APR08-2008-000878

Abstract for an Invited Paper
for the APR08 Meeting of
the American Physical Society

Matching of PN Waveforms with long-time numerical evolutions

LAWRENCE KIDDER, Cornell University

Numerical simulations of 15 orbits of an equal-mass binary black hole system are presented. Gravitational waveforms from these simulations, covering more than 30 cycles before merger, are compared with those from quasi-circular zero-spin post-Newtonian (PN) formulae. The cumulative phase uncertainty of these comparisons is about 0.05 radians, dominated by effects arising from the small residual spins of the black holes and the small residual orbital eccentricity in the simulations. Matching numerical results to PN waveforms early in the run yields excellent agreement (within 0.05 radians) over the first 15 cycles, thus validating the numerical simulation and establishing a regime where PN theory is accurate. In the last 15 cycles to merger, however, *generic* time-domain Taylor approximants build up phase differences of several radians. I will also discuss preliminary results from more recent simulations with unequal masses and spins.