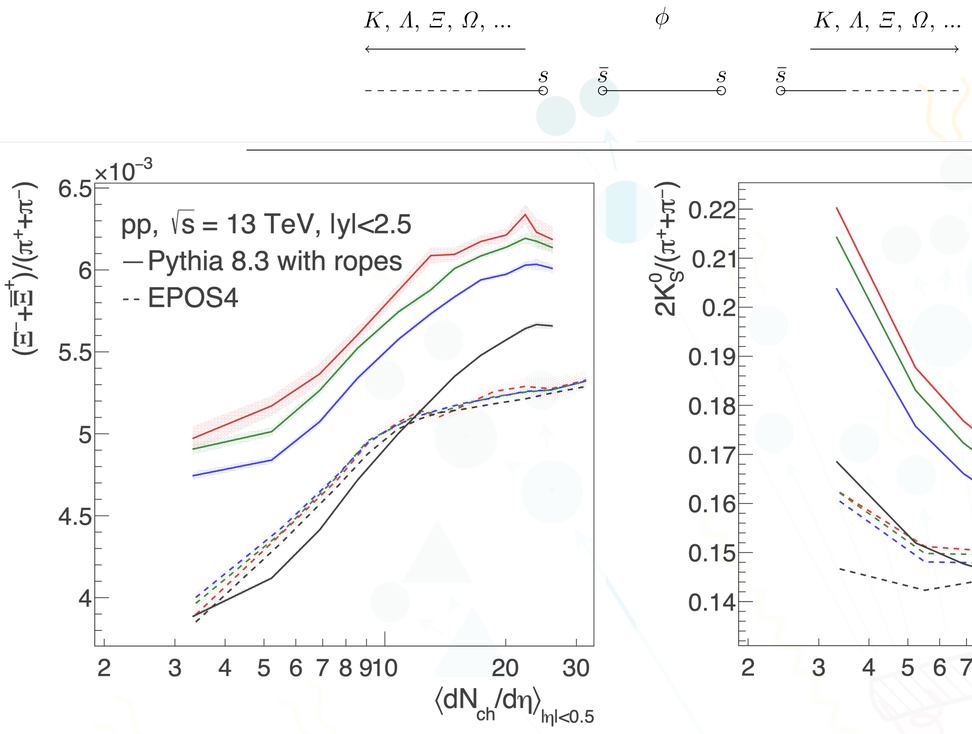
INVESTIGATING HADRONISATION AND LIGHT-NUCLEI FORMATION IN VACUUM AND DENSE ENVIRONMENTS

STRANGENESS CONSERVATION

STRANGE-HADRON PRODUCTION IN EVENTS WITH A ϕ MESON CAN DISCRIMINATE BETWEEN THE TWO MODELS

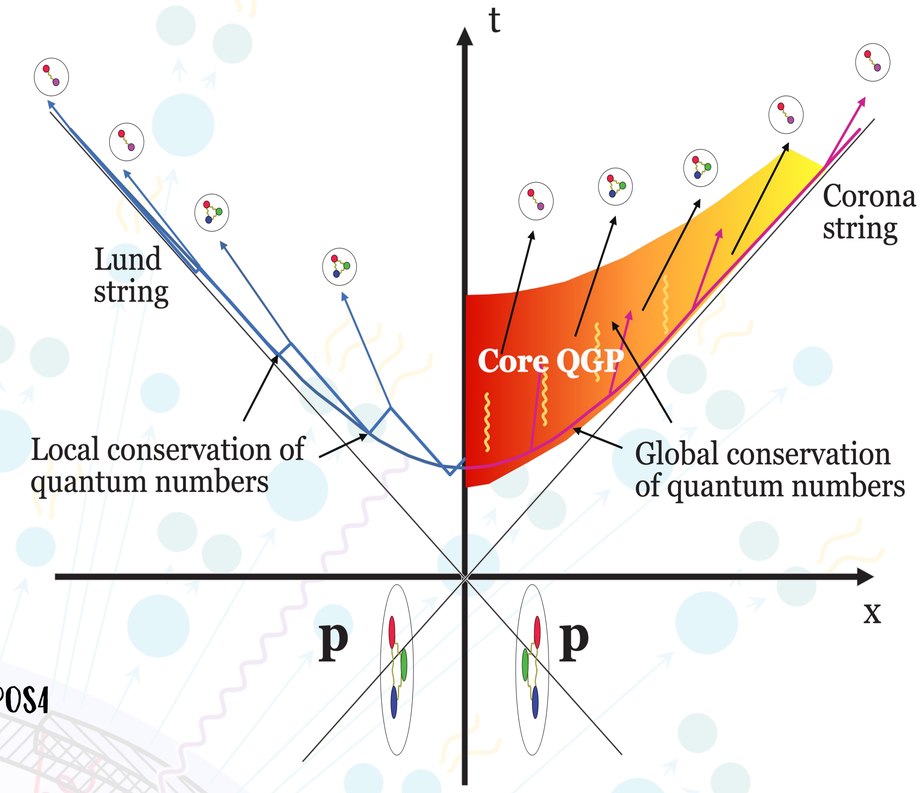


LAYERING OF STRANGE HADRON TO PION RATIOS AS A FUNCTION OF MULTIPLICITY → LUND STRINGS IMPLY LOCAL CONSERVATION OF STRANGENESS

K^0_S/π RATIO DECREASES WITH MULTIPLICITY FOR PYTHIA 8.3 WITH ROPES, REMAINS RATHER FLAT FOR EPOS4

➢ NEED TO MEASURE THESE OBERVABLES

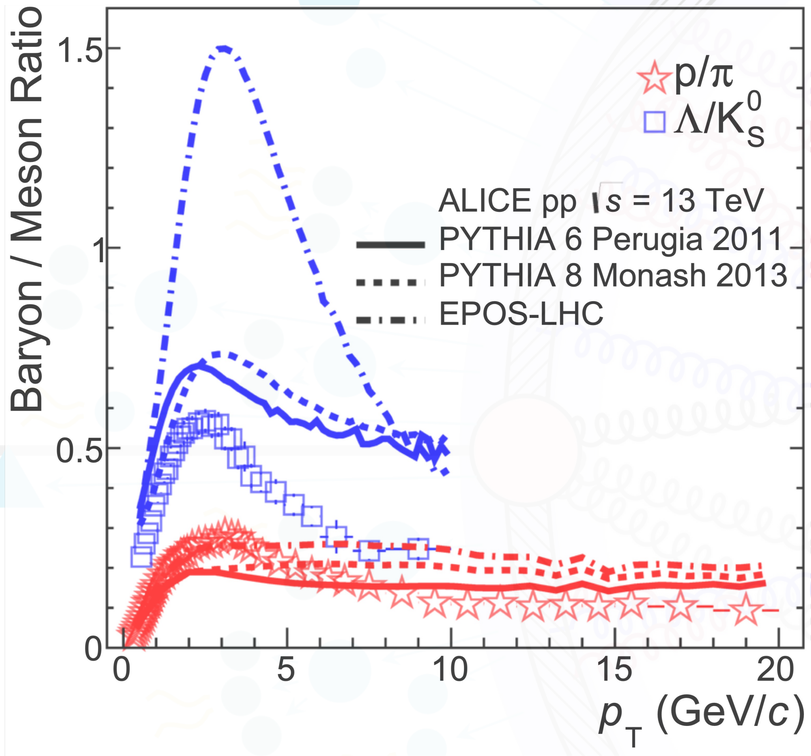
- LUND STRINGS (PYTHIA8.3 WITH ROPES) CONSERVE STRANGENESS **LOCALLY**
- MODELS WITH A MICROCANONICAL ENSEMBLE APPROACH (CORE-CORONA EPOS4) CAN ONLY DO IT **GLOBALLY**

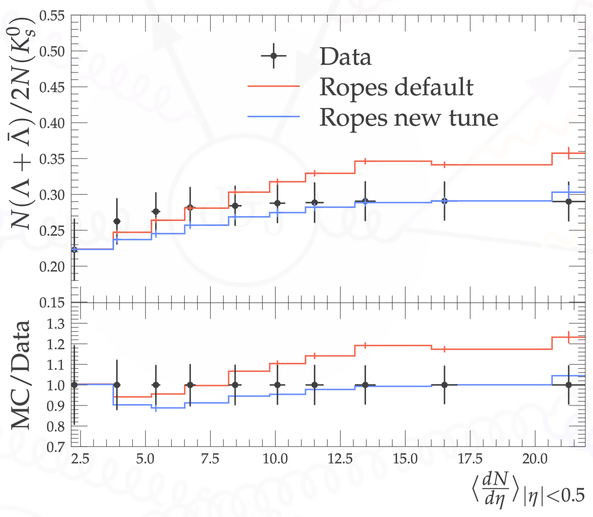


HADRONISATION OF BARYONS

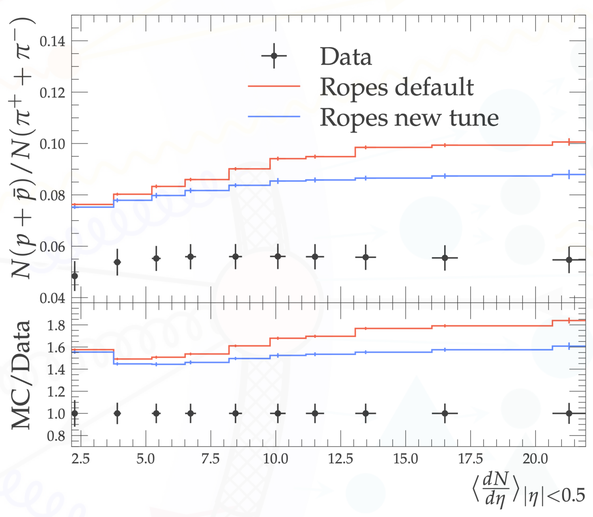
- HADRONIZATION OF BARYONS IS AFFECTED BY **NON-TRIVIAL COLOUR TOPOLOGIES**
- p/π AND Λ/K^0_S RATIOS ARE OVERESTIMATED IN MODELS

TUNING OF PYTHIA8.3 WITH ROPES USING PROFESSOR: VARIATION OF THE MONTE CARLO EVENT GENERATOR FREE PARAMETERS





IMPROVEMENT BY 20% OF Λ BARYON PRODUCTION AS A FUNCTION OF MULTIPLICITY

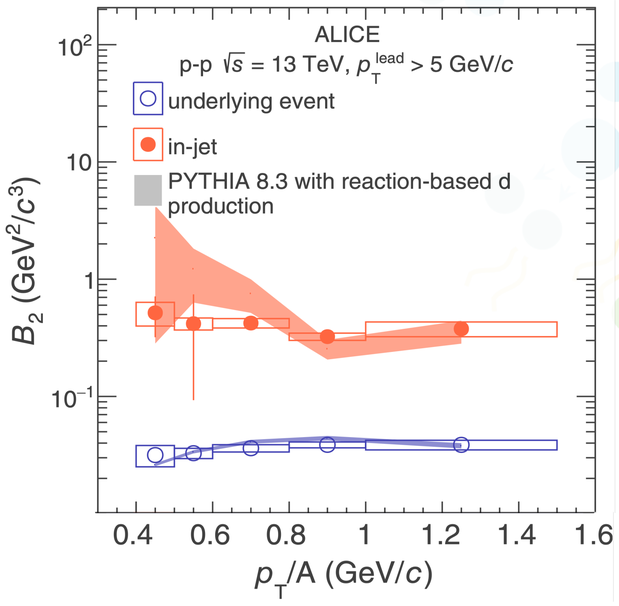


REGARDLESS OF TUNING:
PYTHIA8.3 CANNOT REPRODUCE p/π RATIO

➢ ROOM FOR MODELLING IMPROVEMENT

LIGHT-NUCLEI FORMATION

- DEUTERON SPECTRA ARE MEASURED IN AND OUT OF JETS: B_2^{JET} IS ~ 10 TIMES LARGER THAN THAT IN THE UNDERLYING EVENT



RESULTS REPRODUCED BY PYTHIA8.3 WITH DEUTERON PRODUCTION VIA ORDINARY REACTIONS

PLAN TO IMPLEMENT HELIUM-3 PRODUCTION IN PYTHIA8.3 FROM

$$p + D \rightarrow {}^3He + \pi^0$$

THESE PREDICTIONS WILL HAVE AN IMPORTANT IMPACT ON THE LIGHT-NUCLEI PRODUCTION STUDIES AND ON THE UNDERSTANDING OF THEIR INTERACTION WITH MATTER

➢ DARK MATTER IMPLICATIONS

REFERENCES

- C. BIERLICH, S. CANNITO, V. ZACCOLO, ARXIV: 2403.00511, ACCEPTED BY EPJC
- ALICE COLLABORATION, EUR.PHYS.J.C 81 (2021) 3, 256
- A. BUCKLEY ET AL., EUR.PHYS.J.C 65 (2010) 331-357
- ALICE COLLABORATION, NATURE PHYS. 13 (2017) 535-539
- ALICE COLLABORATION, PHYS.REV.LETT. 131 (2023) 4, 042301

VALENTINA ZACCOLO

UNIVERSITY OF TRIESTE AND INFN

VALENTINA.ZACCOLO@UNITS.IT

COLLABORATORS

LORENZO BERNARDINIS (TRIESTE, ITALY)
CHRISTIAN BIERLICH (LUND, SWEDEN)
STEFANO CANNITO (TRIESTE, ITALY)
RAMONA LEA (BRESCIA, ITALY)