Runaway electron seed population dependence on temperature profile using continuous electric field evolution

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During a thermal collapse in a magnetically confined plasma, the bulk of the electron population drops in energy and begins to equilibrate with the ions, which increases the bulk resistivity of the plasma. As the resistivity increases, a large electric field forms within the plasma to sustain the equilibrium current. This electric field can become very strong, and pulls a small number of electrons to relativistic speeds. These 'runaway' electrons (REs) have enough energy to severely damage plasma facing components, which make them a risk to the operational stability of the International Thermonuclear Experimental Reactor (ITER) and other large fusion devices like it. Understanding the precise conditions that initiate RE populations is essential in developing RE mitigation strategies. One of the least understood aspects of RE generation is the dependence of the initial number of accelerated electrons -- the seed population -- on the time history of the plasma temperature and electron density. Computational investigations with time-dependent parameters allows us to study this dependence. We implemented a continuous electric field evolution scheme in CODE (COllisional Dependence of Electrons) to study this dependence over a grid of temperature drop profiles varying in initial temperature and steepness. With this scheme we see good qualitative agreement of the behavior of the electron distribution with theory and experiment. We find a steep transition of over 30 orders of magnitude in the size of the RE seed population between temperature collapse times of 8-80 ms.