Computational Study of Transport Mechanisms in H-mode Pedestal of Tokamak Plasmas

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The confinement of H-mode plasmas strongly depends on the the H- mode pedestal structure. The pedestal provides the boundary conditions for the hot core tokamak region and determines the stability properties of the plasma edge. The structure of H-mode pedestal depends on many factors such heating of the plasma core, neutral fueling, recycling and particle and thermal transport. It is important to elucidate the primary mechanisms that are responsible for the pedestal structure in order to optimize the tokamak performance, avoid disruptions and large scale instabilities such as NTM and ELMs. In this study, the FACETS code is used to test several models for anomalous, paleoclassical and neoclassical transport in the plasma edge of tokamaks. The FACETS code is a new whole-device integrated modeling code that advances plasma profiles in time using a selection of transport models and models for heating and particle sources. The simulation results are compared with experimental measurements from major US tokamaks such DIII-D. These validation efforts allows to discriminate between different models for transport in the different regions of the H-mode pedestal. In addition in this study, the integrated modeling FACETS code is used for a series of parametric scans against some basic plasma parameters to investigate the difference in fluxes computed using some commonly used transport models such as GLF23, TGLF and Multi-Mode models. This parameter study has an objective to develop UQ&V algorithms in an integrated modeling code.

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