DITANET International Conference: Accelerator Instrumentation and Beam Diagnostics

Report of Contributions

https://indico.cern.ch/e/135831

Contribution ID: **0** Type: **not specified**

Welcome

Wednesday, 9 November 2011 09:30 (30 minutes)

Presenters: Dr WELSCH, Carsten (Cockcroft Institute & U Liverpool/UK); Prof. GOMEZ CAMACHO, Joaquin (CNA & U Seville/Spain); GARCIA LEON, Manuel (U Seville/Spain)

Contribution ID: **1** Type: **Poster**

OVERVIEW OF THE ESRF DIAGNOSTIC SYSTEMS

At the ESRF synchrotron light source the diagnostic systems that measure and monitor the electron beam parameters cover both the Injector system (200MeV - 6 GeV, 5mA) and the 844m circumference Storage Ring (6GeV, 200mA). It is the Storage Ring diagnostics that are in constant need of the ultimate possible performances like resolution, absolute precision, speed of measurement and a wide scope of functionalities. It is for this reason that upgrades and modernizations are being conceived, planned and implemented here almost permanently on various devices and systems. These include the position monitors and their associated orbit stabilization system, the emittance monitors, the beam-loss monitors and the current and lifetime monitors. This presentation will detail their concept, their functionality and their results. This both for routine use and for special and detailed studies on the accelerator and the beam.

Primary author: Mr SCHEIDT, Bertus Kees (ESRF)

Co-authors: Mr PLOUVIEZ, Eric (ESRF); Ms EWALD, Friederike (ESRF)

Presenter: Mr SCHEIDT, Bertus Kees (ESRF)

Contribution ID: **5** Type: **not specified**

Beam Diagnostics for DESIREE

Presenter: Dr DAS, Susanta

Contribution ID: **6** Type: **not specified**

Tune Measurement and Feedback for Heavy Ion Synchrotrons

Wednesday, 9 November 2011 11:30 (15 minutes)

Presenter: SINGH, Rahul

Contribution ID: **7** Type: **not specified**

Beam Position and Tilt Monitors for CTF3 and CLIC

Wednesday, 9 November 2011 12:00 (15 minutes)

Presenter: JOSHI, Nirav (Royal Holloway/UK)

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

Instrumentation and Nuclear Reactions for Medical Applications

Wednesday, 9 November 2011 16:15 (15 minutes)

Presenter: BOCCI, Alessio

Contribution ID: **10** Type: **not specified**

Beam Diagnostics for Medical Accelerators

Wednesday, 9 November 2011 16:00 (15 minutes)

Presenter: CYBULSKI, Tomasz

Contribution ID: **11** Type: **not specified**

Development of Scintillating Screens for Ion Beam Characterization

Thursday, 10 November 2011 09:00 (15 minutes)

Presenter: RIPERT, Marion

Contribution ID: **14** Type: **not specified**

A Modified Neutral Beam Scanner for Least-destructive Beam Profile Monitoring

Wednesday, 9 November 2011 10:00 (20 minutes)

Presenter: PUTIGNANO, Massimiliano (Cockcroft Institute and U Liverpool/UK)

Contribution ID: **16** Type: **not specified**

A Cryogenic Current Comparator for Absolute Ion Beam Ion Current Measurement

Wednesday, 9 November 2011 10:20 (20 minutes)

Presenter: KURIAN, Febin

Contribution ID: **17** Type: **not specified**

Particle Detectors for Beam Imaging

Wednesday, 9 November 2011 16:30 (30 minutes)

Presenter: DROUART, Antoine

Contribution ID: **18** Type: **not specified**

Applications of Diamond Detectors

Thursday, 10 November 2011 09:30 (30 minutes)

Presenter: GRIESMAYER, Erich (CIVIDEC/Austria)

Contribution ID: **19** Type: **not specified**

Diagnostics for Future Low-energy Storage Rings

Thursday, 10 November 2011 10:15 (15 minutes)

Presenter: HARASIMOWICZ, Janusz (Cockcroft Institute and U Liverpool/UK)

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

From nuclear reactions detection to Medical Applications

Thursday, 10 November 2011 10:45 (15 minutes)

Presenter: ABOU HAIDAR, Ziad (CNA and U Seville/Spain)

Contribution ID: **21** Type: **not specified**

Challenging the Resolution Limits of Longitudinal Beam Profile Measurements

Thursday, 10 November 2011 11:30 (30 minutes)

Presenter: JAMISON, Steve (STFC/UK)

Contribution ID: **22** Type: **not specified**

Wire Scanners for the 100 keV Polarized Electron Beam Line at the S-DALINAC

Wednesday, 9 November 2011 10:40 (20 minutes)

Presenter: ECKARDT, Christian (TU Darmstadt)

Contribution ID: **23** Type: **not specified**

XFEL laser heater and Optical Replica Synthetizer

Wednesday, 9 November 2011 11:45 (15 minutes)

Presenter: HAMBERG, Mathias (Uppsala University)

Contribution ID: **24** Type: **not specified**

Tomography module for transverse phase-space measurements at PITZ

Thursday, 10 November 2011 09:15 (15 minutes)

Presenter: ASOVA, Galina

Contribution ID: **25** Type: **not specified**

H- low energy emittance measurements to optimize injection into an RFQ

Thursday, 10 November 2011 10:00 (15 minutes)

Presenter: GABOR, Christoph (Rutherford Appleton Laboratory)

Contribution ID: **26** Type: **not specified**

Low Energy Beam Profile Measurements using Gaseous Detectors

Thursday, 10 November 2011 10:30 (15 minutes)

Presenter: DUARTE PINTO, Serge (CERN)

Contribution ID: **27** Type: **not specified**

A Longitudinal Density Monitor for the LHC

Thursday, 10 November 2011 12:00 (15 minutes)

Presenter: JEFF, Adam (CERN/Switzerland)

Contribution ID: **29** Type: **not specified**

Longitudinal Beam Profiles

Thursday, 10 November 2011 12:15 (15 minutes)

Presenter: PAN, Rui (CERN/Switzerland)

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

Resonant Diffraction Radiation from Inclined Targets as a Tool for Bunch Lengths Diagnostics

Friday, 11 November 2011 09:00 (15 minutes)

Presenter: SUKHIKH, Leonid (DESY/Germany)

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

CLIC beam instrumentation

Friday, 11 November 2011 09:15 (15 minutes)

Presenter: LEFEVRE, Thibaut (CERN)

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

Simulation of Coherent Diffraction

Friday, 11 November 2011 09:30 (15 minutes)

Presenter: LEKOMTSEV, Konstantin (Royal Holloway/UK)

Contribution ID: **33** Type: **not specified**

Electron spectrometer for Multi-GeV laser-plasma accelerator

Friday, 11 November 2011 09:45 (15 minutes)

Presenter: Ms MARTELLOTTI, Silvia

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

Beam Diagnostics for the IFMIF Accelerator

Friday, 11 November 2011 10:00 (15 minutes)

Presenter: EGBERTS, Jan (CEA Saclay/France)

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

High Dynamic Range Beam Imaging using a Digital Optical Mask

Friday, 11 November 2011 10:15 (15 minutes)

Presenter: FIORITO, Ralph (University of Maryland)

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

A Beam Profile Monitor Based on Light Proton Accelerator Emission from Excited Rest Gas Atoms

Friday, 11 November 2011 10:30 (15 minutes)

Presenter: MATEO, Cherry May (CEA Saclay/France)

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

A Transverse Beam Distribution Monitor for LINAC4

Friday, 11 November 2011 10:45 (15 minutes)

Presenter: CHEYMOL, Benjamin (CERN/Switzerland)

Contribution ID: **38** Type: **not specified**

Time-resolved Spectrometry and Emittance Measurements on High Current Electron Beams

Friday, 11 November 2011 11:30 (15 minutes)

Presenter: OLVEGÅRD, Maja (CERN/Switzerland)

Contribution ID: **39** Type: **not specified**

A Beam Profile Monitor Using Laser-wire Systems

Friday, 11 November 2011 11:45 (15 minutes)

Presenter: AUMEYR, Thomas (Royal Holloway/UK)

Contribution ID: **40** Type: **not specified**

High Intensity Proton Beam Diagnostics

Friday, 11 November 2011 12:00 (30 minutes)

Presenter: JANSON, Andreas (ESS/Sweden)

Contribution ID: **41** Type: **not specified**

Prize awards; Conclusion

Friday, 11 November 2011 12:30 (30 minutes)

Presenter: WELSCH, Carsten P.

Contribution ID: **42** Type: **Talk**

Design of an Electro-Optic Bunch Length Monitor for the CERN-CTF3 probe beam

One of the most promising devices to provide accurate measurements of longitudinal beam profile for CLIC is based on electro-optical techniques. A new bunch length monitor, based on electro-optic spectral decoding (EOSD), is currently being designed for the CLIC Test Facility 3 at CERN. EOSD encodes the coulomb field profile of a bunch onto a time-wavelength correlated optical probe, with the temporal profile of the bunch consequently read-out through the wavelength spectrum of the optical probe. The detector will be installed on Califes, the CTF3 probe beam, which typically provides bunches with a charge of 0.2nC and a bunch length of 1ps r.m.s. Three design schemes using different lasers are investigated and evaluated with the expected performance of the monitor also presented.

Primary author: Mr PAN, Rui (CERN)

Co-authors: Prof. GILLESPIE, Allan (Carnegie Laboratory of Physics, University of Dundee); Dr JAMISON, Steven (Accelerator Science and Technology Center, STFC Daresbury Laboratory); Dr LEFEVRE, Thibaut (CERN)

Presenter: Mr PAN, Rui (CERN)

Contribution ID: **43** Type: **Talk**

Beam profile monitoring at the Test Beam Line at CTF3

The 3rd CLIC Test Facility, built by an international collaboration at CERN, addresses feasibility issues of the CLIC RF source and the two-beam acceleration scheme. In particular, the Test Beam Line (TBL), is a small-scale drive beam decelerator and studies the transport of a high current electron beam as it is being decelerated in several Power Extraction and Transfer Structures (PETS). With a maximum of 16 structures, the beam will be decelerated from 150 to a minimum of 69 MeV, while its energy spread increases significantly. In order to monitor the energy loss a segmented beam dump for fast time-resolved spectrometry has been designed and installed at the end of the TBL. The segmented dump provides single-shot spectra with a 1.2% resolution on energy and a 5 ns temporal resolution. Complementary to this, a single-slit dump, which provides fast spectrometry based on a multi-shot dipole scan technique, is installed at the beginning of the line, thus providing a measurement for comparison. This paper presents the first beam measurements at TBL, with an estimation of the performance of the segmented beam dump.

Primary author: OLVEGAARD, Maja (CERN)

Co-authors: BRAVIN, Enrico (cern); ADLI, Erik (University of Oslo); DURAFFOURG, Michel (cern); CHRITIN, Nicolas (cern); LILLESTOL, Reidar (cern); DOEBERT, Steffen (cern); LEFEVRE, Thibaut (cern); DABROWSKI, anne (cern); ANDREAZZA, william (cern)

Presenter: OLVEGAARD, Maja (CERN)

Contribution ID: **44** Type: **Poster**

A scintillating-fiber-based beam loss monitor

A new beam loss monitor, based on scintillating fibers and Silicon PhotoMultipliers, was recently developed by Microsensor Srl in collaboration with INFN Laboratori Nazionali del Sud. Such a device, named micro-BLM, is capable of detecting ionizing radiation by means of scintillation light produced into a thin plastic scintillating fiber, which is then detected by a couple of SiPM placed at the two fiber ends. The device features an intrinsic efficiency close to 1 for charged particles, whereas it has a roughly 0.001 intrinsic efficiency for gamma rays. The geometrical efficiency can be tuned by suitably choosing the fiber length. The micro-BLM can be used in air and in vacuum, and its shape can be decided rather freely, due to its linear fiber constituent.
Preliminary results obtained in a test performed at CERN CTF3 will be shown.

Primary authors: Dr PAPPALARDO, Alfio (INFN-LNS and Microsensor Srl); Dr FINOCCHIARO, Paolo (INFN-LNS)

Co-authors: WELSCH, Carsten (University of Liverpool); Dr COSENTINO, Luigi (INFN-LNS); PANNIELLO, Marco (Max-Planck-Institut Heidelberg); SCIRÈ, Sergio (INFN-LNS and Microsensor Srl); MALLOWS, Sophie (CERN)

Presenter: Dr PAPPALARDO, Alfio (INFN-LNS and Microsensor Srl)

Contribution ID: **45** Type: **Talk**

Beam Diagnostics for Medical Accelerators

Hadron therapy has proven to be a very sophisticated and precise technique in cancer treatment. A particular advantage of hadron therapy is the precise dose distribution, which can be limited exactly to the tumour volume, thus decreasing the dose in the organs at risk. Work on detectors for quality assurance of the proton beam at the Clatterbridge Centre for Oncology (CCO) has been started in the QUASAR Group and focuses on monitoring the following parameters: Beam energy, energy spread and beam position.
Three quality assurance monitors are presently under development: The LHCb VELO detector, a 'classic'Faraday Cup and a multi –layer Faraday Cup. The LHCb VELO detector is being adopted as a non–invasive beam current and beam position monitor. The mechanical design for integrating the detector in the treatment beam line has been finalized. The Faraday Cup design has been optimised in detailed simulations with the FLUKA Monte Carlo code to meet the needs of the 60 MeV proton beam available at CCO. The charged particle spectra w.r.t. energy and angle have been scored and analysed. These results were used to increase the charged particle suppression , the charge collection efficiency of the detector and thus its reliability. Finally, the multi-leaf Faraday Cup is being developed for energy spread measurements of the cyclotron's beam with a resolution in the 1 % range .
In this contribution results from the Faraday Cup design optimisation will be presented together with a description of the VELO detector implementation at the CCO's treatment beam line.

Primary author: Mr CYBULSKI, Tomasz (The University of Liverpool)

Co-author: Dr WELSCH, Carsten (The University of Liverpool)

Presenter: Mr CYBULSKI, Tomasz (The University of Liverpool)

Contribution ID: **46** Type: **Talk**

A Longitudinal Density Monitor for the LHC

The Longitudinal Density Monitor (LDM) is primarily intended for the measurement of the particle population in nominally empty RF buckets. These so-called satellite or ghost bunches can cause problems for machine protection as well as influencing the luminosity calibration of the LHC. The high dynamic range of the system allows measurement of ghost bunches with as little as 0.01% of the main bunch population at the same time as characterization of the main bunches.
The LDM is a single-photon counting system using synchrotron light. The photon detector is a silicon Avalanche Photo-Diode operated in Geiger mode, which allows the longitudinal distribution of the LHC beams to be measured with a resolution of 90ps.
Results from the LDM are presented, including a method for constructing a 3-dimensional beam density map by scanning the LDM sensor in the transverse plane. In addition, we present a scheme to improve the effective dynamic range of the system by using an optical switching technique.

Primary author: Mr JEFF, Adam (CERN / University of Liverpool)

Co-authors: Mr BOCCARDI, Andrea (CERN); Ms RABILLER, Aurelie (CERN); Mr WELSCH, Carsten (Cockroft Institute / University of Liverpool); Mr BRAVIN, Enrico (CERN); Mr RONCAROLO, Federico (CERN); Mr ANDERSEN, Maxim (CERN); Mr BOZYIGIT, Serkan (CERN); Mr LEFEVRE, Thibaut (CERN)

Presenter: Mr JEFF, Adam (CERN / University of Liverpool)

Contribution ID: **47** Type: **Talk**

Development of the IFMIF-EVEDA Ionization Profile Monitor

In the frame of the International Fusion Material Irradiation Facility (IFMIF), a prototype for a non-interceptive transverse beam profile monitor based on residual gas ionization (IPM) has been built and characterized in detail. Based on these tests, the final IPM has been designed, built, and tested.
We present the design of the IPM based on FEM (Finite Element Method) field simulations and the results of test measurements performed at GSI Darmstadt with heavy ion beams of up to 1.6 mA at 5 MeV/u and at CEA Saclay with 80 keV protons in a cw high current beam. During the tests, parameters like extraction field strength, residual gas type and pressure, and beam position with respect to the IPM have been varied and the effects on the profile evaluated. Beam profiles were investigated with respect to signal intensity and profile shape. A profile comparison with a BIF-monitor (Beam Induced Fluorescence) indicates a good agreement of profiles acquired by the two profilers.

Primary author: EGBERTS, Jan (CEA Saclay)

Co-authors: JEANNEAU, Fabien (CEA Saclay); MARRONCLE, Jacques (CEA Saclay); MOLS, Jean-Philippe (CEA Saclay); ABBON, Philippe (CEA Saclay); PAPAEVANGELOU, Thomas (CEA Saclay)

Presenter: EGBERTS, Jan (CEA Saclay)

Contribution ID: **48** Type: **Poster**

Comparison of various techniques for correcting the non-linearities of BPMs

The current LHC orbit system relies on accurate beam position measurement. The beam position is extracted from Beam Position Monitor (BPM) pickups and corrected by a 5th order correction polynomial with a set of pre-calculated coefficients. In this study, a family of 4-button BPMs with various beampipe diameters and buttons is simulated in CST Particle Studio and mapped with beam positions in both planes. The measured beam positions are then corrected with several different position correction methods. The accuracy and performance of a correction polynomial obtained with classic 2D and 3D linear regression fits, is compared to polynomials obtained with probabilistic (genetic algorithm) and deterministic (gradient-based Newton minimization) optimization methods.

Primary author: Mr NOSYCH, Andriy (CERN)

Co-author: Mr BOCCARD, Christian (CERN)

Presenter: Mr NOSYCH, Andriy (CERN)

Contribution ID: **49** Type: **Talk**

Tomography module for transverse phase-space measurements at PITZ

The Photo-Injector Test Facility at DESY in Zeuthen, PITZ, is used to test and optimize high brightness electron sources for free electron lasers. A key issue for such studies is the accurate determination of the beam emittance on which dedicated measurements take place.
The development of a tomography module at PITZ aims to measure the phase-space distribution of the electron beam for the two transverse planes simultaneously with improved signal-to-noise ratio. Specific features of the produced electron beam - low emittance, high charge density, moderate energy - and limited linac length, require a special design and operation. A dedicated quadrupole setup is used for FODO structures able to provide the needed for the tomographic procedure rotations of the beam in the phase space and for matching of the necessary beam parameters at the entrance of the FODO lattice. Measurement of the wanted projections is possible using a system of YAG/OTR screens and a readout system. Further processing of the acquired data using basic tomographic principles allows then reconstruction of the transverse phase-space distribution.
This work presents the final design of the tomography module installed and operated at PITZ.

Primary author: Mr KOURKAFAS, Georgios (DESY/ National Technical Univ. of Athens (NTUA))

Co-authors: Dr OPPELT, Anne (DESY); Dr STEPHAN, Frank (DESY); Ms ASOVA, Galina (DESY/INRNE); Mr MEISSNER, Joachim (DESY); Dr BÄHR, Juergen (DESY); Dr KRASILNIKOV, Mikhail (DESY); Dr KHODYACHYKH, Sergiy (Siemens AG)

Presenters: Ms ASOVA, Galina (DESY/INRNE); Mr KOURKAFAS, Georgios (DESY/ National Technical Univ. of Athens (NTUA))

Contribution ID: **50** Type: **Poster**

Longitudinal Beam characterization on CTF3

The CLIC Test Facility 3 (CTF3) is being built and commissioned by an international collaboration in order to test the feasibility of the proposed Compact Linear Collider (CLIC) two-beam acceleration scheme. The monitoring and control of the bunch length throughout the CTF3 complex is important since this affects the efficiency and the stability of the final RF power production process. Bunch length diagnostics therefore form an essential component of the beam instrumentation at CTF3, and several monitors are already in operation in the Delay Loop and the Combiner ring measuring at the bunch frequency multiplication. Recently a new streak camera optical line and a new RF pick-up have been installed in the CLEX area where the beam is finally decelerated producing 12GHz RF power. This paper presents longitudinal profile measurements along the CTF3 complex with an emphasis on bunch length and bunch spacing dependence on RF power production.

Primary author: FAVIER, Mathilde (CERN)

Co-authors: DABROWSKI, Anne (CERN); RABILLER, Aurelie (CERN); BRAVIN, Enrico (CERN); TECKER, Frank (CERN); SKOWRONSKI, Piotr (CERN); CORSINI, Roberto (CERN); DOEBERT, Steffen (CERN); LEFEVRE, Thibaut (CERN)

Presenter: FAVIER, Mathilde (CERN)

Contribution ID: **51** Type: **Poster**

Characterisation of Cherenkov Fibers for Beam Loss Monitoring at Electron Accelerators

A sophisticated beam loss monitoring system will be of crucial importance for any future high energy lepton accelerator, such as the Compact Linear Collider (CLIC). Depending on the position in the machine, different detector technologies should be applied to fulfil the requirements in terms of the spatial and time resolution, dynamic range and radiation hardness of the device. The requirements summarised in this paper have been determined by Monte Carlo simulations of beam loss at CLIC. Cherenkov fibers are considered as a possible beam loss monitoring system for the CLIC main beam accelerator and drive beam decelerators. Measurements with Cherenkov fibres have been recently performed at CERN test facilities. The results from these measurements are presented in this contribution, together with an analysis of the device performance and suitability as beam loss monitor for a future collider.

Primary authors: Dr PANNIELLO, Marco (Max-Planck-Institut, Heidelberg); MALLOWS, Sophie (University of Liverpool)

Co-authors: Dr WELSCH, Carsten (University of Liverpool); Dr HOLZER, Eva Barbara (CERN); Mr VAN HOORNE, Jacobus (CERN); Dr FINOCCHIARO, Paolo (INFN)

Presenter: Dr PANNIELLO, Marco (Max-Planck-Institut, Heidelberg)

Contribution ID: **52** Type: **Talk**

Wire Scanners for the 100 keV Polarized Electron Beam Line at the S-DALINAC

The spin polarized electron source at the Darmstadt superconducting linear accelerator S-DALINAC is operating at 100 keV. Polarized electrons are extracted by stimulation of a GaAs cathode with circular polarized laser light. Pulsed laser beams with a repetition frequency of 3 GHz provide electron bunches with pulse lengths in the region of 50 ps and smaller. A Wien-filter for spin manipulation and a Mott polarimeter for polarization measurements are installed in the beam line. Polarizations up to 86% have been shown with strained superlattice GaAs cathodes. Wire scanners in the beam line measure beam radius and position and in conjunction with a solenoid the beam emittance. One wire scanner up- and downstream of the Wien-filter are used to exclude emittance growth from the Wien-filter. Further use is in the knowledge of the beam size for a slit measurement of the beam pulse length and as a diagnostic tool for the beam position for an automatic beam alignment. The wire scanners are installed at an angle of 45° in a plane perpendicular to the beam with two 50 micron tungsten wires for x and y mounted on an insulated aluminum frame. Pneumatic as well as electric translation is used while the read-out is done by a 24-bit ADC with variable reading speed. First measurements at the S-DALINAC will be shown.

Primary author: Mr ECKARDT, Christian (TU Darmstadt)

Co-authors: Prof. ENDERS, Joachim (TU Darmstadt); Mr WAGNER, Markus (TU Darmstadt); Ms FRITZSCHE, Yuliya (TU Darmstadt)

Presenter: Mr ECKARDT, Christian (TU Darmstadt)

Contribution ID: **53** Type: **Talk**

Low energy beam profile measurements using gaseous detectors

The Antiproton Decelerator (AD) at CERN delivers 5.3 MeV antiproton beams to four experiments. Beam profiles have long been measured by multi-wire proportional chambers. These detectors have a limited spatial resolution, and the combined effects of multiple scattering and space charge in the sensitive volume result in severely distorted profiles.

The beam profile detectors of the AD are now being upgraded. We present our development of gaseous detectors based on direct detection of ionization charge, or amplified by a Gas Electron Multiplier (GEM). The distortions seen in profiles measured by the old wire chambers are partly attributed to the readout electronics. We describe modifications to the existing electronics, to make it cope with the fast spill structure of the AD.

Six new detectors have already been installed on the beam lines of two experiments. We present profiles obtained with these detectors and compare them with those of wire chambers. We expect to complete the replacement of all wire chambers in 2012.

Primary author: DUARTE PINTO, Serge (CERN)

Co-authors: PHILIPPE, Carriere (CERN); TRANQUILLE, Gerard (CERN); SPANGGAARD, Jens (CERN)

Presenter: DUARTE PINTO, Serge (CERN)

Contribution ID: **55** Type: **Poster**

PERFORMANCES OF IMAGING SCREENS AT THE CLIC TEST FACILITY 3

At the CLIC Test Facility 3 (CTF3), beam imaging systems rely mostly on the use of Optical Transition Radiation screens. Nevertheless for low beam energies or reduced beam intensities, OTR screens are replaced by ceramic and yag screens. Contrarily to fluorescent screens, which emit light isotropically, transition radiation has very narrow emission cone with a width inversely proportional to the beam energy. Imaging system using OTR screens will then suffer from vignetting effect, which alters beam size measurement depending on the beam size, the beam energy and on the angular acceptance of the optical system. This paper presents an experimental study of beam imaging system performed on CTF3 at different beam energies using different type of screens. The performance of classical high-reflectivity OTR screens are compared to parabolic and diffusive OTR screens.

Primary author: Dr BOLZON, Benoit (CERN)

Co-authors: Dr BRAVIN, Enrico (CERN); Mrs OLVEGAARD, Maja (CERN); Dr LEFEVRE, Thibaut (CERN)

Presenter: Dr BOLZON, Benoit (CERN)

Contribution ID: **56** Type: **Talk**

Beam Diagnostics for Future Low Energy Storage Rings

Low energy beams are very important for many existing and future accelerator projects, but require development of new diagnostic methods as most of the standard high-energy techniques no longer work. The future facility for low-energy antiproton and ion research (FLAIR) is an example of an accelerator complex providing such diagnostically challenging beams. Its central machine, the ultra-low energy storage ring (USR), will offer worldwide unique conditions for both in-ring studies as well as for experiments requiring extracted slow beams of antiprotons in the keV range. This contribution presents a set of diagnostic elements for low energy, low intensity charged particle beams. The monitors include a Faraday cup for femtoampere currents detection, a capacitive pick-up for closed-orbit measurements and beam profile monitors based on scintillating screens and secondary electron emission. Although the devices were developed with the USR in mind, they can be applied to other ultra-low energy storage rings and beam lines.

Primary author: Mr HARASIMOWICZ, Janusz (University of Liverpool & Cockcroft Institute)

Co-author: Dr WELSCH, Carsten (University of Liverpool & Cockcroft Institute)

Presenter: Mr HARASIMOWICZ, Janusz (University of Liverpool & Cockcroft Institute)

Contribution ID: **57** Type: **Talk**

Investigation of Coherent Diffraction Radiation from a Dual Target System at CTF3: theory and experiment

For the Compact Linear Collider (CLIC) the demonstration of a bunch train compression and combination in the recombination rings is crucially important. The performance of the CLIC Test Facility 3 (CTF3), at the moment, and CLIC, in the future, depends on the control and monitoring of the electron bunch length.
Diffraction Radiation (DR) has been experimentally investigated as a tool for beam diagnostics over the course of the last 15 years and proved to be effective, non-intercepting tool for longitudinal beam diagnostics purposes. Online bunch length monitoring, based on detection of a coherent radiation spectrum, is a promising technique, providing the single electron spectrum is predictable. However, an idealised theory along with coherent backgrounds generated by the beam complicate the result interpretation.
The experimental setup for longitudinal bunch profile measurements, based on the Coherent Diffraction Radiation (CDR), is installed at CTF3. Two silicon wafers are positioned on one side of the beam and the radiation, originated from them, is translated towards a Michelson Interferometer. The first target cuts off the background generated by the beam from upstream. Over the last two years the experimental setup has undergone several modifications: the second target was installed upstream of the first one; a new silicon beam splitter was installed; several detectors were tested for the potential use in the interferometer.
A theoretical model, based on the Classical Diffraction Radiation theory, was developed for the two target configuration of the experimental setup [1]. The model includes: calculation of the DR from the targets for different polarisation components of the radiation; comparison of the DR spatial distributions for the single target configuration and the dual target configuration; and, also, calculation of a single electron spectrum, which is utilized for the longitudinal beam profile reconstruction.
In this report the recent hardware modifications will be shown. The spectral measurements, performed for the two target configuration, using the ultra fast Schottky Barrier Diodes will be reported. The investigation of the CTF3 bunch length variation issues will be discussed. The measurements of the horizontal and the vertical polarisation components of the radiation spatial distribution, measured using the detectors sensitive over different frequency ranges, will be presented and compared with the theory. The measurements performed in combination with the streak camera will be shown as well.
[1] K. Lekomtsev, G. Blair, G. Boorman, R. Corsini, P. Karataev, T. Lefevre and M. Micheler, Coherent Diffraction Radiation experiment at CTF3 –simulation studies, IL NUOVO CIMENTO Vol. 34C, N.4, 2010 (available online).

Primary author: Mr LEKOMTSEV, Konstantin (Royal Holloway College-University of London)

Co-authors: Mr BOORMAN, Gary (Royal Holloway College-University of London); Prof. BLAIR, Grahame (Royal Holloway College-University of London); Dr KARATAEV, Pavel (Royal Holloway College-University of London); Dr CORSINI, Roberto (CERN); Dr LEFEVRE, Thibaut (CERN)

Presenter: Mr LEKOMTSEV, Konstantin (Royal Holloway College-University of London)

Contribution ID: **58** Type: **Talk**

Non-Interceptive Profile Measurements via Light Emission-based Tomography Technique

High-intense particle accelerator beams require non-interceptive diagnostics to avoid damages during measurements. At CEA Saclay, the use of tomography to develop a non-interceptive transverse profile monitor is foreseen. This profile monitor is first tested on the BETSI ion source test bench and on SILHI (Source d'Ions Légers de Haute Intensité). Within the DITANET network, a tomography algorithm suited for beam profile measurements is developed and tested computationally and experimentally. These measurements utilize the optical measurement techniques based on the beam-residual gas interaction. A combination of optical profile measurements with tomography provides a significant impact on the development of beam profile monitors for high-intensity particle accelerator beam.

Primary author: MATEO, Cherry May (CEA Saclay)

Presenter: MATEO, Cherry May (CEA Saclay)

Contribution ID: **59** Type: **Talk**

H- low energy emittance measurements to optimize injection into an RFQ

The Front End Test Stand FETS is the Uk's contribution to next High Power Proton Accelerators (HPPA) and is located at the Rutherford Appleton Laboratory (RAL). It is a collaboration of several institutes and universities in the UK and elsewhere in Europe and comprises of a high current H- (Penning) ion source including post acceleration, a low energy transport line (three solenoids each with Lambertson coils in x and y direction) to match the beam into a four-vane RFQ and a Medium Energy Beam Transport (MEBT) section. The input energy of the RFQ is 65keV and its output is at 3MeV. One of the projects aims is to operate the RFQ with up to 10% duty cycle (2ms, 50Hz) with currents as high as 60mA. This requires a careful layout of the Low Energy Beam Line (LEBT) and numerous emittance measurements to learn about the best parameters for injection. Challenging aspects are the high currents; a variation of space charge compensation along the matching section; inhomogeneous beam distributions; possible off-centered beams, steering effects; and a variation of input parameters e.g. caused by source instabilities and post acceleration.
An overview of the current status of emittance measurements and how important beam parameters influence the output distribution of the LEBT will be given. Simulations based on the experimental data are compared with the theoretically defined acceptance of the RFQ.

Primary author: Dr GABOR, Christoph (Rutherford Appleton Laboratory)

Co-authors: Dr LETCHFORD, Alan (Rutherford Appleton Laboratory, Isis); Dr BACK, John (Warwick University); Mr LAWRIE, Scott (Rutherford Appleton Laboratory, Isis); Dr IZAOLA, Zunbeltz (ESS Bilbao, Spain)

Presenter: Dr GABOR, Christoph (Rutherford Appleton Laboratory)

Contribution ID: **60** Type: **Poster**

Diagnostics development at KACST

Beam Position Monitoring (BPM) devices are essential for beam transport in any particle accelerator facility. The Button-type BPM is in common use around electron synchrotrons and storage rings. An optimized Button BPM is presently under development at KACST for use in future light sources.

In this contribution, the results from theoretical calculations are presented to determine the button voltage and the signal power depending on the expected beam parameters of such light source. These numbers are compared to results from CST Particle Studio simulations which aim at simulating and optimizing the overall design of the BPM.

Primary author: Mr ALSHAMMARI, Suliman (KACST)

Co-author: Dr WELSCH, Carsten (University of Liverpool)

Presenter: Mr ALSHAMMARI, Suliman (KACST)

Contribution ID: **61** Type: **Talk**

High Dynamic Range Beam Imaging using a Digital Optical Mask

We have developed a new method to image a charged particle beam with a high dynamic range. This method employs any optical radiation which is linearly proportional to the beam charge density, e.g. OTR, OSR, phosphor light, etc. and a spatial filter created with a digital micro-mirror device. We have used this method to image the halo of the 10 KeV electron beam at the University of Maryland Electron Ring and to measure the spatial distribution of the 135 MeV electron beam at the JLAB FEL facility with a dynamic range ˜ 10(5). We discuss the characteristics of the method, recent experimental results and plans to further develop this technique.

Primary author: Dr FIORITO, Ralph (University of Maryland)

Co-authors: Dr SHKVARUNETS, Anatoly (University of Maryland); Dr WELSCH, Carsten (University of Liverpool); Dr DOUGLAS, David (JLAB); Mr WILSON, Francis (JLAB); ZHANG, Hao (University of Maryland); Dr ZHANG, Shukui (JLAB); Dr KOETH, Timothy (University of Maryland)

Presenters: Dr FIORITO, Ralph (University of Maryland); Dr KOETH, Timothy (University of Maryland)

Contribution ID: **62** Type: **Talk**

Resonant Diffraction Radiation from inclined Gratings as a Tool for Bunch Lengths Diagnostics

There exists considerable interest in studying new types of non-invasive bunch length diagnostics for sub-picosecond bunches. In this context coherent Smith-Purcell radiation (CSPR) is a good candidate because the use of grating causes wavelength dispersive radiation emission, i.e. a CSPR based monitor does not require any additional spectrometer.
In contrast to existing CSPR monitors a new scheme is proposed with two detectors placed at fixed positions, and a wavelength scan is performed by scanning the tilt angle between grating surface and beam axis. In this scheme the information of both detectors, positioned opposite to each other and perpendicular to the beam axis, can be combined by taking the intensity ratio of the signals from both detectors. The advantage of such diagnostics scheme is that one has not to rely on absolute values of the radiation yield, avoiding the need to know the sensitivity of each detector with high accuracy.
In contrast to CSPR which is emitted from a grating oriented parallel to the beam, the effect is termed coherent resonant diffraction radiation when the grating is tilted. In the report we present simulation results and a status of the experiment which is planning at bunched beam of the linear accelerator in Paul Scherrer Institut, Villigen, Switzerland with the following parameters: electron energy - 130-230 MeV, bunch length - 50-1000 fs, bunch charge -10-200 pC.

Primary author: SUKHIKH, Leonid (DESY, Hamburg, Germany)

Co-authors: POTYLITSYN, Alexander (TPU, Tomsk, Russia); SMIT, Bennie (PSI, Villigen, Switzerland); KUBE, Gero (DESY, Hamburg, Germany); ISCHEBEK, Rasmus (PSI, Villigen, Switzerland); SCHLOTT, Volker (PSI, Villigen, Switzerland)

Presenter: SUKHIKH, Leonid (DESY, Hamburg, Germany)

Contribution ID: **63** Type: **Talk**

Design of the CERN Linac4 emittance meter.

The CERN LINAC4 commissioning will start in 2011, at first in a laboratory test stand where the 45 KeV H- source is already installed and presently tested, and later in the LINAC4 tunnel. A movable diagnostics bench will be equipped with the necessary sensors capable of characterizing the H- beam in different stages, from 3 MeV up to the first DTL tank at 12 MeV. In this paper we will discuss the accuracy of the transverse emittance measurement that will be performed with the slit-grid method. The system's mechanical and geometric parameters have been determined in order to achieve the required resolution and sensitivity. Space charge effects during the beam transfer from the slit to the grid and scattering effects at the slit have been considered to determine the overall emittance measurement accuracy. In addition, this paper will present the simulations and calculations done for the estimation of the thermal load on the slit.

Primary author: CHEYMOL, Benjamin (CERN-Univeriste Blaise Pascal)

Co-authors: BRAVIN, Enrico (CERN); RONCAROLO, Federico (CERN); RAICH, Uli (CERN)

Presenter: CHEYMOL, Benjamin (CERN-Univeriste Blaise Pascal)

Contribution ID: **64** Type: **Talk**

A Beam Profile Monitor Using Laser-Wire Systems

Laser-wire (LW) beam profile monitors will be very important beam diagnostic instruments for future very high energy/intensity particle accelerators to replace the use of traditional profiling techniques such as wire scanners or screens. LWs can be employed in synchrotron light sources, linear electron-positron colliders, and most recently H– ion accelerators.
The PETRA-III LW, a Compton scattering beam size measurement system at DESY, uses an automated mirror to scan a Q-switched laser across the electron beam and is developed from the system previously operated at PETRA-II.
This talk will present a general overview of LW systems and also discuss the main challenges in setting-up and operating the PETRA-III LW.

Primary author: Mr AUMEYR, Thomas (Royal Holloway, University of London)

Co-authors: Dr BOSCO, Alessio (Royal Holloway, University of London); Mr BOORMAN, Gary (Royal Holloway, University of London); Dr KUBE, Gero (Deutsches Elektronen-Synchrotron (DESY), Hamburg); Dr VAHAGN, Gharibyan (Deutsches Elektronen-Synchrotron (DESY), Hamburg); Prof. BLAIR, Grahame (Royal Holloway, University of London); Dr WITTENBURG, Kay (Deutsches Elektronen-Synchrotron (DESY), Hamburg)

Presenter: Mr AUMEYR, Thomas (Royal Holloway, University of London)

Contribution ID: **65** Type: **Talk**

First Results of transverse measurement with a pepper-pot devise at INFN - LNS

For the characterization of a low intensity, high energy ion beam, a pepper-pot measurement instrument is under development at INFN LNS. The functionality and components of the pepper pot device is reviewed as well as the final mechanical prototype. Separating a beam into several beamlets allow to measure the transverse emittance in one shot. Details of the experimental setup, preliminary results with a parasitic beam and further developments will be presented.

Primary author: Mrs RIPERT, Marion (DITANET - INFN LNS)

Co-authors: Mr COSENTINO, Luigi (INFN LNS); Mr FINOCCHIARO, Luigi (INFN LNS)

Presenter: Mrs RIPERT, Marion (DITANET - INFN LNS)

Contribution ID: **66** Type: **Talk**

Least-Interceptive Transverse Beam Profile Monitor based on a Supersonic Gas-Jet Target

The operation of a least-interceptive transverse beam profile monitor based on a planar supersonic gas-jet target is reported. This monitoring design features least-interceptive operation under excellent vacuum conditions and provides fast acquisition of a fully bi-dimensional transverse profile. It bears application for ultra-low energy particle beams at future storage rings, but also e.g. for linacs at high currents and light source injectors. For instance, the Ultra-low energy Storage Ring (USR), part of the Facility for Antiproton and Ion Research (FAIR) in Germany will store antiprotons at energies of 20-300 keV. Such low energy particles are easily lost in any interceptive device, and will require vacuum levels better than 10-10 mbar. This contribution describes the operation principle of the monitor and analyses the factors affecting resolution and sensitivity. It also presents a set of numerical simulations analyzing the critical process of shaping the expanding jet by a nozzle-skimmer system and leading to geometry optimization for minimum curtain thickness and maximum homogeneity. Finally, experimental results and measured density profile maps are shown.

Primary author: PUTIGNANO, Massimiliano (University of Liverpool)

Co-authors: Dr WELSCH, Carsten (University of Liverpool and Cockcroft Institute); BORROWS, Dominic (University of Liverpool)

Presenter: PUTIGNANO, Massimiliano (University of Liverpool)

Contribution ID: **67** Type: **Talk**

Nuclear Instrumentation and Reactions for Medical Applications

The Basic Nuclear Physics Group (FNB) of the National Accelerator Centre (CNA) has started an activity dedicated to instrumentation and nuclear reactions for medical applications. A collaboration within the FNB group, the Department of Atomic, Molecular and Nuclear Physics and the School of Engineering of Seville University, the Virgen Macarena Hospital and the private Company Inabensa in Seville is dedicated to validate a novel method for measuring 2D axial dose maps in Intensity Modulated Radiation Therapy (IMRT) treatments. A silicon DC-coupled single-sided strip detector (SSSSD) from Micron Semiconductor Ltd. has been irradiated with a Siemens PRIMUS linac at 6-MV photon mode. Two phantom prototypes have been designed for the detector characterization and treatment verification: a water-equivalent slab material and a cylindrical phantom with the capability of rotating along its symmetry axis. The solid-water slab material was used to characterize the detector in terms of linearity, depth dose, reproducibility, uniformity, penumbra and output factor measurements. As an innovation, the detector was positioned inside the cylindrical phantom parallel to the beam axis for dose measurements in the axial plane. A dosimetric characterization of the system at different angular of irradiation has been obtained with this phantom. Based on our experience on nuclear reactions (measurements and analysis) and following our activity related to medical applications, as part of the DITANET goals the FNB group of CNA/University of Seville joined in a new collaboration framework between the INFN, CEA Saclay and GSI laboratories dedicated to the experiment FIRST: Fragmentation of Ions Relevant for Space and Therapy [1]. This experiment has been designed for the measurement of different ions fragmentation cross sections at different energies between 100 and 1000 AMeV at SIS accelerator of GSI laboratory in Darmstadt. Nuclear fragmentation processes are relevant in different fields of basic research and applied physics and are of particular interest for light ion tumour therapy. The detector system is partly based on an already existing setup made of the ALADIN magnet [2], the MUSIC IV TPC [3], the LAND neutron detector [4] and the ToF-WALL scintillator time of flight system. This pre-existing setup has been integrated with newly designed detectors in the interaction Region (IR) around the carbon removable target, namely a scintillator start counter (SC), a beam monitor (BM) drift chamber, a silicon vertex detector (VD) and a proton tagger (PT) for detection of light fragments emitted at large angles. A total of 33 shifts were granted for the measurement of the C+C reactions. Experiment has been carried out during August 2011 with data collection of 12C on graphite at 400 AMeV. A brief description of the experiment and preliminary data will be presented.

[1] R. Pleskac et al., The FIRST experiment at GSI, submitted to NIM-a.
[2] http://www-aladin.gsi.de/www/kp3/aladinhome.html
[3] C. Sfienti et al., Proceedings of the XLI International Winter Meeting on Nuclear Physics, Bormio, Italy, 2003, p. 323
[4] T. Blaich et al., Nucl. Instr. and Meth. A 314, (1992) 136.

Primary author: Dr BOCCI, Alessio (CNA/University of Seville)

Presenter: Dr BOCCI, Alessio (CNA/University of Seville)

Contribution ID: **68** Type: **Poster**

SEM Upgrade for Higher Vacuum Requirements and Beam Intensity

Fermi National Particle Accelerator , Linda Purcell-Taylor, lpurcell@fnal.gov

This abstract will discuss the many improvement made to the Multi-wires (SEMs –Secondary Emission Monitors) design due to increased vacuum requirements driven by the NUMI beam line and future increase of beam intensity to assist in meeting HEP goals. At Fermi we have several types of multiwire configurations. Some of the nomenclature used for identification of the multi-wires is: Numi (modified Gloor2) See Fig. 1. Gloor 2 (Standard) see Fig 2 , 8 GEV (figure 3, Dual Plane (folding modification of the Gloor2). –see Fig. 4 & 5.
A few of the changes that were done are mechanical, material, and the process to build and install the detectors in the beam line will be discussed. Key Players in no specific order are: Dan Schoo, Rick Pierce, Wanda Newby, Gianni Tassotto, Doug Jensen, Manfred Wendt, Gary Crutcher, Randy Wyatt, Paul Gentry, Scott McCormick.
Some of the funding and/or experiments that aided in inspiring ideas: U.S. Dept. of Energy, Fermi, NoVa, Numi, University of Texas, and individuals who always like to improve things.

Primary author: Ms PURCELL-TAYLOR, Linda (Fermi National Particle Accelerator Labratory)

Presenter: Ms PURCELL-TAYLOR, Linda (Fermi National Particle Accelerator Labratory)

Contribution ID: **69** Type: **Talk**

Study of cavity BPM for next generation linear accelerators such as CLIC and ILC

Cavity Beam Position Monitor (BPM) systems form an important part of the diagnostics for linear accelerators with low emittance beam. Using cavity BPMs, the position resolution of less than 100 nm has been demonstrated in single bunch mode operation. Next generation Linear collider, such as proposed Compact LInear Collider (CLIC) and International Linear Collider (ILC) will have high current and shorter bunch separation. Effects of the beam parameters on BPM design and signal processing techniques has been studied.

The design, fabrication and testing of the cavity BPM has been studied in collaboration with the DIAMOND Light source UK. Different ideas, such as frequency separation and broad band coaxial adapter, has been studied and the results from simulation and testing of the prototype has been compared. Effects of the beam parameters on the cavity performance has been examined. Additional complexity in processing because of the signal overlap due to the comparatively shorter bunch spacing has been studied using the cavity BPM system on the Accelerator Test Facility (ATF2) at KEK, Japan. A signal processing method, based on a signal subtraction algorithm, has been developed and tested on the beam as well as simulated data. The limitations applied on the design of electronics has been discussed.

The possible induced wake fields has been simulated for a proposed BPM design for the Clic Test Facility (CTF3). Results has been compared for simulation codes, such as ACE3P and GdfidL. A simple algorithm has been developed to calculate the collective wake fields from multiple bunches with different position offsets and charge. Depending on the observations, the limitations and advantages of the different techniques have been identified, and the design parameters for BPM system and processing technique for the CLIC has been accordingly suggested.

Primary author: JOSHI, Nirav (RHUL-JAI, london, UK)

Co-authors: LYAPIN, Alexey (RHUL); Mr CULLINAN, Francis (JAI-RHUL, Egham, Surrey, UK); BOOGERT, Stewart (Royal Holloway, University of London)

Presenter: JOSHI, Nirav (RHUL-JAI, london, UK)

Contribution ID: **70** Type: **Poster**

Beam Profile Monitoring System: Experimental and Theoretical Investigations

A beam profile monitoring system based on the imaging of low energy electrons created when the ion beam impinges on a metal plate was built to cover the wide range of beam intensities and energies for the DESIREE (Double ElectroStatic Ion Ring ExpEriment) beam line diagnostics [1]. The spatial resolution of the system was tested for a H2+ beam of various energies and was found to be around 2 mm. For the lowest energy (3.5 keV), a significant steering effect on the ion beam before hitting the metallic foil was observed and found to be in good agreement with the SIMION calculations [2].

1. S. Das et al., Proceedings of DITANET workshop on Low Current, Low Energy Beam Diagnostics, page 60-64, Groβsachsen, Germany, Nov. 23-25, 2009.
2. S. Das et al., Proceedings of DIPAC 2011, page 338-340, Hamburg, Germany, May 16-18, 2011.

Primary author: Dr DAS, Susanta (Stockholm University and IISER-Kolkata)

Co-authors: Prof. KÄLLBERG, Anders (Department of Physics, Stockholm University); Mr HARASIMOWICZ, Janusz (University of Liverpool)

Presenter: Prof. KÄLLBERG, Anders (Department of Physics, Stockholm University)

Contribution ID: **71** Type: **Talk**

From nuclear reactions and instrumentation to Medical Applications (IMRT)

Silicon detectors are widely used in nuclear physics and particle detection. In addition to their low cost, silicon detectors present very good time, position (angular), and also energy resolution, besides being easily coupled to commercial dedicated electronics.
The detectors we use for nuclear reactions measurements are commercial single or double sided silicon strip detectors (S/D SSSD). They are segmented into silicon strips on vertical and/or horizontal directions. Each strip has its own electronic chain and the double sided version allows to divide the detector into hundreds of pixels.
DITANET helped establish a permanent experimental setup, based on these detectors, and data analysis protocol at the nuclear physics line of National Accelerator Center (CNA). Knowledge about silicon detectors as well as their electronics (analog, digital and logic) and data acquisition codes have been acquired by performing nuclear reaction and fragment tracking experiments.
From our experience in nuclear instrumentation and following DITANET requirements, an active research program was established to study quality assurance for radiation therapy with high-energy photon beams between the Department of Atomic, Molecular and Nuclear Physics and the Engineering School of the University of Seville, the CNA, the Virgen Macarena Hospital and the private company INABENSA (ABENGOA), in Seville. This collaboration exploits and joins the knowledge of the different groups in nuclear instrumentation, silicon detectors, electronic and mechanical design, theoretical calculations and Monte Carlo simulations, transferring these expertises to the medical field, more precisely to radiotherapy treatments.
Recently, we have finished the characterization of the "W1-SS-500"detector, by measuring 2D dose maps in an axial plane and showing its performance to verify intensity modulated radiation therapy (IMRT) treatments.
Based on these results and on tests performed on a "BB7"detector model from Micron Semiconductor Ltd, we are in the process of designing a new detector in collaboration with them.

Primary author: ABOU HAIDAR, Ziad (Centro Nacional de Aceleradores-CNA/University of Seville)

Presenter: ABOU HAIDAR, Ziad (Centro Nacional de Aceleradores-CNA/University of Seville)

Contribution ID: **72** Type: **Poster**

Longitudinal Dispersion Measurements at the S-DALINAC Using RF Monitors*

The superconducting electron accelerator S-DALINAC is a recirculating linac with two recirculations. Currently the effect of different longitudinal working points on the resulting energy spread of the linac is investigated in order to provide an electron beam with a lower energy spread for the experimental setups in future. For this purpose it is necessary to know the properties of the beam transport system exactly, especially the effects of different settings on the longitudinal phase space. We will report on a new setup for the measurement of the longitudinal dispersion in the recirculation arcs using rf phase measurements on beam intensity monitors and the time of flight method.

Summary

*supported by BMBF under contract 06DA9024I

Primary author: HUG, Florian (TU Darmstadt)

Presenter: HUG, Florian (TU Darmstadt)

Contribution ID: **73** Type: **Poster**

Dynamic Intensity Control of a Slowly Extracted Synchrotron Beam Using Ionisation Chambers

Slow extraction of particles out of a synchrotron is important for many applications in accelerator facilities, e.g. for ion therapy. It is desirable to keep the intensity at the beam-target as good as possible on a predefined level.
In the synchrotron of the Heidelberg Ion Therapy-Centre (HIT) transverse RF-knockout extraction is used to support the raster-scanning method for high-precision dose delivery.
As the phase-space distribution of particles is not homogeneous and varies slightly from pulse to pulse, intensity-fluctuations of the extracted beam appear.
The adjustment of the RF-knockout exciter is time consuming, as the energy range consists of more than 250 levels.
To keep the intensity on a predefined level, a feedback loop has been implemented.
The actual-value of the intensity is provided by ionisation chambers installed at the end of every beam line, the feedback loop controls the amplitude of the RF-knockout exciter.
The technical implementation and the requirements for the involved components are presented.
Tests for both, flat spill with a rectangular intensity profile as well as dynamically adapted intensity show promising results and are presented as well.

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Presenter: Mr SCHÖMERS, Christian (HIT Betriebs GmbH am Universitätsklinikum Heidelberg)

Contribution ID: **74** Type: **Poster**

Real time digital position calculation algorithms at GSI SIS-18

Beam position monitoring is essential for the operation of all synchrotrons. With ever increasing speed of computational infrastructure, many different algorithms are used for treating the pick-up signals at various facilities. At GSI SIS-18 synchrotron, bunches are of the order of few meters and thus capacitive shoebox pick-ups are used. The pick up signals are fast sampled and digitally processed in FPGA to give real time position monitoring. First algorithm implemented was base-line restoration algorithm and is under operation right now. A new improved algorithm based on linear fitting has been recommended recently. We present and compare these algorithms used at SIS-18 for position determination in this contribution.

Primary author: Mr SINGH, Rahul (GSI)

Co-authors: Mr LANG, Kevin (GSI); FORCK, Peter; Dr KOWINA, Piotr (GSI)

Presenter: Mr SINGH, Rahul (GSI)

Contribution ID: **75** Type: **Talk**

Tune Measurements : Methods and Applications at GSI SIS-18

Precise and accurate tune determination is crucial for stable operation of synchrotrons especially with high intensity beams. Real time tune measurements are done at GSI SIS-18 using recently commissioned tune, orbit and position measurement system (TOPOS). Many experiments involving tune measurements were done at energies in the range 11.4- 600 MeV/u with several beam intensities and ion types. Several effects like coherent tune shift, head tail oscillations in dependence of beam intensity were observed. This contribution presents the tune measurement methods available at SIS-18 and selected observations of these experiments which could be useful for design and operation at FAIR synchrotrons.

Primary author: SINGH, Rahul (GSI, Darmstadt)

Co-authors: FORCK, Peter; Dr KOWINA, Piotr (GSI); Mr KAUFMANN, Wolfgang (GSI)

Presenter: SINGH, Rahul (GSI, Darmstadt)

Contribution ID: **76** Type: **Poster**

Design of a Non-destructive Beam Position Monitor for Ultra-low Energy Antiproton Beams

The design of a non-destructive capacitive beam position monitor for low energy ion beams is described in this contribution with a particular focus on a future use with antiproton beams in the Ultra-low energy beam Storage Ring (USR), part of FAIR - the future "Facility for Anti-proton and Ion Research"(in Darmstadt, Germany).
There, antiproton particle beams will be decelerated to energies of only 20keV in a series of cooler synchrotons and will then be provided for fundamental experiments in the USR or external traps.
The design of a capacitive BPM is described in this contribution together with a purpose-built test stand that was set up at the Cockcroft Institute, UK.
Results from measurements in the test stand are compared with simulation results with CST Studio and an overall design optimization is presented.

Primary author: Mr TAKOV, Iliya (University of Liverpool)

Co-authors: WELSCH, Carsten (Cockcroft Institute); HARASIMOWICZ, Janusz

Presenter: HARASIMOWICZ, Janusz

Contribution ID: **77** Type: **Talk**

A Cryogenic Current Comparator for Absolute Ion Beam Current Measurement

For slow extraction from the SIS 100 synchrotron, the high energy beam transfer lines of FAIR accelerators demand for diagnostic devices for non-intercepting measurement of beam currents down to nA range. A Cryogenic Current Comparator (CCC) offers the required absolute and non-intercepting current. The current resolution of the CCC is only limited by the system noise, mainly originating from external magnetic fields and mechanical vibrations. A meander-shaped superconducting shielding efficiently suppresses non-azimuthal field components from coupling with the pick-up coil. The attenuation of external magnetic field components in different directions is studied for various geometrical and material parameters by means of an FEM simulation. The results are compared with experimentally calculated attenuation factor. The status of the recommissioning of a CCC prototype at GSI for the optimized performance in the FAIR accelerators will also be discussed.

Primary author: KURIAN, febin (GSI)

Co-authors: REEG, Hansjoerg; SCHWICKERT, Marcus; Dr HUELSMANN, Peter (GSI Helmholtzzentrum für Schwerionenforschung GmbH); KOWINA, Piotr (GSI Darmstadt); Mr NEUBERT, Ralf (Friedrich-Schiller-Universität Jena); Mr GEITHNER, Rene (Friedrich-Schiller-Universität Jena); Prof. VODEL, Wolfgang (Friedrich-Schiller-Universität Jena)

Presenter: KURIAN, febin (GSI)

Contribution ID: **78** Type: **Talk**

A Goubau line for bench testing of beam instrumentation

We started to explore the possibility of using surface waves traveling along a single wire, a so called Goubau line, for improved bench testing of beam instrumentation. Since the electromagnetic fields resemble closely the fields of a particle beam, bench testing would become a lot more realistic using such a setup. Our calculations are promising and soon we will build a first prototype.

Primary author: Dr STULLE, Frank (Bergoz Instrumentation)

Co-author: BERGOZ, Julien (Bergoz Instrumentation)

Presenter: Dr STULLE, Frank (Bergoz Instrumentation)

Contribution ID: **79** Type: **not specified**

A Goubau line for bench testing of beam instrumentation

Wednesday, 9 November 2011 12:15 (15 minutes)

Presenter: Dr STULLE, Frank (Bergoz Instrumentation)

Contribution ID: **80** Type: **Talk**

XFEL Laser heater and Optical Replica Synthesizer

Manipulating electron bunches with an external laser has many attractive applications, both for beam shaping purposes and for diagnostics. In this talk two projects in which Uppsala University was involved are discussed: the XFEL laser heater and the optical replica synthesizer (ORS) experiment.

An inherent problem with the current design of the XFEL is micro-bunching instabilities in the bunch compressors and the acceleration sections. To overcome this problem it was suggested to heat up those bunches by overlapping them with an IR-laser (1030 nm) when passing through a few period undulator. The laser is travelling ˜50 m within an evacuated pipe to an adjusting focusing telescope before entering the accelerator vacuum chambers. Longitudinal laser beam waist position is determined by splitting the beam and scanning a virtual waist with a camera. XY-positioning will be monitored via OTR screens located before and after the undulator and beam overlap will be obtained by adjusting translation stages in the periscope before the UHV inlet. Temporal overlap will be controlled by reading out signals from a BPM (e-beam) and photo-diode (laser beam) whereas the adjustment is made with an optical delay line.

A setup similar to the laser heater was already used in FLASH, where the energy modulation induced in the undulator was transformed into bunching that caused the emission of a coherent light pulse in a second undulator. This light pulse carries information about the bunch characteristics and is analyzed by an ultrashort laser pulse method (FROG).

We report on the progress of designing and building up the laser heater of the XFEL and briefly go through the ORS, its results and prospects.

Primary author: HAMBERG, Mathias (Uppsala University)

Co-authors: Dr ANGELOVA, Gergana (Uppsala University); Dr GORYASHKO, Vitaliy (Uppsala University); ZIEMANN, Volker (Uppsala University)

Presenter: HAMBERG, Mathias (Uppsala University)

Contribution ID: **82** Type: **Talk**

CLIC Beam Instrumentation

The performance of the Compact Linear Collider (CLIC) will rely on extremely tight tolerances on most beam parameters. The requirements for the CLIC beam instrumentation have been reviewed and studied in detail for the whole accelerator complex. In the context of the completion of the CLIC Conceptual Design Report, a first attempt was made to propose a technical solution for every CLIC instrument. Even if these choices are based on the most recent technological achievements, whenever possible, alternatives solutions focusing on potential improvements in performance, reliability or cost minimization are proposed for further study in the future. This paper presents an overview of the CLIC beam instruments, gives a status of their already achieved performances and presents the future work activities.

Primary author: LEFEVRE, Thibaut (CERN)

Presenter: LEFEVRE, Thibaut (CERN)

Contribution ID: **83** Type: **Poster**

SiPM characterization for prostate cancer diagnosis application

TOPEM: An endorectal multimodality probe (PET TOF and MRI) for diagnosis of prostate cancer that allows for improved SNR and sensitivity with respect to standard imagers, providing better functional diagnosis of prostate diseases.

Primary author: GUARDO, Giovanni

Co-authors: Dr PAPPALARDO, Alfio (INFN); Dr COSENTINO, Luigi (LNS - INFN); FINOCCHIARO, Paolo (INFN)

Presenter: GUARDO, Giovanni

Contribution ID: **84** Type: **Poster**

Implementation of tomographic diagnostics at PITZ

The Photo-Injector Test Facility at DESY in Zeuthen, PITZ, is a test bench developing the electron sources capable to drive FELs like FLASH and European XFEL. The characterisation of the source is mainly based on detailed measurements of the transverse phase space at the injector exit. Except for the standard single slit scan technique, in the 2010/2011 run period a module for tomographic diagnostics has been used as an additional device extending the possibilities of PITZ. The module allows measurements of the two transverse planes simultaneously with improved resolution for short pulses and even of single bunches from the bunch train. The major predicaments towards the usage of the module are the conditions PITZ operates with - energies of about 25˜MeV, transverse emittance below 1˜mm·mrad for nominal charge of 1˜nC, and thus, strong impact of the space-charge forces.

This work presents the first systematic studies done with the module. The measurement procedure is discussed together with experimental results.

Primary author: ASOVA, Galina

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Contribution ID: **85** Type: **Poster**

Diagnostics results during the ALBA SR Commissioning

The ALBA Storage Ring is a 3GeV 3rd Generation Synchrotron Light Source commissioned during Spring 2011 and whose first users are expected by mid 2012. The machine currently runs with the Diagnostics equipment already commissioned: BPMs, BLMs, fluorescent screens, FCT, DCCT, striplines, and two front ends strictly used for electron beam diagnostics (pinhole and streak camera). This paper reports our experience and first results with the diagnostics equipment.

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Contribution ID: **86** Type: **Talk**

An electron spectrometer for multi-GeV laser-plasma acceleration

The advance in laser plasma acceleration techniques pushes the regime of the resulting accelerated particles to higher energies and intensities. In particular the upcoming experiments with the FLAME laser at LNF will enter the GeV regime with more than 100pC of electrons.
At the current status of understanding of the acceleration mechanism relatively large angular and energy spreads are expected. There is therefore the need to develop a device capable to measure the energy of electrons over three orders of magnitude (few MeV to few GeV) with still unknown angular divergences.
Within the PlasmonX experiment at LNF a spectrometer is being constructed to perform these measurements. It is made of an electro-magnet and a screen made of scintillating fibers for the measurement of the trajectories of the particles. The large range of operation, the huge number of particles and the need to focus the divergence present unprecedented challenges in the design and construction of such a device.

But the most challenging part of the system is the use of photodetectors in an extremely dirty environment, with both electromagnetic shots and bursts of Xrays directly on multi-pixel photomultipliers, representing an unprecedented challenge in this field.

We will present the design considerations for this spectrometer, the results of the test-beams on a prototype and the first results on the experiment.

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Presenter: Dr MARTELLOTTI, Silvia (LNF e Univ. Roma3)

Contribution ID: **87** Type: **Talk**

Diamonds for Beam Instrumentation

Diamond is perhaps the most versatile, efficient and radiation tolerant material available for use in beam detectors with a correspondingly wide range of applications in beam instrumentation. Numerous practical applications have demonstrated and exploited the sensitivity of diamond to charged particles, photons and neutrons. A description of a generic diamond detector is given. The interaction of the CVD diamond detector material with protons, electrons, photons and neutrons is presented, together with several application examples.

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Contribution ID: **88** Type: **Talk**

Challenging the Resolution Limits of Longitudinal Beam Profile Measurements

Linear accelerators for light sources, and for next generation
particle physics machines, are now regularly pushing for ever shorter bunch durations, and for well defined non-Guassian temporal
profiles on sub-picosecond bunches. These requirements place significant challenges on the longitudinal diagnostics. To be effective at these time scales, the jitter of the beam profile and arrival time makes it necessary for single shot measurements of the full profile. There are several approaches to these diagnostic challenges, such as the direct temporal measurements of deflecting cavities; Electro-optic interactions between electron beam and lasers; and the so called "Optical Replica" scheme. Established techniques of spectral characterisation of CTR, CDR, or Smith Purcell radiation remain attractive, particularly for empirical feedback or tune-up diagnostics. An overview of capabilities of differing techniques will be given, together with a more detailed discussion of Electro-Optic schemes and the potential for pushing EO diagnostics to time resolutions to rival deflecting cavities.

Primary author: JAMISON, steven (STFC)

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Contribution ID: **89** Type: **Talk**

Tracking of low energy heavy ions with emissive foil detectors

The tracking of low energy (<5A.MeV) heavy (Z>10) ions faces a major difficulty: these particles strongly interact with matter and their trajectories are then perturbed. The resulting energy straggling and, more important, the angular straggling can strongly degrade the precision of the measurements. That is the reason why we must use detectors that are as thin as possible. We will present here the different studies we have performed on emissive foil detectors. Such kind of detectors needs only one thin foil on the ion trajectories. While the ion cross the foil, secondary electrons are emitted. They are accelerated by an electric field and possibly focused by a collinear magnetic field if a good spatial resolution is required. They are guided toward a secondary electron detector (SeD) that will amplify the signal, thus allowing for the measurement of the time of the passing ion and for the reconstruction of their position on the emissive foil. We will focus here on the use of low pressure gas detectors as SeD, either Multiwire proportional counters or Micromegas based chambers. We will present the very good performances we have obtained during laboratory and in-beam tests on the counting rate and time resolution. Finally we will present existing and future applications for such detectors.

Primary author: DROUART, Antoine (CEA)

Presenter: DROUART, Antoine (CEA)

Contribution ID: **90** Type: **Poster**

A Study of Beam Alignment Based on Coupling Modes in Third Harmonic Superconducting Cavities at FLASH

An electron beam excites higher order modes (HOMs) when passing through an accelerating cavity. These HOMs may adversely affect the beam quality and in the worst case result in a beam-break-up instability. It is therefore important to ensure these HOMs are well-suppressed and their effect on the beam is minimized by aligning the beam to the electrical axis of the cavity. Compared to the TESLA 1.3 GHz cavities, HOMs generated in third harmonic cavities are significantly larger, therefore their impact on the beam need to be carefully minimized. Moreover, modes which have strong couplings to the beam propagate through the whole cryo-module containing four third harmonic cavities. Results are presented on the first analysis of beam alignment by minimizing the power of the strong coupling modes in the third harmonic cavity module at FLASH. A single electron bunch per RF pulse is used.

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Contribution ID: **91** Type: **not specified**

Meeting only for DITANET Trainees

Wednesday, 9 November 2011 13:30 (1 hour)

Contribution ID: **92** Type: **Poster**

On the use of FBG sensors as temperature-based Beam Profile Monitors

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We present results of temperature measurements on a proton beam using Fiber Bragg Gratings as sensors. A Fiber Bragg Grating is a local periodic modulation of the refraction index in an optical fiber. The use of temperature measurements for beam profiling is a well-established technique, by means of thermocouples, [1], [2]. An FBG sensor is less intrusive due to its materials (SiO2, plastics) and their thickness (˜125 ⊠m without coating), electrically passive and immune to EMI. They are as precise as thermocouples (<0.1 K) and extremely linear.

Under the proton beam, the FBG sensors transform the ionization interaction into wavelength shifts. The read out of the FBG sensor is made with a tunable laser beam shining through the optical fiber. The equivalence is 1 K for 10 pm of wavelength shift in case of heating. FBG sensors are extremely radiation resistant, far beyond 15 MGy, [3], without significative damage (radiation induces an additional wavelength shift that eventually saturates, [4].). Besides, the radiation induced wavelength shift can be avoided by using Type II FBG sensors, [5].

For our proof of concept test, a curtain of FBG sensors is exposed to a 13.3 MeV, 100 nA proton beam during several minutes in air, for a total of five irradiation periods. The accumulated wavelength shifts in two FBG exposed to the proton beam show . The on and off proton beam events are clearly visible in the FBG sensors curves, for a total of 5 peaks (on instants, 16.75, 16.97, 17.08, 17.28 and 17.88 h. There is also a temperature reference (331) off beam for calibration purposes.

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Contribution ID: **93** Type: **Poster**

First Results of transverse measurement with a pepper-pot devise at INFN –LNS

For the characterization of a low intensity, high energy ion beam, a pepper-pot measurement instrument is under development at INFN LNS. The functionality and components of the pepper pot device is reviewed as well as the final mechanical prototype. Separating a beam into several beamlets allow to measure the transverse emittance in one shot. Details of the experimental setup, preliminary results with a parasitic beam and further developments will be presented.

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