P 1: Magnetic Confinement I

Time: Monday 14:45–15:35 Location: KH 02.016

P 1.1 Mon 14:45 KH 02.016

Application of TALIF for the characterization of negative hydrogen ion production in ion sources for NBI — •Julian Hörsch, Christian Wimmer, and Ursel Fantz — Max-Planck-Institut für Plasmaphysik

The understanding of the surface conversion process of hydrogen/deuterium atoms or positive ions to negative H^-/D^- ions at a low work-function surface is of special interest for the physics understanding of negative ion sources. The negative ion yield from surface conversion is determined by the work function of the converter surface, the flux of the precursor particles (H/D or H_x^+/D_x^+) on the surface and their energy distribution function (EDF). To investigate the flux, respectively the density of neutral hydrogen atoms and their EDF, a two-photon absorption laser induced fluorescence (TALIF) diagnostic is implemented at the negative ion source BATMAN Upgrade (BUG). TALIF measurements at BUG were previously limited by the low signal-to-noise ratio, which made an accurate EDF resolution that is required to resolve potential two-temperature EDFs impossible. Recent improvements of the TALIF diagnostic allowed for the first time the resolution and confirmation of a two-temperature EDF at BUG. This contribution discusses the results of investigations with the improved setup that enables now more in-depth investigations together with additional diagnostics as for H- density or plasma potentials.

P 1.2 Mon 15:10 KH 02.016

Modeling of the BATMAN Upgrade ion-source using the Cs-Flow3D code — •Daniele Mussini, Christian Wimmer, Dirk Wünderlich, and Ursel Fantz — Max-Planck-Institut für Plasmaphysik (IPP), Boltzmannstr. 2, 85748 Garching

The ion sources for the neutral beam injectors (NBI) of ITER rely on the production of negative hydrogen ions on a surface featuring a low work function (plasma grid, PG). Cs is continuously evaporated into the source forming a layer on the PG in order to reduce the work function to low values (<2eV). However, the redistribution of Cs inside the source and the interaction of the plasma with the source surfaces lead to a temporally unstable and inhomogeneous Cs layer. The knowledge of Cs fluxes onto and out of the PG becomes thus necessary in order to be able to carry out stable long pulses at ITER's requirements (several hundred s in H, 3600s in D). Yet, the neutral Cs density can be measured, Cs fluxes are experimentally not accessible. The Monte-Carlo Test-Particle code CsFlow3D is used to model the Cs dynamics inside the BATMAN Upgrade ion-source exploiting several inputs such as plasma parameters, electromagnetic field as well as sticking coefficients. For the first time, 3D plasma parameters from a fluid code are implemented in CsFlow3D. Three different synthetic lines of sight for the quantification of neutral Cs are implemented into the code to validate the code with the experiment. This contribution presents preliminary results after the implementation of the new plasma parameters.