

Group Report on Recent Work

Ma Hsuning

Physics of NKU

maxn@ihep.ac.cn

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Overview

1 Motivation of recent work

2 Event Selection

- Reconstruction of K_S^0 K and π
- Reconstruction of γ_{E1} and π^0

3 signal MC Results

- Results of reconstruction of K_S^0 K and π
- Results of reconstruction of γ_{E1} and π^0

4 Work to be done

Introduction

The process we are studying

$$\psi' \rightarrow \pi^0 h_c$$

$$\pi^0 \rightarrow \gamma\gamma$$

$$h_c \rightarrow \gamma\eta_c$$

$$\eta_c \rightarrow K_S^0 K \pi$$

$$K_S^0 \rightarrow \pi^+ \pi^-$$

The purpose of recent work

Measure of the Branching ratio of the process $\eta_c \rightarrow K_S^0 K \pi$

Method to do it

- Fit η_c signal with the recoil mass of γ and π^0 , requiring the reconstruction of π^0 and γ_{E1} ;
- Fit η_c with K_S^0 , K and π , requiring the reconstruction of K_S^0 , K and π ;
- The branching fraction will be acquired as the ratio of the two η_c signal as

$$Br(\eta_c \rightarrow K_S^0 K \pi) = \left(\frac{N_{Obs1}}{N_{Obs2}} \cdot \frac{\epsilon_2}{\epsilon_1} \cdot \frac{1}{Br(\pi^0 \rightarrow \gamma\gamma) \cdot Br(K_S^0 \rightarrow \pi^+ \pi^-)} \right)^{\frac{1}{2}}$$

Selection of γ and π^0

- $E_\gamma > 25\text{MeV}, |\cos\theta| < 0.8$ (barrel region)
- $E_\gamma > 50\text{MeV}, 0.86 < |\cos\theta| < 0.92$ (end-cap region)
- $450\text{MeV} < E(\gamma_{E1}) < 550\text{MeV}$
- $|M_{\gamma\gamma} - m_{\pi^0}| < 15\text{MeV}/c^2$

Selection of charged tracks

- $|\cos\theta| < 0.93$
- $|R_z| < 10\text{cm}, R_{xy} < 1\text{cm}$ for charged tracks from η_c
- The Track is the particle type with the highest confidence level.
- $|M_{\pi\pi} - m_{K_S^0}| < 20\text{MeV}/c^2$ (Reconstruction $K_S^0 \rightarrow \pi^+\pi^-$)

We accept the one with the smallest $\chi^2 = \chi_{4C}^2 + \chi_{1C}^2 + \chi_{pid}^2 + \chi_{vertex}^2$.

This is a different process

Selection of good photons

- $E_\gamma > 25\text{MeV}, |\cos\theta| < 0.8$ (barrel region)
- $E_\gamma > 50\text{MeV}, 0.86 < |\cos\theta| < 0.92$ (end-cap region)

Selection of $E1_\gamma$ and π^0

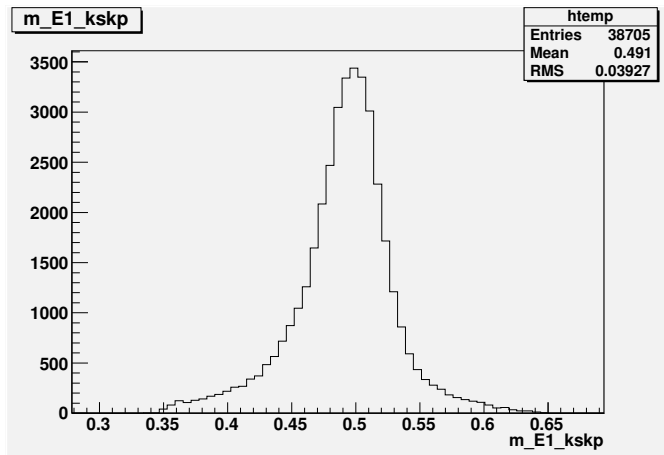
- $450\text{MeV} < E(\gamma_{E1}) < 550\text{MeV}$
- $|M_{\gamma\gamma} - m_{\pi^0}| < 15\text{MeV}/c^2$

Event selected

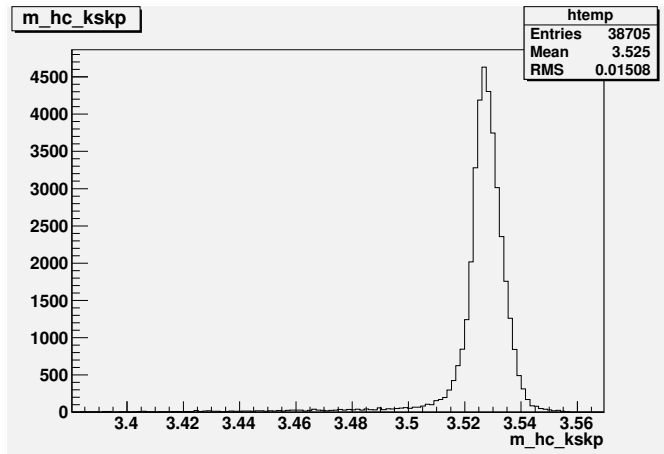
The one with the smallest

$$\chi^2 = \chi_{1C}^2 + \left(\frac{m_{\text{recoil}}(\pi^0) - m_{hc}}{\sigma_{hc}} \right)^2 + \left(\frac{m_{\text{recoil}}(\gamma\pi^0) - m_{\eta c}}{\sigma_{\eta c}} \right)^2 \text{ will do.}$$

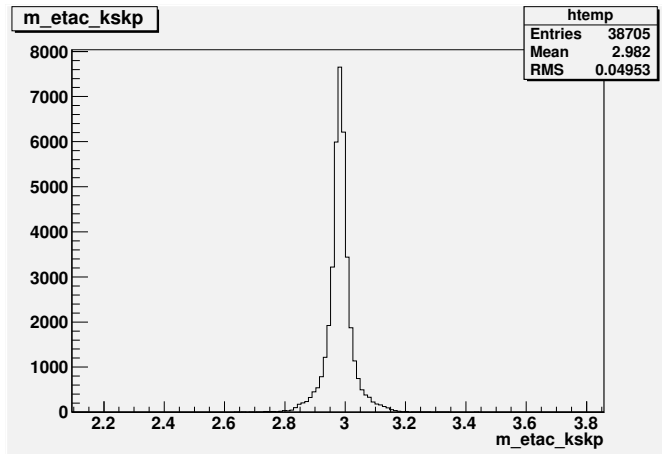
Energy of γ_{E1}



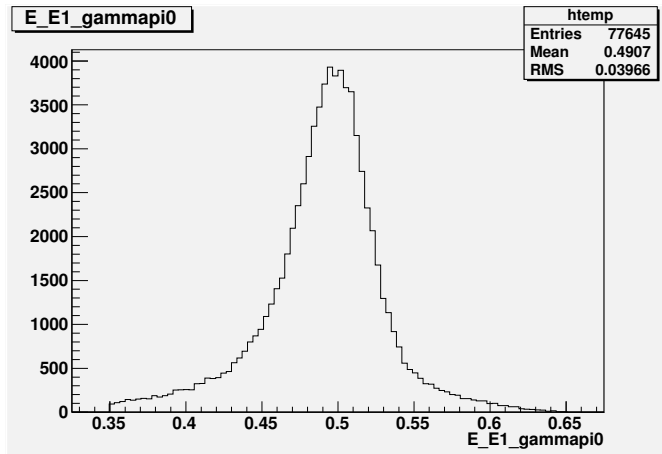
Invariant mass of h_c



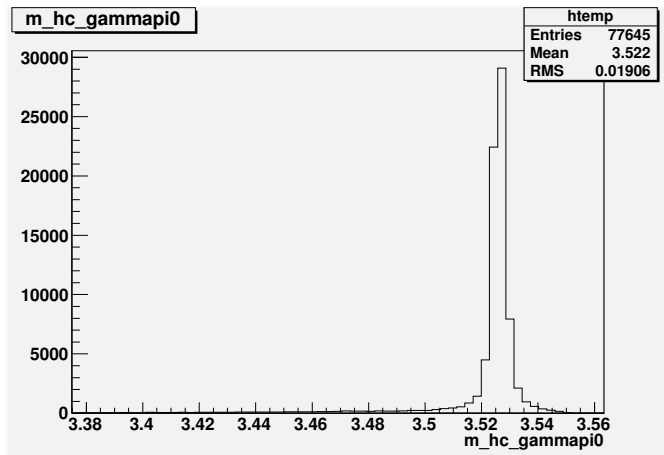
Invariant mass of η_c



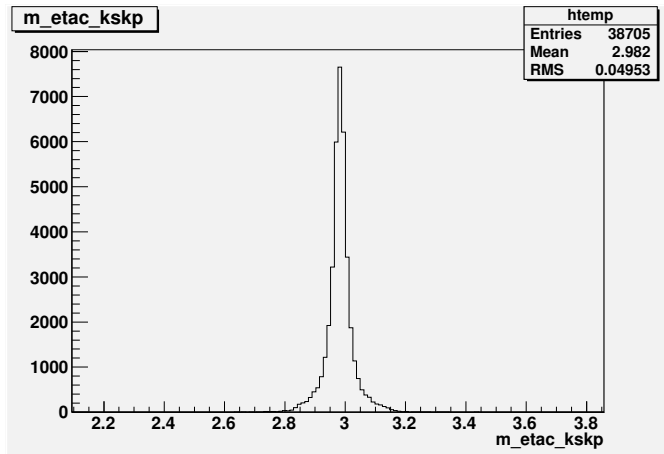
Energy of γ_{E1}



Recoil mass of π^0



Recoil mass of γ_{E1} and π^0



Time table

- Debug the analysis program in less than one week
- Optimize the selection in 2-3 weeks
- Analyze the background in 2-3 weeks
- Fit the signal and get the preliminary results in 2-3 weeks
- Deal with the system error in about 3 months