# FTPC status and results

- Summary of last data taken
- AuAu and dAu calibration : Data Quality
- Physic results with AuAu data
  - Spectra
  - Flow
- Physic results with dAu data
  - Centrality definition
  - Strangeness

Max-Planck-Institut
für Physik
(Werner-Heisenberg-Institut)

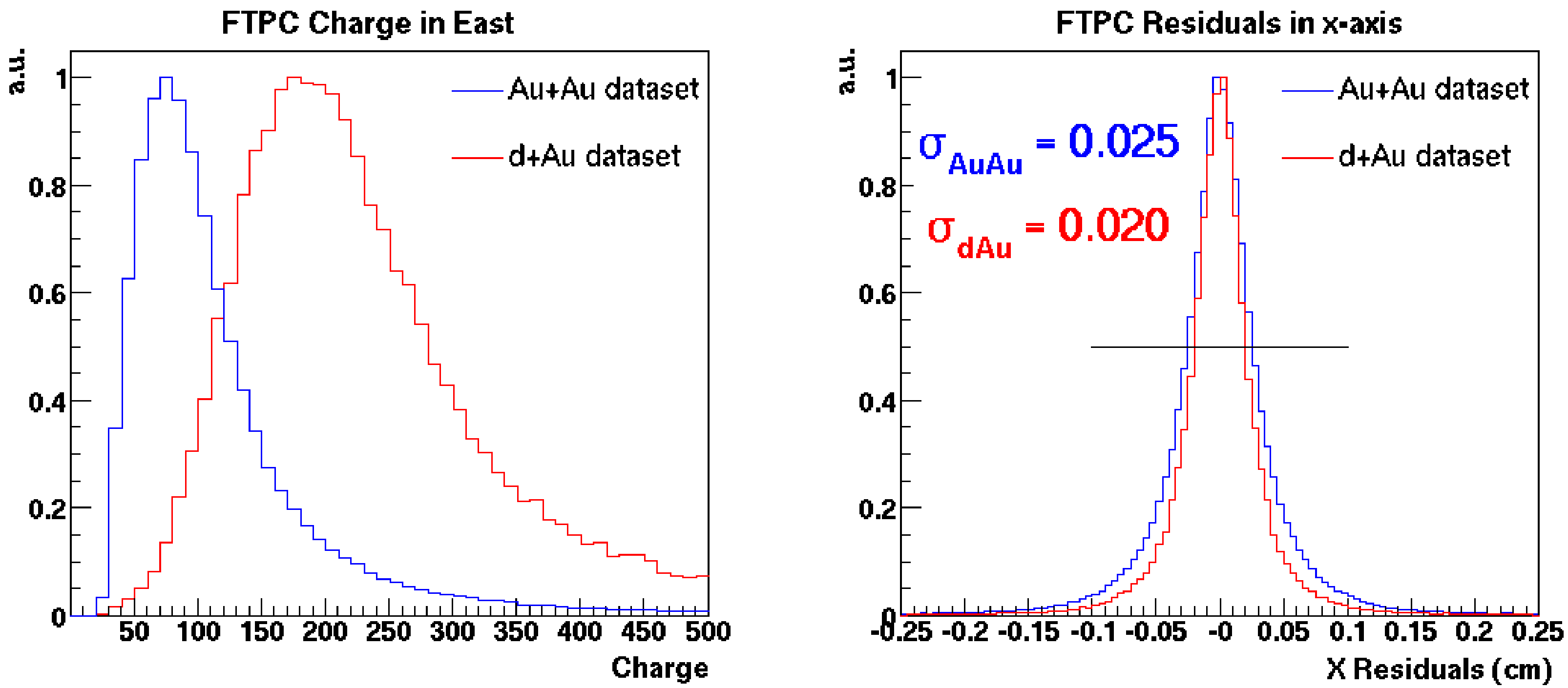
# Summary of RunIII

- FTPC successfully took ~20 $10^6$ dAu events and 8 $10^6$ pp events

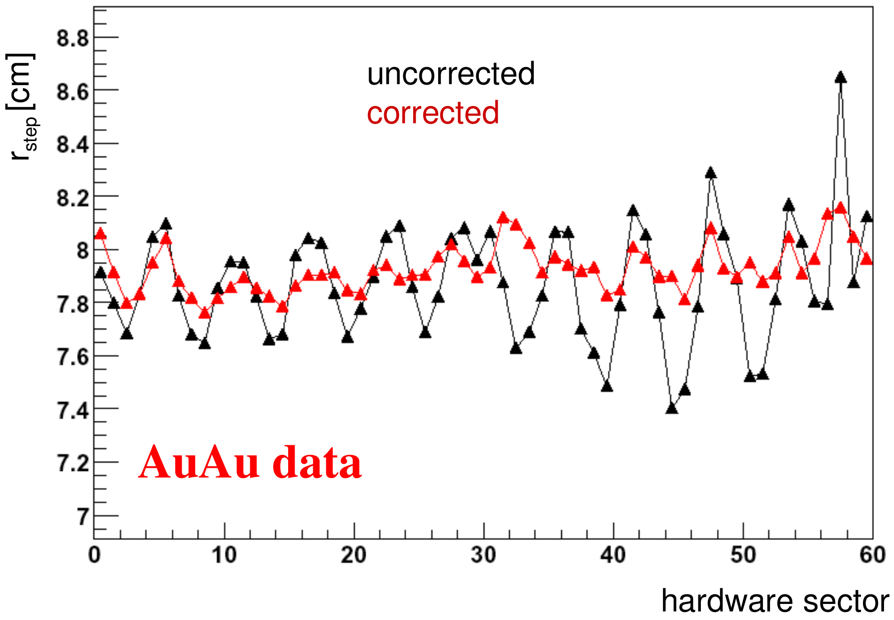
Changes since last AuAu/pp (2001-2002) run

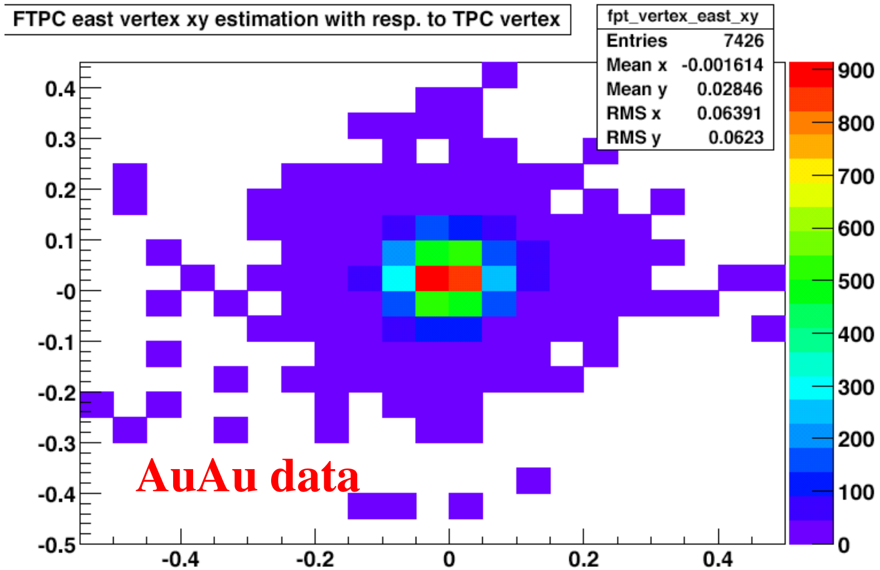
- Increased gain
- Frisch grid grounding problem fixed

$\left.\right\}$ **Better resolution** + **Better residuals**

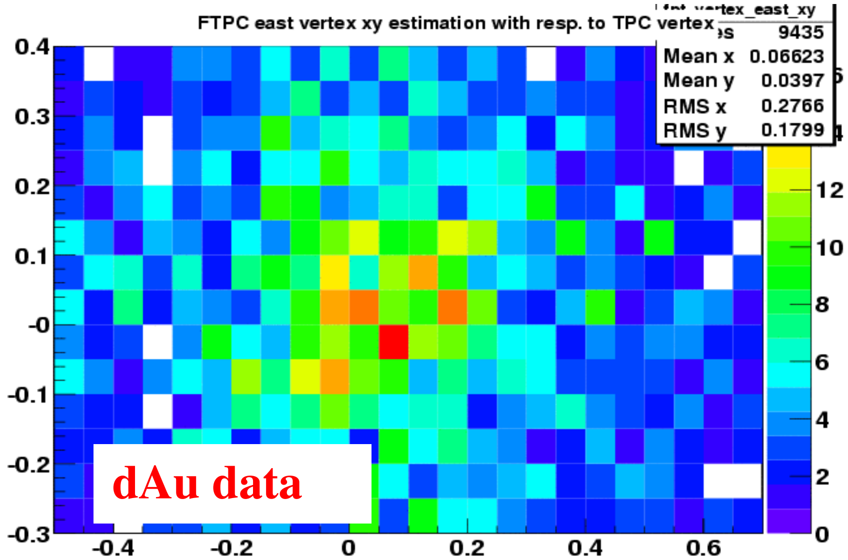


# Data quality




Inner cathode shift correction applied and works with reasonable precision.




Vertex reconstruction with FTPC tracks with respect to TPC vertex :
x,y ± 200 um AuAu data
x,y ± 600 um dAu data

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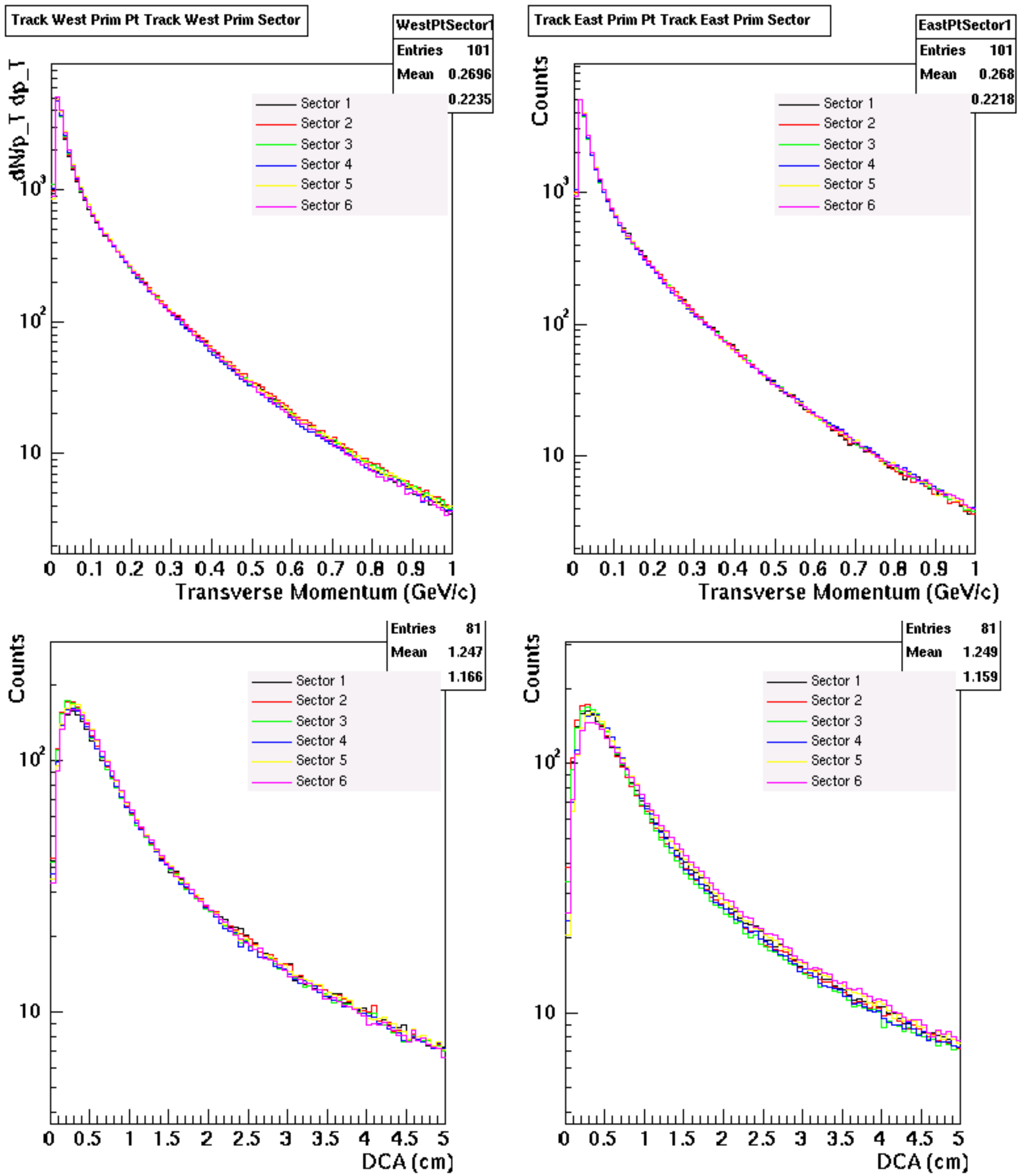
# Data quality II



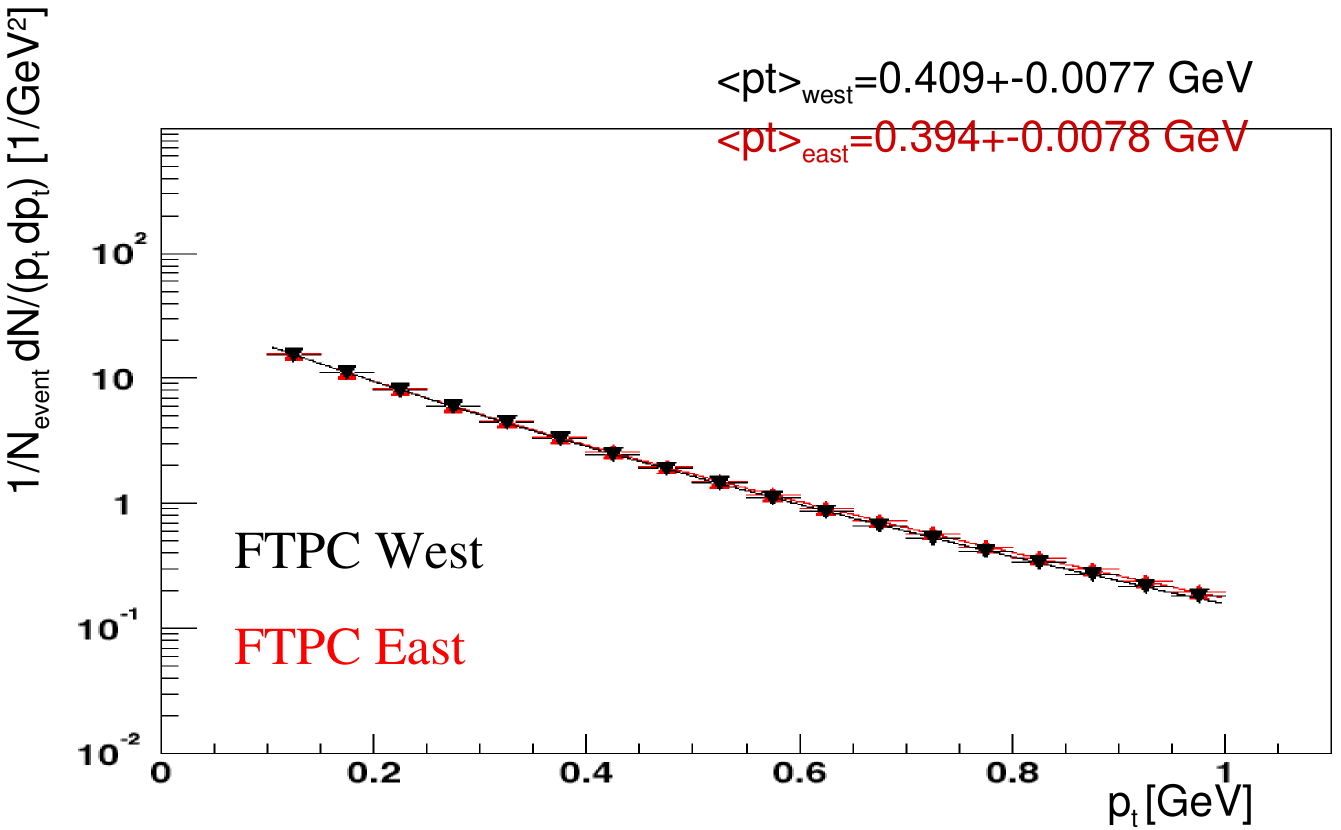

**Cross-check:**

$p_T$ and dca for primaries in different sectors ($\varphi$ regions)

Track parameters do not show any systematic effects.

**FTPC ready for physics!**

# AuAu Minbias $p_T$ spectra



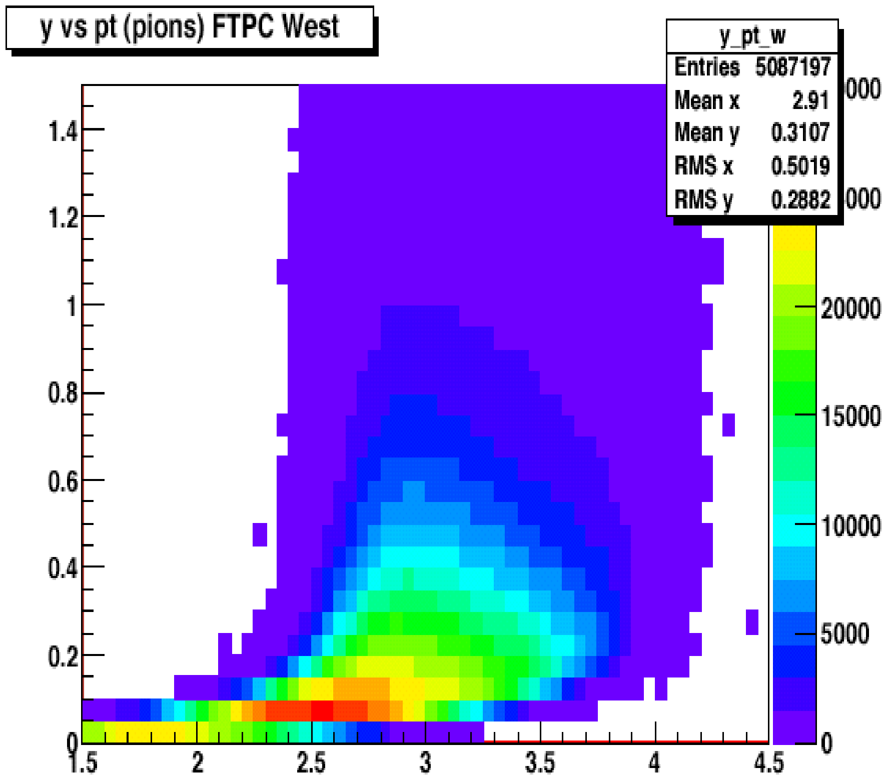

**Charged particles**
**AuAu minbias**
**68k (47k)**

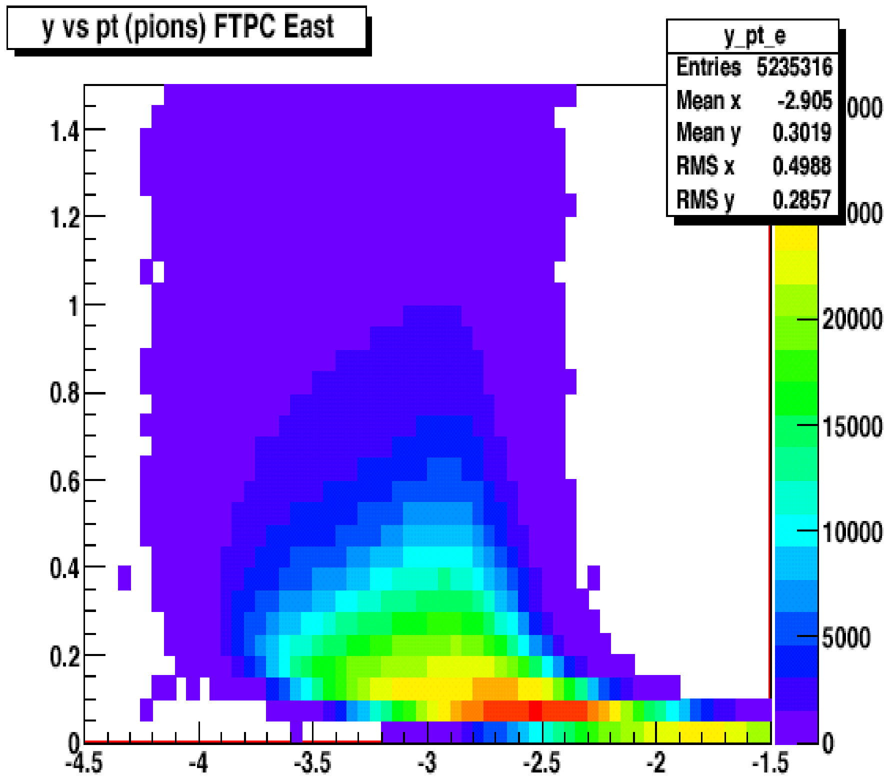
No corrections

Quality Cuts:

- dca < 2.0 cm
- $0.1 \le p_T < 1.0$ GeV/c
- $3.0 \le |y_\pi| < 3.2$
- $N_{hits} \ge 5$
- $|vertex_z| \le 25$ cm

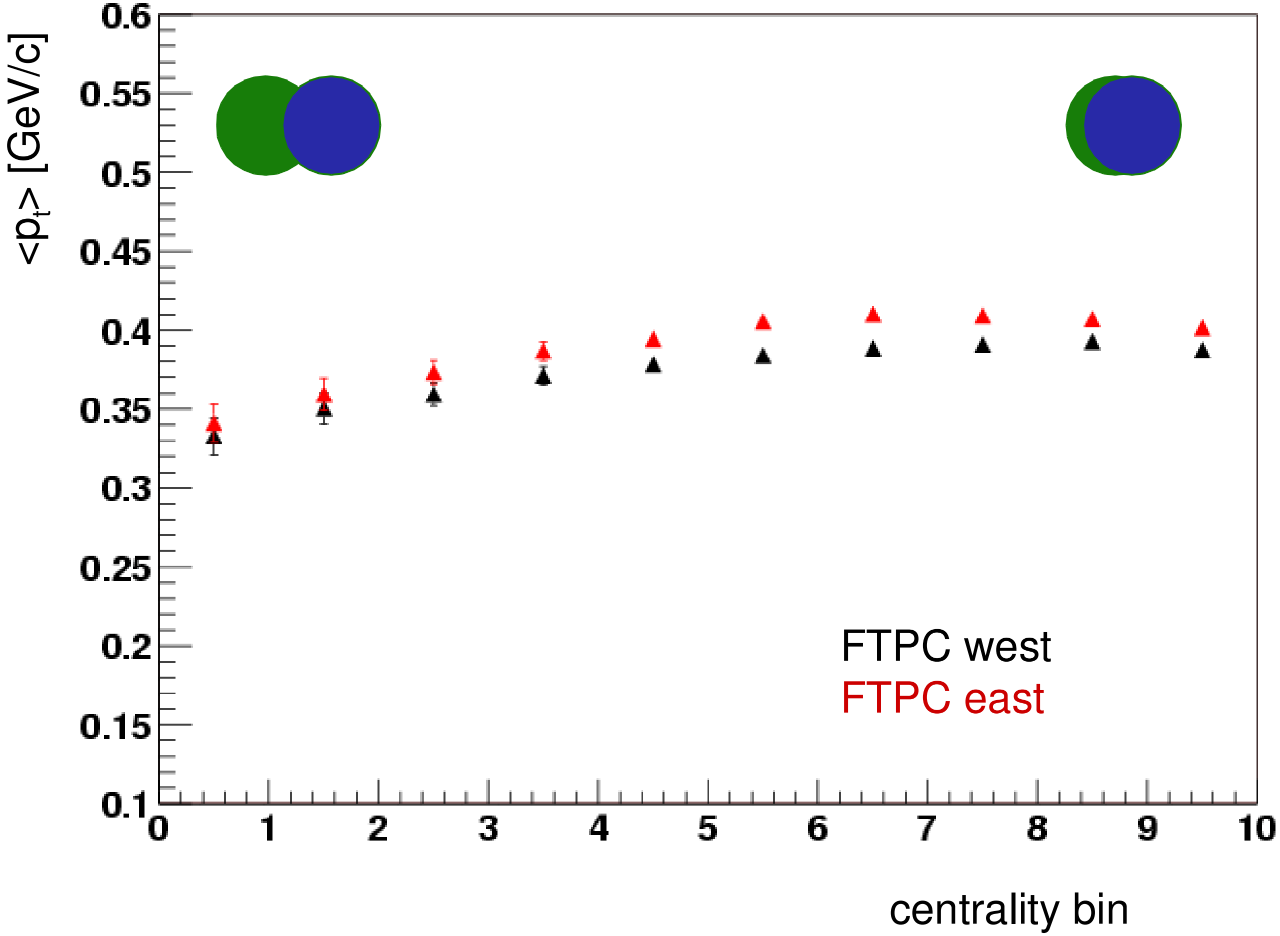
# FTPC pion acceptance



# AuAu: <$p_T$> *vs* centrality

- **Charged hadrons <$p_T$> increase slightly with centrality**
- Same behaviour as for charged particles at central rapidity (TPC)




<$p_T$> calculated from power law fit in range $p_T$ [0.1,1.0] GeV/c

No corrections

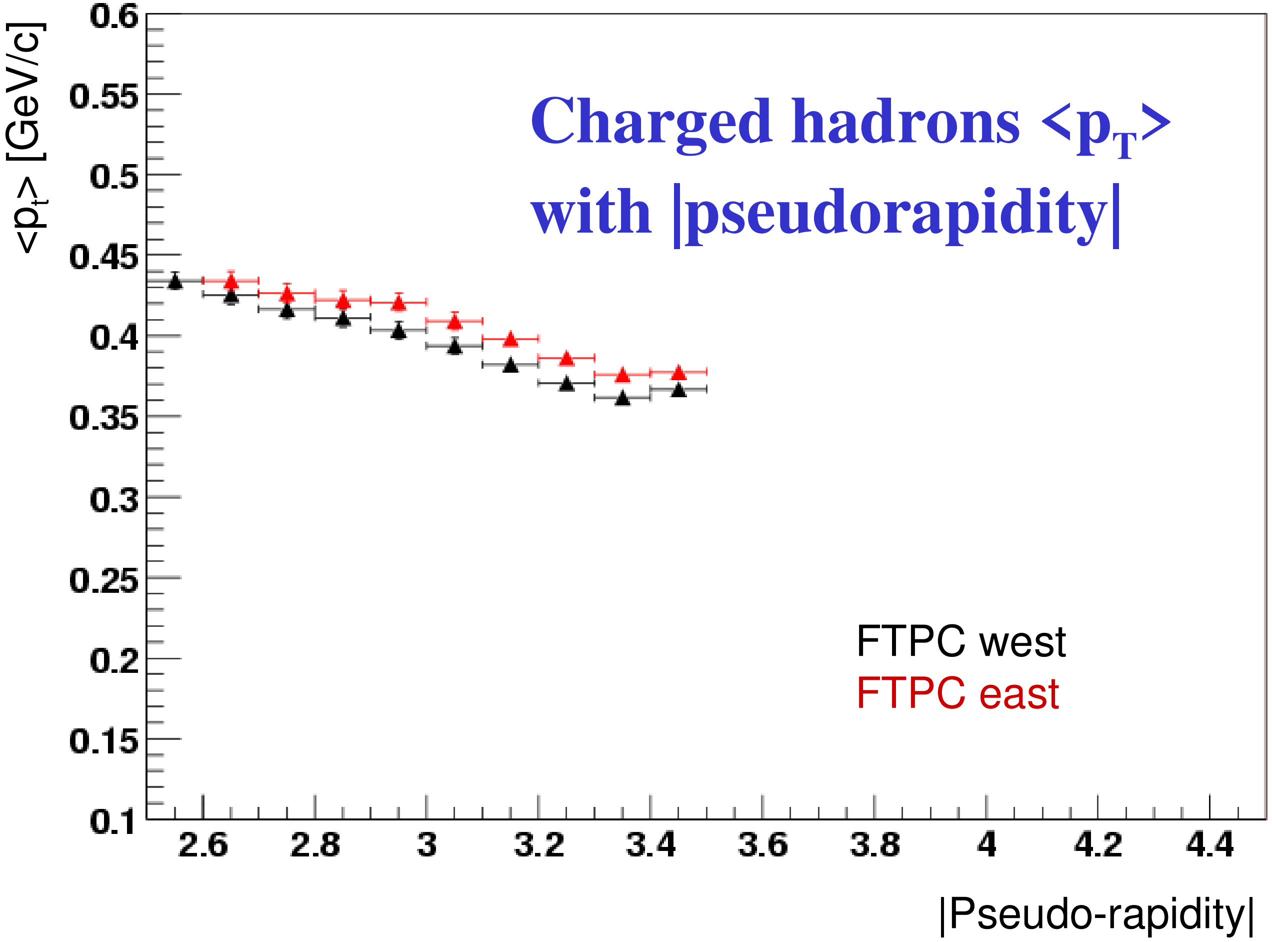
Quality Cuts:

- dca < 3.0 cm
- 0.1 <= $p_T$ < 1.0 GeV/c
- 2.8 <= |$\eta$|< 3.8
- $N_{hits}$ >= 5
- |$vertex_z$| <= 25 cm

# AuAu: $\langle p_T \rangle$ *vs* $|\eta|$

- **Charged hadrons $\langle p_T \rangle$ decrease slightly with pseudo-rapidity**

- Similar behaviour as seen by NA49 and BRAHMS




$\langle p_T \rangle$ calculated from power law fit in range $p_T$ [0.1,1.0] GeV/c

No corrections

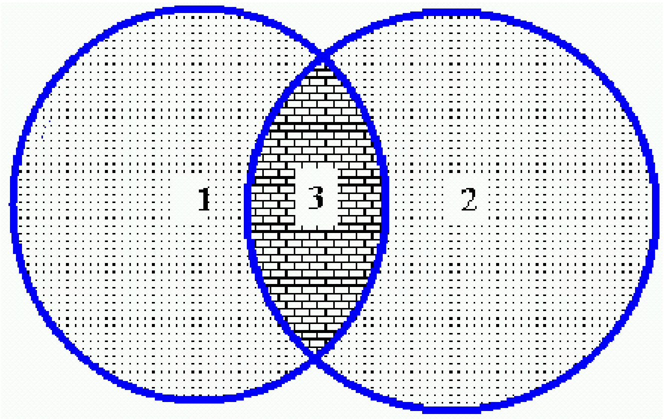
Quality Cuts:

- dca < 3.0 cm
- $0.1 \le p_T < 1.0$ GeV/c
- $2.5 \le |\eta| < 3.5$
- $N_{hits} \ge 5$
- $|vertex_z| \le 25$ cm

# AuAu: forward-backward correlation

## String fusion model

color strings = (small) areas in transverse space
⇒ can overlap, forming clusters (percolation)




Projection of two overlapping strings onto the transverse plane

Overlapping of two color strings ⇒
3 independent regions can be distinguished :

- regions 1,2 no overlapping
  color field = color field of a single string
- overlap region 3 with color field of both strings summed

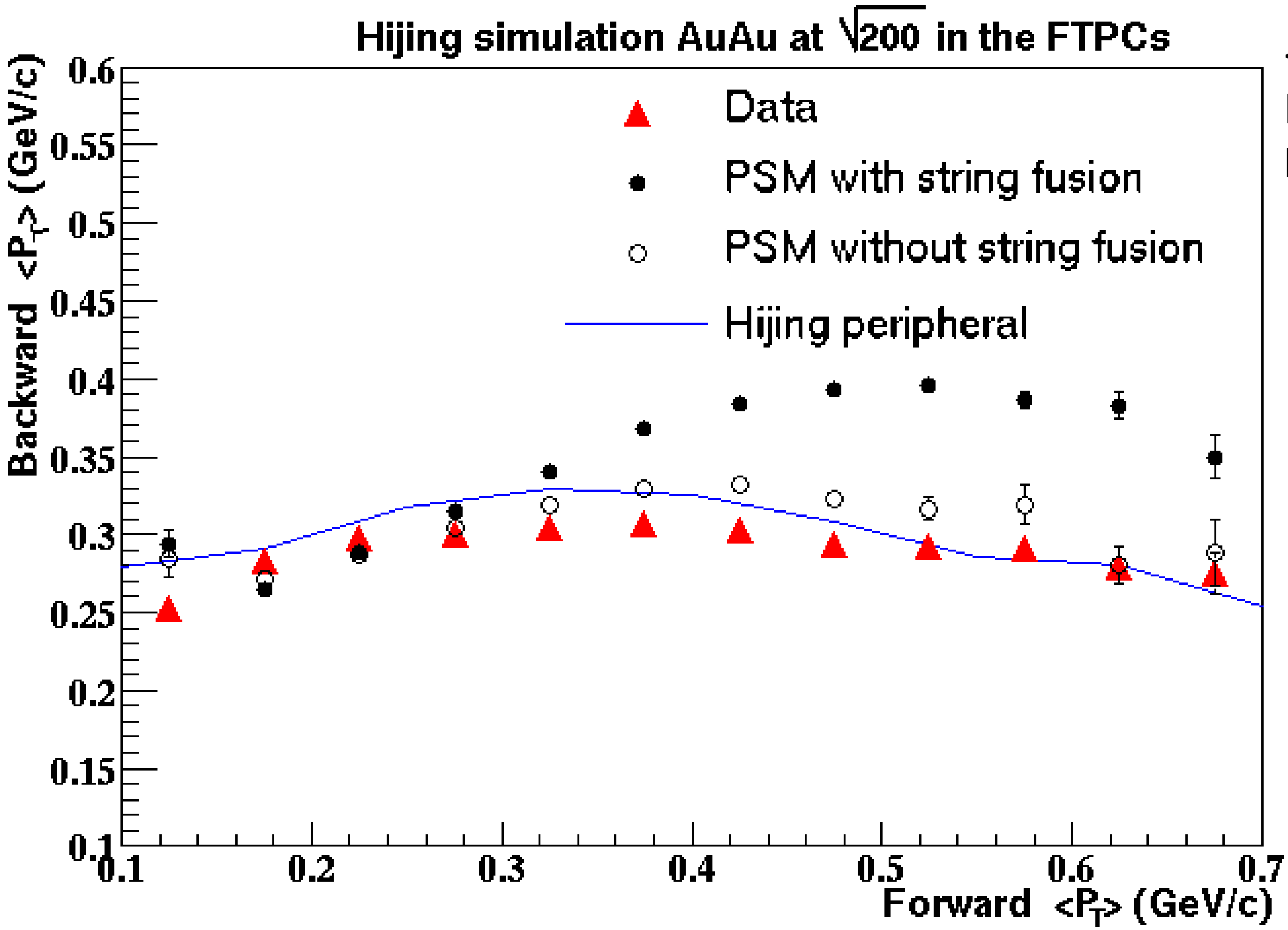
Particle multiplicity is decreased while $p_T$ is enhanced
⇒ Forward/Backward correlations.

One observable: Forward/Backward $<p_T>$ correlation **[Eur. Phys. J. C 16, 349-359 (2000)]**

Monte-Carlo model PSM 1.0 **[Eur. Phys. J. C 22, 149-363 (2001)]**

# AuAu: forward-backward pt correlation

The min. bias data do not show strong correlation (preliminary)




$< p_T >$ = mean $p_T$ per event

Forward; $\eta$ = [2.8,3.8]

Backward; $\eta$ = [-3.8,-2.8]

**FTPCs sensitive and a good tool to study long range forward/ backward correlations**

# AuAu: Embedding

FTPC embedding has just taken off!!

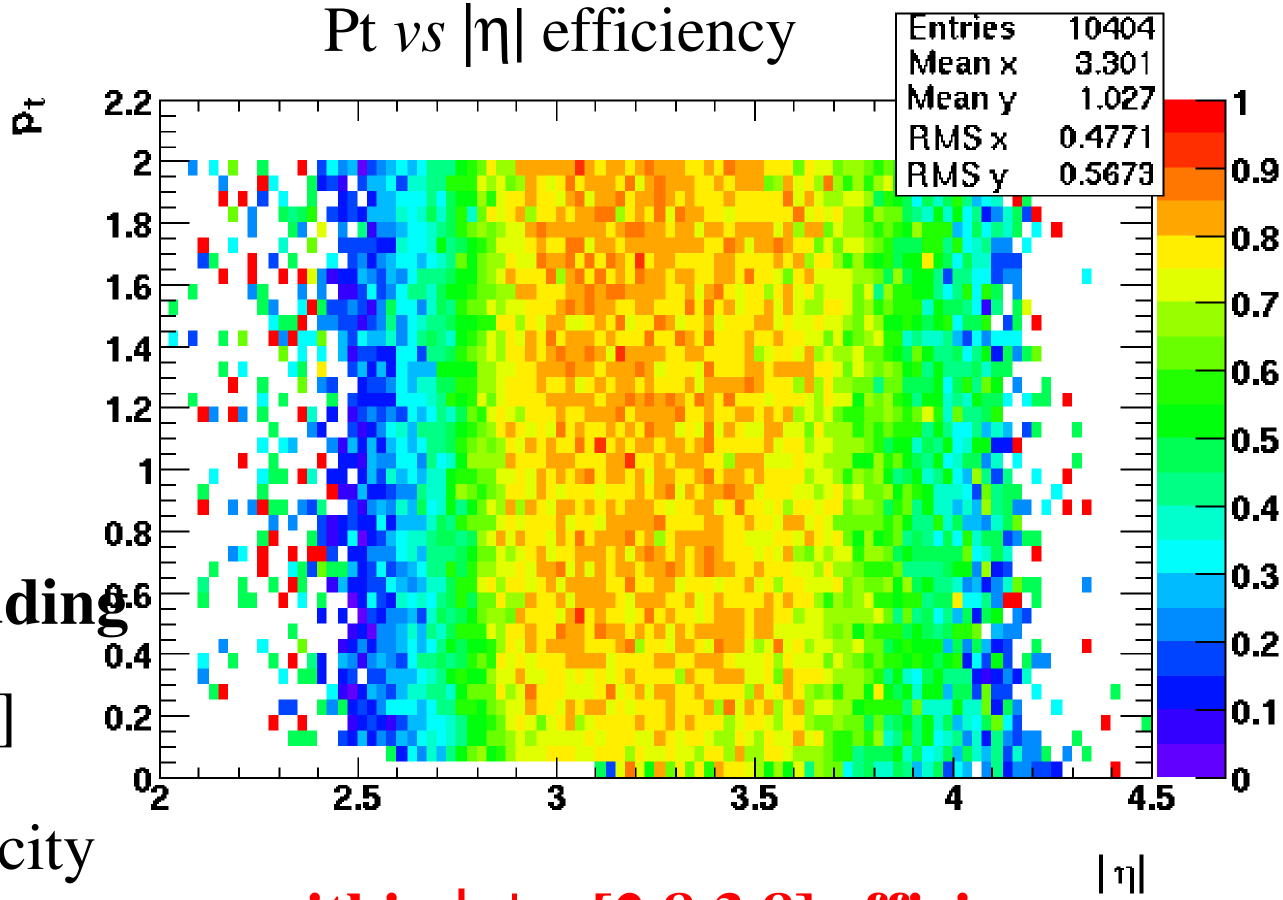
**Thanks Eric!**

**AuAu min. bias embedding**

* $\pi$ with $p_T$ flat [0., 2.0]

* 10% of TPC multiplicity

Pt *vs* $|\eta|$ efficiency

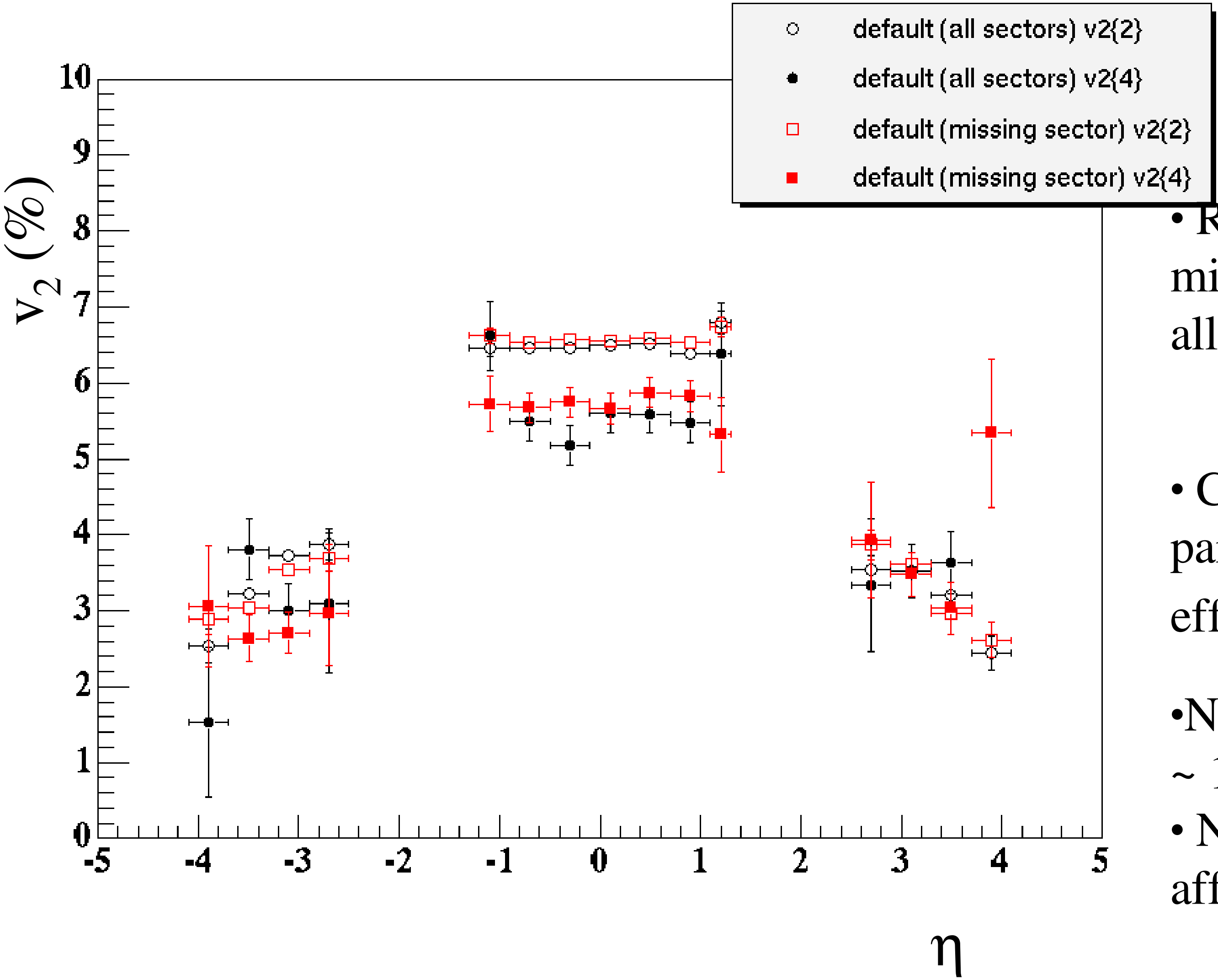



**within $|\eta|$ = [2.8,3.8] efficiency**

**nicely constant ~ 80%**

# AuAu: Flow, $v_2$ cumulant method

$V_2$ calculation with cumulant method with **TPC+FTPC** particles



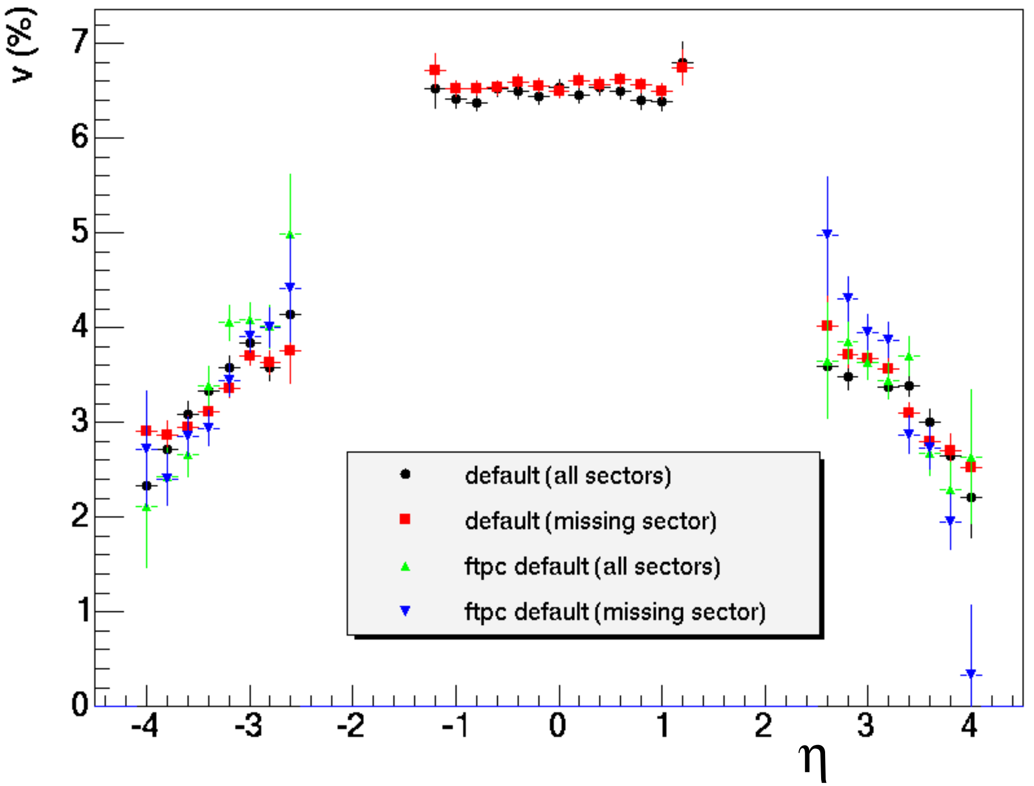

• Results unaffected by the missing sector (this method allows higher statistics).

• Cumulant method with 4 particles removes non-flow effects in $v_2$

•Non-flow effects seem to be ~ 1% in TPC rapidity

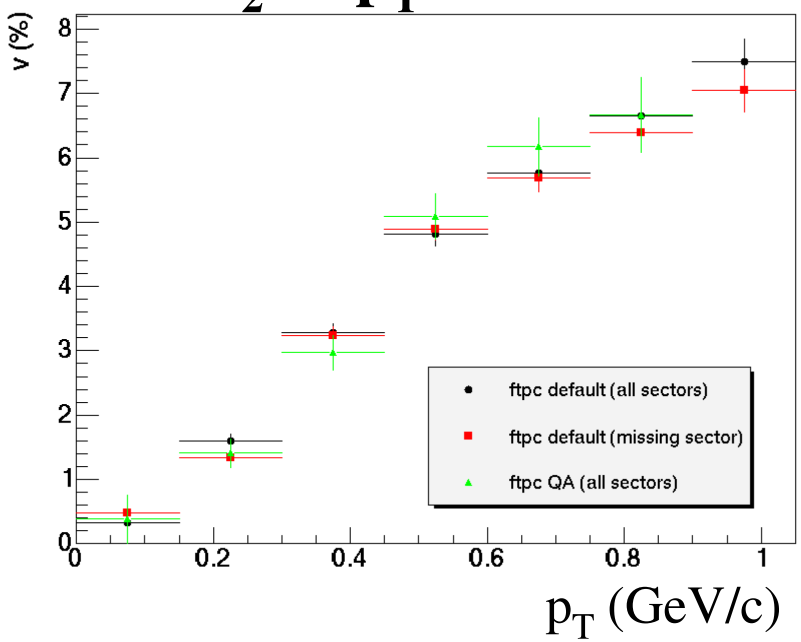
• Non-flow effects do not affect FTPC region ? 

# AuAu: $v_2$ and FTPC




Cumulant method with 2 particles correlation can be used to determine $v_2$ with FTPC ALONE!!

- **$v_2$ vs η and**
- **$v_2$ vs $p_T$**




Good agreement with FTPC+TPC!

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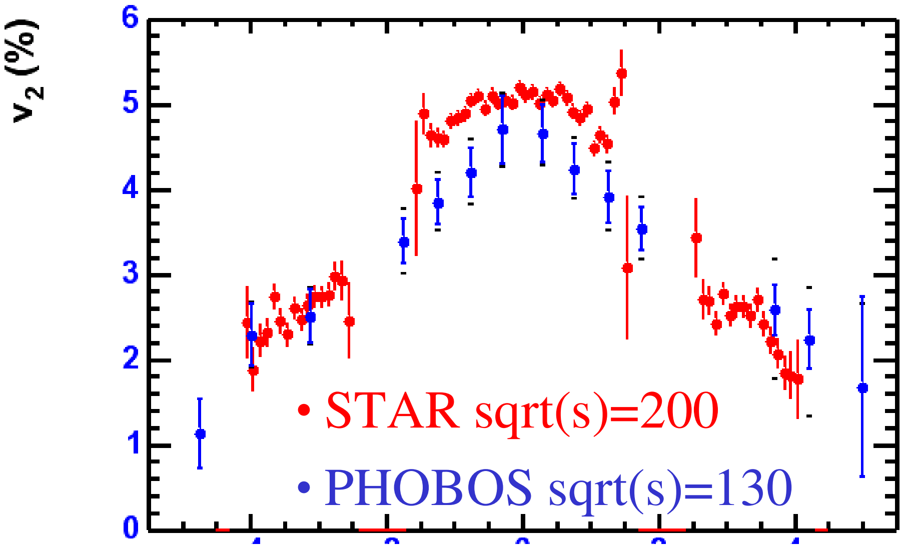
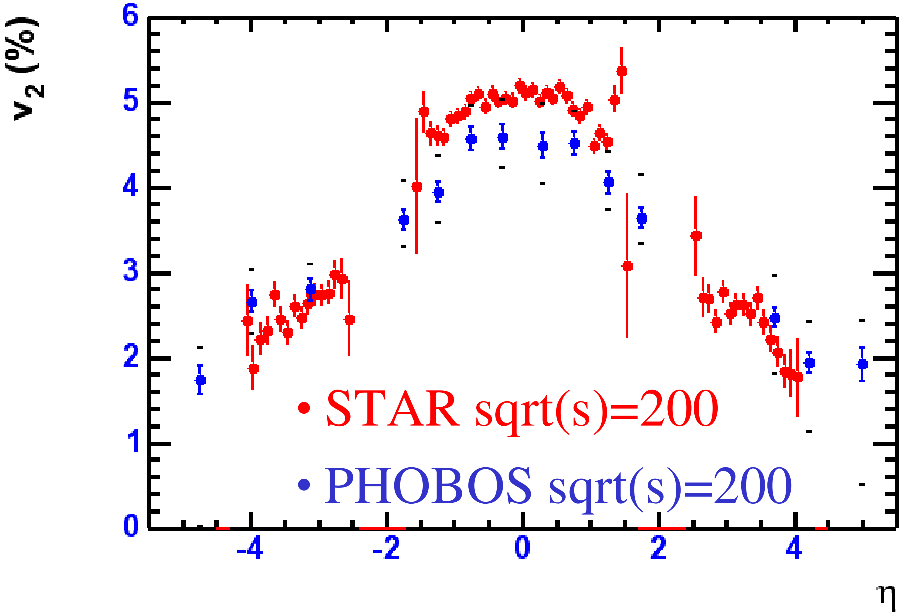
# AuAu: $v_2$ comparison




$V_2$ *vs* η from STAR in comparison with PHOBOS data at 130 GeV and 200 GeV

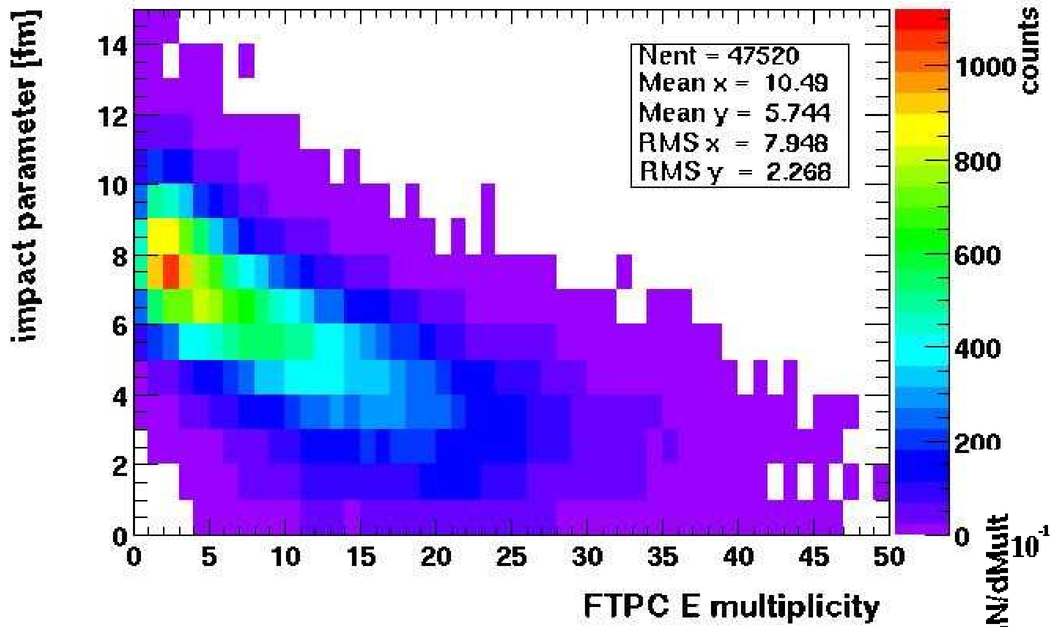
**FTPC** is involved in other **flow studies**:

***$V_1$, $V_2$ with event plane method, Higher harmonics***

***(Markus O. Aihong T. and Art P. work)***

See Art P.'s talk on Saturday

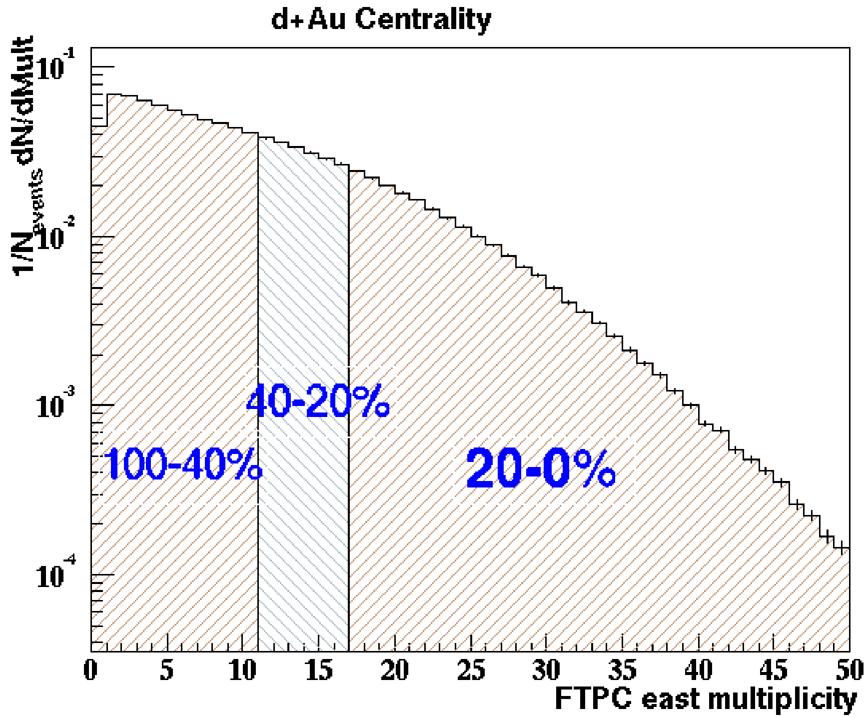
# dAu: FTPC defines centrality




HIJING simulation shows a correlation between the impact parameter and the FTPC East multiplicity

Hijing simulation 50k dAu minbias

z-Vertex <= |60| cm




FTPC data are used for STAR centrality definition

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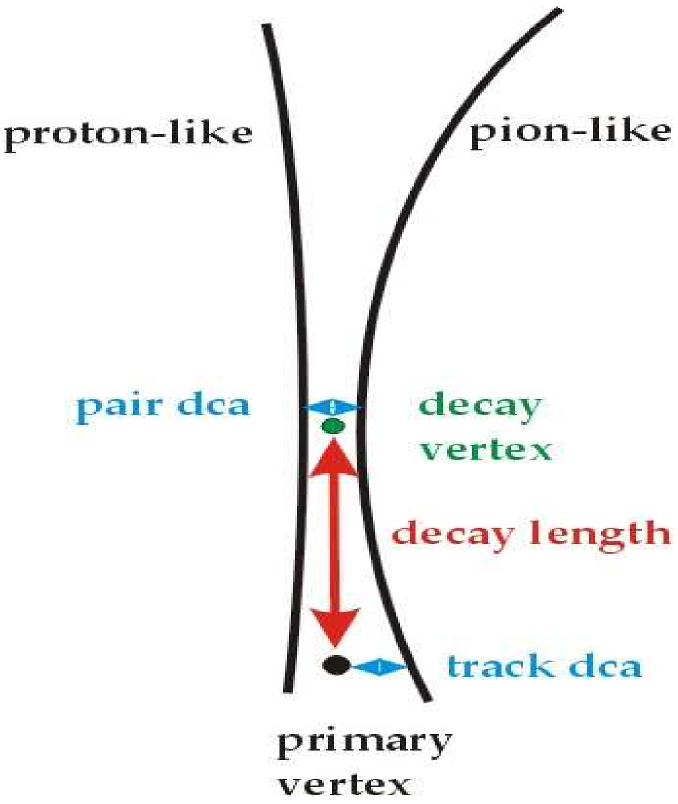
# dAu: Strangeness, Λs




* $\Lambda \rightarrow p\,\pi^-$ (63.9%), $m_\Lambda$=1115.7 MeV, $c\tau$=7.89 cm

* Study **all pos-neg pairs**, assuming **p** mass and π mass (FTPC measures charge but no particle Id).

* Geometrical cuts for pairs

  Decay length > 10 cm

  Pair dca < 2.5 mm

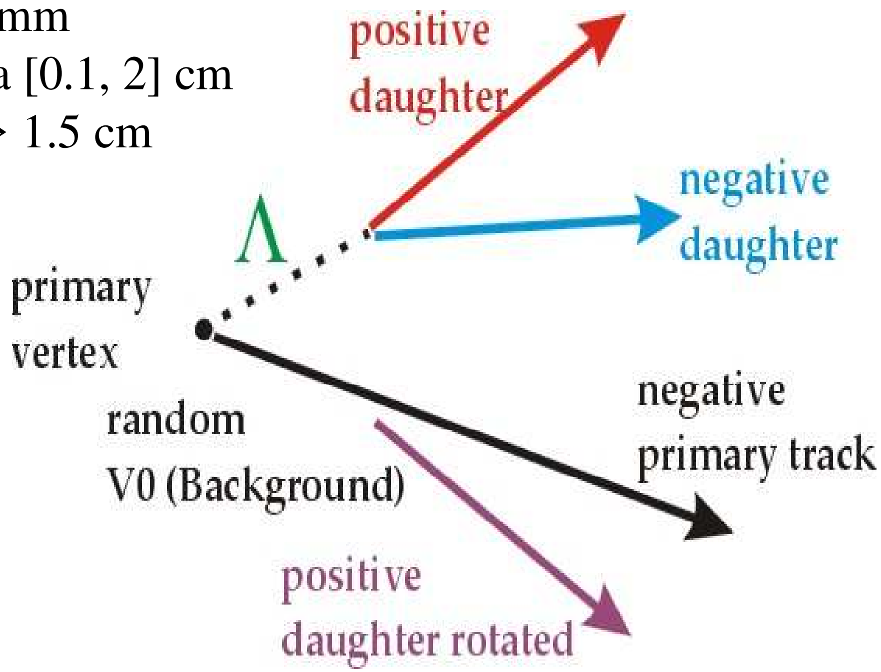
  Proton-like dca [0.1, 2] cm

  Pion-like dca > 1.5 cm

•Background estimation with **rotated tracks**:

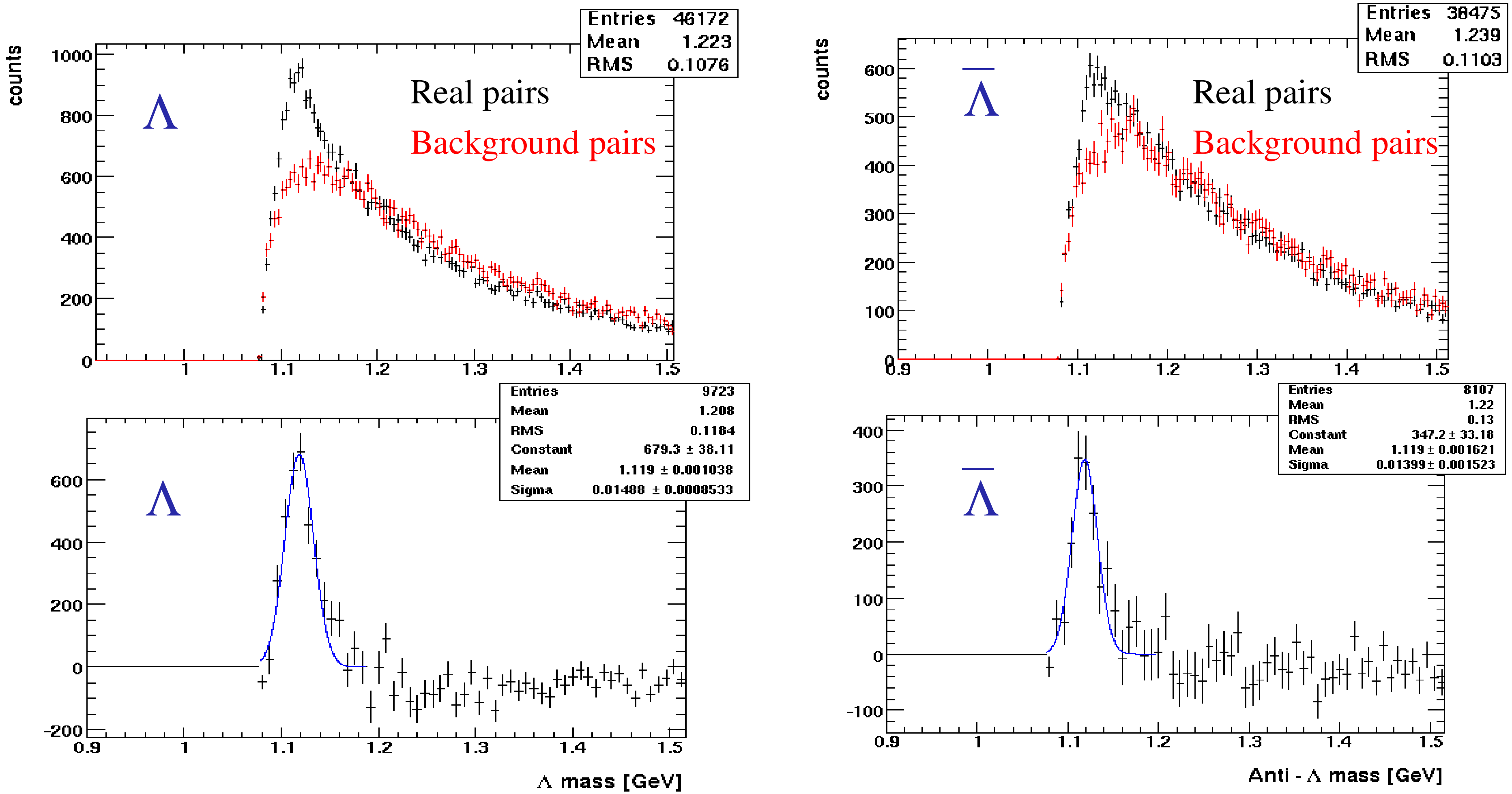
•Every track is rotated 180° in φ and combined with all non-rotated tracks with opposite charge

•**Same event characteristic**, (mult, flow, vertex)



# dAu: $\Lambda$ and $\bar{\Lambda}$ signal

5.8 M events dAu min bias in FTPC West only (better calibration)




**$\Lambda$ yield = ~4000** Row Ratio $\bar{\Lambda}/\Lambda$ = ~0.47 **$\bar{\Lambda}$ yield = ~1900**

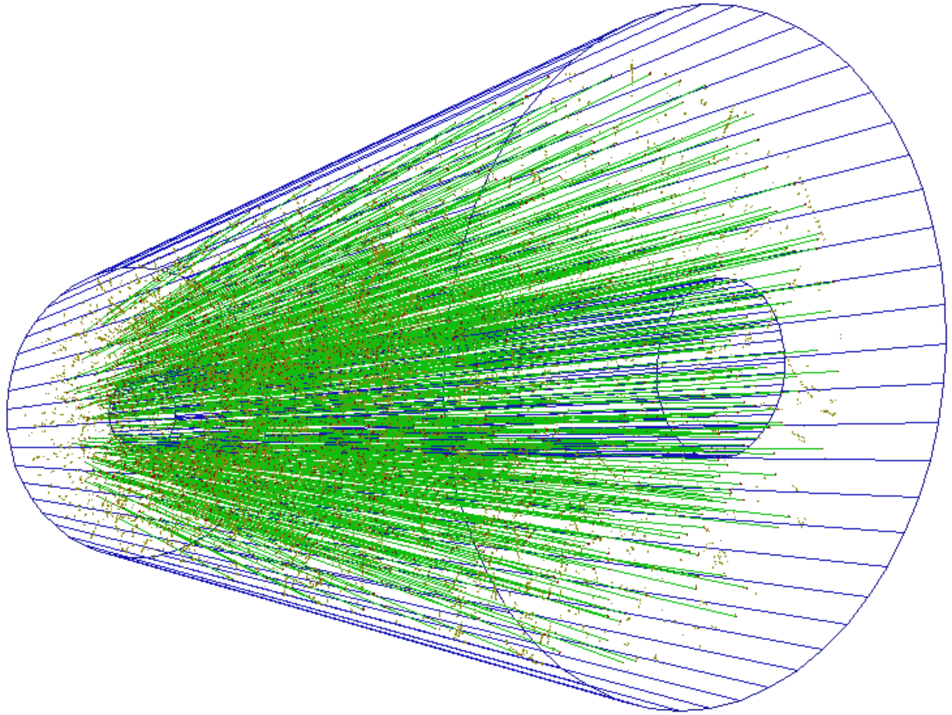
Hijing $\bar{\Lambda}/\Lambda$ ratio = 0.64 and with same cuts = 0.46

# Summary

- AuAu, dAu, pp data with the FTPC available.
- Calibrations : AuAu complete, dAu near final, pp is being checked by Mirko P.
- First physics results on flow.
- Preliminary uncorrected charged particle spectra and $\Lambda$ and $\bar{\Lambda}$ yields.
- Embedding is in progress for efficiency determination.
- FTPC available for data taking in Run IV.

# FTPC group

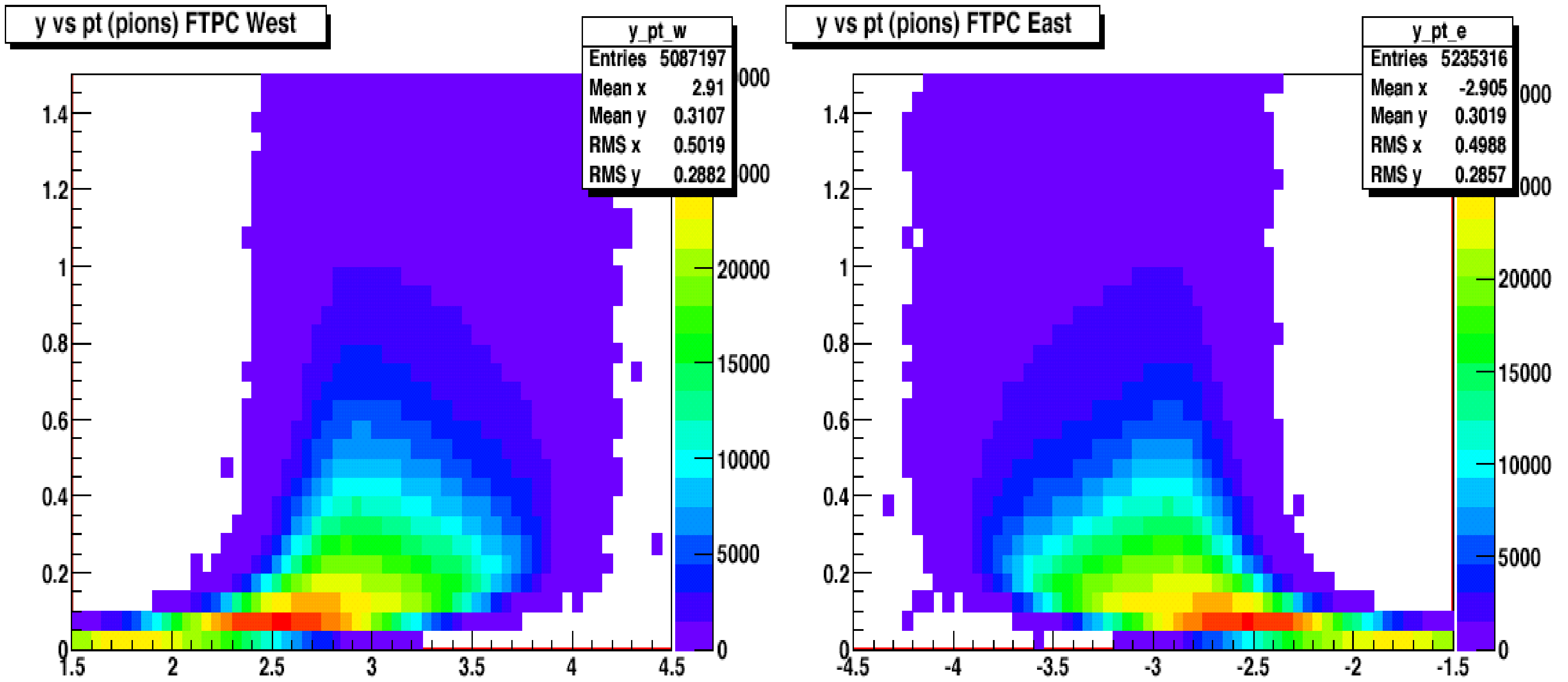
- Volker Eckardt
- María Mora Corral
- Markus Oldenburg
- Jörn Putschke
- Janet Seyboth
- Peter Seyboth
- Frank Simon



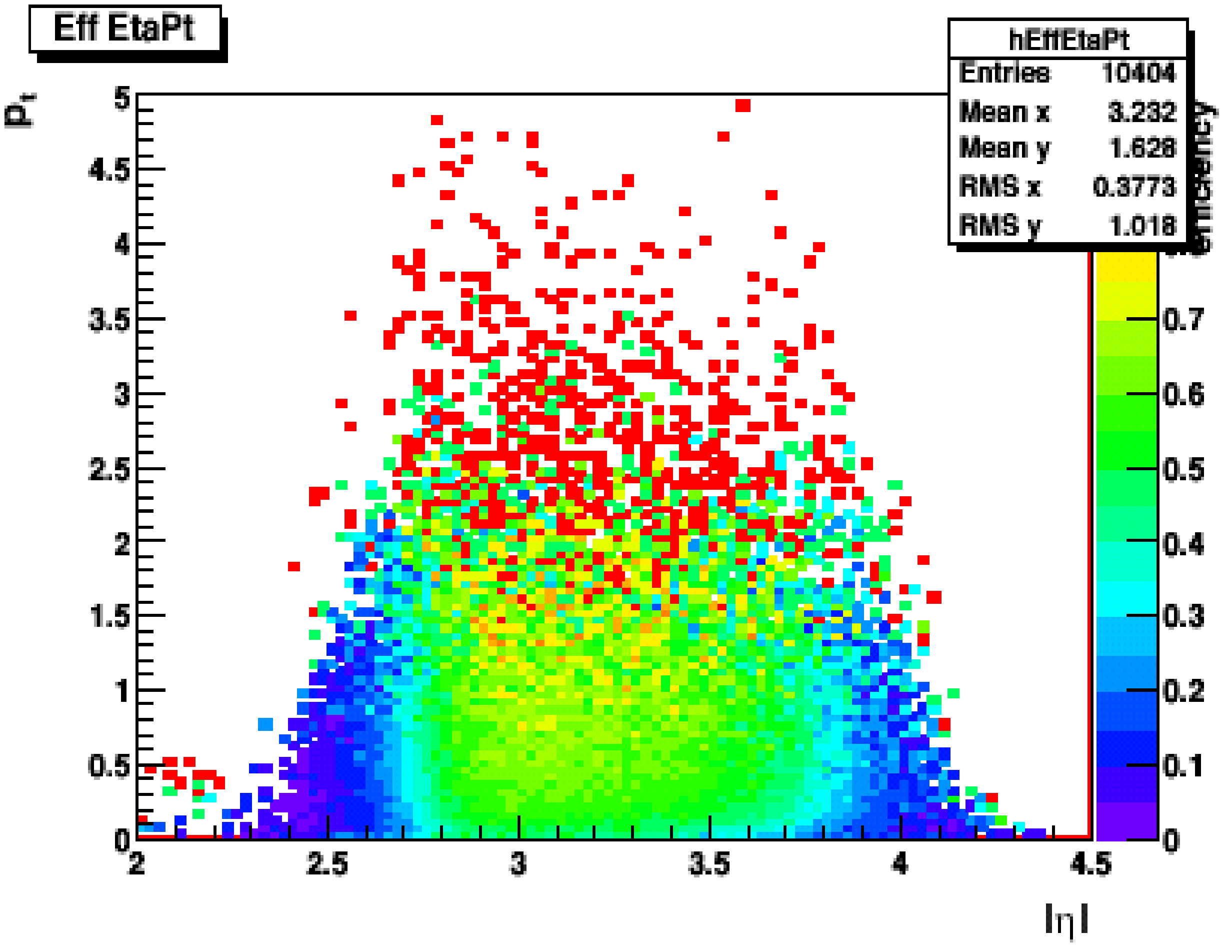
… and lots of help from STAR people, specially :

Eric, Jerôme, Lidia, Jeff …

# FTPC pion acceptance



# AuAu efficiency



# dAu efficiency

|vertex$_z$| < 20cm