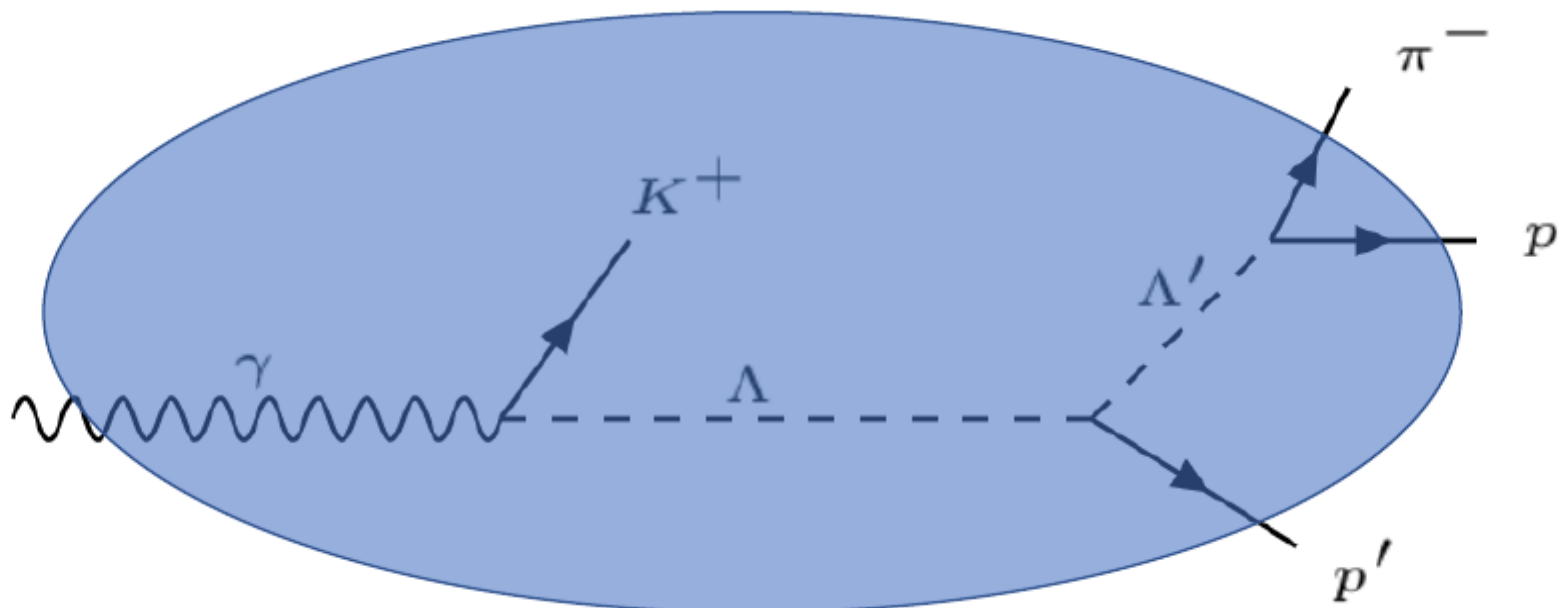


Update on Lambda-Nucleon Scattering with g_{12}

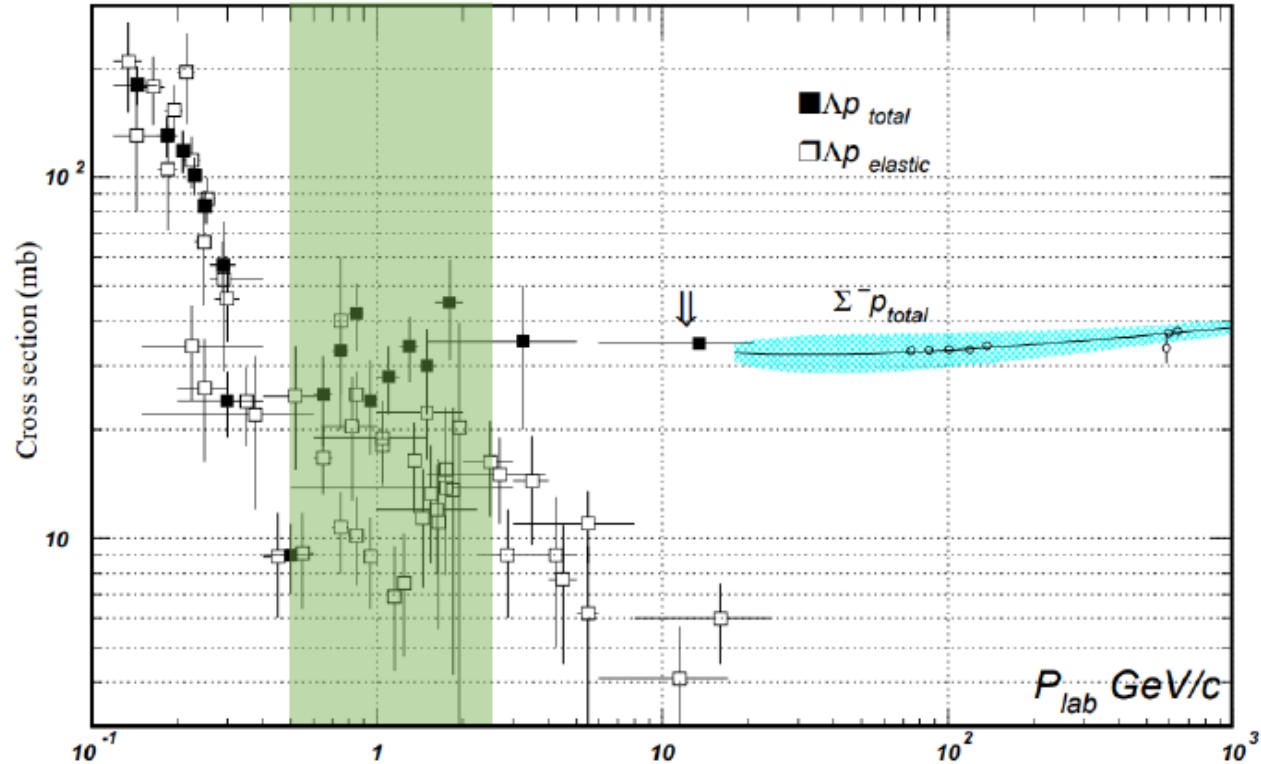
Reaction



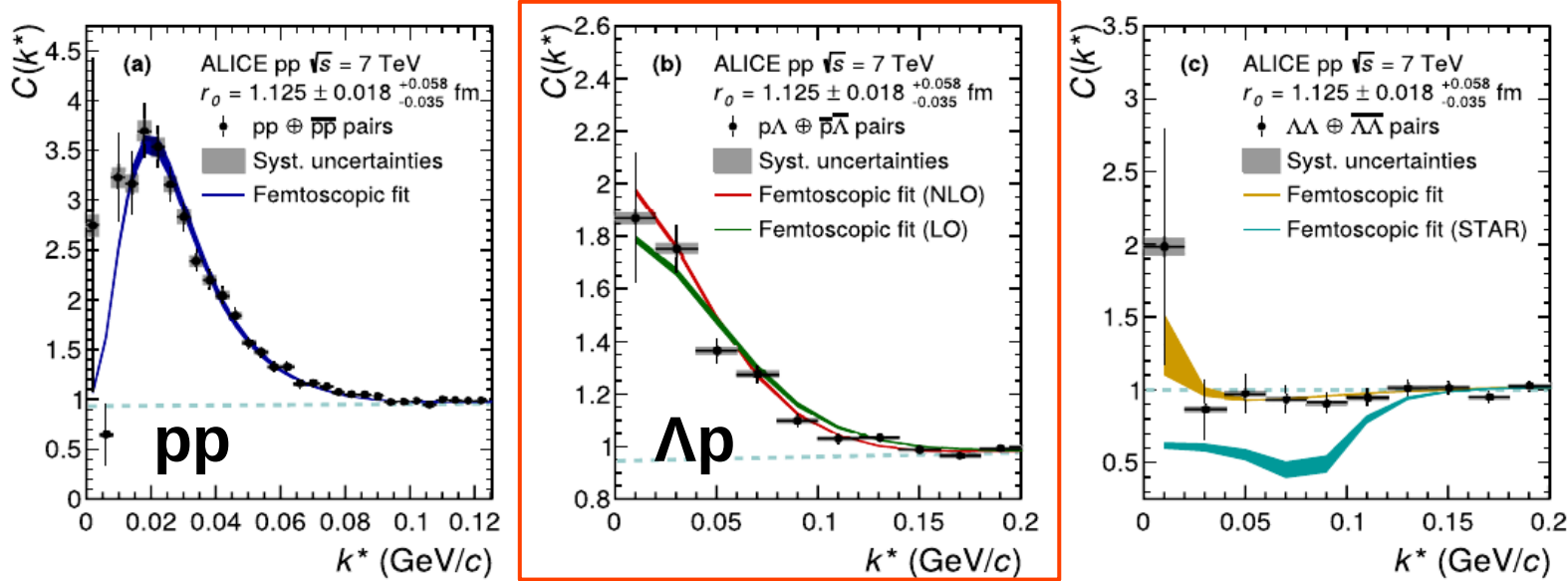
- p, p', π^- detected
- $\Lambda p'$ scatter elastically

Motivation

- Currently very little data for ΛN scattering compared to other elastic scattering processes (NN, KN or πN).
-
- ΛN scattering is important to understand the interior of neutron stars. (Haidenbauer and Meissner, PRC 72, 044005 (2005).)



Motivation: RHIC Data



$$C(\mathbf{p}_1, \mathbf{p}_2) \equiv \frac{P(\mathbf{p}_1, \mathbf{p}_2)}{P(\mathbf{p}_1) \cdot P(\mathbf{p}_2)}$$

\mathbf{k}^* : relative momentum of pair

S. Acharya *et al.* (ALICE Collaboration), Phys Rev C, **99**, 024001 (2019).

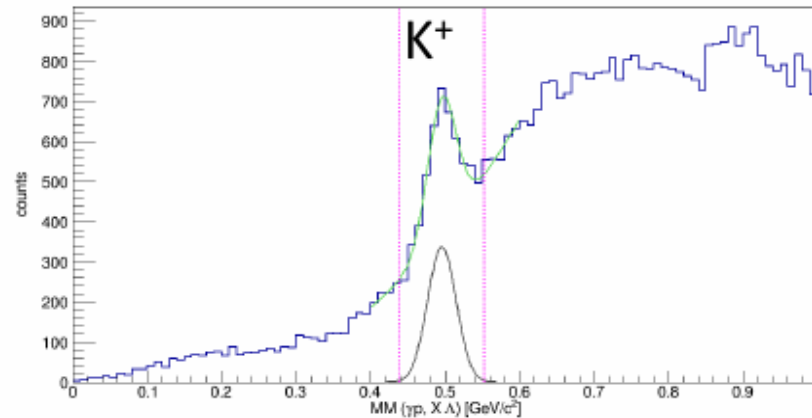
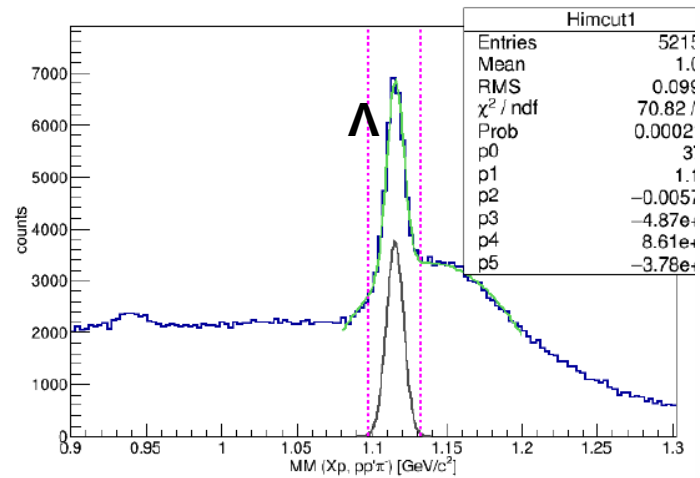
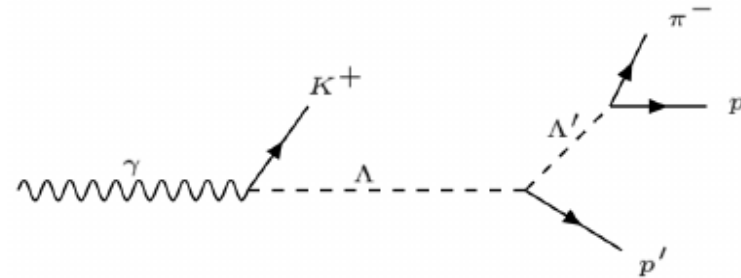
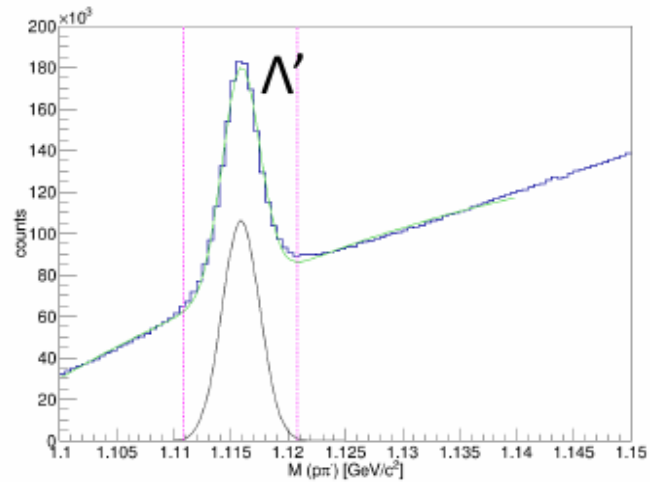
- Correlation function relies on the cross section of Λp
- Our analysis will help improve these results

Procedure Analysis

$$\gamma p \rightarrow K^+ \Lambda \quad \begin{array}{c} \downarrow \\ \longrightarrow \end{array} \Lambda p \rightarrow \Lambda' p' \rightarrow p' p \pi^-$$

- Data from g12
- Reconstruct the Λ' mass: $M(\Lambda') = M(p\pi^-)$
- Reconstruct incident Λ
- Identify K^+ by missing mass

Data



Cross Section

$$\frac{d\sigma}{d\cos(\theta)}(E) = \frac{Y}{A * \mathcal{L} * \text{b.r.} * \Delta \cos(\theta)}$$

Y: Yield

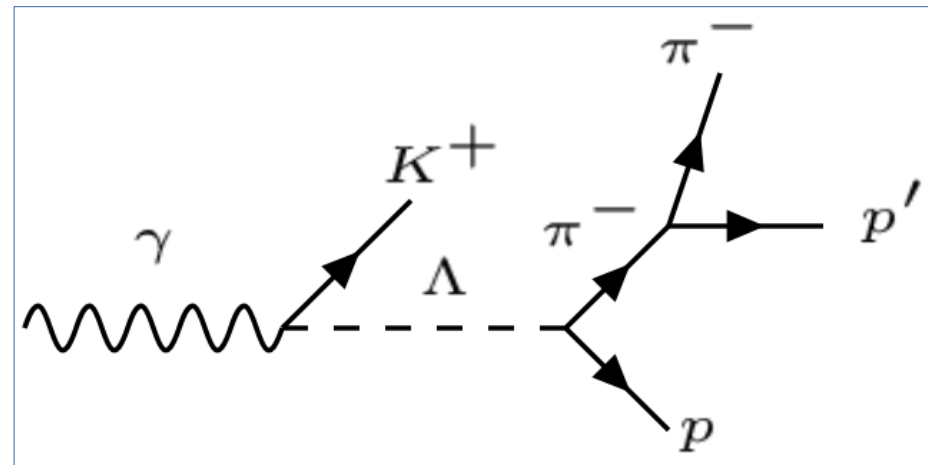
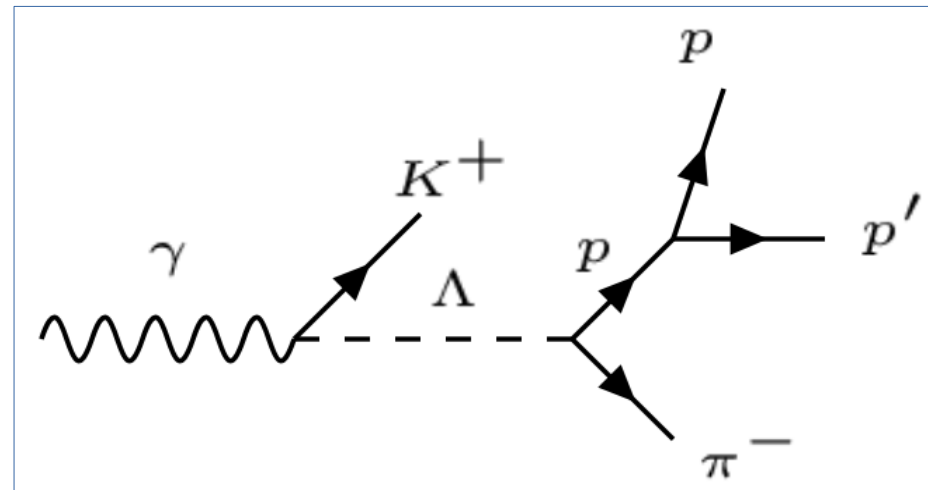
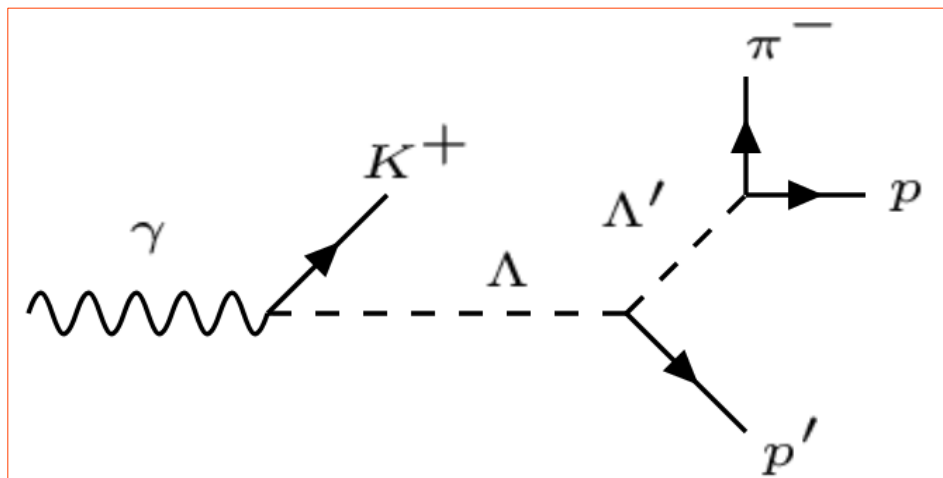
A: Acceptance

\mathcal{L} : Luminosity

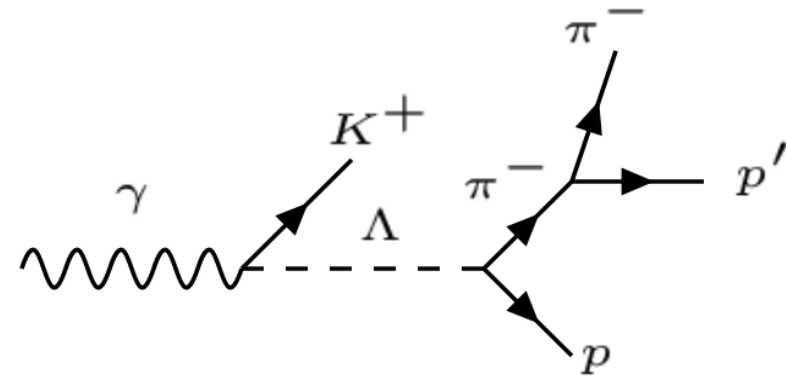
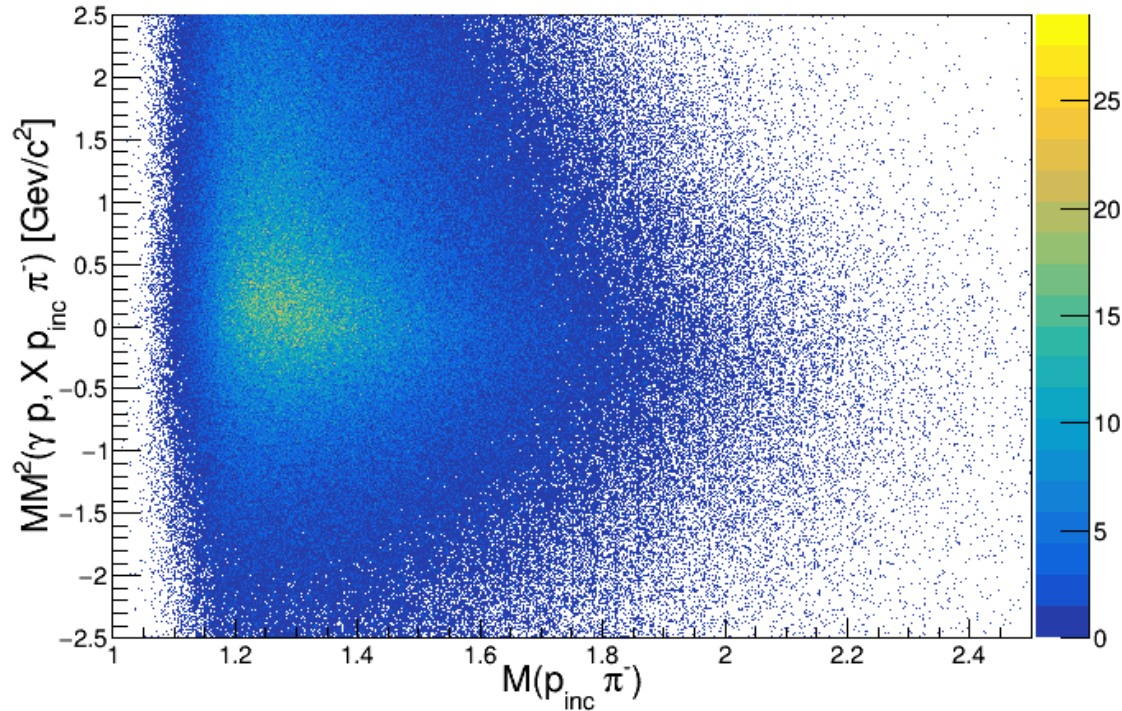
b.r: Branching ratio (for $p\pi^-$)

$\frac{d\sigma}{d\cos(\theta)}(E)$: Energy dependent cross section

Additional Cuts

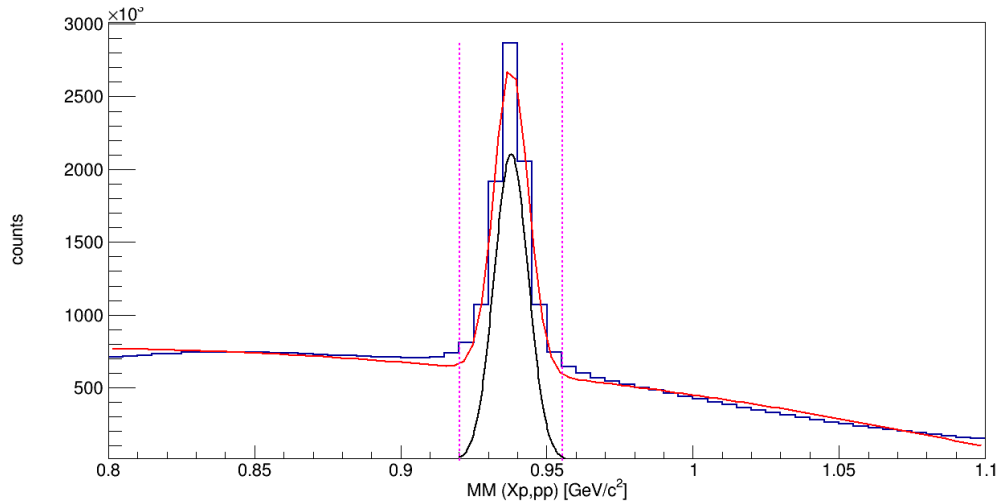


Additional Cuts

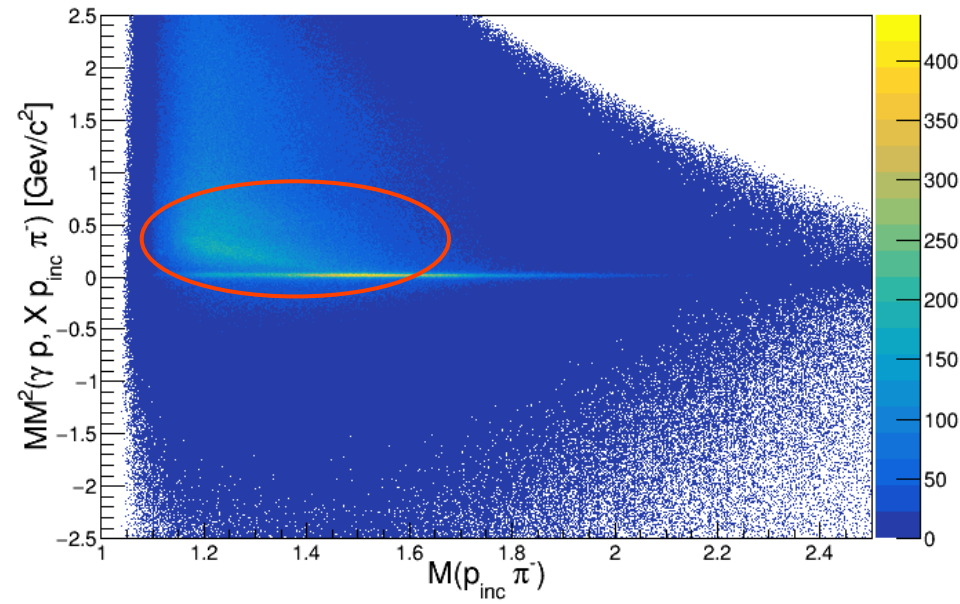
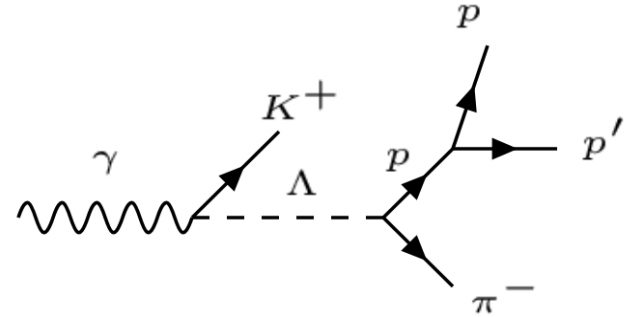


Events need to be removed for incident p events but not for incident π^-

Additional Cuts

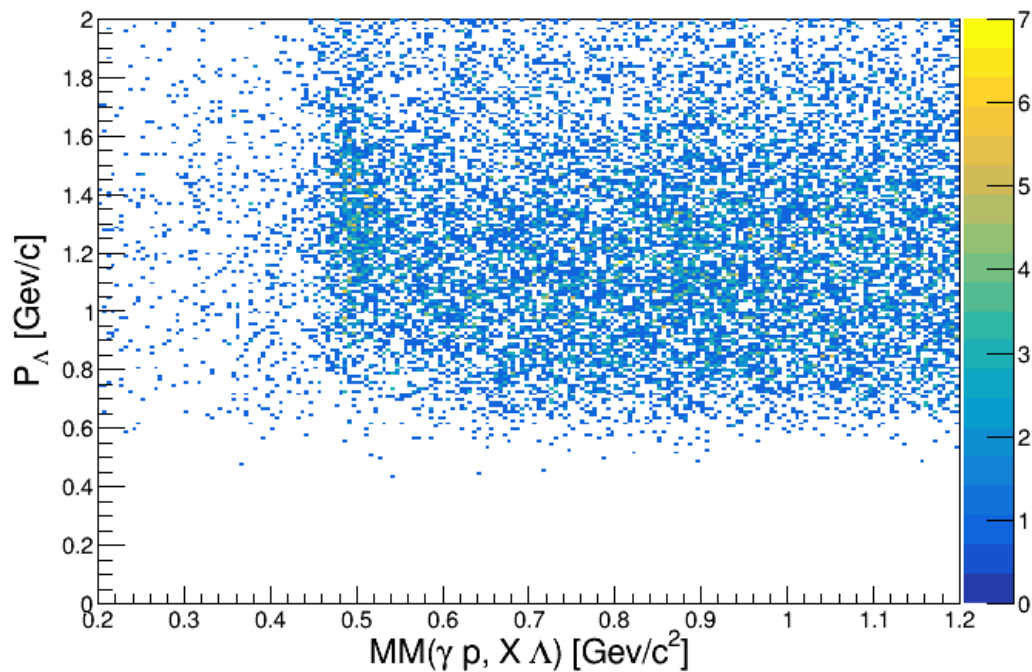


Events need to be removed
for incident p events but not
for incident π^-



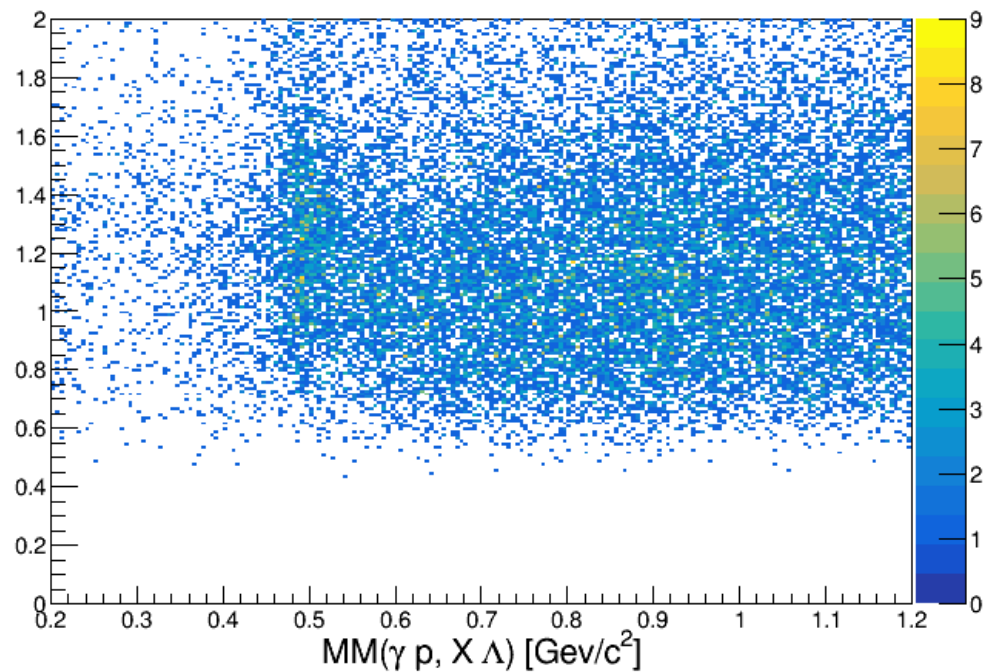
Additional Cuts

Cuts around incident p and π^-



Now

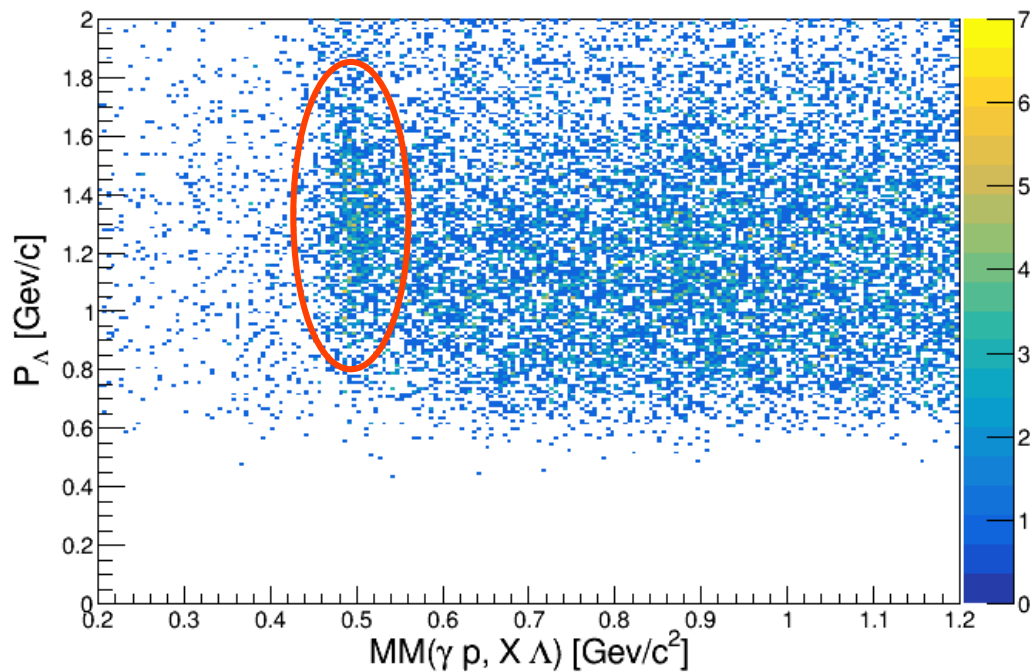
No cuts around incident p and π^-



Previous

Additional Cuts

Cuts around incident p and π^-

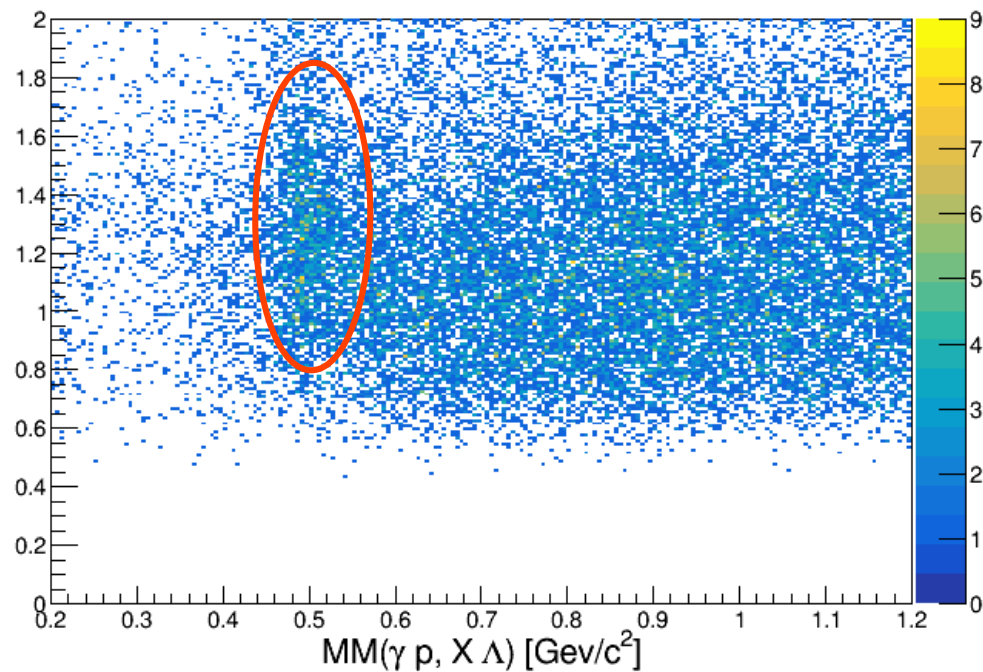


~4887 events

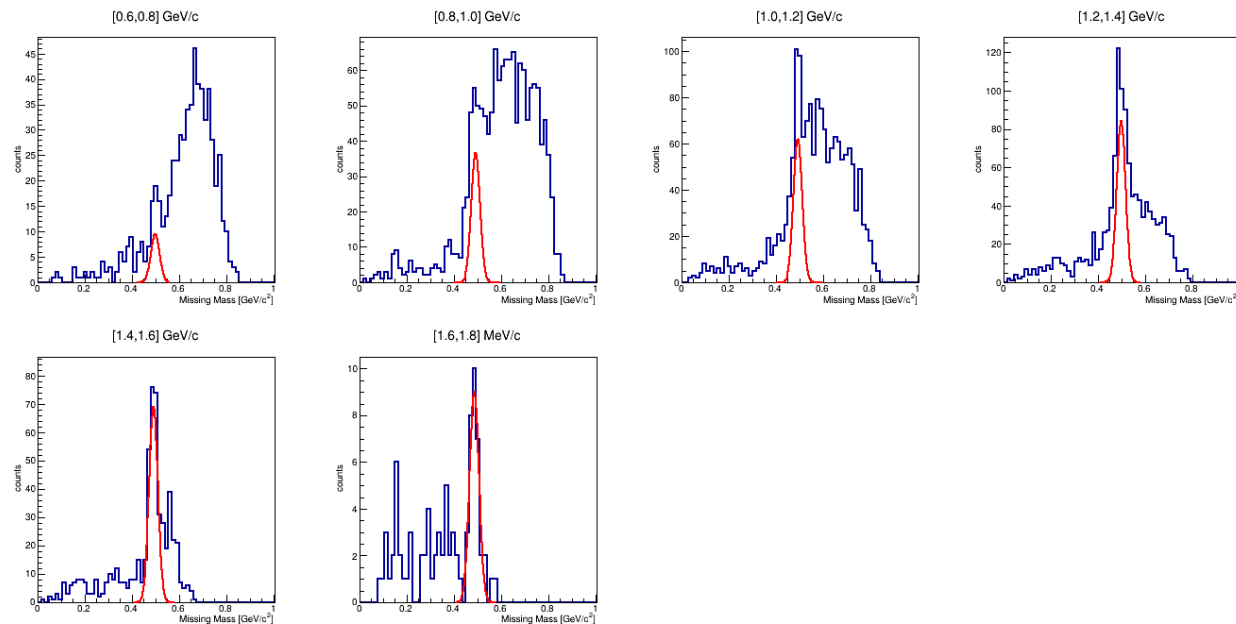


~2622 events

No cuts around incident p and π^-

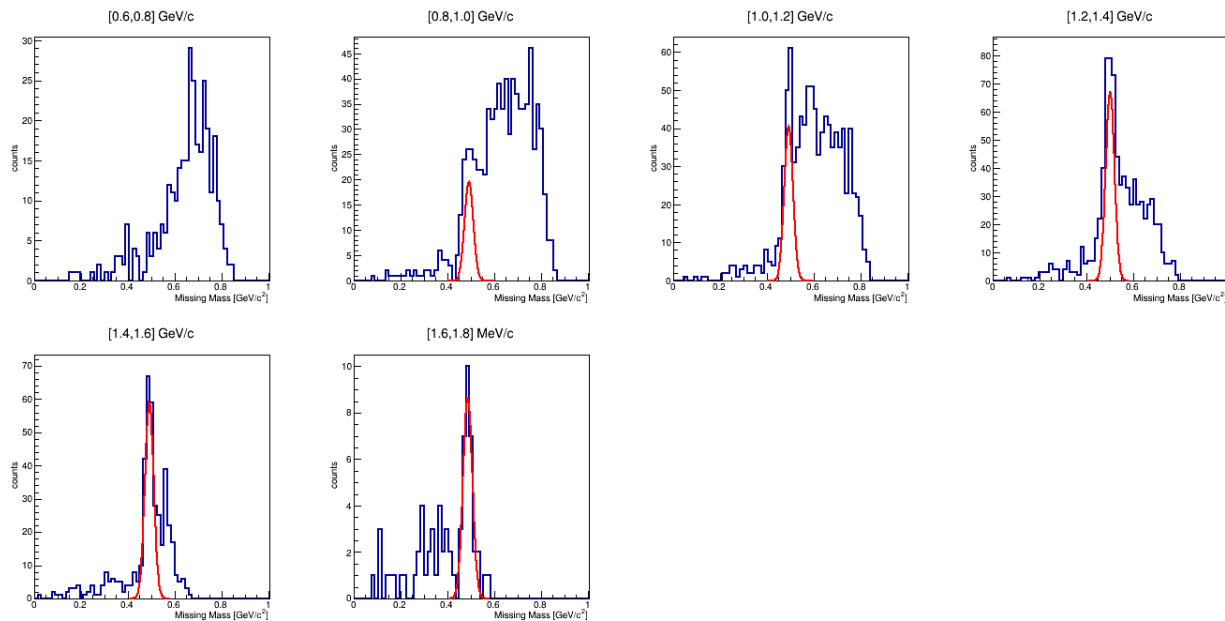


Previous Yields



- Clear peaks for each momentum bin

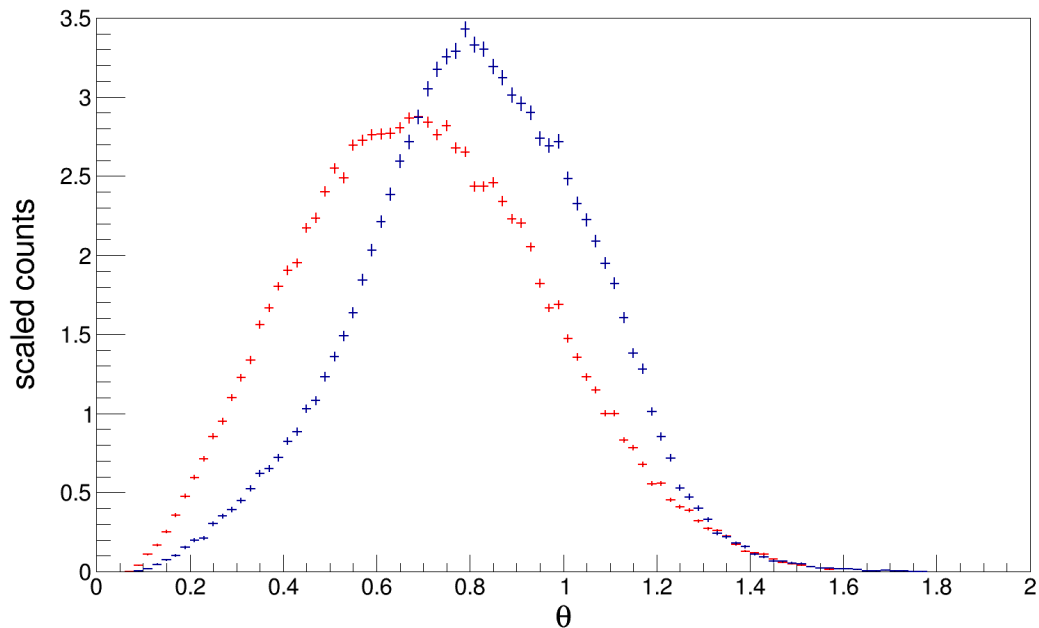
New Yields



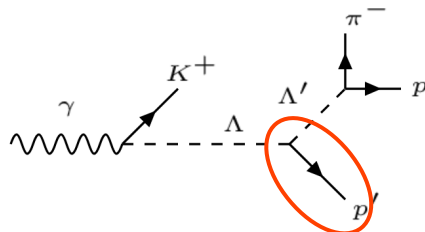
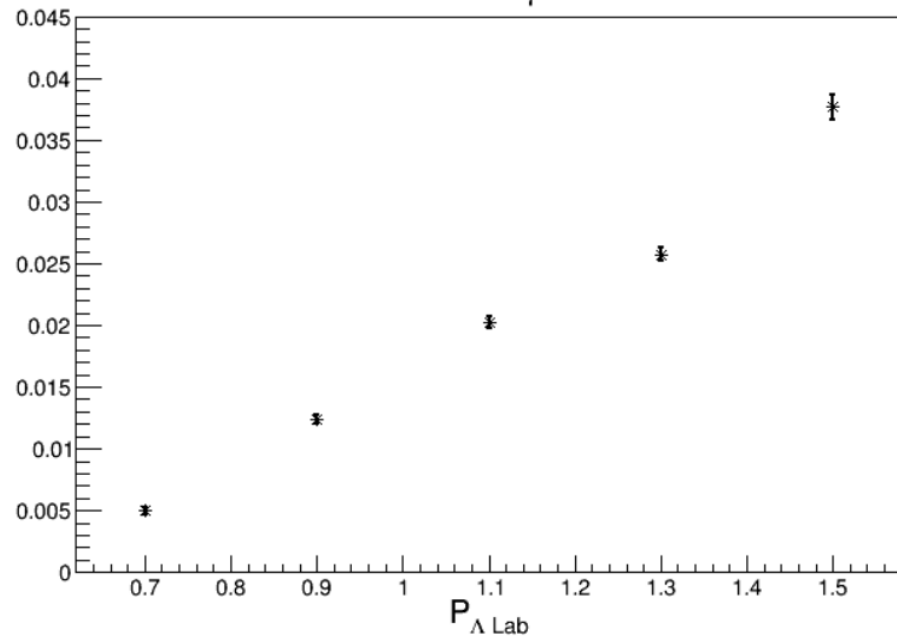
- Note that we lose a yield for momentum bin [0.6, 0.8]

Update on Acceptance

θ of Data (Blue) and MC (Red) before correction

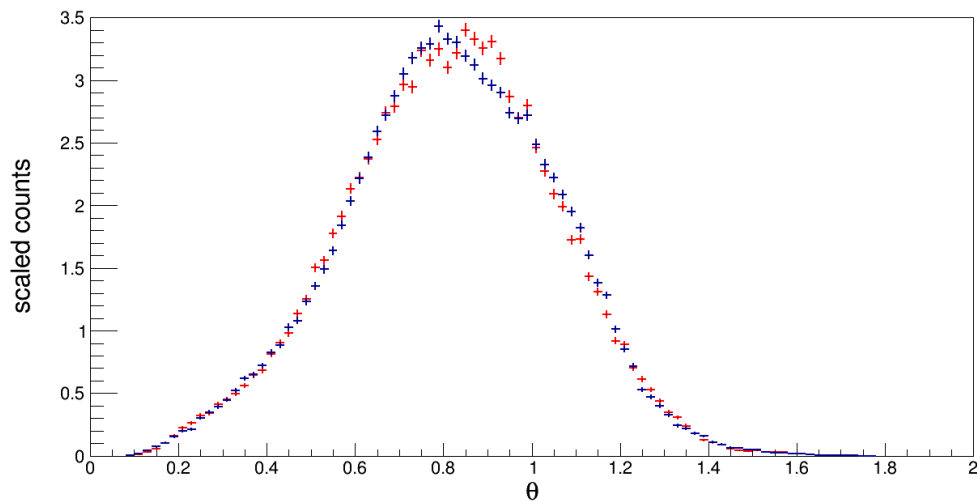


Acceptance (E_γ [1.2,1.6])

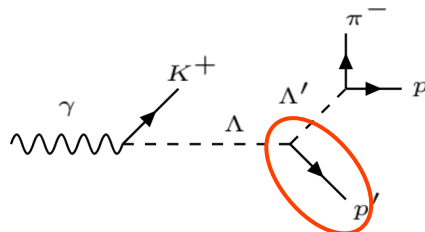
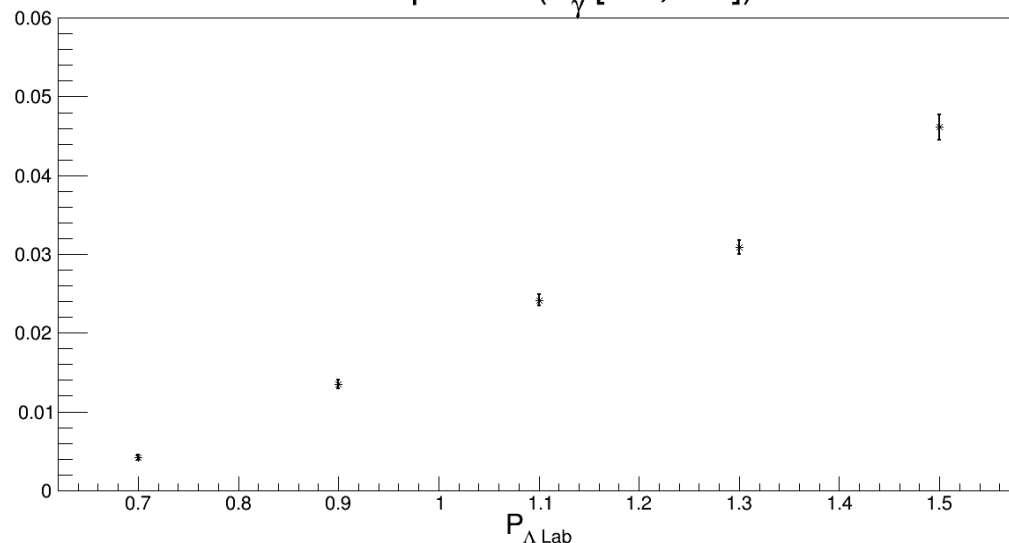


Update on Acceptance

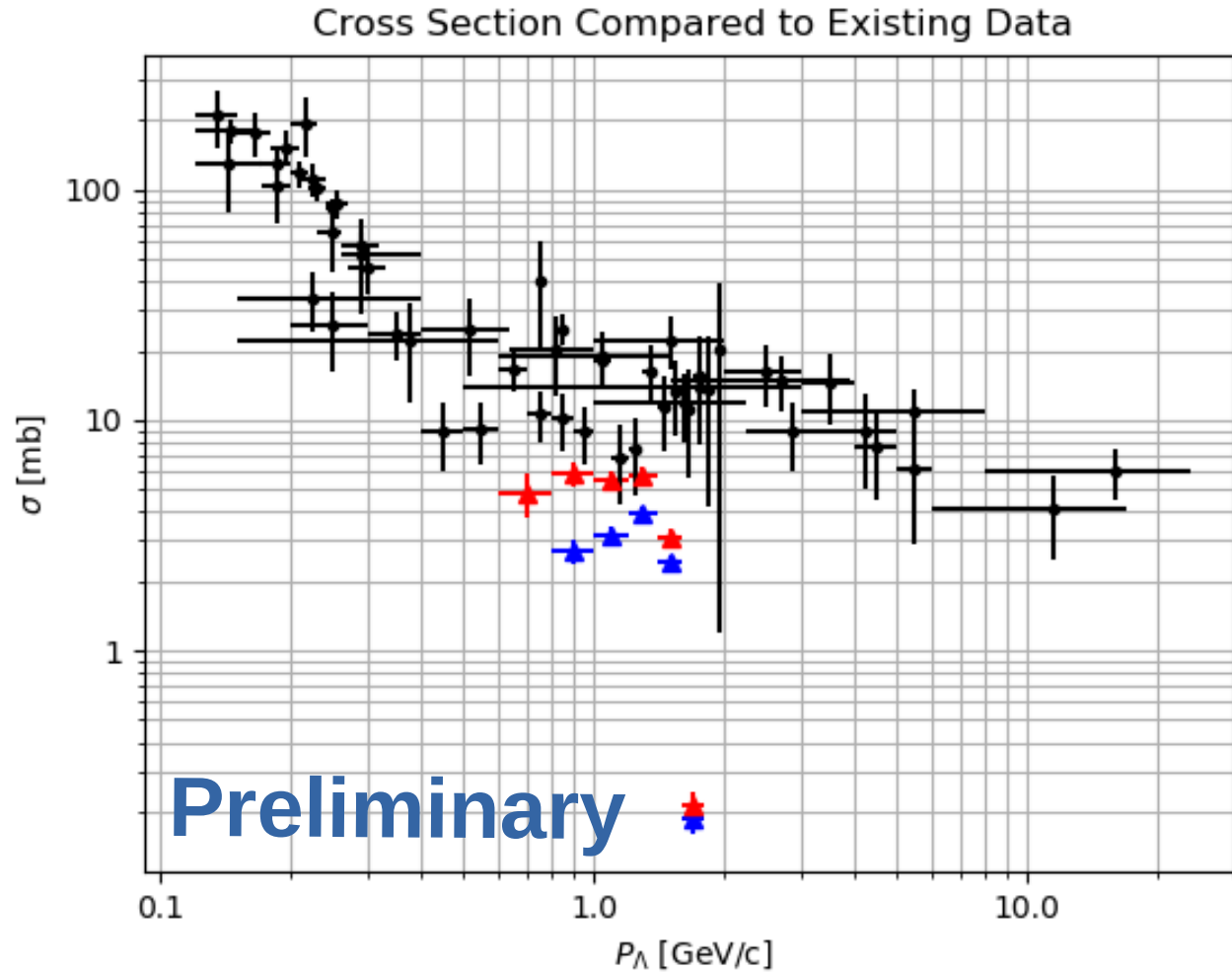
θ of Data (Blue) and MC (Red) after correction



Acceptance (E_γ [1.2, 1.6])



Results

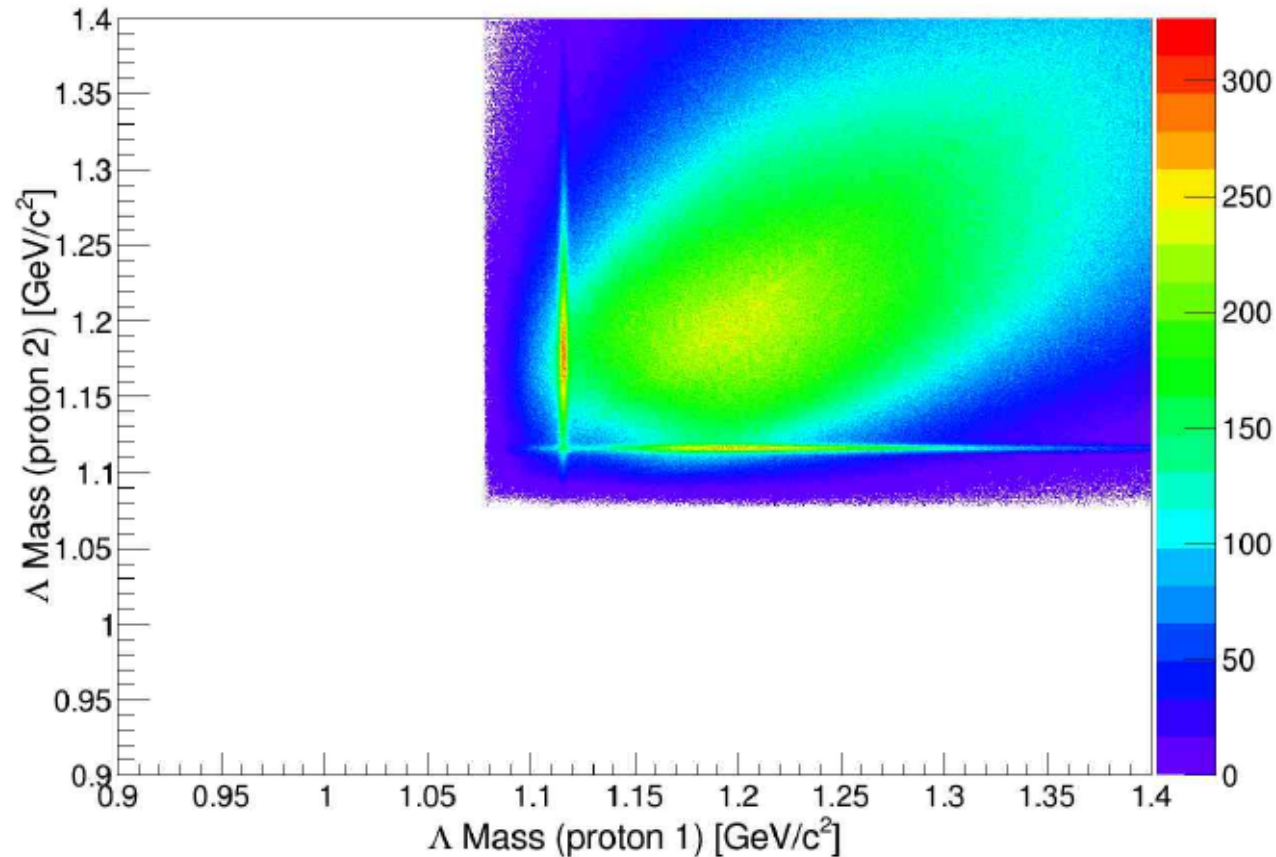


Red: Previous Results

Blue: Current results

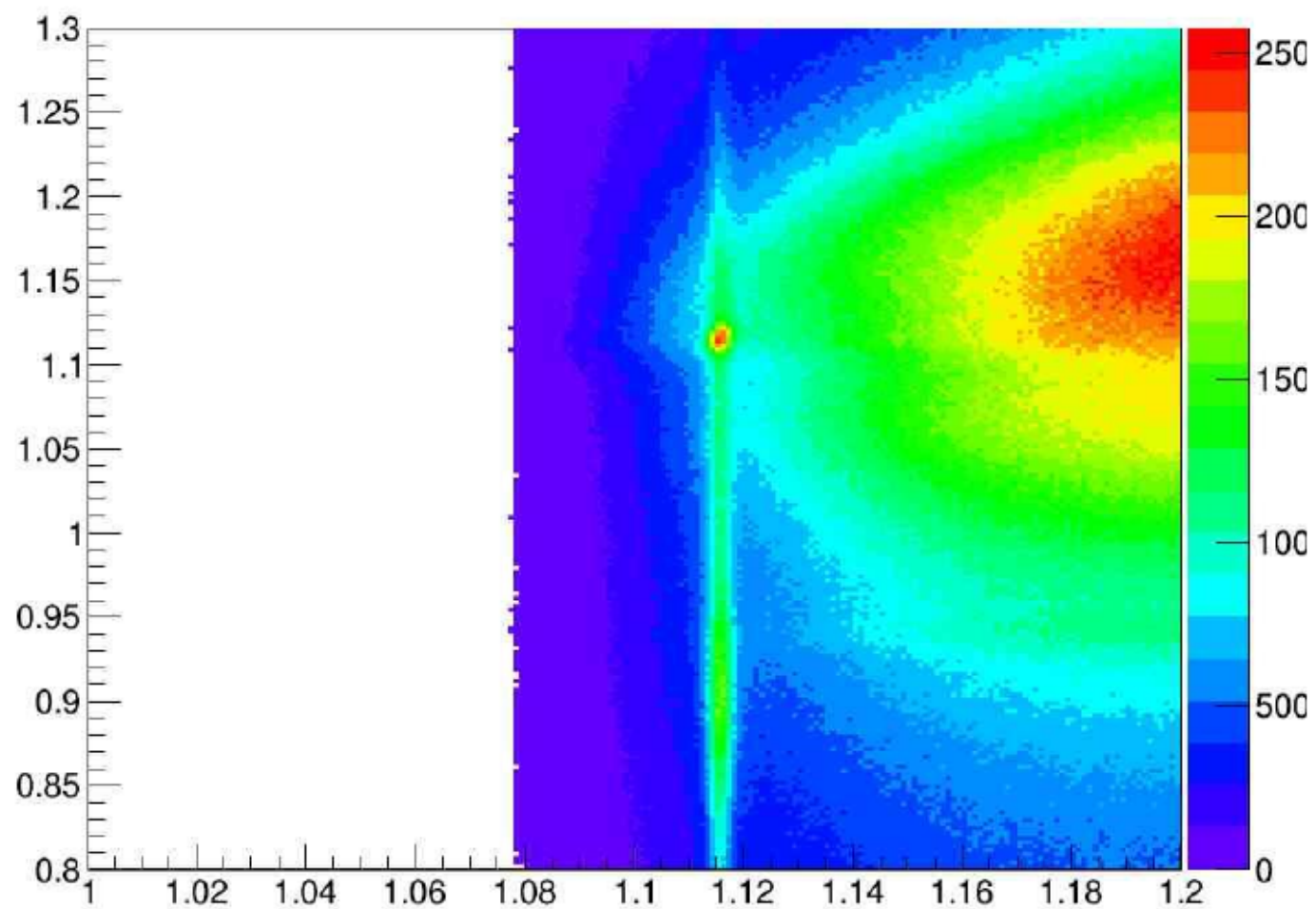
Questions

Proton Identification (EXTRA)



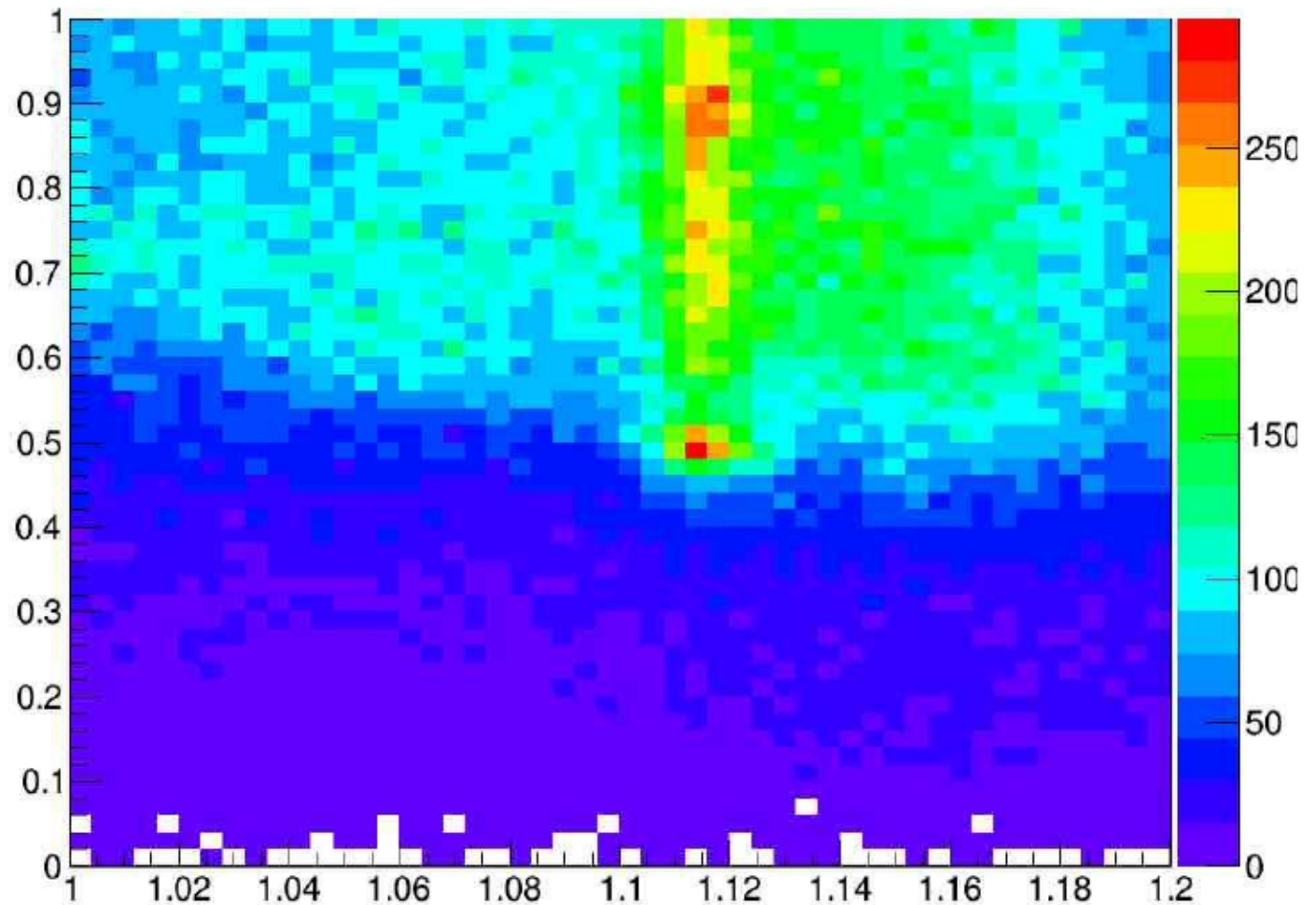
Incident Mass vs. Lambda Mass

Extra

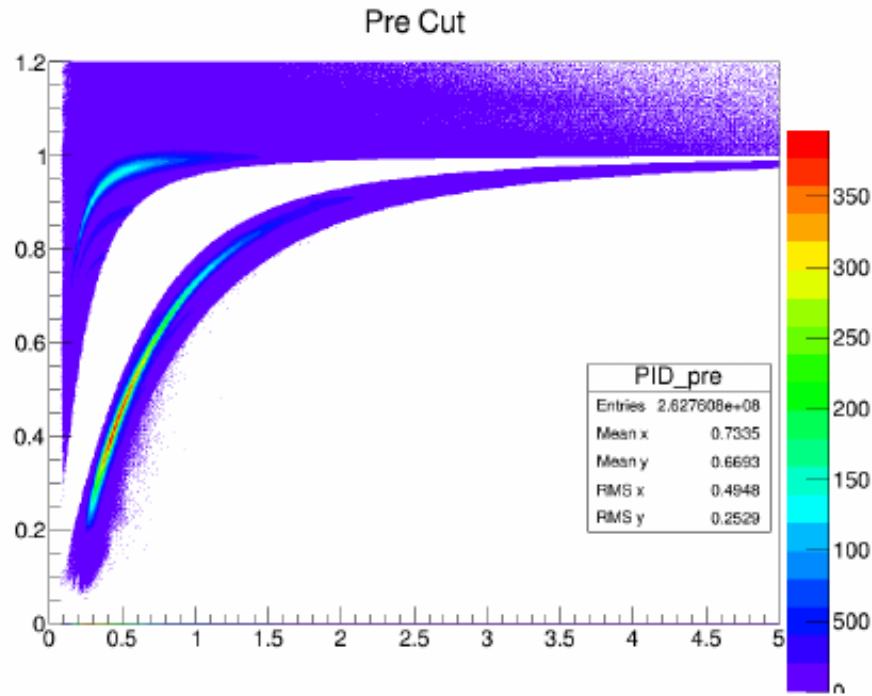


Missing Mass vs. Incident Mass

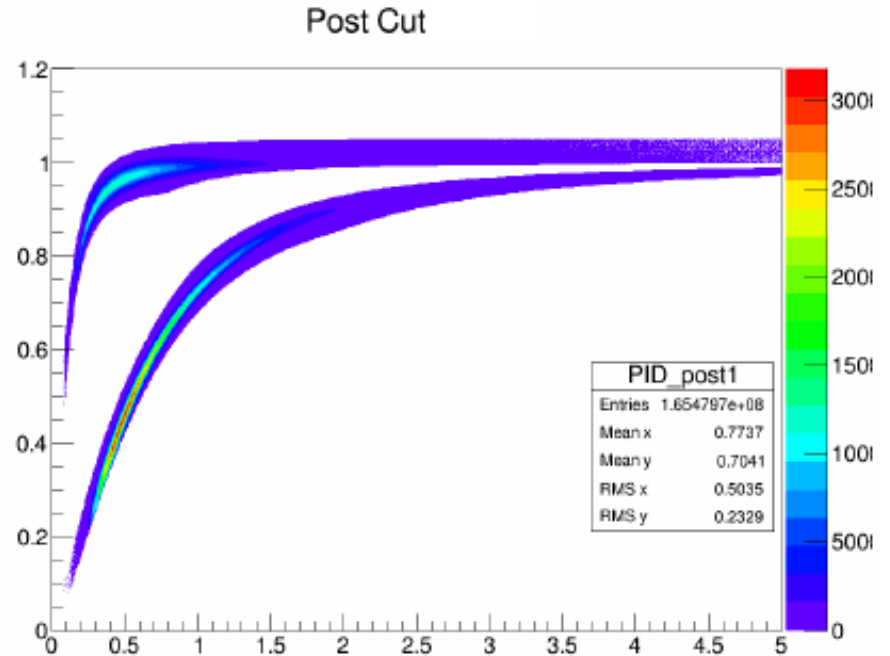
Extra



PID Cuts (EXTRA)



(a) Pre Cut



(b) Post Cut