Impact of the heating scheme on edge poloidal impurity asymmetries

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Impurities are necessary actuators (e.g. to reduce heat loads to the first wall) and, at the same time, drawbacks (e.g. core impurity accumulation) for future fusion devices. Improving the knowledge on the behavior of the impurities in fusion plasmas is a requirement for the success of a fusion reactor. Impurity kinetic profiles are routinely obtained from Charge Exchange Recombination Spectroscopy (CXRS). These systems are normally optimized to measure at the low field side (LFS) as they require the NBI neutrals to produce the CX reactions and thus provide a local measurement at one given position along the flux surfaces. At ASDEX Upgrade, the high field side (HFS) gas puff based CXRS system has been upgraded with a new gas valve that provides a higher signal-to-noise ratio and enables background subtraction to be performed [1].

Previous studies have shown that the impurity flows and densities are poloidally asymmetric in the edge region [2,3,4,5]. In this work, the asymmetry studies are expanded to different heating schemes. HFS and LFS edge rotation measurements have been obtained in ICRF dominated and pure ECRH heated plasmas for the first time at ASDEX Upgrade. The HFS edge toroidal rotation profile changes its shape when changing from wave to NBI heated plasmas. This suggests that the torque induced by NBI is affecting the HFS even if most of the beam neutrals do not reach that region. The LFS edge toroidal rotation profile increases by a constant value without modifying its shape when changing from wave to NBI heated plasmas. Small differences in absolute value have been observed in the HFS edge toroidal velocity between nitrogen, boron and neon measurements. The terms in the parallel force balance equation will be studied to shed light on the differences observed between the different impurities and heating schemes.

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