Abstract Submitted
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Isolated Binary Star Spin Evolution and its Implications for Binary Black Hole Precession[1] NATHAN STEINLE, MICHAEL KESDEN, University of Texas at Dallas — A binary black hole (BBH) may astrophysically arise from isolated stellar binary evolution. The BBH spin momenta provide information on the specific formation history but are currently poorly constrained by observation. The important binary processes that determine the BBH progenitor spin evolution are tides, winds, common envelope (CE), supernova (SN) kicks and stellar core-envelope coupling. For a few physically motivated scenarios, we parameterize binary stellar evolution to study the relationship between these processes and the BBH properties. The O1 and O2 LIGO/Virgo sources have effective spin parameter $\chi_{\rm eff} \sim 0$ which is possibly explained by slow-spinning black hole progenitors due to strong stellar core-envelope coupling; however, if the coupling is weak then it can be explained by misalignments due to SN kicks. We identify likely precessing systems, i.e. for systems that primary SN occurs after a CE phase, binaries with initial mass ratio near unity, initial binary separations between $9000 - 12,000\ R_\odot$, metallicity $Z \leq 0.1\ Z_\odot$ and strong core-env. coupling or binaries with high initial progenitor spins, similar metallicity and weak core-env. coupling both produce maximally spinning black holes with appreciable misalignments.

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