

# Towards a predictive modelling capacity for DT plasmas: European Transport Simulator (ETS) verification and validation

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The European Transport Simulator (ETS) [1] has been developed under the EUROfusion Integrated Modelling (EU-IM) effort [2] to meet the requirements for scenario development of burning plasmas. The ETS focuses both on interpretive and predictive modelling and is now being deployed for broader exploitation, e.g. on the JET computing infrastructure for close integration and use in support of JET campaigns. Recently, developments have been undertaken to enhance the ETS modelling capabilities for DT plasmas in view of the upcoming experiments.

A coherent inclusion of fast particle physics effects as well as a consistent approach for multispecies plasmas have been implemented. Major features are the capability for separate modelling of the different hydrogen isotope channels as well as light and heavy impurities - in all their charge states - and a set of advanced heating and current drive modules, which, for example, allows for ICRH heating effects on majority ions. ETS is also used in modelling runaway electron scenarios and NTMs. Here we describe the extensions to the ETS workflow undertaken to enhance the modelling capabilities for DT plasmas and discuss a detailed verification and validation activity.

The ETS also sports a set of transport models (TGLF, Qualikiz, EDWM) capable of resolving and providing transport for hydrogenic isotopes as well as light and heavy impurities. Results with these models as well as a discussion on approaches attempting to resolve inherent mass scaling issues will be shown.

[1] D. Kalupin et al, Nucl. Fusion 53, 123007 (2013)

[2] G.L. Falchetto, et al., Nucl. Fusion, 54, 043018 (2014)

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