

## MAC: Experimental station for AMO science and Coherent Diffractive Imaging

For the user programme in AMO science and Coherent Diffractive Imaging we are presently seeking users to work with during final instrument commissioning and further methods development of the following systems:

a) *Commissioning of the refocusing optic to the MAC experimental station. First experiments with electron and ion spectroscopy. Excitation and fragmentation of gas phase atoms, molecules, clusters and bio/nano-particles*

Time frame: April, 2019.

Contact person: Maria Krikunova, email: [Maria.Krikunova@eli-beams.eu](mailto:Maria.Krikunova@eli-beams.eu)

b) *Commissioning of the Velocity Map Imaging spectrometer*

Time frame: July, 2019

Contact person: Maria Krikunova, email: [Maria.Krikunova@eli-beams.eu](mailto:Maria.Krikunova@eli-beams.eu)

c) *Commissioning of the pump-probe set up for measurements with synchronized NIR/VUV pulses.*

Time frame: August, 2019

Contact person: Maria Krikunova, email: [Maria.Krikunova@eli-beams.eu](mailto:Maria.Krikunova@eli-beams.eu)

In case you are interested in working with us through the instrument commissioning in the E1 experimental hall and on the development of further functionalities of the MAC end station, or if you want to use the instrument for general AMO science applications, please fill in the application form on the user portal.

### Brief description of the available set up:

The MAC end station is a Multipurpose end station for AMO (Atomic, Molecular and Optical) and CDI (Coherent Diffractive Imaging) science. The design of the MAC vacuum chamber is similar to that of the LAMP chamber in the AMO station at LCLS and the CAMP chamber now located at FLASH, DESY.

### Spectrometers and detection systems

At present the following spectrometers and detection systems are operational or in the commissioning pipeline:

- Electron and ion Time of Flight spectrometers (in house development)
- Velocity Map Imaging (VMI 75 mm MCP with a phosphor screen imaged by a camera with 166 fps 1936 x 1216 pix Sony CMOS 1/1.2" sensor 72 dB (~ 12 bit resolution)) with ns gated imaging detector (Velocitas/Photec)

### Sample delivery

At present the following sample delivery/handling systems are operational or in the commissioning pipeline:

- Fixed target stage
- Gas target – either needle source or a molecular beam.
- Cluster source – for rare-gas and water clusters with sizes from few nm to 100s nm.

- Aerosol injection systems – GDVN aerosol injector or Electrospray Ionization.

**Time-preserving monochromator:**

4 sets of gratings covering the range (1) 10 to 28 eV, (2) 25 to 54 eV, (3) 51 to 98 eV and (4) 86 to 121 eV. Manually selectable exit apertures 50, 100, 200 and 300  $\mu\text{m}$ .

External collaboration with Luca Poletto, Fabio Frassetto (Institute of Photonics and Nanotechnologies, National Research Council of Italy, via Trasea 7, I-35131 Padova, Italy)

**HHG focusing**

Ellipsoidal mirror with 1:4.8 imaging ratio

**NIR focusing**

90deg off-axis parabola with focal length of 101.6 mm. Hole in the parabola mirror allows collinear focusing of HHG and IR beam.

**Available NIR/HHG delay range**

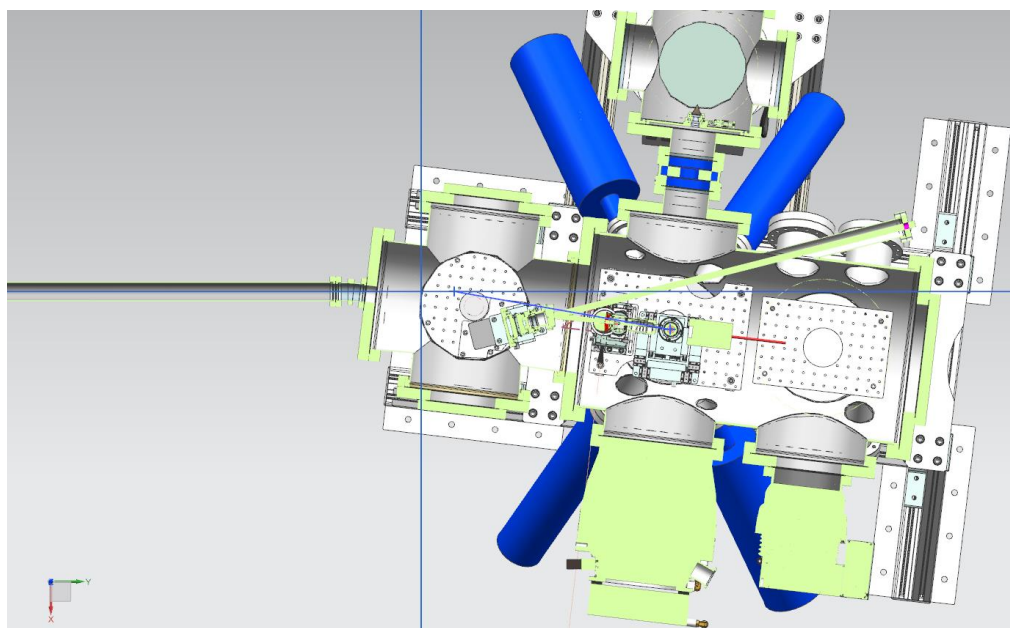
Is covered by a 1 m delay line

**Pump-probe capacities**

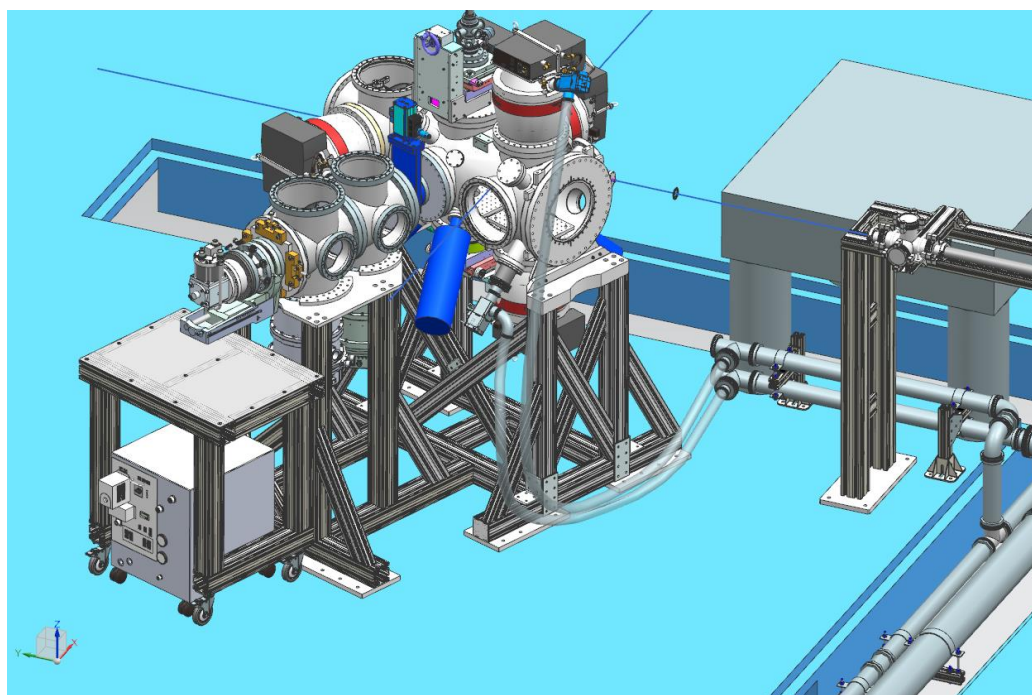
We invite users interested in establishing pump-probe capabilities with monochromatized HHG and optical laser beams. For an updated status of the pump-probe setup please contact the MAC instrument team for the latest updates ([email to instrument scientist](#)).



The MAC end station during installation in the E1 experimental hall.



Model of the MAC station with two different focal geometries. One using a 10 degrees grazing incidence ellipsoidal mirror (current geometry) and another utilizing a 11 degrees angle of incidence Off Axis Parabola (optional geometry).



Model of the MAC station on the beamline location. In this image the station is equipped with the aerosol injector mounted from the top of the main chamber and a cluster source with a cryo-cooled Even Lavie nozzle (under development) mounted from the side.