ICRH heating and turbulent transport modelling of the WEST L-mode plasma using ETS: interpretative and predictive code validation

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The European Transport Simulator ("ETS") [1] is a suite of codes designed to simulate tokamak plasma discharges. Not only it highlights the evolution of particle density and energy due to transport effects accounting for particle, heat and current sources, but it equally provides insight into fast ion dynamics resulting from ICRH (and - if present - beams), and the impact these high-energy populations have on the plasma core [2]. This tool allows to help understand the plasma dynamics in WEST and is being used for optimizing the plasma discharge. In particular, attention is being devoted to identify means to avoid a radiative collapse by ensuring an efficient electron RF induced heating and to help finding favourable conditions to enable the L-H transition.

The first step was to verify and validate the simulator in interpretative and predictive mode for some relevant WEST L-mode plasmas. CYRANO [3] and StixRedist [4] are used as ICRH modules [5, 6], while transport is assumed to be due to turbulence and is described exploiting the TGLF module [7]. Collisional electron power computeded with the ICRF modules was compared with the experimental one obtained by using the Break In Slope method. Scans in minority density and ICRF power were performed in *interpretative* mode in order to determine the electron/ion heating ratio, revealing dominant electron heating and highlighting that the neutron rate is a sensitive function of the power absorbed by the deuterons. Seeking for the highest possible compatibility between the various available measurements (electron temperature profiles, stored energy and neutron rate) while staying within realistic error bars, *predictive* modelling which describes the evolution of particle density and temperatures allowed to estimated the ion temperature profiles and to establish a firm link between the WEST experimental data (e.g. energy & neutron rate) on the one hand and the thermal and fast particle profiles resulting from simulation on the other, yielding a better insight in the scenario dynamics allowing to better steer upcoming experiments.

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