

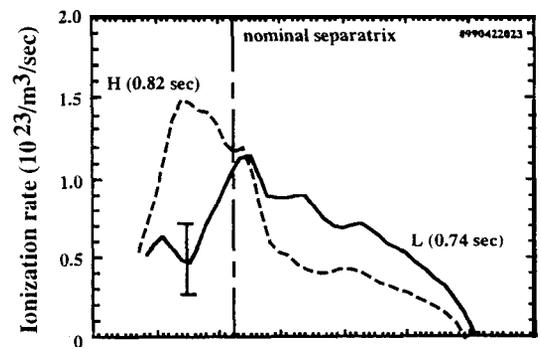
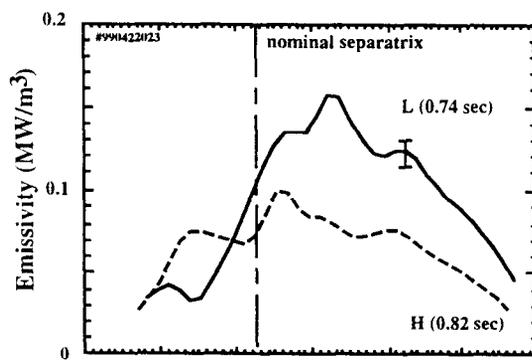
**Study of the effects of neutrals
in Alcator C-Mod plasmas**

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discharge reverts back to L-mode. Although the electron density is rising dramatically at the top of the pedestal (up to $3-4 \times 10^{20} \text{ m}^{-3}$), the Lyman- α emissivity drops across the whole profile. At these densities, the ionization of neutrals from excited states prevents some de-excitation through a Lyman- α photon emission. We integrated the ionization rate inside the separatrix, with the assumption of poloidal and toroidal symmetry. In fact, simulations using the DEGAS code indicated a very broad poloidal distribution for the neutral density, due to large recycling on the inner wall, the outer limiters and RF antennas, in contrast to other larger tokamaks where the X-point is the region of highest neutral density [2]. This change in ionization rate inside the separatrix can explain in part the increase in density found during H-mode. However, the

Summary

New dedicated diagnostics and modeling have been implemented on Alcator C-Mod for the



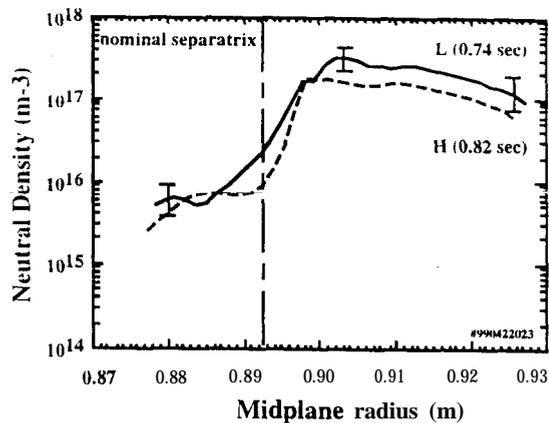


Figure 3: Measured neutral density profile obtained from the Lyman- α measurement shown in Fig. 1.

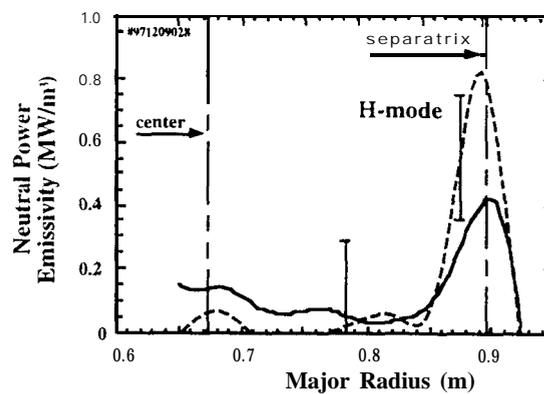


Figure 5: Measured power emissivity profiles for L and H-mode phases of a same discharge.

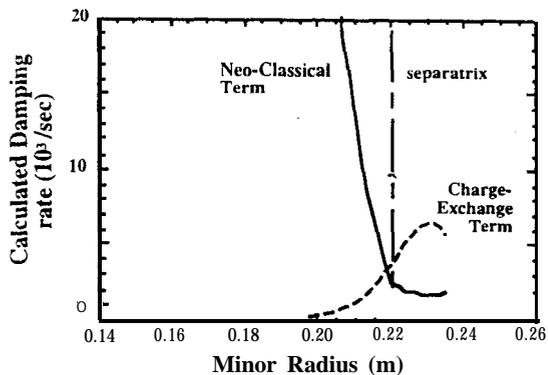


Figure 4: Calculated damping rate profiles for the neo-classical and neutral terms near the edge of a high density L-mode. In this case, the neutral density at the edge approaches $3 \times 10^{17}/m^3$, and line average density is $4 \times 10^{20}/m^3$.