Impact of mergers on LISA parameter estimation for nonspinning black hole binaries

We investigate the precision with which the parameters describing the characteristics and location of nonspinning black hole binaries can be measured with the Laser Interferometer Space Antenna (LISA). By using complete waveforms including the inspiral, merger and ringdown portions of the signals, we find that LISA will have far greater precision than previous estimates for nonspinning mergers that ignored the merger and ringdown. Our analysis covers nonspinning waveforms with moderate mass ratios, q >= 1/10, and total masses 10^5 < M/M_{Sun} < 10^7. We compare the parameter uncertainties using the Fisher matrix formalism, and establish the significance of mass asymmetry and higher-order content to the predicted parameter uncertainties resulting from inclusion of the merger. In real-time observations, the later parts of the signal lead to significant improvements in sky-position precision in the last hours and even the final minutes of observation. For comparable mass systems with total mass M/M_{Sun} = ~10^6, we find that the increased precision resulting from including the merger is comparable to the increase in signal-to-noise ratio. For the most precise systems under investigation, half can be localized to within O(10 arcmin), and 10% can be localized to within O(1 arcmin).