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Access to and performance of I-mode plasmas on Alcator C-Mod[1]

A.E. HUBBARD, S.M. WOLFE, S.-G. BAEK, R.M. CHURCHILL, N. HOWARD, J.W. HUGHES, Y. LIN, E.S. MARMAR, M.L. REINKE, J.E. RICE, J.L. TERRY, C. THEILER, J.R. WALK, A.E. WHITE, D.G. WHYTE, S.J. WUKITCH, MIT Plasma Science and Fusion Center, I. CZIEGLER, UC San Diego, Center for Energy Research — The I-mode regime of operation features an edge thermal transport barrier, without a particle barrier. Stationary conditions are thus achieved without impurity accumulation, and usually without ELMs. In contrast to the EDA H-mode regime on Alcator C-Mod, it is readily accessed at low q_{95} and low collisionality, both relevant for ITER. Analysis of a dataset of 400 discharges at $q_{95} \sim 3$ shows normalized energy confinement in I-modes reaches or exceeds that in most H-modes, up to $H_{98} = 1.2$. Confinement and pedestal temperature increase with input power. In some cases I-mode is maintained up to the maximum available power (5 MW ICRF) while in others a transition to H-mode limits the performance. Understanding and extending the conditions for entering and staying in I-mode is thus critical for extrapolation of the regime. Experiments have extended the regime both to lower densities and to higher densities and powers through gas puffing into established I-modes. Results from an expanded database of C-Mod discharges will be presented, along with details of I-mode profiles and fluctuations, including GAMs and a weakly coherent mode, which are providing insights into the physics of the regime.

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