EUROPEAN
PLASMA RESEARCH
ACCELERATOR WITH
EXCELLENCE IN
APPLICATIONS

EuPRAXIA
Preparatory Phase

Update on 2nd SITE Preparation for CLPU

G. Gatti/Centro de Láseres Pulsados - CLPU

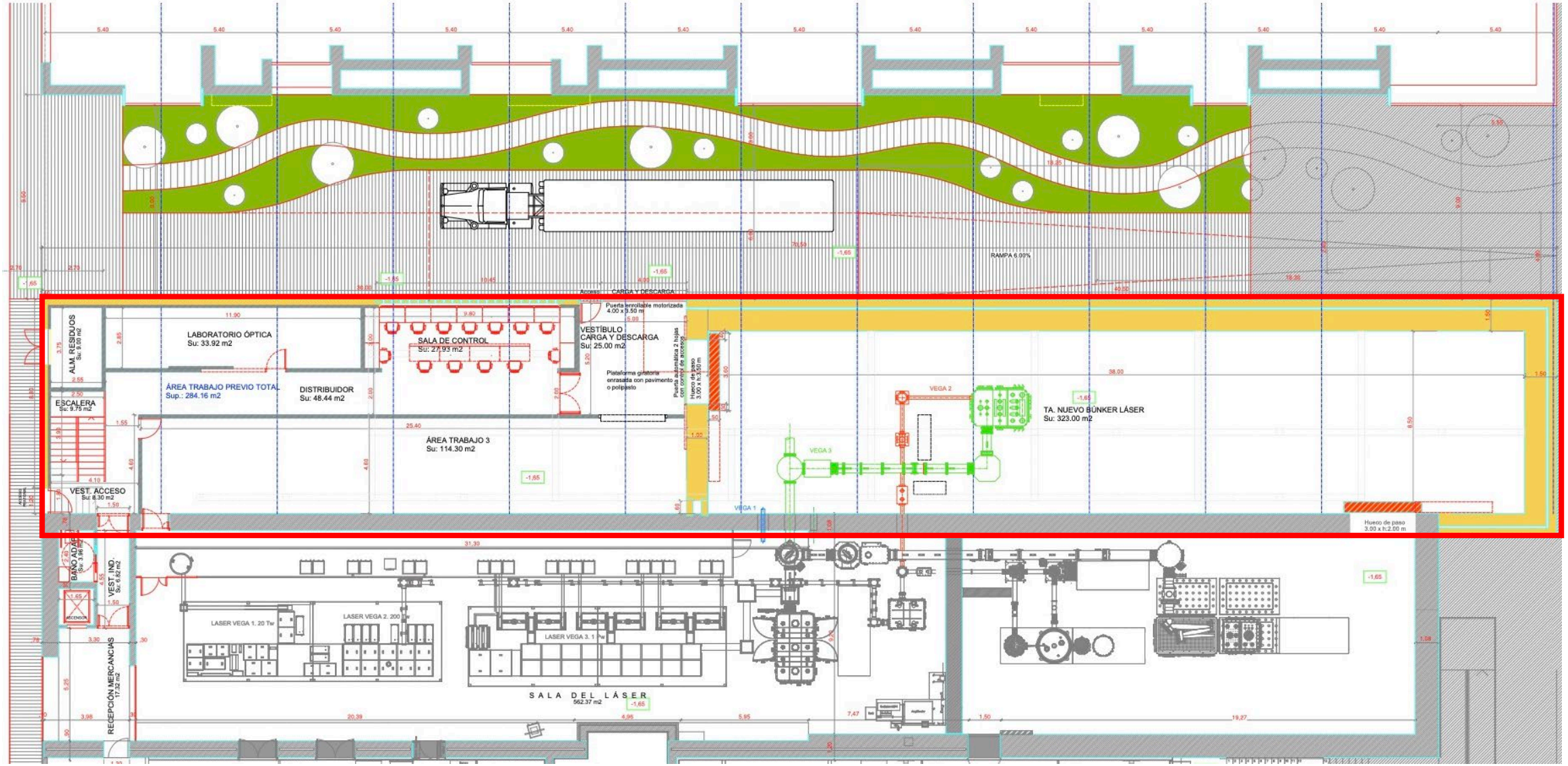
This project has received funding from the European Union´s Horizon Europe research and innovation programme under grant agreement No. 101079773

Outline

- Building Construction Progress
- EMP monitor for HRR Operations
- Progress on VEGA Laser
- New Lasers Development (2 μm)

Building Construction Progress

Funded by the European Union



NEW AREA

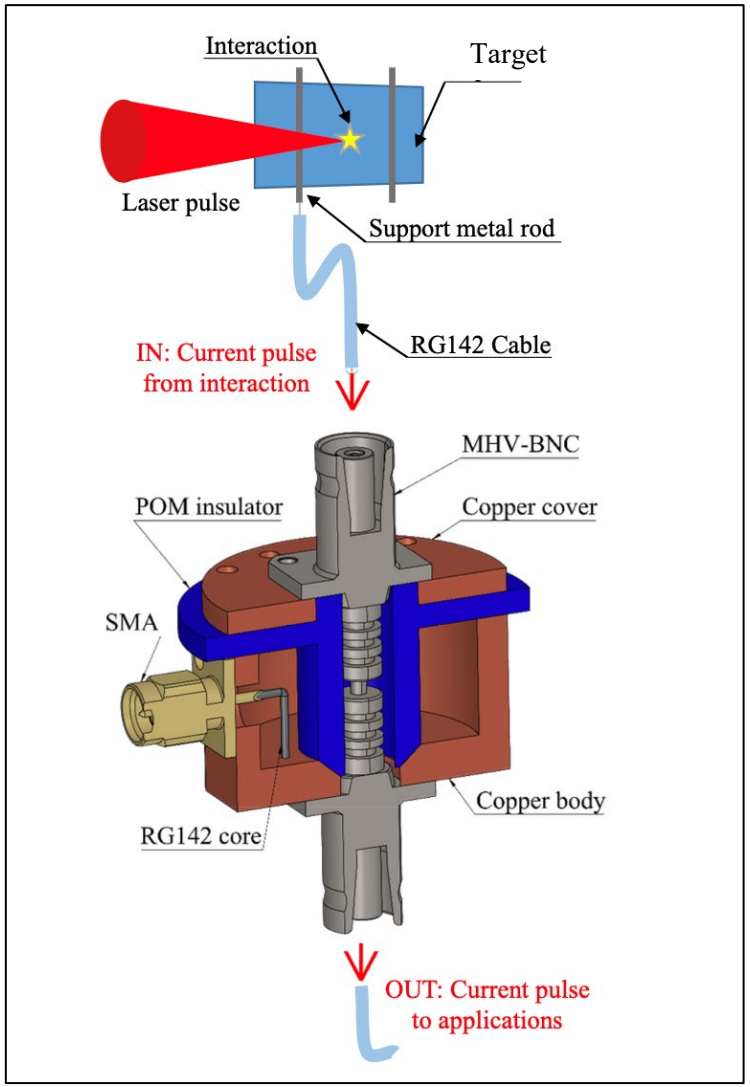
Building Construction Progress

Funded by the European Union

- Laser Transport Lines Defined (launching tender)
- Excavation Starting (in a few weeks)
- Safe Equipment Storage

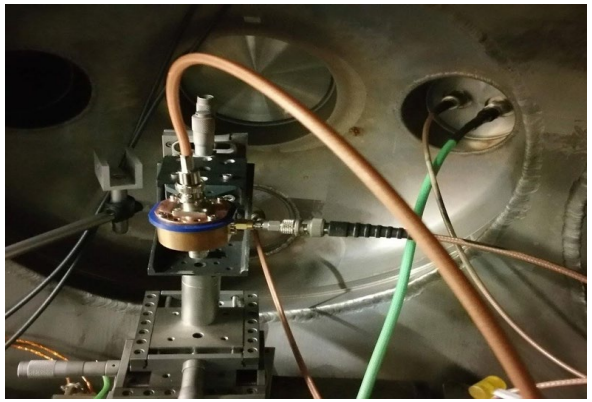
EMP Monitor for HRR Operations

Funded by the European Union

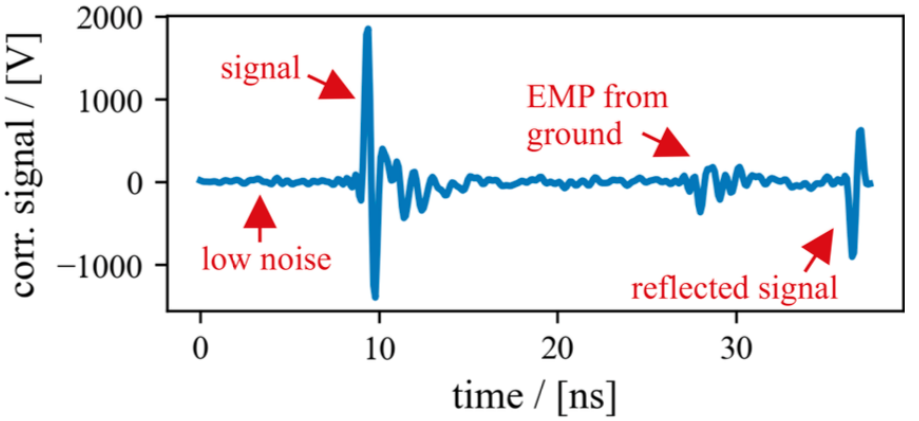


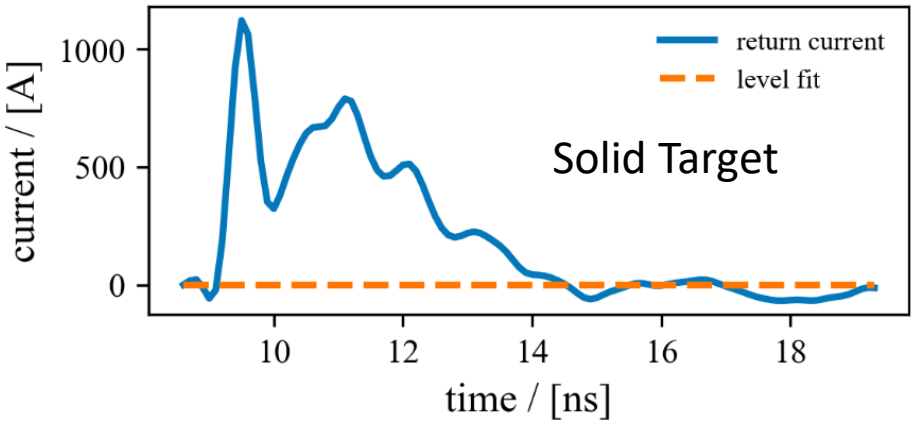
Inductive Coupled Current Monitor

Measures induced current
Associated with plasma source
Beam generation



Testing in vacuum chamber





-Modelling & simulations (not shown here)

Optical Compressor Thermal Analysis

Funded by the European Union

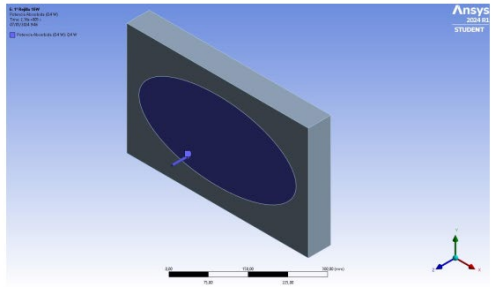
Assessing matching with present working points to scale to Higher Repetition Rates

First simulations ANSYS ongoing, trying to check with real experimental data (HRR)

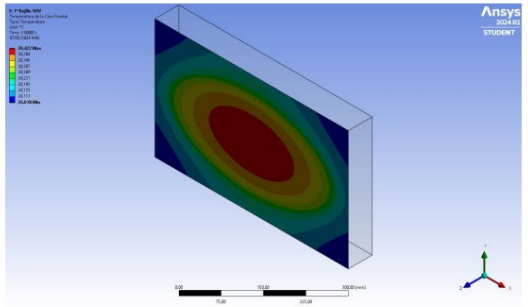
Initial conditions

- Material: Fused Silica
- Energía de simulación:
  - 30 J a 1 Hz
  - 10 J a 1 Hz
  - 30 J a 0,1 Hz
  - 10 J a 0,1 Hz
- Potencia absorbida: 3,5%
- Emisividad (Radiación) : 0,9
- Pérdida: 0,93
- Dimensiones: 485x300 mm

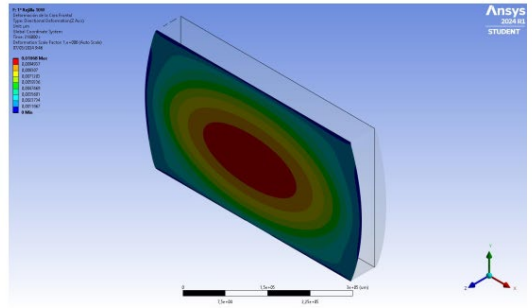
Incident laser footprint

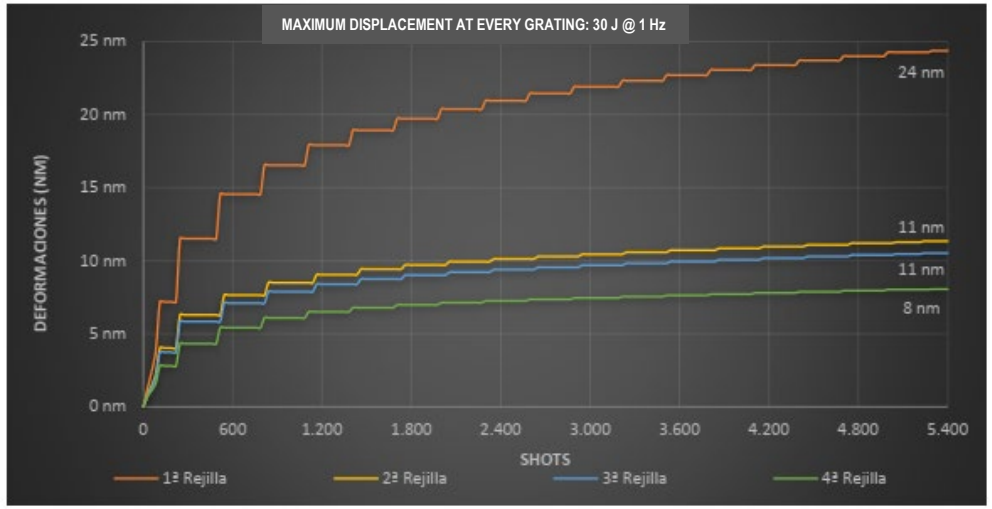


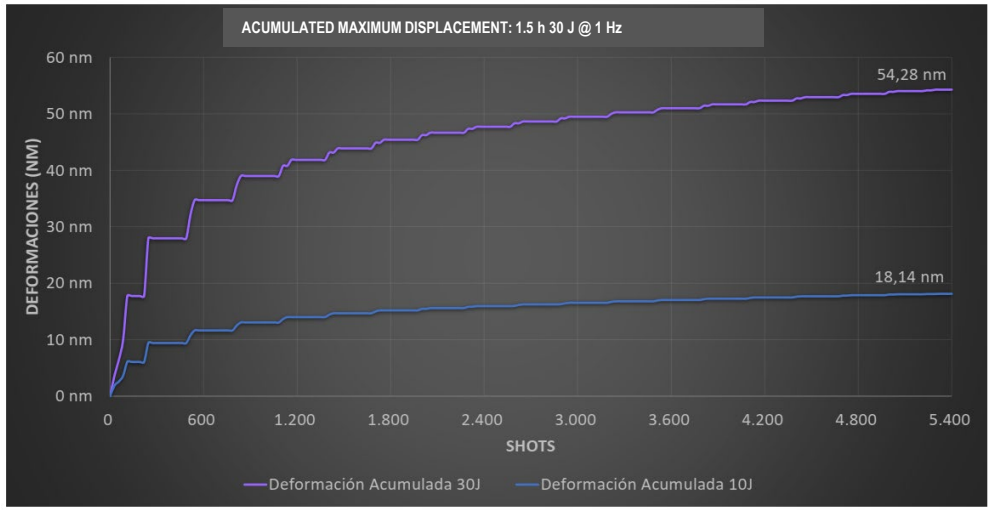
Temperature distribution



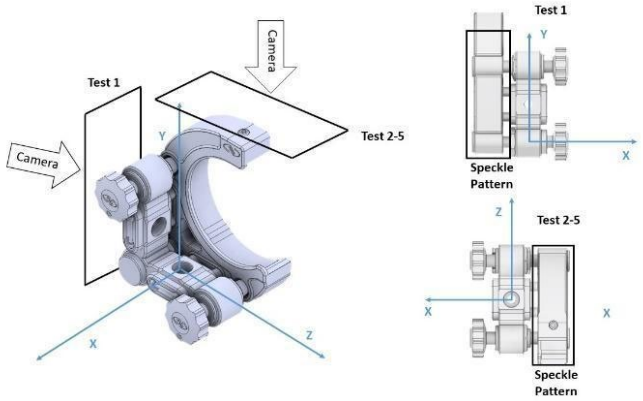
Directional deformation



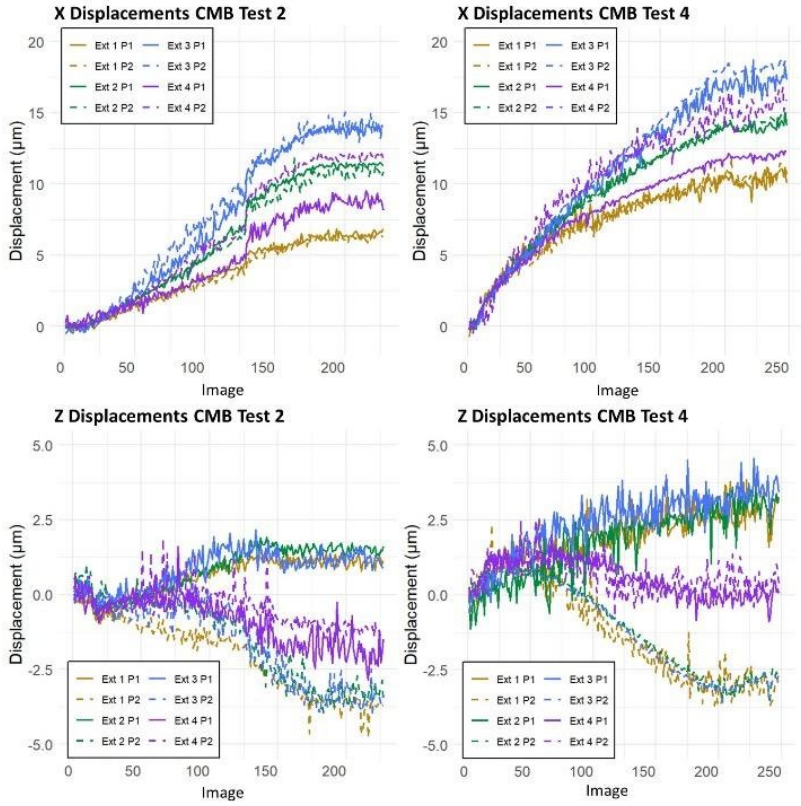




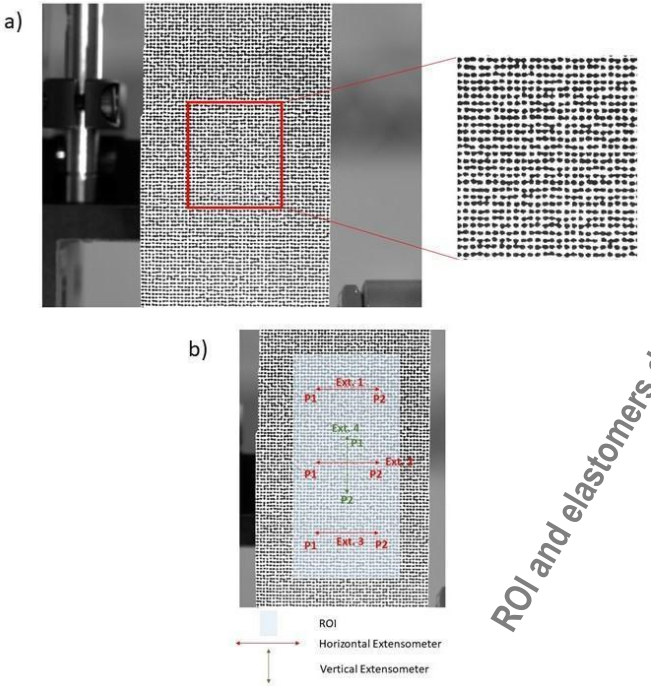
Digital Image Correlation Technique for the kinematics assessment of laser sytems optomechanical mounts. Preliminary study for amplifier thermal checking



Optical mount directions definition



Checking real movement



ROI and elastomers definition

eli nuclear physics

CLPU CENTRO DE LÁSERES PULSADOS

From an idea of
G. Moreau

SPM successfully used in H. Fibers

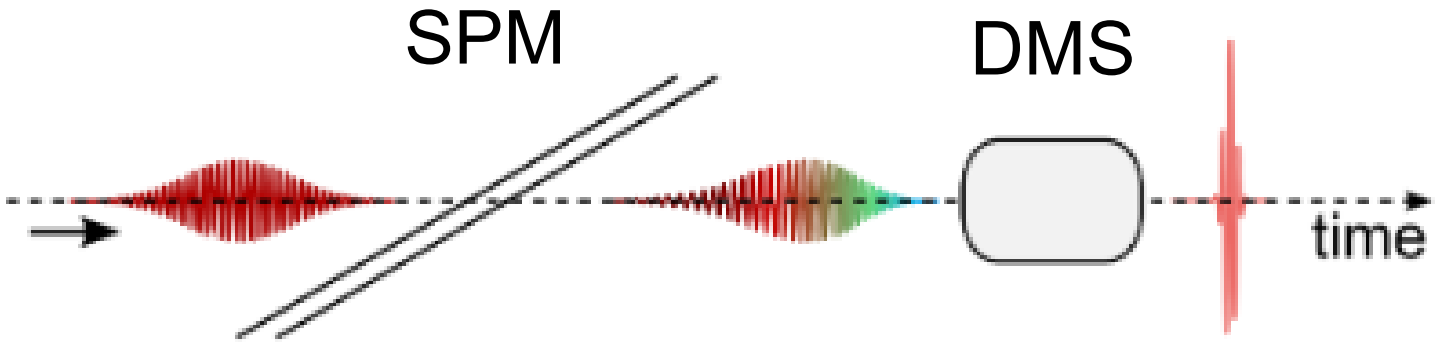
Main issue is to have a 2D
and not a 1D problem!

Post-compression using spectral broadening

Self phase modulation (SPM)

+

Dispersion management System (DMS)



Fourier Limit

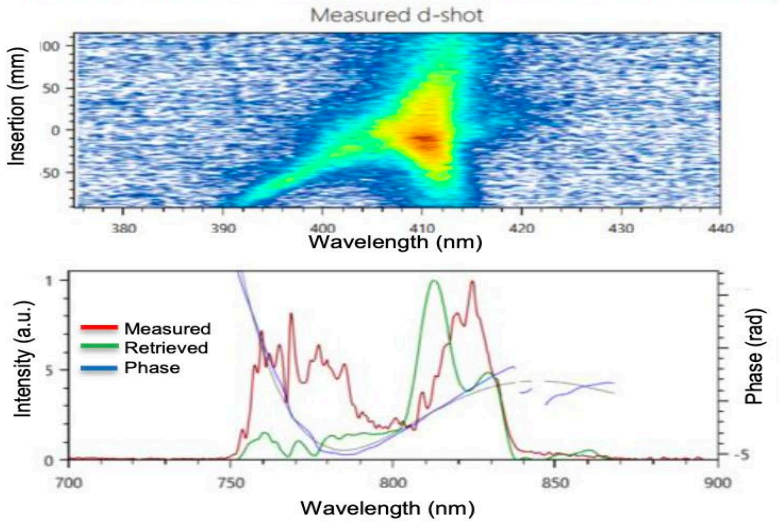
$$\Delta\omega * \Delta\tau = k$$

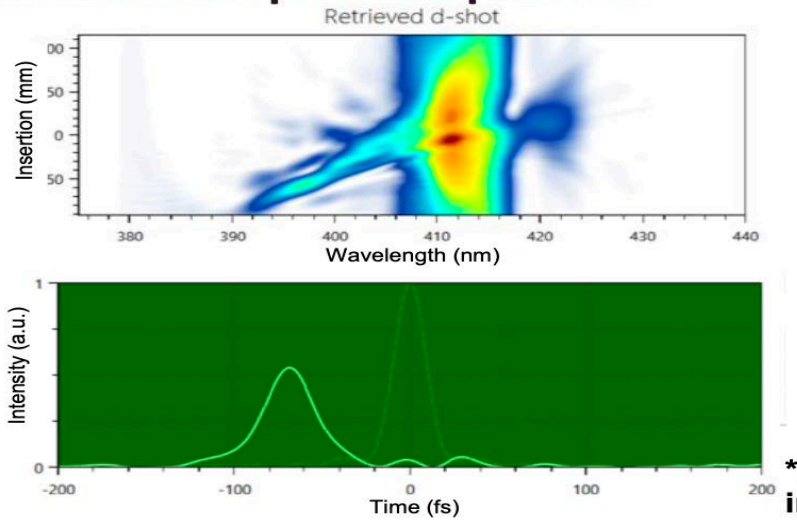
Requirement: Spectral phase=constant

Time-Spectral Analysis (3 J level)

Funded by the European Union

FS Plate IN. Pulse streched. No SPM generation. No post-compression





Wavelength (nm)

Time Domain

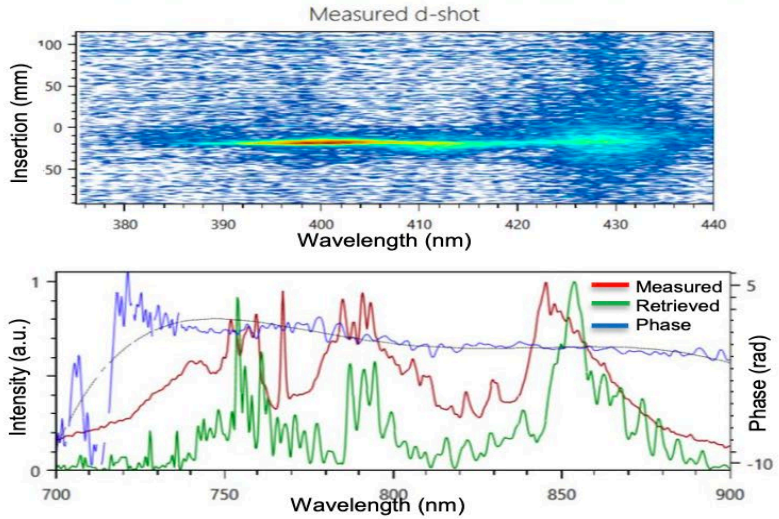
Pulse width	**34.18 fs**
Relative Peak Power	**54.3 %**
TL pulse width	21.34 fs

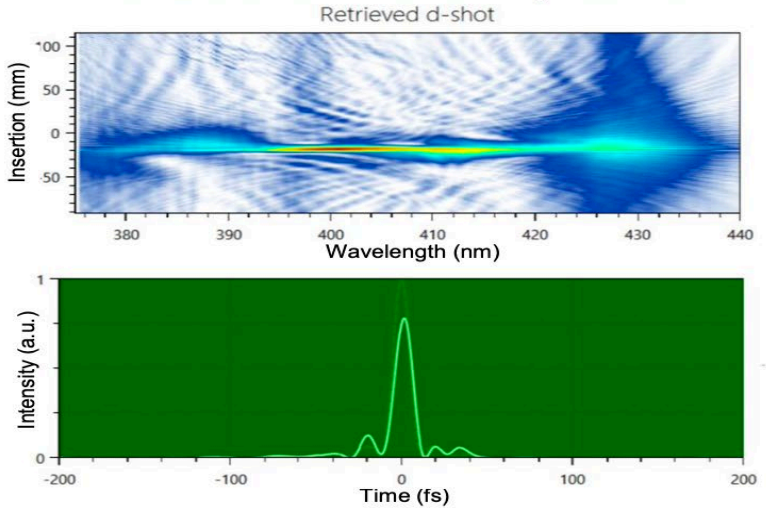
Propagation

Dry Air	-2.0	m
Fused Silica	-12.0	mm
...	0.00	mm

***Estimated pulse duration in focus, eliminating GDD due to propagation in air and optics**

FS Plate IN. Pulse enters to FS in nominal conditions. Post-compression





Time Domain

Pulse width	**11.88 fs**
Relative Peak Power	**78.2 %**
TL pulse width	10.76 fs

Propagation

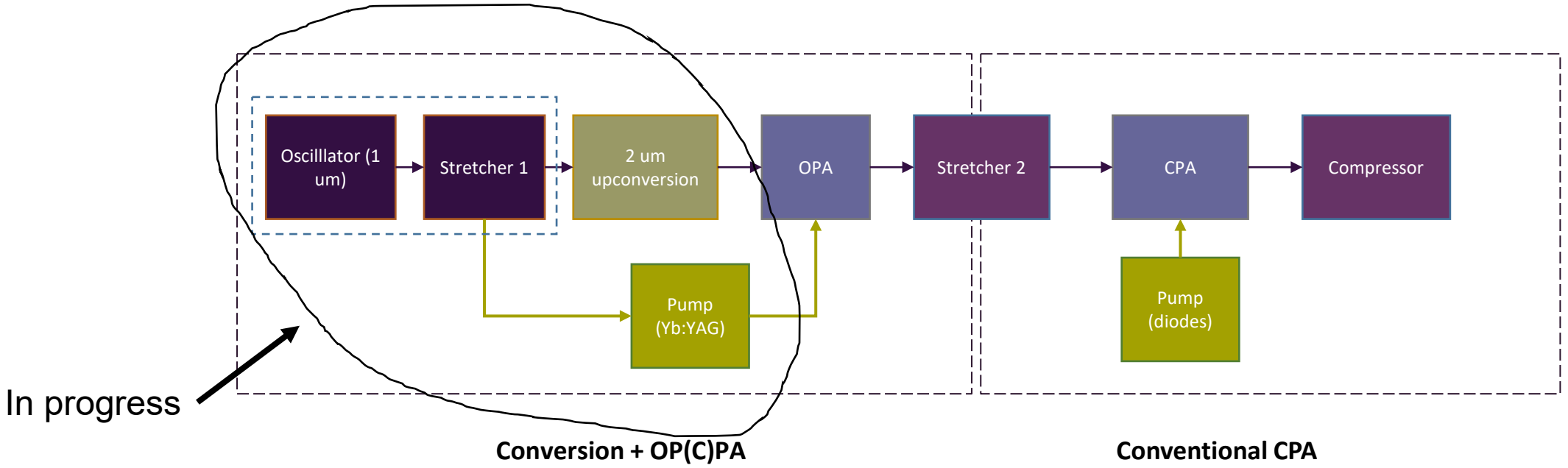
Dry Air	-2.0	m
Fused Silica	-12.0	mm
...	0.00	mm

Development of 2 μm lasers

Funded by the European Union

Hybrid system of parametric + conventional amplification
If possible skip regenerative amplification stage
All-diode pumped

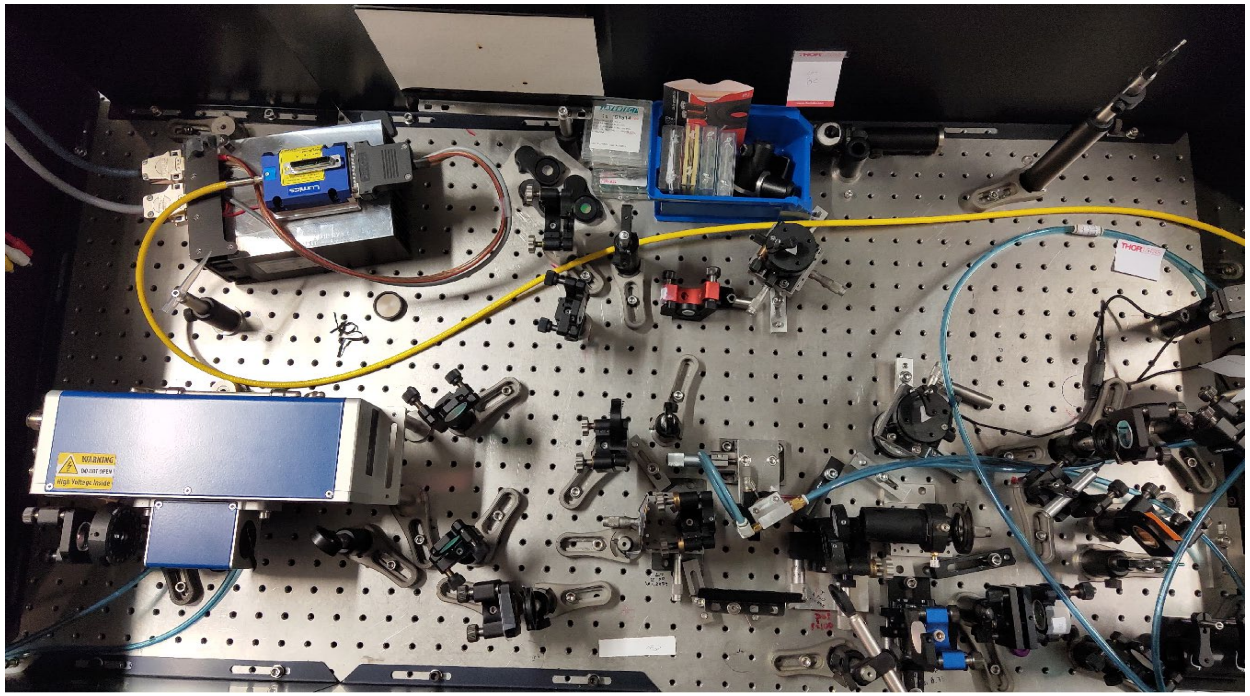
Scheme for 100 mJ, 100 fs, 100 Hz @ 2 μm (10 W)



Development of 2 μm lasers

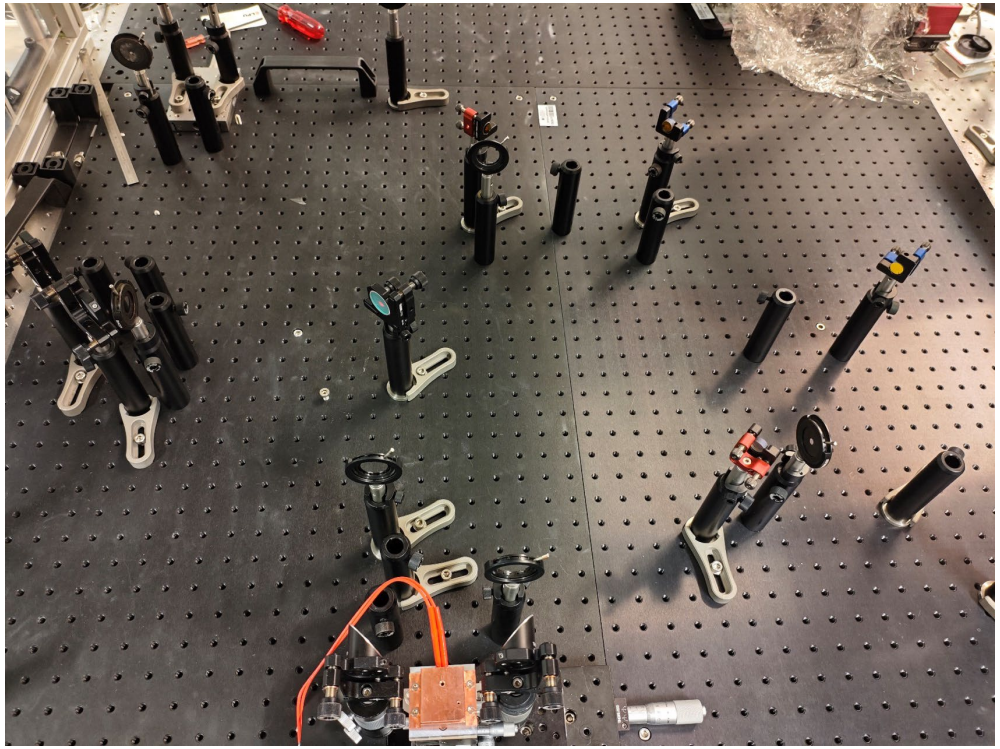
Funded by the European Union

Current Oscillator 1030 nm (Test Bench)



Progress of the OPO cavity

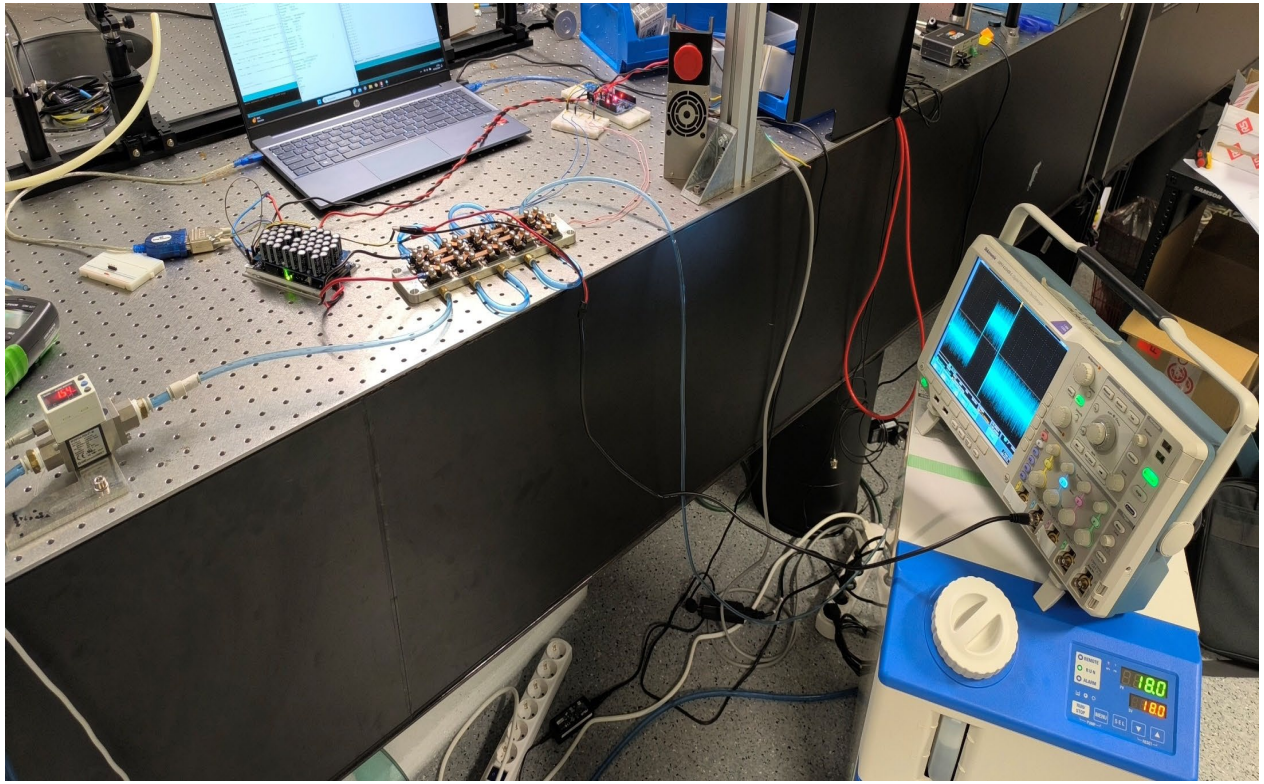
PPLN for degenerate OPO (Test Bench)



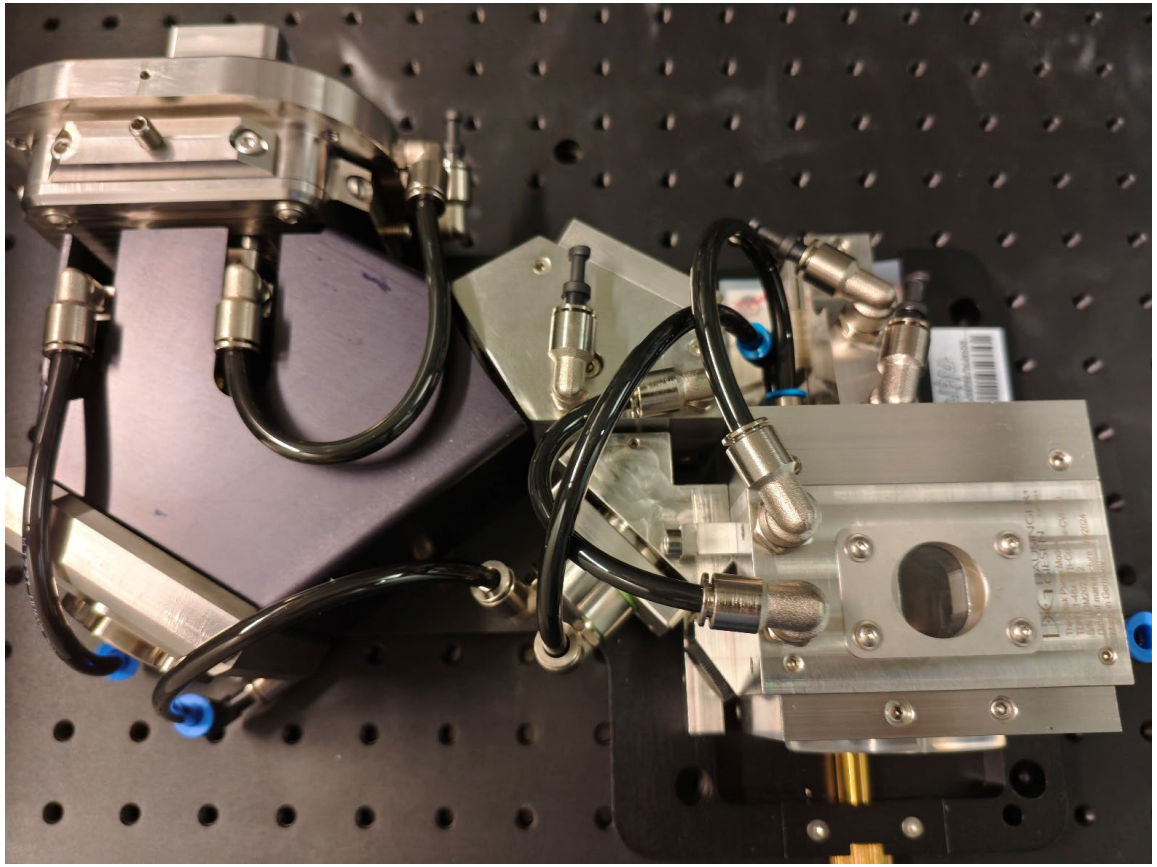
Development of 2 μm lasers

Funded by the European Union

Testing of new diode drivers



Yb:YAG thin disk (1030 nm) as OPA pump



Development of 2 μm lasers

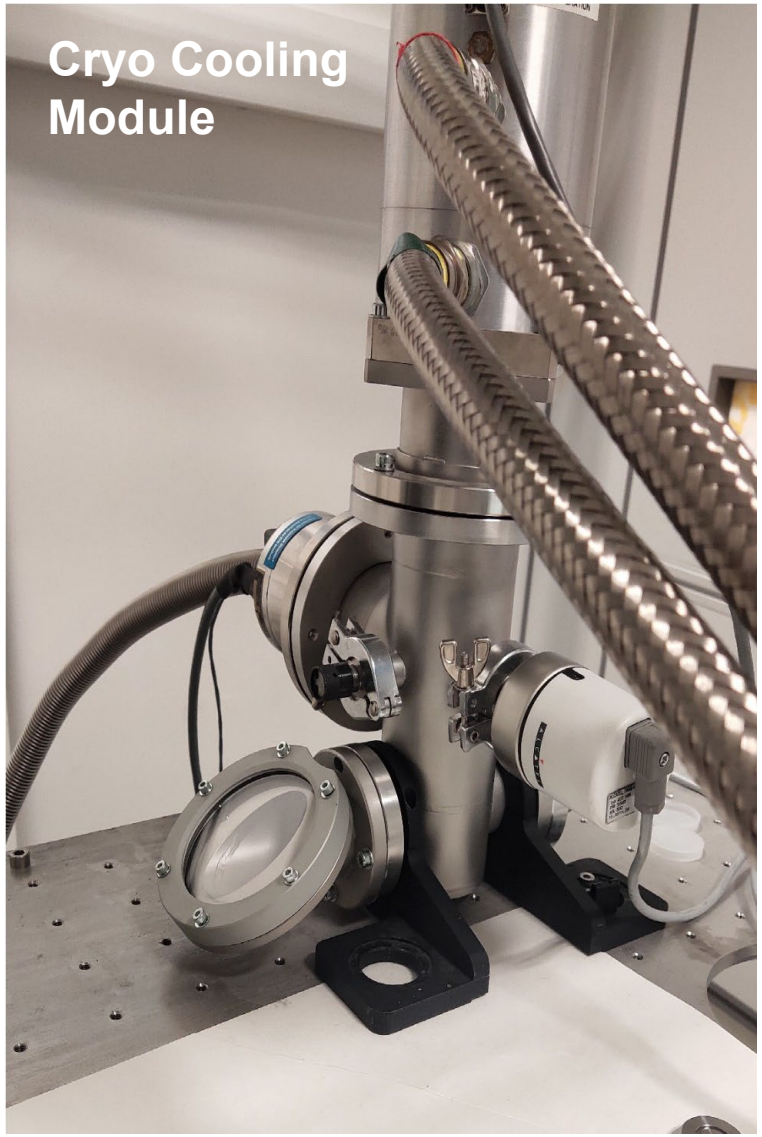
Funded by the European Union

In progress:

Workbench for the characterization of laser materials:

- Optical characterization
  - Emission absorption spectrum
  - Upper state transition lifetime
  - Transmittance
  - Dopant distribution

- Thermal characterization
  - Thermal conductivity
  - Thermal expansion coefficient
  - dn/dT
  - Depolarization



Conclusions

Building Construction Starting

HRR Operations

VEGA Optimization

New Lasers Development

Bid Book Preparation (starting)