Abstract Submitted
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Runaway Electron Transport in Stochastic Toroidal Magnetic Fields[1] LEOPOLDO CARBAJAL, Instituto de Ciencias Nucleares-UNAM, DIEGO DEL-CASTILLO-NEGRETE, Oak Ridge National Laboratory, JULIO MARTINELL, Instituto de Ciencias Nucleares-UNAM — We study the transport and confinement of runaway electrons (RE) in presence of magnetic fields with perturbations producing different levels of stochasticity [L. Carbajal et al. Phys. Plasmas 27, 032502 (2020)]. We use KORC (Kinetic Orbit Runaway electron Code) for simulating the full-orbit (FO) and guiding-center (GC) dynamics of RE in perturbed magnetic fields that exhibit magnetic islands. Full-orbit effects on the RE dynamics are investigated, quantifying FO effects on RE transport by performing one-to-one comparisons between FO and GC simulations. It is found that in the absence of collisions and radiation losses, GC simulations predict twice the RE losses of FO simulations for 1 MeV, and four times the RE losses of FO simulations for 25 MeV. Similarly, GC and FO dynamics of RE moving around magnetic islands is compared, being very different in the scenario where the RE Larmor radius is about the size of the magnetic island. We also study the effects of rotation of the magnetic islands on RE confinement, finding no observable effect in the low-frequency toroidal rotation regime. These results shed some light into the potential of avoidance or mitigation mechanisms based on magnetic perturbations.

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