OVERVIEW OF H-MODE PEDESTAL STUDIES ON THE DIII-D TOKAMAK*

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H-mode pedestal studies on DIII-D are motivated by the impact of this region on the global energy confinement and stability, and, through ELMs, on the divertor. Work on the H-mode edge was divided into studies of edge stability, width of the H-mode transport barrier, and the ELM energy loss mechanism.

A model for edge stability based on lower n edge localized ideal kink-ballooning modes is consistent with the variation in edge pressure gradient with shape, and with observation of fast growing lower n modes as ELM precursors. Calculations with the GATO and ELITE codes indicate that critical pressure gradient for instability decreases with increasing n. It is hypothesis that the n value of the mode is set by the highest n without second stability. Second stability was demonstrated with ELITE for circular cross-section at intermediate n (10–40). We will report on an extension of ELITE to non-circular flux surface geometry, and on quantitative comparisons between edge stability codes and measurements using a new Li beam diagnostic for determination of the edge current density.

Experiments on DIII-D indicate that the H-mode transport barrier width is proportional to the edge poloidal β with no explicit temperature dependence. We will report on a dimensionally similar comparison of edge parameters with Alcator-Cmod which may show whether the H-mode barrier width is dependent on atomic physics. We will also report on comparison of the edge particle source profile and the barrier width.

The radial extent of the lower n kink ballooning mode which is a function of the overall q and pressure profiles may determine the ELM size. We will report experiments on DIII-D designed to test this model.

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