Interaction of real and virtual $p\bar{p}$ pairs in J/ψ decays

Wednesday, 13 September 2017 14:40 (20 minutes)

The $p\bar{p}$ invariant mass spectra of the processes $J/\psi \rightarrow p\bar{p}\pi^0$, $J/\psi \rightarrow p\bar{p}\eta$, $J/\psi \rightarrow p\bar{p}\omega$, $J/\psi \rightarrow p\bar{p}\rho$, and $J/\psi \rightarrow p\bar{p}\gamma$ close to the $p\bar{p}$ threshold are calculated by means of the $N\bar{N}$ optical potential. The simple potential model for $N\bar{N}$ interaction in the ${}^1S_0$ and ${}^3S_1$ states is proposed. The parameters of the model are obtained by fitting the cross sections of $N\bar{N}$ scattering together with the cross sections of $N\bar{N}$ production in e^+e^- annihilation and the $p\bar{p}$ invariant mass spectra of the J/ψ decays. Good agreement with the available experimental data is achieved. Using our potential and the Green's function approach we also describe the peak in the $\eta'\pi^+\pi^-$ invariant mass spectrum in the decay $J/\psi \rightarrow \gamma\eta'\pi^+\pi^-$ in the energy region near the $N\bar{N}$ threshold.

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Session Classification: Parallel P5 & P6

Track Classification: Hadron physics with antiprotons