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PRESS RELEASE

First high-order harmonic radiation at ELI-ALPS

The ELI-ALPS research facility reached a new milestone today evening with the generation of the very first high-order harmonics in noble gases with the use of the recently installed HR1 laser.

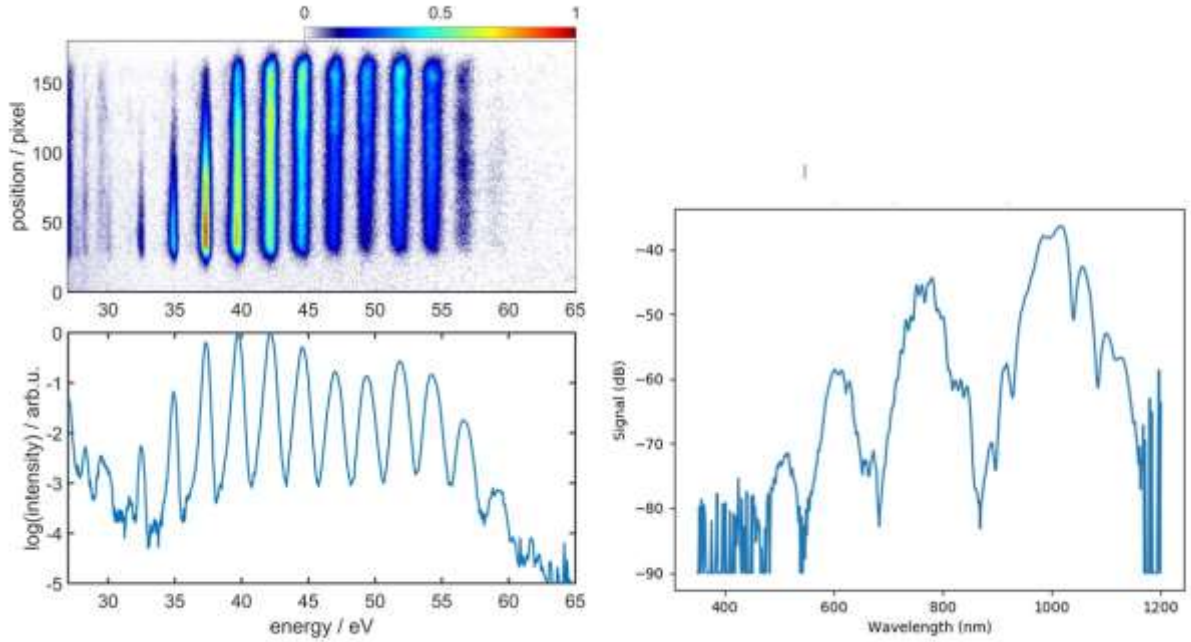
Extreme ultraviolet (XUV) light is generated by the highly nonlinear process of high-order harmonic generation, when intense, infrared laser pulses are focused in a gas jet of noble gas atoms. This radiation is emitted in the form of attosecond bursts of light which propagates collinearly with the infrared pulses.

The generated radiation can be characterized by means of an extreme ultraviolet spectrometer. The XUV radiation is typically emitted in multiple odd harmonics of the fundamental radiation as can be easily recognized in the figure (left-hand side), which shows the first ever extreme ultraviolet light generated at ELI-ALPS. This milestone is another, crucial step towards the full exploitation of the state-of-the-art technology available at ELI-ALPS, which will offer attosecond pulses with unprecedented characteristics in the months to come for the international community.

This milestone was reached in the framework of the first commissioning user experiment of ELI-ALPS, which is led by the group of Prof. Hans Jakob Wörner from ETH Zürich. His group installed a compact, portable attosecond beamline for the generation and characterization of the extreme ultraviolet pulses in combination with the HR1 laser system. The project and the contact to Prof. Wörner was initiated by ELI-ALPS Scientific Advisor Prof. Giuseppe Sansone. The Project Internal Contact team of the Research Institute in Szeged is led by Dr. Sergei Kühn, with the contribution of Dr. Peter Jojart and Dr. Mathieu Dumergue as physicists.

A further milstone, namely the generation of harmonics in crystals has been achieved at ELI-ALPS using the second recently installed laser system emitting in the Mid-IR part of

the spectrum. The first spectrum is shown in the figure (right-hand side). This is a first step within a collaborative project between ELI-ALPS and the FO.R.T.H. institution, aiming at the investigation of quantum mechanical aspects of the harmonic generation process, measuring photon statistics of the driving laser field after the generation. The project is bringing together two different research areas, those of strong field physics and quantum optics. It has been initiated by Dr. Paraskevas Tzallas, group leader at ELI-ALPS. In the project are particiapating Dr. Emmanuel Skantzakis researcher and Nikos Tsatrafyllis PhD. student (both from FO.R.T.H.), while further scientists from ELI-ALPS are Prof. Dimitris Charalambidis, Chief Scientific Advisor, Prof. Eric Cormier, advisor in MIR matters, Dr. Sergei Kühn, Dr. Subhendu Kahaly, Dr. Balint Kiss group leaders, and Dr. Mathieu Dumergue researcher. The theoretical support is provided by Dr. Sandor Varro.



Left-hand side: Extreme ultraviolet spectrum generated by the HR1 laser in Argon.
Right-hand side: High-order harmonic radiation generated in ZnSe by th Mid-IR laser

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The main object of ELI-ALPS (Extreme Light Infrastructure Attosecond Light Pulse Source) project is creating a unique European research center, providing the international research community with laser pulses and further sources based on them. The Szeged facility will stand out from the institutes producing the highest intensity laser pulses in the world with its highest repetition rate and shortest pulses. This facility is expected to lead to reaching outstanding results not only in the field of ultrafast physical processes but also in biological, medical and materials sciences.

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