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### **I-Mode regime with an edge energy transport barrier but no particle barrier in Alcator C-Mod<sup>1</sup>**

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A regime of operation has been investigated on C-Mod which features a strong edge thermal transport barrier and H-mode-like energy confinement, but with little or no particle barrier. There is generally no increase in density or impurities or sudden drop in  $D_\alpha$ ; impurity particle confinement is at L-mode levels. This “I-mode” regime is normally obtained by operating with the ion grad-B drift away from the active X-point and with ICRF heating. While the name was originally an abbreviation for “Improved L-mode” [1], it is now clear that this is a high confinement regime, with  $H_{98(y,2)}$  up to 1.2 achieved. I-mode discharges have now been obtained over a wide parameter range,  $B=3-6$  T,  $I_p=0.7-1.3$  MA,  $q_{95}=2.5-5$ , and maintained in steady state for many  $\tau_E$ . Most discharges are ELM-free; small ELMs are in some cases triggered by large sawtooth heat pulses. I-modes are obtained at powers comparable to the L-H threshold for density barrier formation. This is 1.5-3 times above that in the favorable configuration, up to 6 MW, and scales quite differently, in particular increasing at low  $q_{95}$ . The I-mode regime is of considerable interest for transport barrier studies since it separates particle and energy transport channels. An edge  $E_r$  well develops [2], and in many cases a clear bifurcation from L-mode edge temperatures is seen; pedestals up to 1 keV and edge  $\nu^*$  as low as 0.15 have been obtained. Changes in edge turbulence are observed as the T barrier forms. Broadband fluctuations in the 50-200 kHz band decrease, while a broad peak at higher frequencies appears. This new mode apparently helps to regulate particle transport.

[1] F. Ryter et al, Plasma Phys. Control. Fusion **40** 725 (1998)

[2] R. McDermott et al, Phys. Plasmas **16** 056103 (2009)

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