# Electron Measurement at RHIC

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for the PHENIX Collaboration

# Another Title of the Talk

Measurement of
Electron,
Conversion Photon,
and
Electron pairs
in PHENX

# The PHENIX Collaboration

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# Motivation

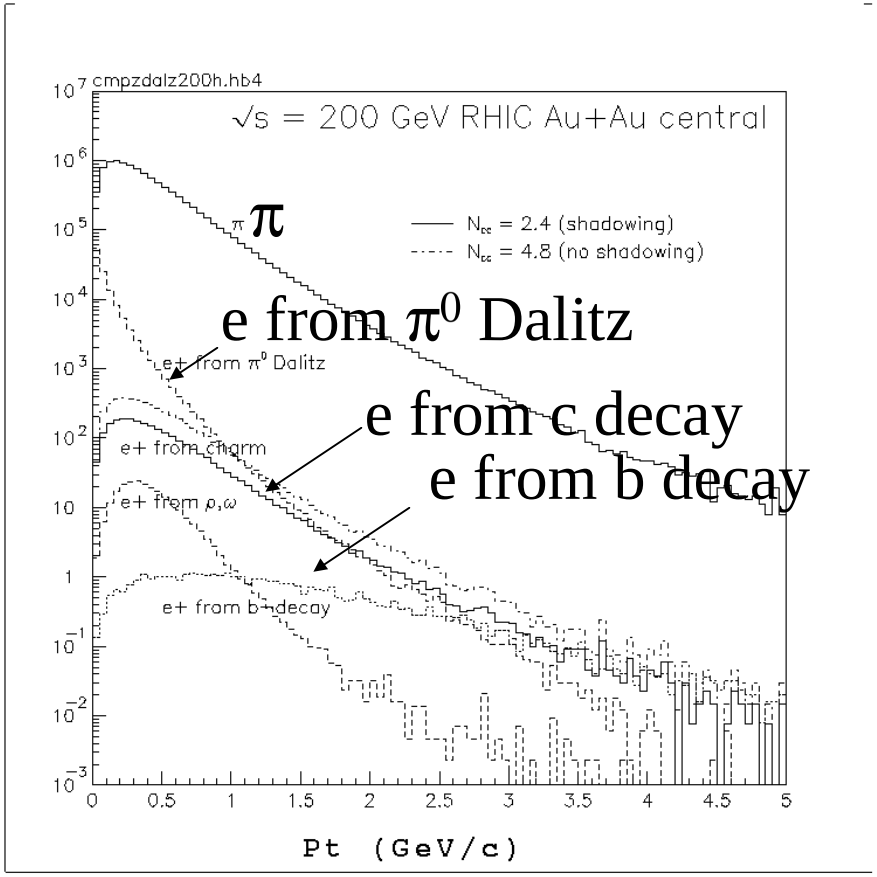
- High pt single electron ($p_t$ > 1 GeV/c)
  - heavy quark decay (c→eX, b→eX)
- Photon (by conversion to e+e- pair)
  - Clean photon identification at low pt
  - Thermal radiation
- Electron pair
  - J/Psi suppression
  - continuum from heavy quark decay
  - medium effect on vector mesons
  - Thermal radiation

# High pt electron (prediction)

- At ISR, single electron signal is observed at $e/\pi \sim 2\times10^{-4}$.
- At RHIC energy , the signal (from c-qark decay) is expected as $e/\pi \sim 3\text{-}4\times10^{-4}$ in p+p
- The $e/\pi$ ratio can be as high as $10^{-3}$ in Au+Au collision, if high pt pions are suppressed (as reported in this conference)

Plot shown in QM95 pre-symposium

"single electron" spectrum in Rhic Au+Au central collisions



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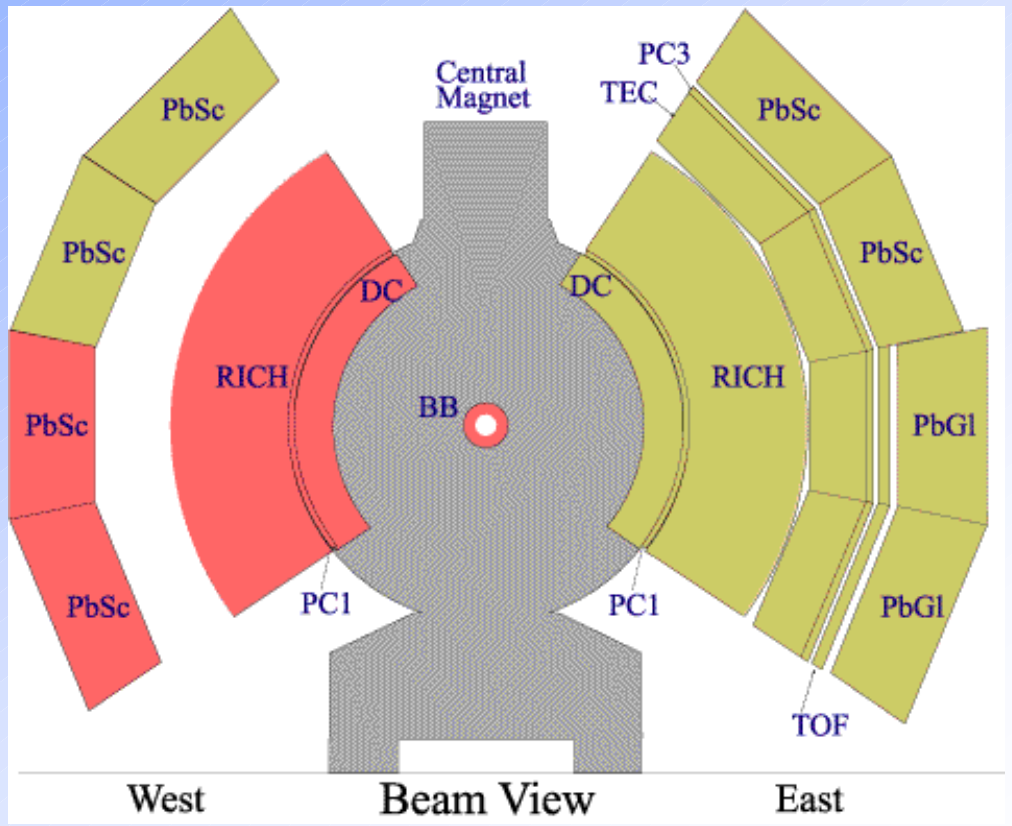
# Detectors Included

- Detectors for single electron analysis
  - BBC
    - Trigger
    - vertex position
    - T0 (TOF start)
  - DC and PC1 (W)
    - tracking
  - RICH(W)
    - electron ID
  - PBSC(W):
    - electron ID
    - Energy measurement
    - TOF (pion ID)



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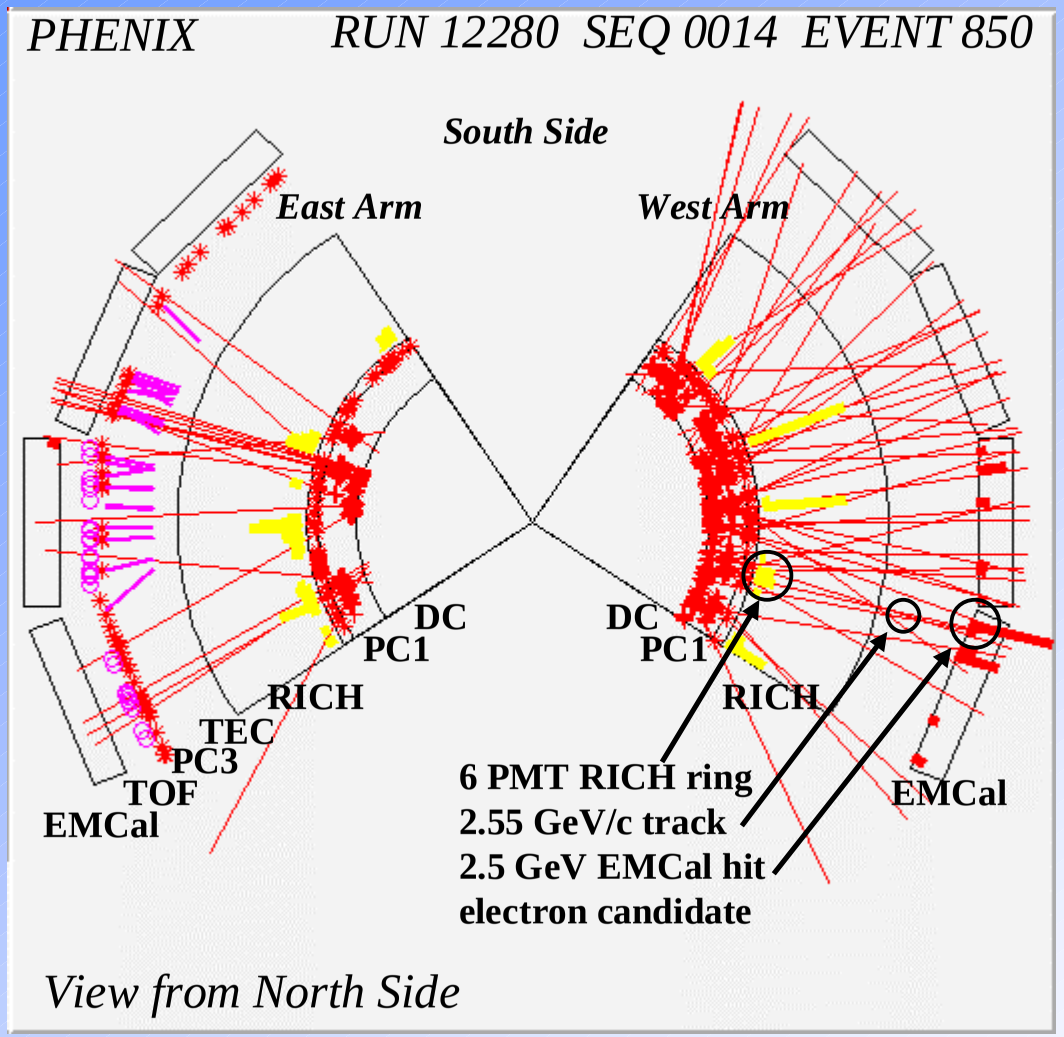
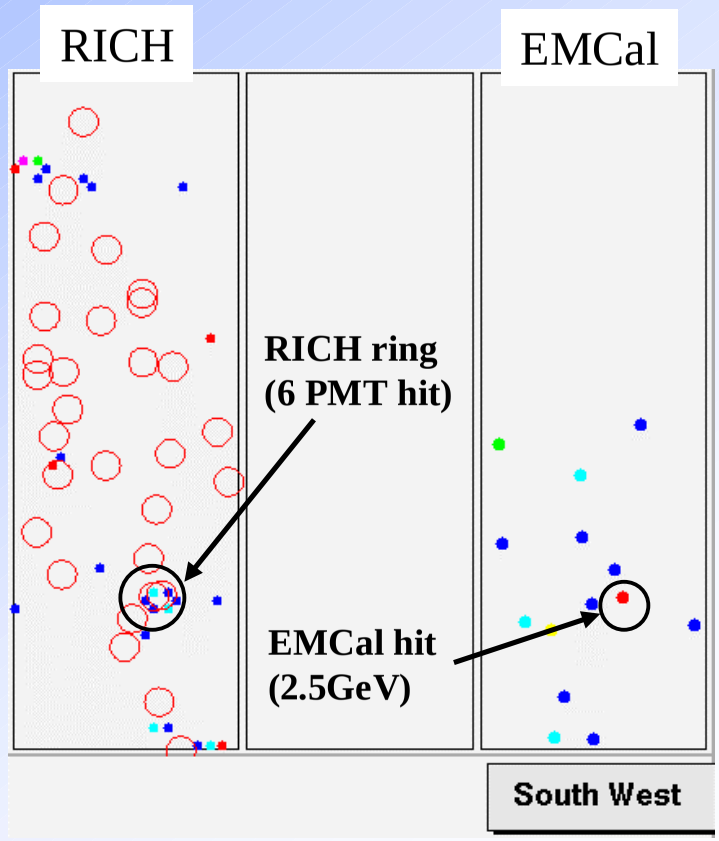
# High Pt electron in PHENIX

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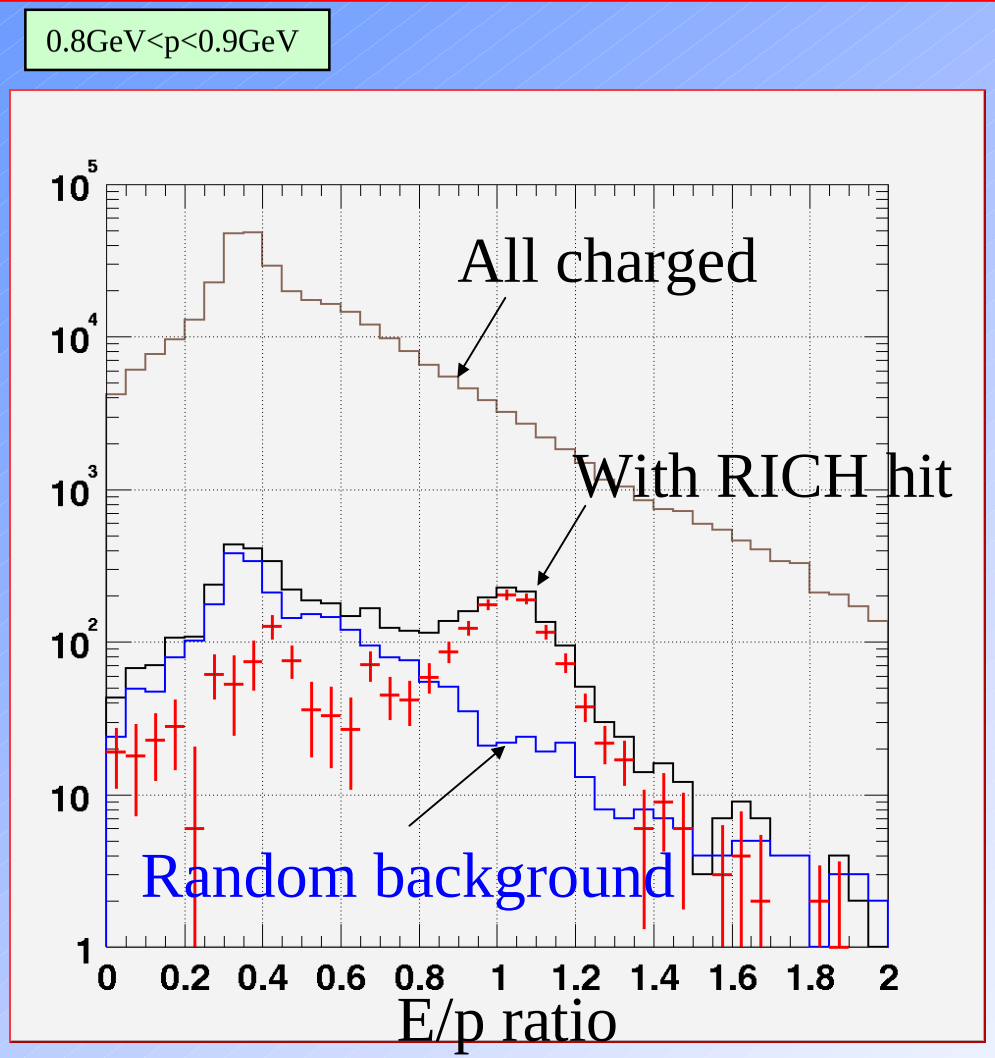
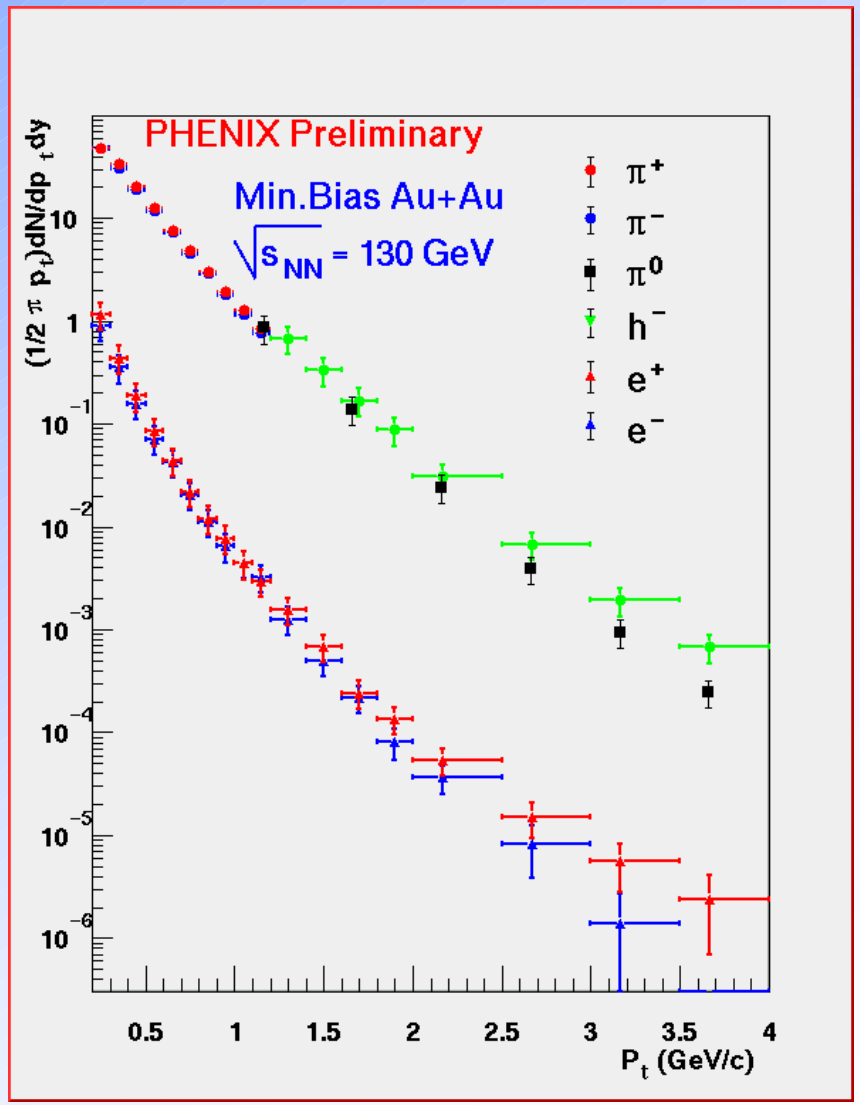
# Electron Identification




- Electrons are identified by RICH and EMCAL
- A clear peak in energy/momentum (E/p) ratio is seen at 1.0 after RICH hit is required
- EMCAL E/p cut cleans up the rest of the background.
- Random background is also subtracted.

# Electron Spectra

- Electron spectrum is measured up to 4 GeV/c, and it is compared with $\pi^{\pm}$ and $h^{-}$ spectra in the same acceptance.
- The $\pi^{\pm}$ spectra are consistent with $\pi^{0}$.
- The electron spectrum includes "trivial" background from $\pi^{0}$ Dalitz decay and photon conversion. The amount of the background can be calculated from the pion spectrum.
- Studies are on-going to look for "excess" electron over the trivial background.

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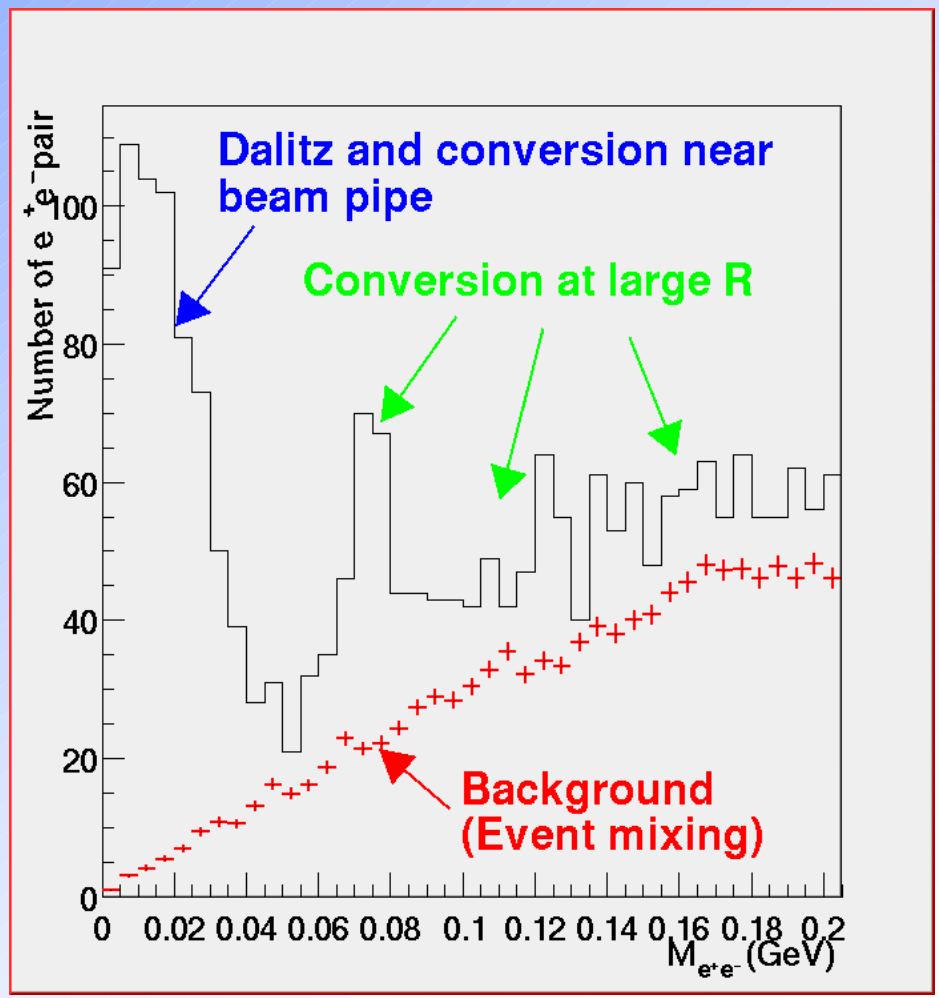
# Measurement of photon conversion

- Dalitz decays and photon conversions are observed as very low mass (Mee~0) e+e- pair.
- A clean signal of conversion photon is seen in PHENIX in Au+Au collisions.
  - Conversion pair produced at large radius acquires apparent “mass” due to reconstruction program. (No new particle, at least for now)



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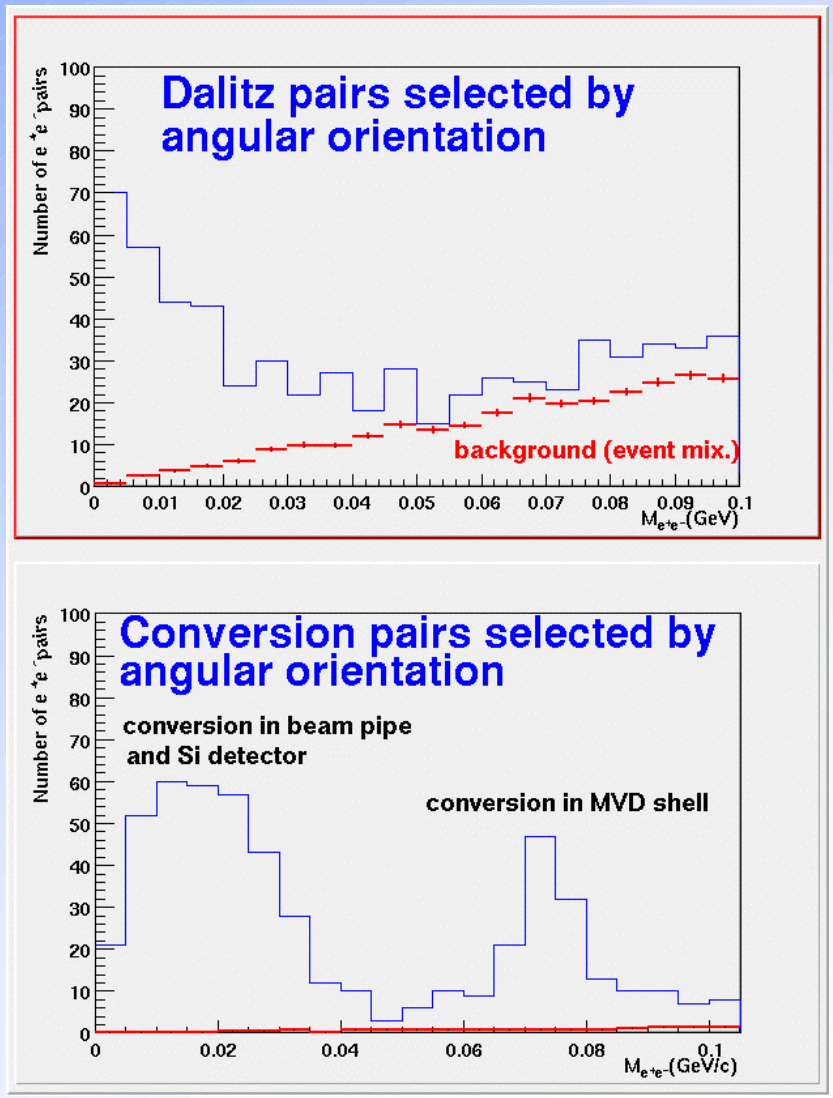
# Separation of Dalitz and conversion

- Dalitz pair (from event vertex R=0) and conversion pair (outside of beam pipe) can be distinguished by its angular orientation.
- Very clean conversion pair signal, with little background is obtained.
- The conversion sample is used to measure photon cross section.



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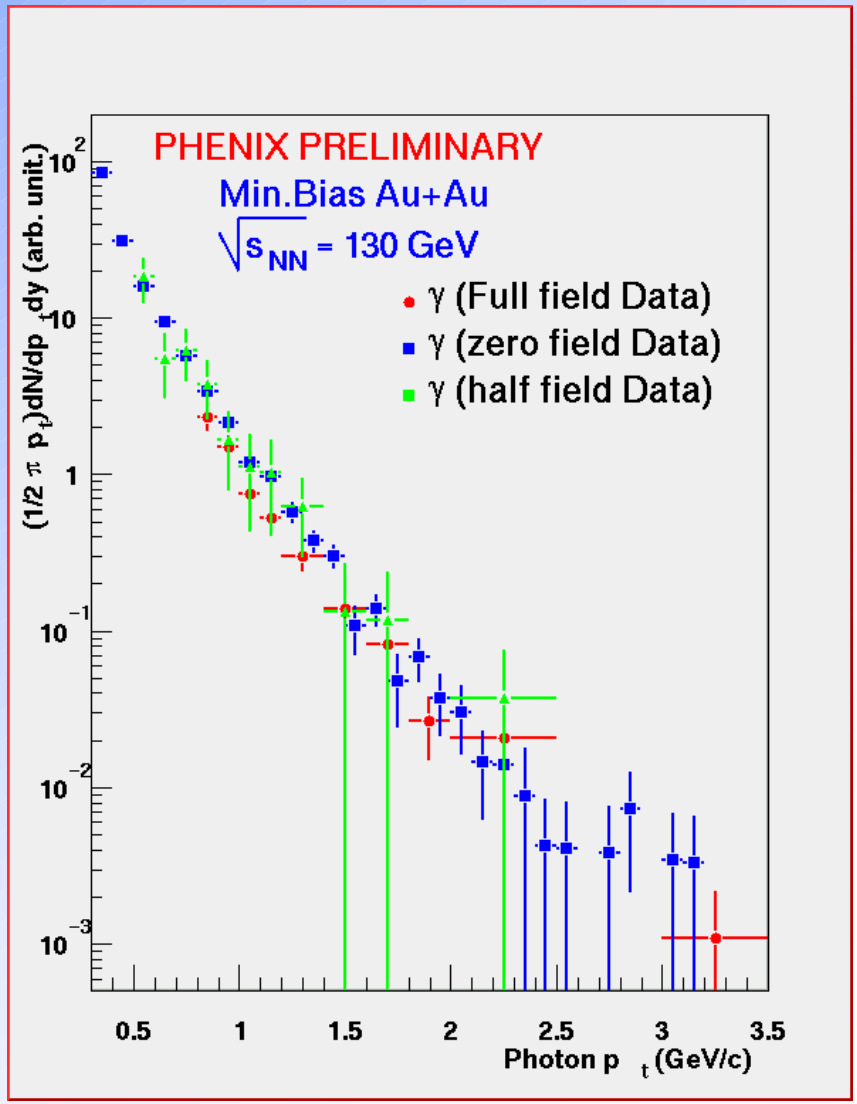
# Inclusive Photon spectrum

- Inclusive photon spectrum is obtained from the conversion pair.
- "Photon" spectrum is also obtained from zero field data by EMCAL-RICH coincidence.
- Work is in progress to establish the absolute cross section and to compare the photon yield with that of pion.

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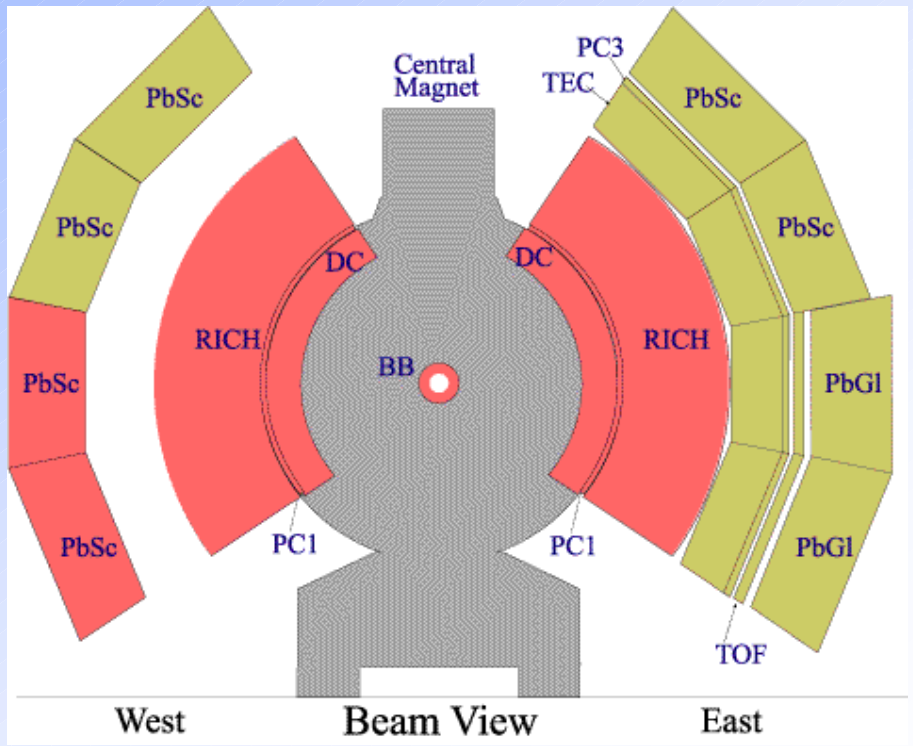
# PHENIX as pair spectrometer

- Higher mass e+e- pairs are accessible by using two arms of PHENIX.
- At present, electron ID in the East Arm is limited to RICH. Soon PBGL will be used
- The RUN-00 data (a few M events) is not sufficient for pair physics



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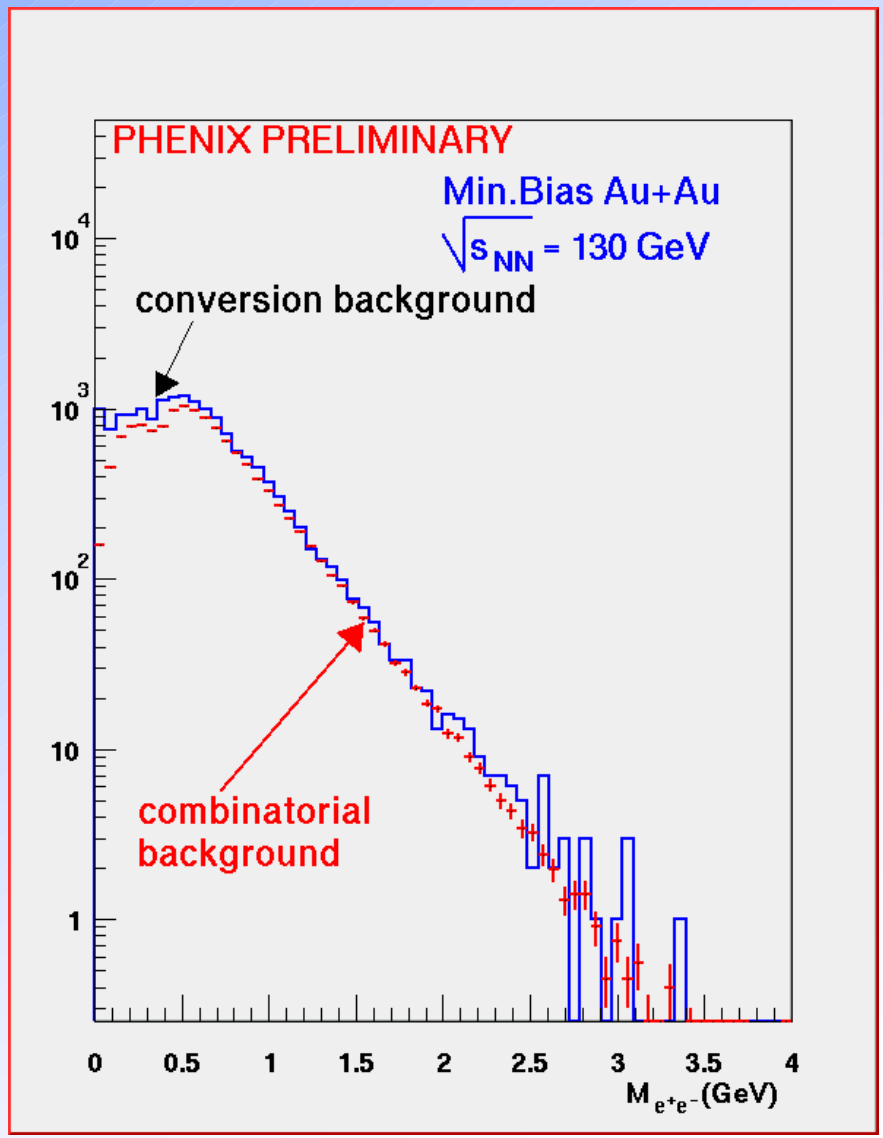
# Coming Attraction

- Di-electron mass distribution is measure up to 3 GeV in RUN-00 data
- Most of the pairs are combinatorial background.
- In Run01, we will accumulate a few thousands times of this statistics to measure J/Ψ and light vector mesons with full two arm system.

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# Summary

- PHENIX measured
  - Inclusive electrons
  - Conversion photons
  - Electron pairs

  in Au+Au collisions at sqrt($s_{NN}$)=130 GeV
- Work is in progress to search for “excess” electrons from heavy quark decays
- Much more data will come in RUN01 with full Two Arm system.