AKBP 12: Beam Diagnosis

Zeit: Donnerstag 13:45–16:15 Raum: BZ.08.06 (HS 1)

AKBP 12.1 Do 13:45 BZ.08.06 (HS 1)

First Tests of the New LHC K-Modulation Tool in the SPS — •Maria Kuhn — CERN, Geneva, Switzerland — Hamburg University, Hamburg, Germany

Several measurement techniques for optics functions have been developed for the LHC. This presentation discusses the first results with a new k-modulation measurement tool. A fully automatic and online measurement system has been developed for the LHC. It takes constraints of various systems such as tune measurement precision and powering limits of the LHC superconducting circuits into account. K-modulation with sinusoidal excitation will also be possible. First tests of the new application in the SPS will be presented and an outlook on the achievable beta function accuracy will be given.

AKBP 12.2 Do 14:00 BZ.08.06 (HS 1)

Visible Light Diagnostics at the ANKA Storage Ring — •Benjamin Kehrer, Edmund Hertle, Nicole Hiller, Michael Holz, Anke-Susanne Müller, Patrik Schönfeldt, and Paul Schütze — Karlsruhe Institute of Technology, Karlsruhe, Germany

Synchrotron radiation in the visible light range is a versatile diagnostics tool for accelerator studies. At the ANKA storage ring of the Karlsruhe Institute of Technology (KIT), we have a dedicated visible light diagnostics beamline and two additional beam ports close to the radiation's source point.The visible light diagnostics beamline hosts a time-correlated single-photon-counting unit to measure the bunch filling pattern and a streak camera for longitudinal diagnostics. Recently, the beamline has been extended with a fast-gated intensified camera to study transverse instabilities. The synchrotron light monitor ports were previously used for direct source imaging. Due to the diffraction limit the vertical beam size could not be resolved. One of the two ports has recently been equipped with a double-slit to allow for interferometric measurements of the vertical beam size. An overview of the different setup modifications will be given and first results will be presented.

AKBP 12.3 Do 14:15 BZ.08.06 (HS 1)

A Fast Gated Intensified Camera Setup for Transversal Beam Diagnostics at the ANKA Storage Ring — •Paul Schütze[1], Edmund Hertle[2], Nicole Hiller[2], Benjamin Kehrer[1], Anke-Susanne Müller[1,2,3], and Patrik Schönfeldt[2] — [1]LAS, KIT, Karlsruhe, Germany — [2]IPS, KIT, Karlsruhe, Germany — [3]ANKA, KIT, Karlsruhe, Germany

ANKA, the synchrotron light source at KIT, can be operated in different modes, including the low-alpha operation with bunch lengths compressed to a few picoseconds. In this mode coherent synchrotron radiation (CSR) is emitted leading to beam instabilities. For gaining further insight into those processes, a setup based on a fast gated intensified camera was installed recently at the visible light diagnostics beamline of the ANKA storage ring. The experimental layout consists of an optical setup, which magnifies the image of the beam in the horizontal and demagnifies it in the vertical plane to obtain a projection of the horizontal beam shape, the camera itself and a fast scanning galvanometric mirror that sweeps the image across the sensor. This allows the tracking of the horizontal bunch size and position over many turns. Here we present the setup, simulations and first tests of the fast gated intensified camera.

AKBP 12.4 Do 14:30 BZ.08.06 (HS 1)

Development of new Beam Position Monitors at COSY — •Fabian Hinder for the JEDI-Collaboration — Institut für Kernphysik IKP-4, Forschungszentrum Jülich, Deutschland — III. Physikalisches Institut B, RWTH Aachen, Deutschland

Electric Dipole Moments (EDMs) violate parity and time reversal symmetries. Assuming the CPT-theorem is valid, this leads to CP violation, which is needed to explain the matter over antimatter dominance in the Universe. Thus, a non-zero EDM is a hint to physics beyond the Standard Model. The JEDI (Jülich Electric Dipole moment Investigations) collaboration has started investigations of a direct EDM measurement of charged hadrons at a storage ring. To measure a tiny EDM signal with high precision, systematic effects have to be controlled to the same level. One way of controlling systematic effects is the use of high precision Beam Position Monitors (BPMs). The idea is based on the usage of magnetic pick-ups in a Rogowski coil configuration. The main advantage of the coil design is the response to the particle bunch frequency and the compactness of the coil itself. In a first step the BPMs will be benchmarked in a laboratory test system. In the next step the calibrated BPMs will be installed and tested at the conventional storage ring COSY (Cooler Cyclotron). In a further step an extension of the BPMs to measure the relative posit ion of two counter rotating particle beams is proposed. At the conference first results and the planned developments will be presented.

AKBP 12.5 Do 14:45 BZ.08.06 (HS 1)

Beam Induced Fluorescence (BIF) monitor development — •Yulia Shutko[1], Dieter Hoffmann[1], Peter Forck[2,3], Beata Walasek-Höhne[2], Thomas Sieber[2], and Serban Udrea[3] — [1]Technische Universität Darmstadt, Darmstadt, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany — [3]Goethe-Universität Frankfurt am Main, Frankfurt am Main, Germany

The development of non-interceptive beam diagnostic methods is of high relevance for the future FAIR accelerator facilities to be built at the GSI. One of these methods is based on Beam Induced Fluorescence (BIF), which is under development at the GSI accelerators. BIF based monitors are already in operation at the GSI's LINAC since some years. Further BIF-monitor development is required for applying this method to high energy beams, as those to be delivered by FAIR's SIS-100 synchrotron. For this purpose beam profile and spectroscopic investigations with Nitrogen and Argon in a pressure range from 1e-3 to 1 mbar with heavy ion beams at energies between 100 and 900 MeV/u have been performed. The results concerning image reproduction and emission spectra will be presented in this contribution.

AKBP 12.6 Do 15:00 BZ.08.06 (HS 1)

Microwave Radiation Studies with a LNB Detector System — •Matthias Martin, Marcel Schuh, Johannes Steinmann, and Anke-Susanne Müller — LAS, KIT, Karlsruhe

At ANKA, the synchrotron radiation facility at KIT (Karlsruhe Institue of Technology), beam studies with an LNB (Low Noise Block) have been carried out. This detector system is normally used to receive satellite TV signals and allows polarization dependent measurements of microwave radiation. We report on beam experiments with this inexpensive detector. Special focus is laid on the signal's polarization and dependencies on bunch length.

AKBP 12.7 Do 15:15 BZ.08.06 (HS 1)

Preserving 3D beam information in one streak camera measurement* — •Michael Switka and Wolfgang Hillert — Elektronen-Stretcher-Anlage ELSA, Physikalisches Institut, Universität Bonn

At the pulse stretcher ring ELSA, the imaging of fast beam dynamics is performed by a streak camera system. The design of its optical beamline has been optimized to match the machine characteristics and allows simultaneous observation of all three beam dimensions at various time scales down to the picosecond regime. The streak camera naturally displays longitudinal information at the expense of one transverse dimension. Hence, in order to preserve 3D beam dynamics in one single shot measurement, the beamline couples two images onto the streak camera slit of which one is perpendicularly orientated to its double. This technique is used in slow sweep and synchroscan camera operation. Characteristics and exemplary measurements, demonstrating the capabilities and limits of this technique, are presented. *Work funded by the DFG within SFB TRR16

AKBP 12.8 Do 15:30 BZ.08.06 (HS 1)

Considerations for a Wakefield-Optimized Near-Field EO Setup at the ANKA Storage Ring — •Patrik Schönfeldt[1], Nicole Hiller[1], Benjamin Kehrer[2], and Anke-Susanne Müller[1,2] — [1]IPS, KIT, Karlsruhe — [2]LAS, KIT, Karlsruhe

ANKA, the synchrotron light source of the Karlsruhe Institute of Technology (KIT), is the first storage ring with a near-field single-shot electro-optical (EO) bunch profile monitor inside its vacuum chamber. Using the method of electro-optical spectral decoding (EOSD), the current setup made it possible to study longitudinal beam dynamics (e.g. microbunching) occurring during ANKA's low-alpha-operation

with sub-ps resolution (granularity). However, the setup induces strong wake-fields spanning the distance between consecutive bunches which cause heat load to the in-vacuum setup for high beam currents. This heat load in turn leads to a laser misalignment thus preventing measurements during multi-bunch operation. Fortunately, the EOSD setup also allows us to directly study these wake-fields so simulation results can be compared to measurement data. This talk reviews possible changes of the setup's geometry with respect to a reduction of the wake-field effects.

AKBP 12.9 Do 15:45 BZ.08.06 (HS 1)

Aufbau eines optischen Messsystems zur Untersuchung von Halo- und Dunkelstrom in GunLab — •Jens Völker, Thorsten Kamps und Andreas Jankowiak — Helmholtz Zentrum Berlin

GunLab ist eine kompakte Test Beamline zur detaillierten Untersuchung des vollständigen Phasenraums von Raumladungsdominierten Elektronenstrahlen. Dadurch sollen vor allem supraleitende Hochfrequenz (SHF) Photoinjektoren charakterisiert werden. Das Design und die Messsysteme von GunLab wurden optimiert um für einen großen Parameterbereich auf unterschiedlichen Wegen die Phasenraumverteilungen der Elektronenpakete zu untersuchen. Somit können verschiedene Messmethoden gegeneinander getestet werden. Eines dieser Systeme dient der optischen Messung der transversalen Ladungsverteilung mit einem hohen Dynamikbereich um Halo- und Dunkelstrom zeitgleich zum Hauptstrahl untersuchen zu können. Dies wird durch eine optodigitale Maske und einer hochauflösenden CCD-Kamera mit hohem Dynamikbereich realisiert. In dieser Arbeit werden Aufbau und erste Tests des Halo-Systems präsentiert.

AKBP 12.10 Do 16:00 BZ.08.06 (HS 1)

Upgrade of the profile monitors in the injection beam line of COSY — •Karl Reimers and Vsevolod Kamerdzhiev — Forschungszentrum Jülich, IKP-4

The injection beam line (IBL) of COSY consists of 4 straight and 4 bent sections. At the beginning and at the end of each bent section a wire array is used to measure the profile of the ion beam delivered by the cyclotron 'JULIC' to COSY.

The 8 stations of wire array assemblies consist of a vacuum chamber holding arrays of each 39 wires for the two transversal planes.

The profile data is used primarily to optimize the beam line transmission.

Further maintenance of the old readout electronics is considered impractical. A decision was made to upgrade the readout system with a state of the art multichannel electronics, designed by iThembaLABS in South Africa.

Each multichannel pico ammeter electronics is connected to one wire array. They measure currents at the wires being hit by the beam.

A brief overview of existing methods of taking beam profile data is presented. Some technical aspects and the latest measurement results are discussed.