Advanced Coherent Ultrafast Laser Pulse Stacking

From 2014-02-01 to 2019-01-31, closed project

Project details

| Total cost: | EUR 1 881 040 |
| Call for proposal: | ERC-2013-CoG See other projects for this call |
| EU contribution: | EUR 1 881 040 |
| Funding scheme: | ERC-CG - ERC Consolidator Grants |
| Coordinated in: | Germany |
| Topic(s): | ERC-CG-2013-PE2 - ERC Consolidator Grant - Fundamental Constituents of Matter |

Objective

"An important driver of scientific progress has always been the envisioning of applications far beyond existing technological capabilities. Such thinking creates new challenges for physicists, driven by the groundbreaking nature of the anticipated application. In the case of laser physics, one of these applications is laser wake-field particle acceleration and possible future uses thereof, such as in collider experiments, or for medical applications such as cancer treatment. To accelerate electrons and positrons to TeV-energies, a laser architecture is required that allows for the combination of high efficiency, Petawatt peak powers, and Megawatt average powers. Developing such a laser system would be a challenging task that might take decades of aggressive research, development, and, most important, revolutionary approaches and innovative ideas. The goal of the ACOPS project is to develop a compact, efficient, scalable, and cost-effective high-average and high-peak power ultra-short pulse laser concept.

The proposed approach to this goal relies on the spatially and temporally separated amplification of ultrashort laser pulses in waveguide structures, followed by coherent combination into a single train of pulses with increased average power and pulse energy. This combination can be realized through the coherent addition of the output beams of spatially separated amplifiers, combined with the pulse stacking of temporally separated pulses in passive enhancement cavities, employing a fast-switching element as cavity dumper.

Therefore, the three main tasks are the development of kW-class high-repetition-rate driving lasers, the investigation of non-steady state pulse enhancement in passive cavities, and the development of a suitable dumping element. If successful, the proposed concept would undoubtedly provide a tool that would allow researchers to surpass the current limits in high-field physics and accelerator science."

Related information

Report Summaries

Final Report Summary - ACOPS (Advanced Coherent Ultrafast Laser Pulse Stacking)

Mid-Term Report Summary - ACOPS (Advanced Coherent Ultrafast Laser Pulse Stacking)
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EU contribution: EUR 1 486 140

Activity type: Higher or Secondary Education Establishments

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To know more