BE 8: Diagnostics and Instrumentation III

Time: Wednesday 9:30–12:15 Location: ZEU 255

BE 8.1 Wed 9:30 ZEU 255

Commissioning of the low-energy electron scraper system for the S-DALINAC injector* — •Lars Jürgensen, Christoph Burandt, Florian Hug, and Norbert Pietralla — Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany

The S-DALINAC is the superconducting linear accelerator of the Institut für Kernphysik at Technische Universität Darmstadt. It delivers an electron beam with energies up to 130 MeV. In order to improve the energy spread and the energy stability of the beam for further acceleration a new scrapersystem has been developed and installed between the 10 MeV injector and the main linac. The system was designed to ensure an energy spread of $\Delta E/\mathrm{E} \leq 10^{-3}$. After installation several tests have taken place, the results will be presented in this talk.

*Work supported by DFG through SFB 634

BE 8.2 Wed 9:45 ZEU 255

Installation and test of a beam monitor for non-destructive phase and amplitude measurements at the S-DALINAC* — •Maximilian Herbert, Thore Bahlo, Christoph Burandt, Patrick Nonn, Florian Hug, and Norbert Pietralla — Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany

The S-DALINAC is a superconducting linear electron accelerator providing electron beams with kinetic energies of up to 130 MeV. For nondestructive measurements of phase and amplitude of the beam, a beam monitor has been developed. The underlying model for the design of the monitor is a pillbox cavity. Its geometric dimensions have been configured to match the accelerator frequency of 3 GHz using CST Particle Studio and additional mechanical adjustments after construction. In the course of developing the beam monitor, a testing setup has been designed and constructed in order to simulate an electron beam with a desired frequency and beam current. This makes it possible to perform tests of a beam monitor before its installation. We will present the parameters of the monitor, the results of the test setup and first measurements with beam.

*Work supported by DFG through SFB 634

BE 8.3 Wed 10:00 ZEU 255

Set up of a beam diagnostic system for the S-DALINAC based on rf monitors* — •Jan Hauke Hanten, Thore Bahlo, Christoph Burandt, Maximilian Herbert, Florian Hug, Patrick Nonn, Norbert Pietralla, and Thomas Schösser — Institut für Kernphysik, TU-Darmstadt, Schlossgartenstr. 9, 64289 Darmstadt

At the superconducting electron accelerator S-DALINAC a system of rf monitors is used for beam current, phase and longitudinal dispersion measurements as well as for stabilization of the beam through feedback to the rf control system. In this work we will present the setup of a newly developed electronic read out system based on FPGA boards, which allows to perform measurements on all monitors simultanously. In addition we will present the integration in the EPICS based control system of the S-DALINAC and first results from measurements on electron beam.

*funded by the DFG through SFB 634

BE 8.4 Wed 10:15 ZEU 255

In-situ quality factor measurement of the S-DALINAC* superconducting cavities — •Ruben Grewe, Christoph Burandt, Florian Hug, Thorsten Kürzeder, Patrick Nonn, and Norbert Pietralla — Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany

The S-DALINAC is a recirculating superconducting linear electron accelerator designed for beam energies of up to 130 MeV. For the main acceleration it uses ten 20-cell niobium cavities which are cooled in a liquid helium bath at 2 K. While operational experience showed that the design electric field gradient of 5 MV/m can be reached and exceeded, it was found that the quality factor is three or more times worse than the design value of $3 \cdot 10^9$. This results in more power being dissipated into the liquid helium bath which limits the electric field gradient for CW operation.

For a better analysis it is necessary to observe the long term change of the quality factor of the cavities in the accelerator cryostats. The system presented is going to use the rf control system developed at the S-DALINAC to obtain the quality factors with decay time measurements.

*Work supported by DFG through SFB 634

BE 8.5 Wed 10:30 ZEU 255

Development of a 130 MeV Møller-Polarimeter at the S-DALINAC* — •Thore Bahlo[1], Christian Eckardt[1], Joachim Enders[1], Florian Hug[1], Norbert Pietralla[1], and Oliver Haas[2] — [1]Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

The Superconducting Darmstadt Linear Accelerator (S-DALINAC) can be used to accelerate polarized electron beams which are produced by the S-DALINAC Polarized injector (SPIN). In order to measure the polarisation of the electrons several devices along the beamline, like a low-energy Mott polarimeter and a Compton transmission polarimeter have already been installed and successfully tested.

For kinetic energies of more than 50 MeV these types of polarimeters are not applicable. Therefore a new high energy Møller-Polarimeter has been developed. In this talk we will present the design of the used dipole magnet and the layout of the polarimeter with respect to the strongly limited available space.

*Work supported by DFG through SFB 634 and by the state of Hesse through the LOEWE center HIC for FAIR.

BE 8.6 Wed 10:45 ZEU 255

Non-Invasive Beam Diagnostics for High-Intensity Electron Beams — •Timo Stengler — Helmholtz-Institut Mainz

For high intensity electron machines e.g. magnetized electron cooling devices or energy recovering linacs non-invasive beam diagnostic devices are needed. Therefore a system based on beam induced ?uorescence (BIF) and a system on Thomson scattering was installed at the 100keV electron source test setup at the Mainzer Mikrotron (MAMI). A major concern in these devices is the signal to noise ratio. To improve this ratio dedicated studies on the background are in progress.

15 min. break

BE 8.7 Wed 11:15 ZEU 255

A highly sensitive cavity-based Schottky sensor for the Collector Ring at FAIR — •Matthias Hansli[1], Andreas Penirschke[1], Rolf Jakoby[1], Peter Hülsmann[2], and Wolfgang Kaufmann[2] — [1]IMP, TU Darmstadt, Darmstadt, Germany — [2]GSI, Darmstadt, Germany

A Schottky Cavity Sensor is poposed for the Collector Ring at FAIR, a dedicated storage ring for secondary particles, rare isotopes, and antiprotons. The Sensor consists of a pillbox cavity with attached waveguide filters utilizing the TM_{010}-mode at 200 MHz for longitudinal and the TM_{110}-mode at 330 MHz for transversal Schottky measurements. Separated coupling structures are used for mode-selective coupling to measure longitudinal and transversal Schottky spectra independently. To allow for non-hermetic adjustable coupling and tuning devices as well as waveguide structures, a ceramic vacuum shielding inside the pillbox is introduced. Simulation investigating the influence of the ceramic and the coupling are shown. Measurements of a scaled demonstrator are compared to the simulations.

BE 8.8 Wed 11:30 ZEU 255

Digitizing video signals for the EPICS-based accelerator control system of the S-DALINAC* — •Thomas Schösser, Jonny Birkhahn, Christoph Burandt, Florian Hug, Patrick Nonn, and Norbert Pietralla — Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany

The Superconducting Darmstadt Linear electron Accelerator S-DALINAC provides electron beams for experiments in the field of nuclear structure physics.

Beam diagnostics is mainly based on beryllium oxide targets which are observed by analog CCD cameras. A video multiplexer allows to send up to eight video signals to the control room. To gain further flexibility, digitizing of the video signals and integration into the EPICS based accelerator control system is being worked on. This will also allow for automatic image processing which is crucial for future plans for computer supported beam commissioning procedures.

*Work supported by DFG through SFB 634

BE 8.9 Wed 11:45 ZEU 255

The Accelerator Control System of the S-DALINAC*

— Michaela Arnold, Thore Bahlo, •Jonny Birkhan, Uwe Bonnes, Christoph Burandt, Florian Hug, Thorsten Kuerzeder, Patrick Nonn, Thomas Schoesser und Norbert Pietralla — Institut fuer Kernphysik, TU Darmstadt

The Superconducting Darmstadt Linear electron Accelerator (S-DALINAC) provides beam energies between 2 MeV and 130 MeV and beam currents up to 20 μA. About 5 years ago the low-level radio frequency control system was replaced by a new digital one, which could be supported best by an EPICS-based control system [1]. This has been the origin for a complete migration to EPICS, which is still in progress. A custom Controller Area Network (CAN) bus device support has been developed for in-house made hardware, which is compatible with EPICS. Also the EPICS stream device support is used for commercial serial communication interfaces. Graphical User Interfaces (GUI) are created with CSS [2], which allows to develop a S-DALINAC specific GUI. Current projects are focused on rotary knob boards for controlling magnet power supplies, digitalization of analog video signals for beam monitoring, alarm handling, and optimization of the data archiver. These projects will be introduced in this talk.

[1] Experimental Physics and Industrial Control System, http://www.aps.anl.gov/epcis/

[2] Control System Studio, http://controlsystemstudio.github.io/

*Work supported by DFG through SFB 634

BE 8.10 Wed 12:00 ZEU 255

Experimental results from the characterization of diamond particle detectors with a high intensity electron beam.

— •Oliver Stein[1], Florian Burkart[1], Daniel Wollmann[1], and Erich Griesmayer[2] — [1]CERN, Geneva, Switzerland — [2]CIVIDEC Instrumentation, Wien, Austria

The detection of ultra-fast beam losses and the understanding of the underlying loss mechanisms is essential for improving the protection routines of the LHC and its pre-accelerator complex for future running periods.

With the diamond particle detectors, which are already installed in the LHC tunnel, it has been shown that these detectors can resolve beam losses bunch-by-bunch with a wide dynamic range. The recorded data lead to a better understanding of different fast particle loss mechanisms.

To fully exploit the potential of the diamond detectors, they were characterized with electron beams of different particle multiplicities with intensities up to 10^{10} electrons per shot. The goal of these measurements was to determine the efficiency and the detectors response function.

In this talk the actual status of the measurements and the results of the detector characterization will be presented.