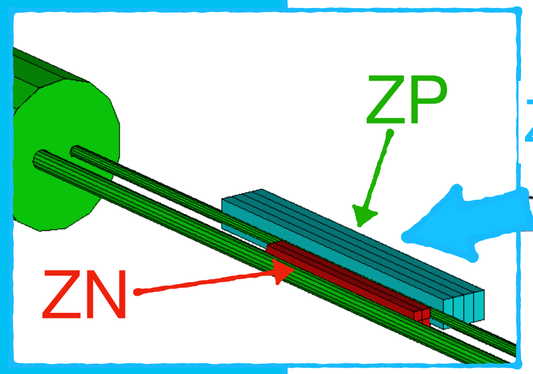
Characterizing pp and p-Pb collisions using very forward energy and underlying event activity with ALICE

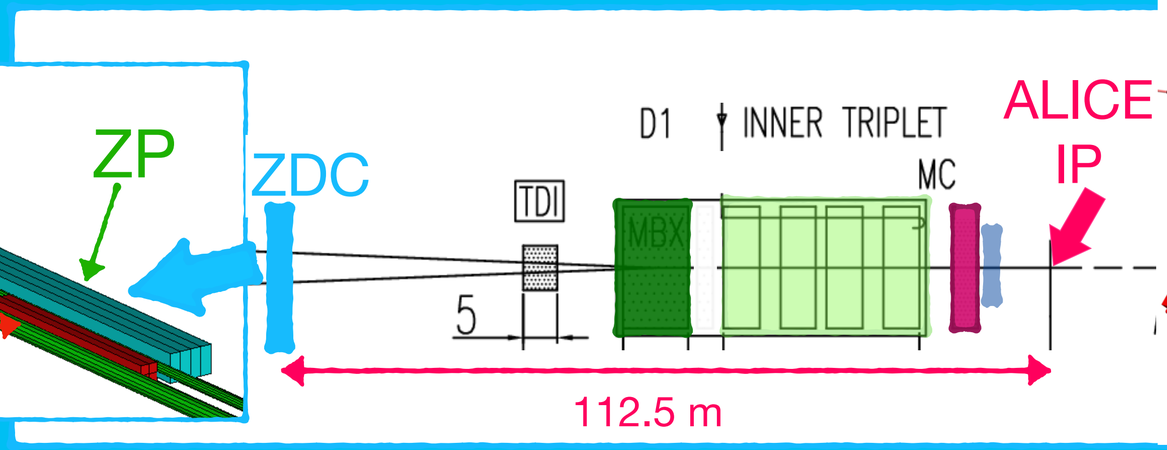
C. Oppedisano for the ALICE collaboration

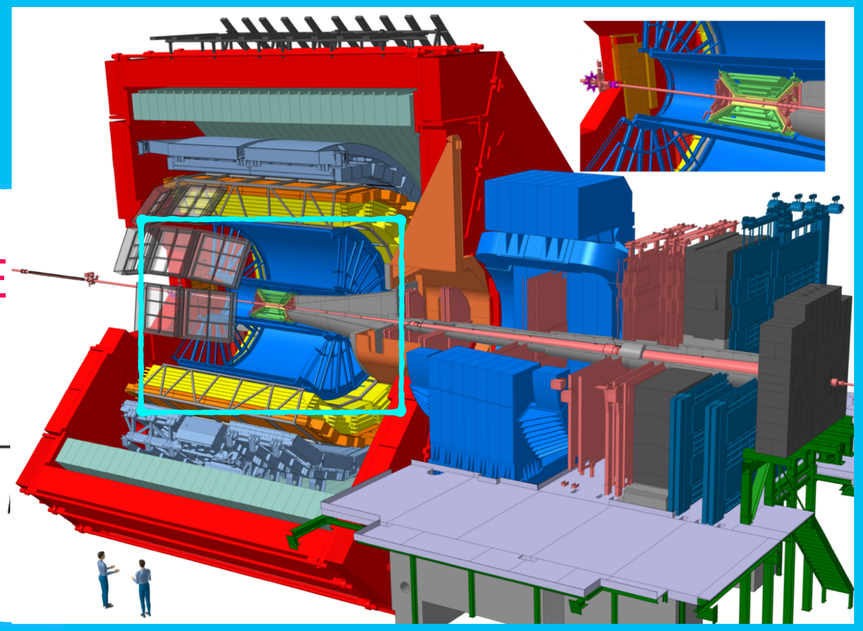
Based on paper
ALICE Collaboration, arXiv 2107.10757

Detectors used in the analysis:

- Inner Tracking System (ITS)
- Time Projection Chamber (TPC)
- VZERO scintillator hodoscopes
- Zero Degree Calorimeters (ZDC)







Very forward energy in p-Pb collisions vs. centrality

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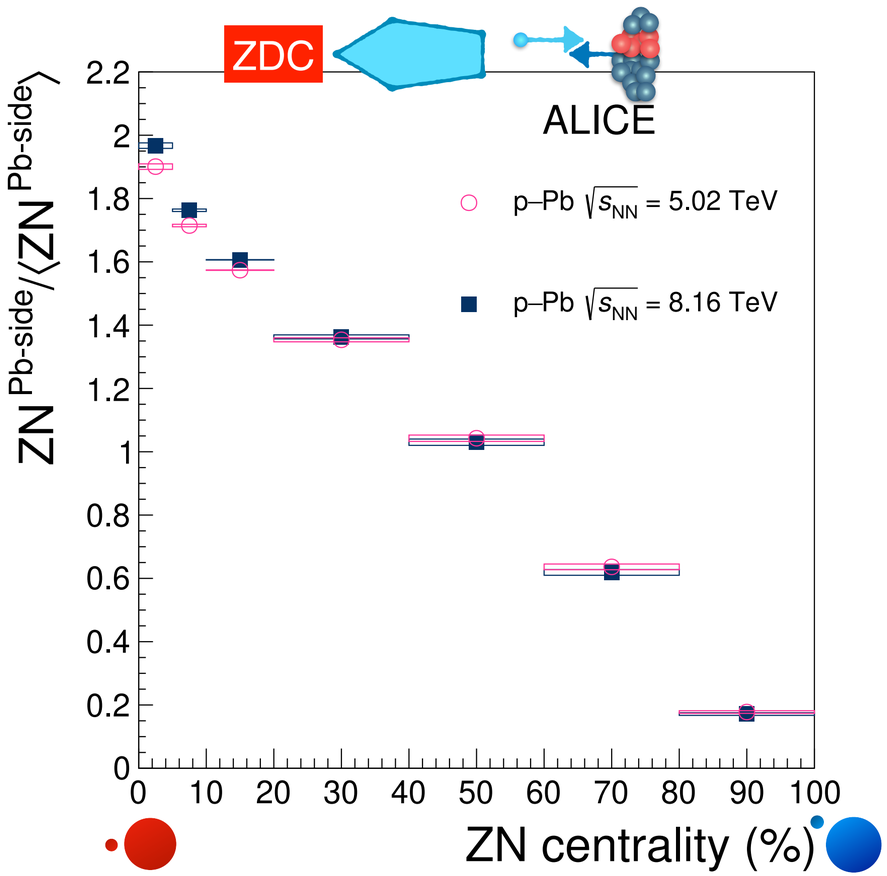

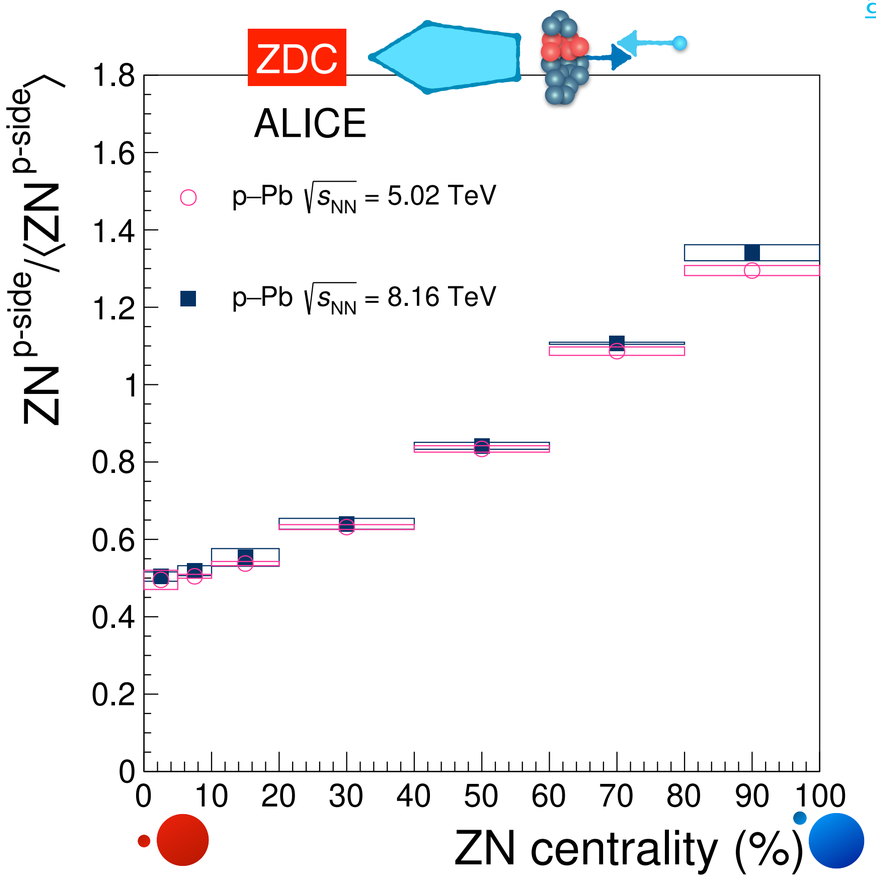

The energy carried by neutrons emitted from the Pb nucleus (slow neutrons) measured in neutron ZDC:

- linearly increases with centrality at different √s
- scales with number of collisions, N_{coll}

The energy coming from the p fragmentation measured in neutron ZDC:

- decreases with the centrality of the collisions
- scales with $1/N_{coll}$ up to very peripheral events

Very forward energy in p-p collisions: asymmetry

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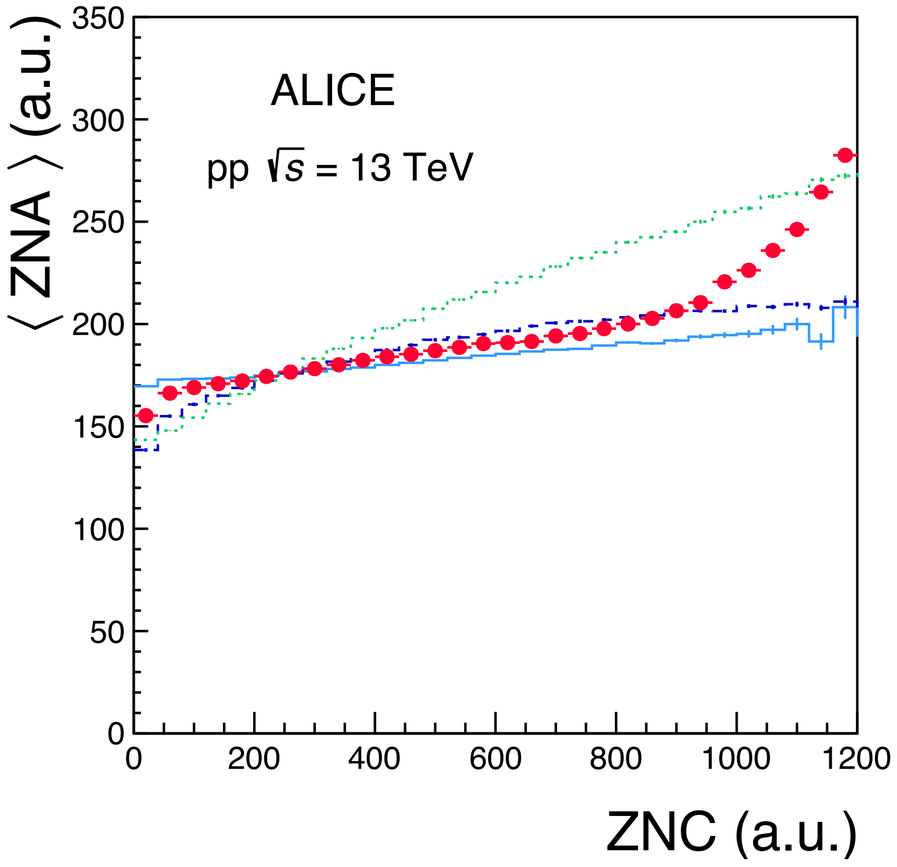
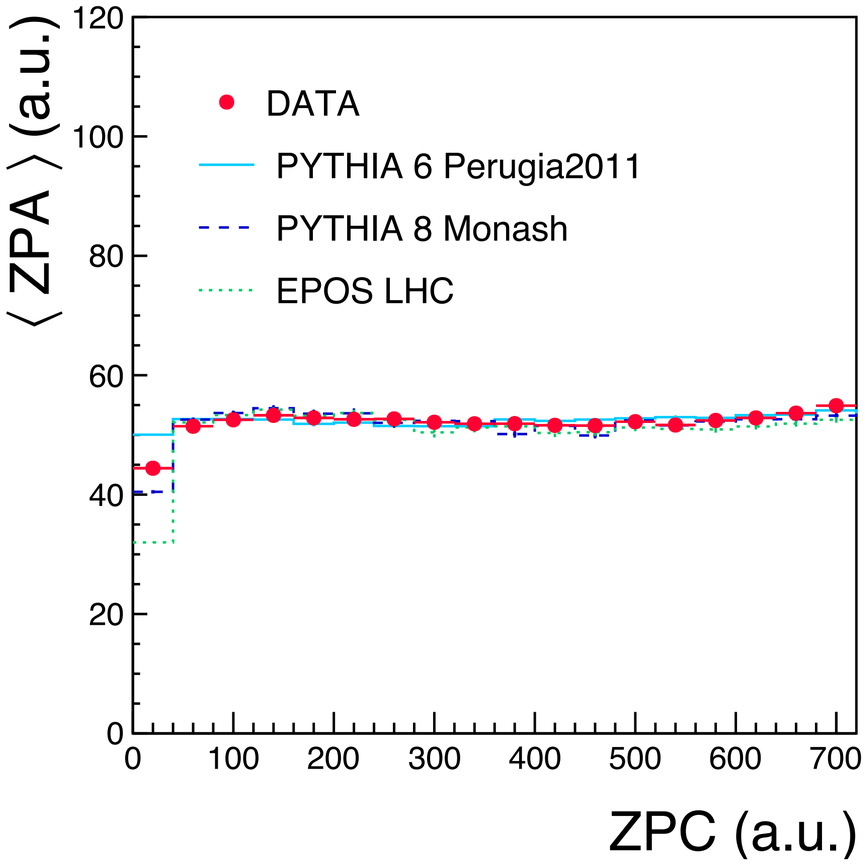
A-side ZDC ZDC C-side





Forward and backward energies carried by neutrons in neutron ZDC are correlated at high energies

Forward and backward energies carried by protons in proton ZDC do not show correlation, as observed at lower energies [1]

[1] M. Basile et al., Il Nuovo Cimento A, 73, 329 (1983)

Very forward energy vs. midrapidity multiplicity in pp collisions

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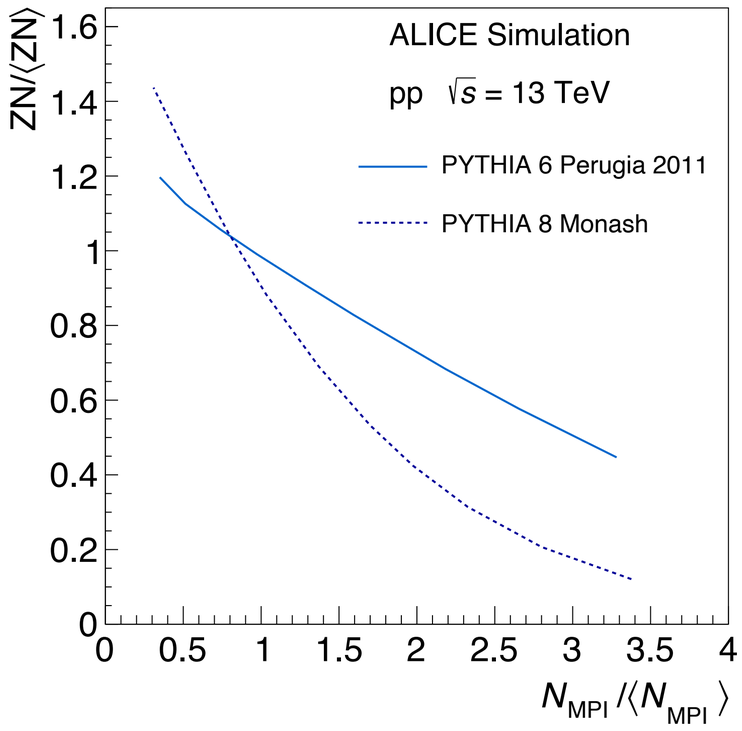
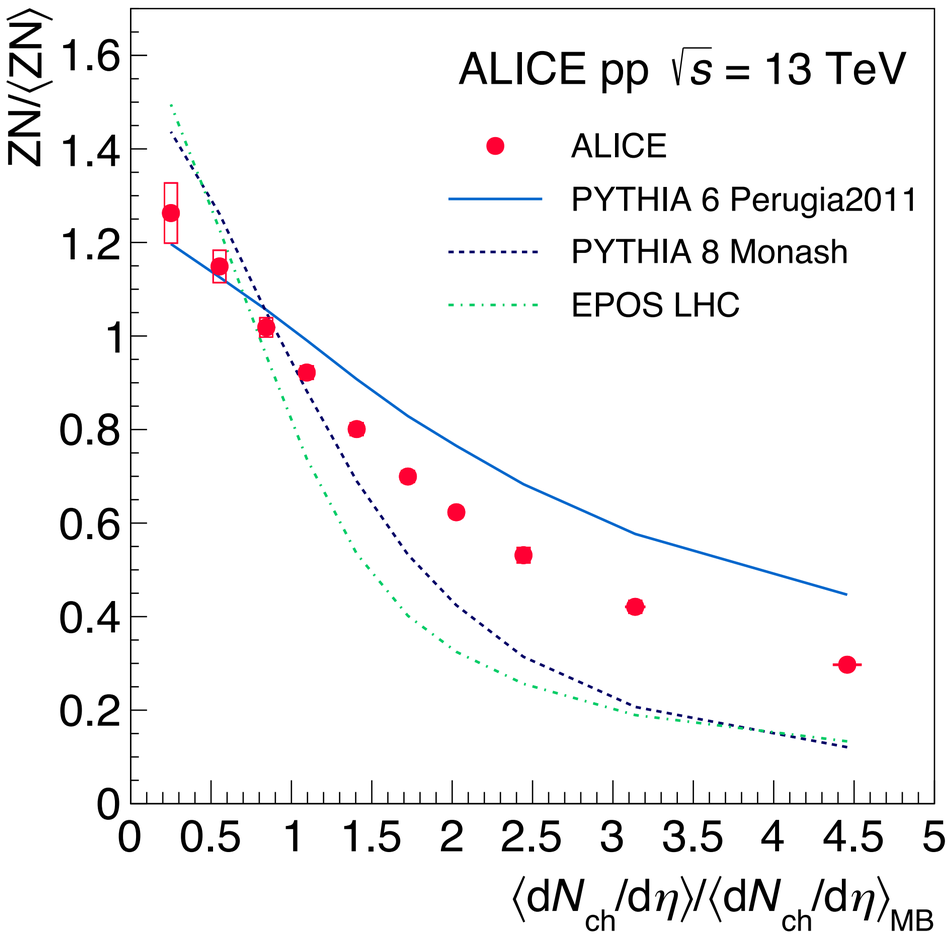


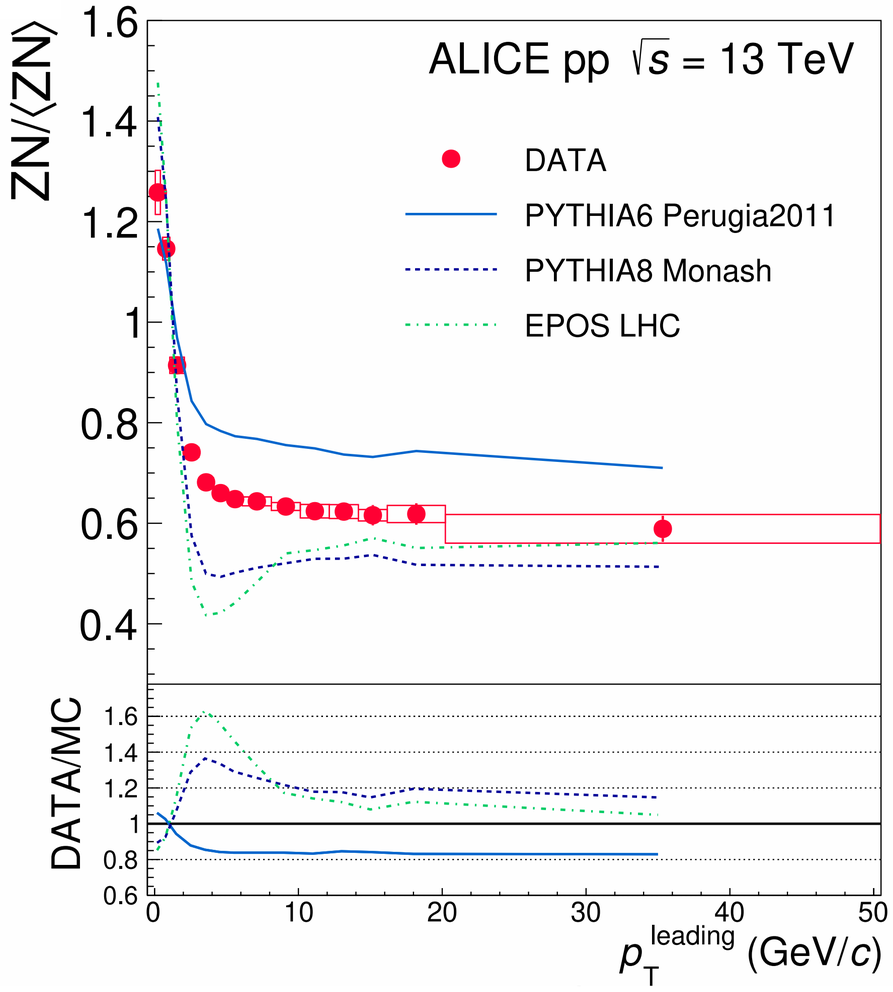


- inverse dependence of very forward energy as a function of the number of MPIs in PYTHIA models

Forward energy decreases with increasing particle multiplicity at midrapidity

PYTHIA6 Perugia2011, PYTHIA8 Monash and EPOS-LHC predictions describe the overall pattern, but are not able to quantitatively reproduce experimental results in multiplicity bins.

Very forward energy vs. leading p_T particle in pp collisions



For leading $p_T > 5$ GeV/c at midrapidity very forward energies normalised to MB value saturate

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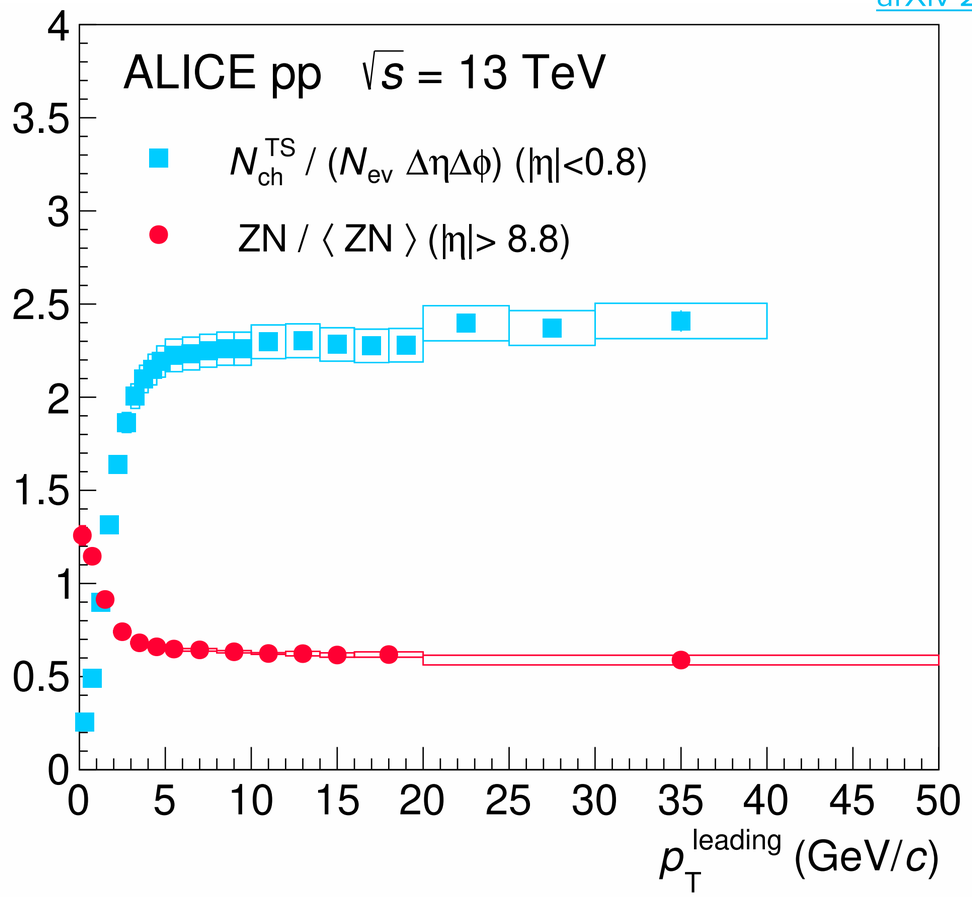

UE measurements (separation in azimuthal angle) ➧ large transverse multiplicity selects central pp collisions with a large number of MPIs

Very forward energy (separation in rapidity) ➧ shows a complementary behaviour to that observed for transverse charged particle multiplicity