

**Charged Particle
 p_T Spectra as Function of Multiplicity
in pp, p-A and A-A Collisions
Measured with ALICE**

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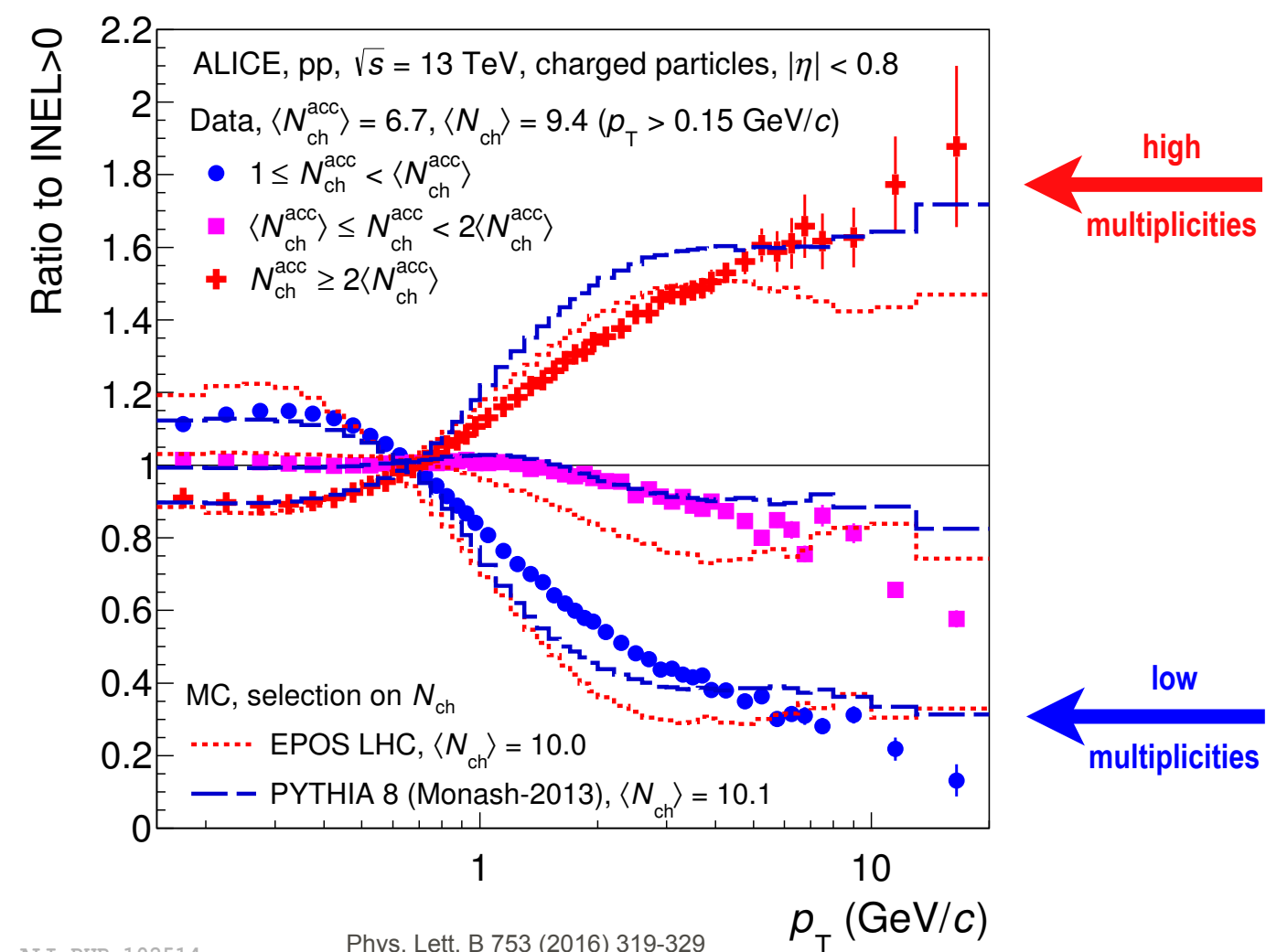
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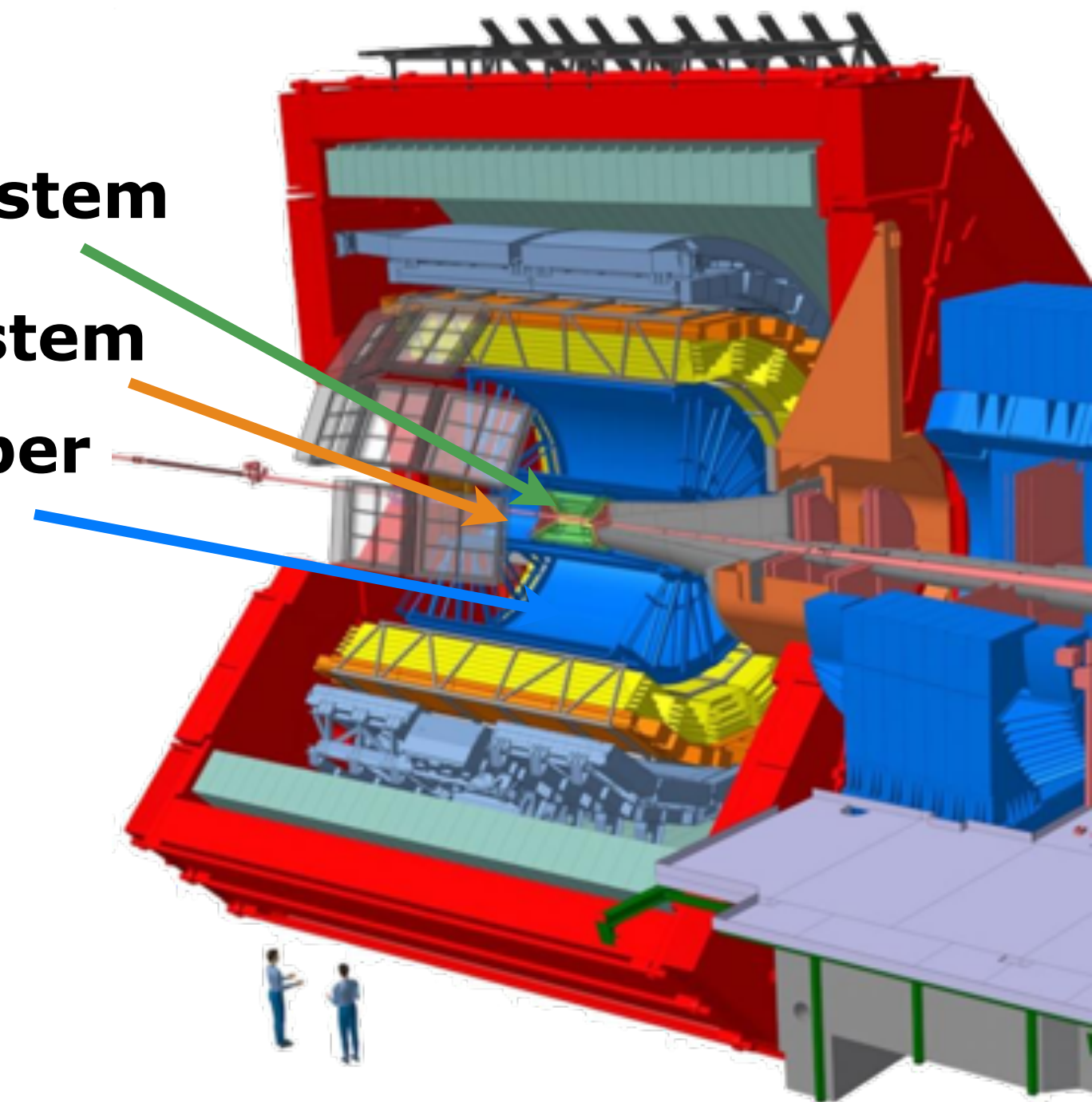
Introduction

- study charged-particle production mechanisms and soft QCD phenomena
- collective effects present in small systems?
- alternative model descriptions:
 - interacting strings and no QGP (PYTHIA)
 - QGP / hydrodynamic flow also in small systems (EPOS)
- correlation between p_T spectra and multiplicity sensitive observable to probe event generators

this analysis:
 primary charged particles
 $0.15 \text{ GeV}/c < p_T < 10 \text{ GeV}/c$
 $|\eta| < 0.8$



Inner Tracking System
V0 System
Time Projection Chamber

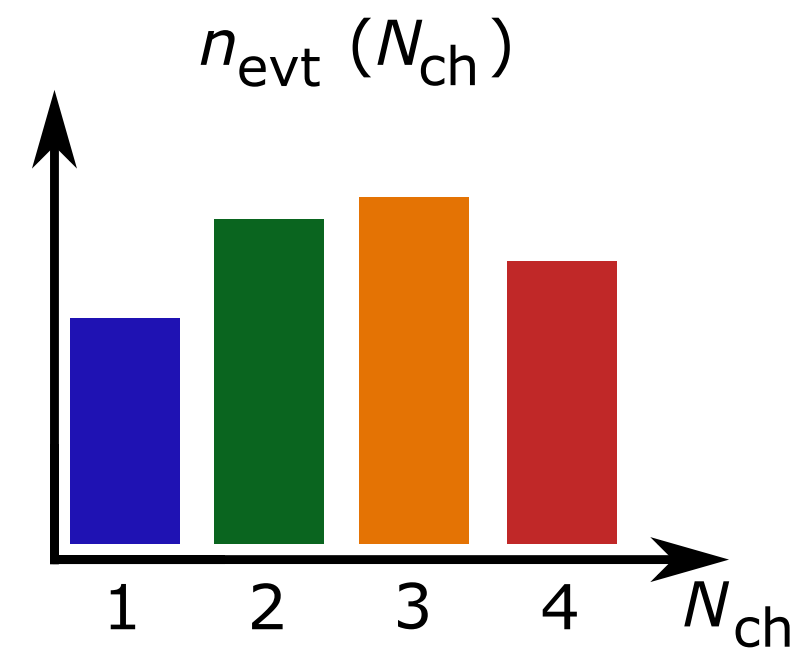




Unfolding of p_T Spectra

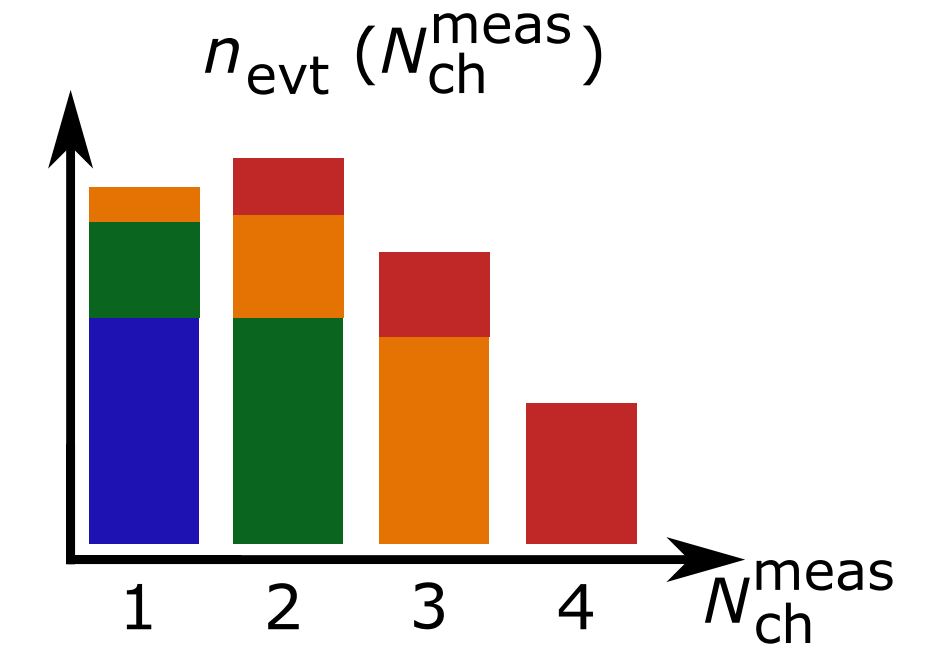


- correlation of p_T spectra with true multiplicity eludes direct observation due to detector effects
- measurement: track yield as a function of track multiplicity
- sequential 2D unfolding based on iterative D'Agostini method
Nucl. Instr. Meth. Phys. Res. A 362 (1995) 487-498
- result: multiplicity and p_T differential invariant yield of primary charged particles

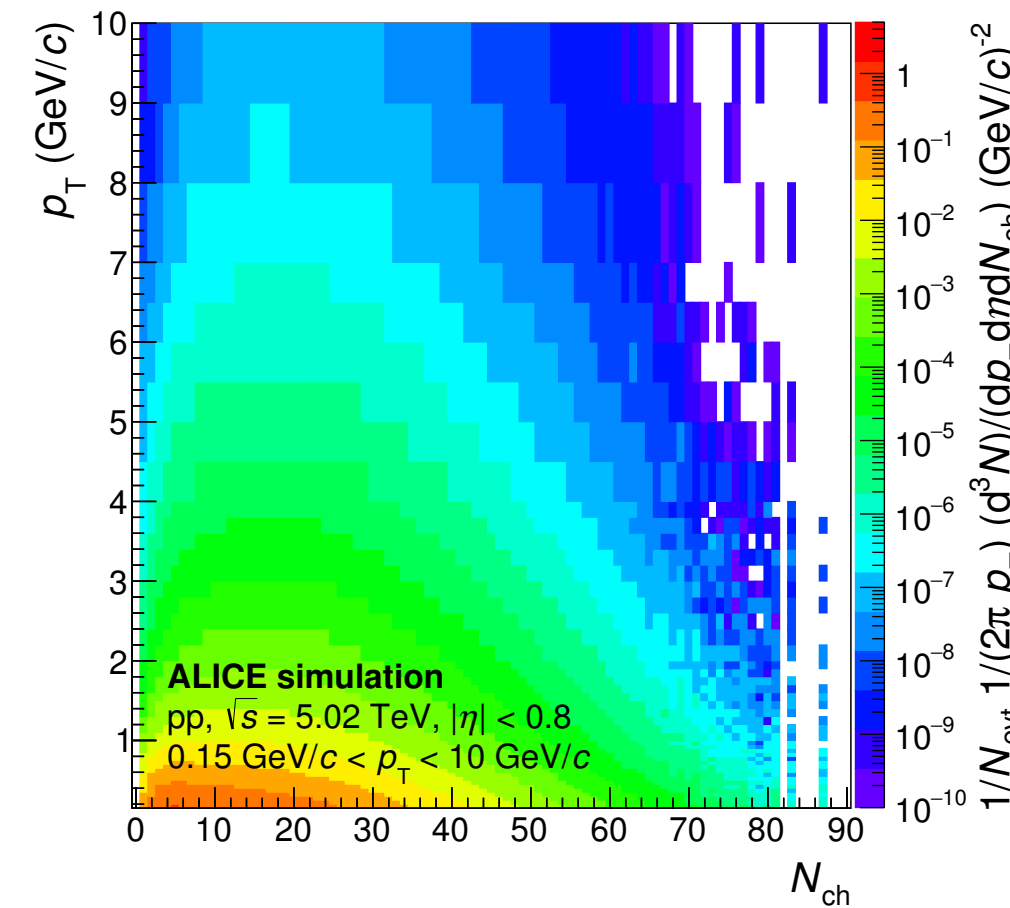
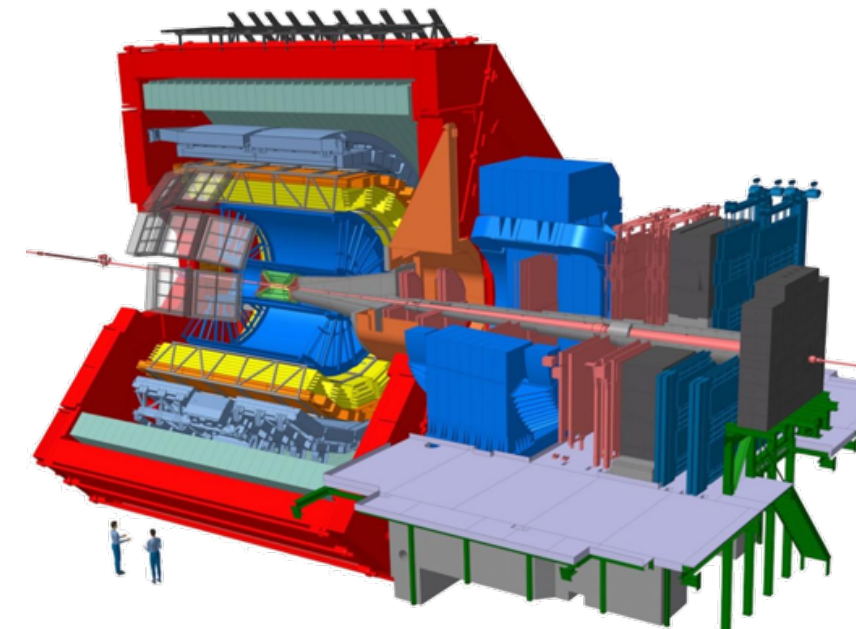


true

detector response

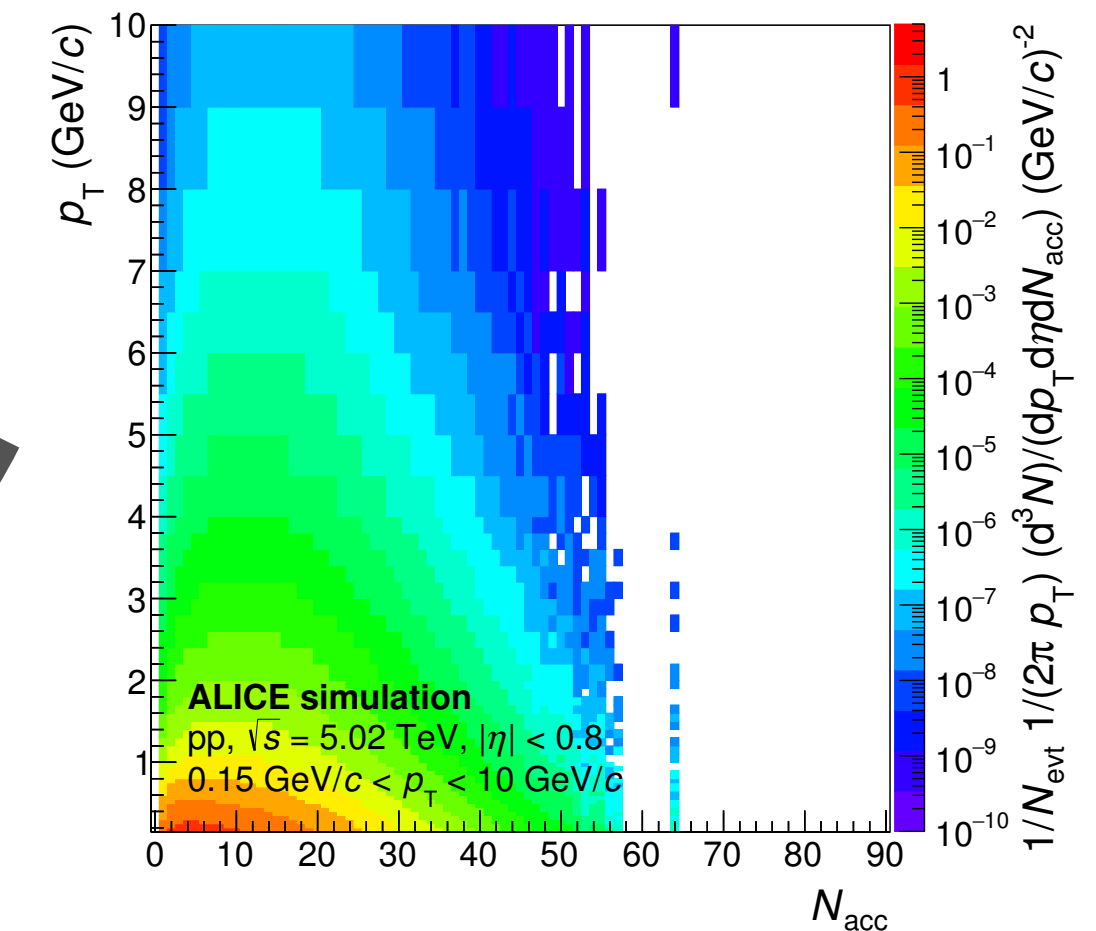


measured



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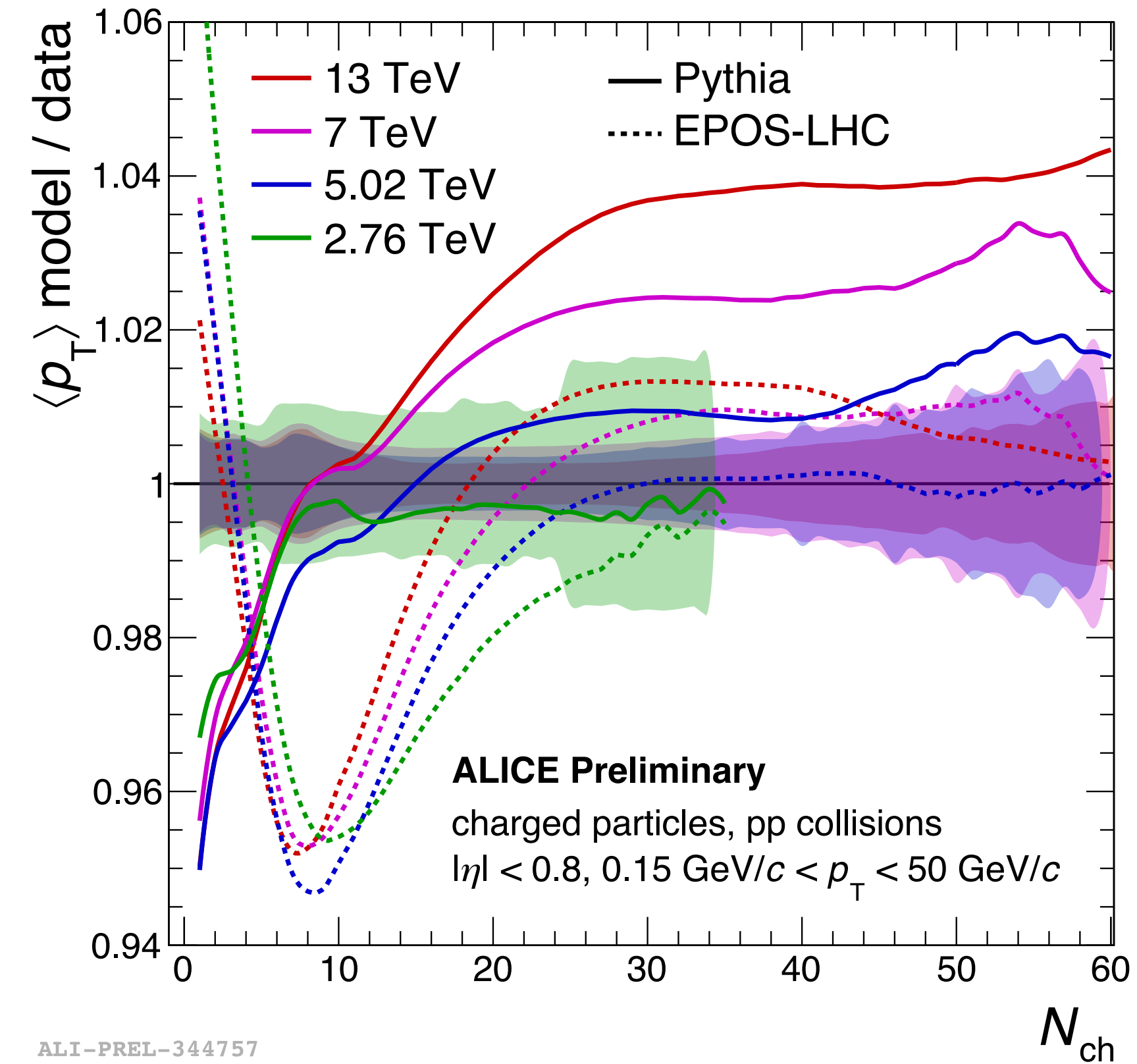
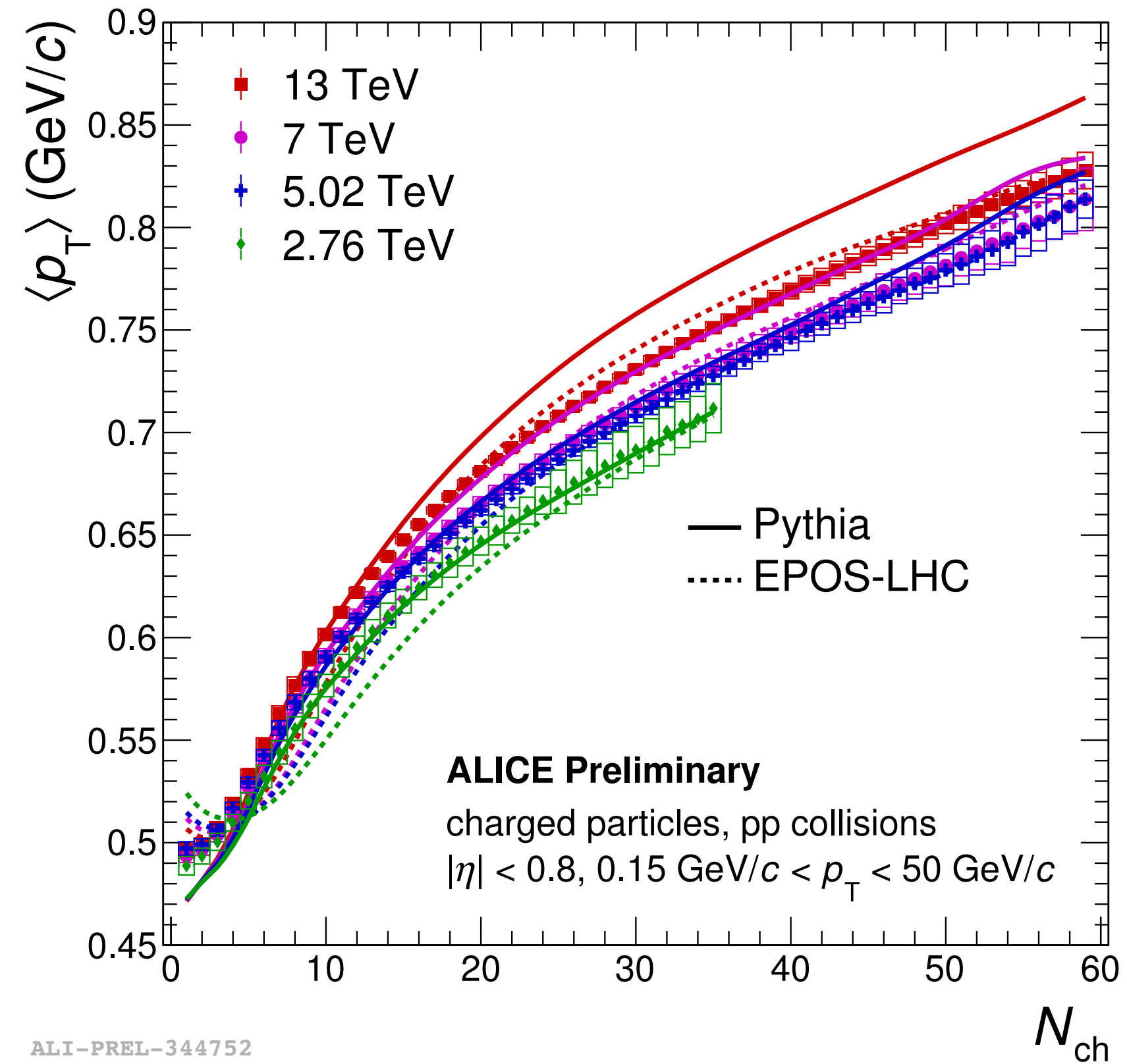
unfolding



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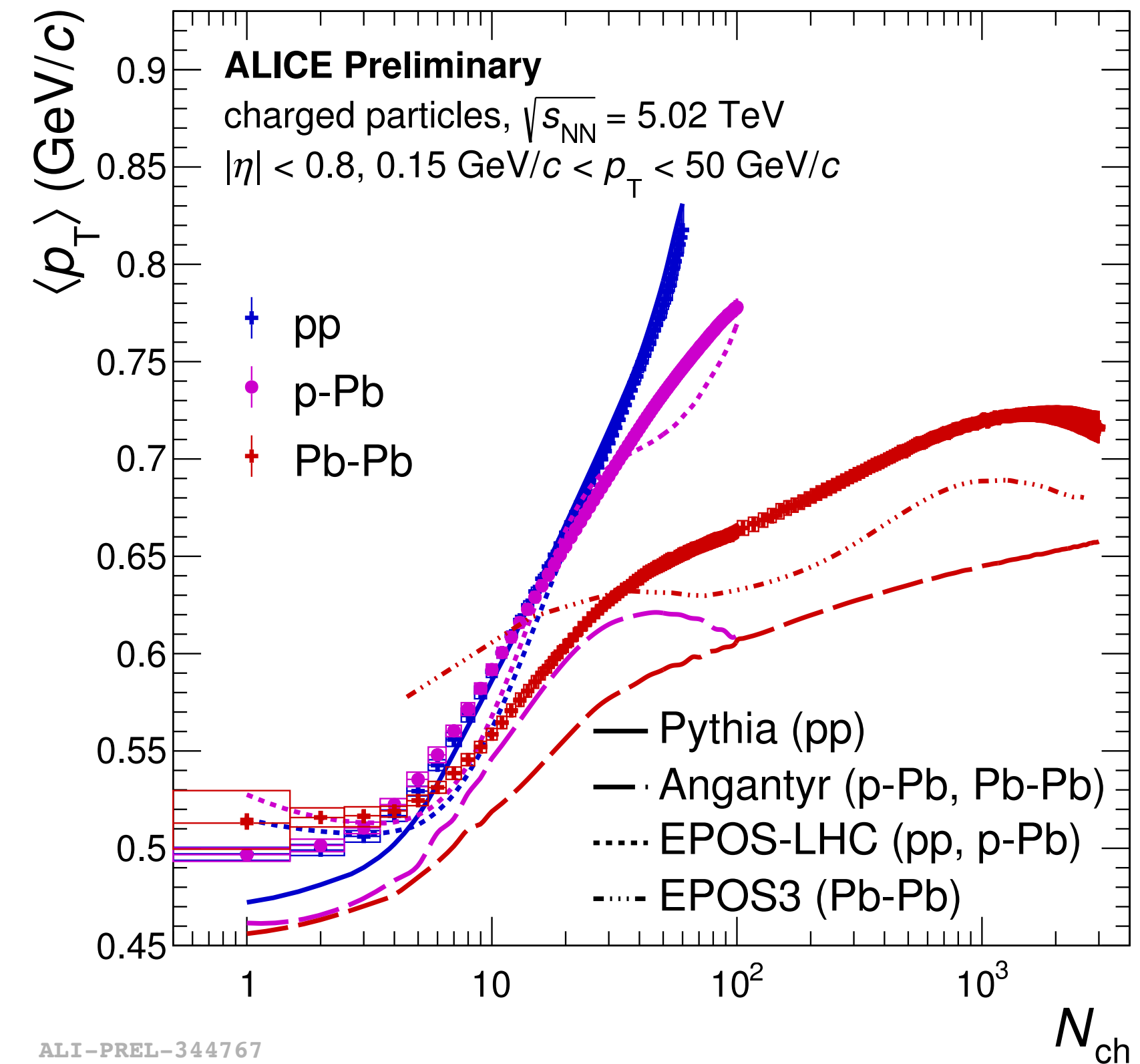
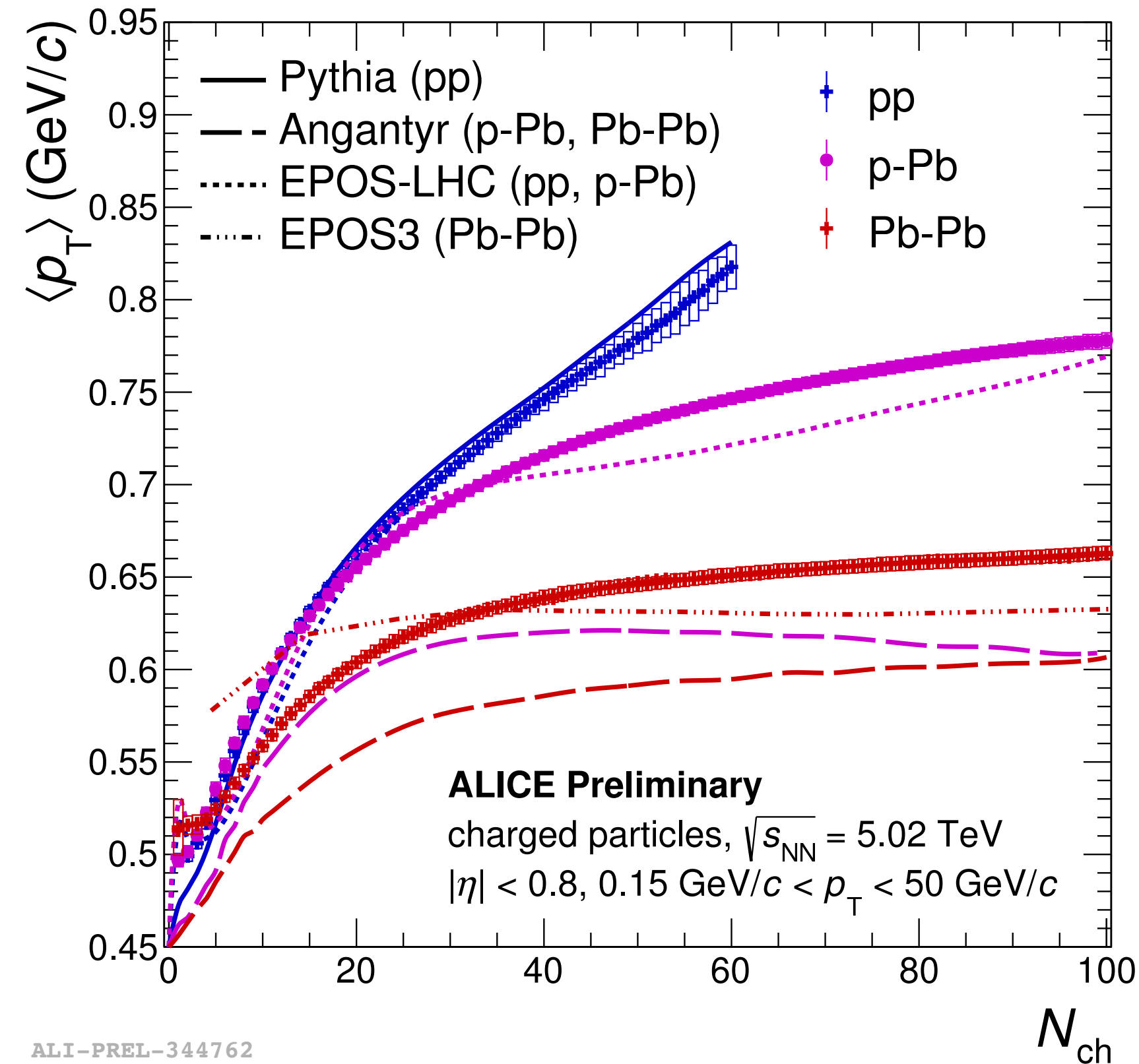
Energy Dependence in pp



- clear collision energy dependence of $\langle p_T \rangle$ vs. N_{ch}
- EPOS LHC: good description for $N_{ch} > 20$
- PYTHIA: discrepancy w.r.t. data increases with collision energy



System Size Dependence



- model description better for pp collisions
- EPOS LHC and EPOS3 closer to data than PYTHIA Angantyr in p-Pb and Pb-Pb



Conclusions and Outlook



- 2D unfolding approach allows to extract p_T spectra as a function of multiplicity with highest possible granularity
- derived quantities can be compared at different energies and system sizes
- for larger collision systems model description of this basic observable still challenging
- comprehensive study including the whole range of LHC collision systems and energies in preparation

