Abstract Submitted
for the APR13 Meeting of
The American Physical Society

General relativistic simulations of black hole-neutron star mergers: Effects of tilted magnetic fields[1] ZACHARIAH ETIENNE, VASILEIOS PASCHALIDIS, STUART SHAPIRO, University of Illinois at Urbana-Champaign — Black hole–neutron star (BHNS) binary mergers can form disks in which magnetorotational instability (MRI)-induced turbulence may drive accretion onto the remnant BH, supporting relativistic jets and providing the engine for a short-hard gamma-ray burst (SGRB). Our earlier magnetized BHNS simulations showed that tidal disruption winds the NS internal magnetic fields into a toroidal configuration, with poloidal fields so weak that capturing MRI with full-disk simulations would require $\sim 10^8$ CPU-hours. In that study we imposed equatorial symmetry, suppressing poloidal magnetic fields that might be generated from plasma crossing the orbital plane. Here we show that tilting the initial poloidal magnetic fields in the NS generates much stronger poloidal fields in the disk, indicating that asymmetric initial conditions may be necessary for establishing BHNS mergers as SGRB progenitors via fully general relativistic MHD simulations. We demonstrate that BHNS mergers may form an SGRB engine when the remnant disk from an unmagnetized BHNS simulation is seeded with purely poloidal fields dynamically unimportant initially, but strong enough to resolve MRI. Magnetic turbulence occurs in the disk, driving accretion and supporting Poynting-dominated jet outflows sufficent to power an SGRB.

[1]This work was supported by NSF Grants AST-1002667 and PHY-0963136; NASA Grant NNX11AE11G; and XSEDE Allocation TG-MCA99S008.

Zachariah Etienne
University of Illinois at Urbana-Champaign

Date submitted: 09 Jan 2013 Electronic form version 1.4