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Implications for Cosmic Birefringence from Recent Cosmological Observations

Thursday 11 September 2025 11:00 (40 minutes)

In this talk, I present implications for the cosmic birefringence from recent cosmological observables. We begin by showing constraints on cosmic birefringence induced by ALPs using the Planck EB power spectrum. We find that cosmic birefringence signal is consistent with a constant rotation model and some specific ALP masses are excluded. Next, we show that cosmic birefringence can explain a higher optical depth $\tau \simeq 0.09$ as a result of the DESI BAO measurements and CMB observations within the standard cosmological model. Specifically, we use the fact that the recent cosmic birefringence measurement, $\beta_0 = 0.34$ deg, has the phase ambiguity, $\beta = \beta_0 + 180n$ deg with $n \in \mathbb{Z}$. An ALP-induced birefringence model with a nonzero n can suppress the reionization bump in the EE spectrum while allowing for a large optical depth. We show a viable parameter region that simultaneously explain the large-scale CMB polarization, Planck EB power spectrum, and an elevated value of τ .

References

<https://arxiv.org/abs/2506.20824>, <https://arxiv.org/abs/2506.22999>

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