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Edge Mechanisms for Power Excursion Control in Burning Plasmas.[1] M.D. HILL, W.M. STACEY, Georgia Tech — ITER must have active and preferably also passive control mechanisms that will limit inadvertent plasma power excursions which could trigger runaway fusion heating. We are identifying and investigating the potential of ion-orbit loss, impurity seeding, and various divertor "choking" phenomena to control or limit sudden increases in plasma density or temperature by reducing energy confinement, increasing radiation loss, etc., with the idea that such mechanisms could be tested on DIII-D and other existing tokamaks. We are assembling an edge-divertor code (GTEDGE-2) with a neutral transport model and a burn dynamics code, for this purpose. One potential control mechanism is the enhanced ion orbit loss from the thermalized ion distribution that would result from heating of the thermalized plasma ion distribution. Another possibility is impurity seeding with ions whose emissivity would increase sharply if the edge temperature increased. Enhanced radiative losses should also reduce the thermal energy flux across the separatrix, perhaps dropping the plasma into the poorer L-mode confinement regime. We will present some initial calculations to quantify these ideas.

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