Hybrid Kinetic-MHD Studies of ICC Devices using Lorentz PIC in Finite Elements CHARLSON C. KIM, PSI Center - U. Washington, NIMROD TEAM — Progress on the implementation of a Lorentz force particle in cell (PIC) module for the NIMROD code wil be presented. This is an extension of the drift kinetic δf PIC module already in place in NIMROD[1]. Particular challenges of the implementation are PIC in high order finite element grids, resolving the finite Larmour radius (FLR) effect resulting from the Lorentz force (both spatially and temporally), and coupling to the resistive time scales of the MHD fluid variables. The Lorentz force PIC module will be used to study the effects of energetic ions on stability and confinement of innovative confinement concept (ICC) devices. FLR effects may also be important in the high energy tails of energetic particle distributions found in tokamaks. As an initial application, we use the the Lorentz PIC module as tracer particles to study trajectories in ICC devices and the resultant phase space distribution function. We also present simulations of FLR effects on tearing modes of reversed field pinch configurations. Comparisons with the drift kinetic model will also be presented where possible.

[1]C. C. Kim "Impact of velocity space distribution on hybrid kinetic-magnetohydrodynamic simulation of the (1,1) mode", Phys. Plasmas 15, 072507 (2008)

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