Shadowing in Glauber Models

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arXiv:1510.01311

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Stages of a Heavy-Ion Collision

- Initial Condition: Generate initial conditions for hydro evolution
- Hydro evolution: EoMs for fields of conserved charges like $T^{\mu\nu}$ etc; require EoS, initial conditions
- Freezeout: the final hydro evolved fields to particles (Cooper Frye,..), hadronic rescattering $\rightarrow$ momentum freezeout

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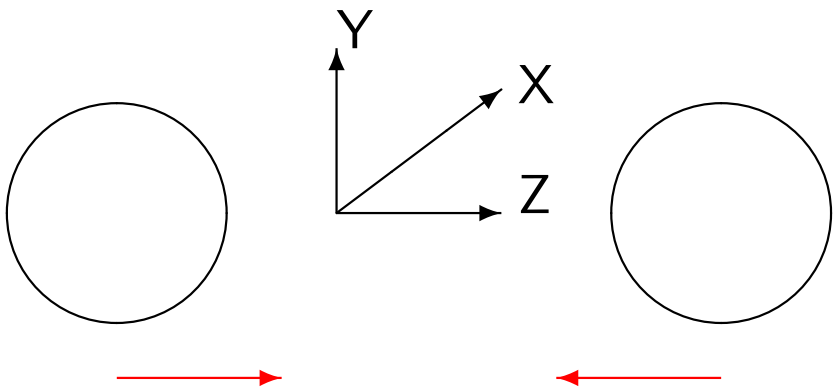
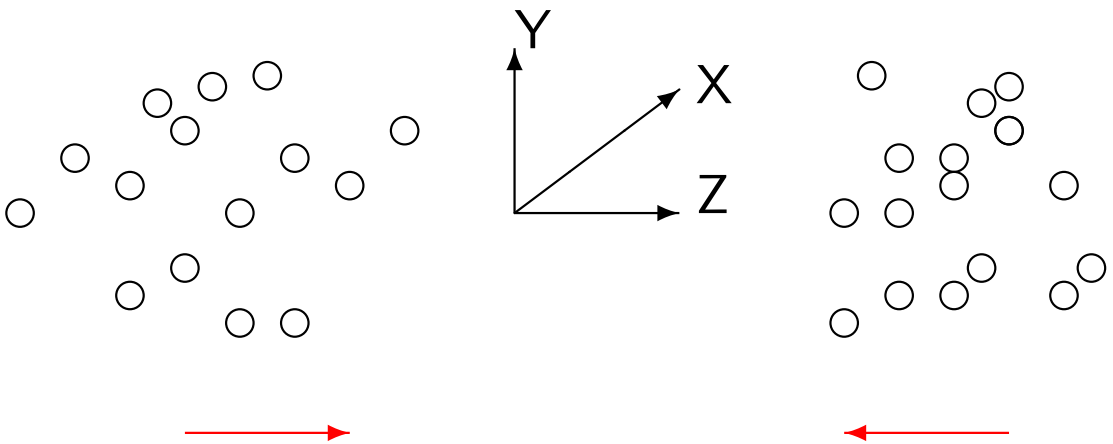
Nucleus-Nucleus Collision



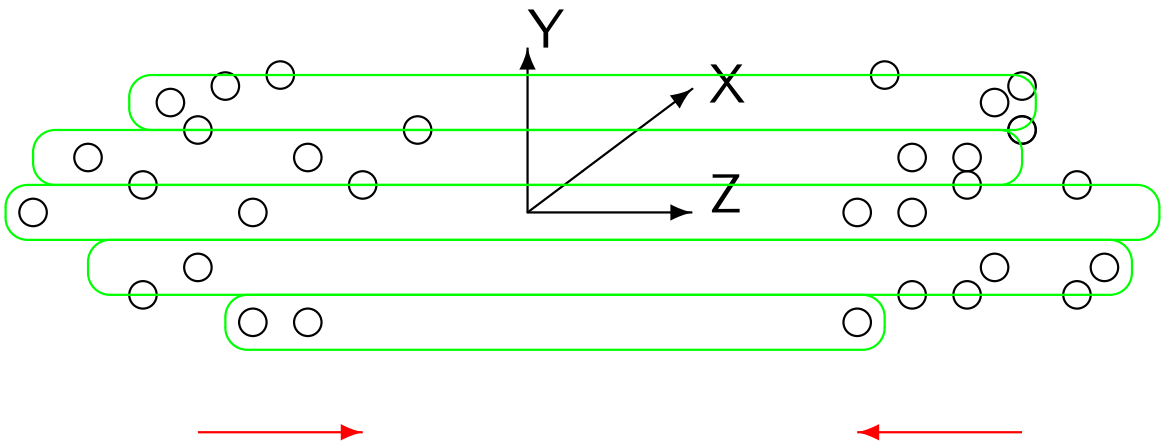
smooth Wood-Saxon profile, by symmetry argument generates only ε_2, can not generate ε_3, ε_4.....

Nucleus-Nucleus Collision: MC Approach



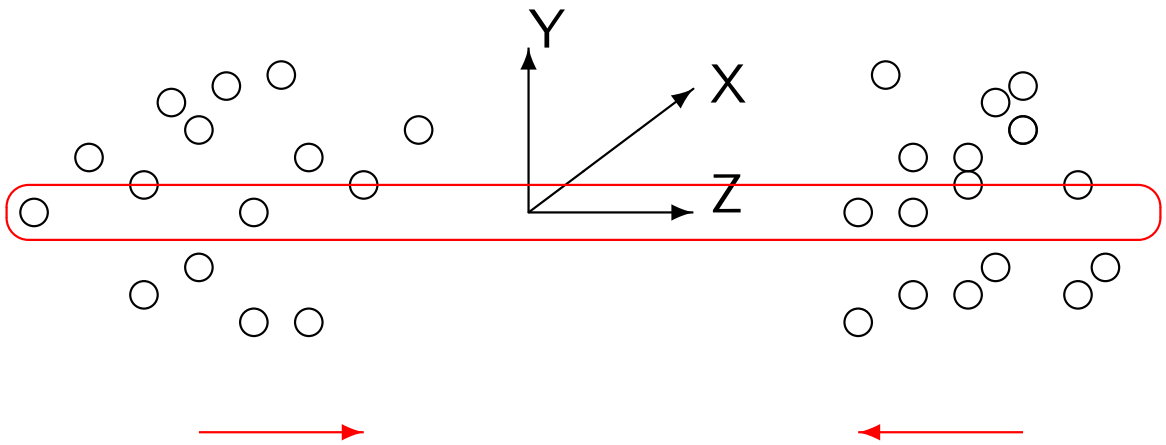
nucleon positions sampled from Wood-Saxon profile, symmetry constraint lifted, can generate higher harmonics ε_3, ε_4...

Energy deposition in the 2 component MC-Glauber Model



Eikonal approximation

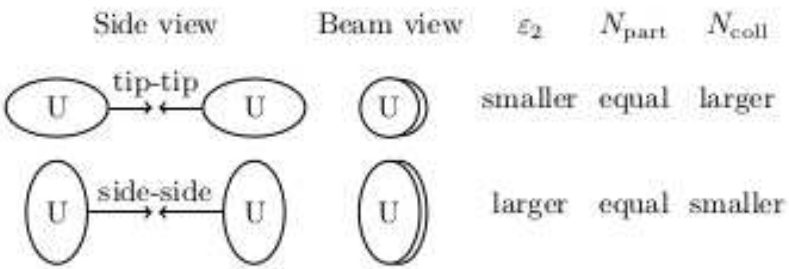
Energy deposition in the 2 component MC-Glauber Model



Receives contribution from no. of participants + no. of binary collisions:

$$\epsilon(x,y) = \epsilon_0 \left[\left(\frac{1-f}{2} \right) N_{part}(x,y) + f N_{coll}(x,y) \right]$$

MCGM: Knee in ε_2 vs dN_{ch}/dy of U+U



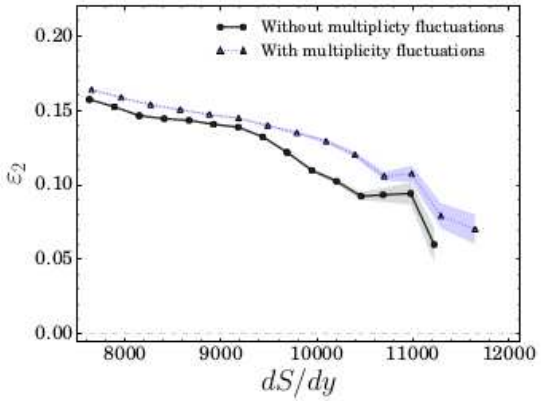
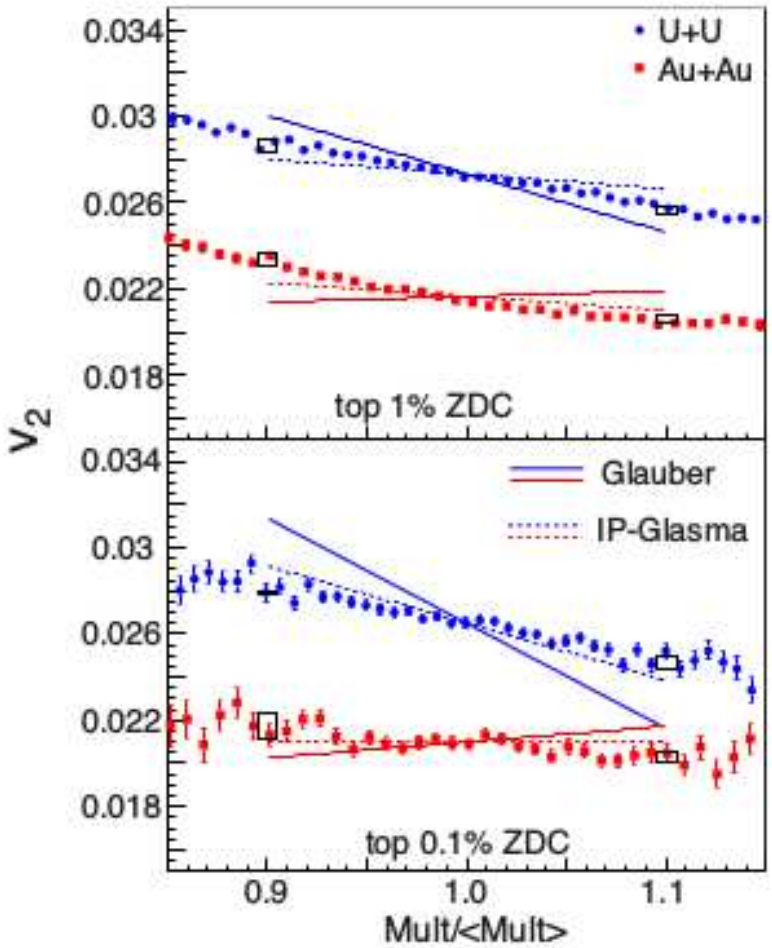


Figure 2. The ellipticity ε_2 as a function of dS/dy from the

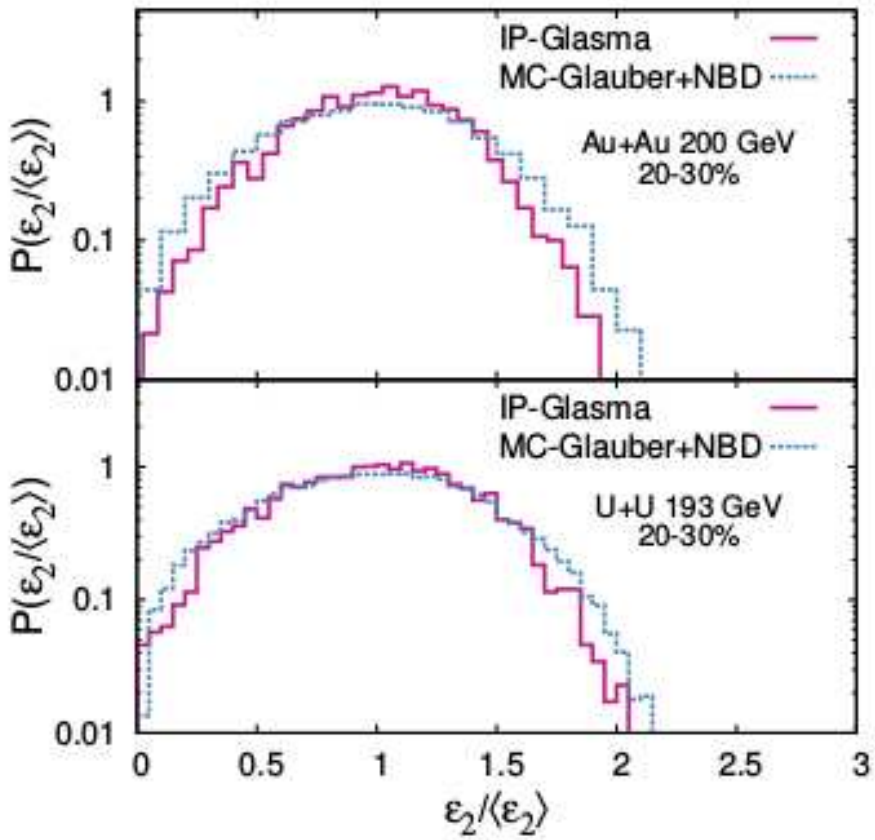
Moreland, Bernhard, Bass: 1412.4708
Goldschmidt, Qiu, Shen, Heinz: 1507.0391

MCGM: Strong anti-correlation in ε_2 vs dN_{ch}/dy of U+U for top ZDC events



STAR Collaboration: 1505.07812

MCGM: Broader event by event distribution of ε_2



Schenke, Tribedy, Venugopalan: 1403.2232

Summarising the observations so far

- MCGM predicts in U+U: knee in ε_2 vs dN_{ch}/dy, strong anti-correlation in ε_2 vs dN_{ch}/dy in top ZDC events. These features have not been found in data.
- MCGM predicts broader event by event distribution in ε_2 compared to models based on gluon saturation physics.

Looking for a solution

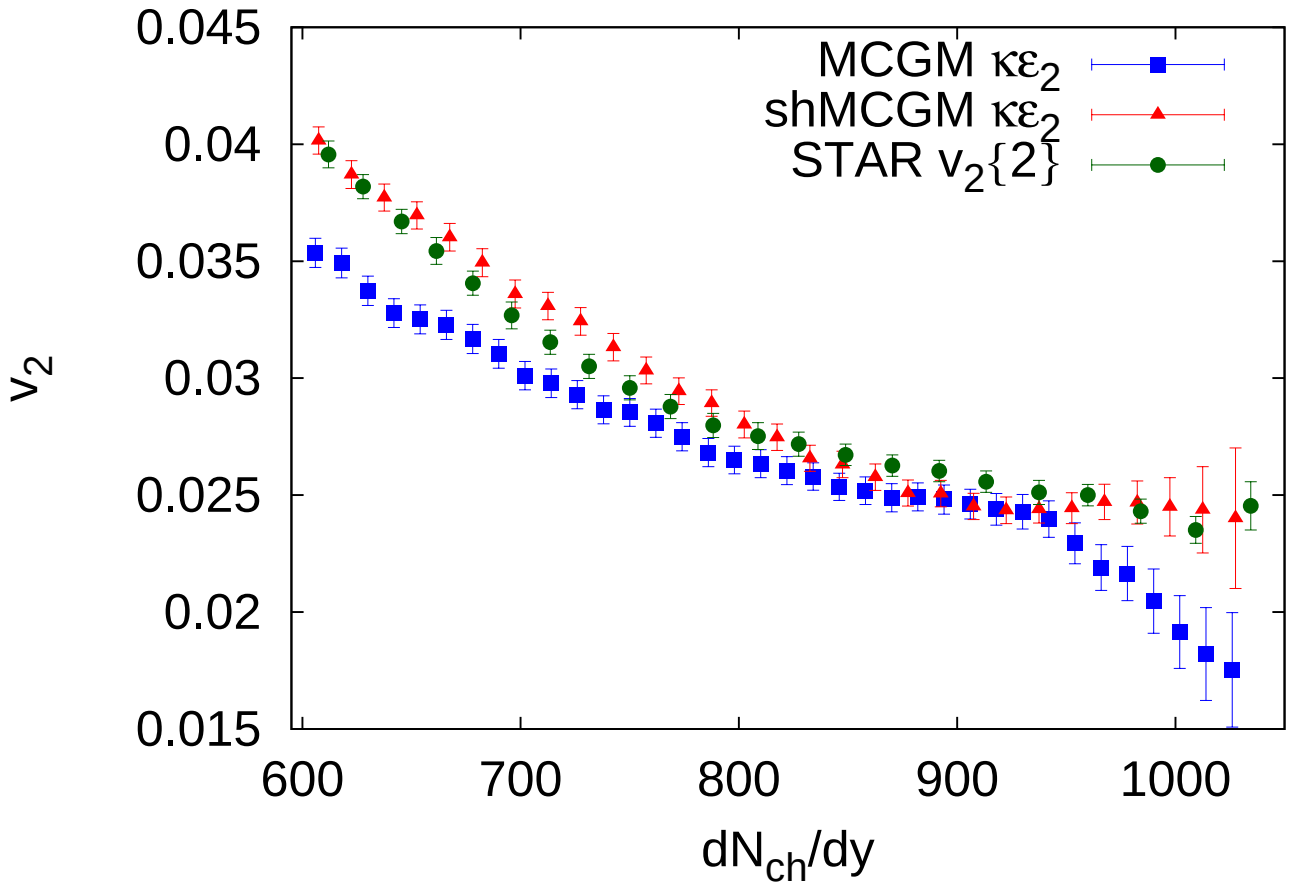
Looking for a solution

Looking for a solution: Shadowing

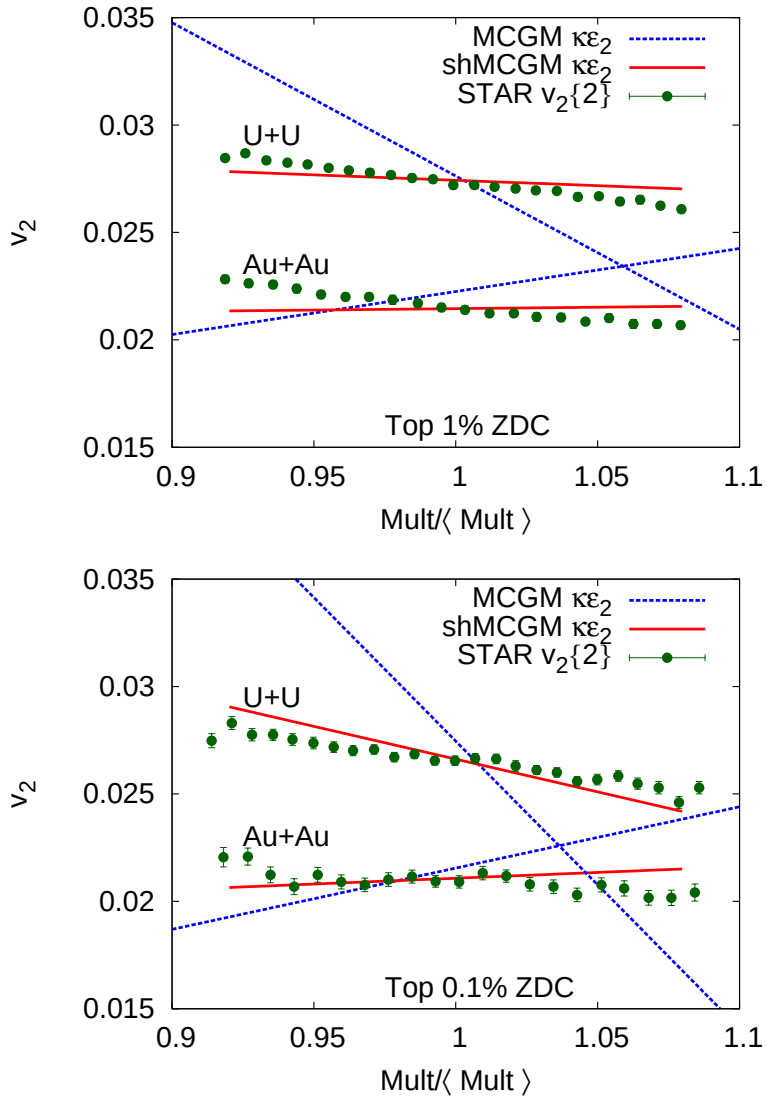
Consequences

- $N_{part}^{sh} \simeq \left(1 - \frac{(N-1)}{2}\lambda\right) N_{part}$
- $N_{coll}^{sh} \simeq (1 - (N-1)\,\lambda)\, N_{coll}$
- $\delta N_X^{sh} \simeq (1 - N\lambda)\, \delta N_X$ where $N_X = (N_{part}, N_{coll})$.

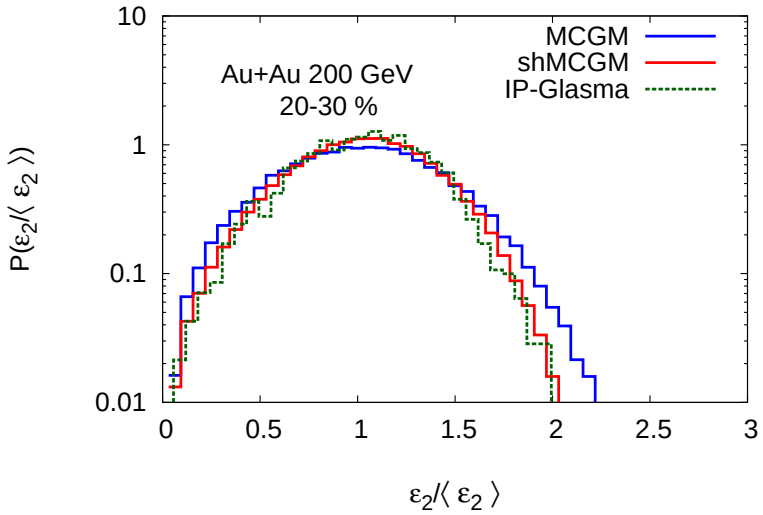
shMCGM: Knee removed

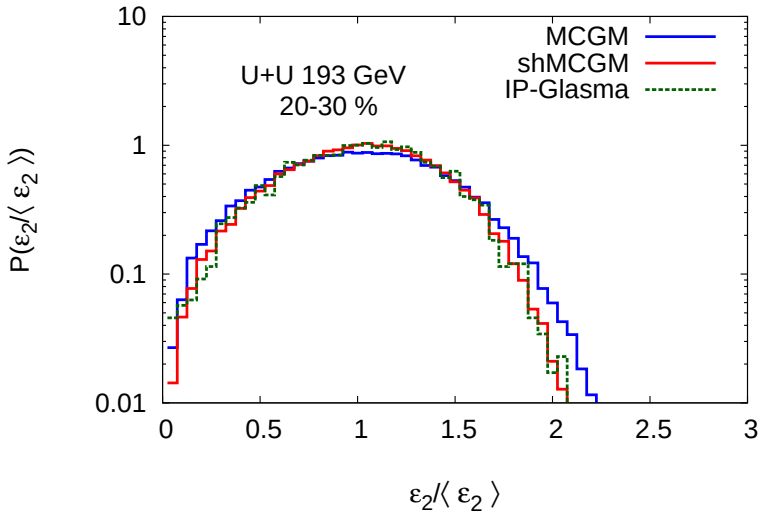


shMCGM: Agreement in top ZDC events



shMCGM: Agreement in Event by Event ε_2





THANK YOU