CERN
EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH
1211 – Geneva 23
Switzerland

Dr. Hermann Schmickler
Tel: +41 22 767 7078
Fax: +41 22 767 7740
E-Mail: Hermann.Schmickler@CERN.CH

Dear Colleague,

It is a great pleasure for me to chair the 7th European Workshop on Beam Diagnostics and Instrumentation for Particle Accelerators, DIPAC 2005, and I look forward to welcoming you to Lyon, France.

This year the organization of the DIPAC workshop returns to CERN, an international organization based in Geneva, Switzerland, with collaborators worldwide, whose main field of activity is elementary particle research: "trying to understand what matter is made of and what forces hold it together". This goal requires the constant improvement of particle accelerators, the Large Hadron Collider (LHC), due to start in 2007, being the current leading project.

Accelerators cannot be improved without the development of adequate beam instruments and diagnostic tools. For this reason CERN has always been an active promoter of DIPAC, since the first workshop held in 1993.

Once again the programme of this edition of DIPAC contains many high quality contributions, thanks to a very lively and competent community of engineers and scientists worldwide, willing to share their work and findings with their colleagues.
The agenda includes about 20 talks, as well as more than 100 posters and several parallel discussion sessions. This year, in order to stimulate discussions among participants, the traditional banquet will be replaced by "happy hours" sessions at the end of each day. The main aim of the DIPAC workshop has always been facilitating the sharing of knowledge and experience within our community. For this reason, considerable importance is given to discussions and comments after the presentations and during the workshop in general.
Several companies active in our field will also be present as sponsors of the workshop, with their main products and services on display. Thanks to some of them fellowships could be awarded to selected students.

I would personally like to thank all the people involved in the organization of this workshop for their commitment. Please contact a local committee member for any question during the workshop.

Hermann Schmickler
(CERN, Chairman of the DIPAC 2005 Programme committee)

Contents

Program

ITMM — Monday Morning Invited Talk

CTMM — Monday Morning Contributed Talk

POM — Monday Poster Session

Contents

ITMA — Monday Afternoon Invited Talk

ITTM — Tuesday Morning Invited Talk

CTTM — Tuesday Morning Contributed Talk

DISS — Tuesday Discussion Sessions

POT — Tuesday Poster Session

Contents

Program

Sunday, June 05, 2005

16:00 – 21:00 **Registration**

18:00 – 21:00 **Welcome Drink**

Monday, June 06, 2005

09:00 – 09:15 **Introduction**

09:00 – 10:45 **Monday Early Morning Session**
Session Chair: H. Schmickler (CERN, Geneva)

ITMM01 **Instrumentation in Small Low Energy Machines**
U. Raich (CERN)

ITMM02 **Commissioning of SNS Beam Instrumentation***
T.J. Shea (ORNL/SNS)

CTMM01 **Design and Testing of the MIT-Bates Stern-Gerlach Polarimeter Cavity**
P. Cameron, N. D'Imperio, A.U. Luccio, W.W. MacKay (BNL) M. Conte (INFN Genova) W.A. Franklin, E. Ihloff, T. Zwart (MIT) D.A. Goldberg (LBNL)

10:45 – 11:15 **Coffee Break**

11:15 – 13:00 **Monday Late Morning Session**
Session Chair: K. Wittenburg (DESY, Hamburg)

ITMM03 **Observation of Beam Halo Image by a Coronagraph**
T. Mitsuhashi (KEK)

ITMM04 **Wire Method for Halos at JLAB Transfer Line**
A. Freyberger (Jefferson Lab)

CTMM02 **Micro-strip Metal Foil Detectors for the Beam Profile Monitoring**
V.M. Pugatch, V.E. Aushev, O.A. Fedorovitch, A.V. Mikhailenko, S.V. Prystupa, Y.V. Pylypchenko (NASU/INR) C. Bauer, M.T. Schmelling (MPI-K) M. Braeuer, H. Franz, K. Wittenburg (DESY) V.G. Karengin, V.L. Perevertailo (NASU/IM)

13:00 – 14:30 **Lunch Buffet**

14:30 – 16:30 POM — Monday Poster Session

POM001 **Detailled Experience of Synchrotron Light Extraction System with Slotted Mirror at the ESRF**
B.K. Scheidt (ESRF)

POM002 **A Complete Dipole Light Monitor System for the ESRF Injector**
B.K. Scheidt (ESRF)

POM003 **Advances Towards the Measurement and Control of LHC Tune, Chromaticity, and Coupling**
P. Cameron, J. Cupolo, C. Degen, A. Dellapenna, L.T. Hoff, Y. Luo, J. Mead, C. Schultheiss, R. Sikora (BNL) M. Gasior, R.O. Jones, H. Schmickler (CERN) C.-Y. Tan (Fermilab)

POM004 **A First Look at Beam Diagnostics for the RHIC eCooling Project**
P. Cameron, I. Ben-Zvi, M. Blaskiewicz, J.M. Brennan, R. Connolly, W.C. Dawson, C. Degen, A. Dellapenna, D.M. Gassner, D. Kayran, J. Kewisch, V. Litvinenko, B. Oerter, T. Russo, M. Wilinski, V. Yakimenko (BNL)

POM005 **The Effects and Possible Origins of Mains Ripple in the Vicinity of the Betatron Spectrum**
P. Cameron (BNL) M. Gasior, R.O. Jones (CERN) C.-Y. Tan (Fermilab)

POM006 **A Calorimeter for Absolute Current Calibrations of 1microAmp CW Electron BeamCW Electron Beam**
A. Freyberger, M.E. Bevins, A.R. Day, P. Degtiarenko, A. Saha (Jefferson Lab) R. Gilman (Rutgers University, The State University of New Jersey)

POM007 **Preliminary Tests of a New Kind of BPM system for SOLEIL**
J.-C. Denard, L. Cassinari, F. Dohou, N. Hubert, N.L. Leclercq, D. Pedeau (SOLEIL)

POM008 **Application of the Beam Profile Monitor for VEPP-4M Tuning**
O.I. Meshkov, V. F. Gurko, A.D. Khilchenko, N.Yu. Muchnoi, A.N. Selivanov, A. N. Zhuravlev, P.V. Zubarev (BINP SB RAS)

POM009 **ROSALI: An application Allowing Online/Offline Algorithm Implementation to Assess Beam Instrumentation Performance**
M. Moles (CERN)

POM010 **A Novel Device for Non-Intersecting Bunch Shape Measurement at the High Current GSI-LINAC**
P. Forck, C. Dorn (GSI)

POM011 **Faraday Cup Designs for the Diamond Injector**
A.F.D. Morgan (Diamond)

POM012 **Design Alternatives for Beam Halo Monitors in High Intensity Accelerators**
C.P. Welsch, H.-H. Braun, E. Bravin, R. Corsini, T. Lefevre, D. Schulte, F. Tecker (CERN)

POM013 **Scintillating Screens Study for LEIR/LHC Heavy Ion Beams**
T. Lefevre, C.B. Bal, E. Bravin, R. Scrivens, M. Taborelli (CERN)

POM014 **Time Resolved Energy Measurement at CTF3**
T. Lefevre, H.-H. Braun, E. Bravin, N.C. Chritin, R. Corsini, C.D. Dutriat, F. Tecker, C.P. Welsch (CERN)

POM015 **Single Photon Detector tests for the LHC synchrotron light diagnostics**
S.C. Hutchins (CERN) G.S. Buller, K.J. Gordon, S. Pellegrini (Heriot-Watt) S. Cova, M. Ghioni, A. Gulinatti, I. Labanca, I. Rech (Politecnico/Milano)

POM016 **Measurement of Longitudinal Phase Space at the Photo Injector Test Facility at DESY in Zeuthen (PITZ)**
J.R. Roensch, J.W. Baehr, M. Krasilnikov, F. Stephan (DESY Zeuthen) D. Lipka, R. Richter (BESSY GmbH)

POM017 **Real-Time, Single-Shot Temporal Measurements of Short Electron Bunches And Terahertz CSR and FEL Pulses**
G. Berden, B. Redlich, A.F.G. Van der Meer (FOM Rijnhuizen) W.A. Gillespie (University of Dundee) S.P. Jamison (Strathclyde University) A. MacLeod (UAD)

POM018 **OTR Based Monitor of Injection Beam for Top-Up Operation of the SPring-8**
S. Takano, M. Masaki, T. Masuda, A. Yamashita (JASRI/SPring-8)

POM019 **Optimization of Beam Injection into the First Accelerating Module at TTF2 with Cavity Dipole Mode Signals**
N. Baboi, G. Kreps, M.W. Wendt (DESY) J.C. Frisch, M.C. Ross (SLAC) O. Napoly, R. Paparella (CEA/DSM/DAPNIA)

POM020 **New Tune Measurement System for the ESRF Booster**
J.M. Koch, J.M. Meyer, E. Plouviez (ESRF)

POM021 **Measurements of Transverse Emittance at the TTF VUV-FEL**
K. Honkavaara, F. Loehl (Uni HH) Y. Kim (DESY)

POM022 **Upgrade of the Global Feedback of the ESRF Storage Ring**
E. Plouviez, J.M. Koch, J.L. Pons, F. Uberto (ESRF)

POM023 **Recent Diagnostic Improvements for the PSI Proton Accelerator**
P.-A. Duperrex, U.P. Frei, M. U. Müller, L. Rezzonico (PSI)

POM024 **Longitudinal Emittance Measurements in the Transfer Channel to the GSI SIS18**
S.G. Richter, W. Barth, L. Dahl, L. Groening (GSI)

POM025 **The Beam Diagnostics for SESAME**
S. Varnasseri (SESAME)

POM026 **An X-ray Pinhole Camera System for Diamond**
C.A. Thomas, G. Rehm (Diamond)

POM027 **Operational Experience with Beam Alignment and Monitoring Using Non-Destructive Beam Position Monitors in the cyclotron Beamlines at iThemba LABS**
J.L. Conradie, A.H. Botha, J.L.G. Delsink, D.T. Fourie, Z. Kormany, P.F. Rohwer, M. Sakildien (IThemba Labs) J. Dietrich, I. Mohos (FZJ/IKP)

POM028 **Performance Verification of the Diamond EBPM Electronics**
G. Rehm, M.G. Abbott (Diamond)

POM029 **High Dynamic Magnetic Beam Current Measurements by Means of Optimised Magneto-Resistance (MR) Sensor Engineering**
M. Hape (U. Kassel)

POM030 **Scraping and Collimation Tests in the SPS**
C. Fischer, M. Facchini, JJ.G. Gras, S.C. Hutchins, R. Jung (CERN)

POM031 **Single Bunch Transient Detection for the Beam Phase Measurement in Superconducting Accelerators**
P. Pawlik, M.K. Grecki (TUL-DMCS) S. Simrock (DESY)

POM032 **A Beam Position Monitor for High Power Beams with Large Transverse Dimensions**
A. Freyberger, P. Degtiarenko, D.W. Dotson, V.P. Popov (Jefferson Lab)

POM033 **Optimisation of 'Shoe-box type' Beam Position Monitors using the finite element methods.**
P. Kowina, W. Kaufmann, J. Schoelles (GSI)

16:30 – 17:00 **Coffee Break**

17:00 – 18:00 **Monday Afternoon Session**
Session Chair: T.J. Shea (BNL, Upton, Long Island, New York)

ITMA01 **Beam Loss-Monitor Systems for Machine Protection**
B. Dehning (CERN)

ITMA02 **Diagnostics of Accelerator Performance under the Impact Of Electron Cloud Effects**
H. Fukuma (KEK)

18:00 – 20:00 **Happy Hours**
free drinks in the hotel foyer

Tuesday, June 07, 2005

09:00 – 10:45 **Tuesday Early Morning Session**
Session Chair: U. Raich (CERN, Geneva)

ITTM01 **Analog Front-End Electronics in beam Instrumentation**
A. Boscolo (DEEI)

ITTM02 **FPGA Technology in Beam Instrumentation and Related Tools**
J. Serrano (CERN)

CTTM01 **A New Trajectory Measurement System for the CERN Proton Synchrotron**
J.M. Belleman (CERN)

CTTM02 **The PSI 'VPC' Board - First Applications of a Common Digital Back-End for Electron and Proton Beam Instrumentation at PSI**
B. Keil, P.-A. Duperrex, G. Janser, R. Kramert, P. Pollet, V. Schlott, N. Schlumpf, E. Schmid, P. Spuhler (PSI)

10:45 – 11:15 **Coffee Break**

11:15 – 13:00 **Tuesday Late Morning Session**
3 Parallel Discussion Sessions

DISS01 **Profile Measurements in Transfer Lines Interceptive Versus Non Interceptive Solutions**
G. Rehm, R. Fiorito

DISS02 **Operation of Diagnostic in Machine Tunnel: Limits and Experiences**
M. Ferianis, T. Shea

DISS03 **Increasing Exploitation of FPGAs in Beam Instrumentation**
V. Schilcher, U. Raich

13:00 – 14:30 **Lunch Buffet**

Program

14:30 – 16:30 POT — Tuesday Poster Session

POT001 **Beam Diagnostics Devices and Data Acquisition for the HICAT facility**
A. Peters, T. Hoffmann, M. Schwickert (GSI)

POT002 **Bremstrahlung Detection and Chamber Obstruction Localisation Using Scanning Radiation Detectors**
G.A. Naylor, B. Joly, D. Robinson (ESRF)

POT003 **The Instrumentation of the TI8 SPS to LHC Transfer Line**
L.K. Jensen (CERN)

POT004 **Improving the Reliability Of IPMs**
T. Giacomini, P. Forck (GSI) D.A. Liakin, V. Skachkov (ITEP)

POT005 **Determination of Beam Charge Using Stripline Signals at the RF Frequency by Fast Signal Processing in a FPGA**
G.A. Naylor, B. Joly (ESRF)

POT006 **Current Status of the Advanced Residual Gas Monitor for Heavy Ion Synchrotron Applications**
D.A. Liakin, S.V. Barabin, O. Sergeeva, V. Skachkov (ITEP) P. Forck, T. Giacomini (GSI) A. Paal (MSL) Vic. Skachkov, A.A. Vetrov (MSU)

POT007 **Design and Test Measurements of the Imaging System of the Ionisation Profile Monitor**
D. Kramer, B. Dehning, C. Fischer, S.C. Hutchins, J. Koopman (CERN)

POT008 **Simulation of an Electron Source Based Calibrating System for an Ionisation Profile Monitor**
H.H. Refsum, B. Dehning, J. Koopman (CERN)

POT009 **SQUID Based Cryogenic Current Comparator for Measurements of the Dark Current of Superconducting Cavities**
A. Peters (GSI) K. Knaack, K. Wittenburg (DESY) R. Neubert, S. Nietzsche, W. Vodel (FSU Jena)

POT010 **Profile Monitors for Wide Multiplicity Range Electron Beams**
B. Buonomo, G. Mazzitelli (INFN/LNF) A. Bulgheroni, C. Cappellini, L.G. Foggetta, A. Mozzanica, M. Prest (Univ. Insubria and INFN Milano) P. Valente (INFN-Roma) E. Vallazza (INFN-Trieste)

POT011 **THI Safety System**
C. Jamet, A.T. Andre, P. Anger, J.L. Baelde, C. Doutresssoulles, B. Ducoudret, E. Petit, S.E. Swartvagher (GANIL)

POT012 **Diagnostics and First Measurement Results at the LEG 100keV Gun Test Stand**
S.C. Leemann, ?. Andersson, V. Schlott, A. Streun, A. Wrulich (PSI)

POT013 **Beam Diagnostics Instrumentation for the High Energy Beam Transfer Line of I.P.H.I.**
P. Ausset, S. Berthelot, J.-L. Coacolo, J. Lesrel, J.N. Maymon, A. Olivier, N. Rouviere, M. Solal, L. Vatrinet, J.-F. Yaniche (IPN) G. Belyaev, I. Roudskoy (ITEP)

POT014 **A Current Mode Inductive Pick-Up for Beam Position and Current Measurement**
M. Gasior (CERN)

POT015 **Result from the SPS High Frequency Travelling Wave Schottky Monitor**
M.E. Castro, F. Caspers, T. Kroyer (CERN)

POT016 **PETRA Proton Beam Profiling by Vibrating Wire Scanner**
S.G. Arutunian, N.M. Dobrovolski, M.R. Mailian, I.G. Sinenko, H.E. Soghoyan, I.E. Vasiniuk (YerPhI) K. Wittenburg (DESY)

POT017 **Semi-Automatic Calibration Bench for BPM in J-PARC LINAC**

S. Sato, H. Hiroki, T. Tomisawa, A. Ueno (JAERI/LINAC) H. Akikawa, K. Hasegawa, H. Sakaki, H. Sako (JAERI) Z. Igarashi, N. Kamikubota, S. Lee, T. Toyama (KEK)

POT018 **Digital Beam Position Measurement at GSI-SIS and CERN-PS**
A.A. Galatis (GSI) J.M. Belleman (CERN)

POT019 **Design of the Soleil Fast Orbit Feedback**
N. Hubert, L. Cassinari, J.-C. Denard, A. Nadji, L.S. Nadolski, D. Pedeau (SOLEIL)

POT020 **A New Method of Detecting the Magnetic Field and its Application to the Beam Current Monitor**
S. Sasaki, T. Fujita, M. Shoji, T. Takashima (JASRI/SPring-8) T. Tadatsu (Loyal Port Co., Ltd.)

POT021 **New Single Shot Beam Position Monitor of the GSI High Energy Transfer Line**
J. Schoelles, W. Kaufmann (GSI)

POT022 **Direct Measurements of Space-Charge-Potential in High Intensity H^- Beam with Laser Based Photo Neutralization**
S. Lee (KEK)

POT023 **Present Status and Upgrade of BPM System in KEK Photon Factory**
T. Obina, W.X. Cheng, K. Haga, T. Honda, M. Tadano (KEK)

POT024 **Test of New Diagnostics for Bunch Length Measurement**
T. Perron, G.A. Naylor, E. Plouviez, B.K. Scheidt (ESRF)

POT025 **Detailed Resolution Studies of the Synchrotron Radiation Profile Monitor for HERAe**
G. Kube, R. Fischer, K. Wittenburg (DESY)

POT026 **Quadrupole Mode Measurement Using Beam Position Monitor in the KEK PS**
T. Miura, S. Igarashi, M.J. Shirakata, T. Toyama (KEK)

POT027 **Wire Scanner at the VUV FEL Accelerator TTF II at DESY**
M. Sachwitz, H.-J. Grabosch, H. Thom (DESY Zeuthen) P. Castro, U. Hahn (DESY)

POT028 **Irradiation control of the SPIRAL target by measuring the ion beam intensity via a Fast Current Transformer.**
P. Anger, A.T. Andre, C. Doutresssoulles, C. Jamet, W.LC. Le Coz, O.M. Ozille, S.E. Swartvagher (GANIL)

POT029 **First Results of a Spatial Auto-Correlation Interferometer with Single Shot Capability Using Coherent Transition Radiation at the SLS Pre-Injector LINAC**
D. Suetterlin, V. Schlott, H. Sigg (PSI) D. Erni, H. Jäckel (ETH) A. Murk (University of Berne, Institute of Applied Physics)

POT030 **A New TV Beam Observation System for CERN**
S. Burger, E. Bravin, G. Ferioli, G.J. Focker, R. Maccaferri (CERN)

POT031 **A Problem in RF Switches of Multiplexing BPM System**
T. Fujita, S. Sasaki, M. Shoji, T. Takashima (JASRI/SPring-8)

POT032 **Design Optimization of the Emittance Measurement System at PITZ**
L. Staykov, J.W. Baehr, M. Krasilnikov, D. Lipka, V. Miltchev, A. Oppelt, F. Stephan (DESY Zeuthen) K. Floettmann, J.H. Han, S. Schreiber (DESY) R. Richter (BESSY GmbH) I. Tsakov (INRNE)

16:30 – 17:00 **Coffee Break**

Program

17:00 – 18:00 **Tuesday Afternoon Session**
Session Chair: A. Peters (GSI, Darmstadt)

ITTA01 **Profile Monitors Based on Residual Gas Interactions**
P. Forck (GSI)

ITTA02 **Beam Diagnostics at High Power Proton Beam Lines and Targets at PSI**
R. Dölling, P.-A. Duperrex, R. Erne, U.P. Frei, M. Graf, M. U. Müller, L. Rezzonico, U. Rohrer, K. Thomsen (PSI)

18:00 – 20:00 **Happy Hours**
free drinks in the hotel foyer

Wednesday, June 08, 2005

09:00 – 10:45 **Wednesday Early Morning Session**
Session Chair: G. Kube (DESY, Hamburg)

ITWM01 **Beam Stability in Synchrotron Light Sources***
G. Decker (ANL)

CTWM01 **Detection of Hard X-Rays in Air for Fast and Precise Monitoring of Both Vertical Position & Emittance in the ESRF Dipoles**
B.K. Scheidt (ESRF)

CTWM02 **The X-Ray Beam Imager for Transversal Profiling of Low-Emittance Electron Beam at the SPring-8**
S. Takano, M. Masaki, H. Ohkuma (JASRI/SPring-8)

10:45 – 11:15 **Coffee Break**

14:30 – 16:30 **POW — Wednesday Poster Session**

POW001 **Photon Counting Measurement in Single Bunch Operation in UVSOR-II Electron Storage Ring**
A. Mochihashi, K. Hayashi, M. Hosaka, M. Katoh, J. Yamazaki (UVSOR) Y. Takashima (Nagoya University Graduate School of Engineering)

POW002 **Bunch by Bunch Current and Lifetime Measurements at DAΦNE**
A. Stella, G. Di Pirro, A. Drago, M. Serio (INFN/LNF)

POW003 **The Renovation of the ISOLDE Instrumentation**
G.J. Focker, S. Bart Pedersen, E. Bravin (CERN)

POW004 **Beam Profile Measurements by Using Wire Detectors in J-PARC**
H. Akikawa, K. Hasegawa, T. Ohkawa (JAERI) H. Hiroki, Y. Kondo, H. Sakaki, S. Sato, M. Tanaka, A. Ueno, H. Yoshikawa (JAERI/LINAC) Z. Igarashi, M. Ikegami, S. Lee, K. Nigorikawa, T. Toyama (KEK) J. Kishiro (JAERI/J-PARC)

POW005 **Linac and Transfer Line Beam Position Monitor at ELETTRA**
S. Bassanese, M. Ferianis, F. Iazzourene (ELETTRA) V. Verzilov (TRIUMF)

POW006 **First Tests of the Machine Protection System for CTF3**
D. Belohrad (CERN)

POW007 **LOCAL Feedback System to Correct Synchrotron Radiation Beam Position at SIBERIA-2 Storage Ring**
A.G. Valentinov, L. Ioudin, V.A. Rezvov, Y.L. Yupinov (RRC Kurchatov Institute) Y.V. Krylov (Russian Research Center, Kurchatov Institute)

POW008 **On-Line Observation of Electron Beam Bunches in the Large Storage Ring of Kurchatov SRC**
L. Ioudin, V. Korchuganov, V.A. Rezvov, A.G. Valentinov, Y.L. Yupinov (RRC Kurchatov Institute) Y.V. Krylov, A. Stirin (Russian Research Center, Kurchatov Institute)

POW009 **LEIR Beam Instrumentation**
L. Soby (CERN)

POW010 **A Hardware Simulation Kit for Beam Instrumentation**
A.E. Lokhovitskiy, D. Kortchaguin, M. Ludwig (CERN)

POW011 **Accuracy of the SPS Transverse Emittance Monitors**
F. Roncarolo, B. Dehning, C. Fischer, J. Koopman (CERN)

POW012 **SRAM-Based Passive Dosimeter for Accelerator Environments**
D.R. Makowski, M.K. Grecki, A.N. Napieralski, B.P. Swiercz (TUL-DMCS) B.M. Mukherjee, S. Simrock (DESY)

POW013 **Beam Position Monitor for the J-PARC Main Ring Synchrotron**
T. Toyama, D.A. Arakawa, Y. Hashimoto, S. Lee, T. Miura, H. Nakagawa, J.-I. Odagiri (KEK) N. Hayashi, R. Toyokawa (JAERI/J-PARC)

POW014 **On-Line Beam Energy and Energy Spread Monitor at the VEPP-4M Collider**
N.Yu. Muchnoi (BINP SB RAS)

POW015 **First Steps towards Integration of Photon Beam Position Monitor Signals in the SLS Fast Orbit Feedback**
T. Schilcher, M. Boge, B. Keil, R. Kramert, J. Krempasky, P. Pollet, V. Schlott (PSI)

POW016 **Mirror Distortion Correction and Absolute Calibration of SR Interferometer**
J.W. Flanagan, S. Hiramatsu, H. Ikeda, T. Mitsuhashi (KEK)

POW017 **Ultrasound Instrumentation for Beam Diagnostics and Accelerating Structures Control**
V.I. Moiseev (RRC Kurchatov Institute)

POW018 **Investigation of Photo Neutralization Efficiency of High Intensity H^- Beam with Nd:YAG Laser for J-PARC**
T. Tomisawa (JAERI/LINAC)

POW019 **The LHC Beam Loss Monitoring System's Real-Time Data Analysis Card.**
C. Zamantzas, B. Dehning, E. Effinger, G. Ferioli, G. Guaglio, R. Leitner (CERN)

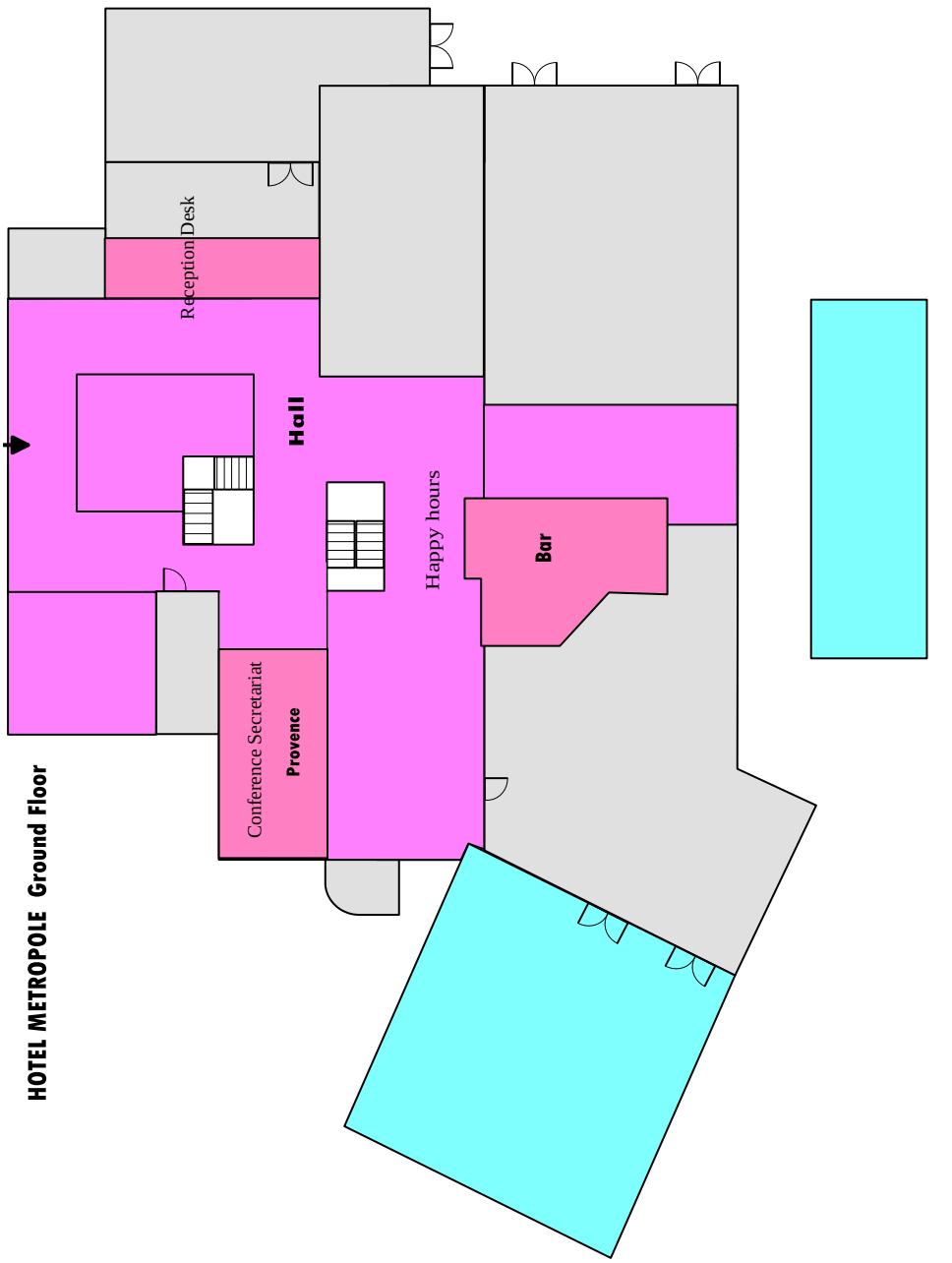
POW020 **Digital Camera Application in Transport Line Diagnostics at the NSRRC**
C.H. Kuo, K.-T. Hsu, K.H. Hu (NSRRC)

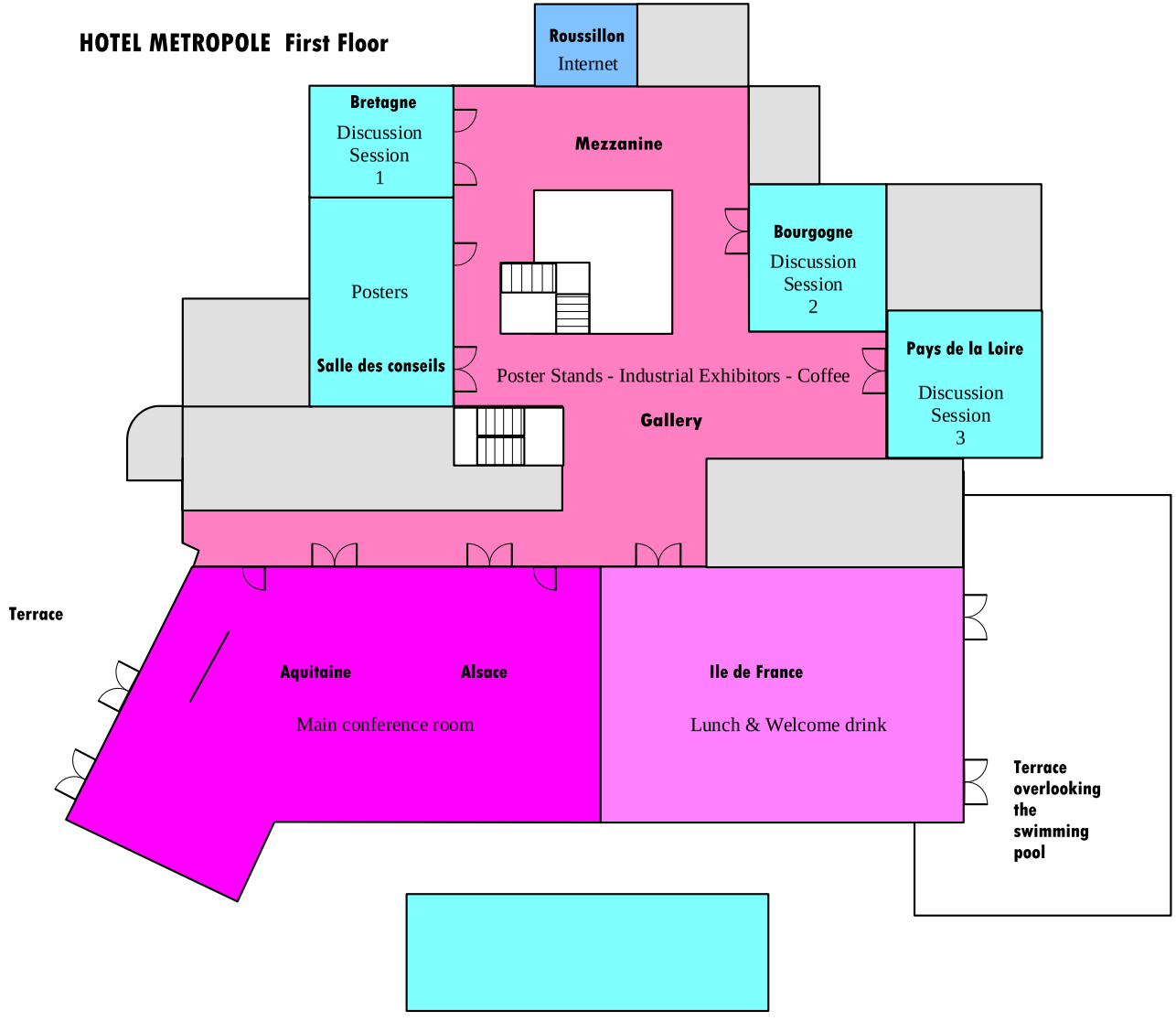
POW021 **Resonant Stripline BPM for Ultra Low Current Measurements**
M. Dehler (PSI)

POW022 **Turn-by-Turn and Bunch-by-Bunch Diagnostics at NSRRC**
K.-T. Hsu, J. Chen, K.H. Hu, C.H. Kuo, C.-J. Wang (NSRRC)

POW023 **BPM System and Its Development for the Storage Ring of NSRRC**
K.-T. Hsu, J. Chen, K.H. Hu, C.H. Kuo, C.-J. Wang (NSRRC)

POW024 **Diagnostics for the 1.5 GeV Transport Line at the NSRRC**
K.H. Hu, J. Chen, K.-T. Hsu, C.H. Kuo, C.-J. Wang (NSRRC)


HOTEL METROPOLE Ground Floor
Reception Desk
Hall
Happy hours
Bar
Conference Secretariat
Provence


HOTEL METROPOLE First Floor
Roussillon
Internet
Bretagne
Discussion
Session
1
Mezzanine
Posters
Salle des conseils
Bourgogne
Discussion
Session
2
Pays de la Loire
Discussion
Session
3
Poster Stands - Industrial Exhibitors - Coffee
Gallery
Terrace
Aquitaine
Alsace
Main conference room
Ile de France
Lunch & Welcome drink
Terrace overlooking the swimming pool

ITMM — Monday Morning Invited Talk

Instrumentation in Small Low Energy Machines

U. Raich (CERN)

Low energy particle accelerators are used either as injector for higher energy machines or as dedicated machines for special purposes. These may by industrial, medical or prototype machines for testing new accelerating schemes. Low energy beams open measurement possibilities not available at higher energies due to the low magnetic rigidity of the particles and due their small penetration depth. On the other hand these beams also represent special challenges due to their high energy deposition in matter, space charge problems etc. which are not seen at higher energies. Measurement principles typical for small accelerators will be presented and explained with the help of example implementations.

Commissioning of SNS Beam Instrumentation*

T.J. Shea (ORNL/SNS)

The Spallation Neutron Source (SNS) is an accelerator-based neutron facility under construction in Oak Ridge, Tennessee. The project is a collaboration of 6 partner laboratories: Lawrence Berkeley (LBNL), Los Alamos (LANL), Argonne (ANL), Brookhaven (BNL), Jefferson (Jlab), and Oak Ridge (ORNL). To achieve the performance goals, the SNS accelerator facility must deliver over one megawatt of beam power to a mercury target. This talk will describe the beam diagnostic instrumentation required to commission and operate such a facility at high beam power. Status of the SNS construction and recent beam commissioning results will also be presented.

Observation of Beam Halo Image by a Coronagraph

T. Mitsuhashi (KEK)

We developed a coronagraph to observe the image of the beam halo, or tail, surrounding the beam. The concept of the coronagraph was invented by B.F. Lyott for the observation of sun coronas. In the coronagraph, an opaque disk is placed in the image plane of an objective lens to block the glare of the sun image. The diffracted light is eliminated by re-diffraction optics with a Lyott stop. We used this coronagraph to observe the beam halo. A great advantage in using the coronagraph is that we can observe the two-dimensional spatial distribution of the beam halo via its image. The re-diffraction optics of the coronagraph is optimized for the observation of beam halo. The optical polishing of the objective lens is one of most critical points in the observation a weak halo or tail. With a very well-polished lens, we succeeded in obtaining a background-to-peak intensity ratio better than 10^{-6}. As a demonstration, we observed the beam tail at the Photon Factory storage ring. We succeeded in observing an image of the non-Gaussian tail surrounding the beam, with an intensity range down to 1/104 of the peak intensity.

Wire Method for Halos at JLAB Transfer Line

A. Freyberger (Jefferson Lab)

Large dynamic range (Peak/Noise>10^5) beam profile measurements are routinely performed in the Hall-B beamline at Jefferson Lab. These measurements are made with a 1 to 10nA electron beam current with energies between 1 to 6 GeV. The electron beam scatters off of a thin (25micron) W or Fe wire and the scattered particle/shower is detected via scintillation or Cerenkov light several meters downstream of the wire. This light is converted to an electrical pulse via photomultiplier tubes (PMT). The PMT readout and wire motion are controlled and synchronized by VME electronics. This report describes results on increasing the dynamic range by using multiple wires of varying diameters and integrating plates. Comparison of the measured beam profile with simulations will be presented as well as plans for extending this technique to microAmp beam currents.

CTMM — Monday Morning Contributed Talk

Design and Testing of the MIT-Bates Stern-Gerlach Polarimeter Cavity

P. Cameron, N. D'Imperio, A.U. Luccio, W.W. MacKay (BNL) M. Conte (INFN Genova) W.A. Franklin, E. Ihloff, T. Zwart (MIT) D.A. Goldberg (LBNL)

Historically, beam polarization measurement has been accomplished by scattering experiments, with the attendant complexity of target and detector installation and operation, and smallness and uncertainty of analyzing powers. The purpose of the present effort is to accomplish fast and accurate polarization measurement not as a scattering experiment, but rather as conventional beam instrumentation, with a resonant cavity pickup. This requires that the coupling of the beam magnetic moment to the pickup be enhanced to bring the signal above the noise floor, and that coupling of the beam charge to the pickup be diminished to reduce the dynamic range problem. We discuss details of cavity design that have been implemented to accomplish these ends. Presently, it is planned to install the cavity in the Bates Ring in early May of this year. Beyond polarimetry, successful polarization measurement will verify the underlying principles, and by pickup/kicker reciprocity will open the serious consideration of the possibility of polarizing the full-energy LHC proton beams in-situ.

Micro-strip Metal Foil Detectors for the Beam Profile Monitoring

V.M. Pugatch, V.E. Aushev, O.A. Fedorovitch, A.V. Mikhailenko, S.V. Prystupa, Y.V. Pylypchenko (NASU/INR) C. Bauer, M.T. Schmelling (MPI-K) M. Braeuer, H. Franz, K. Wittenburg (DESY) V.G. Karengin, V.L. Perevertailo (NASU/IM)

The Micro-strip Metal Foil Detectors (MMFD) designed and used for the Beam Profile Monitoring (BPM) are discussed. Fast particles hitting a metal strip initiate Secondary Electron Emission (SEE) which occurs at 10^{-50} nm surface layers of a strip. The SEE yield is measured by a sensitive Charge Integrator with built-in current-to-frequency converter (1 Hz per 1 fA). The MMFD (deposited onto the 20 mum thick Si-wafer) with 32 Al strips (10 mum wide, 32 mum pitch) has been used for the BPM of the 32 MeV alpha-particle beam at the MPIfK (Heidelberg) Tandem generator for Single-Event-Upset studies of the BEETLE micro-chip. Similar MMFD (0.5 mum thick Ni-strips) with totally removed Si-wafer (by plasma-chemistry, at the working area of 8 x 10 mm^2) has been applied for the on-line X-ray BPM at the HASYLAB (DESY). The number of photons (11.3 GeV, mean X-ray energy 18 keV) producing out of a strip a single SEE was evaluated as (1.5 ±0.5)* 10^4. MMFD has demonstrated stable operation under the X-ray flux of 4.5 *10^{14} photons/second/mm^2. The results obtained for the MMFD produced by different technologies as well as their dependence upon the strip material are presented.

POM — Monday Poster Session

POM001

Detailled Experience of Synchrotron Light Extraction System with Slotted Mirror at the ESRF

B.K. Scheidt (ESRF)

A slotted, non-cooled, mirror was implemented at the ESRF for the extraction of synchrotron light to feed an Infra-Red spectrometer and microscope in a newly installed laboratory. The slot lets the energetic part of the synchrotron light go through and is kept vertically centered on the heart of the X-ray beam in a slow feed-back loop. This paper reports in detail the wealth of experience obtained on : 1) The quality and stability of an imaged light spot that demonstrates the entire system being free of wave-front distortion and vibrations. 2) Elastic deformation study on the Aluminium mirror upto 4.5W/mm2. 3) Mapping of edge radiation, produced by the interference of light emitted by the edges of up- and down-stream dipoles. 4) UV induced mirror blackening with dependence on the choice of the mirror material.

POM002

A Complete Dipole Light Monitor System for the ESRF Injector

B.K. Scheidt (ESRF)

The visible part of the synchrotron radiation produced in a total of 9 dipoles of the ESRF injector is now extracted to obtain simultaneously images of the electron beam profile at these locations. This at each injection and in a non-distructive way to the electron beam. The first transferline (180MeV) contains three monitors on the 2 dipoles (0.387T) and the injection septum magnet. The Booster accelerator has one monitor that allows the profile measurement at any moment in its 50ms acceleration cycle by timing the internal camera shutter. In order to equipe each of the 5 dipoles (0.9T) in the 2nd transferline (6GeV) with such a monitor, a compact and low-cost light extraction system was added at the end of the (non-modified) dipole vacuum chamber. All systems use simple commercial CCD cameras, sufficient light is produced at beamcurrents a factor 20-100 below nominal values. The video images are displayed to the control room operator at each injection, giving a quick & comprehensive view of injection conditions all along the injector path. This paper describes the light emission characteristics, the mechanics and optics of light extraction and collection, and the results obtained since mid-2004.

POM003

Advances Towards the Measurement and Control of LHC Tune, Chromaticity, and Coupling

P. Cameron, J. Cupolo, C. Degen, A. Dellapenna, L.T. Hoff, Y. Luo, J. Mead, C. Schultheiss, R. Sikora (BNL) M. Gasior, R.O. Jones, H. Schmickler (CERN) C.-Y. Tan (Fermilab)

Requirements for tune and chromaticity control in most superconducting hadron machines, and in particular the LHC, are stringent. In order to reach nominal operation, the LHC will almost certainly require feedback on both tune and chromaticity. Experience at RHIC has also shown that coupling control is crucial to successful tune feedback. A prototype baseband PLL tune measurement system, intended for the LHC,

has recently been brought into operation at RHIC. We report on the performance of that system and compare it with the extensive accumulation of data from the RHIC 245MHz PLL. In addition the implementation of coupling and chromaticity feedback using PLL systems will be discussed.

A First Look at Beam Diagnostics for the RHIC eCooling Project

P. Cameron, I. Ben-Zvi, M. Blaskiewicz, J.M. Brennan, R. Connolly, W.C. Dawson, C. Degen, A. Dellapenna, D.M. Gassner, D. Kayran, J. Kewisch, V. Litvinenko, B. Oerter, T. Russo, M. Wilinski, V. Yakimenko (BNL)

High energy electron cooling is essential to meet the luminosity specification for RHIC II. In preparation for electron cooling, an Energy Recovery Linac (ERL) test facility is presently under construction at BNL. The goals of the test facility are first to demonstrate stable intense CW electron beam with parameters typical for the RHIC e-cooling project (and potentially for eRHIC), second to test novel elements of the ERL (high current CW photo-cathode, superconducting RF cavity with HOM dampers, and feedback systems), and finally to test lattice dependence of stability criteria. A preliminary description of Diagnostics for the ERL was presented at an earlier workshop[1]. In this paper we report on recent developments in Diagnostics for the ERL. In addition, we present plans for extension of the ERL Diagnostics into the Cooler, as well as plans for cooling-specific Diagnostics not required in the test facility.

[1] P. Cameron et al, "Beam Diagnostics for the BNL Energy Recovery Linac Test Facility", BIW 2004, Knoxville.

The Effects and Possible Origins of Mains Ripple in the Vicinity of the Betatron Spectrum

P. Cameron (BNL) M. Gasior, R.O. Jones (CERN) C.-Y. Tan (Fermilab)

With the advent of significant improvement in the sensitivity of observation of the betatron spectrum[1], the appearance of spectral lines at harmonics of the mains power frequency has been observed in the PS and SPS at CERN, the Tevatron at FNAL, and RHIC at BNL. These lines are potentially problematic for accurate tune tracking and the implementation of tune feedback. We discuss the possible origins of these lines, and present data to support our discussion.

[1] M. Gasior, these proceedings.

A Calorimeter for Absolute Current Calibrations of 1microAmp CW Electron Beam-CW Electron Beam

A. Freyberger, M.E. Bevins, A.R. Day, P. Degtiarenko, A. Saha (Jefferson Lab) R. Gilman (Rutgers University, The State University of New Jersey)

The future experimental program at Jefferson Lab requires an absolute current calibration of a 1 microAmp CW electron beam to better than 1% accuracy. This paper presents the mechanical and electrical design of a Tungsten calorimeter that is being constructed to provide an accurate measurement of the deposited energy. The energy is determined by measuring the change in temperature after beam exposure. Knowledge of

the beam energy then yields number of electrons stopped by the calorimeter during the exposure. Simulations show that the energy losses due to electromagnetic and hadronic losses are the dominant uncertainty. Details of the precision thermometry and calibration, mechanical design, thermal simulations and GEANT simulations will be presented.

POM007

Preliminary Tests of a New Kind of BPM System for SOLEIL

J.-C. Denard, L. Cassinari, F. Dohou, N. Hubert, N.L. Leclercq, D. Pedeau (SOLEIL)

SOLEIL is a third generation light source in construction near Paris. Its small emittance requires resolution and stability improvements of existing BPM systems for stabilizing the beam position down to sub-micron levels up to 100 Hz with closed orbit feedback systems. The same BPM system has also to perform turn-by-turn acquisitions at high rate (846 kHz) with a resolution of a few microns for machine physics studies. SOLEIL entrusted the design of a new generation of BPM system to a young Slovenian company, Instrumentation Technologies. It already had a strong experience in BPM system design at the Swiss Light Source and other labs. SOLEIL defined technical specifications that seemed attainable and proposed a way of improving beam stability while the beam current decreases due to the finite beam life time. Instrumentation Technologies designed the BPM Electronics called Libera. This paper presents the preliminary tests performed in the laboratory with signal generators simulating the electron beam as well as those done with real beam at ESRF in order to evaluate the SOLEIL Libera.
Synchrotron Soleil Saint-Aubin; BP 48 91192 Gif-sur-Yvette Cedex

POM008

Application of the Beam Profile Monitor for VEPP-4M Tuning

O.I. Meshkov, V. F. Gurko, A.D. Khilchenko, N.Yu. Muchnoi, A.N. Selivanov, A. N. Zhuravlev, P.V. Zubarev (BINP SB RAS)

The transverse beam profile monitor based on the Hamamatsu multi-anode photomultiplier with 16 anode strips is used at VEPP-4M collider [1]. The monitor is applied for studying of turn-to-turn dynamics of the transverse beam profile. The monitor provides regular measurement of synchrotron an and betaron tunes of electron beam as well. The application of the device for tuning of the collider is described.
1. O. I. Meshkov e. a. VEPP-4M optical beam profile monitor with one-turn temporal resolution. Proceedings of 9th European Particle Accelerator Conference, Lucerne, 2004, pp. 2733-2735.

POM009

ROSALI: An Application Allowing Online/Offline Algorithm Implementation to Assess Beam Instrumentation Performance.

M. Moles (CERN)

A software tool called "Rapid Online Software Algorithm Implementation (ROSALI)" has been developed at CERN. This application is intended to provide instrumentation experts and accelerator physicists with a tool, which allows monitoring and storage of beam measurements and rapid algorithm implementation via specialized actions on the embedded Mathematica kernel. The users are able to build or modify online a sequence of actions

implementing their algorithms. Those sequences can subscribe to ongoing measurements from several beam instruments or retrieve data from previous recordings, merge these measurements to obtain correlation diagrams or perform dedicated calculations. This document presents the current state and foreseen extensions of this application. The application has been tested last year on the SPS and we will be used this year on the new LEIR machine at CERN.

A Novel Device for Non-Intersecting Bunch Shape Measurement at the High Current GSI-LINAC

P. Forck, C. Dorn (GSI)

For bunch length determination in the range of 0.3 to 5 ns at the GSI heavy ion LINAC a novel, non-intercepting device has been realized. It uses the time spectrum of secondary electrons created by atomic collisions between beam ions and residual gas molecules. These electrons are accelerated by an electric field of 400 V/mm toward an electro-static energy analyzer, which is used to restrict the effective source region. Then the electrons are deflected by an rf-resonator running in phase with the acceleration frequency (36 or 108 MHz) to transform the time spectrum into spatial separation. The detection is done with a multi-channel plate equipped with a phosphor screen and observed by a CCD camera. The achieved time resolution is about 60 ps, corresponding to 2 degree of 108 MHz. The general layout of the device and first results will be presented.

Faraday Cup Designs for the Diamond Injector

A.F.D. Morgan (Diamond)

This paper details the work done on the design of the Faraday cups for the Diamond injector. Faraday cups are a basic charge capture device which can be used as reference points for current measurement calibration. Diamond has Faraday cups in positions covering the complete energy range of the injector from the electron gun to the booster synchrotron extraction. Specifically there are cups at 90keV, 4MeV, 100MeV and 3GeV. An initial design decision was made to make the designs passive to increase reliability and reduce complexity. The 90keV and 4MeV cups were modified from an existing design using analytical formulae and MathCAD, while the high energy 100MeV and 3GeV designs were done using the EGSnrc Monte Carlo code and MatLAB. The EGSnrc led designs achieved a theoretical electron capture of around 99%, allowing them to be used with reasonable certainty as calibration references. Due to the modest 5Hz repetition rate, power loading of the structures is minimal and active cooling is not required for any of the cups. Ablation is also not thought to be a significant problem for these designs.

Design Alternatives for Beam Halo Monitors in High Intensity Accelerators

C.P. Welsch, H.-H. Braun, E. Bravin, R. Corsini, T. Lefevre, D. Schulte, F. Tecker (CERN)

In future high intensity, high energy accelerators it must be ensured that particle losses are minimized as activation of the vacuum chambers or other components

makes maintenance and upgrade work time consuming and costly. It is imperative to have a clear understanding of the mechanisms that can lead to halo formation and to have the possibility to test available theoretical models with an adequate experimental setup. Optical transition radiation (OTR) provides an interesting opportunity for almost non-destructive, linear real-time measurements of the transverse beam profile with a resolution which has been so far at best in the some μm range. However, the dynamic range of standard OTR systems is typically limited and special actions needs to be taken to guarantee the required sensitivity. In this contribution, possible techniques for halo measurements based on OTR are presented and results from simulations are compared with first measurements in our optical lab. Later beam tests are foreseen to be carried out in CTF3.

POM013

Scintillating Screens Study for LEIR/LHC Heavy Ion Beams

T. Lefevre, C.B. Bal, E. Bravin, R. Scrivens, M. Taborelli (CERN)

It has been observed on different machines that ceramic scintillating screens (Al2O3:CrO2 Chromox) are quickly damaged by low energy ion beams. These particles are completely stopped on the surface of the screens, inducing both a high local temperature increase and the charging up of the material. A study has been initiated to understand the limiting factors and the damage mechanisms. Several materials, Zirconium oxide, Boron nitride and Alumina, have been tested at CERN on LINAC3 with 4.2MeV/u lead ions. Alumina is used as the reference material as it is extensively used in beam imaging systems. Boron nitride has better thermal properties than Alumina and Zirconium oxide has the advantage of increased electrical conductivity when heated. This contribution presents the results of the beam tests, including the post-mortem analysis of the screens and the prospects for further measurements. The strategy for the choice of the screens for the Low Energy Ion Ring (LEIR), currently under construction at CERN, is also explained.

POM014

Time Resolved Energy Measurement at CTF3

T. Lefevre, H.-H. Braun, E. Bravin, N.C. Chritin, R. Corsini, C.D. Dutriat, F. Tecker, C.P. Welsch (CERN)

In CTF3 (CLIC Test Facility 3) an electrons pulse of 3.5A and 1.5μs is accelerated using fully loaded 3GHz accelerating structures. The strong coupling between the beam and the cavities induces transient effects such that the head of the pulse is accelerated twice as much than the rest of the pulse. The resulting energy spectrum shows a strong time dependency with higher energies in the first 10^{-50} nanoseconds of the pulse, followed by 1.35micros of steady behaviour. In order to measure the time evolution of the beam energy and energy spread a system with at least 50MHz bandwidth is required. Three different detectors have been installed and tested so far on the three existing spectrometer lines of the machine: a secondary emission wire grid, a segmented beam dump and a segmented photomultiplier observing OTR emissions. This contribution describes the three devices and gives a comparison of the relative performances.

Single Photon Detector Tests for the LHC Synchrotron Light Diagnostics

S.C. Hutchins (CERN) G.S. Buller, K.J. Gordon, S. Pellegrini (Heriot-Watt) S. Cova, M. Ghioni, A. Gulinatti, I. Labanca, I. Rech (Politecnico/Milano)

A synchrotron light detector using a Single-Photon Avalanche Detector (SPAD) is planned for the LHC longitudinal diagnostics monitor, an application which requires high count rate, low noise and good time resolution. SPAD detectors have been developed at Milan Polytechnic with active quenching circuits. Initial tests of these detectors and currently available commercial time-to-digital data acquisition equipment were made at the ESRF. We present the results of those tests, an estimation of the performance that can be expected for the LHC case and an analysis of the difficulties, constraints and potential of this type of detector.

Measurement of Longitudinal Phase Space at the Photo Injector Test Facility at DESY in Zeuthen (PITZ)

J.R. Roensch, J.W. Baehr, M. Krasilnikov, F. Stephan (DESY Zeuthen) D. Lipka, R. Richter (BESSY GmbH)

PITZ generates electron bunches of about 5 MeV. To optimize the RF-gun and to fulfill the requirements of the bunch compressor for an efficient compression the longitudinal phase space behind the gun has to be studied. A measurement of the longitudinal phase space comprises a correlated measurement of momentum and temporal distribution. The momentum distribution is measured by deflecting the electron bunch using a spectrometer magnet. A subsequent Cherenkov radiator (silica aerogel) * transforms the electron bunch into a light pulse with equal temporal and spatial distribution, which is imaged onto a streak camera by an optical transmission line ** to measure the longitudinal distribution. The longitudinal phase space was measured for different temporal laser distributions, charges and phases between RF field and laser. Physical effects in the dipole, optical transmission line and streak camera, which influence the longitudinal phase space measurements are taken into account. The measurement results were compared with simulations and with directly measured momentum and temporal distributions. The measured longitudinal emittance agree with the simulated one for typical parameters.
* Silica aerogel radiators for bunch length measurements; J. Baehr et al; NIM A 538 (2005) 597-607 ** Optical transmission line for streak camera measurement at PITZ; J. Baehr et al; Dipac Mainz 2003

Real-Time, Single-Shot Temporal Measurements of Short Electron Bunches and Terahertz CSR and FEL Pulses

G. Berden, B. Redlich, A.F.G. Van der Meer (FOM Rijnhuizen) W.A. Gillespie (University of Dundee) S.P. Jamison (Strathclyde University) A. MacLeod (UAD)

Electro-optic detection of the Coulomb field of electron bunches is a promising technique for single-shot measurements of the bunch length and shape in the sub-picosecond time domain. This technique has been applied to the measurement of 50 MeV electron bunches in the FELIX free electron laser, showing the longitudinal profile of single bunches of around 650 fs FWHM [Phys. Rev. Lett. 93, 114802 (2004)]. The method is non-destructive and real-time, and therefore ideal for online monitoring of the longitudinal shape of single

electron bunches. At FELIX we have used it for real-time optimization of sub-picosecond electron bunches. Electro-optic detection has also been used to measure the electric field profiles of far-infrared (or terahertz) optical pulses generated by the relativistic electrons. We have characterised the far-infrared output of the free electron laser, and more recently, we have measured the temporal profile of terahertz optical pulses generated at one of the bending magnets.

POM018

OTR Based Monitor of Injection Beam for Top-Up Operation of the SPring-8

S. Takano, M. Masaki, T. Masuda, A. Yamashita (JASRI/SPring-8)

We have developed an OTR based monitor of injection beam at the SPring-8. The monitor has been installed near the injection point of the storage ring downstream of the beam transport line from the booster synchrotron. A screen made of an aluminum coated polyimide film is used as a nondestructive OTR radiator. A CCD camera with an electric shutter is used to observe the OTR image of the injection beam. The electric shutter is synchronized with the external injection trigger signals. At every injection, the image signal from the CCD camera is captured and analyzed by a personal computer, and the position, size and intensity of the injection beam are recorded by the common database of the SPring-8 control system. The OTR injection beam monitor provides real time and continuous diagnostic tool useful for the top-up operation of the SPring-8 storage ring.

POM019

Optimization of Beam Injection into the First Accelerating Module at TTF2 with Cavity Dipole Mode Signals

N. Baboi, G. Kreps, M.W. Wendt (DESY) J.C. Frisch, M.C. Ross (SLAC) O. Napoly, R. Paparella (CEA/DSM/DAPNIA)

The Tesla Test Facility - Phase 2 (TTF2) will be partially a user facility for intense VUV-FEL light*. The facility is densely equipped with diagnostics, essential in obtaining the necessary beam parameters, in particular the low emittance. However there is no dedicated component for alignment of the beam in the accelerating modules, each containing eight superconducting cavities. Large beam offsets can lead to an increase of the beam emittance. The centering of the beam in these modules is therefore important, mostly at the low energy end. A misalignment of the first TTF module with respect to the gun axis has already been observed using cavity dipole modes**. This paper presents the experimental results of the optimization of the beam injection into the first module, based on the monitoring of dipole modes through the couplers installed for wakefield damping. For this we use a spectrum analyzer, as well as a time-domain waveform recording setup***. By scanning the beam position and tilt with two pairs of steerers, we can find the trajectory which minimizes the wakefield effects on the beam. The impact of the beam steering in the module on the beam emittance will be discussed.

* B. Faatz, Proc. FEL 2002, Argonne, 2002 ** N. Baboi et al. Proc. LINAC04, Luebeck, 2004 *** M. Ross et al., PAC05, Knoxville, 2005

New Tune Measurement System for the ESRF Booster

J.M. Koch, J.M. Meyer, E. Plouviez (ESRF)

The injection of the electrons in the ESRF storage ring is performed at full energy, i.e. 6GeV. A linear accelerator provides the booster with a beam at energy of 200MeV. During the accelerating cycle of the booster, from 200MeV to 6GeV, the tune of the electron beam varies according to the no-proportionality of the magnetic field in the quadrupoles magnets as compared with the dipole one. This is mainly due to the harmonic content of the current in the magnets which differs depending to the load of these systems resonating at 10Hz and their saturation level. In order to measure the fractional part of the tunes all along the accelerating cycle (50ms) it is necessary to acquire the beam position at a rate of at least one sample per turn, each microsecond. A set of 48 tune values can be extracted from this record with accuracy better than 10^{-3}. The principle and the architecture of the system as well as the results obtained will be presented.

Measurements of Transverse Emittance at the TTF VUV-FEL

K. Honkavaara, F. Loehl (Uni HH) Y. Kim (DESY)

The TESLA Test Facility (TTF) Linac at DESY has been extended to drive a new Free Electron Laser facility VUV-FEL. The 250 m long electron linac has been commissioned in 2004 and in the begin of 2005. Characterization of the electron beam is an essential part of the commissioning. The transverse emittance has been measured at a beam energy of 125 MeV with the four-screen method using optical transition radiation (OTR). We describe the experimental set-up and discuss the data-analysis methods. Experimental results as well as simulations are presented.

Upgrade of the Global Feedback of the ESRF Storage Ring

E. Plouviez, J.M. Koch, J.L. Pons, F. Uberto (ESRF)

We have recently upgraded the fast orbit correction system of the ESRF storage ring. We are now operating a global feedback system using 32 BPMs and 24 correctors in the horiozontal and vertical planes to compute and apply corrections at a rate of 4.4 KHz from .1 to 150Hz. This new system has greatly improved the damping of the orbit distortion up to 100Hz. It also provides new diagnostics tools thanks to its new data logging capabilities. We report the performance of this new system and some of its applications as a diagnostic.

Recent Diagnostic Improvements for the PSI Proton Accelerator

P.-A. Duperrex, U.P. Frei, M. U. Müller, L. Rezzonico (PSI)

A new remote control system is being implemented for the numerous wire scanner based profile monitors of the proton accelerator. The structure of the system, improvements compared to the old system and profile measurements are reported here. Also, more detailled signal analysis (e.g. 50 Hz perturbations) can be performed and example of such analysis will be presented. A new current monitor has also been installed as replacement of an older

system. It is basically a re-entrant cavity tuned at the 2nd RF harmonic (101 MHz). The excited TM01 mode provides a direct measurement of the beam intensity. Characteristics, improvements and performances of the system will be presented.

POM024

Longitudinal Emittance Measurements in the Transfer Channel to the GSI SIS18

S.G. Richter, W. Barth, L. Dahl, L. Groening (GSI)

The upgrade of the GSI UNILAC as a heavy ion high current injector for the synchrotron SIS18 is a strong requirement for the planned FAIR project at GSI. For the matching of highly space charge dominated beams to SIS18, the determination of the full 6d-emittance is essential. For this reason the transfer channel is equipped with three transverse slit-grid-emittance measurement devices, a bunch structure monitor and a newly installed longitudinal emittance measurement device. Additionally the well established phase probe system is in use to provide a non destructive monitoring of the longitudinal matching. This contribution comprises of a description of the longitudinal emittance measurement set-up consisting of a dispersive beam transport section, a vertical chopper and a luminescent screen to determine the energy- and phase spread simultaneously. Additionally a frame grabber is in use to measure the longitudinal emittance more precisely. First results of measurements of the bunch structure as well as of the longitudinal emittance will be presented. Multi particle simulations of the 6d matched beam transport to the synchrotron will also be included.

POM025

The Beam Diagnostics for SESAME

S. Varnasseri (SESAME)

SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) is an Independent Intergovernmental Organization developed and officially established under the auspices of UNESCO. SESAME will become a major international research center in the Middle East, located in Allan, Jordan. The machine design is based on a 2.5 GeV 3rd generation Light Source with an emittance of 26 nm.rad and 12 straights for insertion devices. The conceptual design of the accelerator complex has been frozen and the engineering design is started. The completion of the accelerators complex construction is scheduled for the end of 2009. In the following an overview of the electron beam diagnostic system is presented, with special emphasis on the beam position monitoring system and the synchrotron light monitor.

POM026

An X-ray Pinhole Camera System for Diamond

C.A. Thomas, G. Rehm (Diamond)

In this paper we present the X-ray pinhole camera designed for the measurement of the size, the emittance and energy spread of the electron beam at Diamond. The system has been kept as simple as possible. The pinhole and the imaging system are in air, and the X-ray beam from the bending magnet is filtered out through an Al window. The beam is imaged using a fluorescent screen and an IEEE 1394 camera. We describe the system from the problems encountered for the extraction of the X-ray beam, to the optimisation of the imaging system. Taking into account the results of preliminary tests, we estimate the expected performance of the system.

Operational Experience with Beam Alignment and Monitoring Using Non-Destructive Beam Position Monitors in the Cyclotron Beamlines at iThemba LABS

J.L. Conradie, A.H. Botha, J.L.G. Delsink, D.T. Fourie, Z. Kormany, P.F. Rohwer, M. Sakildien (IThemba Labs) J. Dietrich, I. Mohos (FZJ/IKP)

At iThemba LABS proton beams, accelerated in a K=200 separated-sector cyclotron with a K=8 solid-pole injector cyclotron, are utilized for the production of radioisotopes and particle radiotherapy. Beams of heavy ions and polarized protons, pre-accelerated in a second injector cyclotron, are available for nuclear physics research. Beam position monitors have been developed for non-destructive alignment and continuous display of the beam position in the beam lines for the more intense beams used for therapy and the production of radioisotopes in cooperation* with Forschungszentrum Jülich. The monitors consist of four-section strip lines. Narrow-band super-heterodyne RF electronic equipment with automatic frequency and gain control measures the signals at the selected harmonic. A control module sequentially processes the signals and delivers calculated horizontal and vertical beam position data via a serial network to the computer control system. Eleven monitors have been installed in the transfer beam line between cyclotrons and in the high-energy beam lines. Operational experience with alignment and monitoring of the beam position will be discussed.
* Supported by BMBF and NRF, project-code 39.1.B0A.2.B

Performance Verification of the Diamond EBPM Electronics

G. Rehm, M.G. Abbott (Diamond)

The Electron Beam Position Monitor electronics for Diamond are a newly developed product. As such, extensive testing as part of the acceptance tests was carried out. These tests included measurement of the resolution, beam current dependence, fill pattern dependence, temperature dependence and long term reproducibility in the lab. A setup of signal generators was chosen to simulate the signals from button pickups as realistically as possible. Additionally, tests have been carried out with "real beam" signals at the SRS in Daresbury. Solutions for problems identified during these tests have been developed and their suitability is demonstrated.

High Dynamic Magnetic Beam Current Measurements by Means of Optimised Magneto-Resistance (MR) Sensor Engineering

M. Hape (U. Kassel)

The GSI-FAIR project (facility for antiprotons and ion research) will comprehend DC currents up to around 5 A in the SIS 100 synchrotron and after bunch compression down to 50 ns pulse length the peak currents will reach up to 100 A. To meet these higher demands of beam current measurements new sensor techniques are foreseen. The measurement device itself will be designed in form of a clip-on ampere-meter. The air gap of the flux concentrator is assumed to be around 5 mm and thus, the estimated maximum field therein is around 30 mT for a beam current of 100 A peak. The resolution of this device is aimed to be 1 mA in beam current, corresponding to a system dynamic of around 105. This high demands of beam current measurement require more sophisticated sensor types than just using a Hall probe. The characteristics of AMR (anisotropic magneto-resistance), GMR (giant

magneto-resistance) and GMI (giant magneto-impedance) sensors like hysteresis, linearity and sensitivity have been measured within the magnetic field of Helmholtz coils in a range of ± 4 mT. The applicability of these sensors will be discussed and an outlook to the further development will be presented.

POM030

Scraping and Collimation Tests in the SPS

C. Fischer, M. Facchini, JJ.G. Gras, S.C. Hutchins, R. Jung (CERN)

Scraping of the SPS beam is required during several machine studies and will be important prior to extraction towards the LHC in order to remove the beam tails and ensure clean injection conditions. Scraper mechanisms recuperated from the ISR are installed since a few years in the SPS for this purpose. In order to reduce the irradiated area along the machine and in the tunnel, a two stage collimation system is associated, with collimator blocks previously used in LEP. In the past two years various tests were performed. It was first demonstrated that with the help of the collimators, it is possible to scrape with very little contamination, by confining the losses at the collimator locations, hence without irradiating any other part of the machine. Another issue was whether or not enough time is left for ejection towards the LHC after scraping, without repopulation of the removed tails. This was investigated with the SPS rest gas profile monitor and synchrotron radiation telescope. In the paper the system is described and the results of these tests are presented and discussed.

POM031

Single Bunch Transient Detection for the Beam Phase Measurement in Superconducting Accelerators

P. Pawlik, M.K. Grecki (TUL-DMCS) S. Simrock (DESY)

During commissioning and operation of linear accelerators the beam phase must be determined with respect to the accelerating rf fields. It is desirable to perform these measurements at low beam current and with a short beam pulse duration to avoid unnecessary beam loss during start-up when the correct beam phase is not guaranteed. In the case of the European X-FEL and the International Linear Collider the requirements are to measure single bunch transients at a bunch charge of 1nC to 8nC with an accuracy of a few degrees in phase and a few percent in amplitude in presence of accelerating fields up to 35 MV/m. The concept of the transient detector for the X-FEL is based on nulling method, where the cavity probe signal is split into two branches, one delayed by a up to 100 ns and phase shifted by 180 degrees before adding the two signals. The nulled signal is amplified by 60-80 dB with an rf amplifier and the transient induced by a single bunch is detected by a schotty diode based rf vector detector to achieve the required low noise performance. The principle of rf transient detection, the electronics design and measurements at the VUV-FEL at DESY will be presented.

A Beam Position Monitor for High Power Beams with Large Transverse Dimensions

A. Freyberger, P. Degtiarenko, D.W. Dotson, V.P. Popov (Jefferson Lab)

Proper transport of the electron beam with over 0.5MW of power to the beam dump is a prerequisite for operations at Jefferson Lab. Operations has relied on imaging the beam on a beam viewer located at the entrance to the beam dump. The large beam size at the dump entrance, due to beam scattering in the experimental target, sometimes results in no observable image on the viewscreen. Chemical vapor deposited silicon carbide (CVD) material with its large thermal conductivity and high melting point is well suited for surviving the thermal effects of beam exposure with this power density. We are exploring the CVD properties and how it can be used as a robust beam position monitor. Results of some beam tests with 0.5MW beams will be presented.

Optimisation of "Shoe-box type" Beam Position Monitors Using the Finite Element Methods.

P. Kowina, W. Kaufmann, J. Schoelles (GSI)

The sensitivity and linearity of the position determination are the main goals in the optimisation of the Beam Position Monitors (BPMs) for ion synchrotrons. High position sensitivity can be achieved by the reduction of the coupling capacities and the plate-to-plate cross talks. For instance, the insertion of an additional guard ring into the gap between the active plates increases the sensitivity even by about 30% due to reduction of the cross talk. High linearity is typical for the shoe-box type BPM, however, it might be strongly influenced by discontinuities or/and imperfections of the components which are spoiling the fields homogeneity in the BPM volume. This requires a very careful design, especially in the regions close to the edges of the active plates. The BPM response has been investigated in the frequency range from 0-200MHz. It is shown that the transversal transfer impedance is frequency dependent; however, in the range up to 50MHz (typical for the BPM applications) it varies only in the order of a few percent. The displayed simulations are performed using CST Microwave Studio.

ITMA — Monday Afternoon Invited Talk

ITMA01

Beam loss-Monitor Systems for machine protection

B. Dehning (CERN)

Most beam loss monitoring systems are based on the detection of secondary shower particles which depose their energy in the accelerator equipment and finally also in the monitoring detector. To allow an efficient protection of the equipment, the likely loss locations have to be identified by tracking simulations or by using low intensity beams. If superconducting magnets are used for the beam guiding system, not only a damage protection is required but also quench preventions. The quench levels for high field magnets are several orders of magnitude below the damage levels. To keep the operational efficiency high under such circumstances, the calibration factor between the energy deposition in the coils and the energy deposition in the detectors has to be accurately known. To allow a reliable damage protection and quench prevention, the mean time between failures should be high. If in such fail save system the number of monitors is numerous, the false dump probability has to be kept low to keep a high operation efficiency. A balance has to be found between reliable protection and operational efficiency. The talk will discuss the last developments in the field using the examples from FNAL, SNS and LHC.

ITMA02

Diagnostics of Accelerator Performance under the Impact of Electron Cloud Effects

H. Fukuma (KEK)

A large number of electrons called electron clouds are observed in many accelerators. Main sources of the electron clouds are photoelectrons generated by synchrotron radiation and secondary electrons. The electron clouds produce various effects such as pressure rise, beam induced multipacting, tune shifts, coupled bunch instability, beam size blowup and so on which often limit the performance of the accelerators. Characteristics of the electron clouds are studied not only by the direct measurement of the electrons but also by the measurement of beam behavior affected by the electron clouds. Simple electrodes, retarded field analyzers, electron sweepers and strip detectors are used to measure a yield, energy distribution, spatial distribution and time development of the electron clouds. Dipole betatron oscillation caused by the electron clouds is measured by bunch-by-bunch beam position monitors and pickup electrodes connected to a spectrum analyzer. The beam size blowup is measured by interferometers, gated cameras and streak cameras. This talk reviews various diagnostics methods to study the electron clouds with a short summary of the electron cloud effects on the accelerators.

ITTM — Tuesday Morning Invited Talk

Analog Front-End Electronics in Beam Instrumentation

A. Boscolo (DEEI)

The work gives an overview of present and near future technological opportunities for the first analog conditioning and subsequent signal processing of sensor signal. The interactions between beam sensor capability, their signals characteristics and the system requirements are analyzed from different approaches as: full analog continuous, sampled time discrete, full digital time and amplitude discrete. Special attention will be given to the impact of measurement methods and new devices in circuits and instrumentation architecture design, especially from the metrological point of view. A lot of measurement methods and related systems have been developed in order to overcome technological drawbacks and to reach the best cost-performances ratio. By a system revamping, some of these still now show the capability of reaching the actual technological limits in a simpler way in many applications as: ADC, linear and non linear signal processing, ultra high speed logic, etc. These methods could be carried out by the new components in a cost effective manner. From one side these new opportunities increase the flexibility and make simple the analog design in a large number of applications with the support of powerful tools. From the other side these approaches present different performances and capabilities and are able to give different answers to the classical limitations of bandwidth, resolution, accuracy, noise, jitter, time lag, latency, offset stability, etc. but they require a more deep knowledge and ability in the system behaviour definition. Particular emphasis will be given to the new architectures and components as: new ADC, FPAA field programmable analog array, AM analog microcontroller, MSA mixed signal array, ANN analog neural network. The paper aim will be reached by some case analysis of new technology application to actual measurement techniques.

FPGA Technology in Beam Instrumentation and Related Tools

J. Serrano (CERN)

Field Programmable Gate Arrays (FPGA) have become an alternative to traditional Digital Signal Processors (DSP) in many applications. In some cases, where high throughput is the main concern, an FPGA-based system may in fact be the only solution to fulfill the requirements. In the area of particle accelerators, FPGAs are used in many contexts, ranging from digital feedback loops for power converters or RF cavities to Digital Signal Processing for beam instrumentation. These designs harness the vast amount of logic resources inside FPGA chips to deliver unprecedented performance through parallelism and pipelining. After an introduction to the internal architecture of FPGAs and the design process, including advanced issues such as floorplanning, we look at two important techniques to implement arithmetic in FPGAs: Distributed Arithmetic (DA) and the COordinate Rotation DIgital Computer (CORDIC) algorithm. The goal is not to exhaust the list of Digital Signal Processing techniques for FPGAs, but rather to illustrate ways in which FPGAs are used to maximize performance. Beam instrumentation examples are given, with a stress on tradeoffs between FPGA and DSP-based solutions.

CTTM — Tuesday Morning Contributed Talk

CTTM01

A New Trajectory Measurement System for the CERN Proton Synchrotron

J.M. Belleman (CERN)

We describe the projected new trajectory measurement system for the CERN PS, currently under design, in which the trajectory of each particle bunch is calculated on the fly from a continuous high-rate stream of digitised PU signal samples. The system will store data for a full acceleration cycle. Multiple clients will then be able to select subsets of the data for further treatment and display. Using a prototype of the projected hardware, raw PU signals have been accumulated during the 2004 run and processed off-line, validating the algorithms for beam synchronisation and calculation of trajectories for all current and known future beam types (subject to pick-up bandwidth limits) in the PS. Records of the system behaviour, as implemented by the off-line processing chain and using real pre-recorded pick-up signals, will be shown.

CTTM02

The PSI "VPC" Board - First Applications of a Common Digital Back-End for Electron and Proton Beam Instrumentation at PSI

B. Keil, P.-A. Duperrex, G. Janser, R. Kramert, P. Pollet, V. Schlott, N. Schlumpf, E. Schmid, P. Spuhler (PSI)

This report gives an overview of the design concept and applications of the VME PMC Carrier (VPC) board, a VME64x board that was developed at PSI as a common digital back-end for beam instrumentation at the PSI electron and proton accelerators. The two Xilinx Virtex2Pro FPGAs of the VPC allow the implementation of the complete digital section of a beam instrumentation system on a single chip ("SOC"), including detector front-end interface, filters, interlocks, feedback links, high-level data analysis like FFTs, and a generic control system interface. In addition to the two on-chip PowerPC processors of the FPGAs, the VPC provides a DSP, RAM, and multi-gigabit fiber optic links for distributed feedbacks and synchronisation. First applications of the VPC include digital proton beam position monitors (DBPMs) and beam profile monitors for PSI proton accelerators, the readout of several thousand detector channel waveforms for a muon decay experiment, and the integration of photon BPMs into the SLS fast orbit feedback (FOFB). In addition to a status report and first results for these applications, an outlook on possible future applications of the VPC board will be given.

DISS — Tuesday Discussion Sessions

Profile Measurements in Transfer Lines Interceptive Versus Non Interceptive Solutions

G. Rehm, R. Fiorito

Operation of Diagnostic in Machine Tunnel: Limits and Experiences

M. Ferianis, T. Shea

Increasing Exploitation of FPGAs in Beam Instrumentation

V. Schilcher, U. Raich

A discussion round will look into usage of FPGA's in the beam diagnostics environment and it would be interesting if everbody planing to take part in this event could come with a transparent or two describing how FPGAs are used in his field. Since there are several types of chips on the market it would be interesting to see what tools people are using and how they manage to switch from one manufacturer to another one. Can your FPGAs be reprogrammed on the fly? How do you debug your algorithms etc.

POT — Tuesday Poster Session

POT001

Beam Diagnostics Devices and Data Acquisition for the HICAT Facility

A. Peters, T. Hoffmann, M. Schwickert (GSI)

A set of 92 diagnostic devices for beam diagnostics in the heavy ion cancer therapy facility (HICAT) at the university hospital in Heidelberg is currently under development at GSI. For the HICAT facility that is presently under construction, all beam diagnostic devices will be fully computer controlled and will allow an automated detection of all relevant beam parameters. The HICAT raster scan method with active variation of intensity, energy and beam size requires the exact knowledge of the time resolved and spatial structure of the ion beam. An overview of the integrated devices is presented, particularly the time-of-flight method for energy measurement in the Linac is described in detail. The real-time PXI data acquisition system using Acqiris ADC modules with a sampling rate of 4 GSa/s and 1 GHz analog bandwidth, is reviewed. Additionally, the embedding of the diagnostics devices in the timing and control system of HICAT is described.

POT002

Bremstrahlung Detection and Chamber Obstruction Localisation Using Scanning Radiation Detectors

G.A. Naylor, B. Joly, D. Robinson (ESRF)

Radiation monitors consisting of scintillating plastic coupled to photomultipliers are used for diagnostic purposes. By scanning such a detector or a radiation scatterer, two applications are demonstrated: i) Monitoring of vacuum chamber conditioning by monitoring gas Bremstrahlung from residual gas. ii) Localisation of beam interception (beam losses) by longitudinal scanning of a radiation detector. The measurement of gas pressure inside long, small cross section, vacuum vessels is difficult due to the distance between the centre of the vacuum vessel and vacuum gauges (leading to a low vacuum conductance). The narrow beam of gamma Bremstrahlung radiation is intercepted by scanning tungsten blades in the beam line front-end allowing a radiation shower to be detected outside the vacuum vessel proportional to the gas pressure in the corresponding storage ring straight section. A second detector mounted on rails can be moved over a length of 6.5m parallel to the ESRF storage ring so as to localise regions of beam loss. The location of a scraper and narrow chamber entry and exit points are clearly resolved.

POT003

The Instrumentation of the TI8 SPS to LHC Transfer Line

L.K. Jensen (CERN)

The new TI8 transfer-line between the SPS and the future LHC was commisioned during two long machine development sessions in autumn 2004. This paper will present the beam instrumentation linked to the extraction region and along the line from the design and installation up to the tests with beam. Exact copies of these systems will be used for the TI2 transfer-line to be commisioned with beam in 2007.

Improving the Reliability of IPMs

T. Giacomini, P. Forck (GSI) D.A. Liakin, V. Skachkov (ITEP)

IPMs measure in a non-destructive way the profile of ion beams independent whether the beam is bunched or not. Our application is the heavy ion synchrotron SIS, which can accelerate ions with a large variety of different masses and charges. The IPM is used to obtain information about the beam matching, the electron cooling and to support for any kind of machine experiments. To ensure reliable function and to increase the data accuracy we executed some important mechanical improvements. The resistive e-field plates were replaced by discrete electrodes. We designed a new MCP-Phosphor-screen assembly of rectangular shape and large active area and in addition a module with a filament mounted in meander shape to monitor the degradation of the MCPs. The whole device was planned with respect of high field uniformity and small mechanical dimensions at a large clearance for the beam.

Determination of Beam Charge Using Stripline Signals at the RF Frequency by Fast Signal Processing in a FPGA

G.A. Naylor, B. Joly (ESRF)

Traditional methods of measuring beam charge requires integration of a signal from a fast current transformer. Ultimately the integral of a transformer signal is zero, practical measurements are achieved by taking a finite integration, which leads to some error. In the method proposed here the signal at the carrier frequency (RF frequency) is sampled (from a stripline) and demodulated in an FPGA to determine the total charge. By time multiplexing the stripline signals from different parts of the accelerator complex, cross calibration can be achieved.

Current Status of the Advanced Residual Gas Monitor for Heavy Ion Synchrotron Applications

D.A. Liakin, S.V. Barabin, O. Sergeeva, V. Skachkov (ITEP) P. Forck, T. Giacomini (GSI) A. Paal (MSL) Vic. Skachkov, A.A. Vetrov (MSU)

The challenge and complexity of the advanced RGM requires very careful design of each structural component of the monitor and special attention to match the properties of different subsystems. In the present paper the status of the high performance readout electronics is discussed. Single optical decoupled profile measurement channel (one of 100) with 14 bit resolution and 10 MHz bandwidth was tested and step-by-step improved. Special attention had been paid to the noise cancellation and digital data processing algorithms optimization. Another important point is a proper electromagnetic guiding system design. As it is shown, high field homogeneity, which is required for sub-millimeter spatial resolution, can be achieved despite the presence of the field-distorting hole for the light signal transmitting. The low energy (down to 10MeV per nucleon) beam disturbance compensation methods are also discussed. The ionization process and electron dynamics simulations are used for proving this system design.

POT007

Design and Test Measurements of the Imaging System of the Ionisation Profile Monitor

D. Kramer, B. Dehning, C. Fischer, S.C. Hutchins, J. Koopman (CERN)

Light Imaging system for Beam Ionization Profile Monitor (BIPM) was designed to allow simultaneous operation of fast Multi Anode Photo Multiplier and two new types of intensified standard resolution CCD cameras. The main reason for designing the optics was mainly the poor resolution of the preliminary setup limiting seriously the detectors performance and the need of a second optical path for the Multi Anode Photo Multiplier. Increase of the optical luminosity was also necessary for low intensity beams. Optimization of the optical design done in ZEMAX program was targeted mainly on the RMS spot size for the defined image points and a range of wavelengths 520 – 580nm with a maximum weight at 550nm. A higher number of dimensional constraints had to be carefully set and progressively modified with the optimization evolution. Only reasonable glasses and shapes were used. The design of the optical system will be explained in detail and optimization consideration will be discussed. The imaging error was checked by comparing the ionisation profile monitor measurement with wire scanner measurements.

POT008

Simulation of an Electron Source Based Calibrating System for an Ionisation Profile Monitor

H.H. Refsum, B. Dehning, J. Koopman (CERN)

Measurements have shown that the gain of the imaging system of the Ionisation Profile Monitor (IPM) changes over time, in a non-homogenous way. This ageing effect is caused by changes in theμChannel Plate (MCP) channel wall secondary emission coefficient, due to electron scrubbing. The MCP is only capable of emitting a limited number of electrons during its lifetime, and after a large number of electrons have been emitted, the gain is gradually reduced. To measure this ageing effect, and to be able to compensate for it, a remote controlled, built-in calibration system was developed. An Electron Generator Plate (EGP) produced by Burle, Inc. was used as the electron emitter for the calibration system. In this paper, computer simulations of the system is presented. Promising results were obtained from these simulations. Results from experiments conducted at low magnetic fields, coincide with the results of the simulations. Both simulations and experiments indicate that the proposed calibration system should not deteriorate the performance of the IPM during beam profile measurements.

POT009

SQUID Based Cryogenic Current Comparator for Measurements of the Dark Current of Superconducting Cavities

A. Peters (GSI) K. Knaack, K. Wittenburg (DESY) R. Neubert, S. Nietzsche, W. Vodel (FSU Jena)

This contribution presents a LTS-SQUID based Cryogenic Current Comparator (CCC) for detecting dark currents, generated e.g. by superconducting cavities for the upcoming X-FEL project at DESY. To achieve the maximum possible energy the gradients of the superconducting RF cavities should be pushed close to the physical limit of 50 MV/m. The measurement of the

undesired field emission of electrons (the so-called dark current) in correlation with the gradient will give a proper value to compare and classify the cavities. The main component of the CCC is a high performance LTS-DC SQUID system which is able to measure extremely low magnetic fields, e.g. caused by the extracted dark current. For this reason the input coil of the SQUID is connected across a special designed toroidal niobium pick-up coil (inner diameter: about 100 mm) for the passing electron beam. A noise limited current resolution of nearly 2 pA/sqrt(Hz) with a measurement bandwidth of up to 70 kHz was achieved without the pick-up coil. Now, preliminary results with the whole measurement device installed in a special wide-necked test cryostat at DESY will be presented and discussed.

Profile Monitors for Wide Multiplicity Range Electron Beams

B. Buonomo, G. Mazzitelli (INFN/LNF) A. Bulgheroni, C. Cappellini, L.G. Foggetta, A. Mozzanica, M. Prest (Univ. Insubria and INFN Milano) P. Valente (INFN-Roma) E. Vallazza (INFN-Trieste)

The DAFNE Beam Test Facility (BTF) provides electron and positron beams in a wide range of intensity, from single particle up to 1010 particles per pulse, and energy, from a few tens of MeV up to 800 MeV. The pulse time width can be adjusted between 1 and 10 ns and the maximum repetition rate is 50 Hz. The large range of operation of the facility requires the implementation of different beam profile and multiplicity monitors. In the single particle operation mode the beam spot profile and position are measured by a x-y scintillating fiber system with millimetric resolution and multi-anode PMT readout. From a few tens up to 106-7 particles per pulse, a silicon chamber made of two 9.5x9.5 cm^2 wide 400um thick silicon strip detectors organized in a x-y configuration with a pitch of 121um has been developed. Once calibrated, the system can be used also as an intensity monitor. The description of the devices and the results obtained during the data taking periods of several experiments at the facility are presented.

THI Safety System

C. Jamet, A.T. Andre, P. Anger, J.L. Baelde, C. Doutresssoulles, B. Ducoudret, E. Petit, S.E. Swartvagher (GANIL)

For several years, GANIL has been allowed to reach a maximum beam power of six kilowatts (400W in normal mode) thanks to the THI system (High Intensity Transport System). Three modes of running are necessary to accelerate a THI beam ("Injector" mode, "tuning" mode and "surveillance" mode. The "surveillance" mode requires a safety system to protect equipments against beam losses. Inside cyclotrons, diagnostics measure beam losses current at the injection and extraction devices. Along beam lines, diaphragms measure beam losses current at the input and output of dipoles. Current transformers are used for the beam transmission measurements through beam lines and cyclotrons. The safety system controls beam losses and quickly cut the beam with a chopper if some losses overshoot thresholds. These thresholds can be seen and changed by a software.

POT012

Diagnostics and First Measurement Results at the LEG 100keV Gun Test Stand

S.C. Leemann, ?. Andersson, V. Schlott, A. Streun, A. Wrulich (PSI)

In the scope of the Low Emittance Gun Project (LEG) at PSI a field emitter array (FEA) cathode is being considered as an electron source. In order to study the emission of electrons from such a cathode and to study space charge compensation techniques as well as to develop diagnostic procedures to characterize the beam resulting from an FEA cathode it has been decided to build a 100 keV gun test stand. The test stand gun and diagnostics have been modeled with the codes MAFIA and GPT. From extensive parameter studies a design has been derived and construction of the gun and diagnostics has just recently been completed. We present the diagnostics and report on first measurement results acquired during the commissioning of the test stand.

POT013

Beam Diagnostics Instrumentation for the High Energy Beam Transfer Line of I.P.H.I.

P. Ausset, S. Berthelot, J.-L. Coacolo, J. Lesrel, J.N. Maymon, A. Olivier, N. Rouviere, M. Solal, L. Vatrinet, J.-F. Yaniche (IPN) G. Belyaev, I. Roudskoy (ITEP)

I.P.H.I. is a High Intensity Proton Injector under construction at Saclay (C.N.R.S/ I.N.2P.3; C.E.A. / D.A.P.N.I.A and C.E.R.N. collaboration). An E.C.R. produces a 100 keV, 100 mA C.W. proton beam which will be accelerated at 3 MeV by a 4 vanes R.F.Q. operating at 352.2 MHz. Finally, a High Energy Beam Transport Line (H.E.B.T.) will deliver the beam to a beam stopper and will be equipped with appropriate beam diagnostics to carry intensity; centroïd beam transverse position, transverse beam profiles, beam energy and energy spread measurements for the commissioning of I.P.H.I. These beam diagnostics will operate under both pulsed and C.W. operation. Transverse beam profile measurements will be acquired under low and high duty factor pulsed beam operation using a slow wire scanner and a C.C.D. camera to image the beam-induced fluorescence. The beam instrumentation of the H.E.B.T. is reviewed and preliminary obtained transverse profile measurements at 100 keV are described.

POT014

A Current Mode Inductive Pick-Up for Beam Position and Current Measurement

M. Gasior (CERN)

An Inductive Pick-Up (IPU) senses the azimuthal distribution of the beam image current. Its construction is similar to a wall current monitor, but the pick-up inner wall is divided into electrodes, each of which forms the primary winding of a toroidal transformer. The beam image current component flowing along each electrode is transformed into a secondary winding, connected to a pick-up output. Such sensors are operated in the CERN CTF3 Drive Beam Linac [1]. This paper describes a similar device developed for the CERN Linac 2 to PSB transfer line. To cope with two orders of magnitude longer beam pulses, the new sensor is operated in current mode. The transformers drive transresistance amplifiers (TRA), converting transformer currents into voltages, which in turn are processed by an active hybrid circuit (AHC), producing one sum (S) signal, proportional to the beam current, and two difference (D) signals proportional also to the horizontal and vertical beam positions. The bandwidth of the S and D signals spans 6 and 5 decades, respectively. The transformers have an additional one-turn winding to which a pulse from a precise current source can be applied to calibrate the sensor.

[1] M. Gasior, An Inductive Pick-Up for Beam Position and Current Measurements, Proceedings DIPAC 2003, Mainz, Germany, pp. 53-55.

Result from the SPS High Frequency Travelling Wave Schottky Monitor

M.E. Castro, F. Caspers, T. Kroyer (CERN)

The CERN SPS accelerator was recently fitted with a 1.7GHz travelling wave Schottky monitor. Such a monitor has been operational in the FNAL Tevatron for several years, and the use of this principle is currently under consideration for Schottky diagnostics in the LHC. This paper reports on the results obtained during the 2004 SPS run.

PETRA Proton Beam Profiling by Vibrating Wire Scanner

S.G. Arutunian, N.M. Dobrovolski, M.R. Mailian, I.G. Sinenko, H.E. Soghoyan, I.E. Vasiniuk (YerPhI) K. Wittenburg (DESY)

A vibrating wire scanner based on the strong dependence of the wire oscillation frequency on temperature was developed and used in the 15 GeV/c proton beam of the proton accelerator PETRAII at DESY. The results show an enormous sensitivity of the scanner and the possibility to use it for weak particle beams and beam halo profiling. Details of the measurements and the results are given. Some investigations of the frequency and the Q-factor of the vibrating wire oscillations dependence on vacuum level are presented.

Semi-Automatic Calibration Bench for BPM in J-PARC LINAC

S. Sato, H. Hiroki, T. Tomisawa, A. Ueno (JAERI/LINAC) H. Akikawa, K. Hasegawa, H. Sakaki, H. Sako (JAERI) Z. Igarashi, N. Kamikubota, S. Lee, T. Toyama (KEK)

In J-PARC LINAC, 91 BPMs are planned to be installed . Bore diameters are 37.7, 40.0, 70.0, 85.0, 120.0 mm from upstream. Each BPM consists of 4 strip line type of electrodes with 50 ohm termination. To get exact match of impedance, after electrostatic simulation, widths of stripline are tuned in real fabrication. For fine position mapping of electrical readout, a dedicated calibration bench is made to simulate beam which is accelerated in 324 MHz RF. A wire carrying 324 MHz signal is placed through each BPM, and is able to scan area in the beam cross-section. Extracted calibration constants are to be implemented into EPICS record in order to have capability of systematic utilization. This paper describes details of the calibration bench and its measurements.

Digital Beam Position Measurement at GSI-SIS and CERN-PS

A.A. Galatis (GSI) J.M. Belleman (CERN)

New digital BPM techniques needed in hadron machines, accelerating beams with fast varying frequencies, are to be presented. The role of analog electronics is reduced to signal amplification only. This paper explores approaches for the evaluation of acquired digital signals, suggesting systems for "free running" estimation as well

as machine timing dependent methods. For the integration window estimation, two filtering methods will be introduced, me-dian and FFT filtering, both methods detecting peaks at bunch signal starting and ending points. Parallel to those a digital PLL approach is tested. This project is part of an EU-RP6 design study, collaborating members being CERN-AB, GSI-SD, I-Tech, FZ Jülich and TUD.

POT019

Design of the Soleil Fast Orbit Feedback

N. Hubert, L. Cassinari, J.-C. Denard, A. Nadji, L.S. Nadolski, D. Pedeau (SOLEIL)

Soleil is a third generation light source under construction. Great care in the design of the machine is expected to result in submicron resolution. If the result is not as good as expected, a fast global closed-orbit feedback is foreseen for suppressing remaining beam vibrations up to 100 Hz. The correction uses the computing resource of 120 BPM electronic modules, distributed around the storage ring. Each BPM module includes a powerful FPGA, that in addition to its specific BPM task leaves enough room to embed a part of the fast feedback correction algorithm. All the BPM data (including Xbpms in the future) have to be broadcasted to the 120 modules in order to compute the correction. Broadcasting the data is expected to be fast (around 20 us), thanks to eight multigigabit transceivers per module, and fast links between them. The architecture of the dedicated network is flexible enough to keep the feedback system functional even with a few disabled BPMs. The correction is applied to 46 dedicated air-core correctors in each plane at a rate of 8 kHz. Simulations will be performed in order to optimise the system in the bandwidth of interest to the machine users.

POT020

A New Method of Detecting the Magnetic Field and its Application to the Beam Current Monitor

S. Sasaki, T. Fujita, M. Shoji, T. Takashima (JASRI/SPring-8) T. Tadatsu (Loyal Port Co., Ltd.)

A new detecting method of the magnetic field was invented as a patent by a Japanese company. Since the improvement of the resolution of beam current measurement has been desired for the SPring-8 Storage Ring, we started to investigate the feasibility of applying the method to the beam current monitor. A current sensor applying this method uses a magnetic circuit network consisting of a kind of bridge circuit and a sensing core. When the bridge, which consists of four magnetic resistors, is in the equilibrium, all the fluxes excited in the bridge close inside the bridge; no extra flux is generated in the sensing core. However, if a current induces a flux in the sensing core and the flux overlaps on the bridge, the magnetic resistances of the bridge change because of the nonlinearity of the permeability, and the equilibrium breaks; an extra flux leaks into the sensing core. Exciting the bridge by an AC current, and detecting the second harmonic component of the leakage flux in the sensing core is the basic idea of the current monitor. The principle of the method will be explained, and preliminary result obtained by using a prototype core will be reported.

New Single Shot Beam Position Monitor of the GSI High Energy Transfer Line

J. Schoelles, W. Kaufmann (GSI)

In the near future, single bunch handling with intensities from 104 up to 1012 particles and minimum lengths of 50ns are expected at the GSI high energy transfer line. Thus, the demand of an accurate realtime position monitoring is mandatory. At the moment, a recently developed amplifier optimised for the best common mode amplification covers a dynamic range from nearly -80dBm up to +20dBm and a bandwidth of 200MHz. To gain the required dynamic range of 160dB, an improvement of the amplifiers is necessary. The data acquisition shall be done by commercial DSOs which have a sample rate of 2GS/s on each of the four channels for every PU. This DSO based solution is cheap in comparison to the usage of other available sampling units. The data transfer from the DSOs to the operating stuff is foreseen via Ethernet. Amplifier controlling and position calculation happens at the control centre with LabVIEW. First results measured at the GSI synchrotron will be presented.

Direct Measurements of Space-Charge-Potential in High Intensity H^- Beam with Laser Based Photo Neutralization

S. Lee (KEK)

Transverse profiles of H^- beams can be observed by scanning a laser wire across the ion beam and detect the pulse of photo detached electrons. In addition, laser based photo neutralization method have a capability of direct space-charge-potential measurement by investigate the energy distribution of collected electrons. The kinetic energy of photo detached electron corresponds to the ion velocity and space potential at stripped location. The space-charge-potential in H^- beam can be measured by scanning the bias potential of repeller grid in front of Faraday cup. In this paper, an available method to observe the space-charge-potential and preliminary experimental results with Nd:YAG laser in KEK DTL1 (J-PARC) are described.

Present Status and Upgrade of BPM System in KEK Photon Factory

T. Obina, W.X. Cheng, K. Haga, T. Honda, M. Tadano (KEK)

In the KEK-PF, we improve the beam-position monitors (BPMs) and orbit correction system as a part of straight-sections upgrade project. Two different types of BPMs have been used until now, namely the 6-electrode type and the 4-electrode type. We replace the old 6-electrode one by the 4-electrode one, and increase the total number of BPMs from 65 to 77. The additionally installed BPMs are mainly used for local feedback for insertion devices. During the users operation, we only use the fast global orbit feedback which consists of DSP and fast-corrector magnets that can be used up to 100Hz. Because the number of the fast-corrector magnets is limited to 28, drifts of the beam orbit are remained in some location. We plan to install new magnets and build slow orbit correction system controlled by the workstation. The algorithm for the synchronous operation of fast and slow feedback is carefully designed to avoid the conflicts between two feedback loops. Developments of the fast local feedback system are also in progress. We are evaluating the FPGA-based system that can handle the feedback cycle faster than 1 kHz. The operation will start from Sep/2005.

POT024

Test of New Diagnostics for Bunch Length Measurement

T. Perron, G.A. Naylor, E. Plouviez, B.K. Scheidt (ESRF)

Two new diagnostics for bunch length measurements have been recently tested at ESRF. The first one is based on the analysis in the frequency domain of the signal induced by a visible light beam produced by a dipole. The beam is collimated at the input of a photodiode whose output is connected to a spectrum analyzer. The frequencial signature is then equivalent to the longitudinal spectrum of the beam. The second device is based on two HF cavities, tuned at two different frequencies, and coupled to on the beam wake field. Their response to the beam passage gives the component of the beam spectrum at the two specified frequency, from which the beam profile may be reconstructed. Results for those two devices will be presented and compared to measurements made with a streak camera in order to be evaluated. Especially, the reconstruction of the time profile from the information in frequency will be discussed.

POT025

Detailed Resolution Studies of the Synchrotron Radiation Profile Monitor for HERAe

G. Kube, R. Fischer, K. Wittenburg (DESY)

The precise determination of the beam emittance is essential for the understanding of the luminosity in colliding beam experiments as the ones at the e-p storage ring HERA at DESY. For the measurement of the electron beam emittance a monitor is used which is based on the direct imaging of visible synchrotron radiation from a bending magnet. In order to reduce the thermal heating of the light extracting beryllium mirror it is moved away from the beam axis in vertical direction. While the resolution of profile measurements by synchrotron radiation is already strictly limited by fundamental effects, the observation in off-axis geometry modifies the intensity distribution additionally leading to an increased contribution of the diffraction limited resolution. In order to describe the resolution broadening effects detailed calculations have been performed with the computer code SRW. Taking into account the calculated corrections the deduced beam emittances are in good agreement with independent measurements from a wire scanner. In the meantime the monitor serves as online emittance monitor and additionally is a versatile tool for studies of dynamical beam shape variations.

POT026

Quadrupole Mode Measurement Using Beam Position Monitor in the KEK PS

T. Miura, S. Igarashi, M.J. Shirakata, T. Toyama (KEK)

A quadrupole measurement in the KEK PS using the electrostatic-type beam position monitor (BPM) with four pickups has been performed in order to measure the beam size. The response of quadrupole mode (sigma$\mathbf{x^2}$ **- sigma**y^2) has been confirmed for the emittance growth by the injection mismatch and for the emittance damping during the acceleration. The emittance was deduced from the simultaneous quadrupole mode measurements by two BPMs located at the positions which have different betatron amplitude functions.

Wire Scanner at the VUV FEL Accelerator TTF II at DESY

M. Sachwitz, H.-J. Grabosch, H. Thom (DESY Zeuthen) P. Castro, U. Hahn (DESY)

Seven wire scanner stations are implemented in the undulator section of the TTF II accelerator. Vertical and horizontal scans provide vertical resp. horizontal measurements of the beam profile and beam position with um resolution. Absolute position determination in the range of 50 um are achieved by an external reference system. Read out electronics resolve a beam intensity independent beam position signal for a single-bunch data acquision. The wire scanner set up detects the secondary particles which are created when the wire passes the electron beam with constant velocity (0 to 1 m/sec). Results of test measurements at the Photoinjector Zeuthen and first measurements at TTF II are represented.

Irradiation Control of the SPIRAL Target by Measuring the Ion Beam Intensity via a Fast Current Transformer.

P. Anger, A.T. Andre, C. Doutresssoulles, C. Jamet, W.LC. Le Coz, O.M. Ozille, S.E. Swartvagher (GANIL)

In order to obtain a more precise control on the irradiation of the targets of the SPIRAL installation, a new criterion of safety must be respected. To control this latter, a AQ system has been put in operation and more specifically a new device has been set up in order to measure the ion beam intensity and to calculate the number of particules per second. This value can then be integrated over time. This device consists of two Fast Current Transformers integrated in a mechanical unit placed in a vaccum chamber. These sensors reproduce the image of the pulsated beam at 10MHz and we take from the amplified signal of each sensor, the harmonic 2 amplitude. Each one of these amplitudes is detected by a Lock-in Amplifier, which is acquired via a real time industrial controller. The intensity is calculated by the Fourier series relation between the amplitude of harmonic 2 and the average intensity. These equipments can be remotely tested by integrating a test turn on the sensors. They are redundant. The accuracy of measurement is estimated taking into account the variation of beam, of the environment and of the installation.

First Results of a Spatial Auto-Correlation Interferometer with Single Shot Capability Using Coherent Transition Radiation at the SLS Pre-Injector LINAC

D. Suetterlin, V. Schlott, H. Sigg (PSI) D. Erni, H. Jäckel (ETH) A. Murk (University of Berne, Institute of Applied Physics)

A spatial auto-correlation interferometer using the vertically polarized lobes of coherent transition radiation (CTR) has been designed and set-up at an optical beam port behind the 100 MeV SLS pre-injector LINAC. A thorough theoretical and experimental analysis of the CTR emission process lead to spatial interference patterns in the focal plane of the interferometer. A successful proof of principle has been achieved by step-scan measurements using a Golay cell detector. The single shot capability of this bunch length monitor is demonstrated by electro-optical correlation of the spatial CTR interference pattern with a Nd:YAG laser pulse. First results will be reported in this contribution.

POT030

A New TV Beam Observation System for CERN

S. Burger, E. Bravin, G. Ferioli, G.J. Focker, R. Maccaferri (CERN)

The CERN TV beam observation system, known as the BTV or MTV system, consists of an observation camera, an illumination device and a vacuum tank containing the radiator . The main use of this system is machine tuning and emittance measurement. More than 100 such equipments are installed in the CPS complex, another 50 in the SPS complex and another 50 will be installed in the upcoming LHC. A new VME 64x card has been developed to control all the different forms and flavours of MTV/BTV devices. Apart from an analog video signal the card provides also the digitized image. Tests of this new system have been made on the LHC transfer line TI8 last autumn and the production of 300 cards is now under way for the consolidation of the CPS systems and the remaining LHC installations. In this paper the new system is described with particular emphasis on the new VME card. The performances and limitations are also presented.

POT031

A Problem in RF Switches of Multiplexing BPM System

T. Fujita, S. Sasaki, M. Shoji, T. Takashima (JASRI/SPring-8)

At SPring-8, we have been developing a new detection circuit for beam position measurement with a resolution of submicron and a sampling time of a few milliseconds with high stability. In the circuit, a multiplexing method using RF switches is employed in order for a drift of the circuit to cancel out. To achieve design performance, the switches must have properties; a short switching time, high repeatability and long lifetime. During the evaluation of components for the new detection circuit, we found that some RF switches made of GaAs had a problem that the output signal changed a few mdB for seconds after the switches were turned on. A few mdB, which is 1/10000 in voltage ratio, corresponds to a beam position error of a few microns in SPring-8. Such position error is crucial for us. We investigated several kinds of RF switches and decided to adopt a CMOS RF switch as the multiplexer. In this paper, we report switching properties of several RF switches and demonstration of beam position measurement using the switches.

POT032

Design Optimization of the Emittance Measurement System at PITZ

L. Staykov, J.W. Baehr, M. Krasilnikov, D. Lipka, V. Miltchev, A. Oppelt, F. Stephan (DESY Zeuthen) K. Floettmann, J.H. Han, S. Schreiber (DESY) R. Richter (BESSY GmbH) I. Tsakov (INRNE)

The photo injector test facility at DESY Zeuthen (PITZ) has been built to test and to optimize electron sources for Free Electron Lasers (FEL). In order to study the emittance conservation principle, further acceleration is required. To increase the electron beam energy up to 30 MeV, a booster accelerating cavity is under installation. With this upgrade, the projected normalized transverse emittance is expected to improve to less than 1 mm mrad. To measure such small emittance, an upgrade of the existing emittance measurement system EMSY is required. EMSY uses the slit mask technique to determine the emittance. In this paper, considerations on the physics of the system as well as results from GEANT4 simulations are given. The expected signal to noise ratio, the resolution of the system, and the energy deposition in the slit-mask are presented. EMSY is under construction at INRNE Sofia. Installation and first results are expected by the end of this year.

ITTA — Tuesday Afternoon Invited Talk

Profile Monitors Based on Residual Gas Interactions

P. Forck (GSI)

The precise determination of transverse beam profiles at high current hadron accelerators has to be performed non-interceptingly. Two methods will be discussed based on the excitation of the residual gas molecules by the beam particles: Firstly, by beam induced fluorescence (BIF) light is emitted from the residual gas molecules and is observed with an image intensified CCD camera. At most laboratories N_2 gas is inserted, which has a large cross section for emission in the blue wave length region. Secondly, a larger signal strength is achieved by detecting the ionization products in an Ionization Profile Monitor (IPM). By applying an electric field all ionization products are accelerated toward a spatial resolving Micro-Channel Plate. The signal read-out can either be performed by observing the light from a phosphor screen behind the MCP or electronically by a wire array. Methods to achieve a high spatial resolution and a fast turn-by-turn readout capability are discussed. Even though various approaches at different laboratories exist, no 'standard realization' is available. For both methods results for various beam parameters are presented and technical realizations are discussed.

Beam Diagnostics at High Power Proton Beam Lines and Targets at PSI

R. Dölling, P.-A. Duperrex, R. Erne, U.P. Frei, M. Graf, M. U. Müller, L. Rezzonico, U. Rohrer, K. Thomsen (PSI)

High power proton beams of 590 MeV are produced at PSI using 2 consecutive cyclotrons. The beam current has increased over the years to now 1600 to 1900 uA delivered for approximately 4700 hours per year. After the passage of two targets the beam is transported at a current of about 1200 uA to the spallation neutron source SINQ which uses a solid metal target. A liquid metal target is under development as well as an additional beam line with a high power target for ultra cold neutron production. The protection of beam lines, targets and target hulls from beam powers of 0.13 MW (@72 MeV) and 1 MW (@590 MeV) is based on loss monitors (ionization chambers), current measurements at collimators and 4-sector apertures and the measurement of the current transmission as well as on an online beam centering using inductively coupled position monitors. Wire profile monitors are temporarily used for setup and tuning. The new targets also use harps and an optical observation of the thermally emitted light from a thin mesh in front of the target. The high radiation background requires radiation hard devices, shielding, a suitable handling of the components and remotely positioned electronics.

ITWM — Wednesday Morning Invited Talk

Beam Stability in Synchrotron Light Sources*

G. Decker (ANL)

Numerous third-generation light sources are now in a mature phase of operation, and several new sources are under construction. Submicron beam stability is being achieved routinely at many of these light sources in terms of both AC (rms 0.1 - 200 Hz) and DC (one week drift) motion. This level of stability is a necessary condition for the success of x-ray free-electron lasers such as the Linac Coherent Light Source (LCLS) at Stanford or the European XFEL project. The different methods for addressing this problem at different laboratories, involving various combinations of passive noise identification and suppression, feedback, and feedforward, together with accomplishments to date will be discussed.

CTWM — Wednesday Morning Contributed Talk

Detection of Hard X-Rays in Air for Fast and Precise Monitoring of Both Vertical Position & Emittance in the ESRF Dipoles

B.K. Scheidt (ESRF)

The un-used X-rays produced in each of the 64 ESRF dipoles are absorbed in so-called crotch absorbers at the end of the dipole. With 40mm of Copper + 5mm of Steel only 250uW/mrad (out of the total emitted power fan of 154W/mrad) traverse the absorber. About 20% of these >170KeV energy X-rays are converted by a 0.5mm thick high-Z CadmiumTungstenate (CdWO4) scintilator into visible light that is collected and focussed by simple optics on to a commercial CCD camera. This compact monitor operates in air and is situated just behind the crotch chamber. The knowledge of the small vertical opening angle of 170KeV X-rays and the distance of the source-point to the scintillator makes it possible to calculate precisely the vertical electron beamsize at this sourcepoint. The light yield is enough to measure at 1KHz frequency, with a sub-micron meter precision of the beam position, thereby also constituting a powerful tool for beam stability measurement in the vertical plane. The principle, the practical realisation and the results obtained with a prototype since Jan.2005 will be presented.

The X-Ray Beam Imager for Transversal Profiling of Low-Emittance Electron Beam at the SPring-8

S. Takano, M. Masaki, H. Ohkuma (JASRI/SPring-8)

We have developed the X-ray beam imager (XBI) at the accelerator diagnostics beamline I of the SPring-8 to observe transverse profiles of small electron beam of a low-emittance synchrotron light source. The XBI is based on a single Fresnel zone plate (FZP) and an X-ray zooming tube (XZT). The electron beam moving in a bending magnet is imaged by the FZP. Monochromatic X-ray is selected by a double crystal monochromator to avoid the effect of chromatic aberration of the FZP. The X-ray images of the electron beam obtained are converted by the XZT to enlarged images in visible light. The XBI has achieved a superior 1 sigma spatial resolution in the micron range, and a fast time resolution of 1 ms. It has also realized a vignetting-free field of view larger than 1.5 mm in diameter on the coordinates of the electron beam, which is not easily obtained by imaging optics using two FZPs. With the XBI, we have successfully measured the profiles of the small electron beam having low vertical emittance in the pm rad range.

POW — Wednesday Poster Session

POW001

Photon Counting Measurement in Single Bunch Operation in UVSOR-II Electron Storage Ring

A. Mochihashi, K. Hayashi, M. Hosaka, M. Katoh, J. Yamazaki (UVSOR) Y. Takashima (Nagoya University Graduate School of Engineering)

In single-bunch operation in electron/positron storage ring for SR light source, it is very important to always keep good single-bunch purity because undesirable spurious bunches can disturb experiments with pulsed SR light. Even though only one main bunch is injected and stored initially, however, spurious bunches can be generated in RF-buckets following the main bunch and gradually grow. Such phenomenon has been understood as a result of Touschek effect in the main bunch; namely, electrons which gain larger momenta than RF-bucket height by scattering process between electrons in the main bunch and go out of the original RF-bucket can be captured again in the following bucket*. We have observed impurity bunches in single-bunch operation in UVSOR-II electron storage ring by using photon counting method which has enough dynamic range to observe both the main bunch and the impurity bunches simultaneously. With the method, we have measured growth of the single-bunch impurity with time and tried to discuss Touschek effect in UVSOR-II.
*T. Obina, T. Kasuga, M. Tobiyama, T. Katsura, K. Tamura: Nucl. Instrum. Methods A 354 (1995) 204-214.

POW002

Bunch by Bunch Current and Lifetime Measurements at DAFNE

A. Stella, G. Di Pirro, A. Drago, M. Serio (INFN/LNF)

In the electron-positron collider DAFNE, the two symmetric main rings can be filled with different patterns of maximum 120 bunches spaced by 2.7ns. Storage of an equal charge in each bunch is crucial to optimize the luminosity. A dedicated system, based on digital sampling of sum signals from BPMs with a commercial oscilloscope, has been developed to measure bunch by bunch current. Individual bunch current and lifetime are simultaneously computed from the sampled data, collected at a 4Hz rate and provided via ethernet to the accelerator control system to control individual bunch injection. System hardware and software data processing are reported, together with performance and results of the measurements obtained during DAFNE normal operation.

POW003

The Renovation of the ISOLDE Instrumentation

G.J. Focker, S. Bart Pedersen, E. Bravin (CERN)

The ISOLDE instrumentation is mainly based on mechanical scanners, wire grids and faraday cups. Additional items are the fixed needle beam scanner, the tape-station and a device called the Fast Faraday Cup. The control system for these devices is being redesigned and reimplemented in order to be integrated in the standard control system of the CERN accelerators complex. While some device will still be controlled with "usual" standards (VME), the tape-station and the wire grids will be controlled using industrial PLC's. In fact, recently, the automates have

become fast enough for these applications. This article will describe the different developments in the control electronics, the improvements of the devices themselves and will finish with a short peek at future projects.

Beam Profile Measurements by Using Wire Detectors in J-PARC

H. Akikawa, K. Hasegawa, T. Ohkawa (JAERI) H. Hiroki, Y. Kondo, H. Sakaki, S. Sato, M. Tanaka, A. Ueno, H. Yoshikawa (JAERI/LINAC) Z. Igarashi, M. Ikegami, S. Lee, K. Nigorikawa, T. Toyama (KEK) J. Kishiro (JAERI/J-PARC)

Beam intensity profiles are measured by wire detectors in high intensity proton accelerator J-PARC linac, RCS and MR. A single wire scanner is developed and examined for 20mA, 3 MeV H^- beam in KEK linac. Flying wire methods are also planned for RCS and MR commissioning. In this paper, basic design and preliminary experimental results are discussed.

Linac and Transfer Line Beam Position Monitor at ELETTRA

S. Bassanese, M. Ferianis, F. Iazzourene (ELETTRA) V. Verzilov (TRIUMF)

A BPM system based on Log Ratio detectors (Bergoz LR-BPM) has been built, characterised and commissioned at Elettra. Currently, the system is installed on the Elettra linac and transfer line and is integrated in the Elettra control system. The system is being used for monitoring the trajectory along the transfer line, and for the linac to monitor and control the linac beam stability. Furthermore, the transfer line BPMs are integrated in the program TOCA for the correction of the trajectory and the optimisation of the injection efficiency. The paper describes the system and the measurements performed in laboratory and on the Elettra electron beam. The present and future applications of the LR-BPM system for the new Elettra injector and the linac based FEL are also presented and discussed.

First Tests of the Machine Protection System for CTF3

D. Belohrad (CERN)

CTF3 is supposed to be operated at intensities and energies which may cause harm to the machine. For this reason there is a need for a machine protection system (MPS). The aim of the article is to describe the preliminary version of this system and to show first results measured in the CTF3 machine at the end of the 2004 running period. The MPS is based on comparison of particle losses to a given threshold. As the MPS is required to stop the beam production within 1.55s beam train pulse, very fast response needs to be achieved. Due to that, the losses are evaluated in real time as an amplitude attenuation of the beam current measured at two consecutive wall current monitors (WCM). When losses exceed the given threshold, the beam-stop information is transmitted to the CTF3 gun interlock system. This causes inhibition of the beam production within the currently produced beam train. A manual actions are needed in order to recover from the beam-stop state of the MPS.

POW007

Local Feedback System to Correct Synchrotron Radiation Beam Position at SIBERIA-2 Storage Ring

A.G. Valentinov, L. Ioudin, V.A. Rezvov, Y.L. Yupinov (RRC Kurchatov Institute) Y.V. Krylov (Russian Research Center, Kurchatov Institute)

After beginning of long experimental runs at SIBERIA-2 storage ring users of synchrotron radiation (SR) found that SR beam position in experimental stations slowly changed. To correct this, local orbit correction feedback system was organized. The system is based on SR beam position monitor forming TV image of SR beam at experimental station entry (15 meters far from radiation point). PC calculates position of beam center and sends it to storage ring control system one time in a few seconds. Control system forms local orbit bump to correct SR beam position. Achieved accuracy of stabilization is 10 microns. Now two such systems operate at SIBERIA-2 and we plan to extend this number. Reasons of SR beam movement, monitor design, data transmission system are described in the report. Features of storage ring correction system and optic are discussed.

POW008

On-Line Observation of Electron Beam Bunches in the Large Storage Ring of Kurchatov SRC

L. Ioudin, V. Korchuganov, V.A. Rezvov, A.G. Valentinov, Y.L. Yupinov (RRC Kurchatov Institute) Y.V. Krylov, A. Stirin (Russian Research Center, Kurchatov Institute)

A complex of instrumentation for visual and quantitativ estimation bunches of electron beam in the big storage ring of Kurchatov Synchrotron Radiation Centre (KSRC) is tested. The bunches pass through a cylindrical electrostatic sensor whose signal is recorded by a wide-band oscillograph. The TV camera reads the optical image of the signal from the oscillograph screen. The TV signal numbering board inputs the videoimage to the computer memory. The monitor displays the beam bunch structure. A special program provides on-line visualization of bunch behavior on the beam orbit. The images of beam structure and a series of images showing the beam behavior in the regimes of accumulation, acceleration and in the stationary regime at full power.

POW009

LEIR Beam Instrumentation

L. Soby (CERN)

The LEIR ring is central to the "Ions for LHC "project. Its role is to transform a series of long low intensity ion pulses from Linac 3, into short high density pulses, which will be further accelerated in the PS and SPS rings, before injection into LHC. To do so the injected pulses are stacked and phase space cooled using electron cooling, before acceleration to the ejection energy of 72 MEV/u. This note will describe the different types of instruments which will be installed in the ring and transfer lines, as well as their expected performance.

A Hardware Simulation Kit for Beam Instrumentation

A.E. Lokhovitskiy, D. Kortchaguin, M. Ludwig (CERN)

For beam instrumentation front-end software consolidation in the CERN-PS we have launched a campaign in collaboration with the JINR in Dubna (Russia). This consolidation is to a large extend re-engineering of legacy front-end software of the running CERN-PS machine. This raises the following issues: standardization, simulation of non active timing events, simulation of non available hardware, and backward compatibility. This paper describes a beam instrumentation hardware simulation, which is used to test and validate software of instruments, which are disconnected from the real hardware. The devices might be disconnected because the corresponding instruments are currently used operationally or because a new electronic development is not yet finished. The paper discusses in detail the software tool, but it contains also a comparison of the real time behavior of an instrument front-end task connected to the hardware emulation or connected to the real instrument. The paper will evaluate the validity of such an approach for any software renovation.

Accuracy of the SPS Transverse Emittance Monitors

F. Roncarolo, B. Dehning, C. Fischer, J. Koopman (CERN)

A campaign of studies and measurements has been carried out with the aim of establishing the SPS transverse profile monitors resolution, reproducibility and accuracy. The studies regarded systematic dependencies of the SPS Wire Scanner (WS) monitors on the operation setups and on the beam parameters, like beam intensity, bunch spacing and beam size. The emittance increase due to multiple Coulomb during the linear WS operation has been measured and compared with the theoretical model prediction. Numerical simulations estimate the errors introduced by the limited resolution of the imaging systems and by excessive electronic noise of the detectors. The experimental measurements have been carried out with a wide range of beams, from the pilot bunch to the LHC nominal beam. At first the different SPS wire scanners are compared during simultaneous measurements. The SPS IPM monitoring the vertical profiles has been compared to the wire scanners while tracking the beam emittance from 26 to 450 GeV. The IPM resolution improvements from 2003 to 2004 are pointed out, even though beam emittance overestimations with respect to the wire scanners start to show-up for beam sizes below 500 micrometers.

SRAM-Based Passive Dosimeter for Accelerator Environments

D.R. Makowski, M.K. Grecki, A.N. Napieralski, B.P. Swiercz (TUL-DMCS) B.M. Mukherjee, S. Simrock (DESY)

This paper reports a novel NVRAM-based neutron dose monitor (REM counter). The principle of this device is based on the radiation effect initiating the Single Event Upset SEU in high density microelectronic memories. Several batches of Non-Volatile memories from different manufactures were examined in various radiation environments, i.e. 241Am-Be (alpha,n) and Linear accelerators produced radiation fields. A suitable moderator was used to enhance the detector sensitivity. Further experiments were carried out in Linear Accelerators: Linac II, TTF2 and Beam Loss Environment of various Experimental Facilities at DESY Research Centre in Hamburg. A separate batch of SRAM was irradiated with 60Co-gamma rays up to a dose of about 60 Gy. No Single Event Upset (SEU) was registered. This validates,

that gamma radiation has a negligible effect to trigger SEU in the SRAM. The proposed detector could be ideal for a neutron dose measurement produced by a high-energy electron linac, including synchrotron and Free Electron Laser (FEL) facilities.

POW013

Beam Position Monitor for the J-PARC Main Ring Synchrotron

T. Toyama, D.A. Arakawa, Y. Hashimoto, S. Lee, T. Miura, H. Nakagawa, J.-I. Odagiri (KEK) N. Hayashi, R. Toyokawa (JAERI/J-PARC)

A BPM system has been developed for the J-PARC Main Ring Synchrotron. A diagonal-cut 'electrostatic' pick-up and a processing circuit with an analog amplifier/attenuator, filter and ADC are adopted. The system expects no active devices in the tunnel to avoid radiation damage. The system aims at a position accuracy of ±0.1 mm. The test using whole system except a cable at the KEK-PS shows good system performance with position resolution < ±50 micrometer. The position accuracy will be attained with careful installation and beam-based calibration.

POW014

On-Line Beam Energy and Energy Spread Monitor at the VEPP-4M Collider

N.Yu. Muchnoi (BINP SB RAS)

The report describes a new system that provides continuous on-line measurement of the electron beam energy and energy spread at the VEPP-4M collider. The infrared radiation of the carbon dioxide laser interacts with the electron beam, and the energy spectrum of backscattered gamma rays is measured by High Purity Germaniun (HPGe) detector "*". This specrum has a sharp high-energy range, containing information about the electron beam energy in the edge position. Beam energy spread is derived from the observed width of the spectrum edge. At present the system allows to measure the average beam energy with about 3*10-5 accuracy for 5-15 min data acquisition period. Beam energy spread is restored from the same data with 10-15% precision. The described system was found to be the exellent supplement for the rare and extremely precise beam energy calibration by resonant depolarization technique "**". In other cases the same approach could be proposed as an absolute beam energy monitor when no beam polarization is possible.
"*" R.Klein et al., NIM A 384 (1997) 293-298 "**" V.Blinov et al., NIM A 494 (2002) 81-85

POW015

First Steps towards Integration of Photon Beam Position Monitor Signalsin the SLS Fast Orbit Feedback

T. Schilcher, M. Boge, B. Keil, R. Kramert, J. Krempasky, P. Pollet, V. Schlott (PSI)

So far, photon beam position monitor (PBPM) signals at SLS are mainly used to verify the performance of the fast orbit feedback (FOFB), which is based on RF BPM position readings. A slow high level PBPM feedback compensates in addition for systematic effects of the digital BPM electronics. The development of a new PBPM signal processing electronics allows the synchronization of the PBPM signals with the 4 kHz FOFB sampling rate. Subsequent integration of the photon beam position data in the FOFB system is achieved by signal distribution through fiber optics links (Rocket I/

O) based on the generic VME carrier board (VPC) and mezzanine receiver modules on the FOFB DSP board. The integration of PBPM signals based on the new electronics concept is explained and first results of the new PBPM signal processing units are presented.

Mirror Distortion Correction and Absolute Calibration of SR Interferometer

J.W. Flanagan, S. Hiramatsu, H. Ikeda, T. Mitsuhashi (KEK)

Beam sizes at KEKB are measured using synchrotron radiation (SR) interferometers. It has been observed that changes in beam currents are accompanied by sizable variations in the apparent beam size due to heating and distortion of the surface of the SR extraction mirror. In this paper we discuss methods developed to monitor and correct for these distortions in real-time, as well as methods used for the absolute calibration of the SR interferometer system.

POW016

Ultrasound Instrumentation for Beam Diagnostics and Accelerating Structures Control

V.I. Moiseev (RRC Kurchatov Institute)

Sensitive elements and electronics for ultrasound measurements at conducting walls of beam pipes and accelerating structures are described. Noise protected instrumentation provides ultrasound spectra analysis in a wide frequency range up to 5 MHz.In circular accelerators, ultrasound fields in conducting walls of beam pipe represent the space-time characteristics of circulating beams. In accelerating structures, real high power operation modes of structure can be studied by outer ultrasound monitors. The experimental results at KSRS accelerators are discussed.

POW017

Investigation of Photo Neutralization Efficiency of High Intensity H^- Beam with Nd:YAG Laser for J-PARC

T. Tomisawa (JAERI/LINAC)

The photo neutralization method with Nd:YAG laser for negative hydrogen ions has been considered as an available candidate for beam intensity profile monitor and charge exchange procedure for Accelerator-Driven-System (ADS) in J-PARC. An electron of H^- beam can be stripped by fast and intense Nd:YAG (1064nm) laser with non-destructive, and laser system have advantages of maintenance and radiation hardness in high intensity proton accelerators. In this paper, an experimental set-up and preliminary results of photo neutralization method for linac H^- beam in KEK DTL1 are described.

POW018

POW019

The LHC Beam Loss Monitoring System's Real-Time Data Analysis Card.

C. Zamantzas, B. Dehning, E. Effinger, G. Ferioli, G. Guaglio, R. Leitner (CERN)

The BLM (Beam Loss Monitoring) system has to prevent the superconducting magnets from being quenched and protect the machine components against damages making it one of the most critical elements for the protection of the LHC. The complete system consists of 3600 detectors, placed at various locations around the ring, tunnel electronics, which are responsible for acquiring, digitising, and transmitting the data, and surface electronics, which receive the data via 2km optical data links, process, analyze, store, and issue warning and abort triggers. At those surface units, named BLMTCs, the backbone on each of them is an FPGA (field programmable gate array) which treats the loss signals collected from 16 detectors. It takes into account the beam energy and keeps 192 running sums giving loss durations of up to the last 100 seconds before it compares them with thresholds uniquely programmable for each detector. In this paper, the BLMTC's design is explored giving emphasis to the strategies followed in combining the data from the integrator and the ADC, and in keeping the running sums updated in a way that gives the best compromise between memory needs, computation, and approximation error.

POW020

Digital Camera Application at the Taiwan Light Source

C.H. Kuo, K.-T. Hsu, K.H. Hu (NSRRC)

Digital camera has been adopted for the booster, storage ring and transport-line diagnostic recently at the Taiwan Light Source. The system provides low image distortion transmission over long distance. The system is integrated with control system. Each screen monitor equip with a digital camera. These screen monitors are used for beam profile measurement and help injection condition optimization. Wider dynamic range and highly flexibility of the digital gated camera provide various functional enhancements. System configuration and present status will be summary in this report.

POW021

Resonant Stripline BPM for Ultra Low Current Measurements

M. Dehler (PSI)

Proton beams used in proton therapy facilities like PROSCAN have extremely small currents of an order of 1 nA, which create a challenge for a precise beam position measurements due to their extremely low signal level und subsequent bad signal per noise ratios. For suitable power levels with thse currents, pickups need to have a high shunt impedance, something, which is difficult to design for wide band devices. So for a new stripline bpm design, the coupling of the signal outputs to the electrode was deliberately mismatched to create a resonance at the second harmonic of the RF frequency at 150 MHz. The optimum Q-factor to use is given by the coupling between the bpm electrodes leading to to a Q of 100, an overall shunt impedance of 4 kOhms and power output levels of an order of -120 dBm at the design current of 1 nA. A prototype of the devicehas been manufactured, first measurement results will be presented.

Turn-by-Turn and Bunch-by-Bunch Diagnostics at NSRRC

K.-T. Hsu, J. Chen, K.H. Hu, C.H. Kuo, C.-J. Wang (NSRRC)

Turn-by-turn and bunch-by-bunch diagnostics system was set up to support various study. The beam oscillation signal are detected by transverse and longitudinal bunch signal detector, and digitized by transient digitizer or oscilloscope. The acquired data are perform analysis to extract information of the bunch oscillation in turn-by-turn and bunch-by-bunch basis. Various study results will be summary in this report.

BPM System and its Development for the Storage Ring of NSRRC

K.-T. Hsu, J. Chen, K.H. Hu, C.H. Kuo, C.-J. Wang (NSRRC)

There are about sixty BPMs installed around the storage ring of NSSRC. High precision closed orbit are measured by Bergoz's MX-BPMs. Data acquisition is done by multi-channels 16 bits ADC modules. The orbit data is sampled every millisecond. The fast orbit data are shared by reflective memory network to support fast orbit feedback. Averaged data in are update to control system database in 10 Hz rate. Turn-by-turn orbit was measured by several Bergoz's log-ratio BPMs and was recorded by transient digitizer to support various beam physics study. Digital BPM have been installed at the storage ring to enhance functionality of the BPM system at the storage ring to support routine operation and various beam physics study. Preliminary test of Instrumentation Technologies' Libera is on going. The system structure, software environment and performance of BPM system will be summary in this report.

Diagnostics for the 1.5 GeV Transport Line at the NSRRC

K.H. Hu, J. Chen, K.-T. Hsu, C.H. Kuo, C.-J. Wang (NSRRC)

The extracted 1.5 GeV electron beams from the booster synchrotron are transported via a transport line and injected into the storage ring. This booster-to-storage ring transport line equipped with stripline beam positions monitors, integrated current transformers, fast current transformer, and screen monitors. Commercial log-ratio BPM electronics were adopted to process the 500MHz bunch signal directly. The position of the passing beam is digitized by VME analog interface. The transmission efficiency is measured by integrated current transformer. Screen monitors are used to support routine operation. This report summary the system architecture, software tools, and performance of the BTS diagnostics.

Towards a Robust Phase Locked Loop Tune Feedback System - The Continuous Measurement of Global Betatron Coupling Using a Phase Locked Loop Tune Measurement System

P. Cameron, Y. Luo (BNL) M. Gasior, R.O. Jones (CERN)

Attempts to introduce a reliable tune feedback loop at RHIC have been thwarted by two main problems, namely transition crossing and betatron coupling. The problem of transition crossing is a dynamic range problem, resulting from

the increase in the revolution content of the observed signal as the bunch length becomes short and from the fast orbit changes that occur during transition. The dynamic range issue is being addressed by the development of a baseband tune measurement system as part of the US LHC Accelerator Research Program (US-LARP). This paper will focus on the second problem, showing how a phase locked loop tune measurement system can be used to continuously measure global betatron coupling and in so doing allow for robust tune measurement and feedback in the presence of coupling.

POW026

A Beam Loss Position Monitor Using Cerenkov Radiation in Optical Fibers

M. Koerfer (DESY)

Single pass Free Electron Lasers SASE-FELs are developed for high brightness and short wavelength applications. The VUV-FEL at DESY will reach an average beam power of about 72 kW. To avoid particle losses in the radiation sensitive undulators a collimator system is installed. However, the proper operation of the collimator system needs to be measured with a beam loss monitor. Conventional radiation sensor systems are not suited for the VUV-FEL undulators, because the free space in the undulator gap is less than 1 mm. A Beam Loss Position Monitor (BLPM) based on Cerenkov light in optical fibers allows the monitoring of losses inside the undulator. Electrons with energies above 175 keV generate Cerenkov light during their penetration of the optical fiber. The fast response of the Cerenkov signal is detected with photomultipliers at the end of the irradiated fibers. The beam loss position along the section of interest can be determinate by exploiting the system trigger (bunch clock) of the accelerator system. The main advantage of the BLPM system is the measurement of the particle loss trace in the longitudinal and transverse plane. This BLPM system was installed and used for the VUV-FEL commissioning.

POW027

Beam Position Monitor and Kicker for the SPring-8 Transverse Bunch-by-bunch Feedback

T. Nakamura (JASRI/SPring-8)

Beam position monitor and kicker for the SPring-8 transverse bunch-by-bunch feedback system are developed. The beam of the SPring-8 storage ring is micro-meter size and the residual motion driven by the noise in the position signal should be suppressed to be submicro-meters. To meet this requirement, we developed shorted stripline type position monitor that produces one order higher position signal at 509MHz than button type BPM. In this paper, we describe design, simulation and beam test of the BPM and the kicker and the experience with the feedback system.

ITWA — Wednesday Afternoon Invited Talk

Low Energy High Brilliance Beam Characterization

J.W. Baehr (DESY)

Low energy high brilliance beam characterization plays an important role for electron sources and injectors of Free Electron Lasers (FELs) and electron linear accelerators as for example the future ILC project. The topic is discussed basing on solutions of the PITZ facility (PhotoInjector Test facility Zeuthen) which are compared with methods applied at other facilities. The properties of an electron beam produced at a laser-driven rf-gun is mainly influenced also by characteristics of the laser beam and the electron gun itself. Therefore aspects of diagnostics will be also discussed for the laser, laser beam line and gun as well. The main properties of the electron beam are transverse and longitudinal phase space and charge as well. The measurement of transverse beam size and position, transverse emittance, charge, beam current, and longitudinal phase space will be discussed in detail. The measurements of the transverse emittance at PITZ is based on a single slit method. The measurement of the longitudinal phase space is based on a correlated measurement of the momentum spectrum and the temporal characteristics of the electron bunch.
Comment: is invited talk

CTWA — Wednesday Afternoon Contributed Talk

CTWA01

High Sensitivity Tune Measurement by Direct Diode Detection

M. Gasior, R.O. Jones (CERN)

The fractional part of the tune value of a circular accelerator can be measured by observing beam betatron oscillations on a position pick-up. In frequency domain this betatron frequency is seen as sidebands on either side of the revolution harmonics. Usually beam signal pulses from the pick-up are very short with respect to the revolution period, resulting in a broadband spectrum. Classical tune measurement systems filter out just one of the betatron sidebands. As a consequence, most of the betatron energy is lost and only a very small fraction remains for further processing. This paper describes a new method, referred to as Direct Diode Detection (3D). It is based on the idea of time stretching beam pulses from the pick-up in order to increase the betatron frequency content in the baseband. The 3D method was recently tested in the CERN SPS and PS, BNL RHIC and FNAL Tevatron machines. Results from all these machines show that this method can increase the betatron signal level by orders of magnitude as compared to classical systems, making it possible to observe tunes with no explicit excitation.

CTWA02

Radiation Tests on Solid State Cameras for LHC Instrumentation

S.C. Hutchins, M. Facchini, E. Tsoulou (CERN)

Technological advances in solid state camera design have provided a wider choice of equipment for beam diagnostics, but following simulations of the expected radiation environment in the LHC knowledge of their radiation tolerance was required. Several cameras have been progressively exposed to a 60MeV proton beam and their performance degradation monitored. Following these results, further simulations have been carried out on the level of shielding needed to ensure satisfactory operation in the LHC.

Author Index

I

J

K

L

M

T

U

V

W

Author Index

Y

Z

Modules

WIENER CC-USB

CAMAC Crate Controller with USB-2 Interface and list sequencer

⇒ internal FPGA can be programmed to operate as command sequencer with data buffering in a 22kB size FiFo

⇒ Host-controlled readout modes:
- Single word transfer,
- Q-stop / Q-scan
- Autonomous (intelligent) readout pursuant to user-programmed stack

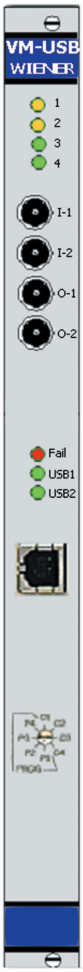
⇒ Supports FASTCAMAC level 1

⇒ Readout triggered either via USB link, or by a programmable combination of LAM's, or by external signal

⇒ 22-kByte data buffer (FIFO) with programmable level of transfer trigger

⇒ 3 user-programmable NIM inputs and outputs (with LEMO)

⇒ data and status display with 54 colored LED's (N, F, A, R / W Data, Q, X, C, Z)



WIENER VM-USB

VME controller with USB-2 Interface and List Sequencer

⇒ low-cost VME master with high speed USB2/USB1 interface

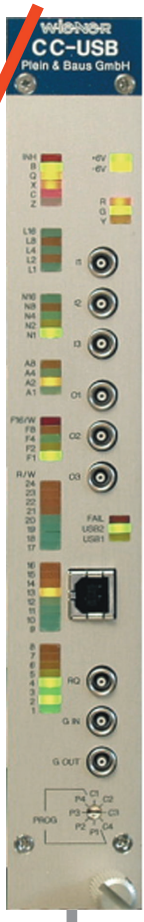
⇒ full VME system controller with bus arbiter and IRQ support

⇒ internal FPGA (SPARTAN) programmable as command sequencer with data buffering, FPGA configures itself upon power-up from a selected sector of the flash memory, up to four configurations, front panel rotary switch for boot sector selection, programmable via USB or VME

⇒ Host-controlled readout modes:
- Single word transfer D16, D24, D32, A24/A32 addressing
- BLT, MBLT, MBLT64
- Autonomous (intelligent) readout pursuant to user-programmed stack (4k), Readout triggered either via USB link, interrupt, or by external signal

⇒ 28-kByte data buffer (FIFO), programmable level of transfer trigger.

⇒ 2 user-programmable NIM inputs and 2 outputs (with LEMO connectors)



New!

New!

www.wiener-d.com

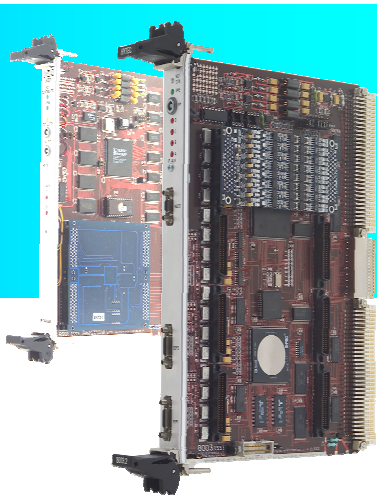
Plein & Baus GmbH. Muellersbaum 20, 51399 Burscheid, Germany
Phone: (+2174) 6780, Fax: (+2174) 678 55

WIENER Plein & Baus Elektronik

Werk für Industrie-elektronik Nuklear-elektronik Regelungs-technik

HYTEC ELECTRONICS LTD

Instrumentation Software and Systems



1U IOC Blade (Input Output Controller)

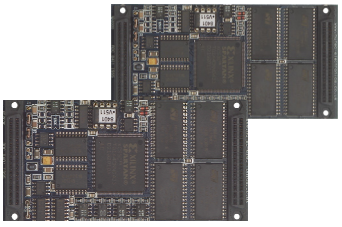
- All-in-One Solution
- 19" Rack Mounted 1U self contained IOC (Input / Output Controller)
- Can be fitted with up to six Industry Pack (IP) Cards
- I/O, ADC, DAC, RS232, RS485, Stepper Motor Controller, Scaler
- PCIm card slot providing additional functionality
- Self contained
- I/O can be read/written via EPICS, TCP/IP or html
- Dual Ethernet option
- RTEMS, Linux

New!

EPICS

HYTEC VME64x

The latest implementation of VME.



- Carrier Boards
- Transition Boards
- Hot Swap—no powering off required
- EPICS Drivers
- Geographical addressing
- Auto configuration
- Extensive range of XILINX multi-function (IP) Industry Pack cards
- ADCs, DACs, Scalers, Digitizers, RS232/485 Stepper Motor

Hytec Electronics Ltd, 5 Cradock Road, Reading, Berkshire, RG2 0JT, England.
Phone : +44 (0)118 9757770 Fax : +44 (0)118 9757566

Email: **sales@hytec-electronics.co.uk** Web: **www.hytec-electronics.co.uk**

YOUR PARTNER

DESIGN AND MANUFACTURING
of computer systems for:

Software development

Hardware development

System integration

Manufacturing

INCAA Computers, your

IN AUTOMATION

- Industry
- Public Transport
- Science
- OEM

Alarm systems; Scalable data acquisition systems; Board computers; Test systems; Electronic modules; GPS applications; GPRS applications; VME modules; CompactPCI modules; Custom design;

INCAA COMPUTERS

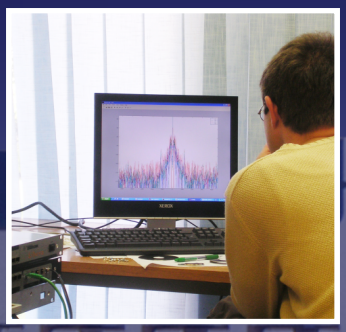
INCAA Computers B.V.
P.O. Box 722, 7300 AS Apeldoorn
The Netherlands
+31-55-5425001
sales @incaacomputers.com
www.incaacomputers.com

partner in automation

Instrumentation Technologies supports 3 students attending DIPAC

We are aware of the importance of investing in young scientists and engineers for the future benefit of accelerator community. Participation at such a conference is in most cases not affordable for young people who are eager to know the latest developments in this field. Therefore, we decided to support the participation for three young engineers working in the field of beam instrumentation and give them the chance to actively contribute to the DIPAC success. The selection of the candidates is done by DIPAC program committee.

You are kindly invited to visit our booth on the first floor gallery of the hotel and participate to the hands-on live demonstration of Libera beam position processor.



Instrumentation Technologies

Instrumentation Technologies
Srebrničev trg 4a
SI 5250 Solkan
Slovenia

Tel.: +386 5 33 11 700
Fax: +386 5 33 11 719

Email: info@i-tech.si

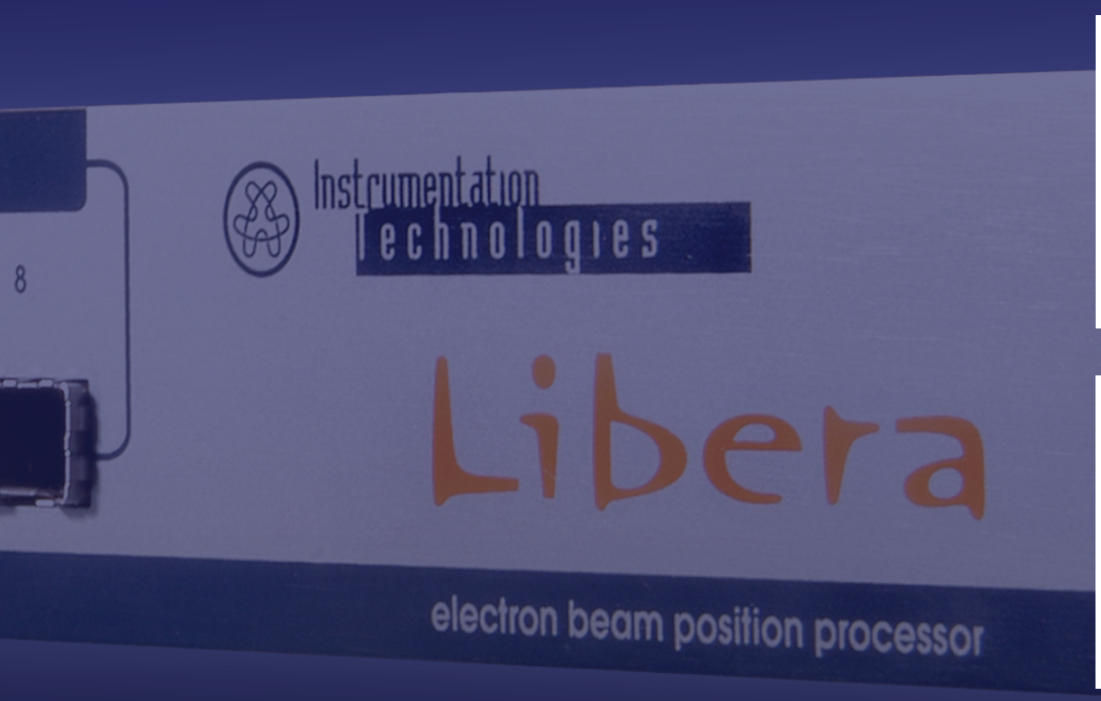
www.i-tech.si

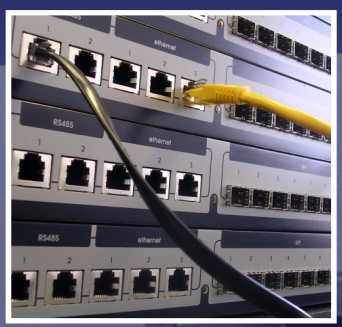
Libera

Libera is conceived as a product family. The first member, Libera electron beam position processor, has already persuaded the most advanced world accelerators. We are pleased to announce the development of two new members:

- **Libera bunch by bunch feedback processor and**
- **Libera hadron beam position processor.**

We will accept orders at the end of 2005.





Instrumentation Technologies

Instrumentation Technologies
Srebrničev trg 4a
SI 5250 Solkan
Slovenia

Tel.: +386 5 33 11 700
Fax: +386 5 33 11 719

Email: info@i-tech.si

www.i-tech.si

Production Notes

Production Notes

The DIPAC2005 abstract booklet was produced using a number of *Open Software* tools and newly developed scripts.

The SPMS database (Scientific Program Management System, author: Matt Arena, FermiLab) of the JACoW Collaboration has been used for abstract and paper submission.

The contents of the database has been exported to XML, providing all data necessary for the batch production of the abstract booklet, proceedings and consistent conference web pages.

The generated XML file consisted of approximately 15 000 lines of meta data describing each paper contribution. A PERL script was developed to read this XML file and transform it to `<html>`, \ConTEXt, and command files, providing all necessary means to generate the proceedings web site, abstract booklet, and conference proceedings.

A script run produces 480 pages for the conference web site (`http://bel.gsi.de/dipac2005/`). These pages consist of lists for *Sessions*, *Authors*, *Keywords* (when all papers have been uploaded), and *Institutes* with all available cross links. All these pages are coded in UNICODE (`UTF8`), making greek characters and small math formulas in abstracts possible, as well as showing the correct writing of names with accented characters. For alphabetic sorting of author names a rule based method is used honoring accented letters, umlauts, etc.

The final version of the abstract booklet was made using ConTEXt version `2005.04.28` and pdfeTEX (version `1.20a-2.2`), design of templates and layout were done with the help of Hans Hagen (CEO of `pragma-ade.nl` and author of ConTEXt).

The scripts are supported by the SPMS. They are available from the JACOW site (`http://www.jacow.org`).

May 2005

Volker RW Schaa