Implementation of a new atomic basis for the He I equilibrium line ratio technique for electron temperature and density diagnostic in the SOL for H-mode plasmas in DIII-D

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Abstract

Evaluating the ratio of selected helium lines allows for measurement of electron densities and temperatures. This technique is applied for L-mode plasmas at TEXTOR [O. Schmitz, *et al*., Plasma Phys. Control. Fusion **50**, 115004 (2008)]. We report our first efforts to extend it to H-mode plasma diagnostics in DIII-D.

This technique depends on the accuracy of the atomic data used in the Collisional Radiative Model (CRM). We present predictions for the electron temperatures and densities by using recently calculated R-Matrix With Pseudostates (RMPS) and Convergent Close-Coupling (CCC) electron-impact excitation and ionization data. We include contributions from higher *Rydberg* states by means of the projection matrix. These effects become significant for high electron density conditions, which are typical in H-mode. We apply a non-equilibrium model for the time propagation of the ionization balance to predict line emission profiles from experimental H-mode data from DIII-D.

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