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Book of Abstracts

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SESSION 2 / 1

Pressure-measurement errors in a cold-cathode-ionization gauge caused by electrons and photoelectrons

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It is well-known that ionization gauges mis-read due to an influx of photoelectrons flowing from an external environment. In the SPring-8 storage ring, some of hot-cathode-ionization gauges (B-A gauges) have indicated abnormally-low pressures (on the order of 10-9 Pa) or negative pressures (from -2 x 10-9 Pa to -2 x 10-7 Pa) at stored-electron-beam conditions due to the same cause, although elbows and permanent magnets are set in front of these gauge heads. On the other hand, cold-cathode-ionization gauges (Inverted magnetron gauges) at RF cavities in the ring have been thought to indicate actual pressures. The effect on a cold-cathode-ionization gauge caused by photoelectrons from an external environment has not been reported. Therefore, a simulated experiment for pressure-measurement errors in a cold-cathode-ionization gauge caused by electrons from an external-electron source, was carried out. As the results, the indicated pressure with the cold-cathode-ionization gauge was higher by about two orders of magnitude from the actual pressure. It also showed that electrons with several eV from the external-electron source were effective in this pressure-measurement error. Using a precise current-measurement system which could measure a current of the order less than 10-9 A under an applied high voltage to the anode of the gauge head, an actual current detected at the anode was also measured. Furthermore, in the New SUBARU electron storage ring (the beam energy of 1 GeV) at a stored-electron-beam current less than 350 mA, the same environment of excess photoelectrons in the SPring-8 storage ring was roughly reproduced and the vacuum gauge was tested, using a gauge tube with metal meshes set in front of the gauge head. As the result, it was found that the cold-cathode-ionization gauge with the gauge tube was not influenced by the strong reflected light of synchrotron radiation at all, in the pressure range of 10-8 Pa.

SESSION 3 / 3

The ESRF preventive maintenance program

Author: Michael Hahn[1]

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The ESRF Vacuum Group uses a number of analysis tools to identify vacuum failures or irregularities by systematic study of not only total and partial pressure data but also by looking into relation with machine data of the Storage ring such as beam emittance, gap opening of Insertion Devices, temperatures, Bremsstrahlung and many more. The storage of all these values in a common database allows to use systematically additional information to conclude for example on the behaviour of low conductance chambers where the pressure readout at the extremities is not representative. A Labview application has been developed allowing a quick comparison

of the actual vacuum data to a known "good"situation from the past stored in the Historical Data Base. These relative measurements have an advantage over absolute ones when one needs to conclude on qualitative behavior of complex devices such as In Vacuum Undulators. These techniques made it possible that even in the presence of more and more corrosion leaks the scheduled user operation was not disturbed by downtime due to Vacuum for several years now: The early identification of problems allowed to cure them temporary during Machine Dedicated Time and finally change the faulty elements during programmed Machine Shutdowns.

SESSION 1 / 4

RAL Main Activities

Author: Shaun Hughes[1]

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An overview of Rutherford Appleton laboratory main activities with a quick look at ISIS and its recent upgrades.

SESSION 4 / 5

Overview of ISIS vacuum system and replacement of straight1 highly radioactive components

Author: Shaun Hughes[1]

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An overview from the problems arising from high levels of gamma
radiation on the
ISIS accelerator.

SESSION 1 / 6

Overview of Vacuum Activities at Laboratory for Elementary-Particle Physics

Author: Yulin Li[1]

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The major vacuum related activity at LEPP, Cornell is centered on the Cornell Electron Storage Ring (CESR), which consists of a RF Linac, a synchrotron boost ring and the CESR. We are currently also starting to ramping up vacuum R&D work leading to the construction of Cornell Energy Recovery Linac (ERL).

This work is supported by US National Science Foundation

SESSION 3 / 7

CESR Vacuum System Monitoring and Component Quality Assurance

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Cornell Electron Storage Ring supports three science programs, the CLEO High Energy Physics Experiments, the Cornell High Energy Synchrotron Sources and the Accelerator Physics and R&D. The reliability of the CESR vacuum system is essential to the success of these science programs. A network of 70+ cold cathode ion gauges, RGAs and over thousand of thermal couples monitor the performance and operational safety of the CESR vacuum systems. Routine inspection and scheduled preventive maintenance programs are implemented to reduce unscheduled vacuum system downtime. A strict quality assurance program is enforced to assure that all new vacuum chambers and components meet adequate specification and satisfactory quality.

SESSION 1 / 8

SPring-8 vacuum system

Author: Hiroshi Saeki[1]

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SPring-8 (Super Photon Ring 8 GeV) as a synchrotron radiation source, is operated and maintained by Japan Synchrotron Radiation Research Institute (JASRI) under a control of RIKEN and JAERI. The facility consists of a 1 GeV linac, a booster synchrotron (1-8 GeV), and a storage ring with 47 beam lines (maximum designed beam lines of 62). The average pressure in beam ducts of the linac and the booster synchrotron, made of stainless steel, is kept as 10-7 Pa using ion pumps and that in beam ducts (anntechamber type) of the storage ring, made of aluminum alloys, is as 10-9 Pa using ion pumps (including distributed ion pumps) and NEG pumps without an electron beam. At a stored-electron-beam condition (8 GeV, 100 mA), the pressure increases to 10-8 Pa. Total vacuum pressures in the booster synchrotron and in the storage ring are measured using nude-type B-A gauges, except for the linac and RF cavity sections. Partial pressures are measured using quadrupole mass analyzers. Some of vacuum failures (due to RF, photoelectrons, radiation etc.) in the injector and the storage ring after operation in March 1997, are reported and discussed.

SESSION 1 / 9

The Vacuum System of ALBA

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ALBA is the Spanish 3GeV, 3rd generation light source to be built near Barcelona. The circumference of the storage ring is 268.8m with 400mA nominal beam current. The storage ring will be divided into 16 vacuum sections by gate valves. The vacuum chamber will be made of stainless steel with electron beam vertical aperture of 28mm and 72mm width with a slot of 10mm height to connect the vacuum chamber to the antechamber where crotch absorbers will absorb the unwanted synchrotron radiation. The pumping will be by lumped ion pumps with an overall pumping speed of 6.104 l/s, this will maintain an average dynamic pressure of 1.10-9 mbar to achieve a beam lifetime of 10 hours at the designed current. No in-situ bakeout is foreseen for the vacuum vessels.

SESSION 4 / 10

Vacuum Interventions in Radioactive Environments: The SPS and LEP Experiences

Author: Jose Miguel Jimenez[1]

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This talk aims to summarize the experience with the SPS and LEP over the past 15 years dealing with leaks in radioactive components and environments. The annual doses and sources of radiation will be presented together with dose estimations during a typical mechanical intervention during the run. The corrosion of the stainless steel materials by the hydrochloric acid is the main cause of leaks appearing in the radioactive environments of CERN machine. Example of how recent problems have been handled will be presented as well as the strategy implemented in collaboration with the Radioprotection Group to reduce the cumulated dose during a given intervention by a proper optimization of the design. This strategy is already used for the LHC machine.

SESSION 1 / 11

Overview of GANIL and SPIRAL 2 project

Author: Patrick Dolegieviez[1]

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Corresponding Author: dolegieviez@ganil.fr

This presentation gives a description of the laboratory and its activities. An overview of the SPIRAL 2 project is given with its specific environmental constraints.

SESSION 1 / 12

Proton Cyclotron Vacuum System at TRIUMF.

Author: Igor Sekachev[1]

[1] *TRIUMF, Canadian National Laboratory*

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The proton cyclotron was built at TRIUMF in 1972 and commissioned to full energy in 1974. The volume of the cyclotron vacuum tank is about 100 m**3.The vacuum during beam production is at 2**10-8 Torr, which is achieved mostly by cryopumping with B-20 cryogenerator and six cryopumps. The B-20 is a Stirling cycle refrigerator, which supplies helium gas at 16K and 70K to the cryopanels in the tank. The tank is also equipped with two turbo pumps. The vacuum system has operated for more than 30 years. The paper will discuss the present status of the cyclotron vacuum system.

SESSION 1 / 13

Vacuum Systems for the Diamond Light Source

Author: Matthew Cox[1]

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Diamond Light Source is new synchrotron light facility currently under construction in Oxfordshire in the UK. First user beam is scheduled for 2007. Diamond consists of a 3 GeV electron storage ring 561.6 m in circumference together with a 100 MeV Linac and a 158.4 m circumference booster ring. 7 experimental beamlines will be available initially. A brief overview of the Diamond project and its vacuum systems will be given.

SESSION 5 / 15

Performance of RHIC Vacuum Instrumentation and Control

Author: Hsiao-Chaun Hseuh[1]

[1] *Brookhaven National Laboratory*

The RHIC storage rings have approximately 1600 vacuum instruments, consisting vacuum gauges, sputter ion
pumps, titanium sublimation pumps, residual gas analyzers, sector gate valves and turbopump stations. They
are distributed in eight service buildings and inside the RHIC tunnel. This PLC based control system has
performed well since 1997 to support the machine operation and the physics programs. The system architecture will be described. The reliability of the individual components will also be summarized.

SESSION 5 / 16

Controls and Interlocking of the Diamond vacuum equipment

Author: Hugo Shiers[1]

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Diamond will utilise around 700 capture pumps, 350 total pressure gauge sets, 150 RGAs, and 100 pneumatic valves. The bulk of the equipment will be contained on the machine and beamlines. The control of this equipment will be done though EPICS, the chosen control system for Diamond.

A discussion here will concentrate on the following points.

·Interfacing the equipment into the control system

·The proposed user interface panels and controls

·The interlocking mechanism for the valves, pumps and gauges

·The proposed data retrieval and storage.

·How the data can be integrated together to give a unified dynamic and historic analysis of the machine vacuum.

SESSION 5 / 17

The Vacuum Interlock System for the TLS Storage Ring

Author: Gao-Yu HSIUNG[1]

Co-authors: June-Rong CHEN [2]; Tsai-Fu LIN [1]; Tzong-Shyan UENG [1]; Zong-Da TSAI [1]

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In order to protect the vacuum system for the Taiwan Light Source (TLS), a vacuum interlock system has been developed. The status of all the vacuum devices, including the sector gate valves, ionization gauges, and the pumps, are monitored and hence the vacuum system can be protected as soon as a vacuum failure happened. In addition, an alarm system has been established to monitor the temperature of vacuum chamber as well as the temperature and flow rate of cooling water system, to avoid the vacuum chambers from melt-down. Recently, the interlock system has been upgraded by including the interlock systems of all the front ends and the temperature alarm system to assure the vacuum quality of the storage ring. This interlock system has been functioned well since the first operation. The architecture of logic design and the features of the interlock system will be described. Besides, a program has been established for archiving the readings of all the vacuum devices and the temperature monitoring systems that can be accessed through the internet for real time comparison of the relationship of various signals. Some experiences of unexpected failures or the malfunctions of the vacuum devices will also be illustrated.

SESSION 4 / 18

The vacuum systems at GANIL : the technical solutions and the maintenance aspect

Author: Patrick Dolegieviez[1]

[1] *GANIL*

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The GANIL is a heavy ions accelerator in operation from 1983, and composed of a set of 5 cyclotrons. Since 2001, the SPIRAL facility allows to produce radioactive ion beams (energy range 2 to 25 MeV/u) with the primary beams delivered by GANIL. The vacuum system of the large vessels of the cyclotrons are described as well as the SPIRAL vacuum systems. The maintenance procedures imposed by the safety constraints are exposed. So, the preliminary studies for the SPIRAL 2 Vacuum System are presented with the constraints due to the radioactive environment.

SESSION 1 / 19

Vacuum systems and vacuum development at The Svedberg laboratory

Author: Lars Westerberg[1]

[1] *The Svedberg Laboratory, Uppsala University*

The k=192 synchrocyclotron is pumped by 2 large diffusion pumps with cryo baffles and has internal Meissner cryo traps. The CELSIUS storage ring is pumped by a combination of ion pumps and sublimation pumps. Large H2 and D2 gas loads from the pellet target of the CELSIUS-WASA experiment are pumped by cryo pumps and NEG pumps to give a low enough pressure in the electron cooler. Similarly, cryo pumps are used to prevent heavy noble gases (Ar, Kr and Xe) from the cluster jet target to limit the beam lifetime.

SESSION 2 / 20

The need for more outgassing data of materials for accelerators and storage ring experiments

Author: Emma Hedlund[1]

[1] *Department of Radiation Sciences, Uppsala University*

Outgassing measurements are often performed by vacuum specialists and physicists when designing new accelerator equipment and experiments in storage rings etc. Such measurements are, however, rather seldom published. It would be an advantage for the vacuum community if such results could be made available for the general public by creating a database. As an example, we could not find relevant data of materials for a complex particle detector system installed in the UHV system of a cluster-jet target in the CELSIUS storage ring in Uppsala. We have therefore measured outgassing from various materials such as multi-layer ceramic printed-circuit boards, flexible printed-circuit boards, electrical insulators, conductive and non-conductive glue, Kapton-insulated single conductor cables and Kapton-insulated coaxial cables

SESSION 3 / 21

The Recent Cyclotron Vacuum System Problems.

Author: Igor Sekachev[1]

[1] *TRIUMF, Canadian National Laboratory*

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The cyclotron at TRIUMF was built in 1972 and commissioned to full energy in 1974.
The cyclotron vacuum tank is very complex with a total of 208 ports and a main double seal 17 meters in diameter. The volume of the tank is about 100 m3 and operates at 2*10-8 Torr. The vacuum is achieved by cryopumping with internal cryopanels cooled by a Philips B-20 cryogenerator and six cryopumps. A few vacuum problems related to air and water leaks into the tank have been experienced recently. The troubleshooting techniques, details on the leak size determination and leak localization are described.

SESSION 1 / 22

The DESY Vacuum Systems

Author: Mike Seidel[1]

[1] *DESY*

The brief presentation will cover an overview on the accelerator vacuum systems presently under operation at DESY. Furthermore a short description of our activities for the two new projects PETRA III and XFEL will be given.

SESSION 2 / 23

Fast Vacuum Valves at CERN

Author: Willemjan Maan[1]

[1] *CERN*

A brief history of the fast valves in use at CERN and of their mechanical design since the 1970's will be given.
The recent example of the LEP fast valves will also be described as well as the improvements introduced.
Finally some arguments in favour and against the use of fast valves in high energy accelerators will be
enumerated and discussed.

SESSION 1 / 24

The SIS18 UHV-upgrade program for high ion beam intensity operation of medium charged heavy ions

Author: Hartmut Reich-Sprenger[1]

Co-authors: Andreas Krämer [1]; Cristina Bellachioma [1]; Holger Kollmus [1]; Jörg Kurdal [1]; Knut Welzel [1]; Mario Bevcic [1]; Markus Bender [1]

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The SIS18 heavy ion synchrotron will operate as an injector for the GSI FAIR project. UHV instabilities were observed during high ion beam intensity operation limiting the ion beam lifetime of medium charged heavy ions (e.g. U28+). An intense upgrade of the existing UHV system was started including an experimental program on the desorption processes and measures to improve the residual gas composition and base pressure. The concept of the program and first results will be presented.

SESSION 3 / 25

Vacuum System Failures at HERA

Author: Mike Seidel[1]

[1] *DESY*

HERA is a large electron proton collider that operates since 2000 with upgraded interaction regions. We present several severe failure scenarios which resulted from heating by mis-steered synchrotron radiation fans, accidental losses of the proton beam or simply component failure.

SESSION 5 / 26

The GSI-vacuum-control and diagnostic-system

Author: Knut Welzel[1]

Co-authors: Graziano Savino [1]; Hartmut REICH-SPRENGER [1]; Jörg Kurdal [1]; Mario Bevcic [1]; Mathias Wolff [1]; Peter Horn [1]

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In 2004 GSI changed the vacuum control- and interlock system from a software to a hardware based system. It's used to control and monitor around 55 pneumatic sector and five fast closing valves. The new control system, which is completely integrated in the GSI accelerator control system, uses total pressure values, determined by the current of ion pumps, and wide-range ion gauges. In addition 60 ion gauges, distributed in the SIS-synchrotron and the beam transport system, are used for the vacuum diagnostic system. This system is web-based and independent of the GSI accelerator control system.
The RGA-network, existing in the synchrotron will be integrated into the diagnostic system, when our network problems are solved.
In the talk a short overview of the vacuum control and interlock system and the diagnostic system will be given. In addition the RGA-network and it's problems will be discussed.

SESSION 2 / 27

Non-Evaporable getter Films for the future GSI facility

Author: Jörg Kurdal[1]

Co-authors: Andreas Krämer [1]; Cristina Bellachioma [1]; Graziano Savino [1]; Hartmut Reich-Sprenger [1]; Holger Kollmus [1]

[1] *GSI*

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For the SIS18 upgrade, in the frame of the FAIR project, the use of non evaporable getter (NEG) films is foreseen.
This will increase the pumping speed for CO and H2 more than one order of magnitude.
Calculations performed by means of the Vaktrak code have proved that the installation of NEG coated dipole and quadrupole chambers will lead to a better base pressure of about a factor 10. Additionally, the problem of the conductance limited pumping speed inside the magnet sections will be overcame.
Therefore it's planned to establish the NEG coating technique at GSI.
In this talk I want to give an overview of our first test facility.

SESSION 1 / 28

AT Vacuum Group: A CERN Wide Mandate

Author: Jose Miguel Jimenez[1]

[1] *CERN*

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The Vacuum Group, as part of the Accelerator Technology Department, has a wide mandate covering the design, installation, exploitation and upgrades of all CERN accelerators including the experimental areas.
This talk will briefly introduce the vacuum specificities of all the accelerators under the responsibility of the CERN Vacuum Group with a special emphasis on the ultimate pressure and technical solution adopted, the overall length and radiation aspects.

SESSION 1 / 29

What's New at the SNS;SCL Installation, Warm Sections

Author: Peter Ladd[1]

[1] *ORNL*

An overview of the installation of the SCL warm sections at the Spallation Neutron Source (SNS) is presented as the project proceeds on schedule to beam on target planned for mid 2006. Specifically addressed are the procedures adopted during the assembly and installation of the warm sections needed to maintain the cleanliness levels required as they are connected to the superconducting cavities

SESSION 3 / 30

RGA's are Great ……if you Know What you are Looking For!

Author: Peter Ladd[1]

[1] *ORNL*

An operational experience to be shared that followed fine tuning of the RF performance of the drift tube linac after initial tank conditioning. The conditioning power level of 2.2 MW that was achieved during initial conditioning could not be obtained following further mechanical tuning of the RF system. The initial suspect was vacuum, specifically pressure spikes in the window area, however, pressure traces did not support this theory and the mystery deepened with uncharacteristic RGA scans. The findings of this investigation are presented as the culprit in bought to justice.

SESSION 1 / 31

The ELETTRA vacuum system

Author: Fabio Mazzolini[1]

[1] *SincrotroneTriesteS.C.p.A.*

Corresponding Author: noel.hilleret@cern.ch

A description of the Elettra vacuum system and of the vacuum related activities will be given.

SESSION 3 / 32

Vacuum faults at Elettra

Author: Fabio Mazzolini[1]

[1] *SincrotroneTriesteS.C.p.A.*

A description of some vacuum faults in Elettra

SESSION 5 / 33

Jefferson Lab's CEBAF (Continuous Electron Beam Accelerator Facility) Vacuum System Overview, Concerns and Diagnostic Tools

Author: Timothy Whitlatch[1]

[1] *Thomas Jeffersson Laboratory*

The CEBAF vacuum system will be described together with an overview of the diagnostic tools and main
concerns.

SESSION 1 / 34

Bienvenue

Author: Pierre Strubin[1]

[1] *CERN*

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