VA 4: Poster Session

Time: Monday 14:45–16:00 Location: P2-OG3

VA 4.1 Mon 14:45 P2-OG3

Laser enhanced field emission — •Simon Däster — ETH Zürich

We report a setup to create femtosecond long electron pulses in an electron microscope. A commercial scanning microscope has been adapted in order to amplify a static electric field with a concentrated femtosecond laser pulse. It is shown how to measure this small electron beams. Furthermore, new research fields are indicated where to use this technique for an enhanced observation of electron dynamics.

VA 4.2 Mon 14:45 P2-OG3

Simulation of thermal and radioactive impacts on the CPS performance — •Lutz Schimpf and KATRIN Collaboration — Karlsruhe Institute of Technology (KIT), IEKP, Postfach 3640, 76021 Karlsruhe

The transport section of the **Ka**rslruhe **Tri**tium **N**eutrino experiment (KATRIN) has two main tasks, which are the adiabatic guidance of the β-electrons from the Windowless Gaseous Tritium Source to the spectrometer section and to lower the tritium flow into the spectrometer section by at least 14 orders of magnitude. This huge reduction of the tritium flow is achieved by a reduction of seven orders of magnitude in the Differential Pumping Section and another seven orders in the Cryogenic Pumping Section (CPS). Two thirds of the beam tube inside the CPS is being operated at a temperature of 3K to adsorb the tritium molecules on a argon frost layer. The pumping performance during an operation interval of 60 days does strongly dependent on the homogeneity and the temporal stability of the beam tube temperature, as well as on the radioactive impact of tritium β decays inside the argon frost. To investigate these time and geometry dependent problems a custom-made simulation program has been developed. This program, based on time dependent desorption probabilities, is used to simulate the time distribution of the gas migration along the beam tubes, and to calculate its suppression factor. Simulation results will be presented both for deuterium used during commissioning and for tritium used in standard operation. This work has been supported by BMBF (05A14VK2), KSETA and the Helmholtz Association.

VA 4.3 Mon 14:45 P2-OG3

Gas dynamics simulations of the tritium source for the KATRIN experiment — •Florian Heizmann[1], Laura Kuckert[2], and KATRIN Collaboration[1,2] — [1]KIT, Institute of Experimental Nuclear Physics (IEKP), P.O. box 3640, D-76021 Karlsruhe — [2]KIT, Institute for Nuclear Physics (IKP), P.O. box 3640, D-76021 Karlsruhe

The Karlsruhe Tritium Neutrino Experiment (KATRIN) aims to measure the neutrino mass with a sensitivity of 200 meV/c^2 (90% C.L.) in a direct approach using the beta decay of molecular tritium. The neutrino mass is extracted by fitting model-based beta decay spectra to the measured electron spectrum. Thereby it is important to include modifications from systematic effects to the spectrum model. Especially the gas dynamics in the windowless gaseous tritium source (WGTS) play a key role for accurate modelling. Since in most cases this can not be measured directly, the modelled beta spectrum relies on gas dynamics calculations as well as on monitoring of operation parameter changes. A comprehensive pseudo-3D model has been developed. The accuracy of the gas dynamics model in the spectrum simulation including the monitoring of operation parameters is reviewed and implications on the systematics budget for the neutrino mass measurement are described. Supported by KSETA, BMBF (05A14VK2), HAP and the Helmholtz Association.

VA 4.4 Mon 14:45 P2-OG3

Time dependent TPMC simulation of the KATRIN cryogenic pumping section — •Fabian Friedel and KATRIN Collaboration — Karlsruhe Institute of Technology (KIT), IEKP, Postfach 3640, 76021 Karlsruhe

The aim of the **Ka**rlsruhe **Tri**tium **N**eutrino (KATRIN) experiment is to determine the effective mass of the electron antineutrino with a sensitivity of 200 meV/c^2 (90% C.L.). This will be achieved by measuring the β-spectrum of tritium close to the kinematic endpoint at 18.6 keV. One main component of the experiment is the transport section which magnetically guides the beta electrons from the windowless gaseous tritium source to the spectrometer for energy measurement. An important part of the transport section is the Cryogenic Pumping Section (CPS) which has been designed to reduce the tritium flow by at least 7 orders of magnitude. The inner surface of the beam tubes is covered by a layer of 3-K-cold argon frost, cryosorbing the tritium. In order to confirm that this stringent requirement, the pumping performance of the CPS is currently tested with deuterium. In addition many TPMC simulations with MolFlow+ have been performed and an algorithm was developed to describe the time dependent evolution of the tritium reduction factor. This work has been supported by BMBF (05A14VK2), KSETA and the Helmholtz Association.

VA 4.5 Mon 14:45 P2-OG3

A Passive Wide Range Gauge — •Jaroslaw Iwicki, Detlev Tietjen, Ruben Gerhardt, Michael Flaemmich, and Ute Bergner — VACOM Vakuum Komponenten & Messtechnik GmbH, Jena, Deutschland

The Pirani gauge, named after its inventor Marcello Stefano Pirani, has become one of the workhorses in vacuum technology and corresponding industries. As a stand-alone gauge, this thermal conductance based principle is widely used in industrial environments for moderate pressure determination. Despite existing needs for such a measuring tool equipped with versatility, accuracy, robustness and low cost, however, in UHV applications the Pirani gauge is rarely used. Primarily this is due to its bake-out restrictions attributed to the location of the signal processing electronics. Latter is to be installed directly onto the gauge, so that bakeable Pirani gauges are hardly or not available. Moreover, bakeable wide range gauges - consisting of a Pirani and a hot or cold cathode - do not exist. In this talk we introduce a novel Pirani gauge setup in which the gauge signal processing is realized by a microcontroller driven digital processing unit. In contrast to the conventional analogue based setup of signal processing (Wheatstone Bridge), the electronics can be spacially separated from the vacuum gauge. Decent theoretical data and experimental results will be presented to explore and support the features of the novel Pirani gauge concept. Finally, the digital setup allows integrating the Pirani sensor in a wide range gauge in a way that boundaries between transducers and passive gauges may disappear in the future.

VA 4.6 Mon 14:45 P2-OG3

Testing all-aluminum CF chambers for UHV applications — •Maximilian Biethahn, Sophie Gottschall, René Bauer, Michael Flämmich, and Ute Bergner — VACOM Vakuum Komponenten & Messtechnik GmbH, Gabelsbergerstraße 9, 07749 Jena

Stainless steel and aluminum are the most widely used materials in vacuum technology - still with the balance more on the stainless steel side. However, aluminum has some strong advantages over stainless steel, e.g.: it is lightweight, it has a very low relative magnetic permeability (approx. 1) and it shows very low outgassing in unbaked and in-situ baked condition.

In this talk, metal-sealed CF vacuum components and chambers made from aluminum are discussed. In this context, adequate knife edge stability, temperature stability and reliable outgassing properties have always been debated as major challenges. Based on detailed experimental studies it will be shown that these challenges have been solved lately. It will be shown that the knife edges are stable for hundreds of closures and outgassing rates below 2E-14 mbar*l/s/cm2 are achieved after very moderate bake-out conditions (24 h at 120 °C). Because the flange connection system is designed according ISO/TS 3669-2 (Bakeable flanges: Dimensions of knife-edge flanges), it can be easily used with conventional stainless steel flanges and chambers. By this means, Aluminum-CF components and chambers based on the AluVaC(R) technology are today a serious alternative to the established components made from stainless steel.