Multi-Messenger Astrophysics 2024



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Modeling the strong-field dynamics of binary neutron star merger

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Binary neutron star mergers (BNSM) are associated to powerful gravitational and electromagnetic astronomical transients. Multimessenger observations of BNSMs promise to deliver unprecedented insights on fundamental physics questions, including constraints on dense matter models and the production of heavy elements. Detailed theoretical predictions of the merger dynamics are a crucial aspect for extracting information from such observations. This talk reviews recent progress on the modeling of BNSMs using simulations in 3+1 numerical general relativity. I will discuss the first predictions for the complete (inspiral-merger-postmerger) gravitational-wave spectrum and their application in gravitational-wave astronomy. Then, I will discuss selected recent results on the mechanisms behind kilonova light and their application to the analyses of astrophysical data.

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