

Abstract Submitted  
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**Progress report on PIXIE3D, a fully implicit 3D extended MHD solver**<sup>1</sup> LUIS CHACON, ORNL, LANL — Recently,<sup>2</sup> an optimal, massively parallel implicit algorithm for 3D resistive magnetohydrodynamics (PIXIE3D) was demonstrated. Excellent algorithmic and parallel results were obtained with up to 4096 processors and 138 million unknowns. While this is a remarkable result, further developments are still needed for PIXIE3D to become a 3D extended MHD production code in general geometries. In this poster, we present an update on the status of PIXIE3D on several fronts. On the physics side, we will describe our progress towards the full Braginskii model, including: electron Hall terms, anisotropic heat conduction, and gyroviscous corrections. Algorithmically, we will discuss progress towards a robust, optimal, nonlinear solver for arbitrary geometries, including preconditioning for the new physical effects described, the implementation of a coarse processor-grid solver (to maintain optimal algorithmic performance for an arbitrarily large number of processors in massively parallel computations), and of a multiblock capability to deal with complicated geometries.

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<sup>2</sup>L. Chacón, *Phys. Plasmas* **15**, 056103 (2008); invited talk at DPP07

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