AKBP 14: Posters

Time: Thursday 16:00–17:30 Location: P

AKBP 14.1 Thu 16:00 P

A miniature transport-line design for laser plasma accelerator-driven FELs using HTS magnets — •Samira Fatehi, Axel Bernhard, and Anke-Susanne Müller — Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

Laser-plasma acceleration is an outstanding candidate to drive the next-generation compact light sources and FELs. Due to extremely high accelerating gradients in LPAs, electron bunches can gain sufficient energies to generate synchrotron radiation in the X-ray regime in only a few millimetres to centimeters of acceleration length. To efficiently capture and transport the LPA-generated bunches in a compact transport line, beam line designs employing combined-function high-strength magnets based on high temperature superconductor technology have been studied. In this contribution we present the beam dynamics calculations as well as the magnet designs for a compact transport line matching the LPA-generated beam to a transverse-gradient undulator.

This work is supported by the BMBF project 05K19VKA PlasmaFEL (Federal Ministry of Education and Research).

AKBP 14.2 Thu 16:00 P

Future Neutron Beam Line at the Bonn Isochronous Cyclotron — •Maximilian Loepke and Reinhard Beck — Helmholtz-Institut für Strahlen- und Kernphysik Bonn

The Bonn Isochronous Cyclotron provides a beam of protons, deuterons or ions up to $^{12}C^{4+}$ with a kinetic energy ranging from 7 to 14 MeV per nucleon. Since 2019 the proton beam is utilized for irradiation of e.g. silicon pixel detectors for radiation hardness tests.

Currently, it is planned to extend the facility's irradiation and experimentation capabilities by providing a neutron beam. The neutrons are produced by converting deuterons into protons and neutrons in a thick carbon or berylium target. Protons are stopped by the target whereas the neutrons, are subsequently collimated and can be used for irradiation of a secondary target.

The angular distribution of neutrons from this stripping reaction is peaked forward and the energy of neutrons emerging at 0 degree is around 0.4 times the deuteron energy for deuterons in this energy range. The neutron flux at the secondary target after collimation has been estimated using simulations with Geant4 and experimental data found in literature to be in the order of 10^7 n/cm^2/s.

AKBP 14.3 Thu 16:00 P

Nitrogen-doping of niobium for SRF cavities — •Márton Major, Lambert Alff, Michaela Arnold, Jens Conrad, Stefan Flege, Ruben Grewe, and Norbert Pietralla — Technische Universität Darmstadt, Darmstadt, Germany

Niobium is the standard material for superconducting radio-frequency (SRF) cavities for particle acceleration. Superconducting materials with higher critical temperature or higher critical magnetic field allow cavities to work at higher operating temperatures or higher accelerating fields, respectively. One direction of search for new materials with better properties is the modification of bulk niobium by nitrogen doping. In the Nb-N phase diagram, the cubic δ-phase of NbN has the highest critical temperature.

Niobium samples were annealed and doped with nitrogen in the high-temperature furnace at TU Darmstadt and investigated at its Materials Research Department with respect to structural modifications. X-ray diffraction (XRD) confirmed the appearance of Nb_4N_3 and Nb_2N phases on the surface of the samples. A single cell cavity was annealed under optimized doping conditions. The test samples treated together with the cavity showed almost single Nb_4N_3 phase. XRD pole figures also showed grain growth during sample annealing.

The work was supported by the German Federal Ministry for Education and Research (BMBF) through grant 05H18RDRB2 and the German Research Foundation (DFG) via the AccelencE Research Training Group (GRK 2128).

AKBP 14.4 Thu 16:00 P

Improving the lifetime of GaAs-photo-cathodes with cryogenic components — •Tobias Eggert, Yuliya Fritzsche, and Joachim Enders — Institut für Kernphysik, TU Darmstadt, Germany

GaAs photocathodes provide a suitable source for polarized lectron beams. However, the operational lifetime is limited by a mandatory negative-electron-affinity (NEA) coating consisting of a cesium and oxygen. This layer gets corroded by oxygen over time and destroyed by ionized residual gas molecules hitting the surface. The latter is called ion back-bombardment (IBB) and is one of the main lifetime limiting factors. Improving the vacuum conditions around the cathodes surface is expected to reduce IBB and corrosion and therefore increase operational time. At the Institut für Kernphysik at TU Darmstadt a dedicated test stand is set up to develop a new kind of GaAs electron source, which uses cryocooling of a sub-volume to increase the vacuum condition around the cathode. In addition to the sub-volume, the cathode itself ets cooled to compensate for the temperature rise from high laser power.

This project is supported by DFG (GRK 2128) and BMBF (05H18RDRB1).

AKBP 14.5 Thu 16:00 P

Electro-thermal studies of quadrupole resonator designs — •Piotr Putek[1], Shahnam Gorgi Zadeh[2], Marc Wenskat[3,4], Simon Adrian[1], and Ursula van Rienen[1] — [1]Universität Rostock, Rostock, Germany — [2]CERN, Meyrin, Switzerland, — [3]Universität Hamburg, Hamburg, Germany — [4]Deutsches Elektronen-Synchrotron, Hamburg, Germany

Exploring the fundamental properties of materials such as niobium or Nb3Sn in terms of high precision surface resistance measurements is crucial for the further development of SRF technology. To precisely determine the radio frequency (RF) properties of superconducting materials, a calorimetric measurement is carried out with the aid of a so-called Quadrupole Resonator (QPR). However, the measurement procedure is affected by various uncertainties, such as geometrical deviations of the cavity design and the accuracy of numerical simulations. Additionally, the measurement bias for the third operational mode is observed in the pre-existing QPR designs, including the QPRs built at CERN and HZB. It motivated us to re-design the QPR to improve the measurement accuracy for the third operational mode (1.3 GHz). We compare the pre-existing QPR designs with optimized configurations from the perspective of electro-thermal simulations.

AKBP 14.6 Thu 16:00 P

Superconducting solenoid field analysis and optimization — •Shuai Ma[1,2], André Arnold[1], Anton Ryzhov[1], Jana Schaber[1,3], Petr Zwartek[1], Jochen Teichert[1], Rong Xiang[1], Paul Zwartek[1], Wolfgang Hillert[2], and Houjun Qian[4] — [1]HZDR — [2]Hamburg University — [3]Technische Universität Dresden — [4]Photo Injector Test Facility at DESY, Zeuthen site

The superconducting solenoid for SRF Gun III at ELBE will be installed and measured. Both the longitudinal and transverse fields will be measured and analyzed. The field axis can be derived from the field and it is helpful for the alignment of the solenoid. Formalism form to the transverse field will be used to analyze the multipole field.

AKBP 14.7 Thu 16:00 P

SRF Cavity and HOM Coupler Design for the W Working Point of the FCC-ee — •Sosoho-Abasi Udongwo[1], Shahnam Gorgi Zadeh[1], Rama Calaga[2], and Ursula van Rienen[1] — [1]University of Rostock, Rostock, Germany — [2]CERN, Geneva, Switzerland

The Future Circular electron-positron Collider (FCC-ee) is planned to operate with beam energies from 45.6 to 182.5 GeV and beam currents from 5.4 to 1390 mA to study the four operation points, the **Z**, **W**, **H** and $\mathbf{t\bar{t}}$. The energy and current specifications for the **W** working point are 80 GeV and 147 mA, respectively. Due to strong higher-order mode (HOM) effects, 2-cell 400 MHz elliptical SRF cavities are proposed for operation at this working point. This contribution summarises the RF design and optimization of the 2-cell cavity and its HOM couplers compatible with the **W** working point.