

## Computational study of the neutral fueling effect on the H-mode pedestal scalings

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The effects of neutral fueling of the H-mode pedestal are studied in the coupled core-edge FACETS simulations [1]. Several transport mechanisms are considered in the plasma core region. These transport mechanisms are described by models for anomalous transport driven by ETG, TEM and RB instabilities, and by a model for the paleoclassical transport [2]. The source of neutrals at the separatrix is computed using the UEDGE component of the FACETS code. The effect of poloidal asymmetry in the neutral source is studied. The neutrals in the plasma core are tracked using the FRANTIC module in FACETS. The neutral profiles are used to compute the sources of electrons and ions in the plasma core. The particle sources due to the neutral influx from the SOL region are combined with the particle sources due to neutral beam injections. The later sources are computed using the NUBEAM module in FACETS. The plasma profiles in the plasma core are found as a solution of coupled transport equations. The DAKOTA toolkit [3] is used to quantify additional transport that is needed to match experimental profiles (see Fig. 1). The pedestal characteristics such as pedestal width and height are compared with experimental observations from the DIII-D tokamak. The dynamics of the pedestal recovery after an ELM crash is studied. The role of particle pinches in the H-mode pedestal buildup is discussed.

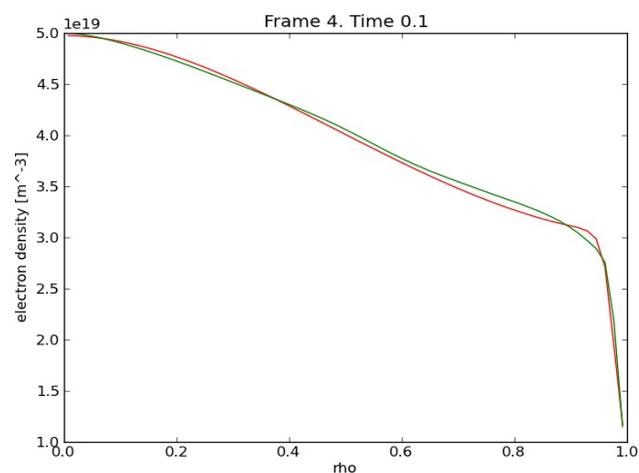


Fig. 1. Electron density profile as a function of square root of the normalized toroidal flux for the DIII-D discharge 98889. The simulation results are shown in green and experimental profile is shown in red.

[1] FACETS – Framework Application for Core-Edge Transport Simulations <https://www.facetsproject.org>.

[2] J. Callen, Phys. Plasmas **14** (2007) 040701.

[3] The DAKOTA – Design Analysis Kit for Optimization and Terascale Applications <http://dakota.sandia.gov/index.html>.