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Searching for New Physics with the NANOGrav Pulsar Timing Array

Wednesday, September 20, 2023 2:00 PM (30 minutes)

NANOGrav, the North American Nanohertz Observatory for Gravitational Waves, recently announced compelling evidence for the existence of a stochastic gravitational-wave background at nanohertz frequencies. This signal may either be of astrophysical origin and stem from a population of supermassive black-hole binaries, or of cosmological origin, reaching us from the early Universe. In this talk, I will focus on the latter possibility and illustrate how the NANOGrav data enables us to probe new physics at the pulsar timing array (PTA) frontier. Specifically, I will show how PTA data allows us to study models of physics beyond the Standard Model at extremely high energies, including scenarios of grand unification and string theory, before I then turn to searches for new physics in our Milky Way, including scenarios of ultra-light dark matter and dark-matter substructures. I will conclude by giving a brief outlook on the future of the field, which is sure to see some spectacular progress in the coming years and decades. This talk is based on 2306.16219.

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