Tuesday Evening Poster Sessions

Vacuum Technology
Room: Hall 3 - Session VT-TuP

Vacuum Technology Poster Session

VT-TuP1 Estimating Measurement Uncertainty of Pressure Calibration, ***Yu-Wei LIN***, *C.-P. Lin, C.N. Hsiao*, National Applied Research Laboratories, Taiwan, Republic of China

A vacuum gauges calibration system for wide-range pressure was developed, and the measurement uncertainty associated with the system. The design of the system took into consideration of influencing factors that include uniformity of gas distribution and the geometric location of the gauge to be calibrated. The system operates following the procedure stipulated in the comparison vacuum gauge calibration method. The calibration may range from 10^5 to 10^{-5} Pa . The system makes use of capacitor vacuum gauge, SRG and hot cathode thermion vacuum gauge to estimate the degree of uncertainty associated with the system. The data collected from the gauge calibration tests indicated that if the background pressure of the system had reached 10^{-7} Pa, the uncertainty associated with the system were as follows: less than 3.6 % in the pressure range of 10^{-5} to 10^{-2} Pa, less than 2.3 % in the pressure range of 10^{-2} to 10^5 Pa. The present research has demonstrated the high stability of the vacuum calibration system, and its capabilities of conducting calibration for vacuum gauge with great efficacy.

VT-TuP5 The ESS Vacuum Control System Concept, ***Hilko Spoelstra***, *M. Zaera-Sanz*, European Spallation Source, Sweden

The European Spallation Source (ESS) is a high current proton LINAC to be built in Lund, Sweden. The LINAC will deliver 5 MW of power to the target at 2000 MeV, with a nominal current of 74 Ma. Ground break took place in September 2014 and the construction of the accelerator tunnel and adjacent buildings progresses rapidly.

Although the different LINAC sections will be in-kind contributions from the several member countries, the accelerator vacuum control system and the machine protection system, will be mainly designed and build in-house which requires a tight collaboration between the Integrated Control System Division (ICS) and the Vacuum Team of the Accelerator Division (AD) of ESS.

The Vacuum control system is based on PLC (Programmable Logic Controller) technology and on EPICS (Experimental Physics and Industrial Control System) SCADA (Supervisory Control and Data Acquisition). Each accelerator section has one or more PLCs to control the different valves by acting on the analog and interlock signals from the gauge- and pump-controllers through a pre defined voting scheme. EPICS modules will be used as the interface between the operator screen and the vacuum controllers. Besides local interlocks for vacuum, machine protection interlocks shall be integrated in the control system for the protection of the LINAC. This integration will provide beam permission to the beam interlock system when all nominal conditions for vacuum are met.

A set of control and machine protection functions will define the vacuum controls system architecture and implementation. This contribution will discuss the design of the ESS proton LINAC vacuum control system, strictly complying with all identified control and protection functions.

VT-TuP6 Effect of Impeller Tip Clearance on the Degree of Vacuum of Self-Priming Pump, ***Youn-Jea Kim***, *H.J. Jeon, J.-H. Boo*, Sungkyunkwan University, Republic of Korea

Self-priming vacuum pump is hybrid-type pump of which the principles of axial-type screw vacuum pump and centrifugal pump are combined for better performance. It is operated by the rotation of inducer-impeller generating partial vacuum and centrifugal force. Due to its unique operating principle, self-priming vacuum pump is characterized for transferring fluid having viscosity and is able to be used in various industrial field treating multiphase fluids such as slurry. Tip clearance in self-priming vacuum pump is an important design factor affecting the performance of the pump, which is closely associated with the suction performance. In this study, the effect of impeller tip clearance on the degree of vacuum of self-priming pump was numerically investigated. Numerical analysis was conducted by ANSYS CFX ver. 16. The results for pressure and velocity distributions and H-Q curve were prepared with various values of tip clearance

VT-TuP7 Simulation of the Transporting of Sputtering Particles and Comparison of the Film Thickness Distributions between Simulations and Experiments, ***Kohei Kuroshima***, *M. Iguchi*, Osaka Vacuum, Ltd., Japan, *S. Sugimoto*, Osaka Vacuum, Ltd.Osaka Vacuum, Ltd., Japan

A Monte-Carlo simulation of the transporting of sputtering particles was performed, using Born-Mayer potential as the two-body potential. Film thickness distribution on the substrate was calculated and compared to experimental results obtained under the same conditions. Calculations and experiments were made for a variety of gas pressures and target-substrate (T-S) distances.

The film thickness distribution on the substrate is determined by the distribution of particle emissions from the target, gas pressure and T-S distance. Therefore, if we can control the distribution of particle emissions, the pressure and the T-S distance, we can control the film thickness distribution on the substrate. The distribution of the transparent film thickness will create the designed Moire pattern.

Our simulations serve as basic research on this control.

VT-TuP8 Finite Element Based Multiphysics Analysis of Photon Stimulated Desorption from Vacuum Chamber used in Electron Storage Ring, ***Kamlesh Suthar***, *B.K. Stillwell*, Argonne National Laboratory

We present preliminary study of the Photon Stimulated Desorption from aluminum vacuum chamber. Synchrotron radiation is generated in electron storage ring when the electron beam pass through magnetic field. In this paper, such synchrotron radiation is simulated on magnetic lattice of the storage beam. The temperature of the vacuum chamber increases due to absorption of photon beam simultaneously the molecular pressure also increases due to desorption of the adsorbed gases. This process of increasing in gases depends upon various physical phenomena, such as irradiation of photon beam due to interaction of electrons in applied magnetic field, secondary emission of electron from surface, heat transfer, and molecular flow of gases. Therefore, the solution of vacuum pressure inside the storage ring depends on various physics. This paper discusses preliminary results of analysis of vacuum pressure combining responsible physics.

Authors Index

Bold page numbers indicate the presenter

— B —

Boo, J.-H.: VT-TuP6, 1

— H —

Hsiao, C.N.: VT-TuP1, 1

— I —

Iguchi, M.: VT-TuP7, 1

— J —

Jeon, H.J.: VT-TuP6, 1

— K —

Kim, Y.J.: VT-TuP6, **1**
Kuroshima, K.: VT-TuP7, **1**

— L —

Lin, C.-P.: VT-TuP1, 1
LIN, Y.-W.: VT-TuP1, **1**

— S —

Spoelstra, H.: VT-TuP5, **1**
Stillwell, B.K.: VT-TuP8, 1
Sugimoto, S.: VT-TuP7, 1
Suthar, K.J.: VT-TuP8, **1**

— Z —

Zaera-Sanz, M.: VT-TuP5, 1