Monte Carlo simulation of runaway electron suppression by pellet injection

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Runaway electrons are of significant concern for large tokamak devices both due to gradual acceleration by the Ohmic heating field and the more rapid acceleration and avalanche production that can occur during major disruptions. We have developed a particle simulation model (KORCGC) that follows large number of runaway guiding center (GC) orbits, including the effects of Coulomb collisions, impurities, synchrotron radiation, rippled (3D) fields. Both a fixed boundary, Boozer coordinates option and a free boundary cylindrical coordinates option have been developed. For the latter case runaways can be followed outside the plasma surface either to their deposition into a plasma-facing component, or their re-entry back into the plasma. Applications to pellet suppression experiments have been made and show similar effects (current/energy decay rates) as the observations. The parameters of runaway pellet suppression regimes fit within the limits of the GC approximation and the longer time-steps allowed by GC facilitate modeling over experimentally relevant timescales. Simulations of impurity injection dissipation experiments on DIII-D and ITER will be discussed.

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