Ξ^* Analysis

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Cuts:

- Best combo
- Mass[$\Lambda\pi^-$] between 1.3 and 1.35 GeV

Datasets

Looked at

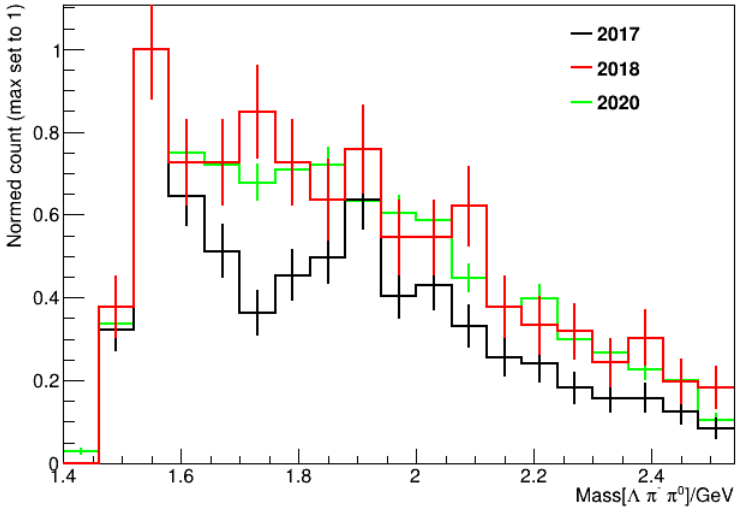
- 2017
- 2018
- 2020

Datasets

Looked at

- 2017
- 2018
- 2020

- Comparison of the above datasets show serious consistency issue for the mass[$\Lambda\pi^{-}\pi^{0}$]



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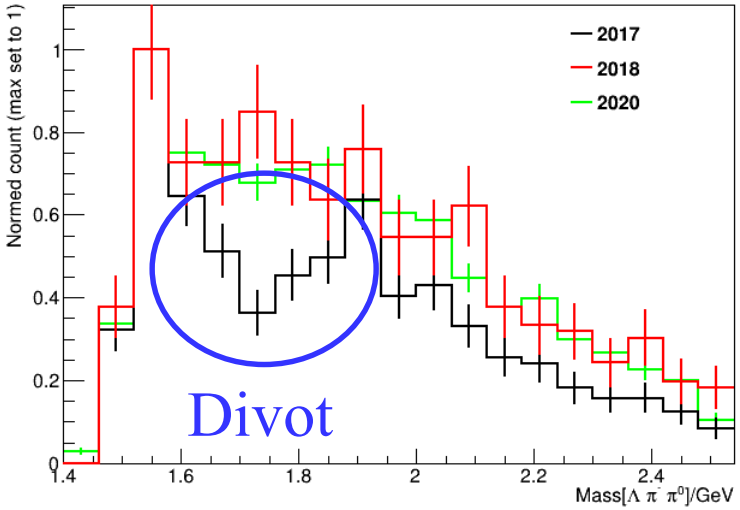

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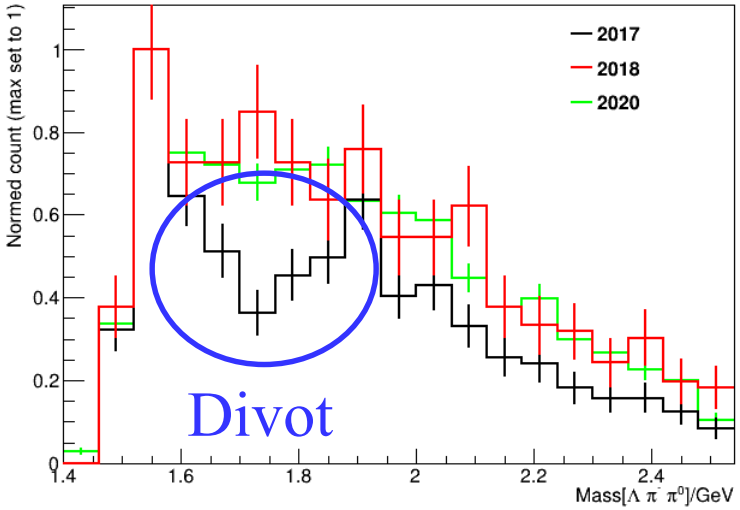

- Comparison of the above datasets show serious consistency issue for the mass[$\Lambda\pi^{-}\pi^{0}$]

- Not using 2017 data until we understand the divot

Table 1. Our estimate of the status of the Ξ resonances. Only those with an overall status of *** or **** are included in the Baryon Summary Table.

Particle	J^P	Overall status	Status as seen in — $\Xi\pi$	ΛK	ΣK	$\Xi(1530)\pi$	Other channels
Ξ(1318)	1/2+	****					Decays weakly
Ξ(1530)	3/2+	****	****				
Ξ(1620)		**	**				
Ξ(1690)		***	**	***	**		
Ξ(1820)	3/2−	***	**	***	**	**	
Ξ(1950)		***	**	**		*	
Ξ(2030)		***		**	***		
Ξ(2120)		*		*			
Ξ(2250)		**					3-body decays
Ξ(2370)		**					3-body decays
Ξ(2500)		*		*	*		3-body decays

****	Existence is certain, and properties are at least fairly well explored.
***	Existence ranges from very likely to certain, but further confirmation is desirable and/or quantum numbers, branching fractions, *etc.* are not well determined.
**	Evidence of existence is only fair.
*	Evidence of existence is poor.

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Looking in this range for now

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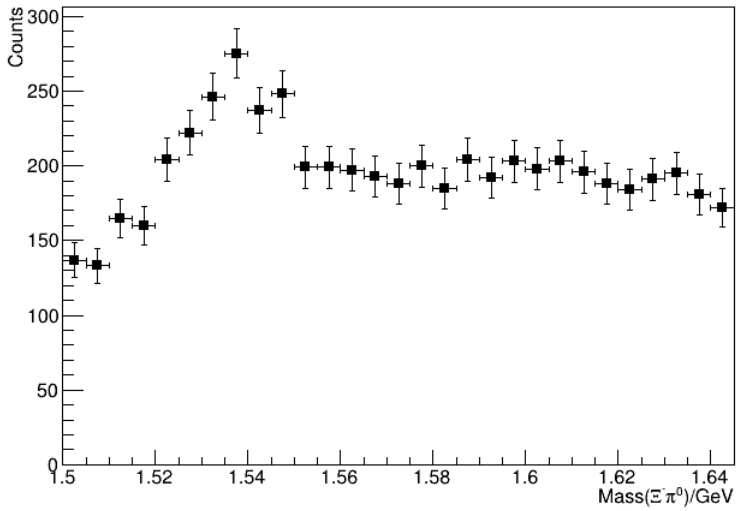
Only single * in particle listing

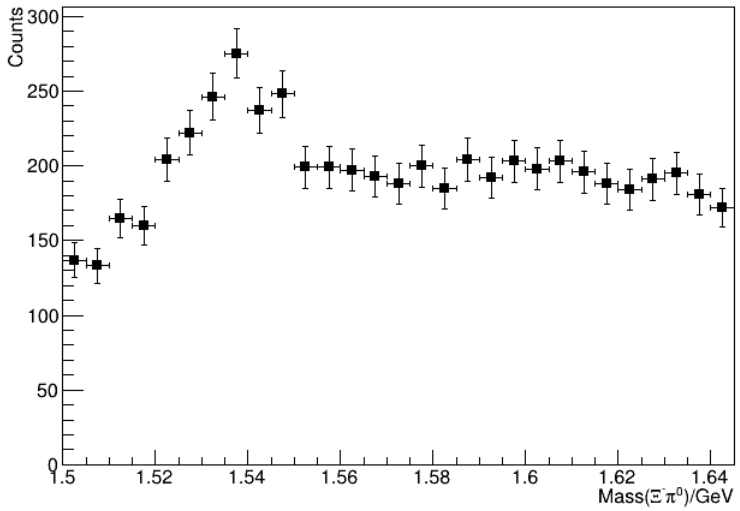
Ξ^* Analysis



Data:

- 2018, 2020
- CL > 10^{-8}
- No background reduction

Ξ^* Analysis



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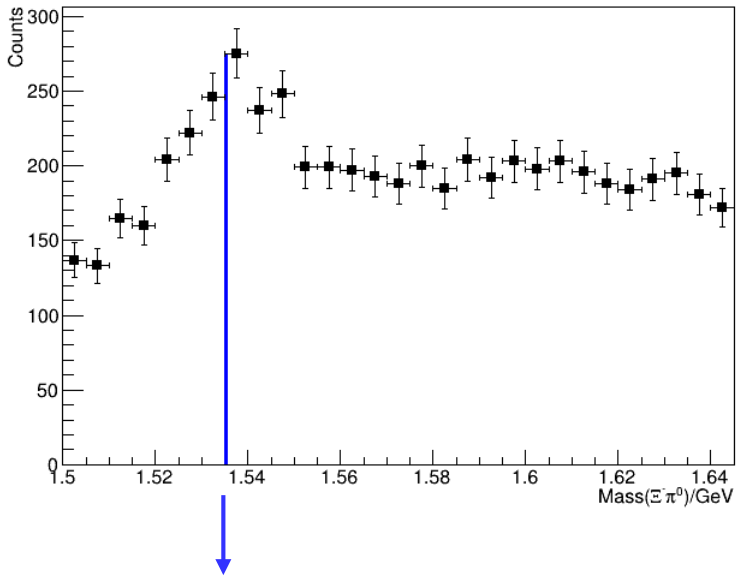
Two PDG states in this mass range:

Ξ^* Analysis



Ξ(1530) MASSES

$\Xi(1530)^0$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1531.80±0.32 OUR FIT	Error includes scale factor of 1.3.				
1531.78±0.34 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.				
1532.2 ±0.7		DEBELLEFON	75B	HBC	$K^- p \to \Xi^- \overline{K}\pi$
1533 ±1		ROSS	73B	HBC	$K^- p \to \Xi \overline{K}\pi(\pi)$
1531.4 ±0.8	59	BADIER	72	HBC	$K^- p$ 3.95 GeV/c
1532.0 ±0.4	1262	BALTAY	72	HBC	$K^- p$ 1.75 GeV/c
1531.3 ±0.6	324	BORENSTEIN	72	HBC	$K^- p$ 2.2 GeV/c
1532.3 ±0.7	286	KIRSCH	72	HBC	$K^- p$ 2.87 GeV/c
1528.7 ±1.1	76	LONDON	66	HBC	$K^- p$ 2.24 GeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1532.1 ±0.4	1244	ASTON	85B	LASS	$K^- p$ 11 GeV/c
1532.1 ±0.6	2700	[1] BAUBILLIER	81B	HBC	$K^- p$ 8.25 GeV/c
1530 ±1	450	BIAGI	81	SPEC	SPS hyperon beam

https://pdg.lbl.gov Page 1 Created: 5/31/2023 09:08

Data:

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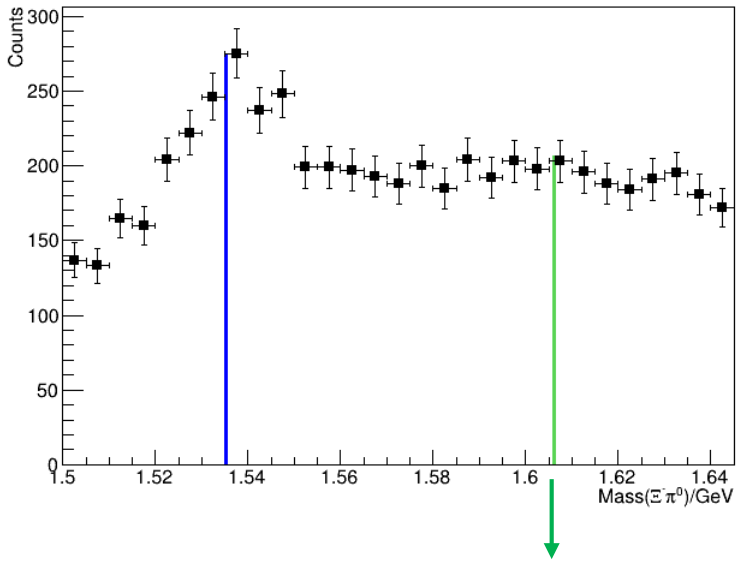
Two PDG states in this mass range:

- Ξ(1530), ****

Ξ^* Analysis



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Two PDG states in this mass range:

- $\Xi(1530)$, ****
- $\Xi(1620)$, *

$\Xi(1620)$ $I(J^P) = \frac{1}{2}(?^?)$ Status: *

J, *P* need confirmation.

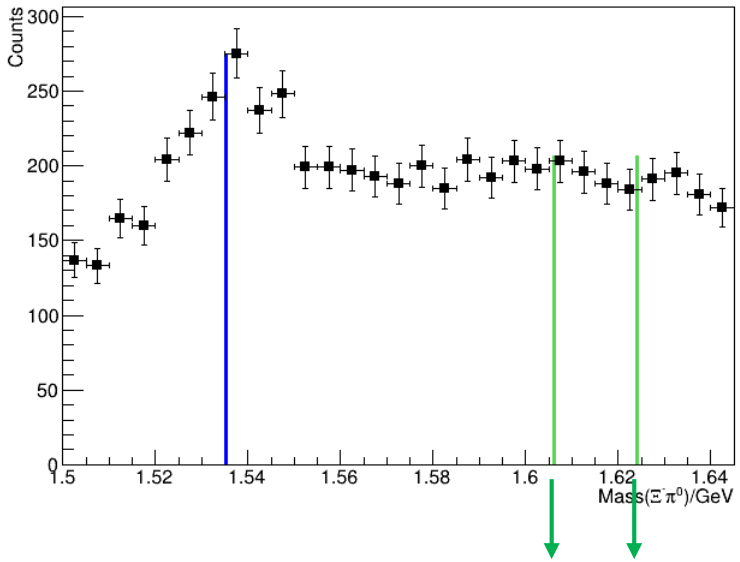
OMITTED FROM SUMMARY TABLE

What little evidence there is consists of weak signals in the $\Xi\pi$ channel. A number of other experiments (e.g., BORENSTEIN 72 and HASSALL 81) have looked for but not seen any effect.

$\Xi(1620)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
≈ 1620 OUR ESTIMATE					
1624 ± 3	31	BRIEFEL	77	HBC	$K^- p$ 2.87 GeV/c
1633 ± 12	34	DEBELLEFON	75B	HBC	$K^- p \to \Xi^- \overline{K}\pi$
1606 ± 6	29	ROSS	72	HBC	$K^- p$ 3.1–3.7 GeV/c

Ξ^* Analysis



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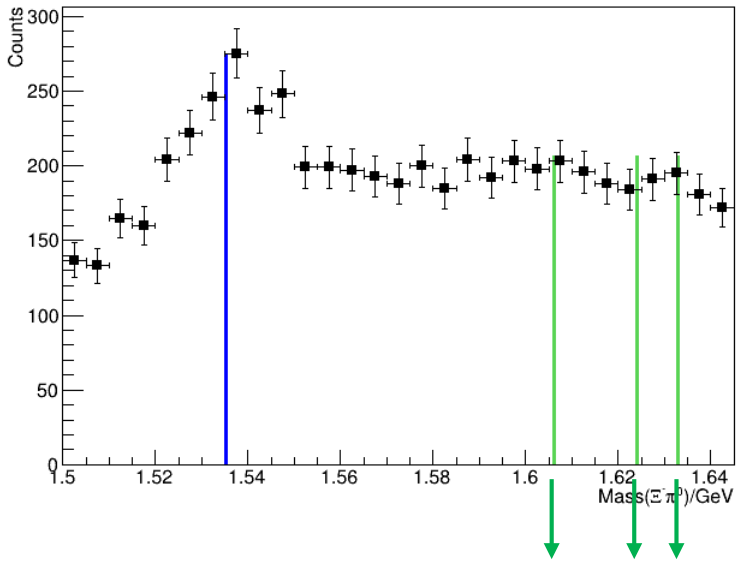

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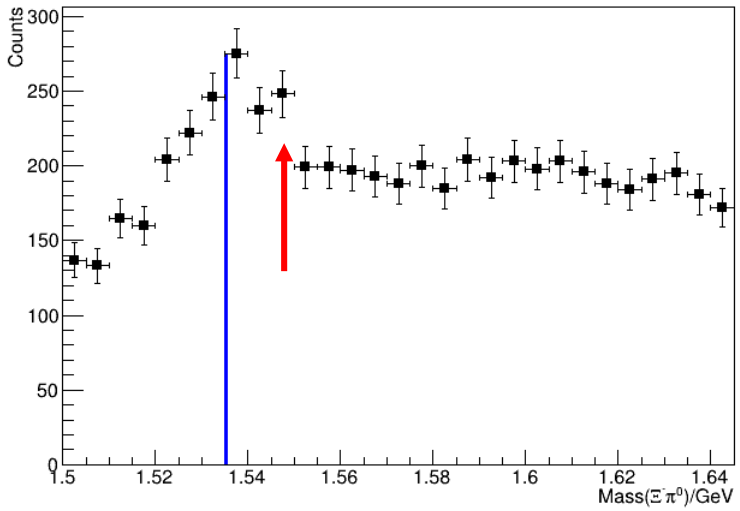

Data:

- 2018, 2020
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- Bump causing problem when fitting $\Xi(1530)$

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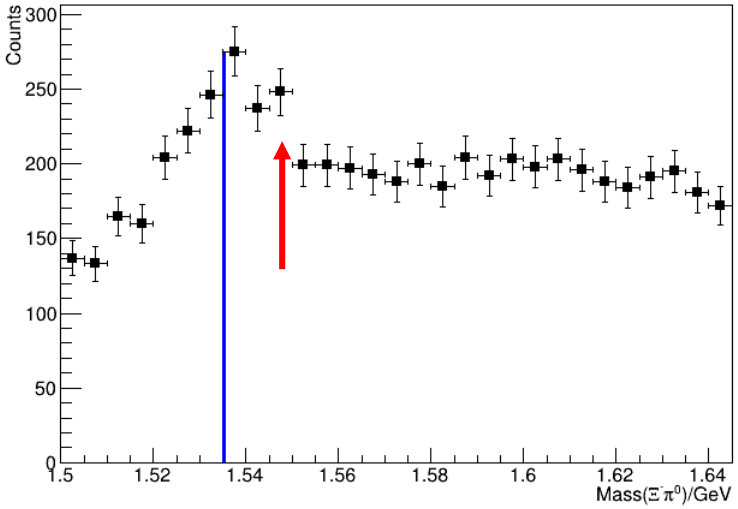

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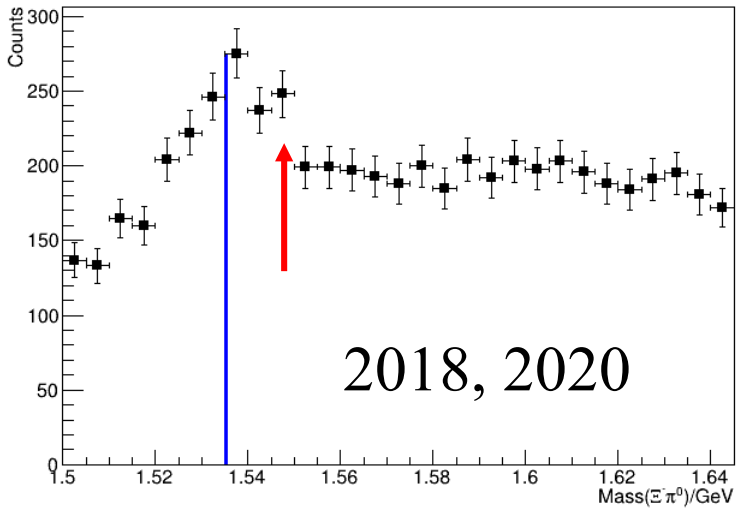
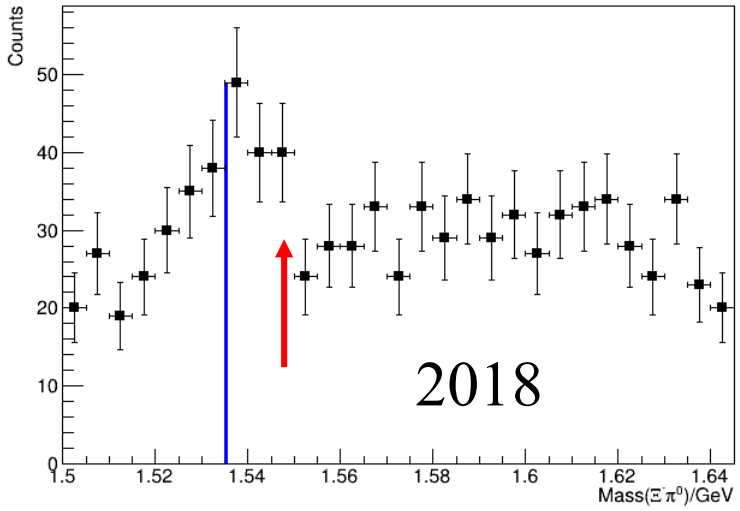
What do 2018 and 2020 look like separately?

Ξ^* Analysis





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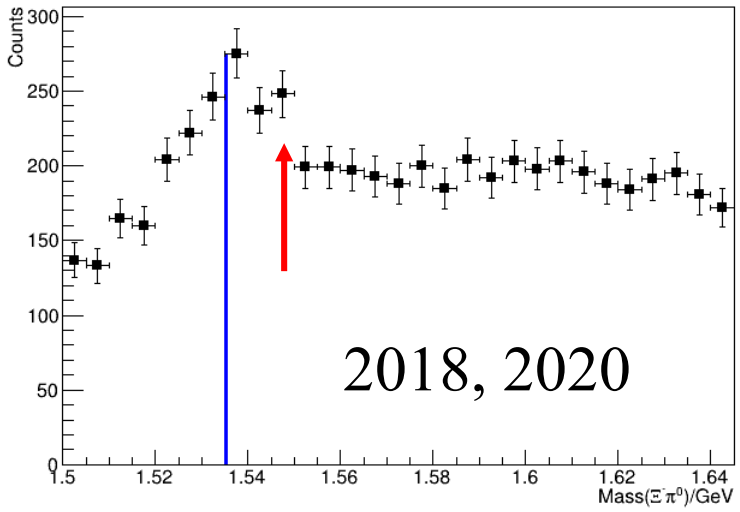

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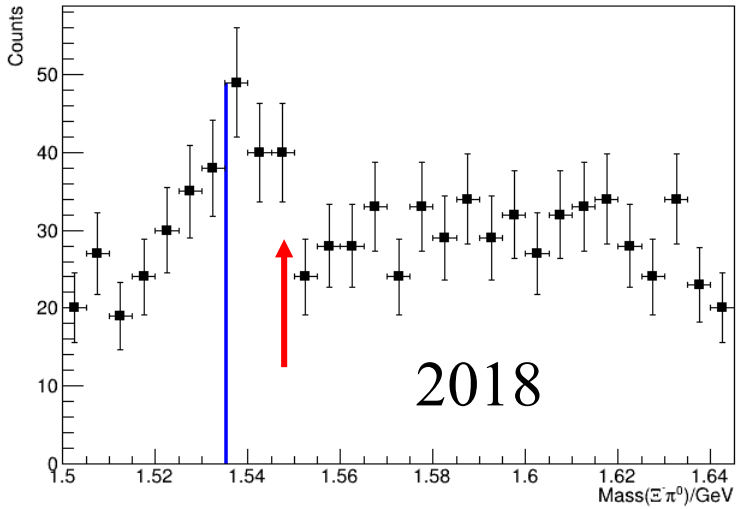

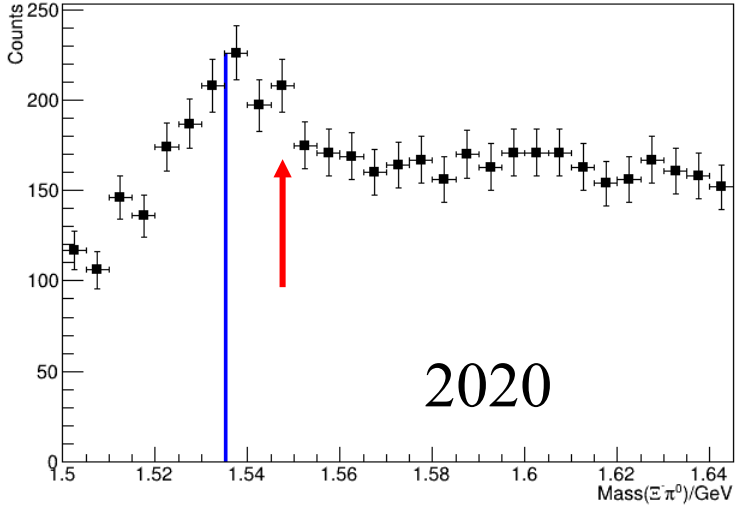

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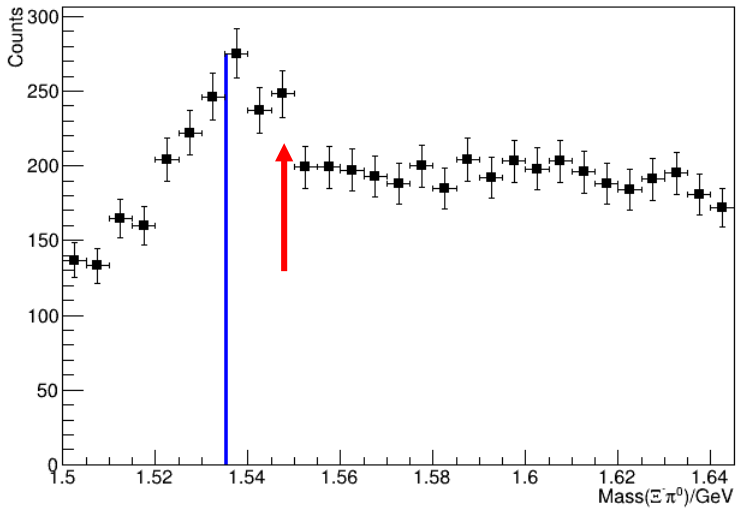

Data:

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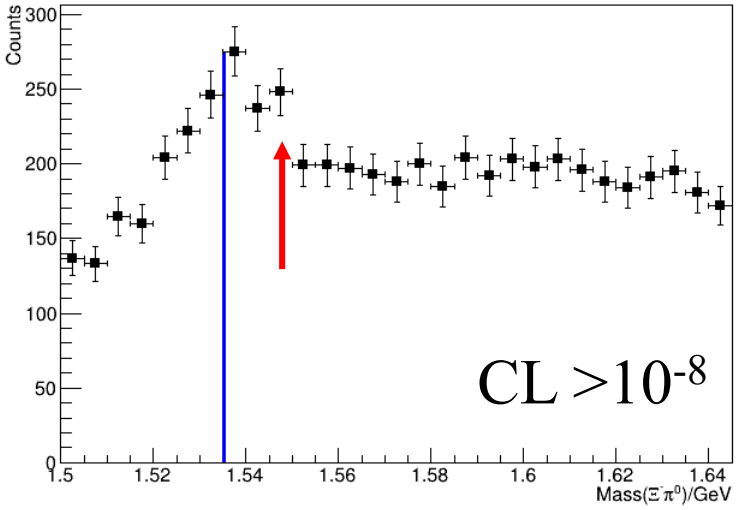
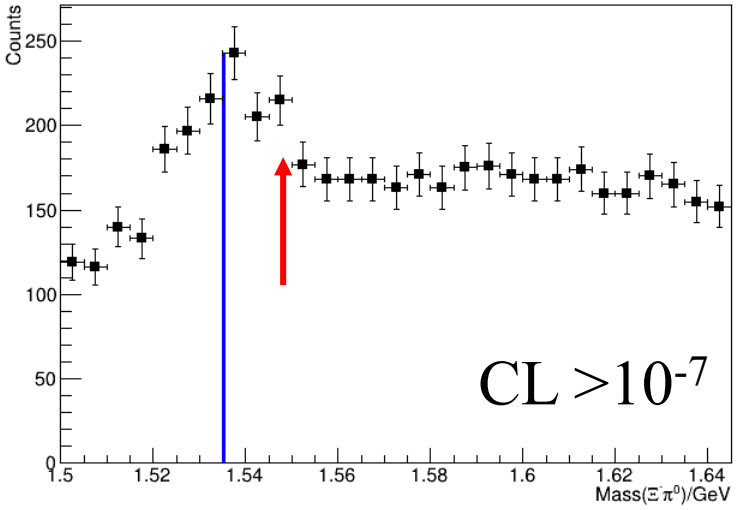
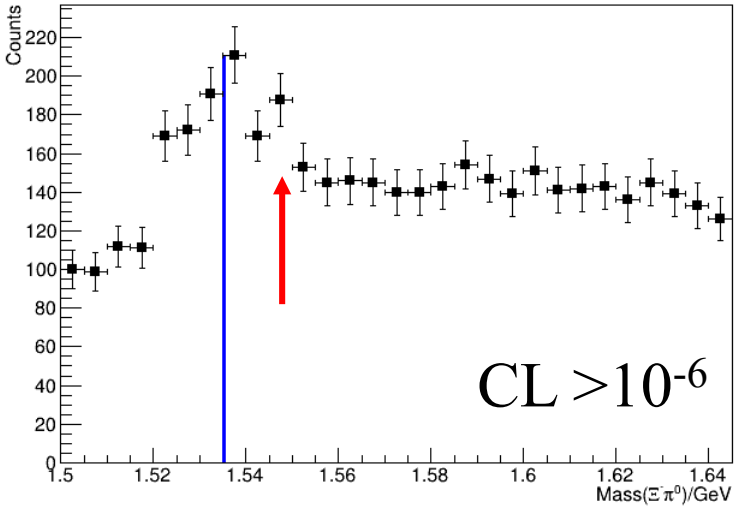
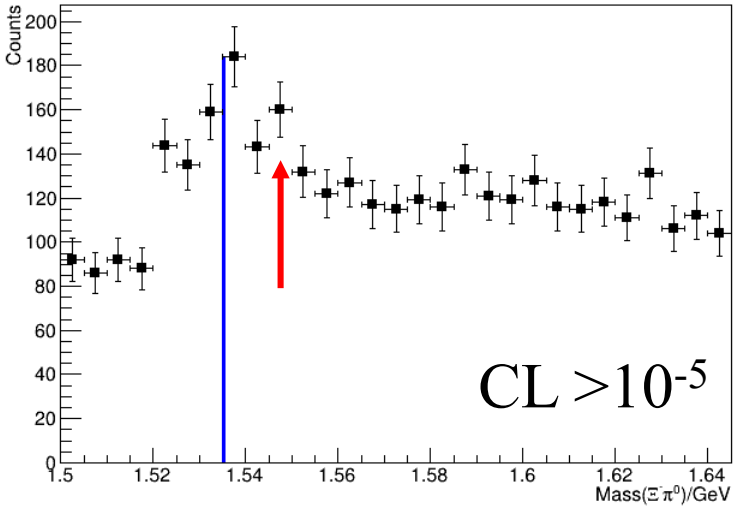
Increase the CL cut ?

Ξ^* Analysis

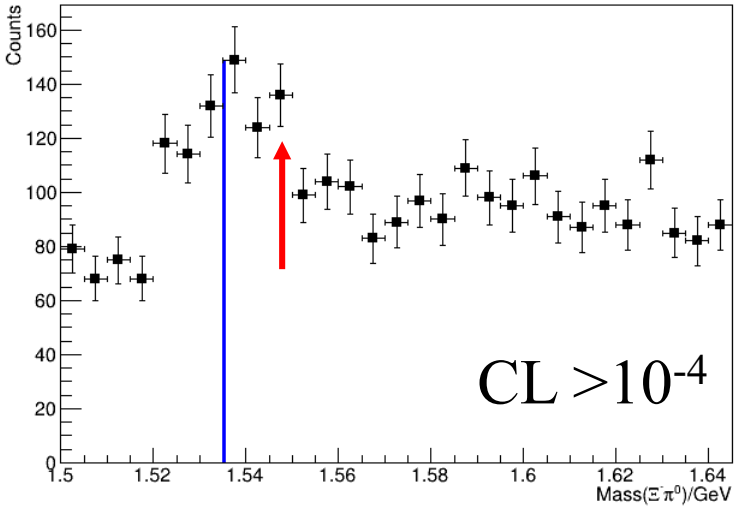

Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-8}

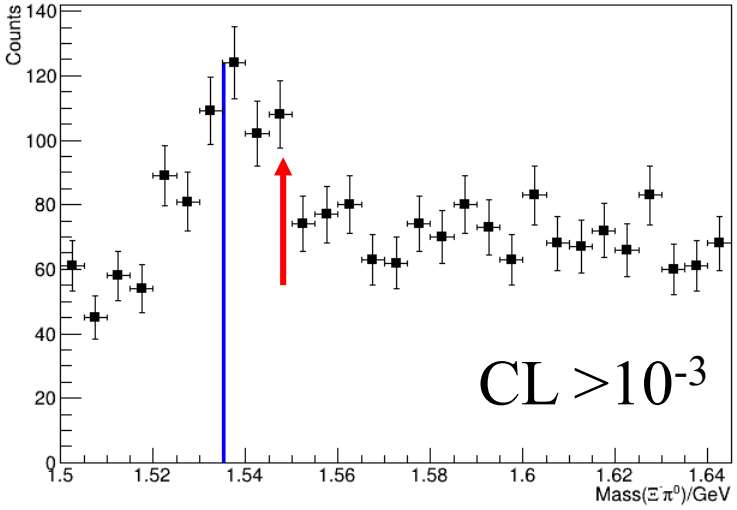

Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-7}

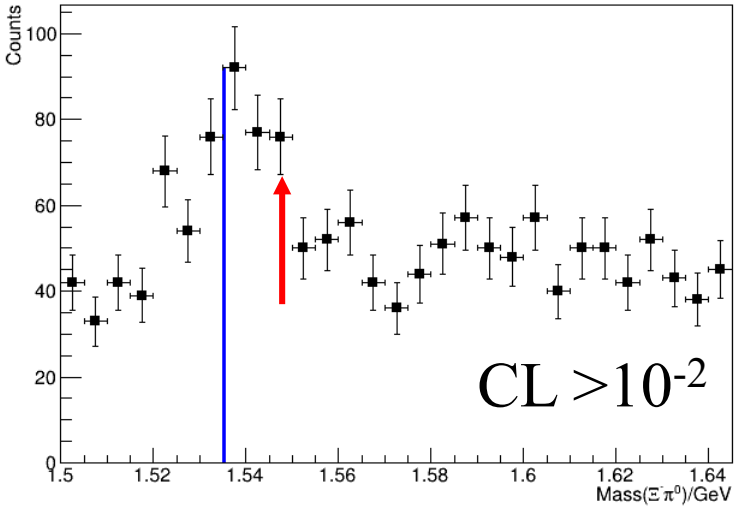

Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-6}

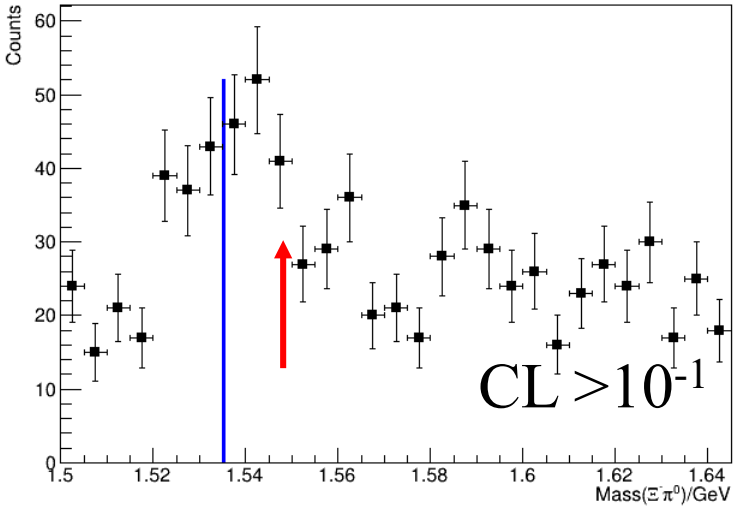

Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-5}

Ξ^* Analysis

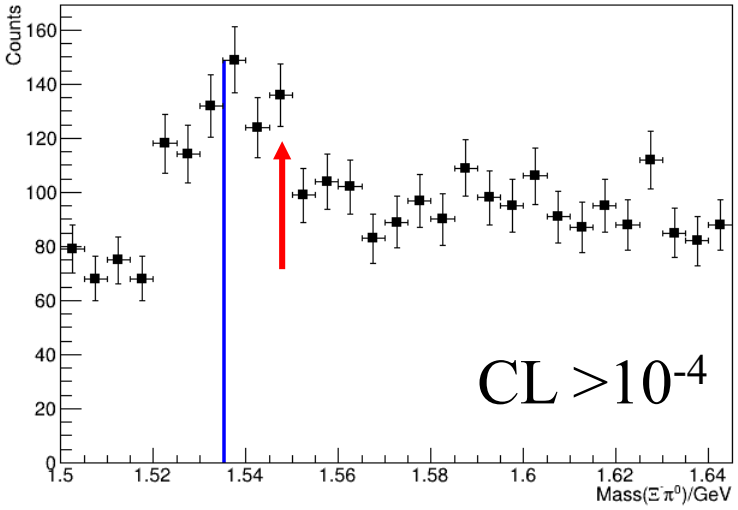

Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-4}

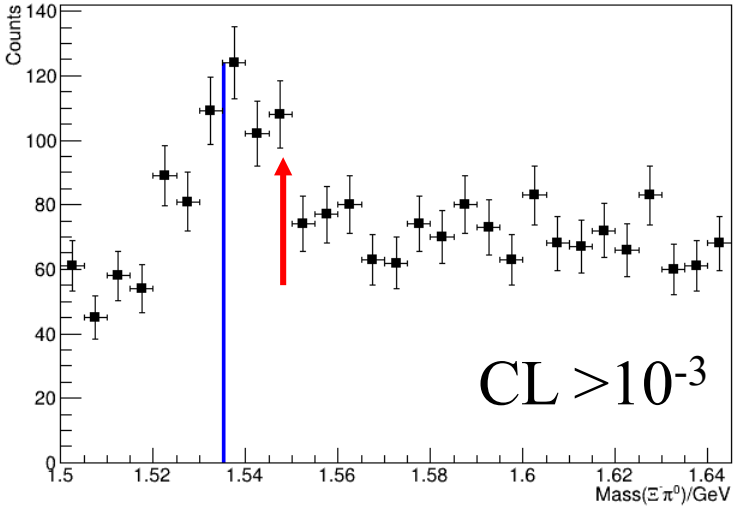

Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-3}


Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-2}


Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-1}

Ξ^* Analysis


Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-4}


Counts
Mass($\Xi^-\pi^0$)/GeV
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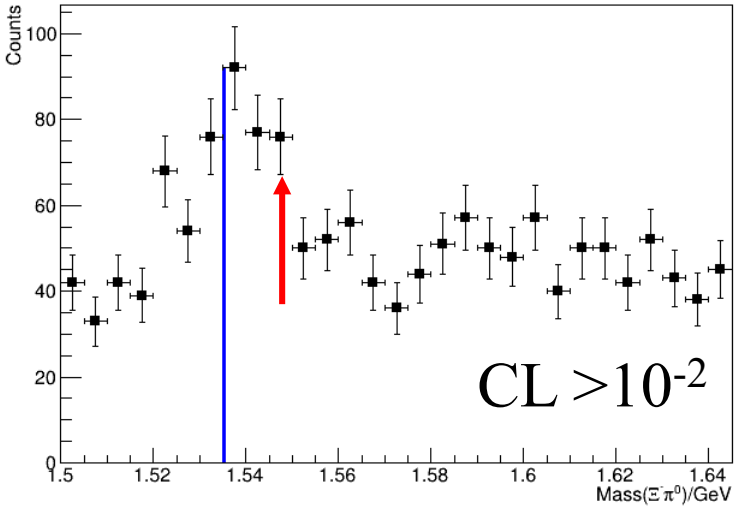
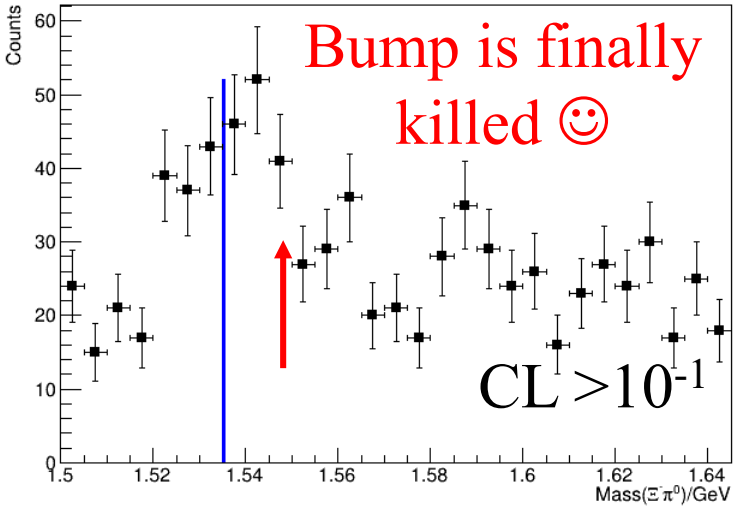
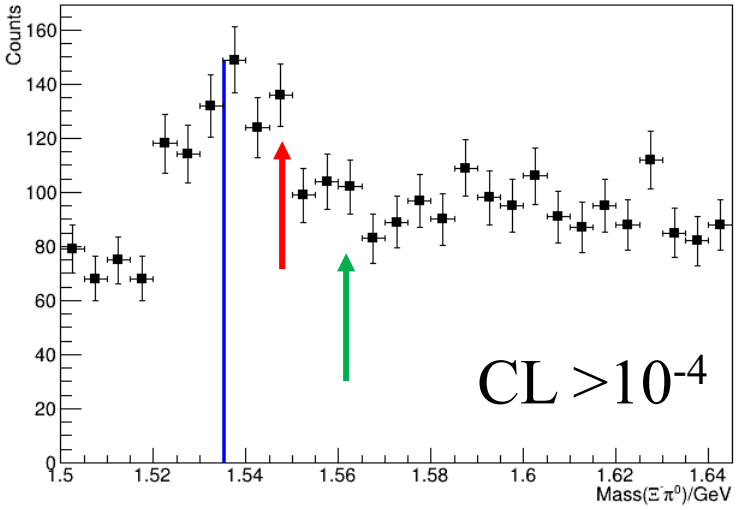
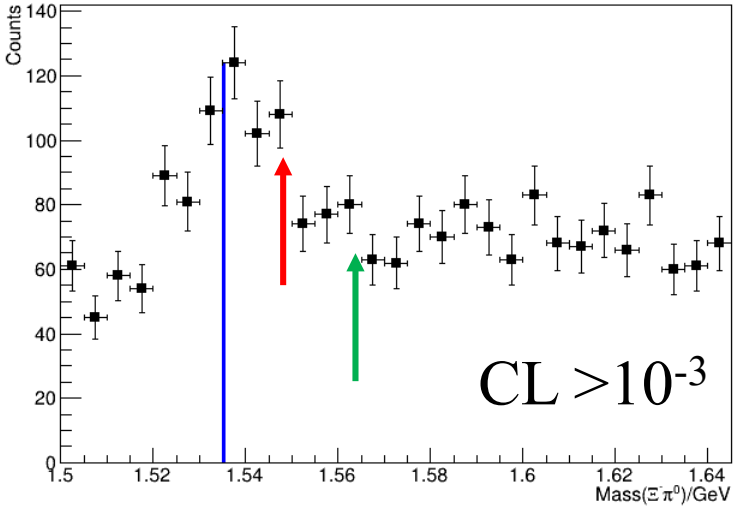
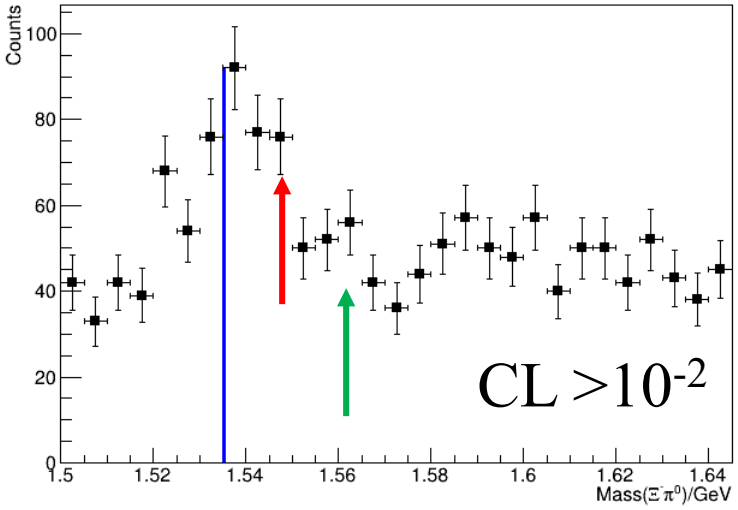

Counts
Mass($\Xi^-\pi^0$)/GeV
CL >10^{-2}

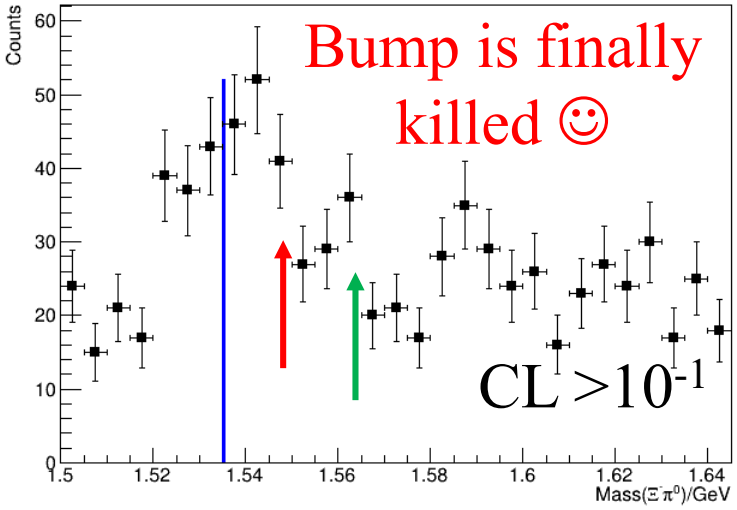

Counts
Mass($\Xi^-\pi^0$)/GeV
Bump is finally killed ☺
CL >10^{-1}

Ξ^* Analysis









- But another bump features starts to cause problems when fitting $\Xi(1530)$ ☹

$\Xi\pi$ Bump fitting in the region of the $\Xi(1530)$ and $\Xi(1620)$

- Goals:
  - Measure the $\Xi(1530)$
  - Measure the $\Xi(1620)$

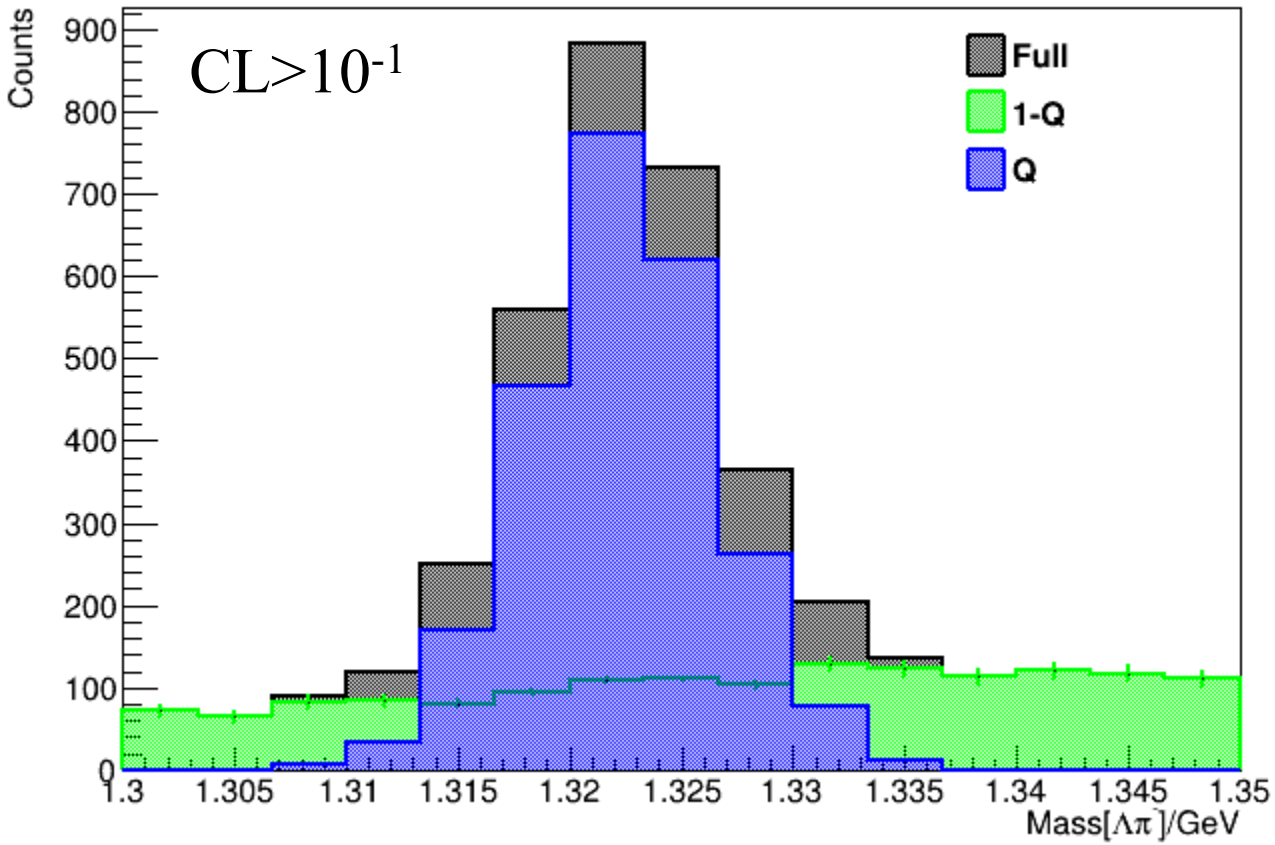
- Utilizing Q-factors to reduce background

Ξ^* Analysis: Q_{Ξ} factors

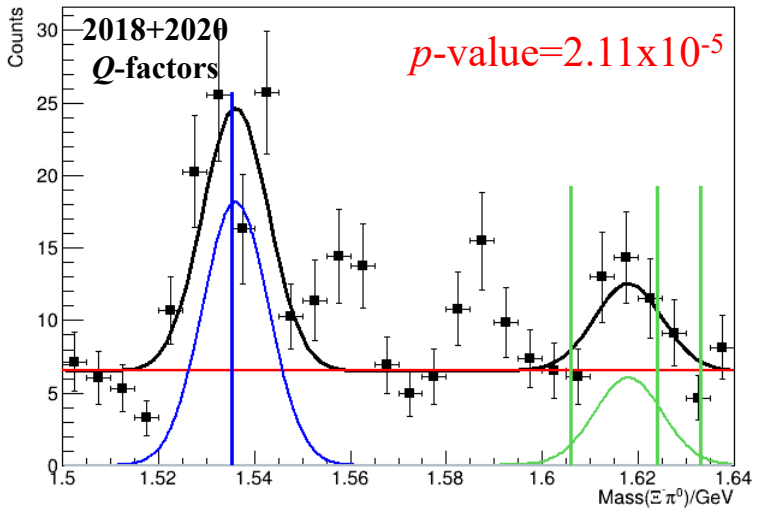
Q-factors:

- Under development
- Fitting mass[$\Lambda\pi^-$] to mass of ground state Ξ^-
- Currently only using mass[$\Lambda\pi^-\pi^0$] to determine "distance" between events
- Using closest 40 events for Q-factor determination

Ξ^* Analysis: Q_Ξ factors applied to mass[$\Lambda\pi^-$]

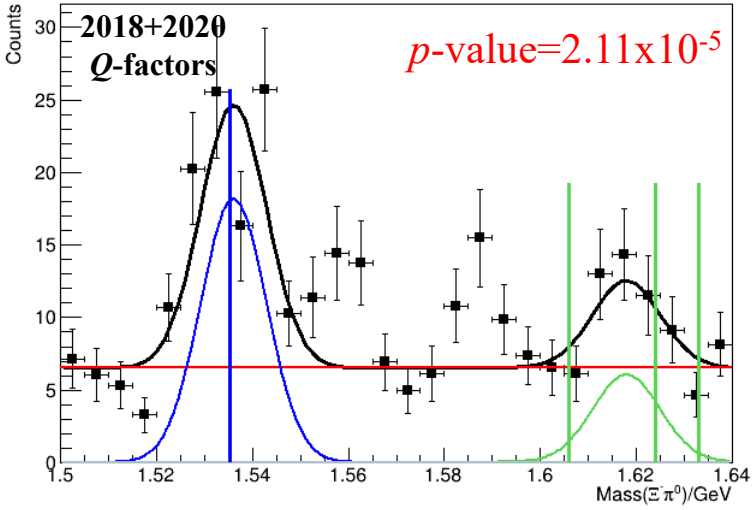


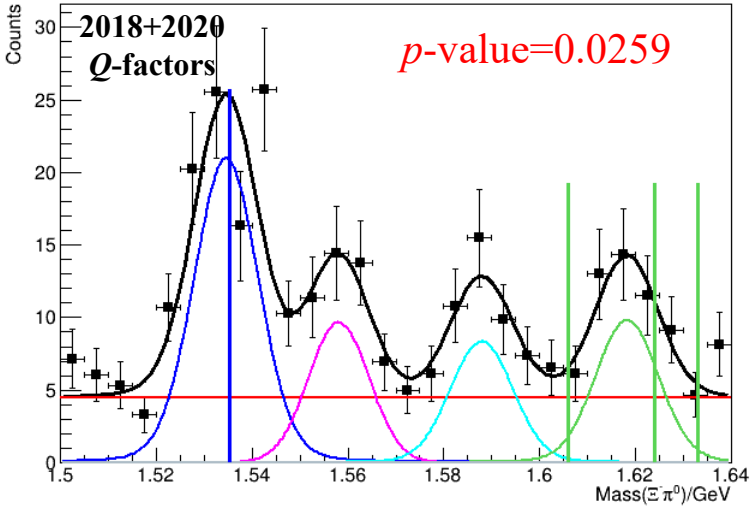
$\Xi\pi$ Bump fitting in the region of the $\Xi(1530)$ and $\Xi(1620)$



- Cuts: CL > 0.1, best combo, incident photon in-time.
- Blue line = PDG center of $\Xi(1530)$
- Green lines = Center of the $\Xi(1620)$ as reported by the three prior known measurements

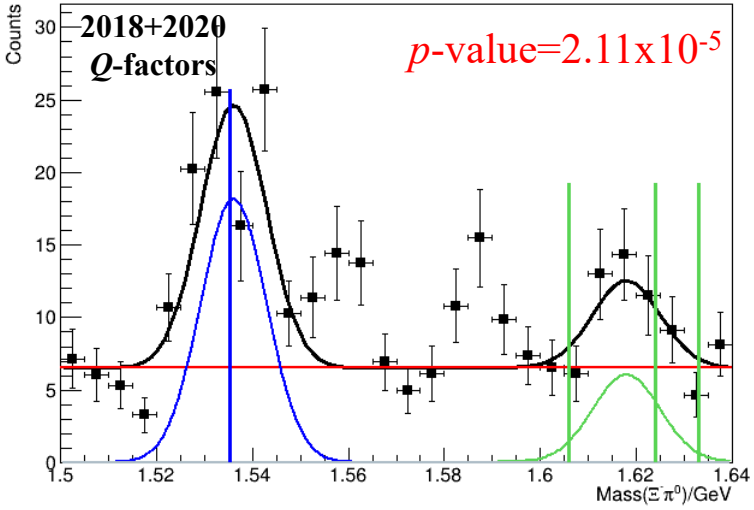
$\Xi\pi$ Bump fitting in the region of the $\Xi(1530)$ and $\Xi(1620)$

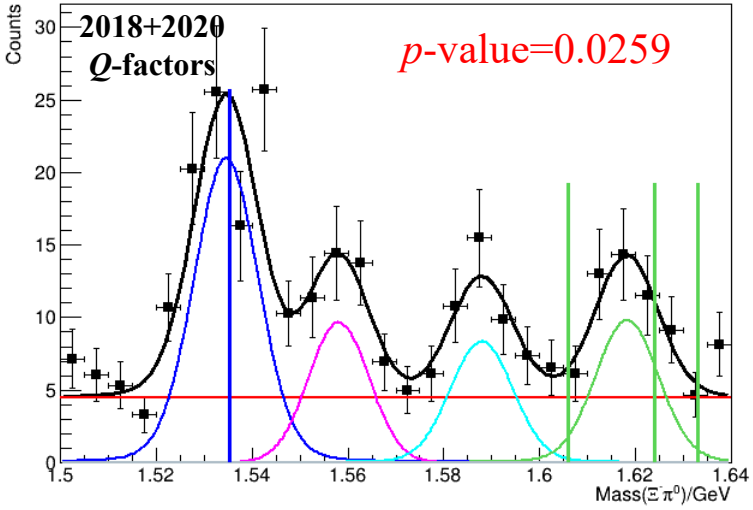




- Cuts: CL > 0.1, best combo, incident photon in-time.
- Blue line = PDG center of $\Xi(1530)$
- Green lines = Center of the $\Xi(1620)$ as reported by the three prior known measurements
- Don't know what causes the double bump feature ☹

$\Xi\pi$ Bump fitting in the region of the $\Xi(1530)$ and $\Xi(1620)$





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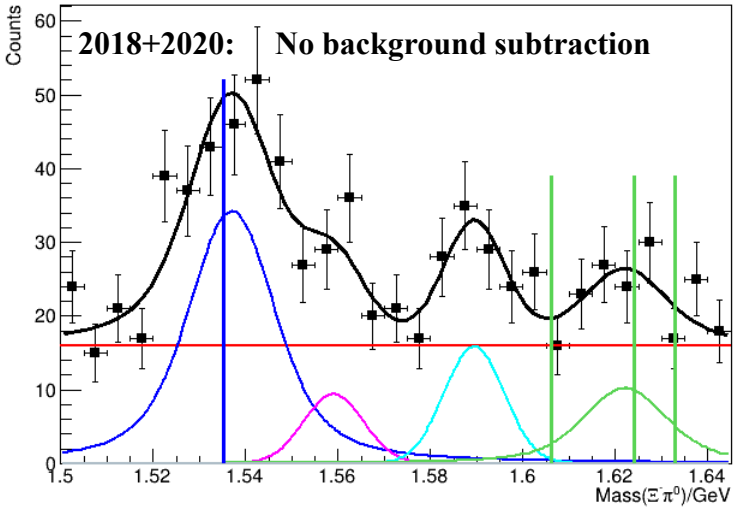

$\Xi(1530)$ lineshape study

In progress:

- Efficiency correct the yields
- Reduce background through χ^2 comparisons of primary to secondary reactions

Title

Title