Contribution ID : **10** Type : **parallel talk**

Molecular components in $D^*_{s0}(2317)$ and $D_{s1}(2460)$ mesons

Thursday, 2 June 2016 18:15 (0:20)

Collaboration

Abstract content

Results obtained by various experiments show that the $D^*_{s0}(2317)$ and $D_{s1}(2460)$ mesons are very narrow states located, respectively, below the DK and D^*K thresholds. This has led much attention because it is markedly in contrast with the expectations from naive quark models and heavy quark symmetry [1]. Early lattice QCD studies found D^*_{s0} and D_{s1} energy levels in line with quark model expectations (see, for instance, Ref. [2]).

Motivated by a recent lattice study [3, 4] which addresses the mass shifts of the $c\bar{s}$ ground states with quantum numbers $J^P = 0^+$ ($D^*_{s0}(2317)$) and $J^P = 1^+$ ($D_{s1}(2460)$) due to their coupling with S-wave DK and D^*K thresholds, we perform a similar analysis within a nonrelativistic constituent quark model in which quark-antiquark and meson-meson degrees of freedom are incorporated. The quark model has been applied to a wide range of hadronic observables and thus the model parameters are completely constrained (see references [5, 6] for reviews). The coupling between quark-antiquark and meson-meson Fock components is done using a $^3P_0$ model in which its only free parameter γ has been elucidated performing a global fit to the decay widths of mesons that belong to different quark sectors [7].

We observe that the S-wave coupling of the 0^+ (1^+) meson sector to the DK (D^*K) threshold is a key feature in lowering the masses of the corresponding $D^*_{s0}(2317)$ and $D_{s1}(2460)$ states predicted by the naive quark model, but also in describing the $D_{s1}(2536)$ meson as the 1^+ state of the $j^P_q = 3/2^+$ doublet predicted by heavy quark symmetry and thus reproducing its strong decay properties. Two features of our formalism cannot be address nowadays by lattice computations: the coupling of the D-wave D^*K threshold in the $J^P = 1^+$ channel and the computation of the probabilities associated with different Fock components in the physical state.

[1] S.N. Gupta and J.M. Johnson, Phys. Rev. D51, 168 (1995)
[2] G.S. Bali Phys. Rev. D68, 071501 (2003)
[3] D. Mohler et al., Phys. Rev. Lett. 111, 222001 (2013)
[4] C.B. Lang et al., Phys. Rev. D90, 034510 (2014)
[5] A. Valcarce et al., Rept. Prog. Phys. 68, 965 (2005)
[6] J. Segovia et al., Int. J. Mod. Phys. E22 1330026 (2013)
[7] J. Segovia, D.R. Entem and F. Fernandez, Phys. Lett. B715, 322 (2012)

Primary author(s) : ORTEGA, Pablo G. (CERN (European Organization for Nuclear Research))

Co-author(s) : SEGOVIA, Jorge (Technische Universität München); ENTEM, David R. (Universidad de Salamanca); FERNANDEZ, Francisco (Universidad de Salamanca)

Presenter(s) : SEGOVIA, Jorge (Technische Universität München)

Session Classification : Parallel Session A2