Arbeitskreis Beschleunigerphysik (AKBP)
(Working Group on Accelerator Physics)

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Übersicht der Hauptvorträge und Fachsitzungen
(Overview of Invited Talks and Sessions)

Fachsitzungen

AKBP 1.1–1.8	Mo	16:00–18:00	NW-Bau - HS4	**Particle Sources and Electron Accelerators**
AKBP 2.1–2.8	Mo	16:00–18:00	NW-Bau - HS2	**New Accelerator Concepts**
AKBP 3.1–3.8	Mo	16:00–18:00	NW-Bau - HS5	**Beam Dynamics**
AKBP 4.1–4.8	Di	16:30–18:30	NW-Bau - HS4	**Diagnostics, Control and Instrumentation**
AKBP 5.1–5.8	Di	16:30–18:30	NW-Bau - HS2	**New Accelerator Concepts II**
AKBP 6.1–6.8	Di	16:30–18:30	NW-Bau - HS5	**Synchrotron Radiation Sources (SR and FEL)**
AKBP 7	Mi	16:30–18:00	NW-Bau - HS2	**Bestowal of Prizes**
AKBP 8.1–8.25	Mi	18:00–19:30	NW-Bau - HS2	**Poster session**
AKBP 9.1–9.8	Do	16:30–18:30	NW-Bau - HS4	**Diagnostics, Control and Instrumentation II**
AKBP 10.1–10.8	Do	16:30–18:30	NW-Bau - HS2	**New Accelerator Concepts and Radiofrequency**
AKBP 11.1–11.7	Do	16:30–18:15	NW-Bau - HS5	**Synchrotron Radiation Sources, Hadron Accelerators and Colliders**
AKBP 12	Do	19:30–21:00	NW-Bau - HS2	**General Assembly of the Working Group on Accelerator Physics**

Mitgliederversammlung Arbeitskreis Beschleunigerphysik

(General Assembly of the Working Group on Accelerator Physics)

Do. 19:30–21:00 NW-Bau - HS2

- Bericht des Vorsitzenden
- Wahl einer / eines neuen Vorsitzenden und Stellvertreter(in)
- Bericht aus den DPG-Vorstandsratssitzungen
- Beschleunigerpreise
- Bericht aus dem Komitee für Beschleunigerphysik (KfB)
- Künftiger Auftritt auf den Frühjahrstagungen
- Verschiedenes

AKBP 1: Particle Sources and Electron Accelerators

Zeit: Montag 16:00–18:00 Raum: NW-Bau - HS4

AKBP 1.1 Mo 16:00 NW-Bau - HS4

Overview of the Photo Injector Test Facility at DESY, Zeithen site (PITZ) — •Ye Chen, Prach Boonpornprasert, James Good, Matthias Gross, Holger Huck, Igor Isaev, Christian Koschitzki, Mikhail Krasilnikov, Xin Li, Osip Lishilin, Gregor Loisch, Raffael Niemczyk, Anne Oppelt, Houjun Qian, Yves Renier, Frank Stephan, and Quantang Zhao — DESY, 15738 Zeuthen, Germany

The photo injector test facility at DESY, Zeuthen site (PITZ), was built to test, develop and experimentally optimize high brightness photoelectron sources for superconducting linac driven SASE FELs, such as the Free electron LASer in Hamburg (FLASH) and the European X-ray Free Electron Laser (European XFEL). Extremely low beam emittance beyond the original European XFEL requirements has been demonstrated at PITZ in 2011. Further improvements of the transverse projected beam emittance are in good progress by generating 3D ellipsoidal electron beams on the basis of photocathode laser pulse shaping. In this talk, an overview of the PITZ facility is given. New progress on emittance optimization will be presented.

AKBP 1.2 Mo 16:15 NW-Bau - HS4

Accelerator R&D at the Photo Injector Test Facility at DESY, Zeuthen site (PITZ) — •Ye Chen, Prach Boonpornprasert, James Good, Matthias Gross, Holger Huck, Igor Isaev, Christian Koschitzki, Mikhail Krasilnikov, Xin Li, Osip Lishilin, Gregor Loisch, Raffael Niemczyk, Anne Oppelt, Houjun Qian, Yves Renier, Frank Stephan, and Quantang Zhao — DESY, 15738 Zeuthen, Germany

The photo injector test facility at DESY, Zeuthen site (PITZ), was built to test, develop and experimentally optimize high brightness photoelectron sources for coherent light sources. The produced high quality electron beam and a large variety of advanced beam diagnostics at PITZ also provide excellent oppotunities for a wide field of research activities. This includes experiments of particle beam driven plasma wakefield acceleration, experiments towards a prototype IR/THz source for pump-probe experiments at the European XFEL, experimental demonstration of ballistic bunching with dielectric-lined waveguides, electron diffraction experiments and many others. In this talk, an overview of recent research activities at PITZ is given. Corresponding results will be presented.

AKBP 1.3 Mo 16:30 NW-Bau - HS4

Erster ERL Betrieb des S-DALINAC* — •Michaela Arnold[1], Florian Hug[2], Jonas Pforr[1], Norbert Pietralla[1] und Manuel Steinhorst[1] — [1]IKP, TU Darmstadt — [2]KPH, JGU Mainz

Der S-DALINAC wird seit 1991 an der TU Darmstadt als rezirkulierender Linearbeschleuniger betrieben. In den Jahren 2015/2016 wurde eine dritte Rezirkulationsstrahlführung eingebaut. Dabei wurde ein Weglängensystem realisiert, das die Gesamtlänge der Rezirkulationsstrahlführung um einen Gesamthub von insgesamt 10 cm verändern kann. Bei der am S-DALINAC verwendeten Betriebsfrequenz von 3 GHz erlaubt diese Strahlführung eine Anpassung der Strahlphase um bis zu 360° der HF Phase. Dadurch erlaubt diese neue Strahlführung sowohl den normalen, beschleunigenden Betrieb (einfacher Durchschuss, einfach- oder dreifach-rezirkulierend auf beschleunigender Phase) als auch den Betrieb als Energy-Recovery LINAC (ERL; einfach oder zweifach auf abbremsender Phase von 180°). Das Weglängensystem wurde nach Installation und Justage mit Strahl in Betrieb genommen und die Änderung der Strahlphase in Abhängigkeit von der Position des Weglängensystems bestimmt. Die Nutzung der neuen Strahlführung für den normalen, beschleunigenden Betrieb sowie der Betrieb als einfach-rezirkulierender ERL konnten im Herbst 2017 erfolgreich gezeigt werden. Dieser Beitrag wird die Inbetriebnahme des Weglängensystems sowie den ersten Betrieb des S-DALINAC als einfach-rezirkulierenden ERL präsentieren.

*Gefördert durch die DFG im Rahmen des GRK 2128 und INST163/383-1/FUGG

AKBP 1.4 Mo 16:45 NW-Bau - HS4

Current Commissioning status of FLUTE Phase I — •Thiemo Schmelzer[1], Axel Bernhard[2], Andreas Böhm[3], Erik Bründermann[2], Stefan Funkner[1], Anton Malygin[1], Sebastian Marsching[1], Wolfgang Mexner[2], Michael J. Nasse[2], Gudrun Niehues[1], Robert Rubrecht[2], Marcel Schuh[2], Markus Schwarz[1], Nigel Smale[2], Pawel Wesolowski[2], Minjie Yan[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe, Germany — [2]IBPT, KIT, Karlsruhe, Germany — [3]IPS, KIT, Karlsruhe, Germany

FLUTE (Ferninfrarot Linac- Und Test-Experiment) is a new compact versatile linear accelerator currently being constructed at KIT. Its primary goal is to serve as a platform for a variety of accelerator studies as well as to generate strong ultra-short THz pulses for photon science. The phase I of the project, which includes the RF photo injector providing electrons at beam energy of 7 MeV and a corresponding diagnostics section, is currently being commissioned. Here, we report on the latest progress of the commissioning phase. The status of the gun conditioning will be given, followed by an overview of the RF system and the laser system as well as the progress of the diagnostics section.

AKBP 1.5 Mo 17:00 NW-Bau - HS4

Segmented Terahertz Electron Accelerator and Manipulator (STEAM) — •Dongfang Zhang[1,2], Arya Fallahi[1], Michael Hemmer[1], Xiaojun Wu[1], Moein Fakhari[1,2], Yi Hua[1], Huseyin Cankaya[1], Anne-Laure Calendron[1], Luis E. Zapata[1], Nicholas H. Matlis[1], and Franz X. Kärtner[1,2,3] — [1]Center for Free-Electron Laser Science, Deutsches Elektronen Synchrotron, Notkestrasse 85, 22607 Hamburg, Germany. — [2]Department of Physics and The Hamburg Centre for Ultrafast Imaging, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany. — [3]Research Laboratory of Electronics, MIT, Cambridge, 02139 Massachusetts, USA.

We present a segmented THz based device (STEAM) capable of performing multiple high-field operations on the 6D-phase-space of ultrashort electron bunches. With this single device, using only a few microjoules of single-cycle THz radiation, we have shown record THz-based acceleration of more than 30 keV, with a peak acceleration field gradient of around 70 MV/m. At the same time, the STEAM device can also manipulate the electrons that show high focusing gradient (2 kT/m), compression of electron bunches down to 100 fs and streaking gradient of 140 urad/fs, which offers temporal profile characterizations with resolution below 10 fs. The STEAM device can be fabricated with regular mechanical machining tools and supports real-time switching between different modes of operation. It paves the way for the development of THz-based compact electron guns, accelerators, ultrafast electron diffractometers and Free-Electron Lasers.

AKBP 1.6 Mo 17:15 NW-Bau - HS4

Inverted Geometry Photo-electron Gun Research and Development at TU Darmstadt* — •Maximilian Herbert, Joachim Enders, Yuliya Fritzsche, Neeraj Kurichiyanil, and Vincent Wende — Institut für Kernphysik, Technische Universität Darmstadt, Schlossgartenstraße 9, 64289 Darmstadt

The Institute for nuclear physics at TU Darmstadt houses the Superconducting Darmstadt Linear Accelerator S-DALINAC. A photoelectron gun using GaAs photocathodes to provide pulsed and/or polarized electron beams, the S-DALINAC Polarized Injector SPIn, has been installed [1] for future nuclear-structure investigations [2]. In order to conduct research and development for this source, a test facility for Photo-Cathode Activation, Test and Cleaning using atomic-Hydrogen (Photo-CATCH) has been constructed [3]. This setup provides several chambers for photocathode handling and a 60 keV beamline for photo-gun design studies [4]. Currently, an upgraded inverted insulator geometry is under investigation for Photo-CATCH that is supposed to be implemented at SPIn. This talk will present the current developments at Photo-CATCH and future measurements.

*Work supported by the Deutsche Forschungsgemeinschaft through GRK 2128 'AccelencE'

[1] Y. Poltoratska et al., J. Phys.: Conf. Series 298, 012002 (2011)
[2] J. Enders, AIP Conf. Proc. 1563, 223 (2013)
[3] M. Espig, Dissertation, TU Darmstadt (2016)
[4] N. Kurichiyanil, Dissertation, TU Darmstadt (2016)

AKBP 1.7 Mo 17:30 NW-Bau - HS4

Simulations on a spin-polarized photo-electron gun for the superconducting Darmstadt electron linear accelerator S-

DALINAC* — •Vincent Wende, Joachim Enders, Yuliya Fritzsche, Maximlian Herbert, and Neeraj Kurichiyanil — Institut für Kernphysik, TU Darmstadt, Schlossgartenstraße 9, 64289 Darmstadt

The S-DALINAC Polarized-electron Injector SPIn [1] provides pulsed and/or polarized electron beams with an electron energy up to 125 keV. To improve the injection into the accelerator, an upgrade of the SPIn photo gun to an operational voltage of 200 kV is planned. For this upgrade it is envisaged to use the inverted insulator geometry, which was previously examined at the Photo-Cathode Activation, Test and Cleaning using atomic-Hydrogen (Photo-CATCH) test facility [2] with an operational voltage of 60 kV. In this talk simulation results, obtained with CST, concerning the adaptability of this gun geometry to 200 kV and observed challenges will be presented.

[1] Y. Poltoratska et al., J.Phys.: Conf. Series 298, 012002 (2011)
[2] M.Espig, Dissertation, TU Darmstadt (2016)
Work supported in part by DFG (GRK 2128 AccelencE and SFB 1245)

AKBP 1.8 Mo 17:45 NW-Bau - HS4

Conceptual Design and Simulation Studies of an Electron Source for Ultrafast Electron Diffraction at DELTA — •Daniel Krieg[1], Shaukat Khan[1], and Klaus Sokolowski-Tinten[2] — [1]Center for Synchrotron Radiation, TU Dortmund University, Dortmund, Germany — [2]University Duisburg-Essen, Duisburg, Germany

Ultrafast electron diffraction (UED) is a technique to study the structural dynamics of matter, combining a femtosecond time resolution with the diffraction of electrons with sub-angstrom De-Broglie wavelength. The method is an alternative approach to X-ray scattering at free-electron lasers. UED pump-probe experiments require ultrashort laser pulses to pump a sample, electron bunches with small emittance and ultrashort length, typically with charges well below 1 pC, to analyze the state of the sample by diffraction, and an excellent control of the delay between laser and electron bunch. Most UED setups use electrostatic electron sources in the keV regime but electrons accelerated to a few MeV in a radiofrequency photocathode gun offer significant advantages concerning bunch length and emittance due to the reduction of space charge effects. Furthermore, the longer mean free path of MeV electrons allows for thicker samples and therefore a wider range of possible materials. In this talk, a first conceptual design and simulation results for a university-based UED facility with ultrashort and low-emittance MeV electron bunches are presented.

AKBP 2: New Accelerator Concepts

Zeit: Montag 16:00–18:00 Raum: NW-Bau - HS2

AKBP 2.1 Mo 16:00 NW-Bau - HS2

Generation of sub-nanosecond, intense proton bunches with the laser-driven LIGHT beamline and first imaging studies of a solid target — •Diana Jahn[1], Dennis Schumacher[2], Christian Brabetz[2], Johannes Ding[1], Rene Leonhardt[1], Florian-Emmanuel Brack[4,5], Florian Kroll[4,5], Abel Blazevic[2,3], Tom Cowan[4,5], Ulrich Schramm[4,5], and Markus Roth[1] — [1]TU Darmstadt, Darmstadt, Deutschland — [2]GSI, Darmstadt, Deutschland — [3]HI Jena, Jena, Deutschland — [4]HZDR, Dresden, Deutschland — [5]TU Dresden, Dresden, Deutschland

In the past two decades, the generation of intense ion beams based on laser-driven sources became an extensively investigated and promising field. The LIGHT collaboration combines a laser-driven proton source with conventional accelerator technology. Therefore, a laser-driven multi-MeV ion beamline at GSI Helmholtzzentrum für Schwerionenforschung was installed. Protons with an energy of 8 MeV are selected via chromatic focusing with a high-field solenoid from an exponentially decaying TNSA spectrum. Afterwards, they are injected into an rf cavity and temporally compressed through phase focusing into the subnanosecond regime. At the end of the beamline, a second solenoid was set up as a final focusing system. Newest focusing results and first imaging studies of a solid target will be presented.

AKBP 2.2 Mo 16:15 NW-Bau - HS2

Breaking the dephasing and depletion limits of laser-wakefield acceleration with Traveling-Wave Electron Acceleration — •Alexander Debus[1], Richard Pausch[1,2], Axel Hübl[1,2], Klaus Steiniger[1,2], René Widera[1], Tom Cowan[1,2], Ulrich Schramm[1,2], and Michael Bussmann[1] — [1]Helmholtz-Zentrum Dresden - Rossendorf (HZDR), 5 Bautzner Landstraße 400, 01328 Dresden, Germany — [2]Technische Universität Dresden, 01062 Dresden, Germany

We show how to simultaneously solve several long standing limitations of laser-wakefield acceleration that have thus far prevented laser-plasma electron accelerators (LWFA) to extend into the energy realm beyond 10 GeV. Most prominently, our novel Traveling-Wave Electron Acceleration (TWEAC) approach eliminates both the dephasing and depletion constraints. The wakefield driver is a region of overlap of two obliquely incident, ultrashort laser pulses with tilted pulse-fronts in the line foci of two cylindrical mirrors, aligned to coincide with the trajectory of subsequently accelerated electrons. TWEAC leads to quasi-static acceleration conditions, which do not suffer from laser self-phase modulation, parasitic self-injection or other plasma instabilities. Particularly, and in contrast to LWFA and PWFA, a single TWEAC-stage can arbitrarily be extended in length to higher electron energies without changing the underlying acceleration mechanism. We introduce the new acceleration scheme, show results from 3D particle-in-cell simulations using PIConGPU, discuss energy scalability for both laser and electrons and elaborate on experimental realization requirements.

AKBP 2.3 Mo 16:30 NW-Bau - HS2

Laser-driven proton acceleration from cryogenic hydrogen jets — •Tim Ziegler[1,2], Martin Rehwald[1,2], Sebastian Göde[3], Stephan Kraft[1], Josefine Metzkes-Ng[1], Lieselotte Obst[1,2], Hans-Peter Schlenvoigt[1], Chandra Curry[4], Maxence Gauthier[4], Christian Rödel[4], Siegfried Glenzer[4], Karl Zeil[1], and Ulrich Schramm[1,2] — [1]Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany — [2]TU Dresden, Dresden, Germany — [3]European XFEL GmbH, Schenefeld, Germany — [4]SLAC National Accelerator Laboratory, Menlo Park, United States

To advance the development of laser proton accelerators for highly demanding applications like cancer treatment a stable source of energetic particles at high repetition rates is required.

We present recent results from our experimental campaign employing a cryogenic hydrogen jet as a renewable and debris free laser-driven source of pure proton beams generated at the 150 TW ultrashort pulse laser Draco.

Different ion diagnostics reveal mono-species proton acceleration in the laser incidence plane around the wire-like target, reaching cut-off energies of up to 20 MeV and exceeding 10^9 protons per MeV per steradian. In addition, the exact jet-position and the laser-plasma interaction could be monitored on-shot in two axes (perpendicular and parallel to the pump laser) with a temporally synchronized stand-alone probe laser beam. Evaluations of two different target geometries (cylindrical and planar) demonstrate more optimized acceleration conditions using the planar hydrogen jet.

AKBP 2.4 Mo 16:45 NW-Bau - HS2

Probing of laser-plasma experiments at DRACO with a stand-alone probe laser system — •Constantin Andreas Bernert[1,2], Florian-Emanuel Brack[1,2], Stefan Kraft[1], Florian Kroll[1,2], Markus Löser[1], Josefine Metzkes-Ng[1], Lieselotte Obst[1,2], Martin Rehwald[1,2], Hans-Peter Schlenvoigt[1], Mathias Siebold[1], Karl Zeil[1], Tim Ziegler[1,2], and Ulrich Schramm[1,2] — [1]Helmholtz-Zentrum Dresden-Rossendorf, 01328 Dresden, Germany — [2]Technische Universität Dresden, 01062 Dresden, Germany

The exploration of the plasma dynamics and its microscopic parameters is crucial for the optimization of laser-driven ion acceleration. Optical probing is one technique to investigate the temporal plasma evolution. However, strong plasma self-emission at the driver lasers wavelength and its harmonics often masks the laser plasma interaction region and thus complicates the data analysis. Here, we present the implementation of a stand-alone probe laser system, which is temporally synchronized to the Dresden laser acceleration source (DRACO).

The probe laser system consisting of a seed laser and one regenerative amplifier is based on Yb:YAG and thus provides a fundamental wavelength of 1030 nm, which is different from the wavelength of the DRACO driver laser (800 nm) and its harmonics. We present the advantages of this probing approach, which was tested during an experimental campaign with wire targets of different materials and diameters in the micrometer range, and give an inside on the current challenges and developments of the probing system.

AKBP 2.5 Mo 17:00 NW-Bau - HS2

Lux - A Plasma-Driven Undulator Beamline — •Andreas R. Maier[1], Niels Delbos[1], Irene Dornmair[1], Timo Eichner[1], Björn Hubert[1], Lars Hübner[1], Sören Jalas[1], Spencer W. Jolly[1,2], Manuel Kirchen[1], Vincent Leroux[1,2], Sebastian Mahncke[1], Philipp Messner[1], Matthias Schnepp[1], Maximilian Trunk[1], Christian Werle[1], Paul A. Walker[3], and Paul Winkler[3,1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [2]Institute of Physics of the ASCR, ELI-Beamlines project, Na Slovance 2, 18221 Prague, Czech Republic — [3]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany

The LUX beamline is a novel laser-plasma accelerator. Building on the joint expertise of the University of Hamburg and DESY the beamline was carefully designed to combine state-of-the-art expertise in laser-plasma acceleration with the latest advances in accelerator technology and beam diagnostics. LUX introduces a paradigm change moving from single-shot demonstration experiments towards available, stable and controllable accelerator operation. In this overview talk, we present the various activities covered by our group. We discuss the general design concepts of LUX and present first critical milestones that have recently been achieved, including the 24h operation of the plasma accelerator with several 10.000 consecutive shots, and the generation of spontaneous undulator radiation at a wavelength well below 9 nm.

AKBP 2.6 Mo 17:15 NW-Bau - HS2

A croygentic FEL undulator for a laser-plasma driven light source — Maximilian Trunk[1], •Niels Delbos[1], Johannes Bahrdt[2], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, 22761 Hamburg, Germany — [2]Helmholtz-Zentrum Berlin für Materialien und Energie GmbH Hahn-Meitner-Platz 1, 14109 Berlin

Laser-plasma accelerators are promising candidates to drive a next-generation FEL. The LUX accelerator, developed and operated by the LUX research group at the University of Hamburg, recently demonstrated the generation of spontaneous undulator radiation from laser-plasma generated electron beams. A future upgrade of the beamline will include the cryogenic FEL undulator FROSTY to demonstrate first FEL gain from laser-plasma electron beams following the decompression scheme developed in our group. The contribution will cover the design, manufacturing and the current status of the FEL undulator.

AKBP 2.7 Mo 17:30 NW-Bau - HS2

First Undulator Radiation Campaigns at the LUX Beamline — •Christian M. Werle[1], Niels M. Delbos[1], Irene Dornmair[1], Timo Eichner[1], Lars Hübner[1], Sören Jalas[1], Spencer W. Jolly[1,2], Manuel Kirchen[1], Vincent Leroux[1,2], Sebastian Mahncke[1], Philipp Messner[1,4], Matthias Schnepp[1], Maximilian Trunk[1], Paul Andreas Walker[3], Paul Winkler[1,3], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science and Department of Physics, University of Hamburg, Hamburg, Germany — [2]ELI Beamlines, Dolní Břežany, Czech Republic — [3]DESY, Hamburg, Germany — [4]Max-Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany

The LUX experiment is a dedicated beamline for the generation of laser-plasma driven undulator radiation. Built within in a close collaboration of the University of Hamburg and DESY we combine novel plasma acceleration techniques with state-of-the-art accelerator technology. After a recent upgrade of the beamline with a compact undulator section, first spontaneous undulator radiation in the few-nm regime was demonstrated in mid 2017. Here, we will report on the first results from the undulator radiation campaigns and report on the beamline performance.

AKBP 2.8 Mo 17:45 NW-Bau - HS2

Wavefront Degradation of a 200 TW Laser from Heat-Induced Deformation of In-Vacuum Compressor Gratings — •Vincent Leroux[1,2], Timo Eichner[1], Sören Jalas[1], Spencer W. Jolly[1,2], Manuel Kirchen[1], Philipp Messner[1,3], Matthias Schnepp[1], Christian Werle[1], Paul Winkler[1,4], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science, Hamburg, Germany — [2]ELI Beamlines, Dolní Břežany, Czech Republic — [3]Max-Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany — [4]DESY, Hamburg, Germany

Laser-plasma accelerators are driven by hundreds terawat or up to petawatt laser systems, at a few Hz repetition rates. Furthermore, as the laser technology pushes forward the average power limit, the absorbed heat into the gold-coated in-vacuum compressor gratings increases. This heat leads to deformations of the grating surface which changes the spatial properties of the laser beam during high-power operation. We report the direct measurement of heat-induced wavefront distortion in gold-coated gratings of a 200 TW vacuum compressor using the actual high-energy ultrashort laser to both heat up the gratings and diagnose their deformations. Input energy and laser repetition rate are scanned to cover a wide range of average power, and the degraded wavefront are analyzed to assess the evolution of the laser beam focusability.

AKBP 3: Beam Dynamics

Zeit: Montag 16:00–18:00 Raum: NW-Bau - HS5

AKBP 3.1 Mo 16:00 NW-Bau - HS5

Vergleich zweier Verfahren zur Optimierung eines SRF Photoinjektors mit Booster für hochbrilliante Elektronenstrahlen — •Simon Koch, Andreas Jankowiak, Thorsten Kamps und Eva Panofski — Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Deutschland

Am Helmholtz-Zentrum Berlin (HZB) sollen hochbrilliante Elektronenstrahlen erzeugt werden, um zeitaufgelöste Beugungsexperimente mit ultra-kurzen Elektronenpulsen zu ermöglichen. Ein SRF Photoinjektor und ein Booster Vorbeschleuniger dienen dabei als Elektronenquelle. Um eine hohe Strahlbrillianz zu erreichen, müssen Emittanz und Länge der Elektronenpakete minimiert werden. Die dafür benötigten optimalen Parametereinstellungen werden mit zwei unterschiedlichen Optimierungsverfahren gesucht - einerseits mithilfe einer numerischen auf einem Multi-Objective Genetic Algorithmus (MOGA) basierenden Methode und andererseits mithilfe einer analytischen Optimierung der longitudinalen Strahldynamik. Es werden erste Ergebnisse der Analyse vorgestellt.

AKBP 3.2 Mo 16:15 NW-Bau - HS5

Beam Dynamics Simulations for the first ERL Operation of the S-DALINAC* — •Jonas Pforr, Michaela Arnold, and Norbert Pietralla — Institut für Kernphysik, Darmstadt, Germany

The S-DALINAC is a superconducting recirculating electron accelerator which has been operated since 1991 at TU Darmstadt. In 2015/16 an additional recirculation beamline was implemented in order to allow for an additional linac pass and thus an increased maximum energy and improved stability. The new recirculation includes a pathlength adjustment system that enables a 360° phase shift. With this device, switching between accelerating and ERL operation is possible. In the design phase the accelerator lattice was optimized for acceleration, not for ERL operation. This contribution presents beam dynamics simulations of the S-DALINAC in ERL mode.

*Work supported by the DFG through GRK 2128

AKBP 3.3 Mo 16:30 NW-Bau - HS5

Autonome Optimierung des Strahltransports am S-DALINAC — Michaela Arnold, •Jonny Birkhan, Timon Dörnfeld, Norbert Pietralla, Alexander Schmidt und Thomas Schösser — Insitut für Kernphysik, Technische Universität Darmstadt

Teilchenbeschleuniger sind die Basisinfrastrukturen physikalischer Grundlagenforschung auf den Gebieten der Teilchen- und Kernphysik. Die technische Komplexität der Anlagen hat in den vergangenen Dekaden infolge der gestiegenen Anforderungen an Strahlenergie und -qualität um ein Vielfaches zugenommen. Die großen Betriebsparameterräume solcher Anlagen machen den Einsatz von strukturbildenden und automatisierenden Algorithmen zur effizienten Einstellung der Parameter erforderlich. Am Darmstädter supraleitenden Elektronenlinearbeschleuniger S-DALINAC wurden zunächst klassische Optimierungsalgorithmen zur autonomen Einstellung des Strahltransports durch verschiedene Strahlführungsabschnitte entwickelt und getestet. Darauf aufbauend ist damit begonnen worden, neuronale Netze zu entwerfen, die solche Optimierungsaufgaben effizienter lösen können. Erste Ergebnisse und Erfahrungen dazu sollen vorgestellt werden.

AKBP 3.4 Mo 16:45 NW-Bau - HS5

Search for Electric Dipole Moments at COSY in Jülich - Closed-Orbit and Spin Tracking Simulations — •Vera Schmidt[1,2] and Andreas Lehrach[1,2] for the JEDI-Collaboration — [1]Forschungszentrum Jülich, IKP-4, Jülich, Deutschland — [2]III. Physikalisches Institut B, RWTH Aachen University, Aachen, Deutschland

The observed matter-antimatter asymmetry in the universe cannot be explained by the Standard Model (SM) of particle physics. In order to resolve the matter dominance an additional $\mathcal{CP}$ violating phenomenon is needed. A candiate for physics beyond the SM is a non-vanishing Electric Dipole Moment (EDM) of subatomic particles. Since permanent EDMs violate parity and time reversal symmetries, they are also $\mathcal{CP}$ violating if the $\mathcal{CPT}$-theorem is assumed.

The JEDI (Jülich Electric Dipole moment Investigations) collaboration in Jülich is preparing a direct EDM measurement of protons and deuterons first at the storage ring COSY (COoler SYnchrotron) and later at a dedicated storage ring.

Ensuring a precise measurement, various beam and spin manipulating effects have to be considered and investigated. Therefore closed orbit and spin tracking simulations are performed in order to quantify the effect of systematics on the EDM measurement and to predict the accuracy of the experiment. The EDM measurement method, as well as simulation results will be presented.

AKBP 3.5 Mo 17:00 NW-Bau - HS5

Injection arc design for ERL operation at MESA* — •Christian Stoll[1] and Aamna Khan[2] — [1]Institut für Kernphysik JGU Mainz — [2]Institut für Theorie Elektromagnetischer Felder, TU Darmstadt

MESA is a recirculating superconducting accelerator under construction at Johannes Gutenberg-Universität Mainz. It will be operated in two different modes: the first is the external beam (EB) mode, where the beam is dumped after being used at the experiment. The required beam current in EB mode is 150 μA with polarized electrons at 155 MeV. In the second operation mode MESA will be run as an energy recovery linac (ERL) with an unpolarized beam of 1 mA at 105 MeV. In a later construction stage of MESA the achievable beam current in ERL-mode shall be upgraded to 10 mA. The careful design of the 5 MeV injection arc of MESA and the control of the optical parameters is crucial to allow for the energy recovery mode to reach the desired performance. Optimization of the arc optics with MadX and the implementation of a cavity model in elegant are presented. The required parameters for the final arc optics were determined via backtracking through the first Cryomodule.

*Supported by DFG through GRK 2128

AKBP 3.6 Mo 17:15 NW-Bau - HS5

Beam Dynamics and Collimation Following MAGIX at MESA* — •Ben Ledroit and Kurt Aulenbacher — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz

The Mainz Energy-recovering Superconducting Accelerator (MESA) will be an electron accelerator allowing operation in energy-recovery linac (ERL) mode. After the beam hits the target at the MESA Internal Gas Target Experiment (MAGIX), the beam is phase shifted and fed back into the linac sections. These will transfer the kinetic beam energy back to the RF-field by deceleration of the beam and allow for high beam power with low RF-power input. Since most of the beam does not interact with the target, the beam will mostly just pass the target untouched. However, a fraction of the scattered electrons may be in the range outside the accelerator acceptance and therefore cause malicious beam dynamical behavior in the linac sections or even damage to the machine. The goal of this work is to determine the beam behavior upon target passage by simulation and experiment and to protect the machine with a suitable collimation system. The present status of the investigations is presented.

*Supported by the DFG through GRK 2128

AKBP 3.7 Mo 17:30 NW-Bau - HS5

Improvement of the Current DELTA Lattice Model Based on Measured Response Matrices — •Andreas Glassl, Stephan Kötter, Thomas Weis, and Bernard Riemann — TU Dortmund University (DELTA) Center for Synchrotron Radiation

An improved lattice model for the electron storage ring DELTA at TU Dortmund is being investigated using MAD-X. For this purpose, an already existing lattice model is updated by introducing fringe fields and data related to new measurements of magnet positions e.g. The linear predictions of this model is compared to optical functions and tunes computed by the COBEA-algorithm (AKBP 66) using measured response matrices of the storage ring as input. To improve the lattice model further the consideration of nonlinear field moments created by sextupoles and modified quadrupoles is presently under progress. Recent results will be presented together with first suggestions for a lattice model aiming at reduced momentum compaction factors while keeping magnet positions and minimizing variations to magnet strengths.

AKBP 3.8 Mo 17:45 NW-Bau - HS5

Beam based alignment tests at the Cooler Syncrotron (COSY) — •Tim Wagner for the JEDI-Collaboration — Institut für Kernphysik, Forschungszentrum Jülich — III. Physikalisches Institut B, RWTH Aachen University

The Jülich Electric Dipole moment Investigation (JEDI) Collaboration works on a measurement of the electric dipole moment (EDM) of charged hadrons using a storage ring. Such a dipole moment would violate CP symmetry, providing a test for physics beyond the Standard Model. The JEDI experiment requires a small beam orbit RMS in order to measure the EDM.

Therefore an ongoing upgrade of the Cooler Syncrotron (COSY) is done in order to improve the precision of the beam position. In this talk the first results of the beam based alignment method that was tested with one quadrupole will be presented. The measurements were done during a beam time in November 2017.

AKBP 4: Diagnostics, Control and Instrumentation

Zeit: Dienstag 16:30–18:30 Raum: NW-Bau - HS4

AKBP 4.1 Di 16:30 NW-Bau - HS4

Characterization of a compact and calibratable von-Hamos X-Ray Spectrometer based on full-cylindrical HAPG mosaic crystals — •Malte Wansleben, Yves Kayser, Ina Holfelder, and Burkhard Beckhoff — Physikalisch-Technische Bundesanstalt

The further development of more complex nano-materials and thin film applications with distinct properties need an analysis independent from any reference material. A method of choice could be X-ray emission spectroscopy (XES). A reliable quantitative and moreover reference-free XES approach, however, requires calibrated instrumentation.

We would like to present a high-resolution wavelength-dispersive spectrometer for XES in the energy range of 2.3 keV to 20.0 keV. Making use of two full-cylindrical Highly Annealed Pyrolytic Graphite (HAPG) crystals as dispersive elements in a modified von-Hamos geometry a large solid angle of detection and hence high efficiency is realized. HAPG is a synthetic type of carbon which forms mosaic crystals. Although the peak reflectivity is smaller than in perfect crystals, the diffraction profile of this mosaic crystal is much wider leading to an increased integrated reflectivity. This work shows the characterization of the spectrometer including mosaicity and integrated reflectivity measurements on the HAPG optics, achievable energy resolution and relative efficiency of the device. Furthermore, the chemical speciation capability of the device is demonstrated with different binary titanium and iron compounds.

AKBP 4.2 Di 16:45 NW-Bau - HS4

Cavity Beam Position Monitor development at CLEAR(CERN) — •Johannes Nadenau for the JEDI-Collaboration — Institut für Kernphysik, Forschungszentrum Jülich — III. Physikalisches Institut B, RWTH Aachden University

At the CERN Linear Electron Accelerator for Research (CLEAR) facility component studies for existing and future machines are performed. Part of these studies are cavity Beam Position Monitor (BPM) developments. Cavity BPMs provide high accuracy position measurements. CLEAR is equiped with three BPMs which allows to measure positions on two devices and check the predicted position in the third one. In the talk the principle of measurement and first results will be discussed.

AKBP 4.3 Di 17:00 NW-Bau - HS4

Development of a Rogowski Coil Beam Position Monitor — •Kirill Grigoryev for the JEDI-Collaboration — Institut für Kernphysik, Forschungszentrum Jülich, Germany

Electric Dipole Moments (EDMs) violate parity and time reversal symmetries. Assuming the CPT-theorem, this leads to CP violation, which is needed to explain the matter over antimatter dominance in the Universe. Thus, a non-zero EDM is a hint to new physics beyond the Standard Model. The JEDI collaboration (Jülich Electric Dipole moment Investigations) has started investigations of a direct measurement of EDMs of protons and deuterons at a storage ring COSY (COoler SYnchrotron). To measure the tiny EDM signal with high precision, systematic effects and the beam orbit have to be controlled to the same level. Therefore, a new Beam Position Monitor (BPM) based on magnetic pick-up coils has been developed. The main advantage of the coil design compared to electric pick-up BPMs is the high response to bunched beam frequency signal and the coil compactness. The Rogowski BPM measures the beam position in horizontal and vertical directions. Tests in laboratory as well as measurements at the COSY accelerator will be presented.

AKBP 4.4 Di 17:15 NW-Bau - HS4

Characterization of a dispersion free bending magnet of the S-DALINAC Polarized-electron Injector* — •René Heber, Maximilian Herbert, Joachim Enders, Yuliya Fritzsche, and Vincent Wende — Institut für Kernphysik, Technische Universität Darmstadt, Schlossgartenstraße 9, 64289 Darmstadt

The S-DALINAC Polarized-electron Injector SPIn creates polarized electron beams of 100 keV. An upgrade is planned to increase the electron energy to 200 keV. A dispersion-free bending magnet, a so-called alpha-magnet, is currently used to transfer the electron beam from the vertical to the horizontal beamline. Subject of this contribution are measurements to determine if the magnet can be used to transfer 200 keV electron beams. Therefore the magnetic field of the alpha-magnet, the temperature of the magnet coil, and the trajectory of the electron beam are observed and simulated [1].

*Work supported in part by the Deutsche Forschungsgemeinschaft through SFB 1245 and GRK 2128 'AccelencE'

[1] Y. Poltoratska et al., J. Phys.: Conf. Series 298, 012002 (2011).

AKBP 4.5 Di 17:30 NW-Bau - HS4

Entwicklung und Test einer Messung der Strahlqualität am S-DALINAC* — •Manuel Dutine, Michaela Arnold, Thore Bahlo, Jonny Birkhan, Uwe Bonnes, Antonio D'Alessio, Michaela Hilcker, Lars Jürgensen, Norbert Pietralla, Philipp Ries, Adrian Rost, Maxim Singer und Gerhard Steinhilber — Institut für Kernphysik, Darmstadt, Deutschland

Der supraleitende Elektronen-Linearbeschleuniger S-DALINAC am Institut für Kernphysik der TU Darmstadt ermöglicht Elektronenstrahlen von bis zu 130 MeV im CW-Betrieb. Diese werden an diversen Experimentierplätzen unter anderem für hochauflösende Elektronenstreuexperimente genutzt. Zur Verbesserung der Strahlqualität am Ort des Experiments wurde ein Hochenergie-Scrapersystem installiert.

Um den Einfluss verschiedener Einstellungen des Scrapersystems auf die Strahlqualität zu überprüfen, wurden Messungen der Energieschärfe und der Strahlausdehnung in der Streukammer des 169°-Spektrometers durchgeführt. Für die vorhandene Geometrie der Streukammer wurde eine neue Targetleiter mit einer Drahtscannermessung und einem Target zur Messung der optischen Übergangsstrahlung entwickelt. Im Vortrag wird das Hochenergie-Scrapersystem kurz vorgestellt und der Aufbau sowie die Ergebnisse der Strahlqualitätsmessung gezeigt.

*Gefördert durch die DFG im Rahmen des GRK 2128.

AKBP 4.6 Di 17:45 NW-Bau - HS4

Progress towards 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], Davit Kalantaryan[1], Christian Koschitzki[1], Mikhail Krasilnikov[1], Xin Li[1], Osip Lishilin[1], Gregor Loisch[1], David Melkumyan[1], Anne Oppelt[1], Houjun Qian[1], Yves Renier[1], Chaipattana Saisa-ard[1,4], Frank Stephan[1], Zohrab Amirkhanyan[2], Anushavan Azatyan[2], Armen Grigoryan[2], Vahe Sahakyan[2], Artsrun Sargsyan[2], Ashot Vardanyan[2], Arsham Yeremyan[2], Marek Otevrel[3], Sakhorn Rimjaem[4], Galina Asova[5], Quantang Zhao[6], and Ingo Will[7] — [1]DESY, Zeuthen, Germany — [2]CANDLE, Yerevan, Armenia — [3]CEITEC, Brno, Czech Republic — [4]CMU, Chiang Mai, Thailand — [5]INRNE, Sofia, Bulgaria — [6]IMP, Lanzhou, China — [7]MBI, Berlin, Germany

Transverse emittance is one of the most important properties for high-brightness electron beams used for X-Ray free-electron lasers. The photo injector test facility at DESY in Zeuthen (PITZ) focuses on the development of high-brightness electron sources. The two main methods to measure the emittance are the quadrupole scan and the slit scan. Combining either of these methods with a transverse deflecting cavity allows the measurement of the slice emittance. At PITZ, space-charge effects at the low beam momentum of 24 MeV/c complicate in particular the quadrupole scan. This has to be considered in the emittance measurements. First slit-scan based slice emittance results will be shown next to studies on the beam transport for quadrupole scans.

AKBP 4.7 Di 18:00 NW-Bau - HS4

Evaluation of a Cone-Program Based Approach to Orbit Correction at the Electron Storage Ring Delta — •Stephan Kötter, Bernard Riemann, Benjamin Dirk Isbarn, Malte Sommer, and Thomas Weis — TU Dortmund University (DELTA) Center for Synchrotron Radiation

A new program for orbit correction is currently being developed at the electron storage ring Delta. The optimization problem of finding a set of dipole-field-strength variations which minimize the deviation of the orbit from a reference orbit can be parameterized as cone program. This parametrization allows for arbitrary, linear constraints. Robust and fast solvers for this type of problem exist.

This presentation focuses on a comparison of correction results of the aforementioned program for three algorithms. These algorithms are singular value decomposition (SVD), the limited-memory Broyden-Fletcher-Goldfarb-Shanno algorithm with box constraints (L-BFGS-B) and a solver for cone programs (from cvxopt python package). After a short introduction to cone programming, measurements are shown along with numerical convergence studies.

AKBP 4.8 Di 18:15 NW-Bau - HS4

Systematic effects in the beam energy measurements by undulator radiation at MAMI — •Pascal Klag[1], Patrick Achenbach[1], Toshiyuki Gogami[2], Philipp Herrmann[1], Masashi Kaneta[2], Yoshihiro Konishi[2], Werner Lauth[1], Sho Nagao[2], Satoshi Nakamura[2], Josef Pochodzalla[1], Yuichi Toyama[2], and Shoko Tomita[2] — [1]Johannes Gutenberg-Universität Mainz — [2]Tohoku University Sendai

The Mainz microtron is an electron accelerator, which delivers electron energies up to 1.6 GeV, with a small spread of the energy $\sigma_{beam} < 13$keV. The uncertainty for the absolute energy for all available beam energies was limited to 160 keV. A novel method is used to improve the uncertainty for the energy of a 195 MeV beam. The method is based on interferometry with two spatially separated light sources (undulators) driven by relativistic electrons. A high resolving monochromator was used to analyse the spectrum of the light. In 2016 a preliminary pilot beamtime proved the principle, but it could also be shown that systematic effects have to be considered. These effects had to be understood and minimized. Recent developments are dedicated to these systematics. In the talk the results and reached accuracy goal will be presented.

AKBP 5: New Accelerator Concepts II

Zeit: Dienstag 16:30–18:30 Raum: NW-Bau - HS2

AKBP 5.1 Di 16:30 NW-Bau - HS2

Hybrid plasma wakefield acceleration: Concept & preliminary results — •Thomas Kurz[1,2], Thomas Heinemann[3,4,5,6], Alexander Knetsch[5], Jurjen Couperus[1,2], Alexander Köhler[1,2], Omid Zarini[1,2], Bernhard Hidding[3,4], Ralf Assmann[5], Michael Bussmann[1,2], Ulrich Schramm[1,2], Alberto Martinez de la Ossa[5], and Arie Irman[1] — [1]Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany — [2]Technische Universität Dresden, Dresden, Germany — [3]University of Strathclyde, Glasgow, Scotland — [4]Cockcroft Institute, Warington, United Kingdom — [5]Deutsches Elektronen Synchrotron, Hamburg, Germany — [6]Universität Hamburg, Hamburg, Germany

Plasma wakefield accelerators can be driven by either a powerful laser pulse (LWFA) or a high-current charged particle beam (PWFA). We combine both acceleration methods in a staged setup to efficiently exploit the advantages of each scheme. We present preliminary results of a proof of concept-experiment at the DRACO laser facility at Helmholtz-Zentrum Dresden-Rossendorf (HZDR). The LWFA stage (1st stage) generates ultra relativistic electron beams with peak currents exceeding 20kA via self truncated inonization injection (STII) out of a 3mm super sonic dopant (He+N) gas jet. These beams are sent into the second 3mm dopant (H+He) gas jet, driving plasma wakefields in the non-linear bubble regime. Thereby, injected electrons induced by the field ionization form a second electron beam (witness) that ideally exeeds the driving bunch (driver) quality in terms of energy and brightness.

AKBP 5.2 Di 16:45 NW-Bau - HS2

Investigating the picosecond leading pulse edge influence on ultra-intense laser heating of solids with 3D PIC simulations — •Marco Garten[1,2], Axel Huebl[1,2], René Widera[1], Heiko Burau[1,2], Thomas Kluge[1], Ulrich Schramm[1], and Michael Bussmann[1] — [1]Helmholtz-Zentrum Dresden - Rossendorf — [2]Technische Universität Dresden

Laser-ion acceleration processes depend strongly on the complex plasma dynamics following the generation of relativistic electrons and bulk heating of a solid target by a short-pulse ultra-high intensity laser. A better understanding of the influence of the pre-pulse phase and picosecond leading pulse edge could lead to better control and reproducibility of ion cutoff energies, two crucial requirements for using laser-plasma accelerated ions for medical applications. We present the first results from a 3D PIC simulation campaign, modeling ultra-intense ($a_0 = 20$) laser interaction with up to micrometer thick foils covering the picosecond time span prior to the arrival of the main pulse. In addition to laser absorption efficiency, electron spectrum, divergence and plasma scale lengths we investigate the spatially and energy-resolved spectrum of in-situ calculated Bremsstrahlung and synchrotron radiation originating from keV to MeV electrons. Simulations have been performed at the Piz Daint supercomputer at CSCS, Switzerland, using the fully-relativistic 3D3V open-source particle-in-cell code PIConGPU developed at HZDR.

AKBP 5.3 Di 17:00 NW-Bau - HS2

A Laser- and Particle Driven Plasma Wakefield Accelerator for High-Brightness Beams — •Thomas Heinemann[1,2,3,4], Thomas Kurz[5,6], Alexander Knetsch[2], Olena Kononenko[2], Jurjen Couperus[5,6], Alexander Köhler[5,6], Omid Zarini[5,6], Michael Bussmann[5,6], Bernhard Hidding[3,4], Ralph Assmann[2], Ulrich Schramm[5,6], Alberto Martinez de la Ossa[1,2], and Arie Irman[5] — [1]Universität Hamburg, Germany — [2]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany — [3]University of Strathclyde, Glasgow, UK — [4]The Cockcroft Institute, Warrington, UK — [5]Helmhotz-Zentrum Dresden - Rossendorf, Germany — [6]Technische Universität Dresden, Germany

Plasma wakefield accelerators can be driven by either a powerful laser pulse (LWFA) or a charged particle beam (PWFA). Here we present a novel plasma accelerator scheme which combines both schemes in a staged setup: The LWFA produces a high current beam electron beam which subsequently drives a PWFA where a new electron beam is produced and accelerated. This hybrid scenario explicitly makes use of several advantages unique to each method. Effectively, this LWFA-to-PWFA (LPWFA) staged setup operates as a beam brightness and energy booster of the initial LWFA output, aiming to match the demanding beam quality requirements of accelerator based light sources in a truly compact setup. We report on theoretical and numerical studies towards an experimental implementation at the DRACO laser facility at Helmholtz-Zentrum Dresden - Rossendorf (HZDR).

AKBP 5.4 Di 17:15 NW-Bau - HS2

Double bunch generation for externally injected plasma wakefield acceleration at FLASHForward — •Sarah Schröder[1,2], Alexander Aschikhin[1], Richard D'Arcy[1], Vladyslav Libov[1,2], Kai Ludwig[1], Alberto Martinez de la Ossa[2], Timon Mehrling[1,2], Bernhard Schmidt[1], Stephan Wesch[1], Johann Zemella[1], and Jens Osterhoff[1] — [1]Deutsches Elektronen-Synchrotron DESY — [2]Universität Hamburg

Owing to the high electromagnetic field gradients (>GV/m) supported by plasma wakefield acceleration (PWFA), plasma-based particle accelerators have the potential to greatly reduce the size of future accelerators. The FLASHForward experiment will be dedicated to studies of beam-driven plasma wakefield acceleration. It is currently under construction and will be housed in an extension beam line to the FLASH free-electron laser (FEL) facility at DESY. One of the core areas of research at FLASHForward is the preservation of bunch parameters for externally injected beams; a process where two electron bunches are injected into plasma, the first bunch driving a plasma wake and the trailing bunch being accelerated by the resulting fields. A metallic mask, placed in a dispersive beam line section, will be used to generate this double bunch structure with variable lengths and separation.
In this contribution particular emphasis is placed on the shaping of the double bunches in order to demonstrate stable and reproducible beam-driven PWFA. Furthermore, simulations of beam dynamics and the acceleration process in the plasma are presented.

AKBP 5.5 Di 17:30 NW-Bau - HS2

Influence of Laser Pulse Shape on Plasma-Accelerated Electron Beams — •Philipp Messner[1,2], Niels Delbos[1], Timo Eichner[1], Sören Jalas[1], Spencer Jolly[3], Manuel Kirchen[1], Vincent Leroux[3], Matthias Schnepp[1], Christian Werle[1], Paul Winkler[4], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science, Hamburg, Germany — [2]Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany — [3]ELI Beamlines, Dolní Břežany, Czech Republic — [4]Deutsches Elektron-Synchrotron DESY, Hamburg, Germany

Laser-plasma accelerators have proven to be a compact source of ultra-relativistic electron beams, generating GeV beam energies over only a few centimeters. However, the laser-plasma interaction, and thus the phase-space of the generated electron beam, is very sensitive to the initial properties of the driver laser. Here, we present the impact of laser pulse properties, specifically the higher order phases of the laser pulse, on the electron beam properties. By tuning the magnitude of the second (GDD) and third-order (TOD) dispersion of our 200 TW laser pulse, we can optimize the laser parameters for enhanced electron beam quality.

AKBP 5.6 Di 17:45 NW-Bau - HS2

Commissioning of a Pump/Probe Beam for LUX — •Timo Eichner[1], Niels M. Delbos[1], Irene Dornmair[1], Björn Hubert[1], Lars Hübner[1], Sören Jalas[1], Spencer W. Jolly[1,2], Manuel Kirchen[1], Vincent Leroux[1,2], Sebastian Mahncke[1], Philipp Messner[1,3], Matthias Schnepp[1], Maximilian Trunk[1], Paul A. Walker[1,4], Christian Werle[1], Paul Winkler[1,4], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Hamburg, Germany — [2]Institute of Physics of the ASCR, ELI-Beamlines project, Prague, Czech Republic — [3]Max-Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany — [4]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

The LUX beamline is a novel laser-plasma accelerator, built in close collaboration of the University of Hamburg and DESY. Here, we report on the commissioning of a dedicated pump/probe beam for advanced diagnostics and first user experiments. Close to the plasma target we split 1% pulse energy off of the main 200 TW Angus driver laser and re-compress the beam using chirped mirrors. Timing stability was demonstrated to be better than few fs using cross-correlation in a BBO crystal. We will present the current status of the setup and discuss first experiments.

AKBP 5.7 Di 18:00 NW-Bau - HS2

Optimizing the efficiency of dielectric laser accelerators via the introduction of a distributed Bragg reflector and novel geometries — •Peyman Yousefi, Joshua McNeur, Martin Kozák, Norbert Schönenberger, and Peter Hommelhoff — Department Physik, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Staudtstr. 1, 91058 Erlangen

Dielectric laser acceleration (DLA) enables miniaturized particle accelerators in the GeV/m gradient regime with the potential to open new applications from low energy medical irradiation devices to high energy fundamental physics [1]. It is based on the interaction of charged particles with a travelling longitudinal laser-induced near-field excited in the close vicinity of a dielectric nano-structure. Electrons with different energies have been effectively accelerated [2, 3] and studies on phase-controlled staging and focusing have brought this concept closer to its final configuration [4]. To realize longer interaction length over multiple stages, structures that efficiently convert the incoming laser field into the accelerating mode are critical. Here we experimentally present an electron acceleration with a dual pillar silicon grating using a distributed Bragg reflector (DBR). We address the effect of DBR on the acceleration gradient and also report on a new geometry of dual pillars for higher acceleration gradients in sub-relativistic regime.

1.England, R. J.et al. Rev.Mod. Phys. 86, 1337 (2014).
2.Peralta, E. A. et al. Nature 503, 91-94 (2013).
3.Breuer, J., Hommelhoff, P. Phys.Rev. Lett. 111, 134803 (2013).
4.McNeur, J et al., arXiv:1604.07684 [accelerator physics] (2016).

AKBP 5.8 Di 18:15 NW-Bau - HS2

Preparation of animal irradiation experiments with laser-accelerated protons and pulsed high-field magnets — •Florian-Emanuel Brack[1,2], Florian Kroll[1,2], Josefine Metzkes-Ng[1], Lieselotte Obst[1,2], Stephan Kraft[1], Hans-Peter Schlenvoigt[1], Lennart Gaus[1,2], Leonhard Karsch[1], Jörg Pawelke[1], Karl Zeil[1], and Ulrich Schramm[1,2] — [1]Helmholtz-Zentrum Dresden - Rossendorf, Dresden, Germany — [2]Technische Universität Dresden, Germany

Laser-driven ion acceleration has been considered a potential alternative for conventional accelerators like cyclotrons or synchrotrons and thus could provide a more compact and cost-efficient particle therapy solution in the future. Instead of continuous ion beams, laser-driven ions exhibit fs to ps bunch length, carrying up to 10^{13} particles with broad energy spectrum and are highly divergent. Pulsed high-field magnets are a versatile and efficient way of shaping those bunches both spatially and spectrally for application, while preserving the short pulse lengths and high intensities leading to high dose rates when stopped in matter.

We performed experiments with the PW beam of the Dresden laser acceleration source Draco to investigate the feasibility of worldwide first controlled volumetric tumour irradiations with laser-accelerated protons. Therefore, a setup of up to two solenoid magnets was used to efficiently capture and shape the proton beam, matching the radiobiological demands, which was then analysed by means of a Thomson parabola spectrometer, ionization chamber and radiochromic film.

AKBP 6: Synchrotron Radiation Sources (SR and FEL)

Zeit: Dienstag 16:30–18:30 Raum: NW-Bau - HS5

AKBP 6.1 Di 16:30 NW-Bau - HS5

Optimization of Synchrotron Light Sources using Machine Learning — •Tobias Boltz[1], Edmund Blomley[2], Erik Bründermann[2], Patrik Schönfeldt[2], Marcel Schuh[2], Minjie Yan[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe, Germany — [2]IBPT, KIT, Karlsruhe, Germany

The operation of particle accelerators often requires manual fine-tuning to achieve optimal conditions. For synchrotron light sources in particular, the machine settings have to be additionally tailored to the particular needs of different users, i.e. specific applications and experiments. Typical requirements concentrate e.g. on the intensity and temporal resolution of the generated light pulses. The optimization of these parameters yields challenging demands on beam characteristics and dynamics. As these are controlled by a multitude of different knobs (e.g. magnetic field strengths), optimization is a highly non-trivial problem. However, with recent developments in computer science similar problems have been solved in various fields by applying machine learning techniques. These are enabled by increasing amounts of data being collected as well as steadily rising computing power. In this contribution, we present recent efforts to employ machine learning techniques to optimize accelerator operation at the storage ring KARA (KArlsruhe Research Accelerator) as well as the linear accelerator and test facility FLUTE at KIT.

AKBP 6.2 Di 16:45 NW-Bau - HS5

Effects of different impedances on longitudinal beam dynamics — •Patrick Schreiber[1], Tobias Boltz[1], Miriam Brosi[1], Patrik Schönfeldt[2], and Anke-Susanne Müller[1,2] — [1]LAS, KIT, Karlsruhe, Germany — [2]IBPT, KIT, Karlsruhe, Germany

The beam dynamics in a particle accelerator are influenced by its impedance. In particular with high charge densities, the production of coherent synchrotron radiation is governed by the longitudinal impedance. With Inovesa, an in-house developed simulation tool, it is possible to simulate the development of the longitudinal phase space density inside a storage ring by solving the Vlasov-Fokker-Planck equation. To get a better understanding and with the long-term goal to design impedances for an explicit purpose, we did systematic studies of the longitudinal dynamics for multiple impedances. In this contribution, we give an overview of the resulting changes and effects in the longitudinal phase space density for various impedances, ranging from basic shapes to real world approximations.

AKBP 6.3 Di 17:00 NW-Bau - HS5

Generation and detection of tunable, narrowband sub-THz and THz radiation at DELTA — •Carsten Mai[1], Benedikt Büsing[1], Shaukat Khan[1], Nils Lockmann[1], Arne Meyer auf der Heide[1], Bernard Riemann[1], Boris Sawadski[1], Peter Ungelenk[1], Christopher Gerth[2], Martin Laabs[3], Niels Neumann[3], Miriam Brosi[4], Johannes Steinmann[4], and Franziska Frei[5] — [1]Center for Synchrotron Radiation (DELTA), TU Dortmund University, Dortmund, Germany — [2]Deutsches Elektronensynchrotron, Hamburg, Germany — [3]TU Dresden, Chair for RF and Photonics Engineering, Dresden, Germany — [4]IBPT, KIT, Karlsruhe, Germany — [5]Paul Scherrer Institut, Villigen, Switzerland

At the 1.5-GeV electron storage ring DELTA, operated by the TU Dortmund University, a broadband source for coherently emitted THz radiation was commissioned in 2011. The THz generation is based on the interaction of titanium-sapphire laser pulses and a single electron bunch in the storage ring. Recently, the laser setup was extended using a temporal modulation of the laser pulses to produce narrowband radiation which can be easily tuned to the desired THz or sub-THz frequency. One application is the measurement of the spectral sensitivity of THz detectors, such as a novel single-shot on-chip spectrometer developed by TU Dresden. A first characterization of the new source and a comparison of different THz detectors are presented.

AKBP 6.4 Di 17:15 NW-Bau - HS5

Control of FEL Radiation Properties by Tailoring the Seed Pulses — •Vanessa Grattoni[1], Hauke Biss[2], Christoph Lechner[1], Jörn Bödewadt[1], Mehdi Mohammad Kazemi[1], Ralph Wolfgang Assmann[1], Tim Plath[3], Armin Azima[1,2], Wolfgang Carl Albert Hillert[2], and Velizar Miltchev[1,2] — [1]DESY, Hamburg — [2]Universität Hamburg, Hamburg — [3]TU Dortmund, Dortmund

Seeded free-electron lasers (FELs) produce intense, ultrashort and fully coherent X-ray pulses. These seeded FEL pulses depend on the initial seed properties. Therefore controlling the seed laser allows tailoring the FEL radiation for phase sensitive experiments. In this contribution we present detailed simulation studies to characterize the FEL process and to predict the operation performance in these conditions. In addition we show an experimental measurement on the temporal characterization of the seeded FEL pulse performed at the sFLASH experiment.

AKBP 6.5 Di 17:30 NW-Bau - HS5

Overview of KIT short bunch activities — Axel Bernhard, Edmund Blomley, Tobias Boltz, Miriam Brosi, Erik Bründermann, Stefan Funkner, Julian Gethmann, Benjamin Kehrer, Michael J. Nasse, Gudrun Niehues, Alexander Papash, Robert Ruprecht, Thiemo Schmelzer, Patrik Schönfeldt, Marcel Schuh, Nigel J. Smale, •Johannes L. Steinmann, Minjie Yan, and Anke-Susanne Müller — Karlsruher Institut für Technologie, Karlsruhe

The KIT synchrotron KARA (Karlsruhe Research Accelerator) is regularly operated in a short bunch mode. The radiation of the short bunches can react back on the source bunch and trigger the microbunching instability. We present recent research on observing the instability by turn-by-turn measurements.

AKBP 6.6 Di 17:45 NW-Bau - HS5

Characterisation of the Second Stable Orbit Generated by Transverse Resonance Island Buckets (TRIBs) — •Felix Kramer[1,2], Paul Goslawski[1], and Andreas Jankowiak[1,2] — [1]Helmholtz-Zentrum Berlin, Deutschland — [2]Humboldt-Universität zu Berlin, Deutschland

Operating the storage ring near a transverse tune resonance can generate TRIBs in the corresponding phase space, providing a second orbit winding around the standard orbit. TRIBs represent a novel bunch separation scheme for photon sources. In combination with the variable bunch length storage ring BESSY VSR *, the proposed upgrade for BESSY II, they provide a promising alternative to dedicated single or few bunch operation modes. Lifetime and stability of the two orbits at BESSY II and MLS are on par with the standard user modes. Results from simulations and measurements of our current island optics at BESSY II will be presented. Beam parameters like the betatron motion, dispersion, and emittance of both the core and island beam will be discussed as well as the separation between the core and island beam. At BESSY II a test week with friendly users is scheduled for the first quarter of 2018.

* A. Jankowiak et al., eds., BESSY VSR Technical Design Study, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany, June 2015. DOI: 10.5442/R0001

AKBP 6.7 Di 18:00 NW-Bau - HS5

Chicane Design Optimization for Echo-Enabled Harmonic Generation at sFLASH — •Hauke Biss[1], Jörn Bödewadt[2], Vanessa Grattoni[2], Christoph Lechner[2], Tim Plath[3], and Wolfgang Hillert[1] — [1]University of Hamburg, Hamburg, Germany — [2]DESY, Hamburg, Germany — [3]TU Dortmund University, Dortmund, Germany

The sFLASH experiment at the free-electron laser (FEL) FLASH at DESY in Hamburg is investigating phase-space manipulating seeding techniques. A scheme under investigation is the echo-enabled harmonic generation (EEHG). In this seeding scheme two laser pulses interact with the electron beam in two separate short undulators, each followed by a dispersive section. The resulting micro-bunched current profile has rich harmonic content, enabling the generation of seeded FEL radiation at high harmonics in a variable-gap undulator system further downstream. As, currently, the achievable harmonics of the sFLASH setup are limited by the dispersion strength of the magnetic chicanes, an upgrade is planned. In this contribution we discuss the parameter optimization aiming at sub-10nm seeded FEL radiation and present design considerations for integrating new magnetic chicanes under the boundary conditions given by the already existing hardware.

This work is supported by the Federal Ministry of Education and Research of Germany within FSP-302 under FKZ 05K13GU4, 05K13PE3, and 05K16PEA.

AKBP 6.8 Di 18:15 NW-Bau - HS5

Inverse Thomson Scattering from a MeV Laser Plasma Accelerator and Plasma Mirror — •Andrea Hannasch[1,2], Rafal Zgadzaj[1,2], Alejandro Laso-Garcia[1], Ulrich Schramm[1], Arie Irman[1], and Michael Downer[1,2] — [1]Helmholtz-Zentrum Dresden-Rossendorf, Institut fur Strahlenphysik, 01328 Dresden, Germany — [2]University of Texas at Austin, Austin, Texas 78012, USA

We convert a MeV laser-plasma accelerator (LPA) driven by the DRACO Laser at HZDR into a compact, femtosecond-pulsed, tunable gamma-ray source by inserting a 25 um-thick transparent low Z Kapton foil ~mm after the accelerator exit. The foil acts as a plasma mirror (PM) that retro-reflects spent drive laser pulses (1.55 eV) with field strength a0 ~ 1 back onto trailing electrons (peak Lorentz factor tunable from 500 - 1000). Compton backscatter generated approximately 1e8 gamma-ray photons with few mrad divergence, and estimated peak brilliance 1e21 photons/s/mm2/mrad2/0.1% bandwidth. Scaling of the generated signal with PM position indicates that the nonlinear Thomson scattering regime is accessible with a PM, and further scaling of thickness and material indicates that bremsstrahlung generated by MeV electrons within the PM is negligible. Gamma-ray photon energy, inferred from the measured electron energy distribution on each shot and measured by a stack calorimeter, peaked at ~ 1 MeV, accessing a range otherwise available with comparable brilliance only from large-scale linac-based high-intensity gamma-ray sources.

AKBP 7: Bestowal of Prizes

Zeit: Mittwoch 16:30–18:00 Raum: NW-Bau - HS2

Horst-Klein-Preis und DPG-Nachwuchspreis für Beschleunigerphysik

AKBP 8: Poster session

Zeit: Mittwoch 18:00–19:30 Raum: NW-Bau - HS2

AKBP 8.1 Mi 18:00 NW-Bau - HS2

Beam Dynamics Simulations for the New Superconducting CW Heavy Ion LINAC at GSI — •Malte Schwarz[1], Markus Basten[1], Marco Busch[1], Holger Podlech[1], Manuel Heilmann[2], Stepan Yaramyshev[2], Winfried Barth[2,3], Viktor Gettmann[3], Thorsten Kuerzeder[3], Maksym Miski-Oglu[3], and Kurt Aulenbacher[3,4] — [1]IAP, Goethe University Frankfurt — [2]GSI Helmholtz Centre, Darmstadt — [3]HIM Helmholtz Institute, Mainz — [4]IKP, Johannes Gutenberg University Mainz

For future experiments with heavy ions near the coulomb barrier within the super-heavy element (SHE) research project a multi-stage R&D program of GSI, HIM and IAP is currently in progress. It aims at developing a superconducting (sc) continuous wave (CW) LINAC with multiple CH cavities as key components downstream the upgraded High Charge State Injector (HLI) at GSI. The LINAC design is challenging due to the requirement of intense beams in CW-mode up to a mass-to-charge ratio of 6 while covering a broad output energy range from 3.5 to 7.3 MeV/u with minimum energy spread. After successful tests with the first CH cavity in 2016 demonstrated a promising maximum accelerating gradient of 9.6 MV/m, the worldwide first and successful beam test with this superconducting multi-gap CH cavity in 2017 was a milestone in the R&D work of GSI, HIM and IAP. In the light of experience gained in this research so far, the Beam Dynamics layout for the full LINAC was recently updated and significantly optimized. The corresponding simulations will be presented within this contribution.

AKBP 8.2 Mi 18:00 NW-Bau - HS2

Manufacturing & Measurements of the 325 MHz Ladder RFQ — •Max Schuett, Marc Syha, and Ulrich Ratzinger — IAP, Goethe University Frankfurt

Based on the positive results of the unmodulated 325 MHz Ladder-RFQ prototype from 2013 to 2016, we developed and designed a modulated 3.3 m Ladder-RFQ*. The unmodulated Ladder-RFQ features a very constant voltage along the axis. It accepted 3 times the operating power of which is needed in operation**. That level corresponds to a Kilpatrick factor of 3.1 with a pulse length of 200 μs.

The 325 MHz RFQ is designed to accelerate protons from 95 keV to 3.0 MeV according to the design parameters of the proton linac within the FAIR project. This particular high frequency creates difficulties for a 4-ROD type RFQ, which triggered the development of a Ladder RFQ with its high symmetry. The results of the unmodulated prototype have shown, that the Ladder-RFQ is a suitable candidate for that frequency. The duty cycle is suitable up to 5%.

The basic design and tendering of the RFQ has been successfully completed in 2016. Manufacturing will be completed in early 2018. We will show the results of manufacturing as well as first low level RF measurements on field flatness and frequency spectra compared in comparison to simulations.

*Journal of Physics: Conf. Series 874 (2017) 012048

**Proceedings of LINAC2016, East Lansing, TUPLR053

Supported by BMBF 05P15RFRBA

AKBP 8.3 Mi 18:00 NW-Bau - HS2

Beam stability study for FCC-hh — •Daria Astapovych and Oliver Boine-Frankenheim — TU Darmstadt, Darmstadt, Germany

The future circular hadron collider FCC-hh is one of the options for the post-LHC era. Currently an accelerator with the circumference of 100 km and center of massenergy 100 TeV is considered. The main limitations for the FCC-hh beam intensity are resistive wall impedance and electron clouds. The electron clouds, appearingdue to the short relativistic bunches, are significant issue causing beam quality degradation, beam instabilities and emittance growth. The numerical and analytical results for the impedance and growth rates of transverse coupled-bunch instabilities will be shown. Estimations of the tune footprint due to electron cloud effect, and secondary electron yield threshold also will be presented.

AKBP 8.4 Mi 18:00 NW-Bau - HS2

Bunch Shape Measurement at the GSI CW-Linac Prototype — •Thomas Sieber[1], Peter Forck[1], Winfried Barth[1], Viktor Gettmann[1], Maxym Miski-Oglu[1], Stepan Yaramyshev[1], Florian Dziuba[1], Manuel Heilmann[1], Thorsten Kürzeder[1], Alexander Feschenko[2], and Sergei Gavrilov[2] — [1]GSI Darmstadt — [2]INR Moscow

The existing GSI accelerator will become the injector for FAIR. To preserve and enhance the current experimental program at UNILAC, a dedicated new Linac is under development, which shall run in parallel to the FAIR injector, providing cw-beams of ions at energies from 3.5 MeV/u to 7.3 MeV/u. For this cw-Linac a superconducting prototype cavity has been developed and was first operated with beam in summer 2017. The resonator is a Cross-bar H-structure (CH) of 0.7 m length, with a resonant frequency of 216.8 MHz. It has been installed behind the GSI High Charge State Injector (HLI), which provided 108 MHz bunches of 1.4 MeV/u Ar6+, Ar9+ and Ar11+ ions at a duty cycle of 25 %. Due to the frequency jump and small longitudinal acceptance of the CH, proper matching of the HLI beam to the prototype was required. The bunch properties of the injected beam as well as the effect of different phase- and amplitude-settings of the cavity were measured in detail with a bunch shape monitor (BSM) fabricated at INR, Moscow, while the mean energy was analyzed by time of flight method. In this contribution, the bunch shape measurements are described and the capabilities of the used BSM measurement principle are discussed.

AKBP 8.5 Mi 18:00 NW-Bau - HS2

RF Simulations of the Injector Part from CH8 to CH15 for MYRRHA — •Patrick Müller, Dominik Mäder, Klaus Kümpel, Holger Podlech, Marco Busch, Nils Petry, and Malte Schwarz — IAP, Goethe-University Frankfurt, Germany

MYRRHA (Multi-purpose hYbrid Research Reactor for High-tech Applications) is the first prototype of an accelerator driven nuclear reactor dealing with the transmutation of long-living nuclear waste. Beam quality and reliability are crucial for the reactor. The injector design is done by IAP, Goethe-University, and has been adapted to the final magnet design and voltage distributions. The energy section from 5.87*MeV up to 16.6 MeV has been changed to normal conducting CH cavities as in the lower energy part of the injector. For beam adjustment a 5-gap CH cavity rebuncher at 5.87 MeV as well as two doublet magnets forming the new MEBT-2 section between CH7 and CH8 have been added. Starting parameters for the RF simulations have been given by beam dynamics results calculated with LORASR. RF simulations of these structures consisting of flatness and tuning optimizations will be presented within this contribution.

AKBP 8.6 Mi 18:00 NW-Bau - HS2

Optics design and space charge effects in Injection arc of MESA* — •Aamna Khan[1], Oliver Boine-Frankenheim[1], and Christian Stoll[2] — [1]Institut für Theorie Elektromagnetischer Felder, TU Darmstadt, Darmstadt-64289, Germany — [2]Institut für Kernphysik, Johannes Gutenberg-Universitat, D-55099 Mainz, Germany.

For intense electron bunches traversing through bends, as for example the recirculation arcs of an ERL, space charge (SC) may result in beam phase space deterioration. SC modifies the electron transverse dynamics in dispersive regions along the beam line and causes emittance growth for mismatched beams or for specific phase advances. The study focuses on the optics design, including SC, of a 180° low energy (5 MeV) injection arc which is matched to the injector with first cryomodule for energy recovery operation in the Mainz Energy-recovering Superconducting Accelerator (MESA). MESA should deliver a CW beam at 105 MeV for physics experiments with an internal target.

AKBP 8.7 Mi 18:00 NW-Bau - HS2

The spatial process model of the GSI-SIS18 synchrotron for the closed orbit feedback system — •Sajjad Hussain Mirza[1,2], Peter Forck[1], Rahul Singh[1], and Harald Klingbeil[1,2] — [1]GSI Darmstadt, Planckstraße 1, 64291 Darmstadt,Germany — [2]TEMF, Schlossgartenstraße 8, 64289 Darmstadt, Germany

A closed orbit feedback system is under development at the GSI SIS18 synchrotron for orbit correction during the whole acceleration ramp. Spatial process model of the system has been investigated and a replacement of the singular value decomposition (SVD) technique with a new faster Discrete Fourier Transform (DFT) based inversion of orbit response matrix (ORM) has been proposed, exploiting the Circulant symmetry of the synchrotron. A clear relation between SVD modes and singular values to DFT modes and coefficients has also been described. The DFT based decomposition gives hints on physical interpretation of SVD and DFT modes of the perturbed closed orbit. The use of DFT modes to provide robustness against BPM failures has been demonstrated with the help of MADX simulations.

AKBP 8.8 Mi 18:00 NW-Bau - HS2

Development of compact heavy ion linear accelerators — •Hendrik Hähnel, Ulrich Ratzinger, Rudolf Tiede, Jan Kaiser, and Christian Wirth — Institut für Angewandte Physik, Goethe Universität Frankfurt

Recent developments of heavy ion accelerators at IAP Frankfurt will be discussed. Using H-mode cavities, compact and efficient linear accelerators can be designed. One example is the development of a replacement for the GSI UNILAC poststripper linac. A replacement based on IH-type cavities would essentially cut the linac length in half while providing the same beam energy and similar beam quality. Additionally, the development of linac structures towards higher energies will be discussed.

AKBP 8.9 Mi 18:00 NW-Bau - HS2

design study on a 800 MHz RF cavity and HOM couplers for the higgs mode of operation of FCC-ee — •shahnam gorgi zadeh[1], rama calaga[2], frank gerigk[2], and ursula van rienen[1] — [1]University of Rostock — [2]CERN

After the discovery of the Higgs particle, CERN launched the study of the Future Circular Collider to act as a potential successor to the LHC. The FCC study includes a high luminosity lepton collider (FCC-ee) aiming to conduct precise measurements on the Z, W and H bosons and top quark. The FCC-ee will include different operating modes with beam energies of 45.6, 80, 120 and 182.5 GeV. The SRF requirements for each case necessitate different cavity designs. Nevertheless, no more than one or two designs should be found that could serve for all four scenarios. In this poster, we present the design of an accelerating cavity at 800 MHz including higher order mode couplers, considering mainly the requirements of the H mode of operation.

AKBP 8.10 Mi 18:00 NW-Bau - HS2

Control system and data acquisition of the laser-plasma ac-

celerator LUX — •Soeren Jalas[1], Manuel Kirchen[1], Niels Delbos[1], Timo Eichner[1], Bjoern Hubert[1], Lars Huebner[1], Spencer W. Jolly[1,2], Vincent Leroux[1,2], Sebastian Mahncke[1], Philipp Messner[1], Matthias Schnepp[1], Max Trunk[1], Christian Werle[1], Paul Winkler[1,3], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [2]Institute of Physics of the ASCR, ELI-Beamlines project, Na Slovance 2, 18221 Prague, Czech Republic — [3]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany

LUX is a dedicated laser-plasma accelerator built within a close collaboration of the University of Hamburg and DESY. Driven by the ANGUS laser system the accelerator provides electrons with GeV-scale energies at up to 5 Hz repetition rate. Here, we present the integration of the laser system and the plasma accelerator into an online control system for continious and non-invasive monitoring and control of the machine. Using an event based data acquisition service we record data from more than 100 diagnostics and operation-critical devices synchronized to each individual laser shot. Active feedback loops allow us to stabilize the accelerator in real time, which is key to enable reliable and reproducible long-term operation of a laser-plasma accelerator.

AKBP 8.11 Mi 18:00 NW-Bau - HS2

FBPIC: A spectral, quasi-3D, multi-GPU Particle-In-Cell code for plasma accelerators — •Manuel Kirchen, Sören Jalas, Sebastian Mahncke, and Andreas R. Maier — Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany

Plasma accelerators are compact high-energy particle sources. Excited by an ultra-short laser or particle beam driver, the strong electric fields inside a plasma allow to accelerate electron bunches to GeV energy levels on mm length scales. Modelling the complex acceleration process requires computationally demanding Particle-In-Cell codes that self-consistently solve the electromagnetic particle interaction inside the plasma. Here, we present FBPIC - a highly parallel Particle-In-Cell code featuring a spectral electromagnetic solver that eliminates numerical instabilities common to traditional field solvers, a quasi-3D geometry that greatly reduces the computational costs and the Lorentz-boosted frame technique that scales down the required simulation time by orders of magnitude. The code is written in pure Python using Just-In-Time compilation to generate machine code supporting CPU multi-threading and multi-GPU execution.

AKBP 8.12 Mi 18:00 NW-Bau - HS2

Beam Dynamics for the FAIR-p-Linac-RFQ — •Marc Syha, Maximilian Schütt, and Ulrich Ratzinger — Institut für Angewandte Physik, Goethe-Universität Frankfurt, Deutschland

After the successful measurements with a 0.8 m prototype a 3.3 m Ladder-RFQ is under construction at IAP, Goethe University Frankfurt. It is designed to accelerate protons from 95 keV to 3.0 MeV according to the design parameters of the p-Linac at FAIR. Along the acceleration section modulation parameter, aperture and synchronous phase all course linear, which differentiates this design approach from other designs developed at IAP. The ratio of transversal vane curvature radius to mid-cell radial aperture as well as the vane radius itself are constant, which favors a flat voltage distribution along the RFQ. This was verified by implantation of the modulated vane geometry into MWS-CST RF field simulations*.

The development of adequate beam dynamics was done in close collaboration with the IAP resonator design team. The Los Alamos RFQGen-code was used for the RFQ design and the beam dynamics simulations.

Furthermore, the effects of and the compensation for the longitudinal on-axis fringe-fields at the gap between the grounded entrance flange and the electrode entrance plane are discussed*.

*M. Schütt, Design and Development of a 325 MHz Ladder RFQ, Dissertation, IAP Goethe-Universität Frankfurt, 2017.

AKBP 8.13 Mi 18:00 NW-Bau - HS2

Intensity limits of DLA grating structures at relativistic energies — •Thilo Egenolf[1], Uwe Niedermayer[1], and Oliver Boine-Frankenheim[1,2] — [1]TEMF, TU Darmstadt, Schloßgartenstraße 8, 64289 Darmstadt, Germany — [2]GSI, Planckstraße 1, 64291 Darmstadt, Germany

Dielectric Laser Acceleration (DLA) is an advanced electron accelerator concept reaching gradients significantly larger than conventional RF cavities. Recent experiments using dielectric nanostructures have demonstrated acceleration gradients of about 690 MeV/m. Due to the extremely small apertures, intensity effects caused by space charge and wakefields are critical limitations. To estimate the intensity limits at relativistic energies, we present simulations of the longitudinal wakefield for different DLA grating geometries and bunch properties. Based on these simulations, we calculate the beam loading intensity limit, where the energy loss equals the external energy gain. Additionally, we simulate the transverse wakefield for beam stability analysis. Furthermore, we outline the integration of a wake kick in our simplified 6D particle tracking code to study the beam dynamics in DLA gratings. The required single particle wake function is obtained by fitting analytical solutions of similar metallic geometries. For verification, we compare the tracking results to Particle-In-Cell simulations with commercial software.

AKBP 8.14 Mi 18:00 NW-Bau - HS2

Setup for cooled GaAs cathodes with increased charge lifetime — •Tobias Eggert, Markus Wagner, Yuliya Fritzsche, Neeraj Kurichiyanil, and Joachim Enders — Institute for Nuclear Physics, TU Darmstadt

For high-current applications of GaAs photocathodes it is necessary to maximize the charge lifetime of the cathode material to ensure reliable operation. By means of cryogenic cooling of the electrode, the local vacuum conditions around the GaAs cathode, with its sensitive negative-electron-affinity surface, are expected to improve due to cryogenic adsorption of reactive residual gas molecules at the surrounding walls. Furthermore, the cooling also allows a higher laser power deposited in the material, resulting in higher currents that can be extracted from the cathode. Ion-backbombardment is expected to be reduced using an electrostatic bend after the electrons leave the cathode. To measure the characteristics of such an electron source, a dedicated set-up is being developed at the Photo-CATCH test facility (Proc. 7th DAE-BRNS Indian particle accelerator conference, Mumbai 2015) in Darmstadt, Germany. We will present the current status of the source, including electrostatic and vaccum simulations and future plans.

The project is funded by DFG (GRK 2128) and BMBF (05H15RDRB1).

AKBP 8.15 Mi 18:00 NW-Bau - HS2

On evaluation of transient BPM signals — •Rahul Singh, Peter Forck, Andreas Reiter, Piotr Kowina, Kevin Lang, Wolfgang Kaufmann, Piotr Miedzik, and Oleksandr Chorniy — GSI Darmstadt, Planckstrasse 1, Germany

Capacitive beam position monitors are non-interceptive devices providing signals from injection till extraction of beam from a synchrotron. Their typical usage is for the orbit or turn-by-turn position measurements of a bunched beam. In this contribution, we will discuss their utility in the *other beam states* such as during injection, debunching, unbunched state, during rf gymnastics and potentially while beam is being extraction. The influence of BPM signal processing on utilizing BPM signals in aforementioned cases will be highlighted.

AKBP 8.16 Mi 18:00 NW-Bau - HS2

Reconstructing Space-Charge Distorted IPM Profiles with Machine Learning Algorithms — •Dominik Vilsmeier, Mariusz Sapinski, and Rahul Singh — GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Deutschland

Measurements of undistorted transverse profiles via Ionization Profile Monitors (IPMs) may pose a great challenge for high brightness or high energy beams due to interaction of ionized electrons or ions with the electromagnetic field of the beam. This contribution presents application of various machine learning algorithms to the problem of reconstructing the actual beam profile from measured profiles that are distorted by beam space-charge interaction. (Generalized) linear regression, artificial neural network and support vector machine algorithms are trained with simulation data, obtained from the Virtual-IPM simulation tool, in order to learn the relation between distorted profiles and original beam dimension. The performance of different algorithms is assessed and the obtained results are very promising for testing with simulation data.

AKBP 8.17 Mi 18:00 NW-Bau - HS2

Experimente zur Beschleunigerphysik für junge Menschen - Schwerpunkt Beschleuniger-Entwicklung — •Stefan Bechstein, Achim Stahl und Josef Riese — RWTH Aachen University (Germany)

Mit der Entwicklung und dem Bau eines Lehr-Zyklotrons, eines Lehr-Linearbeschleunigers und zwei Funktionsmodellen werden erstmals Experimentiergelegenheiten zur modernen Beschleunigerphysik für Schulen, Universitäten und Ausbildungsbetriebe geschaffen. Die gesellschaftliche Relevanz zeigt sich vor allem in den wachsenden Anwendung im Bereich der Medizin/Krebs-Therapie und dem FEL. In der Lehre werden die physikalischen Zusammenhänge bis dato lediglich mithilfe von bildlichen Darstellungen oder Computersimulationen vermittelt, einige Parameter bleiben dabei allerdings außen vor.

Die Kooperationsstruktur, bestehend aus dem Institut für experimentelle Teilchen- und Astroteilchenphysik der RWTH Aachen University und dem Institut für Didaktik der Physik und Technik an der RWTH, sowie der enge Austausch mir dem Head of Educational Outreach and Physics Education Research des CERN/Genf, ermöglicht Forschungen sowohl beim Quellen-Design, der Vakuum- und Beschleunigungstechnik oder den Analyse-Möglichkeiten, als auch bei Konstruktion von Lerngelegenheiten.

Auf dem Poster werden die geplante Modellserie, erste bauliche Lösungen, aber auch Fragestellungen zur Umsetzung aus der laufenden Entwicklungsphase zu sehen sein. Daneben werden Aspekte zur Bedeutung der Teilchenphysik für eine breite Öffentlichkeit skizziert.

AKBP 8.18 Mi 18:00 NW-Bau - HS2

Slow Extraction Spill Characterization from Micro to Milli-Second Scale — •Peter Forck, Plamen Boutachkov, Rahul Singh, Stefan Sorge, and Horst Welker — GSI, Darmstadt

This contribution deals with the topic of slow extraction spill quality characterization based on the measurements performed at GSI SIS-18. As a first step, external ripples were introduced into the dipole and quadrupole power supplies to estimate the source and magnitude of coherent peaks seen in a spill spectrum. Spill characterization techniques in the time and frequency domain are discussed exemplified by typically measured spills and their differences from an ideal or "dc" spill. Standard characterization methods of the slow extraction spill is interesting due to two reasons, firstly; there is a big variety in experimental requirements with each having different tolerances to deviations from a "dc" beam occurring primarily due to beam response to imperfections like power supplier ripples. Secondly, different slow extraction methods lead to characteristic temporal variations of spill quality even during one extraction cycle; some examples are discussed. An appropriate spill characterization aims to provide a suitable abstraction for communication about the spill quality requirements between accelerator operations and users.

AKBP 8.19 Mi 18:00 NW-Bau - HS2

3D space charge tracking using fast multipole methods* — •Steffen Schmid, Erion Gjonaj, and Herbert De Gersem — Institut für Theorie Elektromagnetischer Felder, TU Darmstadt, GER

In high brilliance photoinjectors, such as the PITZ gun used at the EXFEL, the particle bunch properties are strongly influenced by space charge effects [1]. Computer simulations allow to investigate systematically how these effects influence the beam dynamics of the bunch. This knowledge is needed for the optimization of a photoinjector.

Currently, most of the simulation codes are based on particle-particle (PP) or particle-mesh (PM) algorithms. PP-codes are very flexible, but computationally expensive. PM-algorithms are more efficient, but less flexible and conceptually more complicated.

The fast multipole method [2] (FMM) combines some of the advantages of both of the aforementioned approaches. We present a code which uses "ExaFMM" [3] to provide the space charge interaction forces to an in-house developed particle tracker.

In this contribution, a numerical analysis of the approximation errors and the speedup gained by using the FMM-code is shown. Furthermore, FMM and PP beam dynamics simulations for the PITZ photoinjector are compared. The results suggest to use the FMM-code as a basis for the implementation of more advanced interaction models.

[1] Y. Chen et al., IPAC, Richmond, VA, USA, MOPWA029 (2015)
[2] L. Greengard et al., J COMPUT PHYS, **73**, CP975706 (1997)
[3] R. Yokota et al., "ExaFMM", https://github.com/exafmm/exafmm
* This work is supported by the DFG in the framework of GRK 2128

AKBP 8.20 Mi 18:00 NW-Bau - HS2

Numerical studies for optimized ionization injection — •Sebastian Mahncke[1], Niels Delbos[1], Irene Dornmair[1], Timo Eichner[1], Björn Hubert[1], Lars Hübner[1], Sören Jalas[1], Spencer W. Jolly[1,2], Manuel Kirchen[1], Vincent Leroux[1,2], Philipp Messner[1], Matthias Schnepp[1], Maximilian Trunk[1], Christian Werle[1], Paul A. Walker[3], Paul Winkler[1,3], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, German — [2]Institute of Physics of the ASCR, ELI-Beamlines project, Na Slovance 2, 18221 Prague, Czech Republic — [3]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany

The LUX beamline is a novel laser-plasma accelerator, built in close collaboration of the University of Hamburg and DESY, and dedicated for the generation of laser-plasma driven undulator radiation. Separating the injection of electrons from the acceleration in the plasma is crucial for improved control over the electron beam phase space. Here, we present numerical studies on ionization injection with a focus on the separation of the injection and acceleration sections, while optimizing experimentally accessible parameters for improved electron beam quality.

AKBP 8.21 Mi 18:00 NW-Bau - HS2

Beam intensity measurement with nA precision - the Cryogenic Current Comparator (CCC) — •David Haider[1], Thomas Sieber[1], Febin Kurian[1], Peter Forck[1], Marcus Schwickert[1], Frank Schmidl[2], Peter Seidel[2], Ralf Neubert[2], Jessica Golm[2,3], Volker Tympel[3], Nicolas Marsic[4], Herbert De Gersem[4], Matthias Schmelz[5], Ronny Stolz[5], Viatcheslav Zakosarenko[6], and Thomas Stöhlker[1,2,3] — [1]GSI Helmholz Centre for Heavy Ion Research, Darmstadt, Germany — [2]Friedrich-Schiller-University Jena, Germany — [3]Helmholtz-Institute Jena, Germany — [4]TU Darmstadt, Germany — [5]Leibniz Institute of Photonic Technology, Jena, Germany — [6]Supracon AG, Jena, Germany

The storage of low current beams and the slow extraction of ion beams at FAIR bring new demands for a non-destructive beam intensity monitoring of nA currents. To address this requirement, the concept of a Cryogenic Current Comparator (CCC) using a low temperature SQUID sensor has been adapted to form an extremely sensitive beam current transformer. Such CCCs were installed successfully in the extraction line of GSI SIS18 (2014) and - as the first stand-alone device - in the CERN Antiproton Decelerator (2017). Currently, the next generation of CCCs is being designed as a routine diagnostic system for FAIR and will be tested in CRYRING at GSI. The challenge of the ongoing research is to improve the robustness against external interference, based on electro-mechanical studies, and to optimize the design of each component accordingly. In this contribution, recent results and future developments of the FAIR-CCC are discussed.

AKBP 8.22 Mi 18:00 NW-Bau - HS2

Recent developments in beam diagnostics and control systems at COSY — •Philipp Niedermayer, Ilja Bekman, Christian Böhme, Arthur Halama, Vsevolod Kamerdzhiev, Karl Reimers, Michael Simon, and Michael Thelen — IKP-4, Forschungszentrum Jülich, 52425 Jülich, Germany

The Cooler Synchrotron (COSY) is currently operated mainly for accelerator and detector related preparations for the future accelerator facility FAIR as well as the Electric Dipole Moment (EDM) investigations. In order to reach the goals of current and future experiments, fast and reliable real-time diagnostic of beam parameters is crucial. Therefore many present subsystems are being upgraded and new systems are added. Integration of these systems into the Experimental Physics and Industrial Control System (EPICS) enabling online monitoring and archiving is one of the core activities. These include, but are not limited to, Beam Position Monitors (BPM), Beam Loss Monitors (BLM), Profile Grids and Multi-Wire Proportional Chambers, Spill Detector. Latest activities and achievements are presented.

AKBP 8.23 Mi 18:00 NW-Bau - HS2

Long-term performance of the Marburg Ion-Beam Therapy Centre Accelerator — •Adrian Weber[1], Claude Krantz[1], Benno Kröck[1], Uwe Scheeler[1], Rainer Cee[2], Michael Galonska[2], Andreas Peters[2], Stefan Scheloske[2], Christian Schoemers[2], and Thomas Haberer[1,2] — [1]Marburger Ionenstrahl-Therapiezentrum, 35043 Marburg — [2]Heidelberger Ionenstrahl-Therapiezentrum, 69120 Heidelberg

The Marburg Ion-Beam Therapy Centre (MIT) has been in clinical operation since October 2015. The raster scanning technique provides a precise and accurate radiation dose application employing beams of either protons or carbon nuclei. The accelerator, developed by Siemens/Danfysik, consists of an RF linear accelerator and a 65 m synchrotron. During treatment, the position, shape and intensity of the ion beam is monitored online at the beam outlet by the Therapy Control System. In addition, the quality of the beam along the accelerator is monitored by online measurements of beam properties using non-invasive beam diagnostics as well as by dedicated daily performance checks involving also destructive measurements. We present our experience on the machine stability from the first two years of operation of MIT as well as ongoing work to improve analysis tools for long-term monitoring of beam properties. A possible extension of the daily quality assurance tests based on the experience gathered so far is under investigation.

AKBP 8.24 Mi 18:00 NW-Bau - HS2

Performance of the ESR Barrier Bucket LLRF System — •Jens Harzheim[1], Dilyana Domont-Yankulova[1], Michael Frey[2], Kerstin Gross[1], Harald Klingbeil[1,2], and Dieter Lens[2] — [1]TU Darmstadt, Darmstadt, Germany — [2]GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

A barrier bucket (BB) RF system is currently being installed in the Experimental Storage Ring (ESR) at GSI, Darmstadt, Germany. This system will be able to provide pulsed gap voltages, enabling highly sophisticated longitudinal beam manipulations like longitudinal capture, compression and decompression or stacking of the beam.

To fulfill the high requirements on the BB gap signal, the input signal has to be predistorted. This task has to be fulfilled by the LLRF system which includes an identification of the required RF system parameters. Additionally, adiabatic amplitude ramps and phase shifts are required for the intended beam manipulations and need to be performed by the LLRF system. The ramps will be provided by the FAIR Central Control System (CCS).

In this contribution, the topology of the ESR BB LLRF System is presented together with measured performance results for the different functionalities requested of the system.

AKBP 8.25 Mi 18:00 NW-Bau - HS2

A Fluorescence Based Profile Monitor for Electron Lenses — •Serban Udrea[1], Peter Forck[1], Elena Barrios Diaz[2], Nicolas Chritin[2], Tom Marriott-Dodington[2], Rhodri Jones[2], Paolo Magagnin[2], Gerhard Schneider[2], Raymond Veness[2], Vasilis Tzoganis[3,4], Carsten Welsch[3], and Hao Zhang[3] — [1]GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany — [2]CERN, Geneva, Switzerland — [3]Cockcroft Institute, Warrington, United Kingdom — [4]Oak Ridge National Laboratory, Oak Ridge, USA

A hollow electron lens is presently under study as a possible addition to the collimation system for the high luminosity upgrade of the LHC (HL-LHC) at CERN, while an electron lens system is proposed for space charge compensation in the SIS-18 synchrotron at GSI to allow for higher beam intensities at the future FAIR facility. For effective operation of these devices, a precise alignment is necessary between the high energy hadron beam and the low energy electron beam. In order to achieve this, a beam diagnostics setup based on an intersecting gas sheet and the observation of beam induced fluorescence is under development. In this contribution we give an account of recent studies, including the design and performance of the optical system and results of experiments performed using a laboratory gas curtain setup.

AKBP 9: Diagnostics, Control and Instrumentation II

Zeit: Donnerstag 16:30–18:30 Raum: NW-Bau - HS4

AKBP 9.1 Do 16:30 NW-Bau - HS4

Phase-Space Diagnostis at LUX — •P. Winkler[1,3], N. Delbos[1], I. Dornmair[1], T. Eichner[1], B. Hubert[1], L. Hübner[1], S. Jalas[1], S. W. Jolly[1,2], M. Kirchen[1], V. Leroux[1,2], S. Mahncke[1], P. Messner[1], M. Schnepp[1], M. Trunk[1], C. Werle[1], P. A. Walker[1], J. Osterhoff[3], B. Schmidt[3], and A. R. Maier[1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [2]Institute of Physics of the ASCR, ELI-Beamlines project, Na Slovance 2, 18221 Prague, Czech Republic — [3]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany

The LUX beamline is a novel laser-plasma accelerator, built in close collaboration of the University of Hamburg and DESY, and dedicated for the generation of laser-plasma driven undulator radiation. After the laser-plasma target the electron beams are focused by a quadrupole doublet before entering the undulator to produce soft x-rays at few-nm wavelength. Due to shot-to-shot fluctuations of the electron beam propeties a single-shot diagnositc is required and further complicated by the 1 mrad level beam divergence and few percent level energy spread. We discuss our beam diagnostics concepts for LUX, including emittance and bunch length measurements.

AKBP 9.2 Do 16:45 NW-Bau - HS4

Beam-Based Alignment of the LUX Beam Optic — •Björn Hubert[1], Niels Delbos[1], Irene Dornmair[1], Timo Eichner[1], Lars Hübner[1], Sören Jalas[1], Spencer Jolly[1,2], Manuel Kirchen[1], Vincent Leroux[1,2], Sebastian Mahncke[1], Philipp Messner[1,3], Matthias Schnepp[1], Max Trunk[1], Christian Werle[1], Paul Walker[1], Paul Winkler[1,4], and Andreas Maier[1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [2]Institute of Physics of the ASCR, ELI-Beamlines project, Na Slovance 2, 18221 Prague, Czech Republic — [3]Max-Planck Institute for the Structure and Dynamics of Matter — [4]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany

The LUX beamline is a novel laser-plasma accelerator, built in close collaboration of the University of Hamburg and DESY, and dedicated for the generation of laser-plasma driven undulator radiation. After the laser-plasma target the electron beams are focused by a quadrupole doublet before entering the undulator to produce soft x-rays at few-nm wavelength.

Due to the high quadrupole gradients of up to 150 T/m, smallest displacements of the quadrupoles lead to dispersive kicks of the bunch. We performed quadrupole scans to determine the offset in the transversal plane between the magnetic quadrupole centers and the beams center of mass to realign the magnets.

AKBP 9.3 Do 17:00 NW-Bau - HS4

Emittance Measurement at LUX — •Lars Hübner[1], Niels Delbos[1], Irene Dornmair[1], Timo Eichner[1], Björn Hubert[1], Sören Jalas[1], Spencer W. Jolly[1,2], Manuel Kirchen[1], Vincent Leroux[1,2], Sebastian Mahncke[1], Philipp Messner[1,3], Matthias Schnepp[1], Max Trunk[1], Paul Andreas Walker[1], Christian M. Werle[1], Paul Winkler[1,4], and Andreas R. Maier[1] — [1]Center for Free-Electron Laser Science & Department of Physics, University of Hamburg, Hamburg, Germany — [2]Institute of Physics of the ASCR, ELI-Beamlines project, Prague, Czech Republic — [3]Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany — [4]Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

The LUX beamline is a novel laser-plasma accelerator, built in close collaboration of the University of Hamburg and DESY, and dedicated for the generation of laser-plasma driven undulator radiation. For beam transport design, the beam properties after the plasma target are crucial. Here, we discuss first characterization of the electron beam optics at LUX and report on emittance reconstruction using measured beam profiles and electron spectra.

AKBP 9.4 Do 17:15 NW-Bau - HS4

Closed-Orbit Bilinear-Exponential Analysis — •Bernard Riemann, Stephan Koetter, Benjamin Isbarn, Shaukat Khan, and Thomas Weis — Center for Synchrotron Radiation, TU Dortmund University, Dortmund, Germany

Closed-Orbit Bilinear-Exponential Analysis (COBEA) is an algorithm to decompose monitor-corrector response matrices into (scaled) beta functions, phase advances, scaled dispersion, and betatron tunes. No explicit magnetic lattice model is required ("no lengths, no strengths"), but only the sequence of monitors and dipole correctors along the beam path. To get absolute beta functions, the length of one drift space can be provided as optional input.

Results of COBEA are shown while also relating the algorithm to other diagnostic algorithms. Improvements in the free Python implementation of COBEA are presented. Due to COBEA's low requirements on the amount of input data, it should be applicable to many

existing storage rings.

AKBP 9.5 Do 17:30 NW-Bau - HS4

Preparations for electro-optical measurement at DELTA — •Boris Sawadski, Shaukat Khan, Nils Lockmann, Carsten Mai, Arne Meyer auf der Heide, and Raffael Niemczyk — TU Dortmund University, Dortmund, Germany

At the DELTA electron storage ring, operated by the TU Dortmund University, THz radiation is routinely produced by the interaction between the electron bunches and a femtosecond laser pulse. Due to a laser-induced energy modulation, a dip in the longitudinal electron distribution forms after passing a dispersive magnet structure. At a dedicated THz beamline, an Ytterbium-fiber-laser system has been installed which allows for an electro-optical detection of the THz far field. The setup currently being commissioned for the measurement of the longitudinal charge distribution is described and a characterization of the fiber laser system is presented.

AKBP 9.6 Do 17:45 NW-Bau - HS4

Online diagnostics for the ANGUS 200 TW laser — •Matthias Schnepp[1], Niels M. Delbos[1], Timo Eichner[1], Sören Jalas[1], Spencer Jolly[1,3], Manuel Kirchen[1], Vincent Leroux[1,3], Philipp Messner[1,4], Maximilian Trunk[1], Christian M. Werle[1], Paul Winkler[2], and Andreas R. Maier[1] — [1]Center for Free- Electron Laser Science and Department of Physics,University of Hamburg, 22761 Hamburg, Germany — [2]DESY, Hamburg, Germany — [3]ELI Beamlines, Dolní Brežany, Czech Republic — [4]International Max Planck Research School for Ultrafast Imaging and Structural Dynamics, Hamburg, Germany

Laser-plasma based acceleration has matured into a technique providing high-energy electron beams able to drive undulator-based x-ray light sources. The LUX beamline, recently built up in a collaboration between University of Hamburg and DESY is designed to be such a light source. The plasma acceleration stage is driven by the 5 Hz 200 TW laser system ANGUS, and recently demonstrated first x-ray from a plasma-driven undulator. Here, we will introduce the ANGUS laser system as the main driver of the facility and describe the implementation of the online diagnostics with a data acquisition system at the laser repetition rate. We show long-term stability measurements and discuss reliability and reproducibility of the laser as a driver for laser-plasma acceleration.

AKBP 9.7 Do 18:00 NW-Bau - HS4

In-situ synthetic radiation diagnostics for laser wakefield acceleration — •Richard Pausch[1,2], Alexander Debus[1], Axel Huebl[1,2], Ulrich Schramm[1,2], Klaus Steiniger[1,2], René Widera[1], and Michael Bussmann[1] — [1]Helmholtz-Zentrum Dresden - Rossendorf — [2]TU Dresden

We present recent results of LWFA simulations including in-situ radiation diagnostics performed with the particle-in-cell code PIConGPU. Our results demonstrate the power provided by synthetic radiation diagnostics to determine the laser-plasma dynamics with regard to applications in experiments.

PIConGPU is currently one of the fastest 3D3V particle-in-cell codes and provides an in-situ radiation diagnostic based on Liénard-Wiechert potentials. This synthetic diagnostic is capable of quantitatively predicting the spectrally and directionally resolved far-field radiation of billions of macro-particles by an in-situ implementation in the PIC cycle. Among other things, the code enables resolving the spatial origin and temporal evolution of the radiation, determine the polarization, quantifying both coherent and incoherent radiation simultaneously and covering a frequency range from infrared to x-rays.

The talk briefly introduces the technical background of computing the radiation in-situ on GPUs. Its main focus, however, is the characteristic radiation of LWFA that allows identifying the various stages of the laser-plasma dynamics. Possible applications of these radiation signatures in laboratory experiments will be discussed.

AKBP 9.8 Do 18:15 NW-Bau - HS4

Applications of the Double Slit Interferometer for Transverse Beam Size Measurements at BESSY II — •Marten Koopmans[1,2], Ji-Gwang Hwang[1], Andreas Jankowiak[1,2], Peter Kuske[1], Markus Ries[1], Andreas Schälicke[1], and Gregor Schiwietz[1] — [1]Helmholtz-Zentrum Berlin, Deutschland — [2]Humboldt-Universität zu Berlin, Deutschland

For the upgrade of the BESSY II storage ring to BESSY VSR * an interferometric beam size monitor was designed and set up. Since this system uses visible light it can be upgraded efficiently to provide bunch resolved measurements. These are required for machine commissioning, development and to ensure long term quality and stability of user operation of BESSY VSR. Various applications of the system are outlined and measurements are presented. A detailed estimation of possible error contributions is given and the upgrade of the present system with an ICCD will be discussed.

* A. Jankowiak et al., eds., BESSY VSR Technical Design Study, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Germany, June 2015. DOI: 10.5442/R0001

AKBP 10: New Accelerator Concepts and Radiofrequency

Zeit: Donnerstag 16:30–18:30 Raum: NW-Bau - HS2

AKBP 10.1 Do 16:30 NW-Bau - HS2

Plasma acceleration experiments at DESY Zeuthen — •G. Loisch[1], R. Brinkmann[2], Y. Chen[1], J. Chun-Sung[1], J. Engel[1], M. Gross[1], F. Grüner[3,4], G. Koss[1], M. Krasilnikov[1], O. Lishilin[1], A. Martinez de la Ossa[2,4], T. Mehrling[2], J. Niemiec[1], A. Oppelt[1], J. Osterhoff[1], S. Philipp[1], M. Pohl[1], D. Richter[5], F. Stephan[1], and S. Vafin[1] — [1]Deutsches Elektronen-Synchrotron, 15738 Zeuthen — [2]Deutsches Elektronen-Synchrotron, 22607 Hamburg — [3]Center for Free Electron Laser Science, 22607 Hamburg — [4]Universität Hamburg, 20148 Hamburg — [5]Helmholtzzentrum Berlin für Materialien und Energie, 14109 Berlin

Plasma acceleration has attracted a lot of attention in the past decade due to successful acceleration of electrons with gradients exceeding those of conventional accelerator technology by orders of magnitude. An experimental programme was started at the Photoinjector Test Facility, DESY Zeuthen (PITZ), to study aspects of the acceleration mechanisms in beam-driven plasma wakes. Original goals were the investigation of the self-modulation instability and the acceleration of particles with high ratios between energy gain of accelerated and energy loss of wake-driving particles. The goals were later on extended by studies on other wakefield acceleration mechanisms and laboratory studies of acceleration mechanisms in space plasmas as a source of PeV-scale cosmic ray particles. A brief overview of the experiments including experimental results, simulations and plans for future studies is presented.

AKBP 10.2 Do 16:45 NW-Bau - HS2

Start-to-end simulations of the self-modulation experiment at PITZ — •Osip Lishilin, Matthias Gross, Gregor Loisch, and Frank Stephan — DESY, Zeuthen, Germany

The PWFA experiment at the Photo Injector Test facility at DESY, Zeuthen site (PITZ), was launched to experimentally demonstrate and study a promising phenomenon for future plasma-based accelerators and one of the major aspects of the AWAKE experiment – the self-modulation of long particle beams in plasma. First time-resolved measurements of the self-modulation instability (SMI) of a long electron beam in plasma took place at PITZ in 2016; however the due to technical shortcomings the plasma density during the experiment was about an order of magnitude lower than expected.

This contribution describes start-to-end beam dynamics simulations performed for the electron beam and plasma parameters corresponding to that of the experiment conducted in 2016; the beam-plasma interaction is studied for several possible cases of initial beam charge density distributions in plasma, then the measurement of the longitudinal phase space is simulated. The performed simulations show complete saturation of the SMI over the length of the PITZ plasma source and good agreement with the experimental data.

In addition, a variable plasma channel length setup for upcoming in-depth experimental studies of the SMI is presented.

AKBP 10.3 Do 17:00 NW-Bau - HS2

RF Control Stability Investigations during the first Energy Recovery Operation at the S-DALINAC* — •Manuel Steinhorst, Michaela Arnold, Christoph Burandt, and Norbert Pietralla — Institut für Kernphysik - TU Darmstadt, Darmstadt, Deutschland

The recirculating superconducting Darmstadt linear accelerator S-DALINAC is one of the main research instruments at the institute for nuclear physics at the TU Darmstadt. Since the first recirculated beam in 1991 many improvements on the S-DALINAC were implemented. In 2015/2016 the S-DALINAC was upgraded from a twice recirculating to a thrice recirculating scheme. With the new beam line the S-DALINAC is able to provide a beam with the same design energy of up to 130 MeV in cw operation at reduced accelerating gradients by using the main accelerator an additional time. Furthermore a phase-shift of up to 360° due to a path length variation of the arcs in the second recirculation can be done. Therefore the S-DALINAC can be operated in energy recovery mode after this upgrade shifting the phase by 180°. In August 2017 a first once recirculating energy recovery operation was achieved using the second recirculation. During this energy recovery beamtime measurements regarding the rf control stability and rf power were done. This talk is discussing this measurements and possible improvements for future energy recovery beam times.

Supported by the DFG through GRK 2128.

AKBP 10.4 Do 17:15 NW-Bau - HS2

Developing an Improved Capture Section and Longitudinal Beam Diagnostics for the S-DALINAC* — •Simon Weih[1], Michaela Arnold[1], Dmitry Bazyl[2], Herbert De Gersem[2], Joachim Enders[1], and Norbert Pietralla[1] — [1]Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, Germany — [2]Institut für Theorie Elektromagnetischer Felder, Technische Universität Darmstadt, Darmstadt, Germany

For an optimized capture of electron bunches in the radio-frequency (RF) field of the injector of the superconducting Darmstadt electron linear accelerator S-DALINAC, a new capture cavity is currently being developed. For installing this cavity, the cryomodule has to be modified. These modifications include adaptions of the tuner frame as well as changes in the position of the RF output coupler. Furthermore, simulations of the longitudinal beam dynamics of the injector were carried out in order to gain a first estimate of the expected beam quality improvements using the new capture structure. Due to the absence of longitudinal diagnostics in the low-energy section so far, an energy-spread measurement setup is currently also under development. This setup is planned to be used for a characterization of the thermionic gun beam, which then will contribute to more accurate simulations for the commissioning phase of the upgraded injector. This contribution will present the cryomodule modifications, some simulation results, and the conception of the energy-spread measurement setup.

*Work supported by DFG through GRK 2128 "Accelence"

AKBP 10.5 Do 17:30 NW-Bau - HS2

RF Design of an RFQ Linac for PIXE Analysis — •Hermann Pommerenke[1,2], Alexej Grudiev[1], and Ursula van Rienen[2] — [1]CERN, Geneva, Switzerland — [2]University of Rostock, Germany

MeV protons are commonly used for Ion Beam Analysis (IBA) of materials, in particular with the PIXE (Proton Induced X-ray Emission) technique, which is the most widely used in IBA. PIXE covers the quantitative analysis of elements with very good efficiency and minimum detection limits reaching ppm range. Because of its non-damaging character, it is widely used in different fields, in particular for the diagnosis of cultural heritage artwork.

Despite many benefits, moving masterpieces from museum to IBA laboratories can be expensive, unacceptable for curators or simply impossible due to the size or the conservation stage. A transportable accelerator is a unique tool capable of providing access to IBA analysis almost anywhere, in museums, restoration centers or even in the field. Additional applications include environmental and atmospheric sciences, material sciences, and quality control.

This PhD project covers the RF design of a compact transportable radio frequency quadrupole (RFQ) operating at 750 MHz, which will serve as a source of 2 MeV protons for PIXE analysis. The RFQ will be constructed at CERN in close collaboration with Le Louvre (AGLAE laboratory) and INFN-Firenze (LABEC laboratory).

Here, we present general project parameters and the current state of the RF design, which includes results regarding the RFQ geometry, required fabrication tolerances and thermal simulation.

AKBP 10.6 Do 17:45 NW-Bau - HS2

Structural investigations of nitrogen-doped niobium for superconducting RF-cavities — •Márton Major[1], Matthias Mahr[1], Stefan Flege[1], Lambert Alff[1], Jens Conrad[1], Ruben Grewe[1], Michaela Arnold[1], Norbert Pietralla[1], and Florian Hug[2] — [1]Technische Universität Darmstadt, Darmstadt, Germany — [2]Johannes Gutenberg Universität Mainz, Mainz, Germany

Niobium is the standard material for superconducting RF (SRF) cavities. Superconducting materials with higher critical temperature or higher critical magnetic field allow cavities to work at higher operating temperatures or higher accelerating fields, respectively. Enhancing the surface properties of the superconducting material in the range of the penetration depth is also beneficial. One direction of search for new materials with better properties is the modification of bulk niobium by nitrogen doping. In the Nb-N phase diagram the cubic δ-phase of NbN has the highest critical temperature (16 K). Already slight nitrogen doping of the α-Nb phase results in higher quality factors [Grassellino *et al.*, Proc. SRF2015, MOBA06, 48].

Nb samples were N-doped at the refurbished UHV furnace at IKP Darmstadt. Reference samples were annealed in 1 bar nitrogen atmosphere at different temperatures. In this contribution the results on the structural investigations (x-ray diffraction and pole figure, secondary ion mass spectroscopy, scanning electron microscopy) at the Materials Research Department of TU Darmstadt will be presented.

Work supported by the German Federal Ministry for Education and Research (BMBF) through grant 05H15RDRBA.

AKBP 10.7 Do 18:00 NW-Bau - HS2

RF Control for SRF Cavity Tests * — •Sebastian Thomas — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz

The ERL type accelerator MESA, which is currently under construction at the Institut für Kernphysik at the Johannes Gutenberg-Universität Mainz, will utilize two modified ELBE type SRF cryomodules with field strengths of 25 MeV each, for achieving electron energies up to 155 MeV. To realize a stable operation of energy recovery, the cryomodules and, in particular, the two 9-cell TESLA type cavities per module need to meet high fabrication standards. They have to be tested and measured prior to installation. This will be done at the HIM facility on the University campus. One key component of the test setup is the RF control, which is realized by a Phase Locked Loop. The PLL compares the phase of two RF signals in order to maintain the driving signal at the resonance frequency of the SRF cavity. This talk will give an insight into the planning and implementation of a RF control that allows high performance operation in a testing environment for SRF structures.

*Supported by DFG through RTG2128 and cluster of excellence PRISMA

AKBP 10.8 Do 18:15 NW-Bau - HS2

Measurement of the Quality Factors at the S-DALINAC Accelerator Cavities. — •Simon Roeder, Michaela Arnold, Ruben Grewe, Christoph Burandt, and Norbert Pietralla — IKP, TU Darmstadt, Germany

The superconducting thrice recirculating linear electron accelerator at TU Darmstadt (S-DALINAC) is designed to reach a maximum beam energy of 130 MeV. The 20-cell superconducting radio frequency (srf) cavities have design values for an accelerating gradient of 5 MV/m with quality factors of $3 \cdot 10^9$. Due to a lower quality factor during operation of the srf cavities, high beam energies are limited by the cooling power of the helium liquifier. All accelerating gradients and quality factors of the S-DALINAC srf cavities have been measured in-situ, providing information on how to use a given amount of cooling power in the most efficient way. This contribution will present the results of these measurements and was funded by the DFG as part of the GRK 2128.

AKBP 11: Synchrotron Radiation Sources, Hadron Accelerators and Colliders

Zeit: Donnerstag 16:30–18:15 Raum: NW-Bau - HS5

AKBP 11.1 Do 16:30 NW-Bau - HS5

Analytical Calculations for Thomson-Backscattering — •Paul Volz[1,2] and Atoosa Meseck[1] — [1]Helmholtz-Zentrum Berlin — [2]Humboldt-Universität zu Berlin

Scattering high intensity laser radiation on MeV electrons can yield high energy photons that would require GeV or even TeV electron beams using conventional undulators or dipoles. Thus, given the availability of a high brightness electron beam, X-ray and gamma ray sources based on Thomson and Compton backscattering seem very promising. However, the quality of the generated X-ray or gamma beams in terms of flux, bandwidth, and brilliance is often inferior to the radiation delivered by conventional sources. In order to study the merit of Thomson-backscattering-based light sources, we are developing an analytical code to simulate the characteristics of the Thomson scattered radiation. The goal is to incorporate the incident laser profile as well as the full 6D bunch profile, including microbunching. The status of the code and first results will be presented.

AKBP 11.2 Do 16:45 NW-Bau - HS5

Study of the laser-induced energy modulation amplitude at the short-pulse facility at DELTA — •Arne Meyer auf der Heide, Benedikt Büsing, Shaukat Khan, Nils Lockmann, Carsten Mai, Bernard Riemann, and Boris Sawadski — Center for Synchrotron Radiation, TU Dortmund University, Dortmund, Germany

At DELTA, a synchrotron light source operated by the TU Dortmund University, the short-pulse facility provides ultrashort pulses in the vacuum ultraviolet and terahertz regime based on the seeding scheme coherent harmonic generation (CHG). Here, a laser-electron interaction results in a modulation of the electron energy which is transformed into a density modulation by a magnetic chicane giving rise to coherent emission at harmonics of the laser wavelength.

The amplitude of the energy modulation is measured with different techniques. By introducing a second laser pulse and, thus, a second modulation, the amplitude measurements demonstrate that both laser pulses interact with the same electrons within a bunch. This is a crucial requirement for echo-enabled harmonic generation (EEHG) comprising a twofold energy modulation, which is the goal of a future upgrade of the short-pulse facility.

This project was funded by BMBF (05K16PEA, 05K16PEB), MERCUR (PR-2014-0047) and DFG (INST 212/236-1 FUGG)

AKBP 11.3 Do 17:00 NW-Bau - HS5

Studies and results for the EEHG upgrade of the DELTA short-pulse source — •Maximilian Schmutzler, Benedikt Büsing, Shaukat Khan, Daniel Krieg, Nils Lockmann, Carsten Mai, Arne Meyer auf der Heide, Bernard Riemann, Boris Sawadski, Frederik Teutenberg, and Peter Ungelenk — Center for Synchrotron Radiation (DELTA), TU Dortmund University, Dortmund, Germany

At DELTA, a 1.5-GeV synchrotron light source operated by the TU Dortmund University, a short-pulse source based on coherent harmonic generation (CHG) is used to generate sub-picosecond synchrotron radiation pulses in the VUV regime. An upgrade to echo-enabled harmonic generation (EEHG) will enable radiation at shorter wavelengths. The EEHG scheme uses a twofold energy modulation induced by laser-electron interaction and two chicanes to create micro-bunches at the center of an electron bunch. The current status including optics studies, chicane designs and measurements to verify a twofold energy modulation of the same electrons will be presented.

This project is supported by the accelerator initiative (ARD) of the Helmholtz society and by the BMBF under contract 05K16PEB and 05K16PEA.

AKBP 11.4 Do 17:15 NW-Bau - HS5

Recent laser cooling experiments at the ESR — •Sebastian Klammes[1,2], Danyal Winters[1], Thomas Walther[2], Daniel Kiefer[2], Lewin Eidam[2], Oliver Boine-Frankenheim[1,2], Axel Buss[3], Christian Egelkamp[3], Volker Hannen[3], Zhongkui Huang[4], Thomas Kühl[1,5], Markus Löser[6,7], Xinwen Ma[4], Fritz Nolden[1], Wilfried Nörtershäuser[2], Rodolfo Sanchez Alarcon[1], Ulrich Schramm[6,7], Mathias Siebold[6], Peter Spiller[1], Markus Steck[1], Thomas Stöhlker[1,5,8], Johannes Ullmann[2,8], Hanbing Wang[4], Weiqiang Wen[4], Christian Weinheimer[3], Daniel Winzen[3], and Michael Bussmann[6] — [1]GSI Darmstadt — [2]TU-Darmstadt — [3]Uni Münster — [4]IMP Lanzhou — [5]HI-Jena — [6]HZDR Dresden — [7]TU-Dresden — [8]Uni-Jena

In terms of observing relativistic effects and verifying the predictions of quantum electrodynamics, stored particles of high energy with a small momentum spread and small emittance are of great interest in current atomic physics and accelerator research. Due to its effectivity at high energies, laser cooling has proven to be a potentially powerful tool in recent years. Laser cooling is a longitudinal beam cooling method and is based on the resonant absorption and the subsequent spontaneous emission (fluorescence) of photons by ions [1]. We will show results of recent laser cooling experiments performed at the ESR at GSI Darmstadt, Germany [2]. [1] M. Bussmann, ICFA Beam Dyn. Newslett. **65** (2014). [2] D. Winters et al., Phys. Scr. **T166** 014048 (2015).

AKBP 11.5 Do 17:30 NW-Bau - HS5

Status of a Design Study for a Proton EDM Ring — •Martin Gaisser for the JEDI-Collaboration — III. Physikalisches Institut B, RWTH Aachen University

Electric Dipole Moments (EDMs) of charged particles are an important place to search for physics beyond the Standard Model. In order to measure EDMs directly, strong electric fields (in the particle's rest frame) are required. To capture charged particles, a storage ring is necessary. The observable of an EDM is a particular rotation of the spin due to the torque excerted by the electric field. Because the spin precession due to the EDM is expected to be many orders of magnitude smaller than that due to the magnetic dipole moment (MDM), false spin rotations due to the MDM that could create a fake EDM signal have to be suppressed or understood very accurately. Here we report about the current status and challenges of a design study for a dedicated, all-electric storage ring to measure the proton EDM. In such a ring, two counterrotating, longitudinally (spin-) polarized proton beams with kinetic energy of 232 MeV would be stored for about 1000 seconds. There are several challenges for the design of such a ring. First of all, there are many conflicting requirements and second, detailed spin dynamics calculations have to be incorporated into the de- sign process from the start. Furthermore, tight tolerances on field quality, element placement and magnetic shielding etc. exist.

AKBP 11.6 Do 17:45 NW-Bau - HS5

Moving Long-Range Beam-Beam Encounters in Heavy-Ion Colliders — •Marc Jebramcik[1,2] and John Jowett[1] — [1]CERN, Geneva, Switzerland — [2]Goethe University Frankfurt, Frankfurt, Germany

Heavy-ion colliders like the LHC or RHIC are occasionally operated with asymmetric beams, i.e., the two beams contain different ion species. The most prominent example for the LHC is the collision of fully stripped lead ions with protons (Pb-p). One way to accelerate the two beams simultaneously is ramping the energy with both beams having the same magnetic rigidity. This acceleration scheme, however, leads to slightly unequal revolution frequencies and therefore to moving long-range beam-beam encounters in the interaction regions of the collider. The resulting time-modulated momentum kicks might cause the excitation of overlap knock-out resonances, emittance blow-up and fast beam losses. A model to describe the observed phenomena has been developed and is applied to the LHC and RHIC.

AKBP 11.7 Do 18:00 NW-Bau - HS5

Laser cooling at the FAIR SIS100 — •Danyal Winters[1], Gerhard Birkl[2], Michael Bussmann[3], Volker Hannen[4], Daniel Kiefer[2], Sebastian Klammes[1,2], Thomas Kühl[1], Ulrich Schramm[3,5], Mathias Siebold[5], Thomas Stöhlker[1,6,7], Johannes Ullmann[1,4], Thomas Walther[2], Daniel Winzen[4], and Peter Spiller[1] — [1]GSI Darmstadt — [2]TU-Darmstadt — [3]HZDR Dresden — [4]Uni Münster — [5]TU-Dresden — [6]HI-Jena — [7]Uni-Jena

The heavy-ion synchrotron SIS100 is the core machine of the Facility for Antiproton and Ion Research - FAIR in Darmstadt, Germany. It is capable of accelerating a large range of ions, produced by the injector (GSI), up to highly relativistic velocities and extract them for unique experiments (*e.g.* APPA/SPARC). In order to cool such beams of heavy, highly charged ions, laser cooling was considered to be the best option. Therefore, plans to set up a laser cooling pilot facility at the SIS100, as the only in-ring experiment, are currently being executed. We will present this project and give an update of its current status. Finally, we will show which kinds of ions could be used for first experiments.

AKBP 12: General Assembly of the Working Group on Accelerator Physics

Zeit: Donnerstag 19:30–21:00 Raum: NW-Bau - HS2

Bericht des Vorsitzenden, Wahl einer / eines neuen Vorsitzenden und Stellvertreter(in), Bericht aus den DPG-Vorstandsratssitzungen, Beschleunigerpreise, Künftiger Auftritt auf den Frühjahrstagungen, Verschiedenes