Abstract Submitted
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Heat Loss in a Laser-Driven, Magnetized, X-Ray Source with Thermoelectric Terms[1] J.L. GIULIANI, A.L. VELIKOVICH, Naval Research Laboratory, G.E. KEMP, J.D. COLVIN, J. KONING, K.B. FOURNIER, Lawrence Livermore National Laboratory — The efficiency of laser-driven K-shell radiation sources, i.e., pipes containing a gas or a metal foam, may be improved by using an axial magnetic field to thermally insulate the pipe wall from the hot interior. A planar, self-similar solution for the magnetic and thermal diffusion is developed to model the near wall physics that includes the thermoelectric Nernst and Ettingshausen effects. This solution extends previous work [1] for the MagLIF concept to include the full dependence of the transport coefficients on the electron Hall parameter. The analytic solution assumes a constant pressure. This case is matched with a 1D MHD code, which is then applied to the case allowing for pressure gradients. These numerical solutions are found to evolve toward the self-similar ones. The variation of the time integrated heat loss with and without the thermoelectric terms will be examined. The present work provides a verification test for general MHD codes that use Braginskii's or Epperlein-Haines' transport model to account for thermoelectric effects. [1] A.L. Velikovich, J.L. Giuliani, S.T. Zalesak, Phys. Plasmas, 22, 042702 (2015).

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