$\Xi^{*} \rightarrow \Xi\pi$ Accidental Subtraction Study 1

ASU

Reaction

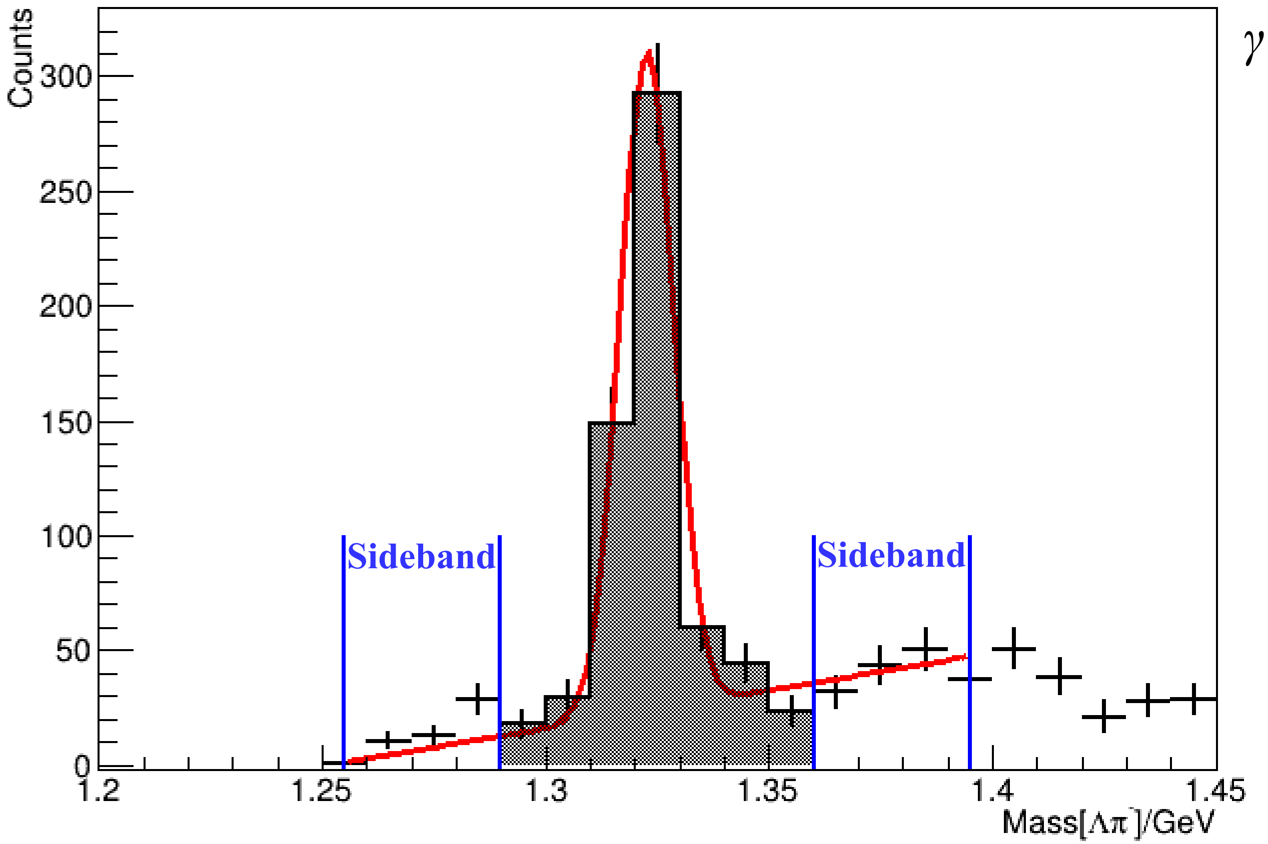
$$\gamma\, p \rightarrow K^+ K^+ \Xi^{*-},$$

where $\Xi^{*-} \rightarrow \Xi^- \pi^0,$

$$\Xi^- \rightarrow \Lambda \pi^-,$$

and $\Lambda \rightarrow p \pi^-$

Invariant mass of $\Lambda\pi^-$



$\gamma\, p \rightarrow K^+K^+\Xi^{*-}$,

$\Xi^{*-} \rightarrow \Xi^-\pi^0$,

$\Xi^- \rightarrow \Lambda\pi^-$

- Hybrid method for accidental subtraction
- CL cut at 10^{-6}
- Significance of Ξ^- pathlength > 4
- $|t_{fast}| < 3$ GeV^2
- K^* cut (0.85 GeV < mass[$K^+\pi^0$] < 0.95 GeV removed)

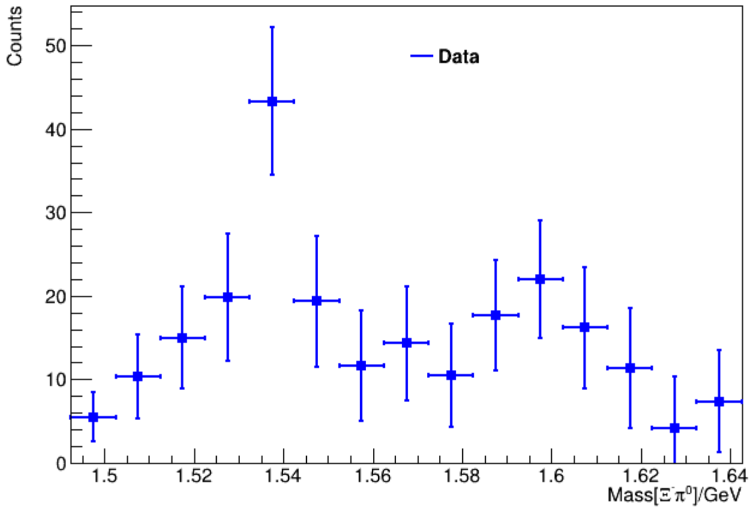
Invariant mass of $\Xi^{-}\pi^{0}$

$\gamma\, p \rightarrow K^{+}K^{+}\Xi^{*-},$

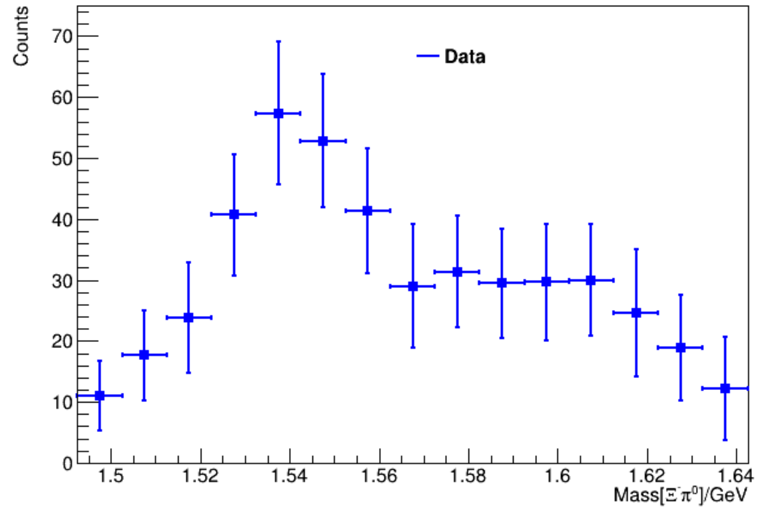
$\Xi^{*-} \rightarrow \Xi^{-}\pi^{0}$

$\Xi^{-} \rightarrow \Lambda\pi^{-}$

Hybrid accidental subtraction



Standard accidental subtraction

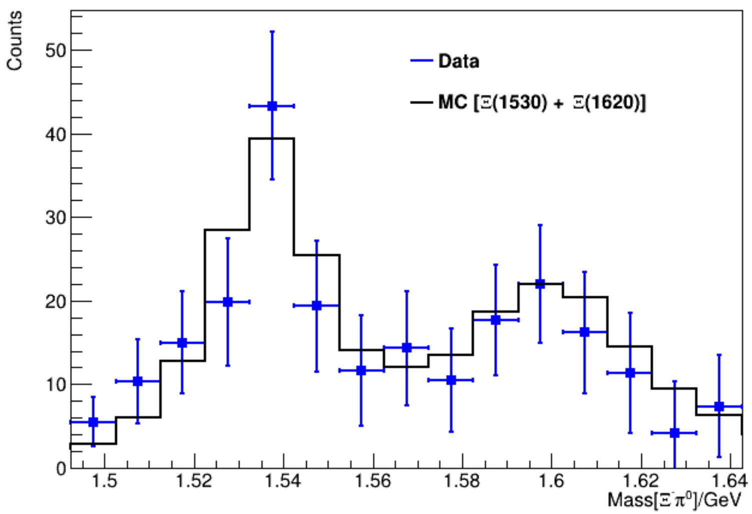


- CL cut at 10^{-6}
- Significance of Ξ^{-} pathlength > 4
- $|t_{fast}| < 3$ GeV^2
- K^{*} cut (0.85 GeV < mass[$K^{+}\pi^{0}$] < 0.95 GeV removed)
- Ξ^{-} sideband subtracted

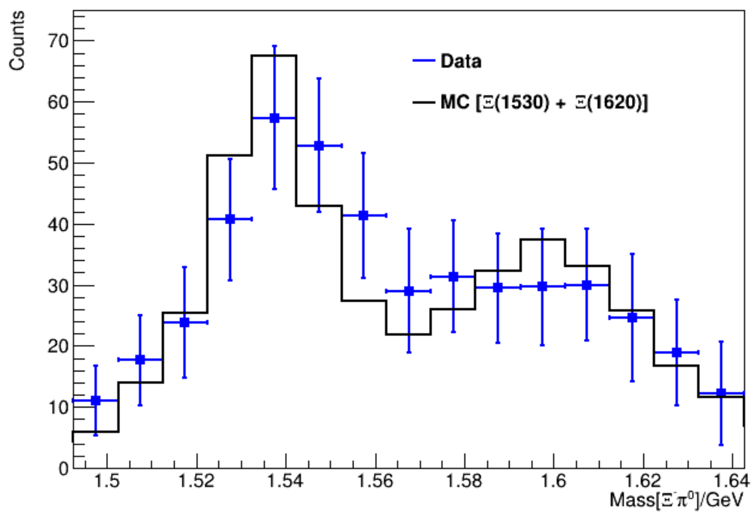
Invariant mass of $\Xi^- \pi^0$ and simulation

$$\gamma\, p \rightarrow K^+ K^+ \Xi^{*-},$$
$$\Xi^{*-} \rightarrow \Xi^- \pi^0$$
$$\Xi^- \rightarrow \Lambda \pi^-$$

Hybrid accidental subtraction



Standard accidental subtraction



The Ξ(1530) generation set to:
- Center = 1535 MeV
- Width = 9.9 MeV

The Ξ(1620) generation set to:
- Center = 1600 MeV
- Width = 30 MeV

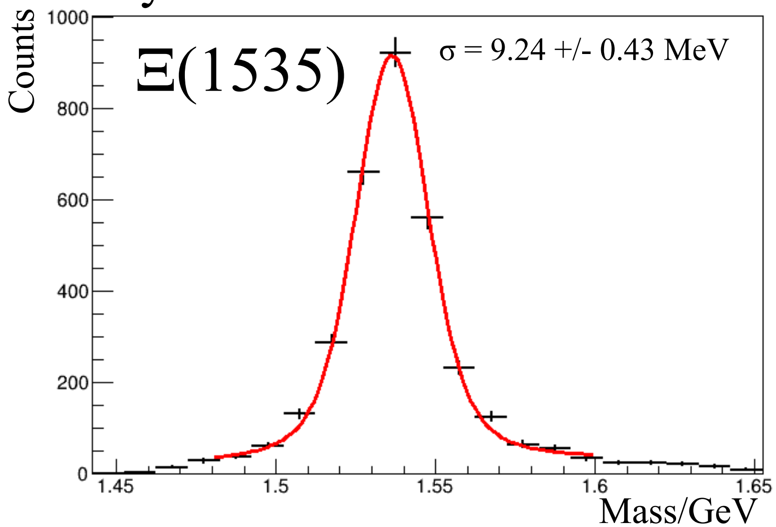
Scaling
- Data: No scaling
- Each MC scaled by eye

Individual fits

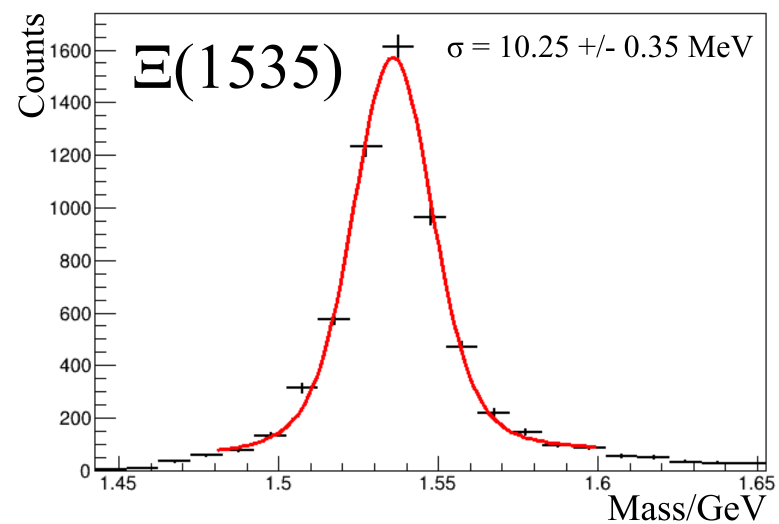
Fitting individual MC signals with Voigtians, where widths are locked to generated values and the value σ of the gaussian convolution is extracted

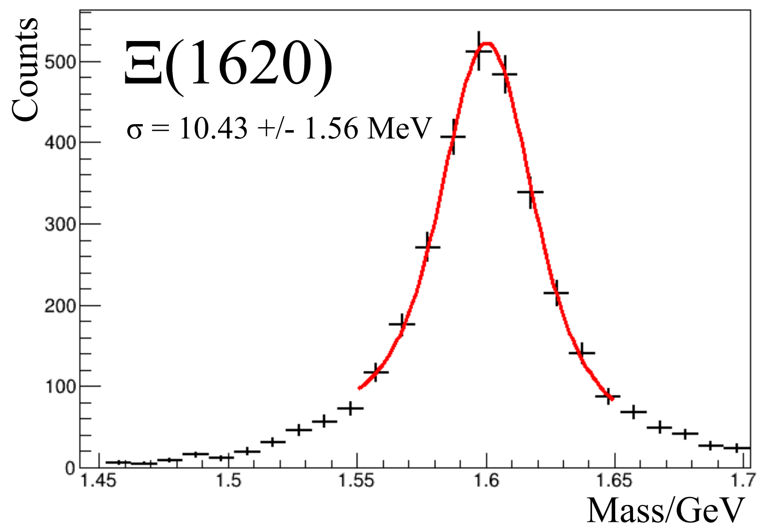
Individual fits

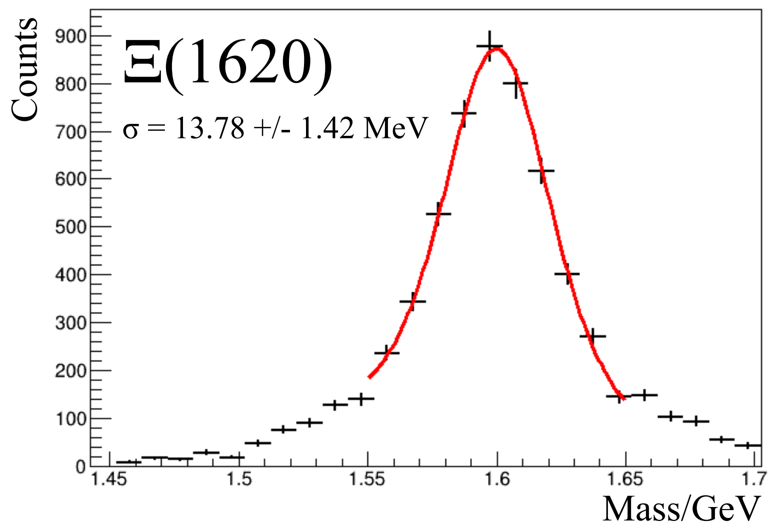
Hybrid accidental subtraction



Standard accidental subtraction







Individual fits

Look at difference in smear parameters

Let $\Delta_\sigma = \sigma$[standard] - σ[hybrid]

- For Ξ(1535), Δ_σ = 1.01 +/- 0.55 MeV
- For Ξ(1620), Δ_σ = 3.35 +/- 2.11 MeV

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Individual fits

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Let $\Delta_\sigma = \sigma$[standard] - σ[hybrid]

- For $\Xi(1535)$, $\Delta_\sigma =$ 1.01 +/- 0.55 MeV
- For $\Xi(1620)$, $\Delta_\sigma =$ 3.35 +/- 2.11 MeV

Hybrid method has better mass resolution

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Individual fits

Look at difference in error bars

Let f = fractional uncertainty for bin of highest count from simulation

- For $\Xi(1530)$: $f_{\text{standard}} = 0.0269,\ f_{\text{hybrid}} = 0.0356$
- For $\Xi(1620)$: $f_{\text{standard}} = 0.0365,\ f_{\text{hybrid}} = 0.0477$

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Individual fits

Look at difference in error bars

Let f = fractional uncertainty for bin of highest count from simulation

- For $\Xi(1530)$: $f_{\text{standard}} = 0.0269$, $f_{\text{hybrid}} = 0.0356$
- For $\Xi(1620)$: $f_{\text{standard}} = 0.0365$, $f_{\text{hybrid}} = 0.0477$

Standard method has better fractional uncertainty for error bars

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Title