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SM prediction for the CP asymmetries in two-body hadronic charm decays

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Charm Physics is highly topical in the current flavour landscape, especially after the announcement by LHCb of the measurement of direct CP asymmetries in the separate decays of $D^0 \to K^+K^-$ and consequently $D^0 \to \pi^+\pi^-$, which was preceded by the discovery of direct CP violation in the difference of these two asymmetries. The experimental result is extremely difficult to interpret, as the fully hadronic decays of charm entail significant QCD uncertainties, precluding tests of the Kobayashi-Maskawa mechanism in the up-type sector. In this work we address the problem of the determination of the strong amplitudes involved by considering very general properties of amplitudes, namely unitarity and analyticity. We implement these properties in two-channel dispersion relations which describe the final-state interactions between the pion and kaon pairs. First, using data-driven parameterisations of just the two-pion and two-kaon rescattering phases as input for the dispersion relations we are able to set upper bounds for the amount of CP asymmetry allowed within the SM in either decay of D mesons. In a second work, by also implementing an appropriate parameterisation of the inelasticity between these two channels which reproduces the experimental branching fractions we are able to make a prediction for the CP asymmetries in the aforementioned channels, as well as the isospin-related ones $\pi^0\pi^0$ and $K^0\overline{K^0}$.

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