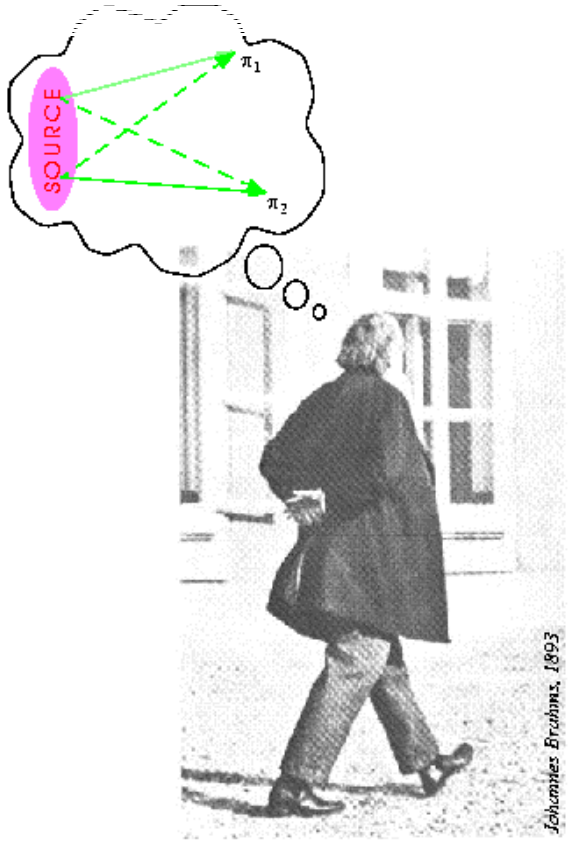
HBT in BRAHMS



J.H. Lee
BNL

Correlations Fest, June 2002, BNL

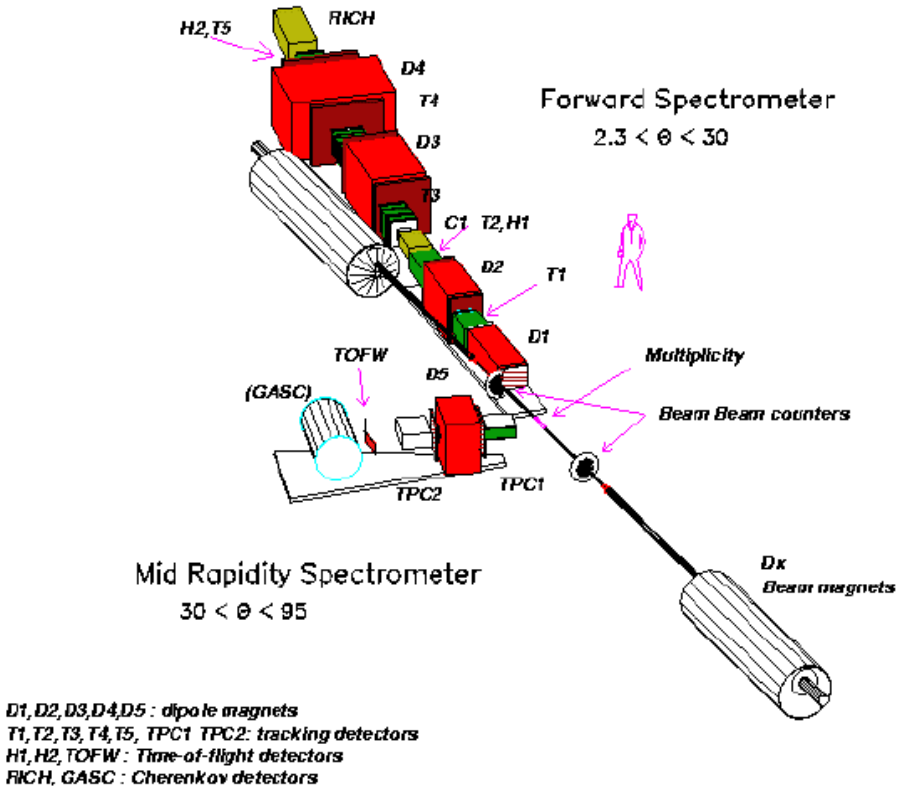
Outline

- BRAHMS Detectors
  - 2 Spectrometers, Global detectors
  - Upgrade for Extended PID
- HBT in BRAHMS
  - What BRAHMS can/can't do: pros and cons
  - Very Preliminary correlations with limited statistics from Run2
  - Plan for Run3
- Flow measurements in BRAHMS
  - Detector reconfiguration

- Summary/Outlook

BRAHMS

Broad **RA**nge **H**adron **M**agnetic **S**pectrometer**S**

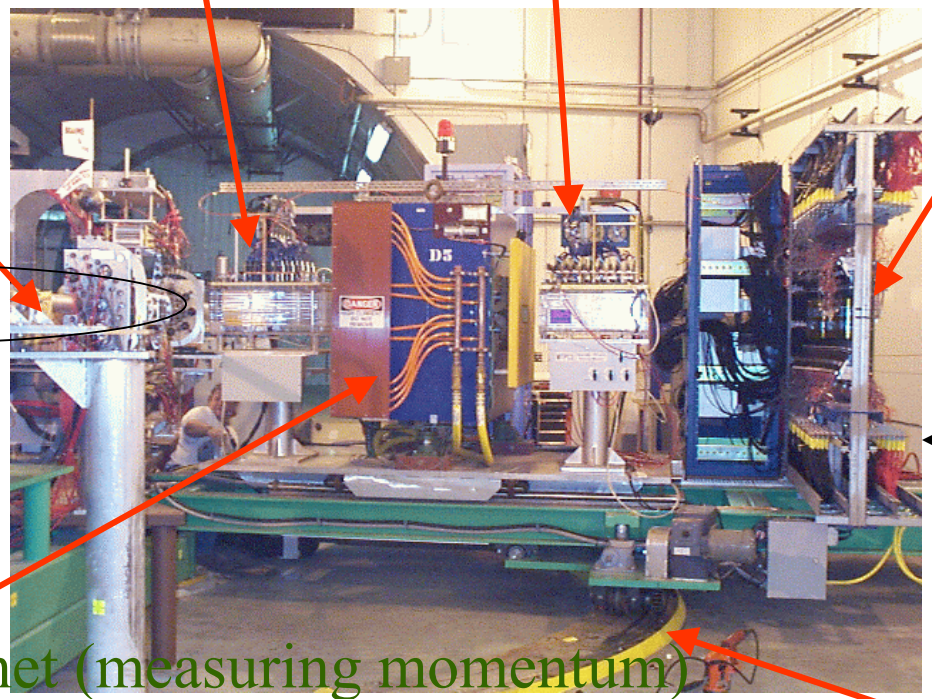


- 2 Movable Spectrometers: (Mid-rapidity Spectrometer and Forward Spectrometer) for track reconstruction and Particle identification

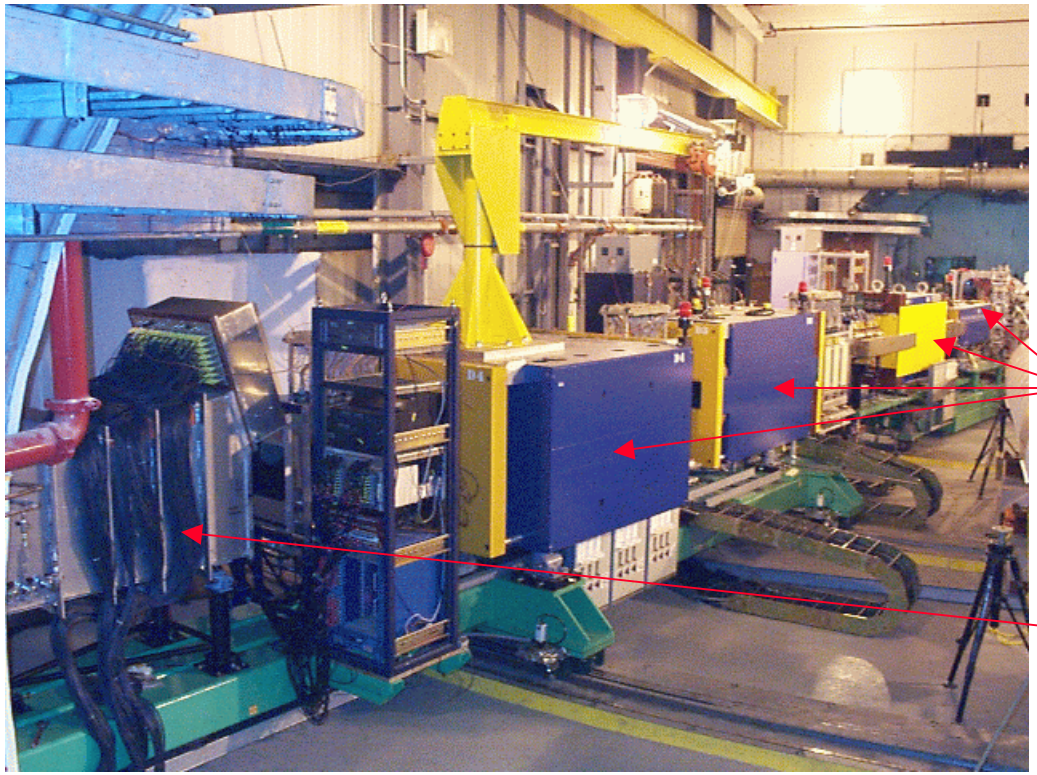
- Centrality Detectors: Tiles, Silicon Strips, Beam-Beam counters, Zero-degree Calorimeters for event characterization

- Collaboration of ~55 Physicists from 11 institutions

Mid-rapidity Spectrometer
(rotates 30°-95°)

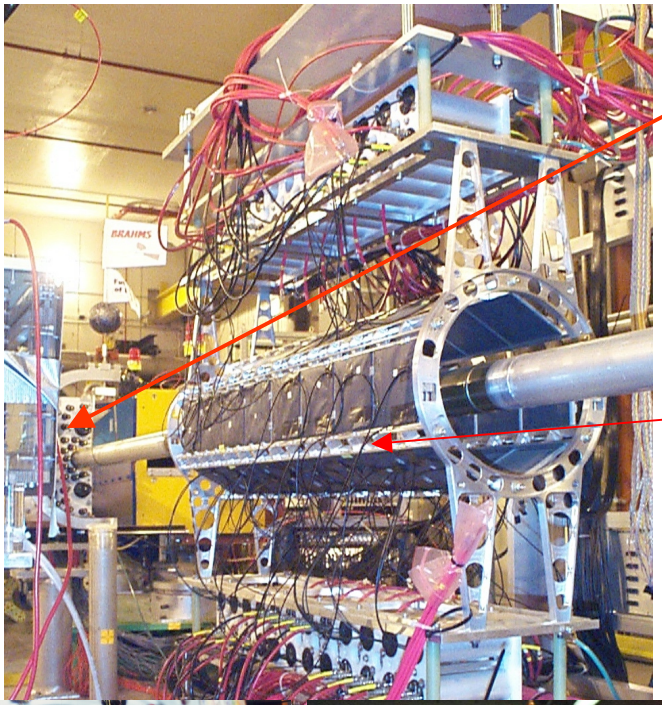


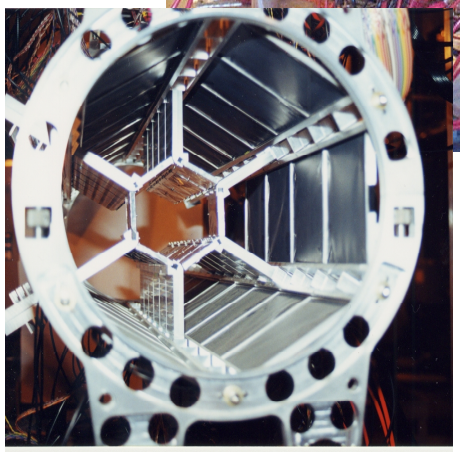
Forward Spectrometer
(rotates 2.5°-30°)

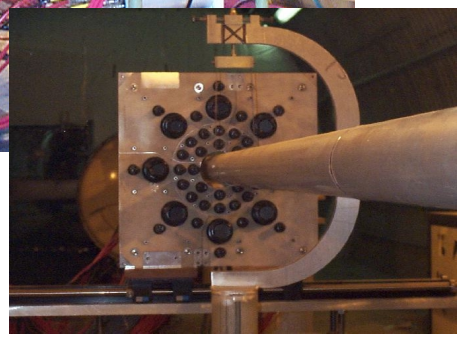


- ~20 m long
- 2 TPC's: T1 and T2
- 3 DC's: T3,T4,T5
- 4 Magnets: D1,D2,D3,D4
- 2 ToF Hodoscopes: H1, H2
- 1 Cerenkov Counter: C1
- 1 RICH

Global Detectors



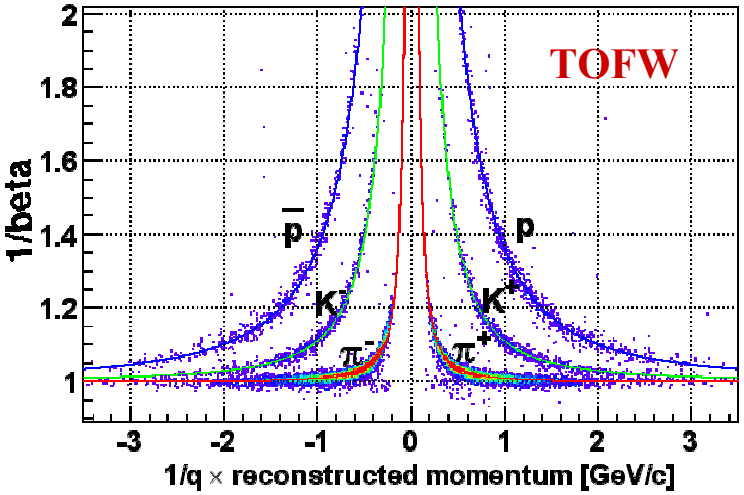


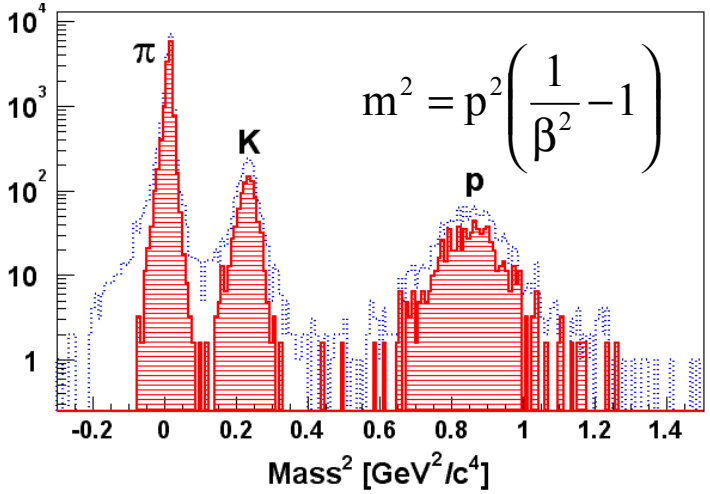


- Beam-Beam Counters
  - Provide a start time and trigger
  - Measure multiplicity at high η ($2.1 < |\eta| < 4.7$)
- Multiplicity Detectors
  - Tile (TMA) and Si Arrays (SiMA)
  - Provide charged particle multiplicity ($-3 < \eta < 3$)
  - Used to characterize centralities of events
- Zero Degree Calorimeters
  - Identifying collisions

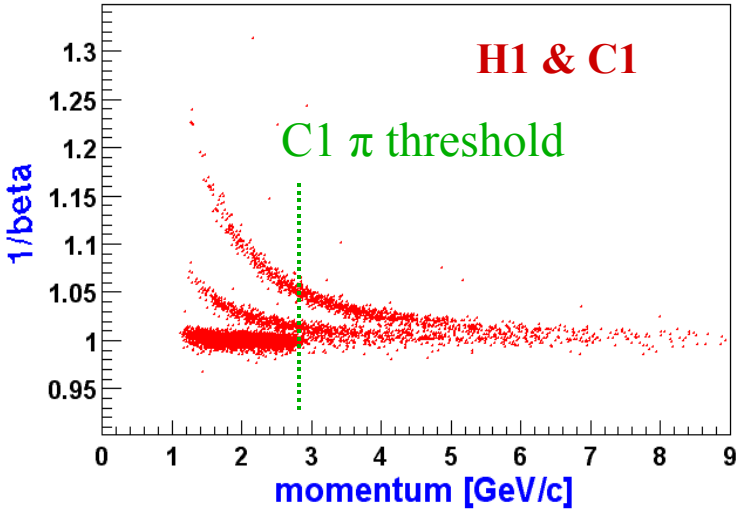
Particle Identification

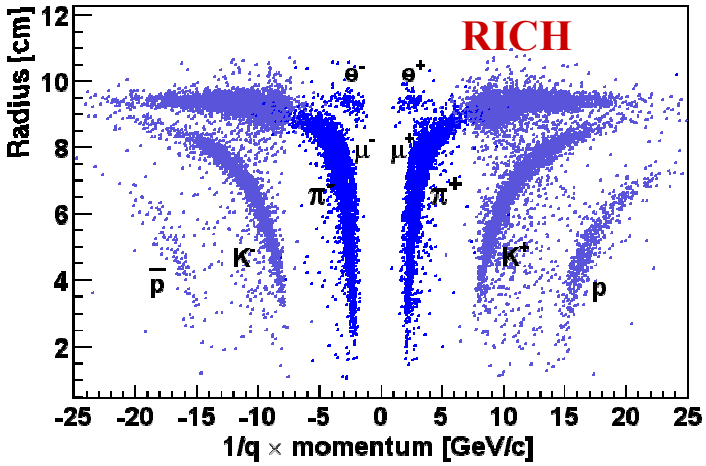
Mid-rapidity Spectrometer



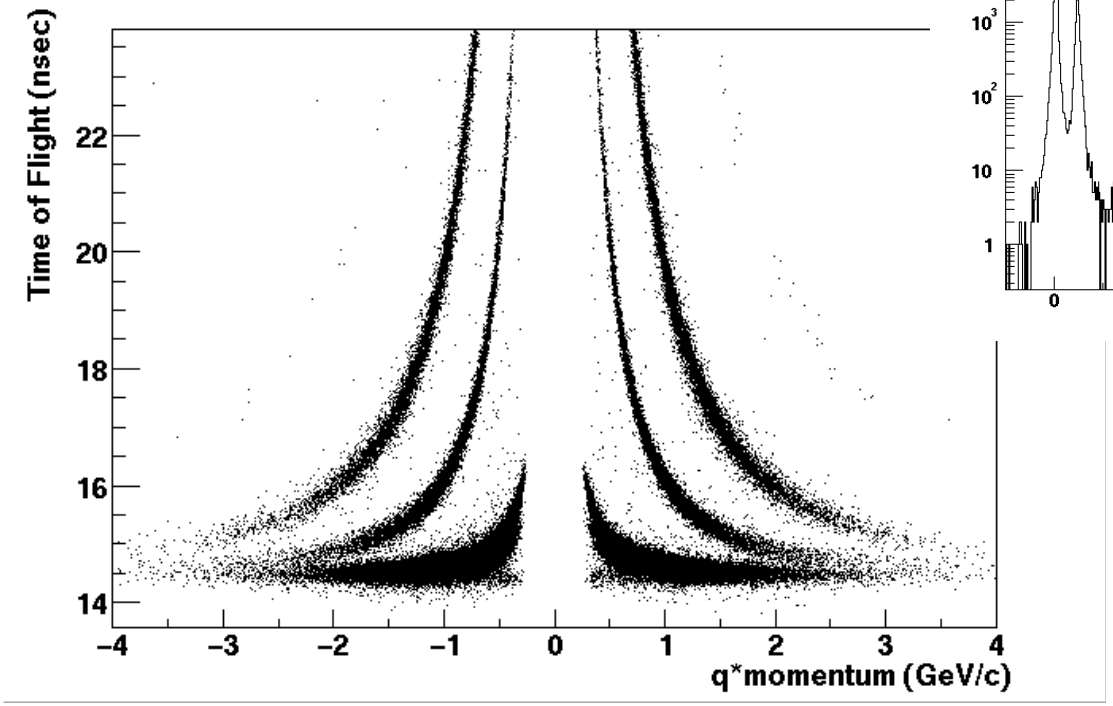


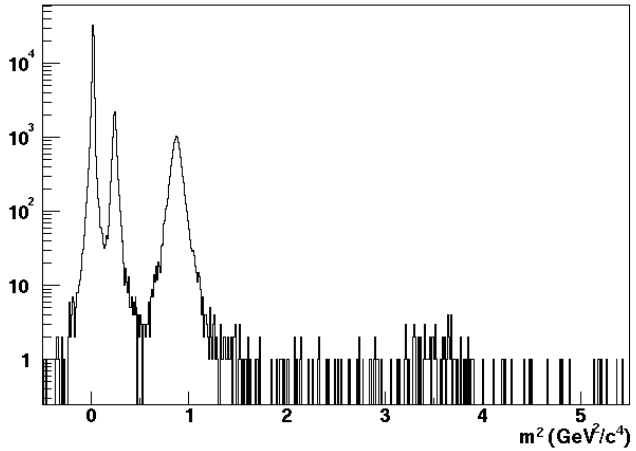
Forward Spectrometer





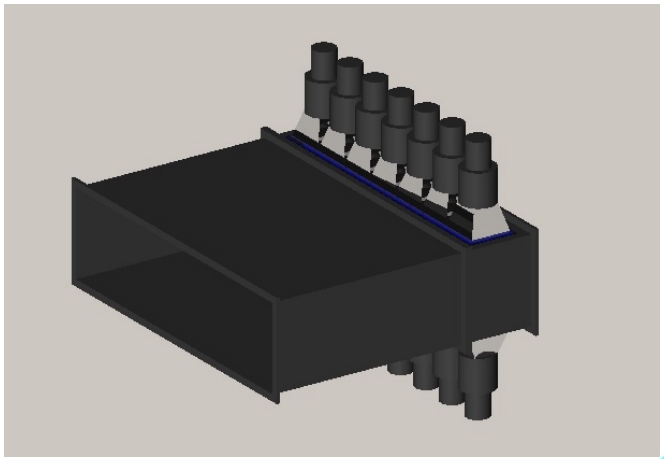
MRS TOFW particle identification

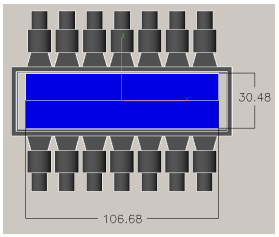




- 125 slats: time of flight resolution ~ 75psec
- π/K separation ~ up to 2.5 GeV/c
- K/p separation ~ up to 4 GeV/c
- An additional detector(s) is needed for identifying higher p_t particles (Cherenkov).

Extended PID for High pt measurements

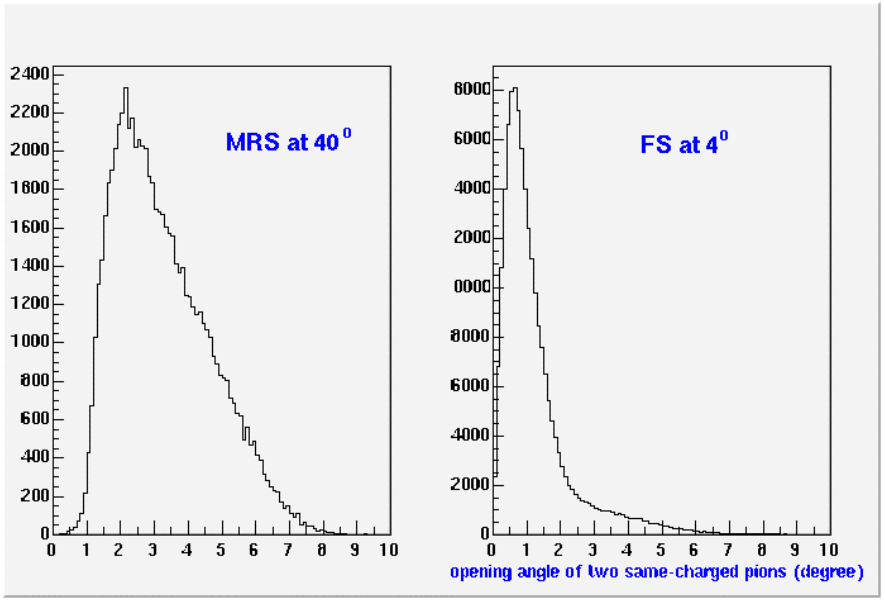




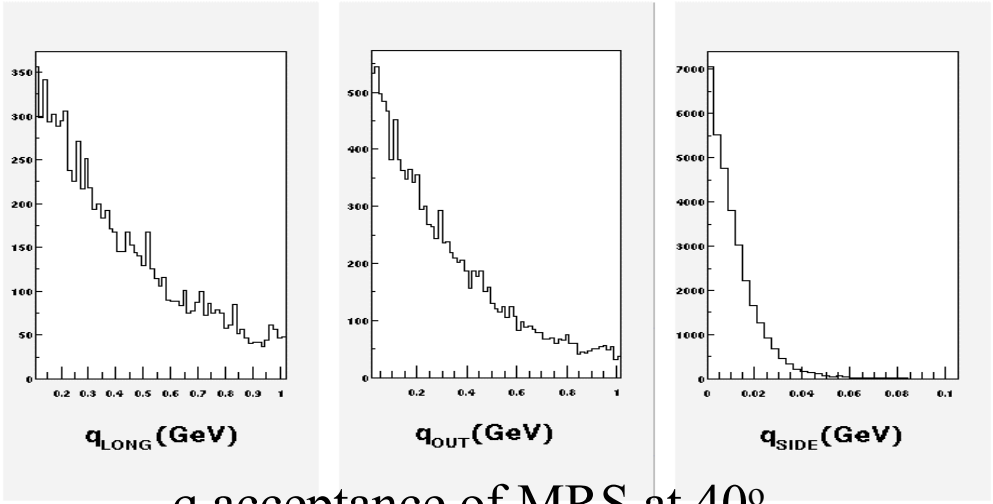
- New Cherenkov detector C4: Addition to TOFW at Mid-Rapidity Spectrometer
- π/K identification up to p = 8 GeV/c (Forward Spectrometer PID up to p = 25 GeV/c)

  "high-pt" pion measurement up to 5 GeV at y ~ 0 (luminosity limited)
- Will be installed for Run3 (2002-3)

HBT in BRAHMS



- Good Tracking and PID ($\delta p/p$ = 1-3% depending on field)
- Can measure $y_{\pi\pi}$ up to 3.5



q acceptance of MRS at 40°

- Small Solid Angle
  - Need good luminosity
  - limited acceptance

HBT in BRAHMS

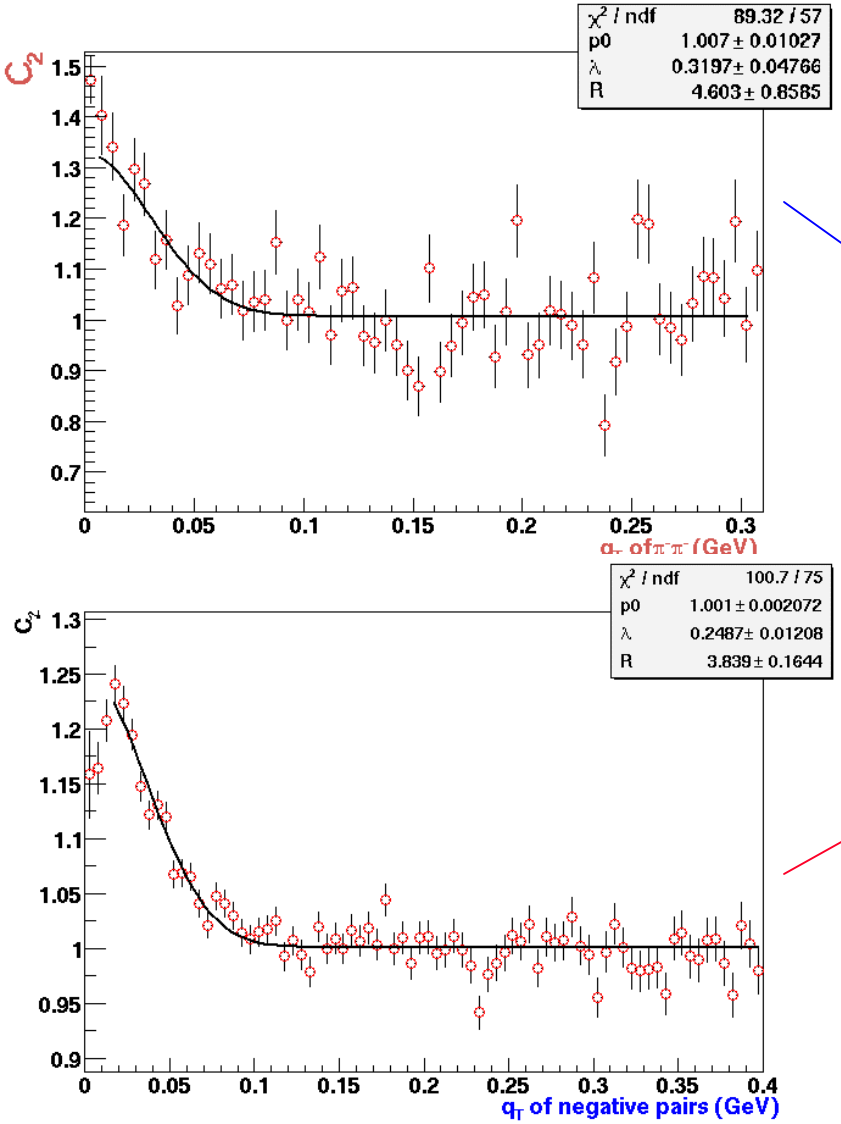
- Best place for the measurement for BRAHMS:
  MRS at ~40° (y~1)
  + multiplicity: number of pairs ~ 4*90deg
  + kinematics: $q_T \sim q_L$

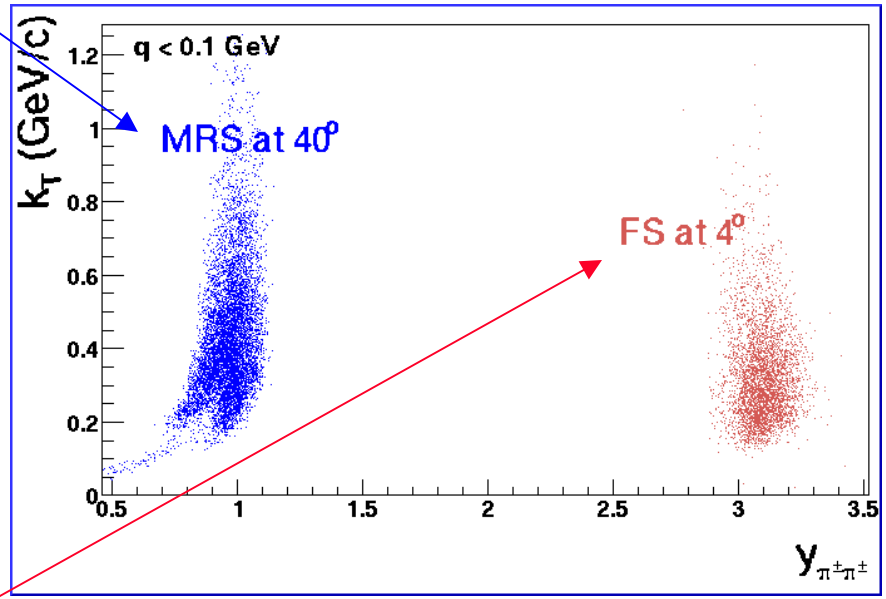
- At very forward rapidities ($p_L >> p_T$): poor resolution for q_L

- Very limited statistics for HBT from Run2

- Analysis in Progress: Finite momentum resolution effect, Background correlation, Corrections..

Rapidity-Dependent Transverse Source Size Measurements

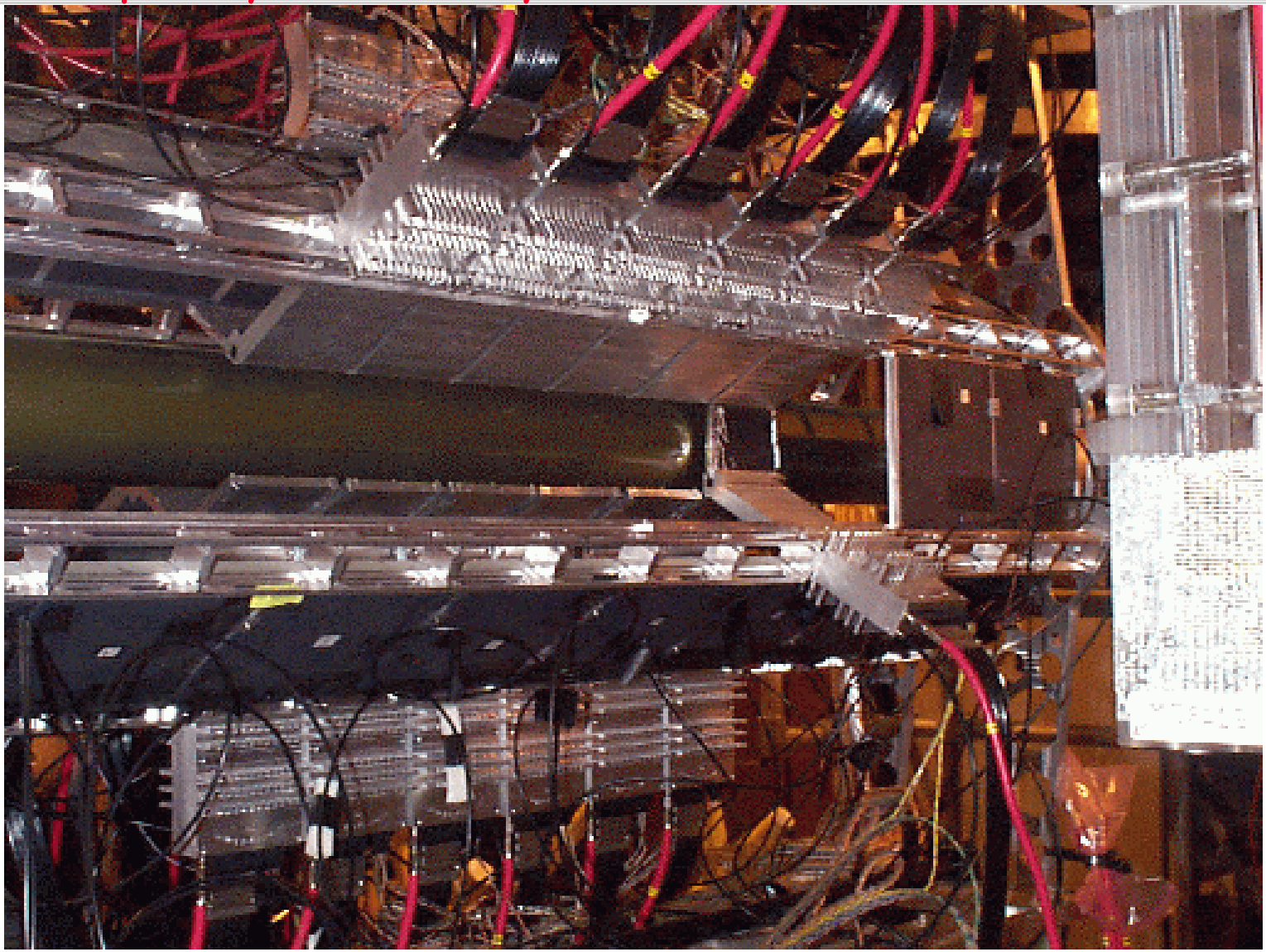




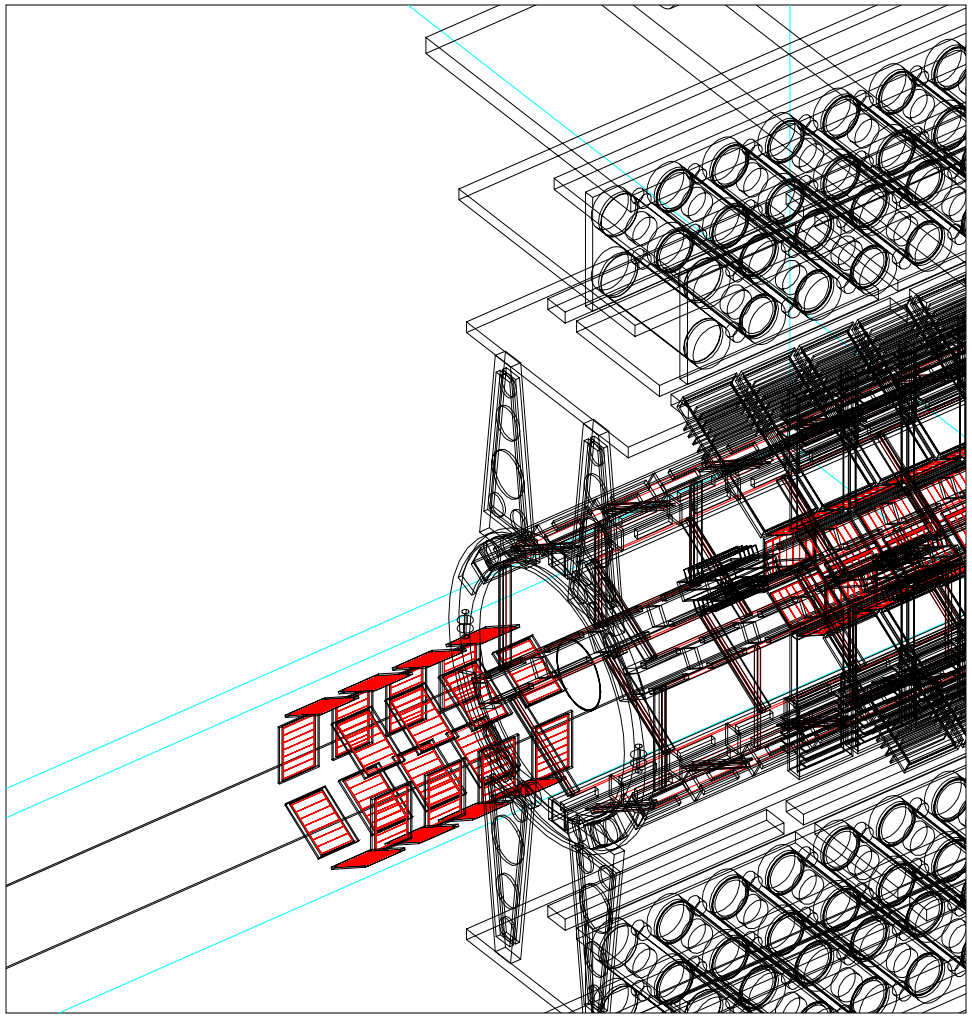
HBT for Run3

- High luminosity + Spec trigger + Extended PID
- Large statistics runs for HBT + "high-pt"
  - MRS at 40 degree: y ~ 1
  - MRS at 90 degree: y ~ 0
  - FS at 4 degree: y ~ 3
- Rapidity/p_T dependent source size measurements
- Possibility of measuring reaction plane dependent HBT measurement

Multiplicity/Centrality Detectors



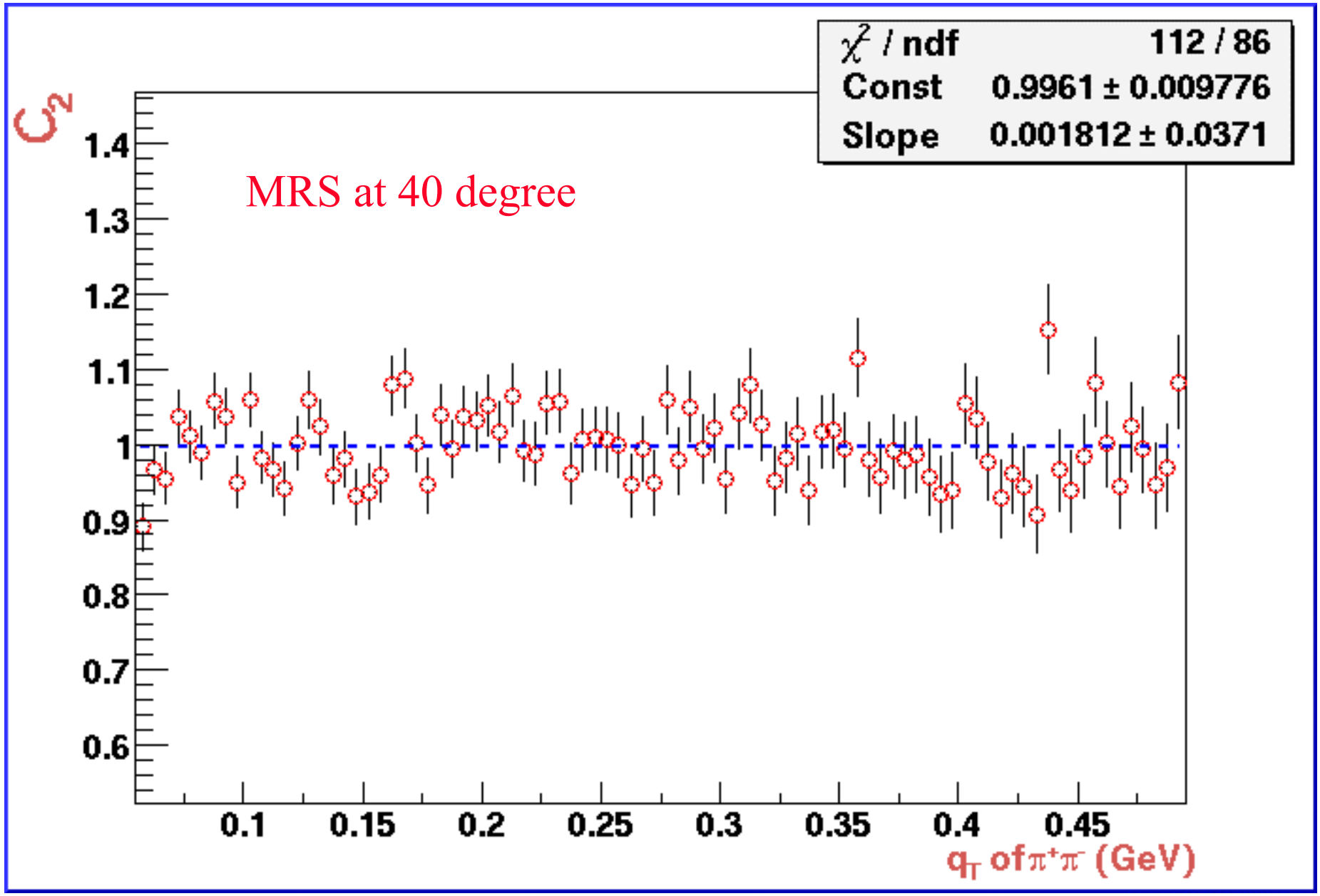
Flow Measurements in BRAHMS



- Reconfiguring Si Arrays for high segmentations in ϕ
- $6x7 = 42$ segmentations
- $2 < \eta < 2.5$ at nominal vertex
- Reaction plane information for spectral physics
- Pseudo-rapidity dependent v_2 measurement (η = 0 – 3)
- Simulation in progress
- Considered for Run3/2002

Summary

- Rapidity dependent HBT can be measured in BRAHMS
- Very limited statistics for HBT from Run2: Analysis in progress
- High statistics data collection at selected rapidities for HBT in Run3
- Flow Measurement in BRAHMS by reconfiguring Si-Array


χ^2 / ndf 112 / 86
Const 0.9961 ± 0.009776
Slope 0.001812 ± 0.0371
MRS at 40 degree
C_2
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
q_T of $\pi^+\pi^-$ (GeV)

The BRAHMS Collaboration

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