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General relativistic simulations of magnetic field-induced explosions from stellar core collapse YUK TUNG LIU, University of Illinois at Urbana-Champaign, MASARU SHIBATA, University of Tokyo, STUART SHAPIRO, BRANSON STEPHENS, University of Illinois at Urbana-Champaign — The explosion mechanism behind core-collapse supernovae remains an active area of research. In order to explore the role of magnetohydrodynamic (MHD) effects in the explosion, we perform axisymmetric simulations of magnetized, rotating cores collapsing to proto-neutron stars (PNSs) in full general relativity (dynamical spacetime). We confirm that significant differential rotation results even when the rotation of the progenitor is initially uniform. Consequently, the magnetic field is amplified both by magnetic winding and the magnetorotational instability (MRI). Following PNS formation, strong MHD outflows lead to losses of rest mass, energy, and angular momentum from the system which could play a role in rejuvenating a stalled supernova shock.

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