



Lake Louise Winter Institute 2009
16th-21st February 2009
Alberta, Canada

***NON-PHOTONIC ELECTRON-HADRON
CORRELATIONS IN CU+CU
AT $\sqrt{s_{NN}} = 200$ GEV***

Miroslav Krús, for the STAR Collaboration
(Czech Technical University in Prague)

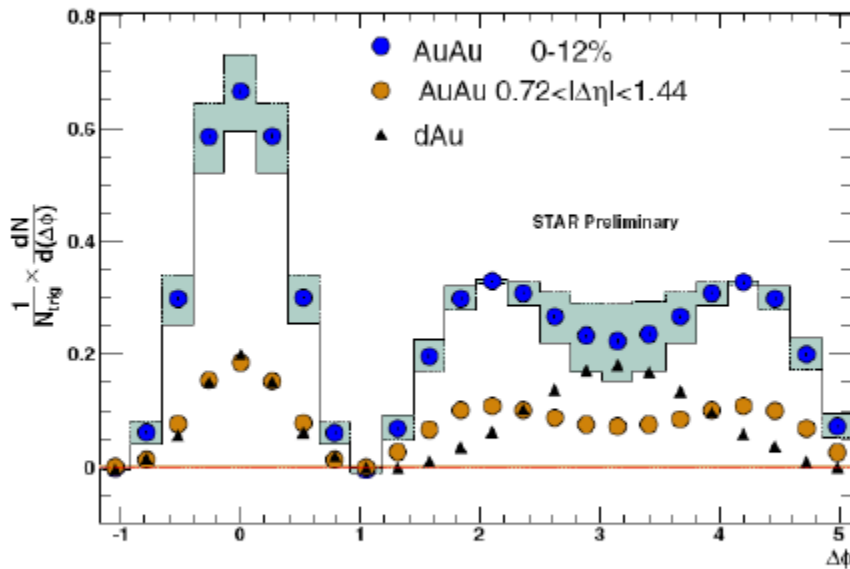


CFRJS

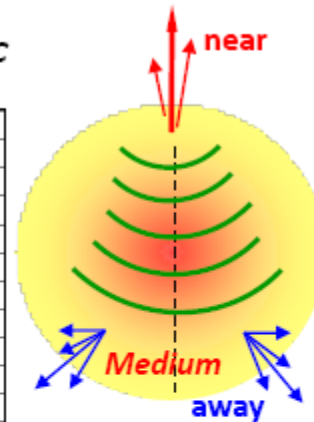
MOTIVATION

→ conical pattern in hadron – hadron correlations in Au+Au collisions at 200 GeV

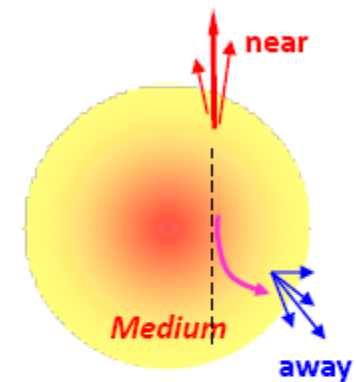
$$p_T^{trig} = 2.5-4.0 \text{ GeV}/c \ \& \ p_T^{assoc} = 1.0-2.5 \text{ GeV}/c$$



Mark Horner (for STAR Collaboration):
J. Phys. G: Nucl. Part. Phys. 34 (2007) S995



Conical Emission
 (Mach cone,
 Cherenkov radiation)



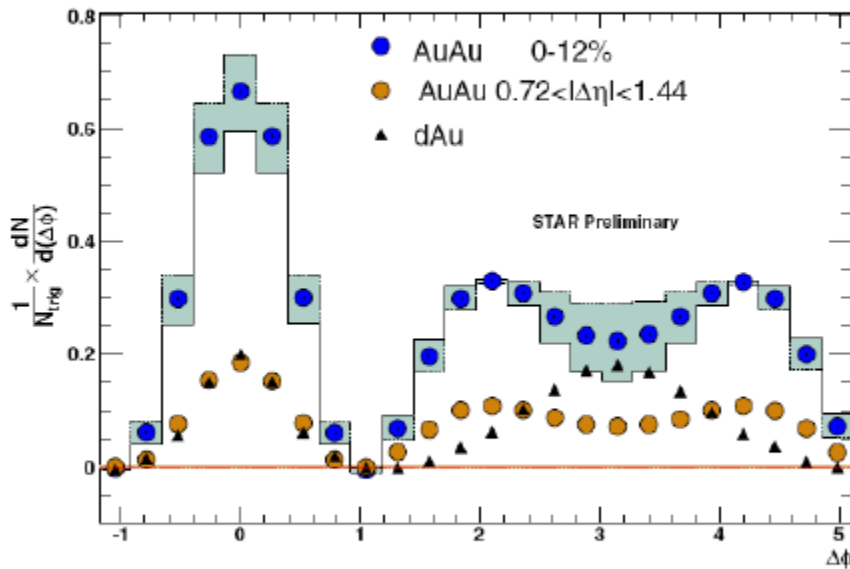
deflected jets

B. Abelev (STAR collaboration): arXiv:0805.0622v1

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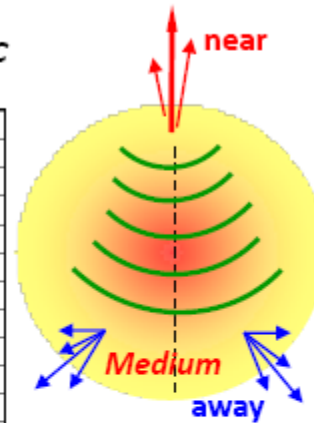
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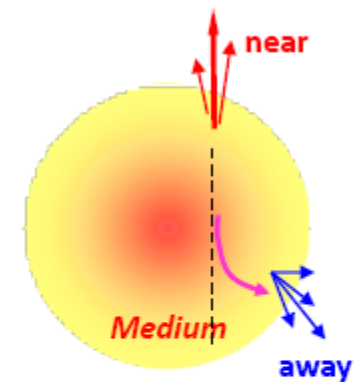


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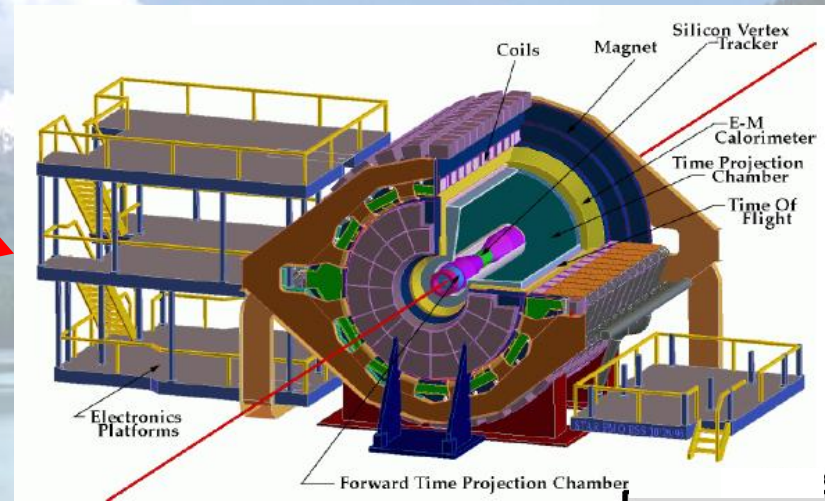
Question: Does heavy quark induce similar effect?

DETECTOR OVERVIEW & DATA SAMPLE

Relativistic Heavy Ion Collider



Solenoidal Tracker At RHIC



p+p, d+Au, Au+Au, Cu+Cu

- Time Projection Chamber (TPC → tracking, momentum, dE/dx)
- Barrel Electro-Magnetic Calorimeter (BEMC → deposited energy)
- Barrel Shower Maximum Detector (BSMD → e-m shower area)

DATA SAMPLE

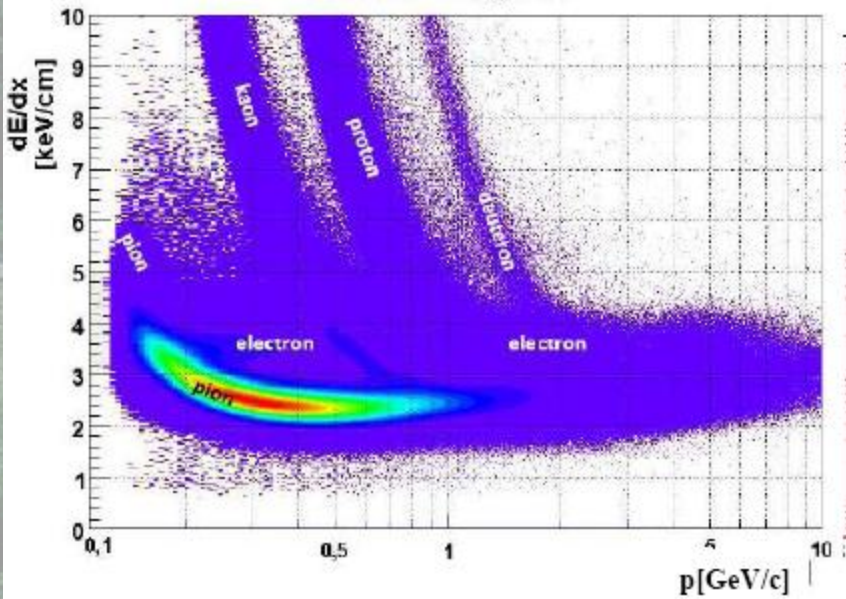
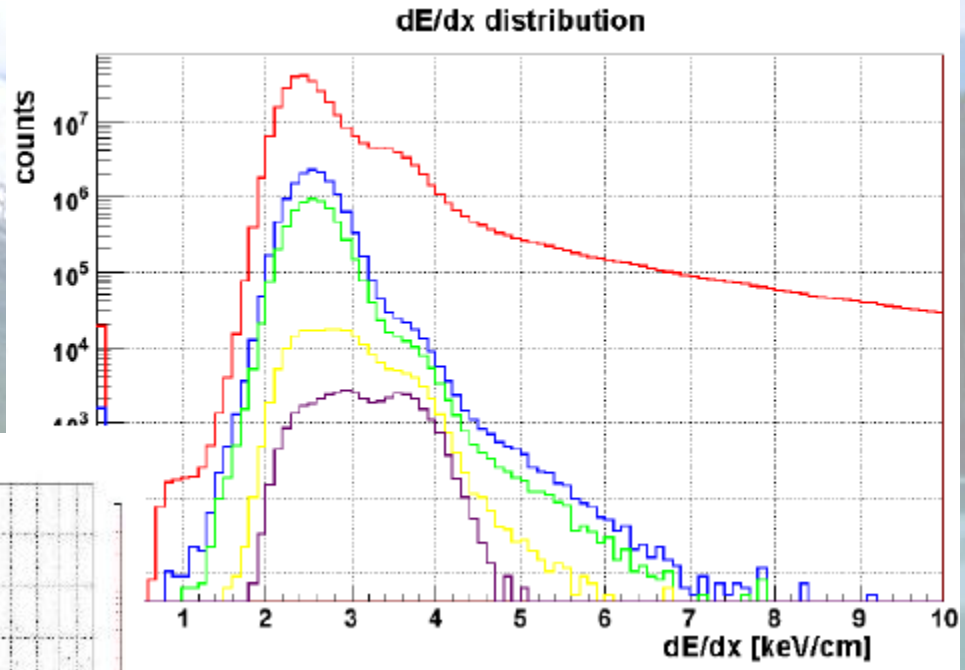
- run V (2005)
- Cu+Cu $\sqrt{s_{NN}} = 200$ GeV
- centrality selection: 0 – 20%
- **HighTower** triggered ($E_T > 3,75$ GeV)
 - 2,2M events (after QA selection)

ELECTRON IDENTIFICATION

TPC: all tracks
 $p > 1.5 \text{ GeV}/c$

BEMC: good track projection
 $p/E_{\text{TOW}} : 0 - 2$

BSMD: electron/hadron shower
shape (cluster size ≥ 2)
ionization energy loss

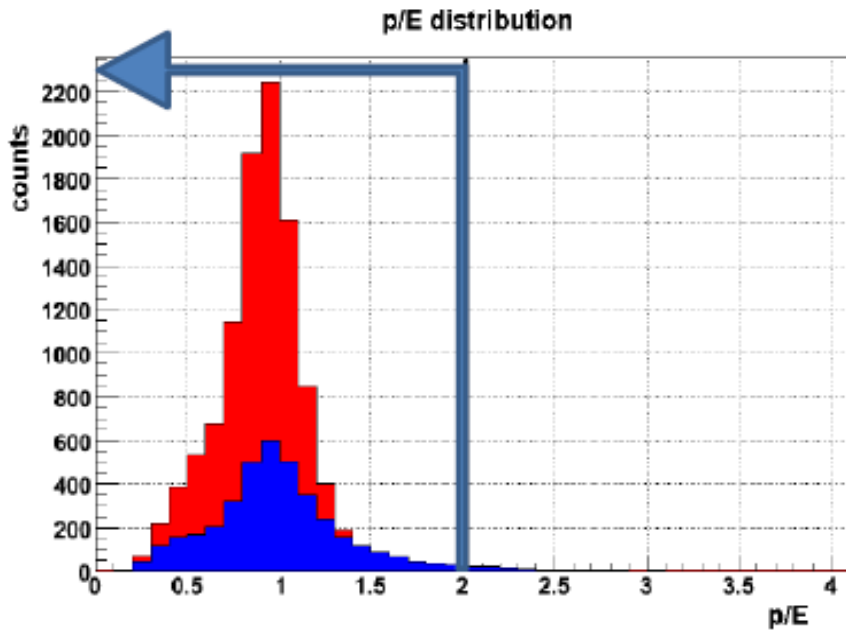
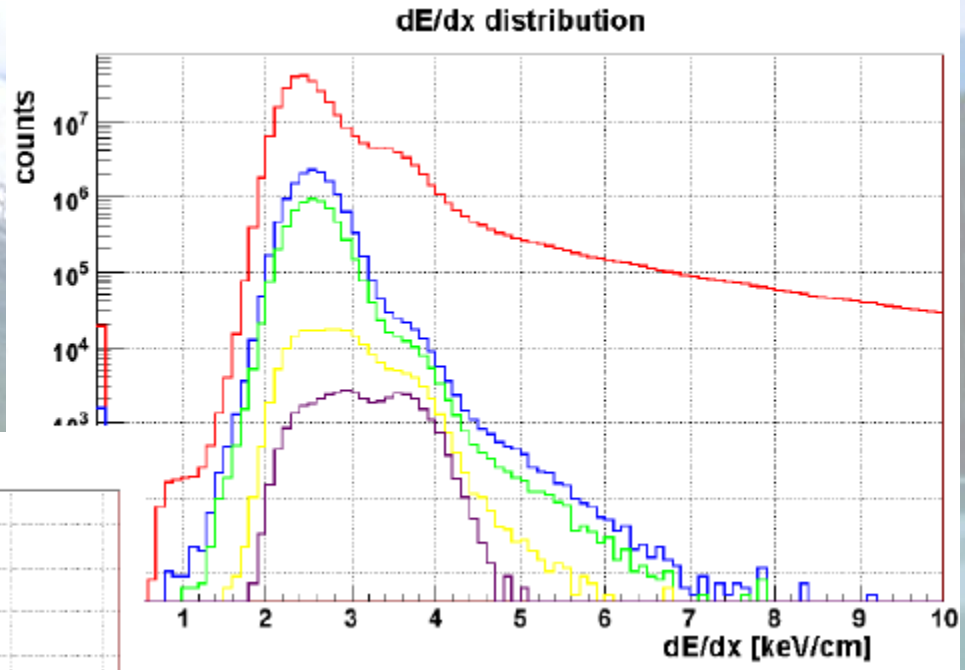


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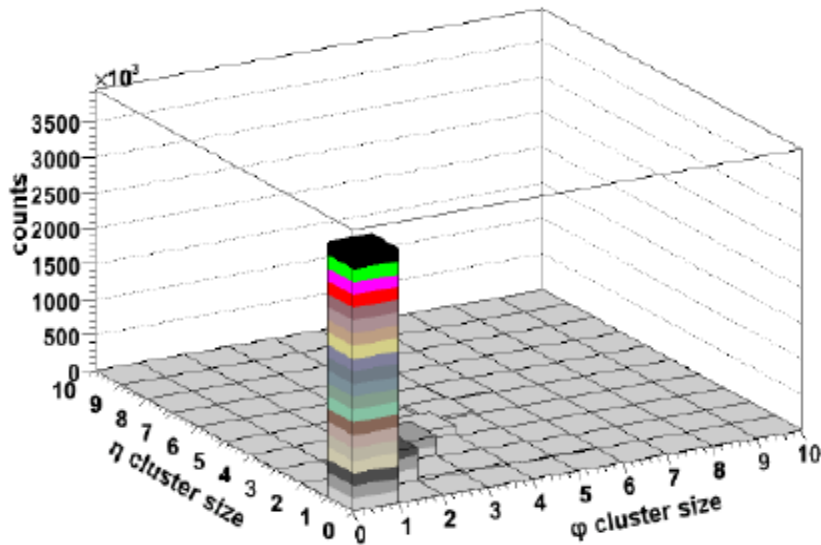
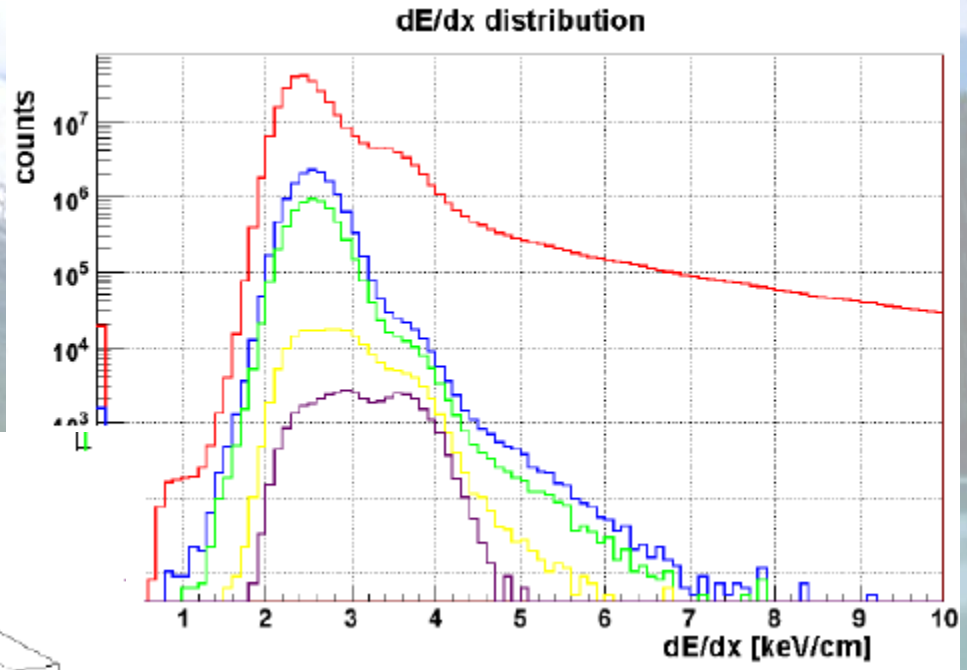
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η, ϕ SMD cluster size - hadrons

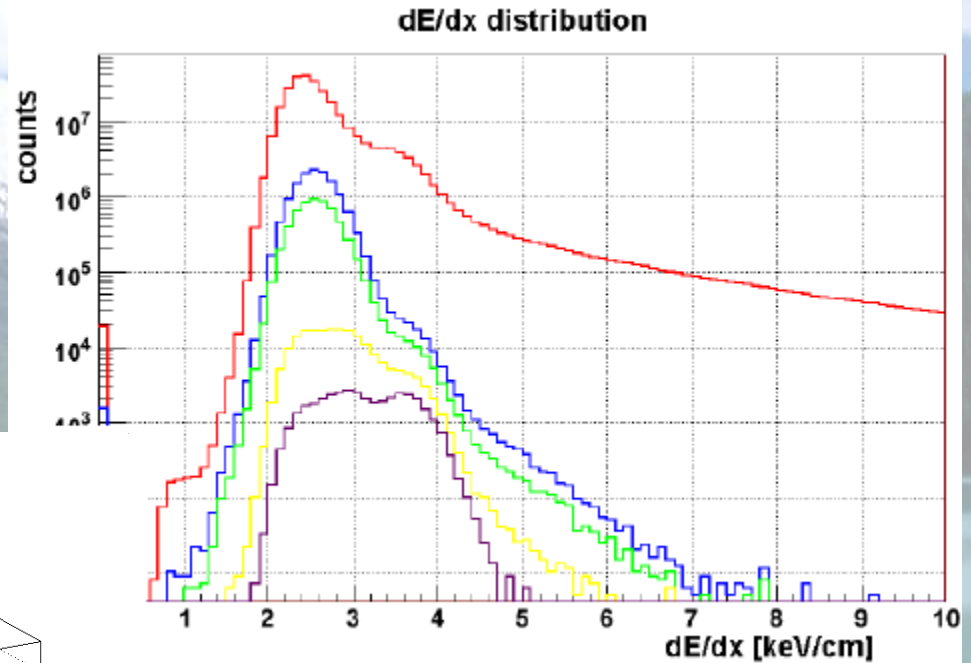
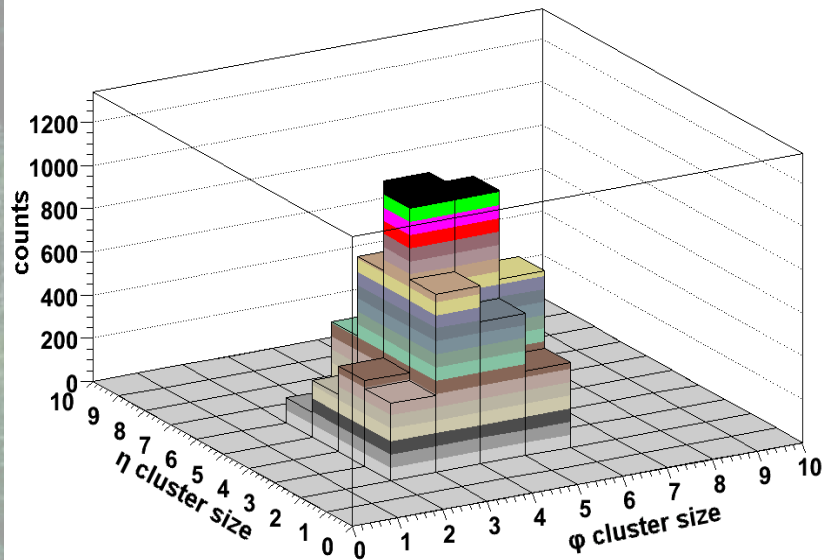


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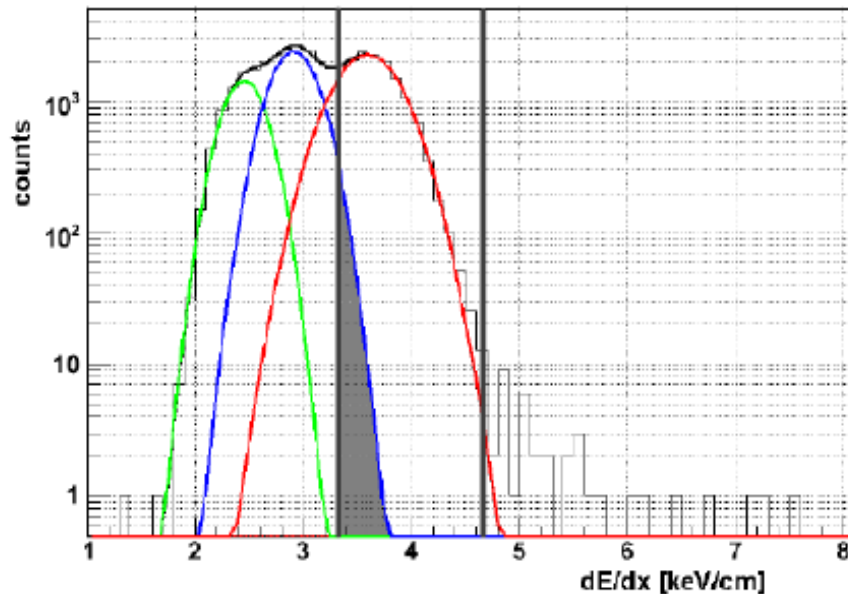
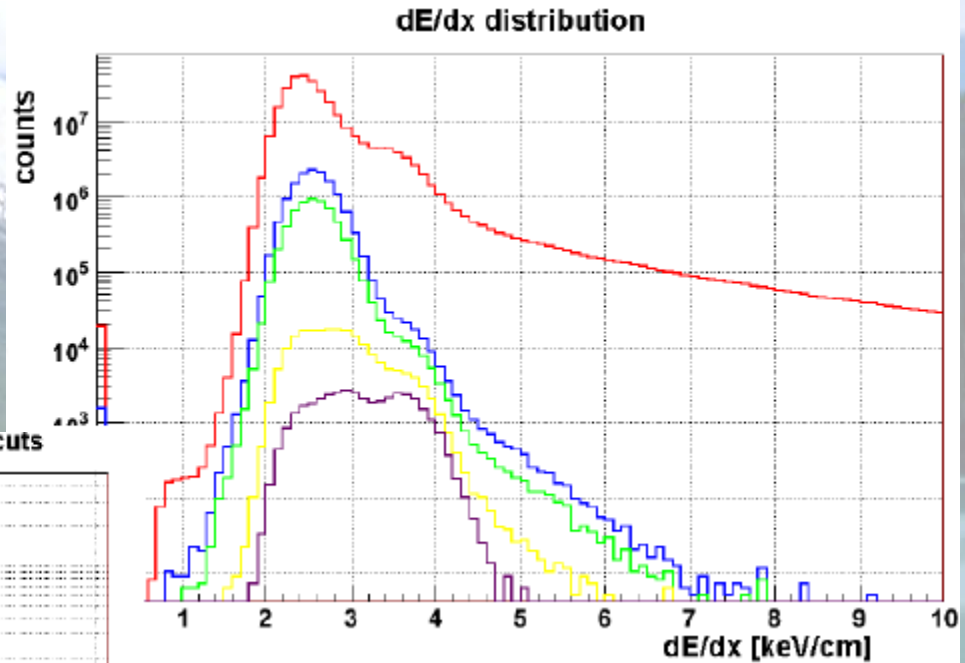
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Ionization energy distribution after all selection cuts



over 99% purity of electron sample
dE/dx: 3.31 - 4.64 keV/cm

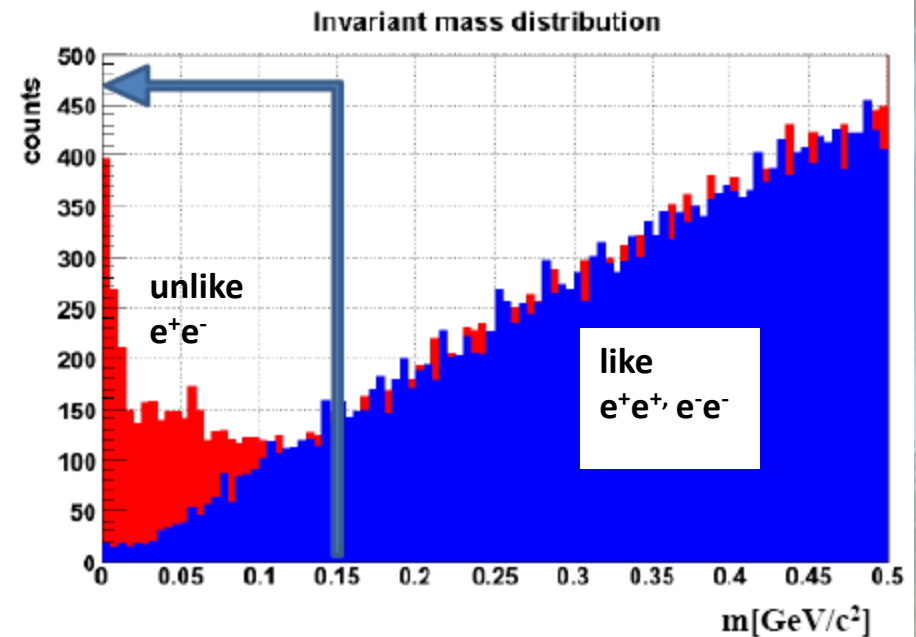
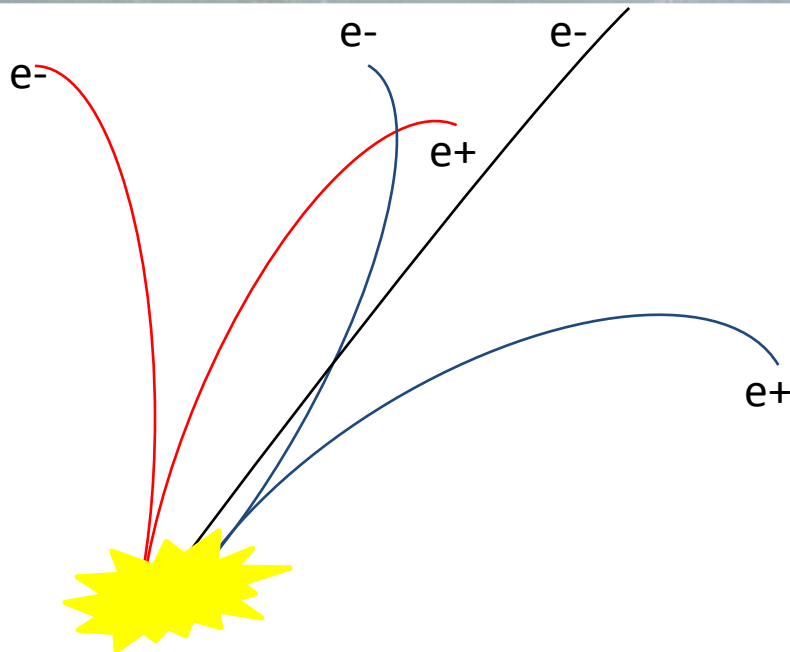
ELECTRON BACKGROUND REJECTION

- photon conversion $\gamma \rightarrow e^+e^-$
- π^0 Dalitz decay $\pi^0 \rightarrow \gamma e^+e^-$
- η Dalitz decay $\eta \rightarrow \gamma e^+e^-$
- kaon decay $K \rightarrow \pi^0 \nu e$
- vector meson decays $\rho^0, \omega, \phi \rightarrow e^+e^-$

$$N_{\text{RECO}} = N_{\text{US}} - N_{\text{LS}}$$

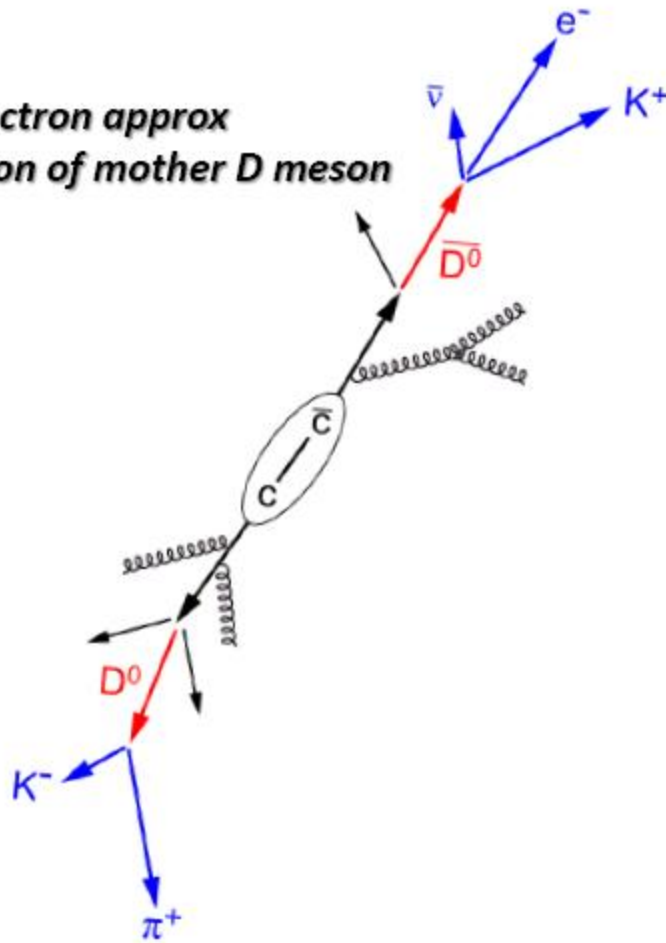
$$N_{\text{PE}} = \frac{N_{\text{RECO}}}{\varepsilon} \quad \varepsilon = 0.665$$

ε - reconstruction efficiency (determined from embedded π^0 in real data)



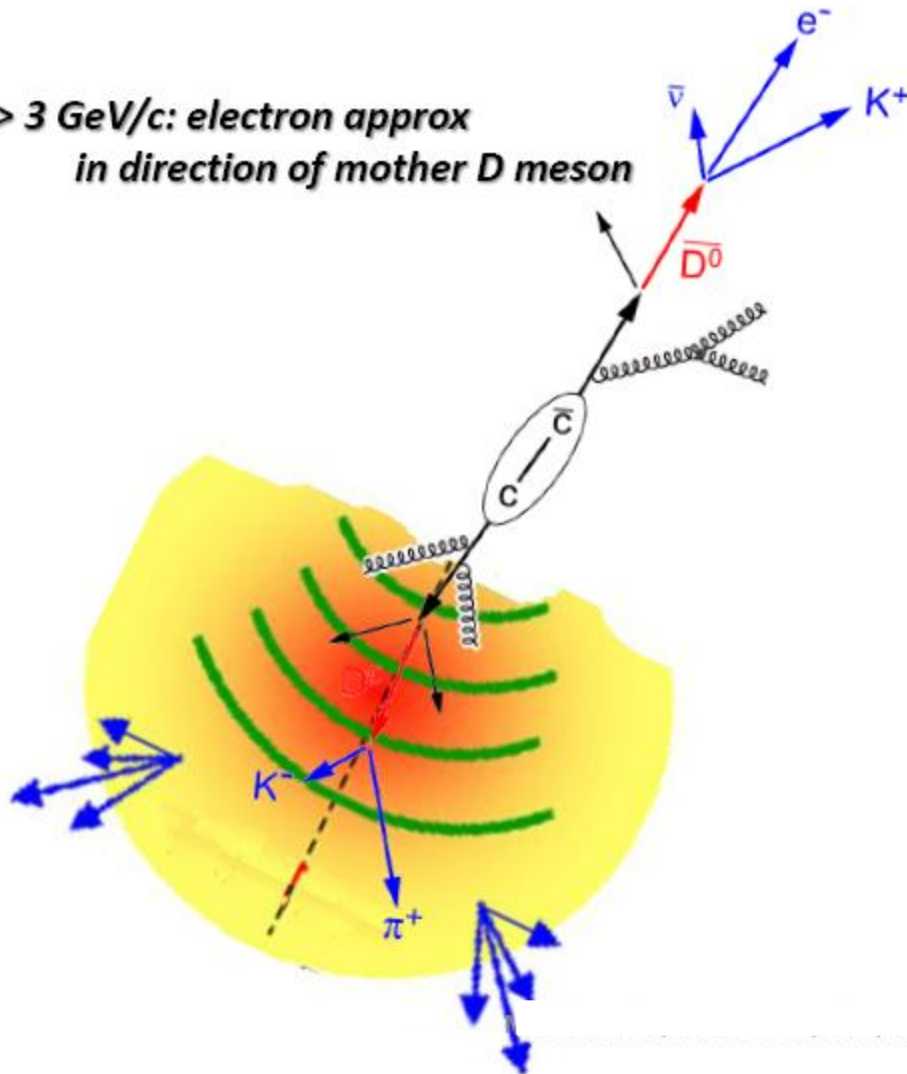
AZIMUTHAL CORRELATIONS

$p_T > 3 \text{ GeV}/c$: electron approx
in direction of mother D meson



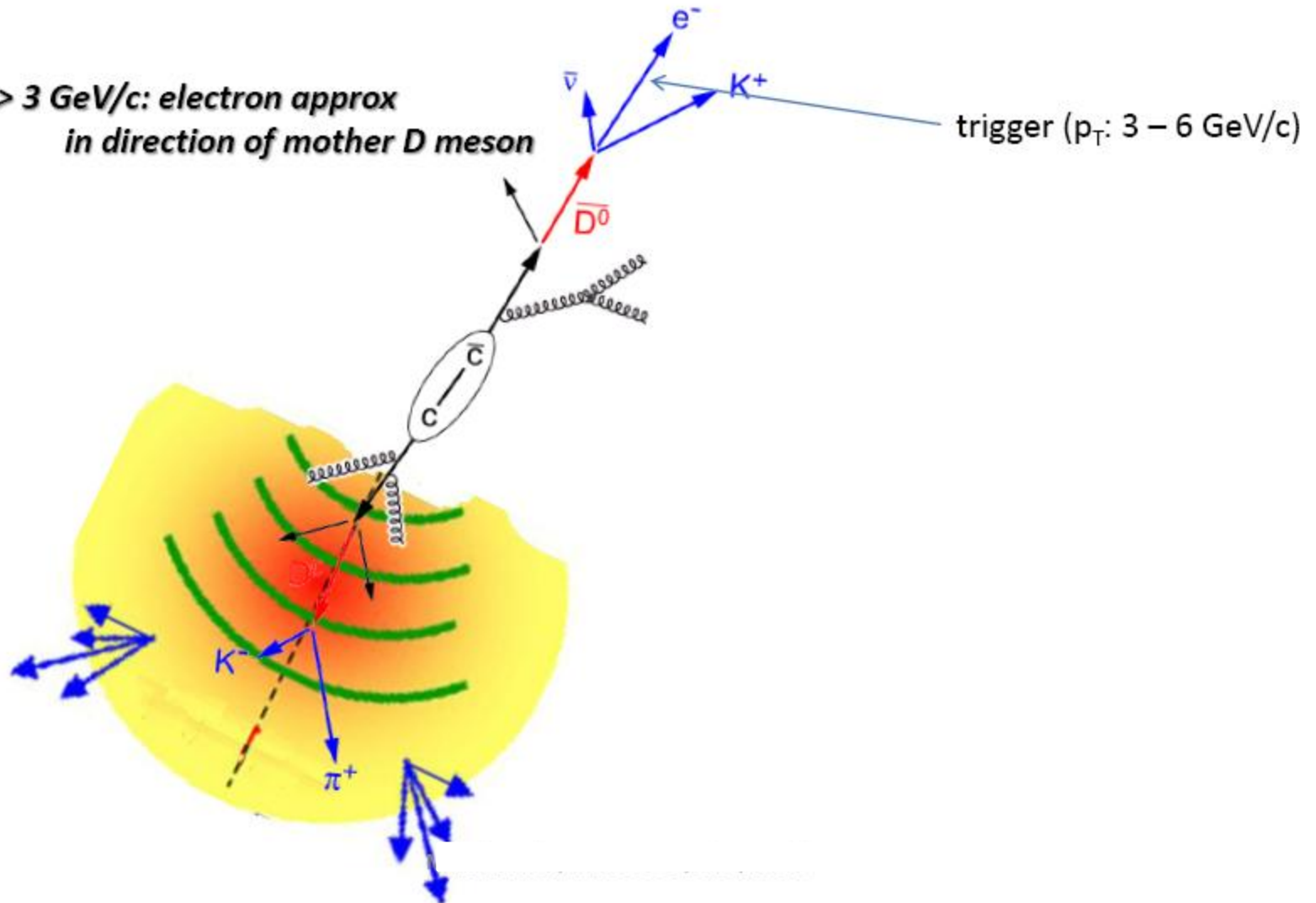
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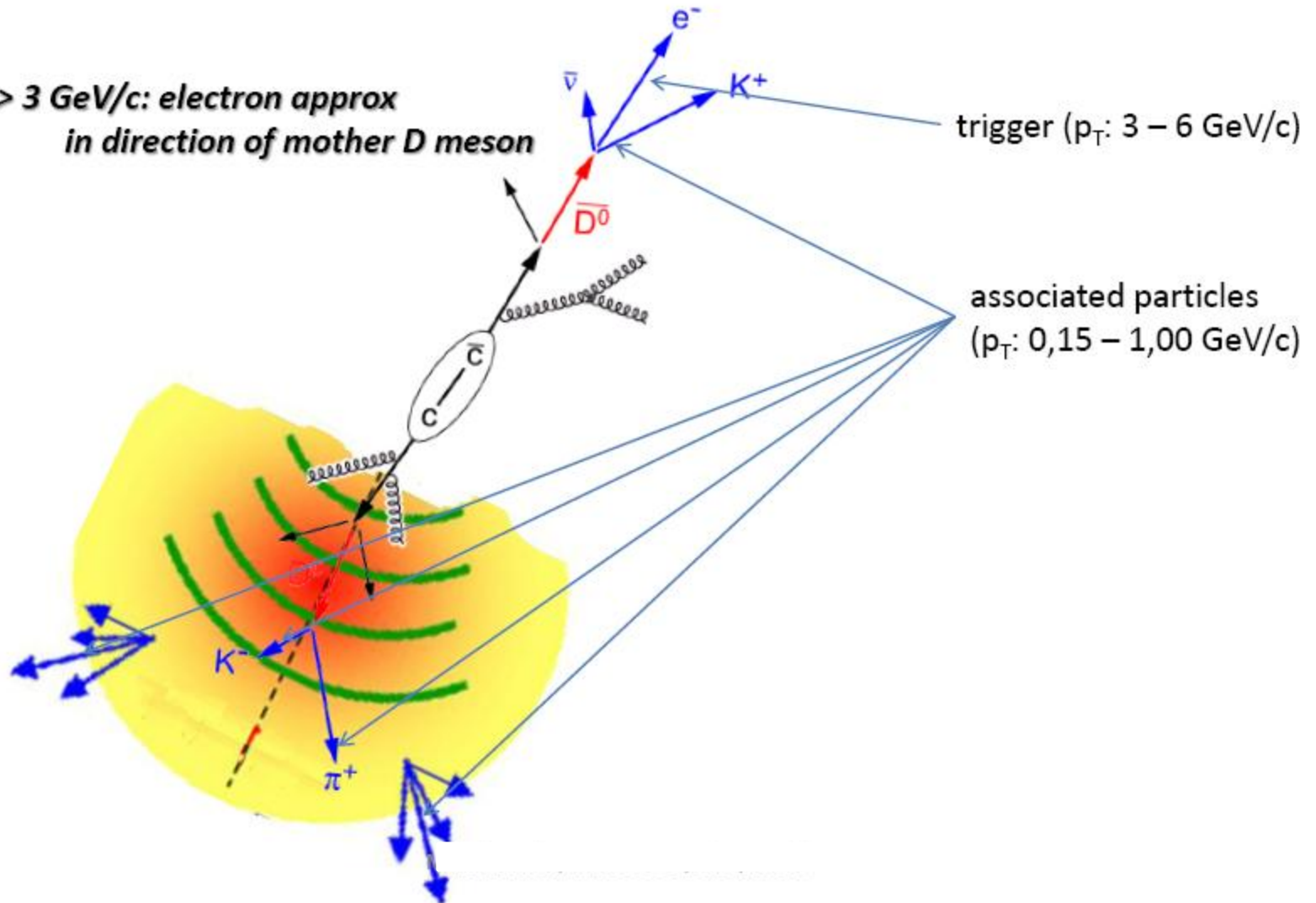
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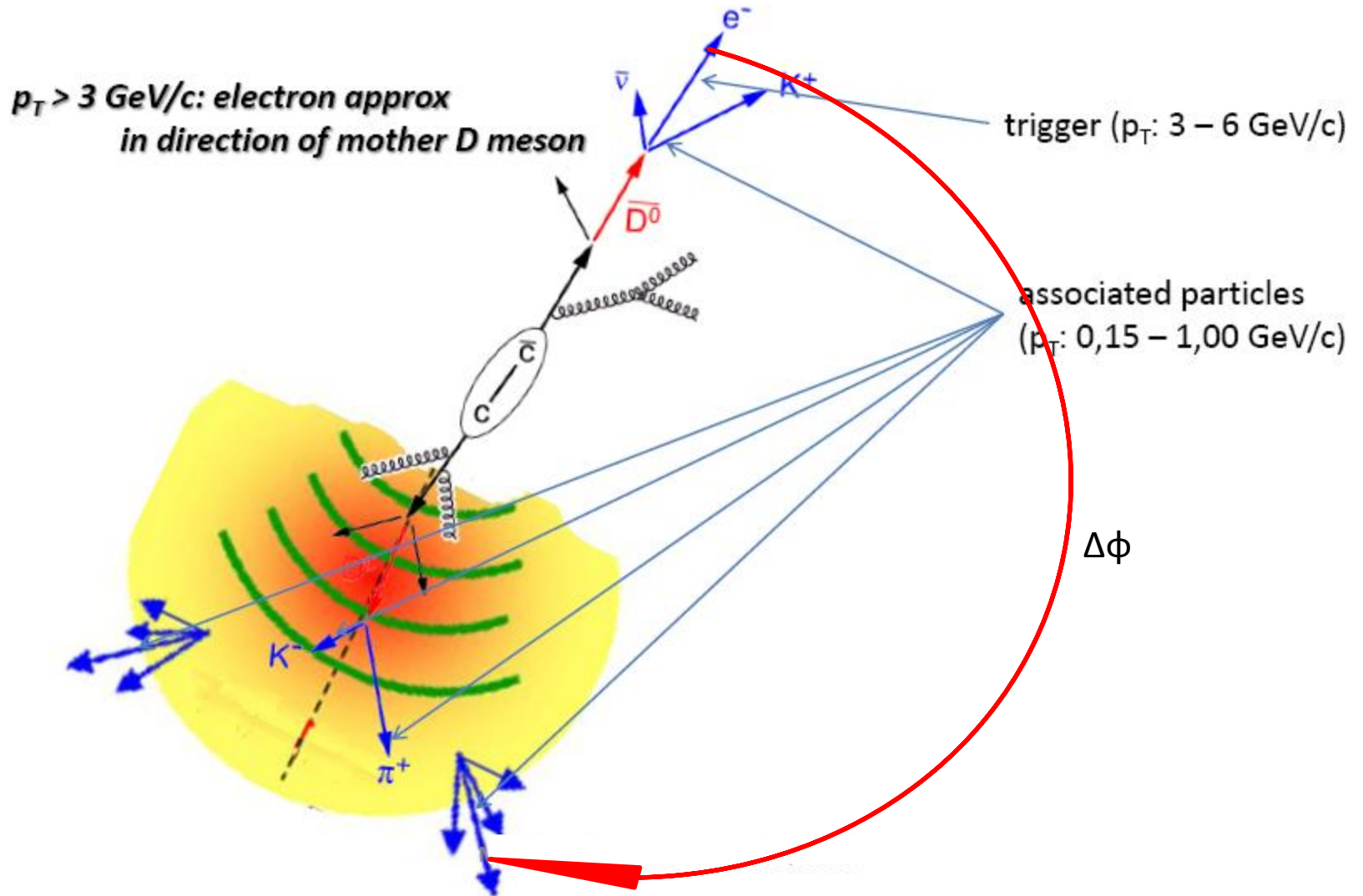


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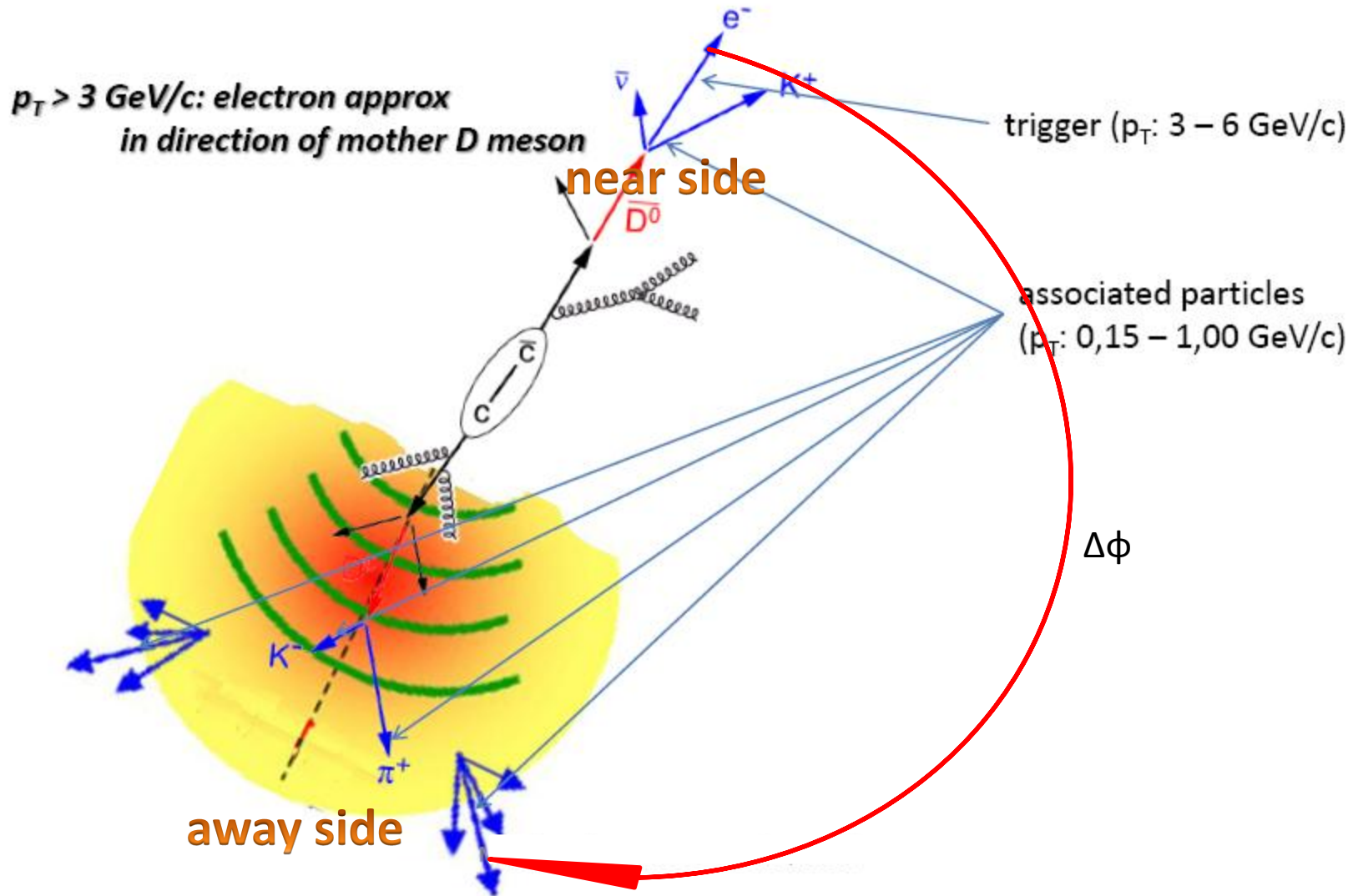
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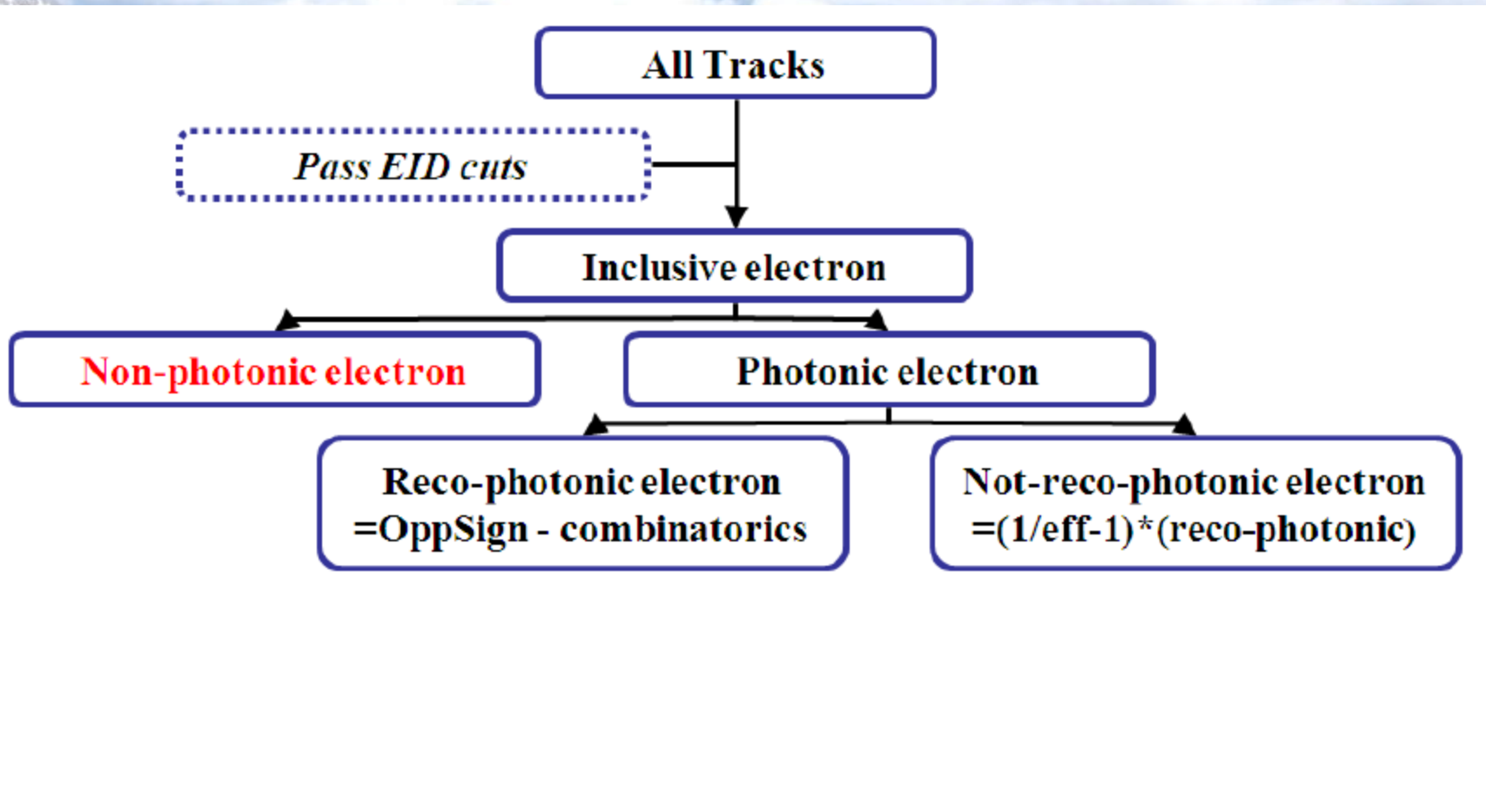


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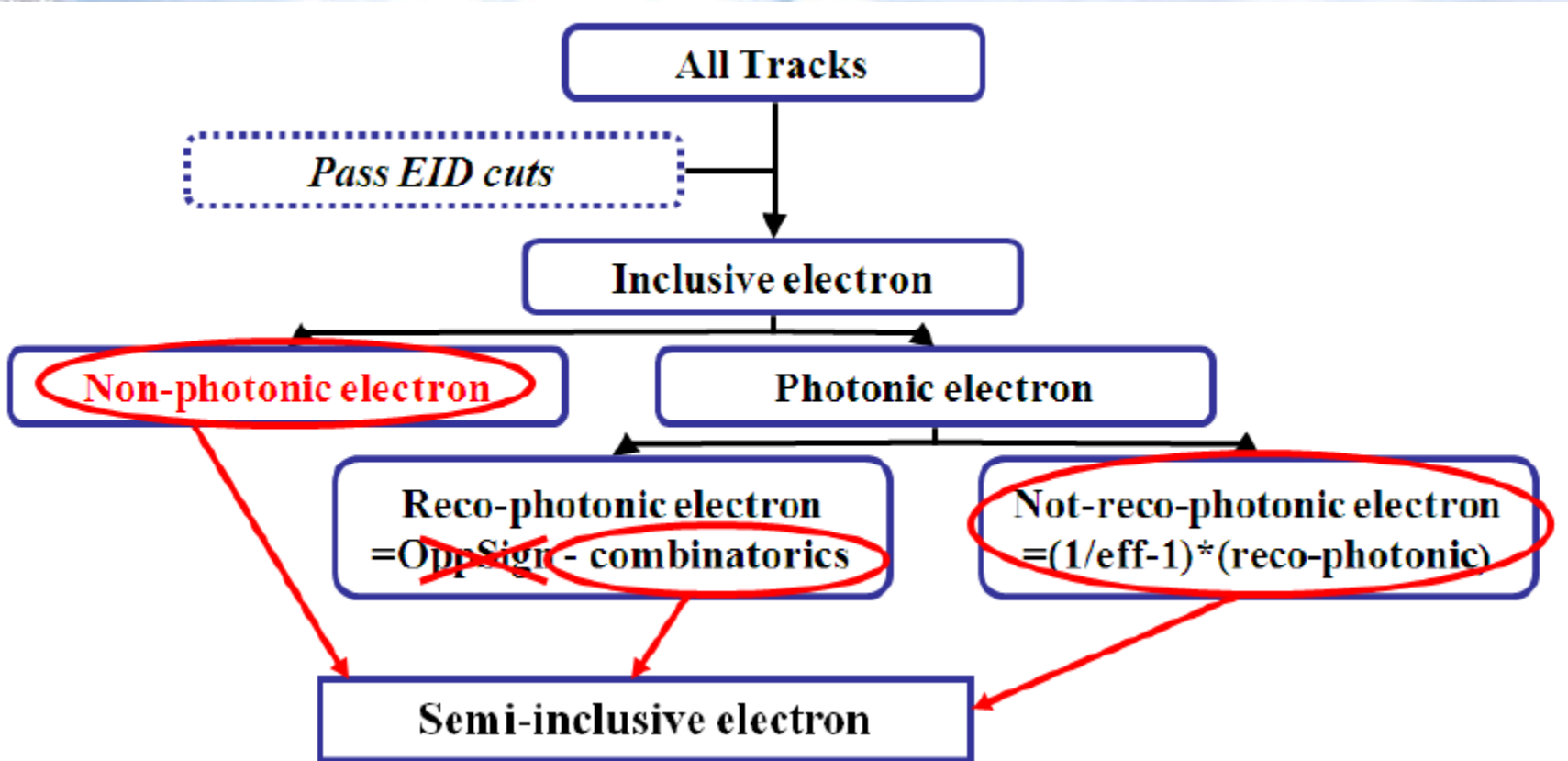
NON-PHOTONIC E-H CORRELATIONS

EXTRACTION PROCEDURE



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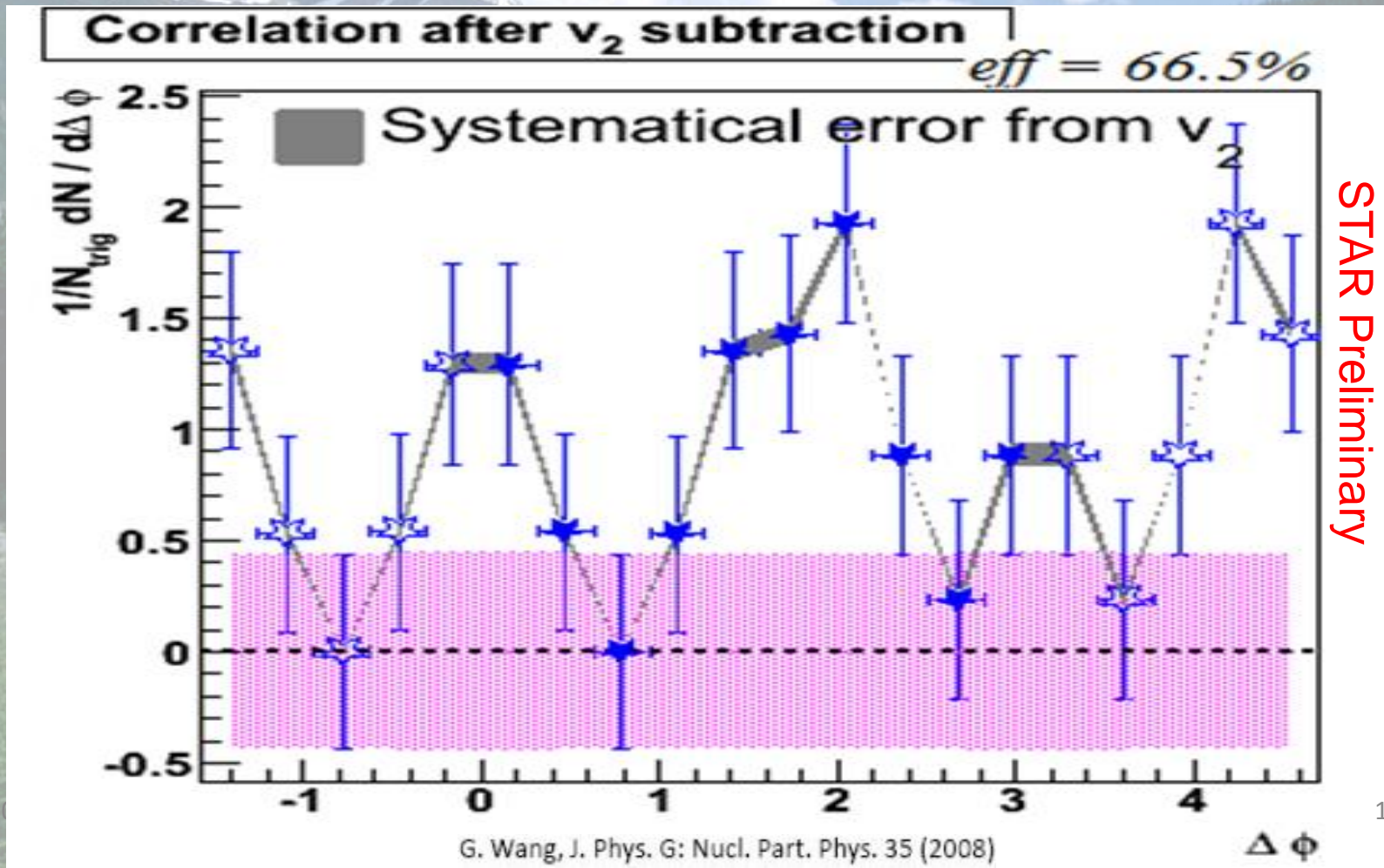


$$\Delta\phi_{NP} = \Delta\phi_{SI} + \Delta\phi_{LS} - \left(\frac{1}{\epsilon} - 1\right) (\Delta\phi_{US} - \Delta\phi_{LS})$$

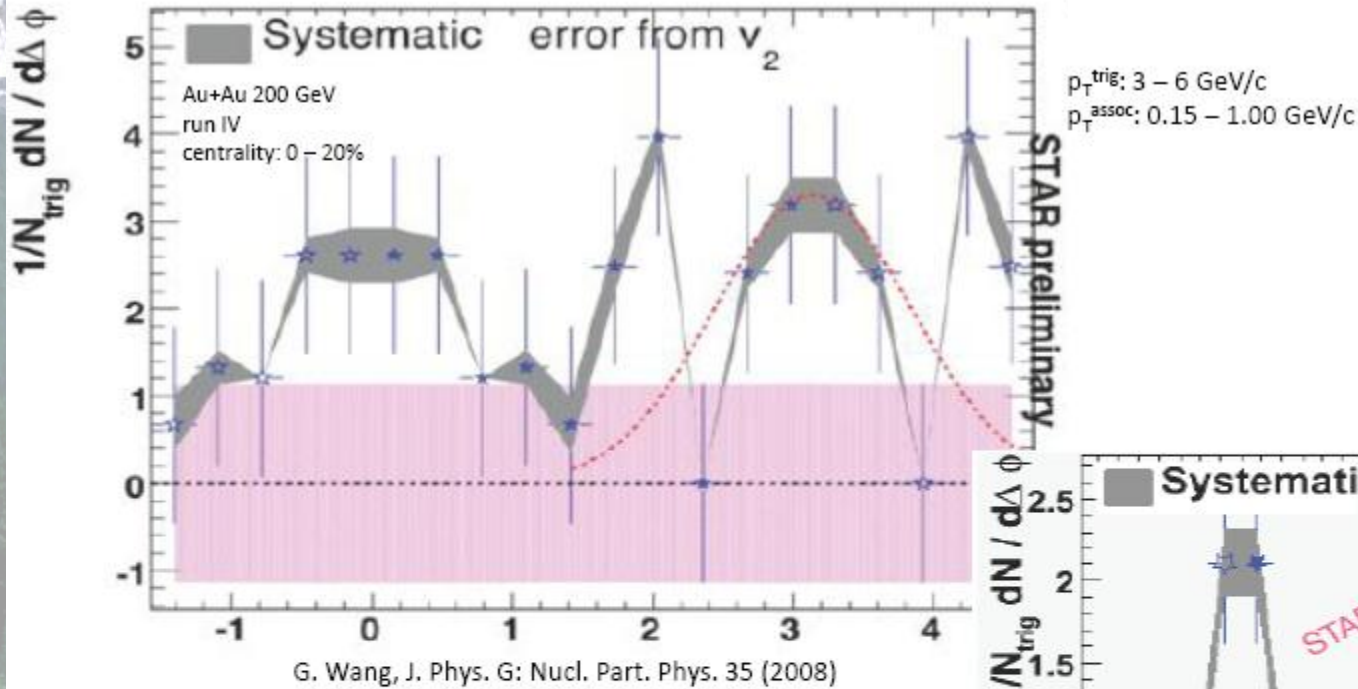
NON-PHOTONIC ELECTRON-HADRON CORRELATIONS IN CU+CU COLLISIONS AT $\sqrt{s_{NN}}=200$ GEV

- centrality: 0 – 20 %
- $3 \text{ GeV}/c < p_T^{\text{trig}} < 6 \text{ GeV}$
- $.15 \text{ GeV}/c < p_T^{\text{assoc}} < .50 \text{ GeV}$

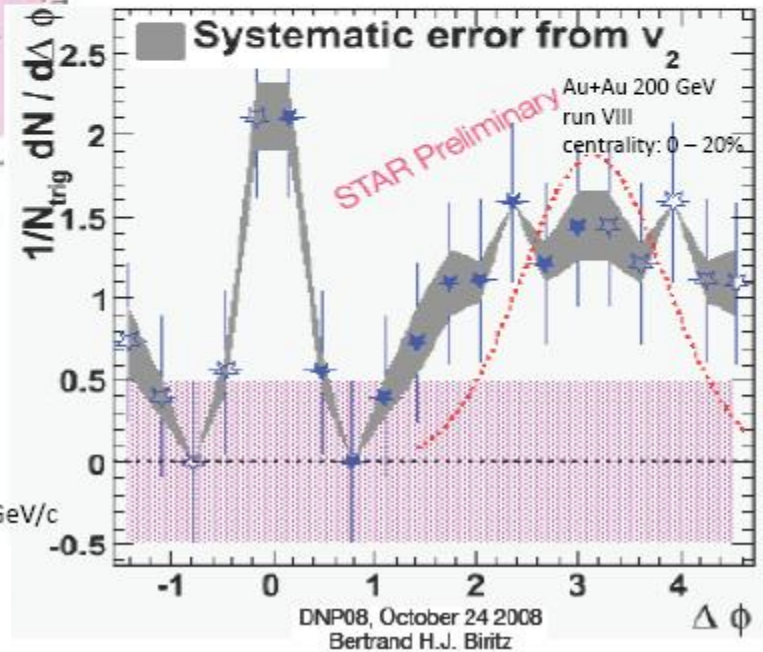
- subtracted elliptic flow: $v_2 = .05$
- detector efficiency corrections



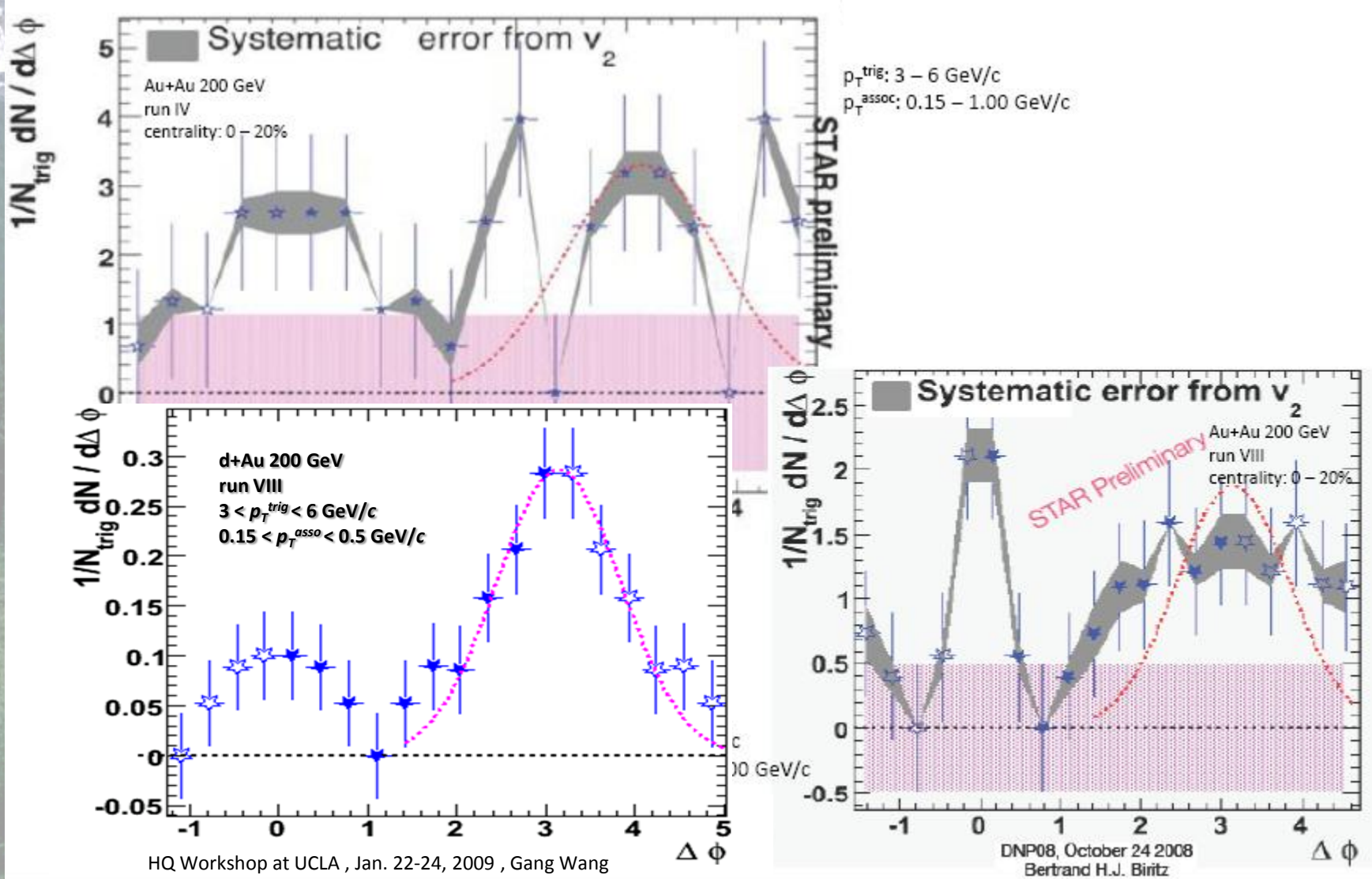
NON-PHOTONIC ELECTRON-HADRON CORRELATIONS IN Au+Au & D+Au COLLISIONS AT $\sqrt{s_{NN}}=200$ GEV



$p_T^{\text{trig}}: 3 - 6 \text{ GeV}/c$
 $p_T^{\text{assoc}}: 0.15 - 1.00 \text{ GeV}/c$



NON-PHOTONIC ELECTRON-HADRON CORRELATIONS IN Au+Au & D+Au COLLISIONS AT $\sqrt{s_{NN}}=200$ GEV



SUMMARY & CONCLUSION

→ *nonphotonic electron – hadron correlations in Cu+Cu 200 GeV extracted*

→ *within large statistical uncertainties results suggest possible modification of away-side peak similar to hadron – hadron correlations & electron – hadron correlations in Au+Au*



BACK UP