AKBP 5: New Accelerator Concepts - Experimental Results

Time: Tuesday 9:30–10:30 Location: E 020

Group Report AKBP 5.1 Tue 9:30 E 020

Status and progress of the PWFA experiment FLASH-Forward — •Stephan Wesch[1], Judita Beinortait[1,2], Jonas Björklund Svensson[1], Lewis Boulton[1], Gregory Boyle[3], James Chappell[4], James Cowley[4], Severin Diederichs[1], Brian Foster[1,4], Matthew Garland[1], Pau González Caminal[1], Harry Jones[1], Advait Kanekar[1,6], Carl Lindstrøm[5], Gregor Loisch[1], Mathis Mewes[1], Jens Osterhoff[1,6], Felipe Peña[1,6], Angel Ferran Pousa[1], Siegfried Schreiber[1], Sarah Schröder[1], Rob Shalloo[1], Maxence Thévenet[1], Matthew Wing[1,2], Jonathan Wood[1], and Richard D'Arcy[1,4] — [1]Deutsches Elektronen-Synchrotro DESY, Hamburg, Germany — [2]University College London, United Kingdom — [3]James Cook University, Australia — [4]University of Oxford, United Kingdom — [5]University of Oslo, Norway — [6]Universität Hamburg, Germany

Experimental results in the last decades of beam-driven plasma-wakefield accelerators (PWFA) have demonstrated the feasibility of high-gradient acceleration and promise reduction of costs and sizes of future high-energy facilities. The requirements of current users of accelerators for luminosity and brightness cannot yet be met in terms of beam quality, high overall energy-transfer efficiency and operation at high-average-power. These are major research pillars which the PWFA experiment FLASHForward at DESY aims to combine in a single stage at acceleration gradients >1 GV/m with significant energy gain. Here, we present the status of the experiment and show latest results.

Group Report AKBP 5.2 Tue 10:00 E 020

Extended coherent nanophotonic electron acceleration — •Stefanie Kraus[1], Tomás Chlouba[1], Roy Shiloh[2], Leon Brückner[1], Julian Litzel[1], Zhexin Zhao[1], Manuel Konrad[1], and Peter Hommelhoff[1] — [1]Friedrich-Alexander-Universität (FAU), Erlangen, Germany — [2]Hebrew University, Jerusalem, Israel

Today's classical particle accelerators use radio-frequency metal cavities to accelerate and confine particles by synchronizing a microwave travelling wave with the particle propagation. We have shown the same principle, but in the optical domain and with dielectric materials. We demonstrate acceleration of electrons from 28.4 to 40.7 keV in a 0.5 mm long structure. Not only do we accelerate the electrons, but we also confine them with the help of the optical fields transversely utilising the alternating phase focussing scheme. This way, we can accelerate the electrons inside of a 250 nm narrow channel [1]. This could lead to a new type of accelerator that fits on a chip for applications in science, medicine, and industry.

[1] T. Chlouba*, R. Shiloh*, S. Kraus*, L. Brückner*, J. Litzel, P. Hommelhoff, Nature, 622, 476-480 (2023)