VA 2: Vacuum Generation and Measurement

Time: Monday 10:15–12:00 Location: A 060

Invited Talk VA 2.1 Mon 10:15 A 060

DIJ: New energy-efficient type of oil diffusion pump — •Stefan Lausberg — Leybold GmbH, Bonner Str. 498, 50968 Köln, Germany

A century passed since the diffusion pump was invented by Wolfgang Gaede and it remained the high vacuum pump of choice for a very long time. Nowadays diffusion pumps are operated with oil which is not allowed for many applications, the most prominent example being semiconductor production. With the rise of turbomolecular pumps and cryopumps oil diffusion pumps were more and more replaced. Still their huge benefits have kept oil diffusion pumps relevant in modern vacuum systems. They are robust and relatively inexpensive for the performance they can deliver. However they require high energy consumption due to their principle of operation.

Leybold has now developed the DIJ: a new energy-efficient type of oil diffusion pump which saves energy in a number of ways. An energy saving unit controls the electrical heaters to keep the desired temperature with minimum power consumption. This also reduces the required cooling capacity of the chiller that supplies cooling water to the pump. On the other hand a thermal isolation reduces the heat flow to the environment. Finally, a new immersion heater design results in an optimized energy transfer to the oil. In this talk we will present the properties and benefits of this new type of diffusion pump in contrast to other high vacuum pumps.

VA 2.2 Mon 11:00 A 060

In-situ calibration of vacuum gauges in the KATRIN spectrometer system — Philipp Triebskorn, •Joachim Wolf, and KATRIN Collaboration — Karlsruhe Institute of Technology (KIT), ETP, Postfach 3640, 76021 Karlsruhe

The **Ka**rlsruhe **Tri**tium **N**eutrino (KATRIN) experiment uses the kinematics of electrons from the tritium β-decay to determine the effective neutrino mass with a sensitivity of $m_\nu = 200\,\mathrm{meV/c^2}$ (90% C.L.). The energy of the β-electrons, produced in the windowless gaseous tritium source (WGTS), is measured in the Spectrometer section at a pressure in the range of 10^{-11} mbar. The spectrometer section consists of the Pre-Spectrometer ($8.5\,\mathrm{m^3}$), the huge Main Spectrometer ($1240\,\mathrm{m^3}$), and the detector section, where electrons that pass the electrostatic filter of the Main Spectrometer, are counted. For to the low pressure regime in the KATRIN spectrometers the vacuum gauges (Inv. Magnetron, Extractor, RGA) are calibrated regularly in-situ at pressures between 10^{-10} and 10^{-7} mbar, using various constant gas flows of Ar, He, H_2, and N_2. Here we describe the calibration system and procedure. We acknowledge the support by KSETA, BMBF (05A17VK2), HAP and the Helmholtz association.

VA 2.3 Mon 11:30 A 060

Ultrahochvakuumsystem für das Atominterferometer der MAIUS-B Höhenforschungsraketennutzlast — •Michael Elsen — Universität Bremen, Zentrum für angewandte Raumfahrttechnik und Mikrogravitation (ZARM), 28359 Bremen

Das wissenschaftliche Experiment der MAIUS-B Höhenforschungsraketennutzlast dient zur Erzeugung des ersten Kalium 41 Bose-Einstein-Kondensat (BEC) im Weltraum und zur Durchführung von Atominterferometrie mit Rubidium 87 und Kalium 41. Zur Durchführung der Experimente muss ein Vakuum * 5*10-10 mbar erreicht werden. In der Beschleunigungsphase des Raketenstarts kommt es zu Beschleunigungen von 13 g und Vibrationen von 1,8 g RMS im Bereich von 20-2000 Hz. Statische Lasten von bis zu 50 g können während dem Wiedereintritt und der Landung auf dem Boden auftreten. Das Design des Ultrahochvakuumsystems zur Aufrechterhaltung der Pumpleistung/Vakuumqualität umfasst eine Ionengetterpumpe und zwei Titansublimationspumpen. Des Weiteren mussten aus Platz- und Gewichtsgründen nicht kommerzielle Dichttechnologien, zum Beispiel für die Fenster, verwendet werden. Das finale Design des Ultrahochvakuumsystem der MAIUS-B Höhenforschungsraketennutzlast wird in diesem Vortrag beschrieben, ebenso wie die durchgeführten Tests.