An investigation of the $D_s^+\pi^0$-DK-$D_s^+\eta$ coupled channel dynamics

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We investigate the dynamics of the coupled channel system consisting of the $D_s^+\pi^0$-, DK- and $D_s^+\eta$-channel both by solving the Blankenbecler Sugar scattering equation numerically as well as by looking at an analytic model. In both cases we find that a dynamical pole is generated close to 2317 MeV in the isoscalar DK-channel, when we assume $SU(4)$-symmetry to relate the coupling parameters to the well known coupling parameters in the case of $\pi\pi$-$K\bar{K}$ scattering. Our models relate in a natural way the contributions to $D_s^+\pi$ scattering originating from this pole to the contributions from the opening iso vector DK-channel, if we assume that isospin breaking only happens via the mass differences and $\rho\omega$- as well as $\pi\eta$-mixing. We use the constrains coming from the BaBar[1], Cleo[2] and Belle[3] observations of the $D_{sJ}^*(2317)$ to give an estimate for the non molecular iso scalar contribution to the observed state.

[1] B. Aubert, et al. (BaBar Collaboration), PRL **90** (2003) 242001

[2] D. Besson, et al. (CLEO Collaboration), arXiv:hep-ex/0305017

[3] Y. Mikami et al. (Belle Collaboration), PRL **92** (2004) 012002

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