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Axiverse Birefringence

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The cosmic microwave background (CMB) holds intriguing evidence of cosmic birefringence - an isotropic rotation of the polarization direction, manifesting in the CMB's parity odd spectra. This phenomenon finds a compelling explanation within axion physics, where a light scalar field interacts with the electromagnetic field through a Chern-Simons interaction, violating parity.

In this presentation, I will explore the implications of cosmic birefringence detection within the framework of a rich Axiverse. The Axiverse suggests the presence of multiple active axions after the CMB, contributing to the observed signal. By leveraging probability density functions (PDFs) for various axion parameters, such as mass and axion decay constant, I will demonstrate how the cosmic birefringence measurement constrains these PDFs and how the outcomes change for different axion potentials.

Finally, I will discuss the future prospects of "birefringence tomography," which can rule out simpler versions of the Axiverse. These collective findings advance our understanding of axions, cosmic birefringence, and their profound implications.

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