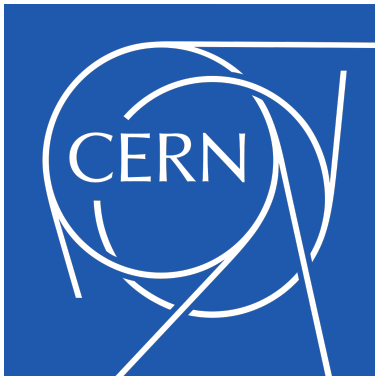
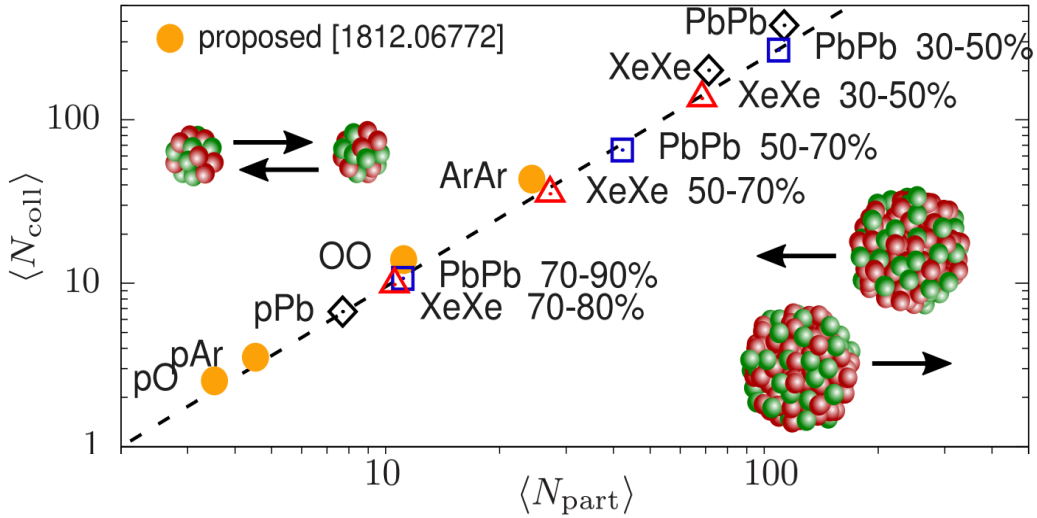
Light ions and future experiments

Jasmine Brewer



Initial Stages 2021

Reference on sizes of small systems



[2007.13754]

… And an advertisement

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)

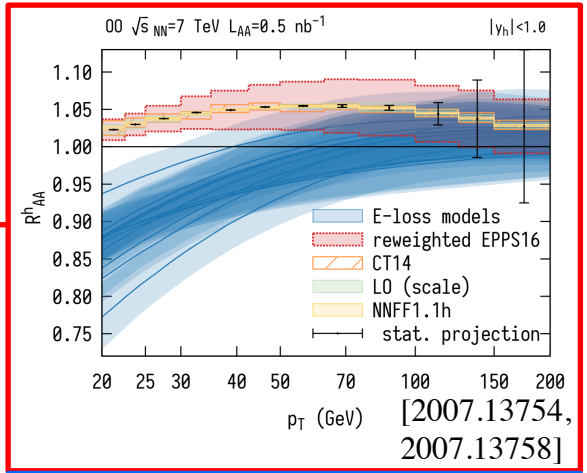
- Centrality selection gives large model uncertainties from
  - light ions allow minimum bias measurements of quenching

  Huss, Kurkela, Mazeliauskas, Paatelainen, van der Schee, Wiedemann [2007.13754, 2007.13758]

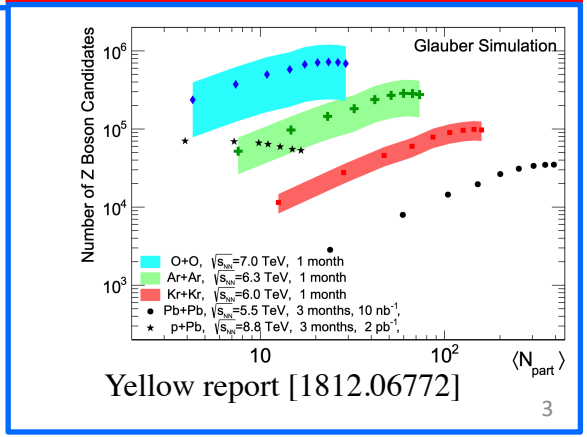
- Larger luminosity → many more Z bosons in small systems
  - $\mathcal{O}(10^5)$ Z bosons / day in OO at LHC [2007.13754]
  - Energy loss from Z-hadron, Z-jet asymmetry?

- 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

  → Enhanced interplay between quenching, equilibration, and flow



[2007.13754, 2007.13758]



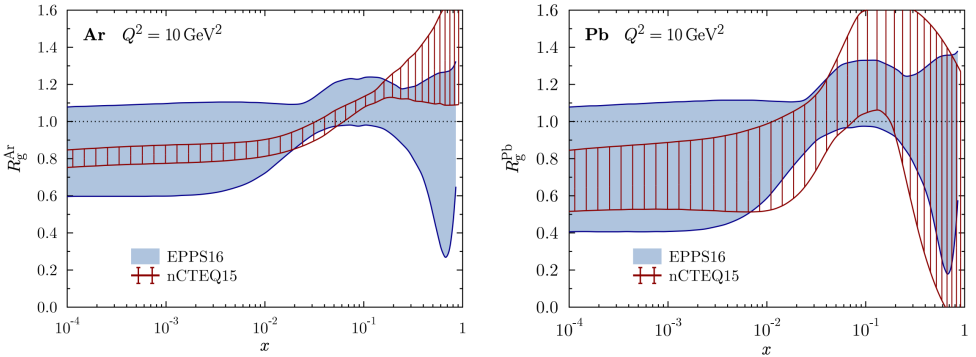
Yellow report [1812.06772]

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]

$$R_i^A(x,Q^2) \equiv f_i^{\text{proton in nucleus } A}(x,Q^2)/f_i^{\text{free proton}}(x,Q^2)$$



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]

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