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Isotropic cosmic birefringence from an oscillating axion-like field

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We propose a new mechanism for isotropic cosmic birefringence with an axion-like field that rapidly oscillates during the recombination epoch. In conventional models, the field oscillation during the recombination epoch leads to a cancellation of the birefringence effect and significantly suppresses the EB spectrum of the cosmic microwave background (CMB) polarization. By introducing an asymmetric potential to the axion, this cancellation becomes incomplete, and a substantial EB spectrum can be produced. This mechanism also results in a washout of the EE spectrum, which can be probed in future CMB observations. Our findings suggest the possibility that an axion-like field responsible for isotropic cosmic birefringence can also account for a significant fraction of dark matter.

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