Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Gravitational Lorenz gauge self-force calculations in the time domain in 2+1D: progress report KRISTEN LACKEOS, University of Alabama in Huntsville, LEOR BARACK, University of Southampton, GAURAV KHANNA, Univesity of Massachusetts Dartmouth, LIOR M. BURKO, University of Alabama in Huntsville — The goal of this project is to calculate the self force acting on a point particle in motion in the spacetime of a Kerr black hole. Already in vacuum the problem presents several challenges, e.g., gauge-condition violating unstable modes. We decompose the field into separable azimuthal m-modes, although for each m-mode all 10 fields are coupled. Individual m-modes of the metric perturbations diverge logarithmically (in the proper distance from the point particle), and practical regularization may be done using a "puncture function." This approach has several advantages, e.g. the amenability to numerical solutions in the time domain, thus benefiting from experience gained by several groups in the numerical solution of linearized wave equations on a Kerr background, and the adaptability to more complex orbits, including generic ones. We first implement this program for the simpler context of circular orbits in Schwarzschild, without exploiting the spherical symmetry of the Schwarzschild backgound or the symmetry of the orbit. Instead, we construct the scheme so that generalizations to either more complex orbits or to Kerr spacetime are susceptible of implementation at later stages, and work in 2+1D. This talk is on work still ongoing.

Lior Burko
University of Alabama in Huntsville

Date submitted: 09 Jan 2009 Electronic form version 1.4