Hydrodynamic modeling of self-generated magnetic fields by ALE methods

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Arbitrary Lagrangian-Eulerian (ALE) methods belong to the most popular approaches for hydrodynamic simulations of laser/target interactions [1]. They benefit from improved accuracy of the simulation due to the Lagrangian motion of the computational mesh, as well as robustness resulting from a regular mesh optimization followed by conservative interpolation (remap) of all quantities between the meshes. In recent years, we were interested in modeling of spontaneous magnetic field (SMF) generation [2, 3] resulting from crossed gradients of electron temperature and density, known as the Biermann battery effect. Such models have been implemented in our developed 2D cylindrical Prague ALE (PALE) code [1], containing also all necessary physical models (EOS, laser absorption, thermal conductivity, etc.). Here, we present performance of the second-order accurate extension of the SMF generation model [4] in the ALE framework on selected realistic tests.

References

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