Large-scale Correlation Structure on Two-particle Axial Momentum Space in Au-Au Collisions at $\sqrt{s_{NN}}$= 130 GeV

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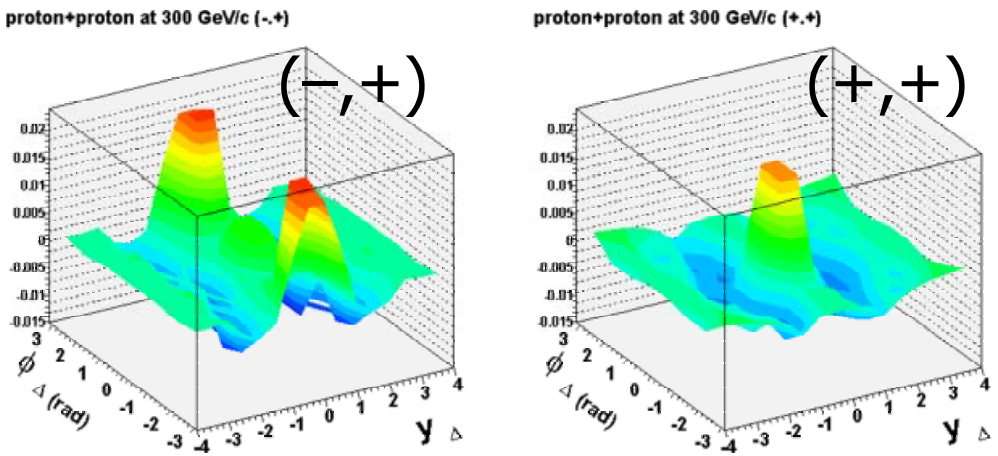
for the STAR collaboration

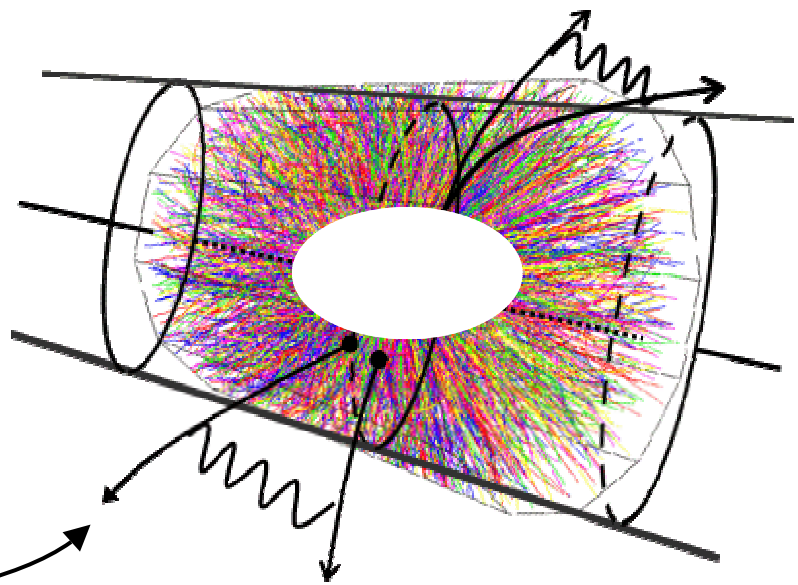
Two-particle Correlations in Axial Momentum Space (η, ϕ)

How are the correlations, well studied in p-p collisions modified in Au-Au collisions?



p-p at 300GeV/c

?

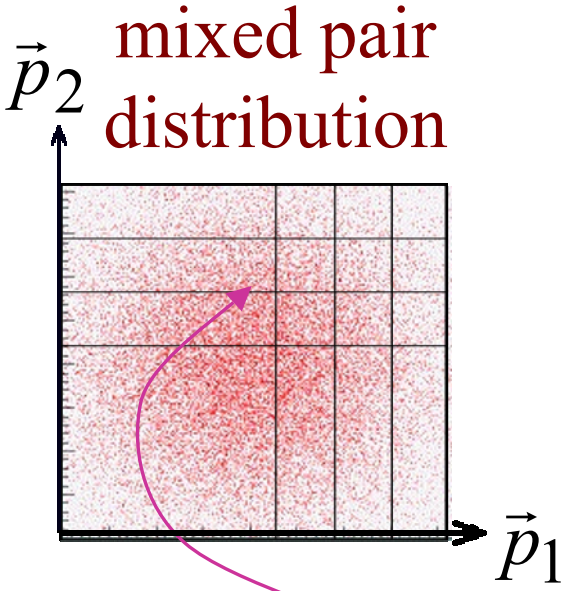


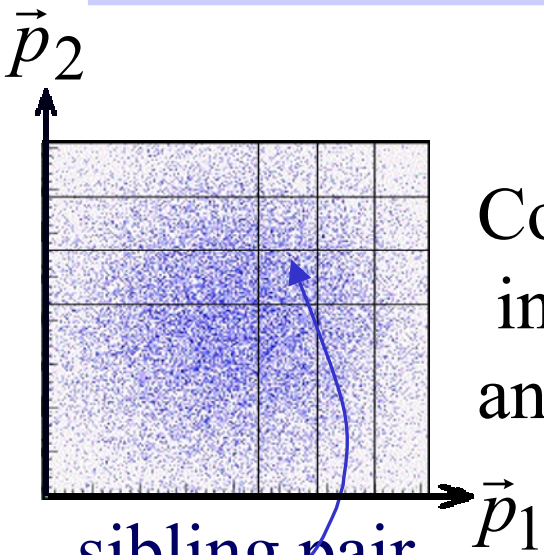
Au-Au

Reproduced with data from Ref. Phys. Lett. B56:400,1975

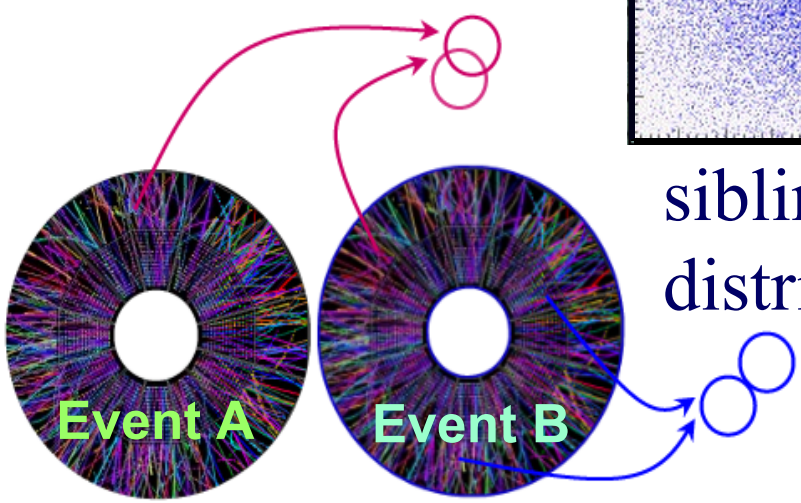
Pair Number Density Ratio

$$r\left(\vec{p}_1,\vec{p}_2\right)=\frac{\rho_{sibling}\left(\vec{p}_1,\vec{p}_2\right)}{\rho_{mixed}\left(\vec{p}_1,\vec{p}_2\right)}$$





Count numbers of pairs in each bin for sibling and mixed and form ratios



Data Selection and Cuts:

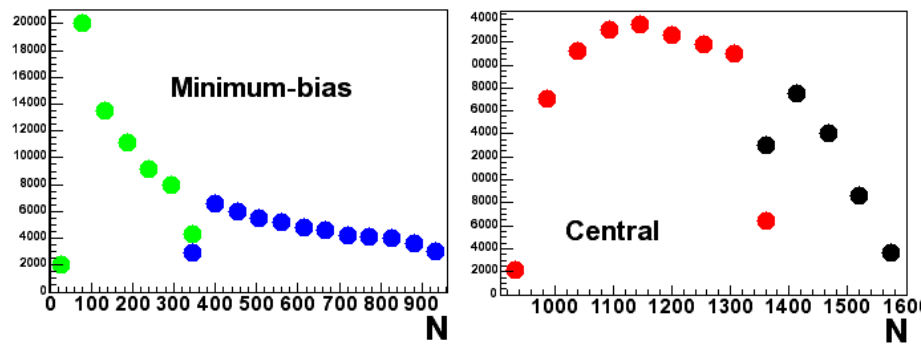
Collision system: $Au + Au \quad \sqrt{s_{NN}} = 130\,GeV$

- Central (15%) trigger (210k events after event cut)
- Minimum-bias trigger (124k events after event cut)

- $0.15 < p_t < 2$ GeV
- $|\eta|<1.3$
- full 2π azimuth

Pair cuts correct for track splitting and merging, and remove most of HBT/Coulomb correlations

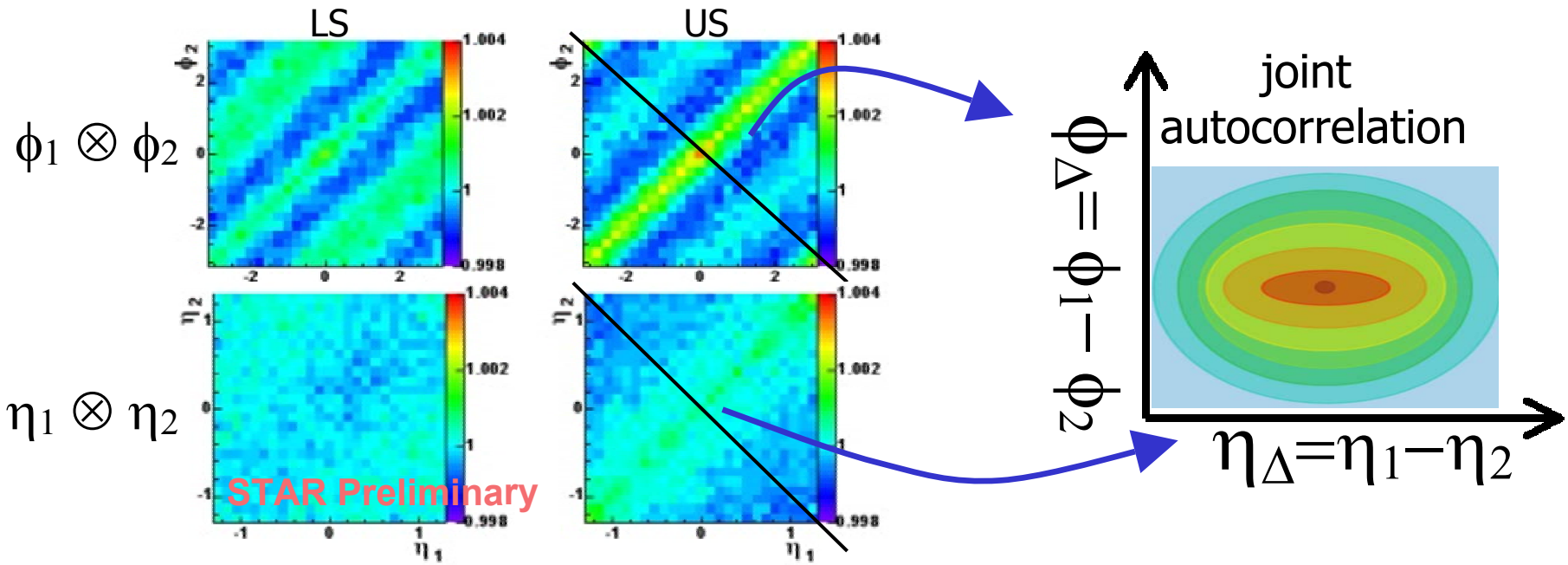
Centrality bins



mixed-pair reference

event ordering on vertex position and multiplicity

Like-sign and Unlike-sign / η⊗η and ϕ⊗ϕ correlation



$$\mathbf{LS}_{(++,--)} \pm \mathbf{US}_{(+-,-+)} = \begin{matrix}\mathbf{CI} \\ \mathbf{CD}\end{matrix}$$

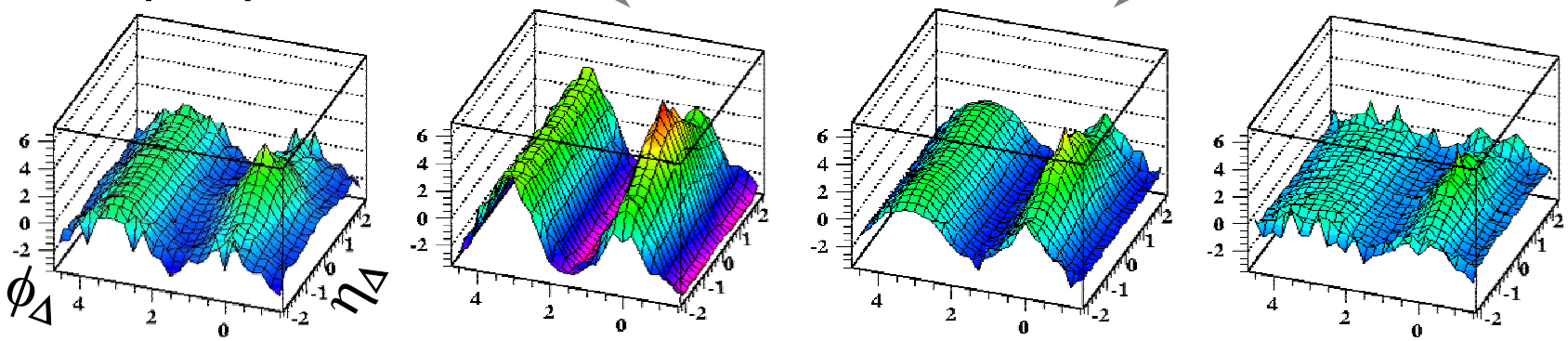
- Little dependence on sum or pair-average η or ϕ
- Form the joint autocorrelation to study *charge-independent* (CI) and *charge-dependent* (CD) correlations

Charge-Independent Joint Autocorrelation

DATA:

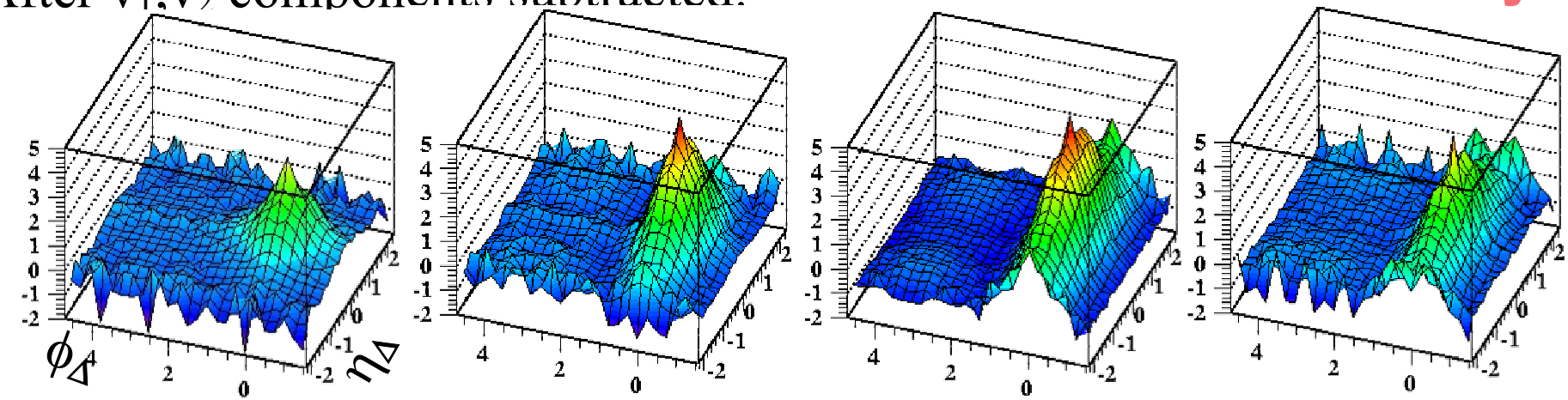
CI = LS + US

peripheral ⟷ central



After v_1,v_2 components subtracted:

STAR Preliminary



- Development of correlation structure with centrality
- Initial state scattering? ➡ See talk by T. Trainor

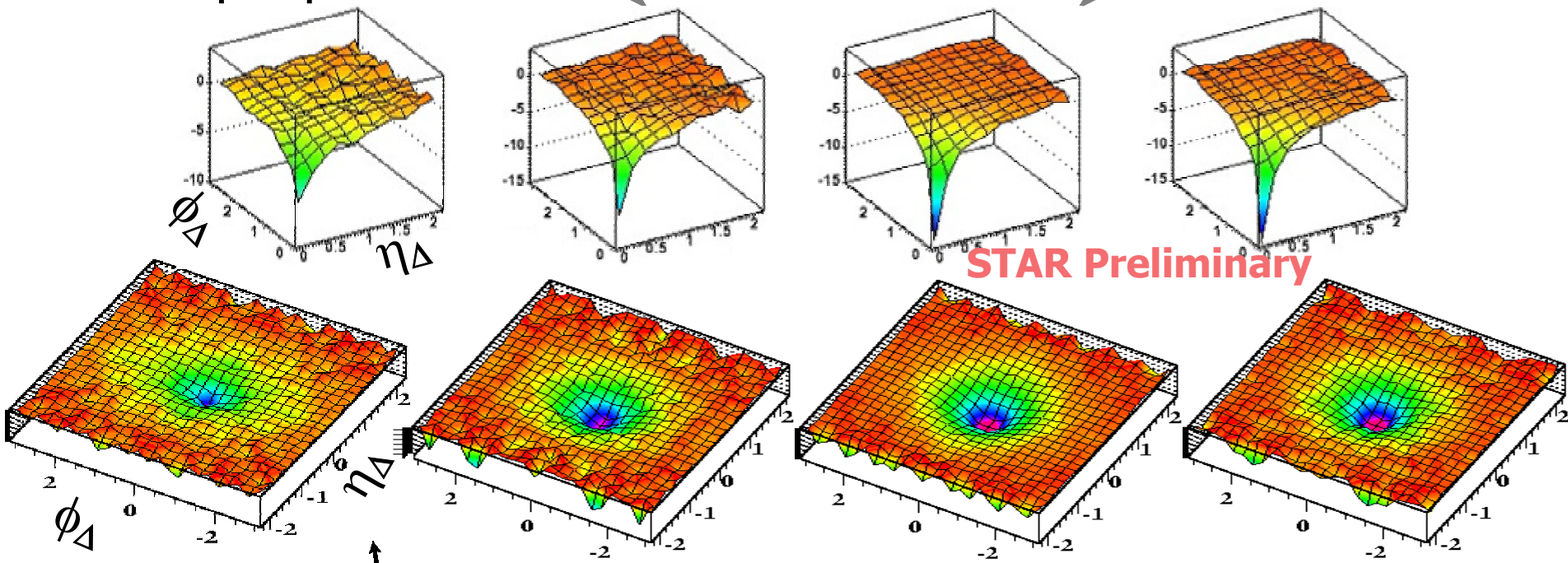
Charge-Dependent Joint Autocorrelation

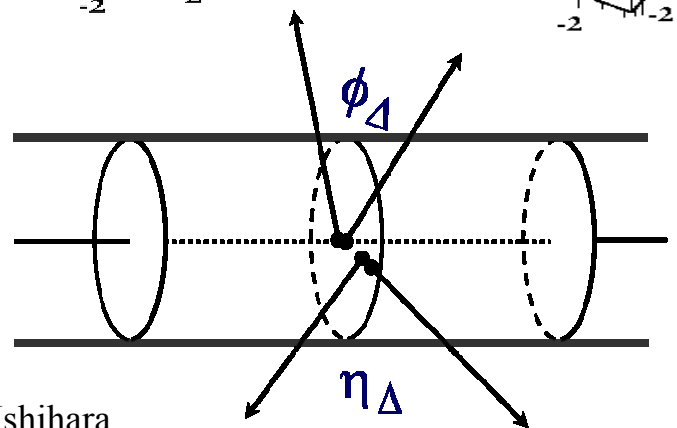
DATA:

CD = LS – US

peripheral

central

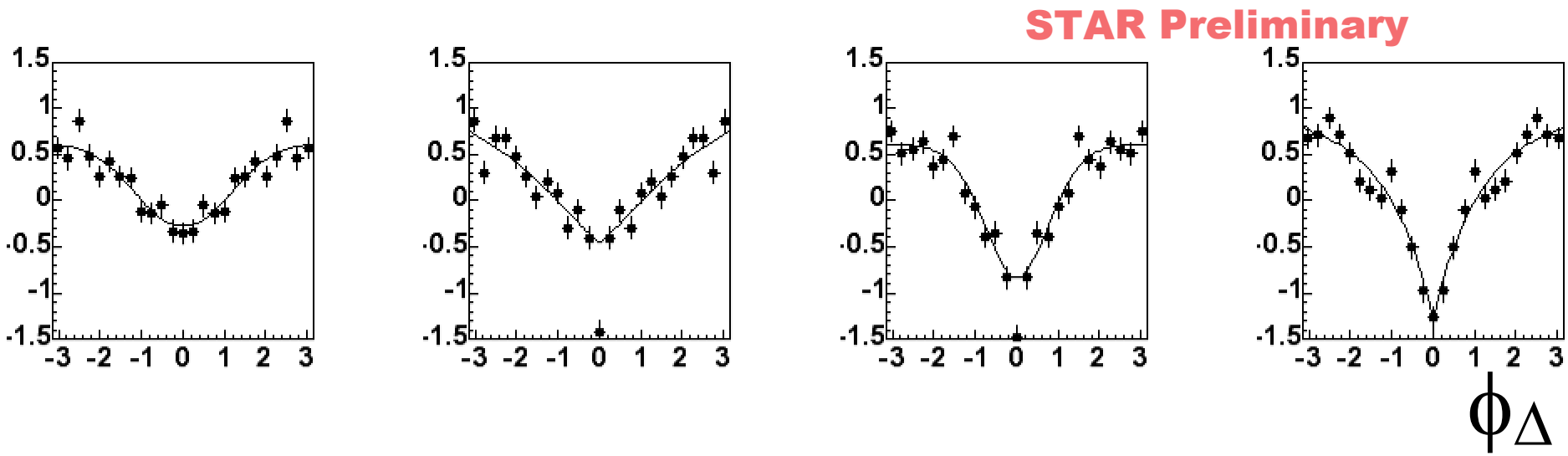




Centrality development of correlation shape and amplitude

1D projections

peripheral ⟷ central



- **Larger change on ϕ_Δ :**
  → evolution from 1D color-string charge-ordering to 2D surface-ordering

- **Shape change and larger amplitude for the most central events :**
  → pair emission probability falls with opening angle

Summary

- Large-amplitude CI and CD two-particle number correlations are observed on axial momentum space
- CI and CD joint autocorrelations show strong centrality dependencies of correlation structure: amplitude, shape and characteristic lengths

CI	CD
•Initial-state multiple scattering (minijets)	•Hadronization geometry
•Suggest modification of minijets in a dissipative medium	•Suggest surface charge ordering and growth of an opaque medium in central collisions