AKBP 8: Diagnostics

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

AKBP 8.1 Thu 11:00 ZHG004

Terahertz Streaking Detection for Longitudinal Bunch Diagnostics at FLUTE — •Matthias Nabinger[1], Michael Nasse[1], Erik Bründermann[1], Matthias Fuchs[1], Anke-Susanne Müller[1], Marvin Noll[1], Johannes Steinmann[1], Jens Schäfer[1], Thiemo Schmelzer[1], Robert Ruprecht[1], Nigel Smale[1], Micha Dehler[3], Rasmus Ischebeck[3], Matthias Moser[3], Volker Schlott[3], Thomas Feurer[4], Zoltan Ollmann[4], Sergei Glukhov[2], Oliver Boine-Frankenheim[2], Mozghan Hayati[4], and Marcel Schuh[1] — [1]KIT, Karlsruhe, Deutschland — [2]TU Darmstadt, Darmstadt, Deutschland — [3]PSI, Villingen, Schweiz — [4]Universität Bern, Bern, Schweiz

The Karlsruhe Institute of Technology is currently exploring a compact method of longitudinal electron bunch diagnostics with femtosecond resolution that has recently been demonstrated for other parameter ranges. The experimental setup utilizes a THz-based streaking approach with resonator structures, achieving both high compactness and efficiency. In this contribution, we report on the experimental observation of streaking signals with our Compact Transverse Deflecting System, which has been successfully tested using two different resonators, an Inverse Split-Ring Resonator and a Tilted-Slit-Resonator.

AKBP 8.2 Thu 11:15 ZHG004

Time-resolved measurements of transverse beam excitation in an electron storage ring — •Marvin Noll, Johannes Steinmann, Erik Brründermann, Erhard Huttel, and Meghana Patil — KIT-IBPT

In the Karlsruhe Research Accelerator (KARA), electron beams of up to 200 mA are stored with an energy of 2.5 GeV, while injection is performed at 500 MeV. At the injection energy, the beam life time and the injection efficiency depend largely on Touschek and/or intrabeam scattering. As a counter measure, the beam size can be enlarged transversally by an exciting modulation, e.g., applied via a strip-line.

Here, we examine different excitation strategies and their effects on beam size and the beam orbit. The ultra-fast line camera KALYPSO is used to measure the transverse beam profile from the emitted synchrotron radiation on a turn-by-turn basis.

AKBP 8.3 Thu 11:30 ZHG004

Upgrade of the RF Readout Electronics of the Cavity Beam Position Monitors at the S-DALINAC* — •Valentin Reichenbach, Michaela Arnold, Uwe Bonnes, Manuel Dutine, Ruben Grewe, Lars Jürgensen, Norbert Pietralla, Dominic Schneider, and Felix Schliessmann — Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, Germany

At the electron accelerator S-DALINAC, cavity BPMs are used for high-precision non-destructive beam parameter measurements. The preexisting RF readout boards have a limited dynamic range. Hence, the existing electronics cannot be used for both low beam current applications (e.g. tuning) and high current experiments without manual adjustments. A new generation of RF boards with a significantly improved dynamic range have been developed in-house, leading to an extensive upgrade of the RF electronics at the S-DALINAC. Within this contribution, the implementation of the new cavity BPM electronics including performance measurements will be presented.

*Work supported by the State of Hesse within the Research Cluster Project ELEMENTS (Project ID 500/10.006) and by DFG (GRK 2128 AccelencE).

AKBP 8.4 Thu 11:45 ZHG004

High-Resolution Longitudinal Beam Diagnostics with a Fast Faraday Cup at the UNILAC Accelerator — •Nimue Schmidt[1,2], Maksym Miski-Oglu[1], Rahul Singh[1], and Winfried Barth[1,3,4] — [1]GSI, Darmstadt, Deutschland — [2]TU, Darmstadt, Deutschland — [3]HIM, Mainz, Deutschland — [4]JGU, Mainz, Deutschland

At the heavy ion accelerator UNILAC at GSI Helmholtz Center for Heavy Ion Research in Darmstadt, measurements were carried out with a Fast Faraday Cup (FFC) in order to precisely measure the time structure of the particle beam. The FFC offers a highly accurate time-resolved recording of the charge distribution along the longitudinal beam profile. The data obtained in combination with a dipole magnet is used to determine the longitudinal phase space and emittance of the beam. After analyzing the measurement results, the method is integrated into the regular beam diagnostics to ensure continuous monitoring and control of the particle beam during operation. Measurement procedure and results are presented.

AKBP 8.5 Thu 12:00 ZHG004

Stabilization of Transverse Beam Parameters for Future Electron-Induced Fission Experiments at the S-DALINAC* — •Dominic Schneider, Michaela Arnold, Jonny Birkhan, Uwe Bonnes, Adrian Brauch, Manuel Dutine, Ruben Grewe, Bastian Hessbacher, Lars Jürgensen, Igor Jurosevic, Norbert Pietralla, Tim Ramaker, Maximilian Resch, Felix Schliessmann, and Gerhart Steinhilber — Institut für Kernphysik, TU Darmstadt

Research on electron-induced fission reactions of transuranium actinides is in preparation at the S-DALINAC. The intended small target sizes require a limitation of transverse displacement of the electron beam due to drifts and distortions to below 200 μm. Three systems have been developed, implemented and interconnected to monitor and improve the transverse beam stability: (i) A beam position monitoring system based on high-speed cameras provides transverse beam parameters with micrometer resolution at a kilohertz rate. (ii) A newly designed compensator device mitigates longitudinal and transversal perturbations from the mains frequency on the electron beam. (iii) Lastly, an active beam-stabilization system ensures high beam stability at the intended interaction point of the electron beam and the fission target. A brief overview of the design and implementation of these systems as well as performance measurements will be presented in this contribution. *Work supported by State of Hesse within the Research Cluster Project ELEMENTS (Project ID 500/10.006) and DFG (GRK 2128 AccelencE).

AKBP 8.6 Thu 12:15 ZHG004

Precise Beam Position Characterization for MESA using ALICE Stripline BPM. — •Robin Wolf — Johannes Gutenberg Universität Mainz

In order to ensure precise beam positioning and stability, the MESA accelerator relies on accurate and fast beam position measurements. This study focuses on adapting the ALICE stripline beam position monitor (BPM) for MESA's beam diagnostics. Originating from the ALICE accelerator, which operates at 1.3 GHz, this BPM aligns well with MESA*s frequency.

Initial laboratory testing demonstrated the functional reliability of the BPM, laying the foundation for practical applications. Subsequent deployment in the Mainz Microtron (MAMI) beamline allowed for further evaluation, despite MAMI*s higher operating frequency of 2.45 GHz. By employing a broadband stripline and fast oscilloscope, the ALICE BPM captured time-resolved images of MAMI bunches, providing the first successful diagnostics of this kind. However, observed non-linearities in position data highlighted the need for deeper analysis.

This talk will present the performance outcomes of the ALICE stripline BPM, addressing challenges such as non-linearities, while showcasing its potential for rapid and precise measurements under diverse operational conditions.