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Evidence of $\psi(3770)$ non-$D\bar{D}$ decay to $J/\psi\pi^+\pi^-$

BES Collaboration

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Abstract

Evidence of $\psi(3770)$ decays to a non-$D\bar{D}$ final state is observed. A total of $11.8 \pm 4.8 \pm 1.3$ $\psi(3770) \to J/\psi\pi^+\pi^-$ events are obtained from a data sample of 27.7 pb^{-1} taken at center-of-mass energies around 3.773 GeV using the BES-II detector at the BEPC. The branching fraction is determined to be $\mathrm{BF}(\psi(3770) \to J/\psi\pi^+\pi^-) = (0.34 \pm 0.14 \pm 0.09)\%$, corresponding to the partial width of $\Gamma(\psi(3770) \to J/\psi\pi^+\pi^-) = (80 \pm 33 \pm 23)$ keV.

1. Introduction

The $\psi(3770)$ resonance is believed to be a mixture of the 1^3D_1 and 2^3S_1 states of the $c\bar{c}$ system [1]. Since its mass is above the open charm-pair threshold and its width is two orders of magnitude larger than that of the $\psi(2S)$, it is thought to decay almost entirely to pure $D\bar{D}$ [2]. However, Lipkin pointed out that the $\psi(3770)$ could decay to non-$D\bar{D}$ final states with a large branching fraction [3]. There are theoretical calculations [4–7] that estimate the partial width for $\Gamma(\psi(3770) \to J/\psi\pi^+\pi^-)$ based on the multipole expansion in QCD. Recently Kuang [7] used the Chen–Kuang potential model to obtain a partial width for $\psi(3770) \to J/\psi\pi\pi$ in the range from 37 to 170 keV, corresponding to 25 to 113 keV for $\psi(3770) \to J/\psi\pi^+\pi^-$ from isospin symmetry. In this Letter, we report evidence for $\psi(3770) \to J/\psi\pi^+\pi^-$ based on a data sample of 27.7 pb^{-1} taken in the center-of-mass (c.m.) energy region from 3.738 to 3.885 GeV using the upgraded Beijing spectrometer (BES-II) at the Beijing electron–positron collider (BEPC).

2. The BES-II detector

The BES-II is a conventional cylindrical magnetic detector that is described in detail in Ref. [8]. A 12-layer vertex chamber (VC) surrounding the beryllium beam pipe provides input to the event trigger, as well as coordinate information. A forty-layer main drift chamber (MDC) located just outside the VC yields precise measurements of charged particle trajectories

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