Group Report on Recent Work

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Introduction to recent work

- Input-output check upon the branching ratio of $\eta_c \to K_S K \pi$.
- Observation of the signals of η_c and h_c.

Input-output check

We generated 200K MC sample of the decay

$$\psi(3686) \to \pi^0 h_c,$$
$$h_c \to \gamma\eta_c,$$
$$\eta_c \to K_S K\pi.$$

And we generated 200K MC sample of the decay

$$\psi(3686) \to \pi^0 h_c,$$
$$h_c \to \gamma\eta_c,$$
$$\eta_c \to \{anything\}.$$

Input-output check results

Decay channel	Reconstruction via K_S, K and π		Recoil via γ and π^0	
	N_{obs}	N_{tot}	N_{obs}	N_{tot}
$\eta_c \to K_S K \pi$	27646	200K	43412	200K
$\eta_c \to \{anything\}$	599	200K	75686	200K

Table: Input-output check results

Analysis is on the following page.

Input-output check results analysis and existing problems

From the table on previous page, we can see that:

- With reconstruction via K_S, K and π, we have

$$Br(\eta_c \to K_S K\pi) = \frac{N_{obs}(\eta_c \to \{anything\}) \times N_{tot}(eta_c \to K_S K\pi)}{N_{tot}(\eta_c \to \{anything\}) \times N_{obs}(eta_c \to K_S K\pi)}$$

$$= 599/27646$$
$$= 0.02167,$$

  which corresponds the branching ratio we used in the MC-generating, which is 0.0288.

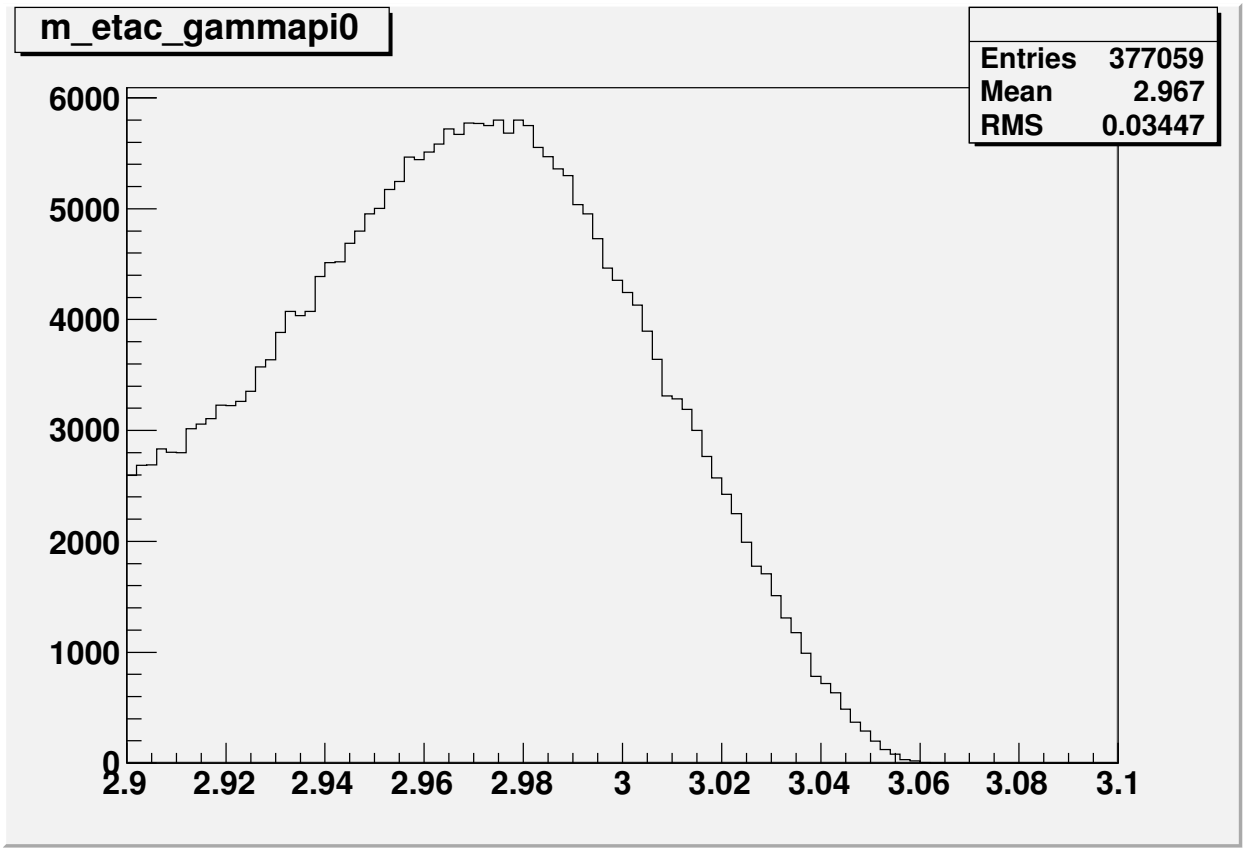
- With recoil via γ and π^0, we don't under stand the reason why $N_{obs}(eta_c \to K_S K\pi)$ and $N_{obs}(eta_c \to \{anything\})$ are on the same level yet different.

Optimized selection

We used the following optimized selections:

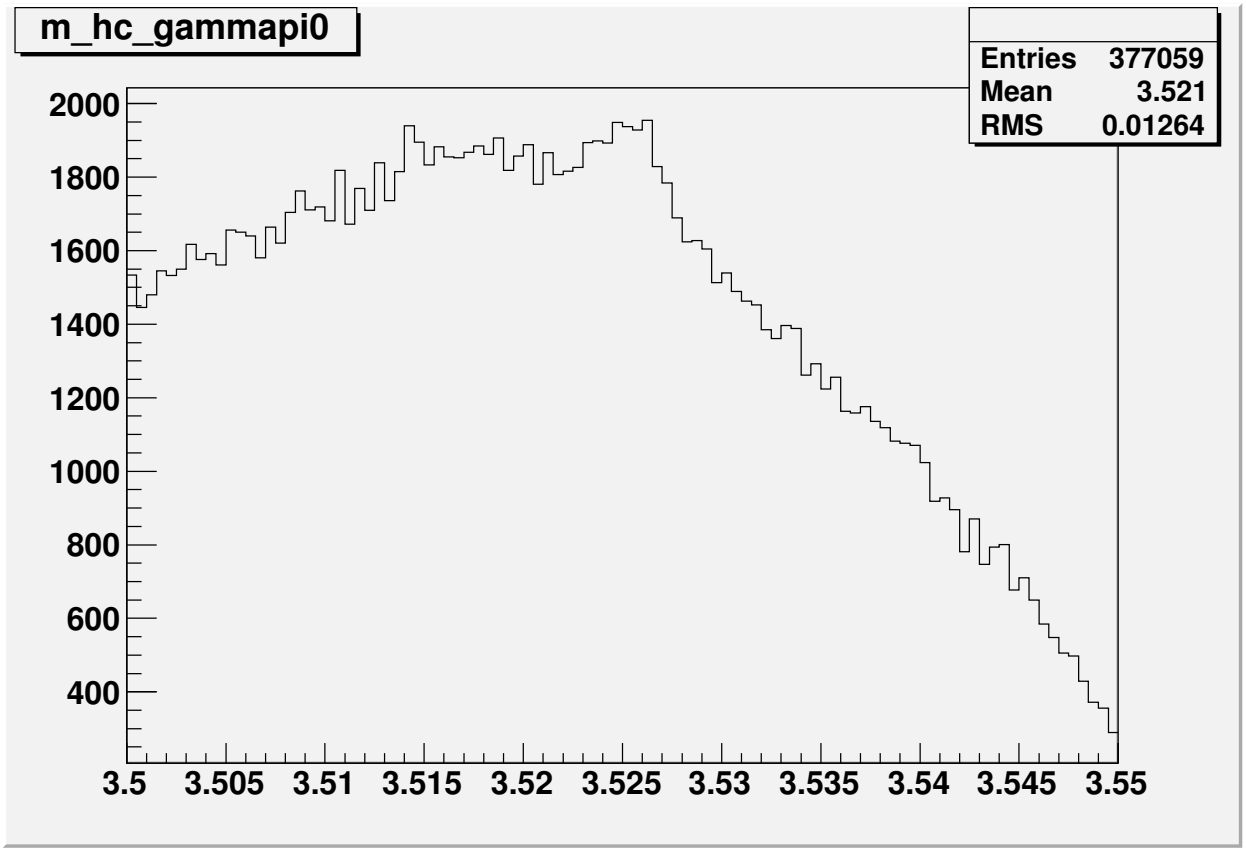
- $0 < \chi^2_{1C} < 5$;
- $0.11 < m^{\gamma\gamma}_{inv} < 0.145$;
- $0.46 < E(\gamma_{E1}) < 0.53$;
- $|m_{recoil}(\pi^0\pi^0) - M_{J/\psi}| < 0.06$;
- $|m_{recoil}(\gamma) - M_{\chi_{c0}}| < 0$;
- $|m_{recoil}(\gamma) - M_{\chi_{c1}}| < 0.013$;
- $|m_{recoil}(\gamma) - M_{\chi_{c2}}| < 0.0$;
- $|m_{recoil}(\pi^+\pi^-) - M_{J/\psi}| < 0.009$.

Distribution of recoil mass of γ and π^0



We can see that the signal of recoil of γ and π^0 is NOT that obvious as expected.

Distribution of the recoil mass of π^0



The signal corresponds with the results in the reference Measurement of $h_c(\,^1P_1)$ in ψ' Decays(PRL 104, 132002(2010)).