

Part 2

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An Inconvenient Second Slider

The tex file of the previous slider was corrupted last night after a power failure with my computer, and I didn't have time to remake it.

I decided to just put in the last part of the contents here in a new file.

The Systematic Uncertainty of the Fitting

The following systematic uncertainties are considered:

- $\eta_c(2S)$ width: estimated with the parameter varying by one time the PDG error.
- Fitting Range: compare with the result of fitting in [3.46 GeV, 3.71 GeV]
- Damping Function: compare with the result of KEDR damping function.
- Background Shapes: Use the biggest difference obtained by changing one background line shape. The changes include using Novosibirsk line shape for $\pi^0 K_s^0 K^\pm \pi^\mp$ or $K^+ K^- \pi^0 \pi^0$ and changing the f_{FSR} of $K^+ K^- \pi^0$ or $K_s^0 K^\pm \pi^\mp$.

The Systematic Uncertainty of the Fitting (09 data)

Table: The summary of systematic uncertainty on the fitted mass and fitted number of events, for 09 ψ' data.

Source	Mass(MeV)	$\gamma K^+ K^- \pi^0$ (%)	$\gamma K_S^0 K^\pm \pi^\mp$ (%)
$\eta_c(2S)$ width	0.9%	11.9%	10.5%
Fitting range	0.0%	3.8%	1.2%
Damping function	2.0%	20.5%	20.5%
Background line shape	0.2%	2.0%	7.0%
Combined	2.2%	23.8%	23.9%

The Systematic Uncertainty of the Fitting (12 data)

Table: The summary of systematic uncertainty on the fitted mass and fitted number of events, for 12 ψ' data.

Source	Mass(MeV)	$n(\gamma K^+ K^- \pi^0)$	$n(\gamma K_S^0 K^\pm \pi^\mp)$
$\eta_c(2S)$ width	1.3 %	14.5%	15.0%
Fitting range	0.1%	5.7%	4.9%
Damping function	2.0%	23.8%	27.5%
Background line shape	0.3%	1.5%	8.0%
Combined	2.4%	28.5%	32.7%

Summary

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- Final calculation is not conducted and the systematic uncertainty of event selection efficiency is not properly estimated.
- The fitting result of 2012 data yields larger systematic uncertainty.
- Working on improvements.

Next Steps

- Finish the final parts.
- Explore various possibilities of improvements on the fitting: correlates the number of events, combine 09+12 data, fit the width, etc.
- Alternative estimation of the effect of the continuum background.