Contamination Study for $\gamma\, p \to K^+\, K^+\, \Xi^{-*}$

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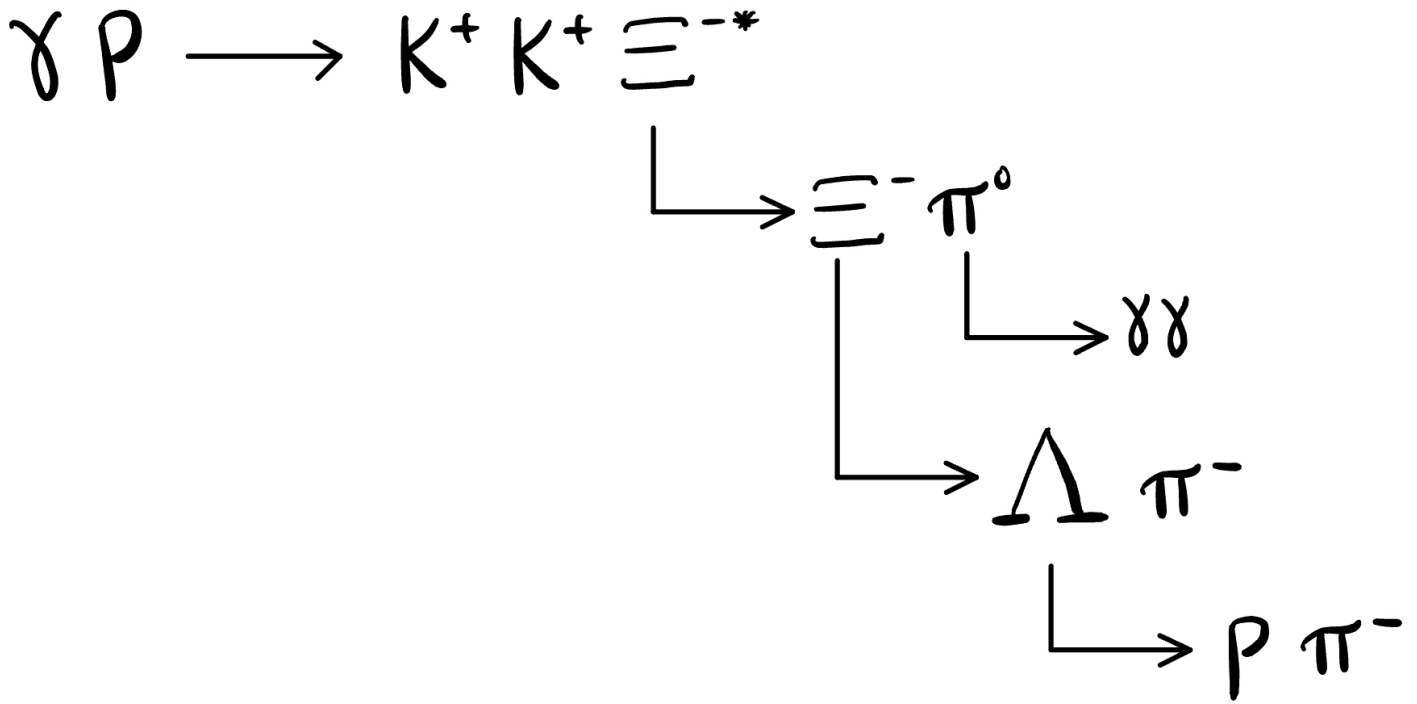
Presentation Overview

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

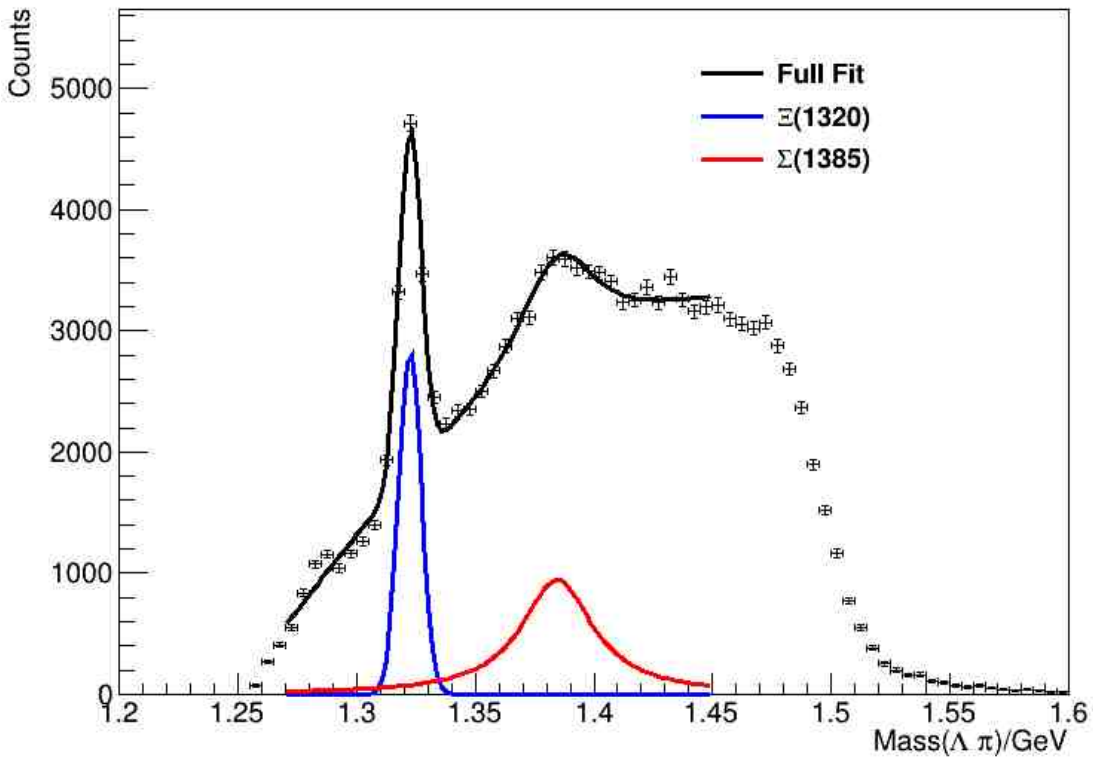


FINAL STATE PARTICLES: $K^+\, K^+\, \gamma\, \gamma\, p\, \pi^-\, \pi^-$

Cuts and Data Used

- Considering:
  - Best combo
  - Kinematic fitter $\rightarrow$ fits for $K^+ \; K^+ \; \Xi^- \; \pi^0$ where mass of Ξ^- is not constrained
- Data included:
  - Spring 2018
  - Fall 2019 - Spring 2020

Feature That Looks Like a $\Sigma(1385)$ Seen in Data

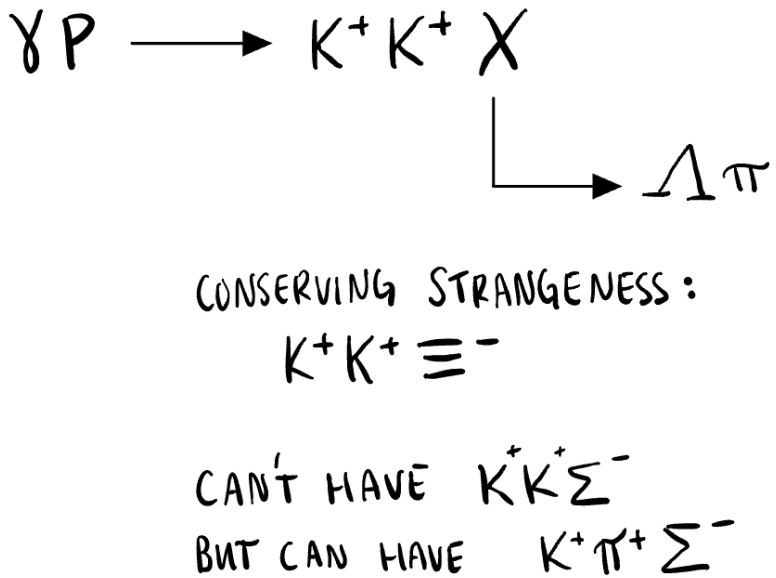


- Seen by FSU
- $\Sigma(1385)$?

Conserving Strangeness

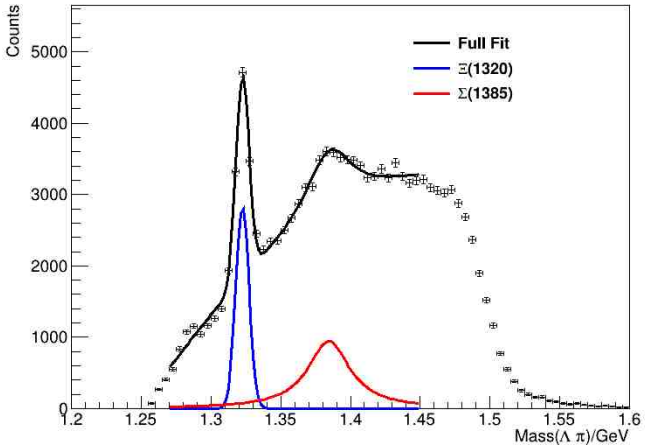
Our real reaction is $\gamma\, p \rightarrow K^{+}\, K^{+}\, \Xi^{-*}$ which doesn't allow for a Σ

How a Σ Could be Seen

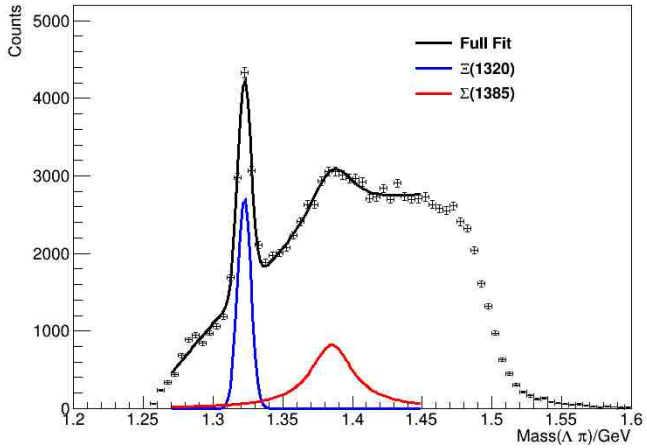


- A Σ would have to have K^+ π^+ Σ^- π^0
- The π^+ was seen as a K^+

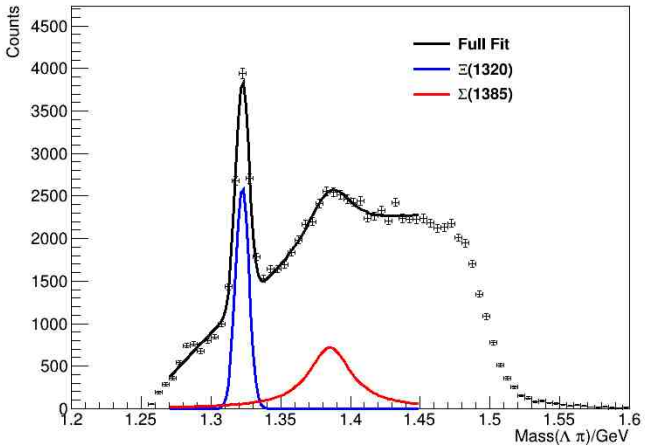
How Σ is Influenced by Confidence Level Cuts



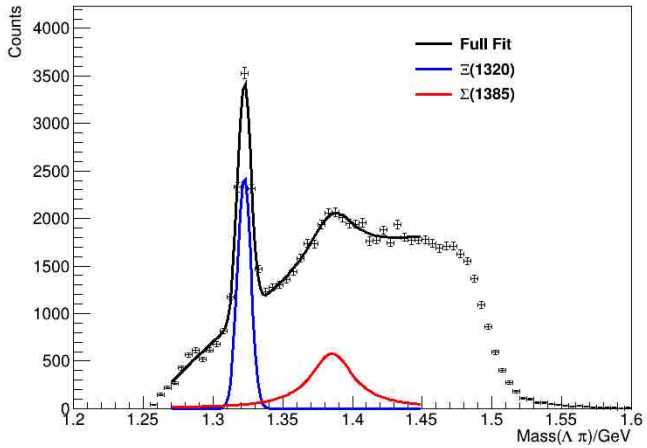
(a) 10^{-8}



(b) 10^{-7}

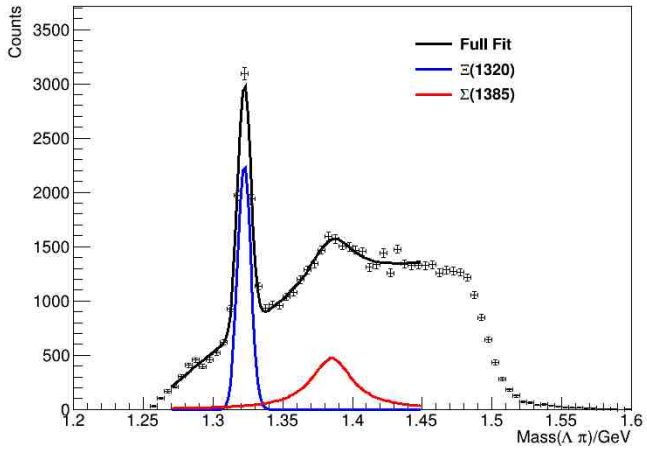


(c) 10^{-6}

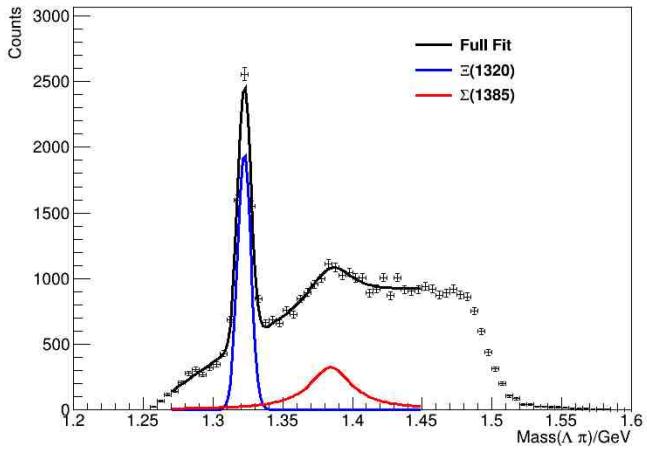


(d) 10^{-5}

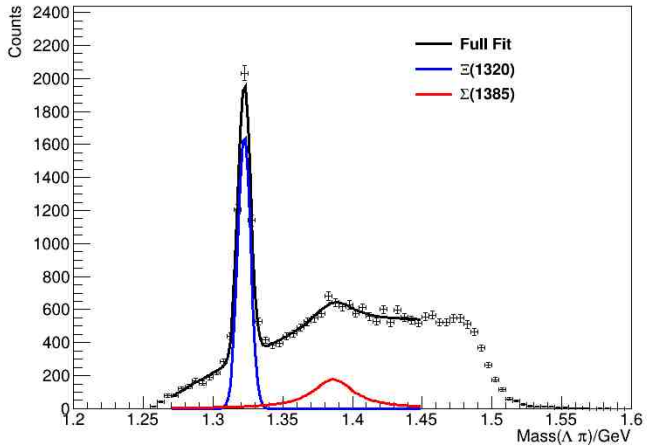
Fraction of Σ to Ξ Gets Smaller



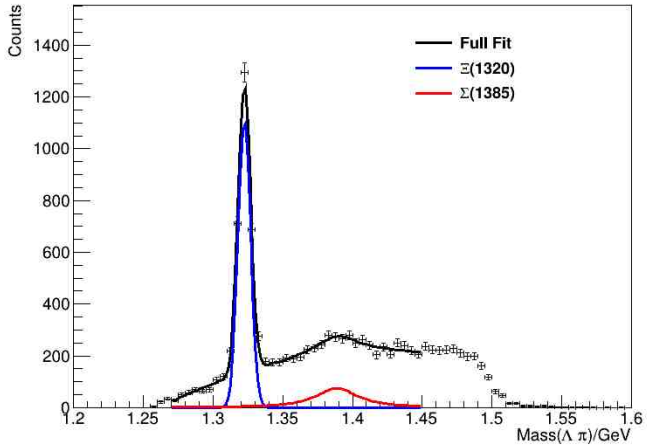
(a) 10^{-4}



(b) 10^{-3}



(c) 10^{-2}

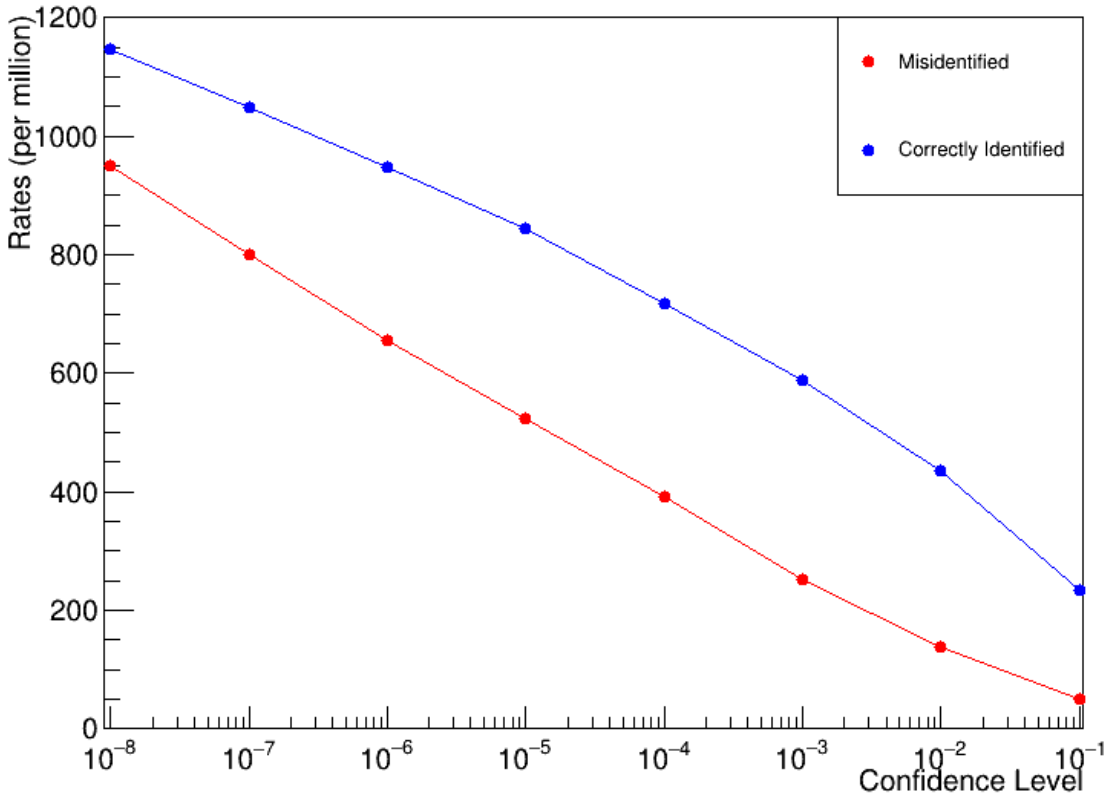


(d) 10^{-1}

Monte Carlo

- Testing leakage hypothesis using Monte Carlo
- Reaction for Ξ
  - Generated 5.6 million phase space events
- Reaction for Σ
  - Generated 2.4 million phase space events
- Looked for number of surviving events per million thrown events $\rightarrow$ CL cut dependent

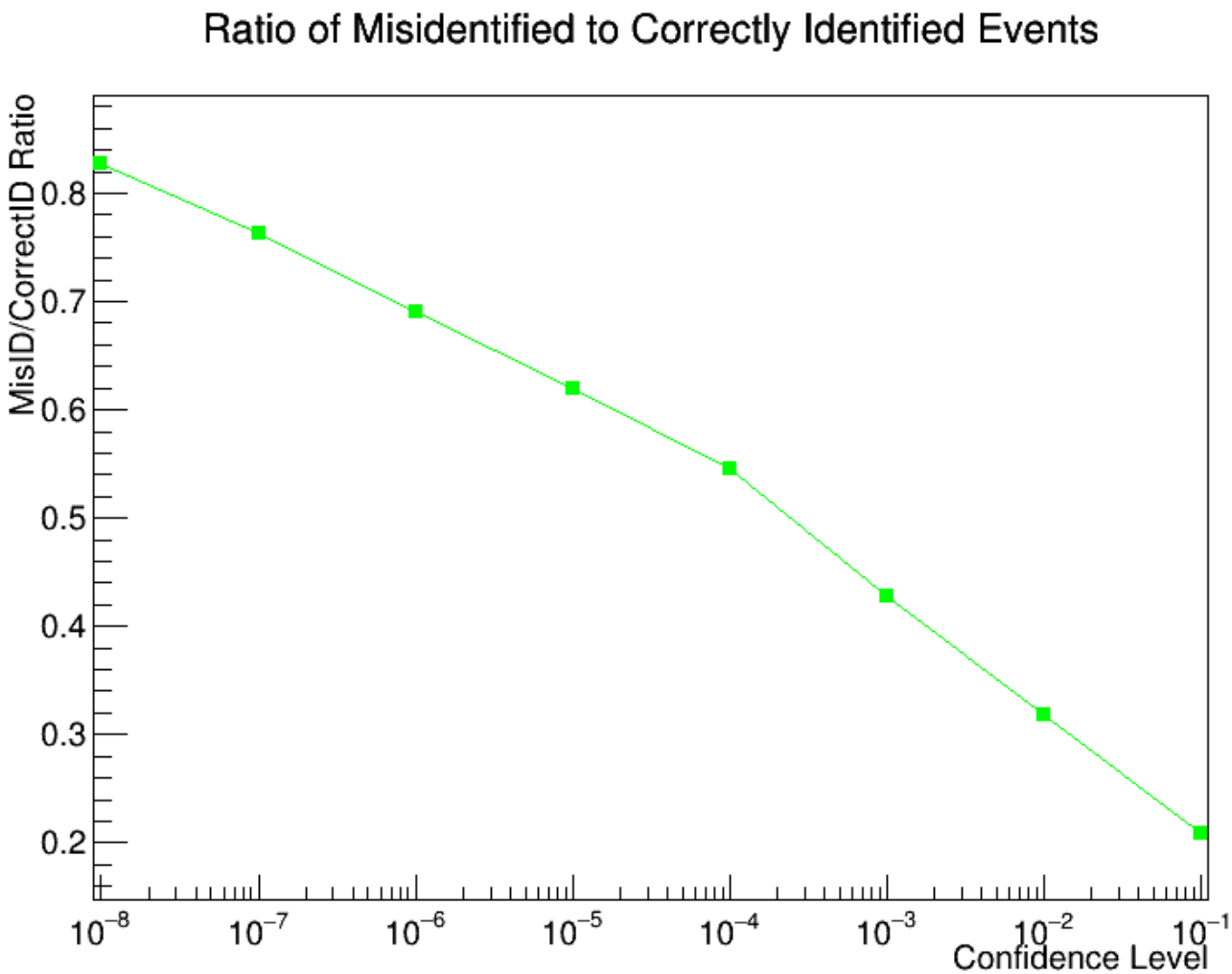
Misidentified and Correctly Identified Events



As we move our CL cut, we get fewer of our misidentified events

Note: Different types $\rightarrow$ *Ξ type reaction identified as Ξ vs. Σ type reaction we identify as Ξ*

Misidentified Divided by Correctly Identified Events



- From here forward $\rightarrow$ calling this a $\Sigma(1385)$