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Sky localization and parameter estimation of massive black hole mergers with LISA

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The future space-based instrument LISA will open a new window to low-frequency gravitational wave signals. In particular, it will detect mergers of massive black hole binaries (MBHB) with high signal-to-noise ratios, enabling unprecedented scientific applications, like multimessenger observations with instruments such as Athena, LSST and SKA, and the use of these joint detections as standard sirens. Understanding the capability of LISA to localize these MBHB signals in the sky, both during their inspiral and after coalescence, is crucial for these applications. Using accelerated Bayesian inference tools that allow to go beyond Fisher-matrix based estimates, we survey LISA's abilities in terms of parameter recovery. We confirm the crucial role of higher harmonics in the signal and identify the respective roles of the time- and frequency-dependencies in the instrumental response in breaking degeneracies in parameter space. We discuss in particular LISA's ability to localize a binary in advance of the merger, and the occurence of multimodalities in the posterior distribution for the sky position.

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