Abstract Submitted
for the APR08 Meeting of
The American Physical Society

Gravitational self-force calculations in the time domain in 2+1D: progress report LEOR BARACK, University of Southampton, LIOR M. BURKO, University of Alabama in Huntsville — The goal of this work is to calculate the gravitational self force acting on a point mass in motion in the spacetime of a Kerr black hole in the Lorenz gauge. We decompose the field into azimuthal m-modes, which leads to separable wave equations in Kerr. Individual m-modes of the metric perturbations diverge logarithmically (in the proper distance from the point particle), and practical regularization of the individual m-modes may be done using a "puncture function," a method that has been found to be efficient in the context of the toy model of scalar-field self forces for circular orbits in Schwarzschild. The m-mode approach has several advantages, most notably 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 in the time domain in 2+1D, and the adaptability to more complex orbits, including generic ones. As a first step we implement this program for the simpler context of circular orbits in Schwarzschild. Notably, we do not exploit 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 a progress report on work still ongoing.

Lior M. Burko
University of Alabama in Huntsville

Date submitted: 11 Jan 2008 Electronic form version 1.4