AKBP 5: Radiofrequency and Miscellaneous

Time: Tuesday 16:30–18:00 Location: AKBPb

AKBP 5.1 Tue 16:30 AKBPb

FAIR phase 0 - laser cooling at the SIS100 — •Sebastian Klammes[1,2], Michael Bussmann[6], Volker Hannen[3], Daniel Kiefer[2], Thomas Kühl[1,5], Benedikt Langfeld[2], Xinwen Ma[4], Ulrich Schramm[6,7], Mathias Siebold[6], Peter Spiller[1], Thomas Stöhlker[1,5,8], Ken Ueberholz[3], Thomas Walther[2], and Danyal Winters[1] — [1]GSI Darmstadt — [2]TU Darmstadt — [3]Uni Münster — [4]IMP Lanzhou — [5]HI Jena — [6]HZDR Dresden — [7]TU Dresden — [8]Uni-Jena

The heavy-ion synchrotron SIS100 is the core element of the Facility for Antiproton and Ion Research (FAIR) and will store, accelerate, and deliver ion beams of highest intensity and energy to experiments. Especially for precision experiments, such as laser and X-ray spectroscopy, ion beams with a high brilliance are indispensable. To generate such ion beams, laser cooling has proven to be a powerful technique at relativistic energies. Furthermore, laser cooling will be the only cooling method to reduce the emittance and the relative longitudinal momentum spread of bunched heavy-ion beams at the SIS100 after acceleration at final energy. We will report on the status of the project and will present our plans for FAIR phase 0 - laser cooling at the SIS100.

AKBP 5.2 Tue 16:45 AKBPb

Multibunch spin manipulation for the deuteron EDM measurement in storage rings — •Jamal Slim for the JEDI-Collaboration — III. Phys. Inst. B., RWTH Aachen, Aachen, Germany

The JEDI collaboration aims to perform a direct measurement of the electric dipole moment (EDM) of deuterons at the Cooler Synchrotron (COSY).

Along with many milestones achieved so far, one of the first ever new devices, developed and commissioned at COSY, and to be used as a spin rotator in the EDM experiment, is an RF Wien filter. The rate of resonant rotation of the in plane precessing spin to the vertical one is a signal used to determine the EDM. In order to retain the resonance condition, one needs a continuous monitoring the of the precessing horizontal polarization which is impossible for polarizations close to the vertical one. We adopted an unconventional multibunch solution to this dilemma.

Two bunches that simultaneously orbit in COSY will be used in the experiment, where the RF Wien filter is gated out for one bunch. A spin of this gated-out bunch shall remain in the ring plane and its precession frequency will be measured by the JEDI technique. Consequently, it will serve as a co-magnetometer for the second bunch the spin of which will be subjected to the RF Wien filter driven rotation at exactly the parametric spin resonance frequency. We report the results of the first ever experimental test of this new approach to a continuous co-magnetometry for the RF resonance spin rotations in storage rings.

AKBP 5.3 Tue 17:00 AKBPb

Calibration Device for Second Sound Quench Detection — •Lukas Ebeling[1,2], Wolfgang Hillert[2], and Lea Steder[1] — [1]DESY, Hamburg, Germany — [2]Universität Hamburg, Germany

An important part of superconducting radio frequency cavity R&D is quench detection since the breakdown of the superconductivity limits the cavity performance. Although a detection based on second sound waves propagating in liquid helium is widely used, estimating its accuracy is difficult and only few studies dealing with systematic uncertainties exist. Particularly helpful for this task is the artificial generation of second sound signals using a calibration device. Therefore, the already existing second sound system at the cavity test facility of DESY is extended by calibration device prototypes.

This talk will show that ohmic resistors can play a crucial role in the construction of such a tool. Heated by means of short electrical pulses, these resistors generate a second sound wave, which can be detected even within larger cryostats using noise cancelling algorithms and the existing reconstruction software. With a calibration device at hand, the influences of sensor positioning and quench location are investigated. This presentation will also address the observed offset in second sound propagation time caused by the resistor's inertia.

AKBP 5.4 Tue 17:15 AKBPb

Goubau-Line Set Up for Measureing Impedance of Vacuum Chamber Components — •Paul Volz[1] and Atoosa Meseck[1,2] — [1]Helmholtz-Zentrum Berlin — [2]Johannes Gutenberg Universität Mainz

Currently, the worldwide first in-vacuum elliptical undulator, IVUE32, is being developed at Helmholtz Zentrum Berlin. The 2.5 m long insertion device with a period length of 3.2 cm and a minimum gap of about 7 mm is to be installed in the BESSY II storage ring. It will deliver radiation in the soft X-ray range for several beam lines. The proximity of the undulator structure to the particle beam makes the device susceptible to wake field effects which can in turn influence beam stability. Therefore, such a device requires a complete understanding of its impedance characteristics prior to installation and operations, as unforeseen heating of components could have catastrophic consequences. Since the complex structure of the device makes numerical calculations, such as CST simulations, at high frequency very resource intensive, bench testing the device may proof invaluable. A Goubau line is a single wire transmission line for high frequency surface waves. The transverse electric field of a Goubau line resembles that of a charged particle beam out to a certain radial distance. This can be used to mimic a particle beam and measure the impedance of vacuum chamber components outside of the accelerator. This presentation will characterize and discuss such a testing set up optimized for bench testing IVUE32-components.

AKBP 5.5 Tue 17:30 AKBPb

Status of the deflecting cavity development as a beam separator for ELBE — •Gowrishankar Hallilingaiah[1], Andre Arnold[2], Peter Michel[1,2], and Ursula van Rienen[1,3] — [1]University of Rostock, Rostock — [2]Helmholtz-Zentrum Dresden-Rossendorf, Dresden — [3]Department of Life, Light and Matter, University of Rostock

The current beamline setup at ELBE tends to a single user experiment at any given time. Further, not all the user experiments utilize the full 13 MHz CW beam capacity. Therefore beam separator is being developed to maximize the beam usage which would distribute the beam simultaneously to different user experiments. A review of deflecting structure designs which can be adapted as a beam separator was carried out. Consequently, radiofrequency cavity was chosen, as they produce stable deflection at MHz range. Subsequently, a comparative study was carried out on the potential deflecting cavity designs, and in-turn, a new normal conducting double quarter wave cavity design was selected. Furthermore, fundamental power coupler and frequency tuners were designed. Finally, multiphysics simulations were carried out to aid in cavity fabrication, ascertain the adequacy of cooling, and to estimate the frequency drift during operation. Subsequently, the copper cavity parts were machined and the frequency pre-tuning was performed before the final vacuum brazing. To verify the field profile and figure of merit, bead-pull experiment was performed. Currently, high power testing is under progress. This research work is funded by Helmholtz-Zentrum Dresden-Rossendorf under the project TRACE.

AKBP 5.6 Tue 17:45 AKBPb

Development of a new B-Mapping System for SRF Cavity Vertical Tests — •Jonas Christian Wolff[1,2], Wolfgang Hillert[1,2], Detlef Reschke[1], and Lea Steder[1] — [1]Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, 22607 Hamburg — [2]Universität Hamburg - Institut für Experimentalphysik, Luruper Chaussee 149, 22761 Hamburg

Magnetic flux trapped in the bulk material (Niobium) of superconducting radio frequency (SRF) cavities degrades their quality factor and the accelerating gradient. Here, the sensitivity of the surface resistance to trapped magnetic flux is mainly determined by the cavity geometry and the Niobium grain size. To potentially improve the flux expulsion characteristics and hence the efficiency of future accelerator facilities further studies of the trapping behavior are essential. For this purpose a so-called "B-Mapping System" to monitor the magnetic flux along the outer cavity surface of SRF 1.3 GHz TESLA-Type single-cell cavities is currently under development at DESY. Contrary to former approaches e.g. at Helmholtz-Zentrum Berlin (HZB), this system digitizes the sensor signals already inside of the cryostat to extensively reduce the number of required cable feedthroughs. Furthermore, the signal-to-noise ratio (SNR) and consequently the measuring sensitivity

can be enhanced by shorter analog signal lines, less thermal noise and the Mu-metal shielding of the cryostat. In this contribution the design, the development process as well as first performance test results of the system are presented.