T 71: Beschleunigerphysik III

Zeit: Freitag 14:00–16:00 Raum: KGI-HS 1019

T 71.1 Fr 14:00 KGI-HS 1019

Superconductive Undulators: Mechanical deviations and their influence on the phase error — •Daniel Wollmann — Universität Karlsruhe

The quality of the emitted spectrum of an undulator depends strongly on the regularity of the magnetic field - in terms of period length and amplitude. Therefore, reasons for deviations of the magnetic field in superconductive undulators have been examined, their influence on the phase error has been calculated and tolerances for the mechanical production process were defined. In addition concepts for field error compensation have been developed.

T 71.2 Fr 14:15 KGI-HS 1019

Investigations on reflective optics for an optical system used for time resolved measurements — •Kilian Rosbach for the PITZ-Collaboration — Humboldt University Berlin

The Photoinjector Test facility at DESY Zeuthen (PITZ) is an electron accelerator which was built to develop and optimize high brightness electron sources suitable for SASE FEL operation. For bunch length and longitudinal phase space measurements, the light from one of several radiators at different screen stations is transported by a complex refractive optical system of about 30m length to a streak camera. Dispersion limits the possible temporal resolution, while radiation damage to the lenses results in a strong loss of light. Intermediate solutions for both problems exist, but improvement is desirable. Since mirrors are not sensitive to radiation and do not introduce any dispersion, using reflective instead of refractive optics is considered. Different geometries of mirrors are investigated to find a design which delivers good spatial and temporal resolution simultaneously. One promising system is analyzed in more detail, results from simulations and measurements at a lab test setup are compared.

T 71.3 Fr 14:30 KGI-HS 1019

Laser-basierte Synchronisation mittels *optical cross correlation* mit Femtosekunden-Genauigkeit am FLASH — •Sebastian Schulz und Vladimir Arsov — Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany

Am Freie Elektronen Laser in Hamburg (FLASH) werden Photonenpakete im weichen Röntgenbereich mit einer Pulsdauer von wenigen 10 fs erzeugt. Für zeitaufgelöste Pump-Probe-Experimente, zukünftige Betriebsmoden des Beschleunigers mittels externem Laser-Seeding sowie für spezielle Diagnostikmessungen ist es notwendig, den Elektronenstrahl und die externen, gepulsten Lasersysteme auf 30 fs (rms) zu synchronisieren. Um diese hohe Genauigkeit und Stabilität zu erreichen, soll das vorhandene HF-Synchronisationssystem durch ein optisches System erweitert und teilweise ersetzt werden.
In diesem Vortrag wird das Konzept eines *two-colour optical cross correlator*s vorgestellt, der es prinzipiell ermöglicht, zwei Lasersysteme unterschiedlicher Wellenlänge mit einer Genauigkeit von unter 10 fs gegeneinander zu stabilisieren. Im Speziellen wird hier auf die Anbindung eines Ti:Sa-Oszillators, der mit einer Zentralwellenlänge von 800 nm für elektro-optische Messungen verwendet wird, an einen *fiber link* des Master-Laser-Oszillators (MLO, Zentralwellenlänge 1550 nm) eingegangen und ein Vergleich mit Simulationsrechnungen angestellt.

T 71.4 Fr 14:45 KGI-HS 1019

Machine Protection for the European XFEL — •Lars Fröhlich[1,2], Igor Cheviakov[1], Sven Karstensen[1], Timmy Lensch[1], Martin Staack[1], Jörg Thomas[1], and Petr Vetrov[1] — [1]DESY, Hamburg, Germany — [2]University of Hamburg, Germany

The planned European X-ray Free Electron Laser (XFEL) linear accelerator will bring an electron beam to an energy of up to 20 GeV. With a designated average beam power of 600 kW and beam spot sizes down to few micrometers, the machine will hold serious damage potential. Therefore, an active Machine Protection System (MPS) has to ensure safe operation by detecting beam losses and the failure of critical accelerator components. The talk presents an outline of the planned MPS architecture and its subsystems.

T 71.5 Fr 15:00 KGI-HS 1019

Development of a new Low Level RF Control for the S-DALINAC — •Martin Konrad[1], Asim Araz[1], Uwe Bonnes[1], Ralf Eichhorn[1], Ulrich Laier[2], Markus Platz[1], and Achim Richter[1] — [1]Institut für Kernphysik, Technische Universität Darmstadt, Schlossgartenstraße 9, 64289 Darmstadt, Germany — [2]Gesellschaft für Schwerionenforschung, Planckstr. 1, 64291 Darmstadt, Germany

The high Q of the superconducting 3 GHz cavities of the S-DALINAC in combination with microphonic disturbances lead to permanent changes in amplitude and phase of the accellerating field increasing the energy spread of the beam. To compensate for this a low level RF control is necessary.

The existing analog control based on a self-excited loop has to be replaced by a digital one to meet the required stability. The concept of converting the signals down to the base band is retained. The implementation using an FPGA provides flexibility in the control algorithm and extensive diagnostics. For example switching between the operational modes self-excited loop and generator driven resonator is possible without changing the hardware.

We will report on results observed with a prototype. This includes different control algorithms and beam loading.

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T 71.6 Fr 15:15 KGI-HS 1019

Messsystem für die Energiekalibration des ANKA-Speicherrings — •Tobias Bückle[1], Ingrid Birkel[2], Miriam Fitterer[2], Erhard Huttel[2], Marit Klein[1], Anke-Susanne Müller[1,2], Robert Rossmanith[2], Nigel Smale[2], Richard Stricker[2] und Pawel Wesolowski[2] — [1]Laboratorium für Applikationen der Synchrotronstrahlung, Universität Karlsruhe — [2]Institut für Synchrotronstrahlung, Forschungszentrum Karlsruhe

Zur präzisen Bestimmung der Energie des Elektronenstrahls wird im ANKA-Speicherring resonante Spin-Depolarisation verwendet. Die Energie des Elektronenstrahls ist proportional zur Präzessionsfrequenz des Spinvektors. Durch Einstrahlung eines horizontalen HF-Magnetfeldes mit der Präzessionsfrequenz kann die Polarisation zerstört werden. Da der Touschek-Effekt von der Elektronenpolarisation abhängt, kann eine Lebensdauermessung bzw. Verlustratenmessung zur Polarisationsbestimmung dienen. In diesem Vortrag wird ein neues System zur Frequenzsteuerung und Verlustratenbestimmung vorgestellt. Erste Ergebnisse werden diskutiert.

T 71.7 Fr 15:30 KGI-HS 1019

ILC Beam Energy Measurement by means of Laser Compton Backscattering — •Michele Viti[1], Heinz Juergen Schreiber[1], and Nickolai Muchnoi[2] — [1]DESY, D-15703 Zeuthen, Germany — [2]BINP institut, Novosibirsk, Russia

A novel, non-invasive method of measuring the beam energy at the International Linear Collider is proposed. Laser light collides head-on with beam particles and either the energy of the Compton scattered electrons near the kinematic end-point (edge) is precisely measured or the positions of the Compton backscattered γ-rays, the edge electrons and the non-interacting beam particles are recorded with high accuracy. A compact layout for the Compton spectrometer is suggested. It consists of a bending magnet and position sensitive detectors operating in a large radiation environment. Several options for high spatial resolution detectors are discussed. Based on simulation studies, operation with an infrared or green laser together with radiation hard quartz fiber detectors to record the positions of backscattered photons and edge electrons as well as the beam downstream of the magnet by means of a cavity BPM provides a feasible and promising scheme to access the incident beam energy. Relative precision of the energy of 10^{-4} or better is achievable on a bunch-to-bunch basis while the electron and positron beams are in collision.

T 71.8 Fr 15:45 KGI-HS 1019

Direct Detection of the Electron Cloud at ANKA — •Sara Casalbuoni[1], Ralf Weigel[2], Michael Hagelstein[1], Ubaldo Iriso[3], Elena Mashkina[4], and Anke Susanne Müller[1] — [1]Institute for Synchrotron Radiation, Research Center Karlsruhe, Germany — [2]Max-Planck Institute for Metal Research, Stuttgart, Germany — [3]Consortium for the Exploitation of the Synchrotron Light Laboratory, Bellaterra, Spain — [4]Physics Institute II, Friedrich Alexander University Erlangen - Nürnberg, Germany

Low energy electrons generated by the interaction of high energy particles with the beam pipe surface can be detrimental for accelerators performances increasing the vacuum pressure, the heat load and eventually producing beam instabilities. The low energy electrons accumulating in the beam pipe are often referred to as electron cloud. In this presentation we report on the direct evidence of the electron cloud in the electron storage ring of the synchrotron light source ANKA (ANgstrom source KArlsruhe).