Synthetic edge and scrape-off layer diagnostics—a bridge between experiments and theory

The scrape off layer (SOL) plasma in a Tokamak device and its coupling with the edge dictate the performance of a discharge to a high degree—especially as all plasma has to go through the SOL, which is the main exhaust channel for the hot plasma. This contribution provides an introduction to the modelling efforts of the plasma dynamics in the SOL and the edge regions. We employ a fully dynamical fluid model, the HESEL code. HESEL is equipped with synthetic diagnostic tools as probe arrays, Li-beam spectroscopy, and Gas Puff Imaging. Using the synthetic probe arrays to measure the electron and ion heat advection and conduction we obtain the upstream power fall-off length for a broad range of plasma parameters and by applying non-linear fitting procedures we derive the scaling of the fall-off length. The obtained results are in agreement with recent experimental observations from L-mode ASDEX Upgrade data. A workflow for generating synthetic Lithium beam data, where the fluctuation data from HESEL are passed to the RENATE code are discussed using experimental results from ASDEX Upgrade.

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