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Estimating the redshift dependence of the BBH population using joint CBC and GWB analysis

Utilising data from the direct detections of compact binary coalescences (CBCs) in the first three observing runs of the LIGO-Virgo-KAGRA Collaboration (LVK), we estimate the redshift dependence of the binary black hole (BBH) population. Specifically, we search for signs that the mass distribution of BBHs varies over cosmic history. The detection of such variation would allow us to gain more knowledge about the population itself, but also the formation channels of CBCs throughout the Universe. However, current CBCs took place at low to moderate redshift, limiting our ability to constrain the high redshift behaviour of the quantities of interest. Nevertheless, current upper limits on the gravitational-wave background (GWB) from CBCs can be used as an additional source of information to uncover the high redshift behavior of the merger rate and the mass distribution. We implement this joint CBC and GWB analysis in a Bayesian framework, allowing us to construct posteriors for the parameters describing the population of CBCs and their evolution with redshift.

Collaboration / Activity

Virgo Collaboration

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