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Scalar Mesons: $q\bar{q}$–Tetraquark Mixing

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The Particle Data Group (PDG) lists three scalar nonets, denoted $0^+_A, 0^+_B, 0^+_C$: one containing $[a_0(980), K^*_0(700)]$, another containing $[a_0(1450), K^*_0(1430)]$, and the third containing $[a_0(1710), K^*_0(1950)]$. We begin by noting that, within the tetraquark picture, two distinct color-spin structures are required to describe the tetraquark configurations of the $[a_0(980), K^*_0(700)]$ and $[a_0(1450), K^*_0(1430)]$ nonets. A notable challenge in understanding these states is the unexpectedly small mass difference between $a_0(1450)$ and $K^*_0(1430)$. In this work, we explore an additional mixing mechanism to address this puzzle, namely the $q\bar{q}$–tetraquark mixing, which may account for the $[a_0(1450), K^*_0(1430)]$ and $[a_0(1710), K^*_0(1950)]$ nonets [Reference: PRD 111, 054016 (2025)].

Collaboration

Primary author: KIM, Hungchong (Korea University)

Presenter: KIM, Hungchong (Korea University)

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