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Bridging the μHz gap in the gravitational-wave landscape with binary resonance

The passage of gravitational waves (GWs) through a binary perturbs the trajectories of the two bodies, potentially causing observable changes to their orbital parameters. In the presence of a stochastic GW background (SGWB) these changes accumulate over time, causing the binary orbit to execute a random walk through parameter space. In this talk I will present a powerful new formalism for calculating the full statistical evolution of a generic binary system in the presence of a SGWB, capturing all six of the binary's orbital parameters. I will show how this formalism can be used to set novel upper limits on the SGWB spectrum in the μHz frequency band, between the regions probed by LISA and pulsar timing arrays. As examples of the discovery potential of these methods, I will show how they are able to probe GWs from cosmological phase transitions in a region of parameter space that is inaccessible with LISA and other experiments, and will discuss how they might shed light on the possible SGWB signal detected by NANOGrav.

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