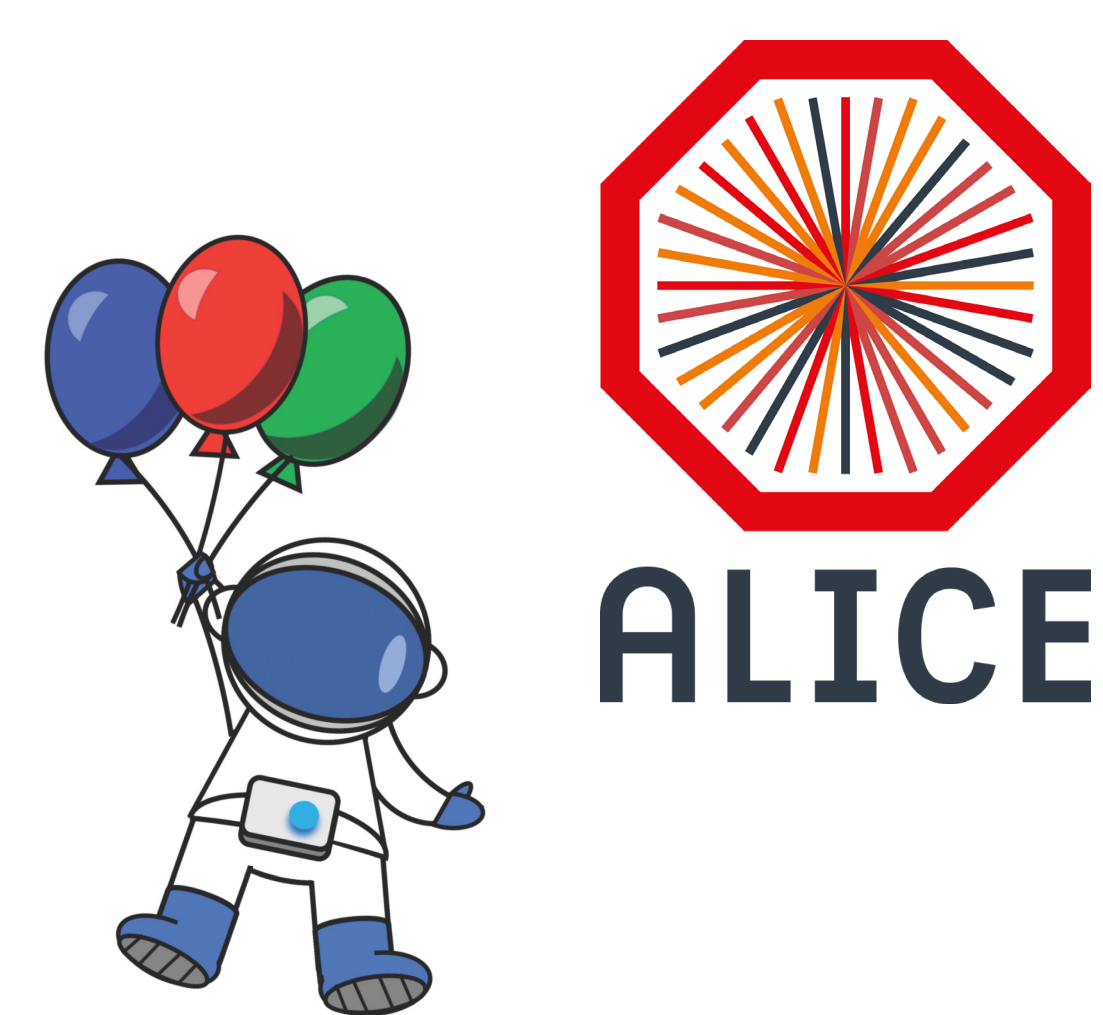


# Prospects for light (anti)nuclei measurements in jets in Run 3 with ALICE

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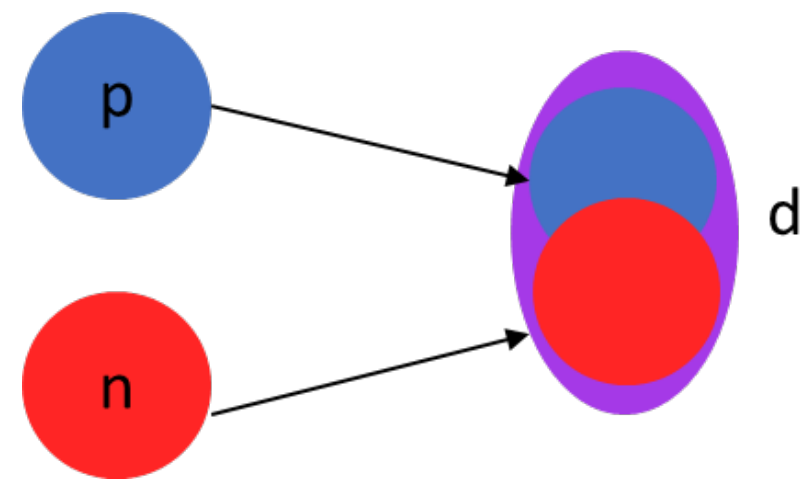
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## Motivation

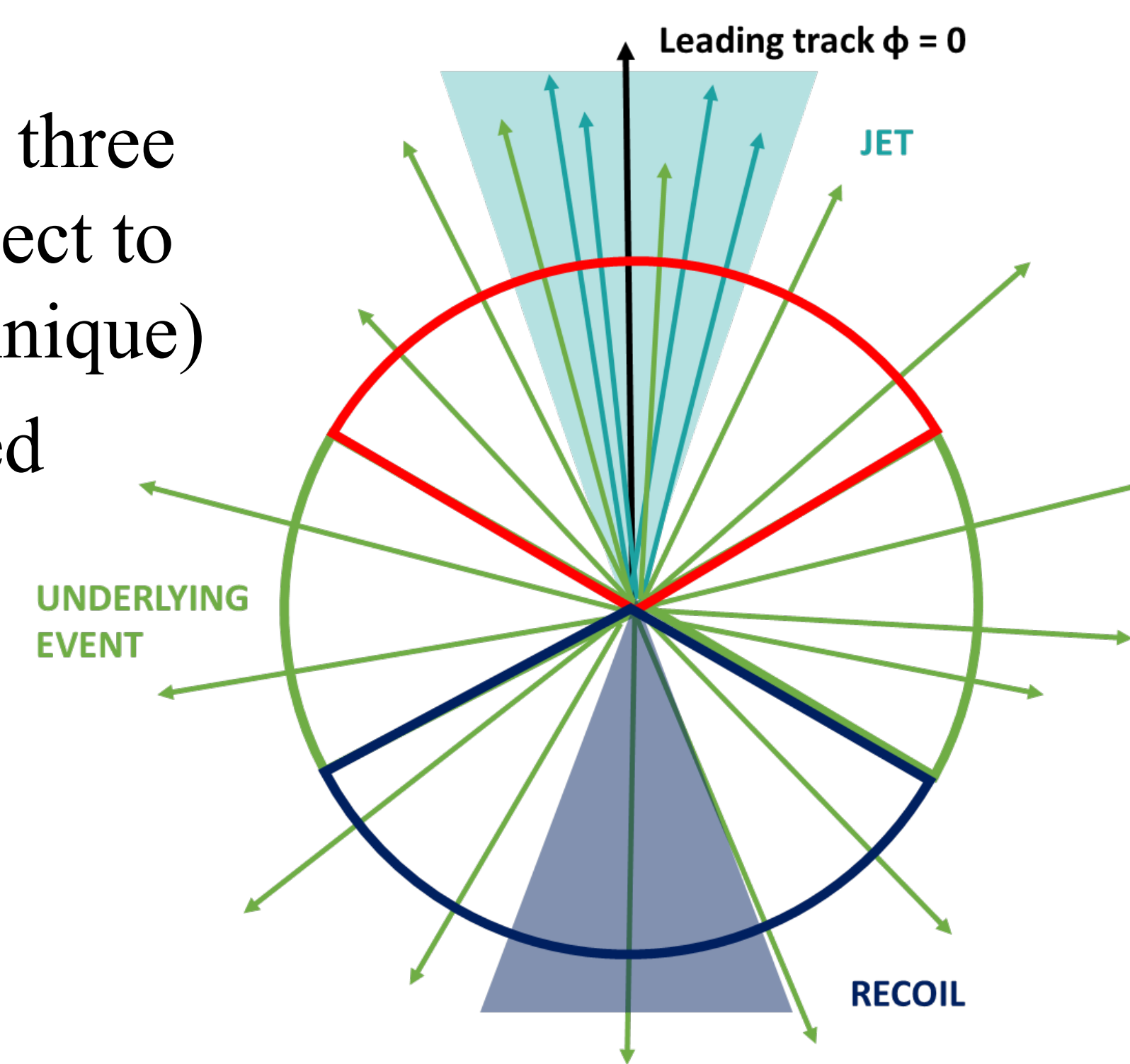
- Baryon coalescence<sup>[1]</sup> → phenomenological model that describes the formation of bound states
- State-of-the-art implementations describe this formation as the overlap between the phase-space distribution of point-like nucleons and the Wigner density of the bound state<sup>[2]</sup>
- Coalescence parameter  $B_A$  proportional to the coalescence probability
- To constrain the coalescence model, the production of (anti)nuclei is studied in regions where the nucleons are close, using a novel technique



$$B_A = \frac{\frac{1}{(2\pi)p_T^A} \left( \frac{d^2N}{dydp_T} \right)_A}{\left( \frac{1}{(2\pi)p_T^p} \left( \frac{d^2N}{dydp_T} \right)_p \right)^A}$$

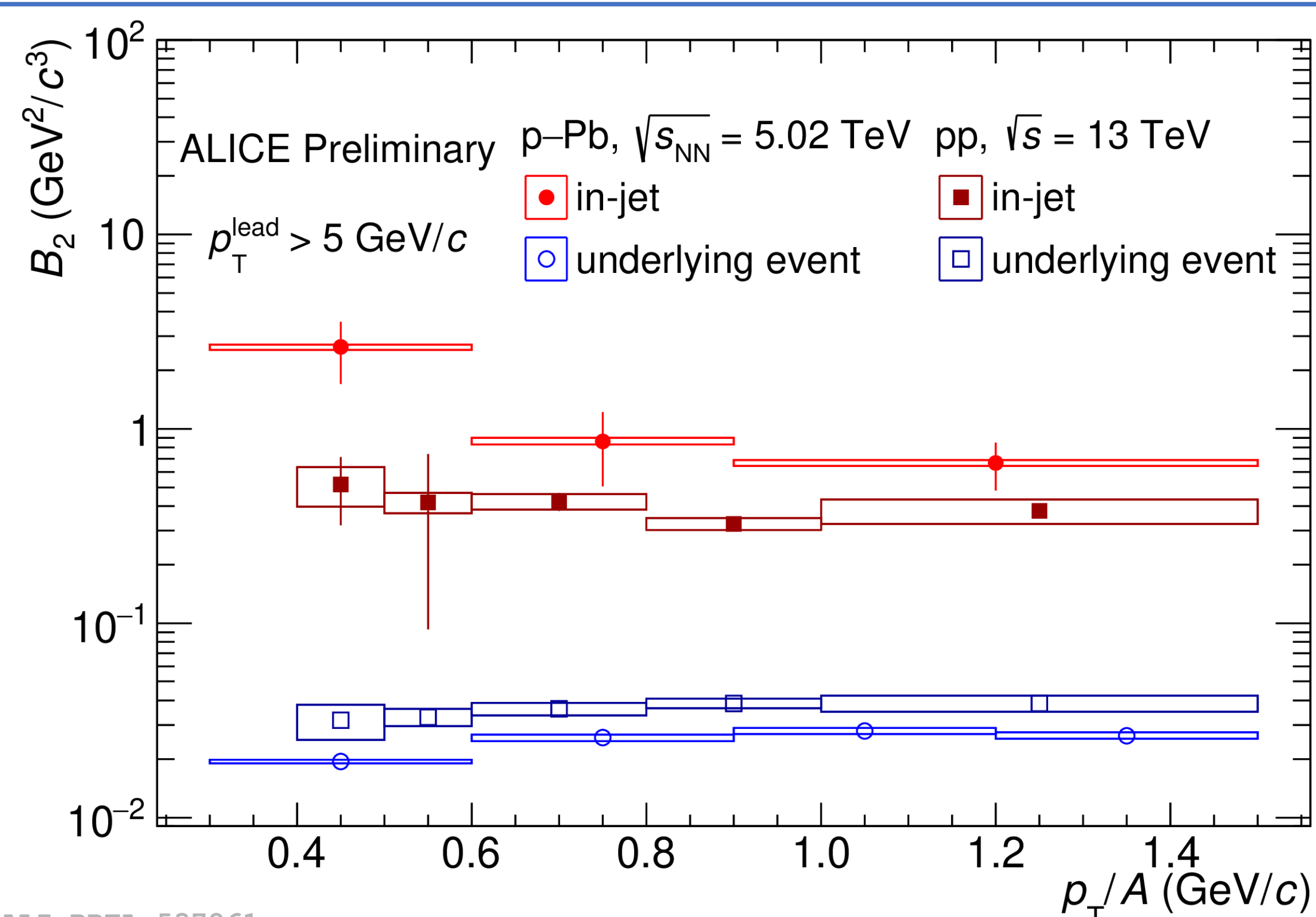
## In-jet and underlying event

- Leading particle (highest  $p_T$  and  $p_T > 5 \text{ GeV}/c$ ) used as a proxy for the jet axis
- Transverse plane divided in three azimuthal regions with respect to the leading track (CDF technique)
- Transverse region dominated by the Underlying Event (UE)
- Jet = Toward (jet + UE) - Transverse (UE)

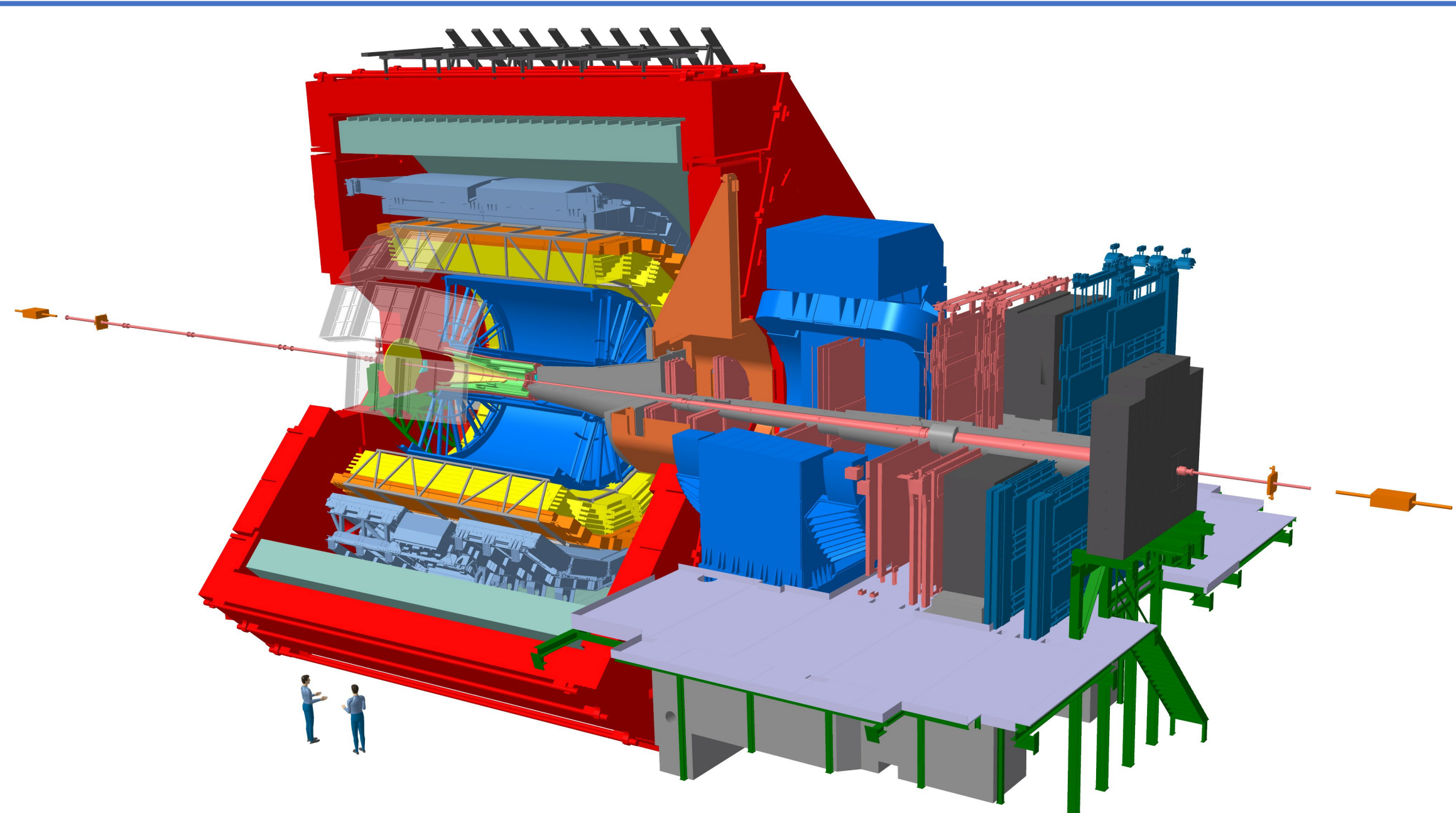


## Experimental results in pp and p-Pb systems

- Striking gap** between  $B_2^{\text{jet}}$  and  $B_2^{\text{UE}}$  → compatible with the coalescence picture
- Larger gap** in p-Pb with respect to pp collisions<sup>[3]</sup>
- Statistical uncertainties dominate over the systematic ones in jet and at low  $p_T$
- More measurements are needed to constraint these observations:
  - Hadron chemistry in jet
  - Full reconstruction of jets with jet-finder algorithms
  - Multi-differential studies vs  $p_T$ , jet radius and multiplicity



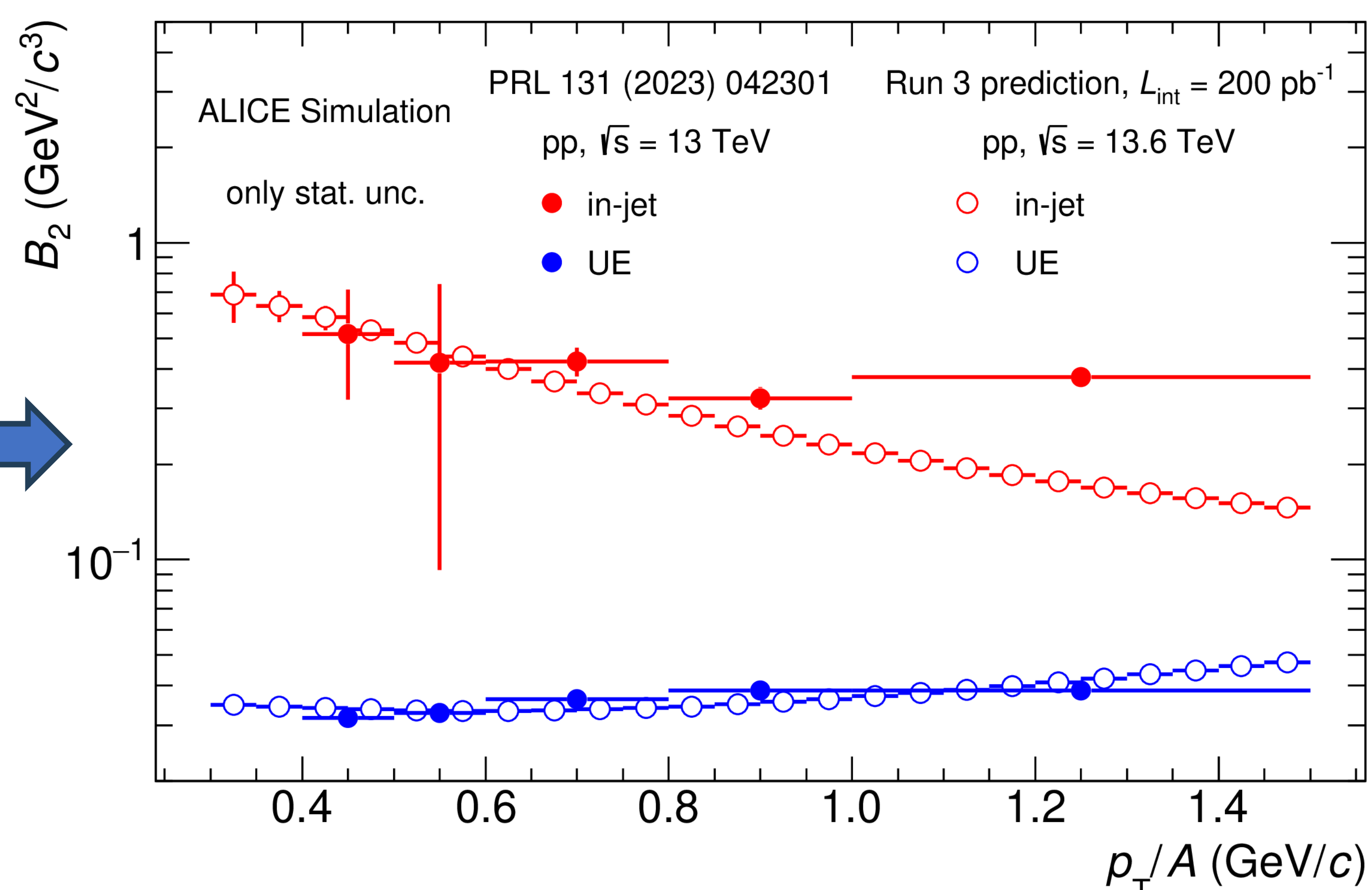
## The ALICE detector in Run 3



- Detector upgrade during the Long Shutdown 2
- ITS, 7 layers of silicon pixel detectors with lower material budget<sup>[4]</sup> → better performance for the tracker
- TPC: MWPC replaced with GEMs and continuous dataflow<sup>[5]</sup> → more events recorded with respect to Run 2
- Target integrated luminosity at the end of Run 3 for pp collisions:  $200 \text{ pb}^{-1}$  <sup>[6]</sup>

## Prospects for Run 3 measurements

- The measured  $p_T$  spectra <sup>[3][7]</sup> are parametrized and used as inputs for the simulation
- Assumed same efficiency and  $\sigma_{\text{inel}}$ <sup>[8]</sup> of Run 2
- Promising results**, multi-differential measurements (e.g. vs multiplicity in the transverse region) could be performed
- Improvement of the statistical uncertainties** of a factor 4 for  $B_2^{\text{jet}}$  and a factor 3 for  $B_2^{\text{UE}}$



## References

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| [1] S. T. Butler et al., Phys. Rev. 129 (1963) 836 | [5] JINST 16 (2021) P03022                 |
| [2] M. Mahlein et al., arXiv:2302.12696            | [6] ALICE-PUBLIC-2020-005                  |
| [3] Phys. Rev. Lett. 131 (2023) 042301             | [7] JHEP 06 (2023) 027                     |
| [4] NIM 1032 (2022) 166632                         | [8] LHCb Collaboration, JHEP 06 (2018) 100 |