Dilepton Spectra in p+p and Au+Au Collisions at RHIC

– Torsten Dahms –
Stony Brook University[1]
RHIC & AGS Users' Meeting
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PHENIX

[1] now at CERN

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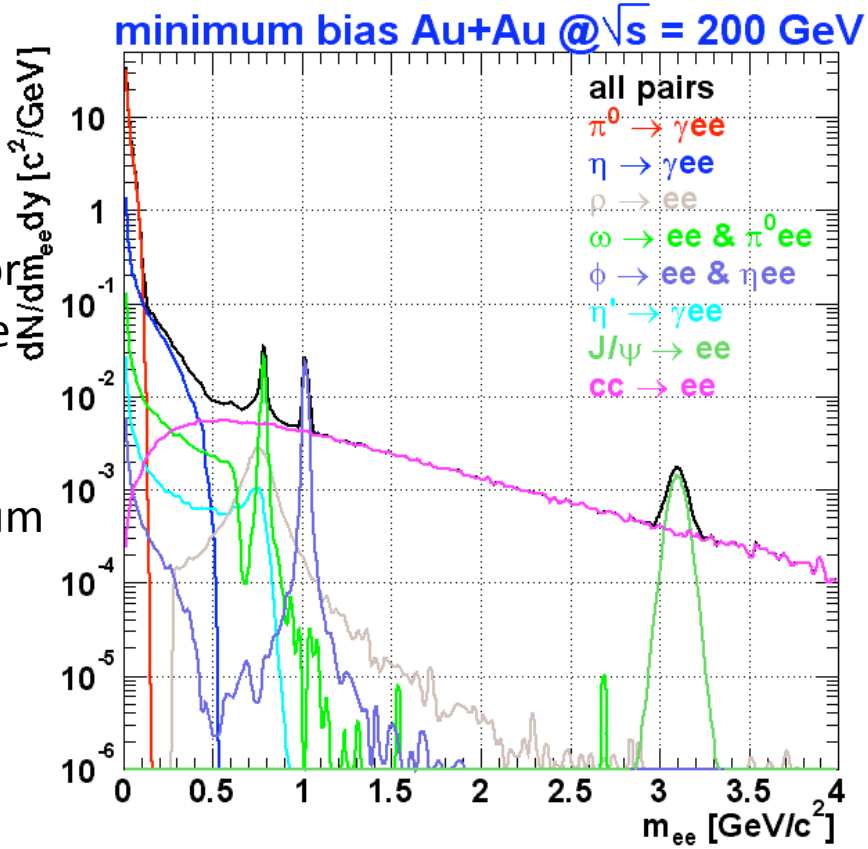
Motivation

Photons and dileptons: radiation from the media

- direct probes of all collision stages (no strong final-state interactions)
- large emission rates in hot and dense matter
- according to VMD their production is mediated in the hadronic phase by the light neutral vector mesons (ρ, ω, and ϕ) which have short life-time
  - Changes in position and width: signals of chiral transition?
- Experiments at SPS energies observed in medium modifications of the ρ spectral function



Expected sources

- Light hadron decays
  - Dalitz decays of π^0, η
  - Direct decays of ρ, ω and ϕ
- Hard processes
  - Charm (beauty) production
  - Much larger at RHIC than at SPS

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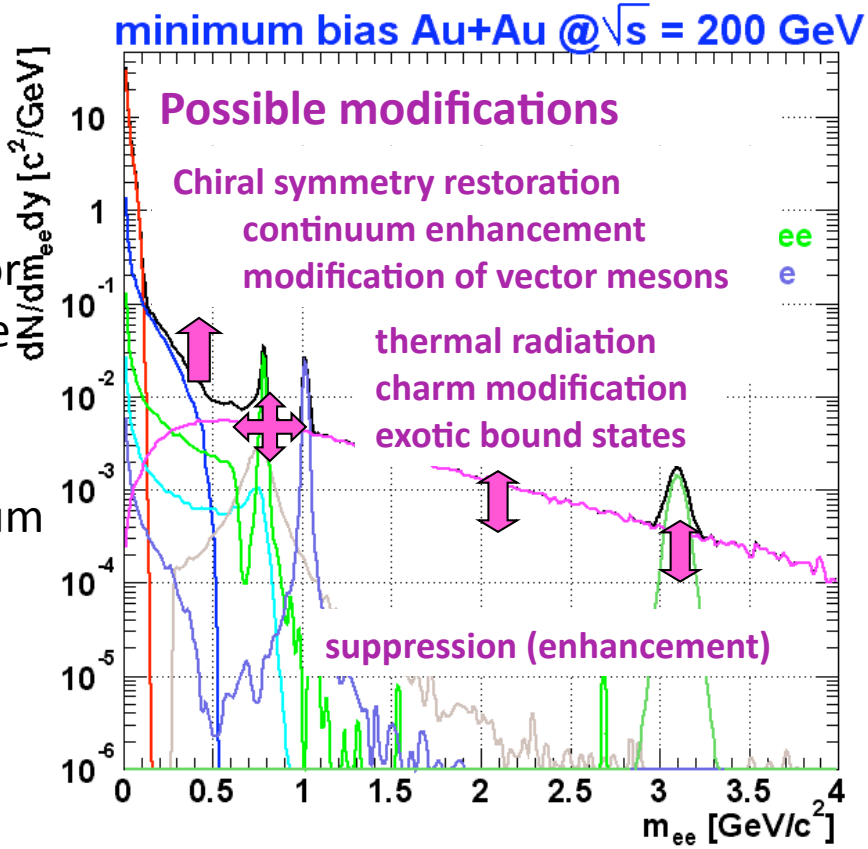

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One of the many Challenges

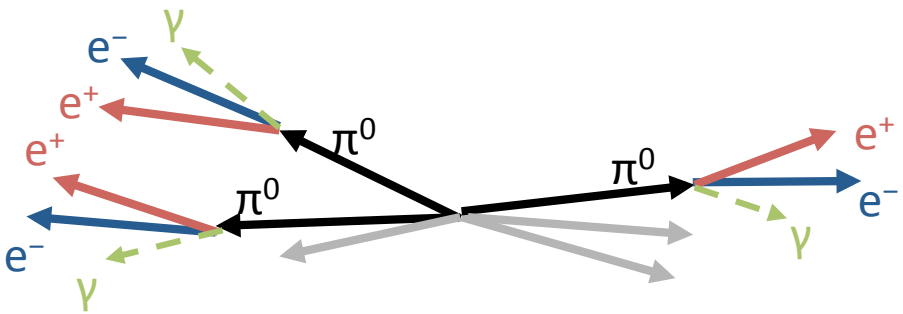
- Small signal/background
- Want to measure continuum, not a resonance
- Requires perfect understanding of background
- Not all background is combinatorial
- Correlated contributions from:
  - hadron decays with four electrons in the final state ($m_{ee} \leq m_h$)

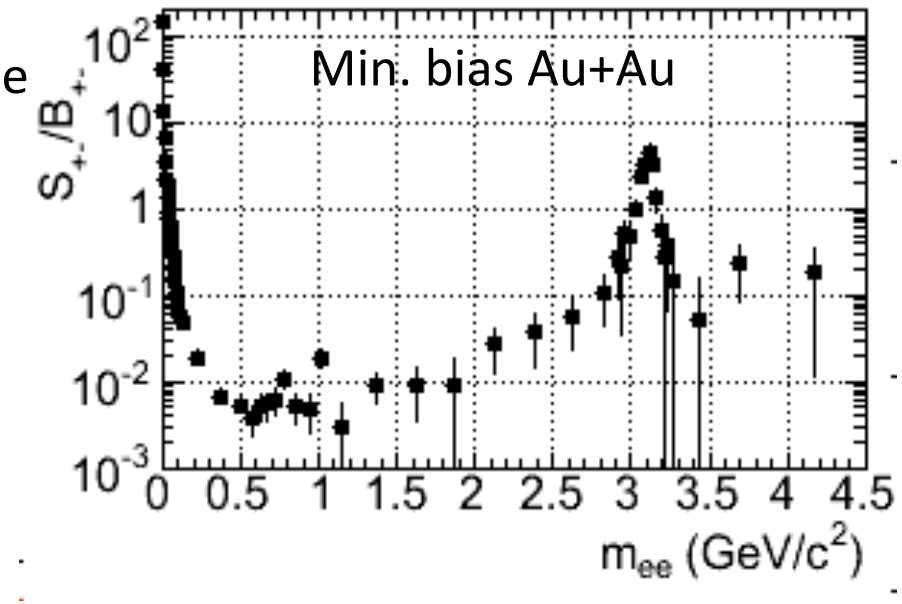
    $\pi^0 \longrightarrow \gamma\, \gamma^*$

    $\hookrightarrow e^+e^-$

    $\times$

    e^+e^-
  - jet-correlated electron pairs





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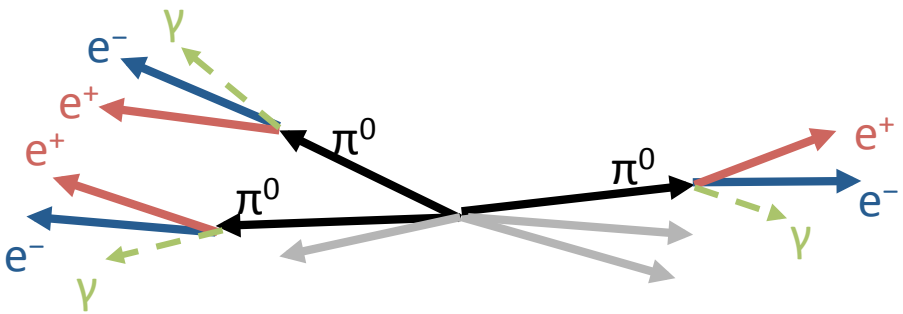
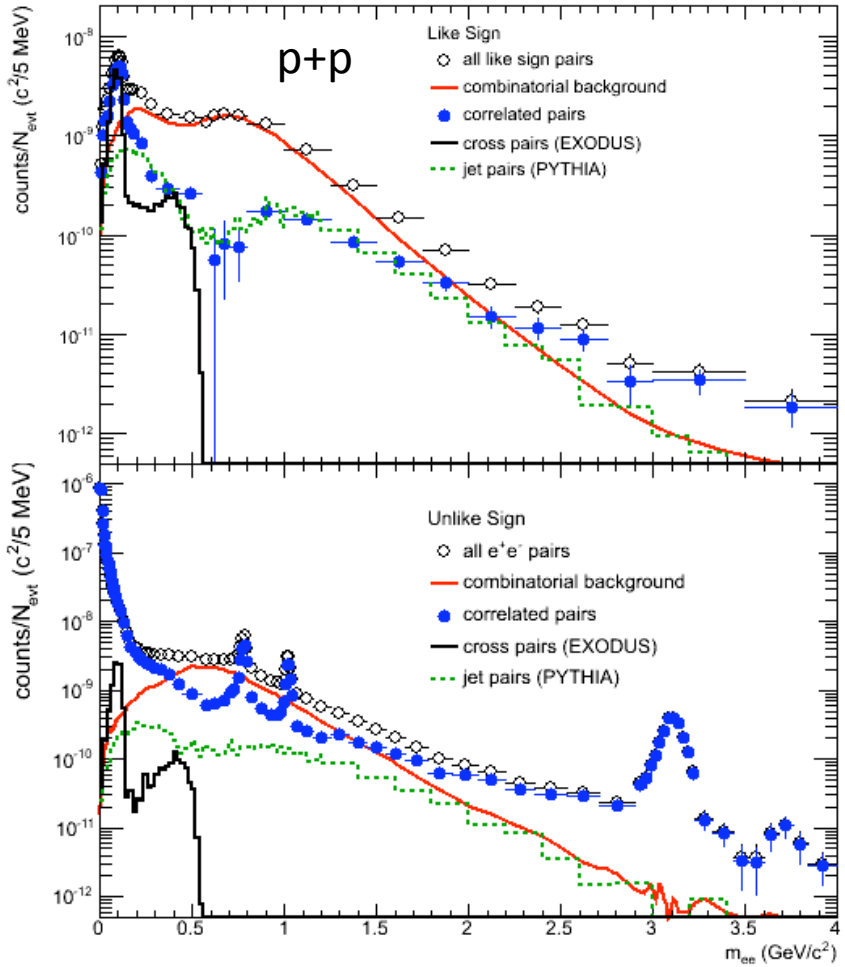
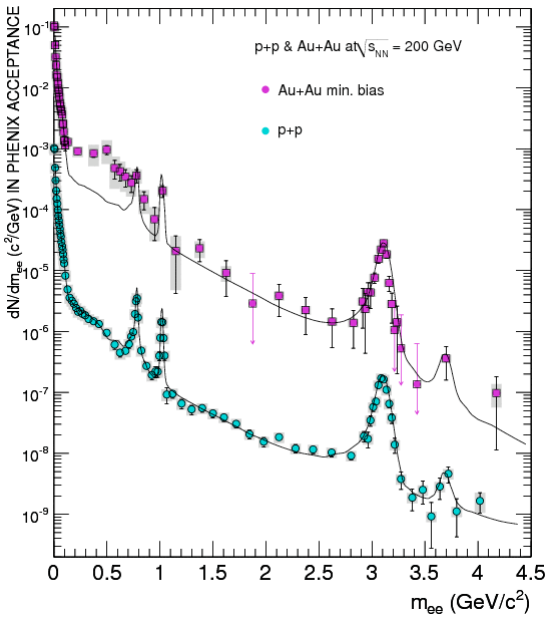
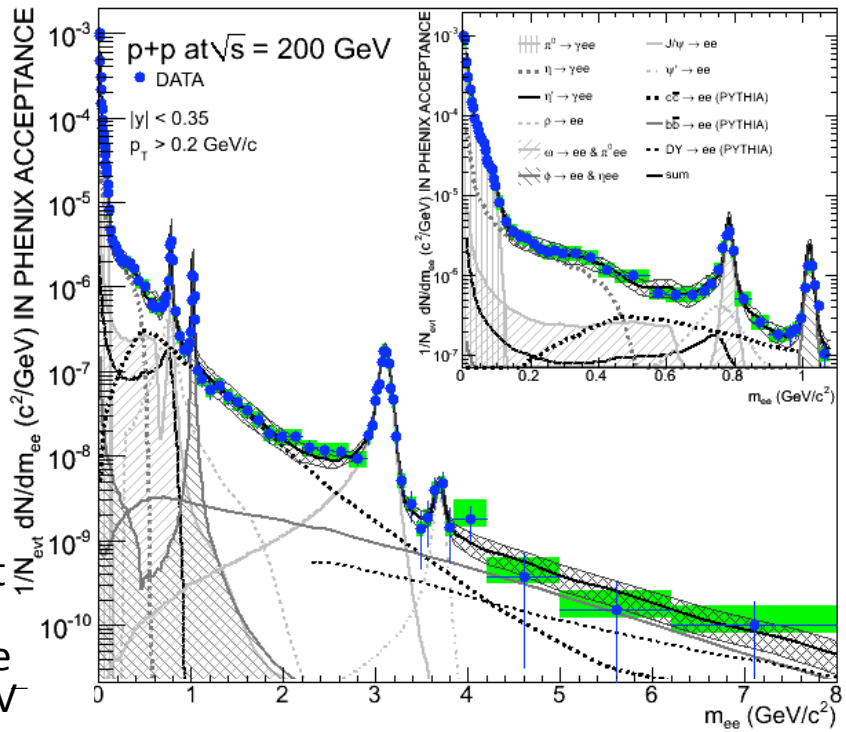
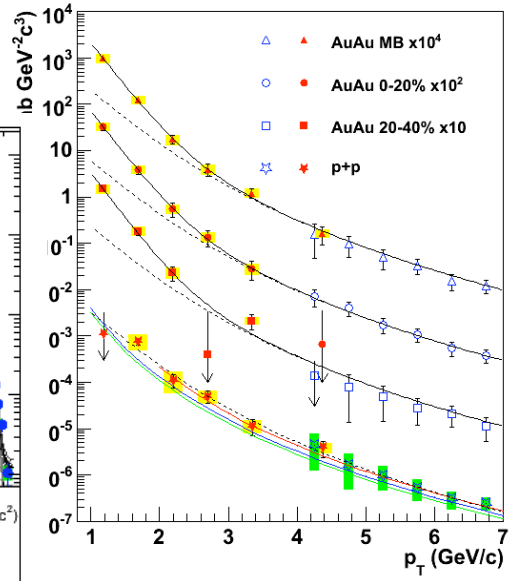


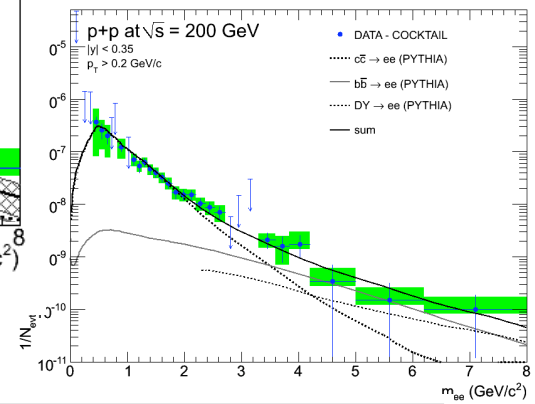


Results







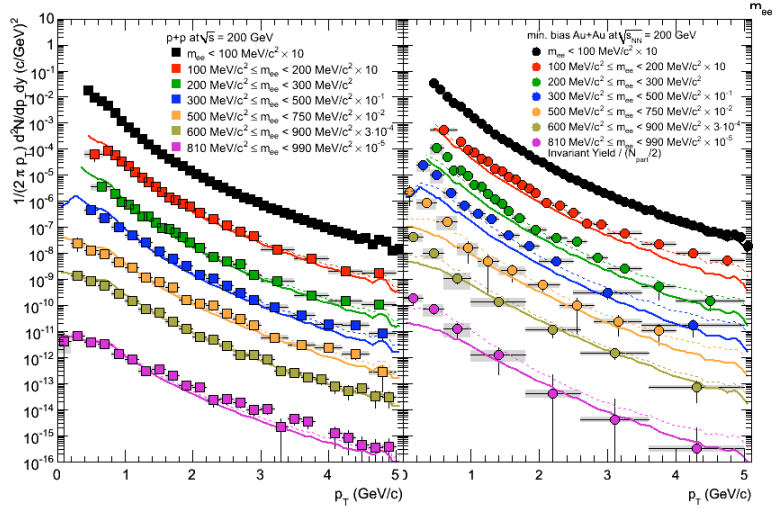


LOW MASS:

- p+p data in excellent agreement with hadronic decay cocktail
- Au+Au data are enhanced above the cocktail in 150<m_{ee}<750MeV
- enhancement concentrated at low p_T

INTERMEDIATE MASS:

- extract charm and bottom cross sections In p+p collisions
  σ_{cc} = 544 ± 39 (stat) ± 142 (syst) ± 200 (model) μb
  σ_{bb}= 3.9 ± 2.4 (stat) +3/-2 (syst) μb
- published in PLB **670**, 313 (2009)

DIRECT PHOTONS:

- first direct photon measurement in 1 < p_T < 4 GeV
- p+p in agreement with pQCD
- Au+Au enhanced above binary scaled p+p
  (T_{eff} = 221 ± 23 (stat) ± 18 (syst))
- submitted to PRL (arXiv:0804.4168)