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Relativistic Radiation Magnetohydrodynamics in Dynamical Spacetimes BRIAN FARRIS, TSZ KA LI, YUK TUNG LIU, STUART SHAPIRO, University of Illinois at Urbana-Champaign — Many systems of current interest in relativistic astrophysics require a knowledge of radiative transfer in a magnetized fluid evolving in a strongly-curved, dynamical spacetime. Such systems include stellar core collapse, GRBs, binary NSNS and BHNS mergers, etc. To model these phenomena, all of which involve general relativity, radiation (either photons and/or neutrinos), and magnetohydrodynamics, we have developed a general relativistic code capable of evolving MHD fluids and radiation in dynamical spacetimes. Our code solves the coupled Einstein-Maxwell-MHD-Radiation system of equations both in axisymmetry and in full 3 + 1 dimensions. We evolve the metric by integrating the BSSN equations, and use a conservative, high-resolution shock-capturing scheme to evolve both the MHD and radiation moment equations. For our initial study, we treat optically thick gases and assume grey-body opacities. We perform a suite of tests to verify our code. In this talk, we summarize tests involving radiating shocks and nonlinear waves propagating in Minkowski spacetime with planar symmetry.

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