

Track 3:

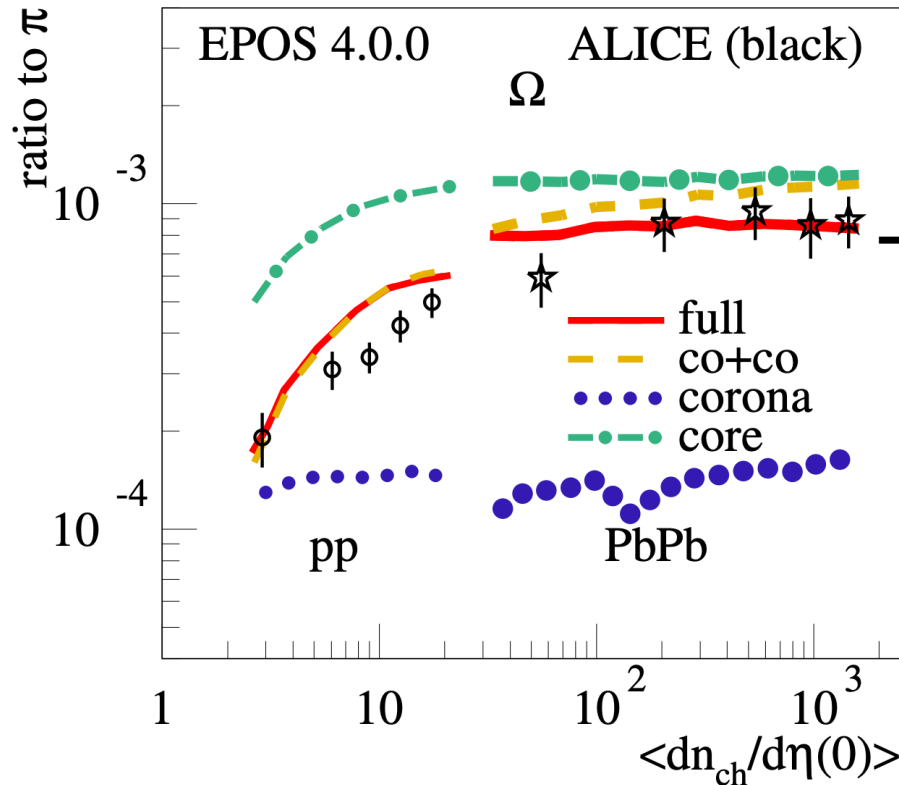
# Event properties and hydro in small and large systems



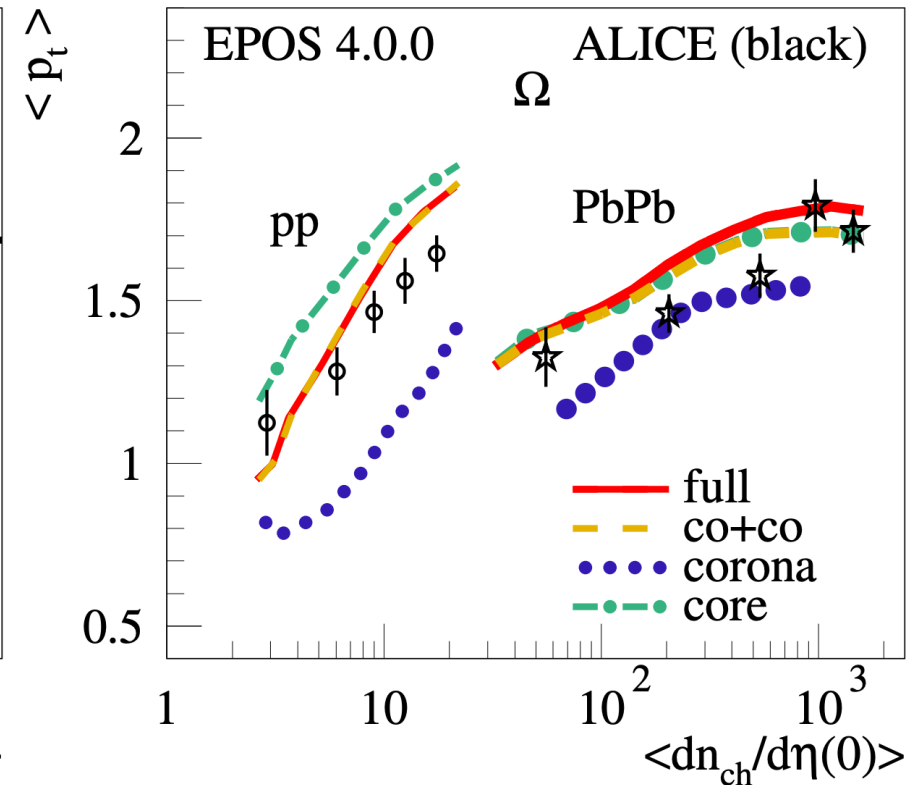
# EPOS4: a full general purpose event generator to do multi-observable analysis

Klaus Werner ([talk](#))

continuous curve



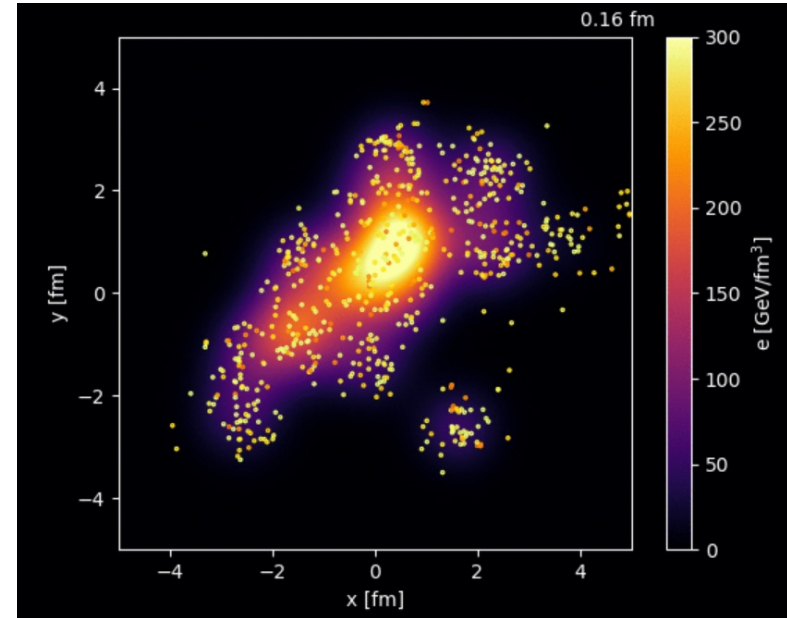
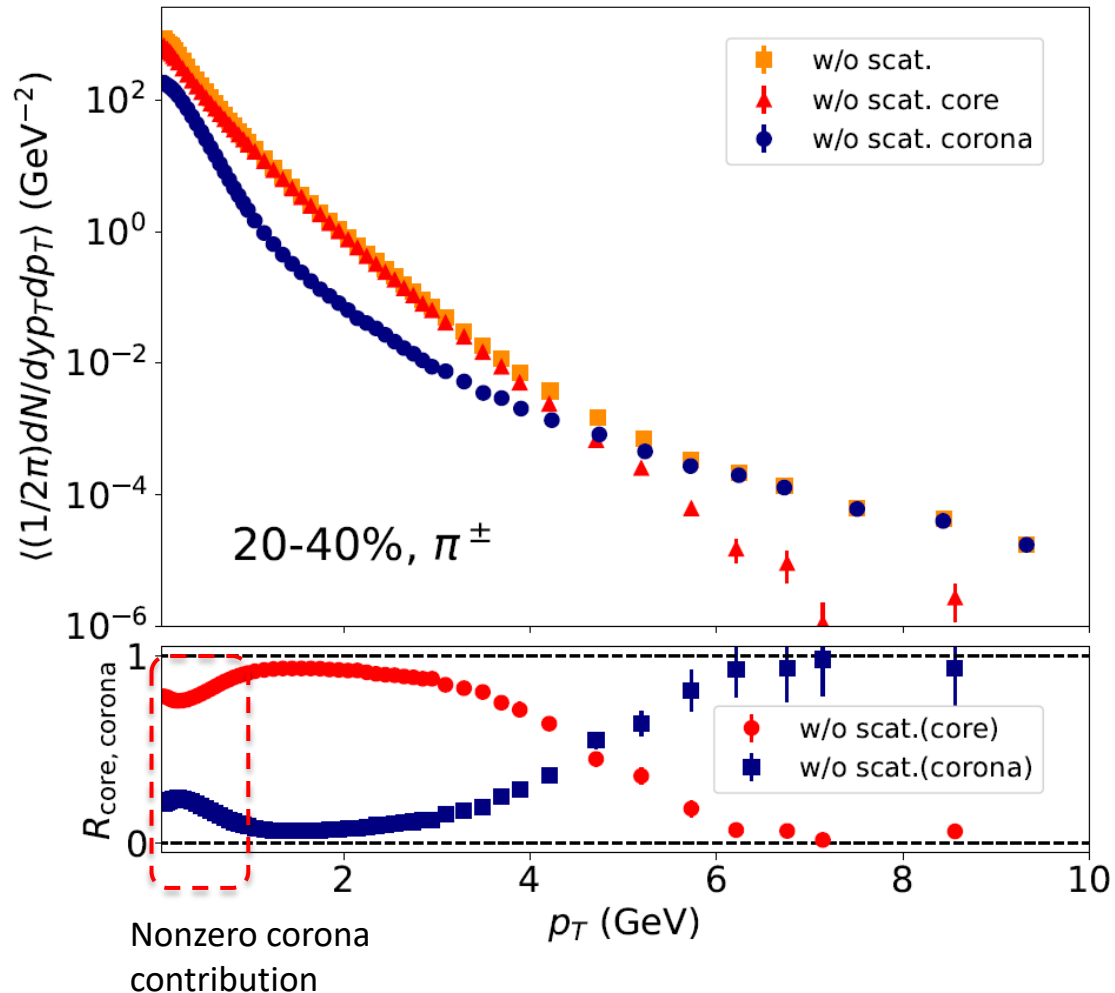
jump



- Pervasive statement: important to do [multi-observable comparison](#)!
- Core-corona description able to [describe hadrochemistry and kinematics across systems](#)
- Even low-multiplicity pp isn't pure corona! Perhaps more consistent with  $e^+e^-$  expectation?

# Interplay between equilibrated and non-equilibrated components with dynamical initialization framework

Yuuka Kanakubo ([talk](#))

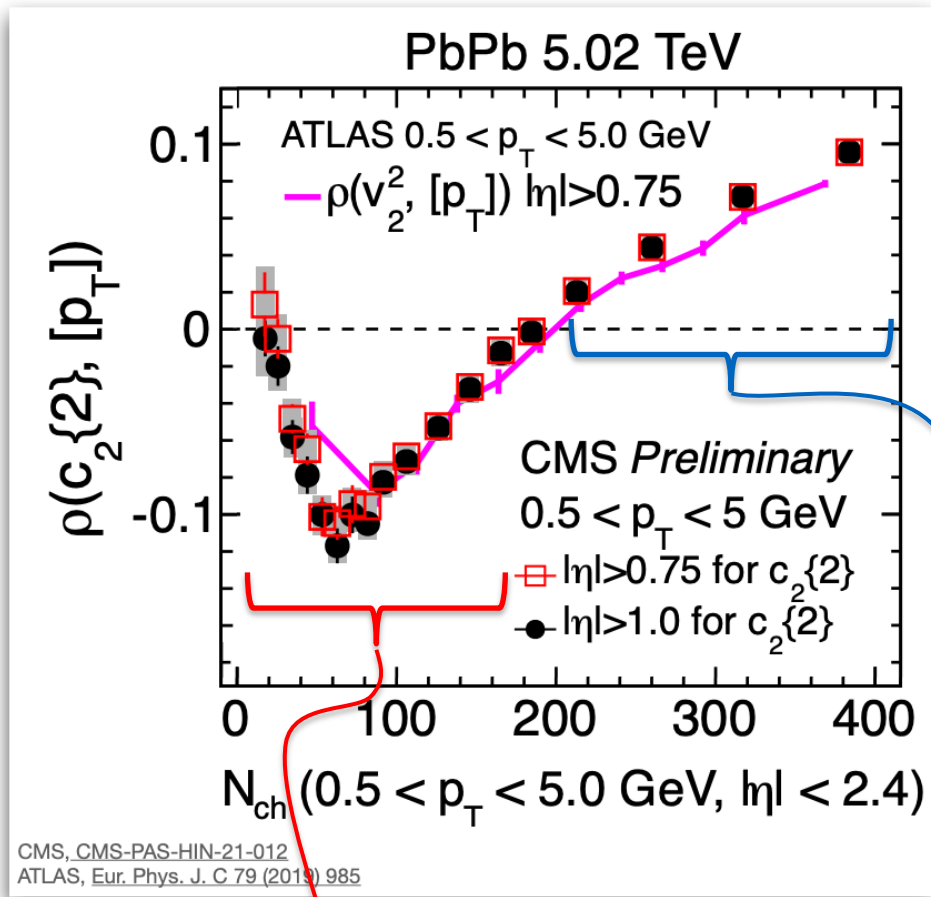


- Equilibrated versus non-equilibrated components: core-corona at work describing spectra
- Can we agree that the core-corona approach is general?
  - **Yes:** different densities present different behaviours
  - **No:** any clear two-phase division is artificial



# Insights into the evolution of hadronic collisions with flow observables

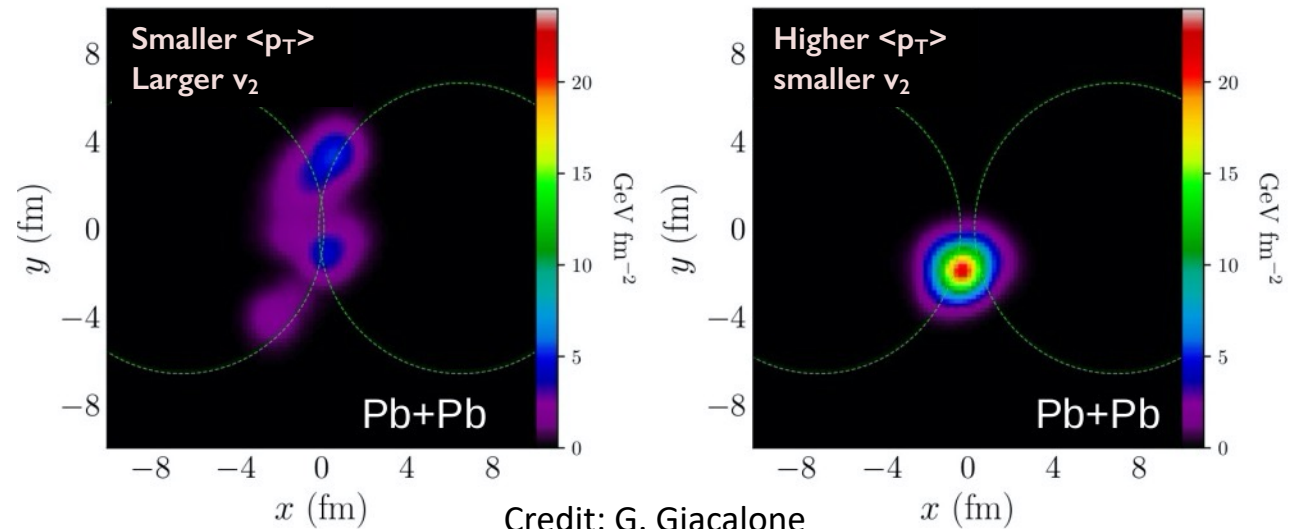
Vytautas Vislavicius ([talk](#))



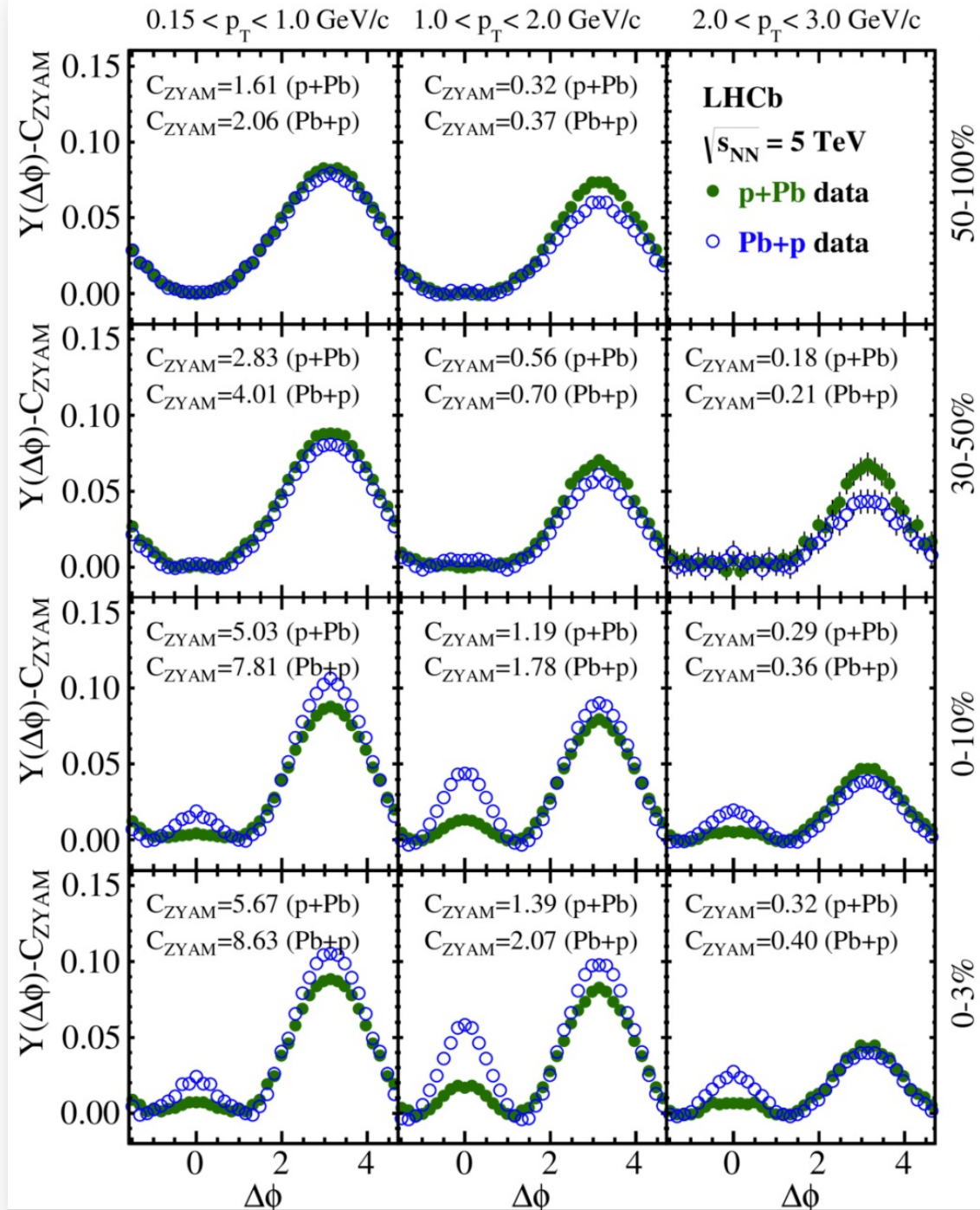
Smaller  $\langle p_T \rangle$   
Higher anisotropy

Higher  $\langle p_T \rangle$   
Higher anisotropy

- Beyond simple  $v_n$ s: correlation between quantities can tell us clues about the origin of phenomena!



- Discussion:** correlations with momentum and rapidity may be quite revealing, especially in small systems
  - Local versus non-local fluctuations – especially in rapidity! – could pinpoint origin of collectivity signatures: initial state versus built up in system



# Correlations and collectivity at LHCb

Jiayin Sun (talk)

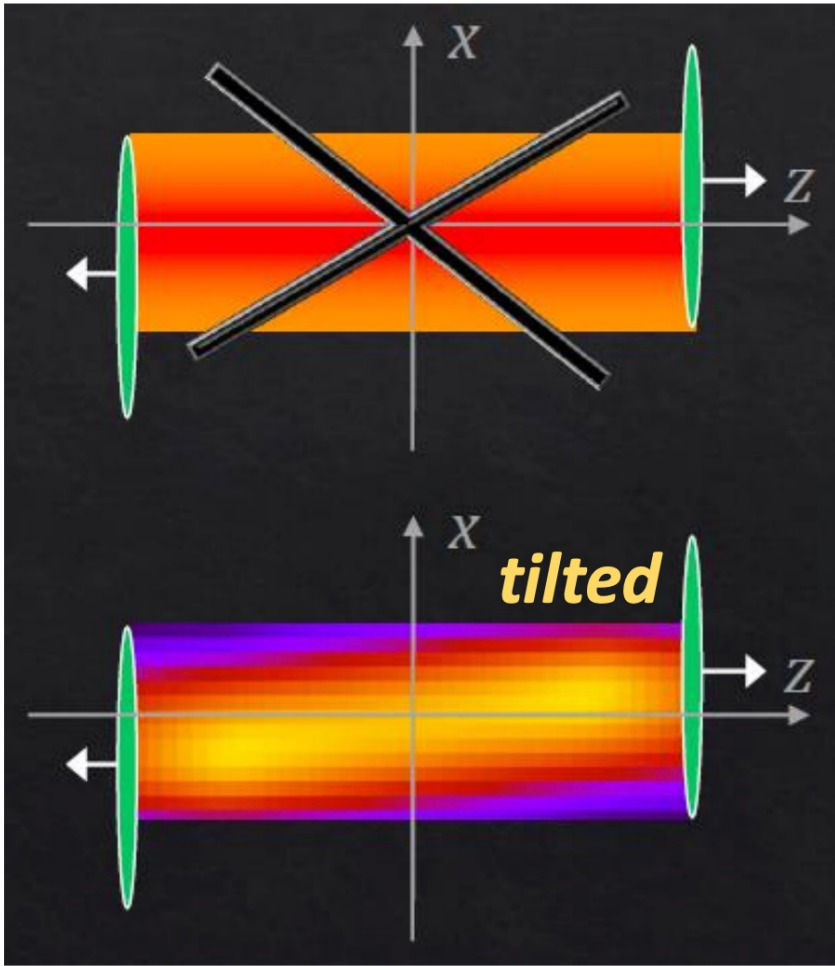
- Rapidity information is in fact accessible:
  - LHCb joins the game!
  - Rapidity dependence of long-range correlations visible
  - Non-boost-invariant models required for proper description

- **After upgrade in Run3:**
  - Up to 30% in PbPb collisions
  - System size study with SMOG2 data
    - High statistics
    - With heavy flavor

- Potentially still interesting: backwards/midrapidity/forward correlations require same detector
- Realm in which projects such as ALICE 3 could help

# Beyond simple elliptical flow: directed flow versus rapidity and others

From S. Plumari's [talk](#)

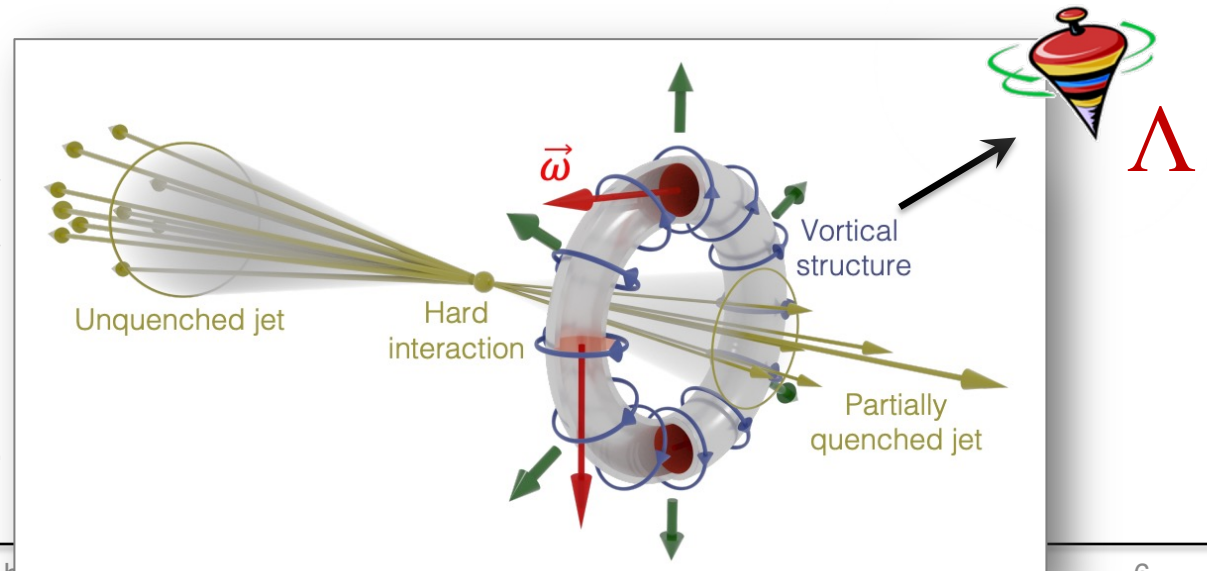


Collectivity manifests itself in multiple ways!

→ **it's also important to explore different directions**

- **Elliptic and triangular flow** → the 'default' approach, sure!
- **directed flow versus rapidity**
  - Is in [models in which the initial condition is modeled in 'realistic' ways](#)
  - Could exist also in core-corona implementations, to be checked
- **Polarization due to medium vorticity**
  - Exists due to system anisotropy as well as energy and momentum lost in interactions with the medium

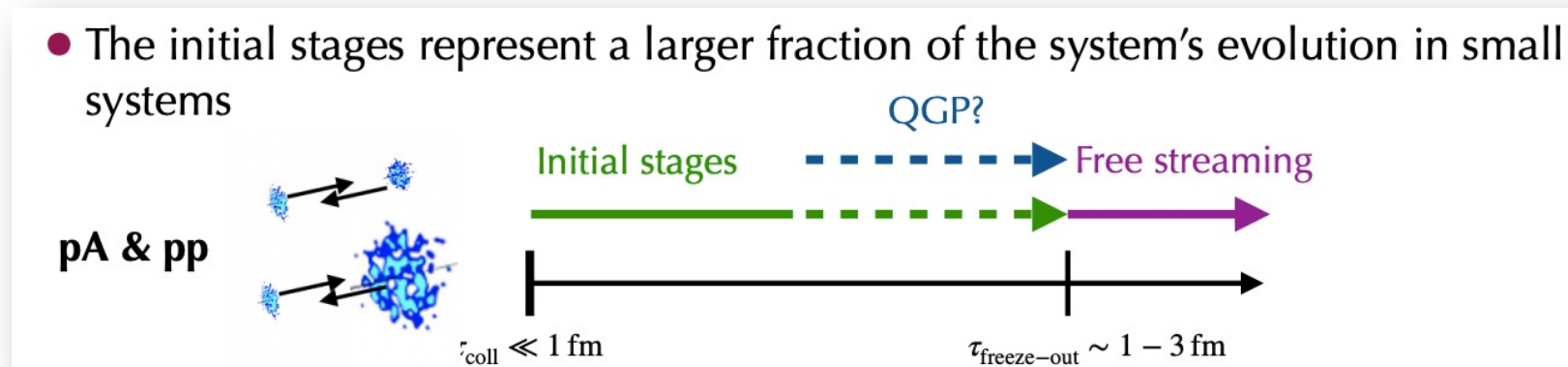
Phys. Lett. B 820 (2021) 136500



# Energy loss and collectivity

- Deposited energy has to lead to some measure-able effect: “jet recoil”
- **role of system size vs density** (proton-proton collisions are small and dense, peripheral AA: larger, less dense)
  - Can we find [signatures of collectivity created via energy loss](#)? → fundamental to define momentum scale
  - Opportunities [with p-O, O-O collisions](#) as well as with [binary-scaling-free observables such as  \$I\_{AA}\$](#)
- **Time dependence of energy loss**: data favors no loss in early times!
  - Possibly related to [lack of energy loss in small systems](#)
  - But [collectivity still present](#): need to create complete picture

From Carlota's [talk](#)





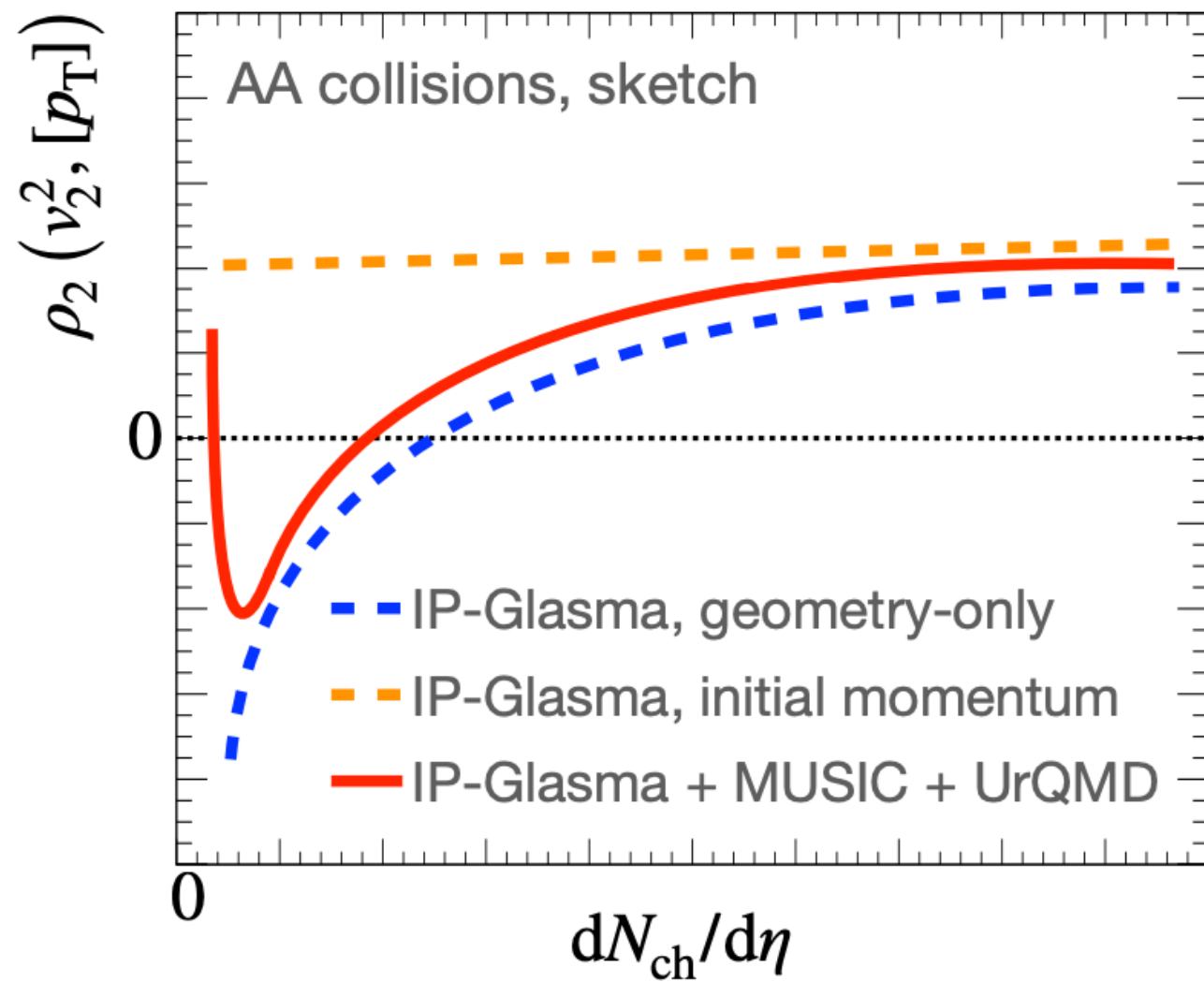


# Thank you!

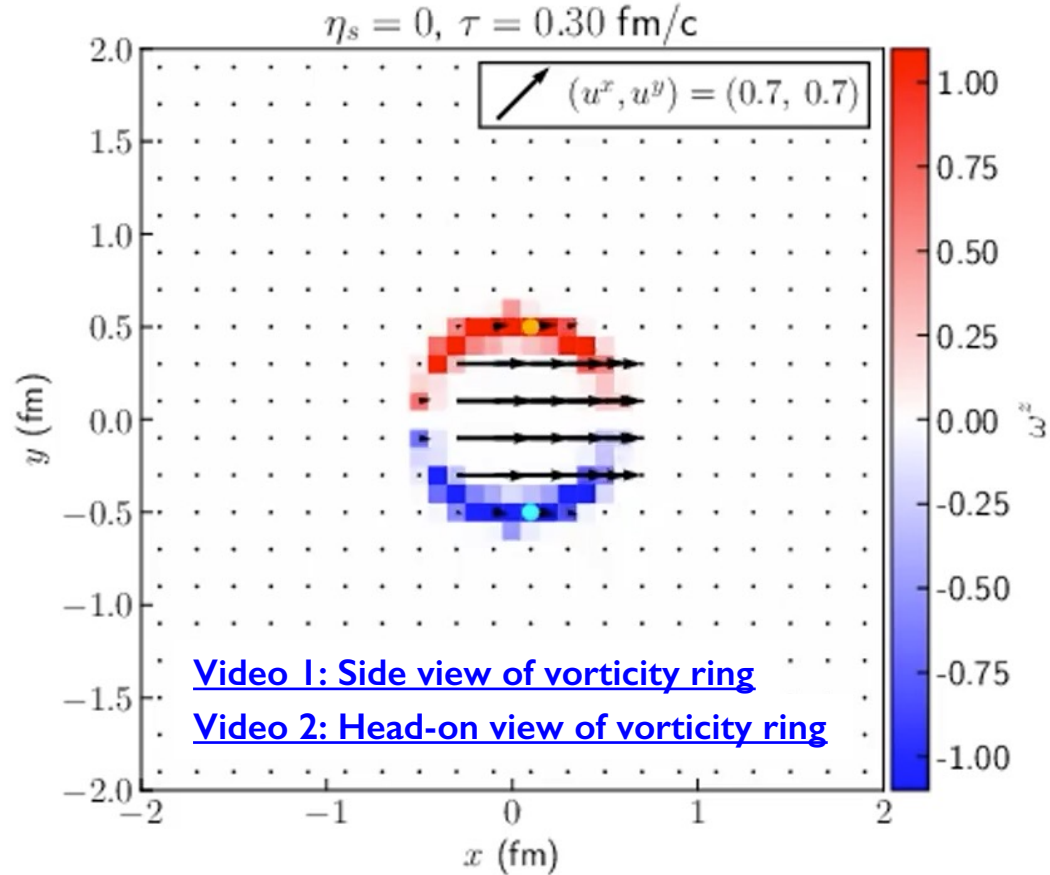




# Backup



# $\Lambda$ polarization from thermalized jet energy

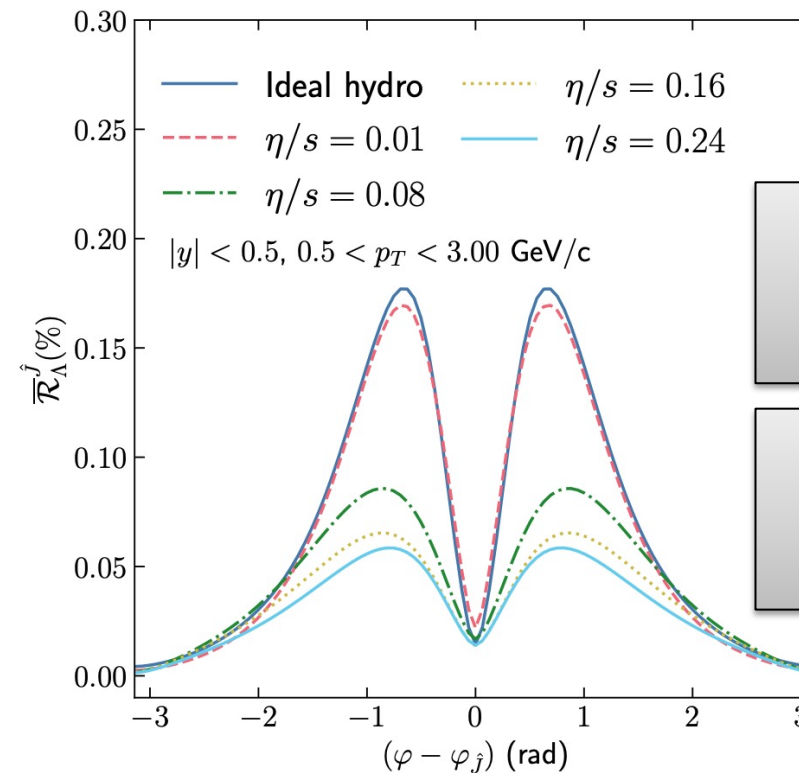


- Simulated via an initial deposition of energy and momentum in a fluid
- Evolution modeled via 3D relativistic hydrodynamics (MUSIC) at LHC energies

- We define a “ring polarization” observable:

$$\bar{\mathcal{R}}_{\Lambda}^{\hat{t}} \equiv \left\langle \frac{\vec{P}_{\Lambda} \cdot (\hat{t} \times \vec{p}_{\Lambda})}{|\hat{t} \times \vec{p}_{\Lambda}|} \right\rangle_{p_T, y}$$

$\vec{p}_{\Lambda}$ : momentum  
 $\vec{P}_{\Lambda}$ : polarization  
 $\hat{t}$ : jet axis



First evidence of jet energy thermalization in a medium!

+ Bonus: extremely sensitive to medium properties

View the video at: <https://www.sciencedirect.com/science/article/pii/S0370269321004408?via%3Dihub>