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Lambda_b –> J/Psi phi Lambda decay and search for exotic hadrons

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We study the weak decay of the Λ_b baryon into $J/\Psi\phi\Lambda$ states and the possibility of producing exotic hadrons via final state interaction in $J/\Psi\phi$ and $J/\Psi\Lambda$ channels.

The elementary weak transition at the quark level proceeds via the creation of a $J/\Psi(\bar{c}c)$ meson and an excited ***sud*** system with **I = 0**, which upon hadronization leads to $\phi\Lambda$ and $\bar{K}N$ meson-baryon pairs, the later one undergoing final state interaction in coupled channels and ending up as an observed $\phi\Lambda$ pair.

The hidden-charm pentaquark $P_c(4450)$ observed recently by the LHCb collaboration [1] may be of molecular nature, as advocated by some unitary approaches that also predict pentaquark partners in the strangeness **S=-1** sector [2]. This strange hidden charm pentaquark can be produced via $J/\Psi\Lambda$ final state interaction in our reaction and, as we shall see, such a state could be seen in $\Lambda_b \to J/\Psi\phi\Lambda$ decay as a peak in the $J/\Psi\Lambda$ invariant mass distribution. A similar study and conclusions have been performed in [3], but looking at the Λ_b decay into $J/\Psi\eta\Lambda$ final states.

On the other hand, studying the invariant mass spectrum of $J/\Psi\phi$ pairs from $\Lambda_b \to J/\Psi\phi\Lambda$ decay, one can also observe the peaks corresponding to the $X(4140)$ and $X(4274)$ exotic hadrons discovered by CDF [4] and recently reconfirmed in B decay at LHCb [5].

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