Contribution ID: **1068**

Type: **not specified**

P3.021 Modeling neutral beam transport in fusion experiments: Studying the effects of reionisation and deflection

Wednesday, 19 September 2018 11:00 (2 hours)

Neutral Beam Injection is the main heating system on a variety of fusion devices, and will be the main heating system of ITER. Especially during high-power operation in long pulse devices, it is important that the losses in the beamline are well quantified. There are several types of beamline losses, such as geometrical losses, due to scraping of the beam on apertures, and reionisation losses, due to interaction of the beam with background gas. Geometrical losses are straightforward to calculate, and lead to well-predictable heat loads. In contrast, quantifying reionisation losses requires knowledge of the local gas density, and the resulting heat deposition depends on the magnetic field. Because of the deflection of the reionized particles, heat deposition can occur in shadowed locations. A computational toolbox is developed to calculate these losses. The results are benchmarked on ASDEX Upgrade. The codes will be used to aid NBI design in future devices such as DEMO.
Damage to components in shadowed locations has occurred in the NBI beamline of ASDEX Upgrade. To model the heat deposition due to reionisation, the vacuum magnetic field in ASDEX Upgrade is calculated for various discharges to identify critical magnetic field conditions in terms of duct damage. For selected shots, the magnetic field including shielding materials and saturation effects is calculated with ANSYS. The neutral density in the NBI beamline of ASDEX Upgrade is calculated assuming molecular flow, taking into account the full 3D geometry and the properties of the pumps. Results from the neutral gas density calculation are benchmarked with experimental pressure measurements. To calculate heat loads, neutral beam particles are tracked through the magnetic field while interacting with the neutral gas via a Monte-Carlo scheme. The damage pattern observed in the experiment is explained by reionisation and subsequent deflection under specific magnetic field conditions.

Presenter: DEN HARDER, Niek (ITER Technology Diagnostics Max-Planck-Institut fŸr Plasmaphysik)

Session Classification: P3