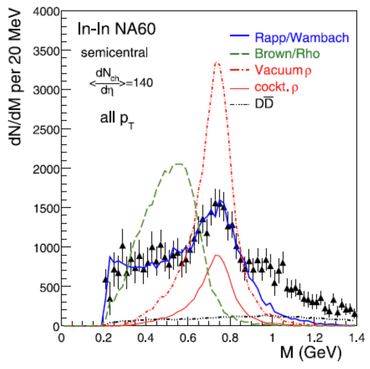
Centrality, mass, and transverse momentum dependence of di-electron elliptic flow in $\sqrt{s_{NN}}$ =200 GeV Au+Au collisions at STAR

Xiangli Cui for the STAR collaboration

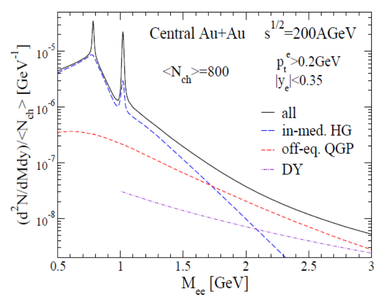
University of Science and Technology of China, Brookhaven National Laboratory

Introduction



NA60: Eur. Phys. J.C 61(2009) 711-720

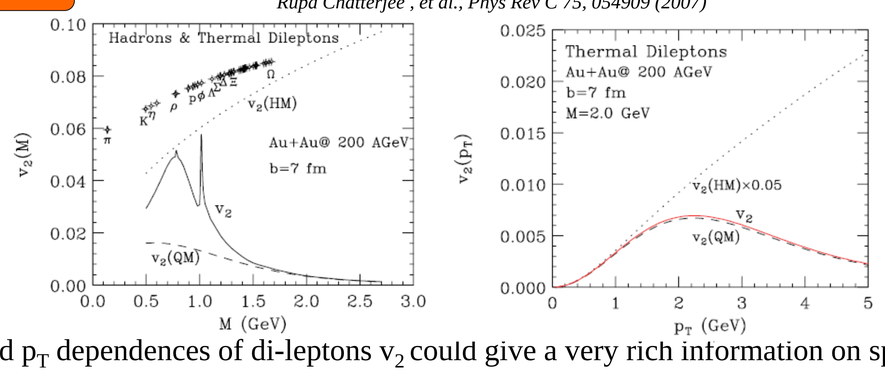
R. Rapp, et al .,Phys.Rev. C63 (2001) 054907.



- **Low mass region(M_{ll}<1.1GeV/c^2):**
  - In-medium modifications of vector mesons.
  - Chiral symmetry restoration?
- **Intermediate mass region(1.1<M_{ll}<3.0GeV/c^2):**
  - QGP thermal radiation.

Motivation

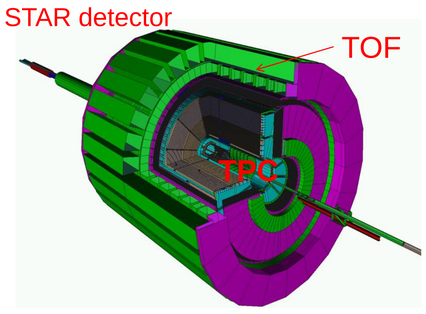
Rupa Chatterjee , et al., Phys Rev C 75, 054909 (2007)



- The mass and p_T dependences of di-leptons v_2 could give a very rich information on specific stages of the fireball expansion
- Measurements of v_2 of thermal di-leptons could distinguish partonic and hadronic radiation sources

PID and Event plane method

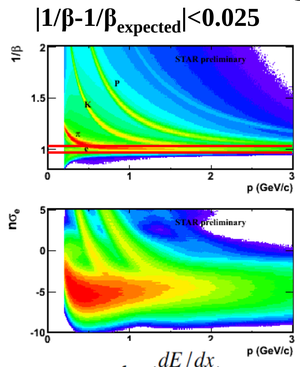
STAR detector

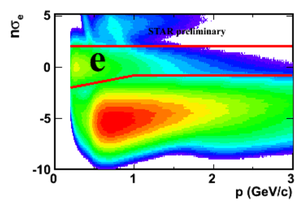


Large data samples Au+Au Minimum bias--- 240M in year 2010 and 480M events in year 2011.

PID : Ionization energy loss (dE/dx) and time-of-flight

$|1/\beta-1/\beta_{expected}|$<0.025



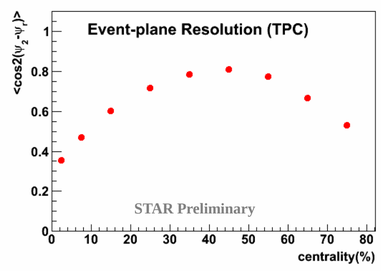


e *purity 97% in Au+Au@200.*

$$n\sigma_e = \frac{\log(\frac{dE/dx}{B_e})}{\sigma_e}$$

Event plane method :

using TPC to reconstruct event plane:

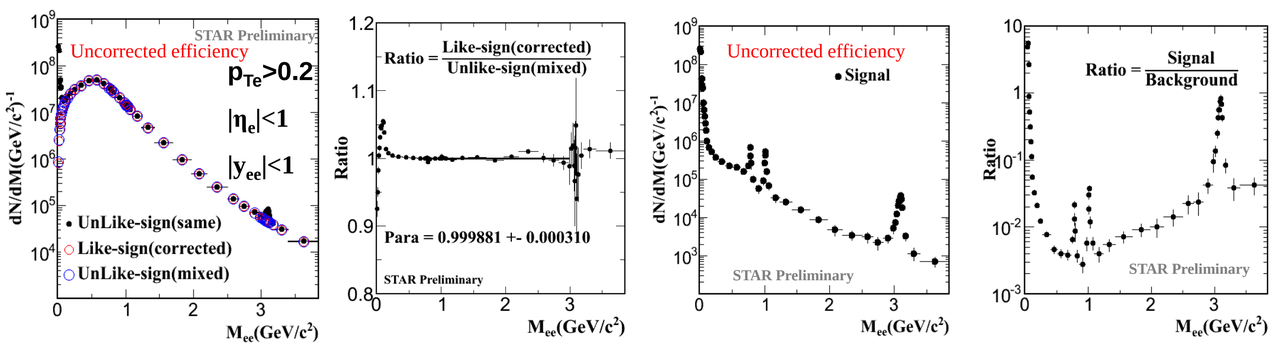


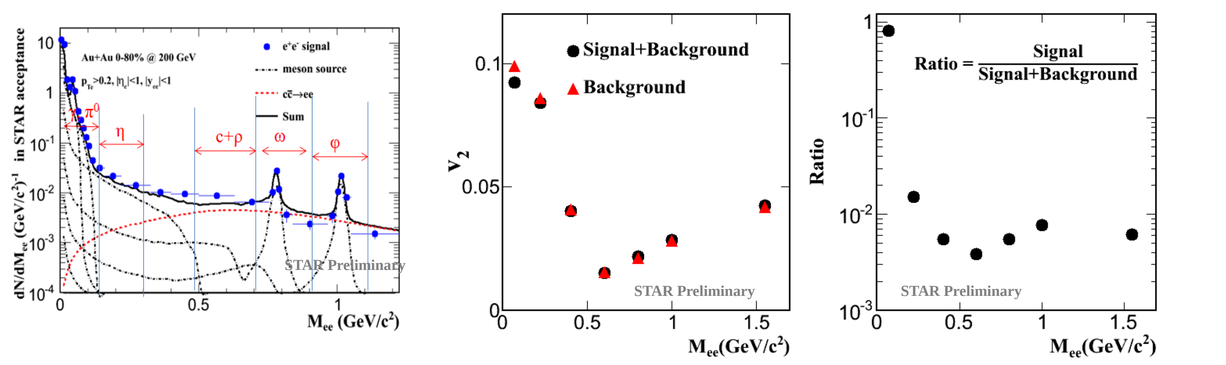
$$v_2^S \times \frac{N_S}{N_{(S+B)}} = v_2^T - v_2^B \times (1 - \frac{Ns}{N_{(S+B)}})$$

$$v_2 = < \cos(2(\phi_i - \psi_2)) / r_j >$$

v_2^T : *Signal + Background v_2,*
v_2^B: *Background v_2,*
v_2^S: *Signal v_2*
$N_S/N_{(S+B)}$: *Signal/(Signal + background)*
r_j : *Resolution of event plane in centrality j*
<>: average over all di-electron pairs in all events

Analysis



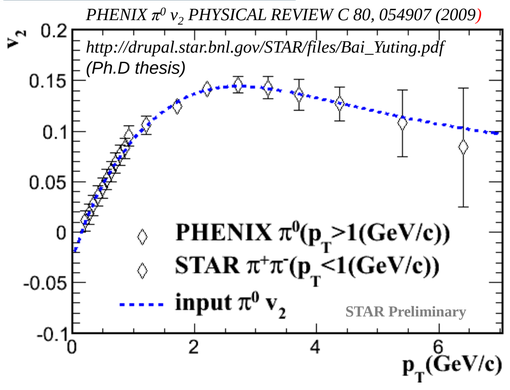


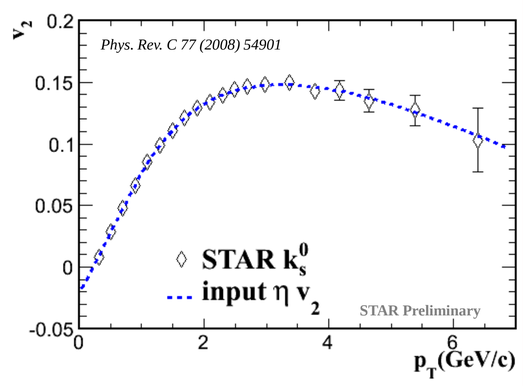
Background subtraction: Subtract the like-sign at M_{ee}<0.7, 1.1<M_{ee}<2.9 GeV/c^2;
Subtract mixed-event at 0.7<M_{ee}<1.1 GeV/c^2.

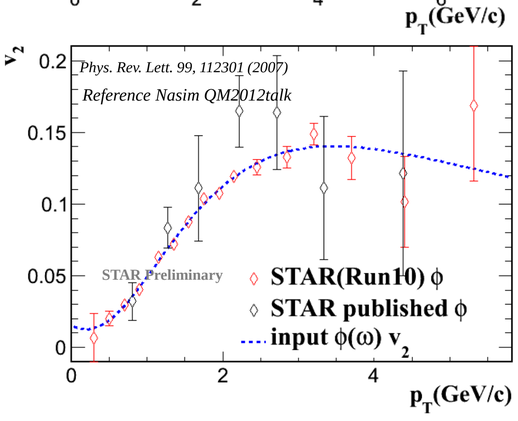
Mixed-event background (normalized to like-sign background at M_{ee}(0.7,3) GeV/c^2 and p_T(0,4) GeV/c).
We mix events which are in the same centrality bin (9), vertex z bin (10) and event plane angle bin (100).

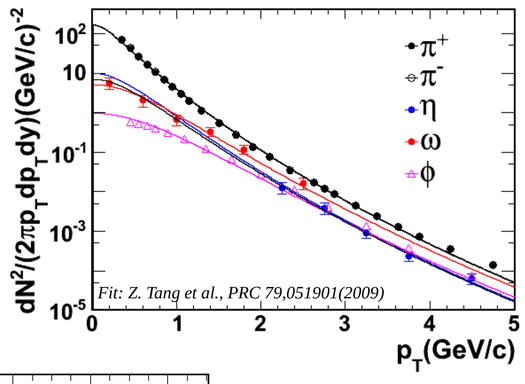
Simulation

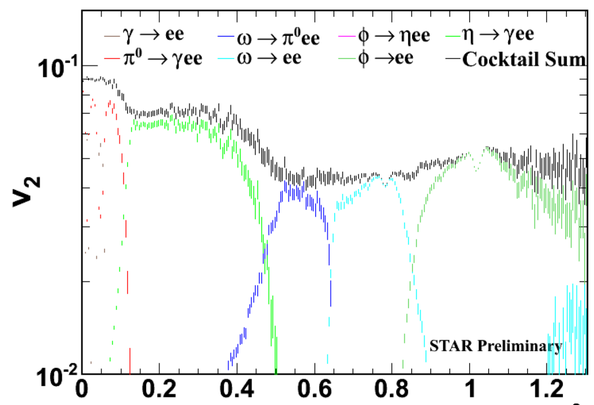
PHENIX π^0 v_2 PHYSICAL REVIEW C 80, 054907 (2009)





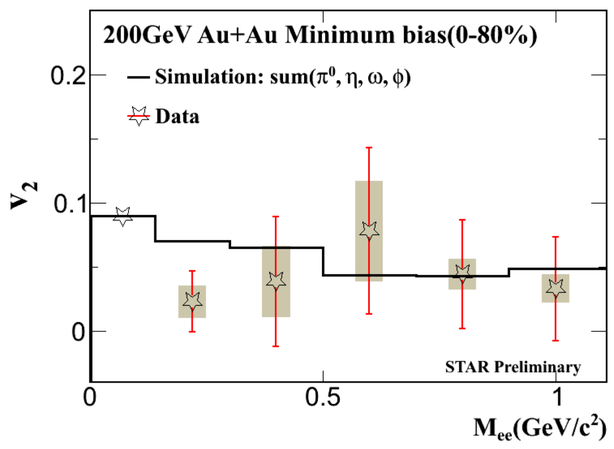


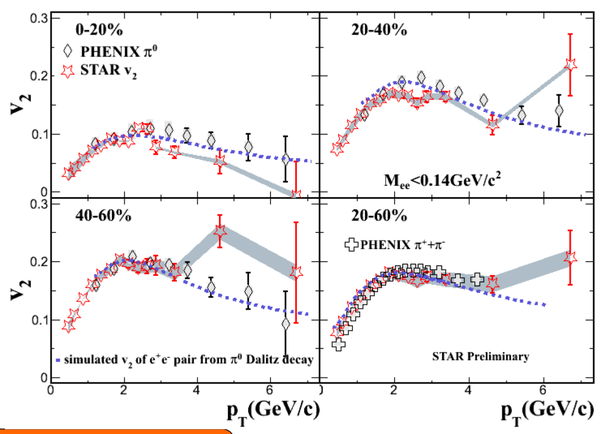


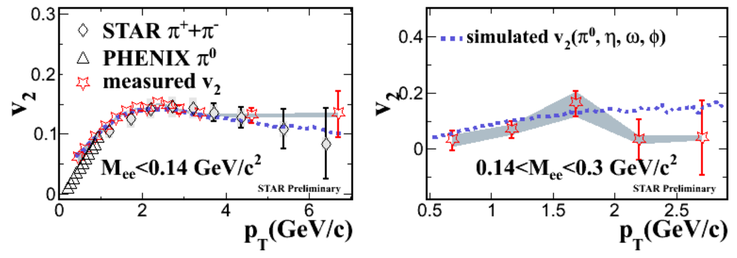


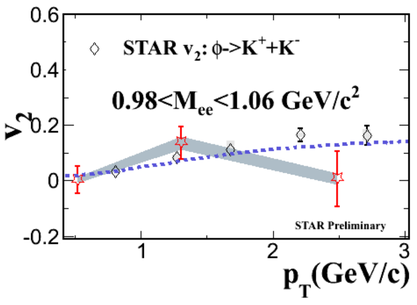
- **Cocktail components : π^0, η, ω, φ**
- **Input:** flat rapidity (-1,1); p_T: Tsallis function; φ:1+2×v_2×cos(2×φ).
- Reconstruct e^+e^- pairs after they decay in the STAR simulators. Same acceptance cuts applied as in data. The total cocktail v_2 and each component contribution (weighted by the yield) are shown.

Results









Conclusions

- **For M_{ee} <1.1 GeV/c^2, the simulated cocktail v_2 are consistent with the measured di-electron v_2 within uncertainties in 0-80% Au+Au collisions at 200 GeV, not only for mass dependence, but also for p_T dependence in each mass bin.**
- **For M_{ee} <0.14 GeV/c^2, the simulated e^+e^- v_2 are consistent with the measured di-electron v_2 in different centralities from 200 GeV Au+Au collisions.**