APR14-2014-020082

Abstract for an Invited Paper
for the APR14 Meeting of
the American Physical Society

Extracting the neutron star equation of state from gravitational wave data[1]

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For most of a binary neutron-star inspiral, orbiting point particles in a post-Newtonian framework are a good model for gravitational wave emission, and ground-based detectors can detect signals using these models. However, additional physics near merger is not captured in the detection templates: as the stars coalesce, the gravitational waveforms depend additionally on the properties of dense matter in the core of the stars. The equation of state of dense matter that determines properties such as the neutron-star radius also characterizes the gravitational waveforms emitted during binary neutron-star mergers. Understanding the effects of the equation of state on gravitational waveforms requires information from both analytic models in the inspiral and numerical simulations of the merger. Our current best estimates suggest that these effects will allow Advanced LIGO to constrain the neutron-star equation of state. I will review current models for waveform effects, estimates of measurability, and the implications for equation-of-state constraint in the next decade.

[1]Supported by NSF PHY-1307545