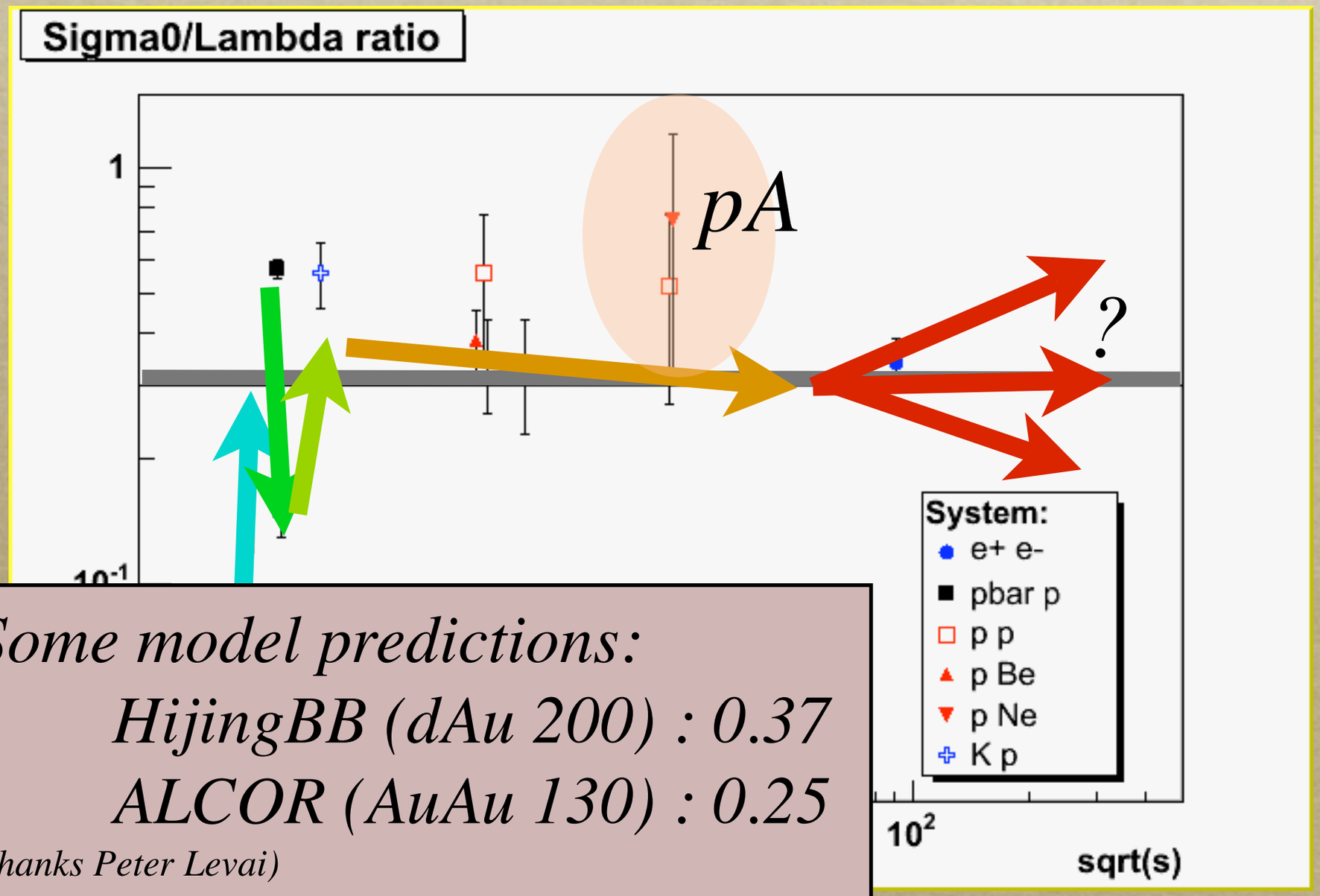
Reconstructing Σ^0 Decays in STAR

Gene Van Buren
Brookhaven National Lab

Strange Quark Matter 2004
Cape Town, South Africa

Σ^0/Λ : Previous Findings

- *Same quark content*
- *Isospin says: 1/3*
- *Larger system size?*



Some model predictions:

HijingBB (dAu 200) : 0.37

ALCOR (AuAu 130) : 0.25

(thanks Peter Levai)

Stat. Model (AuAu 200) : 0.37

(thanks Dan Magestro)

Disentangling the Λ

- $\bar{\Lambda}/\bar{p}$ *: relevance for strangeness enhancement*

$$\Lambda_{obs} = \epsilon\left[\Lambda_{prim} + \Sigma^0_{incl} + 0.88 * \Sigma(1385)\right] + \epsilon' \Xi^0_{incl} + \epsilon'' \Xi^-_{incl} + \epsilon''' 0.68 * \Omega^- + ...$$

$$p_{obs} = \epsilon\left[p_{prim} + 0.52 * \Sigma^+ + ...\right] + \epsilon' 0.64 * \Lambda_{incl} + ...$$

- *How does Λ really scale with h-?*

- Λ *pt spectrum : flow interpretations*

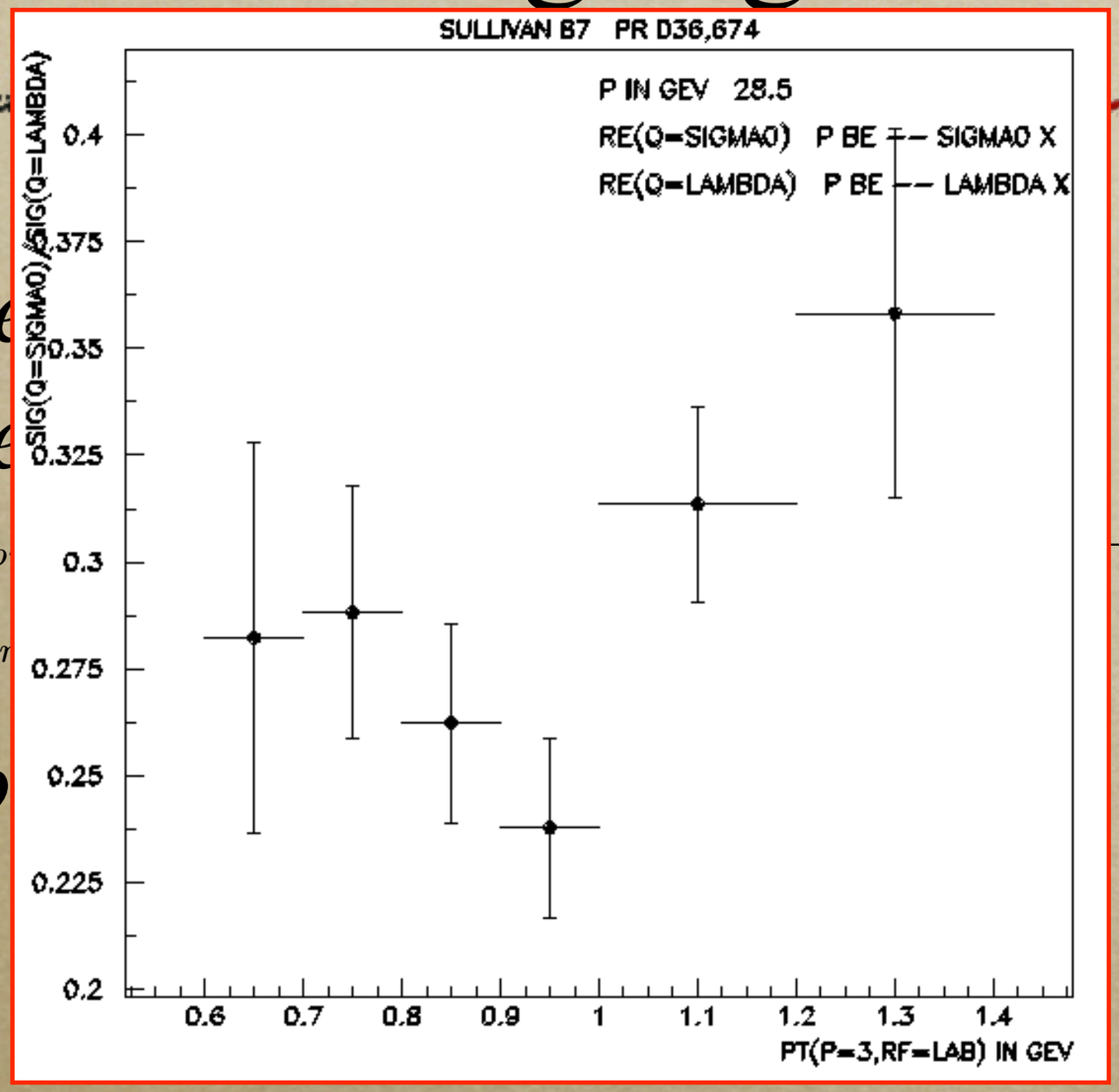
Disentangling the Λ

- $\bar{\Lambda}/\bar{p}$: *re*
  enhance

$$\Lambda_{obs} = \epsilon\left[\Lambda_{p}\right. \qquad + \epsilon'''0.68 * \Omega^{-} + \ldots$$

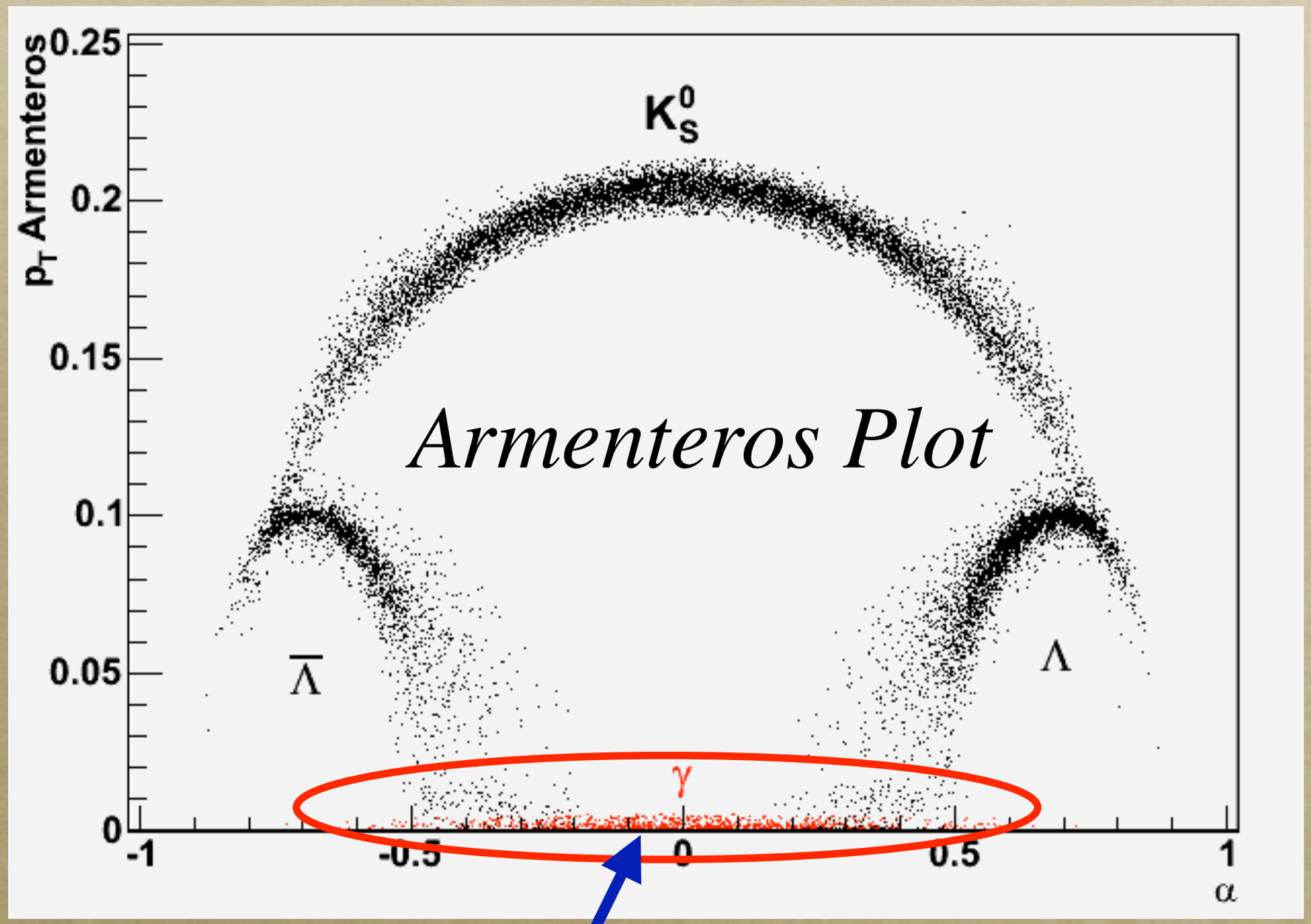
$$p_{obs} = \epsilon\left[p_{pr}\right.$$

- *How do*



- Λ *pt spectrum : flow interpretations*

Must identify Gammas



Photon conversions!

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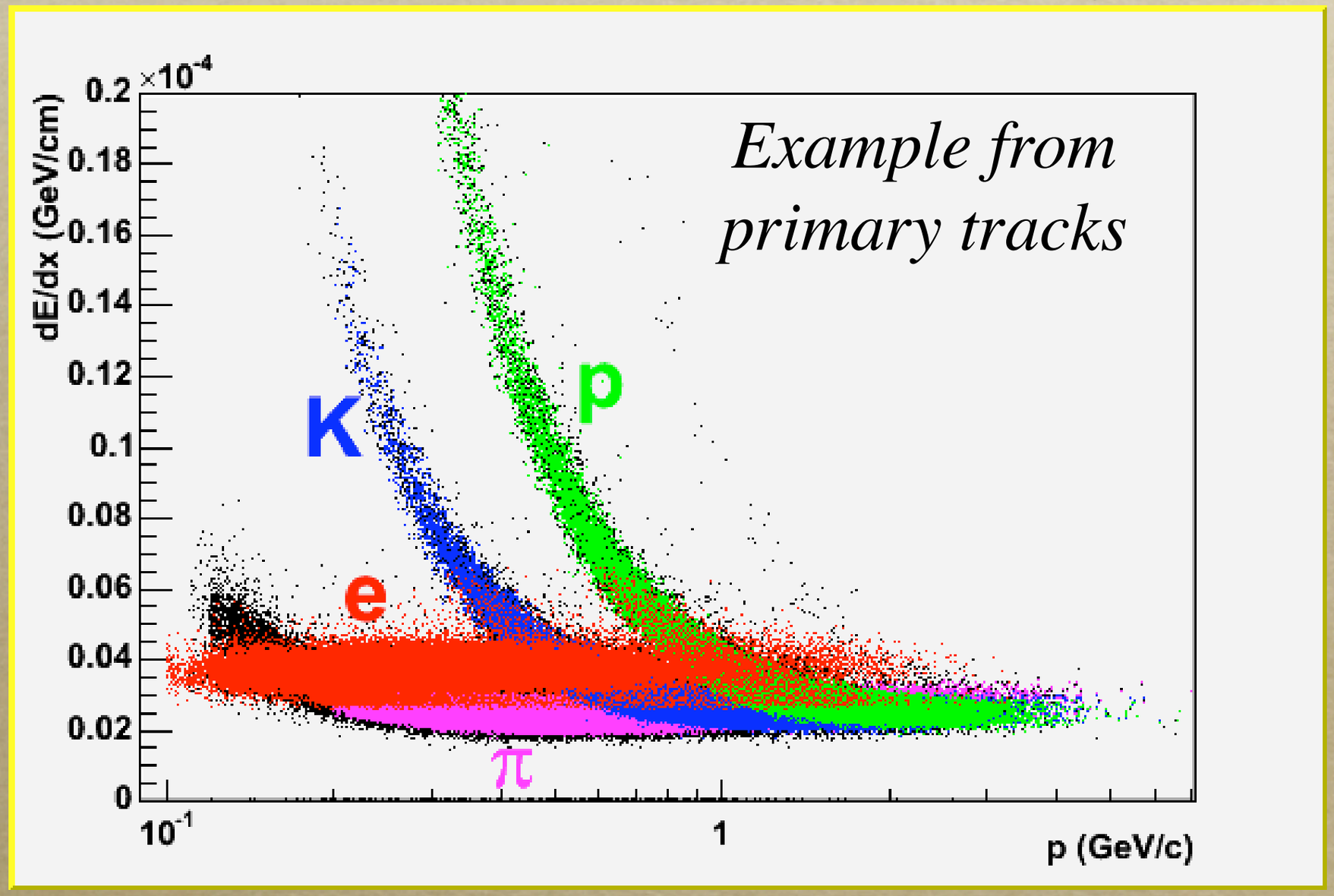
Confident they're gammas?

dEdx vs. p



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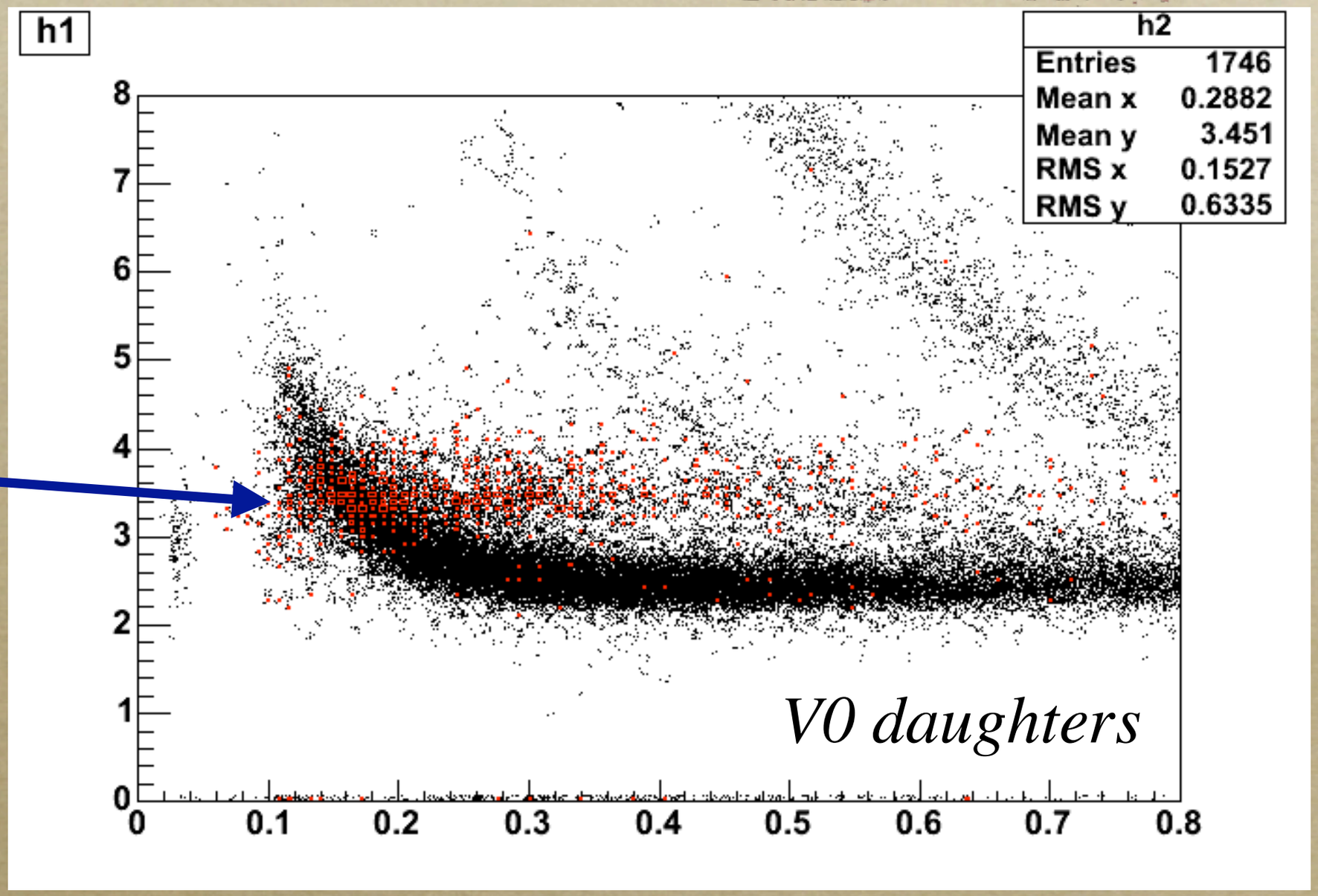
Confident they're gammas?

dEdx vs. p

Electron band



Black - All V0 daughters

Red - Gamma candidate daughters

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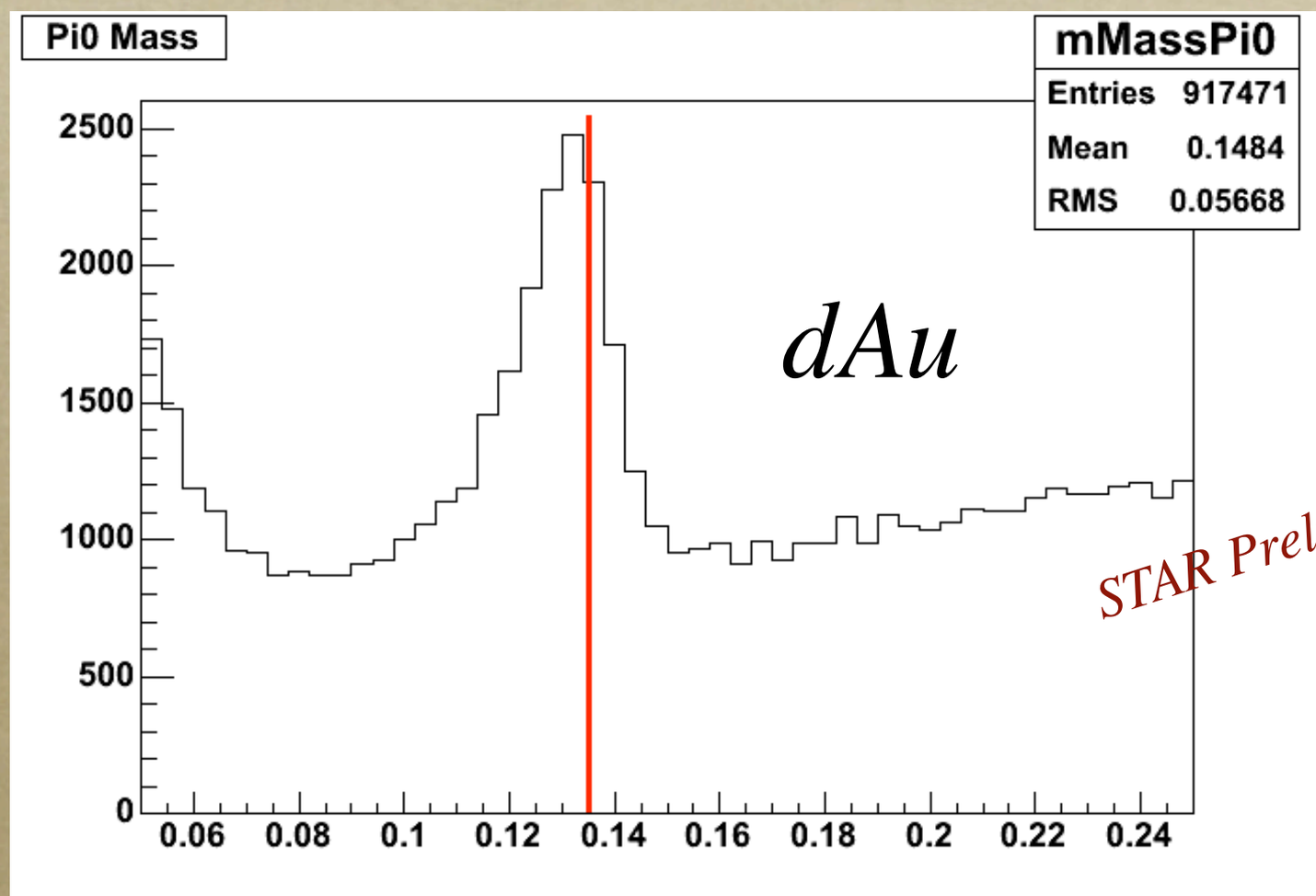
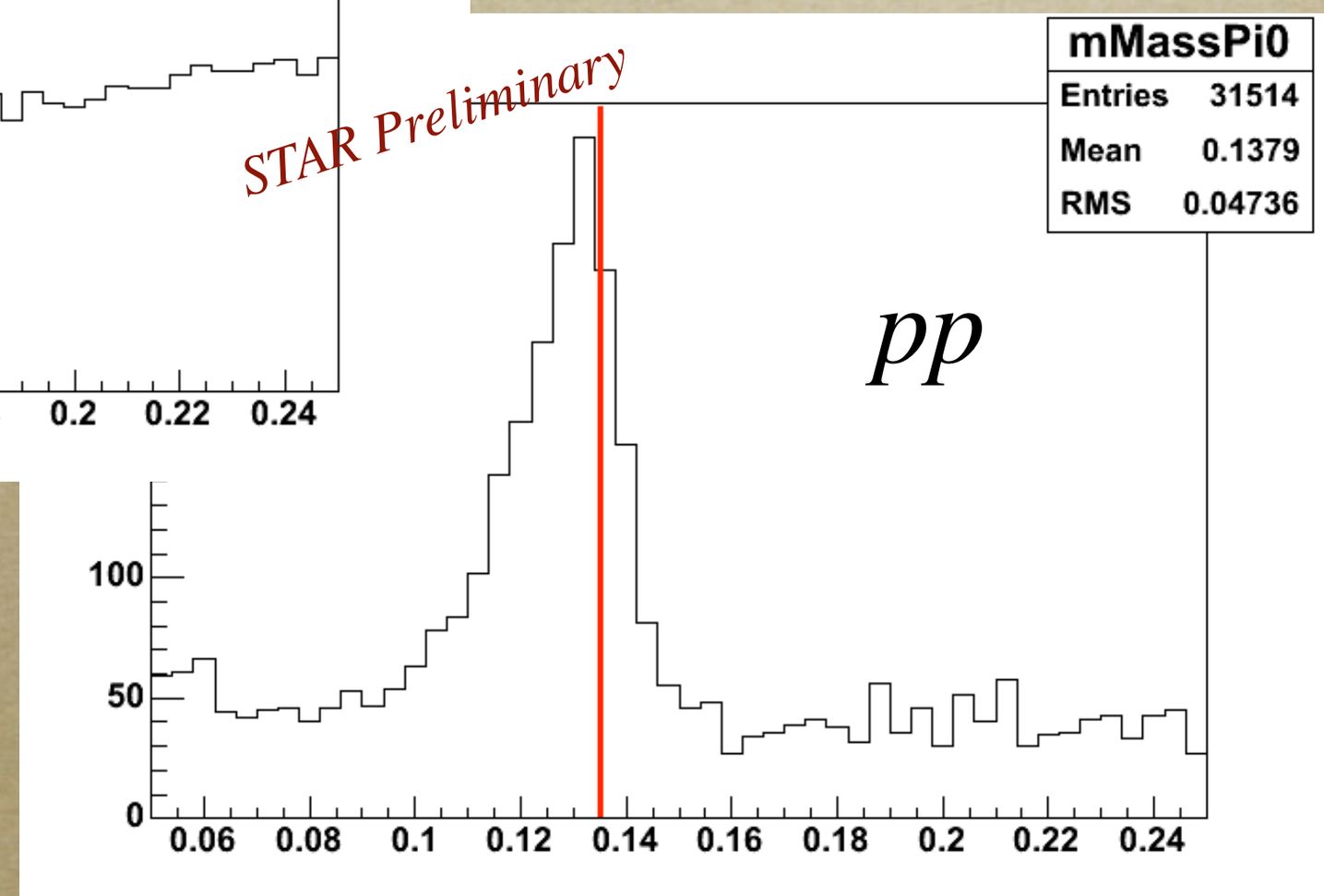
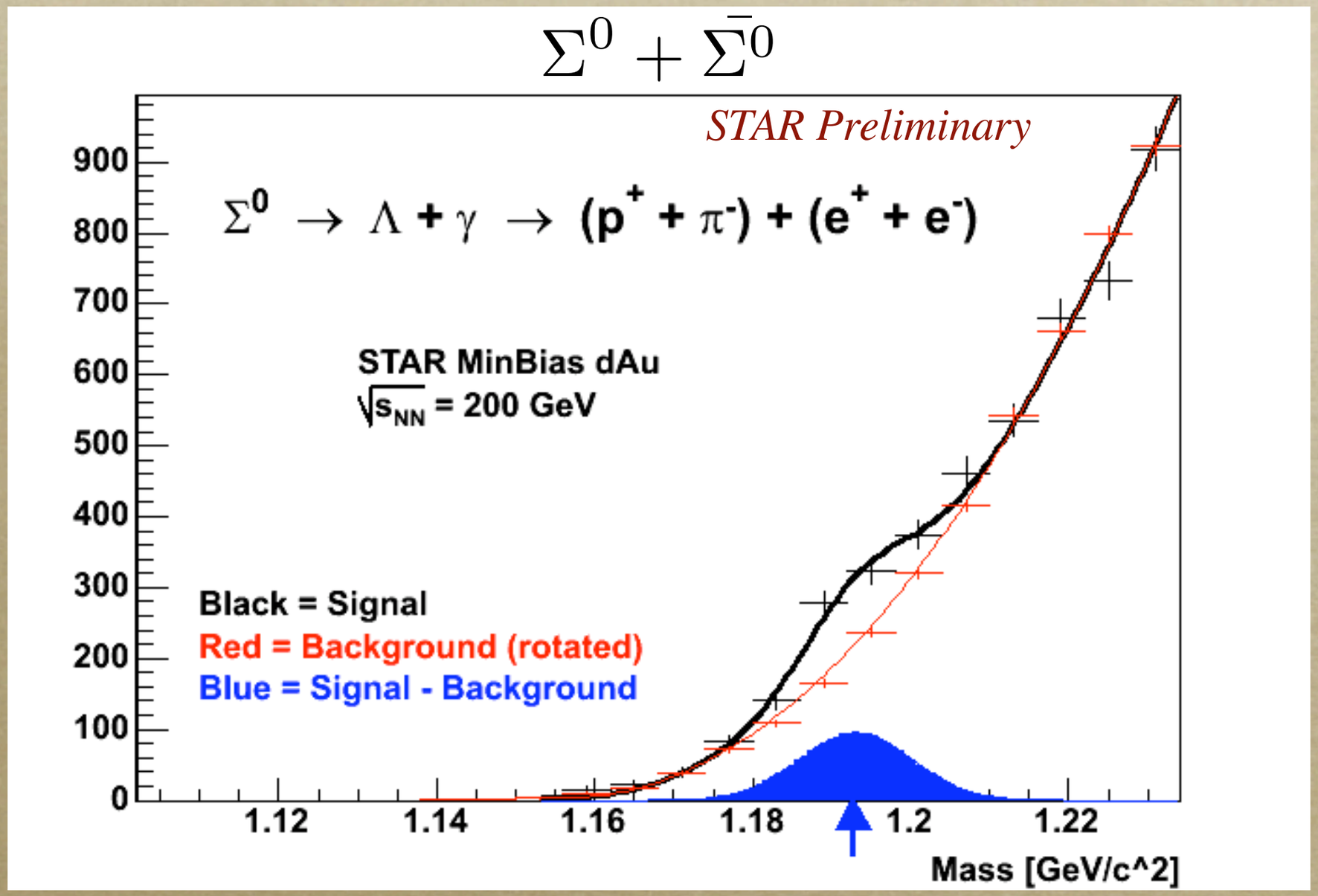
Definitely some gammas!



π^0



Reasonable signal in dAu!



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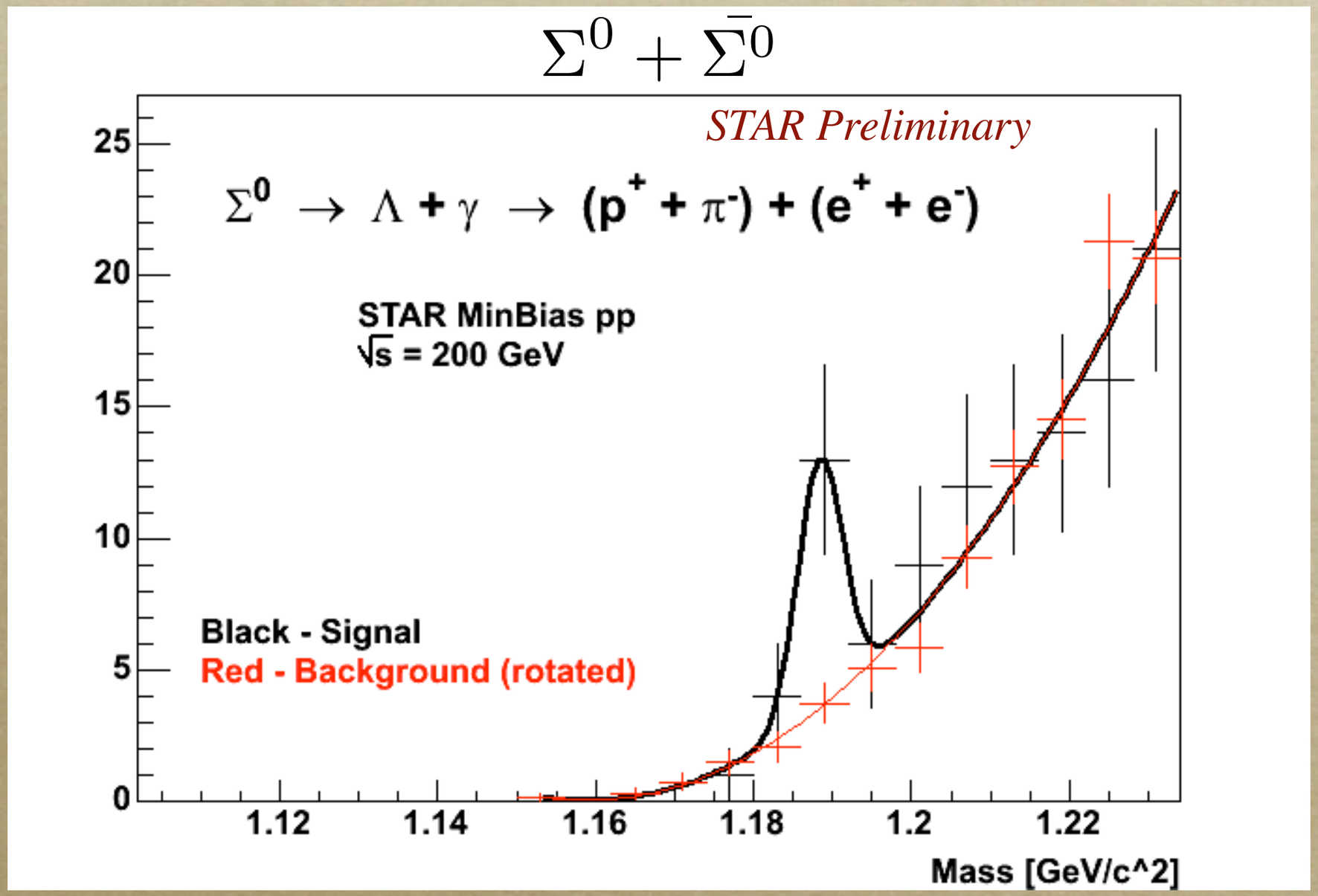
Small signal in pp too



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$\bar{\Sigma}^0/\Sigma^0$ ratio

- *Integrated over all Pt*
- *Integrated over* $|y| < 0.75$
- *No annihilation corrections*
  - *Negligible compared to statistical errors anyhow where data peaks (~2 GeV/c)*

$$\frac{\bar{\Sigma}^0}{\Sigma^0} = 0.6 \pm 0.3$$

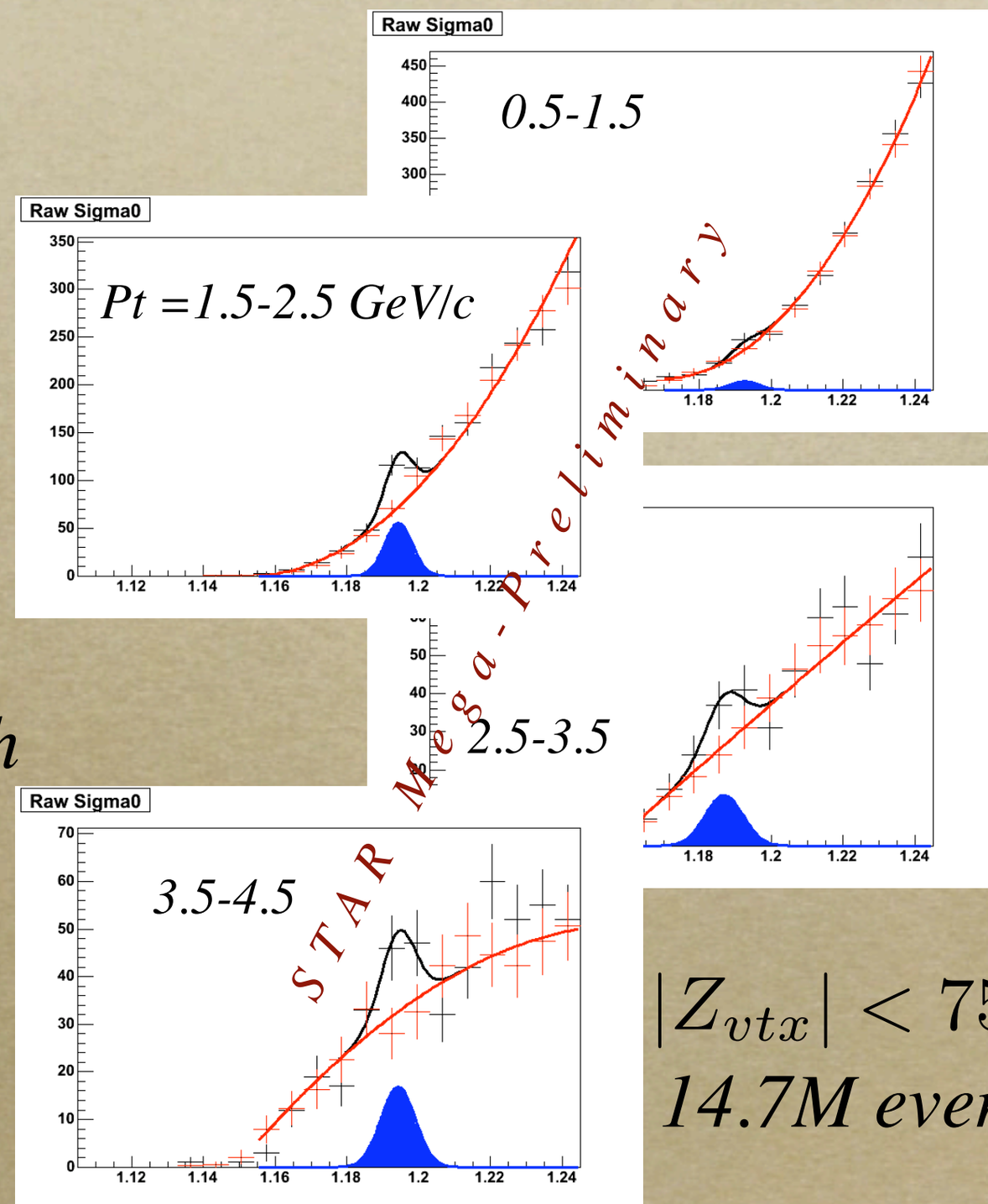
A bit low, perhaps, but large statistical errors

$\Sigma^0 + \bar{\Sigma}^0$ raw data:

- *Rotated events fit to bgnd = poly(3)*
- *Real events fit to Gaus + C * bgnd*

Bin counting and Gaussian area are within errors of each other (errors are large!)

Some systematic errors from varying fit ranges



$|Z_{vtx}| < 75cm$

14.7M events

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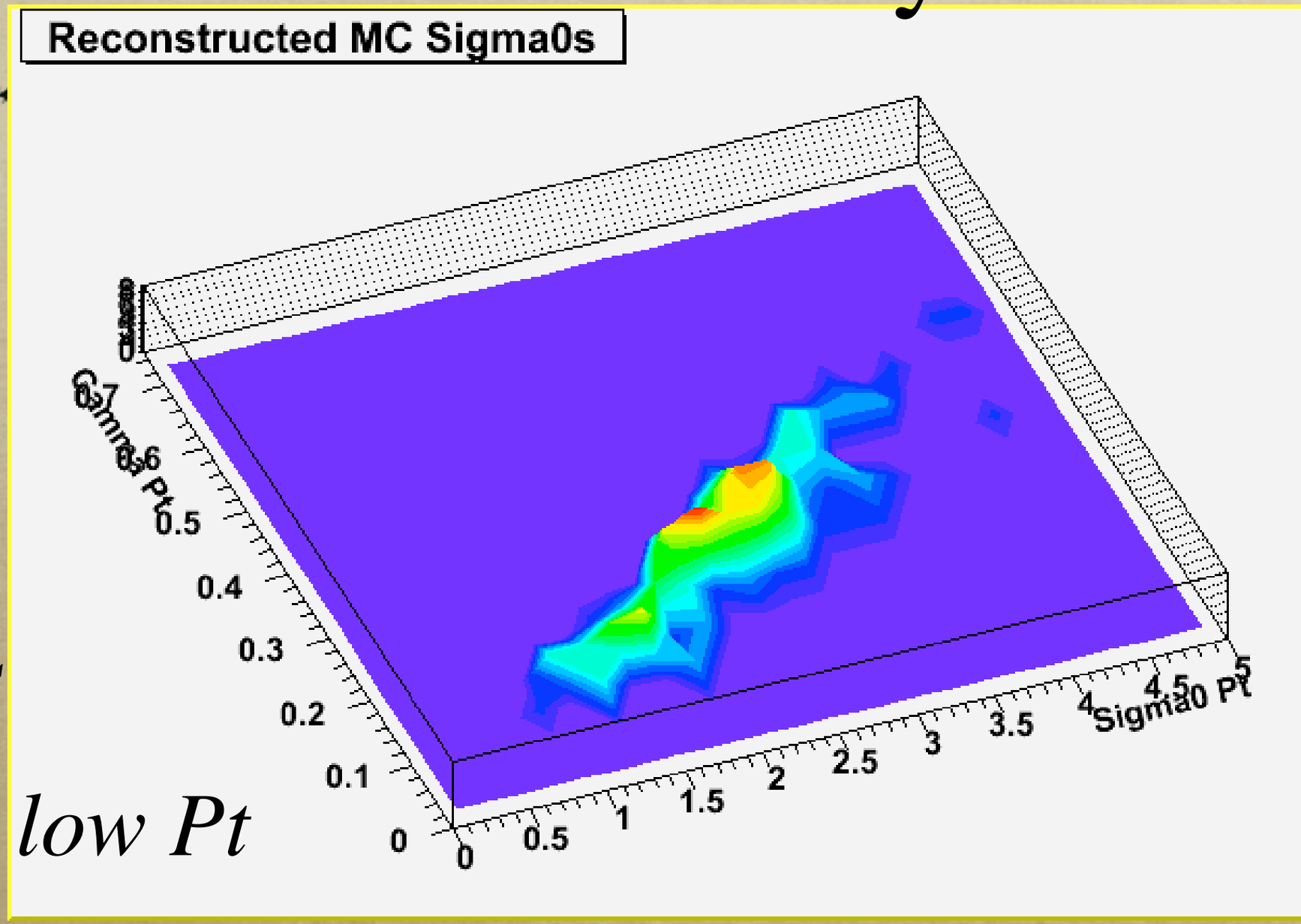
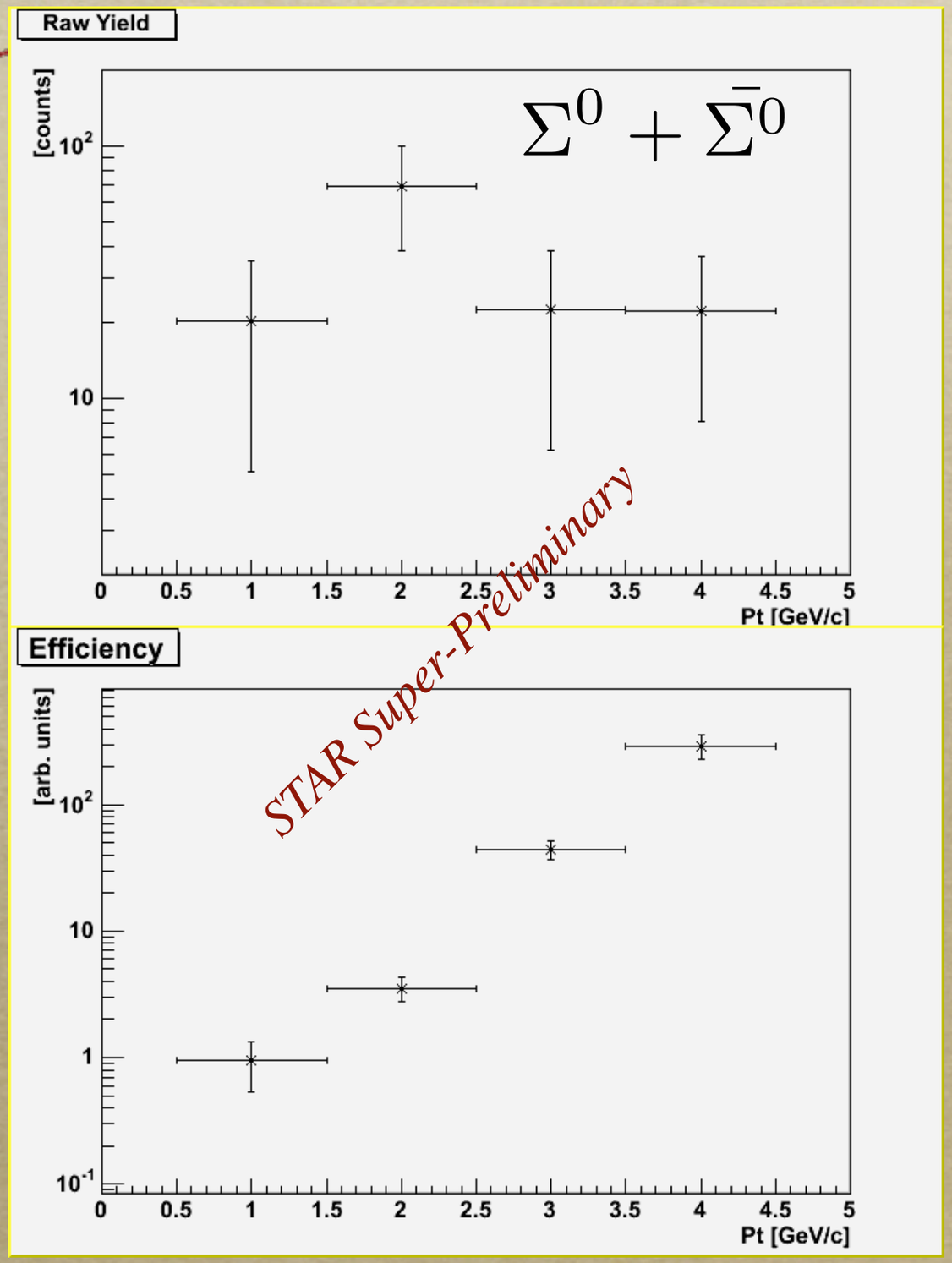
Reconstruction efficiency



- *Embedding of MC Σ^0 into real dAu events*
  - *Gammas are low Pt*
  - *Reconstructed Σ^0 cover about the same range I see in reconstruction*

Reconstruction efficiency

- *Not a piece of cake...*
  - *Photon conversion rate is a bit tricky*
  - *Need confidence that distributions for cuts are same as data ... but can't compare well with Σ^0 data*



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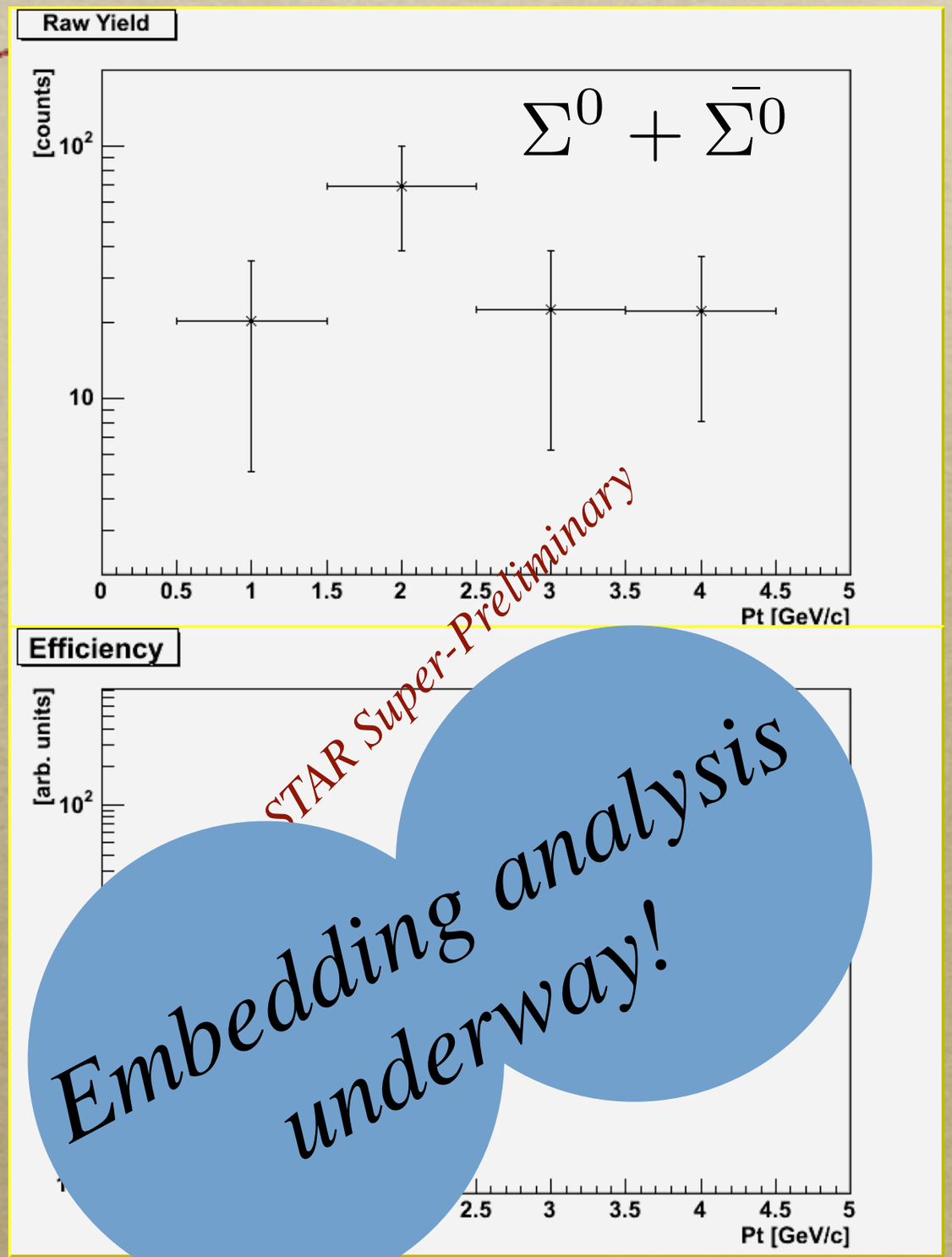
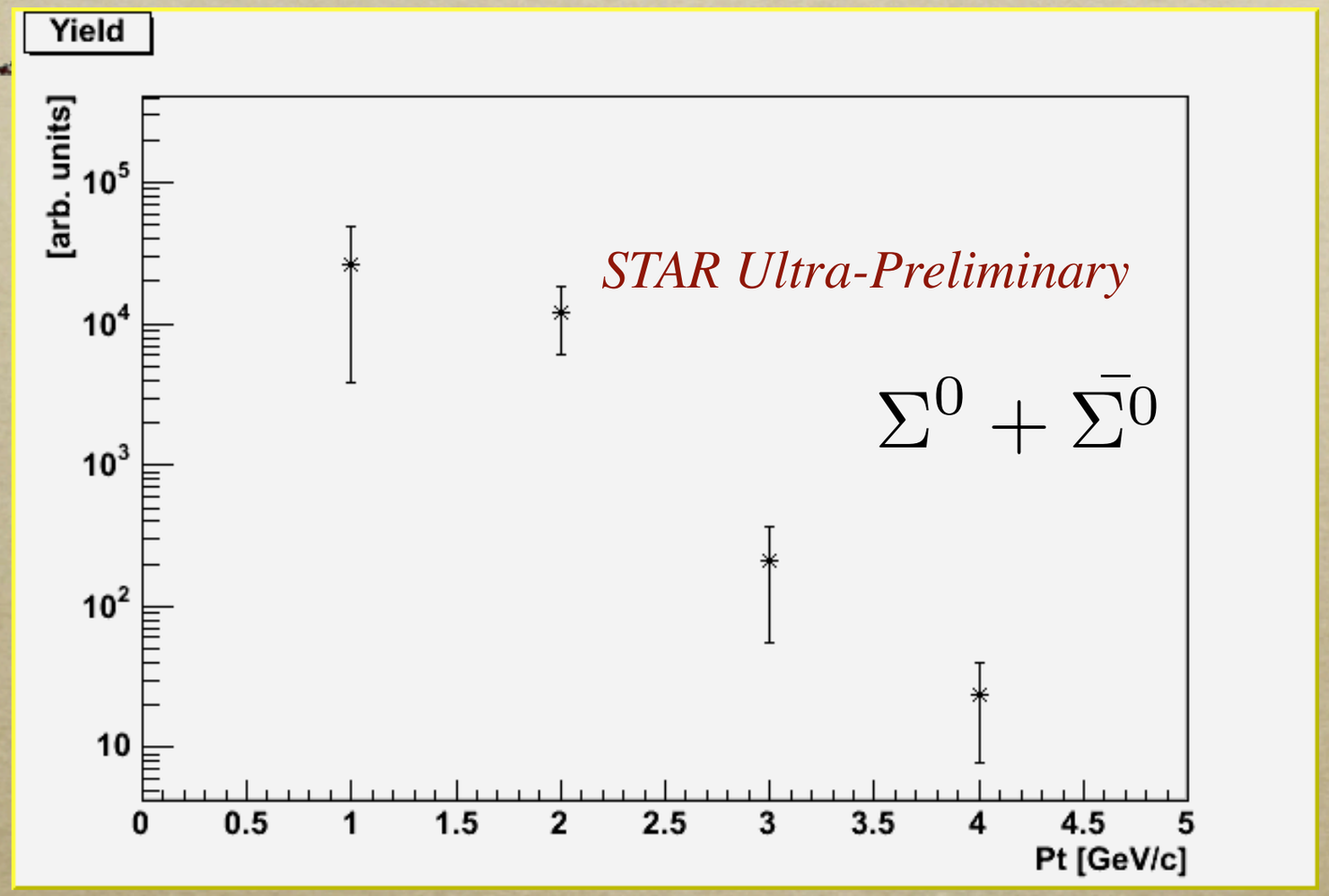


Pt spectrum

- *Will compare to Λ spectra*



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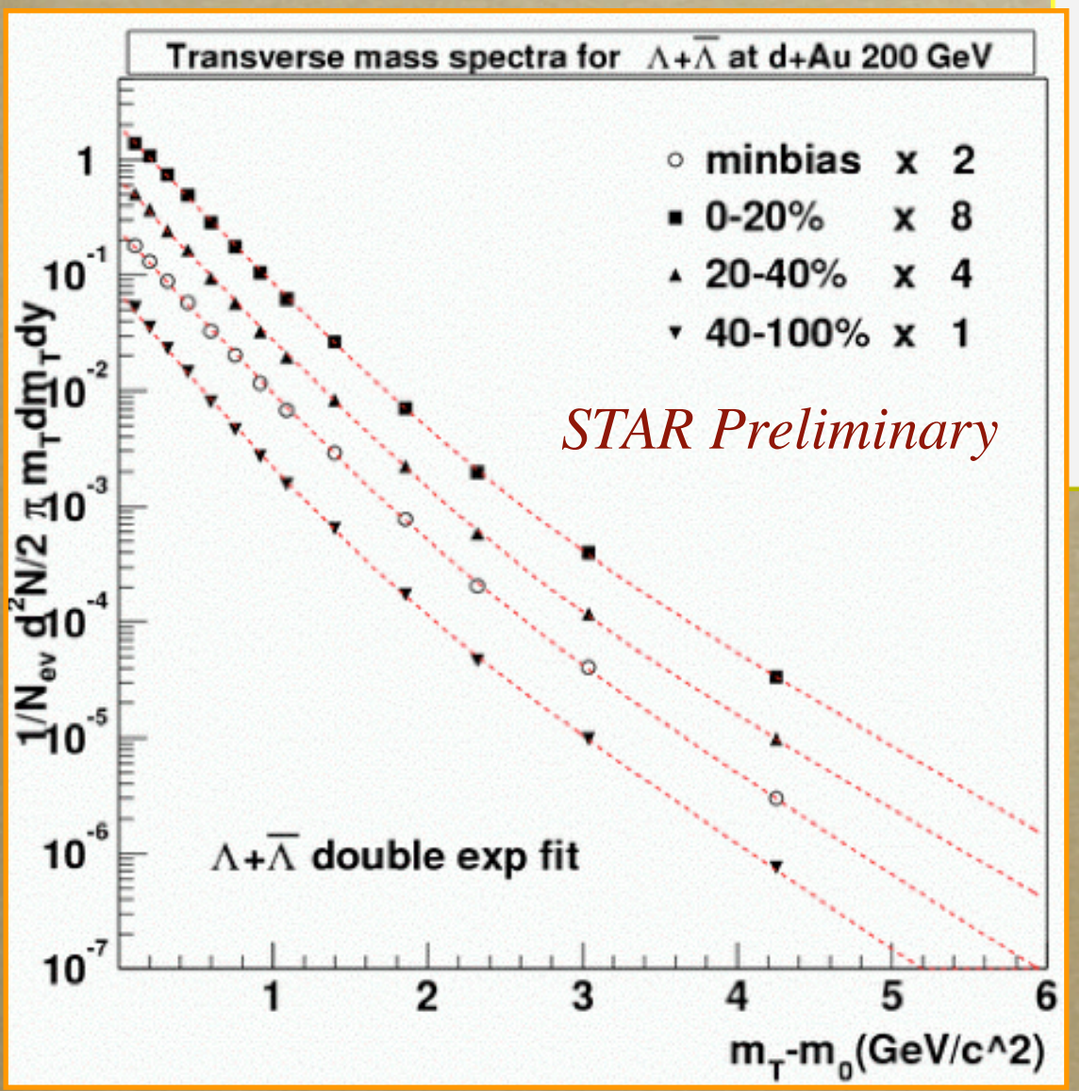

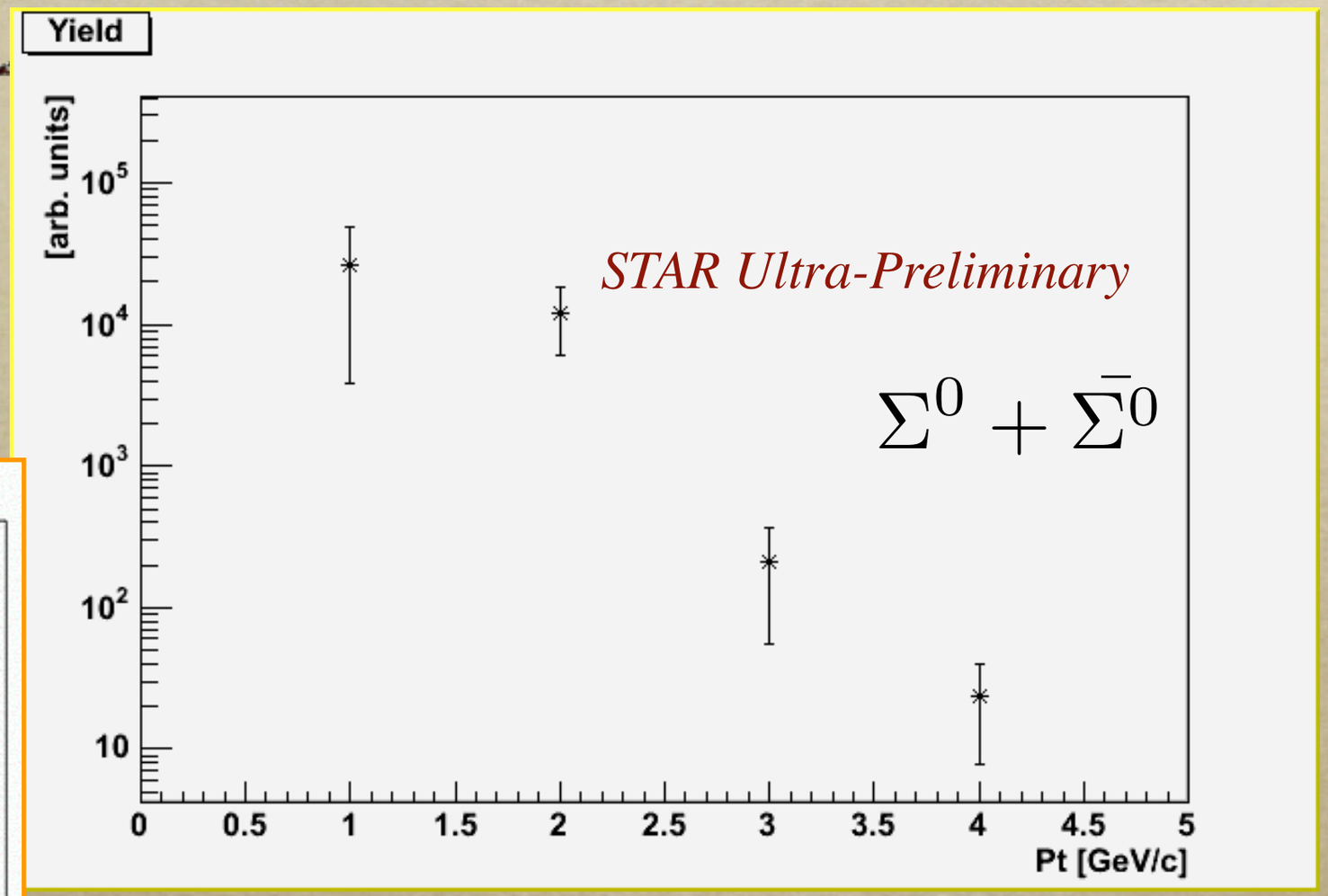

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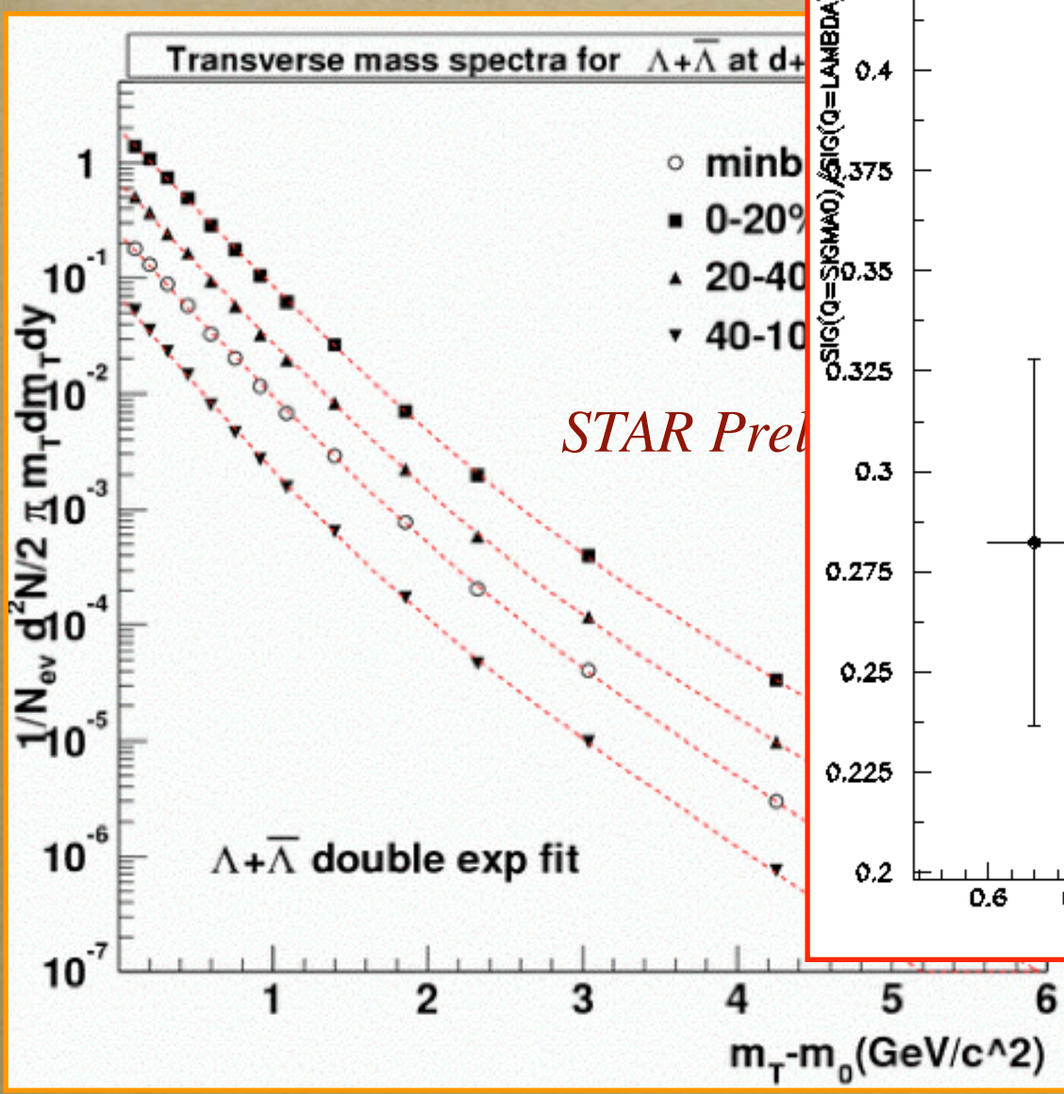
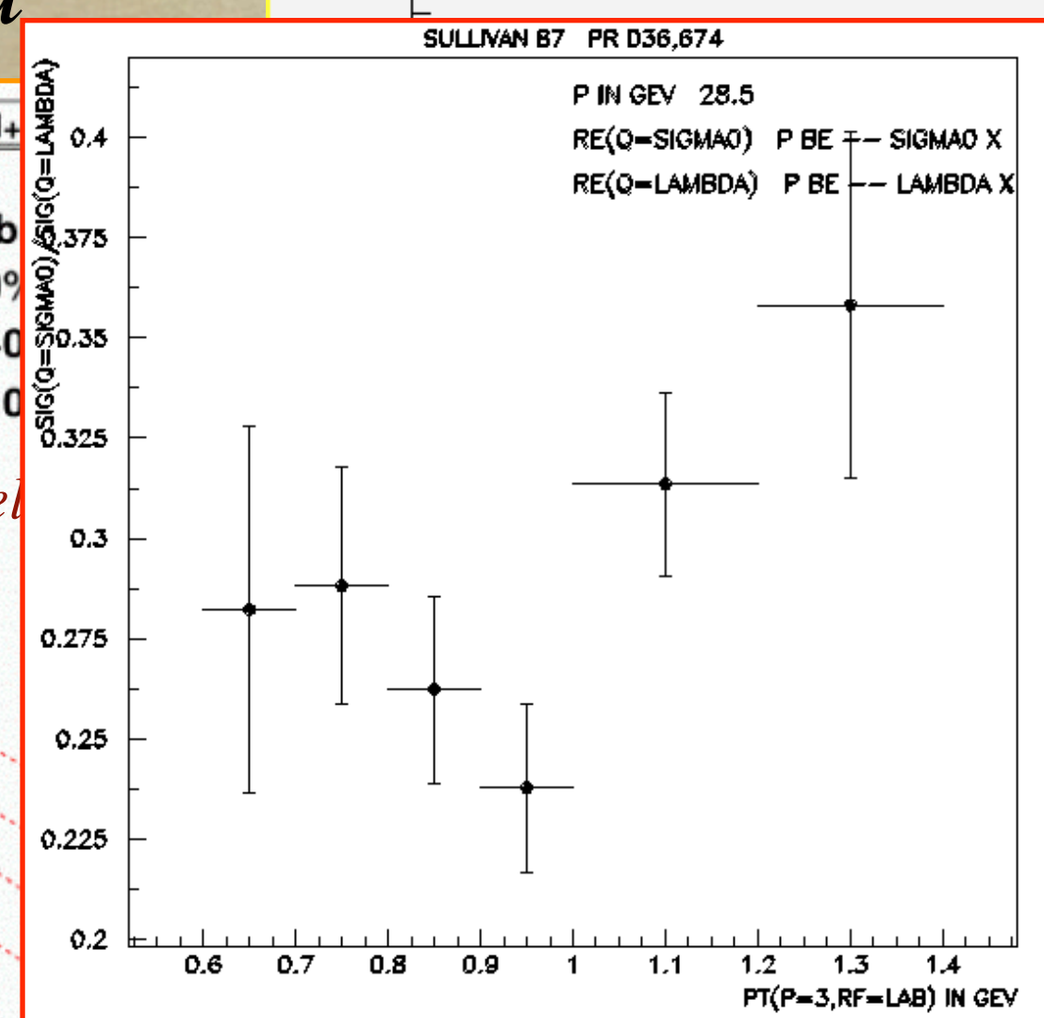
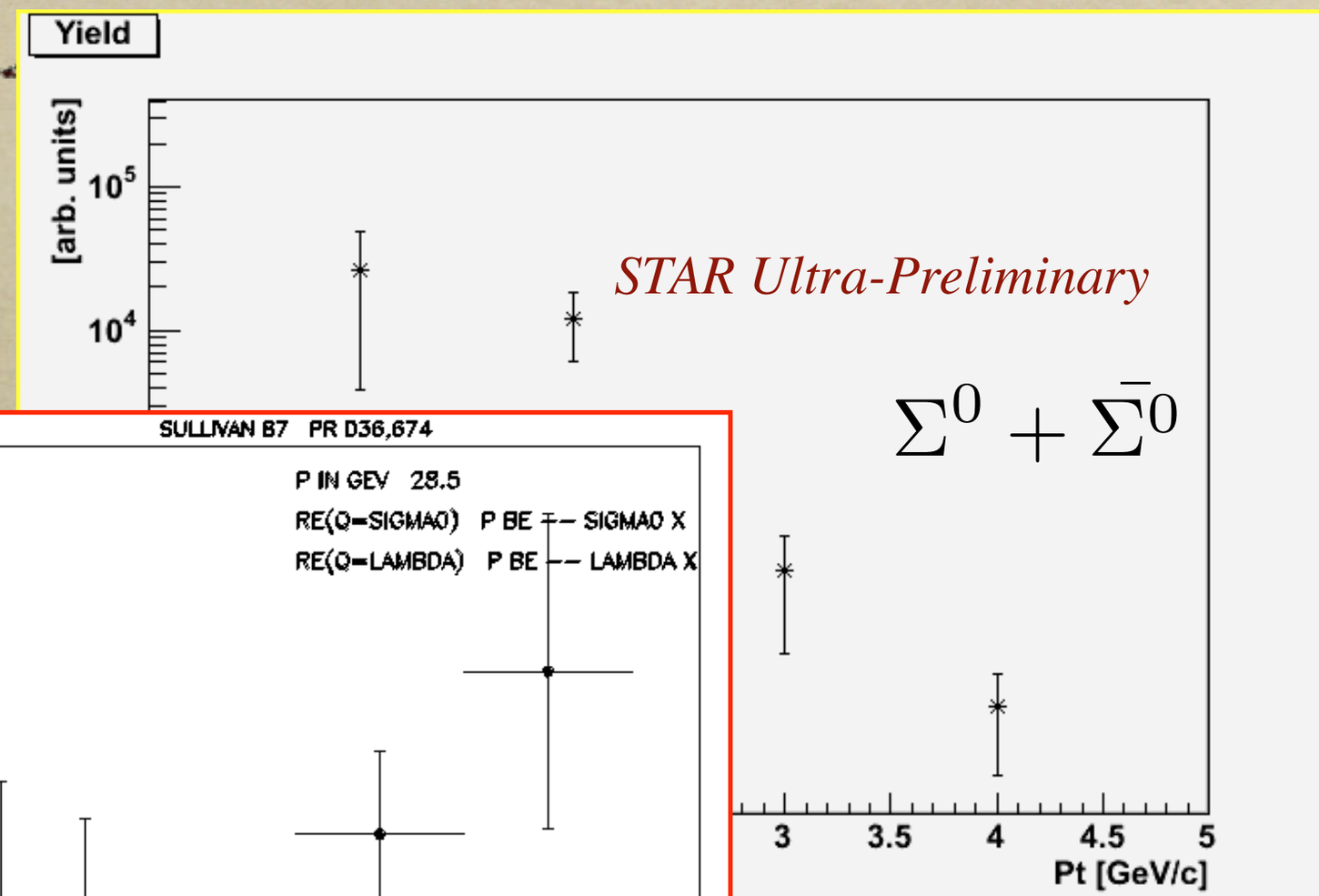
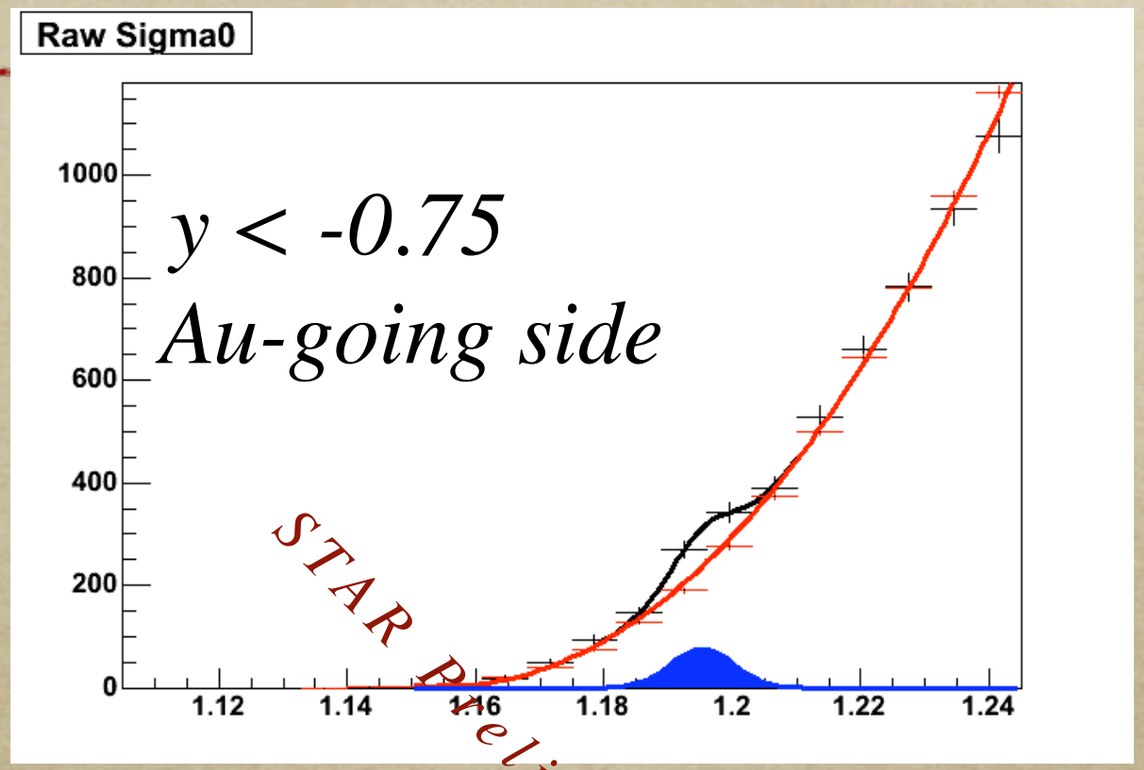


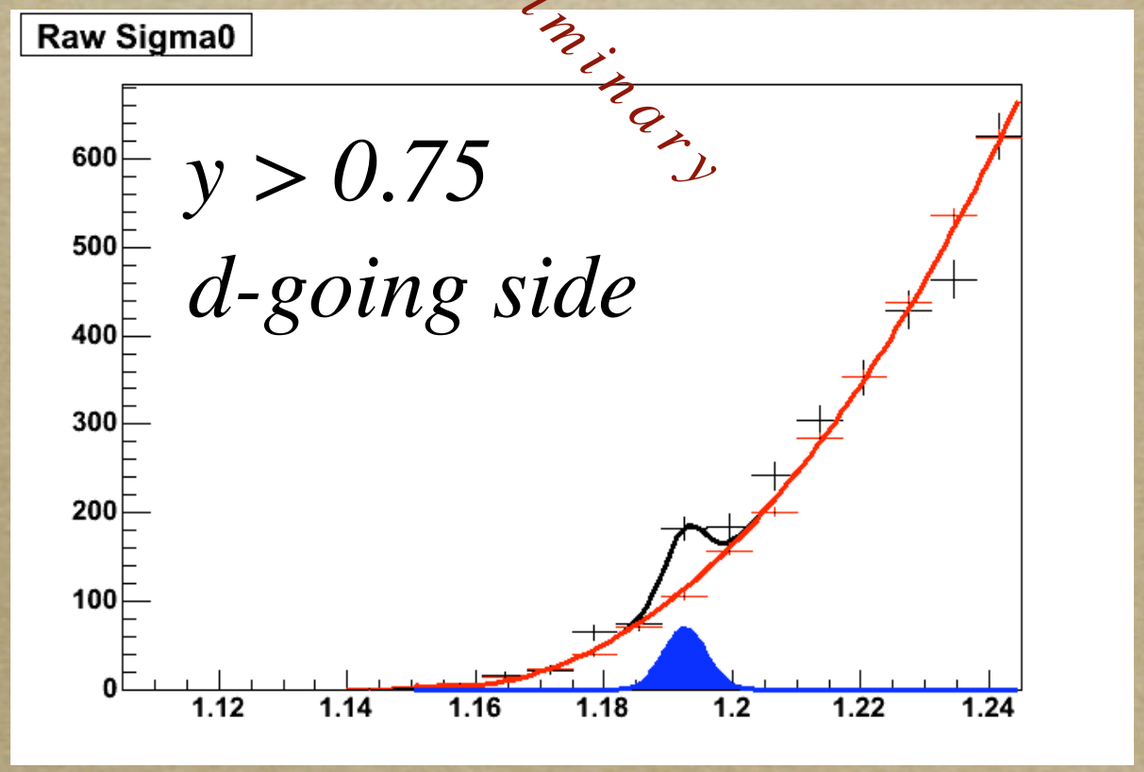




Signals at large rapidity

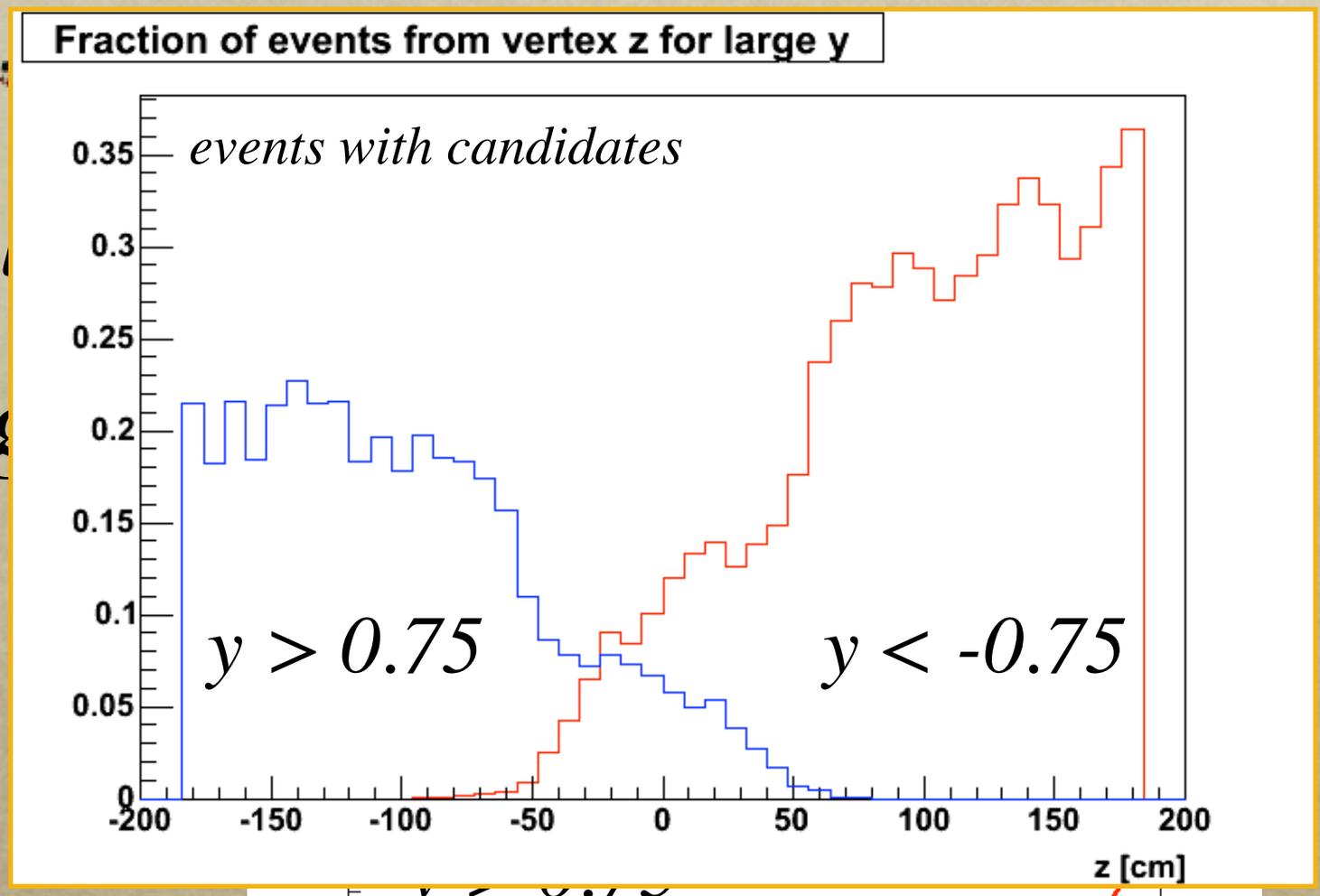
- *Considerable signal!*
- *Particles pass at big angles to detector material.*

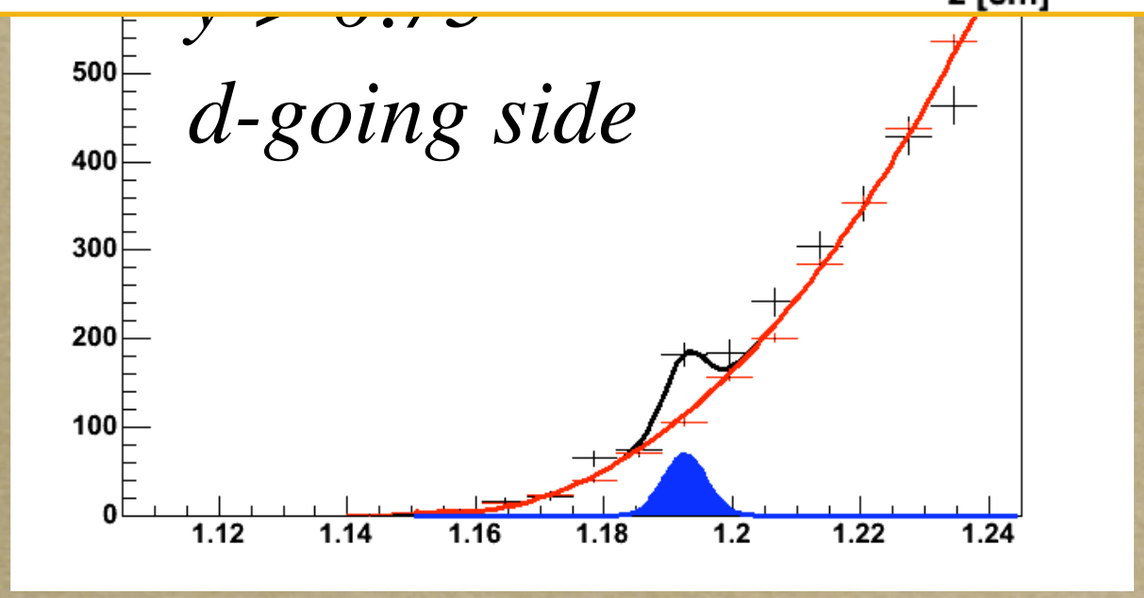




Signals at large rapidity

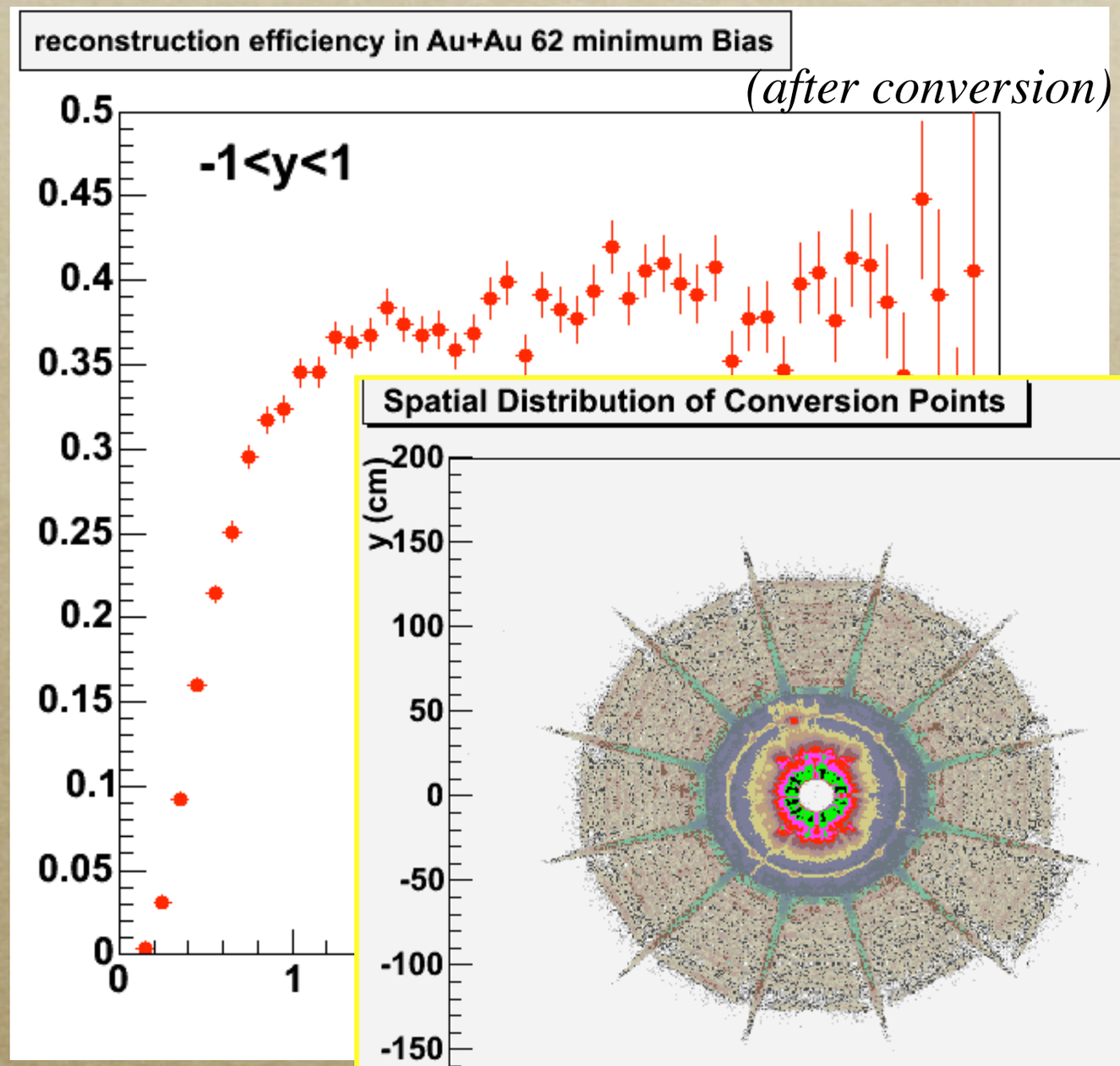
- *Considerable signal*
- *Particles pass at big angles to detector material.*
- *Thanks to a large spread in collision vertices along the beam axis!*

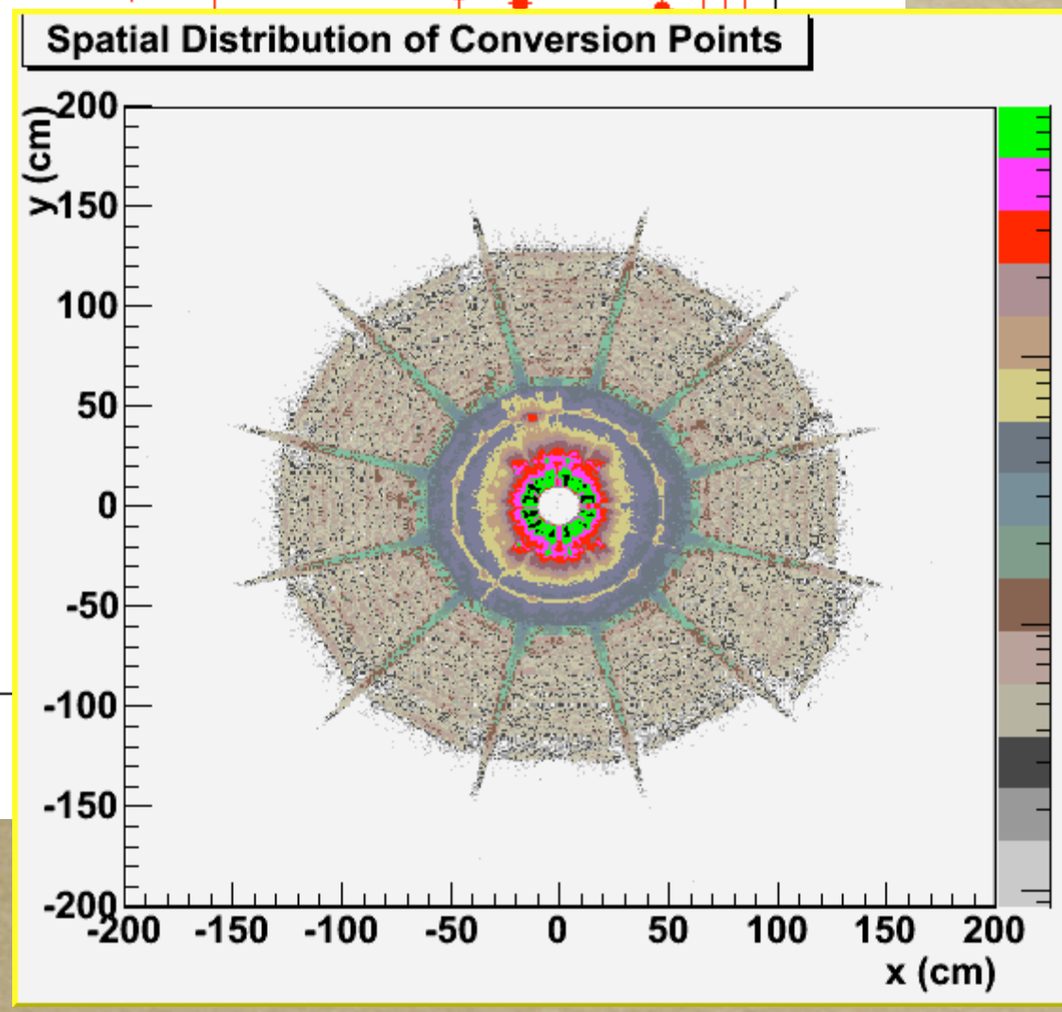




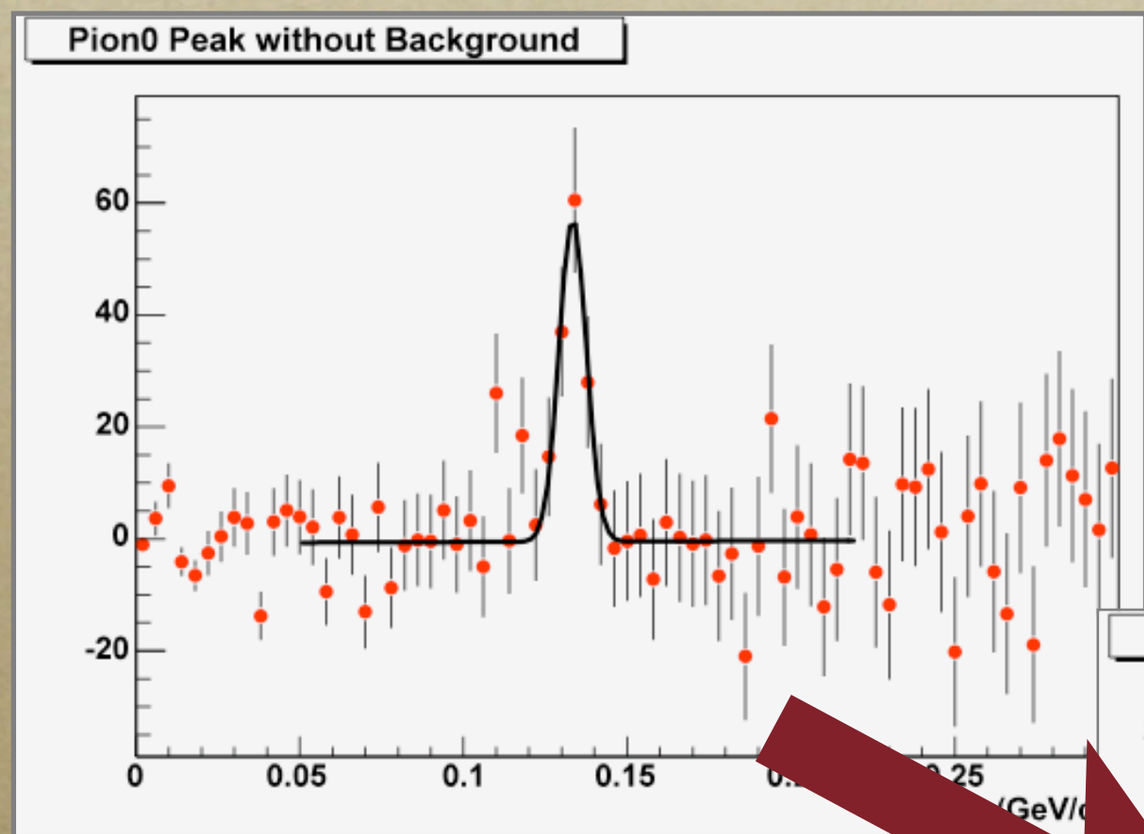
To Come: Better Gamma Finder

- *Better Gamma finder used in STAR π^0 analyses*
- *Much better efficiency*

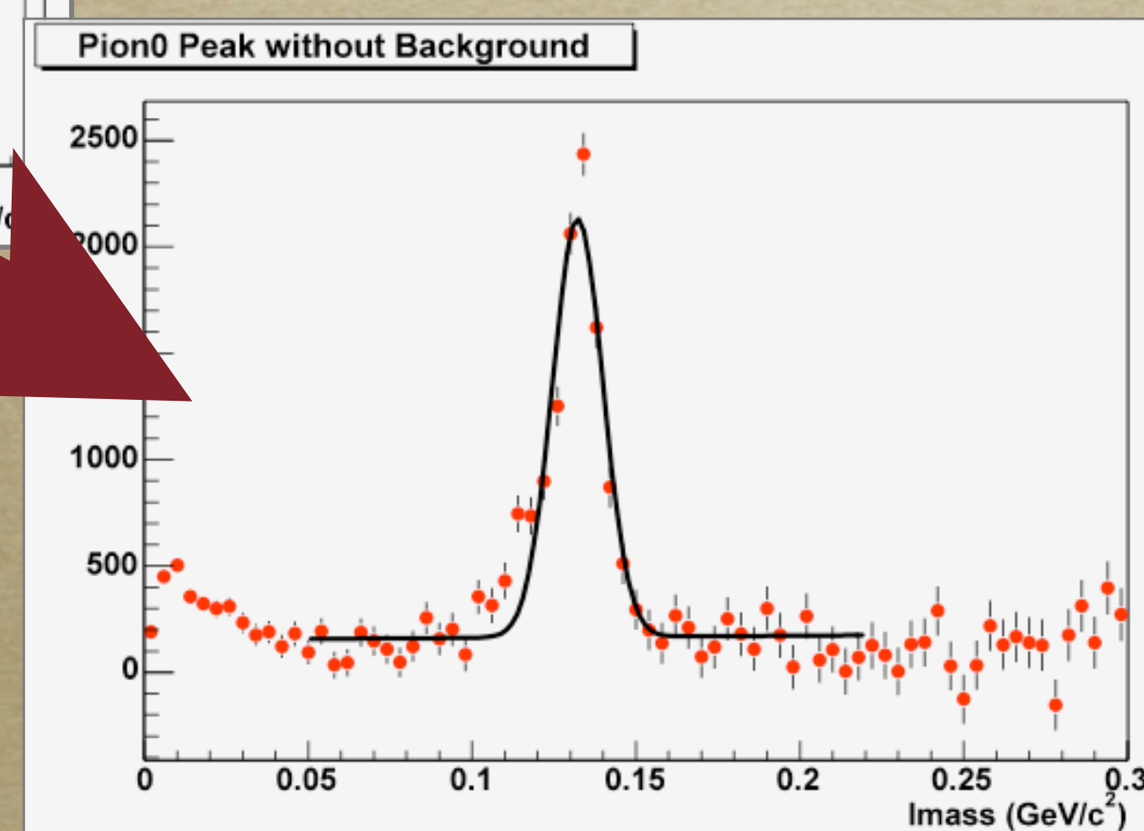




Better Gamma Finder



- *Greatly improved numbers of photons and photon pairs*



π^0

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Future:

- *New gamma-finder!*
- *200 GeV AuAu from 2004 with much better statistics!*
- *62 GeV AuAu from 2004 with better combinatorics than 200 GeV!*
- *Future pp runs to beef up the stats!*
- *More detector material to convert gammas!*
- *EMC to measure gammas?* *(momentum resolution)*