Abstract Submitted
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Full-orbit effects in the dynamics of runaway electrons in toroidal geometry[1] D. DEL-CASTILLO-NEGRETE, L. CARBAJAL-GOMEZ, D.A. SPONG, L. BAYLOR, S. K. SEAL, Oak Ridge National Laboratory — The dynamics of RE (runaway electrons) in fusion plasmas spans a wide range of temporal scales from the fast gyro-motion $\sim 10^{-11}$ sec to the observational time scales $\sim 10^{-2} \to 1$ sec. To cope with this scale separation RE are usually studied within the bounce-average or the guiding center approximations. Although these approximations have yielded valuable insights, a study with predictive capabilities of RE in fusion plasmas calls for the incorporation of full-orbits effects in configuration space in the presence of 3-D integrable and stochastic magnetic fields. Here we present numerical results on this problem using the Kinetic Orbit Runaway electrons Code (KORC) that follows relativistic electrons in general electric and magnetic fields under the full Lorentz force and collisions. At relativistic energies, the main energy loss is due to synchrotron radiation, which we incorporate using the Landau-Lifshitz formulation of the Abraham-Lorentz-Dirac force. Following a study of potential limitations of the bounce-average and the guiding center approximations, we discuss the role of full-orbit effects on the evolution of the pitch-angle, the RE energy limit, the critical electric field, and the emission patterns of synchrotron radiation in toroidal geometry.

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