

AKBP 14: Beam Diagnostics II

Zeit: Donnerstag 16:30–18:30

Raum: S1/05 23

AKBP 14.1 Do 16:30 S1/05 23

THz-Based Longitudinal Beam Diagnostics at DELTA — ●RAFFAEL NIEMCZYK, FIN HENDRIK BAHNSEN, MAX BOLSINGER, FABIAN GÖTZ, SVENJA HILBRICH, MARKUS HÖNER, MARC ANDRE JEBRAMCIK, SHAUKAT KHAN, NILS LOCKMANN, CARSTEN MAI, ARNE MEYER AUF DER HEIDE, ROBERT MOLO, GHOLAMREZA SHAYEGANRAD, PETER UNGELENK, and DENNIS ZIMMERMANN — Center for Synchrotron Radiation (DELTA), TU Dortmund University, Dortmund, Germany

At the 1.5-GeV electron storage ring DELTA operated by the TU Dortmund University, THz radiation is induced by a laser-electron interaction in an undulator. A dip in the longitudinal charge distribution forms after the electron bunch passes dispersive magnet structures leading to the emission of coherent THz radiation. Next to turn-by-turn-resolved studies of the THz intensity, a set-up for electro-optical measurements of the THz field is being commissioned. This method will allow to analyze the charge distribution on a sub-ps scale.

AKBP 14.2 Do 16:45 S1/05 23

Multi-turn Spectral Observation of Coherent THz Pulses at DELTA — ●CARSTEN MAI, FIN HENDRIK BAHNSEN, MAX BOLSINGER, FABIAN GÖTZ, SVENJA HILBRICH, MARKUS HÖNER, MARC ANDRE JEBRAMCIK, SHAUKAT KHAN, NILS LOCKMANN, ARNE MEYER AUF DER HEIDE, ROBERT MOLO, RAFFAEL NIEMCZYK, GHOLAMREZA SHAYEGANRAD, PETER UNGELENK, and DENNIS ZIMMERMANN — Center for Synchrotron Radiation (DELTA), TU Dortmund University, Dortmund, Germany

Coherent ultrashort THz pulses induced by a laser-electron interaction are routinely produced and observed at DELTA, a 1.5-GeV synchrotron light source operated by the TU Dortmund University. The radiation spectrum is known to shift to the sub-THz regime after the initial laser-electron interaction. At a dedicated THz beamline, measurements using a polarizing Fourier-transform spectrometer have been performed in conjunction with an ultra-fast Schottky-diode detector. Studies showing the spectral evolution after several revolutions and further measurements are presented.

AKBP 14.3 Do 17:00 S1/05 23

THz Spectrometer Calibration at FELIX — ●TOKE KÖVENER, STEFFEN WUNDERLICH, PETER PEIER, EUGEN HASS, and BERNHARD SCHMIDT — Deutsches Elektronen-Synchrotron, Notkestrasse 85, 22607 Hamburg, Germany

Coherent radiation spectroscopy is a suitable method for longitudinal electron bunch diagnostics at femtosecond bunch lengths. The absolute value of the longitudinal form factor, that is connected to the longitudinal profile, can be retrieved by measuring the intensity spectrum of a coherent transition radiation source at FLASH. The response function of the used spectrometer has to be well known in absolute values in order to perform accurate measurements. Until now, the response was predicted by calculations.

As the free-electron lasers at the FELIX facility in Nijmegen (NL) provide quasi-monochromatic beams that can be tuned in a wide spectral range at micrometer wavelengths, a calibration campaign for two THz spectrometers was performed at this facility with the goal to deduce their response function. Here we present the setup at FELIX that was used for the calibration scans, the achieved scan ranges and the collected data. Furthermore, the analysis of the measured data is discussed. The results are then compared to the previous calculations of the response functions.

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Status of Near-Field EO Measurements at ANKA — ●PATRIK SCHÖNFELDT, MICHELE CASELLE, NICOLE HILLER, ANKE-SUSANNE MÜLLER, MICHAEL NASSE, GUDRUN NIEHUES, LORENZO ROTA, and SOPHIE WALTHER — KIT, Karlsruhe, Germany

ANKA is the first storage ring in the world that has a near-field electro-optical (EO) bunch profile monitor installed inside its vacuum chamber. Using the method of electro-optical spectral decoding, the setup made it possible to study longitudinal beam dynamics (e.g. microbunching) occurring during ANKA's low-alpha-operation with sub-ps resolution (granularity).

Installed in 2013, the initial setup is currently being upgraded. The

commercial spectrometer is replaced by a custom development that offers repetition rates in the MHz range. The in-vacuum geometry has been redesigned to reduce the effect of wakefields, aiming for measurements in multi-bunch operation. This talk presents the current status of the upgrade and of near-field EO measurements at ANKA in general.

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Snapshot Measurements Used for Systematic Studies of the Bursting Threshold at ANKA — ●MIRIAM BROSI, EDMUND BLOMLEY, ERIK BRÜNDERMANN, MICHELE CASELLE, NICOLE HILLER, BENJAMIN KEHRER, ANKE-SUSANNE MÜLLER, PATRIK SCHÖNFELDT, MARCEL SCHUH, and JOHANNES L. STEINMANN — KIT, Karlsruhe, Germany

The ANKA storage ring at the Karlsruhe Institute of Technology (KIT) can generate brilliant coherent synchrotron radiation in the THz range by using a dedicated electron bunch length reducing optic. One challenge in the production of coherent THz radiation at synchrotrons is the high degree of spatial compression in this so-called low-alpha optics. The resulting complex longitudinal dynamics of the electron bunches, called micro-bunching instability, leads to time dependent fluctuations and strong bursts in the radiated THz intensity.

This contribution will present a quasi instantaneous method to measure the bursting characteristics by evaluating the information of all bunches in a multi-bunch fill. The reduction of the measurement time from hours down to seconds, allows the measurement of bursting characteristics for various accelerator settings within one fill.

AKBP 14.6 Do 17:45 S1/05 23

Influence of filling pattern structure on synchrotron radiation and beam spectrum at ANKA — ●JOHANNES STEINMANN, MIRIAM BROSI, ERIK BRÜNDERMANN, MICHELE CASELLE, EDMUND BLOMLEY, NICOLE HILLER, BENJAMIN KEHRER, ANKE-SUSANNE MÜLLER, PATRIK SCHÖNFELDT, MARCEL SCHUH, MARKUS SCHWARZ, and MICHAEL SIEGEL — Karlsruher Institut für Technologie, Kaiserstr. 12, 76131 Karlsruhe

We present the effects of the filling pattern structure in multi-bunch mode on the beam spectrum. This effects can be seen by all detectors whose resolution is better than the RF frequency, ranging from stripline and Schottky measurements to high resolution synchrotron radiation measurements. Our heterodyne measurements of the emitted coherent synchrotron radiation at 270 GHz reveal the discrete frequency harmonics around the 100'000 revolution harmonic of ANKA, the synchrotron radiation facility in Karlsruhe, Germany. Significant effects of bunch spacing, gaps between bunch trains and variations in individual bunch currents on the emitted CSR spectrum are described by theory and supported by observations.

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Proposal of low-cost COTS Safety MCU for radiation tolerant controls in CBM detectors — ●JOSE ANTONIO LUCIO MARTINEZ and UDO KEBSCHULL for the CBM-Collaboration — Infrastructure and Computer Systems in Data Processing, Goethe University Frankfurt, Germany

Amid general necessity of a robust slow control system for detectors, a DCS board with a cheap COTS MCU conceived for safety critical applications, and that supports conventional RTEMS+EPICS, is being designed for hostile environments. E.g. To operate inside detectors. For this purpose such MCU, which has redundancy features like lockstep run and ECC-SECDED error correction on flash and SRAM internal memories, was tested under radiation condition at the SPS beamtime parasitically to a detector test in CERN. In this preliminary beam-test, RTEMS+EPICS simplifies controls management and in this case supported data acquisition by monitoring the fault registers of the MCU and transmitting them with the ethernet interface, as a backup method the JTAG was used to inspect such registers to confirm the register reads. The results suggest that this is a reliable MCU for hostile conditions.

AKBP 14.8 Do 18:15 S1/05 23

Ein Hochenergie-Scrapersystem für die Extraktionsstrahlführung des S-DALINAC - Design und Aufbau* — ●LARS JÜRGENSEN¹, THORE BAHLO¹, CHRISTOPH BURANDT¹, FLORIAN

HUG², THORSTEN KÜRZEDER¹, NORBERT PIETRALLA¹, SIMON WEIH¹ und JAN WISSMANN¹ — ¹Institut für Kernphysik, TU Darmstadt, Darmstadt, Germany — ²Institut für Kernphysik, Johannes Gutenberg Universität, Mainz, Germany

Der S-DALINAC ist der supraleitende Elektronenlinearbeschleuniger des Institut für Kernphysik der Technischen Universität Darmstadt. Der 30 MeV Hauptbeschleuniger kann mit Hilfe der drei Rezirkulationen bis zu viermal genutzt werden. Die gesamte Anlage ist ausgelegt für eine Endenergie von 130 MeV im Dauerstrich-Betrieb. Zur Verbes-

serung der Energieschärfe und zur Stabilisierung der Elektronenergie wurde ein neues Scrapersystem entwickelt und aufgebaut. Dazu wird die Extraktionsstrahlführung durch eine dispersionsfreie Schikane aus vier Dipolmagneten und drei Scraperkammern ergänzt. Das System soll x- und y-Haloscraping sowie die Verbesserung und Stabilisierung der Energieschärfe durch einen weiteren Scraper in einer dispersiven Strecke ermöglichen. In diesem Vortrag wird die Auslegung des Systems vorgestellt und wir berichten über den Einbau in die Strahlführung.

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