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Guiding-center simulation of runaway electron confinement during tokamak disruptions[1] AKINOBU MATSUYAMA, MASATOSHI YAGI, YASUHIRO KAGEI, Japan Atomic Energy Agency — During disruptions of tokamak discharges, runaway electrons are often generated and may cause a substantial damage to the plasma facing component. For this, runaway generation and transport mechanisms have been paid much attention in recent years. This paper reports a modeling of runaway confinement using a relativistic guiding-center following code ETC-Rel. The generation process is here included as a marker source term by Monte-Carlo sampling, and three-dimensional trajectories of MeV-order electrons are traced in realistic tokamak geometry with collisions and radiation. Simulation results are illustrated for evaluating (1) the energy distribution function with inductive electric field for ITER- and JT-60U-grade disruptions, and (2) the loss rate with low-order magnetic perturbations yielding the island overlapping. Effects of cross-field drift on the threshold of globally chaotic runaway trajectories are discussed, showing the possibility for high-energy part of runaways to be lost even below the stochastic threshold of the magnetic field-lines. The guiding-center model allows us to investigate such a runaway loss process in presence of magnetic perturbation without any diffusive-type approximation.

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