Junior Researcher position in the Surface Plasma Attosources (SPA) Group within the Secondary Sources Division of ELI ALPS

ELI ALPS (https://www.eli-alps.hu/), part of the Extreme Light Infrastructure (ELI), is a world-leading research facility in Szeged, Hungary, dedicated to studying ultrashort high energy processes. As one of the three pillars of this European megaproject, ELI ALPS provides cutting-edge ultrashort light sources, including attosecond XUV and X-ray pulses, for the scientific community, enabling groundbreaking research in light–matter interactions, valence and core electron science, materials science, 4D imaging, and various biomedical applications.

We are looking for highly motivated and self-driven bright candidates for a junior researcher position in the Surface Plasma Attosources Group of ELI ALPS. As part of the job, the successful applicant will also have the opportunity to work towards his/her PhD degree. Major activities of the SPA Group include the investigation of the ultrafast dynamics of intense laser interaction with solid, liquid and gas targets at relativistic intensities and the application of the secondary sources resulting from such interactions for time-resolved studies. The direction offers a synergy of photonics, matter in dense form and relativistic plasma physics.

Description of the laser plasma based instruments

The group operates two state-of-the-art solid and liquid plasma mirror based high harmonic generation beamlines [1,2] driven by a few-cycle kHz SYLOS3 laser and a PW level HF laser, respectively. The SYLOS SHHG beamline is designed for few-cycle relativistic interaction at 1 kHz repetition rate for studies on plasma optics and secondary sources and their applications. The details and current state of the art can be found in [3]. The SHHG HF [1] beamline is driven by a PW laser, similar to [3], but the interaction is driven at a much higher laser intensity and lower repetition rate.

At lower intensities, to investigate laser excited material surface evolution near the material damage threshold, the SPA Group has developed a multimodal, wavefront and amplitude resolved, laser induced damage test (LIDT) station. A more detailed description and the purpose can be found in [4].

[1] S. Mondal et al. *J. Opt. Soc. Am. B* 35, A93-A102 (2018)
[2] M. Shirozhan et al. Ultrafast Science 4, 0067 (2024)
[3] https://up.eli-laser.eu/equipment/sylos-shhg-1101563819
[4] https://up.eli-laser.eu/equipment/lidt-1101563434

What you will do:

The tasks of the Junior Researcher to be hired include but are not limited to the following:

- Opportunity to participate in developing the experimental stations towards time-resolved metrology experiments with secondary sources.
- Work towards a potential PhD degree either on `Intense laser excited surface dynamics' [3] or on `Laser induced phase transitions' [4]. This also involves integrating AI/ML techniques in our data analysis and experiment optimization.
- Proactively participate in international collaborative as well as user experimental campaigns according to the scientific goals of the SPA Group and ELI ALPS.
- Contribute to developing the SHHG and/or the LIDT instruments in terms of their applicability for spatial, spectral and temporal domain metrology.

What we expect:

The candidate for this junior position should hold at least an MSc in physics, or in one of the following disciplines: chemistry, laser engineering, optics, photonics, high harmonic generation (HHG), attosecond physics, atomic, molecular and optical (AMO) physics (or closely related disciplines) or any other related scientific field.

Desired skills and abilities:

- Exposure to experiments in ultrafast optics, optical metrology, and/or light–matter interaction.
- Basic technical knowledge in conducting time-resolved measurements, operating vacuum systems and characterizing ultrashort infrared or extreme ultraviolet pulses.
- 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:

- Basic programming skills (Python, MATLAB) and/or knowledge in AI/ML techniques would be beneficial.
- Exposure to laser plasma metrology, HHG, attosecond physics, AMO physics or related research fields, pump–probe studies would be an asset.
- Good team skills for work in a group in a multidisciplinary environment.

Job location: Hungary, Szeged

Start time: As soon as reasonable

Why join us?

- **International collaborations:** Our team frequently engages in international scientific collaborations with both experimental and theoretical areas, offering excellent opportunities to expand your global network and engage in pioneering research with experts in the field.
- **Cutting-edge facility:** ELI ALPS is part of the Extreme Light Infrastructure (ELI) project, providing access to some of the most advanced research tools in the world. ELI ALPS provides

cutting-edge ultrashort light sources, including attosecond XUV and X-ray pulses, for the scientific community.

- **Quality of life:** We offer very competitive salaries in regional comparison, and the city of Szeged provides pleasant living conditions.

Apply now:

For further information on ELI ALPS, please visit the ELI ALPS website (http://www.eli-alps.hu), while for position-related information please contact the Head of the Secondary Sources Division, Dr. Subhendu Kahaly at subhendu.kahaly@eli-alps.hu.

Your CV including your list of publications and a letter of motivation should be submitted via our career portal:

Extreme Light Infrastructure ERIC / ALPS Facility / ELI-Beamlines

The Extreme Light Infrastructure (ELI ERIC) is the world's largest high-power laser research facility, offering cutting-edge lasers for groundbreaking science and innovation. Operating across two sites – ELI Beamlines in the Czech Republic (near Prague) and ELI ALPS in Hungary (Szeged) – it employs a diverse team of experts from around the globe.

ELI Beamlines operates four advanced femtosecond laser systems, delivering unmatched intensities. These lasers drive unique X-ray and particle sources for groundbreaking research in physics, chemistry, materials, life sciences, and astrophysics.

ELI ALPS operates lasers and secondary sources to deliver ultrafast light pulses (including attosecond pulses) for pioneering research in physics, chemistry, materials and life sciences. Its advanced systems enable exploration of ultrafast electron dynamics and complex molecular processes.