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Bayesian Methods in Time-Delay Interferometric Ranging for the LISA Mission JESSICA PAGE, University of Alabama in Huntsville, TYSON LITTENBERG, NASA Marshall Space Flight Center — Laser frequency noise (LFN) due to unequal separations between spacecraft is the loudest source of noise expected in the LISA mission at 10^7 greater magnitude than the typical strain expected for LISA GW signals. Time-delay interferometry (TDI) suppresses LFN to an acceptable level by linearly combining measurements from individual spacecraft delayed by durations that correspond to their relative separations. Knowledge of the delay durations is crucial for TDI effectiveness, and its been shown that they can be estimated from the raw phasemeter data using fractional delay interpolation (FDI), allowing for TDI implementation during the post-processing of data (time-delay interferometric ranging, TDIR) once data is telemetered to Earth. This work performs TDIR using Bayesian methods to estimate the delay durations. Including TDIR parameters in the LISA data model as part of a "Global Fit" analysis pipeline produces GW inferences that are marginalized over uncertainty in the spacecraft separations. As an initial step towards this goal, a Monte Carlo Markov Chain (MCMC) is used for estimating the four time-independent delays required in the rigidly rotating unequal-arm Michaelson approximation of the spacecraft configuration.

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