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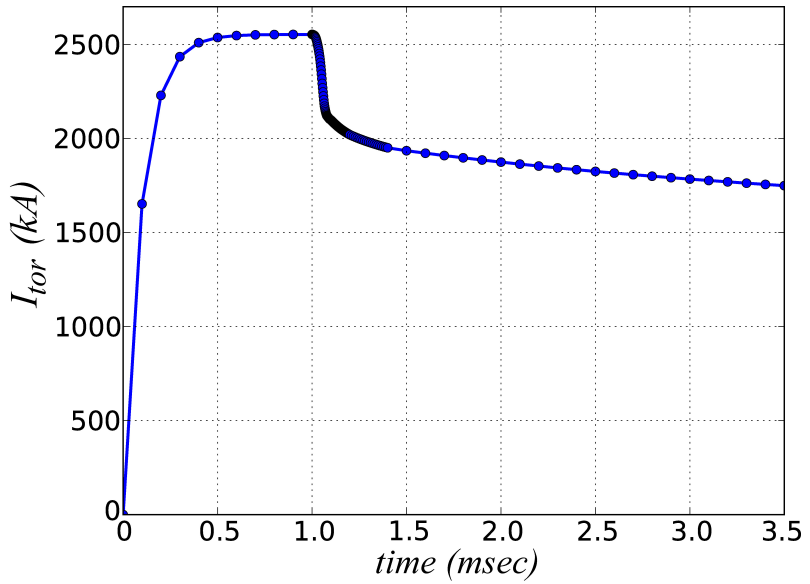
TIME-DEPENDENT RUNAWAY SIMULATIONS: AMPERE-FARADAY EQUATIONS IMPLEMENTED IN CQL3D

R.W. HARVEY, Y.V. PETROV, C.B. FOREST, L.L. LAO, P.B. PARKS

The bounce-averaged Fokker-Planck collisional/quasilinear CQL3D time-dependent simulation for $f_e(u,\theta,\rho;t)$ has been coupled to Ampere-Faraday equations for the self-consistent toroidal electric field. This is a first, for 3D continuum FP codes.

A model first application has been made for the thermal and current quench phases of runaway electrons, including prompt "hot tail" and knockon electrons, as a result of pellet injection into a DIII-D discharge.



At left: Toroidal current driven by the electric field, versus time. A near constant value is established in the time up to 1 msec. As Te drops from 2 keV due to the pellet introduced at t=1 msec, at first the current decreases on a shortened resistive time scale. But as the runaway current sets, increasing the resistive time, the current decay time is greatly extended giving the slow current quench phase. The degree of current drop during the thermal quench is a sensitive function of the plasma cooling rate.