EPAC 06

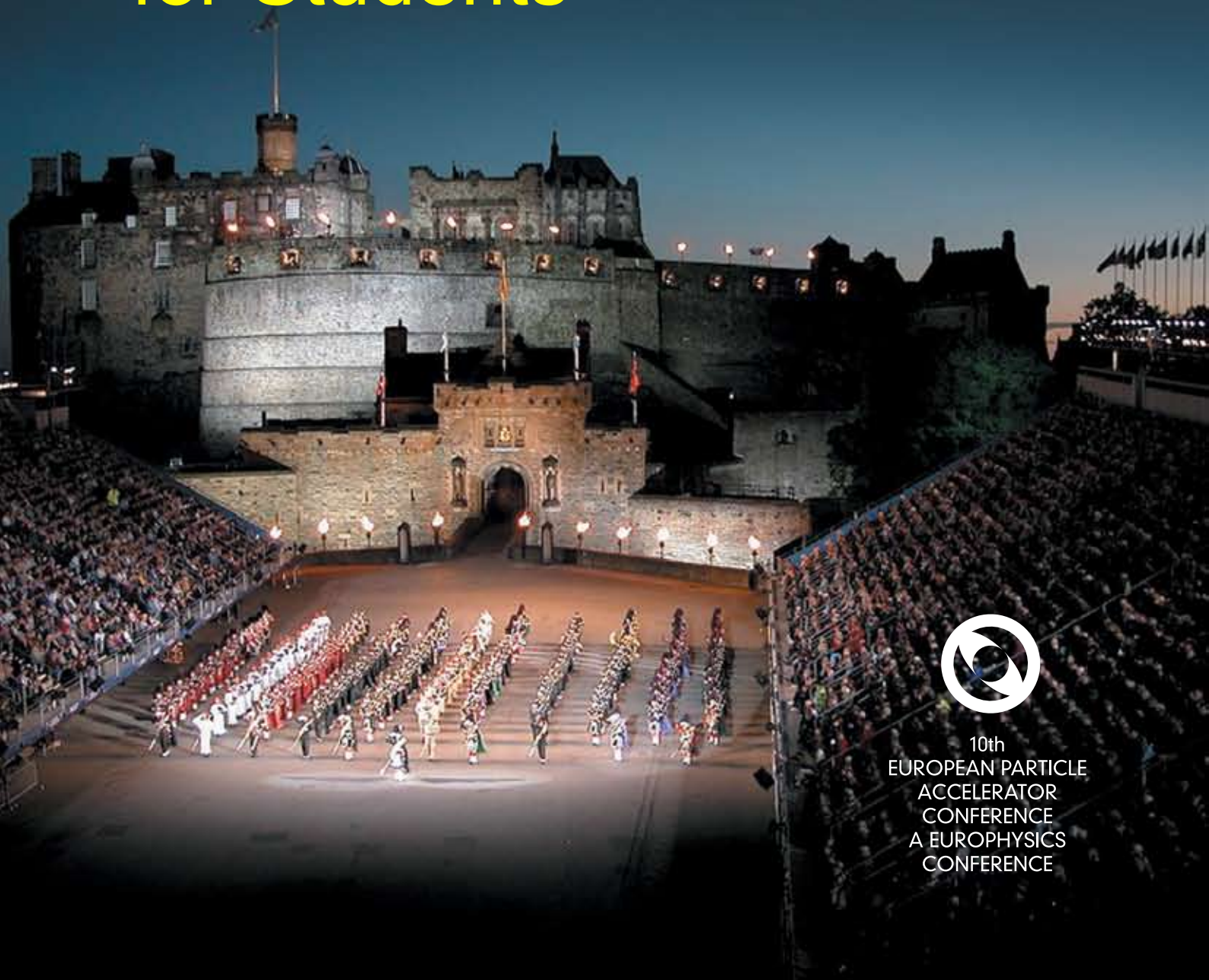
Edinburgh, Scotland

International Conference Centre (EICC)

26-30 June 2006

Abstracts Brochure

Special Poster Session for Students



10th
EUROPEAN PARTICLE
ACCELERATOR
CONFERENCE
A EUROPHYSICS
CONFERENCE

EPAC'06

Special Poster Session for Young Scientists and Prize c) Candidates

Sunday, 25 June 2006
Edinburgh International Conference Centre
Lomond Suite from 17:00 to 19:00

PART 1

Prize c) Candidates

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PART 2

Recipients of Student Grants

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PART 1 PRIZE c) CANDIDATES

Classification 7 Accelerator Technology

Poster Panel 50

ID: 2291 - THPCH175 Automatic Resonant Excitation Based System for Lorentz Force Compensation for VUV-FEL

Presenter Przemyslaw Marcin Sekalski (TUL-DMCS, Lodz)

Authors Przemyslaw Marcin Sekalski, Andrzej Napieralski (TUL-DMCS, Lodz), Stefan Simrock (DESY, Hamburg)

Abstract The cavity is the key element of each linear accelerator used for high-energy physics purpose. The resonant frequency of cavities depends on its shape. Due to the pulse operation, they are deformed by dynamic Lorentz force (LF) caused by accelerating electromechanical field. As a consequence, the cavities are not working on resonance but they are detuned from master oscillator frequency by few hundreds of Hertz depending on accelerating field gradient. The paper presents an automatic control system for LF compensation applied to fast tuning mechanism CTS. The active element is multilayer low-voltage piezoelectric stack (EPCOS). The resonant excitation with adaptive feed forward algorithm is used to drive the actuator. Test performed at VUV-FEL on cav5/ACC1 showed that detuning during flat-top period (800us) might remain below 10Hz for accelerating field gradient of 20MV/m.

Funding We acknowledge the support of the European Community-Research Infrastructure Activity under the FP6 "Structuring the European Research Area" program (CARE, contract number RII3-CT-2003-506395).

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T26 Subsystems, Technology and Components, Other

Poster Panel 51

ID: 2296 – WEPLS141 Operational Experience with the LHC Waveguide Mode Relfectometer

Presenter Tom Kroyer (CERN, Geneva)

Authors Tom Kroyer, Pawel BOROWIEC, Fritz Caspers, Zenon Sulek, Lloyd Williams (CERN, Geneva)

Abstract The LHC microwave mode reflectometer (assembly version) reached operational status by the end of 2005. It is now routinely used in the LHC tunnel to take data on the beam-screen of the individual LHC magnets and also groups of magnets with lengths up to 200 meter. The reflectometer operates in the frequency range from about 4GHz to 8 GHz and employs mode selective launchers. Data traces of typically 16000 data points are taken in the frequency domain with subsequent Fourier transformation into the time domain and numerical waveguide mode dispersion compensation. This paper discusses the operational aspects of the system as well as methods for clutter (fake reflection) elimination and procedures for cross-checks in case of a suspected obstacle or other fault.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T21 Reliability, Operability

Poster Panel 52

ID: 2824 - THPCH126 280 keV He-ion Pulsed Beam Accelerator for Surface Analysis of Materials by Using Time-of-flight Ion Backscattering Spectrometry Technique

Presenter Pimporn Junphong (FNRF, Chiang Mai)
Authors Pimporn Junphong (FNRF, Chiang Mai)

Abstract At Fast Neutron Research Facility in Thailand, an accelerator, originally used for neutron scattering experiments with the time-of-flight technique, has recently been applied to a research field of ion beam analysis such as TOF-RBS. In such experiments a beam of pulsed-D+ ion of 2 ns wide and 140 keV in energy were used. To achieve better mass resolution for TOF-RBS experiments, an upgrade of the accelerator to higher energy and heavier particles is necessary. To make use of the existing pulsing system, a He+-ion beam of 280 keV has been considered. The upgrade is now underway. Result of the system measurements and Calculation will be presented.

Funding Fast Nuetron Research Facility, Chiang Mai University

Presentation Poster
Main Classif. 07 Accelerator Technology
Sub Classif. T04 Accelerator/Storage Ring Control Systems

Poster Panel 53

ID: 2981 - THPCH155 High-quality Proton Beam Obtained by Combination of Phase Rotation and the Irradiation of the Intense Short-pulse Laser

Presenter Shu Nakamura (Kyoto ICR, Uji, Kyoto)
Authors Shu Nakamura, Yoshihisa Iwashita, Akira Noda, Toshiyuki Shirai, Hikaru Souda, Hiromu Tongu (Kyoto ICR, Uji, Kyoto), Takeshi Takeuchi (AEC, Chiba), Atsushi Ogata, Yoshio Wada (HU/AdSM, Higashi-Hiroshima), Sergey Bulanov, Timur Esirkepov, Yukio Hayashi, Masataka Kado, Toyoaki Kimura, Michiaki Mori, Akira Nagashima, Mamiko Nishiuchi, Koichi Ogura, Satoshi Orimo, Alexander Pirozhkov, Akito Sagisaka, Akifumi Yogo (JAEA, Ibaraki-ken), Toshi Tajima (JAEA/FEL, Ibaraki-ken), Zhong Li (NIRS, Chiba-shi), Hiroyuki Daido (New Affiliation Request Pending,), Fukumi Atsushi (Okayama University, Okayama City)

Abstract Ion production from laser-induced plasma has been paid attention because of its high acceleration gradient (>100GeV/m) compared with conventional RF accelerator. Its energy spectrum is Maxwell-Boltzmann distribution with high-energy cut-off, which limited its application. The phase rotation scheme, which rotates laser produced ions by an RF electric field synchronous to the pulse laser in the longitudinal phase space, was applied to proton beam up to 0.9MeV emitted from Ti foil with 3mm thickness irradiated by focused laser-pulse with peak intensity of 9 ´ 1017W/cm2. Multi-peaks with ~6% width (FWHM) were created and intensity multiplication up to 5 was attained around 0.6MeV region. The proton production process by the intense short-pulse laser has been optimized with use of time of flight measurement of proton beam detected by a plastic scintillation counter, which is specially shielded from the heavy background of electrons and X-rays induced by the intense laser. We have succeeded in on-line measurement of such a proton signal by the detector for the first time, which played an essential role for the investigation of phase rotation scheme.

Funding The present work is financially supported by Advanced Compact Accelerator Development from MEXT of Japanese Government and the 21 COE of Kyoto University. Center for Diversity and University in Physics.

Presentation Poster
Main Classif. 07 Accelerator Technology
Sub Classif. T22 Lasers

Poster Panel 54

ID: 3000 - TUPCH173 Understanding of Ion Induced Desorption Using the ERDA Technique

Presenter Markus Bender (GSI, Darmstadt)

Authors Markus Bender, Holger Kollmus (GSI, Darmstadt), Walter Assmann (LMU, München)

Abstract In heavy ion synchrotrons like SIS18 at GSI high energetic ions can impact on the beam pipe and release gas molecules. This so called "ion induced desorption" deteriorates the accelerator vacuum and as a consequence the beam life time and luminosity. To minimize the pressure increase it is necessary to understand the physics of ion induced desorption. The elastic recoil ion detection analysis (ERDA) can give a time resolved element specific depth profile of a probe under ion bombardment. A UHV-ERDA setup has been installed at GSI to investigate correlations between desorption and material properties as well as its dose dependant evolution. Recent experiments have shown the influence of the surface state of a sample such as the oxide layer on steel as well as the importance of a high-purity bulk such as in silicon and OFHC copper. We will present the results of gold coated copper in comparison to stainless steel as applicable materials for accelerators.

Funding We acknowledge the support of the European Community-Research Infrastructure Action under the FP6 "Structuring the European Research Area" program (DIRAC secondary-Beams, contract number 515873).

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T14 Vacuum Technology

Poster Panel 55

ID: 3105 - MOPCH147 Developments in Conditioning Procedures for the TTF-III Power Couplers

Presenter Hassen Jenhani (LAL, Orsay)

Authors Hassen Jenhani (LAL, Orsay)

Abstract The Laboratoire de l'Accélérateur Linéaire (LAL) has the task of preparation and conditioning of thirty TTF-III couplers for the VUV FEL superconducting linear accelerator project at DESY. These couplers will be mounted on the cryo-modules of the VUV-FEL linac and their operation will provide valuable experience for the European XFEL project. The latter project will use 1,000 couplers of the TTF-III type. Such couplers are also the baseline for the International Linear Collider (ILC) which would require between 10,000 and 20,000 units. For projects which require couplers in such large numbers, conditioning time becomes a important consideration in terms of time and cost. As the couplers themselves are complex RF elements, for which multiple mechanical fabrication techniques are used, one may find variations between the finished objects. This may lead to varying conditioning times from one coupler to another. We will present the results of our conditioning experience with the TTF-III couplers and discuss variations in the conditioning procedure aimed at reducing the processing time needed while operating in a safe and reliable fashion in order to protect the coupler.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T07 Superconducting RF

Classification 4 Hadron Accelerators

Poster Panel 58

ID: 2485 - TUPLS128 A New Analytical Method to Evaluate Transient Thermal Stresses in Cylindrical Rods Hit by Proton Beams

Presenter Alessandro Dallocchio (CERN, Geneva)

Authors Alessandro Dallocchio, Alessandro Bertarelli, Tadeusz Kurtyka (CERN, Geneva)

Abstract This paper presents an analytical solution for the thermo-mechanical problem of CNGS target

rods rapidly heated by fast extracted high energy proton beams. The method allows the computation of the dynamic transient elastic stresses induced by a proton beam hitting off-axis the target. The studies of such dynamic thermo-mechanical problems are usually made via numerical methods. However, an analytical approach is also needed to quickly provide reference solutions for the numerical results. An exact solution for the temperature field is first obtained, using Fourier-Bessel series expansion. Quasi-static thermal stresses are then computed as a function of the calculated temperature distribution, making use of the thermoelastic displacement potential for the equivalent isothermal two-dimensional stress problem. Finally, the contribution of dynamic stresses due to longitudinal and bending stress waves is determined by means of the modal summation method. This method can be effectively applied to any solid having cylindrical shape, made out of isotropic elastic material.

Presentation Poster
Main Classif. 04 Hadron Accelerators
Sub Classif. T19 Collimation and Targetry

Poster Panel 59
ID: 1562 - TUPLS099 The New 14 GHz Ion Source for the U-400 Heavy Ion Cyclotron

Presenter Marek Leporis (JINR, Dubna, Moscow Region)
Authors Marek Leporis, Vladimir Bekhterev, Sergei Bogomolov, Andrey Efremov, Georgy Gulbekyan, Yurij Kostyukhov, Aleksander Lebedev, Vladimir Loginov, Nikolaj Yazvitsky (JINR, Dubna, Moscow Region)

Abstract The new 14 GHz ion source DECRIS-4, to be used as a second injector of heavy multiply charged ions for the U-400 cyclotron and, in the future, also as a "charge breeder" (the "1+ -> n+" method) for the second phase of the DRIBs project, has been designed and constructed at the FLNR. The main feature of the ion source design is the creation of the extended resonance zone in a comparatively compact ECRIS. For this purpose the axial magnetic field is formed with a flat minimum by mounting only one additional solenoid coil to the classical CAPRICE magnetic structure. In this case the superposition of the axial magnetic field and the radial field of the permanent magnet hexapole, made from NdFeB, allows one to create a larger resonance volume. First results of the ion source tests show that in this resonance volume electrons are heated very efficiently which allows to produce intense beams of medium charge state ions with comparatively low level of input microwave power. The basic design features, construction issues and the first results of ion source tests are presented.

Presentation Poster
Main Classif. 04 Hadron Accelerators
Sub Classif. T01 Proton and Ion Sources

Poster Panel 60
ID: 2933 - MOPCH078 Simulation of Dynamic Vacuum Induced Beam Loss

Presenter Carsten Omet (GSI, Darmstadt)
Authors Carsten Omet, Peter J. Spiller, Jens Stadlmann (GSI, Darmstadt)

Abstract In synchrotrons, operated with intermediate charge state, heavy ion beams, intensity dependent beam losses have been observed. The origin of these losses is the change in charge state of the beam ions at collisions with residual gas atoms or molecules. The resulting A/Z deviation from the reference beam ion leads to modified trajectories in dispersive elements, which finally results in beam loss. At the impact positions, secondary particles are produced by ion stimulated desorption and increase the vacuum pressure locally. In turn, this pressure rise will enhance the charge change- and particle loss process and finally cause significant beam loss within a very short time (a few turns). A program package has been developed, which links the described beam loss mechanisms to the residual gas status and determines the

vacuum dynamics. Core of the program is an ion optics tracking routine, in which the atomic physics and vacuum effects are embedded.

Presentation Poster
Main Classif. 04 Hadron Accelerators
Sub Classif. A04 Circular Accelerators

Poster Panel 61

ID: 3145 – TUPLS064 Design and Commissioning of a Compact Electron Cooler for the S-LSR

Presenter Hicham Fadil (Kyoto ICR, Uji, Kyoto)
Authors Hicham Fadil, Shinji Fujimoto, Akira Noda, Toshiyuki Shirai, Hikaru Souda, Hiromu Tongu (Kyoto ICR, Uji, Kyoto), Tetsuya Fujimoto, Souma Iwata, Shinji Shibuya (AEC, Chiba), Igor Alekseevich Seleznev, Evgeny Syresin (JINR, Dubna, Moscow Region), Manfred Grieser (MPI-K, Heidelberg), Koji Noda (NIRS, Chiba-shi)
Abstract The ion cooler ring S-LSR has been constructed and commissioned in October 2005. The ring successfully stored a 7 MeV proton beam. The S-LSR is equipped with a compact-electron cooler which has a cooling solenoid length of 0.8 m, a toroid bending radius of 0.25 m and maximum magnetic field in the cooling section of 0.5 kG. The commissioning of the electron cooler was carried out with successful observation of both longitudinal and horizontal cooling of the proton beam. By varying the electric potential on the Pierce electrode in the gun, we have investigated the possibility of generating a hollow shaped electron beam, and studied its effect on the electron cooling process. Also the effect of the electrostatic deflector, installed in the toroid section in order to compensate the drift motion of the secondary electrons, was investigated. The design and results of the commissioning of the compact electron cooler are presented.
Presentation Poster
Main Classif. 04 Hadron Accelerators
Sub Classif. A11 e-Coolers

Classification 5 Beam Dynamics and Electromagnetic Fields

Poster Panel 63

ID: 1864 - THPCH015 Matched and Equipartitioned Dynamics Design for High-intensity RFQ Accelerators

Presenter Xueqing Yan (PKU/IHIP, Beijing)
Authors Xueqing Yan, Jia-er Chen, Jia-Xun Fang, Zhiyu Guo, Yuanrong Lu (PKU/IHIP, Beijing), Robert Jameson (LANL, Los Alamos, New Mexico)
Abstract Maintaining beam envelope match, avoiding structure resonances, and using an equilibrium (equipartitioned) energy balance within the beam are the primary methods for preventing emittance growth and halo formation in high current linacs. A design strategy that requires the RFQ accelerator to be matched and equipartitioned over most of its length will produces very robust designs under a wide variety of conditions, the beam with proper energy balance is also inherently stable against resonances near the operation point. Based on this strategy, a new dynamics method is proposed to avoid the envelope mismatch and energy imbalance between different degrees of freedom. The beam sizes are well confined to match the accelerating channel in this method, to minimize the emittance growth and the related beam loss. Following the method, a RFQ design code named MATCHDESIGN has been written at Peking University. A test design of 50mA proton RFQ operating at 350 MHz was given to prove this method and it resulted in a good dynamics design.
Presentation Poster
Main Classif. 05 Beam Dynamics and Electromagnetic Fields
Sub Classif. D03 High Intensity - Incoherent Instabilities, Space Charge, Halos, Cooling

Poster Panel 64

ID: 2306 - THPCH018 Resonance Trapping, Halo Formation and Incoherent Emittance Growth due to Electron Cloud

Presenter Elena Benedetto (CERN, Geneva; Politecnico di Torino, Torino)

Authors Elena Benedetto (CERN, Geneva; Politecnico di Torino, Torino), Giovanni Rumolo, Frank Zimmermann (CERN, Geneva), Giuliano Franchetti (GSI, Darmstadt)

Abstract The pinched electron cloud introduces a tune shift along the bunch, which together with synchrotron motion, leads to a periodic crossing of resonances. The resonances are excited by the longitudinal distribution of the electron cloud around the storage ring. We benchmark the PIC code HEADTAIL against a simplified weak-strong tracking code based on an analytical field model, obtaining an excellent agreement. The simplified code is then used for exploring the long term evolution of the beam emittance, and for studying more realistic lattice models. Results are presented for the CERN SPS and the LHC.

Presentation Poster

Main Classif. 05 Beam Dynamics and Electromagnetic Fields

Sub Classif. D03 High Intensity - Incoherent Instabilities, Space Charge, Halos, Cooling

Poster Panel 65

ID: 3522 - WEPCH134 Development of Code for Simulation of Acceleration of Ions from Internal Source to End of Extraction System in Cyclotrons and Preliminary Design Study of 8MeV Cyclotron for Production of Radioisotopes

Presenter Sergey Kostromin (JINR, Dubna, Moscow Region)

Authors Sergey Kostromin (JINR, Dubna, Moscow Region)

Abstract From the users' point of view modern cyclotrons must be compact, energy-saving, low-radiation and very reliable facilities. To provide all these characteristics, a very detailed design study of all systems of an accelerator under development is required. Thus, particle tracking from the "beginning" to the "end" in modern cyclotrons with small gaps in the main acceleration region and with efficient extraction systems becomes a very important task for designers. Codes for beam dynamics simulation at the center, main acceleration region and through the extraction system of the cyclotron have been developed. It is possible to monitor all main beam parameters at the different stages of acceleration, radial, axial and phase motion of the beam and the energy increase. During tracking particles through the extraction system it is possible to calculate rms envelopes of radial and vertical motion of the beam and beam losses at the aperture of the extraction system elements. A preliminary design of a compact 8-MeV proton cyclotron was studied using created codes. The accelerator is supposed to have a four sector compact magnet system with the pole 64 cm in diameter.

Presentation Poster

Main Classif. 05 Beam Dynamics and Electromagnetic Fields

Sub Classif. D05 Code Developments and Simulation Techniques

Classification 6 Beam Instrumentation and Feedback

Poster Panel 66

ID: 2773 - TUPCH029 High-precision Laser Master Oscillators for Optical Timing Distribution Systems

Presenter Axel Winter (DESY, Hamburg; Uni HH, Hamburg)

Authors Axel Winter, Peter Schmüser (DESY, Hamburg; Uni HH, Hamburg), Fatih Ömer Ilday (Bilkent University, Bilkent, Ankara), Frank Ludwig, Holger Schlarb (DESY, Hamburg), Jeff Chen, Franz Xaver Kaertner (MIT, Cambridge)

Abstract X-ray pulses with a pulse duration in the 10 fs regime or even less are needed for numerous experiments planned at next generation free electron lasers. A synchronization of probe laser

pulses to the x-ray pulses with a stability on the order of the pulse width is highly desirable for these experiments. This requirement can be fulfilled by distributing an ultra-stable timing signal to various subsystems of the machine and to the experimental area to provide synchronization at the fs level over distances of several kilometers. Mode-locked fiber lasers serve as laser master oscillators (LMO), generating the frequencies required in the machine. The pulse train is distributed through length-stabilized fiber links. This paper focuses on the LMO, devoting special attention to the phase noise properties of the frequencies to be generated, its reliability to operate in an accelerator environment, and the residual timing jitter and drifts of the RF feedback for the fiber links. A prototype experimental system has been constructed and tested in an accelerator environment and its performance characteristics will be evaluated.

Presentation Poster
Main Classif. 06 Beam Instrumentation and Feedback
Sub Classif. T03 Beam Diagnostics and Instrumentation

Classification 8 Applications of Accelerators, Technology Transfer and Industrial Relations

Poster Panel 67

ID: 1322 - WEPCH187 A Compact 5 MeV, S-band, Electron Linac Based X-ray Tomography System

Presenter Lucrezia Auditore (INFN & Messina University, S. Agata, Messina; INFN - Gruppo Messina)
Authors Lucrezia Auditore, Renato Calogero Barnà, Domenico De Pasquale, Umberto Emanuele, Antonio Trifirò, Marina Trimarchi (INFN & Messina University, S. Agata, Messina; INFN - Gruppo Messina, S. Agata, Messina), Dario Loria (INFN & Messina University, S. Agata, Messina), Antonio Italiano (INFN - Gruppo Messina, S. Agata, Messina)

Abstract The availability of commercial X-ray tubes made of radiography and tomography two of the most used non-destructive testing techniques both in industrial and cultural heritage fields. Nevertheless, the inspection of heavy materials or thick objects requires X-ray energies larger than the maximum energy provided by commercial X-ray tubes (600 kV). For this reason, and owing to the long experience of the INFN-Gruppo Collegato di Messina in designing and assembling low energy electron linacs, at the Dipartimento di Fisica, Universita di Messina, a 5 MeV electron linac based X-ray tomographic system has been developed. The X-ray source, properly designed by means of the MCNP-4C2 code, provides a 16 cm diameter X-ray spot at the sample position and a beam opening angle of about 3.6 degree. The image acquisition system consists of a CCD camera (Alta Apogee E1, 768x512 pixel) and a GOS scintillating screen. Preliminary radiographies and tomographies showing the high quality performances of the tomographic system have been acquired. Finally, the compactness of the linac, is one of the advantages of this system that could be used for in situ inspections when huge structures have to be tested

Presentation Poster
Main Classif. 08 Applications of Accelerators, Technology Transfer and Industrial Relations
Sub Classif. U04 Other Applications

PART 2 RECIPIENTS OF STUDENT GRANTS

Classification 7 Accelerator Technology Panels 30-39

Poster Panel 30

ID: 1993 - WEPLS074 SESAME Magnets System

Presenter Seadat Varnasseri (SESAME, Amman)

Authors Seadat Varnasseri (SESAME, Amman)

Abstract In this paper the SESAME storage ring magnet system is described. The storage ring consists of 16 bending magnets with a maximum field of 1.455 T and vertical gradient of 2.79 T/m, 32 focusing quadrupoles with a maximum gradient of 16.92 T/m, 32 defocusing quadrupoles with a maximum gradient of 10.23 T/m, 32 focusing sextupoles with a maximum differential gradient of 200 T/m2 and 32 defocusing sextupoles with the maximum differential gradient of 300 T/m2. The horizontal/vertical correctors will be embedded inside focusing/defocusing sextupoles. For the quadrupole and sextupole, a design similar to ANKA has been adopted. The magnetic and electrical design of dipoles and correctors, field profile and higher order multipoles optimization will be presented.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T09 Room-Temperature Magnets

Poster Panel 31

ID: 2026 - WEPLS104 The Dependence of the Field Decay on the Powering History of the LHC Superconducting Dipole Magnets

Presenter Nicholas Sammut (CERN, Geneva)

Authors Nicholas Sammut, Luca Bottura, Stephane Sanfilippo (CERN, Geneva), Joseph Micallef (University of Malta, Msida)

Abstract The decay amplitude of the allowed multipoles in the LHC dipoles is expected to perturb the beam stability during the injection phase and is strongly dependent on the powering history of the magnet. The effect is particularly large for the pre-cycle nominal flat-top current and duration. With possible prospects of having different genres of cycles during the LHC operation, the powering history effect must be taken into account in the Field Description Model for the LHC (FIDEL) and must hence be corrected for during machine operation. This paper presents the results of the modelling of this phenomenon. We also discuss the statistic of magnetic measurements required to guarantee that the current history effect is predicted within the specified accuracy.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T10 Superconducting Magnets

Poster Panel 32

ID: 2284 - TUPCH115 Status of the 70 mA, 70 MeV CH Proton-DTL for FAIR

Presenter Gianluigi Clemente (IAP, Frankfurt-am-Main)

Authors Gianluigi Clemente, Holger Podlech, Ulrich Ratzinger, Rudolf Tiede (IAP, Frankfurt-am-Main), Lars Groening (GSI, Darmstadt), Sergey Minaev (ITEP, Moscow)

Abstract The CH-type cavity shows promising features in the low and medium beta range: its high accelerator gradient and the high level of shunt impedance together with the compact transverse dimensions make this new cavity a good candidate for proton acceleration up to 100 MeV. That's why GSI has decided to base the new high current proton injector for the new FAIR facility on that structure: the operating frequency will be 352 MHz with an injection energy of 3 MeV. In order to improve the technical experience on this new kind of

structure, IAP has built a model consisting of 8 equidistant gaps for a total cavity-length of 60 cm. Several design options with respect to welding, alignement, cooling and RF joints were studied and compared each other. A new concept for the end-cells geometry will result in the desired flatness of the electric field along the cavity axis and, at the same time, allow effective integration of internal quadruple lenses. Finally, the electric quadruple content of CH-structure gaps is listed in dependence on the geometry of the cell.

Funding EU Contract No. RII3-CT-2003-506395
Presentation Poster
Main Classif. 07 Accelerator Technology
Sub Classif. T06 Room Temperature RF

Poster Panel 33

ID: 2341 - WEPLS142 The Importance of Layout and Configuration Data for Flexibility during Commissioning and Operation of the LHC Machine Protection Systems

Presenter Julien Mariethoz (CERN, Geneva)
Authors Julien Mariethoz, Frederic Bernard, Robert Harrison, Pascal Le Roux, Maciej Peryt, Markus Zerlauth (CERN, Geneva)

Abstract Due to the large stored energies in both magnets and particle beams, the LHC requires a large inventory of machine protection systems, as e.g. powering interlock systems, based on a series of distributed industrial controllers for the protection of the more than 10,000 normal and superconducting magnets. Such systems are required to be at the same time fast, reliable and secure but also flexible and configurable to allow for automated commissioning, remote monitoring and optimization during later operation. Based on the generic hardware architecture of the LHC machine protection systems presented at EPAC 2002 and ICALEPS 2003, the use of configuration data for protection systems in view of the required reliability and safety is discussed. To achieve the very high level of reliability, it is required to use a coherent description of the layout of the accelerator components and of the associated machine protection architecture and their logical interconnections. Mechanisms to guarantee coherency of data and repositories and secure configuration of safety critical systems are presented. This paper focuses on the first system being commissioned, the complex magnet powering system.

Presentation Poster
Main Classif. 07 Accelerator Technology
Sub Classif. T21 Reliability, Operability

Poster Panel 34

ID: 2375 - THPCH194 Investigation of Using Ferroelectric Materials in High Power Fast RF Phase Shifters for RF Vector Modulation

Presenter Joshua Lee Wilson (ORNL, Oak Ridge, Tennessee)
Authors Joshua Lee Wilson, Yoon W. Kang (ORNL, Oak Ridge, Tennessee), Aly Fathy (University of Tennessee, Knoxville, Tennessee)

Abstract A fast ferroelectric phase shifter controlled by an electric field bias is being investigated for high-power RF phase shifters in vector modulation. Such a device could be used in charged particle accelerators, allowing vector control of the RF power delivered to accelerating RF cavities. Bulk ferroelectric materials, particularly those based on barium-strontium titanate (BST) compounds, have shown promise in high-power applications because of their low loss tangent and high dielectric strength. Such materials have already been investigated for use in fast phase shifters at X-Band frequencies*. Several different compositions of BST compounds are investigated in phase shifter prototypes at 402.5 MHz and 805 MHz that could be easily adapted for future large-scale accelerator projects. The ratio of barium versus strontium in the composition is varied from sample to sample. This allows an investigation of the tradeoffs involved between dielectric strength, loss tangent, tunability, and relative permittivity. Since

ferroelectrics are by nature nonlinear dielectric compounds, preliminary study on the nonlinear propagation effects is conducted through computer simulation.

Footnotes *V. P. Yakovlev et al. Fast X-Band Phase Shifter, Advanced Accelerator Concepts: Eleventh Workshop, 2004.

Funding SNS is managed by UT-Battelle, LLC, under contract DE-AC05-00OR22725 for the U.S. Department of Energy.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T26 Subsystems, Technology and Components, Other

Poster Panel 35

ID: 2447 - WEPLS068 The IASA Magnetic Field Mapping (MFM) Project

Presenter Efthymios (Makis) P. Pournaras (IASA, Athens)

Authors Efthymios (Makis) P. Pournaras, Andreas Karabarbounis, Constantinos Papanicolas, Efstathios Stiliaris (IASA, Athens)

Abstract The design and development of an automatic magnetic field mapping device as supporting equipment for the 10 MeV CW-Linac and its transport system at the Institute of Accelerating Systems and Applications (IASA) is presented. The MFM project aims to totally automate the operation of mapping room temperature magnetic field sources, reconstruct the 3D-field shape and reveal nonlinearities in the fridge field regions. The positioning system covers an area of 50x50 cm2 with an accuracy of less than 20 ?m in both axes; magnetic field measurements, mainly based on a Hall probe, can reach in precision the 1x10-4 value. Several software tools for the visualization of the measured fields and for a direct comparison with theoretical estimates are also presented.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T09 Room-Temperature Magnets

Poster Panel 36

ID: 2449 - TUPCH099 Development of HOM Damped Copper Cavity for the ESRF

Presenter Nicolas Guillotin (ESRF, Grenoble)

Authors Nicolas Guillotin, Jörn Jacob, Vincent Serriere (ESRF, Grenoble)

Abstract At the ESRF, HOM driven longitudinal coupled bunch instabilities are currently avoided up to the nominal beam current of 200 mA by precisely controlling the cavity temperatures and thereby the HOM frequencies of the existing five-cell copper cavities. A bunch-by-bunch feedback is presently being commissioned in order to increase the maximum stored current. In parallel, normal conducting strongly HOM damped cavities are under study to possibly replace the five-cell cavities. The design is based on a scaling of the single cell EU cavity*: a pillbox geometry with nose cones and three attached ridged waveguides loaded by ferrites for effective HOM damping. We report on the electromagnetic simulation making use of the 3D codes HFSS and GdfidL. They allowed optimizing the shape of both cavity and dampers, including electromagnetic absorbing material with frequency dependent parameters.

Footnotes *E. Weihreter et al. A Ridged Circular Waveguide Ferrite Load for Cavity HOM Damping, this conference.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T09 Room-Temperature Magnets

Poster Panel 37

ID: 2617 - THPCH139 Development of an Ion Source via Laser Ablation Plasma

Presenter Antonella Lorusso (INFN-Lecce, Lecce)

Authors Fabio Belloni, Domenico Doria, Antonella Lorusso, Vincenzo Nassisi (INFN-Lecce, Lecce), Lorenzo Torrisi (INFN/LNS, Catania)

Abstract Experimental results on the development of a laser ion source (LIS) are reported. LISs are particularly useful in ion accelerators, ion implanters and devices for electromagnetic isotope separation. A focused UV laser beam (0.1 - 1 GW/cm^2 power density) was used to produce a plasma plume from a Cu target. Several aspects were investigated: ion angular distribution, energy distribution, ion extraction and charge loss due to ion recombination. Particular attention was devoted to avoid arcs during the extraction phase; it was accomplished by allowing the proper plasma expansion in a suitable chamber before the extraction gap. Diagnostics on free expanding plasma and extracted ions was carried out mainly by time-of-flight measurements, performed by means of Faraday cups and electrostatic spectrometers. At 18kV acceleration voltage, the ion beam current, measured along a drift tube at 147cm from the target, resulted modulated on ion mass-to-charge ratio and its maximum value was 220uA. The Cu+1 ion bunch charge was estimated to be 4.2nC. Ion implantation tests were successfully performed at high acceleration voltage (several tens kV), by using a simple experimental arrangement.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T16 Pulsed Power Technology

Poster Panel 38

ID: 3273 - MOPCH171 ILC Coaxial Blade Tuner

Presenter Rocco Paparella (INFN/LASA, Segrate (MI))

Authors Carlo Pagani, Angelo Bosotti, Paolo Michelato, Nicola Panzeri, Rocco Paparella, Paolo Pierini (INFN/LASA, Segrate (MI))

Abstract A coaxial (blade) tuner solution has been developed for the compensation of the Lorentz force detuning of the superconducting cavities under the high gradient pulsed operation foreseen for ILC operation. The device is based on prototypes successfully tested at DESY in 2002 both on CHECHIA and on the superstructures inserted in the TTF string. During both tests the blade tuner performed as expected in terms of stiffness, frequency sensitivity and tuning capabilities. An improvement of the tuner characteristics has been designed by the integration of fast tuning capabilities by means of piezo-ceramic element. Two prototipes of the new INFN coaxial piezo blade tuner have just been manufactured and they will be tested at DESY and BESSY after the cavity integration. In this paper the blade tuner design and main characteristics are presented, together with the early interpretation of the cold test results.

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T07 Superconducting RF

Poster Panel 39

ID: 3341 - TUPCH156 Design and Simulation of a Cusp Gun for Gyro-amplifier Application in High Frequency RF Accelerators

Presenter David Hywel Rowlands (USTRAT/SUPA, Glasgow)

Authors David Hywel Rowlands, Adrian William Cross, Wenlong He, Alan Phelps, Euan Rafferty, Craig Robertson, Kevin Ronald, Jamie Thomson, Colin Whyte, Alan Robert Young (USTRAT/SUPA, Glasgow)

Abstract Gyro-amplifiers have potential as the high frequency RF drivers for particle accelerators. They require relativistic electron beams with low velocity spread and with a high fraction of the electron energy associated with the cyclotron motion. For harmonic operation and mode

control an axis-encircling beam is desirable. The passage of an electron beam through a non-adiabatic magnetic field reversal (cusp) converts part of the electron beam's axial velocity into axis-encircling transverse velocity. A cusp-based electron beam forming system, yielding a 10MW, 150kV, 70A axis-encircling beam will be presented. This cusp gun is being designed as the electron beam source for a microwave gyro-amplifier that is relevant for high frequency accelerator applications. The latest results from numerical simulations and experiments will be presented and compared.

Funding EPSRC, PPARC, Faraday Partnership in High Power RF

Presentation Poster

Main Classif. 07 Accelerator Technology

Sub Classif. T08 RF Power Sources

Classification 1 Circular Colliders Panels 68-69

Poster Panel 68

ID: 2469 - MOPLS010 Measurement of Ion Beam Losses Due to Bound-free Pair Production in RHIC

Presenter Roderik Bruce (CERN, Geneva; MAX-lab, Lund)

Authors John M. Jowett, Simone Silvano Gilardoni (CERN, Geneva), Angelika Drees, Wolfram Fischer, Steven Tepikian (BNL, Upton, Long Island, New York), Roderik Bruce (CERN, Geneva; MAX-lab, Lund), Spencer Robert Klein (LBNL, Berkeley, California)

Abstract When the LHC operates as a Pb82+ ion collider, losses of Pb81+ ions, created through Bound-free Pair Production (BFPP) at the collision point, and localized in cold magnets, are expected to be a major luminosity limit. With Au79+ ions at RHIC, this effect is not a limitation because the Au78+ production rate is low, and the Au78+ beam produced is inside the momentum aperture. When RHIC collided Cu29+ ions, secondary beam production rates were lower still but the Cu28+ ions produced were predicted to be lost at a well-defined location, creating the opportunity for the first direct observation of BFPP effects in an ion collider. We report on measurements of localized beam losses due to BFPP with copper beams in RHIC and comparisons to predictions from tracking and Monte Carlo simulation.

Presentation Poster

Main Classif. 01 Circular Colliders

Sub Classif. A01 Hadron Colliders

Poster Panel 69

ID: 3067 - TUPLS018 LHC Collimation Efficiency during Commissioning

Presenter Chiara Bracco (CERN, Geneva)

Authors Chiara Bracco, Ralph Assmann, Alfredo Ferrari, Stefano Redaelli, Guillaume Robert-Demolaize, Mario Santana-Leitner, Vasilis Vlachoudis, Thomas Weiler (CERN, Geneva)

Abstract The design of the LHC collimation system naturally focused on understanding and maximizing the ultimate performance with all collimators in place. However, for the commissioning of the LHC it is important to analyze the collimation efficiency with certain subsets of collimators, with increased collimation gaps and relaxed set-up tolerances. Special studies on halo tracking and energy deposition have been performed in order to address this question. The expected cleaning performance and intensity limits are discussed for various collimation scenarios as they might be used during commissioning and initial operation of the LHC.

Presentation Poster

Main Classif. 01 Circular Colliders

Sub Classif. T19 Collimation and Targetry

Classification 3 Linear Colliders, Lepton Accelerators and New Acceleration Techniques Panels 70-72

Poster Panel 70

ID: 2163 - MOPLS126 Beam and Thermal & Frequency Dynamics Calculation for the RELUS-5 Biperiodic Accelerating System

Presenter Dmitry Alexandrovich Zavadtsev (MEPhI, Moscow)

Authors Dmitry Alexandrovich Zavadtsev, Alexey Igorevich Fadin, Andrey Krasnov, Nicolay Sobenin (MEPhI, Moscow), Alexander Alekseevich Zavadtsev (Introscan, Moscow)

Abstract Beam dynamics calculations in the electron gun and in the 0.5 m long S-band accelerating system show the following result: electron energy may be controlled in the range from 3 to 5 MeV at peak beam current from 0.28 to 0.17 A respectively. The average beam power is 1 kW in any regime. Dynamics calculations of thermal deformation and frequency shift after RF power-on were carried out for the designed accelerating system. The thermal frequency stopway is 340 kHz at 1.3 kW power lost in the accelerating system. The thermal time constant of the accelerating system is not higher than 20 sec.

Presentation Poster

Main Classif. 03 Linear Colliders, Lepton Accelerators and New Acceleration Techniques

Sub Classif. A08 Linear Accelerators

Poster Panel 71

ID: 2451 - WEPLS054 Higher-order Effect Compensation in Magnetic Compressor for < 50 fs Electron Bunch Generation

Presenter Koichi Kan (ISIR, Osaka)

Authors Koichi Kan, Takafumi Kondoh, Jinfeng Yang, Yoichi Yoshida (ISIR, Osaka)

Abstract An ultrashort electron bunch is essential for pulse radiolysis, which is a pump-probe measurement based on an ultrashort electron beam and an ultrashort light. In Osaka University, a laser photocathode electron linear accelerator with a magnetic compressor has been constructed for the femtosecond electron bunch generation. An electron beam with bunch length of 98 fs was successfully generated and used in pulse radiolysis. However, an electron beam with bunch length of < 50 fs is required for development of pulse radiolysis with time resolution of 100 fs. To generate such a short bunch, higher order disadvantage effects, which are caused by the fringing fields of the magnets in the compressor, should be compensated. In this paper, a compensation technique of higher-order effects was proposed by using a nonlinear energy modulation in the bunch produced in the linear accelerator by re-phasing the linac away from the zero-crossing of the rf (i.e., away from the linear slope). In the simulation, we compressed the electron bunch into 48 fs at bunch charge of 0.1 nC.

Presentation Poster

Main Classif. 03 Linear Colliders, Lepton Accelerators and New Acceleration Techniques

Sub Classif. T02 Lepton Sources

Poster Panel 72

ID: 2774 - WEPLS003 Simulation of MICE Using G4MICE

Presenter Chris Rogers (Imperial College of Science and Technology, London)

Authors Chris Rogers (Imperial College of Science and Technology, London), Rikard Sandstrom (DPNC, Genève)

Abstract In the Muon Ionisation Cooling Experiment (MICE), muons will be fired one by one through one or two cooling cells. The experiment will be used to optimise simulation of an ionisation cooling channel for a future Neutrino Factory. This is achieved by measuring the position of each muon in six-dimensional phase space and examining the behaviour of muons collected into bunches offline. The experiment will be run with a number of different input beams,

magnet configurations, RF configurations and absorber types. We present the simulated detector and cooling performance of the MICE cooling channel using the G4MICE simulation code for a range of configurations. We detail the simulation of engineering, field and detector models and examine the implications for the cooling efficacy and measurement.

Presentation Poster
Main Classif. 03 Linear Colliders, Lepton Accelerators and New Acceleration Techniques
Sub Classif. A09 Muon Accelerators and Neutrino Factories

Classification 8 Applications of Accelerators, Technology Transfer and Industrial Relations Panels 73-74

Poster Panel 73

ID: 2654 - WEPCH175 Design of 12 MEV RTM for Multiple Applications

Presenter Anton Vladimirovich Poseryaev (MSU, Moscow)

Authors Anton Vladimirovich Poseryaev, Vasiliy Ivanovich Shvedunov (MSU, Moscow), Miquel Ferrer Ballester, Yuri Alexandrovich Kubyshin (UPC, Barcelona)

Abstract Design of a compact 12 MeV race-track microtron (RTM) is described. The results of operating wavelength choice, accelerating structure and end magnets optimization and beam dynamics simulation are represented. Use of a C-band linac and rare earth permanent magnet end magnets permit to design RTM, which is more compact and more effective as compared with the same energy circular microtron or linac. Electron beam with energy 4-12 MeV in 2 MeV step can be extracted from RTM. The estimated pulsed RF power required for feeding the linac is about 800 kW, total mass of accelerator is less than 40 kg and its dimensions are about 500x200x110 mm3.

Presentation Poster

Main Classif. 08 Applications of Accelerators, Technology Transfer and Industrial Relations

Sub Classif. U01 Medical Applications

Poster Panel 74

ID: 3269 - WEPCH157 Design and Beam Dynamics Simulation for the Ion-injector of the Austrian Hadron Therapy Accelerator

Presenter Thomas Strodl (ATI, Wien)

Authors Thomas Strodl (ATI, Wien)

Abstract MedAustron is an initiative for the construction of the Austrian Hadron Therapy Centre. In 2004 the design study was presented. The basic design consists of two ion sources, an ion-injector, a synchrotron and a beam transfer line with five possible beam exits. The synchrotron is based on the proton ion medical machine study (PIMMS) design with some modifications. The injector is based on the GSI design of the Heidelberg ion therapy cancer accelerator with the original radio frequency quadrupole and IH-Linac. Modifications have been done in the design of the low energy beam transport and the medium energy beam transport lines. The impact of these modifications has been investigated, and several other beam scenarios have bean simulated with different simulation codes.

Presentation Poster

Main Classif. 08 Applications of Accelerators, Technology Transfer and Industrial Relations

Sub Classif. U01 Medical Applications

Classification 2 Synchrotron Light Sources and FELs Panels 75-90

Poster Panel 75

ID: 1548 - MOPCH004 Coherent Harmonic Generation Experiment on UVSOR-II Storage Ring

Presenter Marie Labat (CEA, Gif-sur-Yvette)

Authors Marie Labat, Marie-Emmanuelle Couprie, Guillaume Lambert (CEA, Gif-sur-Yvette), Daniele Nutarelli (LAC, Orsay), Yoshifumi Takashima (Nagoya University, Nagoya), Toru Hara (RIKEN Spring-8 Harima, Hyogo), Masahito Hosaka, Masahiro Katoh, Akira Mochihashi (UVSOR, Okazaki)

Abstract Harmonic Generation schemes on Free Electron Laser devices are very promising. The injection of a traditional laser source inside the first undulator leads to an efficient energy modulation of the electron bunch, and therefore, its spatial modulation, resulting in a more coherent light emission along the second undulator. Experiments have been performed on the UVSOR-II Storage Ring at Okazaki (Japan) with electrons stored at an energy of 600 MeV, and using a 2.5 mJ Ti:Sa laser at 800 nm wavelength, 1 kHz repetition rate, and 100 fs up to 2 ps pulse duration. The experimental setup is presented, including the transport alignment and synchronisation between the laser and the electron beam. The third harmonic at 266 nm has been characterised versus various parameters: current, RF cavity voltage, undulator gap, magnetic functions of the storage ring, and laser pulse duration. Those results are compared with theory via analytical models and simulations.

Presentation Poster

Main Classif. 02 Synchrotron Light Sources and FELs

Sub Classif. A06 Free Electron Lasers

Poster Panel 76

ID: 1973 - MOPCH038 Predicted Parameters of the Second Stage of High Power Novosibirsk FEL

Presenter Alexander Viktorovich Kuzmin (BINP SB RAS, Novosibirsk)

Authors Alexander Viktorovich Kuzmin, Oleg Alexandrovich Shevchenko, Nikolay Vinokurov (BINP SB RAS, Novosibirsk)

Abstract The first stage of Novosibirsk high power terahertz FEL was successfully put into operation in 2003*. The measured parameters of the FEL turned out to be in a good agreement with calculations [2]. The second and the third stages of the FEL are under construction now. The beam energy at the second stage will be about 20 MeV and the wavelength will change in the range 40-80 μm. In this paper we present the design parameters for the second stage FEL. The simulations were carried out with the help of 1-D code based on macroparticles. This code was previously used for the first stage simulations**.

Footnotes *E. A. Antokhin et al. NIM A528 (2004) p.15-18.
**A. V. Kuzmin et al. NIM A543 (2005) p.114-117.

Presentation Poster

Main Classif. 02 Synchrotron Light Sources and FELs

Sub Classif. A06 Free Electron Lasers

Poster Panel 77

ID: 2023 - THPLS135 The Study of Errors of ALBA Fixed Stretched Wire Bench

Presenter Jordi Marcos (ALBA, Bellaterra)

Authors Jordi Marcos, Josep Campmany (ALBA, Bellaterra)

Abstract The new synchrotron radiation source ALBA to be built nearby Barcelona is planned to start operation in 2009. The facility includes a laboratory for magnetic measurements laboratory devoted to IDs. The stretched wire measurement technique is widely used to obtain magnetic field integrals. This technique is based upon the displacement of a stretched wire relative to the magnetic structure to be measured. In the most usual configuration, the magnets are kept

fixed while the wire is moved. This arrangement is especially well suited for measuring big structures such as full undulators or its jaws. In contrast, in the fixed stretched wire configuration the magnetic structure is moved relative to a stationary pick-up coil with a straight segment. This layout is convenient for the measurement of small units, such as individual magnet blocks or magnetic modules. These measurements allow characterising the inhomogeneities of the building blocks of an undulator. In this paper we present an exhaustive analysis of error sources and tolerance requirements for a particular design of a fixed stretched wire bench made at ALBA, based both in the ESRF, SOLEIL and BESSY previous existing designs.

Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. T15 Insertion Devices

Poster Panel 78
ID: 2084 - MOPCH073 A Project of a High-power FEL Driven by an SC ERL at KAERI
Presenter Alexey Vladimirovich Bondarenko (BINP SB RAS, Novosibirsk)
Authors Alexey Vladimirovich Bondarenko, Sergey Vladimirovich Miginsky (BINP SB RAS, Novosibirsk), Young Hwan Han, Young Uk Jeong, Byung Cheol Lee, Seong Hee Park (KAERI, Daejon)
Abstract A project of a high-power FEL at Korea Atomic Energy Research Institute is described. The FEL is driven by a superconducting energy recovery linac. The future ERL will be connected to the existing machine without any modification. It consists of two 180-degree bents and two straight sections: one is for the FEL, another for a Compton X-rays source. One can choose the regime controlling the lenses. The total ERL is isochronous to avoid any problems with longitudinal beam instability. The total relative emittance degradation through the whole machine is ? 1.5. The FEL will be based on a 2 m helical in-vacuum undulator made of permanent magnets. One mirror of the optical cavity is blind and made of copper; the other one, the outcoupler, is semi-transparent and made of CVD diamond. The expected average power is a few kW and the tuning range 35...70 ?m.
Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A16 Energy Recovery Linacs (ERLs)

Poster Panel 79
ID: 2118 - MOPCH036 Photocathode Roughness Impact on Photogun Beam Characteristics
Presenter Timofey Gorlov (MEPhI, Moscow)
Authors Timofey Gorlov (MEPhI, Moscow), Alexander Mikhailovich Tron (LPI, Moscow)
Abstract Photocathode surface roughness has an impact on photoelectron yield, bunch duration, beam emittance at the exit of femtosecond photogun with an accelerating field that is considered in assumption of quasi-stationary one in the paper. The main problem in investigating the impact is determination of the field near the surface, statistical properties of which are defined through rms values of deviation and slope in profile line of the surface roughness. Developed and created code allows determining the field with relative rms error not worse than 0.001%. The results of the investigation for rms values of roughness and its slope within respectively 500...0 nm and 20...0 degrees are presented and discussed.
Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A06 Free Electron Lasers

Poster Panel 80

ID: 2142 - THPLS025 Diamond Light Source Vacuum System Commissioning

Presenter Bastien Boussier, (Diamond, Oxfordshire)

Authors Matthew Peter Cox, Bastien Boussier, Stephen Bryan, Brian Frazer Macdonald, Hugo Shiers (Diamond, Oxfordshire)

Abstract Diamond Light Source is a new 3 GeV light source currently being commissioned in the UK. The main vacuum systems are a 561.6 m circumference electron storage ring and a 158.4 m circumference booster ring. The storage ring target operating pressure is 1E-9 mbar with 300 mA of stored beam after 100 A.h of beam conditioning. The booster ring target operating pressure is up to an order of a magnitude higher. Pumping is provided by discrete noble diode ion pumps, supplemented by titanium sublimation pumps and NEG cartridge pumps. Vacuum vessel construction is mainly from 316LN stainless steel. There is no in situ bakeout except for the 24 storage ring straights and the front ends. An ex situ bakeout process is used for the storage ring arcs followed by installation under vacuum. This paper reports results and experience from the construction and commissioning of the diamond vacuum systems.

Presentation Poster

Main Classif. 02 Synchrotron Light Sources and FELs

Sub Classif. A05 Synchrotron Radiation Facilities

Poster Panel 81

ID: 2210 - THPLS118 Status of the SOLEIL Insertion Devices

Presenter Fabien Briquez (SOLEIL, Gif-sur-Yvette)

Authors Fabien Briquez, Chamseddine Benabderrahmane, Philippe Berteaud, Oleg Chubar, Antoine Dael, Laetitia Dubois, Jean-Marc Filhol, Mathieu Girault, Olivier Marcouillé, Fabrice Marteau, Michel Massal, François Paulin, Mathieu Valleau, José Vétéran (SOLEIL, Gif-sur-Yvette), Marie-Emmanuelle Couprie (CEA, Gif-sur-Yvette)

Abstract SOLEIL is the French 2.75 GeV synchrotron radiation light source of low emittance under construction near Paris. It will provide high intensity photons covering a wide spectral range from the IR to the hard x-rays. The storage ring commissioning will start in April 2006, and the first photons in the beam lines are expected during summer 2006. The first set of Insertion Devices (ID) will be installed before the commissioning or within the first year of operation of the machine. They consist of one 640 mm period and three 256 mm period electromagnetic helical undulators, three 80 mm period Apple II type undulators, and three 20 mm period in-vacuum undulators. All these ID's make use of a wide panoply of technical solutions for generating various types of magnetic fields. Magnetic and conceptual designs were performed by SOLEIL, and the technical realisation was carried out together with the different manufacturers. The design specificities of the different types of ID's and the magnetic field characterisation and optimisation will be reported. The first commissioning on the beam of these undulators will be described.

Presentation Poster

Main Classif. 02 Synchrotron Light Sources and FELs

Sub Classif. T15 Insertion Devices

Poster Panel 82

ID: 2256 - THPLS119 Development of a Cryogenic Permanent In-vacuum Undulator at the ESRF

Presenter Charles Agbehonou Kitegi (ESRF, Grenoble)

Authors Charles Agbehonou Kitegi, Joel Chavanne, Pascal Elleaume, Christophe Penel, Bernard Plan, Franck Revol, Michel Rossat (ESRF, Grenoble)

Abstract Lowering the temperature of NdFeB materials increases their field remanence and intrinsic coercivity*. This property is potentially interesting for the construction of cryogenic permanent in-vacuum undulators (CPMU)**. Around 150K, the coercivity is increased to such an extent that the NdFeB material is comparable to the Sm2Co17 as far as resistance to

radiation damages is concerned. The improvement in field remanence is less remarkable (15% at 150K) and is dominated by a reversible Spin Reorientation Transition (SRT) occurring around 135K. Below this temperature, the remanence decreases. The complete magnetization curves of NdFeB material measured at different cryogenic temperatures are presented. Non-linear models have been constructed and used in the RADIA code in order to compute the field performance of a hybrid NdFeB in-vacuum undulator. A prototype CPMU is presently under construction at the ESRF. It has a period of 18mm and a magnetic length of 2m. The field integral and local field measurements of the cryogenic device require new systems operated in vacuum. A stretched wire bench and a hall probe bench are under construction; their main characteristics will be presented.

Footnotes *D. Givord et al. Analysis of hysteresis loops in NdFeB sintered magnets, J. Appl. Phys. 60(9) (3263-3265).
**T. Hara et al. Cryogenic permanent undulator, Phys.rev. ST AB volume 7 050702 (2004).

Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. T15 Insertion Devices

Poster Panel 83
ID: 2264 - MOPCH043 An Optimization Study for a FEL Oscillator at TAC Test Facility

Presenter Öznur Mete (Ankara University, Tandogan, Ankara)
Authors Öznur Mete, Özlem Karsli, Omer Yavas (Ankara University, Tandogan, Ankara)

Abstract Recently, conceptual design of the Turkic Accelerator Center (TAC) proposal was completed. The main goal of this proposal is a charm factory that consists of a linac-ring type electron-positron collider. In addition, synchrotron radiation from the positron ring and free electron laser from the electron linac are proposed. The project related with this proposal has been accepted by the Turkish government. It is planned that the Technical Design Report of TAC will have been written in the next three years. In this period, an infrared oscillator free electron laser (IR FEL) will be constructed as a test facility for TAC. 20 and 50 MeV electron energies will be used to obtain infrared FEL. The main parameters of the electron linacs, the optical cavities and the FEL were determined. The possible use of obtained laser beam in basic and applied research areas such as biotechnology, nanotechnology, semiconductors and photo chemistry were discussed.

Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A06 Free Electron Lasers

Poster Panel 84
ID: 2358 - THPLS001 The Strict Solution of a Radiation Problem in Toroidal Cavity

Presenter Martin Khojoyan (YerPhI, Yerevan)
Authors Taron Artur Harutyunyan (YSU, Yerevan), Edmond David Gazazyan, Martin Khojoyan (YerPhI, Yerevan)

Abstract The radiation of charged particles bunch which is moving along the axes of toroidal cavity cross section is considered. The toroidal cavity has a finite value of the quality factor and is filled with special symmetry inhomogeneous dielectric medium. The problem's solution is based on the complete set of the toroidal cavity's own modes being defined strictly for the mentioned dielectric medium the cavity is filled with. The charged particles bunch exists in the cavity during a finite time period and the charged bunch's arising and vanishing effects are examined and are taken into account as well. The toroidal cavity is considered as a convenient model to investigate the electromagnetic properties of the tokamak system, using the defined modes.

Presentation Poster

Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A05 Synchrotron Radiation Facilities

Poster Panel 85

ID: 2483 - MOPCH011 Single Shot Jitter Measurement between an Optical Laser Pulse and the VUV-FEL Electron Bunch at DESY by Electro-optical Sampling

Presenter Armin Azima (DESY, Hamburg)
Authors Armin Azima, Stefan Düsterer, Holger Schlarb (DESY, Hamburg), Adrian Liebe Cavalieri (MPQ, Garching, Munich), David Fritz (Michigan University, Ann Arbor, Michigan)
Abstract For pump-probe experiments carried out at the VUV-FEL at DESY, FEL laser pulses with 32 nm wavelength have to be synchronized with high precision to optical laser pulses generated by a TiSa oscillator. To measure the relative timing variations between the FEL and the optical laser, an electro-optical experiment to determine the electron beam arrival time at the undulator has been installed. Here, the electron beam profile is encoded spatially into the laser pulse and readout by an intensified camera. A similar experimental setup has been successfully used at the sub-picosecond pulsed source (SPPS) at higher charge and shorter rms bunch length. In this paper, we report about the achievements and difficulties of the Timing Electro-Optical (TEO) setup, that allows to post-order experimental user data with a precision of 100 fs rms and better.
Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A06 Free Electron Lasers

Poster Panel 86

ID: 2510 - MOPCH072 Adjustable Input Coupler Development for Superconducting Accelerating Cavity

Presenter Michael Vladimirovich Lalayan (MEPhI, Moscow)
Authors Michael Vladimirovich Lalayan, Maria Gusarova, Andrey Krasnov, Nicolay Sobenin (MEPhI, Moscow), Alexander Alekseevich Zavadtsev, Dmitry Alexandrovich Zavadtsev (Introscan, Moscow)
Abstract The waveguide and coaxial-type input couplers for Energy Recovery Linac type injector cavity electrodynamical and thermal simulation results are presented. The devices are designed to feed the superconducting cavity with up to 500 kW RF power in continuous wave regime at 1.3 GHz operating frequency. The cavity external quality factor adjustment is provided. The heat load to the cryogenic system was lowered to a tolerable level by coupler design optimization.
Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A16 Energy Recovery Linacs (ERLs)

Poster Panel 87

ID: 2594 - THPLS115 Simulation and Optimisation of a 100MA DC Photo Injector

Presenter Fay Elizabeth Hannon (Jefferson Lab, Newport News, Virginia)
Authors Fay Elizabeth Hannon, Carlos Hernandez-Garcia (Jefferson Lab, Newport News, Virginia)
Abstract A prototype 100mA injector is presently being designed and manufactured jointly between Thomas Jefferson National Accelerator Facility (J-Lab) and Advanced Energy Systems (AES). This paper discusses the physics optimisation and performance of the injector, which has been studied using the space-charge tracking code ASTRA. The objective is to operate the 7MeV injector with 135pC electron bunches at 748.5MHz repetition rate. We show that the longitudinal and transverse electron bunch properties can be realised within the constraints of the design.
Presentation Poster

Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. T12 Beam Injection/Extraction and Transport

Poster Panel 88
ID: 2712 - THPLS128 Overview of Diamond IDs for Phase 1
Presenter Emily Carya Longhi (Diamond, Oxfordshire)
Authors Emily Carya Longhi, Allan Ian Baldwin, Shriram Padmakar Mhaskar, Jos Chris Schouten, Charles Thompson, Richard Walker (Diamond, Oxfordshire), James Clarke (CCLRC/DL/ASTeC, Daresbury, Warrington, Cheshire)
Abstract Diamond Light Source is a 3GeV synchrotron currently under construction in the UK, which will be operational in early 2007. It is a third generation light source comprising 22 usable straight sections for insertion devices. Phase 1 of beamline construction will include eight Insertion Devices: five PPM in-vacuum undulators, two APPLE-2 devices to be installed in the same straight, and one 3.5T superconducting wiggler. This paper describes the current status of construction and magnetic measurements for each of the Phase 1 devices.
Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. T15 Insertion Devices

Poster Panel 89
ID: 2978 - THPLS057 Injector Design for ALBA
Presenter Antonio Falone (CELLS, Bellaterra (Cerdanyola del Vallès))
Authors Montserrat Pont, Gabriele Benedetti, Dieter Einfeld, Antonio Falone (CELLS, Bellaterra (Cerdanyola del Vallès)), Eshraq Al-Dmour, Francisco Pérez (ALBA, Bellaterra), Werner Joho (PSI, Villigen)
Abstract The storage ring ALBA is a 3rd generation synchrotron light source under construction in Barcelona (Spain). The facility is based on a 3.0 GeV storage ring of 268.8 m circumference with a beam emittance under 5 nm.rad. Top-up operation is foreseen from the start. The injector complex for ALBA will consist of a 100 MeV linac and a full energy booster. The linac will be a turn-key system which has already been ordered to the industry and delivery is expected in the second half of 2007. The full energy booster will be placed in the same tunnel as the storage ring and will have a circumference of 249.6 m. The lattice of the booster is a modified FODO lattice providing an emittance as low as 9 nm.rad. The magnet system comprises 40 combined magnets and 60 quadrupoles. Chromaticity correction relies on the sextupole component built-in the combined magnets and the quadrupoles. In this paper a description of the booster design including the present status of the different components will be given.
Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A05 Synchrotron Radiation Facilities

Poster Panel 90
ID: 3328 - MOPCH018 Intra-cavity Coherent Harmonic Generation from a Storage-ring Free Electron Laser: a Combined Particle-tracking plus FEL Simulation Approach
Presenter Francesca Curbis (ELETTRA, Basovizza, Trieste; Università degli Studi di Trieste, Trieste)
Authors Francesca Curbis (ELETTRA, Basovizza, Trieste; Università degli Studi di Trieste, Trieste), Enrico Allaria, Giovanni De Ninno (ELETTRA, Basovizza, Trieste), William M. Fawley (LBNL, Berkeley, California)
Abstract In a storage-ring free-electron laser (FEL), the onset and growth of intra-cavity power at the fundamental resonant wavelength is naturally accompanied by coherent emission at higher harmonics. Contrary to what happens in single-pass linac-based devices, the electron beam is

re-circulated in the storage ring and the microbunching becomes thermalized. As a consequence, a correct theoretical understanding of the process requires a proper modelling of the turn-by-turn evolution of the electron-beam phase space, both inside the undulators (where the FEL interaction takes place) and along the ring. To simulate this process we have coupled an ad hoc modified version of the 3D numerical code Ginger (which models the FEL interaction) together with a linear one-turn map (which propagates the electron beam along the ring). We present our results and draw a comparison with previous simplified approaches. We also present the first benchmarking of experiments carried out with the ELETTRA storage-ring FEL.

Presentation Poster
Main Classif. 02 Synchrotron Light Sources and FELs
Sub Classif. A06 Free Electron Lasers

Classification 4 Hadron Accelerators Panels 92-95

Poster Panel 92

ID: 1962 - TUPLS075 Design of Flat-top Cavity for the K 800 Superconducting Cyclotron

Presenter Leandro Amos Cristiano Piazza (INFN/LNS, Catania)

Authors Leandro Amos Cristiano Piazza, Daniele Battaglia, Luciano Calabretta, Antonio Caruso, Fabrizio Consoli, Mario Maggiore, Danilo Rifuggiato, Antonino Spartà (INFN/LNS, Catania)

Abstract A 3rd harmonic Flat-top acceleration system for the K 800 Superconducting Cyclotron operating at the Laboratori Nazionali del Sud (LNS) was designed to improve beam quality by reducing the energy spread of accelerated particles. The superposition of the fundamental and the 3rd harmonic acceleration voltage allows to obtain a more uniform acceleration voltage. The Flat-top effect is realized by an additional 3rd harmonic coaxial resonator, capacitively coupled to K 800 cavities, that perturbs the EM field in the cavities by forcing the system to resonate both at 3rd harmonic and at fundamental at the same time. The Flat-top system was designed and optimized using 3D electromagnetic codes like Ansoft HFSS and CST MicroWave Studio. Calculations of dissipated power, Dee acceleration voltage and cavities' coupling are presented.

Presentation Poster

Main Classif. 04 Hadron Accelerators

Sub Classif. A12 FFAG, Cyclotrons

Poster Panel 93

ID: 2260 - MOPCH091 An Alternative Nonlinear Collimation System for the LHC

Presenter Javier Resta (IFIC, Valencia; CERN, Geneva)

Authors Javier Resta (IFIC, Valencia; CERN, Geneva), Ralph Assmann, Stefano Redaelli, Guillaume Robert-Demolaize, Daniel Schulte, Frank Zimmermann (CERN, Geneva), Angeles Faus-Golfe (IFIC, Valencia)

Abstract The optics design of an alternative nonlinear collimation system for the LHC is presented. We discuss an optics scheme based on a single spoiler located in between a pair of skew sextupoles for betatron collimation. The nonlinear system allows opening up the collimator gaps and, thereby reduces the collimator impedance, which presently limits the LHC beam intensity. After placing secondary absorbers at optimum locations behind the spoiler, we analyze the beam losses and calculate the cleaning efficiency from tracking studies. The results are compared with those of the conventional linear collimation system.

Presentation Poster

Main Classif. 04 Hadron Accelerators

Sub Classif. A04 Circular Accelerators

Poster Panel 94

ID: 2649 - MOPCH083 Design Study for an Antiproton Polarizer Ring APR

Presenter Archil Garishvili (FZJ, Jülich)

Authors Archil Garishvili, Andreas Lehrach, Bernd Lorentz, Siegfried Arno Martin, Frank Rathmann (FZJ, Jülich), Erhard Steffens (Erlangen University, Erlangen), Paolo Lenisa (INFN-Ferrara, Ferrara)

Abstract In the framework of the FAIR* project, the PAX collaboration has suggested a new experiments using polarized antiprotons**, in particular the study of the transverse spin structure of the proton. To polarize antiprotons the spin filtering method is proposed. The PAX collaboration is going to design the Antiproton Polarizer Ring (APR). In this contribution the design of this storage ring is described. The basic parameters of the APR are antiproton beam energy of 250 MeV and emittance in both planes of 250 pi mm mrad. The APR consists of two 180 degree arcs and two straight sections. One straight section houses the

injection/extraction and the polarized internal target cell, in the other straight section, the electron cooler and a Siberian snake are located. Different optical conditions have to be fulfilled in the straight sections: (1) The target cell requires a beta function of less than 0.3 m. (2) The beam has to be circular and upright in the phase space ellipse at the target, the electron cooler, and the snake. (3) The antiproton beam should have a size of 10 mm for an emittance of 250 pi mm mrad. (4) The momentum dispersion has to be zero in both straight sections.

Footnotes *Conceptual Design Report for an International Accelerator Facility for Research with Ions and Antiprotons, available from www.gsi.de/GSI-Future/cdr.
**PAX Technical Proposal, available from www.fz-juelich.de/IKP/pax.

Presentation Poster
Main Classif. 04 Hadron Accelerators
Sub Classif. A04 Circular Accelerators

Poster Panel 95
ID: 3158 - MOPCH075 Internal Target Effects in Storage Rings with Cooling

Presenter Vitaliy Gostishchev (GSI, Darmstadt)
Authors Vitaliy Gostishchev, Karl Beckert, Peter Beller, Oliver Boine-Frankenheim, Alexei Dolinskii, Fritz Nolden, Markus Steck (GSI, Darmstadt), Oleg Bezshyyko (National Taras Shevchenko University of Kyiv, Kyiv)

Abstract For the planned new storage ring of the FAIR facility the accurate description of target effects is important for the prediction of experimental conditions in terms of high luminosity and high quality of the beam. This paper outlines numerical calculations to evaluate the beam dynamics of ions in storage rings, where strong cooling in combination with thick targets is applied. Important effects due to internal targets and their influence on the beam parameters have been considered. Experiments at the existing ESR storage ring have been performed in order to benchmark the codes. Comparison of experimental results and simulations will be given.

Presentation Poster
Main Classif. 04 Hadron Accelerators
Sub Classif. A04 Circular Accelerators

Poster Panel 96

ID: 2491 - TUPCH016 Numerical Simulation of Synchrotron Radiation for Bunch Diagnostics

Presenter Andreas Paech (TEMF, Darmstadt)

Authors Andreas Paech, Wolfgang Ackermann, Thomas Weiland (TEMF, Darmstadt), Oliver Grimm (DESY, Hamburg)

Abstract For the operation of the VUV-FEL at DESY, Hamburg, the longitudinal charge distribution of the electron bunches that drive the free electron laser is of high importance. One novel method to measure the bunch shape is to analyze the coherent far-infrared synchrotron radiation generated at the last dipole magnet of the first bunch compressor. For the correct interpretation of the results it is mandatory to know how various parameters, like the bunch shape and path, the vacuum chamber walls, the optical beamline, etc., influence the observed spectrum. The aim of this work is to calculate the generation of synchrotron radiation inside the bunch compressor with the emphasis of including the effects of the vertical and horizontal vacuum chamber walls in the vicinity of the last dipole magnet. Challenging problems for the numerical simulations are the very short wavelength and the broad frequency range of interest. As a first step, it is shown how the radiation leaving the vacuum chamber, that is generated by a single point charge, can be calculated with the help of the uniform theory of diffraction (UTD).

Funding This project is supported by the Helmholtz Association under contract HGF-VH-FZ-006.

Presentation Poster

Main Classif. 06 Beam Instrumentation and Feedback

Sub Classif. T03 Beam Diagnostics and Instrumentation

Classification 5 Beam Dynamics and Electromagnetic Fields Panels 126-133, 136-137

Poster Panel 126

ID: 1722 - THOAFI01 The Development of Computational Tools for Halo Analysis and Study of Halo Growth in the Spallation Neutron Source Linear Accelerator

Speaker Dirk Alan Bartkoski (ORNL, Oak Ridge, Tennessee)

Authors Dirk Alan Bartkoski, Alexander V. Aleksandrov, Sarah M. Cousineau, Stuart Henderson, Jeffrey Alan Holmes (ORNL, Oak Ridge, Tennessee)

Abstract Computational tools have been developed to quantify the halo in a beam by analyzing beam profiles and identifying the halo particles using the Gaussian area ratio and kurtosis methods. Simulations of various injection quadrupole magnet configurations using three types of initial simulated distributions, along with an analysis of their phase space and rms properties, provides insight into the development of halo in the Spallation Neurton Source linear accelerator. Finally, comparisons with machine beam profile data, taken at the same conditions as that of the simulated data, show how accurately the simulations model the beam and its halo development and provide a better understanding of the best machine configuration with which to minimize beam halo and losses.

Funding SNS is managed by UT-Battelle, LLC, under contract DE-AC05-00OR22725 for the U.S. Department of Energy. A collaboration of six National Labs: Argonne, Brookhaven, Jefferson, Los Alamos, Lawrence Berkeley, and Oak Ridge.

Presentation Contributed Oral

Main Classif. 05 Beam Dynamics and Electromagnetic Fields

Sub Classif. D03 High Intensity - Incoherent Instabilities, Space Charge, Halos, Cooling

Poster Panel 127

ID: 1801 - WEPCH008 The Beta-beam Decay Ring Design

Presenter Antoine Chance (CEA, Gif-sur-Yvette)

Authors Antoine Chance, Jacques Payet (CEA, Gif-sur-Yvette)

Abstract The aim of the beta-beams is to produce highly energetic beams of pure electron neutrino and anti-neutrino, coming from beta radioactive decays of the 18Ne10+ and 6He2+, both at gamma = 100, directed towards experimental halls situated in the Frejus tunnel. The high intensity ion beams are stored in a ring until the ions decay. Consequently, all the injected particles will be lost anywhere in the ring, generating a high level of losses. The ring circumference has to be a multiple of the SPS circumference. The straight sections must be as long as possible in order to maximize the useful neutrino flux. The straight section length is chosen to be about 35% of the circumference length, which gives 1-km-long arcs. The bend field in the arcs is then reasonable. The arc has been chosen as a 2Pi phase advance insertion, which improves the optical properties (dynamic aperture and momentum acceptance) and allows the easy determination of the working point by the optics of the straight sections.

Funding We acknowledge the financial support of the EC under the FP6 "Research Infrastructure Action - Structuring the European Research Area" EURISOL DS Project Contract no. 515768 RIDS

Presentation Poster

Main Classif. 05 Beam Dynamics and Electromagnetic Fields

Sub Classif. D01 Beam Optics - Lattices, Correction Schemes, Transport

Poster Panel 128

ID: 1963 - WEPCH053 Peculiarities of Influence of Coherency Processes at Charged Particles Channeling on Particle Beams Characteristics

Presenter Mykhaylo Vysotskyy (National Taras Shevchenko University of Kyiv, Kiev)

Authors Vladimir Vysotskii, Mykhaylo Vysotskyy (National Taras Shevchenko University of Kyiv, Kiev)

Abstract In the work the length of reciprocal coherency existence and peculiarities of coherency of different states of channeled particles wave functions are discussed. It was shown that the length of coherent channeling depends on the monochromaticity of initial particle beam as well as on the interaction of channeled particles with thermal oscillations of the crystal lattice. Peculiarities of influence of coherency processes at relativistic and nonrelativistic charged particles channeling on spatial and angular characteristics of particle beam that has passed through a thin crystal are discussed. In was shown, that the influence of different particle states interference within the area of coherent channeling leads to very strong periodic dependence of final beam angular width from the crystal length. This effect allows to control beam parameters (e.g., to form narrower beam, that it was before falling on the crystal). Influence of coherency of particle states in a single channel and several channels on the angular distribution and the possibility of quasicharacteristic short-wave spontaneous and stimulated radiation is also studied.

Presentation Poster

Main Classif. 05 Beam Dynamics and Electromagnetic Fields

Sub Classif. D01 Beam Optics - Lattices, Correction Schemes, Transport

Poster Panel 129

ID: 1989 - WEPCH120 Simulation of 3D Space-charge Fields of Bunches in a Beam Pipe

Presenter Aleksandar Markovik (Rostock University, Rostock)

Authors Aleksandar Markovik, Gisela Pöplau, Ursula van Rienen (Rostock University, Rostock), Klaus Floettmann (DESY, Hamburg)

Abstract Recent applications in accelerator design require precise 3D calculations of space-charge fields of bunches of charged particles additionally taking into account the shape of the beam pipe. An actual problem of this kind is the simulation of e-clouds in damping rings. In this paper a simulation tool for 3D space-charge fields is presented where a beam pipe with an arbitrary elliptical shape is assumed. The discretization of the Poisson equation by the method of finite differences on a Cartesian grid is performed having the space charge field solved only in the points inside the elliptical cross-section of the beam pipe taking care of the conducting boundaries of the pipe. The new routine will be implemented in the tracking code ASTRA. Numerical examples demonstrate the performance of the solution strategy underling the new routine. Further tracking results with the new method are compared to established space-charge algorithms such as the FFT-approach.

Funding Supported by DESY, Hamburg

Presentation Poster

Main Classif. 05 Beam Dynamics and Electromagnetic Fields

Sub Classif. D05 Code Developments and Simulation Techniques

Poster Panel 130

ID: 2283 - WEPCH015 Measurement and Correction of Dispersion in the VUV-FEL

Presenter Eduard Prat (DESY, Hamburg)

Authors Eduard Prat, Vladimir Balandin, Winfried Decking, Nina Golubeva, Torsten Limberg (DESY, Hamburg)

Abstract Increase in transverse beam size in the undulator caused by dispersive effects is one of the major limitations for the operation of the VUV-FEL at DESY. Sources of the (spurious)

dispersion are field errors and stray magnet fields in the undulator beam line as well as spurious dispersion created upstream of the undulator by, for instance, rf coupler kicks, magnet misalignments and field errors. The impact of these errors on dispersion generation depends on the actual operating conditions of the accelerator, so the dispersion must be measured and controlled frequently. In this paper we present a dispersion measurement procedure and first dispersion measurement and correction results obtained at VUV-FEL. Numerical studies of the sensitivity of the spurious dispersion on various machine imperfections are presented.

Presentation Poster
Main Classif. 05 Beam Dynamics and Electromagnetic Fields
Sub Classif. D01 Beam Optics - Lattices, Correction Schemes, Transport

Poster Panel 131

ID: 2453 - WEPCH094 An Early Beam Separation Scheme for the LHC

Presenter Guido Sterbini (CERN, Geneva)
Authors Jean-Pierre Koutchouk, Guido Sterbini (CERN, Geneva)
Abstract The high nominal luminosity of the LHC requires a large number of bunches spaced by about 7.5 m. To prevent more than one head-on collision in each interaction region, a crossing angle of 0.285 mrad is necessary. A side effect of this crossing angle is the increase of the effective transverse beam cross-section, thereby decreasing the luminosity by some 16%. For the LHC upgrade, depending on the focusing scenarios, this loss significantly increases and largely offsets the potential gain of a stronger focusing. In this paper we analyze a strategy to circumvent this difficulty, based an early beam separation using small dipoles placed at a few meters from the interaction point, deep inside the detectors. This allows quasi co-linear head-on collisions at the crossing point only. From the beam dynamics point of view, the essential constraint is to control the long-range beam-beam interactions in a scenario where the normalized beam separation is not constant. In this paper the criteria of the analysis and the performance improvement obtained with the scheme are discussed. The strength of the dipoles is estimated as well as the impact on the detectors structure.
Funding Work supported by the European Community-Research Infrastructure Activity under the FP6 "Structuring the European Research Area" programme (CARE, contract number RII3-CT-2003-506395).
Presentation Poster
Main Classif. 05 Beam Dynamics and Electromagnetic Fields
Sub Classif. D02 Non-linear Dynamics - Resonances, Tracking, Higher Order

Poster Panel 132

ID: 2520 - WEPCH072 The High Order Non-linear Beam Dynamics in High Energy Storage Ring of FAIR

Presenter Alexey Chechenin (FZJ, Jülich)
Authors Alexey Chechenin, Rudolf Maier, Yurij Senichev, Evgenia Senicheva (FZJ, Jülich)
Abstract The High Energy Storage Ring (HESR) is part of the international project FAIR for antiproton physics with beam in the momentum range from 1.5 to 15 GeV/c to explore the research areas of hadron structure and quark-gluon dynamics. An important feature of the project is the combination of phase space cooled beams with thick internal targets. Therefore there are two obvious reasons of beam heating: the target-beam interaction and the intra-beam scattering. Another source of the beam size growth is the higher order resonances. In the paper we investigate the non-linear beam dynamics together with different correction schemes minimizing this effect and compare with other sources of beam heating. Since the tune working point has a spread dependent on the chromaticity correction scheme and space charge, we include in our consideration both effects as well. All beam dynamics calculations are carried out with the SIMBAD code from the Unified Accelerator Library (UAL). We use

10000 macro particles, grid sizes 64x64 and 1000 turns per run.

Presentation Poster
Main Classif. 05 Beam Dynamics and Electromagnetic Fields
Sub Classif. D02 Non-linear Dynamics - Resonances, Tracking, Higher Order

Poster Panel 133

ID: 2545 - WEPCH010 Beam-based Alignment for the Storage Ring Quadrupole and Sextupole Magnets of SOLEIL

Presenter Arnaud Madur (SOLEIL, Gif-sur-Yvette)
Authors Arnaud Madur, Pascale Brunelle, Amor Nadji, Laurent Stanislas Nadolski (SOLEIL, Gif-sur-Yvette)
Abstract First beam-based alignment (BBA) measurements will be carried out during the commissioning of the SOLEIL Storage Ring that will start in April 2006. The results will allow calibrating the zero reading of the 120 Beam Position Monitors (BPMs) with respect to the magnetic centre of the adjacent quadrupoles or sextupoles. BPMs being either adjacent to quadrupoles or sextupoles, we plan to resort to two different BBA methods related to each multipolar magnet. Moreover, as some BPMs are located near both quadrupole and sextupole, the use of both methods will allow us to cross-check the results. We will present here the first results and the comparison with the positions of the magnetic centres as obtained from the magnetic measurements.
Funding Synchrotron SOLEIL L'Orme des Merisiers Saint-Aubin - BP 48 91192 GIF-sur-YVETTE CEDEX FRANCE
Presentation Poster
Main Classif. 05 Beam Dynamics and Electromagnetic Fields
Sub Classif. D01 Beam Optics - Lattices, Correction Schemes, Transport

Poster Panel 136

ID: 2610 - WEPCH138 Simulations of Long-range Beam-beam Interaction and Wire Compensation with BBTRACK

Presenter Ulrich Dorda (CERN, Geneva)
Authors Ulrich Dorda, Frank Zimmermann (CERN, Geneva)
Abstract We present weak-strong simulation results for the effect of long-range beam-beam collisions in LHC, SPS, RHIC and DAFNE, as well as for proposed wire compensation schemes or wire experiments, respectively. In particular, we discuss details of the simulation model, instability indicators, the effectiveness of compensation, the difference between nominal and PACMAN bunches for the LHC, beam experiments, and wire tolerances. The simulations are performed with the new code BBTRACK.
Presentation Poster
Main Classif. 05 Beam Dynamics and Electromagnetic Fields
Sub Classif. D05 Code Developments and Simulation Techniques

Poster Panel 137

ID: 3037 - WEPCH032 Orbit Correction System for S-LSR Dispersion-free Mode

Presenter Hikaru Souda (Kyoto ICR, Uji, Kyoto)
Authors Hikaru Souda, Shinji Fujimoto, Masahiro Ikegami, Akira Noda, Toshiyuki Shirai, Mikio Tanabe (Kyoto ICR, Uji, Kyoto), Hicham Fadil (MPI-K, Heidelberg)
Abstract An ion storage ring S-LSR has been constructed at ICR, Kyoto Univ. It is a small ring with 22.557m circumference, and has an electron cooler and laser cooling section to achieve crystalline beam. In the commissioning process, closed orbit correction of a 7MeV proton beam has been successfully realized by means of Simplex Method. Responses to the correctors are linear only within narrow limits because of the space-charge effect in the

electron cooler. Therefore, the correction must be repetition of small corrections. Under such condition, measured COD has been reduced less than 0.1mm. Orbit correction is necessary for 35keV Mg+ dispersion-free mode* using both bending magnets and electrostatic deflectors. Since electrostatic deflectors have relatively large field errors, it needs a special process to inject the beam into the dispersion-free mode ring. First circulation is under only the magnetic field, then, the electric field will be added little by little applying continuous COD correction. In this way the dispersion gradually diminishes with keeping stable orbit. In this paper we present the correction scheme and the trial to the dispersion-free circulation.

Footnotes *M. Ikegami et al. Phys. Rev. ST-AB, 7, 120101-1 (2004).

Funding This work is financially supported by Advanced Compact Accelerator Development from MEXT of Japanese Government and the 21 COE of Kyoto University. Center for Diversity and Universality in Physics.

Presentation Poster

Main Classif. 05 Beam Dynamics and Electromagnetic Fields

Sub Classif. D01 Beam Optics - Lattices, Correction Schemes, Transport