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Producing cosmic birefringence through CP-violating axions

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Even if they do not comprise the dark matter, light axion-like particles may be sourced by bulk Standard Model matter through a coupling that violates CP. When considered in combination with the usual axion-photon coupling, the resulting ‘monopole-dipole’ scenario possesses a rich phenomenology, as has previously been studied in the context of terrestrial detection. In this talk, I discuss the possible *cosmological* consequences of such interactions. Standard Model nucleons contribute to a homogeneous vacuum expectation value for the axion field, which evolves between recombination and the present day as matter redshifts. This means that regardless of the field’s initial conditions, the photon coupling will cause the plane of linear polarization of the CMB to globally rotate, manifesting as a cosmic birefringence signal. Recent analyses of Planck and WMAP data place strong limits on this scenario, and may even favour a non-zero value for the couplings.

Mini Symposia (Invited Talks Only)

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