

Progress Report

Signal MC Study

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Fitting Function

- **Decay channels**

- $\Xi_c(2970)^+ \rightarrow \Xi_c(2645)^0 \pi_1^+ \rightarrow \Xi_c^+ \pi_2^- \pi_1^+$

- Double Gaussian

- $\Xi_c(2970)^+ \rightarrow \Xi_c' \pi^+ \rightarrow \Xi_c^0 \gamma \pi^+$

- Gaussian + Crystal ball function

- Crystal ball function : kind of asymmetric gaussian

- **Part** of Gaussian + x^{-n} (power function) : additional two parameters

Report

- I worked for $\Xi_c(2970)^+ \rightarrow \Xi_c'^0 \pi^+ \rightarrow \Xi_c^0 \gamma \pi^+$.

- $\Xi_c^0 \rightarrow \Xi^- \pi^+$

- $\Xi_c^0 \rightarrow \Omega^- K^+$

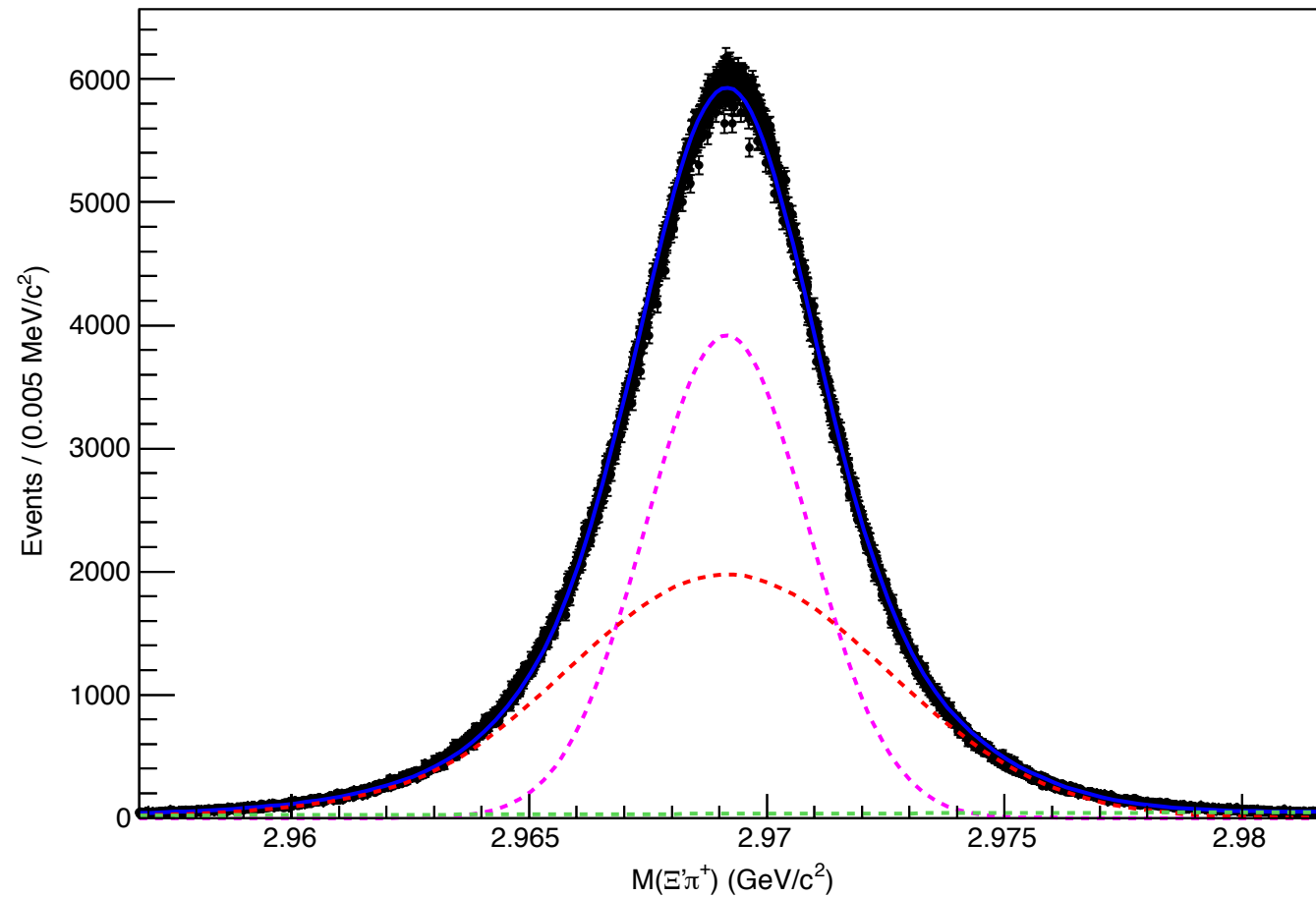
- I mixed the sample following relative branching ratio of the upper two.

Γ_8	$\Xi^- \pi^+$	DEFINED AS 1
Γ_9	$\Xi^- \pi^+ \pi^+ \pi^-$	3.3 ± 1.4
Γ_{10}	$\Omega^- K^+$	0.297 ± 0.024

- Mass peak of $\Xi_c(2970)$ and efficiency were obtained with the mixed sample.

Mass Peak Fitting

$M(\Xi'\pi^+)$ - Zero Width MC

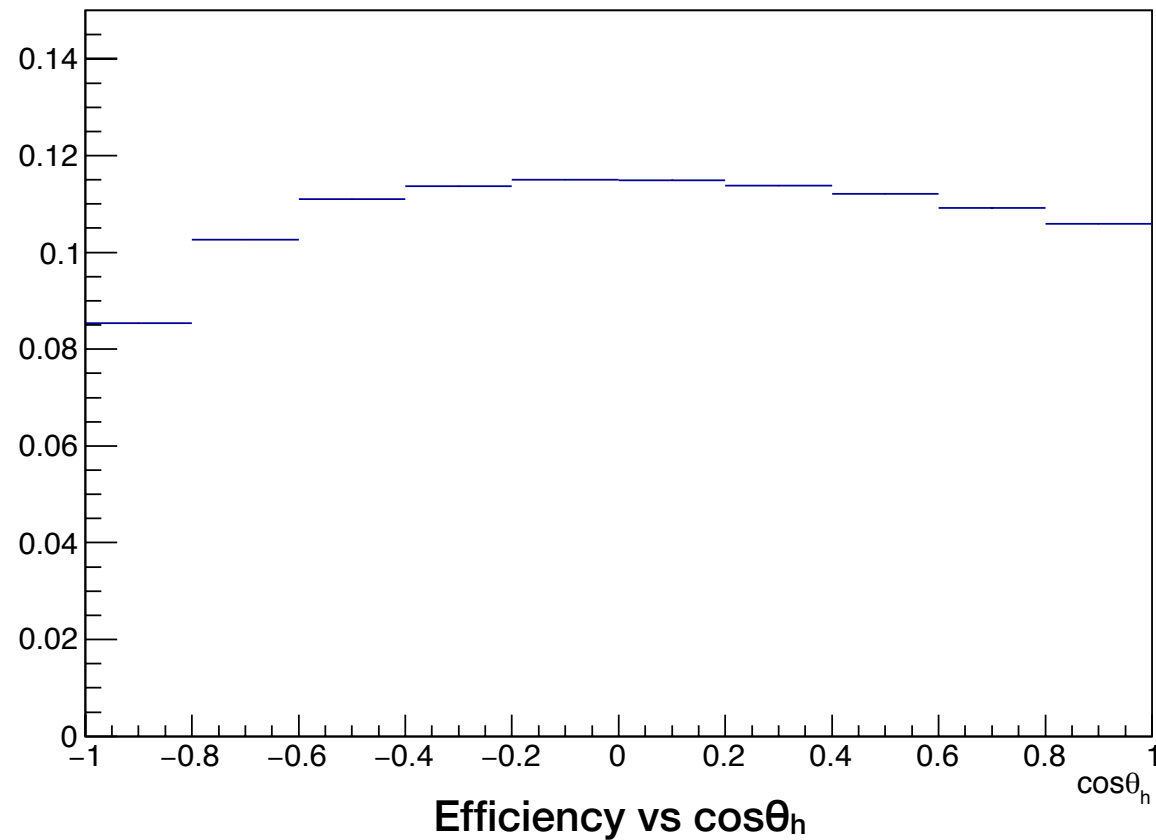


Mass Histogram of $\Xi_c(2970)$

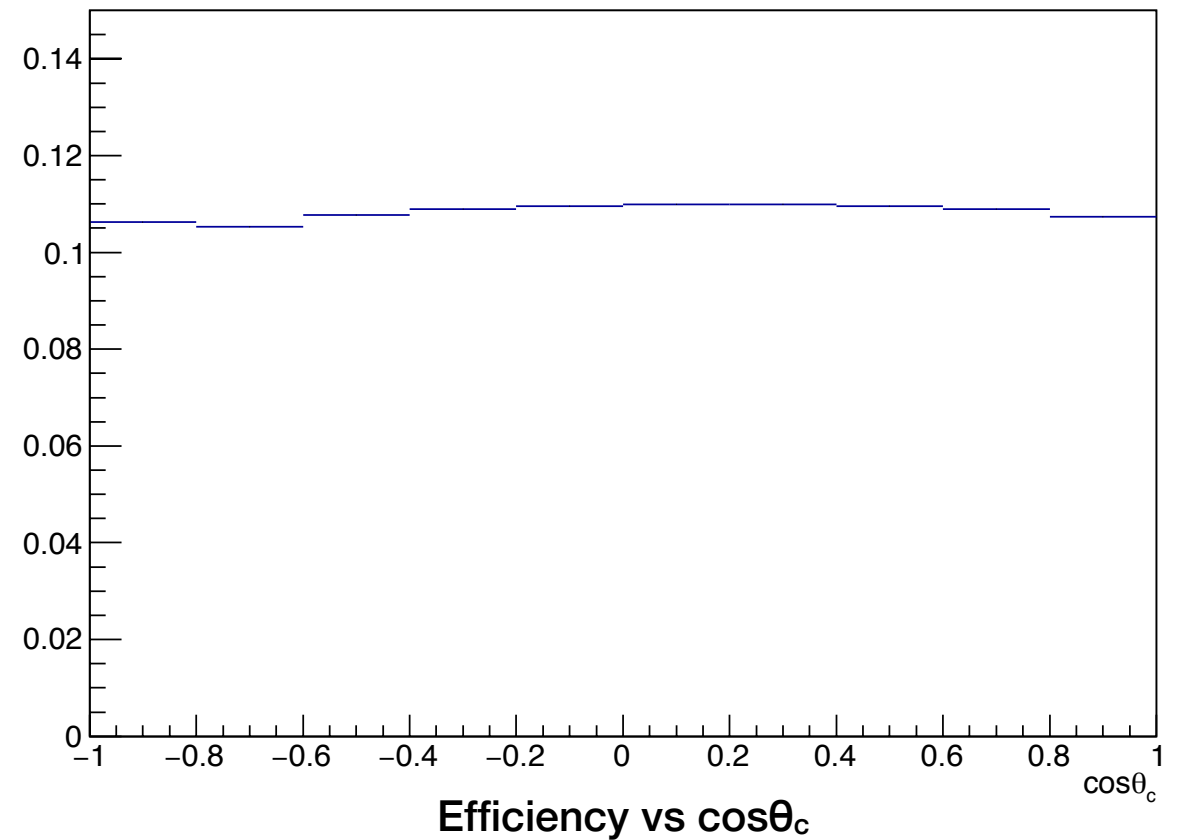


Efficiency

Efficiency



Efficiency (inter)



$$\Xi_c(2970)^+ \rightarrow \Xi_c'^0 \pi^+ \rightarrow \Xi_c^0 \gamma \pi^+$$

$$\Xi_c(2970)^+ \rightarrow \Xi_c'^0 \pi^+ \rightarrow \Xi_c^0 \gamma \pi^+$$

θ_h : angle bet.

boost direction of $\Xi_c(2970)$ in CM frame
and
boost direction of π_1 in $\Xi_c(2970)$'s rest frame.

θ_c : angle bet.

boost direction of $\Xi_c(2645)/\Xi_c'$ in $\Xi_c(2970)$'s rest frame
and
boost direction of π_2/γ in $\Xi_c(2645)/\Xi_c'$'s rest frame.

To Do

- $\Xi_c(2970)^+ \rightarrow \Xi_c' \pi^+ \rightarrow \Xi_c^0 \gamma \pi^+$
- Mass peak fitting w.r.t. cos's
 - Mass peak vs $\cos\theta_h$
 - Mass peak vs $\cos\theta_c$

Backups

Parameter Search List

	$\Xi_c(2970)^+ \rightarrow \Xi_c(2645)^0 \pi^+$	$\Xi_c(2970)^+ \rightarrow \Xi_c' \pi^+$
Mass peak fitting for all $\cos\theta_h$ (Parity)	DONE.	To be reported. (p.4)
Efficiency study w.r.t. $\cos\theta_h$ (Spin, θ_h)	DONE.	To be reported. (p.5)
Mass peak fitting for each $\cos\theta_h$ (Spin, θ_h)	DONE.	Ongoing.
Efficiency study w.r.t. $\cos\theta_c$ (Spin, θ_c)	DONE.	To be reported. (p.5)
Mass peak fitting for each $\cos\theta_c$ (Spin, θ_c)	DONE.	Ongoing.

θ_h : angle bet.
 boost direction of $\Xi_c(2970)$ in
 CM frame
 and
 boost direction of π_1 in
 $\Xi_c(2970)$'s rest frame.
 θ_c : angle bet.
 boost direction of $\Xi_c(2645)/\Xi_c'$
 in $\Xi_c(2970)$'s rest frame
 and
 boost direction of π_2/γ in
 $\Xi_c(2645)/\Xi_c'$'s rest frame.

Goal & Jobs

1. Yield vs Angle

- Helicity angle distribution for $\Xi_c(2970)^+ \rightarrow \Xi_c(2645)^0 \pi^+ / \Xi_c'^0 \pi^+$ decays. (θ_h)
- Angular correlation for $\Xi_c(2970)^+ \rightarrow \Xi_c(2645)^0 \pi_1^+ / \Xi_c'^0 \pi^+ \rightarrow \Xi_c^+ \pi_2^- \pi_1^+ / \Xi_c^0 \gamma \pi^+$ decays. (θ_c)

2. Partial width

- Ratio of partial decay width between $\Xi_c(2970)^+ \rightarrow \Xi_c(2645)^0 \pi^+ / \Xi_c'^0 \pi^+$ decays.

• Fitting Parameter Search !!

- Double Gaussian for $\Xi_c(2645)\pi$ / Gaussian + Crystal ball function for $\Xi_c'\pi$
- To fix **yield ratio** and **sigma ratio**.

θ_h : angle bet.
boost direction of $\Xi_c(2970)$ in
CM frame
and
boost direction of π_1 in
 $\Xi_c(2970)$'s rest frame.

θ_c : angle bet.
boost direction of $\Xi_c(2645)/\Xi_c'$
in $\Xi_c(2970)$'s rest frame
and
boost direction of π_2/γ in
 $\Xi_c(2645)/\Xi_c'$'s rest frame.