

Tomography of cosmic birefringence induced by 3-form dark energy

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3-form dark energy shows a similar behavior to but distinguishable one from that of a scalar field in an expanding universe, and its tensorial structure allows for unique couplings that cannot be experienced by canonical scalars.

We here explore the possibility that 3-form dark energy can explain the cosmic birefringence angle $\beta \sim 0.3^\circ$, as suggested by observations of the CMB polarization.

We consider two EFT-inspired couplings between the 3-form and the photon, finding a dimension-4 operator is a candidate explanation, moreover predicting a photon mass around the Hubble scale.

The profiles for $\beta(z)$ from the model can mimic those from ALP dark energy or ALP dark matter, or be distinguishable, depending on the field configuration in the early universe, which may be tested by precise measurements of CMB polarization or radio galaxies.

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