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Equation-of-state dependence of neutron-star mergers

Friday 28 March 2014 14:00 (20 minutes)

By a representative set of hydrodynamical simulations we investigate the influence of the high-density equation of state on observable features of neutron-star mergers. The dependence of the gravitational-wave emission on the equation of state of neutron-star matter is addressed. On the basis of our survey we point out a novel possibility to determine neutron-star radii from gravitational-wave detections of the postmerger phase of a neutron-star coalescence. This idea is based on the observation that the dominant oscillation frequency of the merger remnant correlates with the radii of neutron stars. The analysis also reveals constraints on other properties of neutron stars and the equation of state. The likelihood of a corresponding gravitational-wave observation is estimated. Moreover, nucleosynthesis calculations are presented showing a robust rapid neutron-capture process in the matter becoming gravitationally unbound by neutron-star collisions. The properties of optical transients which are powered by the radioactive decay of the freshly synthesized elements, are discussed as well. Also from these possibly observable signals information on the equation of state may be inferred.

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