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Cosmic birefringence mediated by dark U (1)

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A kinetic coupling between the photon and a dark photon, a massless U(1)-gauge boson in the dark sector, transfers dark photon's birefringence to observed cosmic birefringence. Regardless of the origin of the dark birefringence, the amplitude and unique frequency-dependence of the cosmic birefringence depend on the kinetic-coupling constant and the dark-photon temperature. To explain the reported tantalizing 3-sigma hint of cosmic birefringence, the dark photon temperature must exceed 0.82 K, corresponding to $\Delta N_{\rm eff} \geq 0.022$, which is within reach of the CMB Stage-4.

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