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Scalar meson $a_0(980)$ as the mixed tetraquark within QCD sum rules

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Recently the tetraquark mixing framework has been proposed for the two light-meson nonets in the $J^{PC} = 0^{++}$ channel, namely the light nonet composed by $a_0(980)$, $K_0^*(800)$, $f_0(500)$, $f_0(980)$, and the heavy nonet by $a_0(1450)$, $K_0^*(1430)$, $f_0(1370)$, $f_0(1500)$. According to this mixing framework, these two nonets are represented by the linear combination of the two tetraquark types, one type containing the spin-0 diquark and the other with the spin-1 diquark. One interesting result from the mixing framework is that the second tetraquark with the spin-1 diquark configuration is more important to explain the light nonet. For the light nonet, the second tetraquark with the spin-1 diquark is found to be more dominant configuration.
In this work, we report that this result is consistent with the QCD sum rule calculations. In particular, we construct QCD sum rules for the isovector resonance $a_0(980)$ using both type of tetraquark currents by performing the operator product expansion up to dimension 10 operators. We perform the operator product expansion
is performed up to dimension 10 operators and see if the we investigate whether this result is consistent with QCD sum rules by constructing a QCD sum rule for the isovector resonance, $a_0(980)$.

Primary author: Prof. LEE, Hee-Jung (Chungbuk National University)

Presenter: Prof. LEE, Hee-Jung (Chungbuk National University)

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