

DALITZ PLOT STUDIES OF $D^0 \rightarrow K_S^0 \pi^+ \pi^-$ DECAYS

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Dalitz-plot time dependent amplitude analyses have recently been performed [1,2] for the CP self conjugate D^0 meson decays into $K_S^0 \pi^+ \pi^-$. These studies, relying mainly on the isobar model, have allowed a direct measure of the D^0 - \bar{D}^0 mixing parameters, the knowledge of which could show the presence of new physics contribution beyond the standard model. Following our program devoted to the understanding of rare three-body B decays (see e.g. Ref. [3] we analyze, in the framework of the quasi two-body QCD factorization approximation [4], the present available $D^0 \rightarrow K_S^0 \pi^+ \pi^-$ data. The annihilation, via W -exchange, amplitudes are added to the weak-decay tree amplitudes. The doubly Cabibbo suppressed parts of amplitudes are also considered. The strong interactions between the kaon-pion and pion-pion pairs in the S -, P - and D -final states are described in terms of the corresponding form factors. The kaon-pion or pion-pion scalar and vector form factors are constrained by other experimental data. Unitarity, analyticity and chiral symmetry are also used to obtain their functional forms. We study the Dalitz plot distributions and we go through a minimization procedure to reproduce the $K_S^0 \pi^-$, $K_S^0 \pi^+$ and $\pi^+ \pi^-$ effective mass projections. The large number of 27 non-zero amplitudes leads to a large number of parameters. The resulting model distributions and branching fractions are compared to the accurate Belle [2] and BABAR [1] Collaboration data.

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