

Predator-Prey Oscillations During Slow L-H Transitions on DIII-D

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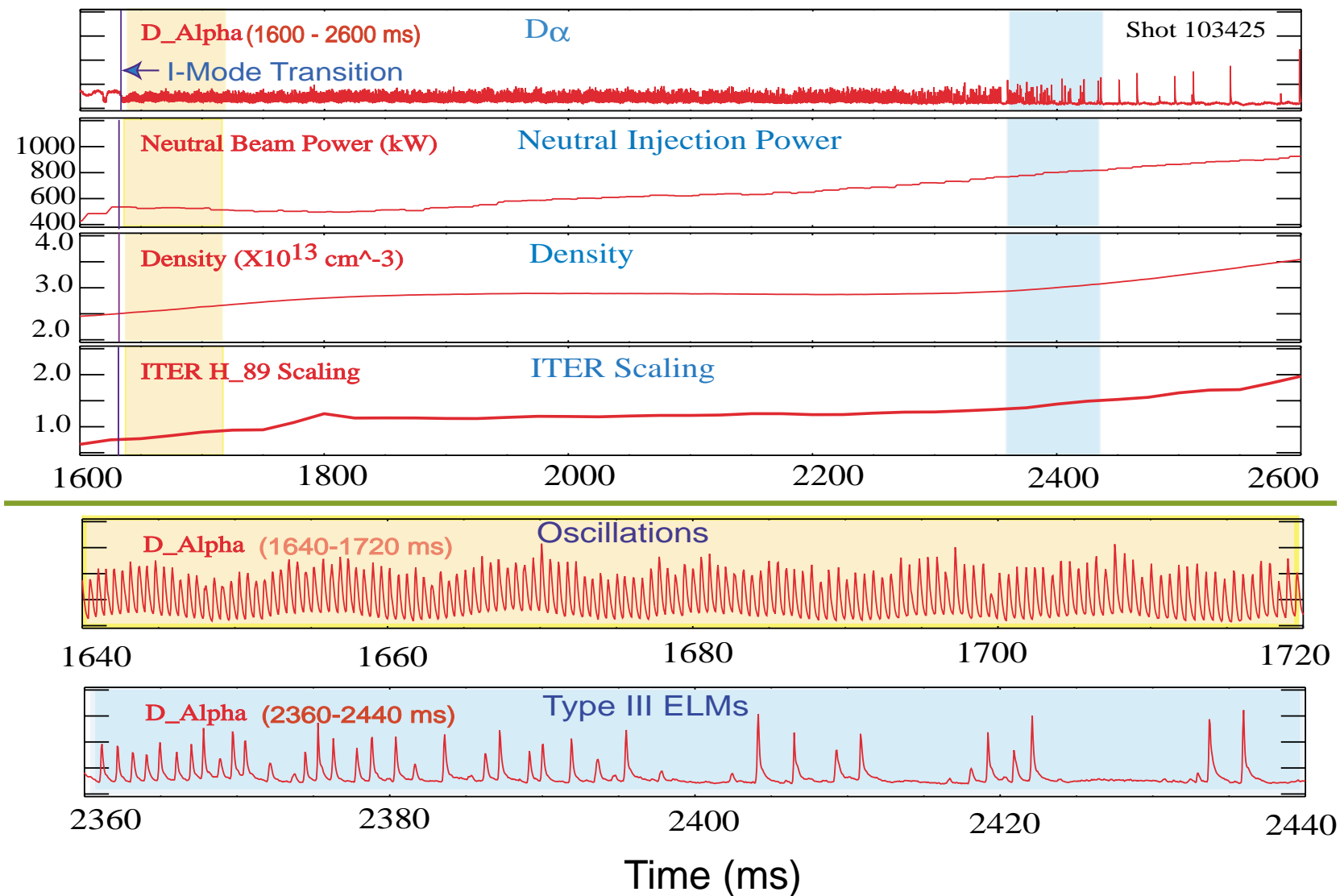


Talk Summary

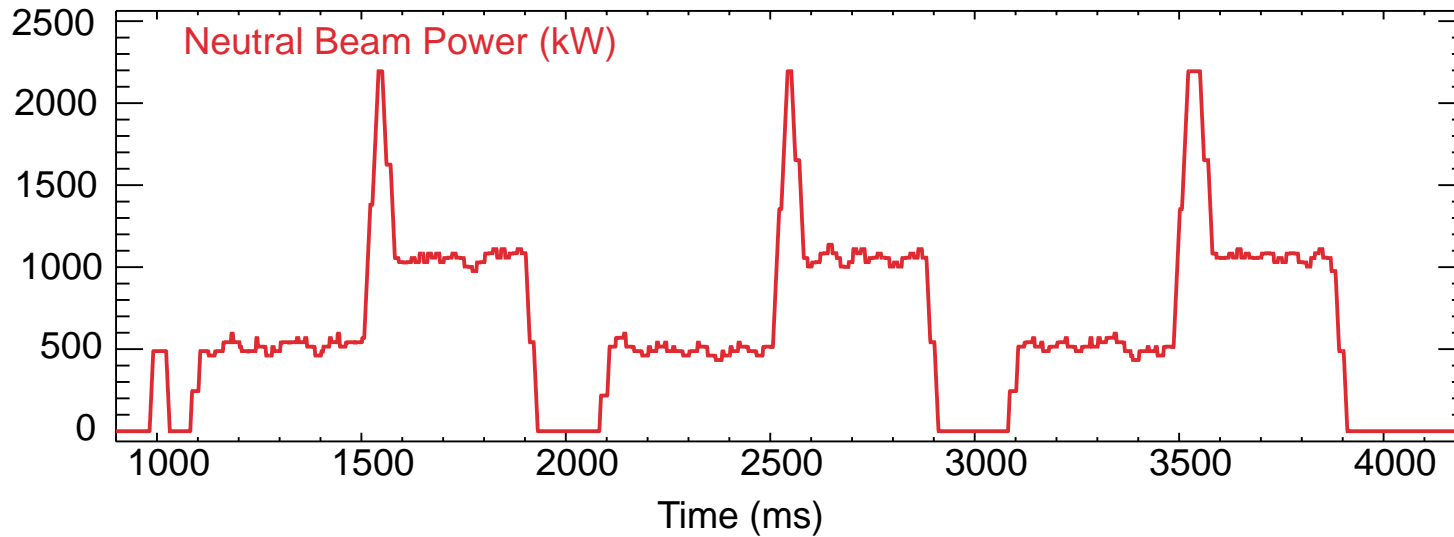
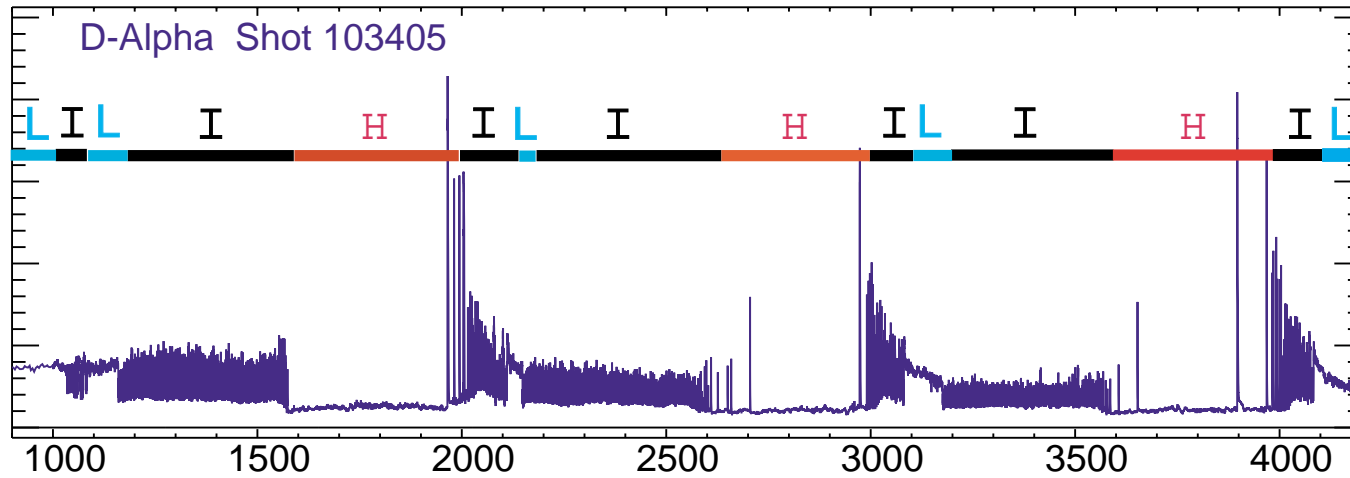
- A regime of energy and particle confinement intermediate between the L- and H-modes has been discovered.
- This regime is called the I-mode and allows time to study the detailed physics of the L-H transition.

- The I-mode is characterized by periodic bursts of an instability located just inside the separatrix.
 - Entry into the I-mode is obtained when neutral-beam-induced shear flow reduces turbulence to a single instability.
 - The instability clamps the particle confinement but not the energy confinement.
 - Increases in the energy confinement during neutral beam heating allow transition to the H-mode.

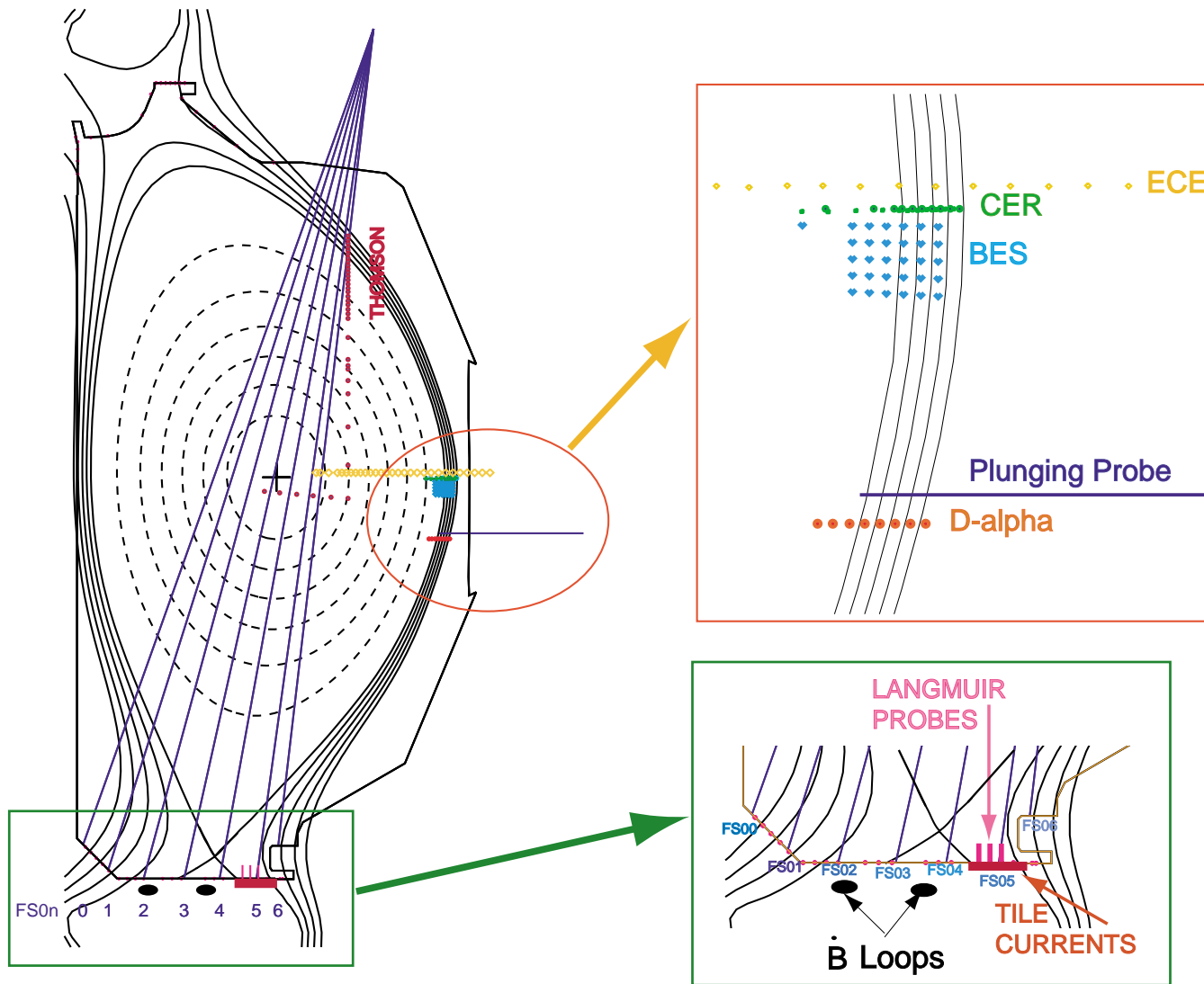
L-I-H MODE Transition



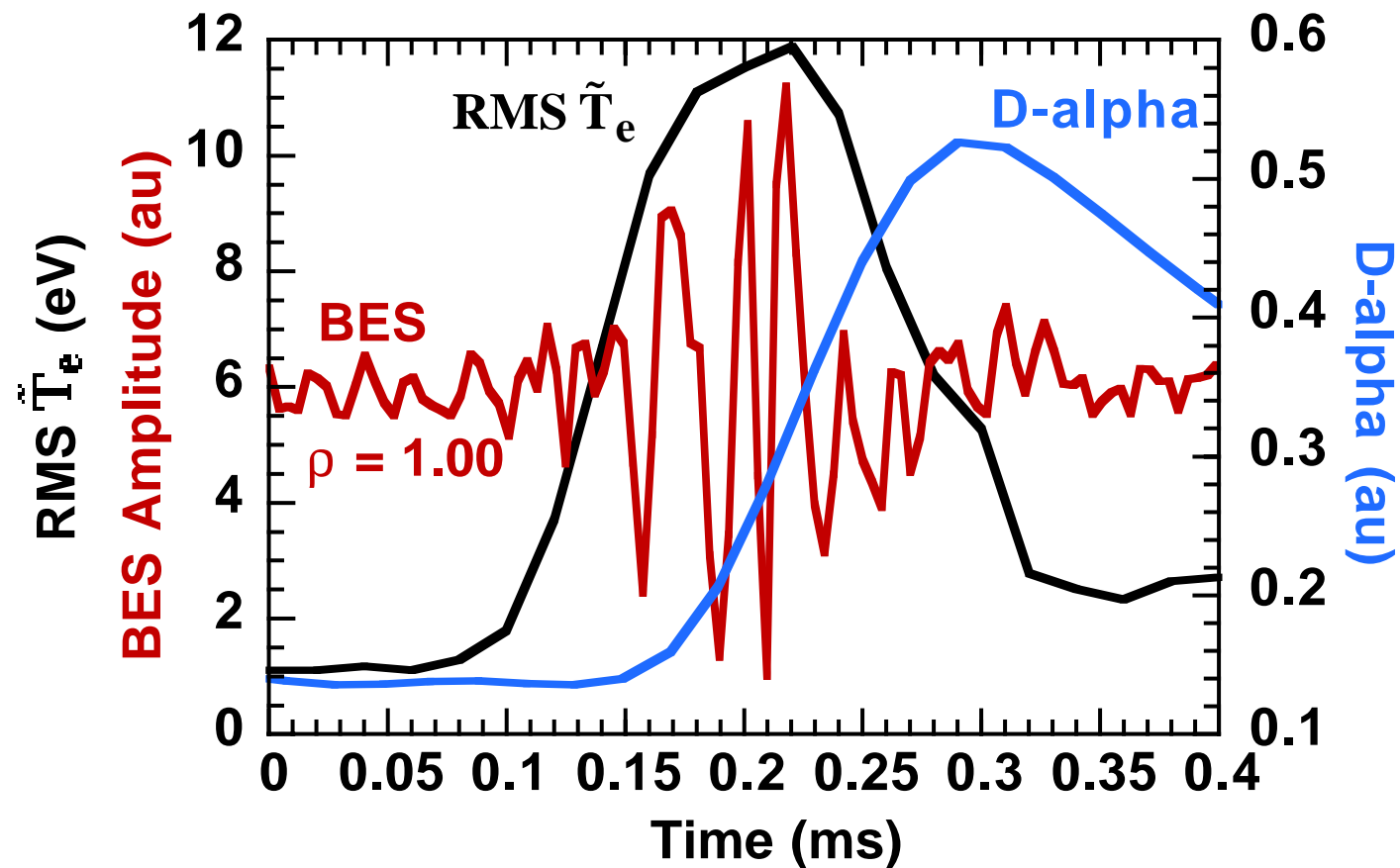
I-Mode Can Be Controlled by Neutral Beam Power



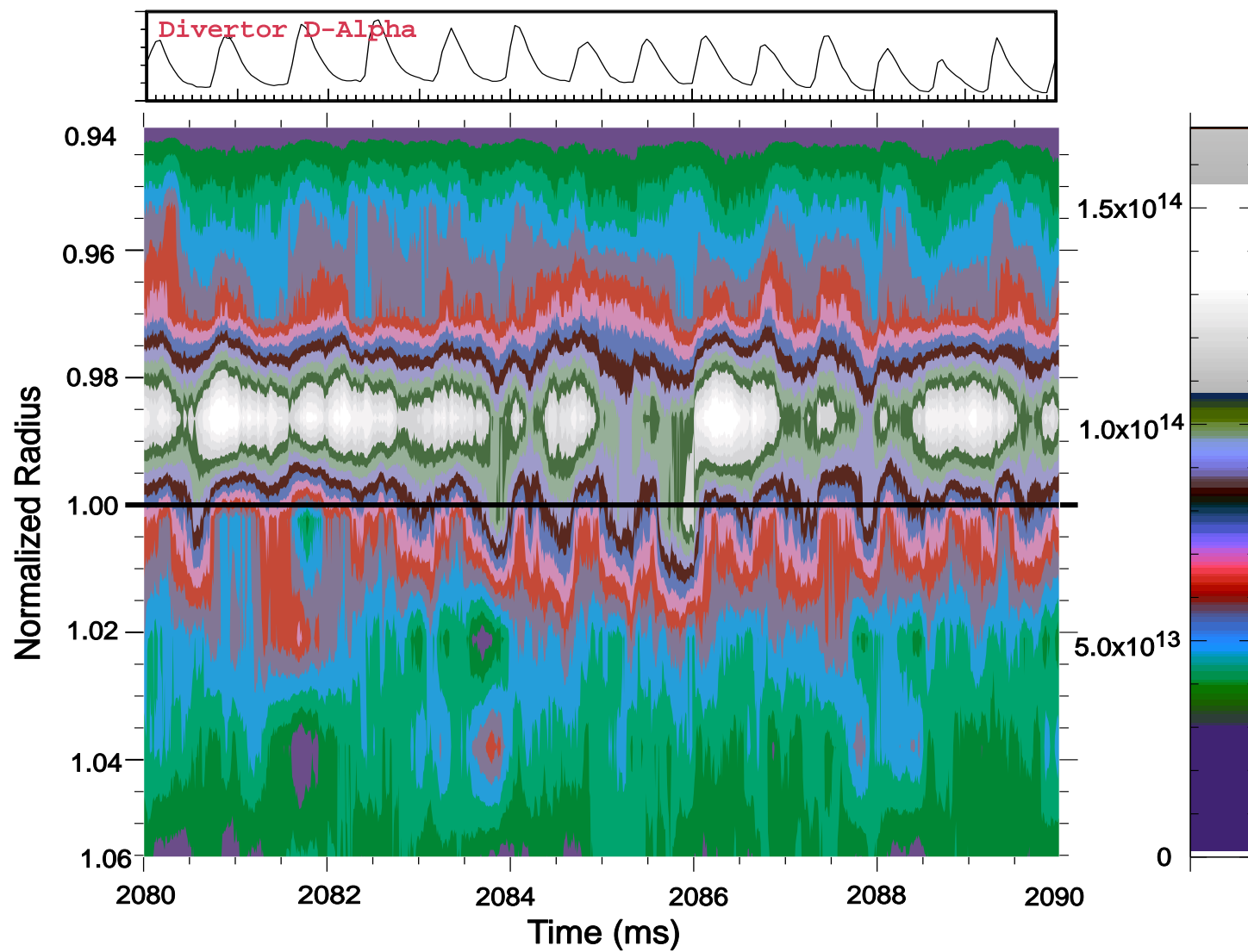
DIII-D Diagnostics



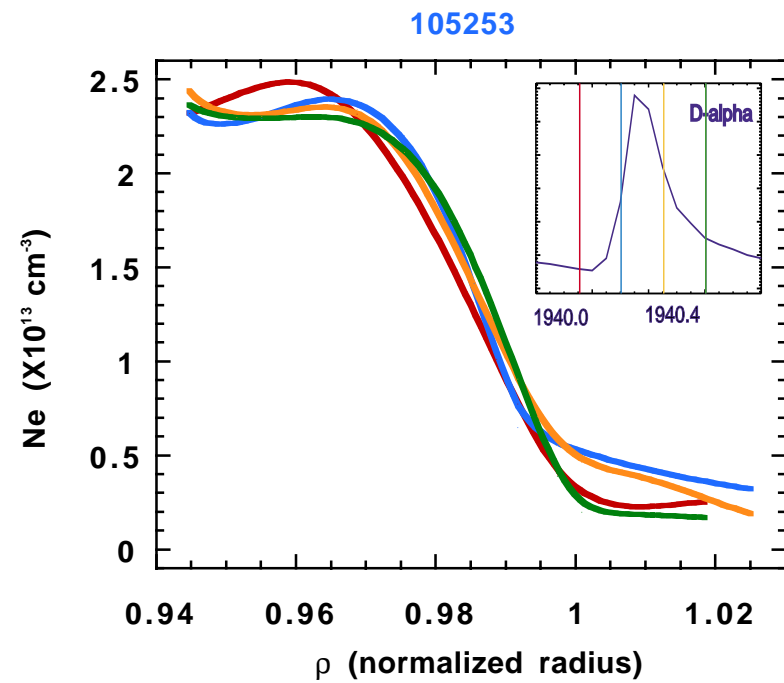
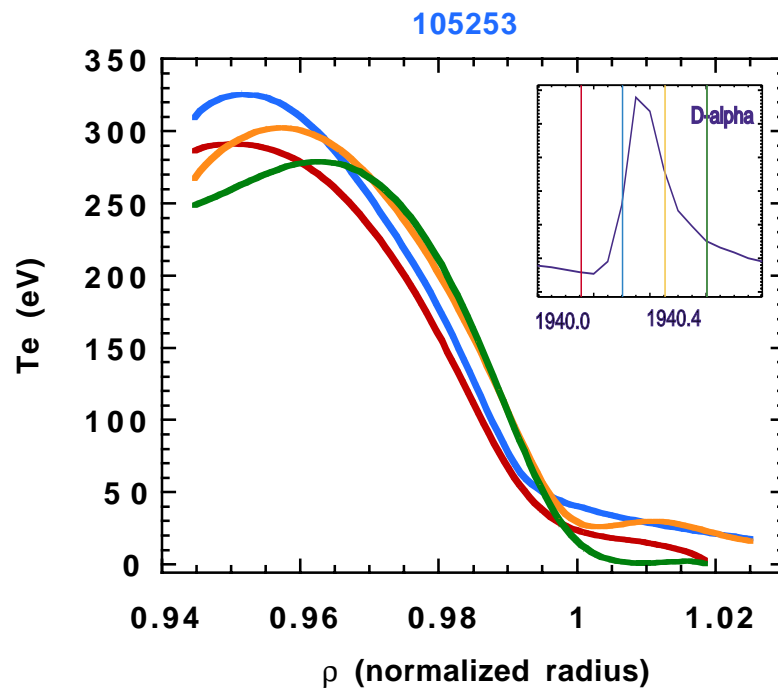
I-Mode Instability Bursts Grow and Damp



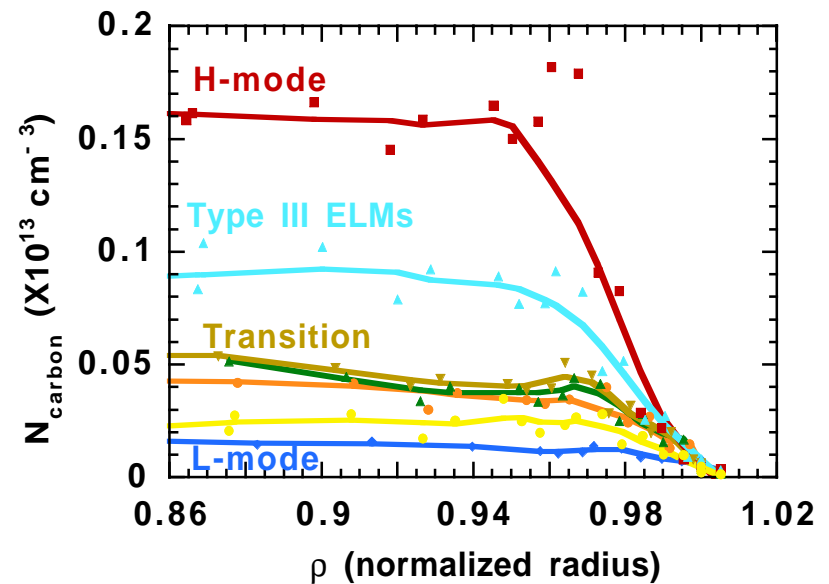
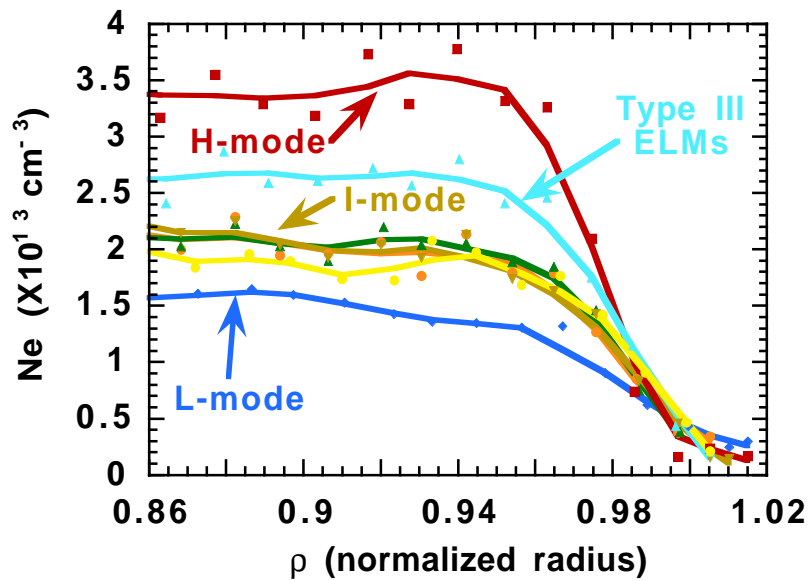
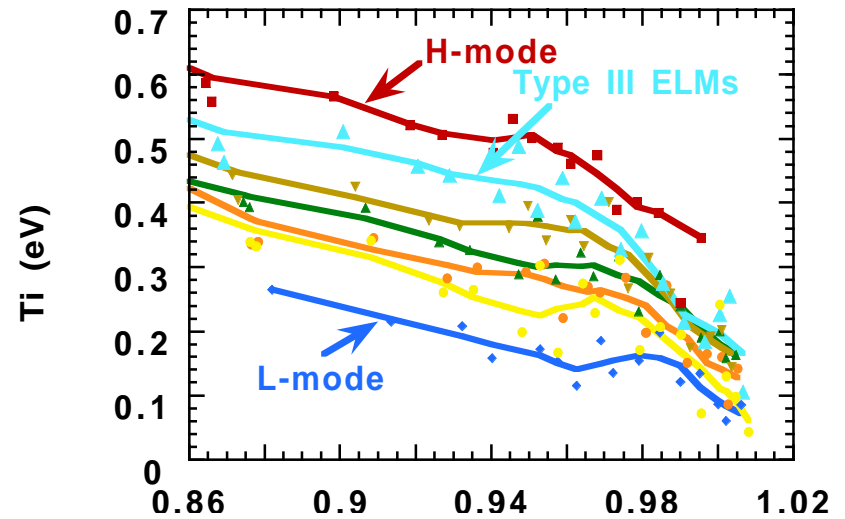
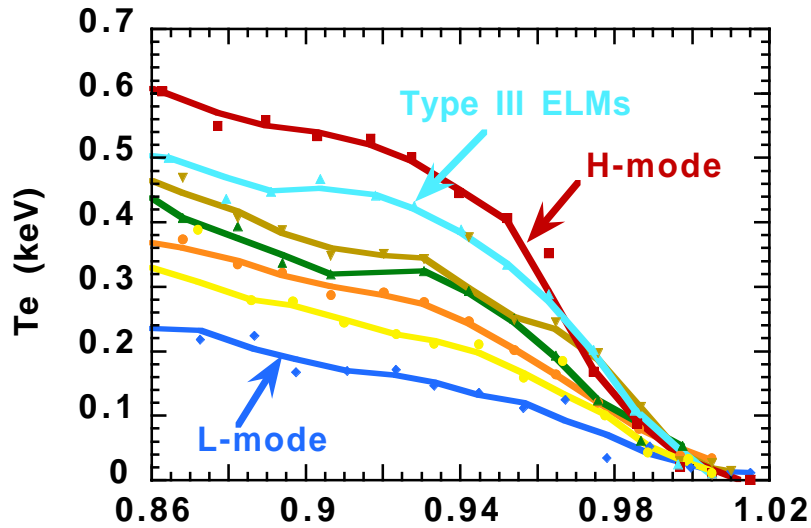
I-Mode Instability Located Just Inside Separatrix



I-mode Te & Ne Profiles “Invariant” During Instability Burst

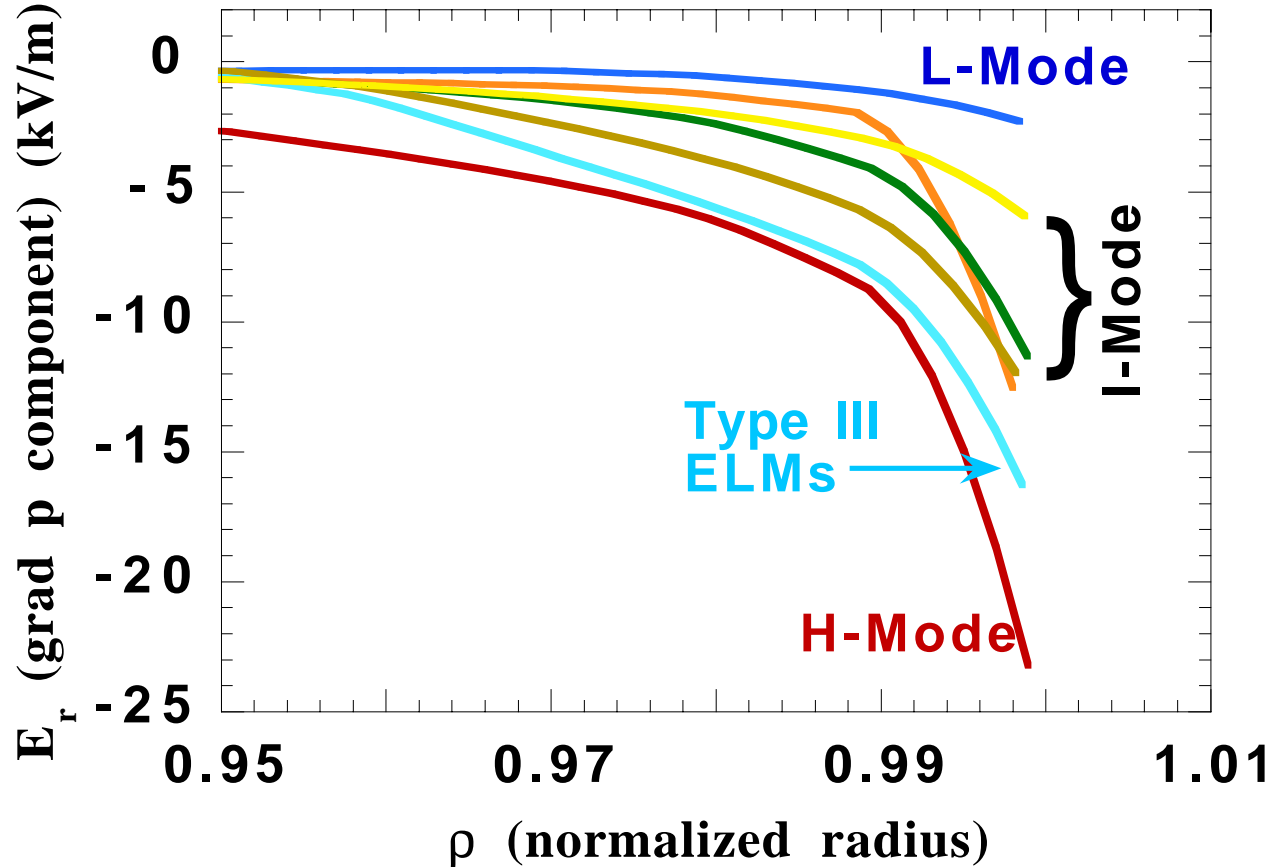


I-mode Instability Limits Particle but not Energy Confinement



Edge E_r & Shear Flow Grow During L-I-H Transition

$$\text{Shear Flow} \sim \frac{\partial E_r}{\partial \Psi} \sim \frac{\partial \nabla p}{\partial \Psi}$$



L-I-H Mode Transition Summary

- I-mode allows time for observation of the L-H transition physics.
- L-I transition is initiated when shear flow from the neutral beams limits edge turbulence to a single instability.
- I-mode confinement is intermediate between the L- and H-modes.
- Entry into the H-mode occurs when the shear flow increases enough to suppress the remaining I-mode instability.