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Search for CP violation with spin entangled hyperon-antihyperon pairs at BESIII

With the largest datasets on e^+e^- annihilation at the J/ψ and $\psi(3686)$ resonances collected at the BESIII experiment, multi-dimensional analyses making use of spin polarization and entanglement can shed new light on the production and decay properties of hyperon-antihyperon pairs. In a series of recent studies performed at BESIII, significant transverse spin polarization of the (anti)hyperons has been observed in J/ψ and $\psi(3686)$ to $\Lambda\bar{\Lambda}$, $\Sigma\bar{\Sigma}$, and $\Xi\bar{\Xi}$. For the first time, the decay asymmetry parameters of hyperons and antihyperons have been determined independently with high precision. Comparing the hyperon and antihyperon decay parameters provides precise tests of direct $\Delta S = 1$ CP-violation, complementing the studies performed in the kaon sector. Additionally, BESIII investigates weak radiative hyperon decays, semi-leptonic hyperon decays, and hyperon-nucleon interactions.

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