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Birefringence angle estimation using D-estimators

This poster focuses on harmonic estimators for the cosmic birefringence (CB) effect, the "in vacuo" rotation of the linear polarisation plane of photons during propagation. This effect is a tracer of parity-violating extensions beyond standard electromagnetism and may point to the existence of a new cosmological field (i.e. an axion) acting as dark matter or dark energy. When such an extension is modelled by a Chern-Simons interaction, the amplitude of the CB rotation is proportional to the distance traveled by photons. Hence CMB photons represent the best observable we have in nature to investigate this effect since they are linearly polarised and have traveled the longest distance in the Universe. In this poster, we describe in detail the so-called D-estimators, a methodology used for measuring the CB angle from CMB observations. Additionally, we examine the performance of these estimators when applied to subranges of the complete harmonic domain, a test that could yield valuable insights into the parameters of the axion, such as its mass.

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