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The hybrid nonet of $\pi_1(1600)$ and $\eta_1(1855)$: analysis and predictions

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The hybrid mesons form a part of the exotic spectrum of the standard model. The recent observation of the isoscalar hybrid, called the $\eta_1(1855)$, provides an important step towards the completion of the 1^{-+} nonet. In the present work, we analyze the masses and two-body decays of the members of this nonet using a model Lagrangian. The isovector $\pi_1(1600)$ has been studied extensively - both experimentally and on lattice. We use the available experimental and lattice data to extract the coupling constants. Using these parameters, we analyze the possible decay channels for the hybrid kaons and the isoscalars. We find that the hybrid kaons have to be at least as broad as the $\pi_1(1600)$. We expect the isoscalars to mix only to a small extent. The mass and the total width of the heavy isoscalar can be identified with those of the $\eta_1(1855)$ state reported by the BESIII collaboration if the mixing angle is taken to be small but non-zero. The light isoscalar, on the other hand, can be marginally lighter than the $\pi_1(1600)$ and significantly narrow.

In-person participation

Yes

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