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Numerical Simulations of Neutron Star Mergers

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The observation of gravitational waves and electromagnetic signals powered by the merger of two neutron stars has already provided us with a wealth of information about compact objects, high-energy astrophysics, and nuclear astrophysics. To extract as much information as possible from such observations, however, a deeper understanding of the highly non-linear merger events is necessary. Accurate studies of the merger of two neutron stars, or of a black hole and a neutron star, require complex numerical simulations capable of evolving Einstein's equations of general relativity, and the general relativistic equations of magnetohydrodynamics and neutrino radiation transport. In this talk, I will review recent efforts to improve the accuracy and physical realism of these simulations. I will discuss our current ability to model the properties of observable gravitational wave and electromagnetic signals, as well as important limitations of existing simulations that may still affect our ability to reliably extract information from some of these signals.

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