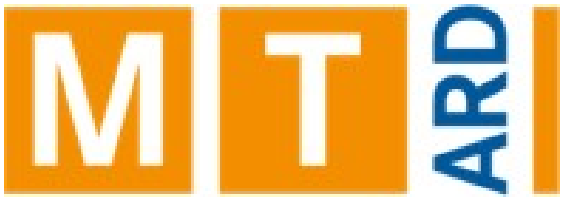
12th MT ARD ST3 Meeting 2024 in Darmstadt 3 to 5 July



Report of Contributions

Contribution ID: **1** Type: **not specified**

Discussion: Collaboration and preparation for PoF V

Friday 5 July 2024 12:00 (15 minutes)

Presenters: Dr BRUENDERMANN, Erik (KIT); Dr SCHLARB, Holger (DESY)

Session Classification: Discussion: Collaboration, preparation for PoF V & Closing

Contribution ID: **2** Type: **not specified**

Closing

Friday 5 July 2024 12:15 (5 minutes)

Presenter: FORCK, Peter (GSI)

Session Classification: Discussion: Collaboration, preparation for PoF V & Closing

Contribution ID: **3** Type: **Invited Oral Presentation**

Opening and Welcome by GSI

Wednesday 3 July 2024 13:00 (10 minutes)

Presenter: BLAUROCK, Jörg

Session Classification: Session 1: Facility Status Talks

Contribution ID: **4** Type: **Invited Oral Presentation**

General Remarks to Workshop Organization

Wednesday 3 July 2024 13:10 (5 minutes)

Presenter: FORCK, Peter (GSI)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **5** Type: **Invited Oral Presentation**

S-DANILAC Facilty at TU-Darmstadt

Wednesday 3 July 2024 13:15 (20 minutes)

Presenter: ARNOLD, Michaela (Technische Universität Darmstadt)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **6** Type: **Invited Oral Presentation**

HZB Facility Overview

Wednesday 3 July 2024 13:55 (20 minutes)

Presenter: KAMPS, Thorsten (Helmholtz-Zentrum Berlin / Humboldt-Universität Berlin)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **7** Type: **Invited Oral Presentation**

MAMI and MESA Facility at University Mainz

Wednesday 3 July 2024 13:35 (20 minutes)

Presenter: Mr HUG, Florian (University Mainz)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **8** Type: **Invited Oral Presentation**

GSI facility Overview and FAIR

Wednesday 3 July 2024 14:15 (20 minutes)

Presenter: REIMANN, Stephan

Session Classification: Session 1: Facility Status Talks

Contribution ID: **9** Type: **not specified**

Tutorial on Cryogenic Techniques

Wednesday 3 July 2024 15:10 (1 hour)

Presenter: Mr KOLLMUS, Holger (GSI)

Session Classification: Tutorials

Contribution ID: **10** Type: **Invited Oral Presentation**

DESY Facility Overview

Thursday 4 July 2024 08:30 (20 minutes)

Presenter: BURKART, Florian (MPY1 (MPY Fachgruppe 1))

Session Classification: Session 1: Facility Status Talks

Contribution ID: **11** Type: **Invited Oral Presentation**

Status of the PITZ facility: photoinjector R&D and applications

Thursday 4 July 2024 08:50 (20 minutes)

The Photo Injector Test facility at DESY in Zeuthen (PITZ) focuses on the development of high brightness electron sources for Free Electron Lasers (FELs) as well as on the applications of high brightness electron beams. In this talk, we will introduce the PITZ facility with its wide spectrum of beam parameters and its advanced diagnostics capabilities. The latest results of all three research directions will be presented: the development of new L-band normal conducting photocathode RF guns, the worldwide first high-power tunable narrow-band THz SASE FEL, and the new R&D platform FLASHlab@PITZ which offers unique research capabilities for tumor radiotherapy and radiation biology.

Summary

Primary author: OPPELT, Anne (DESY)

Presenter: OPPELT, Anne (DESY)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **12** Type: **Invited Oral Presentation**

Accelertor Developments at TU-Dortmund -> cancelled

Thursday 4 July 2024 09:50 (20 minutes)

Presenter: MAI, Carsten (TU Dortmund)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **13** Type: **Invited Oral Presentation**

HZDR Facility Overview

Thursday 4 July 2024 09:10 (20 minutes)

Presenter: KUNTZSCH, Michael (HZDR)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **14** Type: **Invited Oral Presentation**

KIT Facility Overview

Thursday 4 July 2024 09:30 (20 minutes)

Presenter: Dr BRUENDERMANN, Erik (KIT)

Session Classification: Session 1: Facility Status Talks

Contribution ID: **15** Type: **Invited Oral Presentation**

Tutorial on Electromagnetic Field Simulation of Particle Accelerator Components

Thursday 4 July 2024 10:30 (1 hour)

Presenter: Mr DEGERSEM, Herbert (TU-Darmstadt)

Session Classification: Tutorials

Contribution ID: **20** Type: **not specified**

Single-shot diagnostics for electron beam dynamics - challenges and opportunities

Thursday 4 July 2024 15:40 (20 minutes)

Presenter: NIEHUES, Gudrun (KIT)

Session Classification: Session 2: Beam Diagnostics

Contribution ID: **29** Type: **Invited Oral Presentation**

Status of the PITZ facility: photoinjector R&D and applications

The Photo Injector Test facility at DESY in Zeuthen (PITZ) focuses on the development of high brightness electron sources for Free Electron Lasers (FELs) as well as on the applications of high brightness electron beams. In this talk, we will introduce the PITZ facility with its wide spectrum of beam parameters and its advanced diagnostics capabilities. The latest results of all three research directions will be presented: the development of new L-band normal conducting photocathode RF guns, the worldwide first high-power tunable narrow-band THz SASE FEL, and the new R&D platform FLASHlab@PITZ which offers unique research capabilities for tumor radiotherapy and radiation biology.

Summary

Primary author: Dr OPPELT, Anne (Z_PITZ (Technologie))

Presenter: Dr OPPELT, Anne (Z_PITZ (Technologie))

Session Classification: Session 1: Facility Status Talks

Track Classification: Facility overviews

Contribution ID: **30** Type: **not specified**

Extended coherent nanophotonic electron acceleration

Thursday 4 July 2024 11:30 (20 minutes)

Presenter: KRAUS, Stefanie

Session Classification: Special topic talk

Contribution ID: **31** Type: **not specified**

TRIBs in Advanced Light Sources –An analysis based on Lie Algebra Calculations

Thursday 4 July 2024 13:00 (20 minutes)

Presenter: ARLANDOO, Michael (HZB)

Session Classification: Session 4: Beam Dynamics

Contribution ID: **32** Type: **not specified**

STERN Project - Terahertz Science at European XFEL

Thursday 4 July 2024 13:20 (20 minutes)

Presenter: LEMERY, Francois (MXL (XFEL))

Session Classification: Session 4: Beam Dynamics

Contribution ID: **33** Type: **Invited Oral Presentation**

Overview of ultrafast electron scattering activities

Thursday 4 July 2024 13:40 (20 minutes)

Presenter: NIEMCZYK, Raffael (Helmholtz-Zentrum Dresden-Rossendorf)

Session Classification: Session 4: Beam Dynamics

Contribution ID: **34** Type: **not specified**

FPGA-based online pulse-resolved detection at light sources

Thursday 4 July 2024 14:00 (20 minutes)

Summary

Presenter: DE OLIVEIRA, Thales (HZDR)

Session Classification: Session 4: Beam Dynamics

Contribution ID: **35** Type: **not specified**

Cut-edge RF Oscillators for Accelerator Facilities, Future Perspectives

Friday 5 July 2024 08:50 (20 minutes)

Co-authors:
Julien Branlard, Krzysztof Czuba, Marie Kristin Czwalinna, Bartosz Gasowski, Thorsten Lamb, Heinz Pryschelski, Holger Schlarb, Maximilian Schuette

Today's high-precision accelerators with arrival time stabilities in the sub-fs range require a very low-noise and long-term stable source as the main oscillator. Due to the different locking bandwidths of the various subsystems, sources with low phase noise down to below -175dBc/Hz are required for arrival times below 1fs. In order to connect laser systems and optical low-latency links without time jitter loss, additional low 1/f noise edges, typically from high frequency (RF) sources, are required. In this presentation, state-of-the art RF oscillators will be presented, current challenges and an outlook of the next generation of RF sources for arrival times in the 100as range will be given.

Summary

Presenter: LUDWIG, Frank (MSK (Strahlkontrollen))

Session Classification: Session 3: Controls/Seeding/DAQ

Contribution ID: **36** Type: **not specified**

Real-time Reinforcement Learning on FPGA with Online Training for Autonomous Accelerators

Friday 5 July 2024 08:30 (20 minutes)

Presenter: SCOMPARIN, Luca (KIT IPE)

Session Classification: Session 3: Controls/Seeding/DAQ

Contribution ID: **37** Type: **not specified**

XUV FEL oscillator experiment at FLASH

Friday 5 July 2024 09:10 (20 minutes)

Presenter: ASATRIAN, Margarit (UNI/EXP (Uni Hamburg, Institut fur Experimentalphysik))

Session Classification: Session 3: Controls/Seeding/DAQ

Contribution ID: **39** Type: **Poster and Speed Talk**

Wake Up and Dance! - A Report on the Progress of the ChimeraTK Framework

Friday 5 July 2024 10:00 (3 minutes)

This poster reports on the improvements in the ChimeraTK frameworks since last year's ARD ST3 workshop.

We will present the new Tango support feature, which completes the set of mainstream control system middleware supported by ApplicationCore-based device servers.

Integrating our software stack into the Yocto embedded Linux ecosystem enables us to run directly on SoCs with current and future FPGAs.

Vastly improved support for hardware interrupts has been introduced, which enhances synchronisation of data acquisition and slow control loops with machine and event triggers.

Summary

Primary author: GEORG, Jens (MSK (Strahlkontrollen))

Co-authors: PHAM, Jade (SOLEIL); Dr BARKER, Anthony (MSK (Strahlkontrollen)); Dr HIERHOLZER, Martin Christoph (MSK (Strahlkontrollen)); KILLENBERG, Martin (MSK (Strahlkontrollen)); KOZAK, Tomasz (DESY - Deutsches Elektronen-Synchrotron); OMIDSAJEDI, Seyed Nima (MSK (Strahlkontrollen)); RANDALL, Michael (None); ROTHE, Dietrich (MSK (Strahlkontrollen)); SHEHZAD, Nadeem (MSK (Strahlkontrollen)); WILLNER, Christian (MSK (Strahlkontrollen))

Presenter: GEORG, Jens (MSK (Strahlkontrollen))

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **40** Type: **Poster and Speed Talk**

4D Transverse phase space characterization at PITZ via virtual pepper pot

Thursday 4 July 2024 16:10 (3 minutes)

Due to the space-charge dominated nature of the electron beams at high brightness photoinjectors, a slit scan technique is utilized as a standard tool for quantifying horizontal and vertical emittance and reconstructing corresponding phase spaces. A novel method for 4-dimensional transverse phase space diagnostics is proposed at the Photo Injector Test facility at DESY in Zeuthen (PITZ), the so-called Virtual Pepper Pot (VPP) technique, that can give insight to the transverse beam phase space coupling. Also, since it is virtual, there is no mechanical design consideration, rather VPP utilizes the horizontal and vertical single slit scan data to form pepper-pot like beamlets and mask. By post processing of this data, all elements of the 4D transverse beam matrix are calculated and used to obtain the 4D transverse emittance and coupling factor. Additionally, the signal loss due to low SNR in the beamlets is estimated and the systematic error resulting from the crossing of beamlets is also explored. The VPP technique has been applied to ASTRA simulated beams as well as specially designed experiments with rotated beams (generated by a pair of normal and skew gun quadrupoles installed near the gun) to demonstrate the diagnostic capability.

Summary

Primary author: AFTAB, Namra (Z_PITZ (Betrieb und Forschung))

Co-authors: HOFFMANN, Andreas (Z_PITZ (Technologie)); OPPELT, Anne (Z_PITZ (Technologie)); RICHARD, Christopher James (Z_PITZ (Betrieb und Forschung)); STEPHAN, Frank (DESY); GEORGIEV, Georgi (Z_PITZ (Betrieb und Forschung)); VASHCHENKO, Grygorii (Z_DV (Datenverarbeitung)); Dr QIAN, Houjun (DESY); Mr GOOD, James (PITZ DESY); GROSS, Matthias (Z_PITZ (Technologie)); BOONPORNPRASERT, Prach (Z_PITZ (Betrieb und Forschung)); LI, Xiangkun (Z_PITZ (Betrieb und Forschung))

Presenter: AFTAB, Namra (Z_PITZ (Betrieb und Forschung))

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **41** Type: **Poster and Speed Talk**

Emittance Optimization studies with Photo-Injector Laser Pulse shaping for PITZ

Friday 5 July 2024 10:39 (3 minutes)

The Photo Injector Test Facility at DESY in Zeuthen (PITZ) develops and optimizes high-brightness electron sources for modern Free Electron Lasers (FELs), like the European XFEL. PITZ's goal is to generate intense electron beams having small transverse emittance to achieve optimum FEL performance. ASTRA simulations have been used as a tool to study the optimal parameters at PITZ for the minimization of emittance and will be presented. The longitudinal pulse shaping of Photo Injector's photocathode laser can effectively reduce emittance growth due to space charge effects. A benchmarking analysis of Gaussian and Flattop laser profiles will be presented. The lasing process in XFEL occurs predominantly through highly charged slices with low emittance, assumed to originate from the longitudinal core of the electron bunch in the photo injector. The optimization of transverse emittance of these segments along with projected emittance are carried out through ASTRA. The results of these comprehensive optimization studies will be presented in terms of further improving the performance of European XFEL.

Summary

Primary authors: ZEESHAN, Sumaira (Z_PITZ (Betrieb und Forschung)); LI, Xiangkun; RICHARD, Christopher James; KRASILNIKOV, Mikhail; STEPHAN, Frank

Presenter: ZEESHAN, Sumaira (Z_PITZ (Betrieb und Forschung))

Session Classification: Session 4: Beam Dynamics

Track Classification: Beam dynamics

Contribution ID: **42** Type: **Poster and Speed Talk**

Commissioning and Experiments with a Compact Transverse Deflecting System at FLUTE

Thursday 4 July 2024 16:34 (3 minutes)

A Compact Transverse Deflecting System (Compact-TDS) designed for longitudinal electron bunch diagnostics in the femtosecond regime is presently undergoing commissioning at the Karlsruhe Institute of Technology (KIT). This technique, based on THz streaking using a resonator structure, demands a high level of electron beam controllability and stability at the micrometer scale. To meet these requirements, the linear accelerator FLUTE (Ferninfrarot Linac- Und Test-Experiment) has undergone major upgrades in 2023, incorporating a new RF system equipped with a klystron, RF photoinjector and solenoid magnet.

In this contribution, we present first experiments conducted with the Compact-TDS at FLUTE, utilizing the upgraded RF setup.

Summary

Primary author: NABINGER, Matthias (KIT)

Co-authors: MUELLER, Anke-Susanne (KIT); MALYGIN, Anton (Karlsruhe Institute of Technology); Dr BRUENDERMANN, Erik (KIT); SCHÄFER, Jens (KIT IBPT); STEINMANN, Johannes (Karlsruhe Institute of Technology (KIT), IBPT); Mrs MAYER, Katharina (KIT); NOLL, Marvin (KIT); FUCHS, Matthias; Mr MOSER, Matthias (PSI); DEHLER, Micha (PSI); NASSE, Michael (Karlsruhe Institute of Technology); Mrs HAYATI, Mozghan (PSI); SMALE, Nigel (IBPT KIT); Mr BOINE-FRANKENHEIM, Oliver (TU Darmstadt); ISCHEBECK, Rasmus (Paul Scherrer Institut); Mr RUPRECHT, Robert (KIT); Mr GLUKHOV, Sergei (TU Darmstadt); SCHMELZER, Thiemo (Karlsruhe Intitute of Technology (KIT)); Mr FEURER, Thomas (University of Berne); Mr OLLMANN, Zoltan (University of Berne)

Presenter: NABINGER, Matthias (KIT)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **43** Type: **Invited Oral Presentation**

Wakefield-based bunch duration diagnostics with dielectric capillaries at ARES for the TWAC project

Thursday 4 July 2024 15:00 (20 minutes)

The EIC-Pathfinder project TWAC (Terahertz Wave Accelerating Cavity) aims to build a prototype accelerator demonstrating the feasibility of a compact machine based on THz-driven accelerating structures for the purpose of research, medical and industrial applications. The prototype should deliver low-energy, ultrashort and high peak current electron bunches (~10 MeV, femtosecond scale and ~1 kA) on a small footprint. Within the framework of the TWAC project, DESY is in charge of developing and experimentally testing compact advanced bunch duration diagnostics for the prototype. The retained option is a diagnostics based on streaking of the bunch by the self-induced transverse wakefields when passing through a dielectric-loaded cylindrical waveguide (the so-called passive streaking). To study the performance of this diagnostic, a proof-of-principle experiment has been carried out on the ARES linear electron accelerator at DESY, whose versatility allowed setting up several working points to approach iteratively the beam parameters expected in TWAC, which are far from the current range of applicability of passive streaking. In addition, ARES offers a benchmark possibility through a comparison with an X-band transverse deflecting structure (PolariX-TDS). In this contribution, we present the experimental setup installed at ARES, the development of a current profile reconstruction algorithm from the experimental data as well as the first passive streaking results at ARES and their comparison with PolariX-TDS measurements.

Summary

Primary authors: KELLERMEIER, Max (MPY1 (MPY Fachgruppe 1)); VINATIER, Thomas (MPY1 (MPY Fachgruppe 1))

Presenters: KELLERMEIER, Max (MPY1 (MPY Fachgruppe 1)); VINATIER, Thomas (MPY1 (MPY Fachgruppe 1))

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **44** Type: **Poster and Speed Talk**

Laser Pulse Arrival Time Measurements for User Experiments at FLASH and EuXFEL

Friday 5 July 2024 10:24 (3 minutes)

While the arrival time stability of electron bunches in a free-electron laser (FEL) can be as precise as 5 fs rms, the arrival time jitter of optical laser pulses is around 10 fs rms or worse at the experimental setups. In this contribution, we will provide an update on a laser pulse arrival time monitor, where the arrival time of optical pulses will be measured against an optical reference from the laser-based synchronisation system. By performing measurements as close as possible to the interaction point, we can evaluate and correct instabilities caused by e.g. laser beam transport or other manipulation, either by time-sorting experimental data or through active feedback loops, with recent data collected at the FELs FLASH and EuXFEL will be presented.

Summary

Primary author: SCHWICKERT, David (MSK (Strahlkontrollen))

Co-authors: CALENDRON, Anne-Laure (MSK (Strahlkontrollen)); GRUENHAGEN, Arne (MSK (Strahlkontrollen)); ZUMMACK, Falco (MSK (Strahlkontrollen)); CIRMI, Giovanni (FS-LA (Laser Operations & User Support)); CANKAYA, Hueseyin (FS-LA (FLASH 2020+ flexible pump probe lasers)); PUDELL, Jan-Etienne (Eur.XFEL (European XFEL)); HALLMANN, Joerg (Eur.XFEL (European XFEL)); FELBER, Matthias (MSK (Strahlkontrollen)); SCHUETTE, Maximilian (MSK (Strahlkontrollen)); KSCHUEV, Nick (MSK (Strahlkontrollen)); ALISAUSKAS, Skirmantas (FS-LA (FLASH 2020+ flexible pump probe lasers)); DUESTERER, Stefan (FS-FLASH-D (FLASH Photon Diagnostics and Controls)); LAMB, Thorsten (MSK (Strahlkontrollen)); KOZAK, Tomasz (DESY - Deutsches Elektronen-Synchrotron); SCHULZ, Sebastian (Deutsches Elektronen-Synchrotron)

Presenter: SCHWICKERT, David (MSK (Strahlkontrollen))

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **45** Type: **Invited Oral Presentation**

”Cut-edge RF Oscillators for Accelerator Facilities, future perspectives”

Today’s high-precision accelerators with arrival time stabilities in the sub-fs range require a very low-noise and long-term stable source as the main oscillator. Due to the different locking bandwidths of the various subsystems, sources with low phase noise down to below -175dBc/Hz are required for arrival times below 1fs. In order to connect laser systems and optical low-latency links without time jitter loss, additional low 1/f noise edges, typically from high frequency (RF) sources, are required. In this presentation, state-of-the art RF oscillators will be presented, current challenges and an outlook of the next generation of RF sources for arrival times in the 100as range will be given.

Summary

Primary author: Dr LUDWIG, Frank (MSK (Strahlkontrollen))

Co-authors: Dr GASOWSKI, Bartosz (WUT); Mr PRYSCHELSKI, Heinz (DESY); Dr SCHLARB, Holger (DESY); Dr BRANLARD, Julien (MSK (Strahlkontrollen)); Prof. CZUBA, Krzysztof (WUT); Dr CZWALINNA, Marie Kristin (DESY, MSK); SCHUETTE, Maximilian (MSK (Strahlkontrollen)); Dr LAMB, Thorsten (MSK (Strahlkontrollen))

Presenter: Dr LUDWIG, Frank (MSK (Strahlkontrollen))

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **46** Type: **not specified**

Discussion at posters

Friday 5 July 2024 10:45 (1h 15m)

Session Classification: Session 4: Beam Dynamics

Contribution ID: **47** Type: **not specified**

Discussion at posters

Friday 5 July 2024 10:45 (1h 15m)

Session Classification: Session 3: Controls/Seeding/DAQ

Contribution ID: **48** Type: **not specified**

Discussion at posters

Thursday 4 July 2024 16:50 (1h 20m)

Session Classification: Session 2: Beam Diagnostics

Contribution ID: **49** Type: **Invited Oral Presentation**

A Profile monitor based on single fluorescence photon detection for electrons and ions

Thursday 4 July 2024 14:40 (20 minutes)

On behalf of the consortium CERN, Cockcroft Institute, GSI and University of Liverpool (full author list on the slides)

The spatial-resolved detection of single fluorescence photons delivers an image of the transverse beam profile. A supersonic gas jet transverses the beam to enhance the gas density (up to 1E11/cm3). A set of narrow skimmers creates a curtain-like gas sheet, allowing one camera to observe both transverse beam directions. The fluorescence in the visible wavelength range is caused by atomic transition either in nitrogen molecules or neon atoms and is observed by an image-intensified camera. A consortium from CERN, Cockcroft Institute, GSI and the University of Liverpool developed this monitor, which is now in operation at CERN LHC. The entire acceleration and storage cycle is observed with a typical time resolution of several seconds. Moreover, the transverse profile is monitored at a 10 keV electron beam at a test stand for a hollow electron lens. The talk presents the physics of the monitor, general technical design and some recent results.

Summary

Primary author: FORCK, Peter (GSI)

Presenter: FORCK, Peter (GSI)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **50** Type: **Poster and Speed Talk**

Cheetah –A High-speed Differentiable Beam Dynamics Simulation for Machine Learning Applications

Friday 5 July 2024 10:30 (3 minutes)

Machine learning has emerged as a powerful solution to the modern challenges in accelerator physics. However, the limited availability of beam time and the high computational cost of simulation codes pose significant hurdles in generating the necessary data for training state-of-the-art machine learning models. Furthermore, optimisation methods can be used to tune accelerators and perform complex system identification tasks. However, they too require large numbers of samples of expensive-to-compute objective functions in order to achieve state-of-the-art performance. In this work, we introduce *Cheetah*, a PyTorch-based high-speed differentiable linear-beam dynamics code that enables fast collection of large datasets and sample-efficient gradient-based optimisation, while being easy to use, straightforward to extend and integrating seamlessly with widely adopted machine learning tools. Ultimately, we believe that Cheetah will simplify the development of machine learning-based methods for particle accelerators and fast-track their integration into everyday operations of accelerator facilities.

Summary

Primary authors: KAISER, Jan (DESY); XU, Chenran (KIT); EICHLER, Annika (MSK (Strahlkontrollen)); SANTAMARIA GARCIA, Andrea (KIT)

Presenter: KAISER, Jan (DESY)

Session Classification: Session 4: Beam Dynamics

Track Classification: Beam dynamics

Contribution ID: **51** Type: **Poster and Speed Talk**

Towards Natural Language-driven Autonomous Particle Accelerator Tuning

Friday 5 July 2024 10:09 (3 minutes)

Autonomous tuning of particle accelerators is an active and challenging field of research with the goals of reducing tuning times and enabling novel accelerator technologies for novel applications. Large language models (LLMs) have recently made enormous strides towards the goal of general intelligence, demonstrating that they are capable of solving complex task based just a natural language prompt. Here we demonstrate how LLMs can be used for autonomous tuning of particle accelerators using natural language. We test our approach on commonly performed tuning task at the ARES accelerator facility at DESY, and briefly compare its performance to other state-of-the-art autonomous accelerator tuning methods. Ultimately, this line of work could enable operators of particle accelerators to request working points through natural language and collaborate with autonomous tuning algorithms in an intuitive way, thereby significantly simplifying the operation of these complex and high-impact scientific facilities.

Summary

Primary authors: KAISER, Jan (DESY); EICHLER, Annika (MSK (Strahlkontrollen)); Prof. LAUSCHER, Anne (Universität Hamburg)

Presenter: KAISER, Jan (DESY)

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **52** Type: **Poster and Speed Talk**

Reinforcement Learning for Intensity Tuning at Large FEL Facilities

Friday 5 July 2024 10:06 (3 minutes)

One of the key metrics determining the capabilities of Free Electron Laser (FEL) facilities is the intensity of photon beam they can provide to experiments. However, in day-to-day operations, tuning to maximise the FEL intensity is one of the most difficult and time-consuming tasks. Skilled human operators still need large amounts of the available beam time, which are then not available for experiments, to achieve maximum performance. The large number of tuning parameters and high non-linearity of the underlying dynamics have so far made it challenging to develop autonomous FEL tuning solutions. We present a method based on reinforcement learning to train a neural network policy to autonomously tune the FEL intensity at LCLS and European XFEL. Our method is trained requiring little to no beam time and is appealing for tuning across different FEL setups. In contrast to conventional black box optimisation approaches that do not share information across different tuning sessions and setups, a trained policy can leverage its experience to tune the FEL intensity with minimal online exploration.

Summary

Primary authors: KAISER, Jan (DESY); EICHLER, Annika (MSK (Strahlkontrollen))

Co-authors: Dr EDELEN, Auralee (SLAC National Accelerator Laboratory); Dr RATNER, Daniel (SLAC National Accelerator Laboratory)

Presenter: KAISER, Jan (DESY)

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **53** Type: **Poster and Speed Talk**

Axial Double core CCC for FAIR

Thursday 4 July 2024 16:22 (3 minutes)

The Cryogenic Current Comparator (CCC) is a superconducting device based on an ultrasensitive SQUID magnetometer (fT range). Measuring the beam's azimuthal magnetic field, it provides a calibrated non-destructive measurement of beam current with a resolution of 10 nA or better, independent from ion species and without tedious calibrations procedure. The non-interceptive absolute intensity measurement of weak ion beams (< 1 μA) is essential in heavy ion storage rings and in transfer lines at FAIR. With standard diagnostics, this measurement is challenging for bunched beams and virtually impossible for coasting beams.
To improve the performance of the detector a new type of CCC using an alternative magnetic shield geometry has been developed. The so-called 'axial'geometry will allow for much higher magnetic shielding factor, an increased pick-up area, and an expected lower noise component at low frequencies. Thanks to a specially developed cascade SQUID system the axial CCC will have an improved bandwidth, strongly increasing the utilize spectrum of the detector. The use of two high magnetic permeability cores working in parallel allows to have an higher signal to noise ratio especially at low frequency.
Hereby the first test of the new detector in the controlled environment in Jena and in the GSI cryostat will be presented. Furthermore the test of the device on the beam-line at GSI will be shown, where the detector have been used to perform analysis of slow extracted beams as it will be used in FAIR. The results collected shows as the DCCC is an optimal solution for the measurement of slow extracted beam of low intensity and it's capability as a detector for FAIR.

Summary

Primary author: CRESCIMBENI, Lorenzo (Friederich schiller universität jena)

Co-authors: SIEBER, Thomas (GSI); TYMPEL, Volker (Helmholtz Institute Jena)

Presenter: CRESCIMBENI, Lorenzo (Friederich schiller universität jena)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **54** Type: **Poster and Speed Talk**

Ultra-Wide Band Intermediate Frequency Response of GaAs-Based THz Detectors with ps-scale THz Pulse Resolution

Thursday 4 July 2024 16:46 (3 minutes)

Terahertz (THz) radiation sources based on accelerators provide new fields of study for physical matter research and applications. The generated THz spectrum, its pulse shape and the arrival time of the pulse are of key importance for such experiments. Among available detector technologies, high electron mobility field effect transistors (HEMTs) based on Gallium arsenide (GaAs) are ideal detectors for picosecond (ps)-scale Terahertz (THz) beam alignment and synchronization at high power accelerator facilities, including free electron lasers (FELs). We develop detectors that serve two application cases: (i) beam line scientists who investigate beam dynamics and (ii) users who need to align and characterize the high power pulses for their experiments on-site in a quick and reliable manner. FET detectors are excellently suited because they are fast, sensitive, robust, compact and offer large frequency coverage.

Here, we present measurement findings from studies carried out at the Helmholtz Zentrum Dresden-Rossendorf to evaluate detector limits in the intermediate frequency (IF) domain. The second order non-linear coefficient of a LiNbO3 crystal was used to generate THz signals with a 1 kHz Ti:sapphire oscillator-amplifier laser system (Astrella, Coherent). As IF post detection electronics, a 110 GHz Keysight Infinium oscilloscope was employed. We have examined different versions of antenna-coupled GaAs THz detectors. These detectors utilize various packaging methods and RF connectors, which could potentially restrict the detector's performance in IF range. The Ultra-Wide band IF response is crucial for accurately characterizing FEL pulses at FELBE. These results are bench-marks for future detector development and commissioning at accelerator facilities.

The work is supported by the German Federal Ministry of Education and Research (BMBF) under contract no. 05K22RO1 (at THM, Friedberg) and 05K22RD1 (at TU Darmstadt).

Summary

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Presenter: YADAV, Rahul (Terahertz Devices and Systems, IMP , TU Darmstadt)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **55** Type: **Poster and Speed Talk**

Stability and limitations of the EuXFEL 3rd harmonic cryomodule in CW and LP operation

Friday 5 July 2024 10:21 (3 minutes)

Future high duty cycle operation scenarios of the European X-ray Free Electron Laser (EuXFEL) promise increased bunch repetition rate and photon delivery, at the cost of changing system requirements and moving away from the proven mode of short pulse operation. To assess the applicability of the currently installed 3rd harmonic cryomodule, key parameters of its spare sibling installed at the Accelerator Module Test Facility are examined for long pulse (LP) and continuous wave (CW) operation. For RF related energy efficiency, the cavity resonance tuning precision and the loaded quality factor tuning range are investigated. As performance indicators, limitations on attainable cavity gradient and RF stability are quantified. The results show that the module in its current design is not sufficient for LP and CW at the required operating points. The mechanical cavity tuner prohibits tuning precision within the intended cavity half bandwidth, and the installed 3-stub tuners only yield quality factors up to 1.4e7. Also, some higher order mode couplers do not allow CW operation at required gradients. Nevertheless, closed-loop RF stability measurements with single cavity control fulfill the current EuXFEL requirements if assembled to a pseudo vector-sum.

Summary

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Presenter: RICHTER, Bozo (MSK (Strahlkontrollen))

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **56** Type: **Poster and Speed Talk**

Influence of environmental parameters on calibration drift in superconducting RF cavities

Friday 5 July 2024 10:27 (3 minutes)

Precisely calibrating RF superconducting radio-frequency linear accelerators is crucial for accurately assessing cavity bandwidth and detuning, which provides valuable insights into cavity performance, facilitates optimal accelerator operation, and enables effective fault detection and diagnosis. In practice, however, calibration of RF signals can present several challenges, with calibration drift being a significant issue, especially in settings prone to humidity and temperature fluctuations. In this paper, we delve into the effect of environmental factors on the calibration drift of superconducting RF cavities. Specifically, we examine long-term calibration drifts and explore how environmental variables such as humidity, temperature, and environmental noise affect this phenomenon. The results show that environmental factors, particularly relative humidity, significantly influence calibration drifts. Moreover, we observe and analyze the lag in their influence. By analyzing these correlations, appropriate compensation algorithms can be designed to mitigate and eliminate these effects, thus optimizing calibration accuracy and stability.

Summary

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Presenter: SUN, Yue (MSK (Strahlkontrollen))

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **57** Type: **Invited Oral Presentation**

Slow extraction improvements with novel methods at GSI

Friday 5 July 2024 09:30 (20 minutes)

Improving the temporal structure of slowly extracted beams (spills) is a key challenge for efficient beam operation at the SIS18 synchrotron of GSI.
This contribution focusses on the recently developed spill optimization system implemented with software-defined radio (SDR) technology. It comprises a feedback system to control the spill rate and an optimization algorithm to automatically improve the spill quality –implemented on a single device. The idea, system layout and results with beam of the developed spill control system are discussed.

Summary

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Presenter: NIEDERMAYER, Philipp (GSI)

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **58** Type: **Poster and Speed Talk**

Report on latest developments of electro-optic pulse shape measurements at European XFEL and FLASH

Thursday 4 July 2024 16:25 (3 minutes)

Over the past years Electro-optical (EO) crystal-based mixing techniques are gaining interest to characterize electric fields of THz waveforms with high temporal resolution, single-shot capability and high data rate acquisition.
Those EO-techniques are equally suited for various THz sources, utilising either directly the electron bunch coulomb field for bunch length monitoring, or for characterizing THz waveforms from electron-based or laser-based THz generation setups.
In the context of electro-optical diagnostics (EOD) for bunch length monitoring, promising results have been obtained with so-called diversity decoding schemes, using multiple simultaneous measurements and sophisticated algorithms for resolving ultra-short waveforms well below 1ps length, while still keeping long acquisition windows.
Here we present the first results of this novel method applied to the EOD-Setups at DESY.

Summary

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Presenter: CZWALINNA, Marie Kristin (DESY, MSK)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **59** Type: **Poster and Speed Talk**

Characterization of low-light cameras for beam diagnostics

Thursday 4 July 2024 16:13 (3 minutes)

Low-light cameras are often used in beam diagnostics for non-destructive profile measurements. Especially beam induced fluorescence (BIF) monitors are characterized by very low light intensities when measurements are performed in LINACs, high energy transport lines or even synchrotrons. In this contribution the characterization of three different types of low-light cameras is presented: an EMCCD (ProEM:+512B), an ICCD (Image Intensifier (Proxivison) and CMOS camera (Basler)) and two sCMOS cameras (pco.edge 4.2bi and Kinetix 22). As a light source pulsed LEDs in the wavelength range from 500 nm to 385 nm with light pulse durations of 0.05 ms to 8 ms were used. While sCMOS cameras proved to have the best resolution, followed by the EMCCD and the ICCD, in this order, the ICCD was the most sensitive, being able to easily detect single photons as observed on images obtained at lowest LED pulse lengths. When used with an electron multiplication gain of 100, the EMCCD is for most of the determined signal-to-noise ratios comparable to the ICCD.

Summary

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Presenter: BAUER, Leonie (GSI)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **60** Type: **Poster and Speed Talk**

Disturbance model integration into ring simulations for PETRA IV fast orbit feedback system

PETRA IV, a low emittance fourth generation light source is the upcoming flagship project of DESY. Stringent stability of the electron beam orbit in the ring will be required to achieve a diffraction limited photon beam quality. A fast orbit feedback system is being modelling and designed. One important aspect is the disturbance modelling. Preliminary ideas for correlation lengths of ground and amplification factors of the closed orbit are presented

Summary

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Presenter: MIRZA, Sajjad Hussain (MSK (Strahlkontrollen))

Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **61** Type: **Poster and Speed Talk**

Status of the MicroTCA.4-based LLRF control system at TARLA

Friday 5 July 2024 10:15 (3 minutes)

The Turkish Accelerator and Radiation Laboratory in Ankara (TARLA) is Turkeys first particle accelerator research facility. DESY provides TARLA with a MicroTCA.4-based LLRF control system. This system was assembled and tested at DESY and shipped to TARLA. It was commissioned earlier this year and saw first beam. Find in this contribution a more detailed description of the LLRF system as well as first results of operation.

Summary

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Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **62** Type: **Poster and Speed Talk**

Continuous-Wave Piezo-to-RF System Identification

Friday 5 July 2024 10:03 (3 minutes)

Motivated by the overarching goal of designing a unifying controller for continuous wave operation that integrates piezo and RF control for stabilizing amplitude and phase of a cavity field with active microphonics suppression , we conducted measurements on a cryo module with piezo signal as input and cavity gradient as output to establish a linear model that could be used for model-based estimation and control.

Summary

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Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **63** Type: **Poster and Speed Talk**

DESY DAMC-DS5014DR

Thursday 4 July 2024 16:19 (3 minutes)

This work will show the recent developments of the DESY DAMC-DS5014DR MicroTCA card. The core of the DAMC-DS5014DR is the Xilinx Zynq UltraScale RFSoC Gen. 3. It consists of eight 14-bit, 5-GSPS RF-ADCs, eight 14-bit, 10-GSPS RF-DACs, programmable logic (PL) and processing system (PS). The RF-ADCs convert the wideband analog pulses directly to the digital. DAMC-DS5014DR has a PCIe Gen. 3 x4 interface to the feedback server over the AMC backplane and a 100 GbE interface to the tools server over the front panel. Three separate 16-GB, 64-bit DDR4 memory banks, two dedicated to the PL and one to the PS, are especially useful for the processing of fast data streams. The RF-DACs are connected differentially and single-ended over Zone 3 to the back-ends. The RF-DACs of the RFSoC have built-in variable output power (VOP), which regulates the output power of the differential signals from -18.5 dBm to 6 dBm. In the Zone 3 interface, four single-ended RF-DACs are connected to the Radiall connector, and four RF-DACs' differential outputs are connected to the ERNI connector.

Summary

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Presenter: BOGHRATI, Behzad (MSK (Strahlkontrollen))

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **64** Type: **not specified**

Latest Developements Digital Boards from DESY

Thursday 4 July 2024 16:16 (3 minutes)

This work will show the latest generation of the DESY MicroTCA cards developed for high-performance processing, low-latency high-frequency digitizer, artificial intelligence and machine learning platforms based on the GPU carrier and the motion control application.

Summary

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Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **65** Type: **Poster and Speed Talk**

Investigation of transit time spread in tune scan slow extraction at SIS18 GSI

Friday 5 July 2024 10:36 (3 minutes)

The temporal structure of the slowly extracted beams on the 100 microseconds time scale is crucial for fulfilling the demands of fixed target experiments and hadron therapy. The transit time is a crucial quantity in beam dynamics considerations, and its spread provides a mechanism for the improvement of the quantity of the slowly extracted spill. Transit time measurements in tune scan slow extraction were performed at SIS18, with the machine tune excited by stepwise and sinusoidal signals. Spills were evaluated, and the results from sinusoidal tune excitation indicate an increasing tendency of the transit time spread along the extraction time. The results and associated technical limitations were discussed.

Summary

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Session Classification: Session 4: Beam Dynamics

Track Classification: Beam dynamics

Contribution ID: **66** Type: **Poster and Speed Talk**

Effect of surface roughness on optical transition radiation characteristics of a 10 keV electron beam

Thursday 4 July 2024 16:28 (3 minutes)

This study investigates the effects of surface roughness on the optical transition radiation (OTR) characteristics of a 10 keV electron beam incident on carbon steel targets. While OTR is well-established as a profile monitoring tool for relativistic charged beams, its viability for low-energy beams is still under scrutiny, primarily due to issues such as low yield and a wide angle of the radiation cone. This study explores the potential of exploiting the anomalously high intensity of OTR observed on rough surfaces for precise profile measurements of low-energy charged beams.

We present a systematic examination of the dependence of OTR yield and polarization on surface roughness characteristics, beam current, and the incidence angle of the beam. The observations are discussed qualitatively, shedding light on the nuanced interactions between these parameters and OTR characteristics. This research contributes insights to the ongoing discourse on utilizing OTR for low-energy charged beam diagnostics.

Summary

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Presenter: GHAGI, Rupeshkumar

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **67** Type: **Poster and Speed Talk**

Electro-optical spectral Decoding of THz Pulses at MHz Repetition Rates

Thursday 4 July 2024 16:40 (3 minutes)

A far-field electro-optical (EO) setup based on a balanced detection scheme has been set up to measure the coherent synchrotron radiation (CSR) at the Karlsruhe Research Accelerator (KARA). To enable the readout with a electro-optical spectrally decoded scheme (EOSD), a KALYPSO-based line array camera, sensitive to NIR operating at a read-out rate of 2.7 MHz, has been included in the set-up. In this contribution, measurement results with the KIT-developed ultra fast line array camera KALYPSO-based spectrometer in combination with a commercial THz emitter are presented.

Summary

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Presenter: PATIL, Meghana

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **68** Type: **Poster and Speed Talk**

Utilizing differentiable beam dynamics code for simulated optimization

Friday 5 July 2024 10:33 (3 minutes)

Simulation optimization plays a crucial role in designing new accelerators and enhancing the performance of existing ones. In this contribution, we utilize the innovative differentiable simulation code Cheetah for parameter optimization, specifically aiming to maximize the THz pulse generated by coherent synchrotron radiation (CSR) at FLUTE. Our approach involves implementing a differentiable model of the CSR field produced by arbitrary bunch distributions. Initially, we employ gradient descent for efficient parameter optimization. We then leverage the strengths of Bayesian optimization to demonstrate its capability in optimizing under collective effects such as space charge, and highlight the potential of this approach for guiding online optimization.

Summary

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Presenter: XU, Chenran (KIT)

Session Classification: Session 4: Beam Dynamics

Track Classification: Beam dynamics

Contribution ID: **69** Type: **Invited Oral Presentation**

First Measurements of a Demonstrator for the Electro-Optical Bunch Arrival-Time Monitor with PCB-based Pickups

Thursday 4 July 2024 15:20 (20 minutes)

In an ongoing quest to improve beam instrumentation, an update of the established electro-optical bunch arrival-time monitors (EO-BAM) is intended to achieve a sensitivity that enables stable operation of X-ray free-electron lasers with bunches down to a minimum charge of 1 pC or significantly increase the resolution of single-shot measurements in normal operation. In a joint project, the pickup structure and the RF path as well as the electro-optical modulators are being redesigned. The preliminary concept achieved an estimated theoretical jitter charge product of 9 fs pC. To proof feasibility of this concept, in 2023 a first demonstrator of the EO-BAM together with its rf part, comprising of planar pickups with integrated combination network on a printed circuit board and 67-GHz feedthrough, was manufactured and rf measurements were carried out at ELBE.

Summary

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Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **70** Type: **Poster and Speed Talk**

Simulations and measurement results of a radially coupled fast faraday cup with increased signal strength

Thursday 4 July 2024 16:31 (3 minutes)

Longitudinal bunch shape and mean energy of high-intensity heavy ion beams accelerated at the GSI UNILAC up to 11.4 MeV/u may differ from macro-pulse to macro-pulse and even within a single macro-pulse. Fast Faraday Cups (FFC) are able to measure these changes with high precision. A study on different FFCs has been performed and showed very promising results for a radially coupled FFC (RCFFC). An adapted version of the RCFFC used in the study has been designed to increase the signal strength while still suppressing the secondary electrons as much as possible. We present simulations and measurement results of the FFC study combined with the latest results of the new high-current radially coupled FFC (HCRCFFC) investigating the bunch shapes and longitudinal emittance of the beam @GSI X2.

Summary

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Presenter: KLAPROTH, Stephan (Technische Hochschule Mittelhessen)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **71** Type: **Poster and Speed Talk**

Simulations of an electro-optical in-vacuum bunch profile monitor and measurements at KARA for use in the FCC-ee

Thursday 4 July 2024 16:43 (3 minutes)

The Karlsruhe Research Accelerator (KARA) is an electron storage ring for accelerator research and the synchrotron of the KIT light source at the Karlsruhe Institute of Technology (KIT). KARA features an electro-optical (EO) in-vacuum bunch profile monitor to measure the longitudinal bunch profile in single shot on a turn-by-turn basis using electro-optical spectral decoding (EOSD). A simulation procedure has been set up to evaluate its suitability as a beam instrumentation for the operation of the future electron positron collider FCC-ee. In order to assess the simulations, this contribution focuses on a comparison to EO sampling
(EOS) measurements at KARA and a study on the heat load of the EO crystal due to the expected high bunch repetition rate envisioned for FCC-ee.

Summary

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Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **72** Type: **Poster and Speed Talk**

Implementing bunch-by-bunch diagnostics at the KARA booster synchrotron

Thursday 4 July 2024 16:37 (3 minutes)

In the upcoming compact STorage ring for Accelerator Research and Technology (cSTART), LPA-like electron bunches are only stored for about 100 ms, in which the equilibrium emittance will not be reached. Therefore, to measure parameters such as bunch profiles, arrival times and bunch current losses, bunch-resolved diagnostics are needed.
The booster synchrotron of the KARA accelerator accepts pre-accelerated bunches from a racetrack microtron and accelerates them further over a 500 ms long energy ramp. As the KARA booster synchrotron has a similar circumference and injection energy as the cSTART storage ring, new bunch-by-bunch diagnostics developed there can be transferred to the cSTART project with minimal effort. Currently the diagnostic system of the booster is not designed for bunch-by-bunch diagnostics, thus after using the booster as a testbed for cSTART, such a system could be used permanently.
At the booster synchrotron we use the picosecond sampling system KAPTURE-II to read-out a button beam position monitor and an avalanche photo diode at the synchrotron light port.

Summary

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Presenter: NOLL, Marvin (KIT)

Session Classification: Session 2: Beam Diagnostics

Track Classification: Beam diagnostics

Contribution ID: **73** Type: **not specified**

An open source FPGA firmware framework (FWK) by DESY

Friday 5 July 2024 10:18 (3 minutes)

Many components, including software/hardware CPUs, hardware description language (HDL) modules, high-level synthesis (HLS) entities, and embedded Linux / bare-metal applications, are used in the development of modern FPGA firmware. This is due to the usage of custom modules, tools from various vendors, and hierarchical designs from various manufacturers. The mentioned process is initially complicated and involves many abstract layers. Moreover, maintaining long-term repeatability and maintenance adds more challenges, especially in collaborative environments such as the Deutsches Elektronen-Synchrotron (DESY). To overcome these obstacles, DESY has created an open-source FPGA firmware framework (FWK) that promotes cooperation, simplifies development, and reduces complexity. The initial version of our framework, developed in 2013 for MTCA.4 systems at EuXFEL, served as the foundation for its continuous development. The FWK generates essential documentation and address maps required for high-level software frameworks such as ChimeraTK, thereby simplifying the development process. One of the most challenging aspects of FPGA design is the generation of address space descriptions. The FWK addresses this by collecting address space information and creating address space trees. A key tool in this process is DesyRDL, an open-source utility that generates outputs for address spaces defined by one or multiple SystemRDL input files. Furthermore, FWK offers generic Yocto package feeds for a range of embedded FPGA architectures, supporting custom Embedded Linux developments via the Yocto build method. An overview of the FWK, its inception, and its current developments are presented in this work, with a focus on how it facilitates the development of FPGA firmware, encourages collaboration, and improves repeatability and maintainability.

Summary

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Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control

Contribution ID: **74** Type: **Poster and Speed Talk**

Status of the FLUTE RF system upgrade

Friday 5 July 2024 10:12 (3 minutes)

FLUTE (Ferninfrarot Linac Und Test Experiment) is a new compact versatile linear accelerator at KIT. Its main goal is to serve as a platform for a variety of accelerator studies as well as a generation of strong ultra-short THz pulses for photon science. Also it will be used as an injector for a Very Large Acceptance compact Storage Ring (VLA-cSR) which will be realized at KIT in the framework of the compact STorage Ring for Accelerator Research and Technology (cSTART) project. To achieve acceleration of electrons in the RF photo-injector and linac with high stability, it is necessary to provide stable RF power. For this goal, an upgrade of the existing RF system design has been proposed and is currently being implemented.

Summary

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Session Classification: Session 3: Controls/Seeding/DAQ

Track Classification: Beam control