Plans for Neutral Meson Analysis in e^+/e^- Annihilation at Belle

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Outline

Motivation for the Unpolarized Fragmentation Function for η

- Unpolarized yield needed as input for Global QCD analysis fragmentation function
- η fragmentation function has been studied at NLO accuracy.
  C. Aidala, F. Ellinghaus, R. Sassot, J. Seele, M. Stratmann Phys.Rev. D83 (2011) 034002 arXiv:1009.6145
  BaBar input data preliminary
- π^0 data will give x-check of π^+, π^- yields (See Martin Leitgab's talk)

Collins Effect for π^0

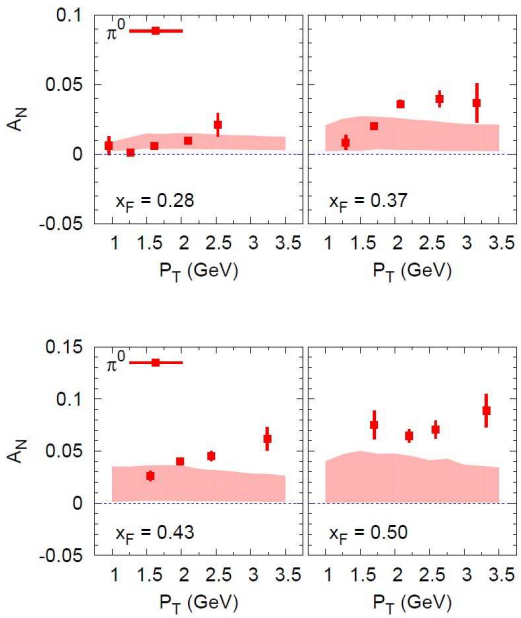


Figure 1: Collins contribution to the neutral pion SSA

M. Anselmino, M. Boglione, U. D'Alesio, E. Leader, S.Melis, F. Murgia, A. Prokudin
Phys.Rev. D86 (2012) 074032 arXiv:1107.4446

Measurement of η Collins FF to understand $A_N^{\eta} > A_N^{\pi^0}$

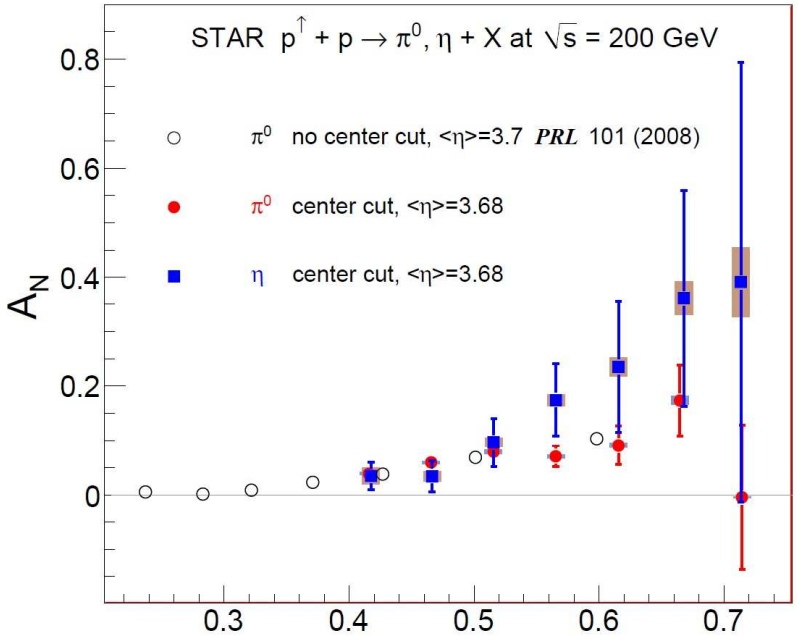


Figure 2: A_N vs. x_F at average pseudorapidity of 3.68 for π^0 and η.

L. Adamczyk et. al.
Phys.Rev. D86 (2012) 051101 arXiv:1205.6826

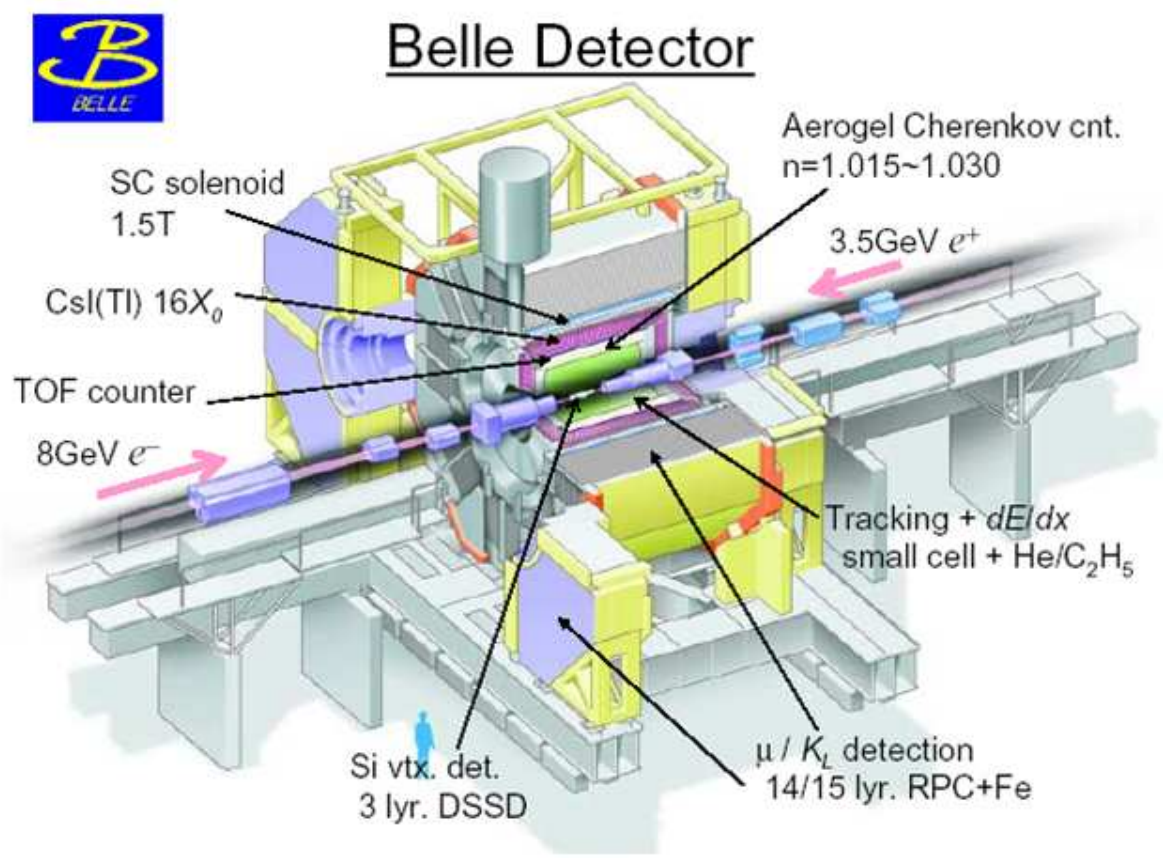


Figure 3: Belle Detector.

Belle EMCAL: High granularity, good resolution

Data Selection

- Use only Barrel EMCAL
- minimum E_γ=100MeV
- Thrust cut of 0.8. Minimal effect on uds, but enables using on_resonance dataset
- Projections from 15.07 fb^{-1} MC data
- Asymmetry cut 0.8
- Photon come from same jet

Cut optimization using FoM $S^2/(S+B)$

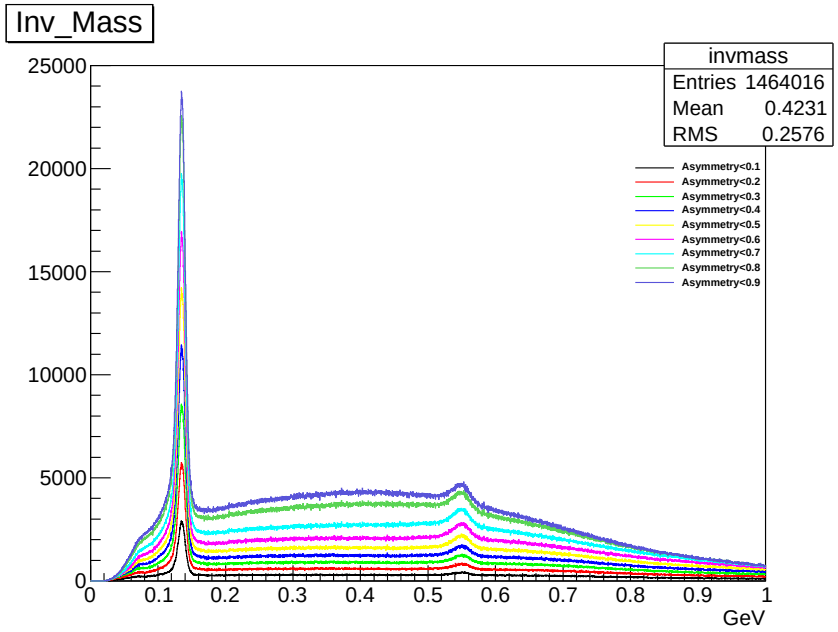


Figure 4: InvMass Vs A

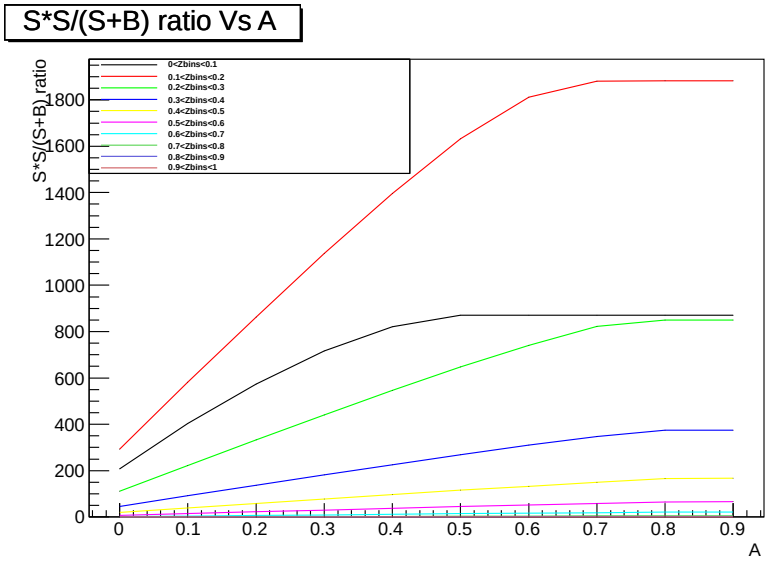


Figure 5: $S^2/(S+B)$ Vs A

Invariant Mass distributions for select z bins

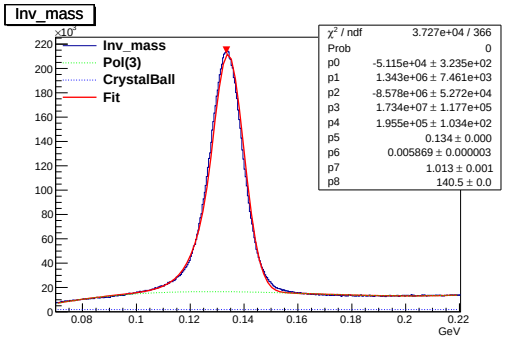


Figure 6: Invariant Mass of Pion($0.3 < z < 0.4$).

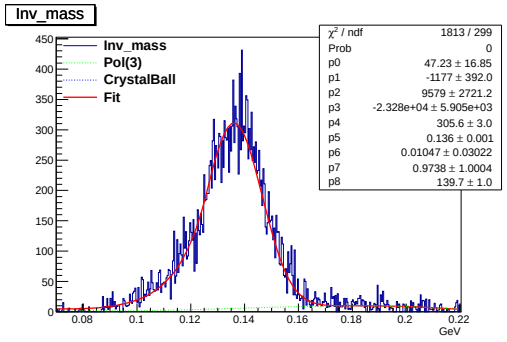


Figure 7: Invariant Mass of Pion($0.8 < z < 0.9$).

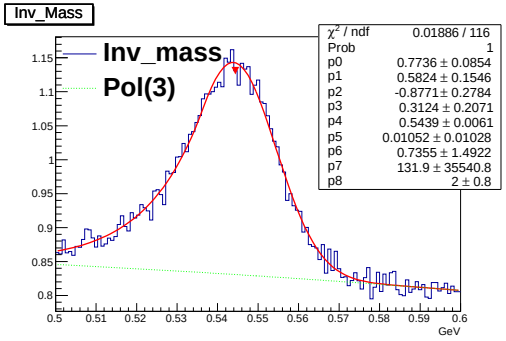


Figure 8: Invariant Mass

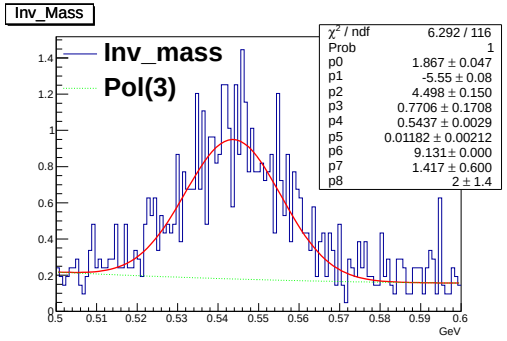


Figure 9: Invariant Mass

Pion Mass and Width

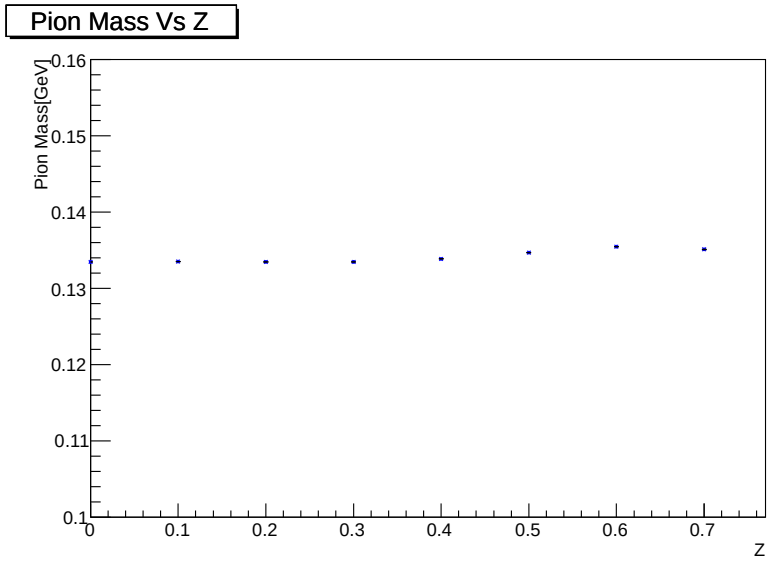


Figure 10: Pion M_{Inv} Vs Z

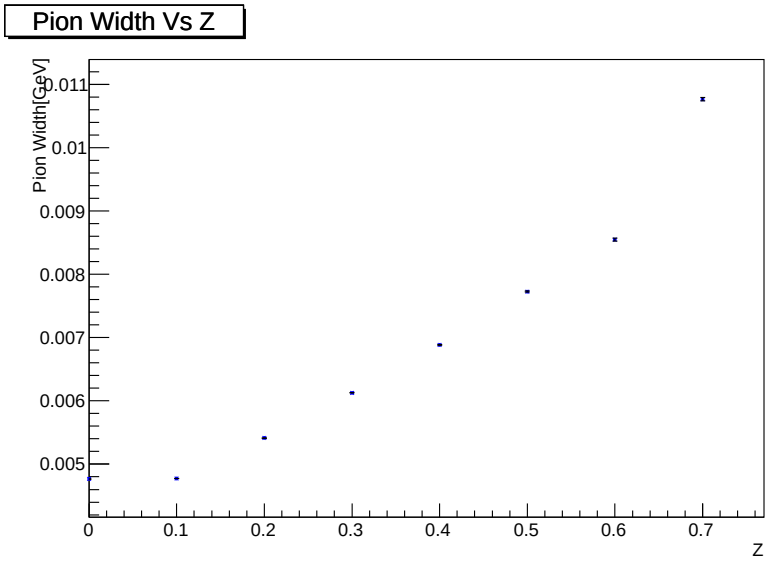


Figure 11: Pion Width Vs Z

Relative Errors on Yield Vs Z (Off Resonance)

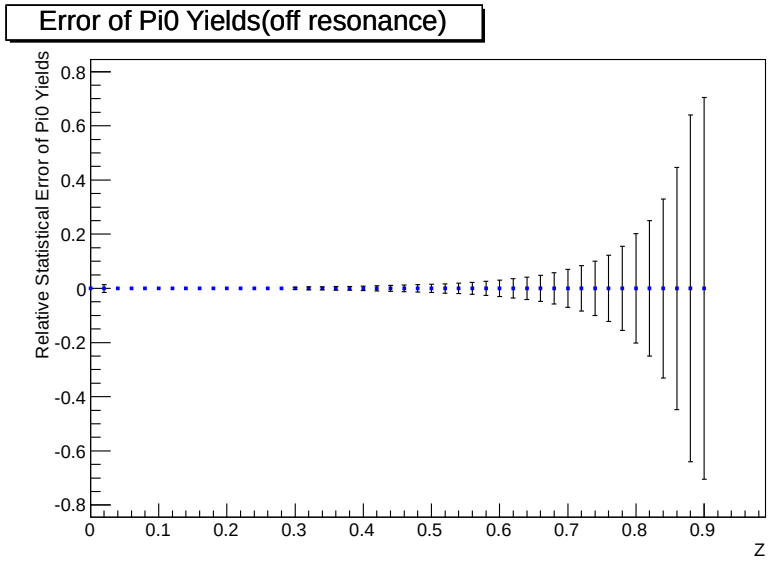


Figure 12: Error of Yield Vs Z (Pion).

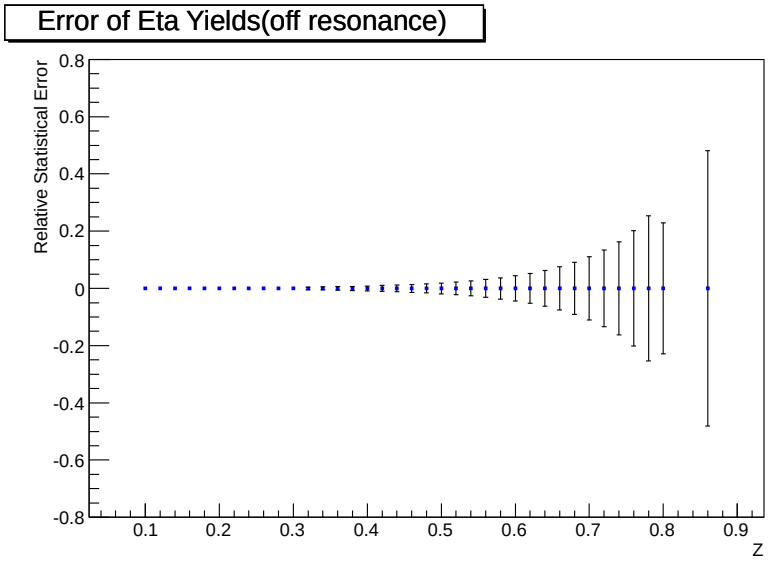


Figure 13: Error of Yield Vs Z (Eta).

Error of Yield Vs Z (On Resonance, with thrust cut)

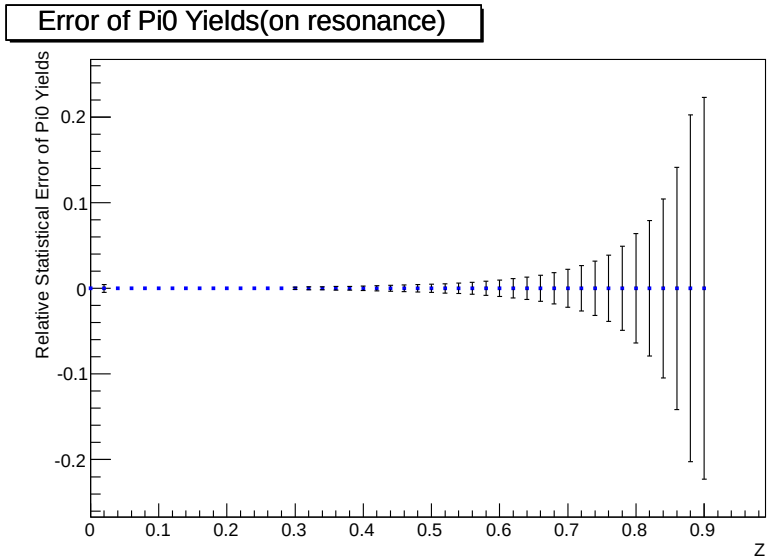


Figure 14: Error of Yield Vs Z (Pion).

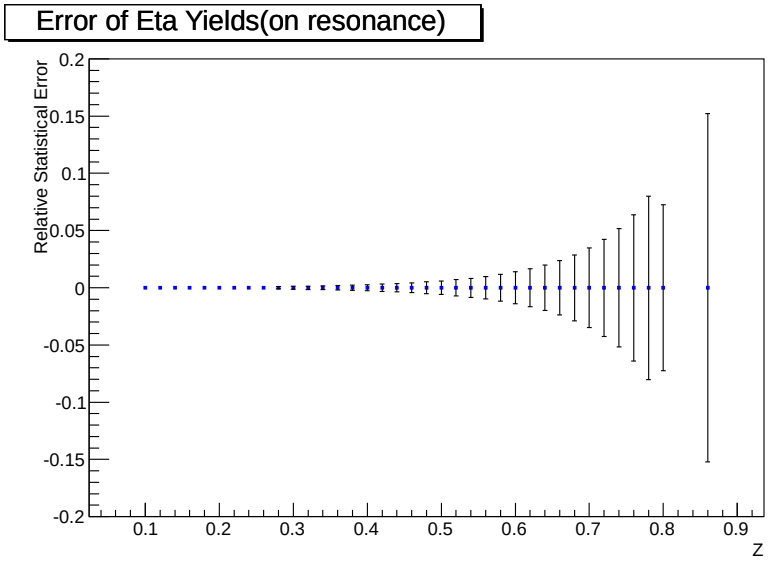
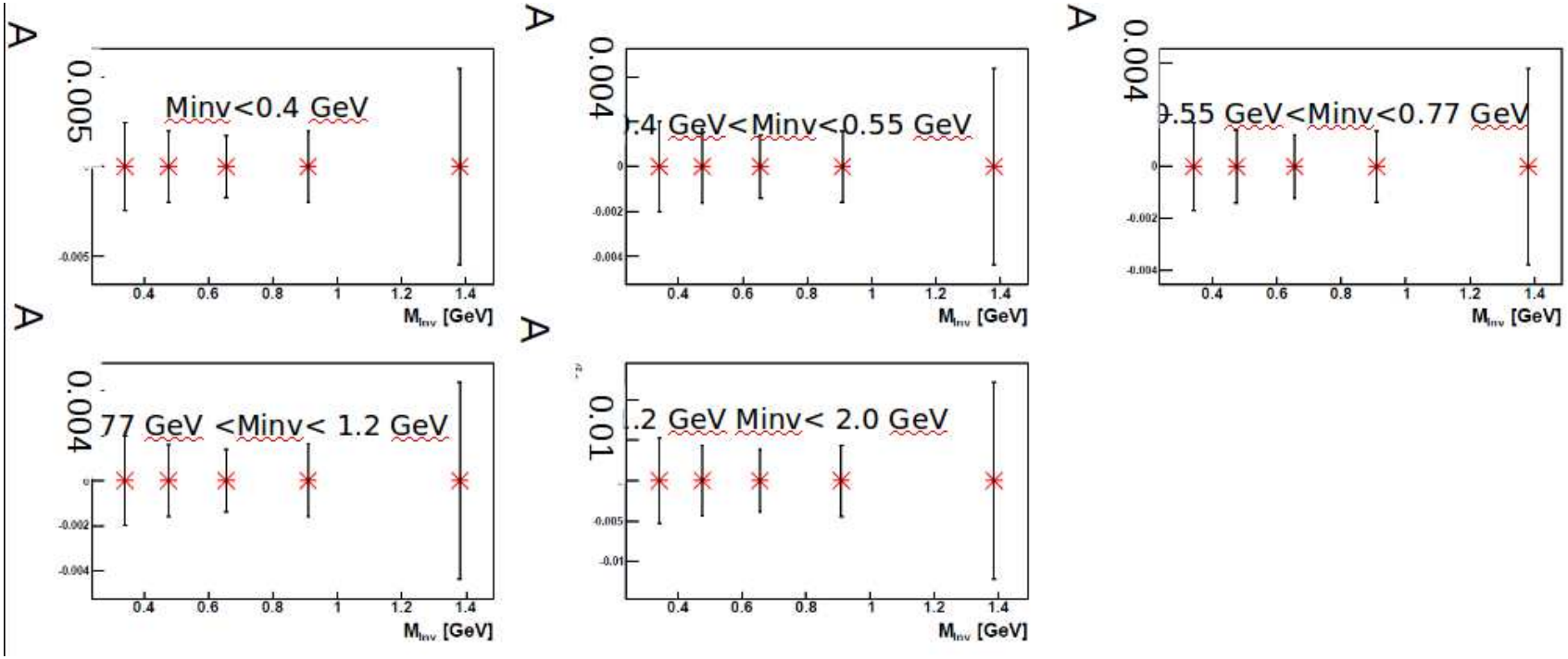


Figure 15: Relative Error of Yield Vs Z (Eta).

Projections for π^+/π^0-π^+/π^0 IFF



Outlook

- Analysis of neutral meson fragmentation functions started
- π^0 and η yields will give input to global analysis
- Collins fragmentation function for η and π^0 needed to interpret π^0, η A_N
- di-hadron IFF with π^0 in final state can be used for transversity extraction from RHIC data