Abstract Submitted
for the APR12 Meeting of
The American Physical Society

Magnetized Accretion onto Inspiraling Binary Black Holes: I. Spacetime Metric BRUNO MUNDIM, HIROYUKI NAKANO, SCOTT NOBLE, MANUELA CAMPANELLI, YOSEF ZLOCHOWER, Rochester Institute of Technology, JULIAN KROLIK, Johns Hopkins University, NICOLAS YUNES, Montana State University — Fully general relativistic numerical solutions to magnetized accretion onto black hole binaries are computationally very expensive. Current efforts are limited to very short binary separations. On the other extreme, however, point-particle Newtonian mechanics is used to accurately model accretion onto binaries with very large separations. In order to bridge the gap between these two extreme regimes, we construct a global time-dependent analytic approximation to the binary spacetime metric by asymptotically matching analytic metric approximations with different regions of validity. We apply black hole perturbation theory in the inner zone; 2.5 post-Newtonian theory in the near zone; and post-Minkowskian theory consistent with post-Newtonian theory in the far zone. In addition, we employ 3.5 post-Newtonian equations of motion to accurately describe the binary dynamics in its inspiral phase. We find the spacetime to be accurate to the expected leading post-Newtonian order, and demonstrate its reasonably small violations of the Hamiltonian and momentum constraints.

Bruno Mundim
Rochester Institute of Technology

Date submitted: 10 Jan 2012 Electronic form version 1.4