Abstract Submitted
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Equilibrium and Braking of Fully Avalanched Runaway Electron Currents: a New Disruption Mitigation Strategy for ITER[1] P.B. PARKS, D.A. HUMPHREYS, J.C. WESLEY, General Atomics, E.M. HOLLMANN, UCSD — A first-of-kind solution of the Grad-Shafranov equation is described for post-thermal quench plasma discharges where the current is dominated by a fully avalanched runaway electron (RE) current plateau. The RE current profile tends to be much more centrally peaked relative to the initial plasma current and yet stable to internal kinks, in qualitative agreement with experiments. The current profile displays an interesting "resilience," depending only weakly on the spatial distribution of the initial RE "seed" population. The RE current equilibrium has a slow secular time dependence that is traced to the presence of collisional dissipation on cold plasma electrons and the associated inductive energy decay. It is predicted that massive RE currents in ITER could be completely braked in ~ 200 ms by a combination of modest, $20\times$ electron density increase, and reversed surface loop voltage, with $E_{sur} \sim -1$ V/m. The model is being used to interpret recent DIII-D experiments where this erosion effect was recently observed.

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P.B. Parks
General Atomics

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