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Thermal Misalignement for Scalar Dark Mtter

The conventional misalignment mechanism for scalar dark matter depends on the initial field value, which governs the oscillation amplitude and present-day abundance. We present a mechanism by which a feeble (Planck-suppressed) coupling of dark matter to a fermion in thermal equilibrium drives the scalar towards its high-temperature potential minimum at large field values, dynamically generating misalignment before oscillations begin. Unlike conventional misalignment production, the dark matter abundance is dictated by microphysics and not by initial conditions. As an application of the generic mechanism, we discuss a realistic scenario in which dark matter couples to the muon.

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