

The Extreme Light Infrastructure (ELI) project is an integral part of the European plan to build the next generation of large research facilities identified and selected by the European Strategy Forum on Research Infrastructures (ESFRI). ELI will be able to investigate interactions between light and matter with the highest intensity, in the so-called ultrarelativistic range. It will open a doorway into new territories within physics and will foster new technical developments e.g. in relativistic microelectronics and small laser-driven particle accelerators. ELI will have a considerable impact on numerous fields of material sciences, medicine and environmental protection. On the way to these goals, the main objective of ELI Attosecond Light Pulse Source (ELI ALPS) is to establish a unique attosecond facility which provides ultrashort light pulses from the THz to the X-ray frequency range with high repetition rate for developers and end-users.

New Research Fellow positions are available in the HR Attosources Group and in SYLOS GHHG Attosources Group of ELI ALPS

We are looking for an enthusiastic and skilled researcher with expertise in high-harmonic generation (HHG)/attosecond physics/atomic, molecular and optical (AMO) physics (or closely related disciplines) to participate in various projects managed by the HR Attosources Group or SYLOS GHHG Attosources Group of ELI ALPS. In addition to contributing to designing, building and commissioning various pieces of equipment, the candidate is also expected to take part in user support during the use of beamlines and end-stations in this permanent position.

Description of the HR Attosources Group

The HR Attosources Group of ELI ALPS is responsible for two gas-based high-harmonic generation beamlines (HR GHHG Gas and HR GHHG Condensed) driven by the 100 kHz high average-power HR laser of ELI ALPS. The HR GHHG Gas beamline, which is designed for extreme ultraviolet – infrared (XUV-IR) pump-probe studies in gas phase and has been in use since June 2019 [1], is under continuous upgrade and has been user-ready since the beginning of 2021 [2]. The HR GHHG Condensed beamline, equipped with a time-delay compensated XUV monochromator for experiments with liquid and solid phase samples, has been producing attosecond pulse trains since June 2020, and its commissioning was finished at the end of 2021. The development of the beamlines to extend their capabilities is a permanent task of the HR Attosources Group [3].

The group is also responsible for a Velocity Map Imaging (VMI) end-station (available since November 2020), and soon the HR GHHG Gas beamline will be equipped with a Reaction Microscope (ReMi or COLTRIMS). Further end-stations and detectors are planned to be installed and will be accessible for research as well as for projects initiated by the group [3,4].

[1] P. Ye et al., *J. Phys. B: At. Mol. Opt. Phys.* 53, 154004 (2020).

[2] P. Ye et al., *Ultrafast Science 2022*, 9823783 (2022).

[3] L. Gulyás Oldal et al., *Phys. Rev. Applied* 16, L011001 (2021).

[4] T. Csizmadia et al., *New J. Phys.* 23, 123012 (2021).

Description of the SYLOS GHHG Attosources Group

The SYLOS GHHG Attosources Group of ELI-ALPS maintains two gas-based high harmonic generation beamlines (COMPACT and LONG) driven by the two-cycle, 1 kHz, TW-class SYLOS laser. Both beamlines are in the phase of commissioning and are expected to enter user operation early 2022. The beamlines are dedicated to the study of nonlinear XUV processes by the XUV-XUV pump-probe technique with attosecond time resolution, which has so far been achieved only in a few laboratories worldwide. Furthermore, the LONG beamline has the ability to combine two additional pulses in the UV-IR range for the preparation of specific sample states. In addition to comprehensive diagnostics, the scientific equipment includes various time-of-flight spectrometers, a cold particle source and an ion microscope, and will soon be joined by a reaction microscope (ReMi or COLTRIMS) to enable the study of multi-photon many-body processes. The activities are conducted in strong collaboration with Lund University and FORTH IESL.

Duties and Responsibilities:

The work tasks of the Research Fellow to be hired in the **HR Attosources Group** include but are not limited to the following:

- Participating in the commissioning, maintenance and operation of various pieces of equipment for ultrafast physics studies in gas, liquid and condensed phases. These include two HHG beamlines incorporating time-of-flight (TOF) and XUV flat-field spectrometers, VMI and ReMi end-stations, and further experimental apparatus to be installed.
- Provision of user support on the above mentioned research tools.
- Participating in the design and construction/assembly of additional group-managed equipment.
- The candidate will have the possibility to conduct own research as well, when beam time is available. Hence it is expected that the candidate has a vision of projects that could be implemented using the available infrastructure.

The work tasks of the Research Fellow to be hired in the **SYLOS GHHG Attosources Group** include but are not limited to the following:

- Operation, maintenance and further development of a GHHG beamline.
- Operation of associated scientific equipment for attosecond pulse generation and diagnostics. Application to scientific problems in ultrafast physics with an emphasis on XUV non-linear processes.
- Support of international user experiments during the preparation, execution and interpretation phase.

- Advancement of in-house research and development. It is expected that the candidate has a vision of projects that could be carried out using the available infrastructure.

Education and Experience:

The candidate should hold a PhD in physics, chemistry or other related scientific field (applications of candidates on track to complete their PhD are also considered).

Skills and Abilities:

- Experience in HHG, attosecond physics, AMO physics or related research fields.
- The successful candidate is expected to have the ability to work both independently in the lab and as part of a team.
- Good written and oral communication skills in English.

Additional preferred qualifications:

- Good programming skills (Python, Matlab).
- Experience with ultrafast (femtosecond) lasers and ultrafast optics.
- Ability to lead a (research) project alone.
- Experience in projects where people from different disciplines (physics, engineering, IT) work together.

Job location:

Hungary, Szeged

Start time:

As soon as available

If you are interested in the position, please upload your CV (including a list of publications) and motivation letter merged into a single PDF file to our Career Site at <https://www.eli-alps.hu/en/Career>. Please make sure to highlight in your motivation letter why you are applying to the specific position.