T 79: Beschleunigerphysik 2

Convenor: Anke-Susanne Müller

Zeit: Dienstag 16:45–18:50 Raum: A213

T 79.1 Di 16:45 A213

Beam Optimization at the FELBE User Facility — •Matthias Justus — Forschungszentrum Dresden-Rossendorf, Institut für Strahlenphysik, PF 510119, 01314 Dresden

The radiation source ELBE at the Research Centre Dresden-Rossendorf (FZD) delivers coherent high brightness infrared light for spectroscopy and microscopy in materials and biochemical research since 2004. Two FELs driven by a high current electron beam cover the MIR and FIR range from 3 to 230 micrometers. Information on the electron LINAC, the technical implementation of the FELs and selected experimental work within the FELBE program is given.

For FELBE users, stringent beam quality measures may play a role in time domains from milliseconds to hours and define requirements on the electron beam. Any beam optimization stabilization system has therefore to cover a broad spectrum of machine settings in terms of overall IR light power, wavelength and temporal structure. The electron beam energy is stabilized by a spectrometric feedback to prevent the IR beam from wavelength drifts. Further, the IR light power is permanently measured from backscattered light and stabilized by adjusting the electron beam current up to the 10 Hz range. The detector setup is explained and control loop design aspects are covered as well.

T 79.2 Di 17:00 A213

MATLAB and ACS: Connecting two worlds of accelerator physics — •Sebastian Marsching[1], Miriam Fitterer[1], Steffen Hillenbrand[1], Nicole Hiller[1], André Hofmann[1], Erhard Huttel[2], Marit Klein[1], Anke-Susanne Müller[1,2], Nigel Smale[2], and Kiran Sonnad[1] — [1]Laboratorium für Applikationen der Synchrotronstrahlung, Universität Karlsruhe (TH) — [2]Institut für Synchrotronstrahlung, Forschungszentrum Karlsruhe

In the world of accelerator physics there is a vast amount of different software tools based on different platforms. At ANKA, the synchrotron radiation source at the Forschungszentrum Karlsruhe, a Java based software system is used to monitor and control the storage ring. While this system is based on ALMA Common Software, a component framework using CORBA and supporting Java, C++ and Python, many simulation tools are based on MATLAB and therefore no direct interoperation is possible.

In order to integrate existing simulation tools with the control and monitoring system, a bridge that mediates between both worlds has been created. Thus simulation tools can use live data from the monitoring system and the control system can use simulation tools to improve automatic adjustment of operation parameters.

This talk provides an insight into the concepts of this bridge approach and how it is used at ANKA to improve the beam quality for beam line users especially in the lowalpha mode providing coherent terahertz radiation.

T 79.3 Di 17:15 A213

Microphonics compensation with a FPGA based RF control system at the S-DALINAC* — •Martin Konrad, Asim Araz, Uwe Bonnes, Ralf Eichhorn, Achim Richter, and Norbert Pietralla — Institut für Kernphysik, Technische Universität Darmstadt, Schlossgartenstraße 9, 64289 Darmstadt, Germany

The high Q of the superconducting 3 GHz cavities of the S-DALINAC in combination with microphonic perturbations leads to permanent fluctuations in amplitude and phase of the accelerating field. These fluctuations increase the energy spread of the beam which has to be compensated by a low level RF control system. To meet the required stability the existing analog control system has to be replaced by a digital one.

The digital signal processing is done in a FPGA which allows for different control algorithms. Superconducting cavities are operated in a self-excited loop whereas a generator driven resonator is used for normalconducting cavities. The implementation of these algorithms, measurements for characterization of microphonics, and latest results using the control algorithms with a prototype will be presented.

Furthermore we will report on the features of the improved FPGA board revision. These include real time digital readout at full sampling rate which allows extensive diagnostics.

*Supported by DFG through SFB 634.

T 79.4 Di 17:30 A213

Development of a new low level RF control system for the S-DALINAC — •Asim Araz[1], Uwe Bonnes[1], Ralf Eichhorn[1], Martin Konrad[1], Ulrich Laier[2], Achim Richter[1], and Rolf Stassen[3] — [1]Institut für Kernphysik, Technische Universität Darmstadt, Schlossgartenstrasse 9, 64289 Darmstadt — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstr. 1, 64291 Darmstadt — [3]Forschungszentrum Jülich GmbH, Wilhelm-Johnen-Straße, 52428 Jülich

The Superconducting DArmstadt electron LINear ACcelerator S-DALINAC has a maximum energy of 130 MeV and beam currents of up to 60 μA. In order to achieve a minimal energy spread of the beam, the impact of microphonic perturbations on the superconducting cavities have to be compensated, resulting in a strict control of amplitude and phase of the cavities. The existing analog RF control system based on a self-exited loop, converts the 3 GHz signals down to the base band. This concept will also be followed by the new digital system currently under development. It is based on an FPGA in the low frequency part, giving a great flexibility in the control algorithm and providing additional diagnostics. For example it is possible to change the operational mode between self-exited loop and generator driven resonator within a second.

We will report on the design concept, the status and the latest results measured with a prototype, including different control algorithms as well as beam loading effects.

*Supported by DFG through SFB 634.

T 79.5 Di 17:45 A213

Optische Synchronisation verteilter Lasersysteme bei FLASH — •Sebastian Schulz[1], Vladimir Arsov[2], Matthias Felber[2], Patrick Gessler[2], Kirsten Hacker[2], Florian Loehl[2], Frank Ludwig[2], Karl-Heinz Matthiesen[2], Holger Schlarb[2], Bernhard Schmidt[2], Axel Winter[2], Laurens Wissmann[1] und Johann Zemella[1] — [1]Universität Hamburg, Deutschland — [2]Deutsches Elektronen-Synchrotron (DESY), Hamburg, Deutschland

Der Freie-Elektronen Laser in Hamburg (FLASH) sowie der geplante Europäische XFEL erzeugen weiche Röntgenstrahlungspulse von wenigen Femtosekunden Länge. Hochaufgelöste Pump-Probe-Experimente, spezielle Diagnostikmessungen und zukünftige Betriebsmodi wie Laser-Seeding sind dabei entscheidend von der Synchronisation verschiedenster Lasersysteme abhängig. Aus diesem Grund wird bei FLASH ein rein optisches Synchronisationssystem aufgebaut und getestet.

Wir berichten hier über die Entwicklung und die Performance eines optischen Kreuzkorrelationsschemas, um zwei individuelle Lasersysteme mit unterschiedlichen Zentralwellenlängen und Repetitionsraten mit einer Genauigkeit von unter 10 fs zu synchronisieren. Der erste Aufbau wurde an einem Ti:Sa-Oszillator für elektro-optische Strahldiagnostik realisiert. Dieser kann optisch entweder an einen lokal installierten Faserlaser oder an den Endpunkt eines längenstabilisierten Fiber-Links, der die Pulse eines Master-Laser-Oszillators verteilt, gekoppelt werden. Letzteres synchronisiert den Diagnoselaser zum Elektronenstrahl. So konnten erste Messungen zur Leistungsfähigkeit der optischen Synchronisation am Beschleuniger durchgeführt werden.

T 79.6 Di 18:00 A213

Aufbau eines Ytterbium-Faserlasers für elektro-optische Experimente zur longitudinalen Elektronenstrahldiagnostik bei FLASH — •Laurens-Georg Wissmann[1], Vladimir Arsov[2], Matthias Felber[2], Patrick Gessler[2], Kirsten Hacker[2], Florian Loehl[2], Frank Ludwig[2], Karl-Heinz Matthiesen[2], Holger Schlarb[2], Bernhard Schmid[2], Sebastian Schulz[1], Axel Winter[2] und Johannes Zemella[2] — [1]Universität Hamburg, Deutschland — [2]Deutsches Elektronen-Synchrotron (DESY), Hamburg, Deutschland

Am Freie-Elektronen-Laser FLASH werden mit Hilfe nichtlinearer Kompression Elektronenpakete erzeugt, deren Ladung sich auf einen führenden, scharfen Puls und ein ausgedehntes Ende verteilt. Es wird über den Aufbau und das geplante integrierte Design eines Ytterbium-Faserlasers (YDFL) berichtet, der zur elektro-optischen Untersuchung der Elektronenpakete eingesetzt wird. Dabei erwartet man auf Grund verringertem Phasenschlupfes im elektro-optischen Kristall eine höhere