AKBP 10: Instrumentation I

Time: Wednesday 17:30–19:00 Location: CHE/0183

AKBP 10.1 Wed 17:30 CHE/0183

Development of a Thermal Conduction Instrument for Niobium at Cryogenic Temperatures — •Cem Saribal, Mark Wenskat, Cornelius Martens, Isabel Gonzáles Díaz-Palacio, and Wolfgang Hillert — Department of Physics, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany

Particle accelerators form an important tool in a variety of research fields including particle physics, material science, chemistry and medicine. In an effort to reduce operation costs while maintaining high energies, their accelerating structures, so-called superconducting radio-frequency (SRF) cavities, are steadily improved towards higher accelerating fields and lower RF losses. Stable operation of such a cavity generally requires Joule heating, generated in its walls, to be conducted to an outer helium bath. Therefore, it is of interest to experimentally evaluate how present and future cavity treatments affect thermal characteristics. We present an instrument for measuring the thermal performance of SRF cavity materials at cryogenic temperatures. Pairs of niobium disks are placed inside of a liquid helium bath and a temperature gradient is generated across them to obtain thermal transmission conductivity for temperatures ranging from 2 Kelvin to 4 Kelvin. To get an idea of the instrument's sensitivity and how standard cavity treatments influence thermal conductivity, samples are tested post fabrication, polishing and 800 degrees baking. These first tests serve as a baseline to study and evaluate new and promising cavity treatments such as ALD-coatings.

AKBP 10.2 Wed 17:45 CHE/0183

Status of the 5 MeV Mott polarimeter design for the MESA — •Rakshya Thapa — Institut für Kernphysik, Mainz, Germany

A high intensity polarised beam has to be delivered to the P2 experiment at Mainz Energy Recovering Superconducting Accelerator Facility (MESA). The absolute error of the beam polarisation should be $\leq$1%. To track the polarisation, a Mott polarimeter will be installed after the pre-acceleration of the polarised beam to 5 MeV energy and measurements will be done in quasi-online mode with beam current $\approx$150 μA at $\leq$1% precision. For that, the polarimeter scattering chamber and its assembly in the beam line is being designed which will be reported.

AKBP 10.3 Wed 18:00 CHE/0183

Teaching an old magnet new tricks — •Tasha Spohr — Helmholtz-Zentrum Berlin — Humboldt-Universität zu Berlin

For beam dynamics studies in the SeaLab SRF photoinjector, a dipole spectrometer built in 1993 and recycled from a decommissioned ion beamline was installed.

With this spectrometer, the beam energy and energy spread can be measured. The photoelectron beam will be bend by 60deg to a viewscreen in the dispersive section. For a precision energy analysis based on the beam size measurement at the viewscreen, it is necessary to know the beam transfer matrix of the dipole, as well as the relationship between magnetic field and coil current in the plane of all possible trajectories.

With this information about the dipole magnet, the transformation matrix of the beamline was determined and now can be applied for a large range of energy measurements.

AKBP 10.4 Wed 18:15 CHE/0183

Design and set-up of a spectrometer for the electro-optical far-field setup to monitor the CSR at KARA — •Ling Leander Grimm[1], Gudrun Niehues[2], Christina Widmann[2], Johannes Leonhard Steinmann[2], Micha Reissig[2], Erik Bründermann[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe — [2]IBPT, KIT, Karlsruhe

At the KIT storage ring KARA (Karlsruhe Research Accelerator), a new system to monitor the emitted coherent synchrotron radiation (CSR) is under commissioning aiming for single-shot measurements. The electro-optical (EO) far-field setup measures the time profile of the CSR employing electro-optical spectral decoding (EOSD). To achieve a sub-picosecond resolution for single-shot measurements, a high signal-to-noise ratio is crucial. Therefore, a spectrometer setup for balanced detection is developed. The ultra-fast line camera KALYPSO (KArlsruhe Linear arraY detector for MHz-rePetition rate SpectrOscopy) will be installed as a detector. This contribution discusses the development and setup of the spectrometer, including optics simulations and first experiments.

AKBP 10.5 Wed 18:30 CHE/0183

Low Gain Avalanche Detectors for beam monitoring — •Vadym Kedych[1], Wilhelm Krueger[1], Adrian Rost[4], Jerzy Pietraszko[2], Tetyana Galatyuk[1,2], Sergey Linev[2], Jan Michel[3], Michael Traxler[2], Michael Traeger[2], Christian Joachim Schmidt[2], and Felix Ulrich-Pur[2] — [1]Technische Universität Darmstadt, Darmstadt, Germany — [2]GSI GmbH, Darmstadt, Germany — [3]Goethe-Universität, Frankfurt, Germany — [4]FAIR GmbH, Darmstadt, Germany

The S-DALINAC at TU Darmstadt is a 3 GHz electron accelerator that allows the possibility to operate it in an energy recovery LINAC (ERL) mode. The multi-turn ERL operation mode was demonstrated in 2021. During the operation in this mode once accelerated and once decelerated beams share the same beamline which leads to the repetitive bunch rate of 6 GHz. A non-destructive beam monitoring tool is important for the simultaneous position measurement of both beams. For these purposes a setup based on Low Gain Avalanche Detectors (LGADs) is being developed for the beam time structure monitoring. LGADs are silicon detectors optimized for 4D-tracking with timing precision below 50 ps thanks to an internal charge amplification mechanism which makes it an ideal candidate for precise timing monitoring at S-DALINAC.

**This work has been supported by DFG under GRK 2128.*

AKBP 10.6 Wed 18:45 CHE/0183

Split-ring resonator experiments and data analysis at FLUTE — •Jens Schäfer, Matthias Nabinger, Michael J. Nasse, Robert Ruprecht, Thiemo Schmelzer, Nigel Smale, Bastian Härer, and Anke-Susanne Müller — IBPT, KIT, Karlsruhe

FLUTE (Ferninfrarot Linac- Und Test-Experiment) is a compact linac-based test facility for accelerator and diagnostics R&D located at the Karlsruher Institute of Technology (KIT). A new accelerator diagnostics tool, called the split-ring resonator (SRR), was tested at FLUTE, which aims at measuring the longitudinal bunch profile of fs-scale electron bunches. Laser-generated THz radiation is used to excite a high frequency oscillating electromagnetic field in the SRR. Electrons passing through the 20 *m x 20 *m SRR gap are time-dependently deflected in the vertical plane, leading to a vertical streaking of the electron bunch. During the commissioning of the SRR at FLUTE, large series of streaking attempts with varying machine parameters and set-ups were investigated in an automatized way. The recorded beam screen images during this experiment have been analyzed and evaluated. This contribution motivates and presents the automatized experiment and discusses the data analysis.