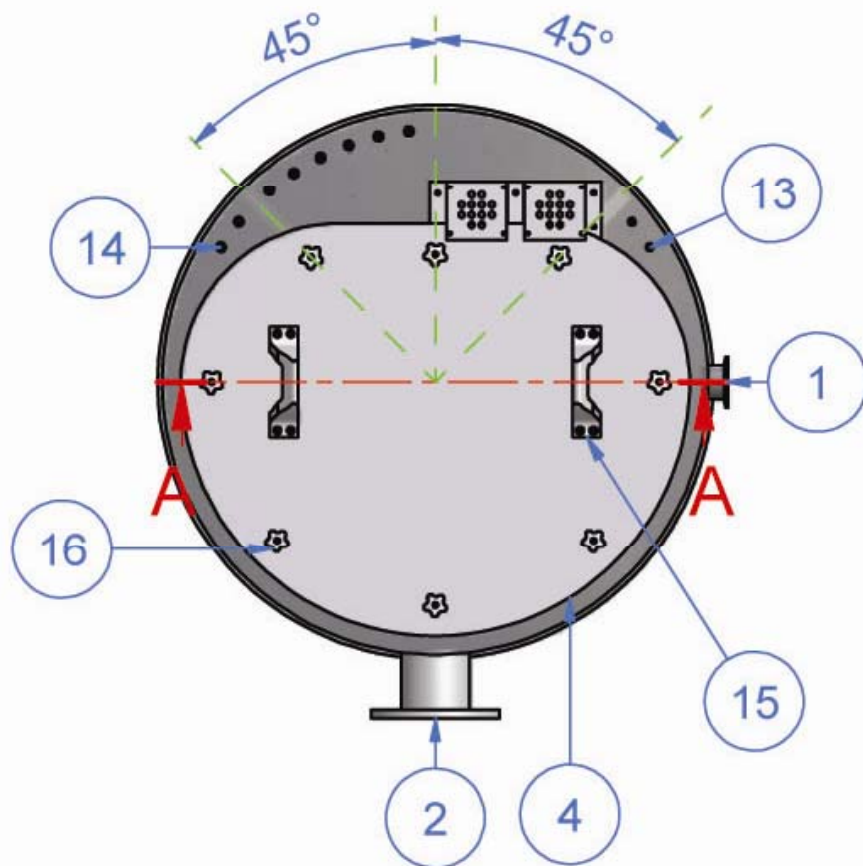


# Long Term Performance and Pressure/Temperature Dependence

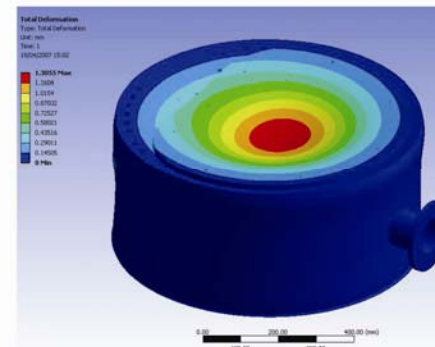


- Remaining difference compatible with laser fluctuations

# Vacuum Test system

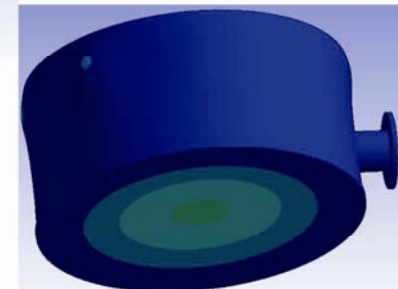


FEA results:



Deformation plots

Under 0.1 MPa external pressure load. The max. deformation is ~1.3mm (on the Al cover plate). The deformation on the base plate is ~0.5mm.

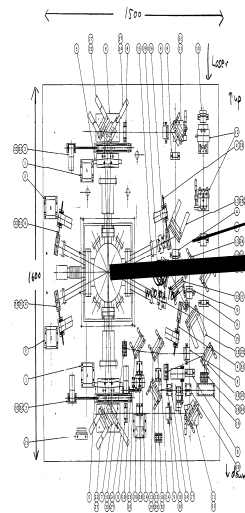


18-April-2007  
S Yang

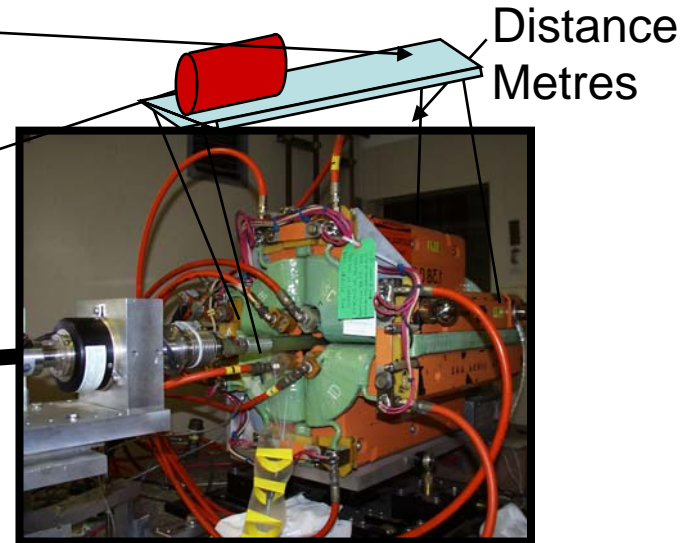
MoNALISA: vacuum drum

# Setup at ATF2

**Mount on top of quadrupole**  
**Need to add nest for survey?**



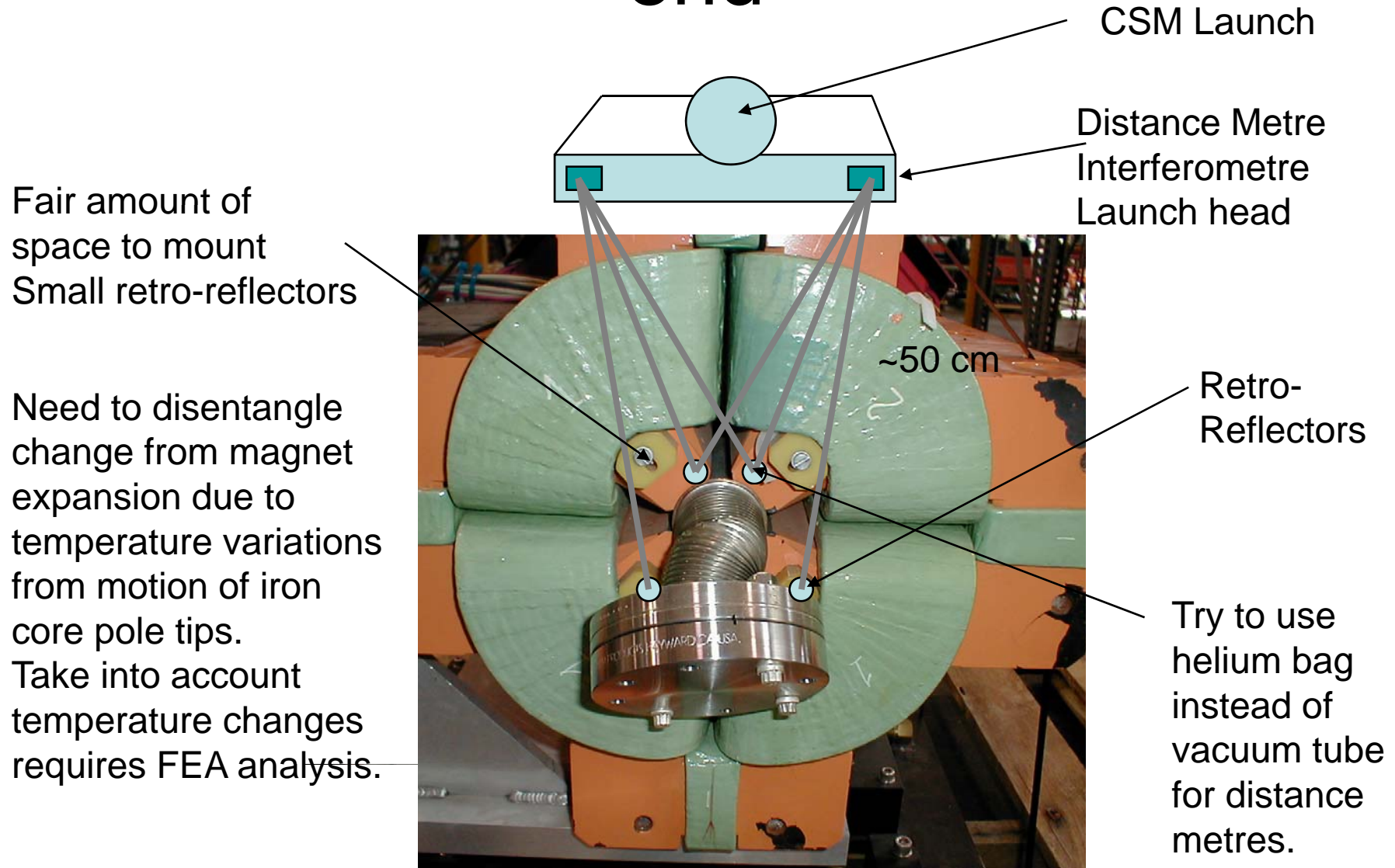
CSM



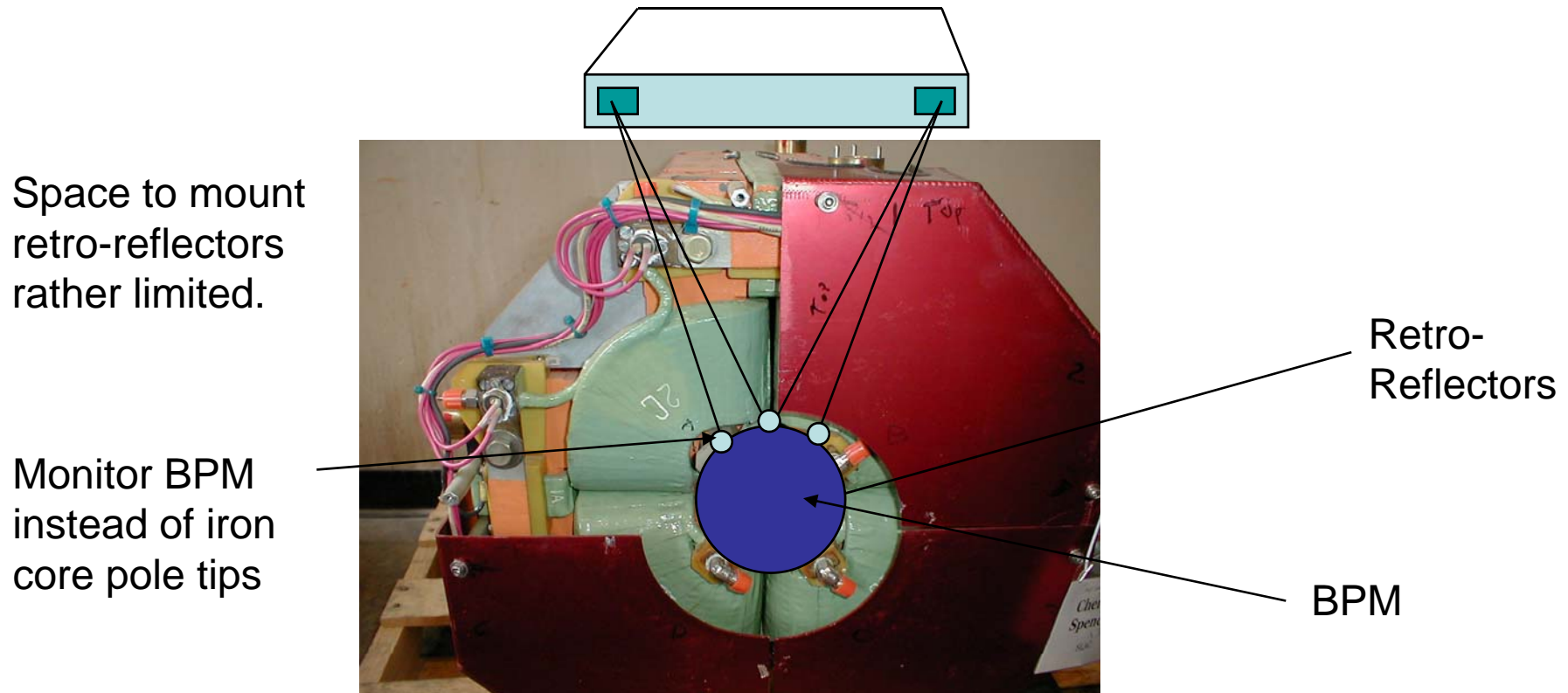
- Project out from Quadrupole to a platform
- Use CSM (Compact straightness monitor) to correlate platform with Shintake Monitor



# The problem at the Quadrupole end



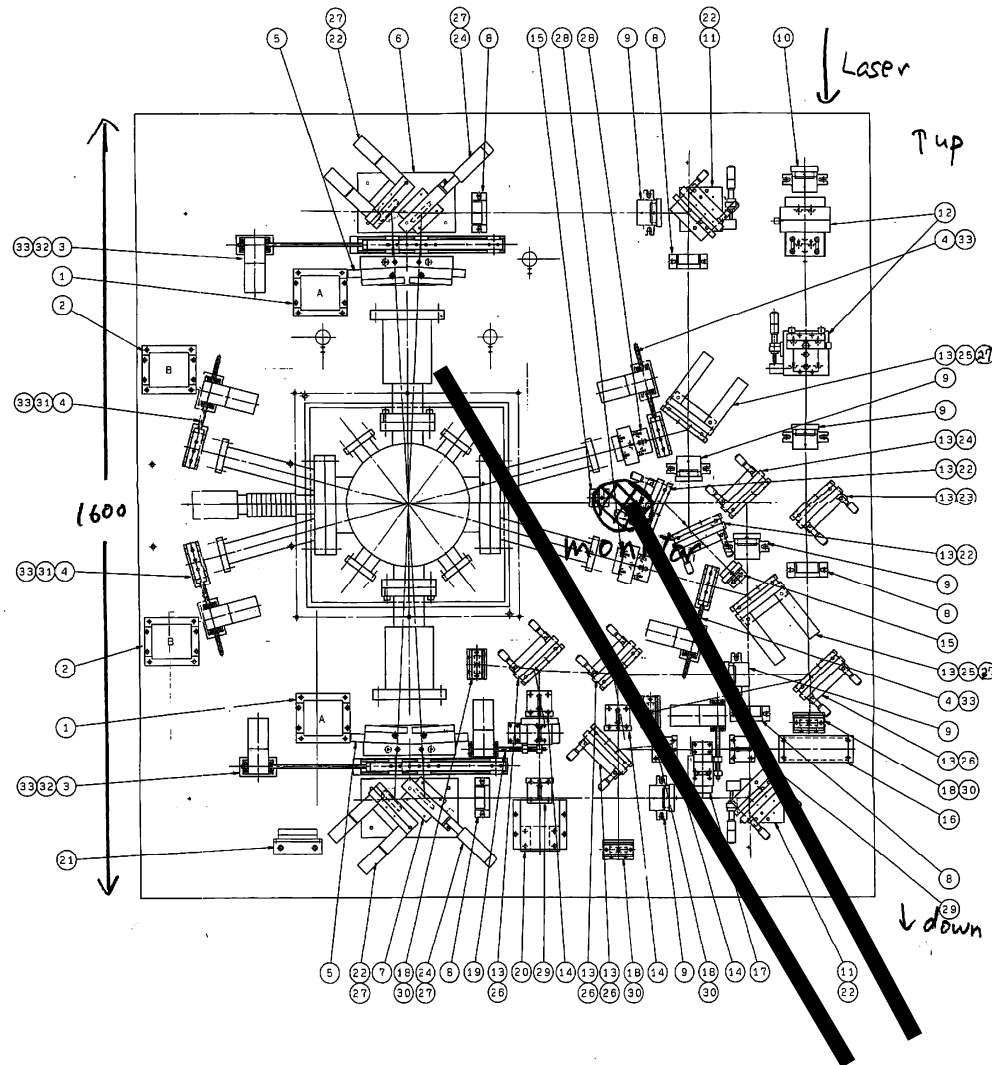
# The problem at the Quadrupole end on the other side



- Can BPM be mounted on terminal side of quadrupole?

# The problem at the Shintake

## Monitor end



- Monitor
  - Shintake monitor plate close to CCD camera at secondary interference spot
  - IP BPM down stream of Shintake monitor

# Integration

- Motion of Shintake monitor can be take into account with analysis of Shintake data. (No active stabilization required)
- Cross check with inertial sensors for overlapping (sub second) frequency range.

# Conclusion

- Nice progress on distance meter results
- Still quite a few questions on how to attach the MONALISA system. It is important to monitor the relevant motions!
- Offline meeting Fr at 5PM to discuss these issues and make a sketch of IP region.