# VA 1: Large Vacuum Systems

Time: Monday 9:00–10:15 Location: H25

**Invited Talk** VA 1.1 Mon 9:00 H25

**The stellarator Wendelstein 7-X: vacuum technology, vacuum leak search, system commissioning** — •Juergen Baldzuhn, Hans-Stephan Bosch, Heinz Grote, Olaf Volzke, and Lutz Wegener — Max-Planck Institute for Plasma Physics, 17491 Greifswald, Germany

The new stellarator Wendelstein 7-X (W 7-X) is now (Nov. 2015) almost ready to go into plasma operation. This experimental plasma device is built to exploit the potential of nuclear fusion in a toroidal arrangement. The plasma will be situated inside a non-magnetic stainless steel vessel, surrounded by seventy superconducting and fifteen normal conducting coils. In order to guarantee reliable plasma operation, the vacuum pressure inside the plasma vessel must be in the range of 10-8 mbar. Mechanical pumps are available today for the evacuation of the vessels. In the future they will be complemented by cryo-pumps. A description of the stellarator W 7-X will be given. Emphasis is on the vacuum systems and the particular requirements for the technical vacuum production in a fusion device. Some particular pumping and vacuum systems will be delineated, as they are used for high power neutral particle injection systems in a fusion device. They highlight the peculiar requirements that are imposed by the harsh plasma environment on the vacuum production. The neutral particle balance and pressure development during plasma operation will briefly be depicted.

VA 1.2 Mon 9:45 H25

**Vacuum solutions for ion thruster testing** — •Stefan Lausberg — Oerlikon Leybold Vacuum, Bonner Str. 498, 50968 Köln, Germany

Electrical propulsion is the keyword for nowadays movement of space vehicles. Here ionized particles, usually xenon, are accelerated by thrusters in an electric field. State-of-the-art xenon thrusters emit a gas flow of 0.1 to 10 mg/sec. In order to maintain a high vacuum pressure at this flow in thruster test chambers, a large pumping speed is required, often in the range of 10'000 to 100'000 l/s for xenon. The benefit of a large mass for propulsion on the one hand is a huge challenge for vacuum pumps on the other hand. One of the reasons is the poor thermal conductivity of xenon gas which leads to critical temperature rises in gas transfer vacuum pumps like turbomolecular pumps. Moreover, dozens of large turbomolecular pumps would be necessary to reach the required pumping speed. We will show that big standard cryopumps are no appropriate solution either - even though they can principly provide large pumping speeds.

Oerlikon Leybold Vacuum has developed an optimized and simple cryogenic solution for xenon pumping. Strong single-stage Gifford-McMahon type cold heads carry metal discs which condense the xenon gas with a pumping speed at the edge of the theoretical limit. In this talk, we will present the whole vacuum system for a thruster testing facility.