EMRI Search and Inference within the LISA Global Fit - Part I

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## A test for LISA foreground Gaussianity and stationarity. Extreme mass-ratio inspirals

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Extreme Mass Ratio Inspirals (EMRIs) are key observational targets for the Laser Interferometer Space Antenna (LISA) mission. Unresolvable EMRI signals contribute to the formation of a gravitational wave background (GWB).

Characterizing the statistical features of the GWB from EMRIs is of great importance, as EMRIs will ubiquitously affect large segments of the inference scheme.

In this work, we apply a frequentist test for GWB Gaussianity and stationarity, exploring three astrophysicallymotivated EMRI populations. We construct the resulting signal by combining state-of-the-art EMRI waveforms and a detailed description of the LISA response with time-delay interferometric variables.

Depending on the brightness of the GWB, our analysis demonstrates that the resultant EMRI foregrounds show varying degrees of departure from the usual statistical assumptions that the GWBs are both Gaussian and Stationary.

If the GWB is non-stationary with non-Gaussian features, this will challenge the robustness of Gaussianlikelihood model, when applied to global inference results, e.g. foreground estimation, background detection, and individual-source parameters reconstruction.

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