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P4.1020 The study of L-mode filament dynamics using synthetic and experimental BES diagnostics

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Fluctuation beam emission spectroscopy (BES) is an active plasma diagnostic used for density measurements which has sufficient spatial and temporal resolution for the study of turbulent density fluctuations and associated flows. A high energy neutral beam consisting of hydrogen isotopes or light alkali metal atoms is shot into the plasma. Through various collisional processes with plasma particles, the beam atoms get excited and the photons originated from their spontaneous emitted is collected by an observation system. RENATE is a fluctuation BES modelling code [1], featuring 3D beam and 3D observation geometry modelling capabilities as well as accounting for the underlying magnetic geometry, thereby incorporating all relevant spatial artefacts of the diagnostic [2]. Time-dependent density and temperature fluctuations are taken as input, provided by 2D fluid model, HESEL, used to study interchange dynamics in the SOL. Flux tube expansion of turbulent structures within the beam geometry allows for 3D modelling of the synthetic diagnostic signal [3]. In the present contribution, the statistical properties of synthetic BES signals are discussed and compared to corresponding experimental measurements of L-mode plasmas. Filament frequencies, amplitudes, sizes and velocities are acquired for both synthetic and experimental signals alike. Our work focuses on the reproducibility of experimental observations with the RENATE-HESEL synthetic diagnostic, by coupling the HESEL results to the RENATE BES modelling code. The HESEL code was run in a Kepler workflow, developed within the EUROfusion Integrated Modelling framework. A workflow for passing HESEL fluctuation data via integrated data structures to the RENATE BES code will be discussed. Our work was carried out using BES diagnostics on the ASDEX-Upgrade tokamak, where the magnetic field dependence on filament dynamics was discussed in a previous work [4]. Measurements and modelling of SOL turbulence were also carried out for on the EAST tokamak data, a density dependence on SOL dynamics, as well as poloidal sizes and velocities of filaments are discussed.
[1] D. Guszejnov et al. RSI 83, 113501 (2012). [2] O. Asztalos et al. EPS P4.107 (2017). [3] A.H. Nielsen et al. Submitted NF (2019). [4] G. Birkenmeier et al. PPCF 56, 075019 (2014).

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