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General Relativistic Simulations of Black Hole-Neutron Star Mergers: Status and Applications

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Black hole-neutron star (BHNS) mergers are expected to be among the leading sources of gravitational waves observable by ground-based detectors, and may be progenitors of short-hard gamma-ray bursts (SGRBs). BHNS merger simulations in full general relativity represent the ultimate challenge of compact binary evolution: they involve all of the complications of relativistic hydrodynamics, including shocks, in a strong dynamical field, together with all of the hurdles of evolving moving black holes without encountering their spacetime singularities. In this talk, I will review the numerical techniques used by various groups to simulate BHNS binaries through inspiral, merger and ringdown. I will discuss the effects of binary mass ratio, black-hole spin, and neutron star compaction on the final outcomes of the mergers, and the implications on the gravitational wave and SGRB physics. Finally, I will discuss the possibilty of simultaneous detections of gravitational waves and SGRBs, and what we could learn from these detections.