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Simulations of magnetized, differentially rotating neutron stars in full general relativity BRANSON C. STEPHENS, University of Illinois at Urbana-Champaign, MATTHEW D. DUEZ, Cornell University, YUK TUNG LIU, STUART L. SHAPIRO, University of Illinois at Urbana-Champaign, MASARU SHIBATA, University of Tokyo — Many problems at the forefront of theoretical astrophysics require the treatment of magnetized fluids in dynamical, strongly curved spacetimes. In order to tackle such problems, we have recently developed a code which evolves the full Einstein-Maxwell-MHD system of equations. We employ this code to track the evolution of magnetized hypermassive neutron stars (HMNSs), which are equilibrium configurations supported against collapse by rapid differential rotation. HMNSs may form as possible transient remnants of binary neutron star mergers or through core collapse. We find that secular angular momentum transport due to magnetic braking and the magnetorotational instability results in the collapse of the HMNSs to rotating black holes surrounded by massive accretion tori. For comparison, we also evolve non-hypermassive but differentially rotating neutron stars with magnetic fields. Though we do not find collapse, an extended, torus-like structure does form for stars with excessive spin.

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