FLAME Activities

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- γ-resist (gas target)
- LILIA (solid target)
- DESY collaboration (gas target)
- Thomson Beamline

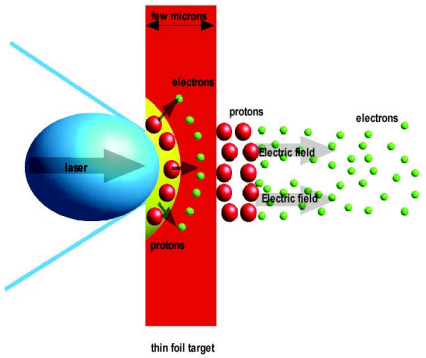
Ongoing & Future Experiments

- Synchronization
- AO installation

In progress Activities

LILIA: Solid target

Collaboration:Milano, Milano Bicocca, Bologna, Pisa, Lecce, LNS, LNF.



Goal: Production of a proton beam suitable for injection into (conventional) accelerating structures

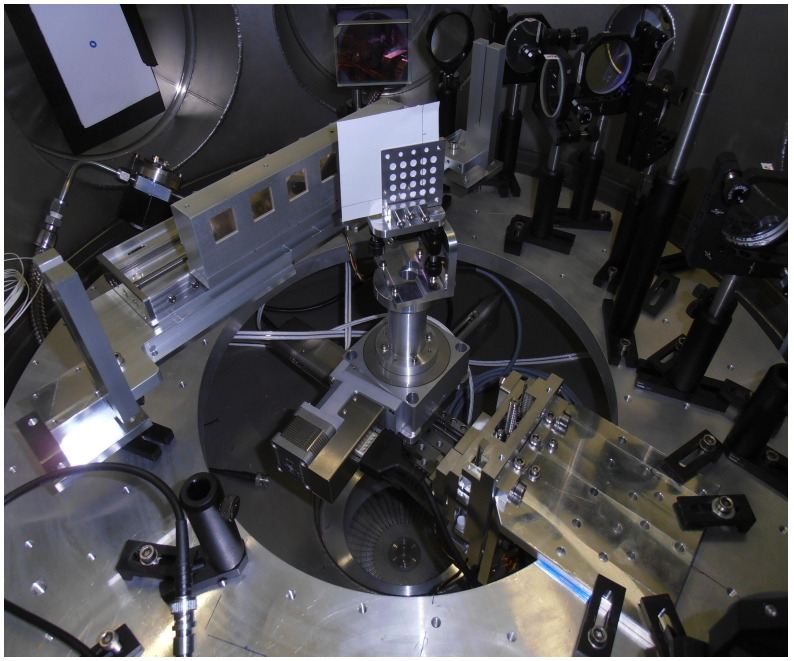
TNSA in the regime 1E18 < I <1E20 W/cm^2

-Metallic target of 1-10 microns

-GAFchromic and CR39 films have been used
Solid state detectors (PIN) in order to investigate
Noise baseline.

-Last run: Thomson parabola (ELIMED LNS)

-Detected protons < 4 MeV

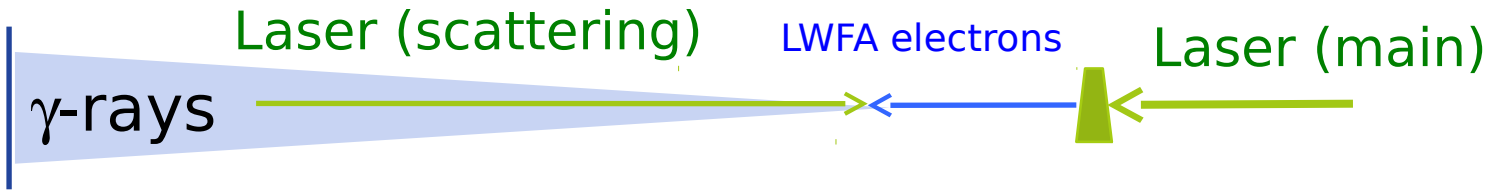


Possible higher intensity
For the next run

OAP F=1 mt → OAP F= 0.5 mt

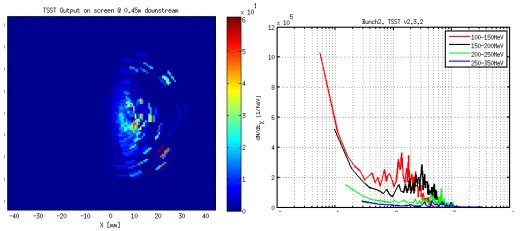
γ-RESIST

Inverse Compton scattering of of self-injected, LWFA sub-GeV electrons1,2



γ–photons

Expected: 2E8 photons/shot



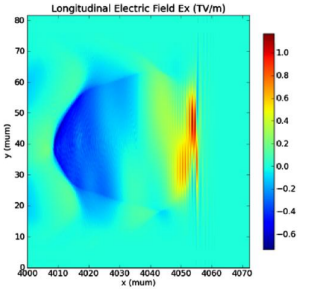
Montecarlo TSST: expected angular and spectral distribution

Photons at screen: image and spectrum

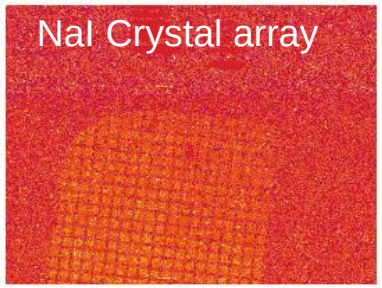
SIMULATIONS

e- bunch

PIC (Jasmine) self-injection on a 4 mm gas–jet

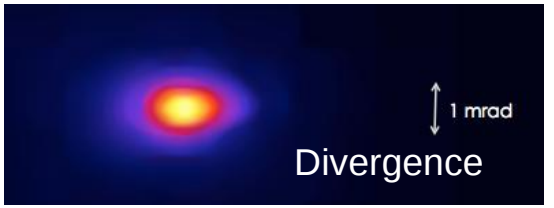


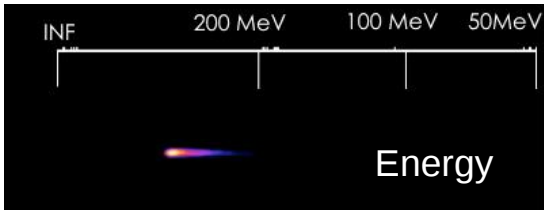
EXPERIMENT



First measured (July 2013) γ–ray signal: low S/N ratio. **Higher shielding, collision stability and laser beam energy needed**

Measured bunch fully established July 2013 run: monoenergetic+ **low emittance**





1L.A. Gizzi et al., NIM B 309, 202-209 (2013);2T. Levato et al., NIMA A720, 95-99 (2013) 3P. Tomassini et al., Appl. Phys. B **80**, 419-436 (2005)

DESY Proposal

DESY, INO-CNR, Strathclyde University, LNF

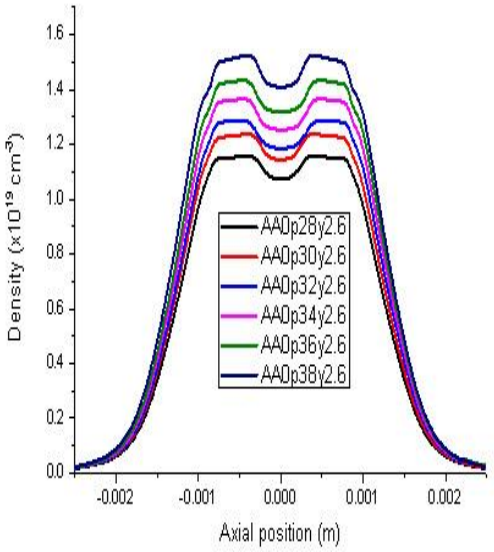
Density Profile Modulation:

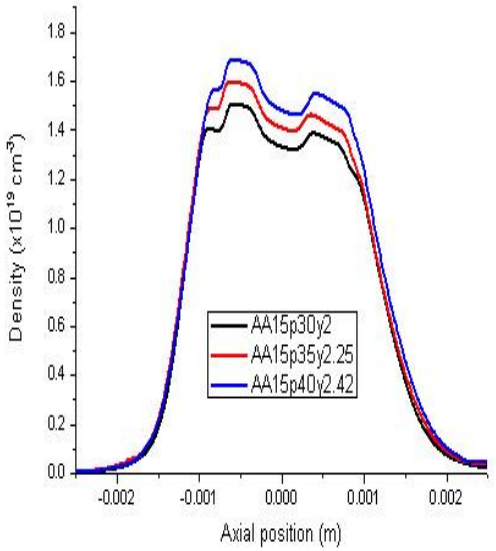
Goal → Dephasing Length

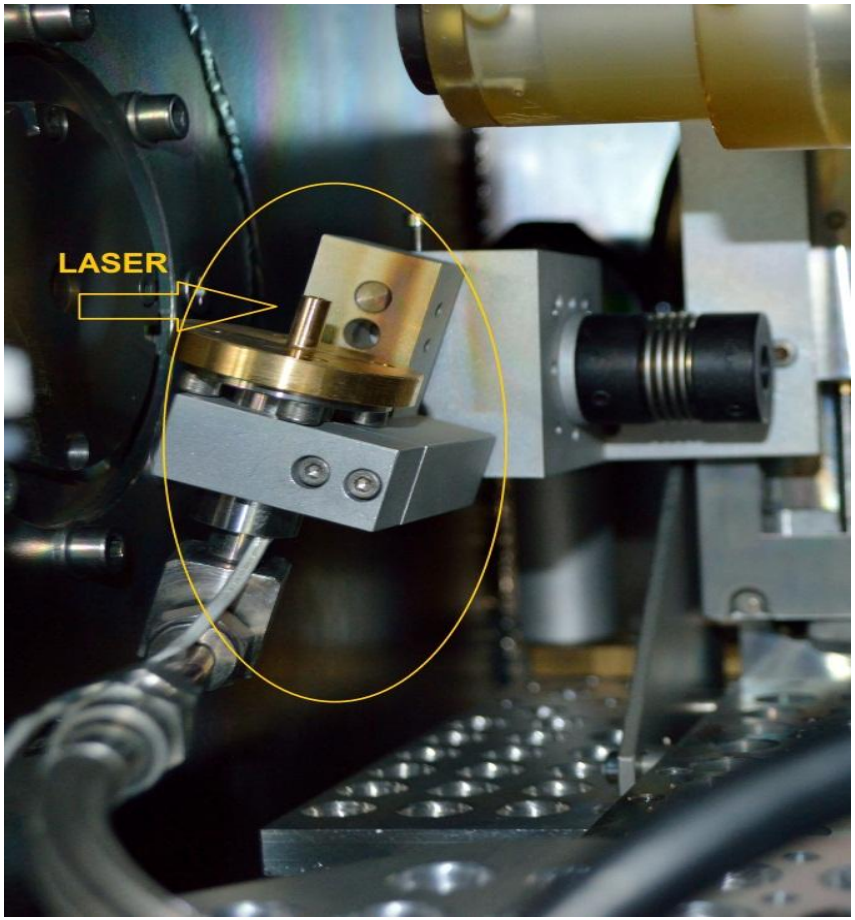
Goal → Pump Depletion

Also study of pointing, divergence dependence on the density profile parameters (ramp, plateau)

Expected asimmetries in the 2 planes





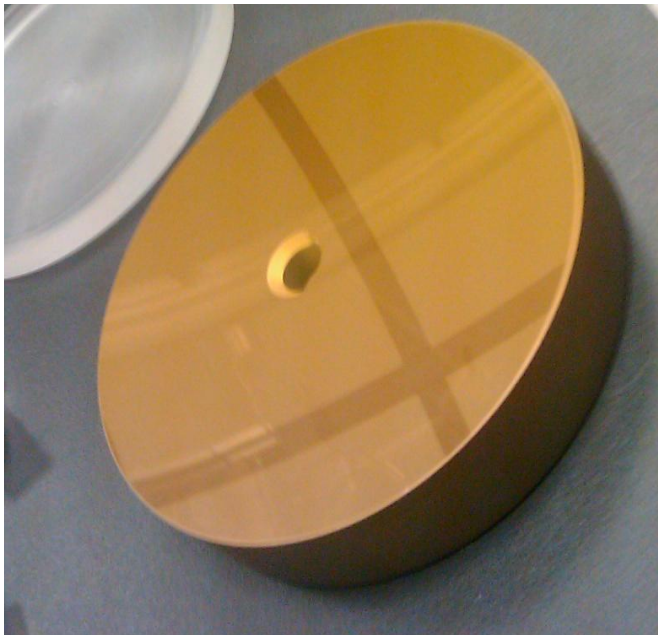


FURTHER ON...

2 Gas-Jet → Plasma lensing effect, dependence on the gas ionization (different gases)

Thomson Beamline

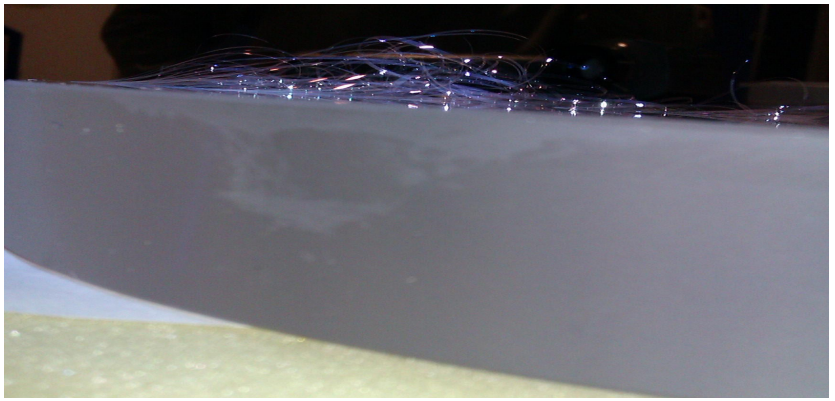
FINAL FOCUS



“Defective” OAP Ready to be mounted

F.F. Installation and line alignment under way during the present weeks

Some Issues..



But work in progress

Synchronization

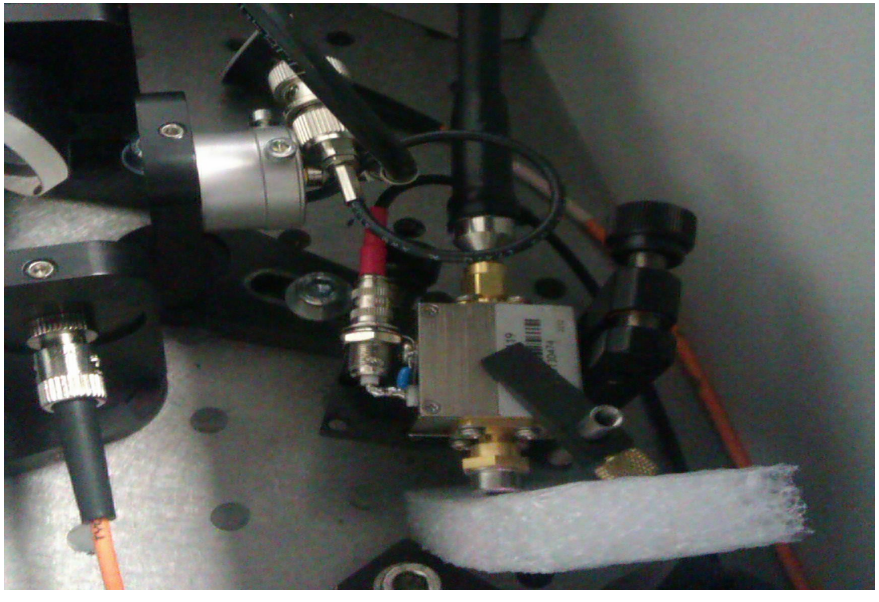
Slow EXT. Synchronization almost complete (Interaction with linac now possible)

NEW MODULE

Fast Synchronization (step 1) was already installed and checked (Electronic distribution)

Some work under way in order to improve performance of the system (bandwith of the loop)

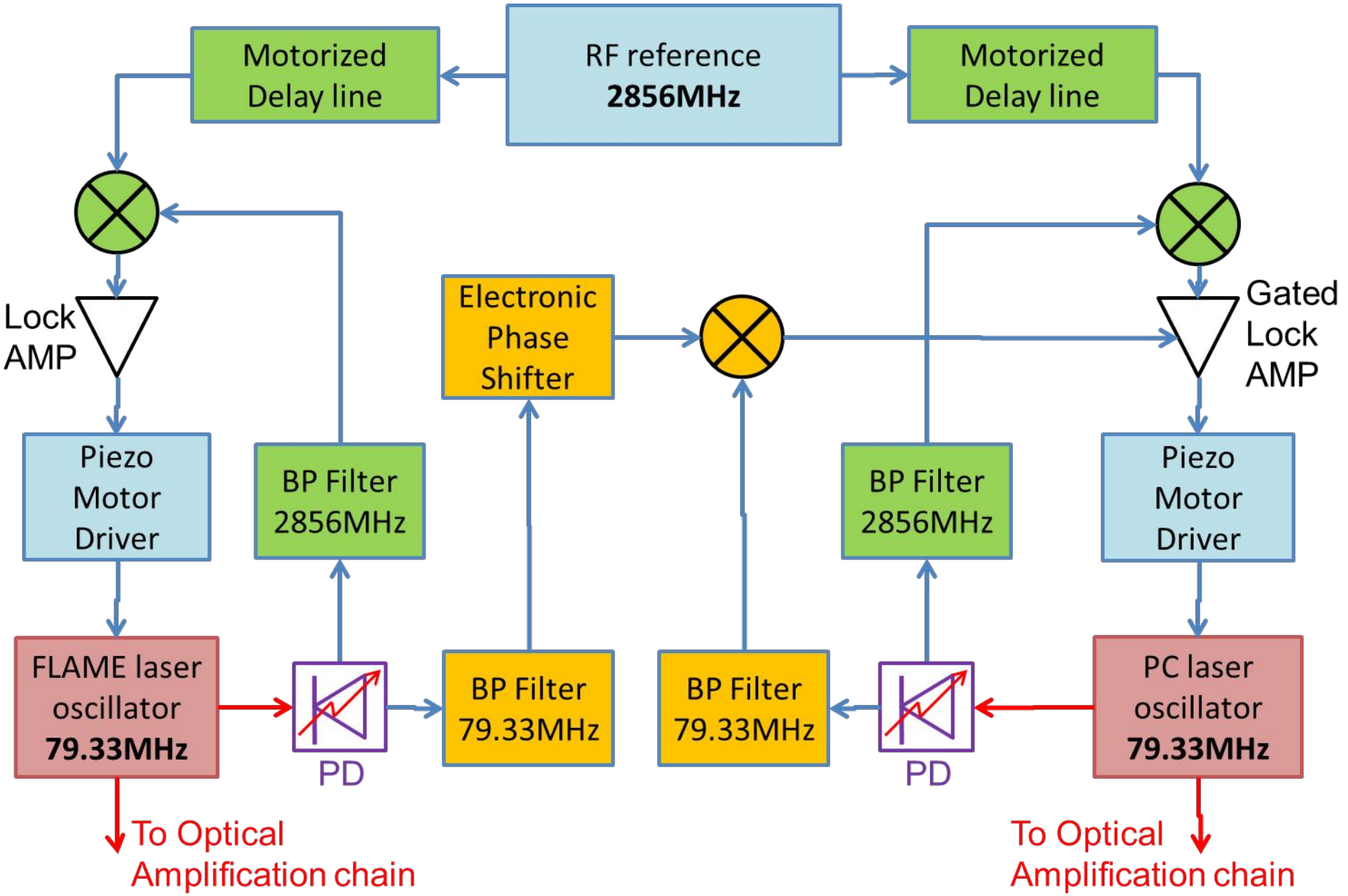
Preparation work in progress For optical synchroniz.



2 laser oscillators synchronization test

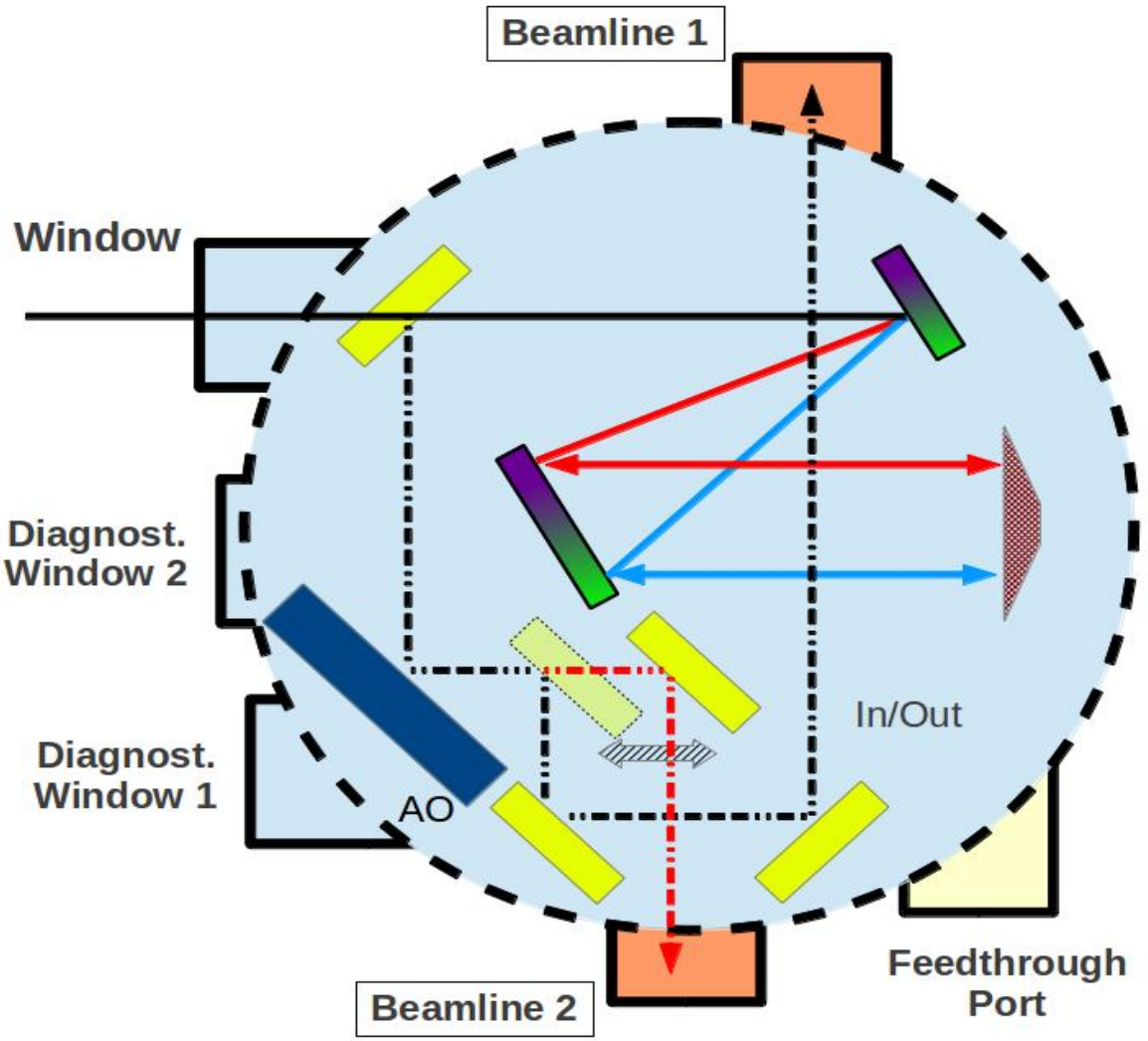
Green: High freq. loop (fs synchronization)

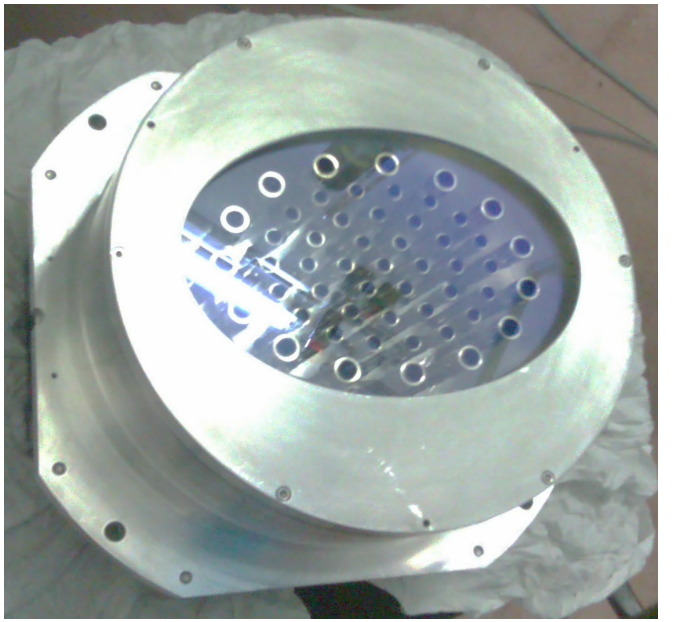
Yellow: Low freq. loop (only aligning pulses)



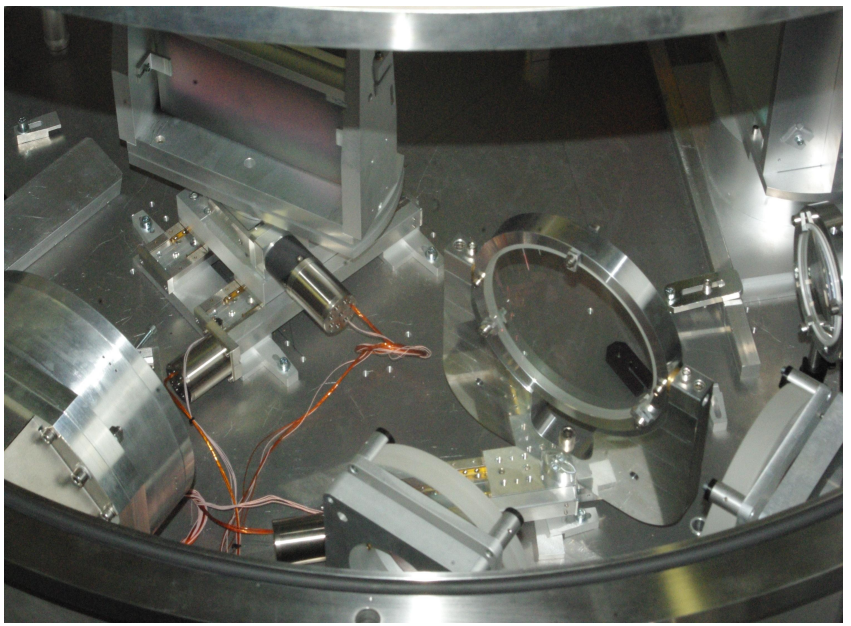
AO Installation

NEW SETUP: SWITCH
AND WFE MEASUREMENT
FOR BOTH BEAMLINES



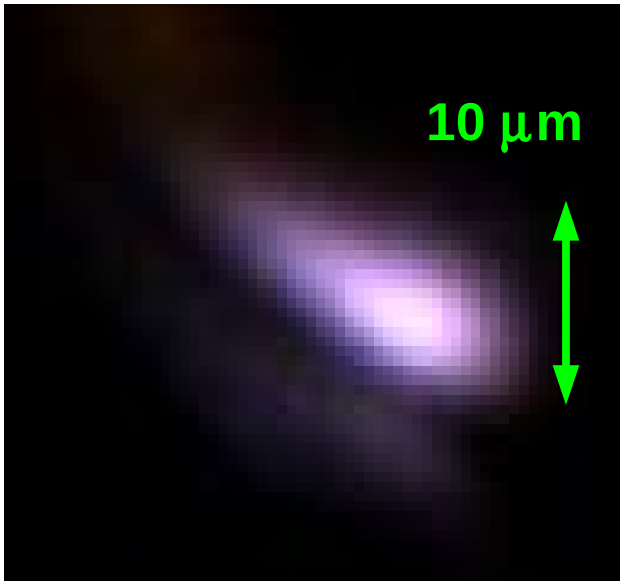


AO AND DIAGNOSTICS LEAK

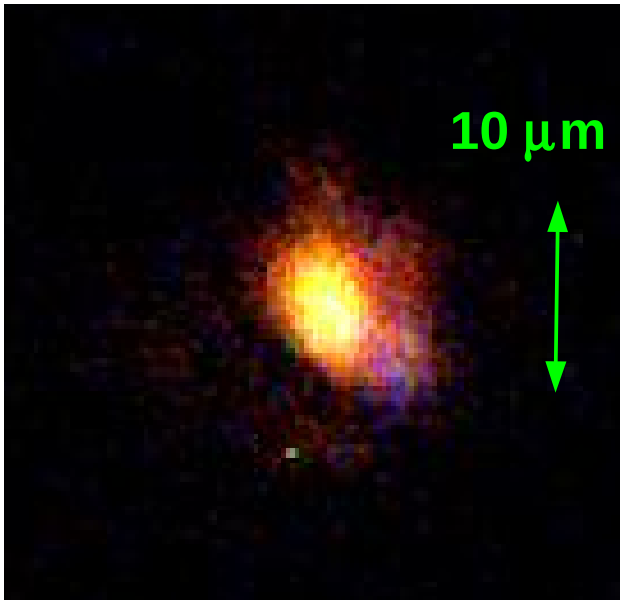


AO Testing

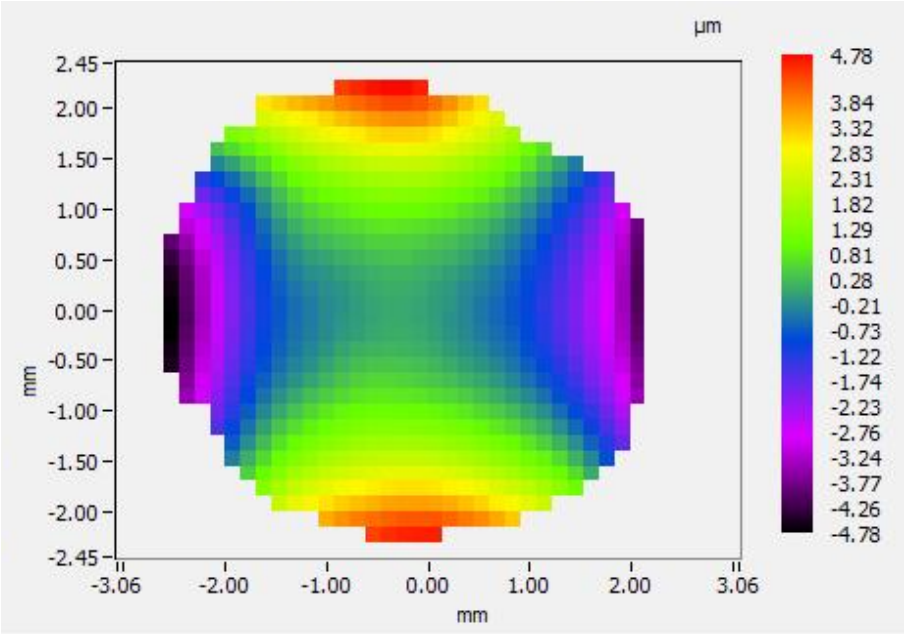
NO CORRECTION



AO CORRECTION

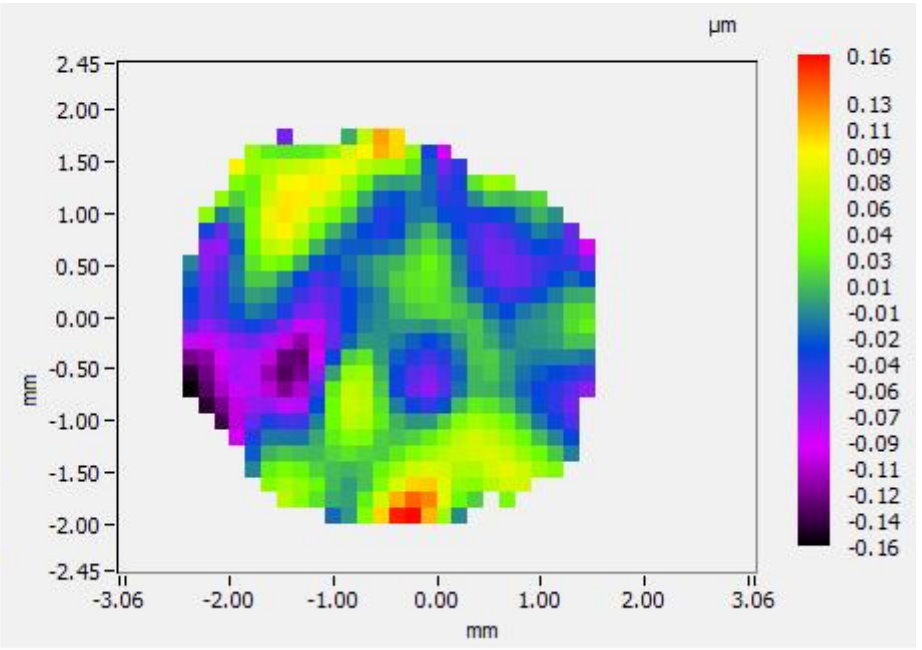


FOCUS



1.98 um RMS WFE

WFE



0.054 um RMS WFE

CONCLUSIONS

- BIG EFFORT (IN SPITE OF NOT HUGE RESOURCES) AND LOT OF WORK HAS BEEN DONE

- AGREEMENT BETWEEN LNF TEAM AND USERS FOR EFFICIENT SCHEDULING

- EXPERIENCE GAINED BUT STILL TIME AND PEOPLE NECESSARY IN ORDER TO GET COMPLETE CONTROL OF THE SYSTEM (AND EFFECTIVE UPTIME)

- FAIR SUPPORT OF THE LAB, BUT NEED TO GROW-UP ON A BUSINESS NOT REALLY PART OF OUR TRADITION