

High Energy Physics - Phenomenology

How large can the SM contribution to CP violation in D^0 - \bar{D}^0 mixing be?

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We investigate the maximum size of CP violating effects in D -mixing within the Standard Model (SM), using Heavy Quark Expansion (HQE) as theoretical working tool. For this purpose we determine the leading HQE contributions and also α_s corrections as well as subleading $1/m_c$ corrections to the absorptive part of the mixing amplitude of neutral D mesons. It turns out that these contributions to Γ_{12} do not vanish in the exact $SU(3)$ limit. Moreover, while the leading HQE terms give a result for Γ_{12} orders of magnitude lower than the current experimental value, we do find a sizeable phase. In the literature it was suggested that higher order terms in the HQE might be much less affected by the severe GIM cancellations of the leading terms; it is even not excluded that these higher order terms can reproduce the experimental value of Γ_{12} . If such an enhancement is realized in nature, the phase discovered in the leading HQE terms can have a sizeable effect. Therefore, we think that statements like: "CP violating effects in D -mixing of the order of 10^{-3} to 10^{-2} are an unambiguous sign of new physics"--given our limited knowledge of the SM prediction--are premature. Finally, we give an example of a new physics model that can enhance the leading HQE terms to Γ_{12} by one to two orders of magnitude.

Comments: 14 pages, considerably extended version of [0904.3971](#) with completely new main aspect; text (except title and abstract) identical to the version accepted by JHEP

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