AKBP 9: Diagnostics, Control and Instrumentation

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

AKBP 9.1 Tue 16:30 MOL 213

An Ultra-fast detector for wide-spectral range measurements — •Meghana Mahaveer Patil, Matthias Balzer, Erik Bründermann, Michele Caselle, Andreas Ebersoldt, Stefan Funkner, Benjamin Kehrer, Michael J. Nasse, Gudrun Niehues, Weijia Wang, Anke-Susanne Müller, and Marc Weber — Karlsruhe Institute of Technology

The KALYPSO (Karlsruhe Linear arraY detector for MHz rePetition rate SpectrOscopy) is a novel detector for beam diagnostics purposes capable of operating at frame rates up to 10 MHz. This detector consists of a silicon or InGaAs line array sensor with spectral sensitivity from 350 nm to 1600 nm. Such a wide range of spectral sensitivity is obtained by applying an ARC (anti-reflective coating) optimized for these wavelengths. The unprecedented frame rate of this detector is achieved by a custom-designed ASIC readout chip. The FPGA readout architecture enables continuous data acquisition and real-time data processing. In this contribution, various features of KALYPSO and initial measurements will be presented.

AKBP 9.2 Tue 16:45 MOL 213

Advanced temporal and spatial electron bunch diagnostics for laser-wakefield accelerated electron bunches — •Omid Zarini[1], Maxwell LaBerge[3], Jurjen Couperus Cabadag[1], Alexander Köhler[1], Richard Pausch[1], Thomas Kurz[1,2], Susanne Schöbel[1,2], Yen-Yu Chang[1], Michael Bussmann[1], Michael Downer[3], Ulrich Schramm[1,2], Alexander Debus[1], and Arie Irman[1] — [1]Helmholtz-Zentrum Dresden-Rossendorf — [2]Technische Universität Dresden — [3]University of Texas at Austin

Laser wakefield accelerators (LWFA) feature unique electron bunch characteristics, namely micrometer beam size with duration ranging from a few fs to tens of fs. Precise knowledge of the longitudinal profile of such ultra-short electron bunches is essential for the design of future table-top x-ray light-sources. Our broadband, single-shot spectrometer combines the coherent transition radiation (CTR) spectrum in UV/VIS, near-IR and mid-IR. Our fully calibrated spectrometer is capable to characterize electron bunches with charges as low as 1 pC and resolve time-scales from 0.4 to 40 fs. In addition, complementary data on the transverse bunch profile is provided by simultaneously imaging the CTR in the far- and near-field. We present recent experimental results on electron bunch profiles and peak currents of different LWFA injection mechanisms. Furthermore, we present single-shot CTR imaging and interferometry data from electron bunches. We combine near field (NF) and far field (FF) imaging of CTR from a foil just outside the accelerator to determine the transverse structure of micro-bunched portions of the beam.

AKBP 9.3 Tue 17:00 MOL 213

Impedance studies at the Karlsruhe Research Accelerator using the Bunch-by-Bunch feedback system — •Edmund Blomley, Akira Mochihashi, Marcel Schuh, and Anke-Susanne Müller — IBPT, KIT, Karlsruhe

At the KIT storage ring KARA (KArlsruhe Research Accelerator) the impedance is influenced by several factors like in vacuum moving gap insertion devices and scrapers. Additionally, over the last several years, the vacuum chamber has been modified multiple times due to installation of new insertion devices. This contribution presents systematic studies of the impedance using long-term archive data as well as measurements using the fully digital 3D bunch-by-bunch feedback system.

AKBP 9.4 Tue 17:15 MOL 213

Status of Slice Emittance Measurements at PITZ — •Raffael Niemczyk[1], Prach Boonpornprasert[1], Ye Chen[1], James Good[1], Matthias Gross[1], Holger Huck[1], Igor Isaev[1], Christian Koschitzki[1], Mikhail Krasilnikov[1], Shankar Lal[1], Xiangkun Li[1], Osip Lishilin[1], Gregor Loisch[1], David Melkumyan[1], Anne Oppelt[1], Houjun Qian[1], Hamed Shaker[1], Guan Shu[1], Frank Stephan[1], and Wolfgang Hillert[2] — [1]DESY, Zeuthen site — [2]University of Hamburg

The Photo Injector Test facility at DESY in Zeuthen (PITZ) conditions and optimises high-brightness electron sources for the use at X-ray free-electron lasers (FELs). Since the lasing process occurs only on a fraction of the bunch, much smaller than the total bunch length, the slice emittance is of interest. To characterise the slice emittance, a measurement procedure was developed at PITZ, combining a single-slit scan with a transverse deflecting structure. The transportation of the beam at low energies of 20 MeV is complicated due to the high bunch charge and wide separation of the needed diagnostics devices. The slice emittance measurement setup, improving the beam transport, will be discussed. Also, problems arising from low signal-to-noise ratio during emittance measurements and possible solutions will be presented.

AKBP 9.5 Tue 17:30 MOL 213

Adding an Online Orbit-Response-Matrix Model to the Slow Orbit Feedback at DELTA — •Stephan Kötter and Thomas Weis — TU Dortmund University, DELTA

At DELTA, a 1.5 GeV synchrotron radiation light source operated by the TU Dortmund University, a software upgrade for the slow orbit feedback was introduced. An online fit of the bilinear-exponential model with dispersion (BE+d model) which passively leverages beam position measurements from orbit corrections is currently being added to the system. The fit will boost diagnostic capabilities by supplying estimates of beta functions and phases in both planes. The fitted model can also be used instead of a measured orbit-response matrix for estimating steerer currents for orbit corrections to adapt to changing beam optics without a dedicated orbit-response measurement.

AKBP 9.6 Tue 17:45 MOL 213

Towards arbitrary shaping of THz pulses from a laser-electron interaction at DELTA — •Carsten Mai, Benedikt Büsing, Shaukat Khan, Daniel Krieg, and Arne Meyer auf der Heide — Center for Synchrotron Radiation (DELTA), TU Dortmund University

The TU Dortmund University operates the 1.5-GeV electron storage ring DELTA as a lightsource in user operation. In 2011, a short-pulse facility including a beamline for experiments with THz radiation was commissioned. Broadband as well as tunable narrowband radiation up to 6 THz is generated by an interaction of short laser pulses with a single electron bunch. The spectral profile of the THz pulses was controlled using a modulation of the spectral phase of the laser pulses. This was realized by employing a spatial light modulator as a phase shifter in the Fourier plane of the laser beam setup. Measurements of THz spectra shaped by laser modulation are presented.