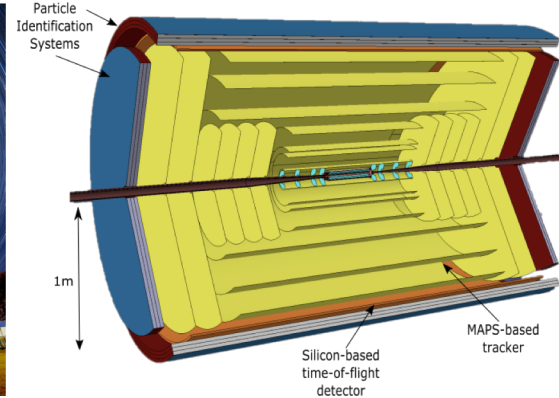
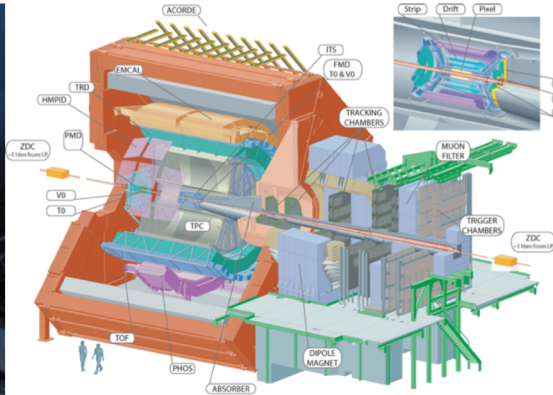
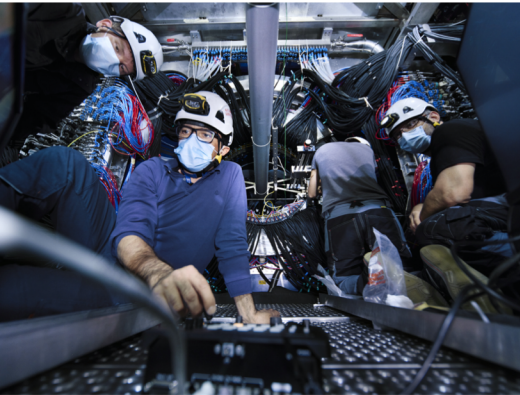


ALICE and the LPCC working group on heavy-ions



M. Verweij (Utrecht)
A. Kalweit (CERN)

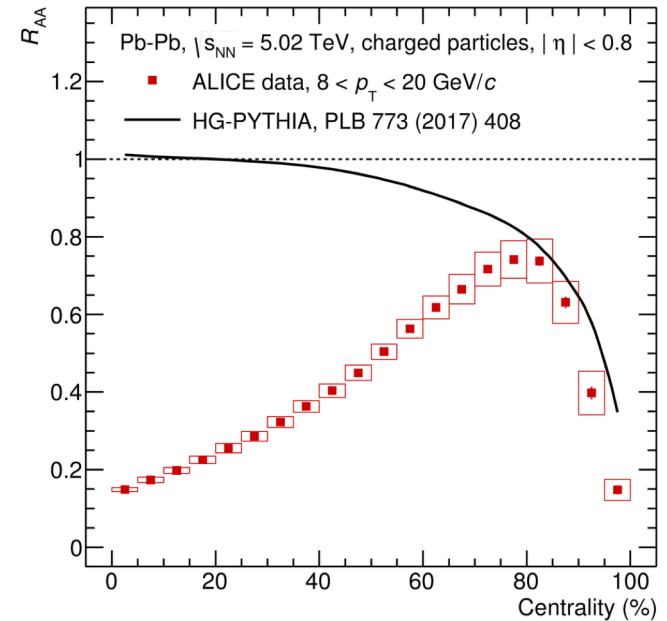
LPCC kickoff meeting 7th July 2021

Introduction

- The ALICE Management Board has endorsed the plan of the LPCC heavy-ion working group on the 25th of February.
- Starting contact persons:
 - Marta Verweij
 - Alexander Kalweit
- Special role of the ALICE collaboration: dedicated and largest heavy-ion experiment at the LHC.
- Exciting and busy times for the collaboration: commissioning of LS2 upgrades, preparation for October pilot testbeam, completion of Run-2 analyses, preparation for new ALICE3 experiment (Run 5),...

Event selection and centrality: AA

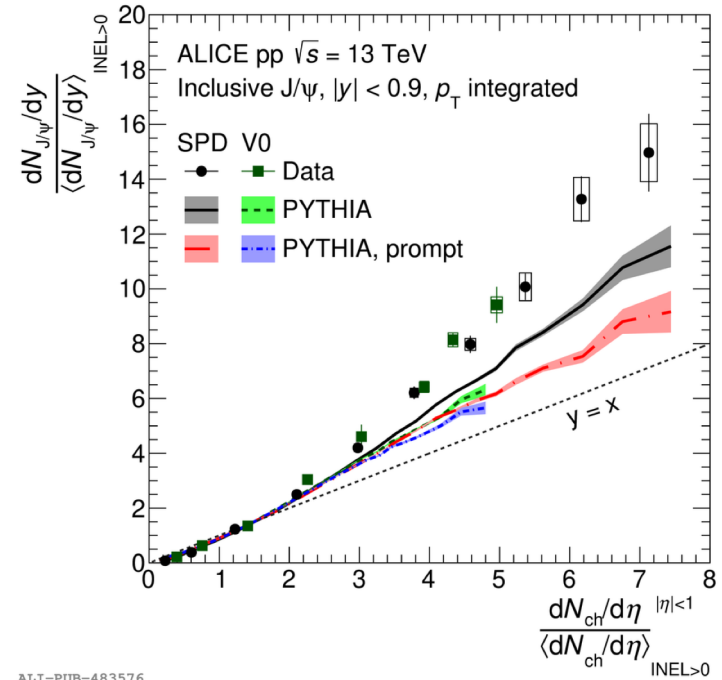
- Pb-Pb and other ion species: common ingredients for collision geometry parameters and related uncertainties
 - inelastic NN cross-section and its potential modification in AA collisions (see e.g. [PRL 125, 212301 (2020)])
 - nuclear density parameters
 - neutron skin (recent JLAB measurements [\[link\]](#))
 - including work by d'Enterria, Loizides, Reygers [\[link\]](#)
- Ultra-central collisions: resolution of centrality estimators in the various experiments
- Discussion on selection biases and common baselines (peripheral AA and small systems)



[ALICE, [Phys.Lett. B793 \(2019\) 420-432](#)]

Event selection and centrality: pp and p-Pb

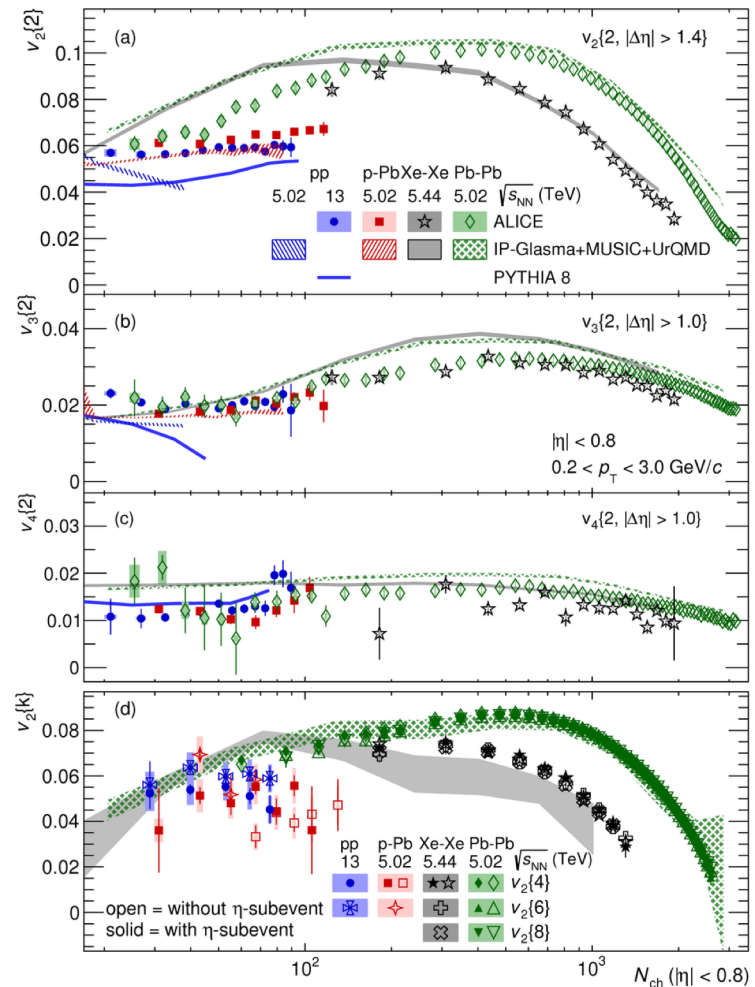
- Harmonisation of event activity estimators (standard estimators in terms of η -ranges and track selection) based on **fully corrected** quantities
- Unique opportunity for future measurements since ALICE tracklet acceptance will increase for LHC Run 3.
- Close collaboration with **Min. Bias & Underlying event working group of LPCC**



[ALICE, PLB 810 (2020) 135758]

Flow measurements

- Pb-Pb: generalization of event-shape engineering in terms of η -ranges (separation)
- Small systems: rapidity gaps, treatment of non-flow (peripheral subtraction, template fits, multi-particle cumulants, cumulants with sub-events etc.)

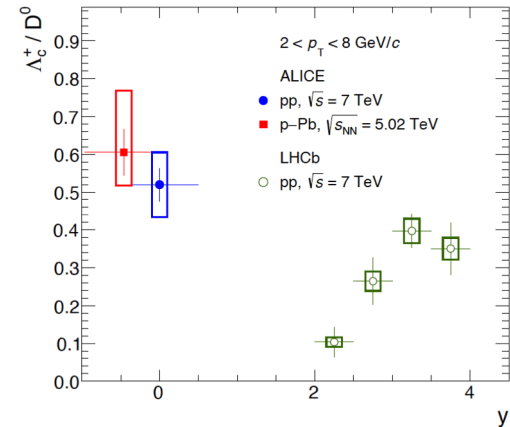


Open heavy-flavour, quarkonia, W/Z-bosons

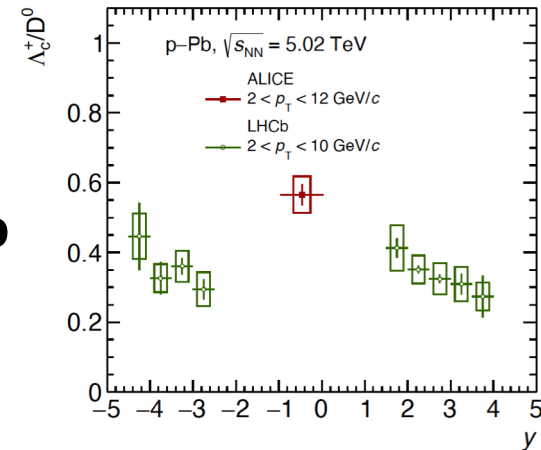
- Common (additional) η ranges for direct comparisons (e.g. “ALICE barrel” for ALICE vs ATLAS vs CMS, “ALICE fwd” for ALICE vs LHCb)
- Common kinematic selections, e.g. muon from W decays
- Clarification of rapidity dependence of single-charm hadron production (in particular Λ_c/D^0 in ALICE vs. LHCb)

[ALICE, arXiv:2011.06079v2, JHEP 04 (2018) 108]

pp



p-Pb

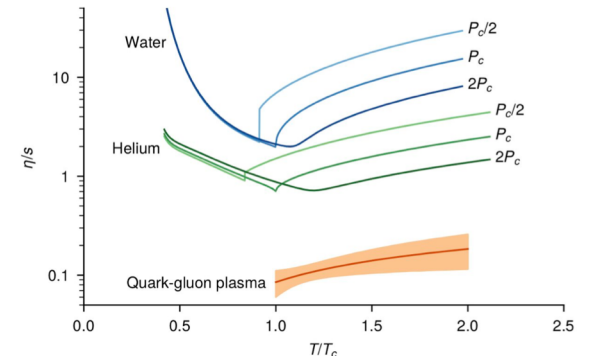
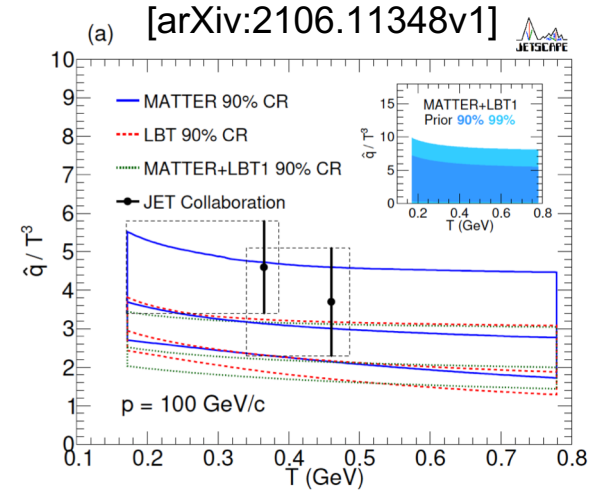


Jet and energy loss measurements

- Selection of theoretically-robust observables to study jet modifications
- Common choices of jet resolution R
- Provide sufficient information about (anti)correlation of systematic uncertainties (ideally publish covariance matrix) in order to facilitate comparisons to models and extraction of model parameters.

Extraction of medium properties

- Various theory groups and theory collaborations use inputs from multiple experiments to constrain medium properties such as q -hat or shear viscosity.
- The LPCC could serve as a central contact points for wishes and requests from these groups.
- The working group could establish recommendations how correlated systematics should be identified and published so that data can be treated by theory groups in an identical way and biases are avoided.

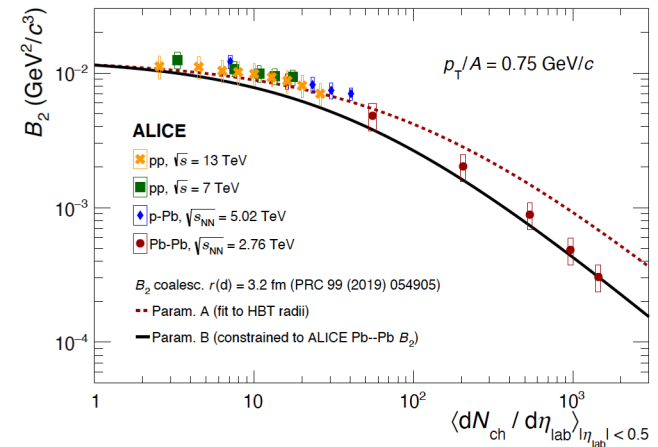
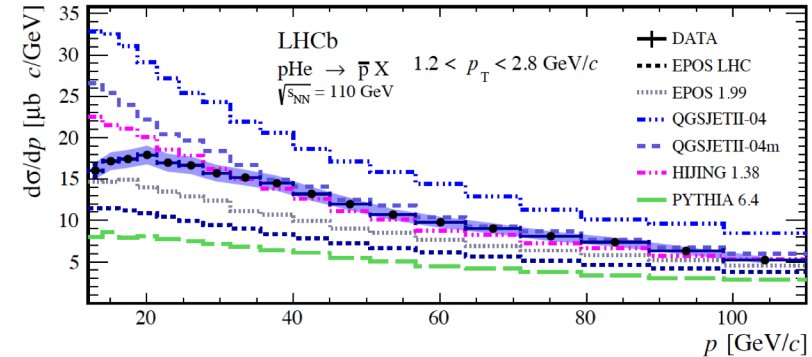


Anti-nuclei and astrophysics

ALICE and LHCb provide input for the search of anti-protons and anti-nuclei in space:

- LHCb measures the anti-proton production at forward rapidities in p-He collisions
- ALICE measures the coalescence probabilities that quantify how often anti-protons coalesce with anti-neutrons to anti-deuterons and heavier anti-nuclei
- The working group could channel discussions with the astrophysics community and also establish common procedures, e.g. for feed-down corrections.

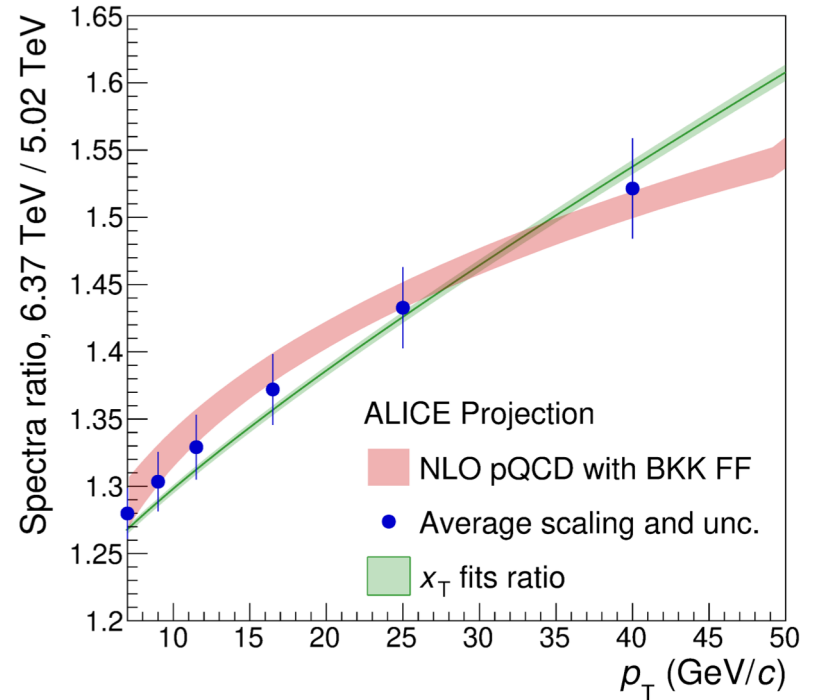
[LHCb, PRL 121 (2018) 222001]



[ALICE; Eur. Phys. J. C 80 (2020) 889]

Oxygen reference and related topics

- ALICE presented in detail its physics interests concerning proton-Oxygen and Oxygen-Oxygen running in the dedicated LPCC workshop in January
- Active participation in the interpolation of the charged hadron reference spectrum to clarify if a dedicated pp reference run will be needed.



[\[link to talk at OO workshop\]](#)

Summary and outlook

- There is a plethora of important cross-collaboration topics that need to be addressed.
- Unique opportunity given the upcoming LHC Run 3: common kinematic and acceptance selections can be established *before* the starting the analysis.
- The ALICE collaboration and its management look forward to interesting and productive discussions in this working group!

Additional slides