High p_T identified hadron ratios in $\sqrt{s_{NN}}$=200GeV Au+Au collisions

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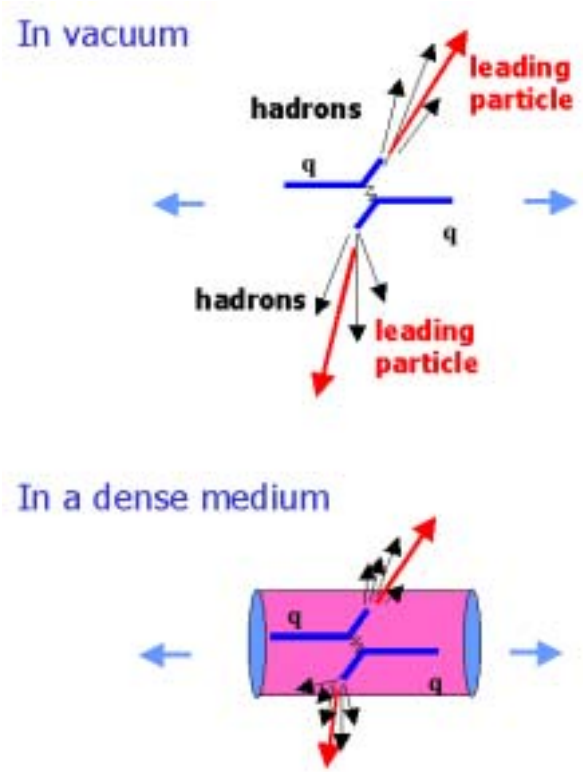
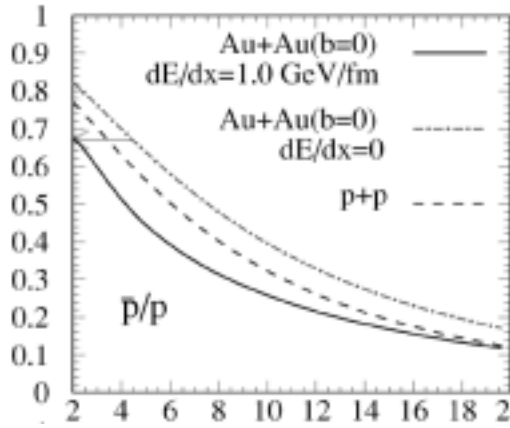
Outline of the talk

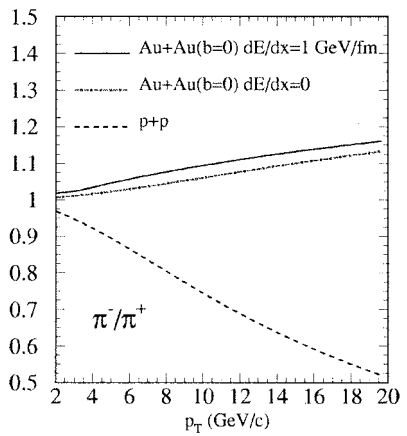
- Physics Motivation
- Detectors used for the analysis
- Ratios of several particles
- Comparison of Year-1 and Year-2
- Another Fun

Physics at high p_T particle ratio (I)
Jet quenching

- Jets will loose its energy in the dense medium
  - In Year-1, suppression of high p_T hadrons are seen
    - Both π^0 and h^+, h^-
  - At even higher p_T, will suppression be more dramatic?



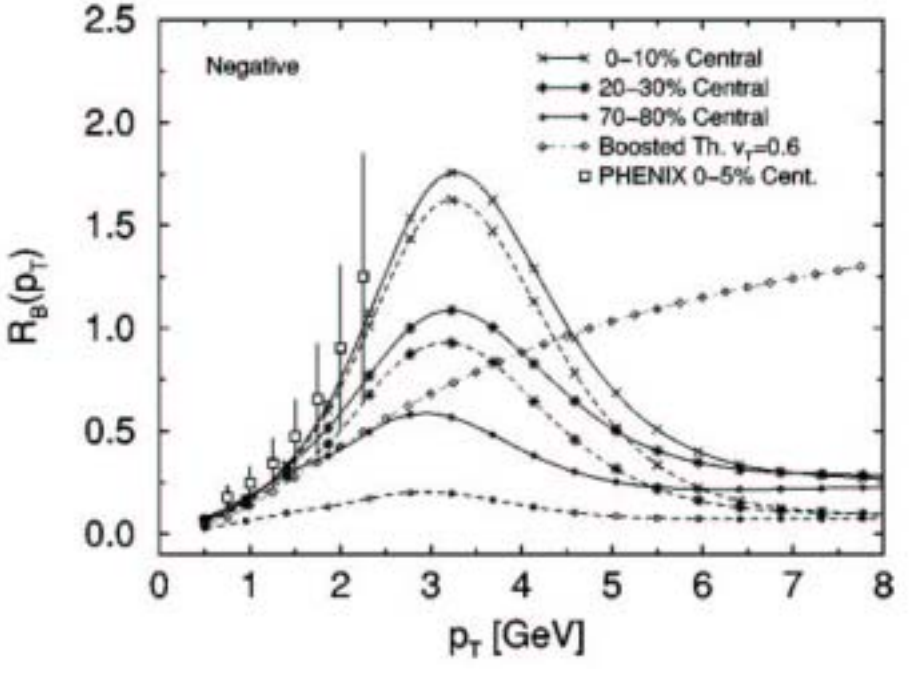




Xin-Nian, Wang,
PRC Vol.58 (1998)2321

Physics at high p_T particle ratio (II)
Baryon number transport

- Baryon number will be transported via gluon junction
  - Another p_T kick on baryon spectra (accelerated?)
  - In Year-1, proton spectra reaches close to charged π spectra
  - What will happen even more high p_T? (return to pQCD base?)
- Baryon/meson ratio will give an information on baryon number transport
  - Jet quenching enhances baryon transport?
  - π^+, π^-, π^0 suppress, pbar, p enhance?



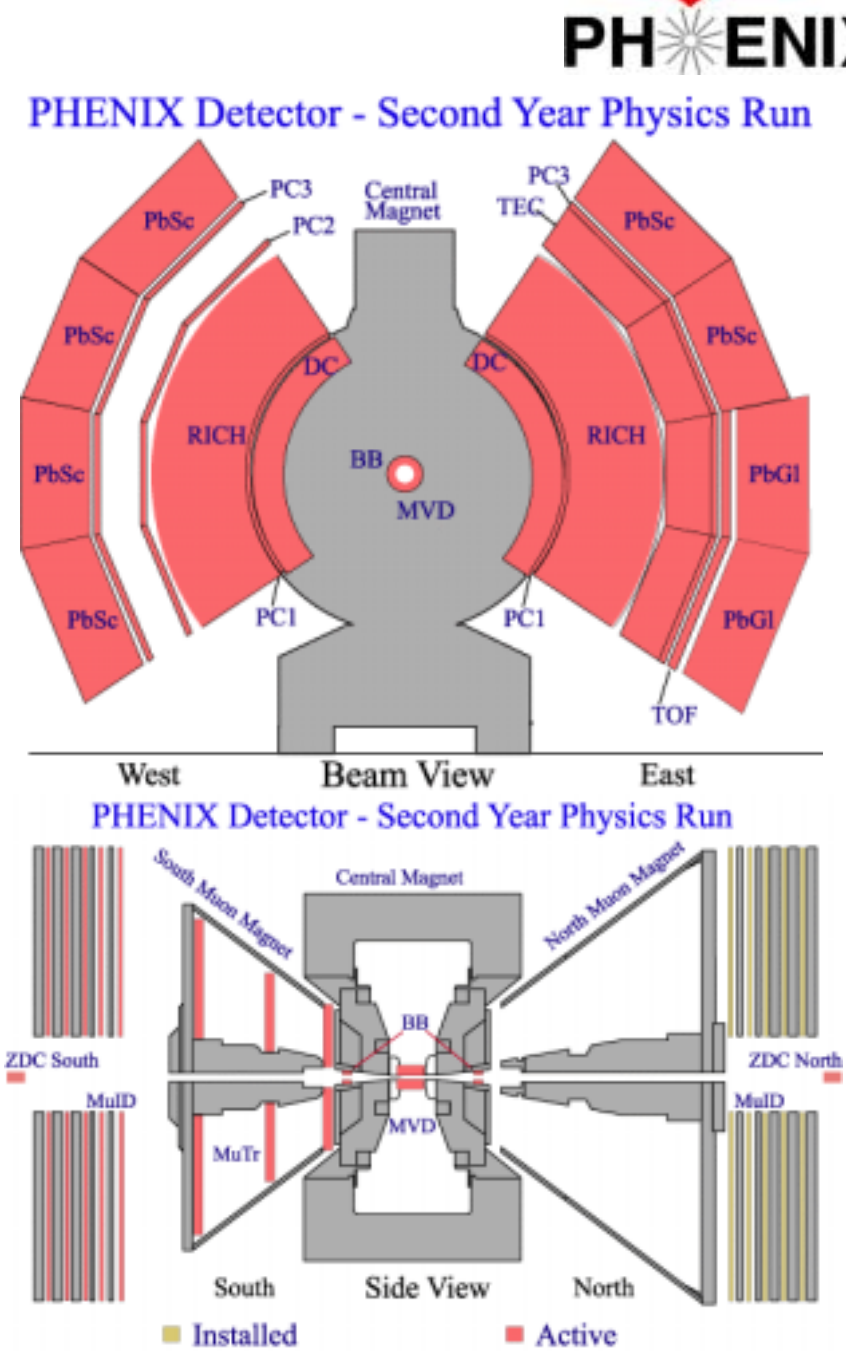
I. Vitev and M. Gyulassy, PRC65(2002)041902

PHENIX detector

- Detectors used in the analysis
  - Tracking: DC and PC
  - Identified charged hadrons: TOF
  - Neutral π: PbSc and PbGl (EMCal)
  - High p_T charged π: RICH

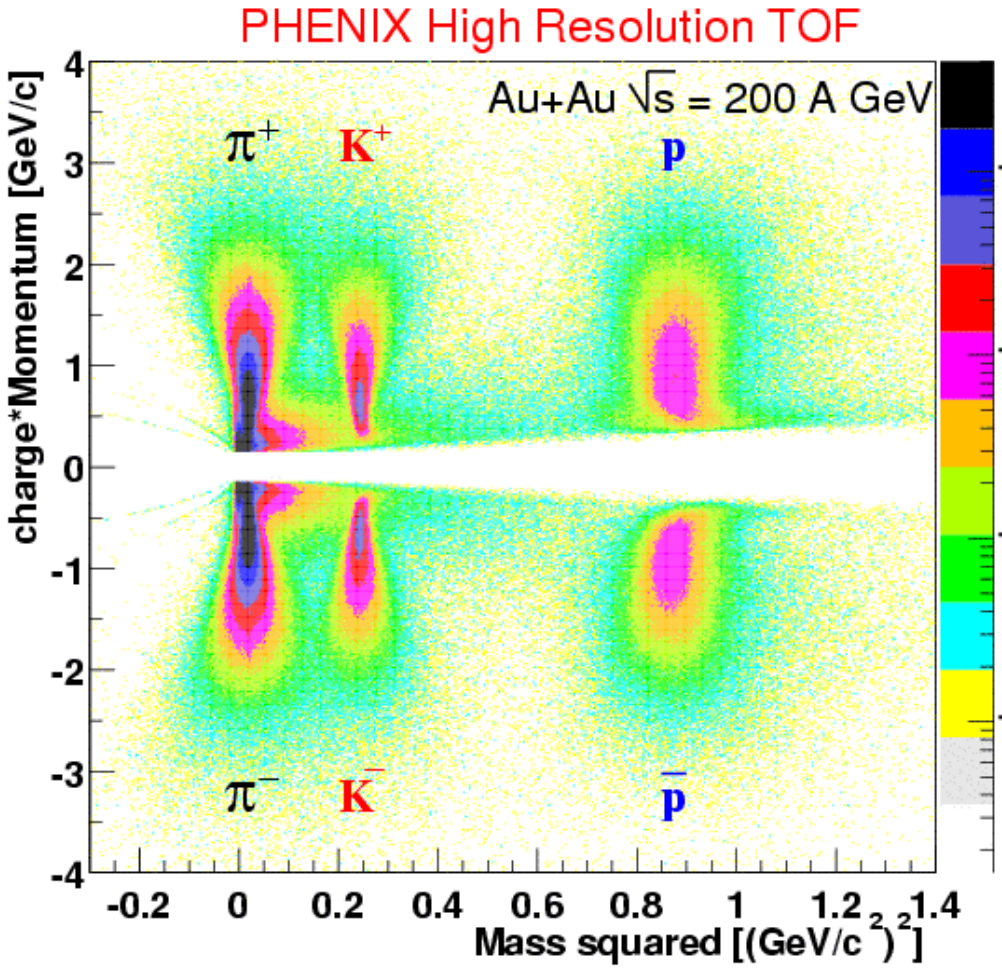
- ~30Million Minimum Bias Events @ $\sqrt{s_{NN}}$=200GeV Au+Au Collision are used

- Events triggered by BBC and ZDC
  - Centrality characterized



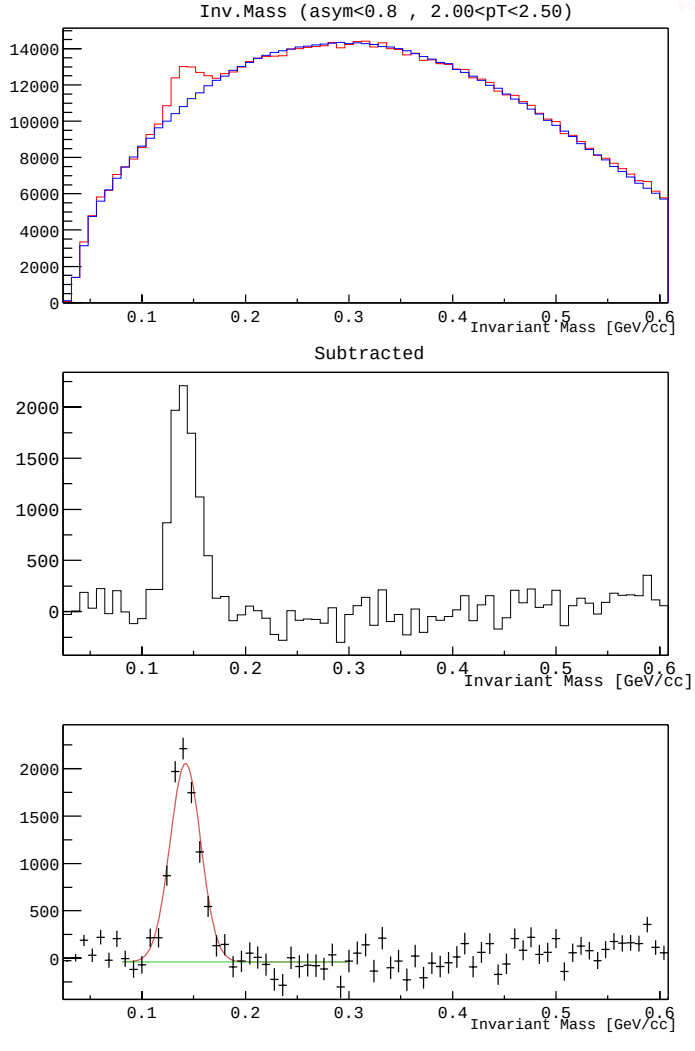
Analysis (proton, pbar and π^+, π^-)

- Using High Resolution TOF PID device and Drift Chamber.
- Making p_T dependent 2σ cut in squared mass
- Range and Systematic Error
  - proton, pbar: up to 4GeV/c
    - p_T dependent: 11%
    - Overall normalization: Central 18%, Peripheral 16.4%
  - π^+, π^- : up to 2GeV/c
    - p_T dependent 7%
    - Overall normalization: Central 14%, Peripheral 14%



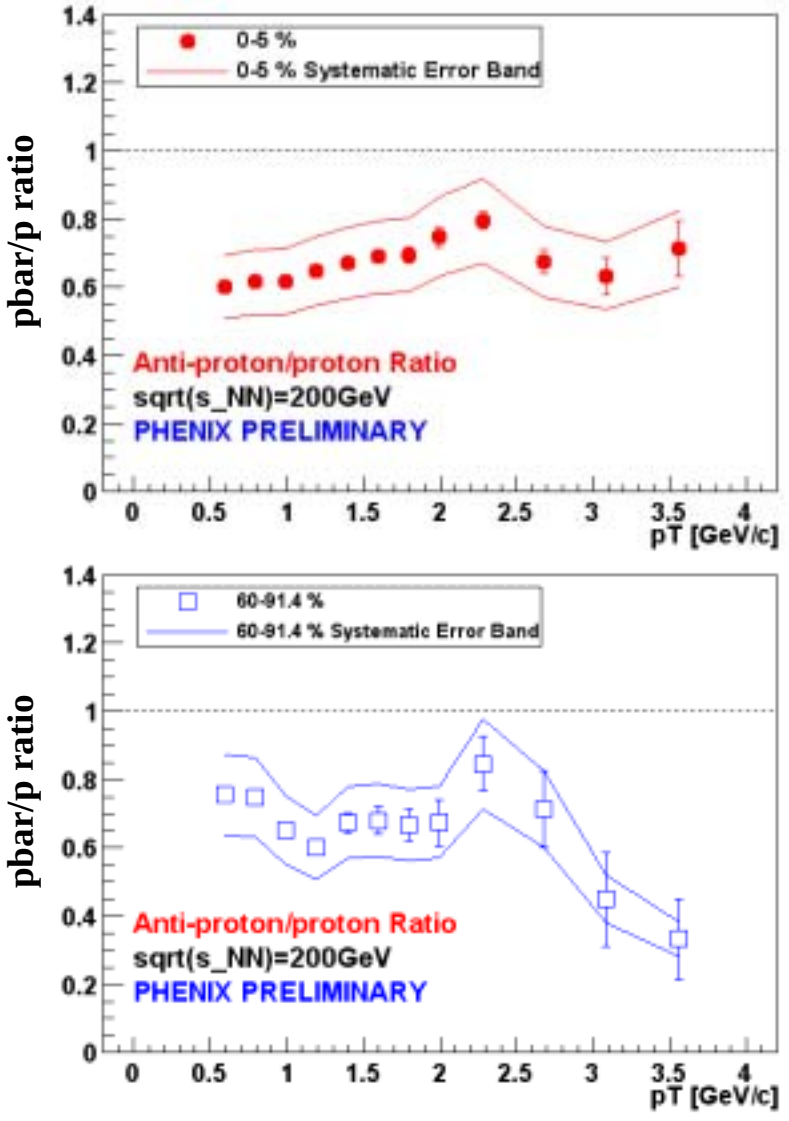
Analysis (Neutral π)

- Using Electro-magnetic Calorimeter
  - 1GeV/c<p_T<10GeV/c for π^0 !
- Calculate $\gamma\gamma$ invariant mass spectra and subtract combinatorial background
- Efficiency is evaluated by embedding simulated π^0 into real event.
- Systematic Error
  - p_T independent: 9%
  - Overall: 20-30%

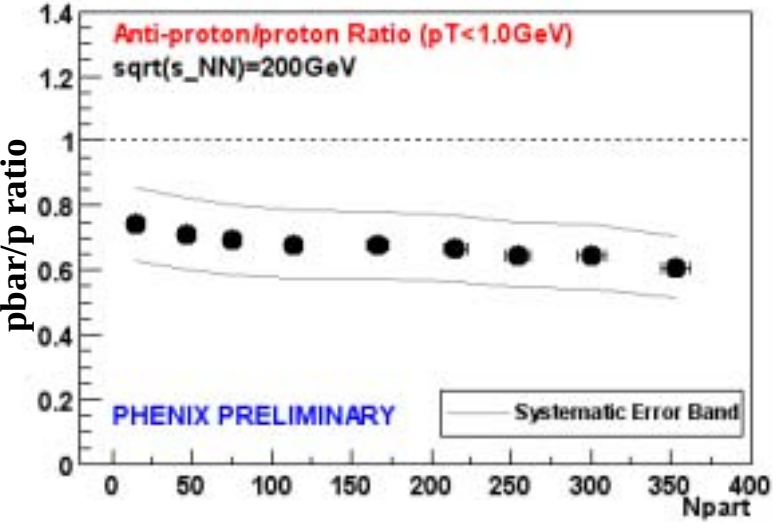


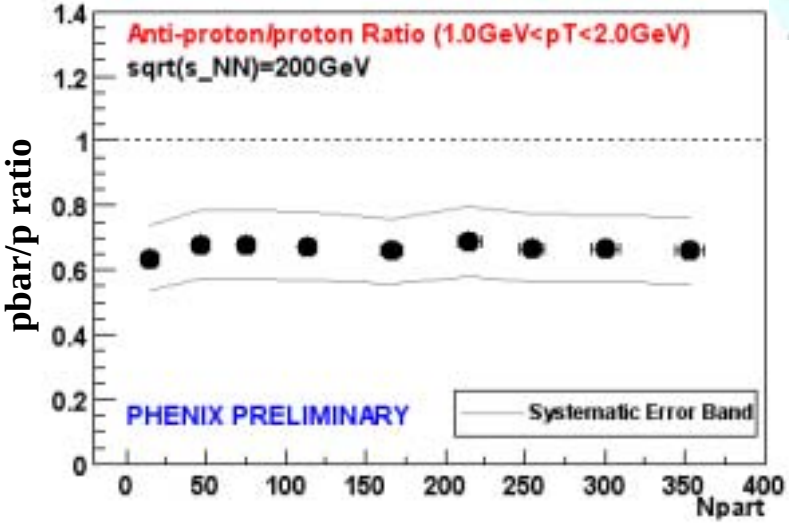
pbar/p as a function of p_T

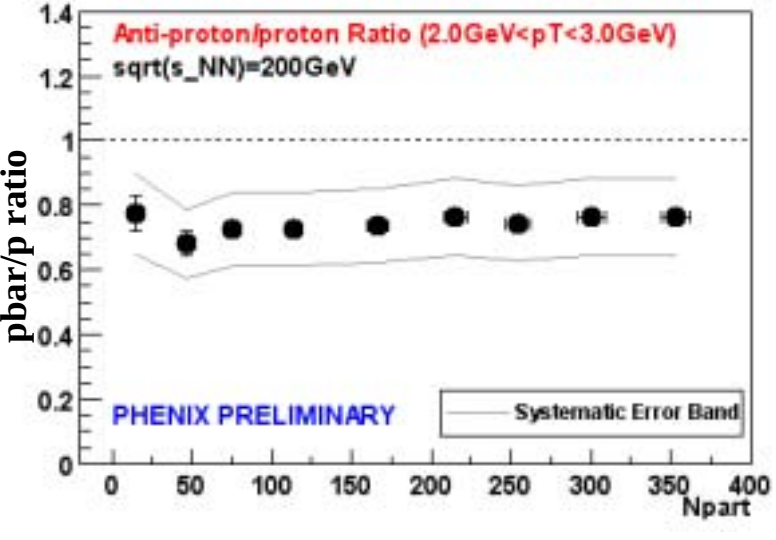
- pbar/p ratio extends up to 4GeV/c in Year-2
- Point-by-Point Error: Statistical Error
- Bands by lines: Common Systematic Error
- It is almost flat over the entire p_T

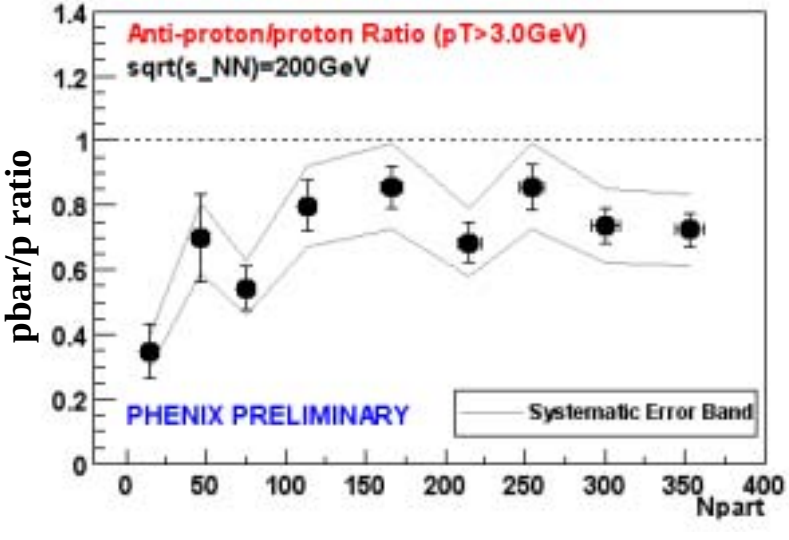


Centrality dependences of pbar/p



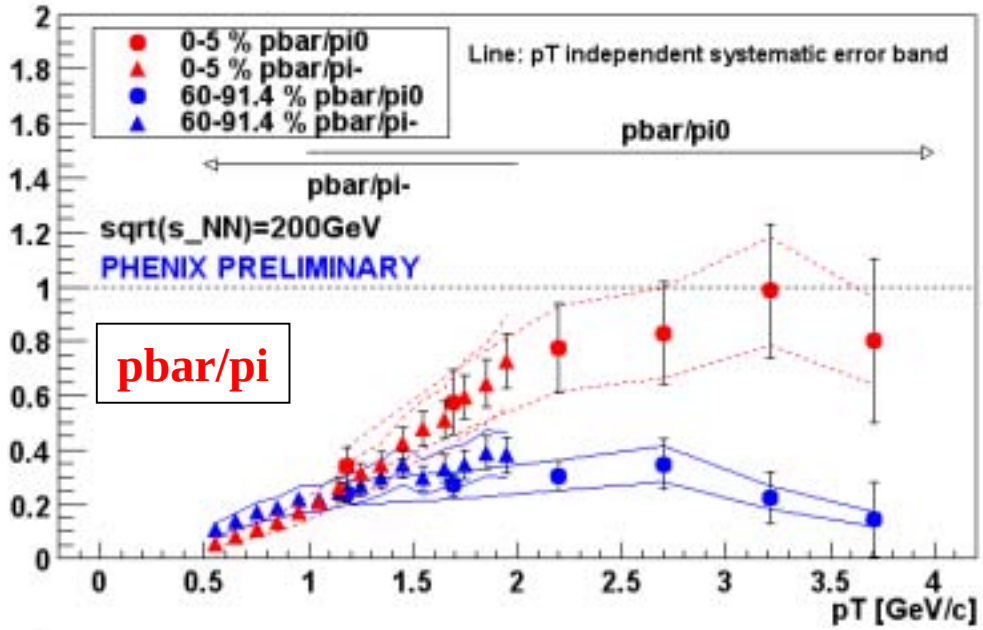


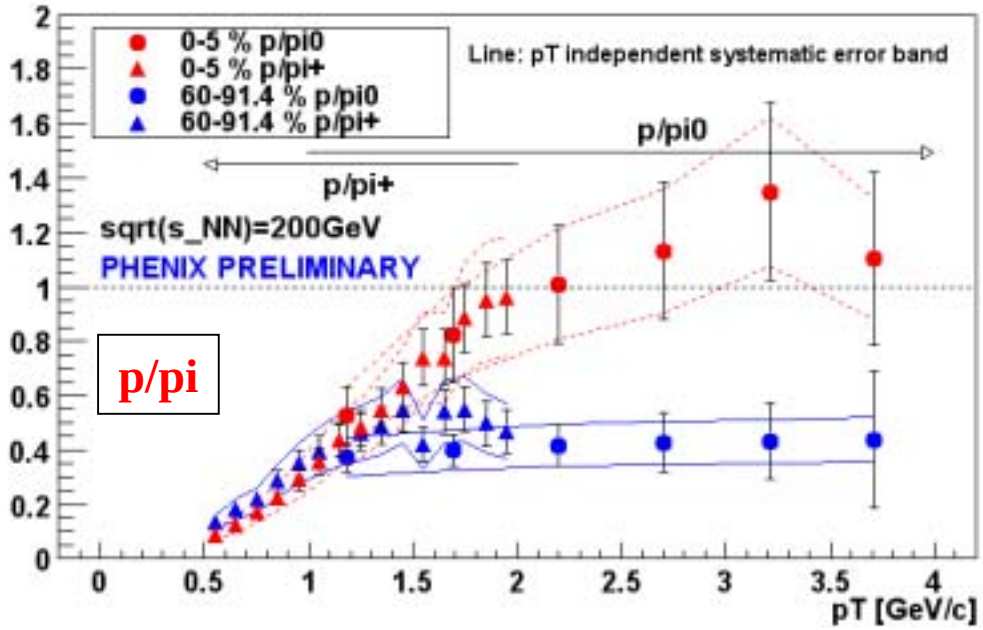




pbar/π and p/π

- pbar/π , p/π ratios
  - p_T<2GeV, pbar/π^-, p/π^+
  - p_T>1GeV, use π^0 with π^-, π^+
- Point-by-Point Errors include point-by-point statistics+systematic errors
- Bands: p_T independent systematic errors
- Decreasing at much more high p_T?

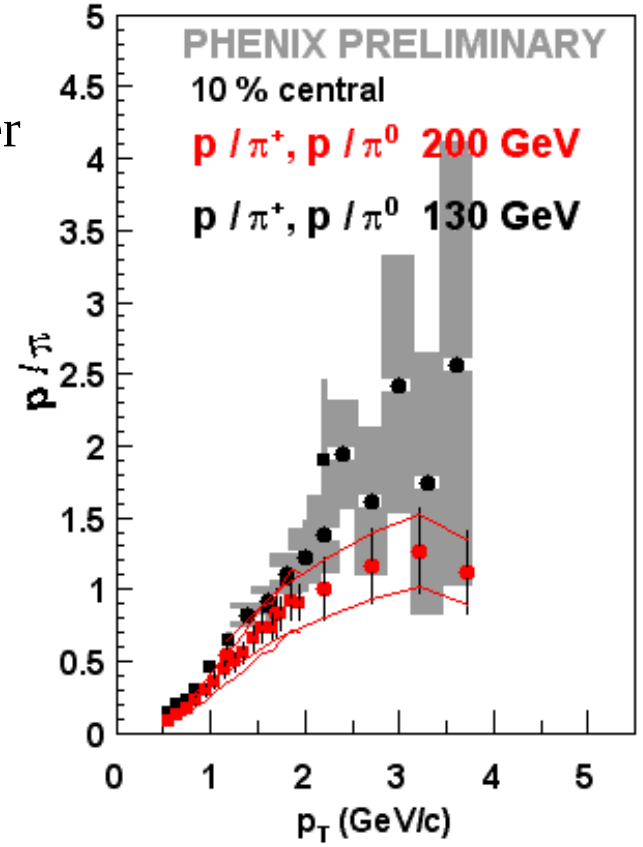


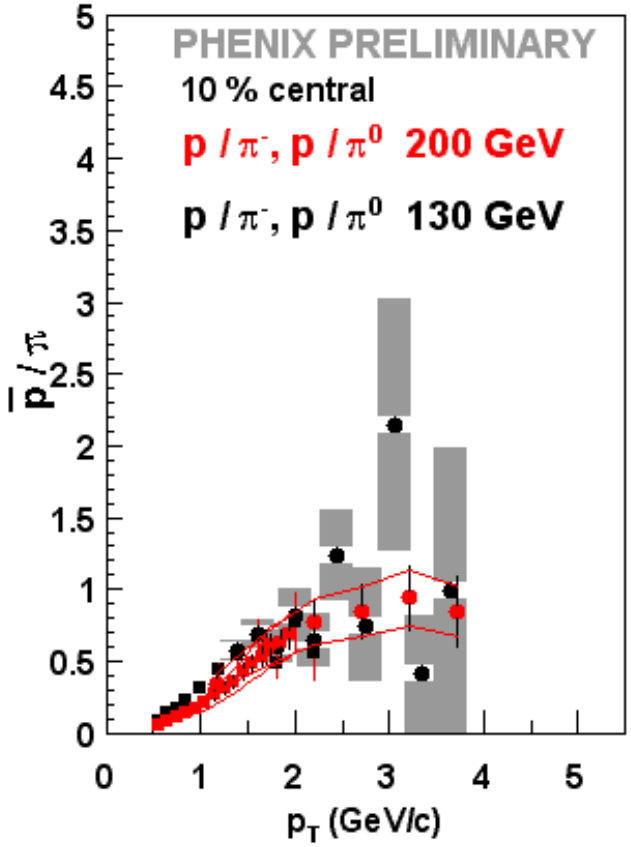


Comparison with Year-1 Data

- Data Compared to Year-1
- Both Year-1 and Year-2 are consistent within systematic errors

- Another hint.
  - –More π rather than protons?

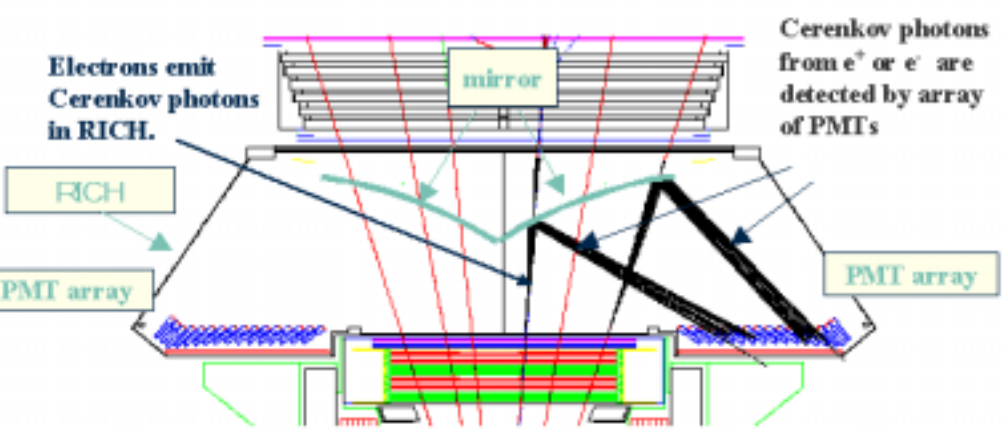




Another Interesting Analysis

High p_T charged π

See F. Messer poster presentation!



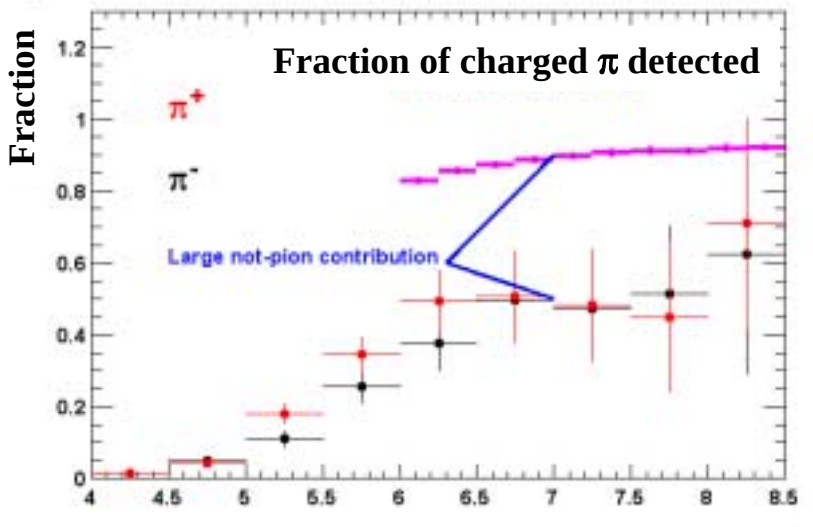
RICH detectors in PHENIX

For electron and positron:
- Momentum Threshold : 18MeV
- Average number of PMT : 4-5
- Number of photo-electron is 2*PMT : ~ 10

For pions:
- Momentum Threshold : 4.7GeV/c
- Number of photo-electrons strongly dependent on momentum
- Kaon Threshold: 15 GeV/c

P(GeV)	5	6	7	8	9
%max ph-el	4.7	39	56	66	73

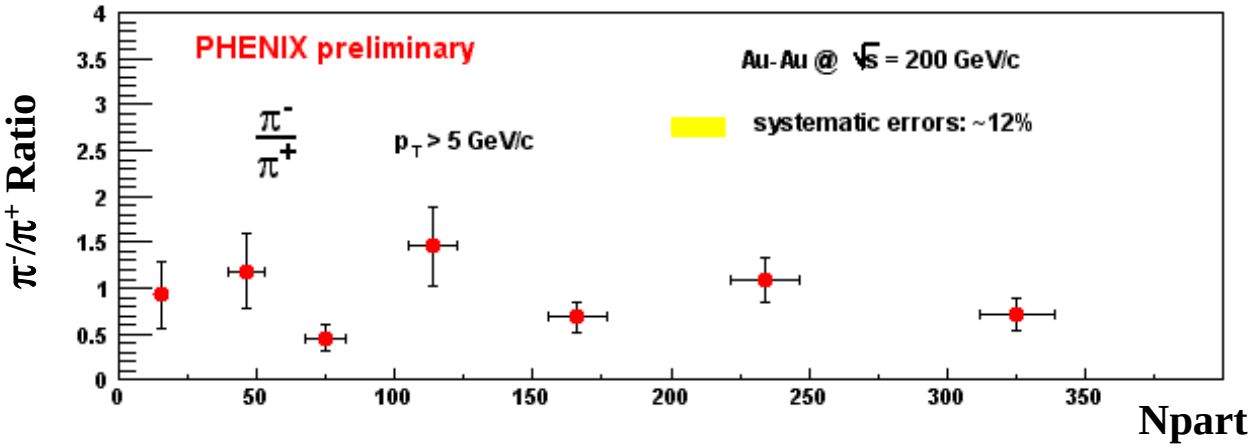
- RICH already tagged "electrons" excellently
  - *See R. Averbeck(single electrons) and A. Frawley($J/\psi \rightarrow e^+e^-$) talks!*
- Also a strong device for tagging charged π for p_T>5GeV/c

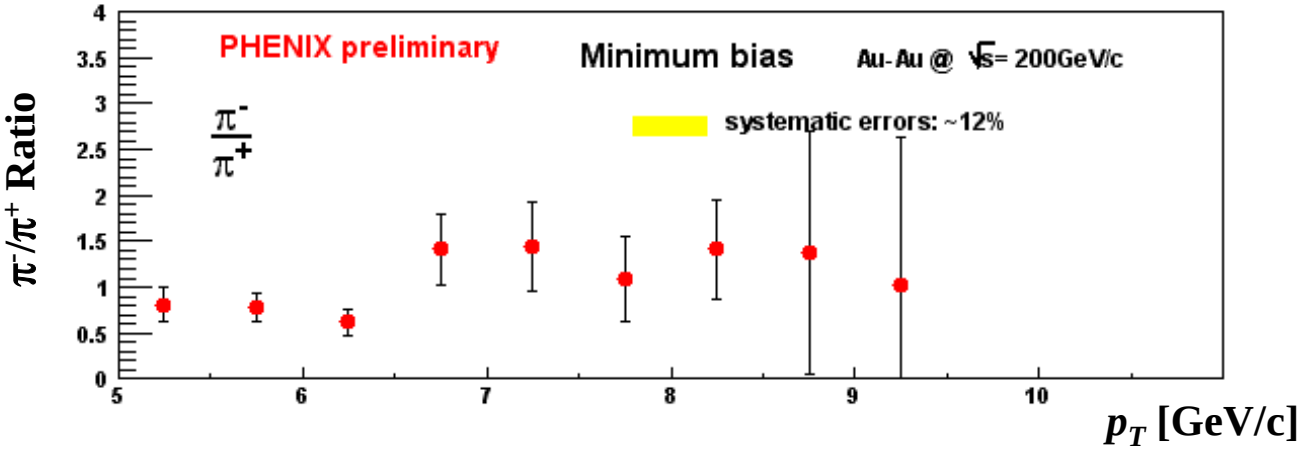


High p_T π^-/π^+ ratio

See F. Messer poster presentation!

- Still the ratio is ~1 at high p_T in Minimum Bias data within systematic errors





Conclusion

- Ratio of anti-proton/proton is measured up to 4GeV/c
  - The result is almost flat over the entire p_T and centrality within systematic error
- Ratio of baryon/meson through pbar/π and p/π is measured up to 4GeV/c
  - Hints on the effect of dense medium
  - Consistent with Year-1 result within systematic errors
- High p_T π^-/π^+ ratio is measured (p_T>5GeV/c)
  - Flat over p_T and centralities within systematic errors

Another Conclusion

Viva PHENIX!

PHENIX