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Hyperon Physics at BESIII

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Based on the large J/ψ and $\psi(3686)$ data samples collected at BESIII, recent studies have established significant transverse polarization in hyperon–antihyperon pairs, including $\Lambda\bar{\Lambda}$, $\Sigma\bar{\Sigma}$, $\Xi\bar{\Xi}$, and $\Omega^-\bar{\Omega}^+$. These measurements have enabled the first model-independent determination of the Ω^- spin. The observed nonzero polarization further allows independent determinations of hyperon and antihyperon decay parameters, providing precise tests of direct CP violation.

BESIII also provides a unique opportunity to search for hyperon electric dipole moments (EDMs) using entangled hyperon–antihyperon pairs produced in J/ψ decays. This method is expected to reach sensitivities of order $10^{-19}\, e \cdot \mathrm{cm}$ for Λ, Σ^+, Ξ^-, and Ξ^0, surpassing previous limits by several orders of magnitude. These studies demonstrate the strong potential of hyperon physics as a probe of physics beyond the Standard Model, with further advances expected at the future STCF.

Collaboration

BESIII

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