

Detectability of the second mode in binary black hole ringdown

Swetha Bhagwat

Ringdowns are the post-merger signature emitted during the coalescence of two black holes and comprise of superposition of quasi-normal-modes whose spectrum is unique to the final black hole formed. Ringdown serves as a very powerful probe to test the strong field dynamics of the general theory of relativity. Being able to measure more than one quasi-normal-mode in the ringdown will allow for the test of some fundamental predictions of the theory like the no-hair theorem. To first order, whether or not one can detect the second mode depends on the overall signal-to-noise ratio present in the ringdown signal and on the mode amplitude ratio. In this paper, we study zero noise-injections of ringdown signals, systematically varying both these parameters. We perform a full Bayesian model selection to detect the presence of the second mode in the ringdown. This study is done with an aim of developing an intuition on what kind of systems might allow us to detect the second mode at different SNRs. We find that detection of second mode seems promising for unequal mass progenitor binaries with advanced LIGO detector.
