Light ions and future experiments

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Initial Stages 2021
Reference on sizes of small systems

\[ \langle N_{\text{coll}} \rangle \]

... And an advertisement

[2007.13754]

with Aleksas Mazeliauskas and Wilke van der Schee
Quenching in small systems

- Baseline is important when looking for small energy loss
  - nuclear PDFs required (pp not correct baseline)

- Centrality selection gives large model uncertainties from
  - light ions allow minimum bias measurements of quenching

- Larger luminosity \(\rightarrow\) many more Z bosons in small systems
  - \(\mathcal{O}(10^5)\) Z bosons / day in OO at LHC [2007.13754]
  - Energy loss from Z-hadron, Z-jet asymmetry?

- Theory challenges:
  - energy loss sensitive to geometry; clearer in symmetric systems
  - centrality selection sensitive to soft physics
  - energy loss presumably more sensitive to pre-hydrodynamic phase in small systems
  \(\rightarrow\) Enhanced interplay between quenching, equilibration, and flow

Yellow report [1812.06772]
Nuclear PDFs

- Constrain A-dependence of nuclear PDFs
  - Fits dominated by Pb, but strong A-dependence
  - Motivation for p-A data with $A \ll 208$

Paukkunen [1811.01976]

Collectivity

- Competition between initial momentum and spatial anisotropy in generating $v_2$ can be disentangled in small systems
  - Energy, system dependence of initial momentum and spatial anisotropy motivates RHIC+LHC w/ different small systems

Giacalone, Schenke, Shen [2006.15721]

\[
\hat{\rho}(v_2^2, [p_T]) = \frac{\langle \hat{v}_2^2 \hat{\delta}[p_T] \rangle}{\sqrt{\langle (\hat{v}_2^2)^2 \rangle \langle (\hat{\delta}[p_T])^2 \rangle}}
\]