Jet Correlations after an event selection of two back-to-back, high-pt particles

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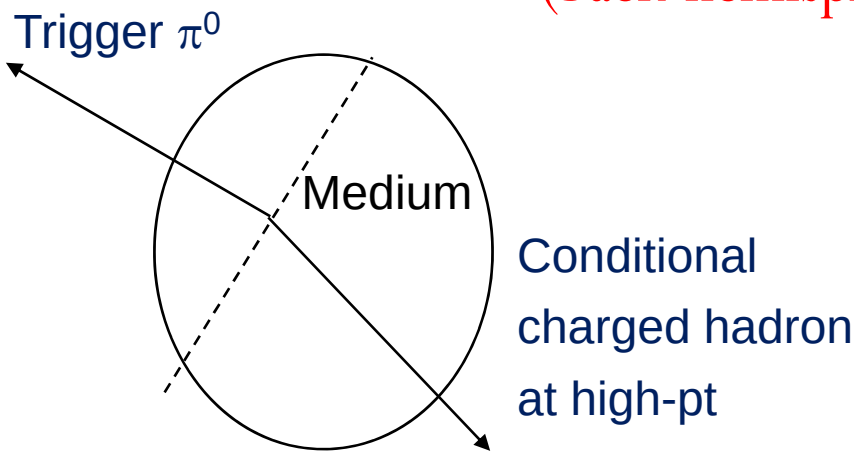
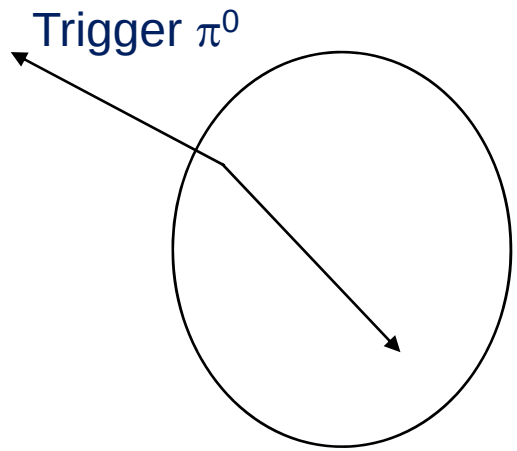
Motivation:

Energy-loss probes QGP density + potentially nature of coupled medium
Need to increase control of path-length to really exploit this diagnostic probe

Reduce the surface-bias

Select events that have **both** a high-pt π^0 **and** a back-to-back hadron (back-hemisphere of π^0)





Path –lengths comparable in dense medium

Removes some events where hard-scattering occurs near surface (large difference between path lengths)

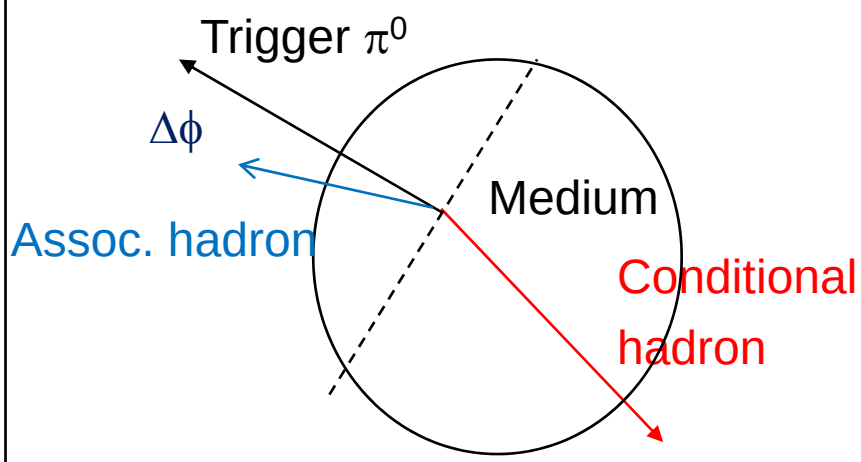
Selection shifts distribution of hard scattering towards center of medium

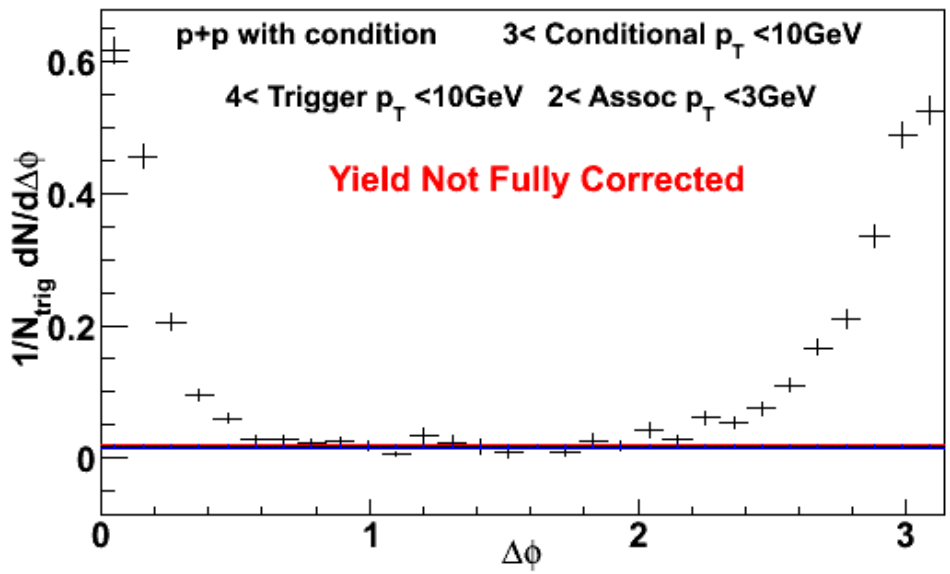
$\Rightarrow$ Near-side parton travels through more medium

$\Rightarrow$ Change in near-side yields, widths, response of medium?

A.K.A 2+1 Correlations: probe near-side

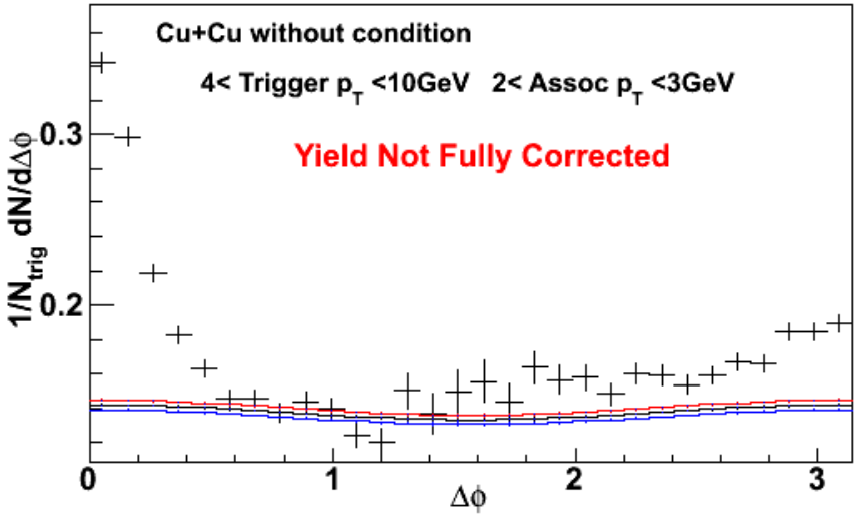
- Require (+1) conditional hadron in back hemisphere
- Plot (2-part.) correlation between trigger π^0 and associated hadrons

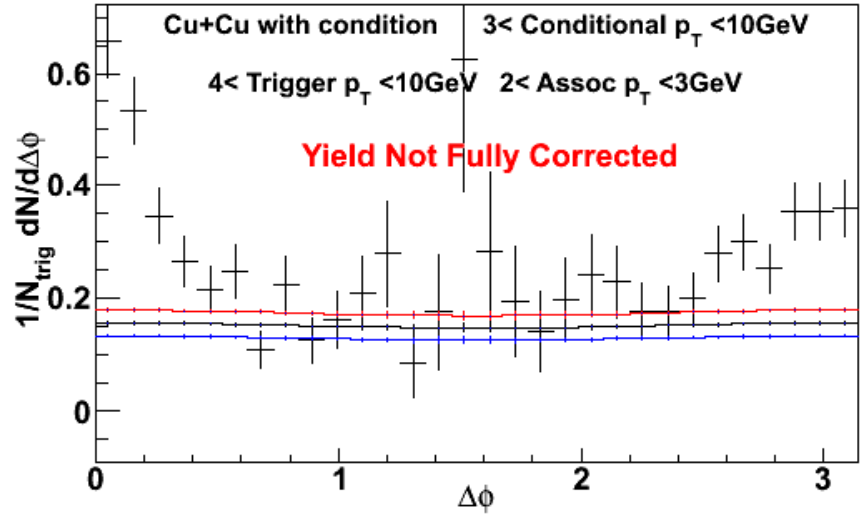




Compare Cu+Cu to baseline p+p collisions
Use as high-pt as possible to reduce effects of underlying event, flow etc.

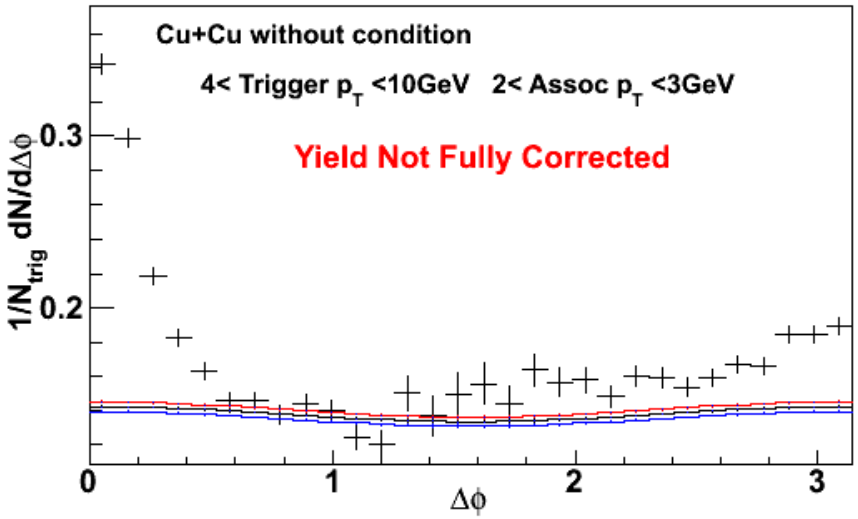
Cu+Cu $\sqrt{s_{NN}}$=200 GeV, 2+1 Correlations

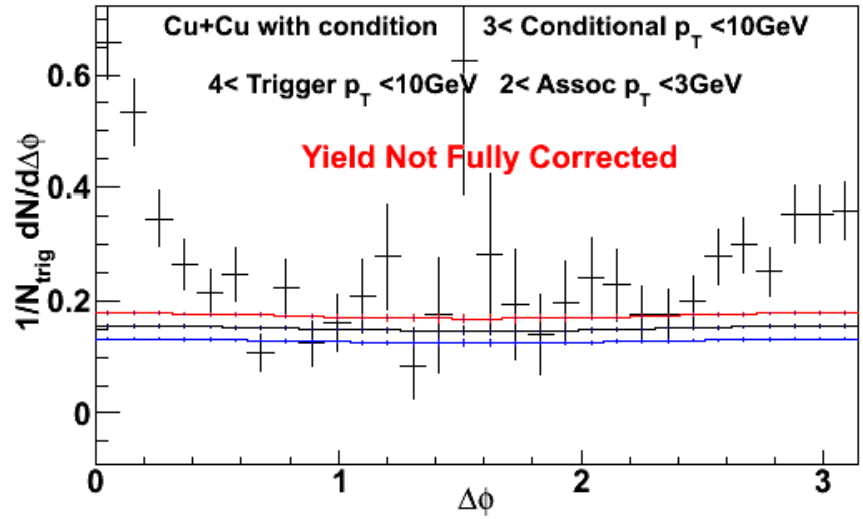


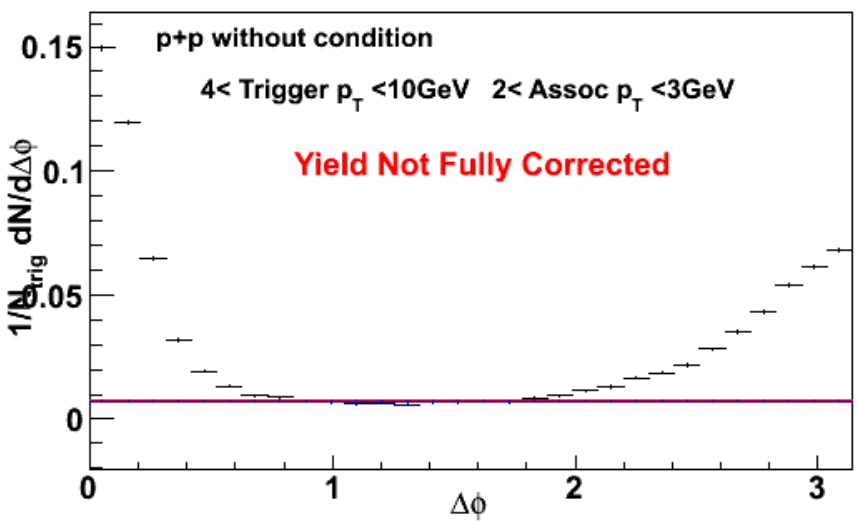


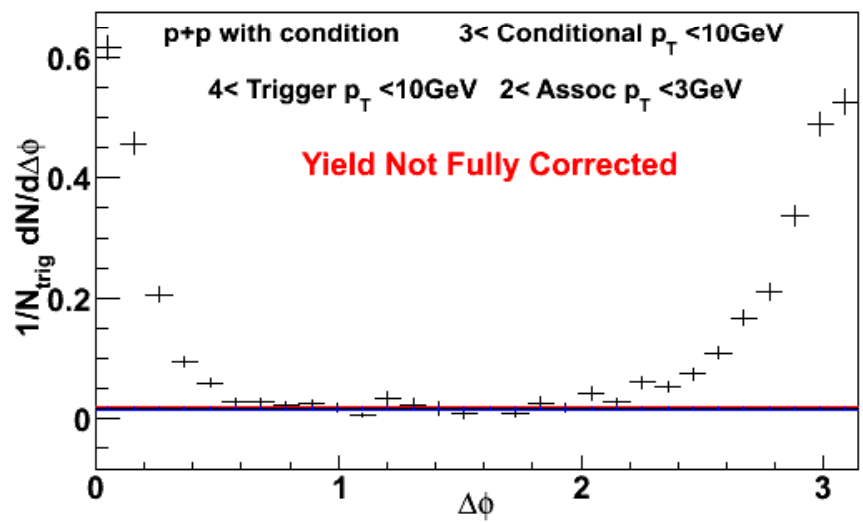
- Lines indicate underlying event with elliptic flow (systematic err. of ZYAM)
- Yields not fully corrected
  - The distribution of π^0 changes when conditional hadrons selected
  - Changes the acceptance for associated hadron
  - Still working on understanding this fully: done by QM08
- Acceptance change same for (Cu+Cu) and (p+p) => ratio of yields

Cu+Cu and p+p 2+1 correlations

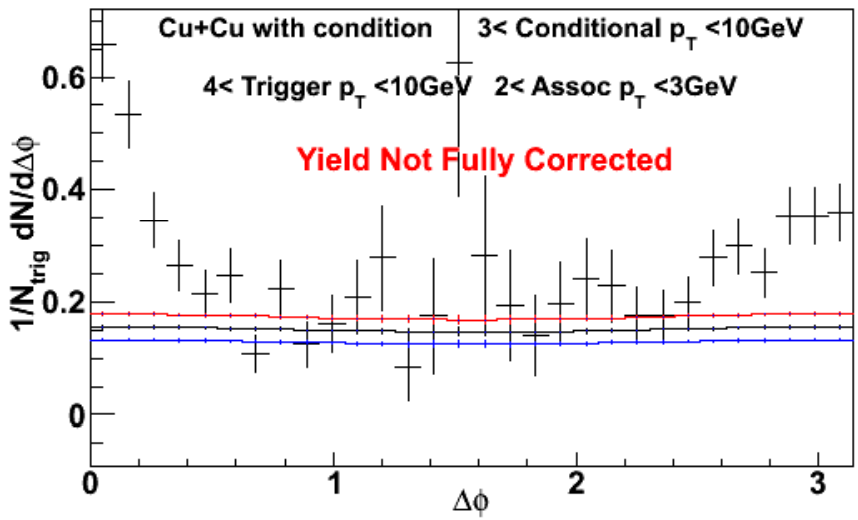








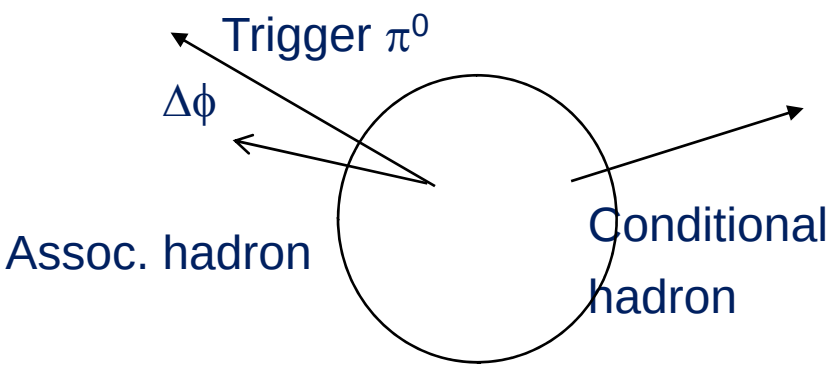
Define jet-function as signal above background

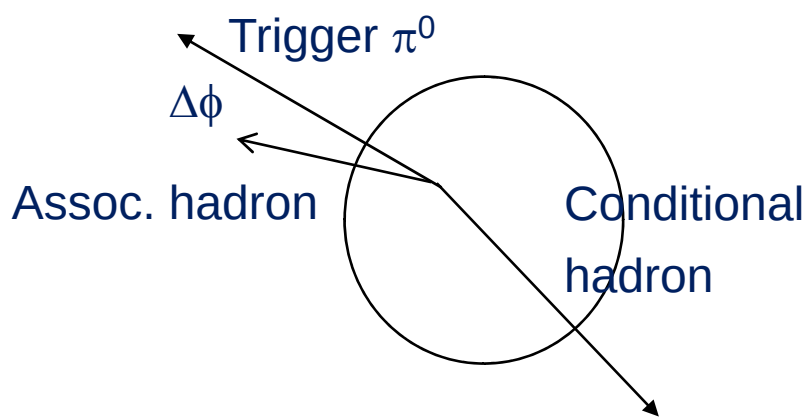


$$J(\Delta\phi) = \frac{1}{N_{trig}} \frac{dN}{d\Delta\phi} - B(1 + 2v_2^t v_2^a \cos(2\Delta\phi))$$

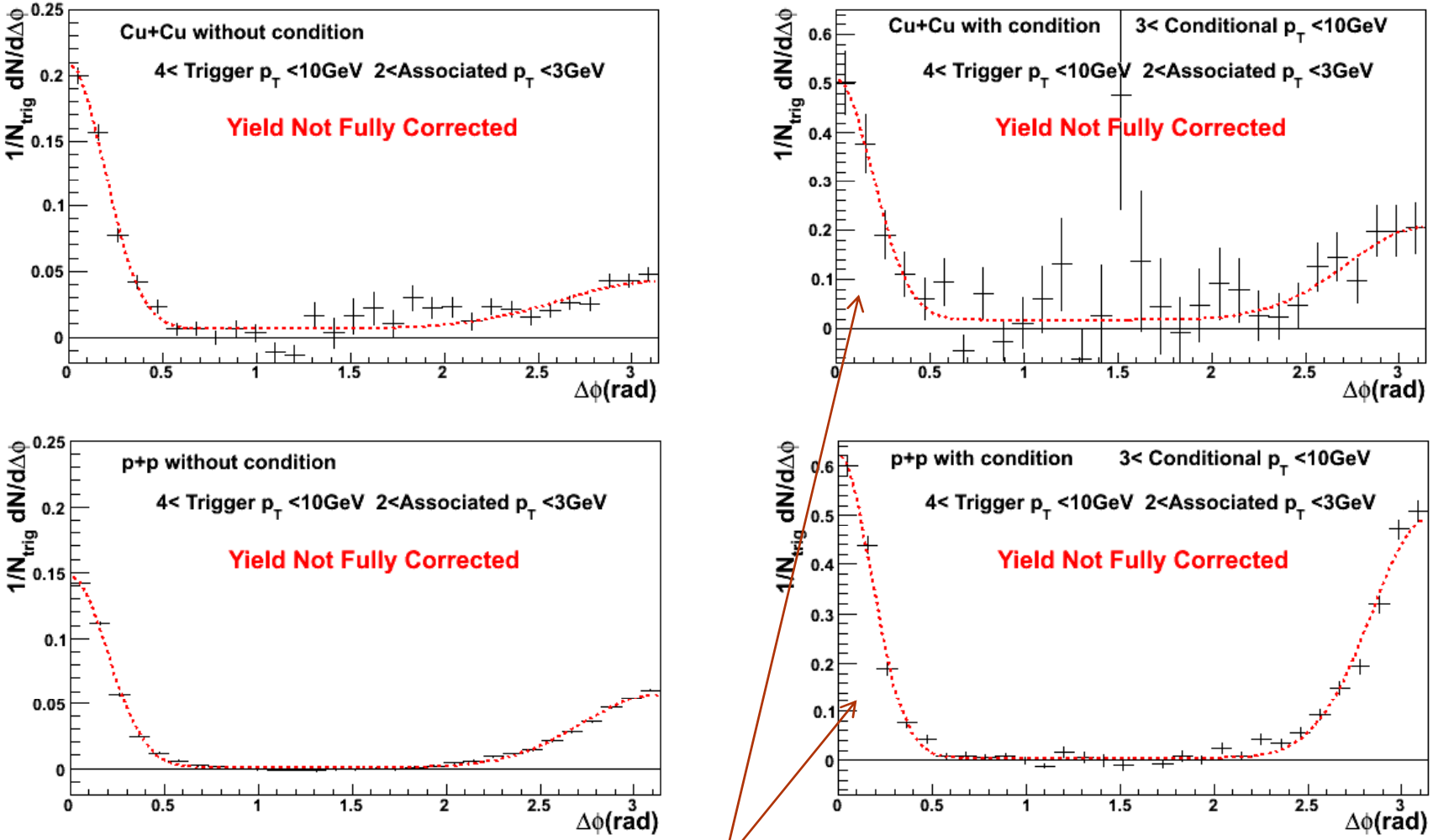
Note: no attempt to distinguish whether conditional particle comes from

1) flow or 2) hard scattering



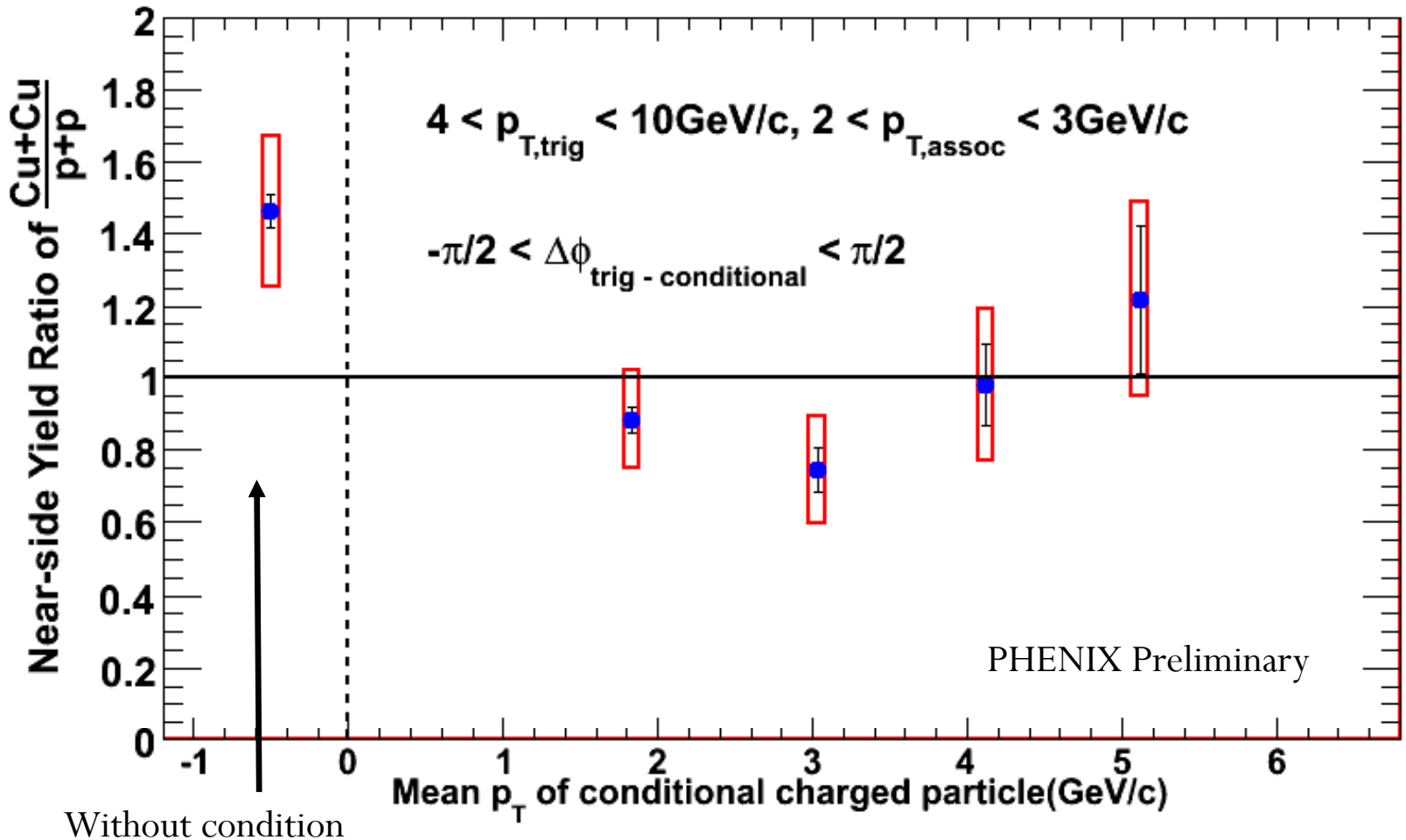


Jet-function = Correlation - background



$$\text{Near-side yield} = \int_0^1 J(\Delta\phi)\,d\Delta\phi$$

Ratio of near-side yields (Cu+Cu)/(p+p)



The near-side yield in Cu+Cu tracks the yield in p+p baseline

no significant impact of potential extra path-length in medium

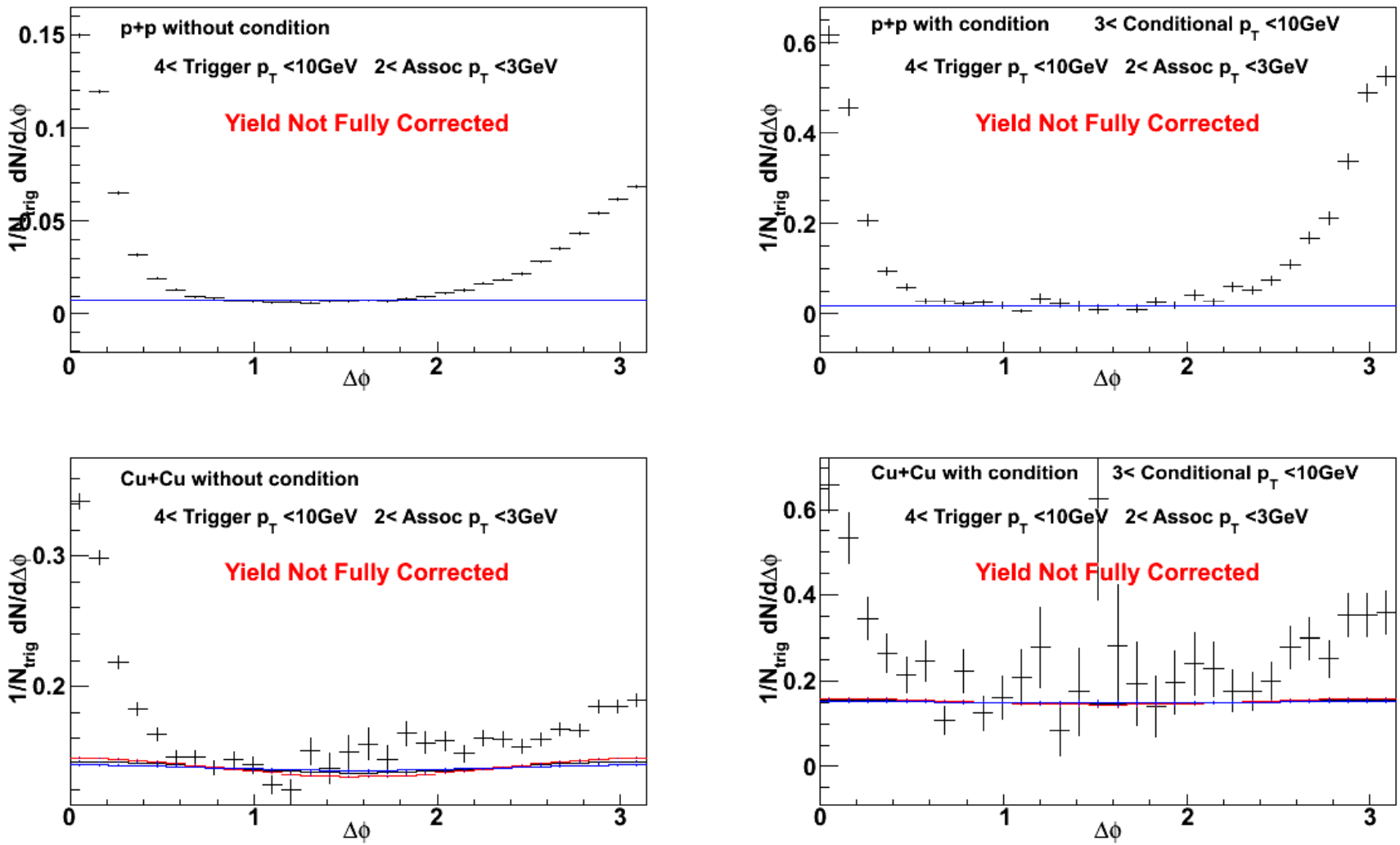
Summary and next steps

- Motivation: explore ways to increase control of path-length
- Selection of conditional back-to-back high-pt hadron
  - Should shift distribution of hard scattering towards center of medium
  - Near-side parton potentially travels through more medium
  - Look for change in near-side yields, widths, response of medium
- Near-side yield in Cu+Cu is comparable to that in p+p when you require a back-to-back conditional hadron
  - No significant impact of potential extra path-length in medium

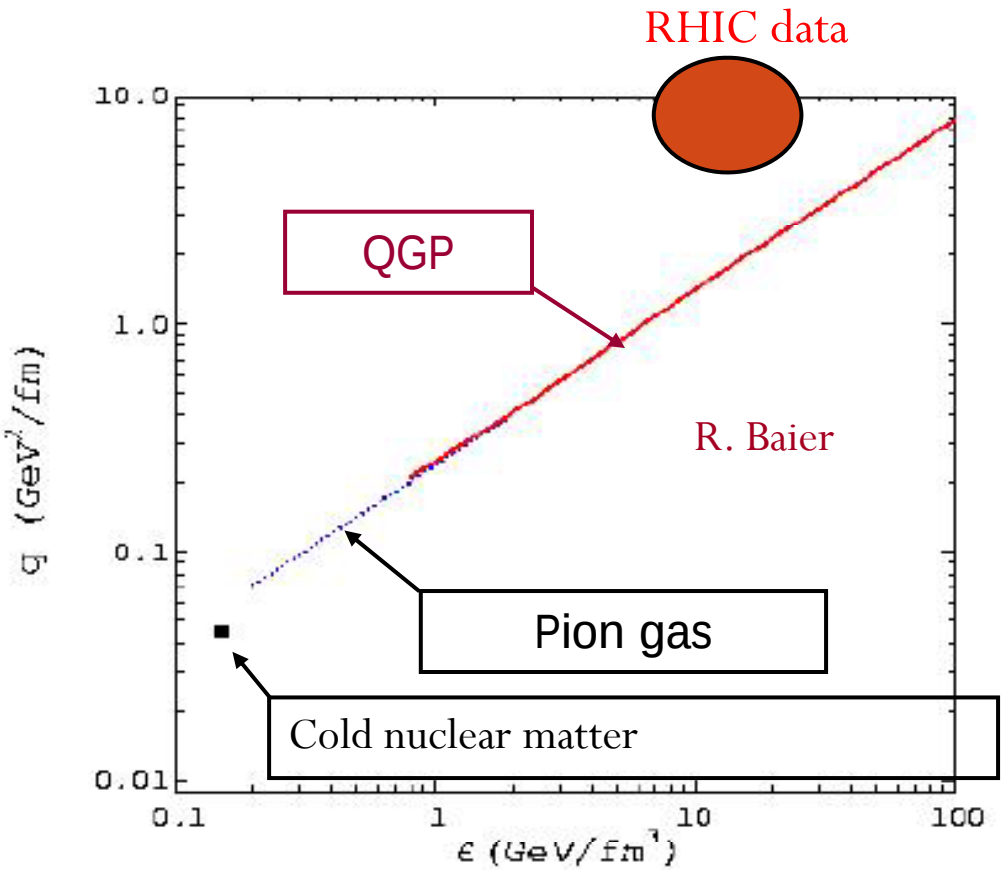
- Next
  - Confirm how acceptance changes when requiring conditional hadron
    - Yields rather than ratios
  - Analyse factor of 10 more Cu+Cu triggered data

Backups

Variation of v2



Strong energy-loss not fully understood



Larger than expected from QGP that interacts perturbatively

Calculate q in non-perturbative QCD, compare to expt