

Distinguishing high-mass binary neutron stars from binary black holes

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Advanced LIGO and Advanced Virgo are expected to detect tens of binary neutron stars (BNSs) in upcoming observing runs, and third-generation gravitational wave detectors are expected to detect many more. While the BNS merger that produced GW170817 led to a wide variety of electromagnetic counterparts, some of the BNSs detected in the future are expected to have a large enough total mass that they will collapse directly to a black hole when they merge. In such cases, little to no matter remains outside the final black hole to power electromagnetic counterparts. Thus, for these systems, the imprint of the neutron stars' material nature on the gravitational waveform (e.g., through tidal deformations) will be the only way to distinguish them from low-mass binary black holes (BBHs). To predict how easy it will be to distinguish high-mass BNSs from low-mass BBHs with current and future gravitational wave detectors, we perform parameter estimation on injections of hybrid effective-one-body/numerical relativity BNS and BBH waveforms using the `IMRPhenomPv2.NRTidal` waveform model and consider the constraints on masses and tidal deformabilities.

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