A First Principles Predictive Model of the Pedestal Height and Width: Development, Testing, and ITER Optimization with the EPED Model

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Abstract

We develop and test a model for the H-mode pedestal height and width based upon two fundamental and calculable constraints: 1) onset of non-local peeling-ballooning (PBM) modes at low to intermediate mode number, and 2) onset of nearly local kinetic ballooning modes (KBM) at high mode number. Calculation of these two constraints allows a unique, predictive determination of both pedestal height and width. The present version of the model is first principles, in that no parameters are fit to observations, and includes important non-ideal effects. Extensive successful comparisons to existing experiments on multiple tokamaks, including experiments where predictions were made prior to the experiment, are presented, and predictions for ITER are discussed.

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