Quenching with Hydro

A study of Jet Quenching properties using JEWEL *framework coupled with* v − USPhydro *for hydrodynamic simulation along with* T$_{\mathrm{R}}$ENTo *initial conditions*

HEPIC - Instituto de Física da USP

Fabio Canedo Marcelo G Munhoz
J Noronha-Hostler J Noronha
Caio Prado

11 de setembro de 2019

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   - Jet Quenching
   - Initial conditions
   - Medium Evolution
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   - Jet Observables
   - Thermal Subtraction
3. Results
   - Shape
   - v_2
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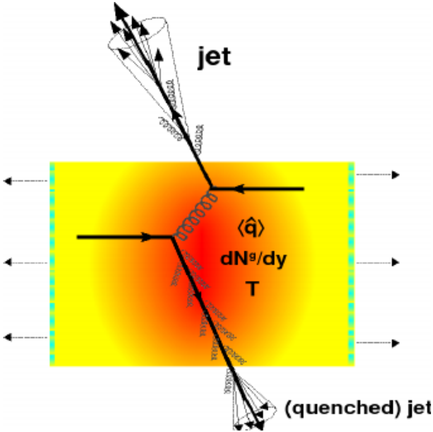

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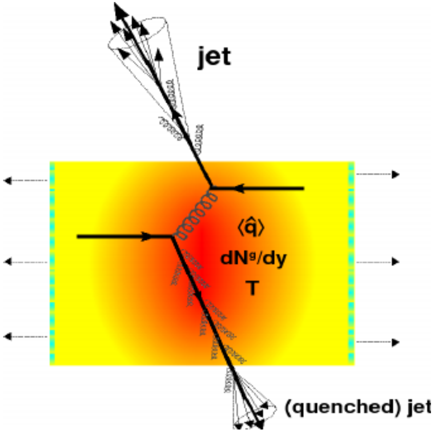
Study Jet Quenching on a realistic enviroment.



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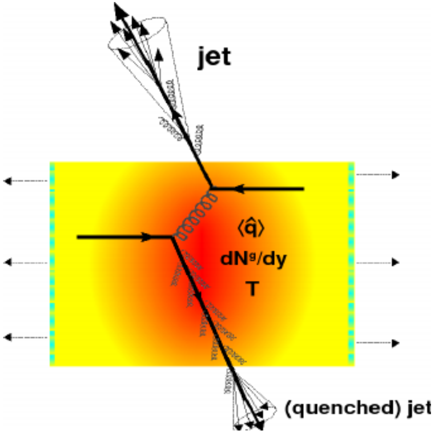

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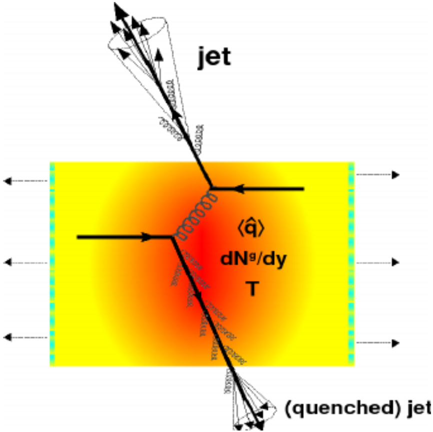

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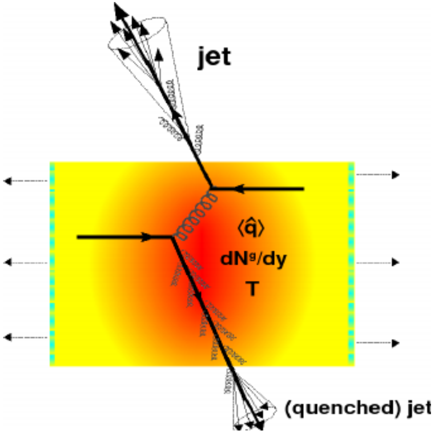

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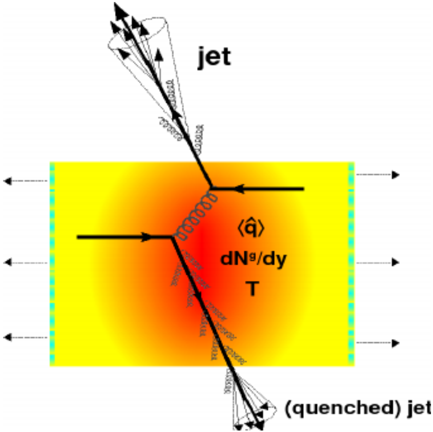

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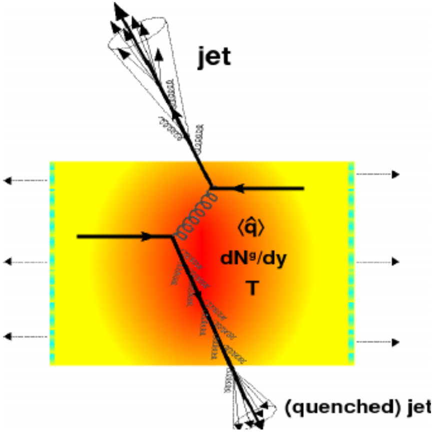

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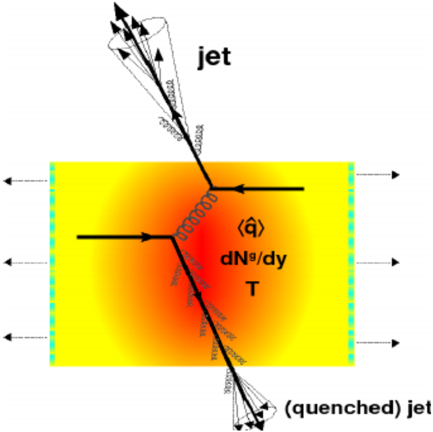

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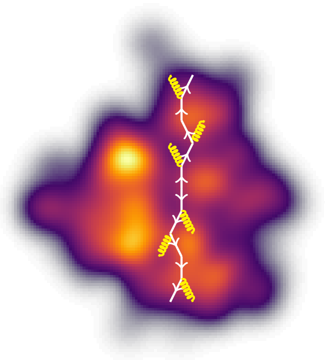
Must be able to make differential predictions



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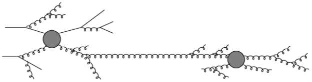

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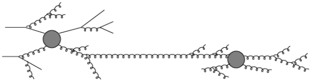

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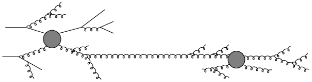

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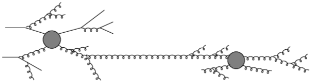

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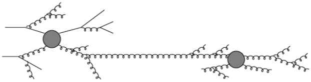
- Perturbative and minimal in assumptions;
- Allows differential and geometric treatment(jet shape);



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Default

Smooth Glauber[1]

$$n(b,x,y) = T_A(x-\frac{b}{2},y)\left(1-\exp\left(-\sigma_{NN}T_B(x+\frac{b}{2},y)\right)\right) + T_B(x+\frac{b}{2},y)\left(1-\exp\left(-\sigma_{NN}T_A(x-\frac{b}{2},y)\right)\right)$$

[1] JEWEL Default

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$$+\,T_B(x+\frac{b}{2},y)\left(1-\exp\left(-\sigma_{NN}T_A(x-\frac{b}{2},y)\right)\right)$$

Where:

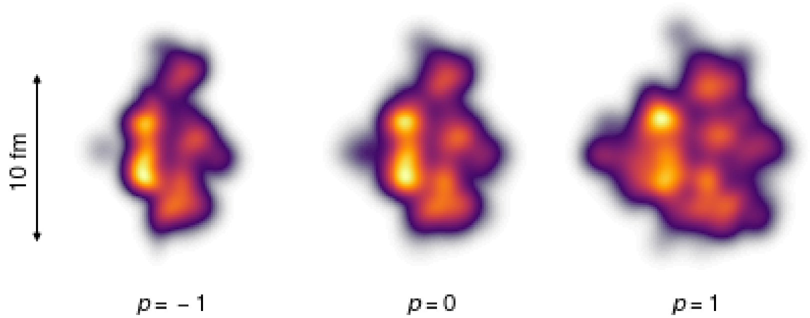
$$T(x,y) = \int dz\rho(x,y,z)$$

And ρ is the Woods-Saxon potential.

[1] JEWEL Default

TRENTo

TRENTo [a]



[a] arXiv:1412.4708 [nucl-th]

TRENTo

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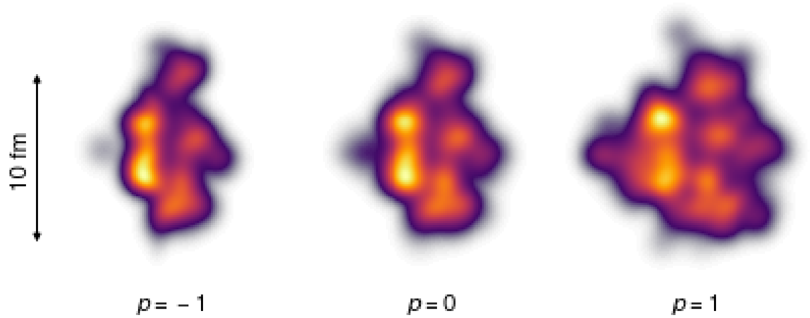
- parametric model based on Glauber;



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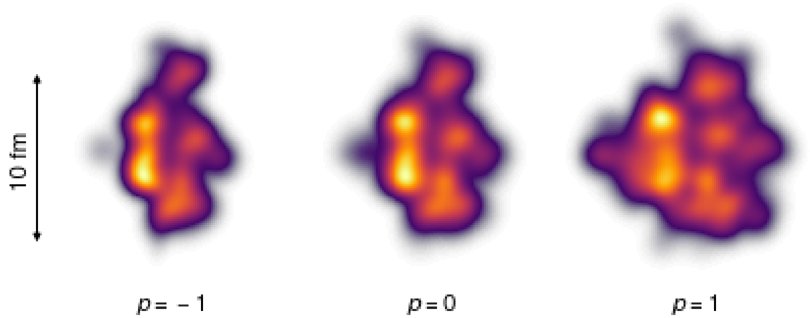
TRENTo

TRENTo[a]

- parametric model based on Glauber;
- includes fluctuations event-by-event;



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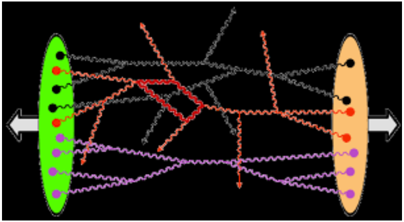
MC-KLN

MK-KLN[a]

Based on CGC with kt factorization



[a] arXiv:0707.0249 [nucl-th]

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Bjorken

A variant of the Bjorken model is used. The (proper)time dependence is given by

$$\epsilon(x, y, b, \tau) = \epsilon(x, y, b, \tau_i) \left(\frac{\tau}{\tau_i}\right)^{-4/3}$$

and

$$T(x, y, b, \tau) \propto \epsilon^{1/4}(x, y, b, \tau_i) \left(\frac{\tau}{\tau_i}\right)^{-1/3}$$

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v-USPhydro

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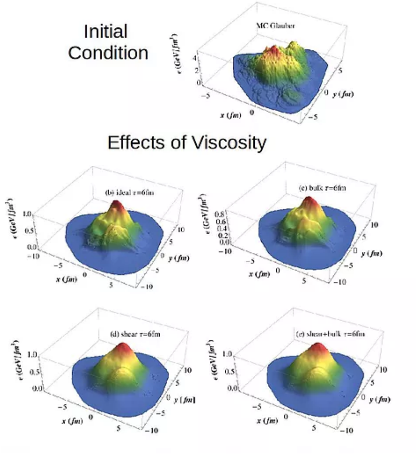

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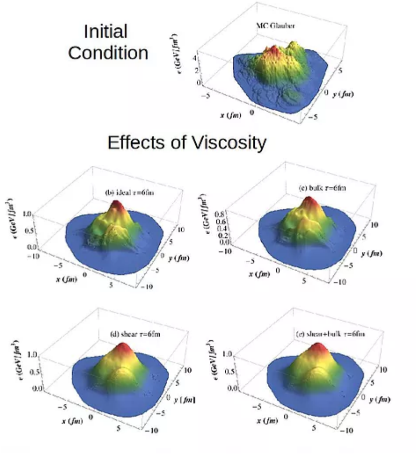

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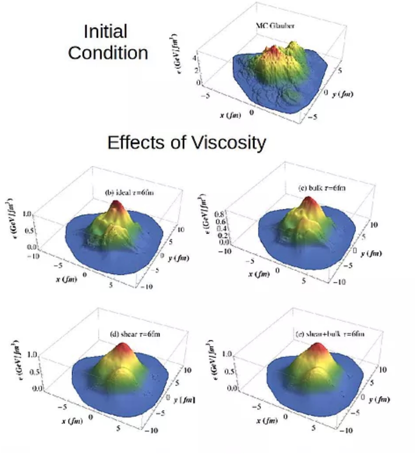

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- both shear viscosity($\frac{\eta}{s} = 0.1$);

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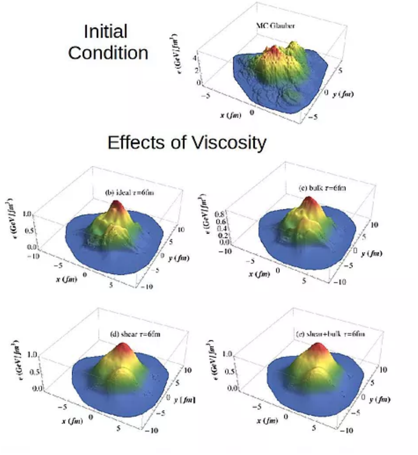

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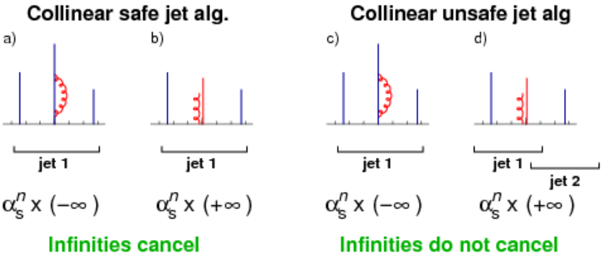

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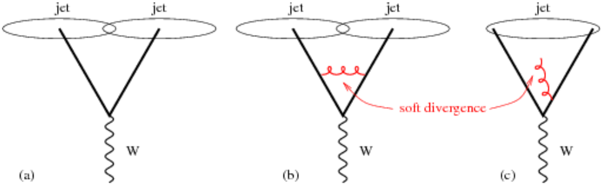

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Anti-kt

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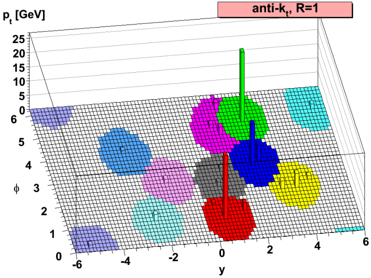

Anti-kt

Based on a two particle distance;

$$d_{ij} = \min({p_t}_i^{-2}, {p_t}_j^{-2})\Delta \mathrm{R}_{\mathrm{ij}}$$

$$d_i = {p_t}_i^{-2}\Delta \mathrm{R}_{\mathrm{iB}}$$

Where:

$$\Delta \mathrm{R} = \sqrt{\Delta\phi^2 + \Delta\eta^2}$$

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- Mass;

$$M_{jet} = {p_{jet}}^{\mu} {p_{jet}}_{\mu}$$

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The observables chosen were the following:

- Mass;
- Girth;

$$g = \frac{\sum_i p_i^T \Delta R_i}{p_J^T}$$

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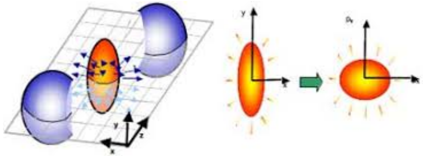

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4 Moment Subtraction: Thermal momenta $\longrightarrow$ ghost particles

Particles close enough to these ghost particles are classified as thermal momenta. 4 thermal momenta summed up and subtracted from the observable.

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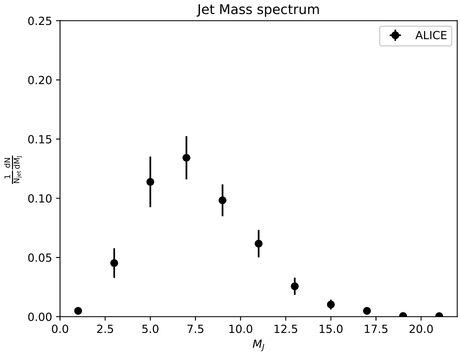

anti-kt $R = 0.4$
$|\eta| < 0.8$
$40\,\mathrm{GeV/c} < p_T < 60\,\mathrm{GeV/c}$

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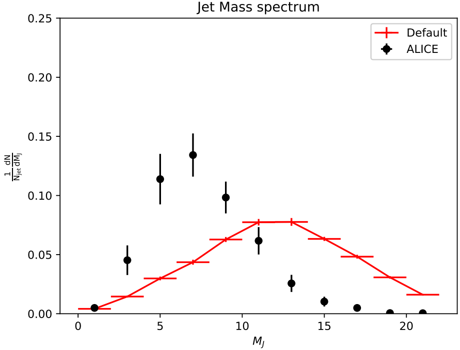

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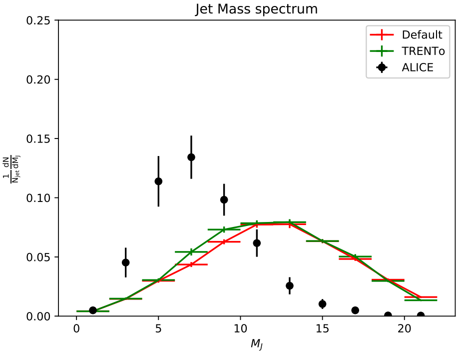

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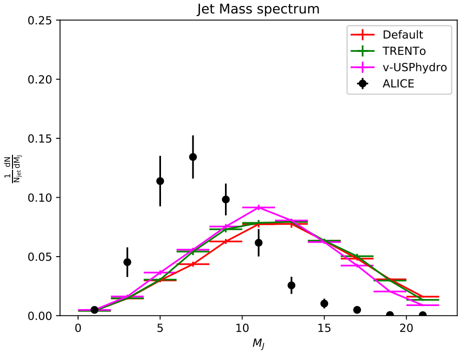

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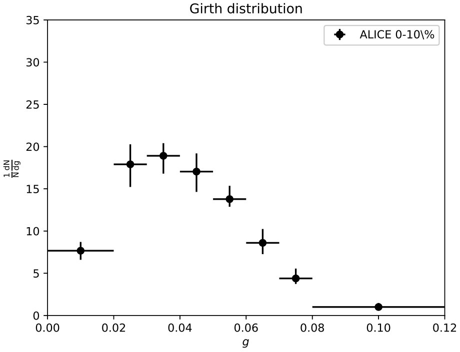

PbPb $\sqrt{s_{NN}} = 2.76\,\mathrm{TeV}$
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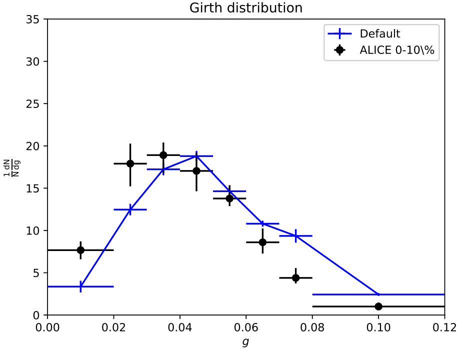

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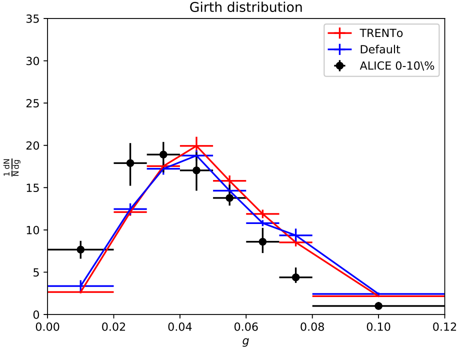

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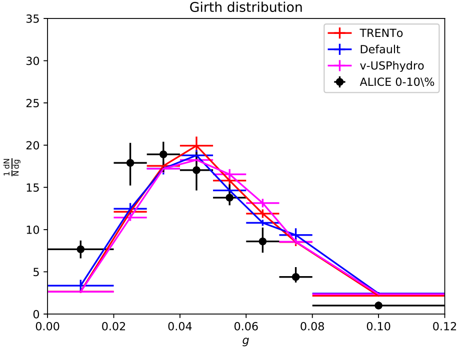

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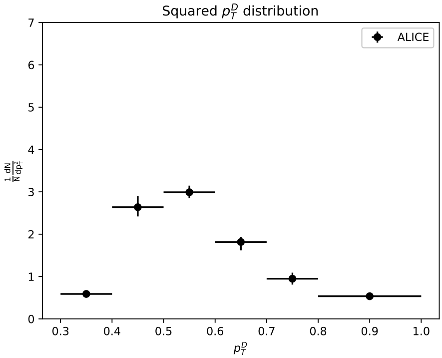

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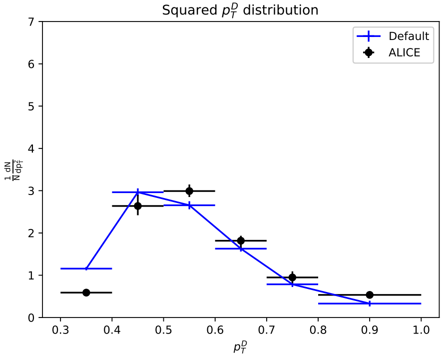

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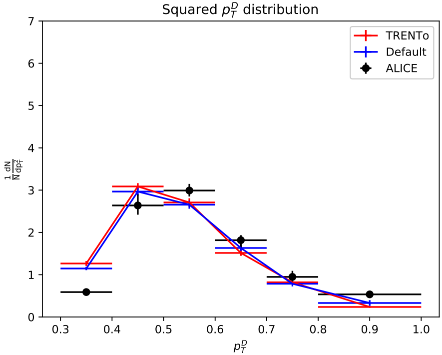

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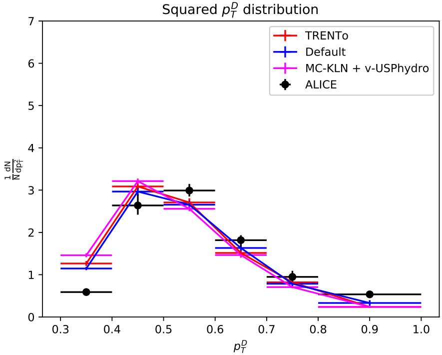
Dispersion



PbPb 0-10%

$\sqrt{s_{NN}} = 2.76\mathrm{TeV}$ anti-kt

$R = 0.2$

$|\eta| < 0.8$

$40\,\mathrm{GeV/c} < \mathrm{p_T} < 60\,\mathrm{GeV/c}$

$$p_D^T = \frac{\sqrt{\sum_i {p_i^T}^2}}{p_J^T}$$

Content

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- Jet Quenching
- Initial conditions
- Medium Evolution

2 Methods
- Jet Algorithm
- Jet Observables
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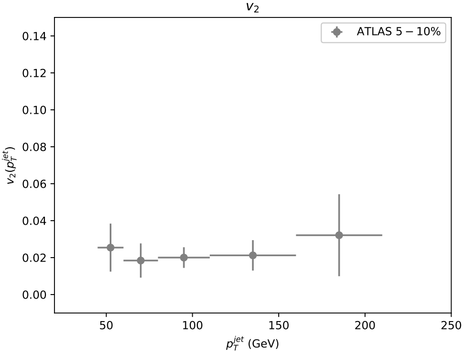
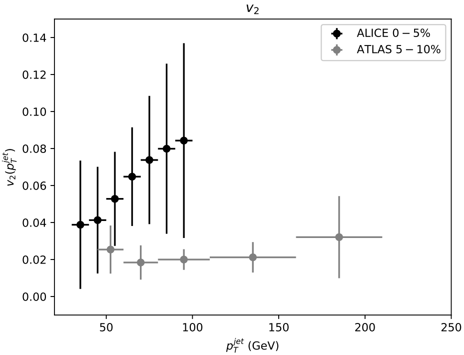
4 Conclusions and Outlook

v_2



PbPb $\sqrt{s_{NN}} = 2.76\,\mathrm{TeV}$
anti-kt $R = 0.4$
$|\eta| < 0.8$

v_2



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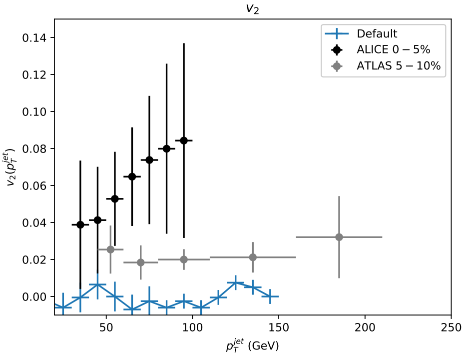

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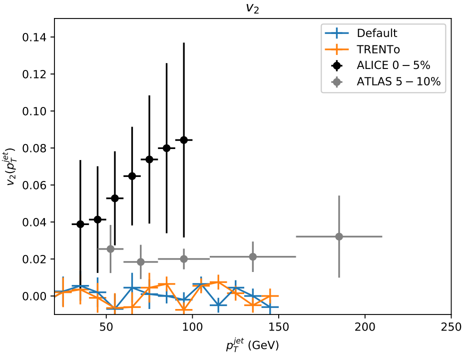
v_2



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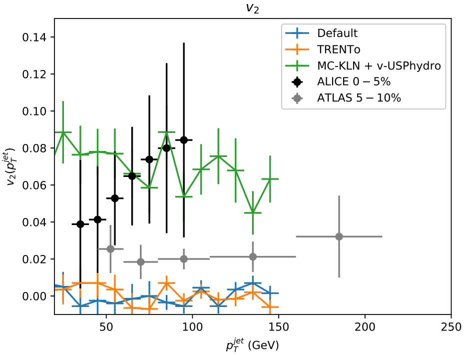

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- Observables that look at event-by-event fluctuations might give further constraint both on hydro models and on the Jet Quenching models themselves;
- In the future, more systematic studies will be done;
- Determine which observables depend on which specific features of the hydro and initial conditions models;

Thanks!