Schedule for PWA study of $\psi' \to J/\psi\pi^+\pi^-$

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1 Introduction

- **Motivation:**

1. Independent of models
2. Successful PWA analyses on BES data
3. good characters of $\psi' \to J/\psi\pi^+\pi^-$

- **Application on BES data:**

1. *PWA analysis of BES Data on* $J/\psi \to \gamma\pi^+\pi^-\pi^+\pi^-$.
Proceedings, AIP conference, Big Sky, 1997, p476.

2. *Partial wave analysis of* $J/\psi \to \gamma\eta\pi^+\pi^-$.
To be submitted to Phys. Lett.

3. *Partial wave analysis of* $J/\psi \to \gamma K^+K^-\pi^0$.
To be submitted to Phys. Lett.

4. *Partial wave analysis of* $J/\psi \to \omega\pi^+\pi^-$.
The work is being undertaken.

- $\psi' \to J/\psi\pi^+\pi^-$

1. Similar to the process: $J/\psi \to VPP$

The quantum numbers of the two processes are same and it's feasible to use the same formula.

2. High statistics and low background

3. few resonance structrues

2 Analysis Method

1. Analysis Method

For a process

$$
\begin{array}{l} J/\psi \to \omega \ X \\ \qquad\qquad \hookrightarrow \ Y + Z \end{array}
$$

the total decay amplitude is

$$A_{\text{total}} = \sum_i \lambda_i A_i$$

A_i**: the ith partial wave amplitude**

λ_i**: relative magnitude and phase of the ith partial wave.**

Differential cross section:

$$\frac{d\sigma}{d\Phi} = |A_{\text{total}}|^2$$

ML method is employed to fit λ_i.

$*$ **Probability density function:**

$$f(x, \alpha) = \frac{d\sigma}{d\Phi}/\sigma$$

$$\sigma = \int |A_{\text{total}}|^2 d\Phi$$

$*$ **Likelihood function:**

$$\mathcal{L} = \prod_{i=1}^{N_{evt}} f(x, \alpha)$$

$* - \ln \mathcal{L}$ **is minimized in the fit.**

2. Bin by bin fit

- **Event selection**
- **Extract four-momentum of J/Ψ, π^+ and π^-**
- **Generate ~2,000,000 $\psi' \to J/\psi \pi^+\pi^-$ M.C. events**
- **ML fit**
- **Check the variation of D wave contribution with $m_{\pi\pi}$**

3 Possible Problems

- **Partial wave formula**
  the decays of J/ψ not considered
- **M.C. and Event selection**
- **Efficiency correction**
- **Backgound study**