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Prospects and Limitations of PTA Anisotropy Searches

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Anisotropies play a central role in distinguishing between a cosmological or astrophysical origin of the nanohertz gravitational wave background, as detectable anisotropies are expected for a GWB from a population of supermassive black hole binaries but not for cosmological sources.
We analyze prospects for detecting anisotropies from either bright single sources or large scale anisotropies with frequentist methods by simulating complete pulsar timing array datasets for both current and expected future PTA configurations. From this, we identify the most promising search strategies, derive fundamental limits of frequentist anisotropy searches and set realistic expectations for near-future anisotropy detection prospects.

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