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The FLASH code for computational HEDP âĂŞ recent additions and improvements

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FLASH is a publicly available, finite-volume Eulerian, spatially adaptive radiation magnetohydrodynamics (MHD) code that has the capabilities to treat a broad range of physical processes. FLASH performs well on a wide range of computer architectures and has a broad userbase spanning numerous research communities. Extensive high energy density physics (HEDP) capabilities exist in FLASH, making it a powerful open toolset for the academic High Energy Density Laboratory Astrophysics (HEDLA) community. We summarize these capabilities, emphasizing recent additions. We describe several algorithmic improvements and extended-MHD capabilities that have been added to FLASH, including interface capturing, Hall, Biermann battery, Nernst, anisotropic magnetic resistivity, Ettingshausen, Maggi-Righi-Leduc, and Seebeck, allowing modeling of Z-pinch, fusion, and magnetized HEDP experiments. We showcase FLASHâĂŹs ability to simulate ab initio complex laboratory astrophysics experiments performed by the Turbulent Dynamo (TDYNO) collaboration. Finally, we describe several collaborations with the academic HEDLA community in which FLASH simulations were used to design and interpret HEDLA experiments.