IAP Seminar

Tuesday, 5th Nov. 2019, 16:00 s.t.
TU Wien, Institut für Angewandte Physik, E134
1040 Wien, Wiedner Hauptstraße 8-10
Yellow Tower „B", 5th floor, SEM.R. DB gelb 05 B

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Erosion investigations of fusion relevant plasma facing materials

Nuclear fusion could be a clean and climate protecting energy source of the future, but still a lot of physical and technical issues need to be solved. In order to operate a future fusion power plant economically the first wall in the reactor must withstand the tremendous heat load and the continuous particle bombardment long enough. To investigate the erosion of such plasma facing materials (PFM) of a fusion device under well-defined laboratory conditions, the TU Wien quartz crystal microbalance technique (QCM) is ideally suited. In-situ studies with the QCM allow a unique insight into the dynamics of material mixing, erosion phenomena and particle retention processes. In addition, experimental results can be used to benchmark new surface morphology sensitive BCA (binary-collision-approximation) codes, like TRI3DYN and SDTrimSP-3D. We can show that by taking surface morphology information into account, the agreement with the experimental results is greatly improved.

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Small ELMs – A promising reactor scenario

The foreseen operational scenario for future fusion devices is the high confinement mode, which is characterized by a strong increase in confinement due to the formation of a transport barrier at the plasma edge. The periodic crash of this so-called pedestal is caused by large edge localized modes (type-I ELMs) which lead to possibly intolerable heat and particle loads if not controlled. In ASDEX Upgrade, discharges with plasma edge conditions comparable to ITER, exhibit small ELMs at good confinement, if these high density plasmas are strongly shaped. In the experiment, type-I ELMs and small ELMs can coexist. In this contribution a model is proposed that explains how the small ELMs modify the shape of density profile in such a way that it is stable against large type-I ELMs. The manifestation of small ELMs at reactor-like conditions as filamentary transport rather than large bursts offers a possible route to tolerable heat loads at high pedestal top pressure in future devices.

All interested colleagues are welcome to this seminar lecture(s) (2 x 20 min. presentations followed by discussion)

Friedrich Aumayr. (LVA Leiter und Seminar Chair)