

Correlations of Identified Hadrons at RHIC and LHC Energies

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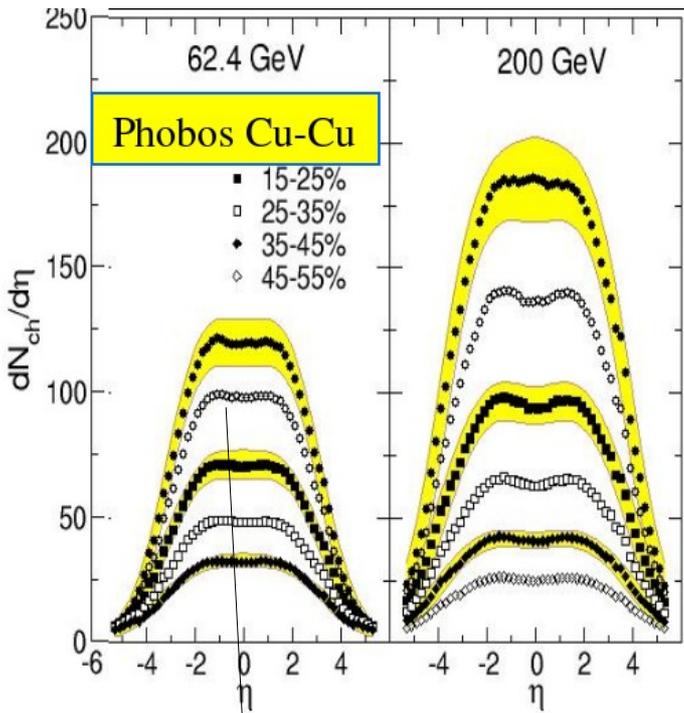
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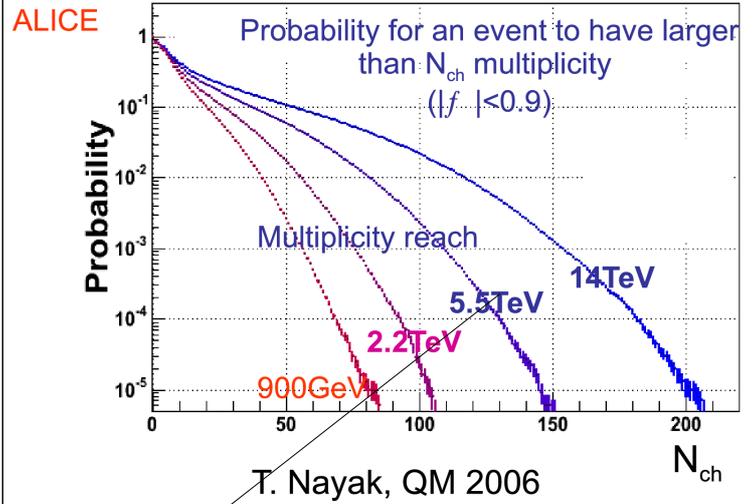


Hot and Cold Baryonic Matter, Budapest, 17/8/2010

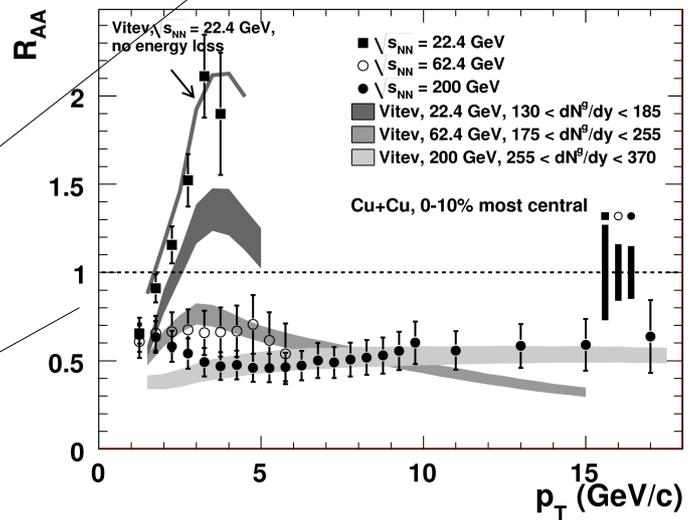
Motivation



LHC p+p multiplicities comparable to RHIC HI multiplicities



T. Nayak, QM 2006



1. We can see pion suppression at 62.4 GeV energy, a result of the interaction between the jets and the QGP. We are looking for possible similar phenomena at LHC energies in p+p collisions.
2. The p+p collision data is the basis in the calculation of RAA. What if we have some kind of medium interaction in p+p? We need to understand the baseline at LHC energies too.

Simulation Setup

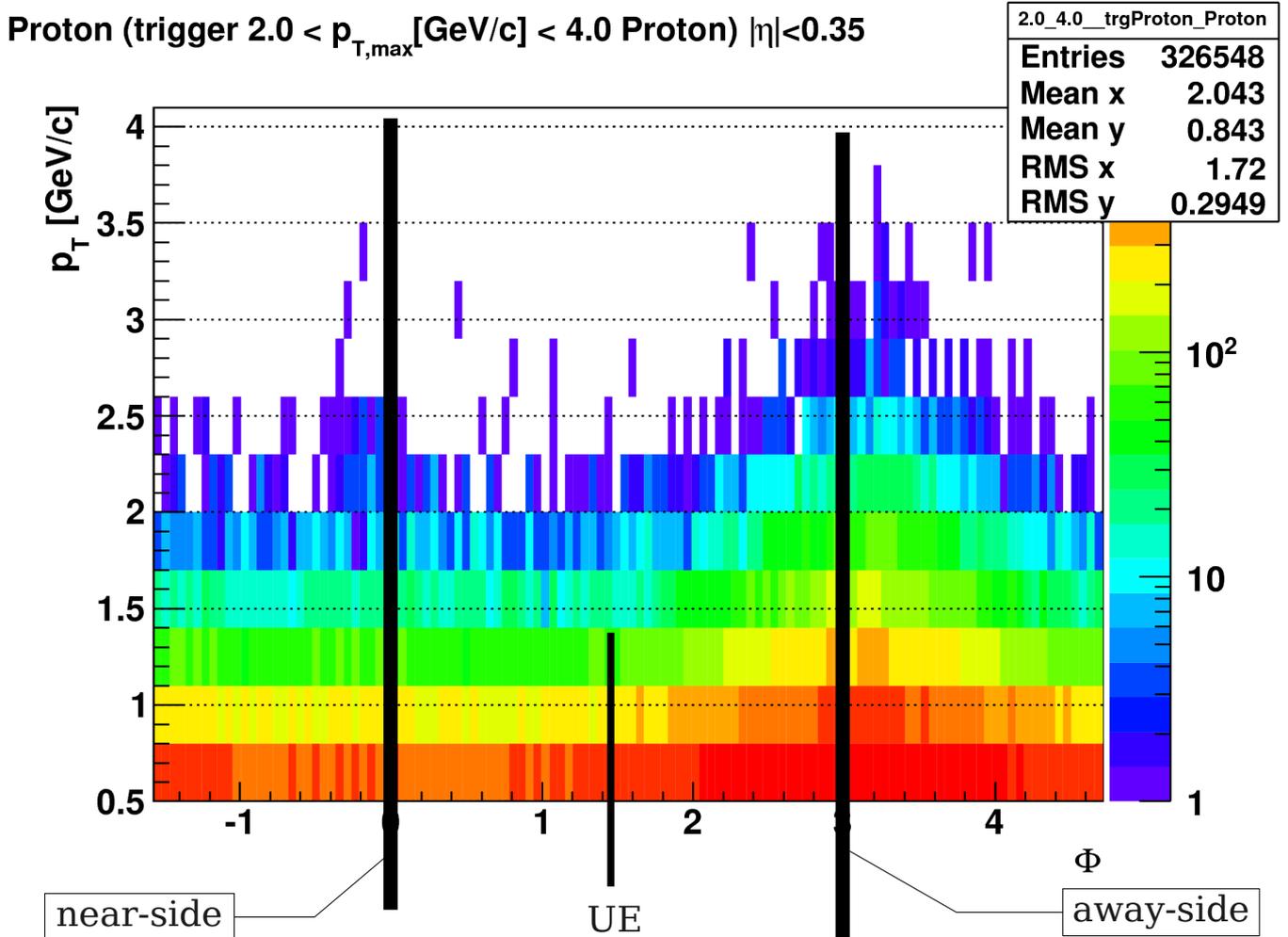
PYTHIA 6 with ATLAS-CSC tune:

- ~100M events @ 200 GeV
- ~45M events @ 7000 GeV

Pseudo-rapidity range: -0.35 .. 0.35

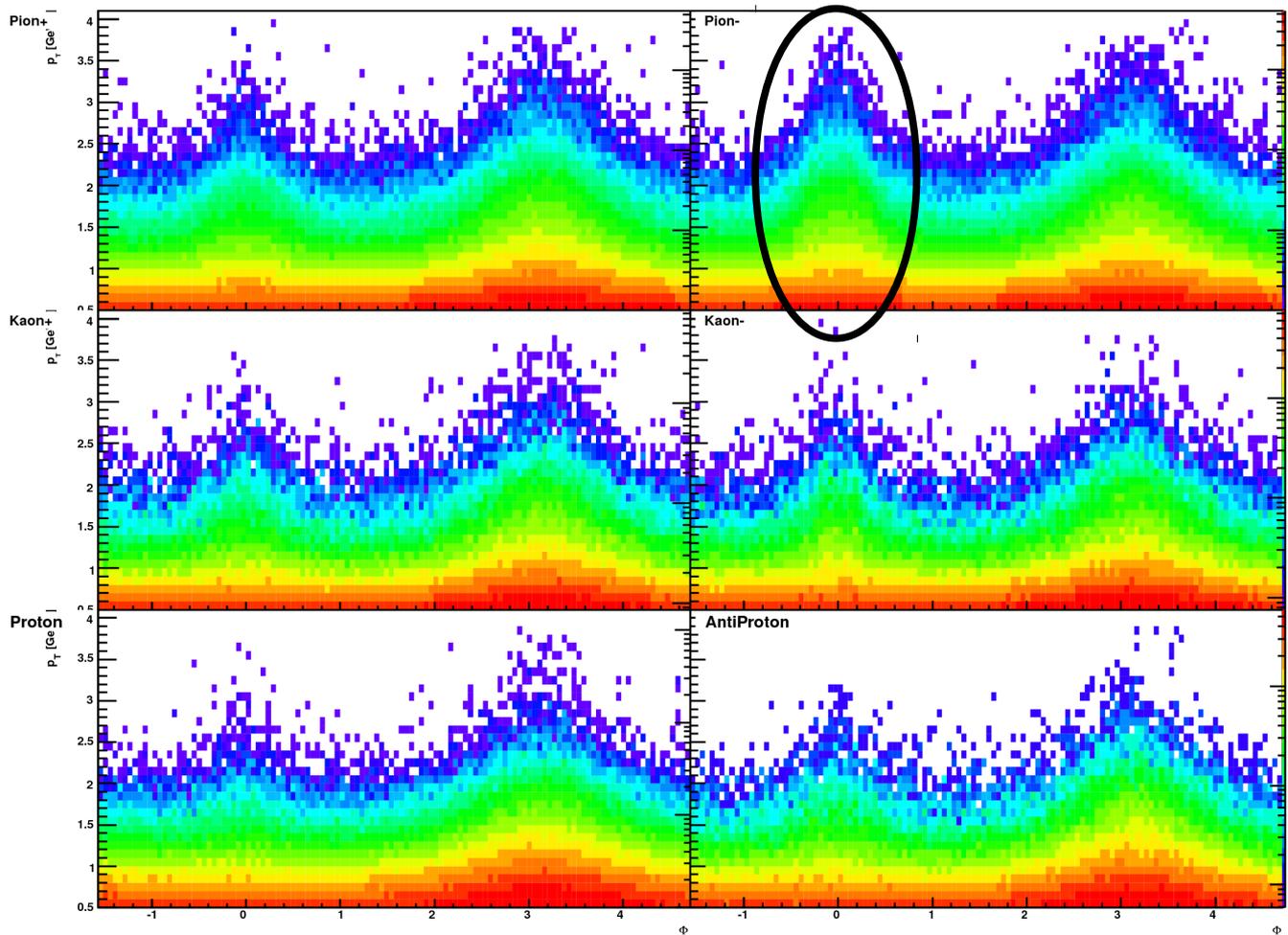
Basic method

We study *charged hadron* correlation augmented with *PID information*. We differentiate on the species of the trigger particle (the charged hadron with the highest p_T). We study the surrounding of the trigger (“*near-side*”) and the opposite side (“*away-side*”).

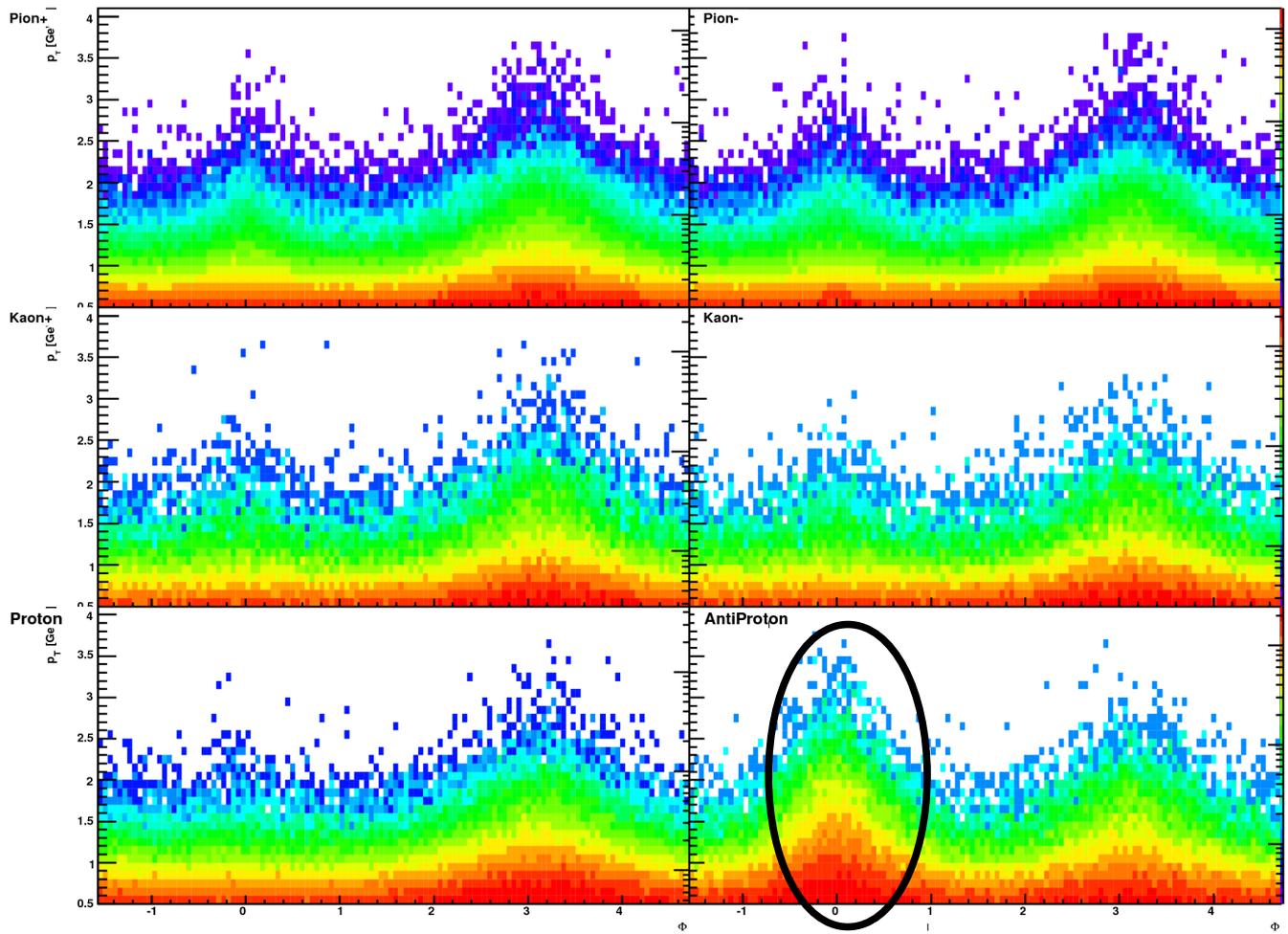


In this example figure we selected events with proton trigger with $2 < p_T [\text{GeV}/c] < 4$, and associated protons and compared their azimuthal angle as a function of associated particle p_T .

Visual correlations @ 200 GeV

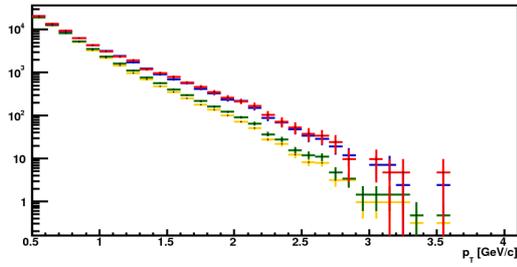


Pion trigger, $2 < p_T$ [GeV/c] < 4 .

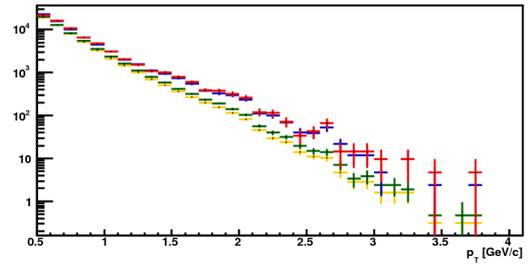


Proton trigger, $2 < p_T$ [GeV/c] < 4 .

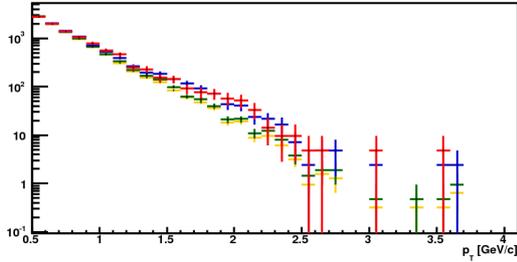
Pion+ (trigger Proton)



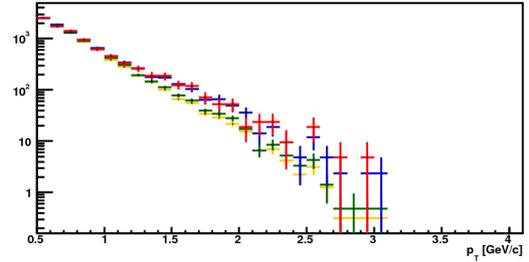
Pion- (trigger Proton)



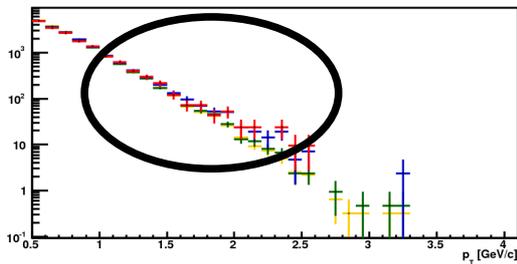
Kaon+ (trigger Proton)



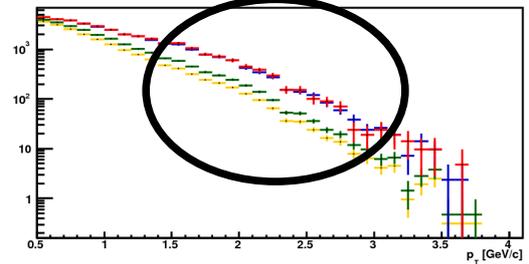
Kaon- (trigger Proton)



Proton (trigger Proton)

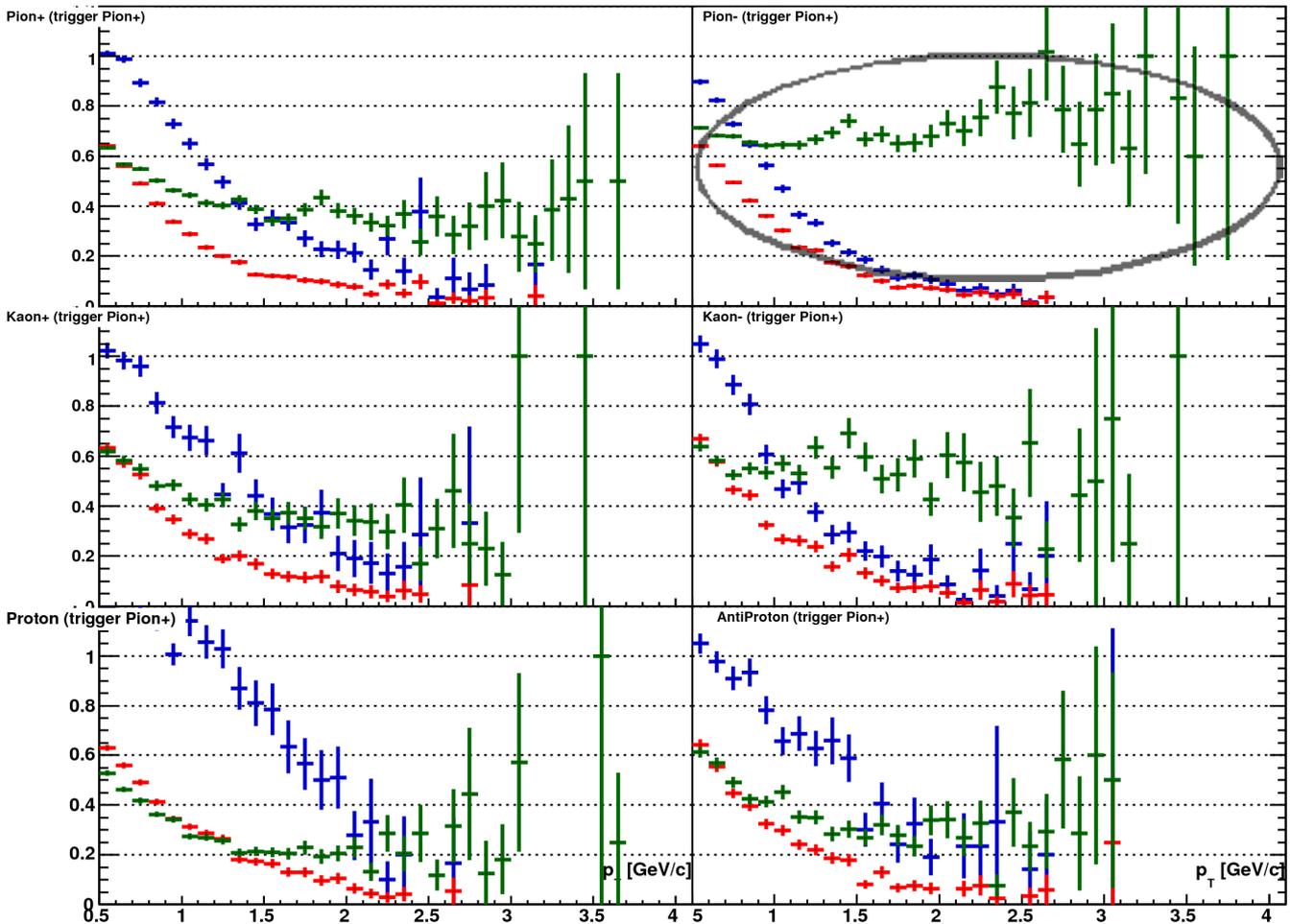


AntiProton (trigger Proton)



Capturing the information

Integrating around the near-side (proton trigger, $2 < p_T \text{ [GeV/c]} < 4$), Red, blue: narrow angle (12° , 24°), green orange: wide angle (60° , 120°). By widening the interval, we wash out precious correlation information. We will work with 12° width.



Near vs. Away vs. UE

We compare the p_T -dependence in the 3 regions:

- Blue: UE/near
- Red: UE/away
- Green: near/away

Top: pion trigger, $2 < p_T$ [GeV/c] < 4 @ 200 GeV.

Next page:

Top: proton trigger, $2 < p_T$ [GeV/c] < 4 @ 200 GeV.

Bottom: proton trigger, $2 < p_T$ [GeV/c] < 4 @ 7000 GeV.

