Contribution ID: **15** Type: **Regular Talk (20' + 5')**

Electromagnetic Birefringence Signatures of Ultralight Axions in Pulsar Timing Arrays

Wednesday 16 July 2025 14:50 (25 minutes)

Axion-like particles (ALPs) can behave as a wave-like dark matter medium, and their interactions with photons may leave observable imprints in astrophysical environments. In this talk, I will show how pulsar arrays can act as sensitive detectors of ALP effects through birefringence signatures observed in polarimetric measurements. We use high-precision polarimetry data from the Parkes Pulsar Timing Array, the QUIJOTE (Q-U-I Joint TEnerife) experiment, and the European Pulsar Timing Array to search for signals of ALP-induced effects arising from their electromagnetic behavior. A combined analysis, taking into account stochastic fluctuations, allows us to derive strong constraints on the mass and electromagnetic interactions of ultralight ALPs. I will also discuss theoretical opportunities and future prospects for detecting these particles using pulsars located in galactic regions with enhanced dark matter densities.

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