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Study of the near-threshold $\omega\phi$ mass enhancement in doubly OZI suppressed $J/\psi \to \gamma\omega\phi$ decays

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The Beijing Electron-Positron Collider (BEPCII) is a double ring e^+e^- collider operating within a Centre-of-Energy interval of $2.0 - 4.6$ GeV with a design luminosity of 1×10^{33} cm^{-2}s^{-1}.
The Beijing Spectrometer (BESIII) is a large detector located at the BEPCII and has accumulated the largest sample of J/ψ, $\psi(2S)$, and $\psi(3770)$ events for studies of light hadron and charmonium spectroscopy, the hadron-to-lepton ratio R as a function of energy, and high mass charmonium states including the X, Y and Z particles.
Until now, a lot of physics results have been published.

In this talk, I focus on the study of the near-threshold $\omega\phi$ mass enhancement in doubly OZI suppressed $J/\psi \to \gamma\omega\phi$ decays. A sample of 2.25×10^8 J/ψ events was accumulated with the BESIII detector.
A strong deviation ($> 30\sigma$) from three-body $J/\psi \to \gamma\omega\phi$ phase space is observed near the $\omega\phi$ mass threshold that is consistent with a previous observation reported by the BESII experiment.
A partial wave analysis (PWA) with a tensor covariant amplitude formalism has been performed, assuming that the enhancement is due to the presence of a resonance, here referred to as the $X(1810)$.
PWA is an important tool in light hadron spectroscopy, used to determine resonance properties (like mass, width, branching fraction, spin and parity).
Also PWA can deal with the interference of resonances.
The PWA confirms that the spin-parity of the $X(1810)$ is 0^{++}.
The mass and width of the $X(1810)$ are determined to be
$M = 1795 \pm 7$(stat)$^{+13}_{-5}$(syst)$\pm$19(mod) MeV/c^2 and
$\Gamma = 95 \pm 10$(stat)$^{+21}_{-34}$(syst)$\pm$75(mod) MeV/c^2, respectively.
The product branching fraction is measured to be
$calB(J/\psi \to \gamma X(1810)) \times calB(X(1810) \to \omega\phi) = (2.00 \pm 0.08$(stat)$^{+0.45}_{-1.00}$(syst)$\pm$1.30(mod))$\times 10^{-4}$.
These results are consistent within errors with those of the BESII experiment.
The decay $J/\psi \to \gamma\omega\phi$ is a doubly OZI suppressed process that is expected to be suppressed relative to $J/\psi \to \gamma\omega\omega$ or $J/\psi \to \gamma\phi\phi$ by at least one order of magnitude.
The anomalous enhancement observed at the $\omega\phi$invariant-mass threshold and the large measured branching fractions
($\sim$1/2 of $calB(J/\psi \to \gamma\phi\phi)$) are surprising and interesting.
The enhancement is not compatible with being due either to the $X(1835)$ or the $X(p\bar{p})$, due to the different mass and spin-parity.

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