Group meeting
July 19th, 2024

Instruction responsibilities

- Classes for Fall 2024:
  - PHY 331:
    - Need to make syllabus
  - PHY 361:
    - Need to make syllabus

Service responsibilities

- Committee:
  - GlueX Compton Analysis Review Committee:
    - Waiting for author response

Group responsibilities

- Undergrad: Met with Dylan on Tuesday

$\Xi^* \rightarrow \Xi\pi^0$ update

Reaction

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

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

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

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- Mass of Ξ^{-} not constrained

Ξ^* Analysis

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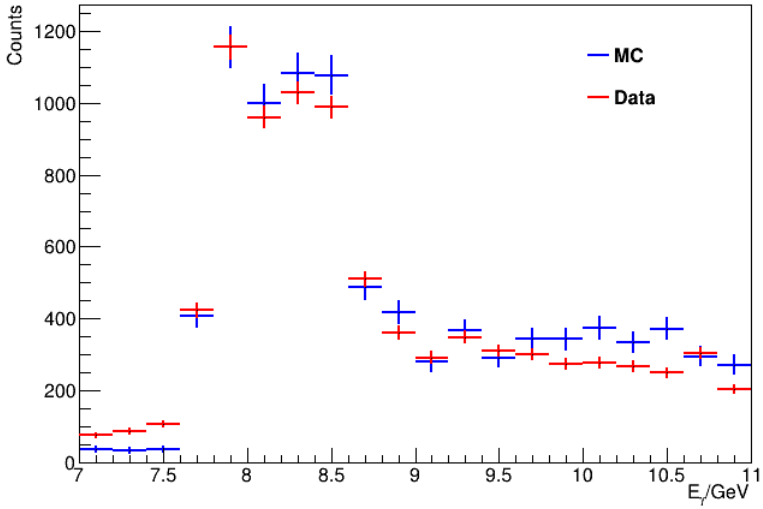
- We can lock down the kinematics of the initial reaction by specifying s, t and m_{Y*}
- Started with Mandelstam s and t
- Will move to m_{Y*} refinement next time

Ξ^* Comparison of Reconstructed MC to Actual Data

Confidence level and pathlength significance

- Same confidence level cut: CL > 10^{-6}
- Same pathlength significance cut > 4

Ξ^* Comparison of Reconstructed MC to Actual Data



Note: $s = 2E_\gamma m_p + m_p^2$

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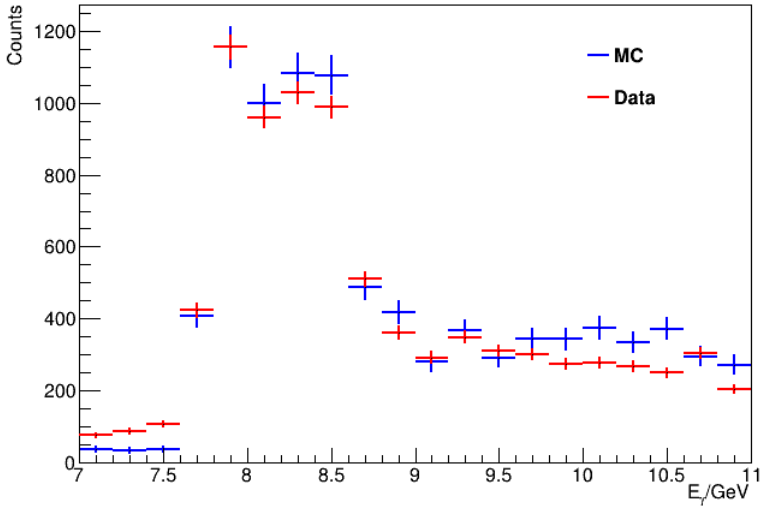

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- Looks OK, but will be refined more

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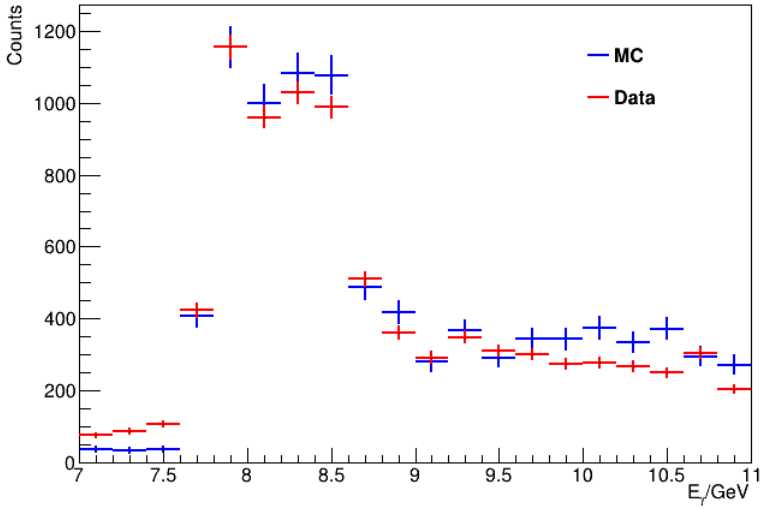

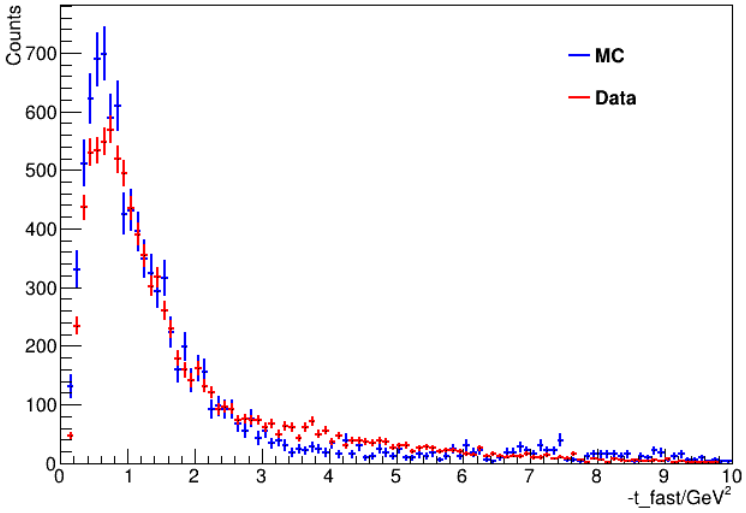

- -*t* (fast) looks good, except

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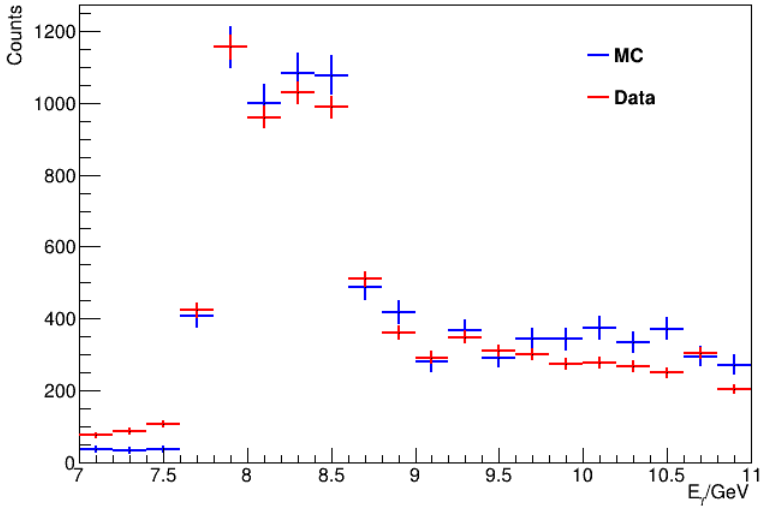

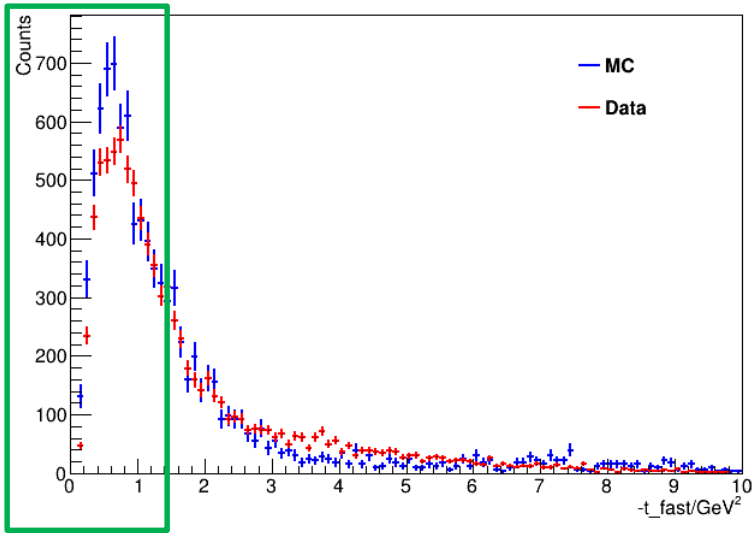

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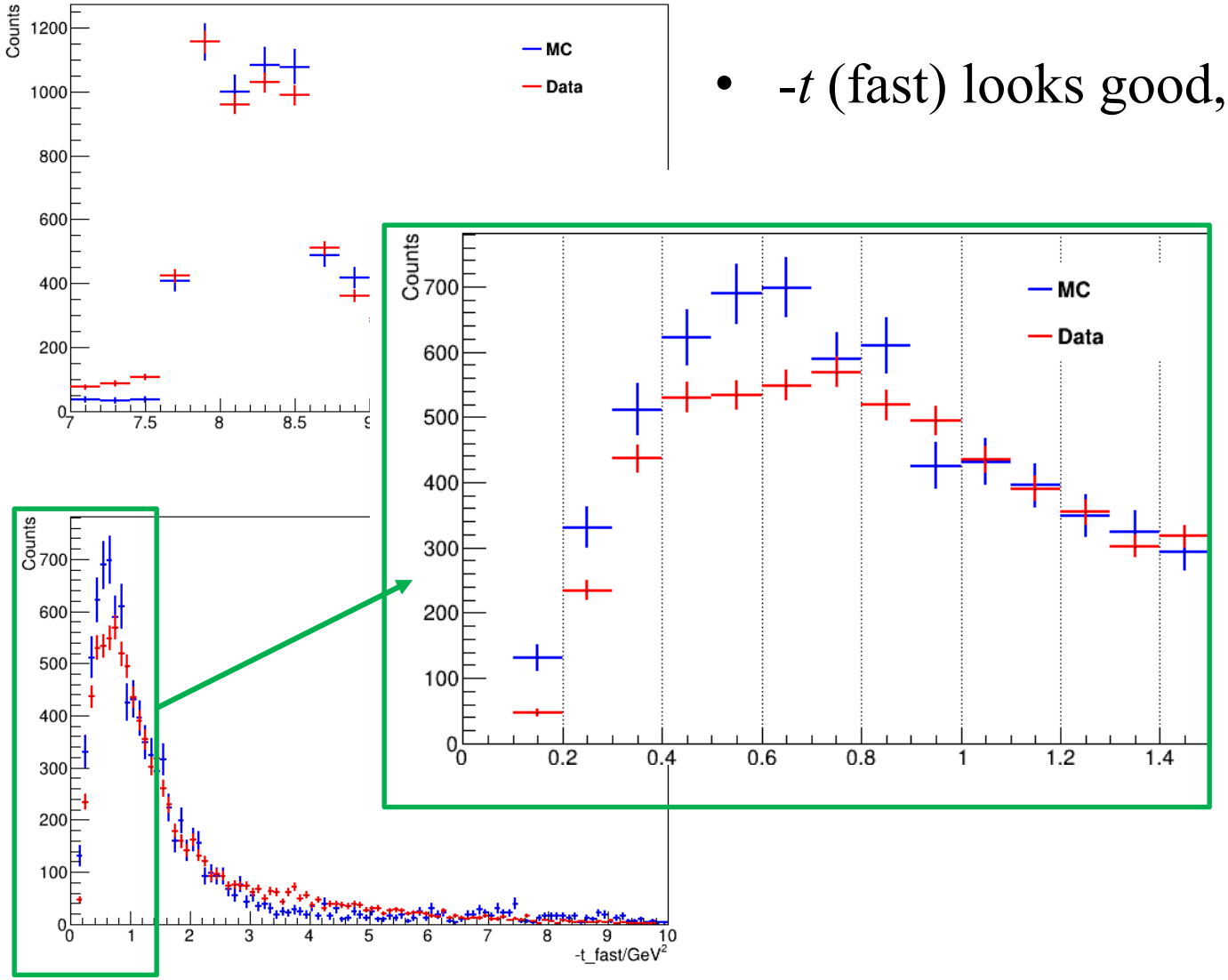

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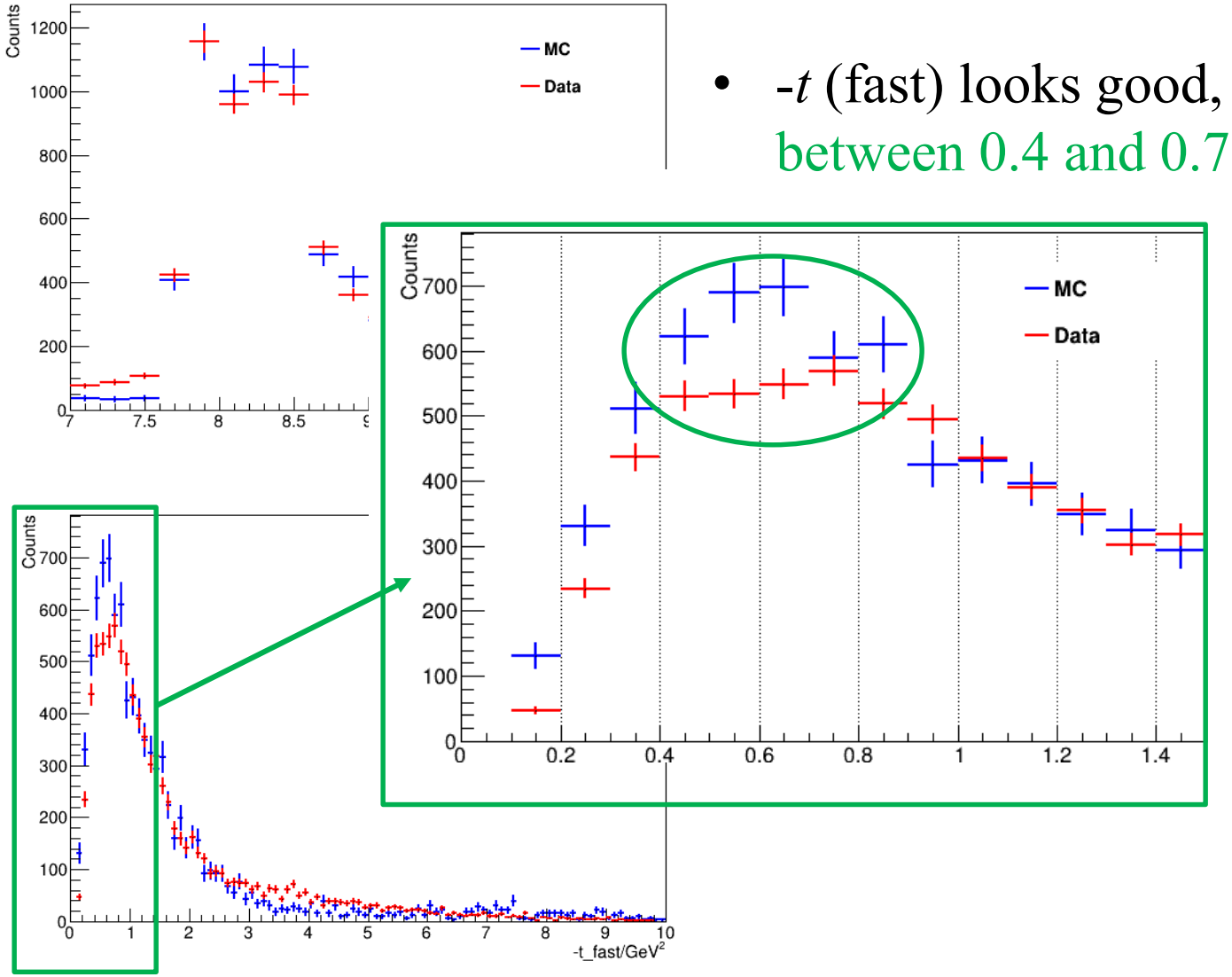

- $-t$ (fast) looks good, except between 0.4 and 0.7

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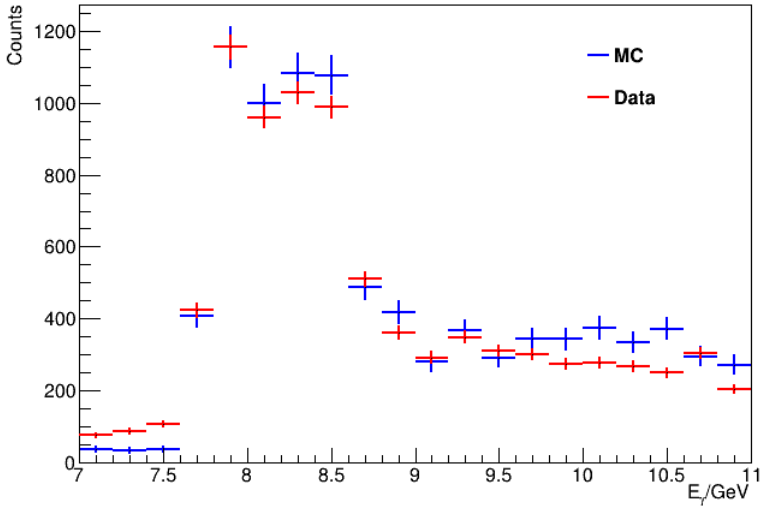
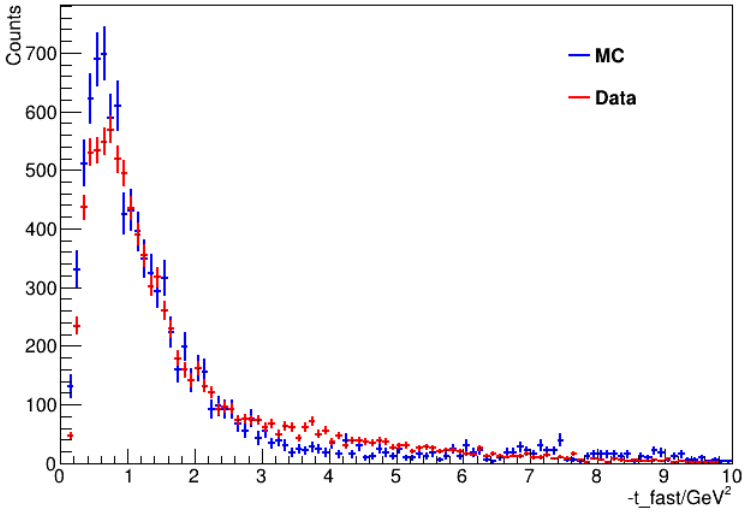
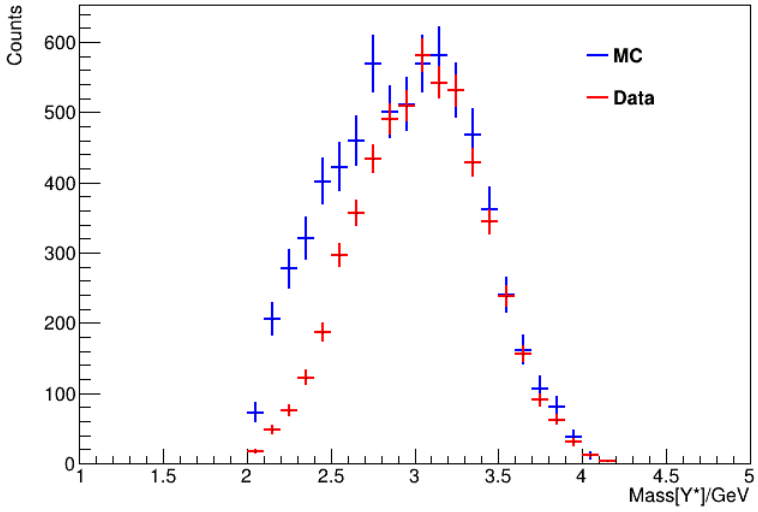


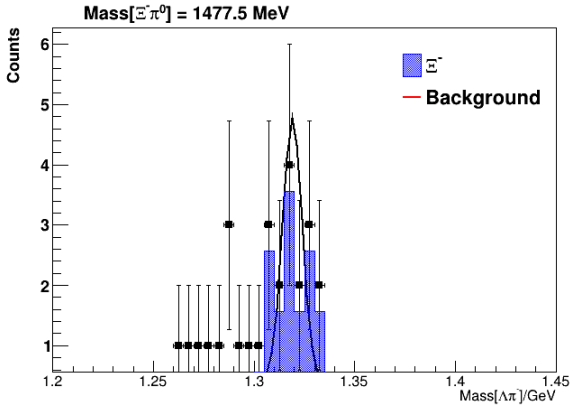
Not yet tried to get the Y^* shape to match and the high-mass part of distribution already looks good ☺

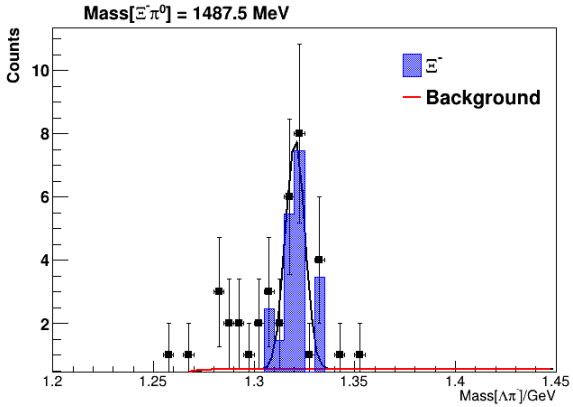


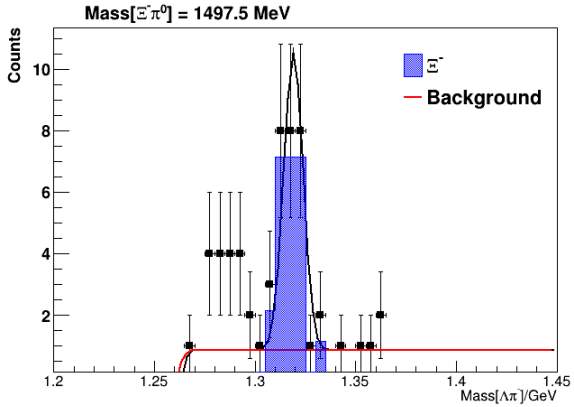


Ground State Ξ^- Fits

From 1477.5 to 1557.5 MeV


Mass[Ξ⁻π⁰] = 1477.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1487.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV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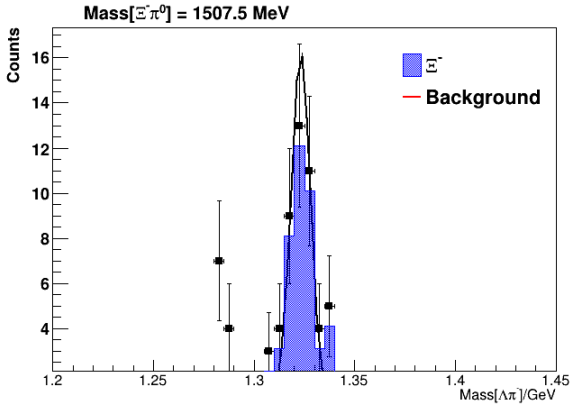
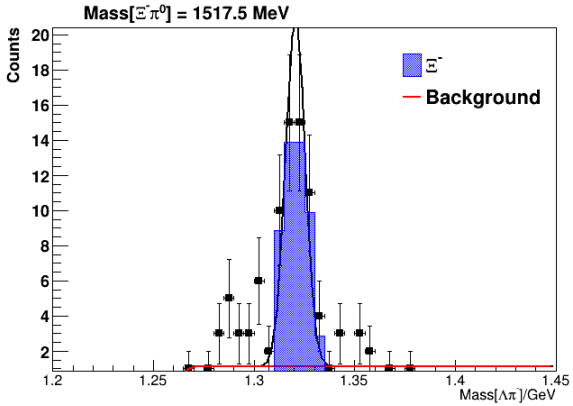
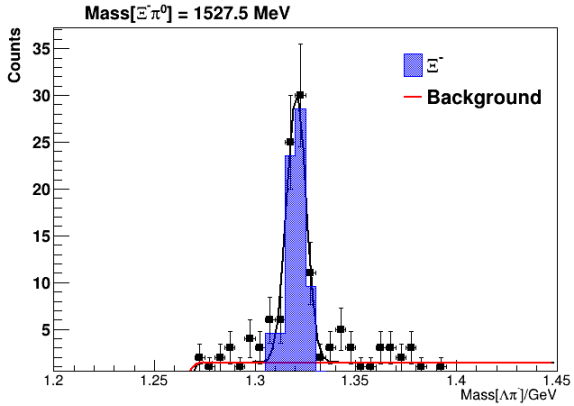
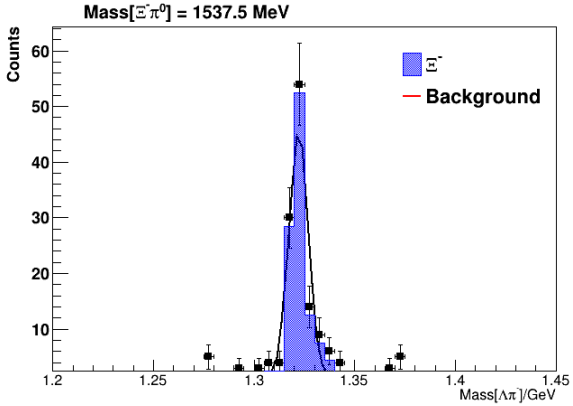
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1507.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1517.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1527.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV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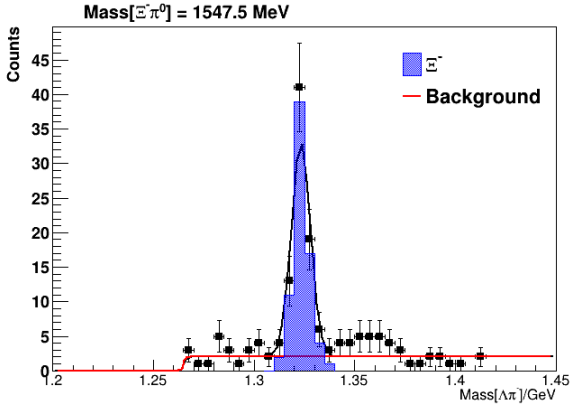
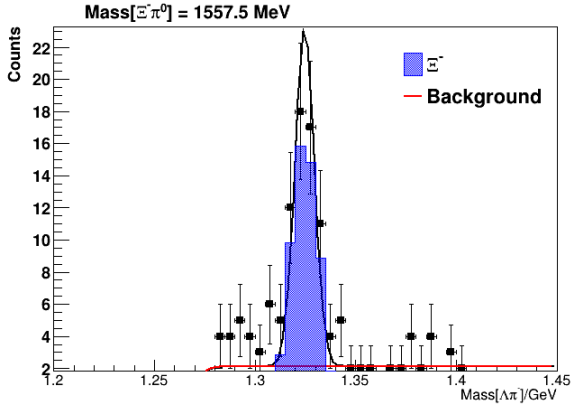
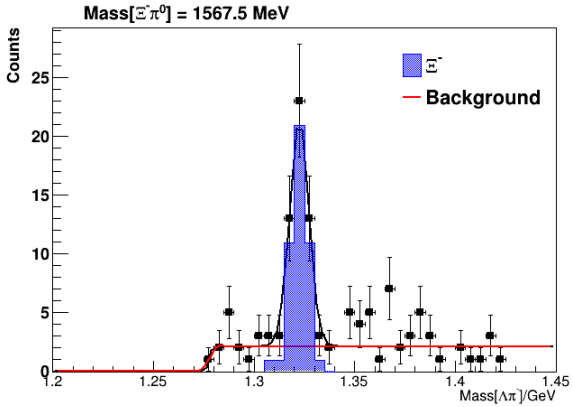

Mass[Ξ⁻π⁰] = 1547.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1557.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV

Ground State Ξ^- Fits

Next: From 1567.5 to 1647.5 MeV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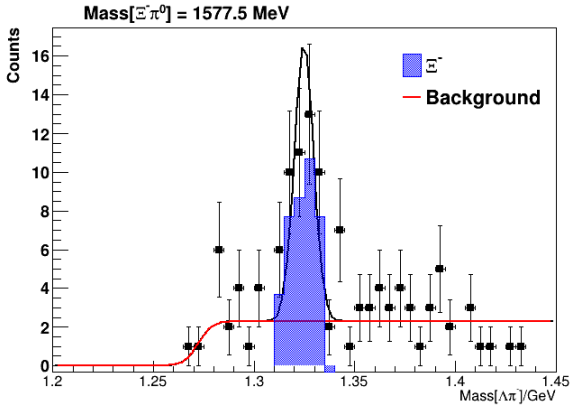
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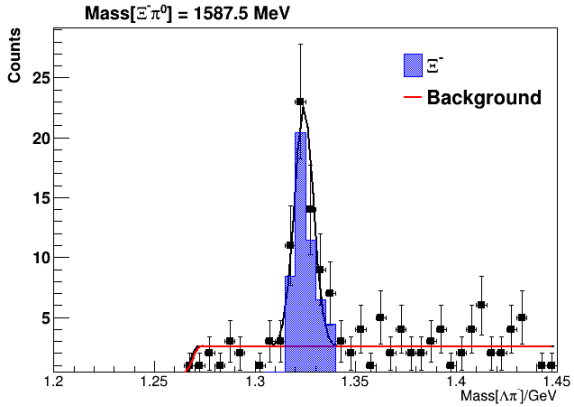
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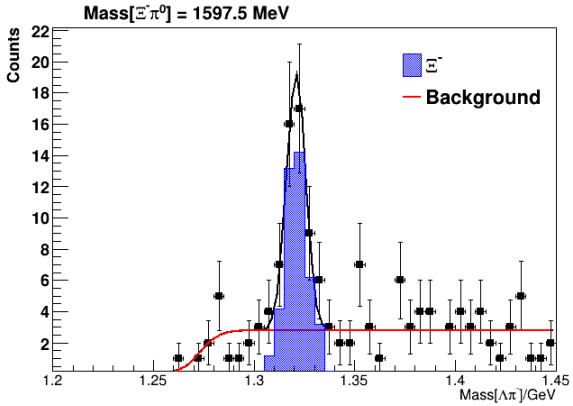
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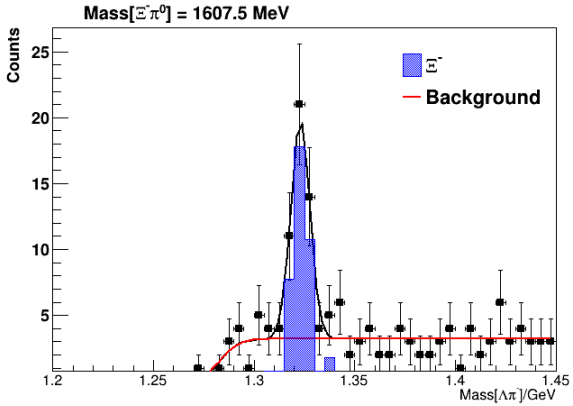
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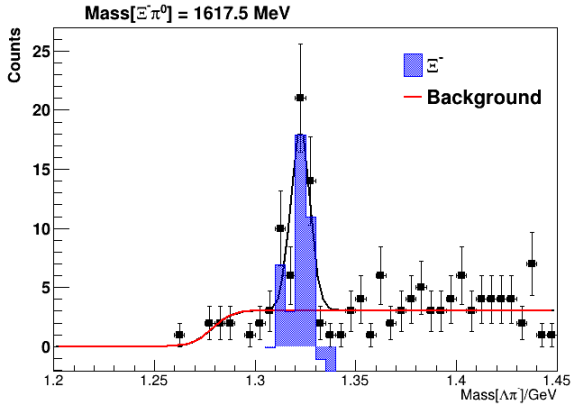
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1617.5 MeV
Counts
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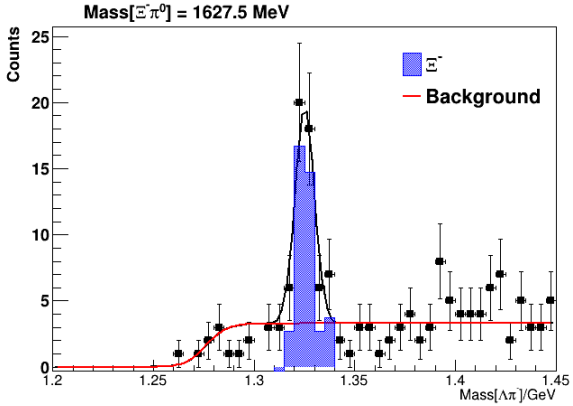
Background
Mass[Λπ⁻]/GeV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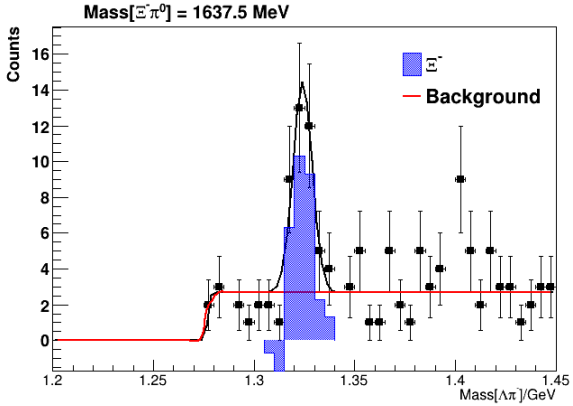
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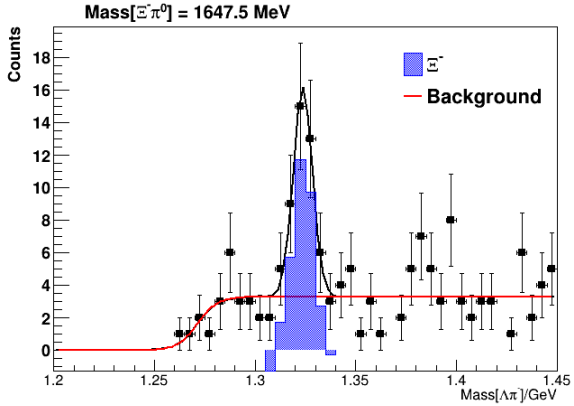
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Ground State Ξ^- Fits

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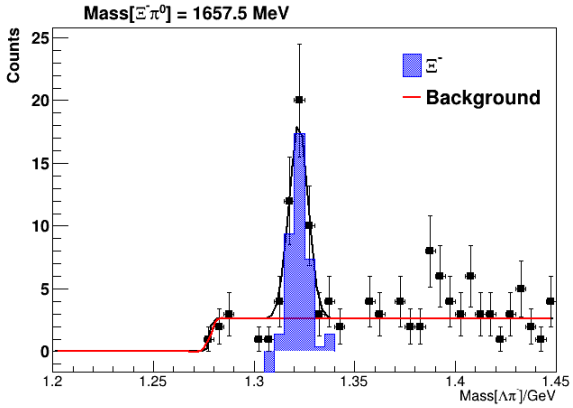
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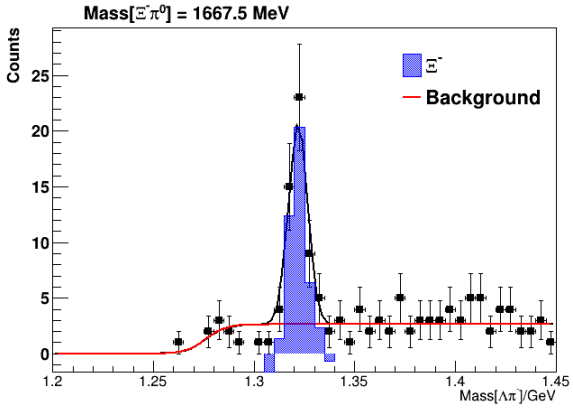
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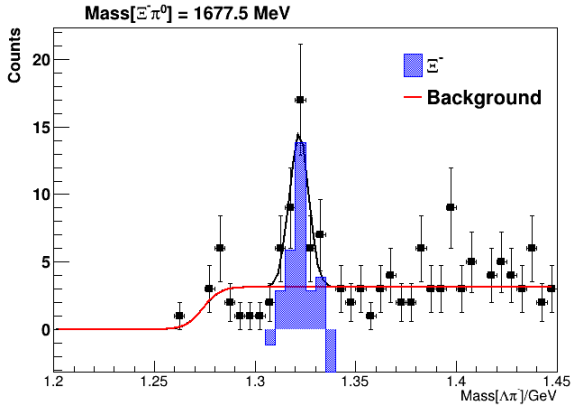
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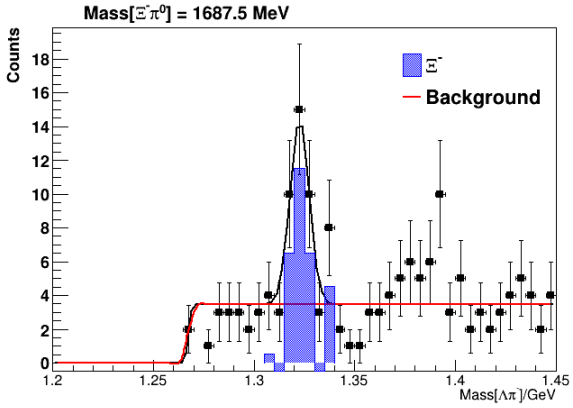
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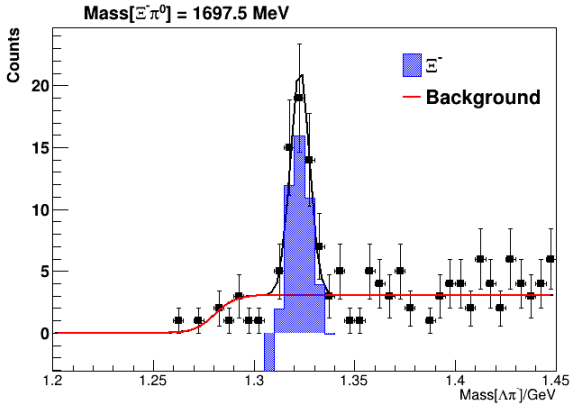
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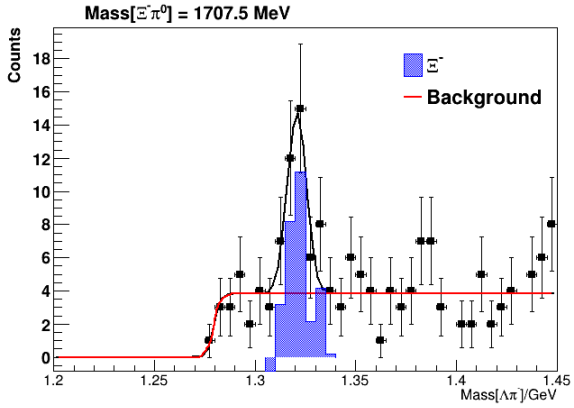
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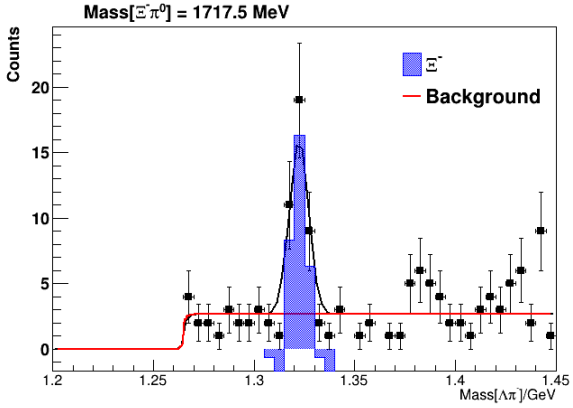
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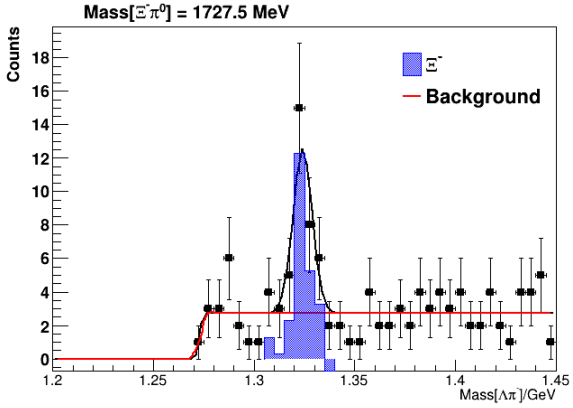
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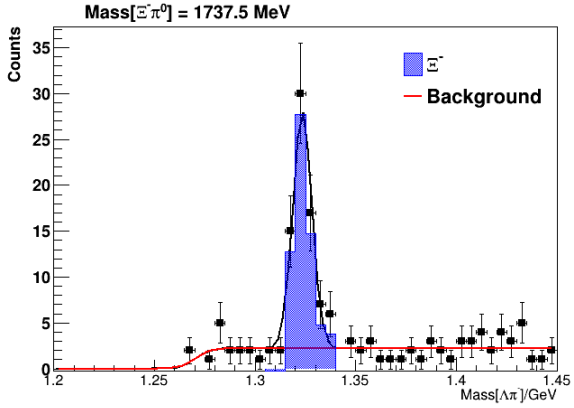
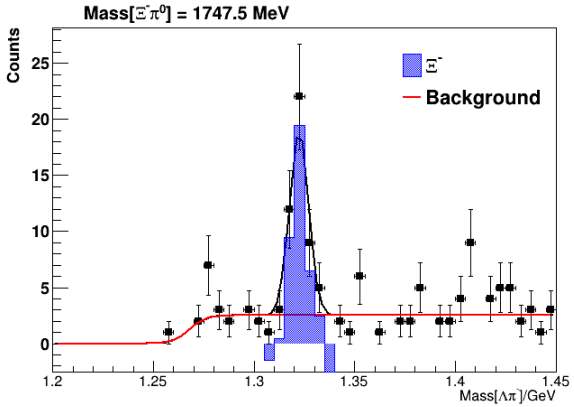
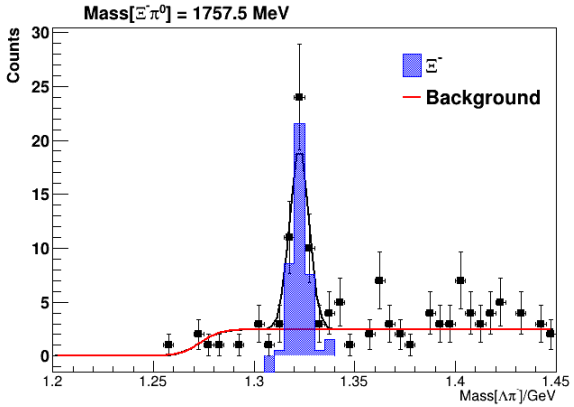
Background
Mass[Λπ⁻]/GeV

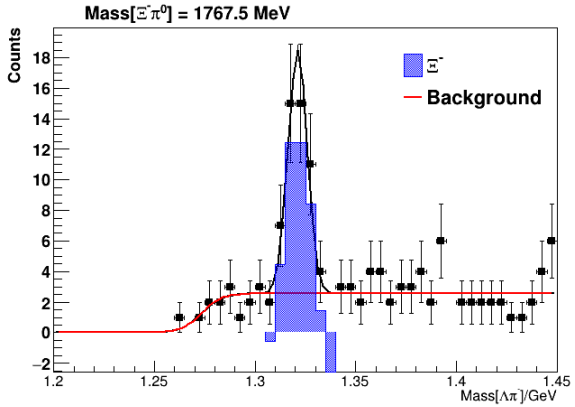

Mass[Ξ⁻π⁰] = 1737.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV

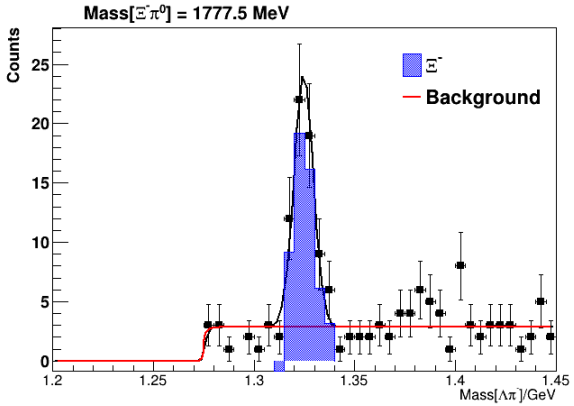
Ground State Ξ^- Fits

Last: From 1747.5 to 1777.5 MeV


Mass[Ξ⁻π⁰] = 1747.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1757.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1767.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV


Mass[Ξ⁻π⁰] = 1777.5 MeV
Counts
Ξ⁻
Background
Mass[Λπ⁻]/GeV

Comparison of Mass[Ξ^*]

$\Xi(1690)$:

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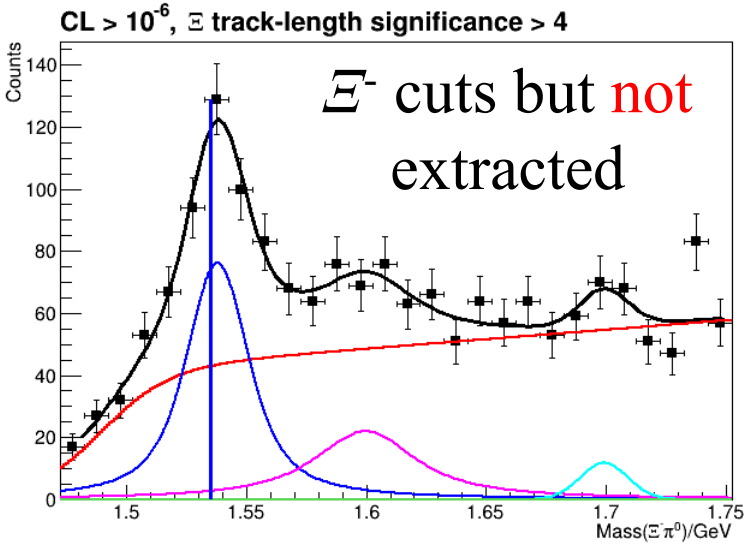
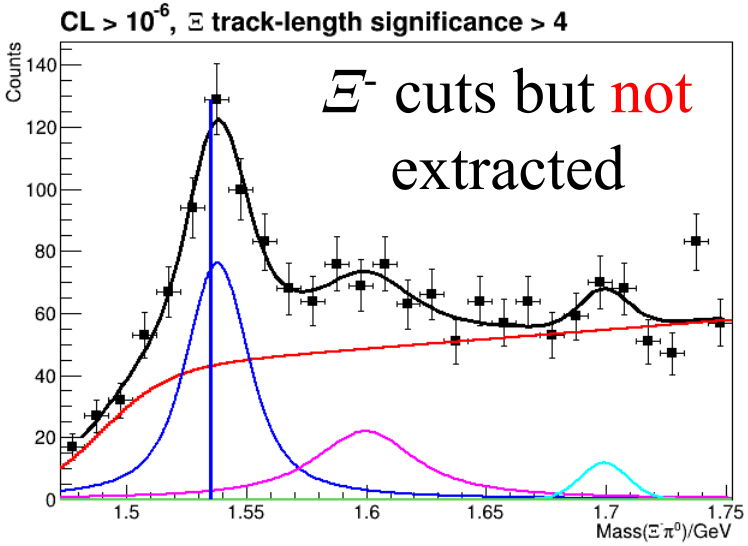


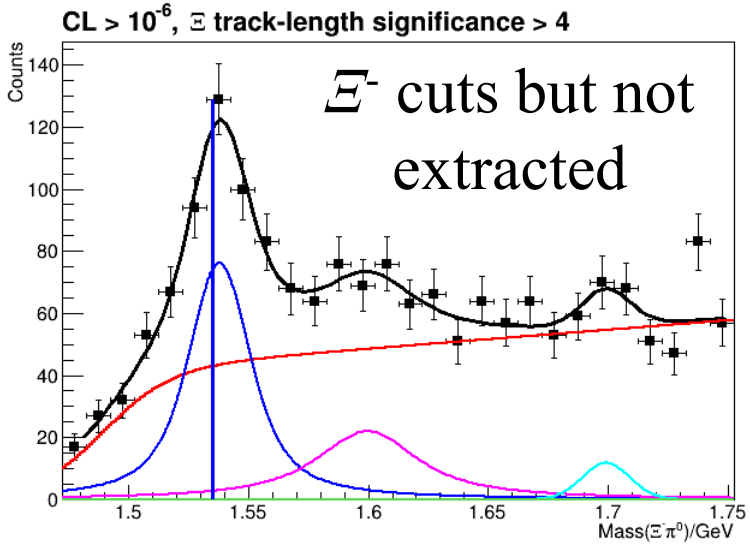
Ξ^- cuts: mass[$\Lambda\pi^-$] between 1.3 and 1.35 GeV

Comparison of Mass[Ξ^*]



- Ξ(1530):
  - Center = 1537(2) MeV
  - Width = 22(14) MeV
- Ξ(1620):
  - Center = 1599(7) MeV
  - Width = 20(30) MeV

Comparison of Mass[Ξ*]



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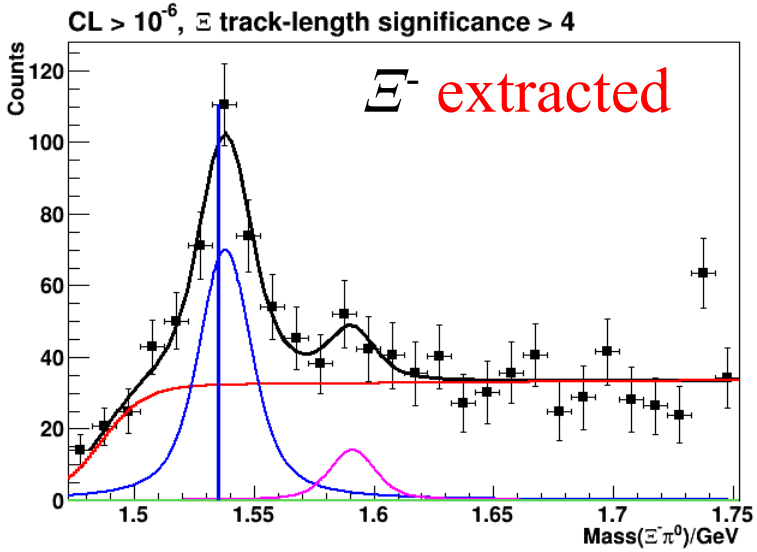
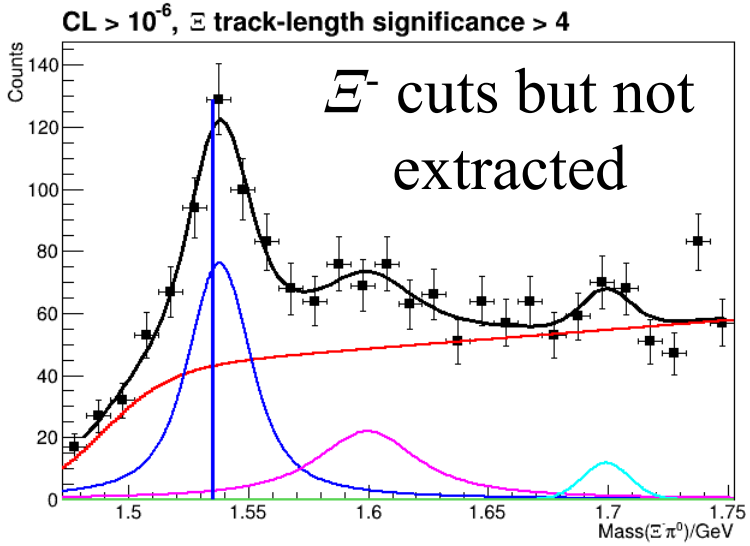


- Ξ(1530):
  - Center = 1538(2) MeV
  - Width = 15(16) MeV
- Ξ(1620):
  - Center = 1591(3) MeV
  - Width = 10(40) MeV

Comparison of Mass[Ξ^*]



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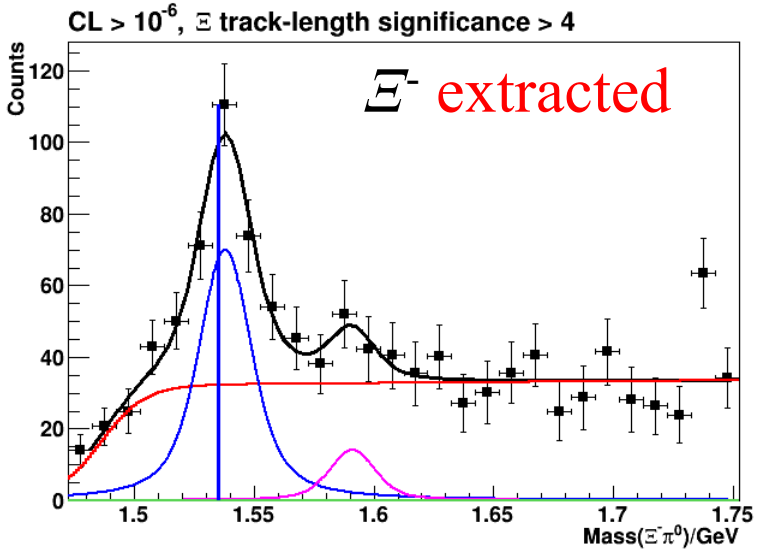

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Cuts on Mandelstam -*t*

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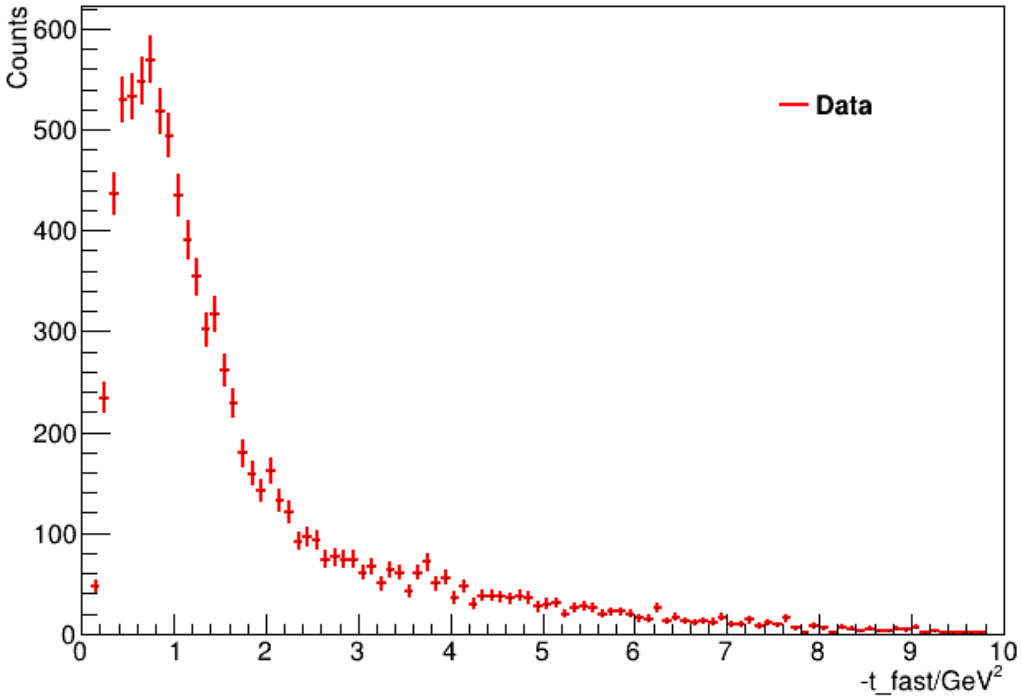

Cuts on Mandelstam -*t*

For this study

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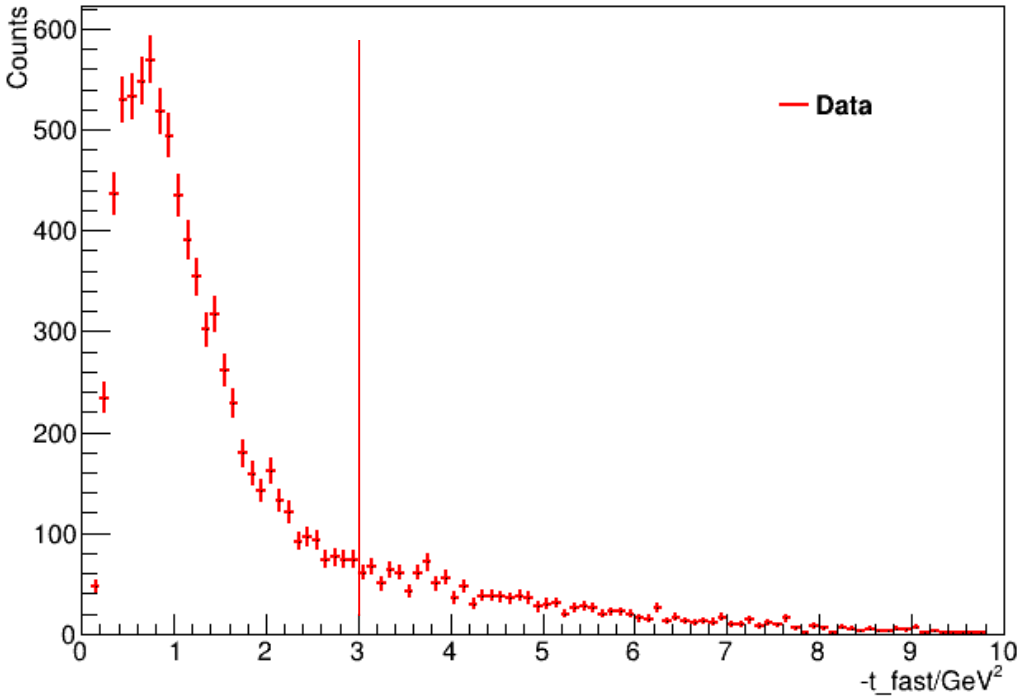
- *t*-Cuts investigated:
  - $-t < 3$ GeV^2



Cuts on Mandelstam -*t*

For this study

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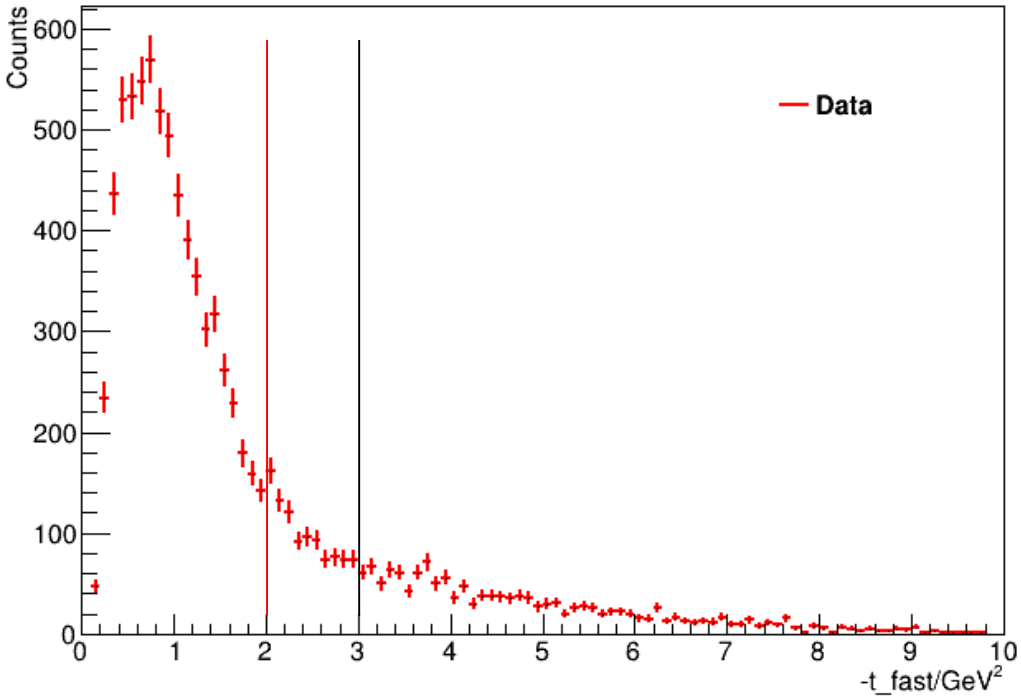
- *t*-Cuts investigated:
  - $-t < 3$ GeV^2
  - $-t < 2$ GeV^2



Cuts on Mandelstam -*t*

For this study

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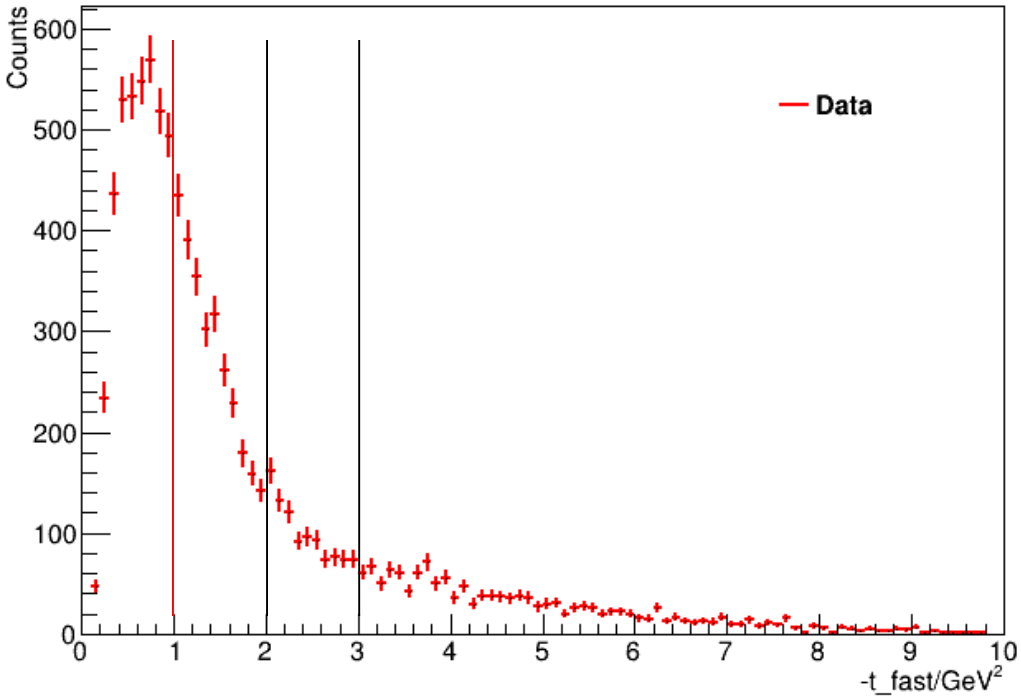
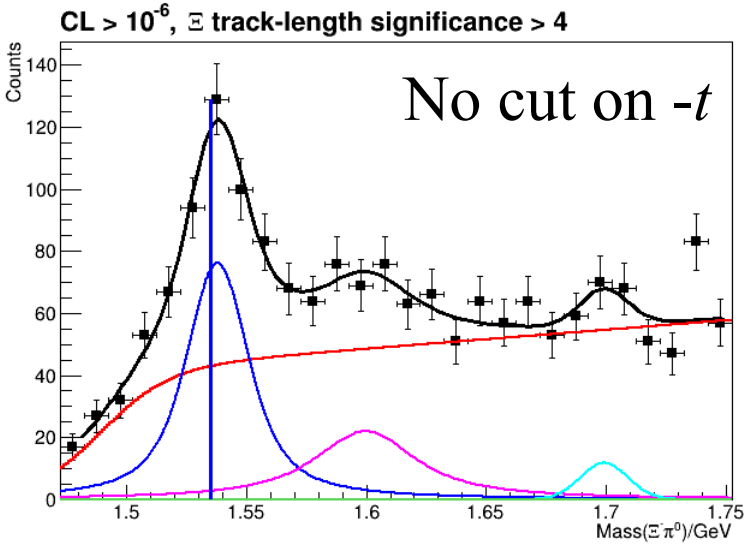
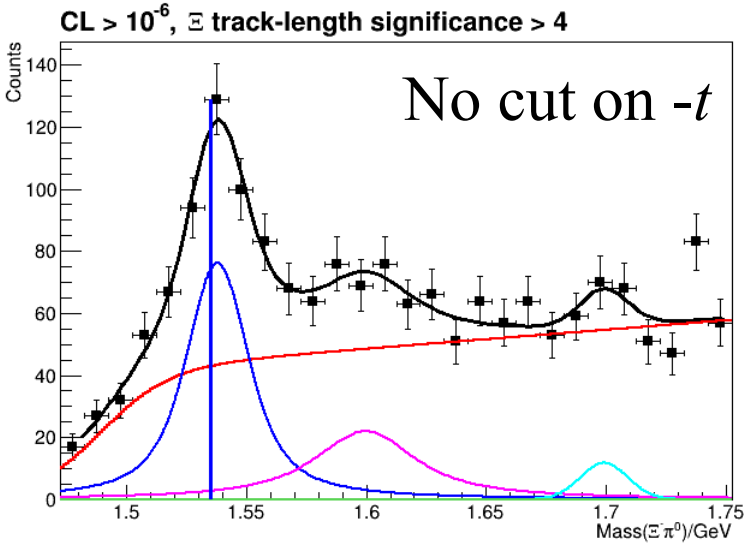
- *t*-Cuts investigated:
  - $-t < 3$ GeV^2
  - $-t < 2$ GeV^2
  - $-t < 1$ GeV^2

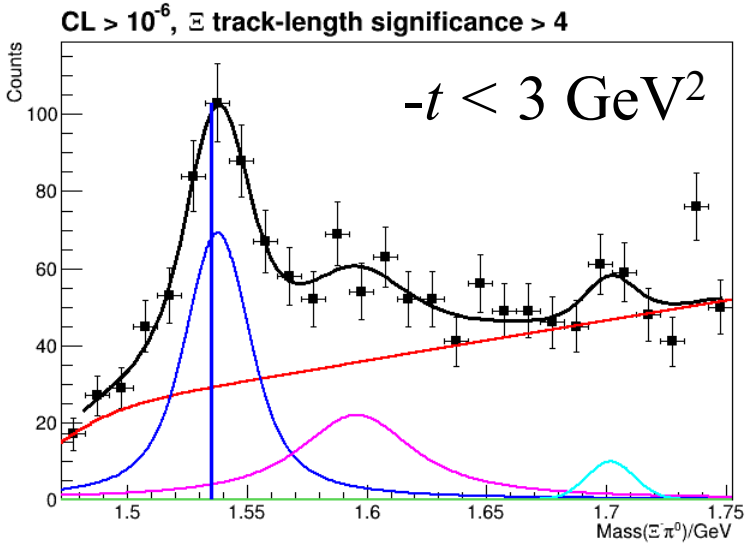


Cuts on Mandelstam -*t*

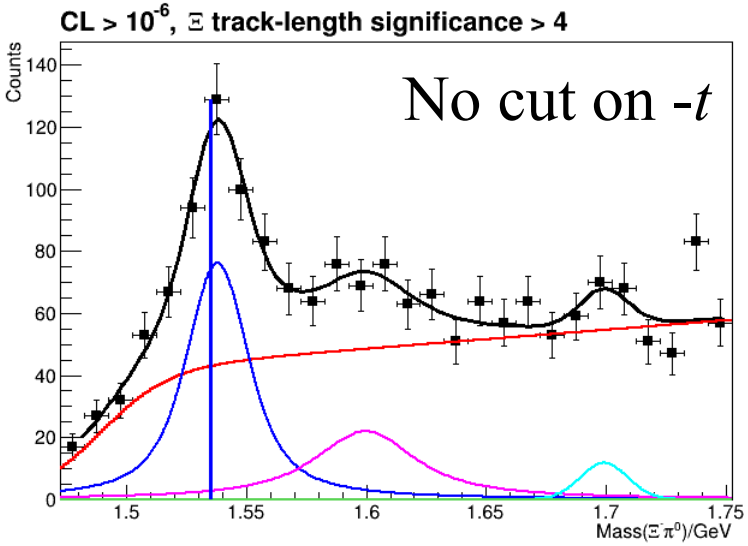


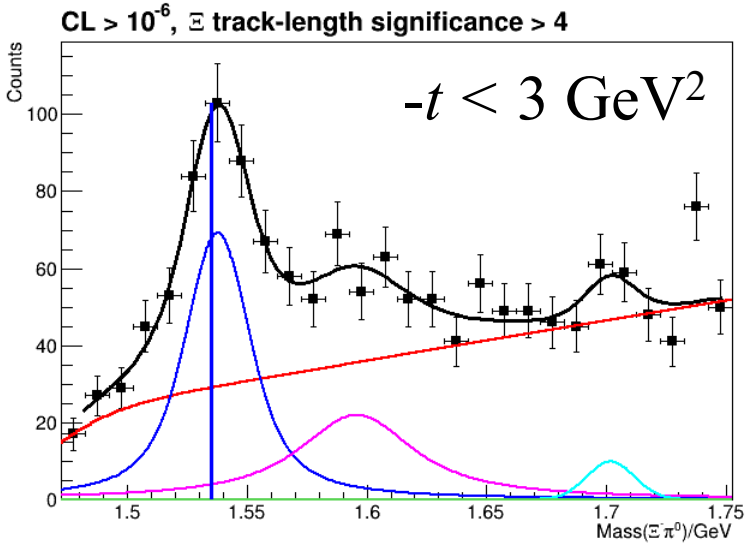
Cuts on Mandelstam -*t*

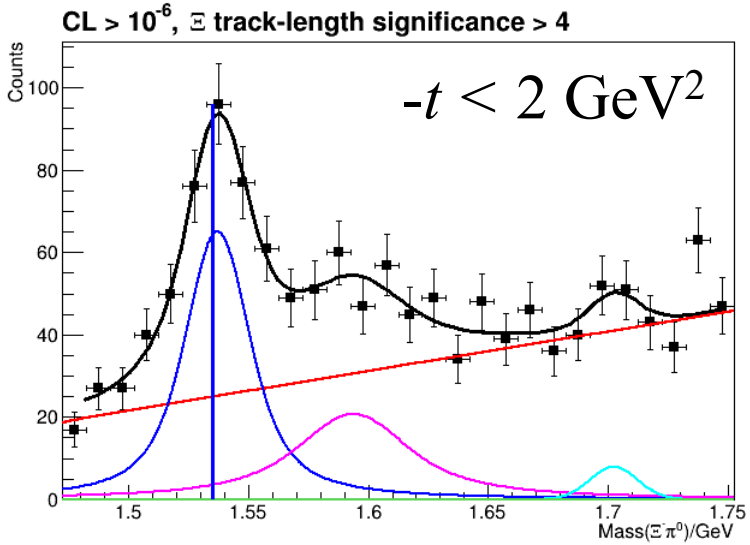




Cuts on Mandelstam -*t*







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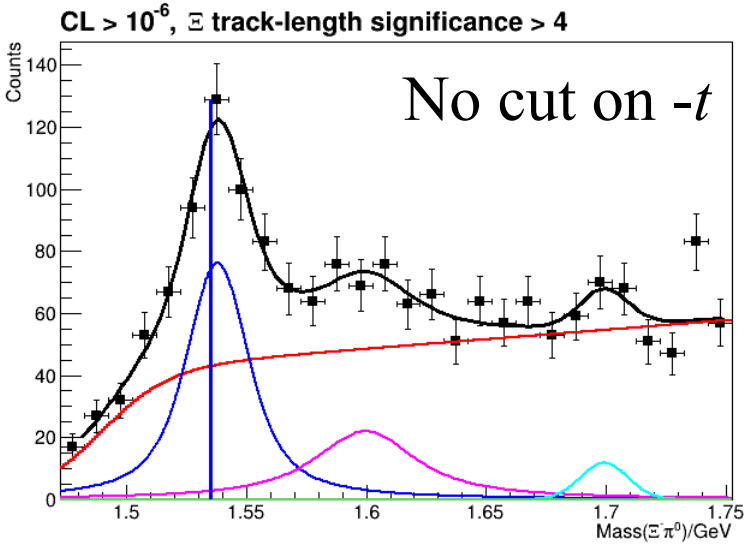
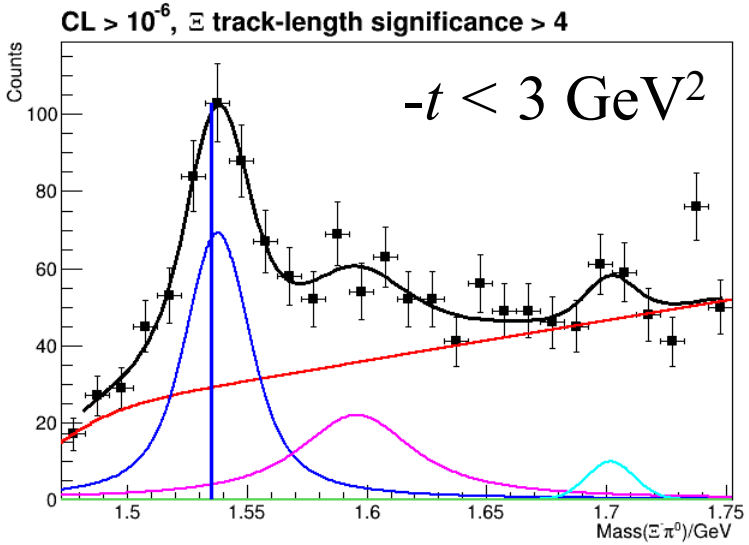
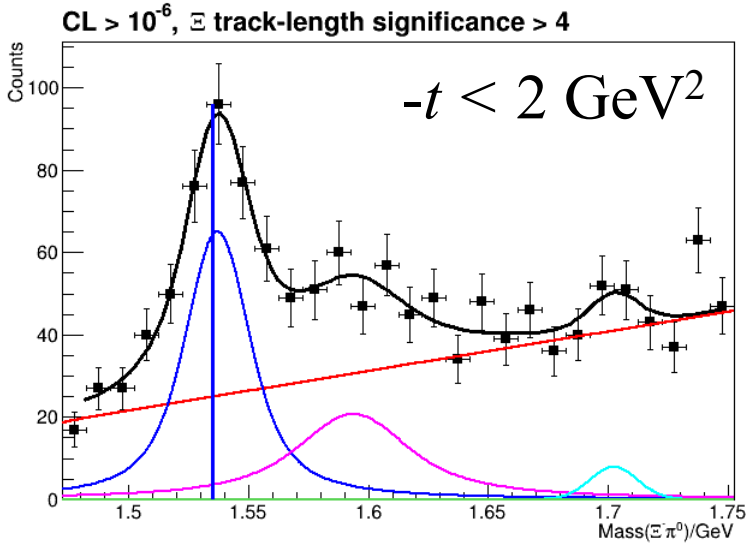
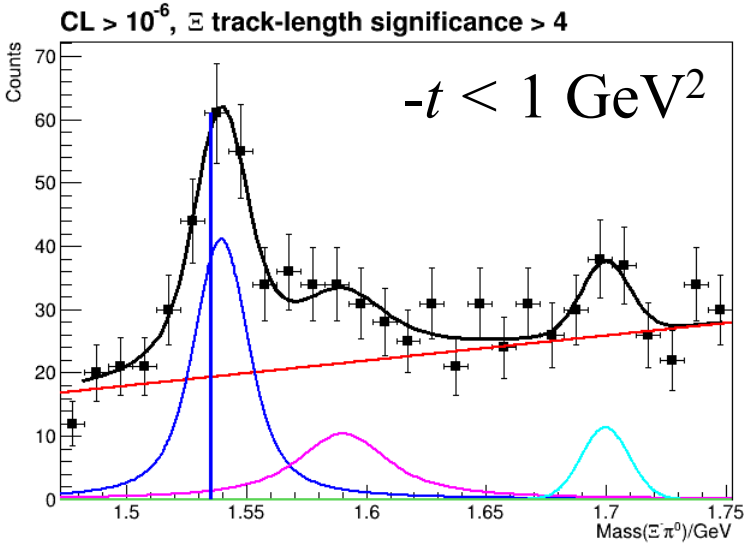


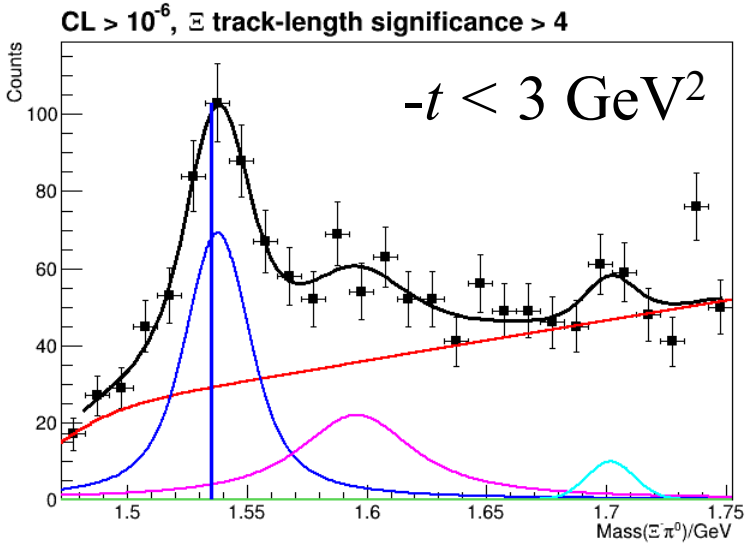


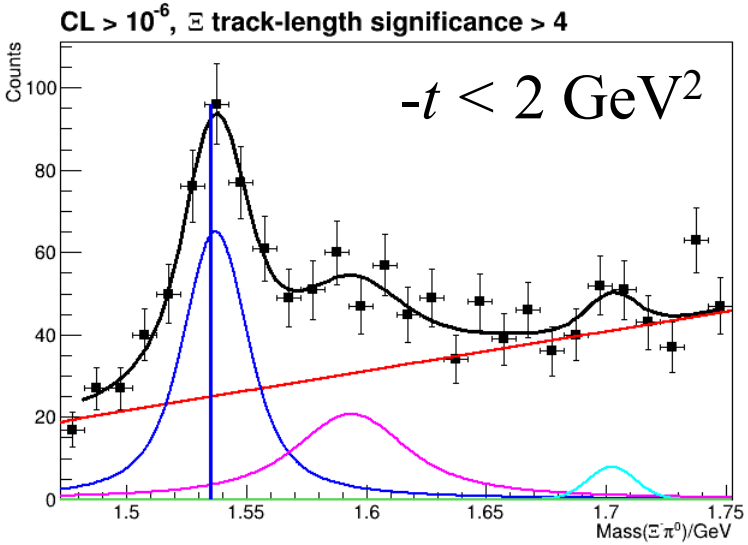


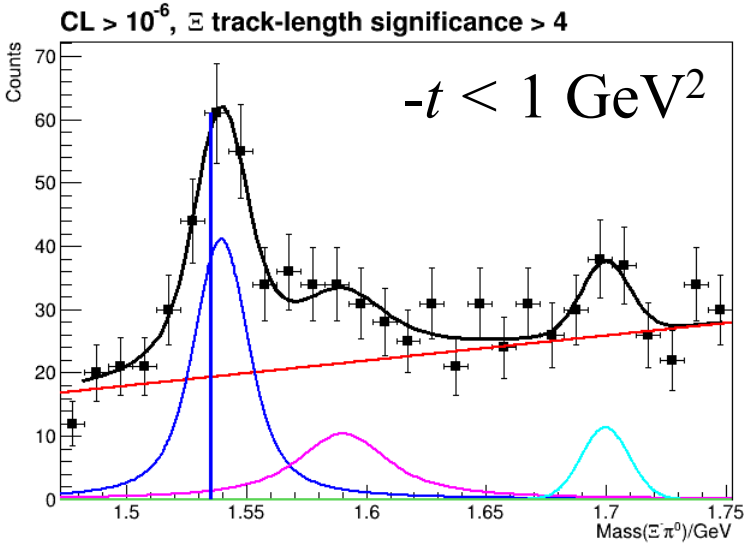


Cuts on Mandelstam -*t*

- Should more broadly explore *t*-cuts within my list of standard cuts







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