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# Some Novel Probes for Chirality-Flip Interactions at Colliders

To reveal hidden NP effects on the top of SM, it is SMEFT that provides a powerful systematic bottom-up approach to parameterize them. Among them the chirality-flip operators, which flip fermion helicities, remain poorly constrained by current experimental analyses for lack of interference with the SM amplitudes in traditional observables with leading effect starting at $\mathcal{O}(1/\Lambda^4)$. Moreover, things goes much worse for light-quark relevant operators due to the QCD confinement. None direct measurement on quark can be carried out, and the knowledge on quark spin and nucleon structure is still foggy in mess. To address these issues, we novelly propose several unique and efficient probes for such chirality-flip interactions, which originate from the interference of them and the SM with leading effect beginning at $\mathcal{O}(1/\Lambda^2)$. These novel approaches among the future lepton, hadron and lepton-ion colliders are linearly dependent on their Wilson coefficients without any contamination from the SM and other NP operators. As a result, nontrivial azimuthal behavior can be exhibited and serves as specific asymmetry observables. These new methods can improve the current constraints and can also simultaneously determine both their real and imaginary parts, offering a new opportunity for probing potential $CP$-violating effects arising from these operators. Therefore, our work opens up a new avenue to utilize spin physics for exploring the NP effects from the chirality-flip operators.

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