

# Pre-hydrodynamic phase, thermalization, and jet quenching

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# Points to discuss

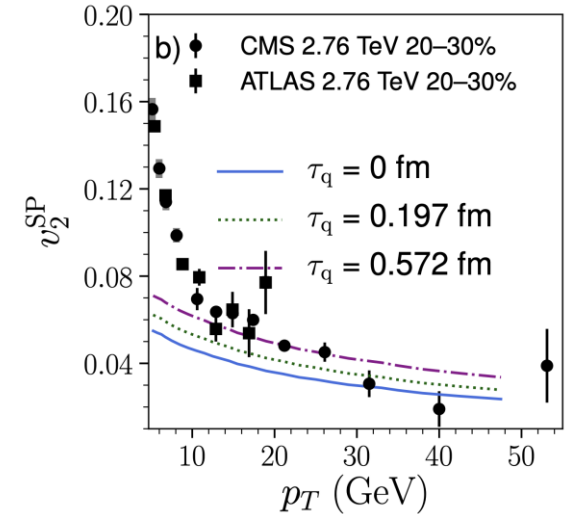
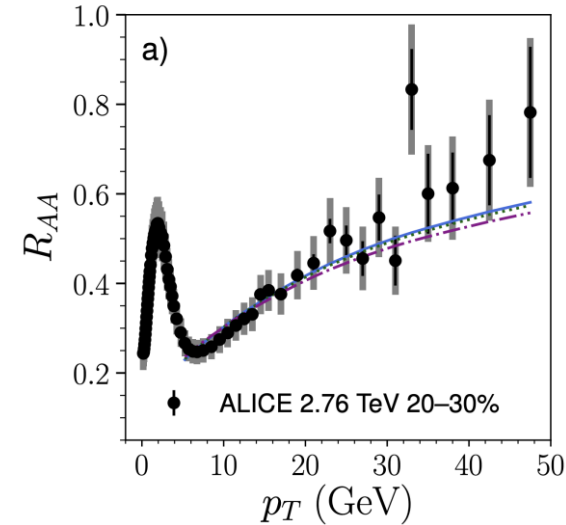
Is there some unique feature of the pre-hydrodynamic phase that results in little or no quenching in small systems? Or the system is just too short-lived, or...?

- What observables are sensitive to the pre-hydrodynamic phase and how large is the effect?
- What advances are needed to compute the role of jets during the pre-hydrodynamic phase?
- Speculation: toward using jets to probe QCD thermalization?
  - Do jets influence thermalization of the bulk medium?
  - Can we access details of QCD thermalization in the wake of jets?

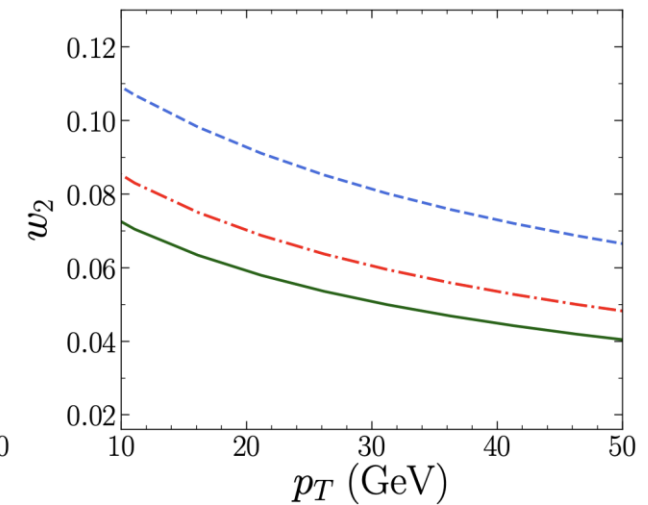
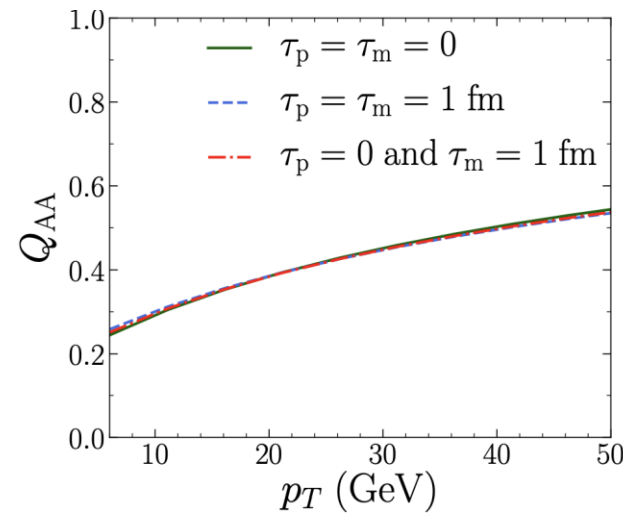
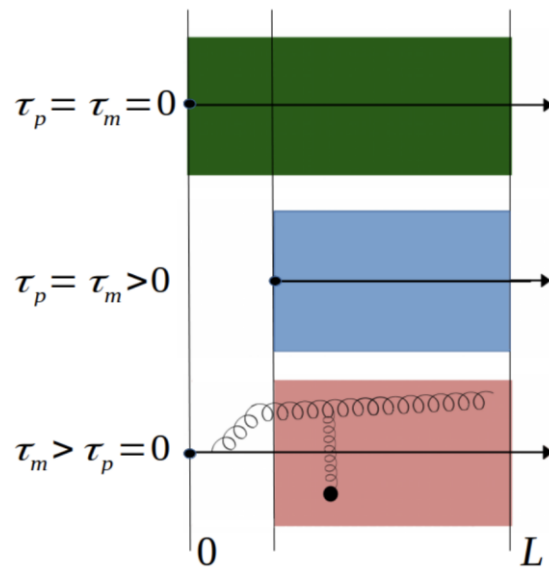
# Importance and influence of pre-hydrodynamic phase

## Existing observables:

- High- $p_T$   $v_2$  in large systems
- RAA in small systems?
  - All jet observables in small systems?
  - Some are more sensitive than others?
- ?



Andres, Armesto, Niemi, Paatelainen, Salgado [1902.03231]



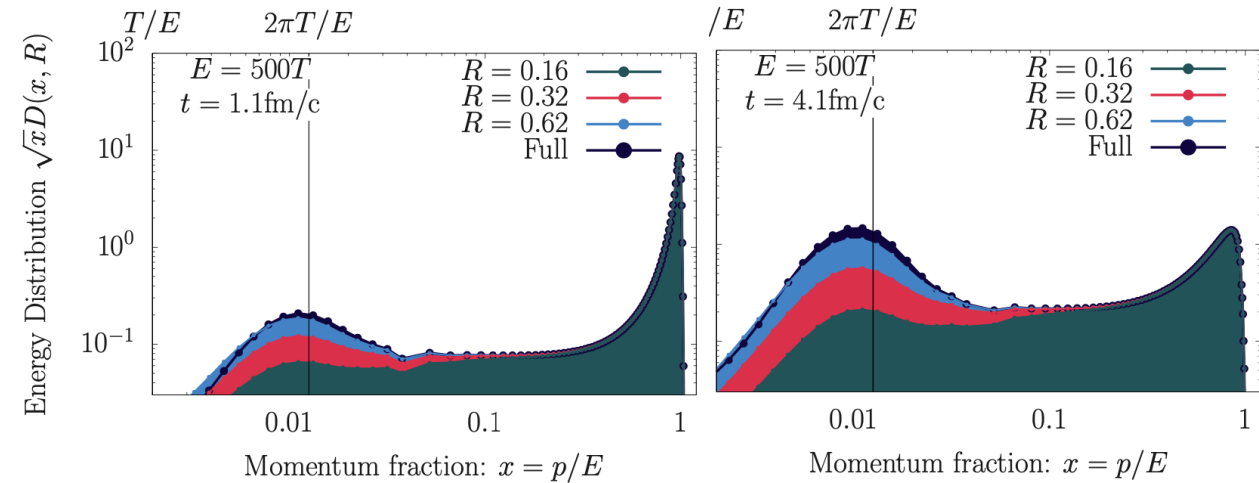
Andres, Apolinario, Dominguez, Martinez, Salgado [2211.10161]

# Computations of jets in the pre-hydrodynamic phase

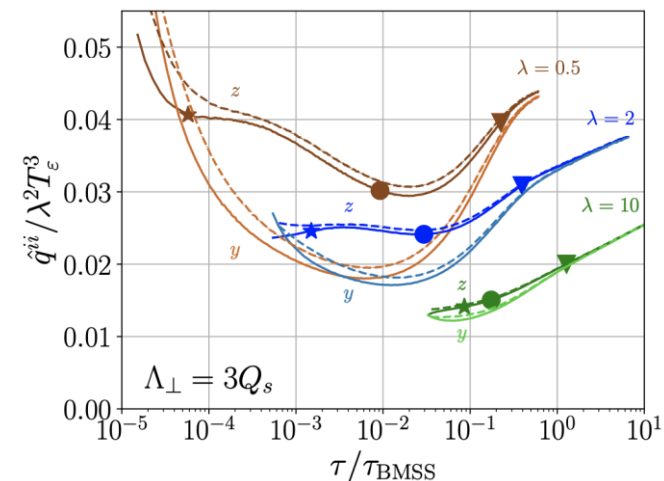
Most computations start hydrodynamics at time that is a substantial fraction of the lifetime of small collision systems which leads to large uncertainties

## Existing techniques for earlier times:

- EKRT
  - Based on hydrodynamics so less valid far-from-equilibrium and does not contain far-from-equilibrium structure of QCD
- QCD kinetic theory
  - Intersects with studies of QCD equilibration
  - Does not incorporate any vacuum structure of jets
  - Currently only in momentum space



Mehtar-Tani, Schlichting, Soudi [2209.10569]



Boguslavski, Kurkela, Lappi, Lindenbauer, Peuron [2303.12595]

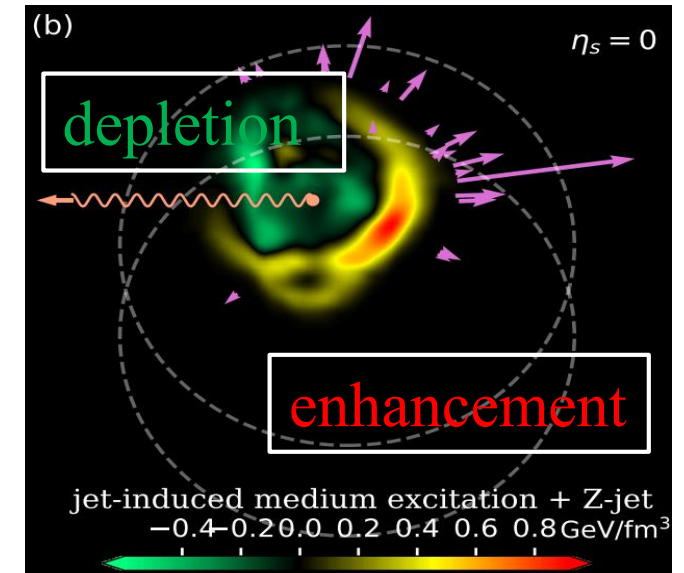
# Toward jets as a probe of QCD equilibration

## Existing observables:

- Boson-tagged jet measurements
- Wake in the opposite direction of Z boson
- ?

## Speculation:

- Isolating the role of pre-hydrodynamic phase through control over formation times?
- How do jets influence the progress/timescales for equilibration of the bulk medium? Can we estimate if it's important?



Chen, Yang, He, Ke, Pang, Wang [2101.05422]

