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A New Code for Relativistic Magnetohydrodynamics in Dynamical Spacetimes YUK TUNG LIU, MATTHEW DUEZ, STUART SHAPIRO, BRANSON STEPHENS, University of Illinois at Urbana-Champaign — Several problems at the forefront of theoretical astrophysics require treatment of magnetic phenomena in full general relativity (GR). Such problems include the origin of gamma-ray bursts, magnetic braking of differential rotation in nascent neutron stars arising from stellar core collapse or binary merger, the formation of disks around newly-formed black holes, etc. To tackle these interesting, unsolved problems involving both GR and magnetohydrodynamics (MHD), we have developed a GR-MHD code capable of evolving magnetized fluids in dynamical spacetimes. We evolve the metric by integrating the BSSN equations, and use a high resolution shock capturing scheme to handle the MHD. We will describe the formulation of the coupled Einstein-Maxwell-MHD evolution equations and the algorithms used to integrate them. We will also present some code tests, giving particular attention to tests involving MHD waves induced by a gravitational wave.

Yuk Tung Liu
University of Illinois at Urbana-Champaign

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