AKBP 5: Beam Dynamics

Time: Tuesday 9:30–11:00 Location: MOL 213

AKBP 5.1 Tue 9:30 MOL 213

Systematic studies of RF phase modulation at KARA — •Sebastian Maier[1], Edmund Blomley[1], Tobias Boltz[1], Akira Mochihashi[2], Marcel Schuh[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe — [2]IBPT, KIT, Karlsruhe

At the KIT storage ring KARA (KArlsruhe Research Accelerator), the beam lifetime is limited by scattering with rest gas atoms, but also affected by Touschek scattering. It has been reported in previous work, that a bunch lengthening can be achieved by a modulation of the RF acceleration voltages' phase, which causes an excitation of longitudinal oscillation modes within the stored bunches. In this contribution, we present first results of a systematic study of phase modulation (PM) close to the second harmonic of the synchrotron oscillation frequency with peak-to-peak amplitudes between 10% and 20% of the synchronous phase, focusing explicitly on its impact on the beam lifetime.

AKBP 5.2 Tue 9:45 MOL 213

Alignment Studies for the Low Energy Stage of FLUTE — •Micha Reissig[1], Axel Bernhard[2], Bastian Härer[2], Anton Malygin[1], Michael Nasse[2], Robert Ruprecht[2], Nigel Smale[2], Jens Schäfer[2], Thiemo Schmelzer[1], Pawel Wesolowski[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe — [2]IBPT, KIT, Karlsruhe

The versatile linear accelerator FLUTE (Ferninfrarot Linac- Und Test-Experiment) at Karlsruhe Institute for Technology (KIT) is designed to generate strong ultra-short THz pulses, which can be used for photon science. It provides a platform for a variety of accelerator studies and different diagnostics for the characterization of electron bunches. The low energy stage of FLUTE includes an electron gun, a solenoid, a quadrupole and a spectrometer, which are currently being commissioned. This contribution presents simulations showing the impact of alignment errors and compares them to measurements taken at FLUTE.

AKBP 5.3 Tue 10:00 MOL 213

Developing Beam Optics for BESSY-VSR Project — •Felix Andreas and Paul Goslawski — Helmholtz-Zentrum Berlin, Hahn-Meitner-Platz 1, 14109 Berlin

At the HZB superconducting cavities are developed for the generation of long and short electron bunches. A cavity module, consisting of two 1.5 GHz and 1.75 GHz cavities each, can be assembled into a straight of the BESSY II storage ring, if the space for the module can be enlarged by modifying the beam optics. One possible solution is to remove two quadrupoles to gain the required installation length. With a self-developed code the two quadruples were turned off in simulations and the obtained optics was transferred to the storage ring. To avoid coupled bunch instabilities low beta functions within the VSR-module are required. Therefore a tool was developed which can change the minimum beta function within the given straight by interpolating between two different optics. The sextupoles were used to optimize the phase acceptance to such an extent that they were better than in the current standard optics. In another session the optics was successful audited for user operation by testing for high current, life time, kicker lifetime, bunch length and chromaticity.

AKBP 5.4 Tue 10:15 MOL 213

Studies on Instabilities and Negative Momentum Compaction Operation at KARA — •Patrick Schreiber[1], Tobias Boltz[1], Miriam Brosi[2], Alexander Papash[2], Marcel Schuh[2], Bastian Haerer[2], Akira Mochihashi[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe — [2]IBPT, KIT, Karlsruhe

New operation modes are often considered during the development of new synchrotron light sources. An nderstanding of the instabilities involved is inevitable for a successful operation of these schemes. At the Karlsruhe Research Accelerator, KARA, new modes can be implemented and tested employing a variety of performant beam diagnostics devices and therefore instabilities in those regimes can be investigated. Currently, a negative momentum compaction optics is being established. In order to reinject quickly, the operation with a negative momentum compaction factor is being implemented at injection energy (500 MeV). This contribution presents the status of the implementation of this new regime as well as first results of instability studies at this energy.

AKBP 5.5 Tue 10:30 MOL 213

Model based algorithm to specify the alignment of the bERLinPro photoinjector components — •Jens Völker and Bettina Kuske — Helmholtz Zentrum Berlin, Berlin, Deutschland

The photoinjector module for bERLinPro will be assembled in the beginning of 2020 and will be installed in the bERLinPro injector beamline afterwards. Due to tight installation shedule, it is not possible to operate the assembled module prior to installation. Thus, module components like the SRF gun cavity, SC Solenoid or photocathode, can only be pre-adjusted in the warm state. However, they can be remotely adjusted in the module during operation. Therefore, a method is needed to quantify the alignment and other parameters of module components based on electron beam measurements with the aid of only limited diagnostic tools. With scans of known module parameters and the measurement of the changing beam response, this method should quickly clarify the alignment status and helps to adjust important components. In this talk, we will present the algorithm and simulation results.

AKBP 5.6 Tue 10:45 MOL 213

Design studies for final focus system for laser wake field acceleration experiment at SINBAD facility at DESY — •Sumera Yamin, Ralph W Assmann, Florian Burkart, Francois Lemery, Barbara Marchetti, Eva Panofski, and Paul A Walker — Deutsches Elektronen Synchtron, DESY, Notkestrasse 85, 22607, Hamburg, Germany

The ARES (Accelerator Research experiment at SINBAD) Linac at SINBAD (Short and INnovative Bunches and Accelerators at DESY) facility at DESY aims to produce high brightness ultrashort electron bunches (sub fs to few fs) at around 100 MeV, suitable for injection into novel accelerators such as dielectric Laser acceleration (DLA) and Laser Wake Field Acceleration (LWFA). The LWFA Experiment with external injection planned at ARES aims towards studies for stable LWFA by combining the reproducible and stable RF based- accelerator technology with high gradient plasma wake field dynamics. One of the possible configurations, which is currently under consideration, for the injection in the plasma experiment requires the Twiss parameter β to be of the order of few mm at the injection point. The effect of space charge for high density electron bunches, such the ones produces at ARES with bunch charge of up to 10 pC and bunch length from sub fs to few fs, is dominant in the matching region. With the co-propagating Laser and electron beam in the external injection experiment, there are a lot of technical constraints that has to be considered for the final design. We aim to present design studies for the final focus system for LWFA experiment planned at ARES.