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Numerical Relativity Simulations of Black Holes Binaries, Neutron Star Binaries, and Neutron Star Oscillations SHAWN ROSOFSKY, University of Maryland, ROMAN GOLD, Perimeter Institute for Theoretical Physics, CECILIA CHIRENTI, Universidade Federal do ABC, COLE MILLER, University of Maryland — We present the results of numerical relativity simulations, using the Einstein Toolkit, of black hole binaries, neutron star binaries, and neutron star oscillations. The black hole binary simulations represent the source of LIGO's first gravitational wave detection, GW150914. We compare the gravitational wave output of this simulation with the LIGO data LIGO on GW150914. The neutron star binaries we simulated have different mass ratios and equations of state. These simulations were compared with each other to illustrate the effect of different mass ratios and equations of state on binary evolution and gravitational wave emission. To perform the neutron star oscillation simulations, we applied pressure and density perturbations to the star using specific eigenmodes. These evolutions of the stars were then compared to the expected oscillation frequencies of those excited eigemodes and contrasted with simulations of unperturbed neutron stars.

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