AKBP 5: Particle Sources

Time: Wednesday 11:00–12:30 Location: ZHG004

AKBP 5.1 Wed 11:00 ZHG004

Current Developments in a Hybrid Thermionic and Photoemission Electron Gun for ELSA — •Samuel Kronenberg, Klaus Desch, Philipp Hänisch, Dennis Proft, Yannick Schober, and Michael Switka — Physikalisches Institut der Universität Bonn

A novel electron gun is currently under development for the S-band Linac injector for ELSA. The goal of this enhancement is to realise a new single bunch injection mode in addition to the standard long pulse (multi bunch) mode along with a potential increase in emission current. A dual-mode design is being developed that utilises a caesium dispenser cathode both as a thermionic and a photo-cathode using thermally assisted photoemission. Initial measurements on dispenser cathodes were performed to verify the properties in this mode of operation. The current progress regarding gun design, as well as the development of a dedicated gun test stand will be presented.

AKBP 5.2 Wed 11:15 ZHG004

Spin-Polarized Electron Beams at the ELSA Accelerator Facility — •Axel Spreitzer, Klaus Desch, Dennis Proft, and Michael Switka — Physikalisches Institut der Universität Bonn

At the Electron Stretcher Facility (ELSA) in Bonn a spin-polarized electron beam is generated by irradiating a Strained-Layer Superlattice GaAs photocathode. The electron beam converted into a circularly polarized photon beam allows for double polarization hadron physics experiments. After being hibernated for several years, the polarized source is to be characterized and optimized to re-establish regular operation. Current efforts focus on the optimization of the source's laser and its beamline, as well as the investigation of the quantum efficiency of different photocathode crystals. Furthermore, in prospect of improving the overall system performance, plans include the optimization of the electron beamline and enhancing the electron polarization transfer efficiency. The current state of the polarized electron source setup is presented and discussed.

AKBP 5.3 Wed 11:30 ZHG004

Photocathode Research at Photo-CATCH* — •Maximilian Herbert, Joachim Enders, Markus Engart, Jonas Imhof, Maximilian Meier, Robin Petry, Julian Schulze, Vincent Wende, and Victor Winter — Institut für Kernphysik, Fachbereich Physik, Technische Universität Darmstadt, Darmstadt, Germany

TU Darmstadt's test stand for Photo-Cathode Activation, Testing and Cleaning using atomic-Hydrogen Photo-CATCH faciliates dedicated research on GaAs photocathodes for electron-beam production at accelerators. This contribution will give an overview of recent, ongoing and planned projects at Photo-CATCH, e.g., on automatized activations [1] and Li-enhanced surface layers for increased photocathode lifetime [2,3].

[1] M. Herbert et al., PoS(PSTP2022), Vol. 433, p. 003 (2023).
[2] N. Kurichiyanil et al., J. Instrum. 14 (8), P08025 (2019).
[3] M. Herbert et al., Phys. Rev. Accel. Beams, in press.

*Work supported by DFG (GRK 2128 "AccelencE", project number 264883531)

AKBP 5.4 Wed 11:45 ZHG004

Studie zur Nutzung einer Lanthanhexaborid-Kathode als thermionische Elektronenquelle des S-DALINAC* — •Benjamin Thormann, Michaela Arnold, Lars Jürgensen und Norbert Pietralla — Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, Deutschland

Der Elektronenbeschleuniger S-DALINAC verwendet aktuell ein Wolfram-Filament als thermionische Elektronenquelle. Hinsichtlich der ausgezeichneten Strahlqualität, die mittels LaB_6-Kathoden in Elektronenmikroskopen erreicht wird, wurde untersucht, ob die Elektronenquelle des S-DALINAC durch den Einsatz dieser Kathoden verbessert werden kann. Dazu wurde die Elektronenquelle mit LaB_6-Kathode in CST Studio simuliert und mit einer Simulation des aktuellen Aufbaus verglichen. Dieser Vortrag gibt einen Überblick über die Studie. Ihre Ergebnisse werden diskutiert.

*Unterstützt durch DFG (GRK 2128, IRTG 2891) und das Land Hessen (Research Cluster ELEMENTS (Project ID 500/10.006)).

AKBP 5.5 Wed 12:00 ZHG004

Positron Source at Future Linear Collider Designs (ILC, HALHF, CLIC) — •Gudrid Moortgat-Pick[1,2], Sabine Riemann[3], Peter Sievers[4], Gregor Loisch[2], Carmen Tenholt[2], Tim Lengler[5], Dieter Lott[5], Niclas Hamann[1,2], and Manuel Formela[1,2] — [1]University of Hamburg, Hamburg, Germany — [2]DESY, Hamburg, Germany — [3]DESY, Zeuthen, Germany — [4]CERN, Geneva, Switzerland — [5]Helmholtz Zentrum Hereon, Geesthacht

Positron Sources for high luminosity high-energy colliders with at least a cms of 500 GeV are a challenge for all future lepton colliders as, for instance, the International Linear Collider (ILC), Compact Linear Collider (CLIC) as well as new concepts as the HALHF collider design. In the talk new R&D developments for the undulator-based positron source are discussed. The talk includes physics requirements, target material tests, current prototypes for optic matching devices as pulsed solenoid as well as plasma lenses. The applicability of the undulator-based positron source in order to provide polarized positrons for all three collider designs is discussed.

AKBP 5.6 Wed 12:15 ZHG004

Results Of Longevity Measurements Of A Prototype Plasma Lens For Positron Matching — •Niclas Hamann[1], Manuel Formela[1], Gregor Loisch[2], Gudrid Moortgat-Pick[1,2], Kai Ludwig[2], Stephan Wesch[2], and Jonathan Wood[2] — [1]Uni Hamburg — [2]DESY Hamburg

The pursuit of novel technologies in the dynamic landscape of scientific exploration has driven the investigation of plasma lensing as a promising solution for optical matching at future positron sources. This research gains importance as emerging scientific objectives call for innovative approaches to advance experimental capabilities. Our initial experiments uncovered instabilities within the plasma and a significant level of copper sputtering at the electrodes. This presentation will explore these findings in detail and will also present the results of longevity tests conducted across various pressure regions and for two different materials.