

Experiments: The second data release from the European Pulsar Timing Array II. Customised Pulsar Noise Models for Spatially Correlated Gravitational Waves

Tuesday, September 5, 2023 3:00 PM (30 minutes)

The subtle imprints that the gravitational wave background (GWB) induces on pulsar timing data are obscured by many sources of noise that occur on various timescales. These must be carefully modelled and mitigated to increase the sensitivity to the background signal. In this talk, I will present novel techniques and methodologies developed for robustly estimating the noise budget in 25 millisecond pulsars (MSPs) used by the EPTA to search for the GWB. The robustness of any GWB detection depends strongly on the reliability of the pulsar noise models and the assumptions that underly them - typically that the noise is a stationary process modeled by a power-law in the Fourier domain. Here I will discuss some initial explorations of possible deviations from these assumptions. We compare the EPTA datasets across several epochs to explore the stationarity of the noise model hyperparameters, and we also investigate the effect of incorporating low radio frequency data from the Indian Pulsar Timing Array collaboration for a common sample of 10 MSPs. We also demonstrate via simulations the ability of the Bayesian codes to recover the correct hyperparameter posteriors, and show that the choice of low-frequency cut-off in the power-law model can lead to a bias in the exponent of the power-law model.

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