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## Searching for Ultra-Light Axion-Like Particles Using Pulsars Polarimetry Measurements from PPTA and QUIJOTE

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A dark matter medium composed of ultra-light axion-like particles (ALPs) with electromagnetic couplings can induce a birefringence effect in the polarization of photons emitted by pulsars. We have developed a robust and comprehensive method to search for such birefringence effects using polarimetry measurements from the Parkes Pulsar Timing Array (PPTA) and the QUIJOTE experiment targeting the Crab Nebula. Moreover, we analyze the stochastic nature of the axion's wavelike behavior within the coherence patches, which depends on the distances between the pulsars and Earth. Our analysis imposes stringent constraints on the axion mass and its coupling constant, particularly in the range  $10^{-23} \text{ eV} < m_a < 10^{-21} \text{ eV}$ . Finally, we outline future prospects for studying pulsars located in high dark matter density regions and propose opportunities for further pulsar polarimetry measurements by other dedicated collaborations.

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