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Type: Parallel-Goldstone Boson

Patterns of C- and CP-violation in hadronic η and η' three-body decays

We construct hadronic amplitudes for the three-body decays

 $\eta^{(\prime)} \to \pi^+\pi^-\pi^0$ and $\eta^\prime \to \eta\pi^+\pi^-$ in a non-perturbative fashion,

allowing for C- and CP-violating asymmetries in the $\pi^+\pi^-$ distributions.

These amplitudes are consistent with the constraints of analyticity and unitarity. We find that the currently most accurate Dalitz-plot distributions taken by the KLOE-2 and BESIII collaborations confine the patterns of these asymmetries to a relative per mille and per cent level, respectively.

Our dispersive representation allows us to extract the individual coupling strengths of the C- and CPviolating contributions arising from effective isoscalar and isotensor operators in $\eta^{(\prime)} \rightarrow \pi^+\pi^-\pi^0$ and an effective isovector operator in $\eta' \rightarrow \eta \pi^+\pi^-$, while the strongly different sensitivities to these operators can be understood from chiral power counting arguments.

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