

# Centrality Dependence of identified hadrons at mid-rapidity

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# Overview

- Brief review of analysis
- Identified charged hadron spectra
- $\langle dN/dy \rangle$ ,  $\langle p_t \rangle$  vs centrality( $N_{part}$ )
- Hadron spectra etc...
- Particle ratios ( $p_t$ ,  $N_{part}$ )

# Event/Track Selection

- **All MRS 90 degree data set**
  - > **run4692 - run5983**
  - > **BB, TPC, TOFW, BbVertex calibration**
- **No specific Trigger selection**
- **Centrality cut from latest calibration from DB**
- **Select Good MrsTracks**
- **Magnet Fiducial cut : 1cm (x,y) from edge**
- **Run-by-Run fitting**
  - **Diff( $V_{zdc}$ - $V_{bb}$ ) :  $4\sigma$  cut**
  - **matching ( $D_{ang}, D_y, D_{aly}, T_y$ ) :  $3\sigma$  cut**

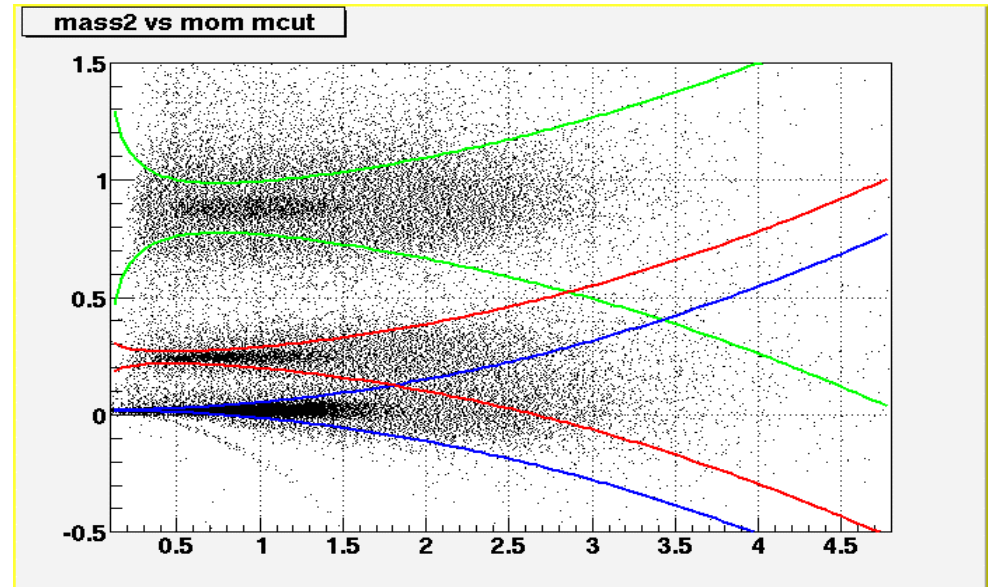
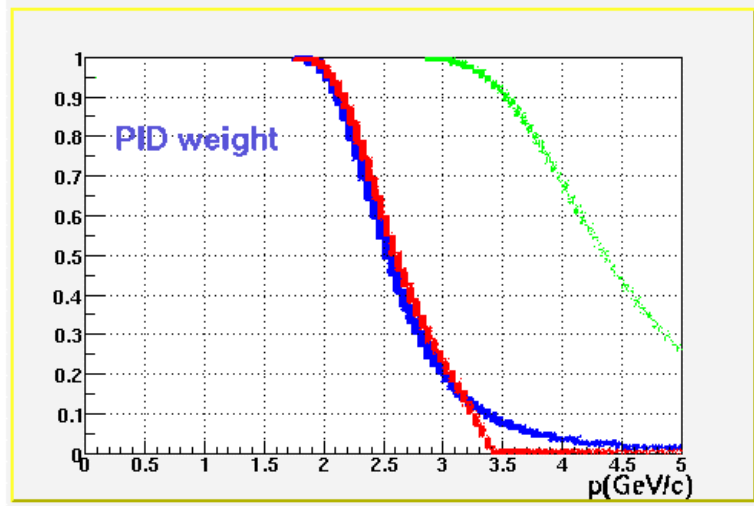
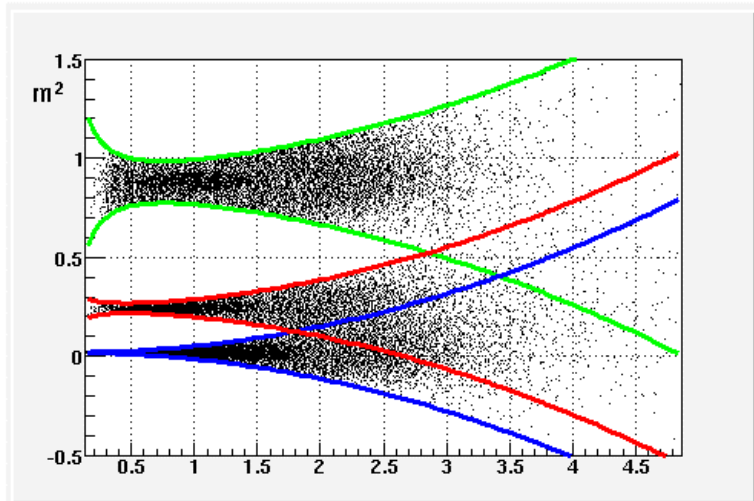
# Acceptance Map

- **Flat distributions :  $p, \theta$** 
  - > **10M at each setting**
  - >  **$-17.5\text{cm} < z < 17.5\text{cm}, \Delta z = 5\text{cm}$**
- **New TPM2 geometry for 2001 data setting**
- **Selection : same as used in data**
  - > **remove bad TOFW slats**
  - > **Magnet Fiducial cut : 1cm (x,y)**
- **y-mt, y-pt map for  $\pi, K, p$** 
  - > **Acceptance values below 4.5(5.5) are applied to data. (reduce edge effect)**

# Corrections

- **Track-by-Track corrections**
- **TPC efficiency : ~ 89%, 96%**
  - > as a function of # of clusters
- **TOFW : remove bad slats**
- **Corrections for particle species**
  - > **Multiple scattering :  $\pi$ , K, p**
  - > **Decay correction :  $\pi$ , K**
  - > **Absorption : pbar**
  - > as a function of momentum

# PID

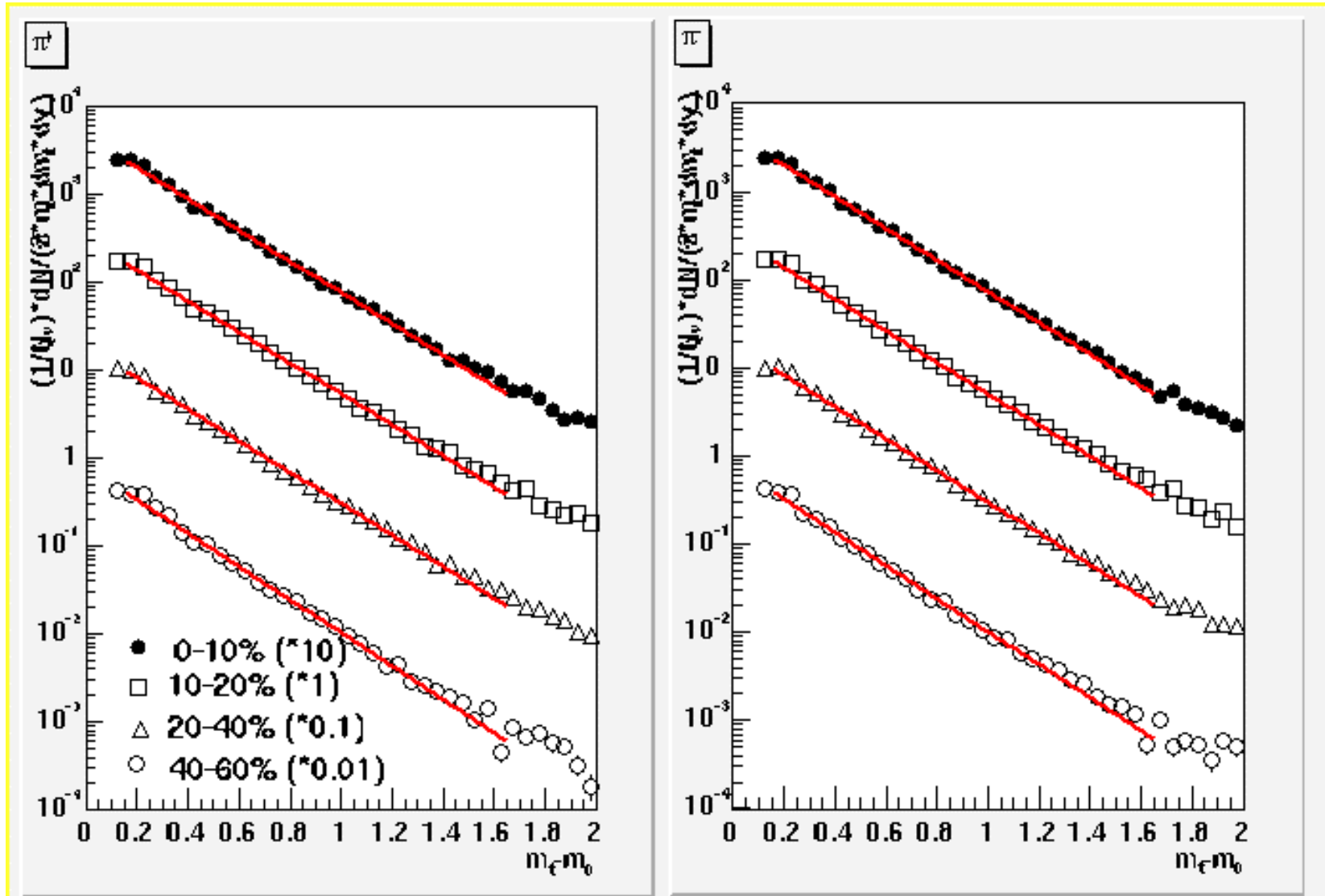


- **New PID function from JH**
  - > can we use as a weight ?
  - > can we extend momentum?
  - > be careful of use weight above 1.5~2.0

# Identified Hadron Spectra

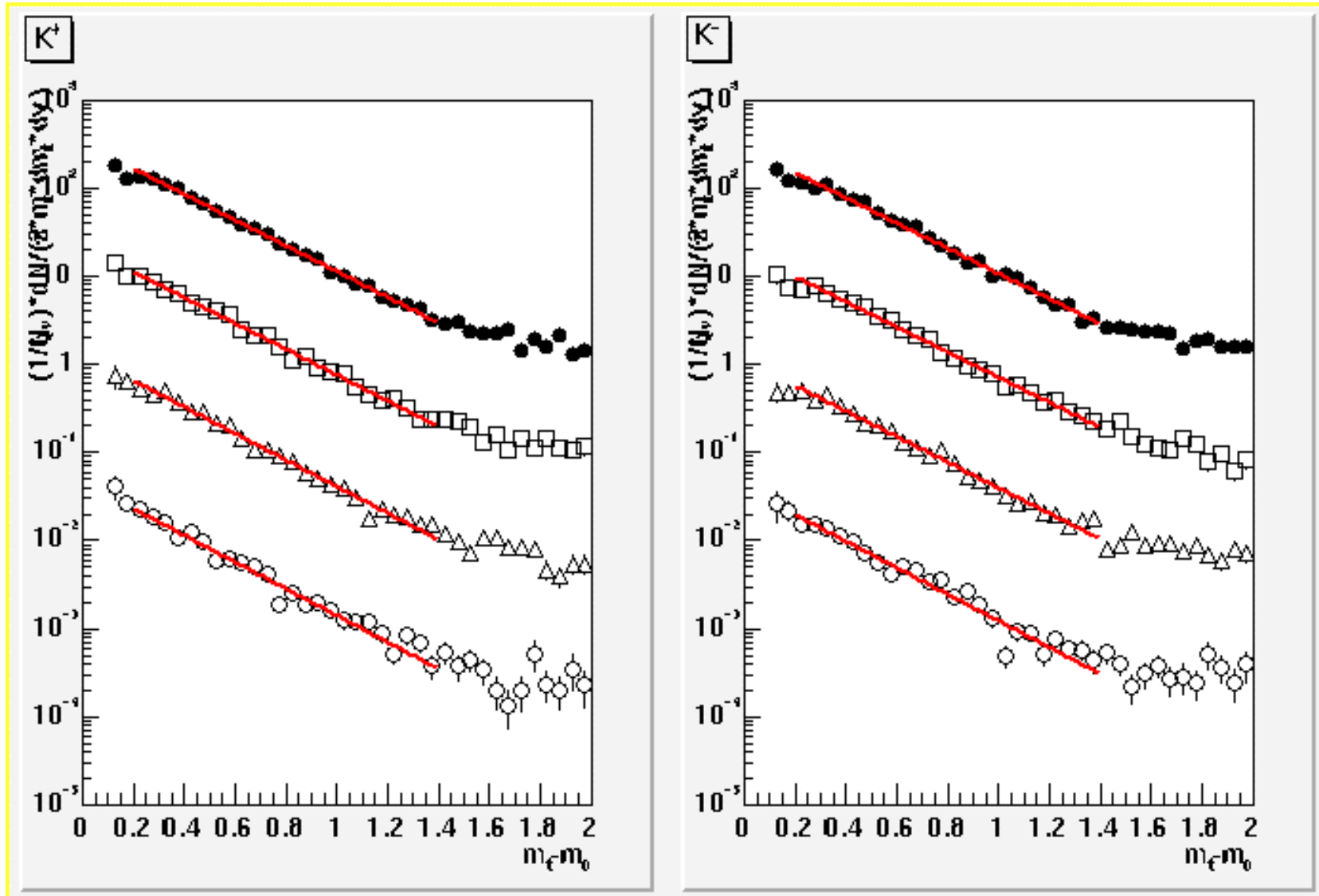
- **Fit by  $m_t$  exponential function**
  - >  $\pi$  (  $0.15 < (m_t - m_p) < 1.66$  )
  - >  $K$  (  $0.2 < (m_t - m_K) < 1.4$  )
  - >  $p$  (  $0.2 < (m_t - m_\pi) < 2.0$  )
- **Fit by Boltzmann function**
  - > yield, slope is smaller than  $m_t$  exp fit  
for  $\pi$  (~85%),  $K$ (~92%)
  - >similar for  $p$ (~97%) yield

# $\pi$ Spectra

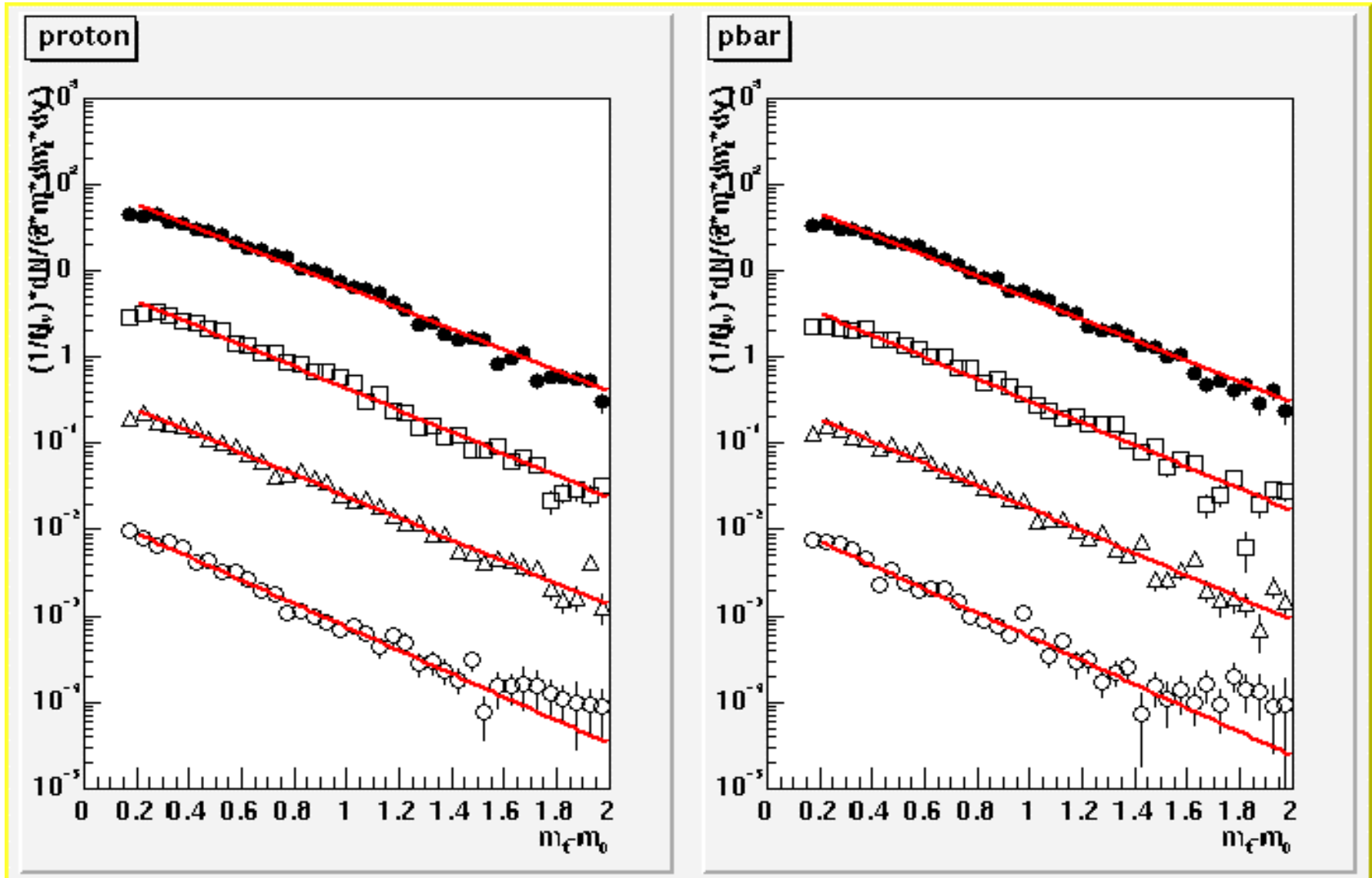




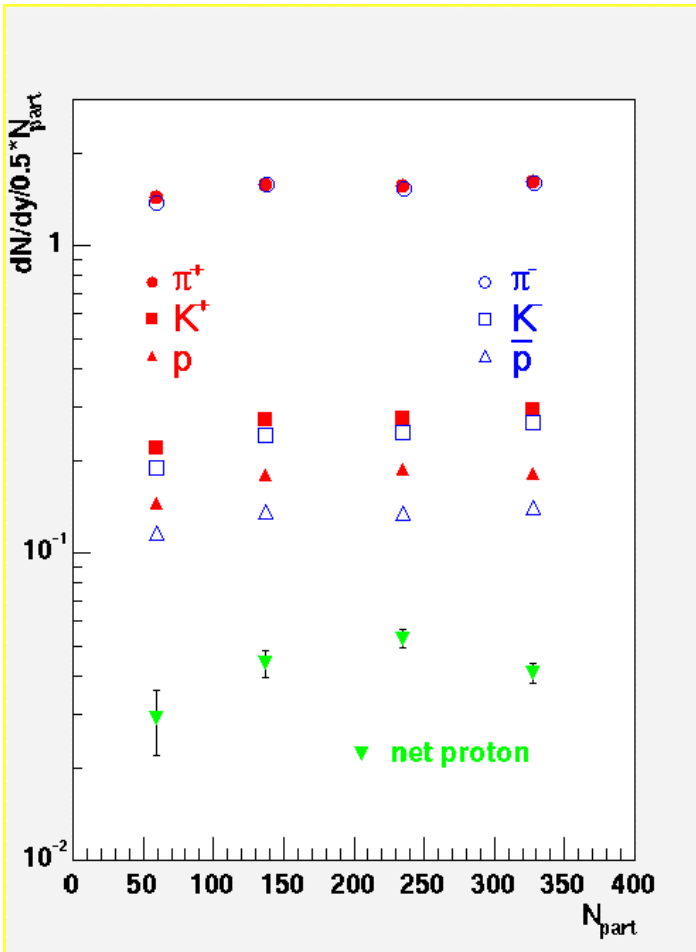
# K Spectra



# p, pbar Spectra

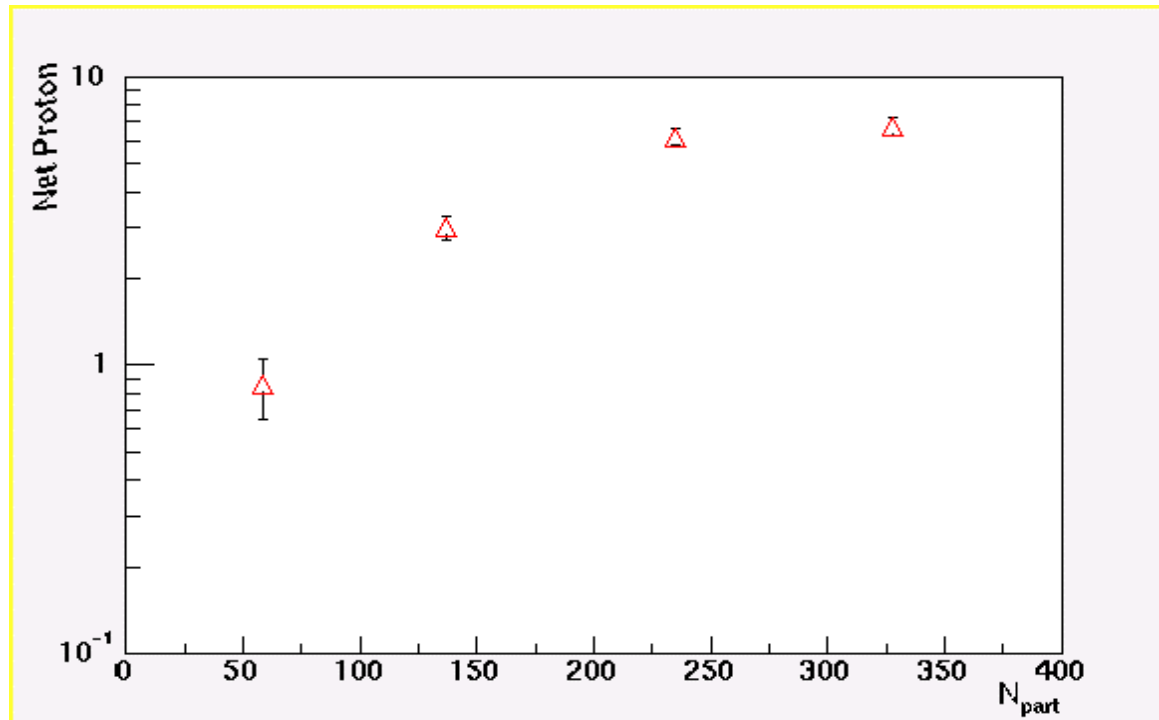


# $dN/dy$ per participant at $y=0$

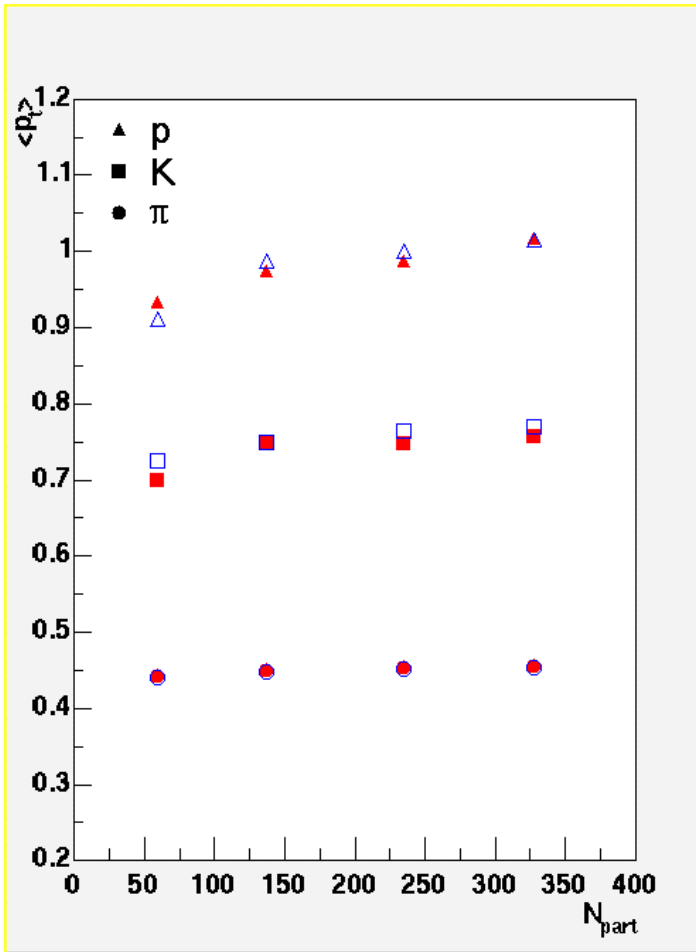


- For all the particle species, the yield per participant increase with  $N_{part}$ .
- $K^\pm$ ,  $p$ ,  $pbar$  yields per participant rise faster than  $\pi^\pm$  yield.

# Dependence of Net proton on $\langle N_{part} \rangle$

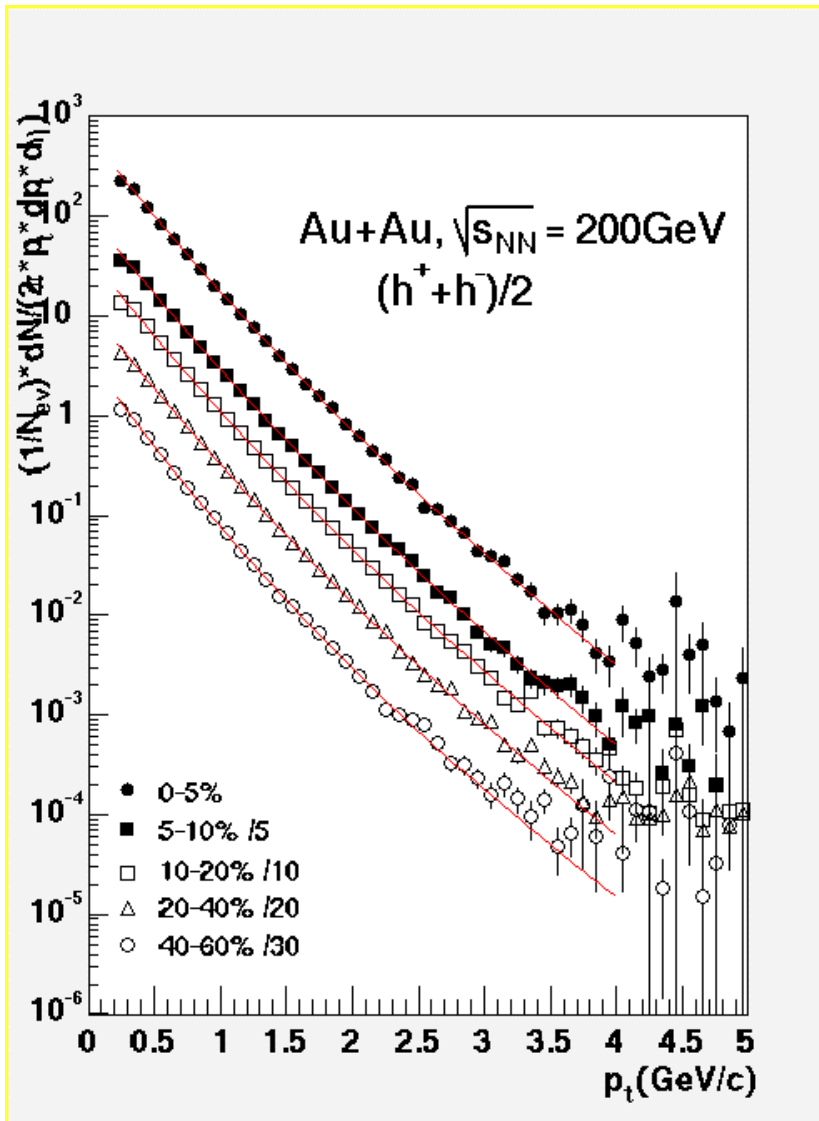


# $\langle p_t \rangle$ for $\pi$ , $K$ , $p$



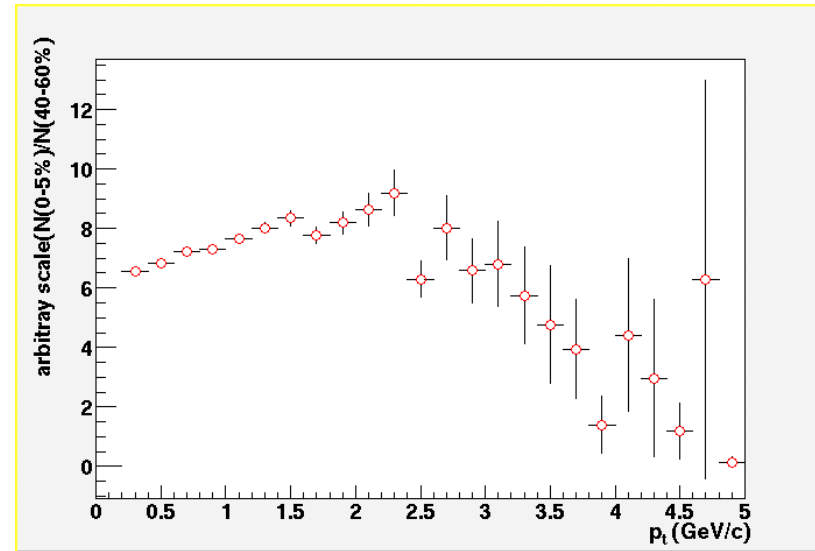
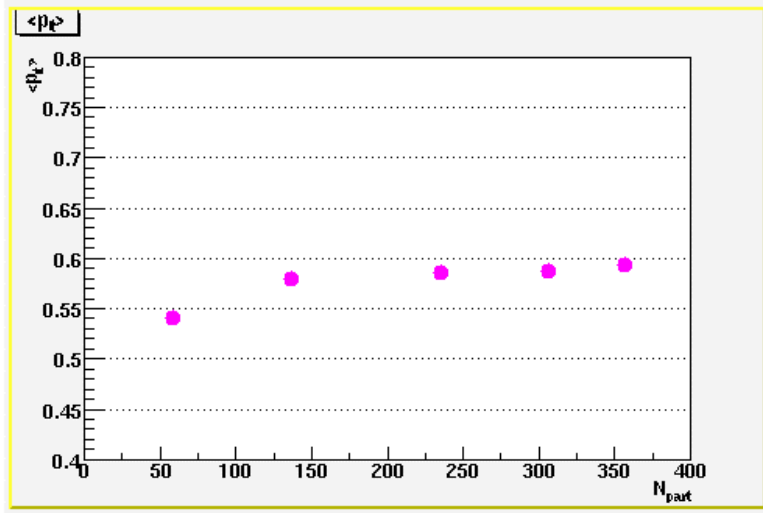
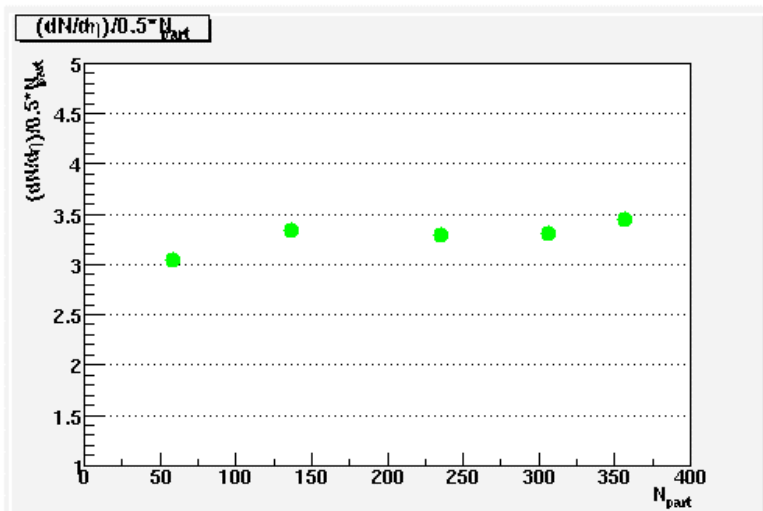
- $\langle p_t \rangle$  for all particle species increase from peripheral to central events.
- The slopes of the  $\pi, K$  mt spectra flatten with centrality,  $T(\pi) \sim 240 \text{ MeV}$ ,  $T(K) \sim 300 \text{ MeV}$ .
- The slopes of  $p, pbar$  are not flat.
  - >  $\sim 360 \text{ MeV}$  (0-10%)
  - >  $\sim 342 \text{ MeV}$  (10-20%)
  - >  $\sim 335 \text{ MeV}$  (20-40%),
  - >  $\sim 315 \text{ MeV}$  (40-60%).

# Hadron Spectra



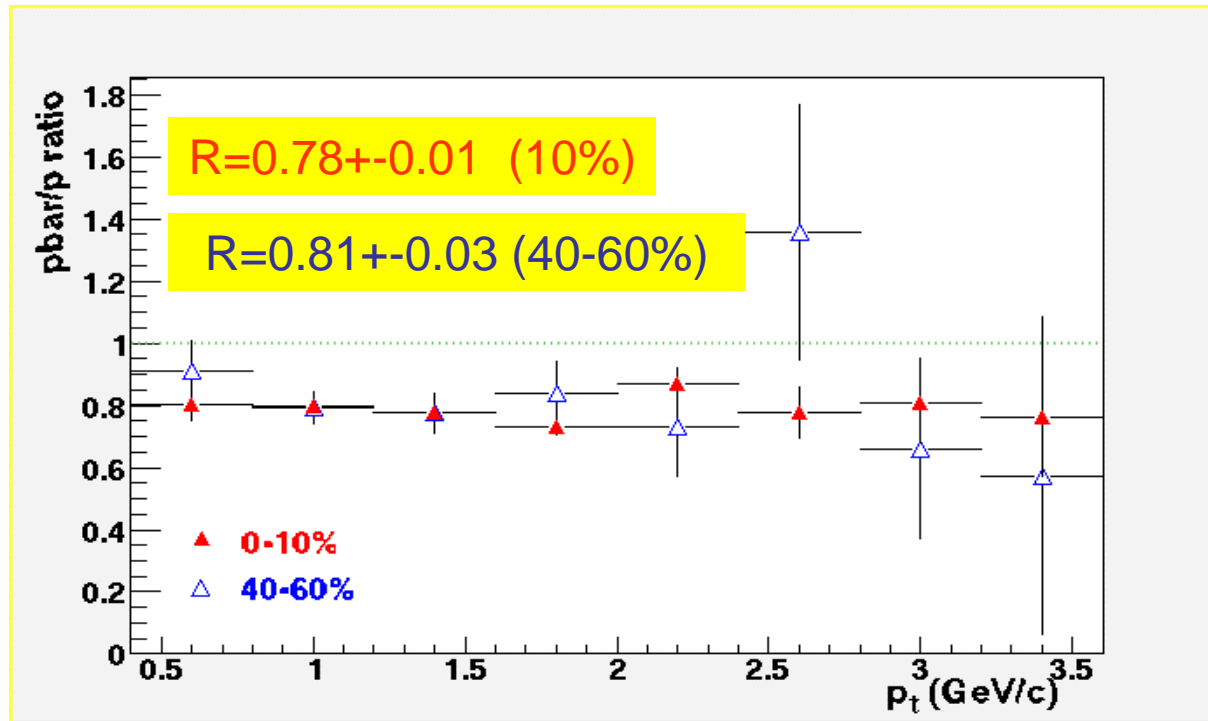
- Pt distribution of charged hadron spectra were fit by the power law function,  $\sim C/(1+pt/p_0)^{**n}$ ,  $0.2 < p_t < 4.0 \text{ GeV}/c$ .
- $dN/d\eta$ ,  $\langle p_t \rangle$  values are obtained from fit parameters,  
 $\langle p_t \rangle = 2p_0/(n-3)$

# $dN/d\eta$ , $\langle pt \rangle$ , etc vs $N_{part}$



- $dN/d\eta/N_{part}$  and  $\langle pt \rangle$  slightly increase from peripheral to central events.
- The ratio of central (0-10%) peripheral (40-60%) collisions rises below  $p_t \sim 2.5$  GeV/c and decreases at high  $p_t$ .

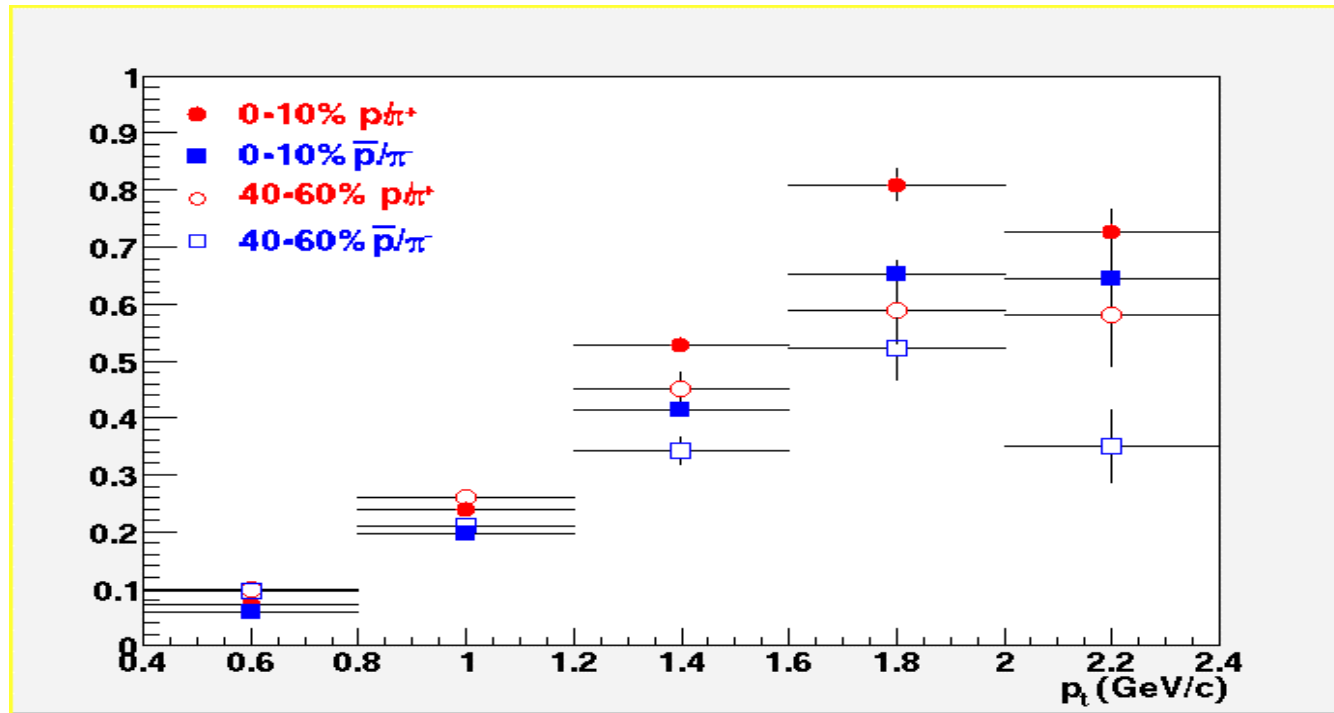
# pbar/p ratios



- The ratio for central events(0-10%) are almost flat over  $0.5 < p_t < 3.5 \text{ GeV/c}$ .
- $R(\text{central}) \sim R(\text{peripheral})$



# $\bar{p}/\pi^-$ , $p/\pi^+$ ratios



- $\bar{p}/\pi^-$ ,  $p/\pi^+$  ratios show the centrality dependence. The ratios in central events reaches 0.8~0.9 at 2GeV/c, while in peripheral events the ratios are up to 0.4~0.5.

# Plan

- Finish 130GeV data reduction
  - before Christmas
  - I will start TOFW calibration tomorrow
  - compare with 200GeV data  
(proton, anti-proton spectra)
- Try to fit other function on 200GeV data
- Try to analyze MRS( $y=1$ ) data?
- We need more statistics, as always