Abstract Submitted
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Binary neutron stars: Equilibrium models beyond spatial conformal flatness[1] KOJI URYU, UWM, FRANCOIS LIMOUSIN, Paris-Meudon Observatory, JOHN FRIEDMAN, UWM, ERIC GOURGOULHON, Paris-Meudon observatory, MASARU SHIBATA, University of Tokyo — Equilibria of binary neutron stars in close circular orbits are computed numerically in a waveless approximation to general relativity. The new formulation exactly solves the Einstein-Euler system written in 3+1 form on a spacelike hypersurface. All components of the field equation are written elliptic equations, and hence all metric components, including the spatial metric, have Coulomb-type fall off. We choose the time-derivative of conformal three-metric to vanish on a spacelike hypersurface for a waveless condition, and impose helical symmetry for the other quantities. Two independent numerical codes, one based on a finite difference method, the other on a spectral method, are developed, and solution sequences that model inspiraling binary neutron stars during the final several orbits are successfully computed. The binding energy of the system near its final orbit deviates from earlier results of third post-Newtonian and of spatially conformally flat calculations. The new solutions may serve as initial data for merger simulations and as members of quasiequilibrium sequences to generate gravitational wave templates, and may improve estimates of the gravitational-wave cutoff frequency set by the last inspiral orbit.

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