

Tetraquark mixing framework for the two light-meson nonets

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We propose a tetraquark mixing framework for the two light-meson nonets in the $J^P = 0^+$ channel, the light nonet $f_0(500)$, $f_0(980)$, $a_0(980)$, $K_0^*(800)$, and the heavy nonet $f_0(1370)$, $f_0(1500)$, $a_0(1450)$, $K_0^*(1430)$. According to this framework, one can introduce two types of tetraquark with different spin configuration, $|J, J_{12}, J_{34} = |000 \rangle, |011 \rangle$, where J is the spin of the tetraquark, J_{12} the diquark spin, J_{34} the antidiquark spin. They differ by the color configuration also but both have the same flavor structure. The two tetraquark types seem to have interesting correspondence with the two nonets in PDG. Indeed, the two tetraquarks mix strongly through the hyperfine color-spin interaction and the eigenstates that diagonalize the hyperfine masses can be identified with the two nonets in PDG. We report that their hyperfine mass splitting can generate the mass gap between the two nonets qualitatively. We also discuss interesting signatures in the decays of these tetraquarks.

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