Access to and performance of I-mode plasmas on Alcator C-Mod¹
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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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