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Precessing binary black-holes in the isolated formation channel[1]
NATHAN STEINLE, MICHAEL KESDEN, University of Texas at Dallas — The masses and spins of binary black holes (BBHs) that form from the collapsed cores of isolated high-mass binary stars are determined by the interplay of phenomena such as tides, winds, accretion, common-envelope evolution, natal kicks, and stellar core-envelope coupling. The possibility for these BBHs to experience spin precession, which modulates the gravitational waves that are emitted during inspiral and merger, also depends on these astrophysical phenomena. If BBHs from the isolated channel generally have negligible spin-orbit misalignments, then their spin precession would be greatly suppressed. In previous work, we used a simplified model of stellar-binary evolution to identify regions of the parameter space that may produce BBHs with large, misaligned spins. Here, we use five new parameters (see D. Gangardt's talk), which describe the evolution of the direction of the orbital angular momentum, to explore the spin precession of such highly spinning and misaligned BBHs. We compare this behavior with the expected precession of BBHs originating from the dynamical channel and find that in the absence of alignment mechanisms, such as tides or accretion, isotropic natal kicks can produce precessing BBHs with appreciable nutation of the orbital angular momentum.

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