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SU(3)_F Breaking through Final State Interactions and CP Asymmetries in $D \rightarrow PP$ Decays

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The question of the validity of analyzing charmed meson decays to pairs of mesons within the $SU(3)_F$ framework has been long and often debated. There are convincing arguments that small breaking of this symmetry can accommodate for the current experimental data on branching fractions of $D \rightarrow PP$ ($P = \pi, K, \eta$). However, the uncertainty in the evaluation of the amplitudes in these modes renders it quite impossible to justify with complete authority the physical interpretations of the parameters extracted from experimental data. In our current work we build a parametrization of perturbative $SU(3)_F$ breaking in an attempt to incorporate final state interactions through isospin specific phases and small breaking in the amplitudes. We use a reduced menu of decay modes consisting of the D^0 and $D_{(s)}^\pm$ initial states and excluding η/η' in the final states in an initial attempt to explain the branching fractions data with our parametrization. We also incorporate CP non-conservation in our parametrization which requires the knowledge of poorly estimated penguin amplitudes. We attempt at estimating $\Delta A_{CP}^{\text{dir}}$, and build its correlation with several other CP asymmetries using our parametrization making predictions which are testable at Belle II and LHCb.

Experimental Collaboration

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