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Progress in nonlinear 3D MHD modeling of fusion plasmas with the PIXIE3D code D. BONFIGLIO, S. CAPPELLO, M. VERANDA, Consorzio RFX, Italy, L. CHACÓN, LANL, NM, USA, D.F. ESCANDE, Aix-Marseille Université, CNRS, France — Recent advancements in nonlinear 3D MHD modeling of fusion plasmas with the PIXIE3D code [1] are reported. After the nonlinear cross-benchmark with SpeCyl proved the fundamental mathematical correctness of both codes [2], PIXIE3D has been used to model both tokamak and reversed-field pinch (RFP) plasmas. Qualitative agreement with respect to experimental observations has been demonstrated by taking advantage of numerical features such as toroidal geometry and the possibility of applying external magnetic perturbations [3]. In particular, the toroidal coupling between (either spontaneous or externally stimulated) MHD modes affects both the MHD dynamics and the magnetic topology. More recently, the inclusion of a momentum source as well as a self-consistent coupling with heat transport have been considered. Preliminary simulations of helical RFP states with self-consistent temperature evolution will be presented. The effect on the final helical equilibrium will be discussed and compared with the reference case in which the temperature equation is not taken into account and a fixed resistivity profile is used.

[1] L. Chacón, Phys. Plasmas **15**, 056103 (2008)
[2] D. Bonfiglio *et al.*, Phys. Plasmas **17**, 082501 (2010)
[3] D. Bonfiglio *et al.*, Bull. Am. Phys. Soc. **57**, 82 (2012)

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