DIII-D experimental contributions to FY13 JRT, and possible modeling support

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Experimental planning

- **FY2012: ½ day planned for I-Mode experiment**
  - Attempt to achieve clear I-Mode operation in DIII-D and compare to C-Mod

- **FY2013**
  - Perform detailed physics studies in QH-mode and I-mode
  - Possible joint experiments with CMOD
    - Match C-Mod I-mode in DIII-D
    - C-Mod to obtain QH-mode operation and match DIII-D

DIII-D Physics goals for FY2013 JRT

For RMP ELM-suppressed regimes, QH-mode, I-mode

1) **Study similarities and differences of physics processes causing these regimes**
   1) In particular, is blockage of density pedestal expansion a key requirement?
   2) If yes, what is physics mechanism for blockage?
2) **In one device, compare performance of each regime**
3) **Perform experiments to more closely approach key dimensionless parameters for ITER**
   1) Determine how well the regimes extrapolate to ITER
4) **Identify correlations between edge fluctuations and transport**
5) **Investigate role of rotation**
6) **Coordinate experiments and analysis with C-Mod and NSTX**

There are proposed physics mechanisms for the "wall", i.e., blockage of pedestal expansion

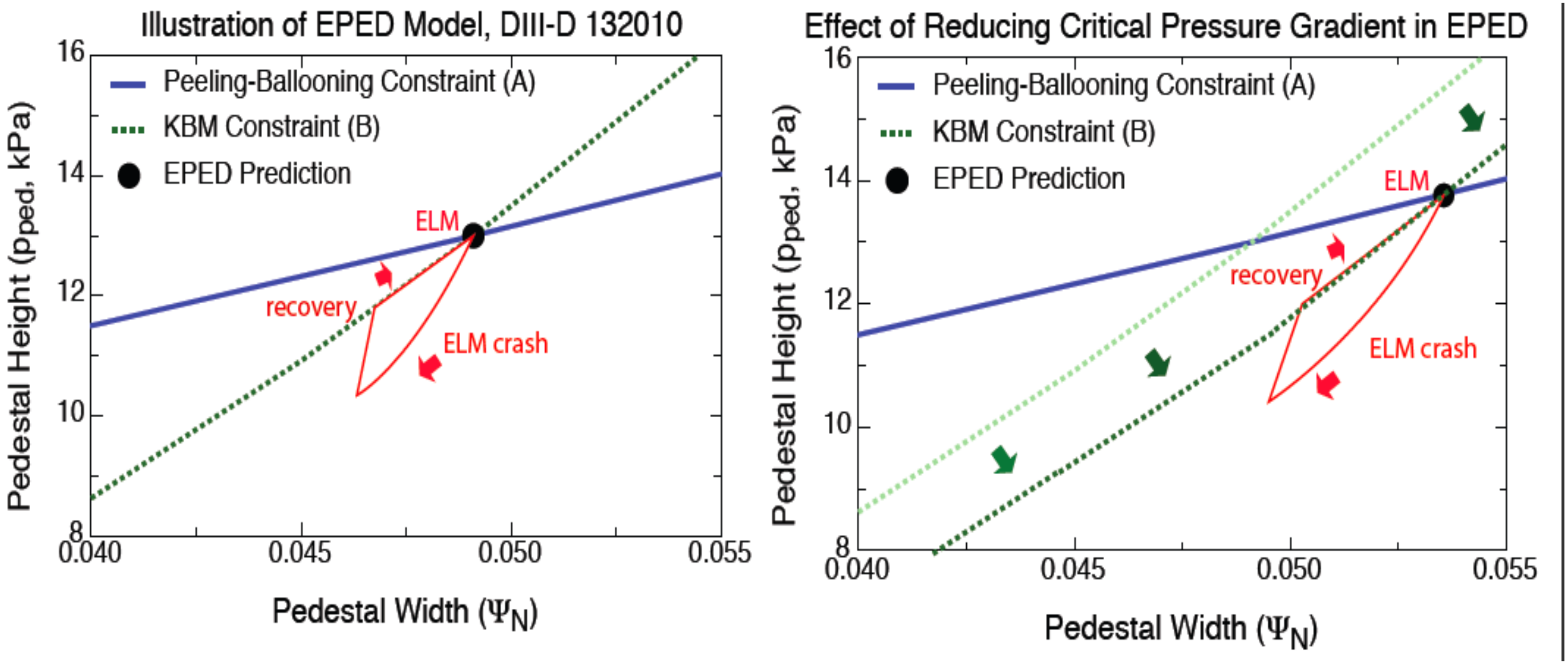
- **Thin laminar layer and strong parallel transport (O. Schmitz)**
- **ExB convective transport from islands (T. Evans)**
- **Magnetic flutter transport from imperfect screening of resonant fields plus non-resonant fields just off resonant surfaces (Callen)**
- **JxB flutter transport from perfect screening of resonant fields and resulting helical shielding currents (Waelbroeck)**
- **Transport by friction between trapped and passing particles from the neoclassical view (C.S. Chang)**
- **Others . . .**

Back-up Slides

Recent Pedestal Structure Research Generated Pedestal and ELM Control Physics Model

Snyder APS11

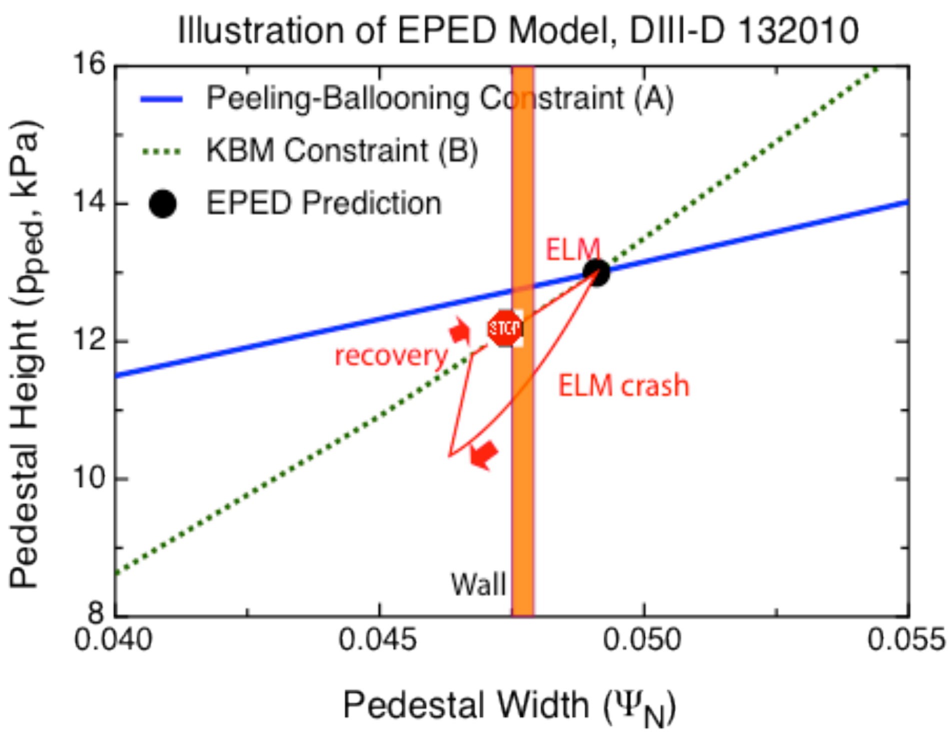
- **Simply lowering pedestal pressure gradient not sufficient to suppress ELMs**
  - EPED model suggests lowering pressure gradient shifts ELM to larger pedestal width

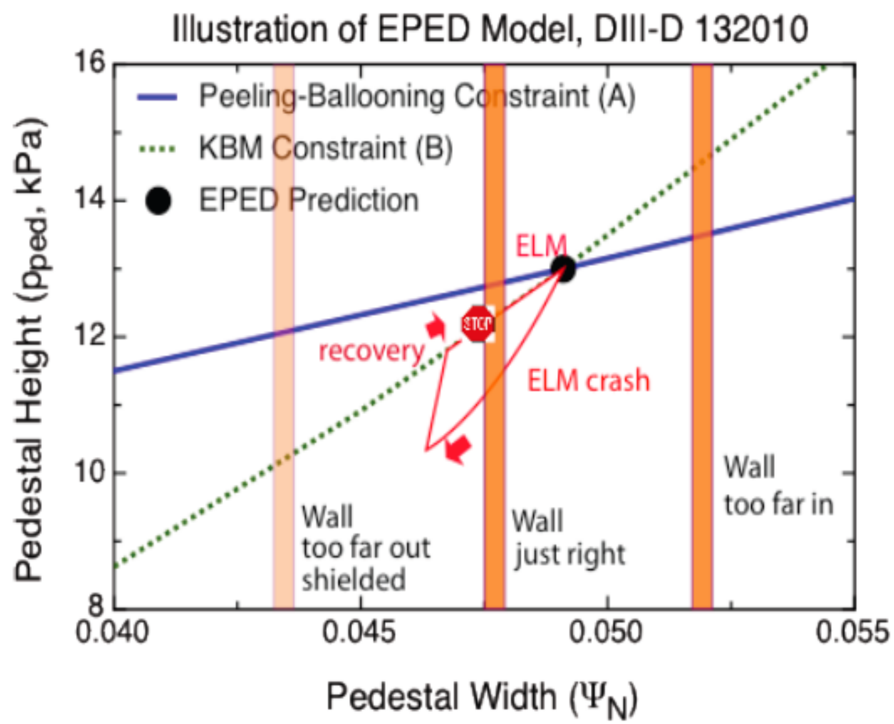


Recent Pedestal Structure Research Generated Pedestal and ELM Control Physics Model

Snyder APS11

- **Some mechanism must prevent expansion of pedestal width to prevent ELMs**





Callen: Magnetic flutter model of radial plasma transport induced by RMPs

- **Could reduce electron pressure gradient at pedestal top ($0.9 < \Psi_N < 0.97$) even if flow screening prevents "penetration" of RMP fields and stochasticity**
- **Preliminary results agree qualitatively with low ν^* ISS DIII-D data, both transport magnitude and reduction of Te and ne gradients at pedestal top**
  - From resonant and non-resonant fields near rational surface at pedestal top
  - Assuming near perfect resonant field screening at rational surfaces
  - Predicts T_e, n_e gradient reductions would scale ~ $(I_{RMP})^2$
  - Predicts T_e gradients would be reduced 3x more than n_e gradients
- **Present analysis only for low ν^* DIII-D RMP cases – low A plasmas (MAST, NSTX) may not see effect because parallel heat transport ~100x less due to lower T_e^{ped} and very small fraction of untrapped electrons there**