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Theoretical interpretation of the $D_s^+ \to \pi^+\pi^0\eta$ decay and the nature of $a_0(980)$

Content

In a recent paper [1], the BESIII collaboration reported the so-called first observation of pure W-annihilation decays $D_s^+ \to a_0^+(980)\pi^0$ and $D_s^+ \to a_0^0(980)\pi^+$. The measured absolute branching fractions are, however, puzzlingly larger than those of other measured pure W-annihilation decays by at least one order of magnitude. In addition, the relative phase between the two decay modes is found to be about 180 degrees. In this work, we show that all these can be easily understood if the $a_0(980)$ is a dynamically generated state from $\bar{K}K$ and $\pi\eta$ interactions in coupled channels. In such a scenario, the D_s^+ decay proceeds via internal W emission instead of W-annihilation, which has a larger decay rate than W-annihilation. The proposed decay mechanism and the molecular nature of the $a_0(980)$ also provide a natural explanation to the measured negative interference between the two decay modes.

[1] M.˜Ablikim et al. [BESIII Collaboration], Phys. Rev. Lett. 123, 112001 (2019)

Summary

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