AVFD Studies for Au+Au and Isobar Collisions

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$\Delta\gamma_{112}$ observable in different systems

200 GeV (AVFD): 30-40%

- Au+Au
- Ru+Ru
- Zr+Zr

(a)

(b)

$\Delta\gamma_{112}\{RP\}$

$\Delta\gamma_{112}\{PP\}$

n_5/s
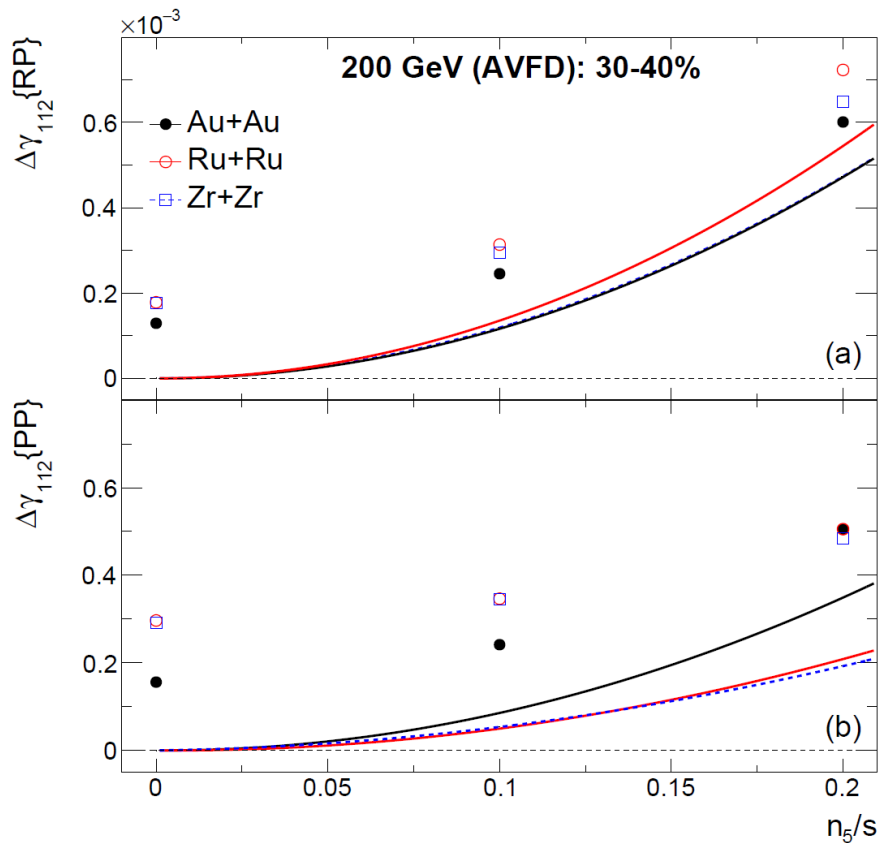
- AVFD events same as those used in the STAR technical paper, arXiv:2105.06044
- True signal illustrated with curves
  - Given by $\Delta\gamma_{112}^{\mathrm{CME}} = \Delta\gamma_{112} - \Delta\gamma_{112}|_{n_5/s=0}$
  - Same as $\frac{1}{2}\left(a_{1,+}^2 + a_{1,-}^2\right) - a_{1,+}a_{1,-}$
- True signal w.r.t. RP is a bit larger in the isobar collisions than Au+Au
  - Although isobar has weaker **B**, the dilution effect ($\propto$ multiplicity) that reduces signal is smaller
    - Can also be seen for background at $n_5/s = 0$
- True signal w.r.t. PP are reduced for both systems
 - This effect is larger for isobars due to smaller system size

Using CME Fraction, f_{CME}
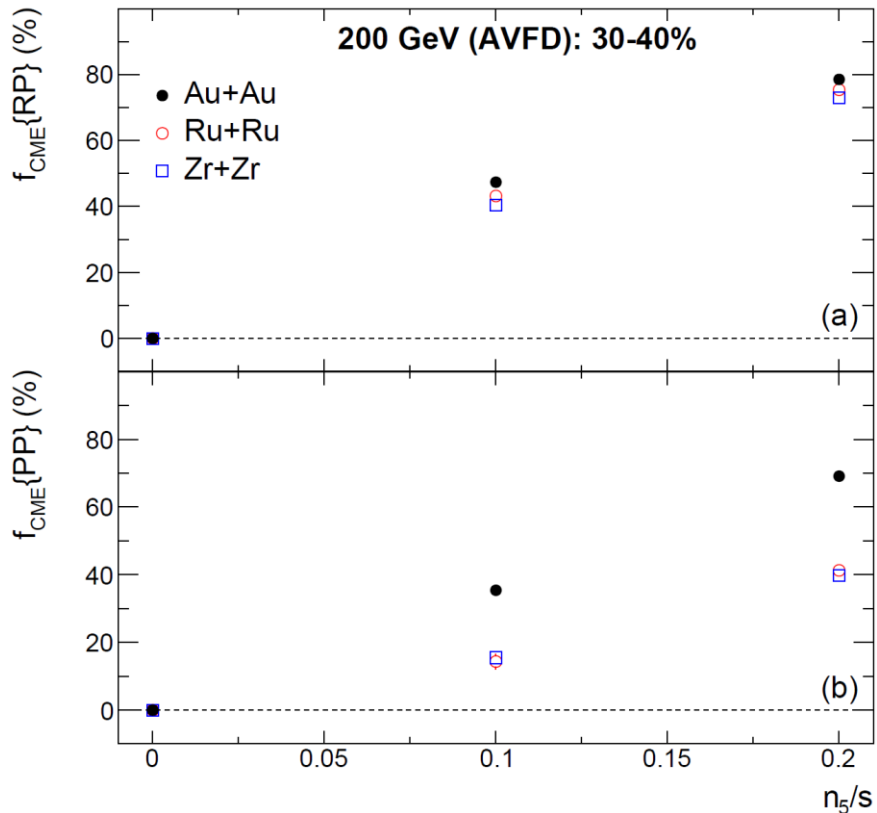
- Use CME fraction to quantify how much of the $\Delta\gamma_{112}$ signal is due to the CME
  - $f_{\mathrm{CME}} = \mathrm{True}/\Delta\gamma_{112}$
- Using RP, the true signal is similar in all systems, but the background is larger in isobars
  - f_{CME} slightly smaller for isobars
- Using PP greatly reduces f_{CME} for the isobars compared to Au+Au
  - Smaller isobaric systems have fluctuations with larger v_2, leading to more background signal
  - PP is less correlated with **B** than RP, and this effect is much stronger in isobar
  - Consistent with the observations in Y. Feng, Y.F. Lin, J. Zhao and F. Wang, Phys. Lett. B 820, 136549 (2021).

Backup

Diagram of Collisions
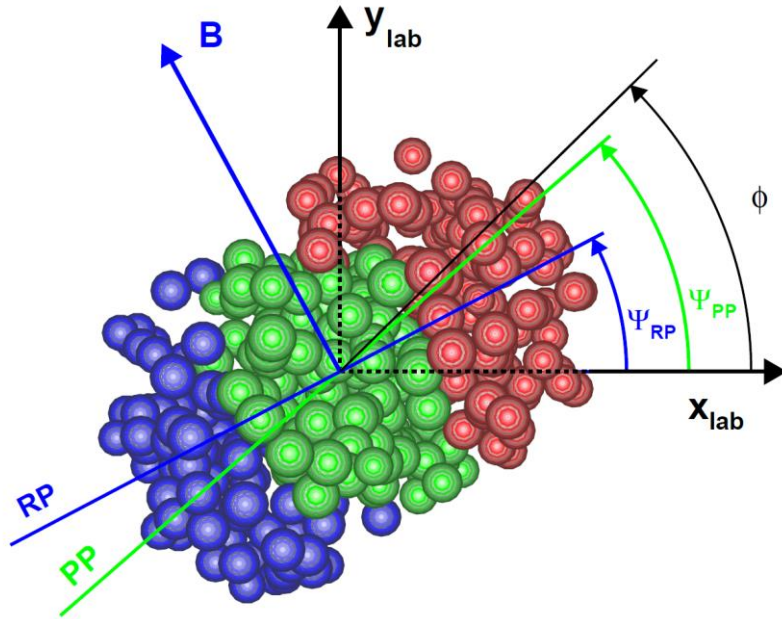
- Magnetic field perpendicular to the RP
  - Generated by incident protons
- Ψ_{RP} approximated by spectator plane in experiment
  - Determined by sideward deflection of spectators (red/blue)
- Ψ_{PP} defined by the initial density distribution of the participants (green)