

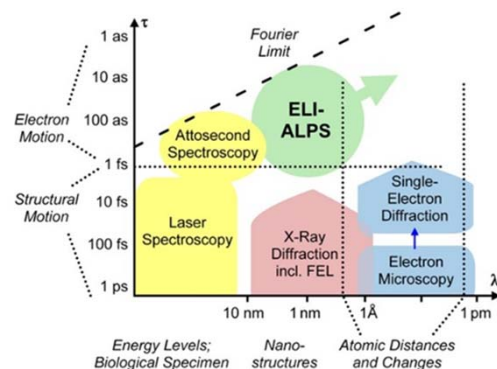
Physikalisches Kolloquium

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New opportunities for attosecond time-resolved experiments at the ELI-ALPS facility



The attosecond domain ($1\text{as}=10^{18}\text{ s}$) is the current frontier of time-resolved spectroscopy. This domain classically corresponds to the timescale of electronic motion within an atom, and in quantum mechanics, the attosecond timescale is the typical timescale on which dynamics of coherent superpositions of broadband electronic wave packets evolve in the core and valence shells.

The availability of trains and isolated attosecond pulses generated by high-order harmonic generation gives the possibility to excite, control and probe the dynamics of such wave packets. The application of these pulses in atoms, molecules and solids has shown that attosecond technology could give new opportunities in complementary fields, including the control and manipulation of electronic correlation in simple atoms, the observation of ultrafast charge dynamics in molecules and the processing of signal at unprecedented speed.

The technology required for the generation and application of attosecond pulses remains challenging, thus calling for the availability of laser facilities, which can offer user access and provide those expertises required for the implementation of pump-probe experiments with extreme time resolution on different targets. This would make possible a widespread application of attosecond technology to chemistry, biochemistry and material science.

The primary mission of the Extreme Light Infrastructure Attosecond Light Pulse Source (ELI-ALPS) facility in Szeged, Hungary is to provide the international scientific community with attosecond sources beyond the current state in terms of repetition rate, intensity and reliability. This will be realized by using novel primary laser sources having unprecedented characteristics in terms of average power, pulse duration and repetition rate.

In my talk, I will briefly summarize the unique characteristics of the ELI Project, and I will present a few examples of experiments that will be carried out in the upcoming years at ELI-ALPS.