Constraints on hadronic final-state interaction in B and D decays[1]

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One would like to reduce as much as possible the strong interaction uncertainties in hadronic heavy meson decay in order to extract with the best possible precision the weak interaction observables. For three-body decays one can introduce an approximation where one assumes that two of the three produced mesons form one state (which could be a resonance) in a S, P or D wave. Assuming that this state originates from a quark-antiquark pair one can then apply the QCD factorization hypothesis [1] to this quasi two-body final state. In this framework, the final state meson-meson strong interaction can enter through the knowledge of the meson-meson form factor (meson-meson transition to the vacuum). Field theory and dispersion relations [2] show that the knowledge of strong interaction meson-meson form factors is available if the meson-meson interaction is known at all energies.

So far our knowledge of meson-meson interaction is incomplete and the needed form factors can be phenomenologically extracted from semileptonic processes as, for instance, the $\pi\pi$ vector form factor from the Belle Collaboration analysis [3] of the $\tau^- \to \pi^0\pi\nu_\tau$ decays. They can also be built theoretically from our knowledge of the strong meson-meson interaction to which one applies theoretical constraints such as unitarity, analyticity and chiral symmetry using experimental data from processes other than heavy meson decays. This has been applied to calculate the $\pi\pi$ scalar form factor in the studies of $B^\pm \to \pi^\mp\pi^\pm\pi^\pm$ [4] and $D^0 \to K^0_S\pi^+\pi^-$ [6, 7] decays. It has also been performed for the πK scalar and vector form factors in the analysis of the πK channel of the $B \to K\pi^+\pi^-$ [5] and $D^0 \to K^0_S\pi^+\pi^-$ [6, 7].

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