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Constraining extreme matter with gravitatonal waves

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Gravitational waves from neutron star collisions carry key information about matter at extreme densities. Advanced LIGO and Virgo can, for example, constrain the properties of zero-temperature neutron star's equation of state by estimating the tidal polarizability coefficients that parametrize the neutron stars' tidal interactions in the inspiral-merger phase. Third generation detectors might also probe higher densities and temperatures by taking advantage of the enhanced sensitivity at kiloHertz frequencies and detecting signals from the merger remnant.

I will talk about the realization of such measurements from a theoretical point of view. In particular, I will discuss recent advances in the modeling of strong-field dynamics and radiation from neutron star collision in general relativity. Prospects and open problems for third-generation detectors will be discussed.

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