Enhancing FLASH's MHD solver for HEDP capabilities

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FLASH is a publicly available astrophysical code designed to solve highly compressible multi physics reactive flows. We are adding capabilities to FLASH that will make it an open science code for the academic HEDP community. In this presentation, I will give some details of our plans to add HEDP capabilities in FLASH. First, I will discuss a Spitzer type of conductivity model to treat thermal and radiative heat conduction along magnetic field lines. Second, I will discuss the numerical implementation of enhancements to the Unsplit Staggered Mesh MHD [1] solver in FLASH. Two of these are time-stepping algorithms that overcome the problem of disparate time scales, especially with diffusive processes. One uses a super time stepping algorithm [2]; the other uses a new implicit formulation (see e.g., [3]). Finally, I will discuss incorporation of the Biermann Battery term that is needed to account for spontaneous generation of magnetic fields in the presence of nonparallel temperature and density gradients.

References

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