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Progress on simulating high-n energetic particle driven instabilities with the GEM code[1] YANG CHEN, SCOTT PARKER, University of Colorado at Boulder, GUOYONG FU, Princeton Plasma Physics Lab — GEM is an explicit δf particle code with kinetic electrons and EM perturbations [2]. The code has been recently extended to handle general toroidal equilibrium magnetic field configuration and arbitrary equilibrium density and temperature profiles. The perturbed magnetic field is given by $\delta \mathbf{B}_\perp = \nabla A_\parallel \times \mathbf{b}$, with $A_\parallel$ given by the parallel Ampere's law. The electric potential is obtained from the quasi-neutrality condition. It has been shown [3] that this gyrokinetic model recovers the MHD equation for the shear Alfvén modes, and previous numerical studies have also shown that this model accurately describes the slab shear Alfvén waves and the Kinetic Ballooning Modes. Work is underway to implement energetic particle species, with experimentarily relevant equilibrium distributions, such as the slowing-down distribution. The primary coupling of the hot particles to the bulk plasma comes from the hot particle term in the quasi-neutrality condition. Possible extensions of the model, such as the inclusion of the perturbed parallel magnetic field through the pressure ballance equation, will be discussed, with an emphasis on the solution method.

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