VA 2: Vacuum technology: New developments and applications

Time: Monday 11:45–12:45 Location: H2

Invited Talk VA 2.1 Mon 11:45 H2

IFMIF-DONES gas flow modelling using Test Particle Monte-Carlo Simulations — •Volker Hauer — Karlsruhe Institute of Technology, Institute for Technical Physics, Karlsruhe, Germany

IFMIF, the International Fusion Materials Irradiation Facility, is a test facility for materials foreseen in fusion reactors. High neutron fluxes are generated with an energy spectrum and intensity similar to the conditions at the burn phase inside a fusion reactor. The high energy neutrons result from accelerating deuterons onto a lithium target. Simulations of the gas flow inside the IFMIF-DONES vacuum system were performed with the Test Particle Monte-Carlo code Molflow+. The IFMIF-DONES model is based on the latest design and of the LIPAc accelerator, which is being built for testing IFMIF accelerator components. Both, LIPAc and IFMIF-DONES share the same type of accelerator subsystems. The model was prepared for simulation by adding different sets of boundary conditions for the pumping of deuterium and hydrogen originating from beam losses and outgassing, respectively. The simulations of the gas pumping show pressure profiles which are mainly determined by the beam losses in this subsystem except for the Linac modules where the beam losses are very low. As LIPAc and IFMIF-DONES share most sections the pressure profiles are very similar.

Invited Talk VA 2.2 Mon 12:15 H2

Current design status and outgassing considerations for the vacuum system of the Einstein Telescope — •Katharina Battes, Christian Day, and Stefan Hanke — Karlsruher Institut für Technologie, Eggenstein-Leopoldshafen, Deutschland

As third-generation, underground gravitational-wave observatory the Einstein Telescope is currently being planned in Europe. In order to enhance sensitivity compared to the current detectors as well as to expand the frequency band to lower frequencies, the length of the vacuum pipe arms will be increased to 10 km and the main optics will partly be cooled to cryogenic temperatures below 20 K.

Designed as an equilateral triangle, the Einstein Telescope will consist of six laser interferometers, which require high to ultra-high vacuum conditions. As especially residual gases like water can cryosorb as frost on the cryogenic mirror surfaces and thus degrade its optical performance, this frost formation has to be mitigated by properly designing the cryostat and additional pumping as well as considering the outgassing characteristics of the room temperature parts.

Therefore, potentially relevant materials are investigated at the Outgassing Measurement Apparatus, which uses a modified throughput method. As a result, besides total outgassing rates, information on the outgassing species are determined by a mass spectrometer.

This paper describes the current design of the Einstein Telescope vacuum system and evaluates materials and possible pre-treatments with respect to their potential application based on optimized outgassing characteristics.

Lunch break