COLLABORATIONNAME entry for MLDC 3.5

Emma L Robinson(1) and Alberto Vecchio(2)*
(1) *Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Am M"uhlenberg 1, D-14476 Golm, Germany*
(2) *School of Physics and Astronomy, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK*

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I. SUMMARY OF THE ENTRIES

We have carried out a set of analyses on the MLDC-3.5 Synthetic LISA data set using different assumptions. Here we summarize the analysis assumptions and strategy

A. Entry 1: bin-by-bin analysis

We analyze a selection of frequency bins independently assuming that each frequency is independent. We use the T channel to "calibrate" the instrumental noise contribution of the A and E channels. We assume that the transfer function between the T and A and E channels can be derived through monitoring of subsystems and/or modeling of the instrument, and that depending on what can actually be done, the knowledge is different. We encode this into

$$\begin{aligned} P_A(f) &= a(f)P_T(f) + P_h(f) \\ P_E(f) &= a(f)P_T(f) + P_h(f) \end{aligned} \tag{1}$$

The carried out analyses on six frequency bins. For each of these bins, we carried out two analyses, representing two different states of knowledge of the transfer function. We calculated the transfer function $a_{true}(f)$ using the noise power spectra described in [1], and, for the k-th frequency bin set two priors; the "moderate prior" restricts the parameter a to between 0 and $2a_{true}(f_k)$, while the "narrow" prior restricts it to between $0.8a_{true}(f_k) < a < 1.2a_{true}(f_k)$.

These analyses are presented in the file `bin-by-bin.txt`, where the two priors are labelled in the first column by "m" and "n" respectively. The second column labels the frequency bin, the third gives the posterior mean on Ω_{gw}, while the last two give the 95% probability intervals on Ω_{gw}.

B. Entry 2: wide band analysis

We use the A, E channels and *assume* that the spectral shape of A and E are the same and known, but the overall amplitude is unknown. For the instrumental noise power spectral densities $P_A(f)$ and $P_E(f)$ we use the theoretical expressions for a symmetric LISA constellation, as given in [1]. We therefore have:

$$\begin{aligned} P_A(f) &= P_{A,0}\, p(f) \\ P_E(f) &= P_{E,0}\, p(f) \end{aligned} \tag{2}$$

where $p(f)$ is known and $P_{A,0}$, and $P_{E,0}$ are unknown.

We assume the stochastic background is a power-law (in Ω),

$$\Omega_{\rm gw}(f) = \Omega_0 \left(\frac{f}{f_0}\right)^\alpha \tag{3}$$

*Electronic address: `elr@aei.mpg.de,av@star.sr.bham.ac.uk`

where both Ω_0 is unknown, and α is known to be zero.

We compute the posterior density probability functions on the unknown parameters:

$$\vec{\theta} = \{P_{A,0}, P_{E,0}, \Omega_0\} \tag{4}$$

We do two analyses, simply changing the frequency interval:

- An analysis on the frequency window $0.1 - 1$ mHz;
- An analysis on the frequency window $0.1 - 5$ mHz;

This analysis is presented in the file `wide.txt`, where the first two columns show the minimum and maximum frequencies studies, the third column gives the posterior mean on Ω_{gw} and the last two columns show the 95% probabilty interval on Ω_{gw}.

[1] S. Babak *et al.*, Class. Quant. Grav. **25**, 184026 (2008) [arXiv:0806.2110 [gr-qc]].