Non-photonic electron-hadron azimuthal correlation for $\sqrt{s_{NN}}$ = 200 GeV AuAu collisions at STAR/RHIC

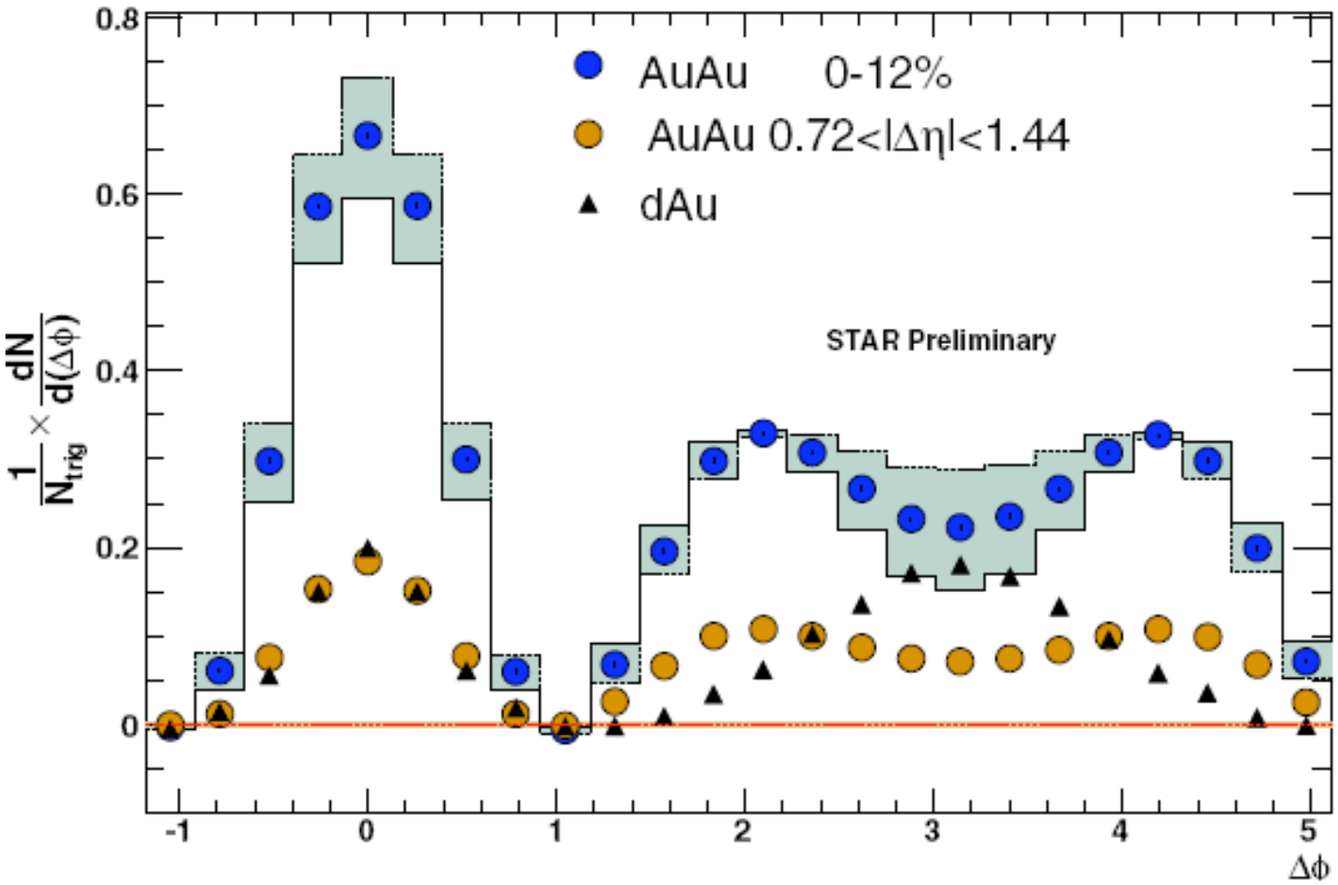
UCLA
Bertrand H.J. Biritz for the STAR Collaboration

Motivation: Heavy Quark Jet - Medium Interactions

Conical emission pattern in 2-particle correlations in AuAu

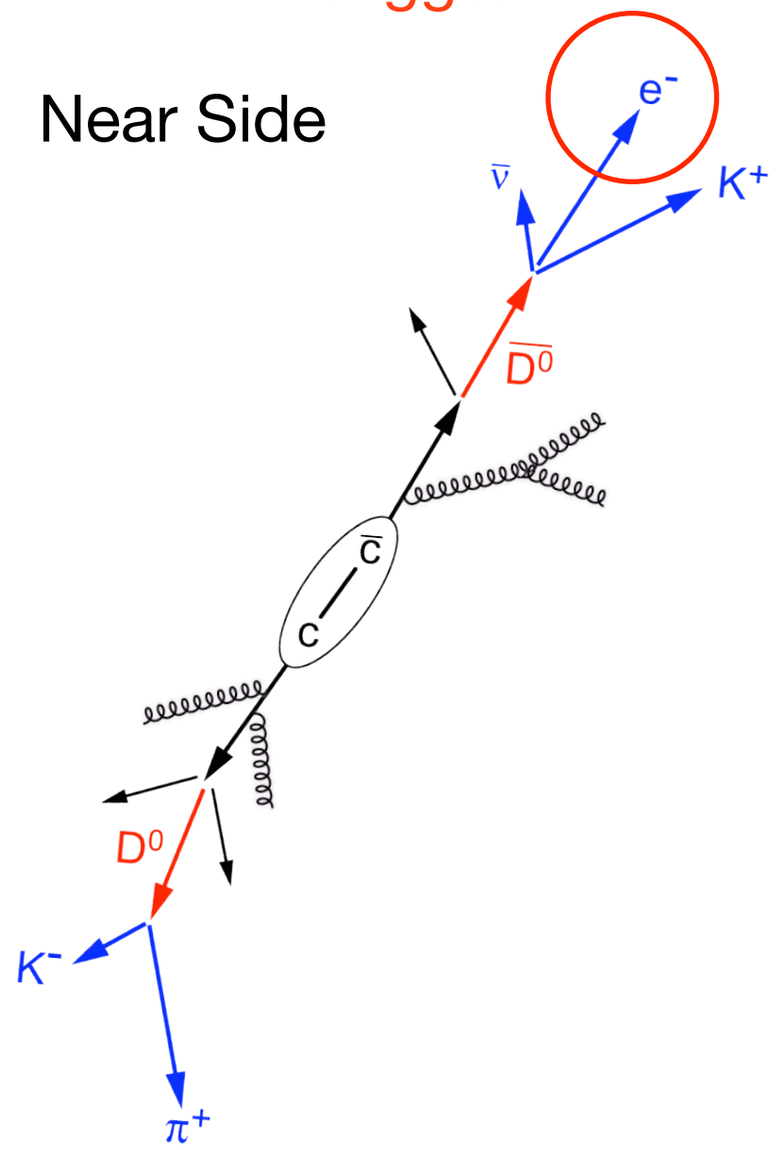
B.I. Abelev, et al
arXiv:0805.0622v1

$2.5 < p_T^{trig} < 4.0$ GeV/c
$1.0 < p_T^{asso} < 2.5$ GeV/c



Trigger

Near Side



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J. Phys. G: Nucl. Part. Phys. 34 (2007) S995

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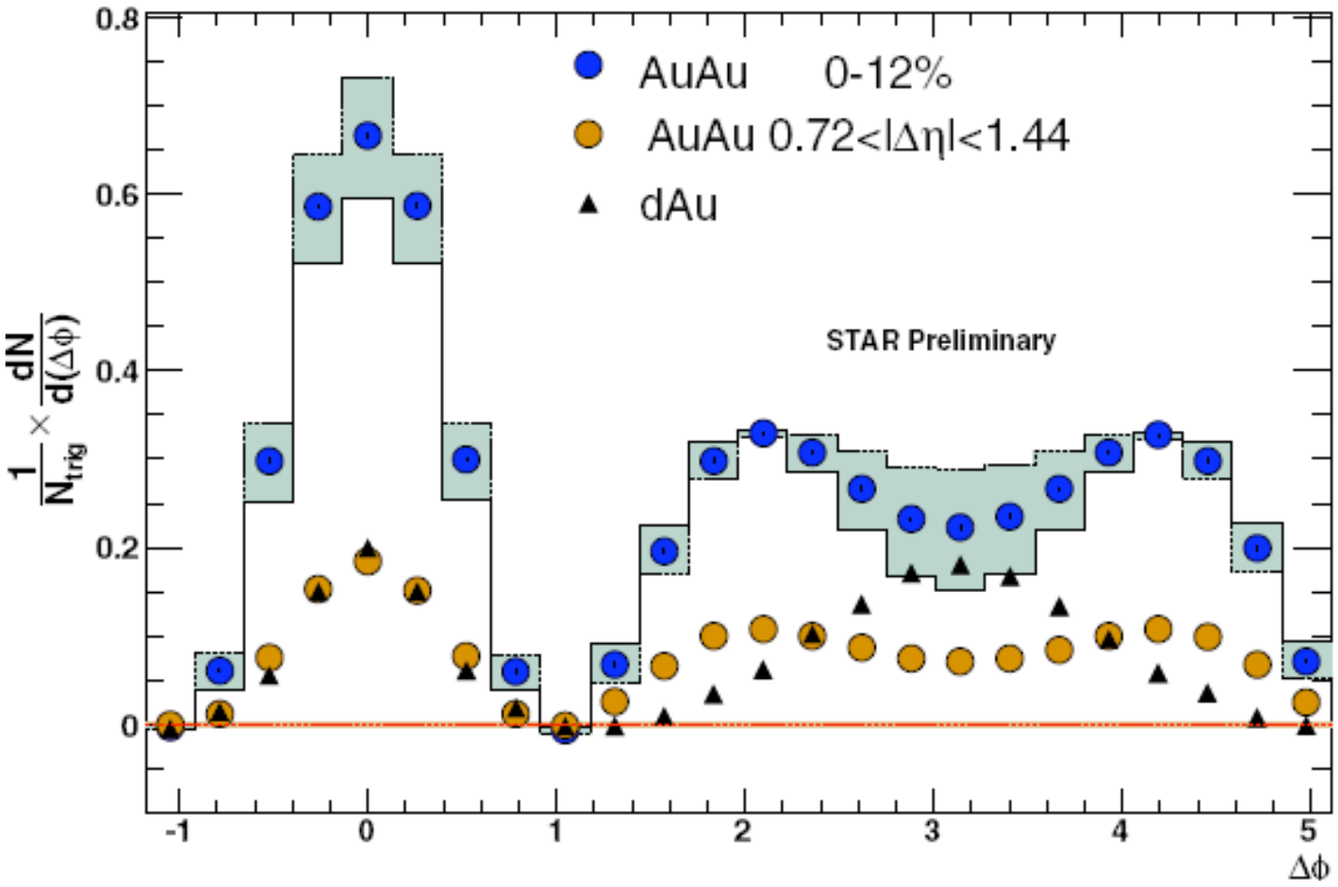

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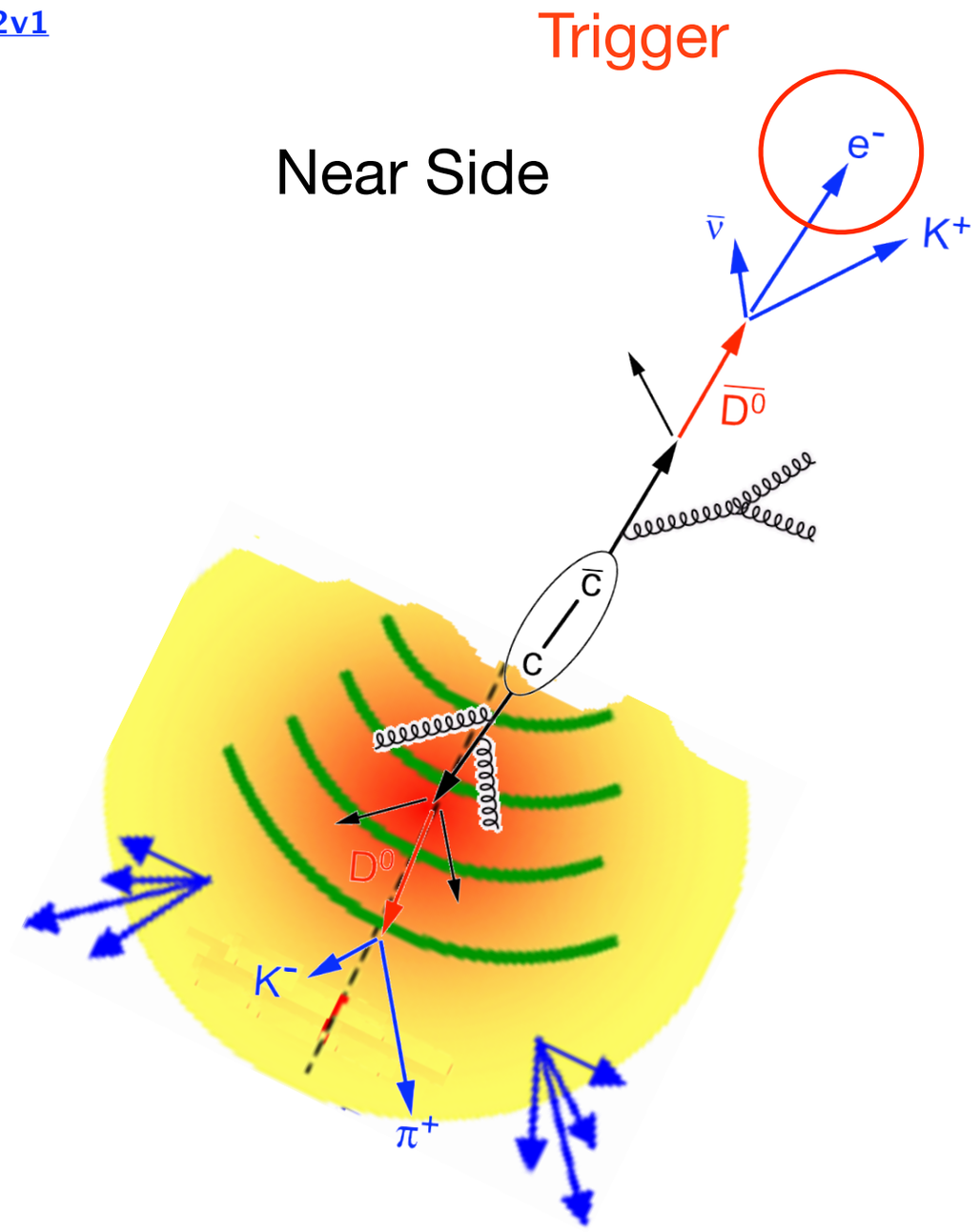
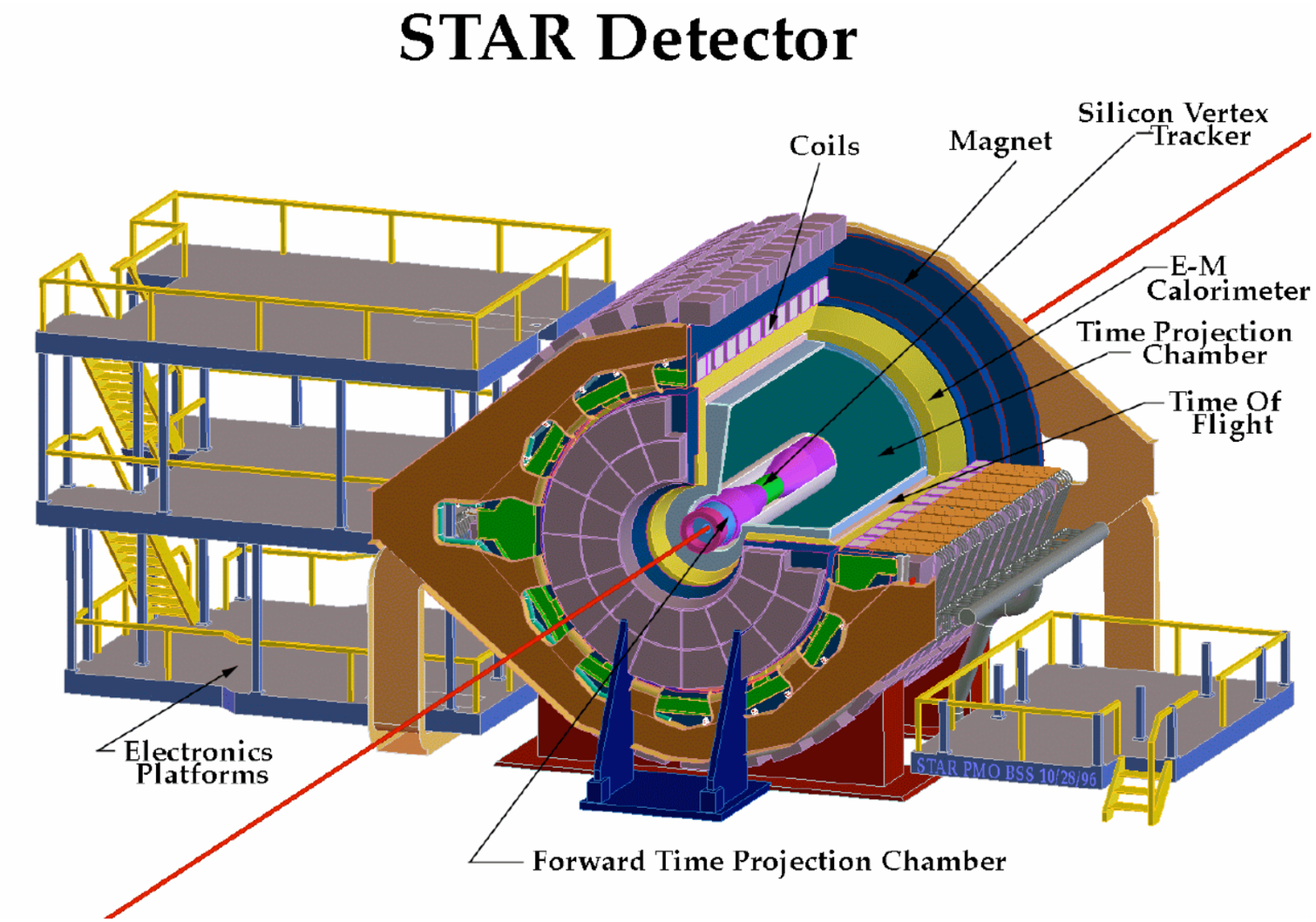


Is the same seen using e trigger?
How does B or D lose energy?

Detector, Signal and Background



Signal are non-photonic electrons from charm and bottom decay

Background are hadronic from

- π^0 Dalitz decay
- η Dalitz decay
- Kaon decay
- Vector meson decays

and photonic electrons from photon conversions

Detector components used

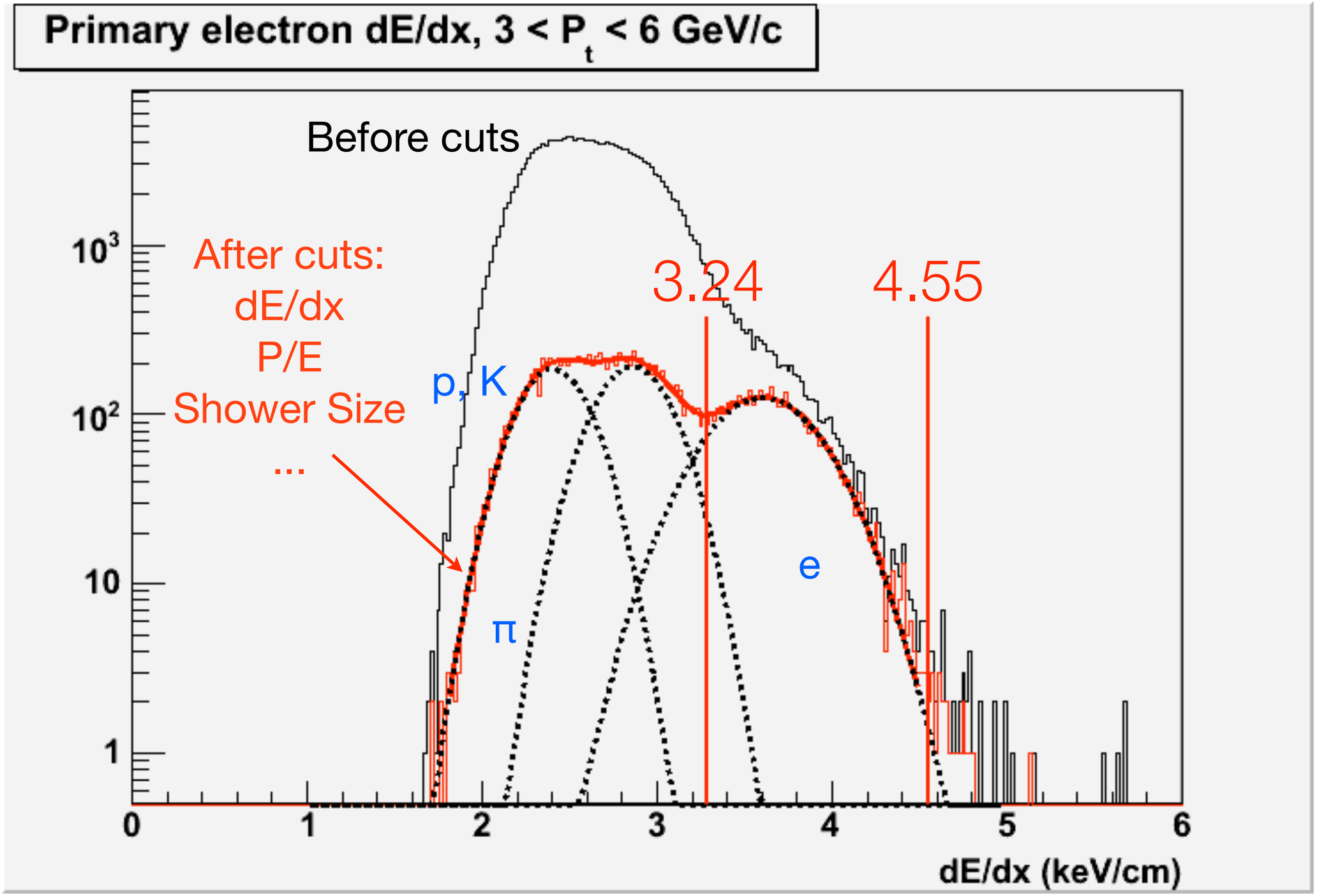
- Time Projection Chamber (TPC) – dE/dx, p
- Barrel Electro-Magnetic Calorimeter (BEMC)
- Barrel Shower Maximum Detector (BSMD)

} e ID, background

Electron Purity

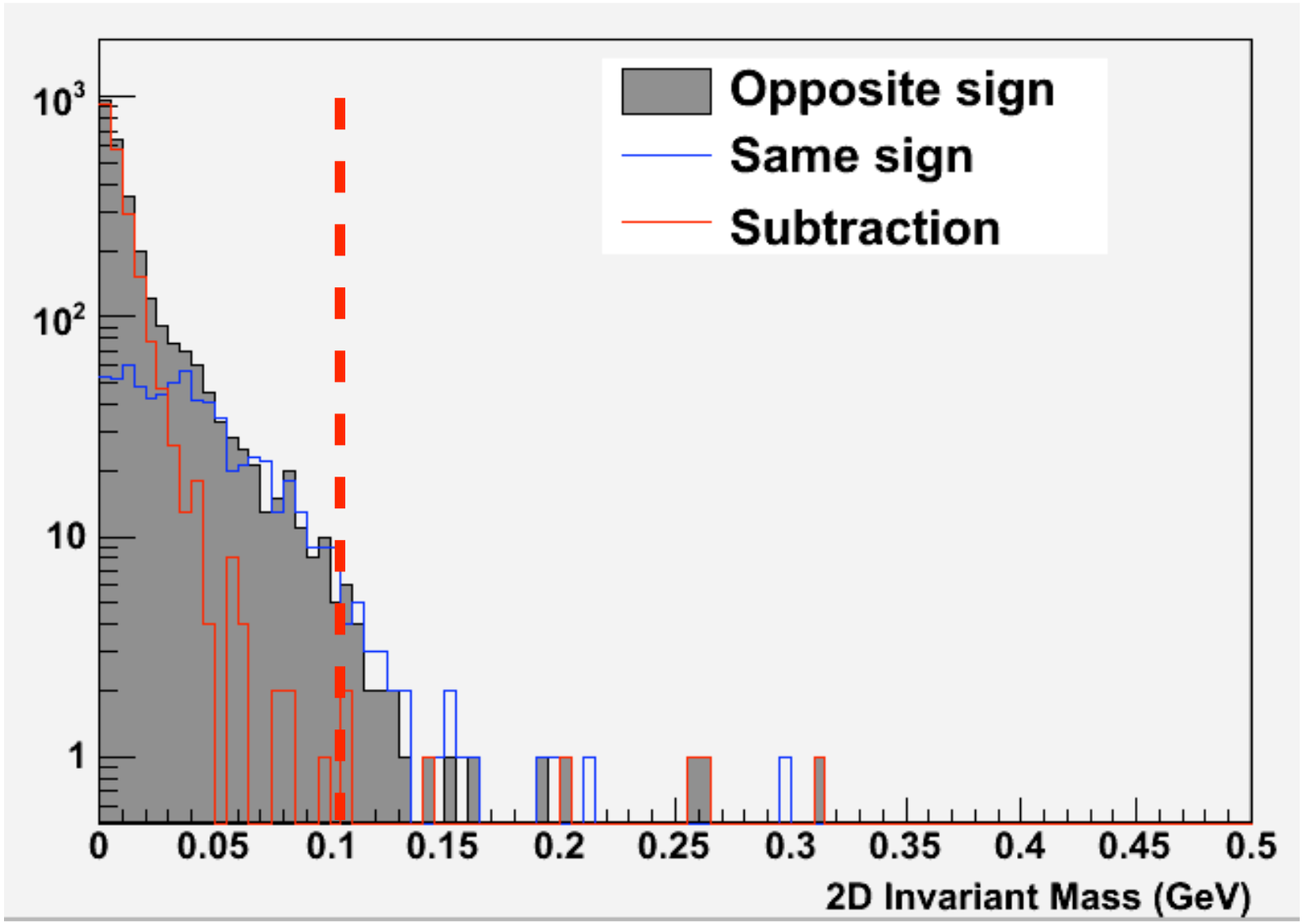
Cut	Description
dE/dx	(3.335, 4.551 keV/cm)
Primary	Primary track
Charge	±1
SMD Strips	≥ 2 in both eta and phi
P over E	(0.3, 1.5)
DCA Global	[0, 2)
Rcut	(-0.0979, 0.0107) for Phi dist. (-3.564, 0.865) eta > 0 (-1.092, 3.169) eta < 0

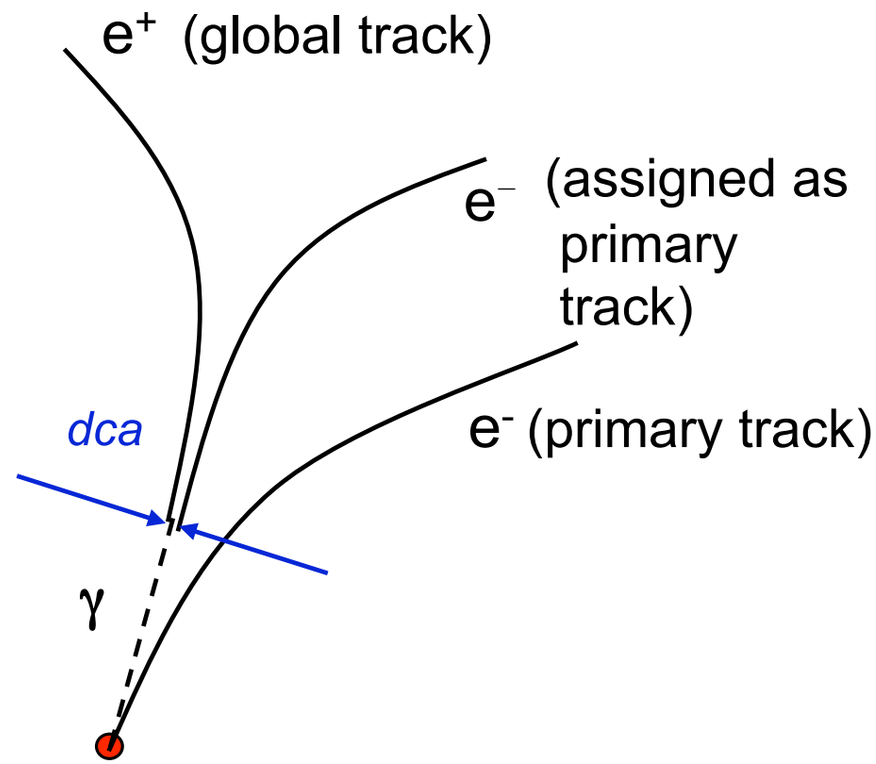
Electron Purity



98% purity

2D Invariant Mass



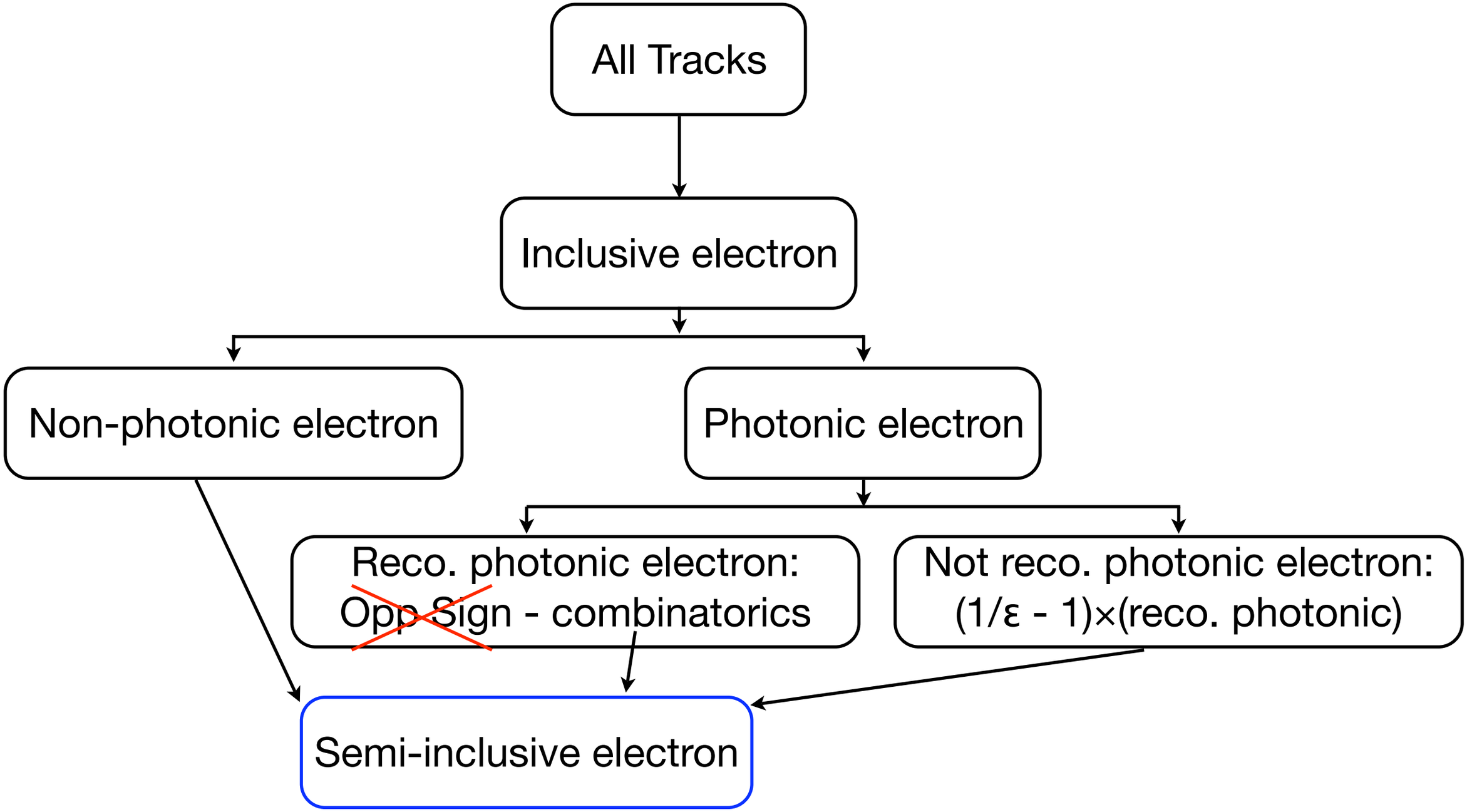


2D

- Projection onto the rz plane
- Eliminates TPC resolution effect in xy plane

- The invariant masses of the O.S. and S.S. e-pairs have different distributions
- Reconstructed photonic electrons are subtracted
- Photonic electrons are reconstructed-photonic/ε
- ε is the background reconstruction efficiency calculated from simulations

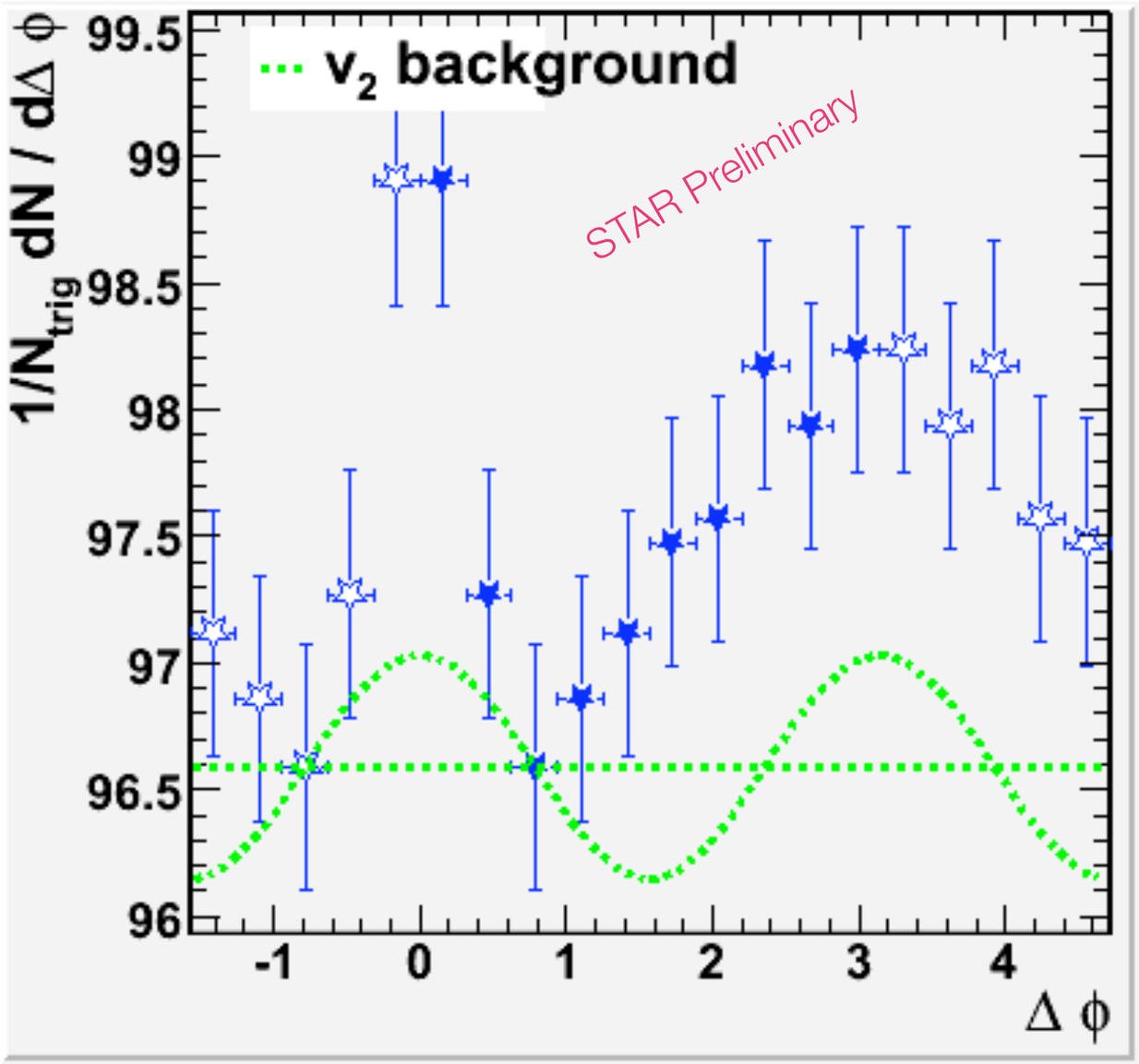
Signal Extraction for e-h Correlation

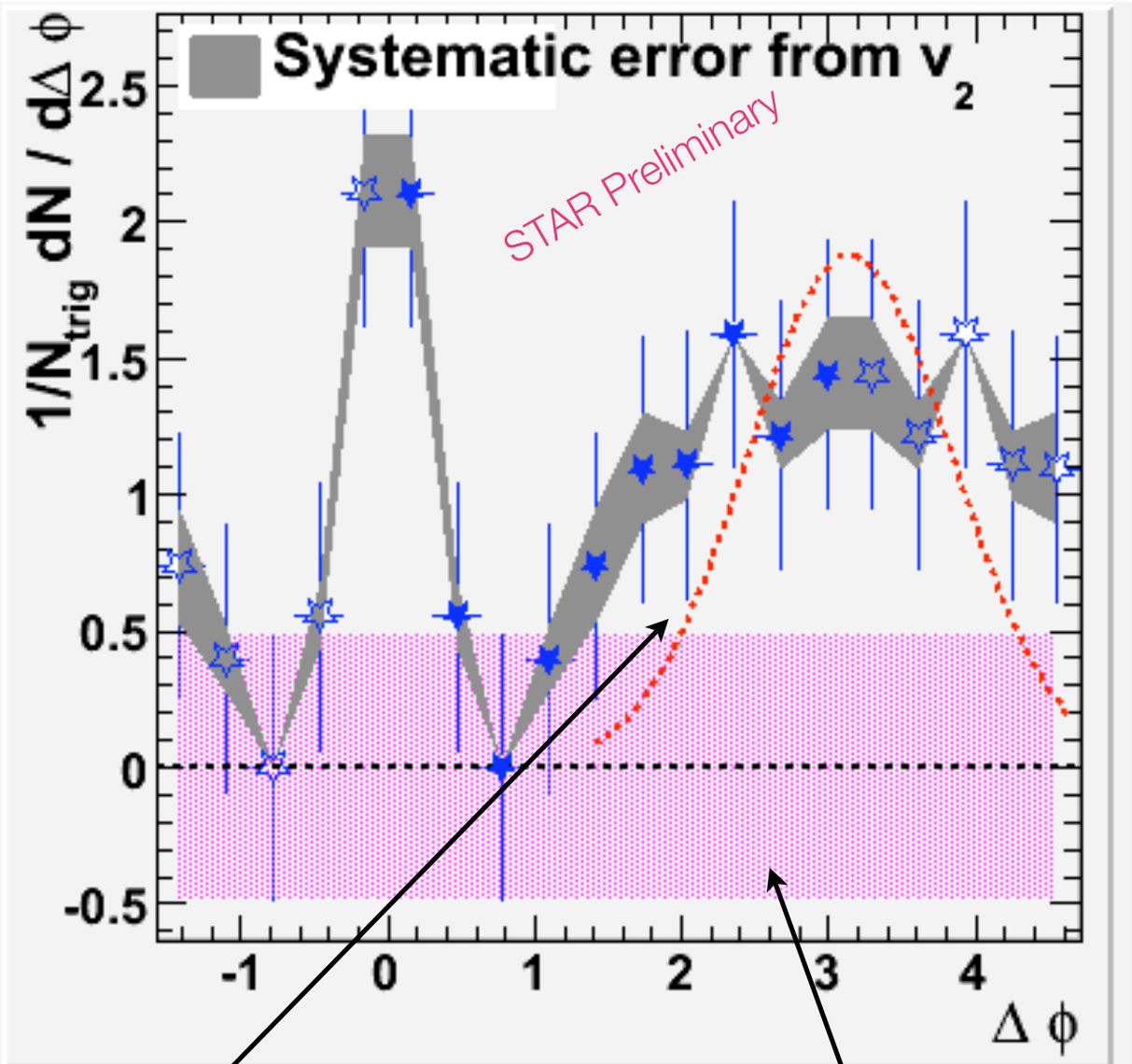


$$\Delta\Phi_{\text{non-photo}} = \Delta\Phi_{\text{semi-incl}} + \Delta\Phi_{\text{Same Sign}} - (1/\varepsilon - 1)\times(\Delta\Phi_{\text{Opp Sign}} - \Delta\Phi_{\text{Same Sign}})$$

Preliminary AuAu results

0-20% Centrality, 3 < p_T^{trig}< 6 GeV/c and 0.15 < p_T^{asso}< 1 GeV/c



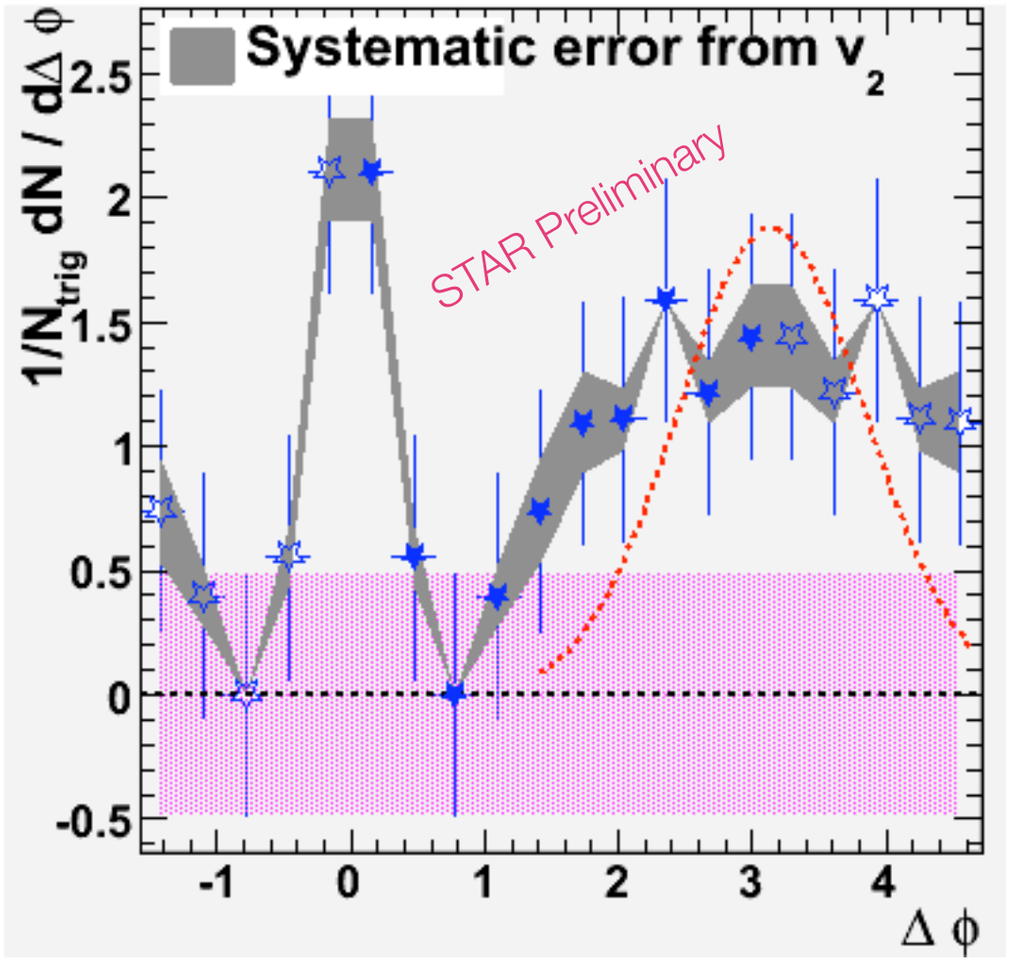


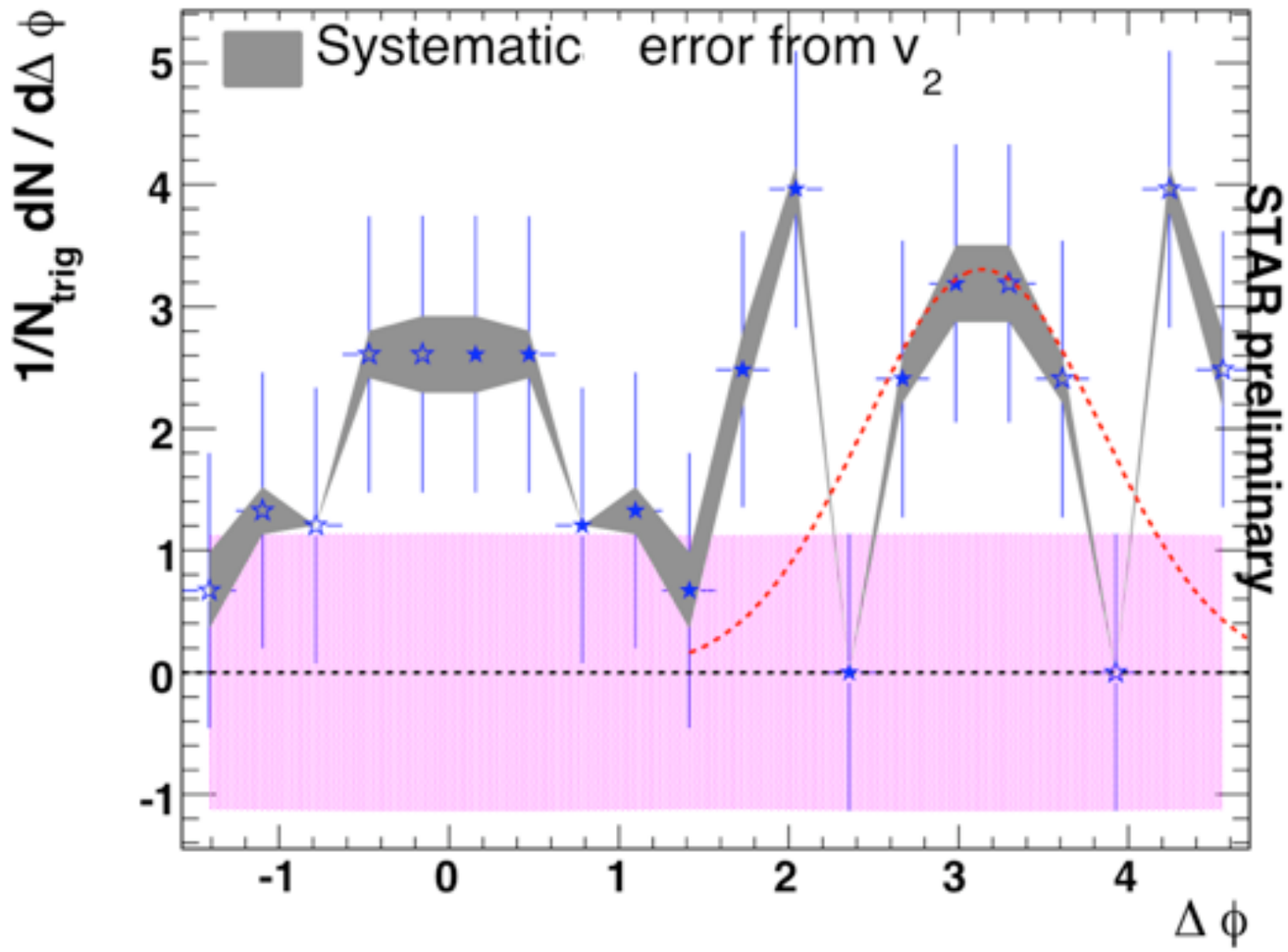
Away side fit is from PYTHIA for p+p result

Error band due to ZYAM

Comparison with another AuAu 200GeV result

Different data set was used, lower statistics



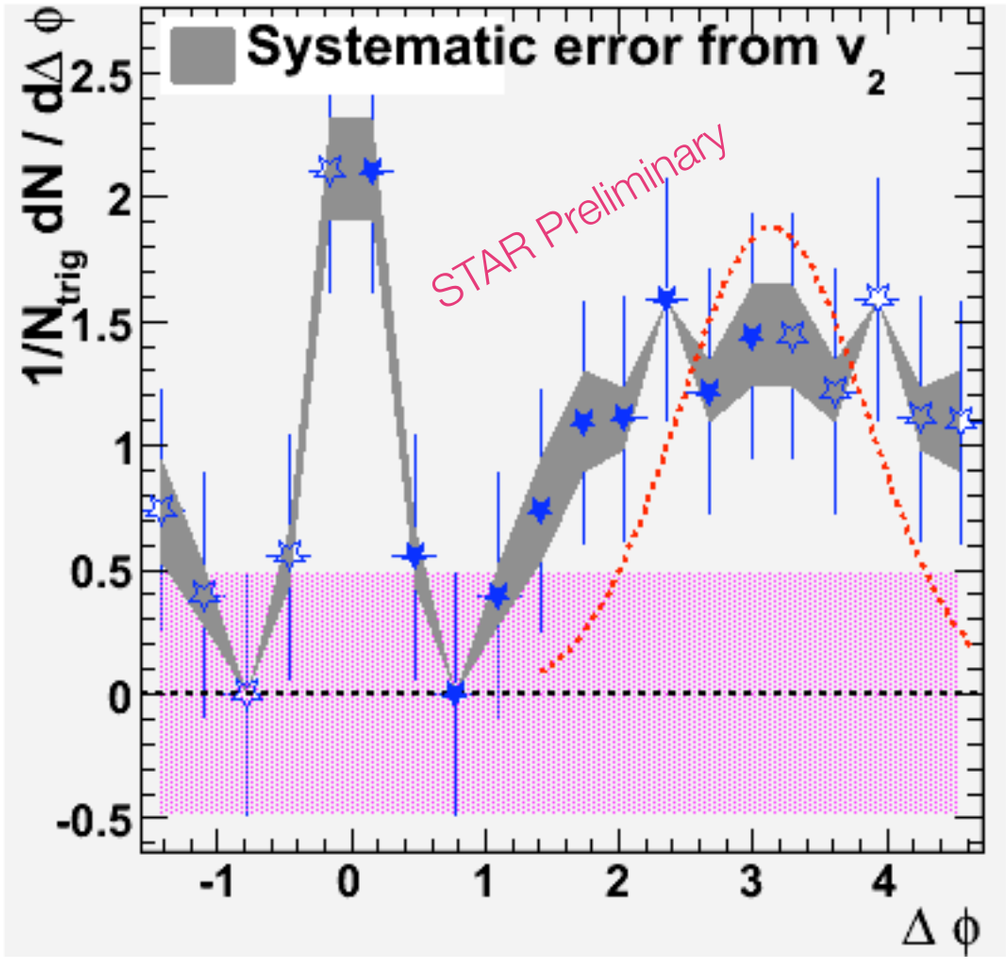


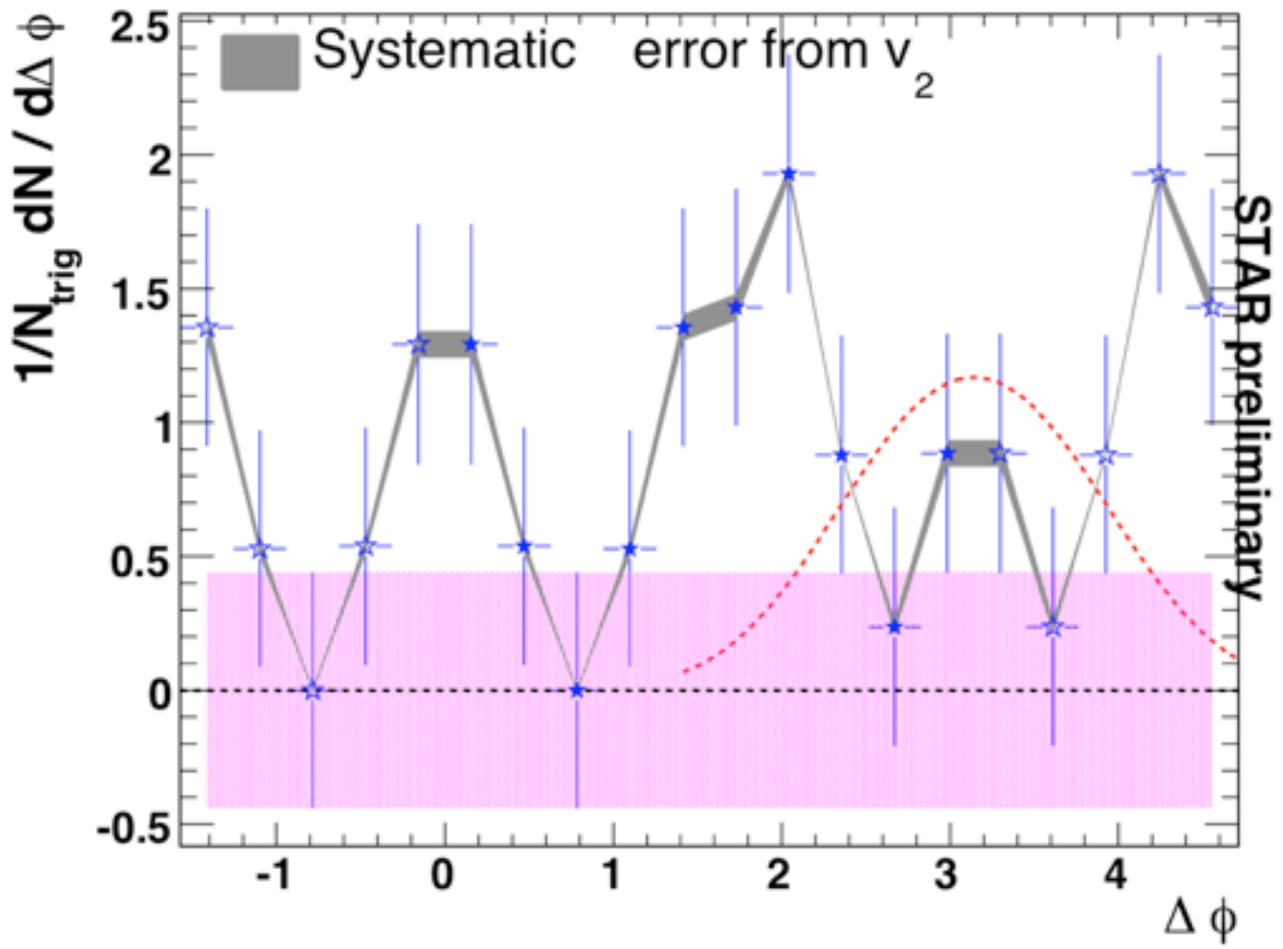
70% photonic electron reconstruction efficiency

(Gang Wang, QM 2008)

0-20% Centrality, $3 < p_T^{trig} < 6$ GeV/c and $0.15 < p_T^{asso} < 1$ GeV/c

Comparison with CuCu 200GeV result





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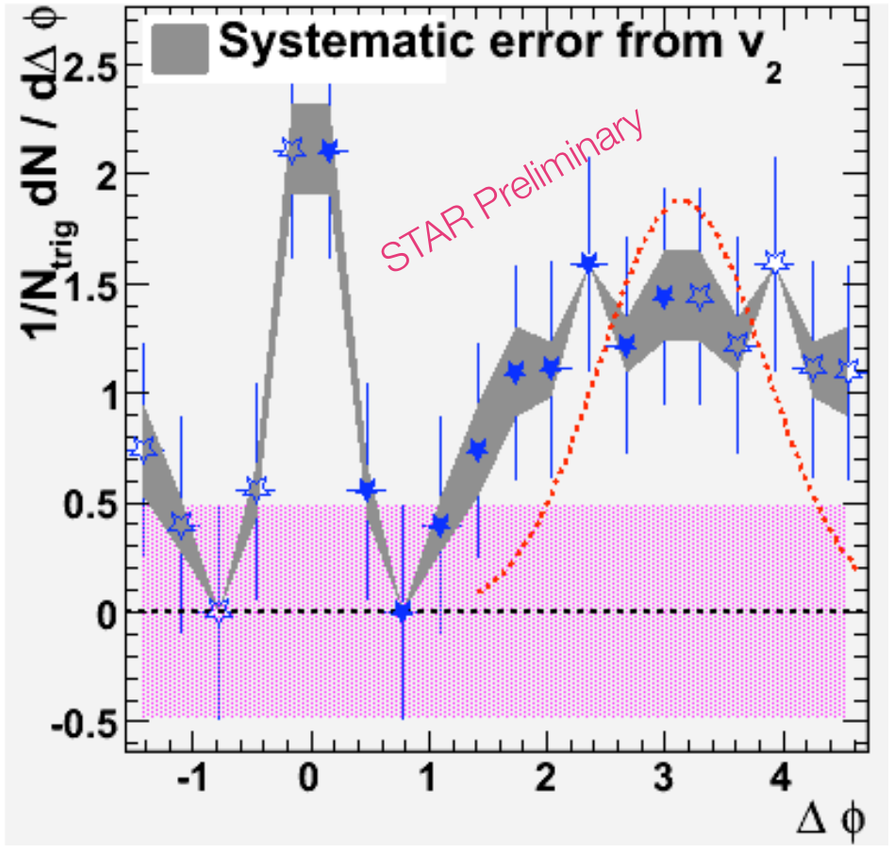
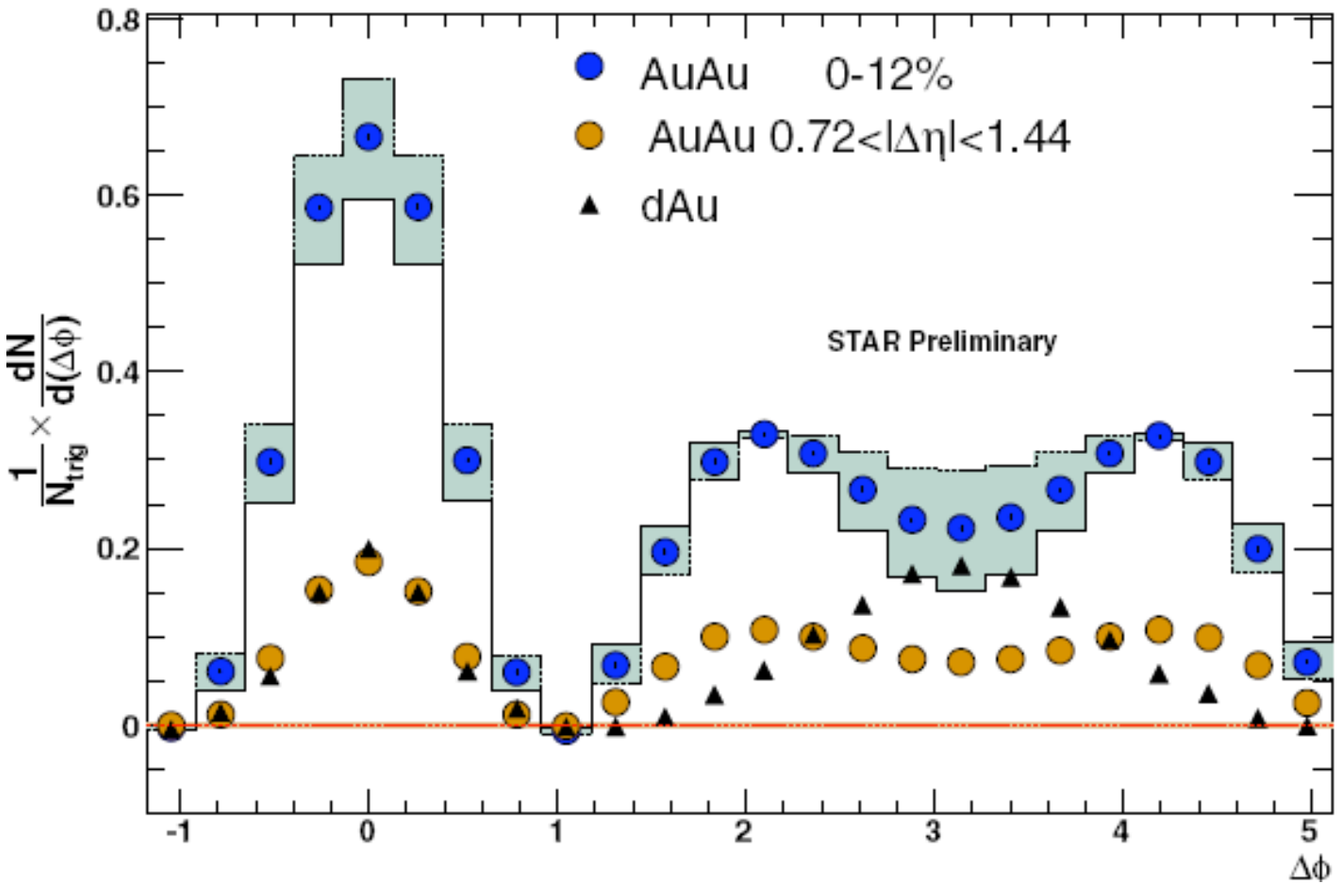
Conclusions

- Even with large error bars the e-h correlation for AuAu 200 GeV indicates there is difference from pp or dAu and is in general agreement with CuCu results





- Refining of cuts and possible combination of prior AuAu results to increase the statistics

Backup Slides

Data Sample

- P07ie, ran with P08ib library though
  - trgsetupname = 2007Production2
  - tpc, emc and bsmd all included
  - runnumber > 8122053
- Preliminary cuts
  - Centrality > 0-60%
  - Z-vertex within 30 cm
  - TPC points >= 15
  - P_t > 2 GeV/c
- Approximately 1M events make it

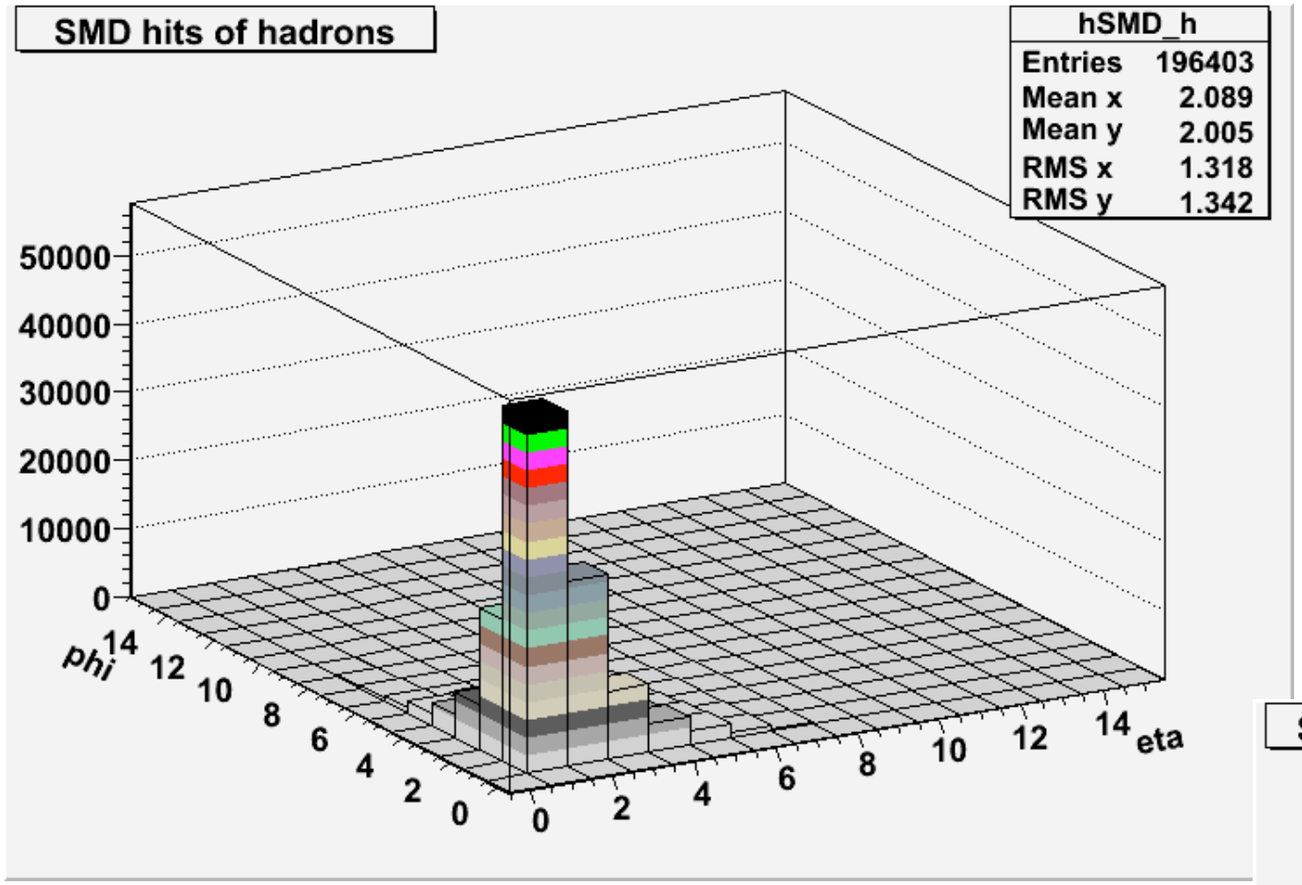
Further cuts

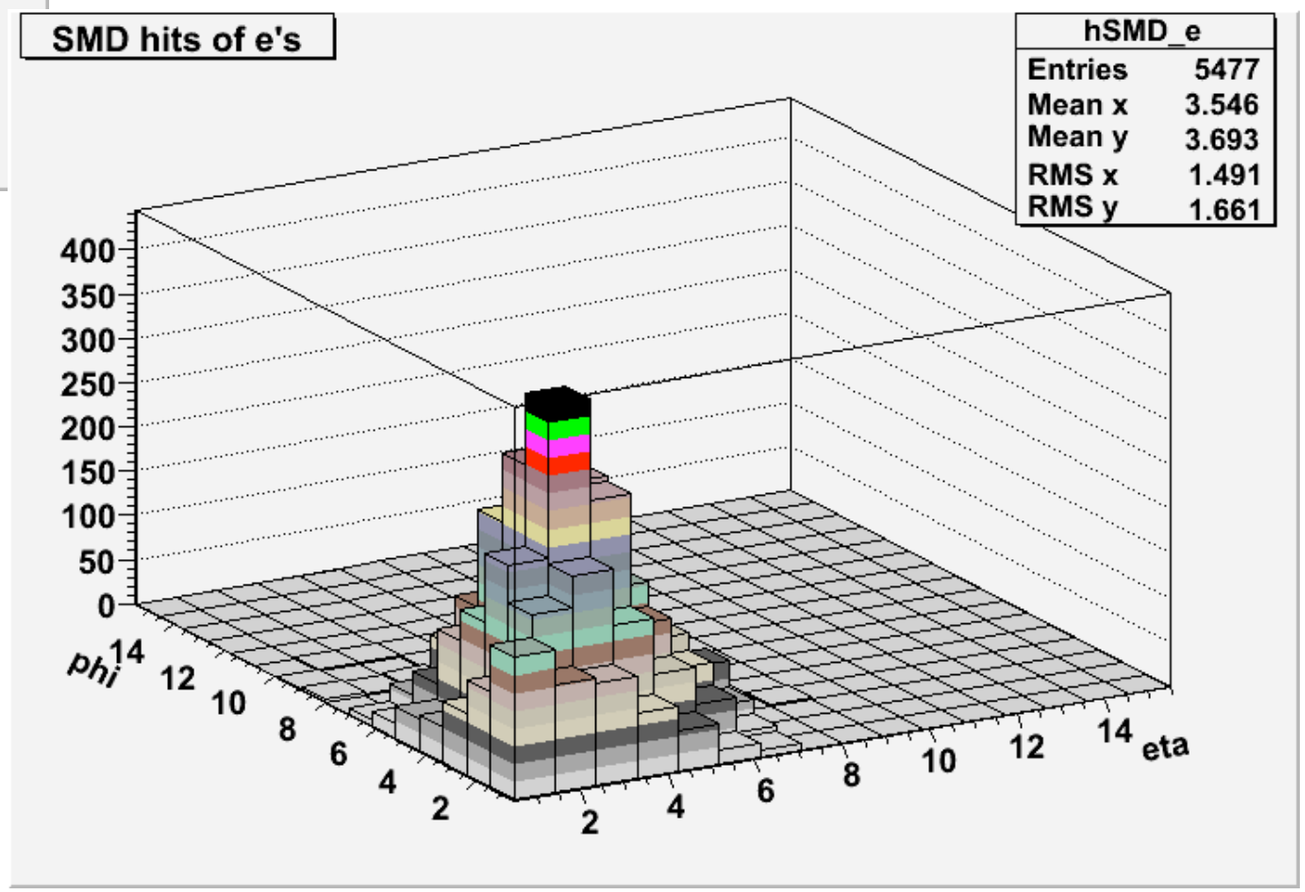
- 1M events which are reduced to .6M after initial cuts (0-20% centrality, Z-vertex)
  - 2.5M matched tracks
    - TPC track matched to an EMC point
  - Lower momentum (> 3 GeV/c) and eta (-0.7, 0.7) cut reduce it to 200k
  - Electron cuts

change to nsigma →

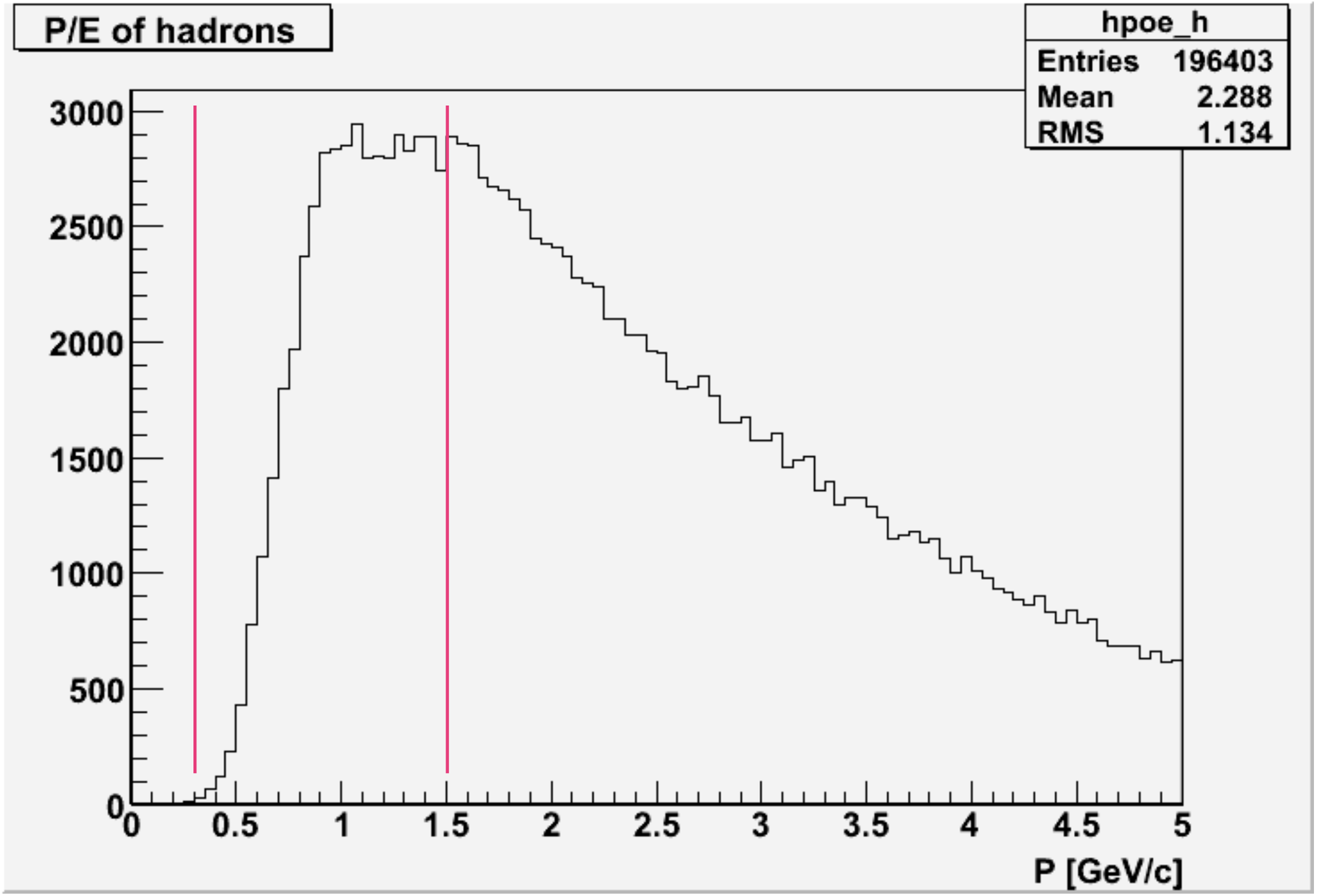
Cut	Desc.	rel. % survived
dE/dx	P > 2, (3.335, 4.551 keV/cm)	100
Primary	Primary track	100
Charge	±1	100
SMD Strips	≥ 2 in both eta and phi	34
P over E	(0.3, 1.5)	25
DCA Global	[0, 2)	99
Rcut	(-0.0979, 0.0107) for Phi dist. (-3.564, 0.865) eta > 0 (-1.092, 3.169) eta < 0	41

SMD eta-phi check



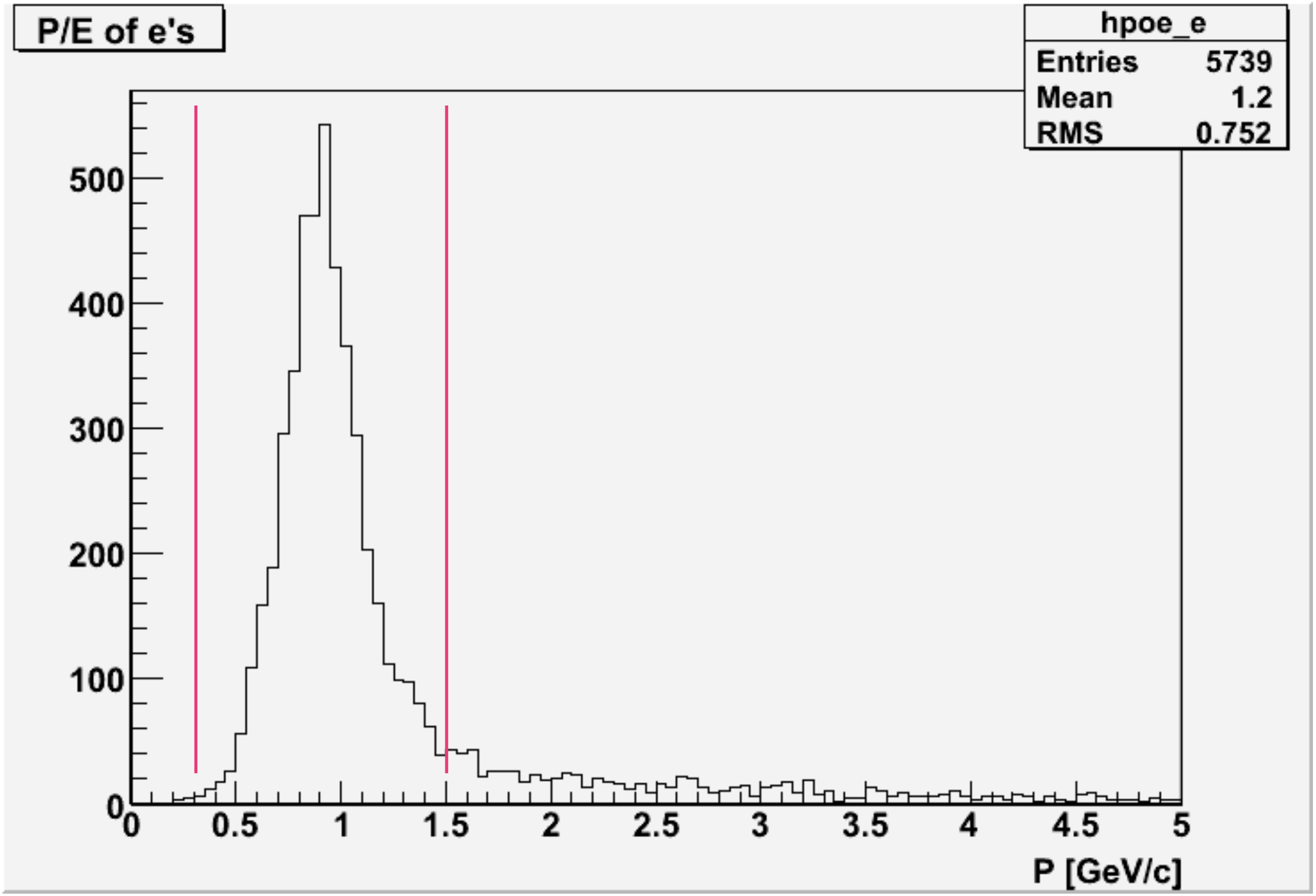


P over E check



- Using electron cuts besides P over E (i.e. dE/dx, nstrips...)

P over E check



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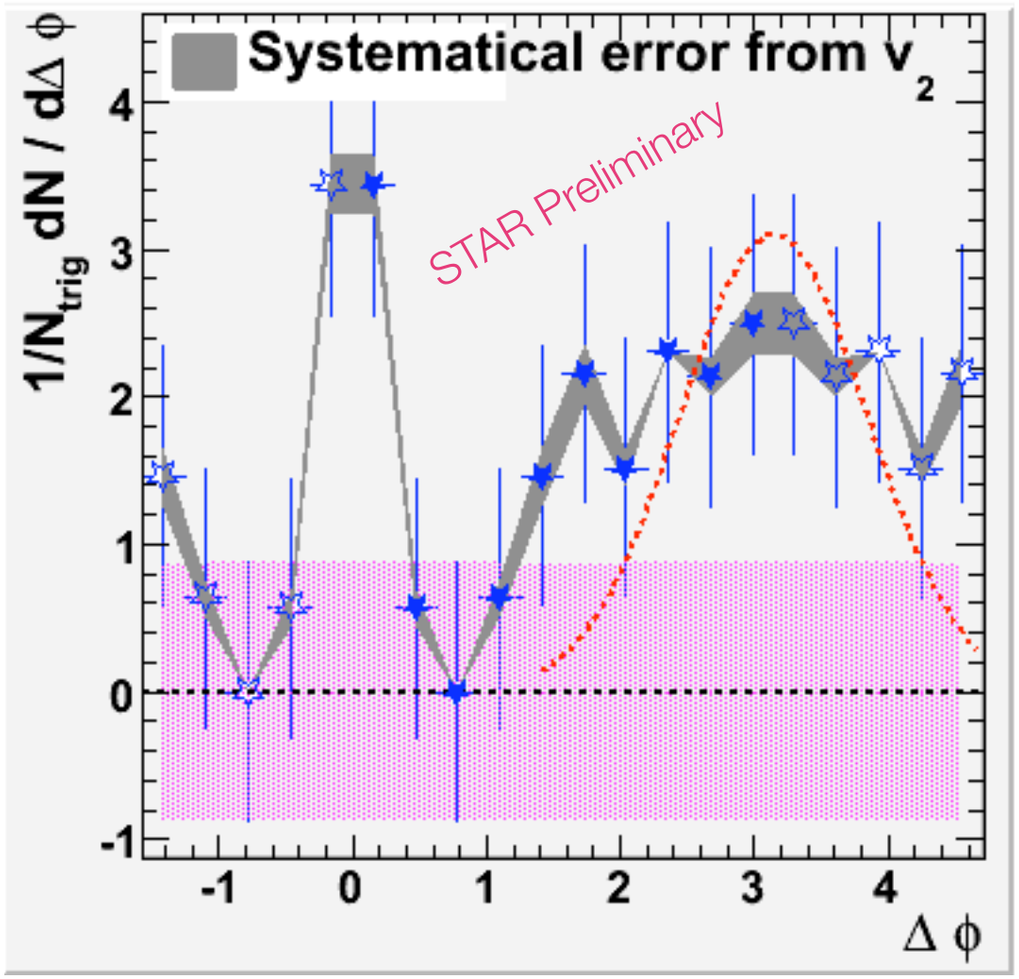

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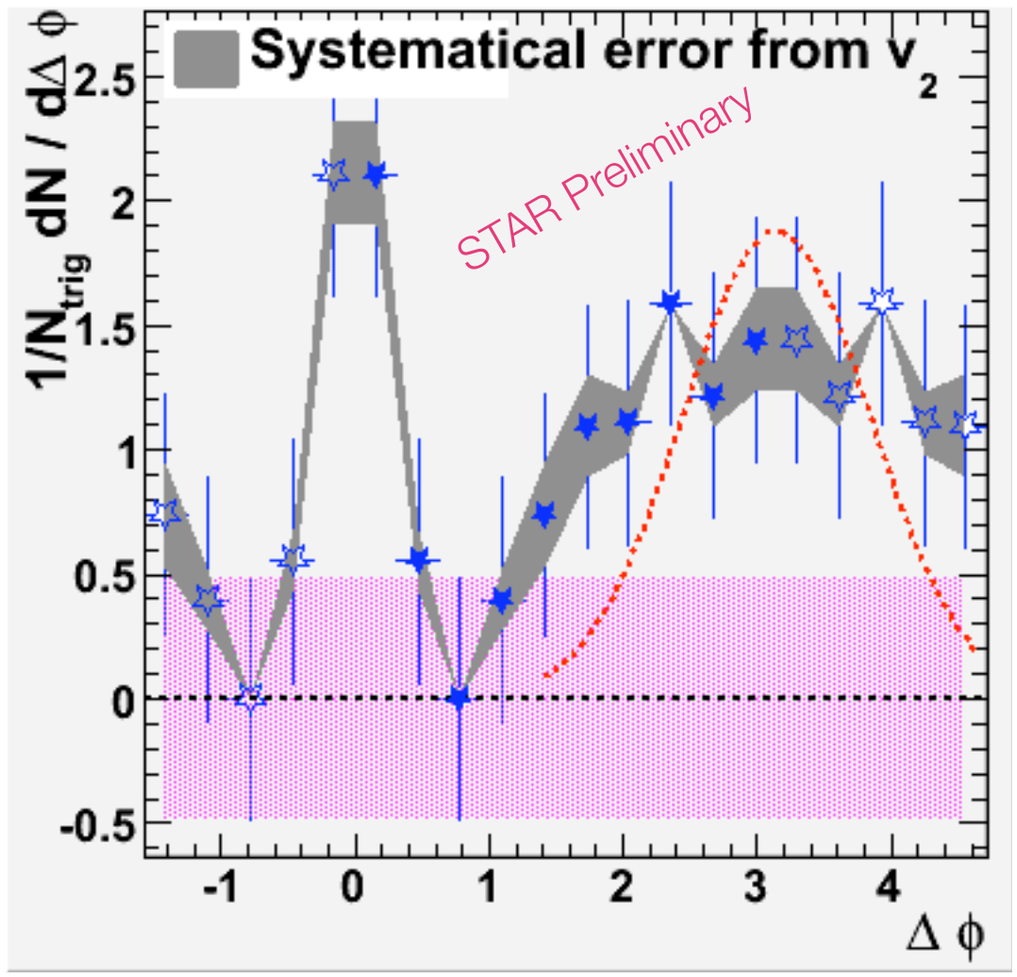
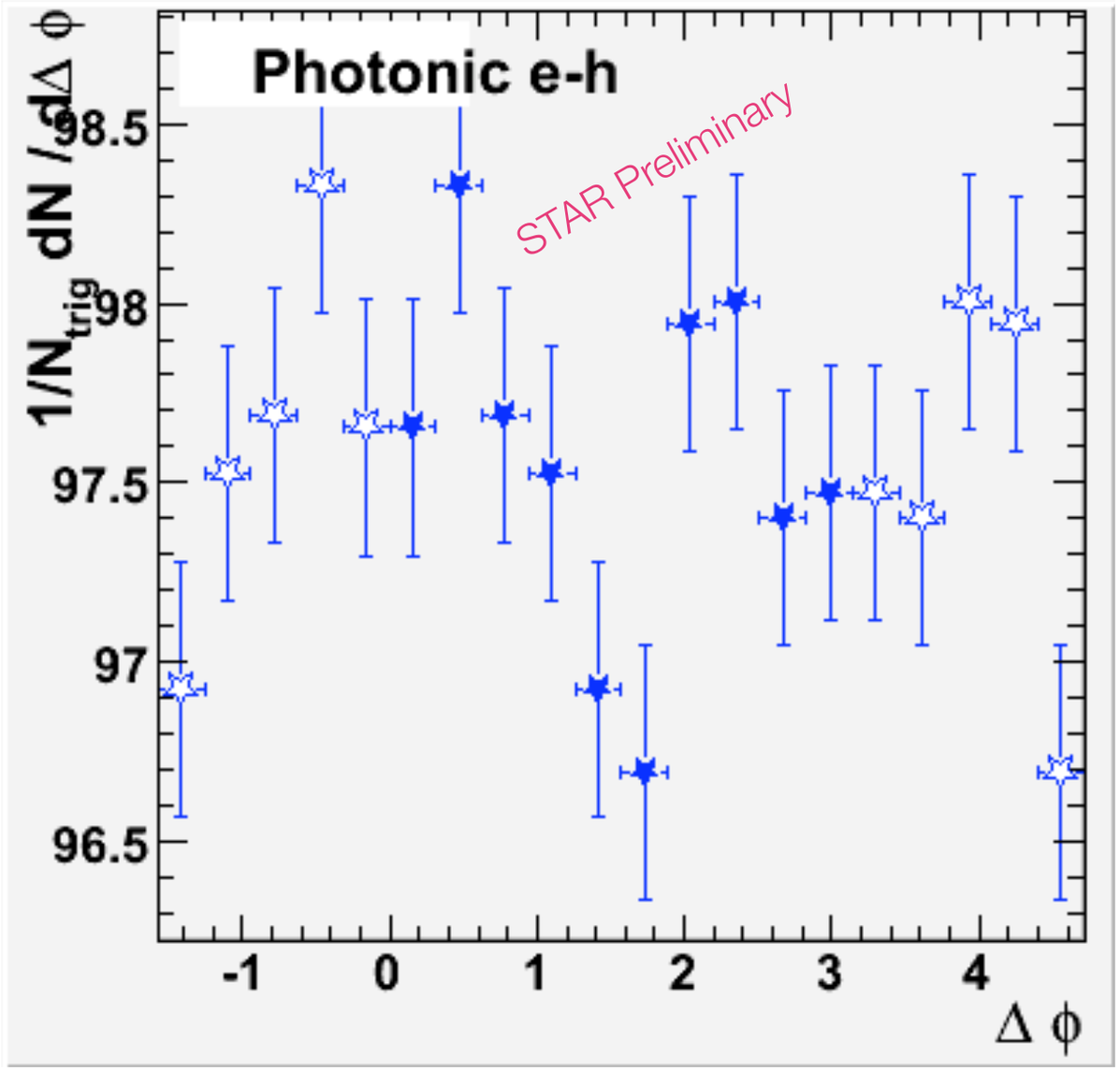


60% electron reconstruction efficiency

Photonic correlation



Semi + combinatorical