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A robust high-order ideal magnetohydrodynamic solver DAVID SEAL, U.S. Naval Academy, ANDREW CHRISTLIEB, XIAO FENG, Michigan State University, QI TANG, Rensselaer Polytechnic Institute — In this work we present a robust high-order numerical method for the ideal magnetohydrodynamics (MHD) equations. Our method is single-stage and single-step, and hence amenable to adaptive mesh refinement (AMR) technology. The numerical robustness of the scheme is realized by accomplishing a total of two unrelated tasks: we retain positivity of the density and pressure by limiting fluxes similar to what happens in a flux corrected transport method, and we obtain divergence free magnetic fields by implementing an unstaggered transport method for the evolution of the magnetic potential. We present numerical results in two and three dimensions that indicate the utility of the scheme. These results include several classical test problems such as Orzag-Tang, cloud shock interactions and blast wave problems.

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