AKBP 3: Beam Dynamics

Time: Monday 16:30–18:00 Location: MOL 213

AKBP 3.1 Mon 16:30 MOL 213

Simulation of a Prototype Proton EDM Storage Ring — •Maximilian Vitz[1,2] and Andreas Lehrach[1,2] for the JEDI-Collaboration — [1]Institut for Nucler Physics IV, FZ Jülich, Germany — [2]III. Phyysikalisches Institut B, RWTH Aachen University, Germany

The matter-antimatter asymmetry might be understood by investigating the EDM (Electric Dipole Moment) of elementary charged particles. A permanent EDM of a subatomic particle violates time reversal and parity symmetry at the same time and would be a strong indication for physics beyond the Standard Model. The JEDI-Collaboration (Jülich Electric Dipole moment Investigations) in Jülich is preparing a direct EDM measurement for protons and deuterons: first at the storage ring COSY (COoler SYnchrotron) and later at a dedicated storage ring. The prototype proton EDM storage ring is an intermediate step before building the final storage ring to demonstrate suffcient beam lifetime and spin coherence time in a pure electrostatic ring as well as in storage ring with combined electric and magnetic bending elements. In order to study the effect of E-B-detectors on the orbit and the spin motion the software library Bmad is used. First results of optics and spin simulations towards the prototype ring will be discussed.

AKBP 3.2 Mon 16:45 MOL 213

Dynamic aperture studies for the Transfer Line from FLUTE to cSTART — •Jens Schäfer[1], Bastian Härer[1], Alexander Papash[1], and Anke-Susanne Müller[1,2] — [1]IBPT, KIT, Karlsruhe, Deutschland — [2]LAS, KIT, Karlsruhe, Deutschland

The compact Storage ring for Accelerator Research and Technology cSTART is a test facility for novel acceleration techniques and diagnostics. One major goal of cSTART will be to demonstrate storing the beam of a Laser Wake Field Accelerator (LWFA) for the first time. Before installing a LWFA, the linear accelerator FLUTE serves as a full energy injector for cSTART, providing stable bunches with a length of a few femtoseconds. The transport of the bunches from FLUTE to cSTART requires a transfer line which includes horizontal, vertical and diagonal deflections which leads to coupling of the dynamics of the two transverse planes. In order to conserve the ultra-short bunch length during the transport, the transfer line relies on a special optics which invokes high and negative dispersion. This contribution presents the dynamic aperture studies performed for the three dimensional lattice of the transfer line.

AKBP 3.3 Mon 17:00 MOL 213

Investigation of RF-dependent charge production and electron energy at the FLUTE injector — •Tonia Windbichler[1], Michael J. Nasse[2], Thiemo Schmelzer[1], Marcel Schuh[2], Nigel Smale[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe, Deutschland — [2]IBPT, KIT, Karlsruhe, Deutschland

FLUTE (Ferninfrarot Linac und Test Experiment) is a linear electron accelerator which is currently being commissioned at the Karlsruhe Institute of Technology. The electron bunch is produced by a photoinjector in the injector section. The beam parameters, like energy and charge, are highly dependent on the RF settings of the 3 GHz electron gun. One adjustable RF parameter is the accelerating phase at the time of electron production with our laser system. By scanning this parameter the points of highest energy transfer and highest charge production can be distinguished. In this contribution measurements of the influence of the RF phase on the transported charge will be discussed.

AKBP 3.4 Mon 17:15 MOL 213

Progress towards short bunches and short pulses at the DELTA storage ring — •Benedikt Büsing, Shaukat Khan, Daniel Krieg, Carsten Mai, and Arne Meyer auf der Heide — Center for Synchrotron Radiation (DELTA), TU Dortmund University, Dortmund, Germany

DELTA is a 1.5-GeV synchrotron light source operated by the TU Dortmund University providing synchrotron radiation in a spectrum from hard X-rays to the VUV regime. The bunch length in a storage ring can be compressed by either increasing the cavity voltage or decreasing the momentum compaction factor. On the other hand, short pulses can be generated by using seeding schemes to modulate a short slice of the bunch by a laser-electron interaction. Latest results on bunch shortening due to a newly installed cavity as well as low-alpha optics and the status of the upgrade plan for the short-pulse source from coherent harmonic generation (CHG) to echo-enabled harmonic generation (EEHG) will be presented.

AKBP 3.5 Mon 17:30 MOL 213

Efficient Semi-Lagrangian Vlasov-Simulation of FEL-type Phase-Space Densities — •Philipp Amstutz and Mathias Vogt — DESY, Hamburg, Germany

In semi-Lagrangian (SL) approaches a solution to the Vlasov-Equation is obtained by back-tracking its characteristics and subsequently evaluating the initial condition. These methods yield a smooth numerical approximation to the phase-space density (PSD), which can put them at an advantage over particle-based methods. For instance, when studying small-scale effects where the inherent stochastic noise of particle methods becomes burdensome, SL schemes are a promising alternative.

In free-electron lasers (FELs) the electron bunches typically exhibit an "exotic" structure in the longitudinal phase-space resembling a fine, wiggling hair-like band. Such PSDs are not efficiently captured by a regular grid, as large parts of the minimum bounding rectangle of the PSD are void and do not contribute to the dynamics of the system. We present a code which employs tree-based domain decomposition to overcome this problem and its application to the study of space-charge driven micro-bunching in bunch-compressor stages of FEL-injectors.

AKBP 3.6 Mon 17:45 MOL 213

Beam matching to superconducting short crossbar H-Mode cavities — •Simon Lauber[1,2,3], Kurt Aulenbacher[1,2,3], Winfried Barth[1,2], Christoph Burandt[1,2], Florian Dziuba[1,2,3], Peter Forck[2], Viktor Gettmann[1,2], Manuel Heilmann[2], Thorsten Kürzeder[1,2], Julian List[1,2,3], Maksym Miski-Oglu[1,2], Holger Podlech[4], Anna Rubin[2], Malte Schwarz[4], Thomas Sieber[2], and Stepan Yaramyshev[2] — [1]Helmholtz Institute, Mainz, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [3]Johannes Gutenberg University, Mainz, Germany — [4]Goethe University, Frankfurt, Germany

The superconducting (SC) heavy ion linear accelerator HELIAC is going to be operated with SC short crossbar H-Mode (CH) cavities. One of the special features of the linear accelerator, besides its continuous wave capability, is the smoothly variable output energy from 3.5 to 7.3 MeV/u, which requires a special beam dynamics concept. This can be realized with the Equidistant Multigap Structure (EQUUS). The deployment of this novel concept requires a detailed study of the beam matching to these structures.