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Global coupled-channel analysis of ee -> ccbar data

Recent high-precision e^+e^-⟶ccbar data from the BESIII and Belle are highly useful to understand the vector charmonium pole structure and puzzling line shapes due to the exotic hadron candidates Y. We thus conduct a global coupled-channel analysis of most of the available data (9 two-body, 8 three-body, and 1 four-body final states) in √s=3.75-4.7GeV. Not only cross sections but also invariant mass distributions of subsystems are fitted. Our model includes dozens of (quasi) two-body states that nonperturbatively couple with each other through bare charmonium excitations and particle-exchange mechanisms required by the three-body unitarity. The amplitudes obtained from the fits are analytically continued to vector charmonium and Zc poles. We do not find a ψ(4160) pole that has been considered well-established. Instead, we find two poles of ~4230MeV; ψ(4230) with Γ=36MeV and a broader one with Γ=114MeV. Two Zc poles are found as virtual states ~40MeV below the D* D*_bar thresholds, being consistent with lattice QCD results. This work presents the first global analysis to determine the vector charmonium and Zc poles, thereby paving the way to extracting detailed properties of the prominent exotic hadron candidates from data. This presentation is based on arXiv:2312.17658.

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