

Developing and Testing the EPED Pedestal Model as Part of the 2011 Joint Research Target*

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The EPED model [1,2] predicts the H-mode pedestal height and width based upon two fundamental and calculable constraints: 1) onset of non-local peeling-ballooning modes at low to intermediate mode number, 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 taken from observation.

The model has been successfully tested on several tokamaks, including cases where predictions have been made before the experiments were conducted, across a wide range of dimensionless and dimensional parameters [1-5]. This initial success has spurred ongoing development and improvement of the model, as well as continued testing of both the model as a whole, and its individual components, particularly the KBM [3,6].

In 2011 a Joint Research Target on pedestal structure is underway, with a goal of conducting experiments on Alcator C-Mod, DIII-D and NSTX to characterize the structure of the pedestal, and test these observations against models. As part of this process, the EPED model is being tested in several experiments on C-Mod and DIII-D, and extended to allow tests on NSTX. Here we report on progress, including model predictions for experiments varying the plasma current, magnetic field and plasma shape. Prediction and optimization of the ITER pedestal is also discussed.

[1] P.B. Snyder et al., *Phys. Plasmas* **16**, 056118 (2009); *Nucl. Fusion* **49**, 085035 (2009).

[2] P.B. Snyder et al., "A First Principles Predictive Model of the Pedestal Height and Width: Development, Testing, and ITER Optimization with the EPED Model," presented at the 23rd IAEA Fusion Energy Conf., Daejeon, Republic of Korea, 2010 and submitted to *Nucl. Fusion*.

[3] R.J. Groebner et al., *Nucl. Fusion* **50** 064002 (2010); *Nucl. Fusion* **49**, 085037 (2009).

[4] T.H. Osborne et al., "Scaling of H-Mode Pedestal and ELM Characteristics in the JET and DIII-D Tokamaks," Proc. 23rd IAEA Fusion Energy Conf., Daejeon, Republic of Korea, 2010; M. Beurskens et al submitted to *Phys. Plasmas*.

[5] J.R. Hughes et al., APS/DPP 2010.

[6] Z. Yan, et al., "Pressure-Gradient-Limiting Instability Dynamics in the H-Mode Pedestal on DIII-D," presented at the 52nd Annual Mtg. APS/DPP, Chicago, Illinois, 2010 to be published in *Phys. Plasmas*.

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