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Gravitational-wave imprints of nonconvex dynamics in binary neutron star mergers

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Explaining gravitational-wave (GW) observations of binary neutron star (BNS) mergers requires an understanding of matter beyond nuclear saturation density. Our current knowledge of the properties of high-density matter relies on electromagnetic and GW observations, nuclear physics experiments, and general relativistic numerical simulations. We perform numerical-relativity simulations of BNS mergers subject to nonconvex dynamics allowing for the appearance of expansive shock waves and compressive rarefactions. Using a phenomenological nonconvex equation of state we identify observable imprints on the GW spectra of the remnant. Nonconvexity regions may be associated with first order phase transitions from nuclear/hadronic matter to deconfined quark matter. We find that this dynamics induces a significant shift in the quasiuniversal relation between the peak frequency of the dominant mode and the tidal deformability (of order f_{peak} 380 Hz) with respect to that of binaries with convex (regular) dynamics.

session

H. Equation of State and Neutron Stars

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