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Exploring the outer limits of Numerical Relativity CARLOS LOUSTO, YOSEF ZLOCHOWER, Rochester Institute of Technology — We perform a first exploration of black-hole binary evolutions using full nonlinear numerical relativity techniques at separations large enough that low-order post-Newtonian expansions are expected to be very accurate. As a case study, we evolve an equal-mass nonspinning black-hole binary in a quasicircular orbit at an initial coordinate separation of $r = 100M$. We measured the orbital period of the binary and find $T = 6422M$. We perform convergent simulations at three different grid resolutions and complete two, one and a half, and one and a quarter orbits for the low, medium and high resolutions, respectively. The orbital motion agrees with post-Newtonian predictions to within 1%. We discuss on how to improve this accuracy in future simulations. The results are relevant for the generation of long-term waveforms for detection and analysis of gravitational waves by the next generation of detectors.

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