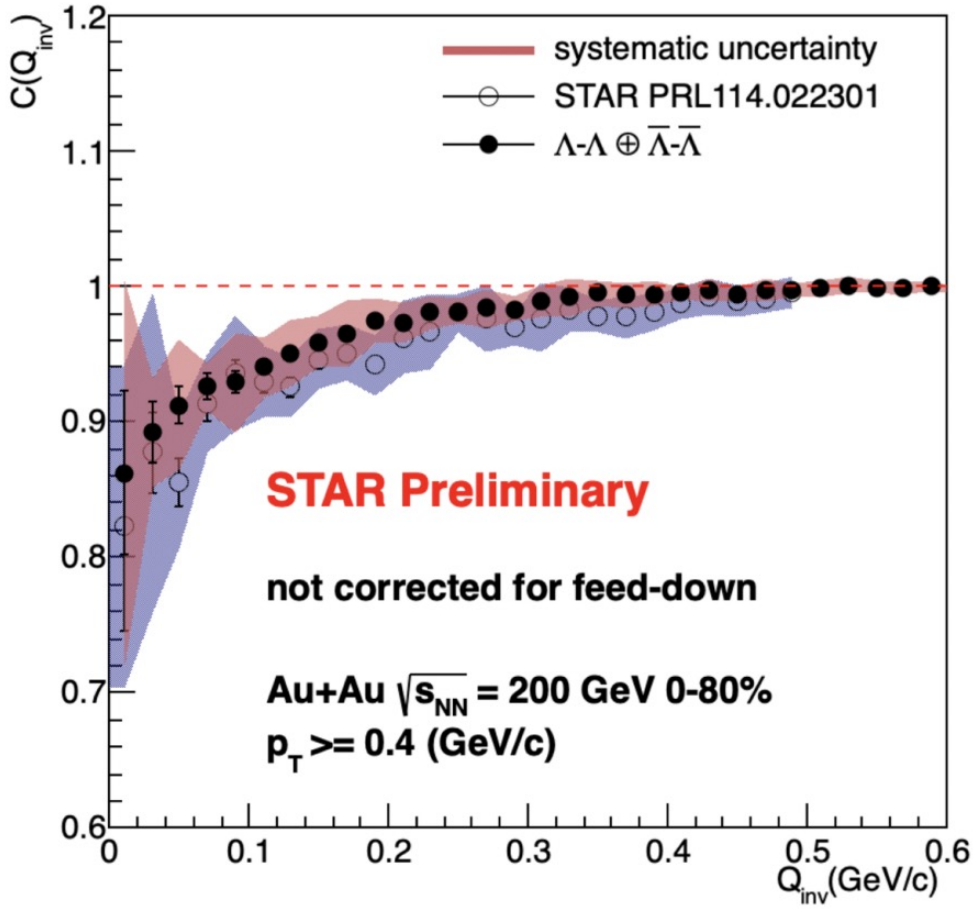
Correlations and bound states wrap up

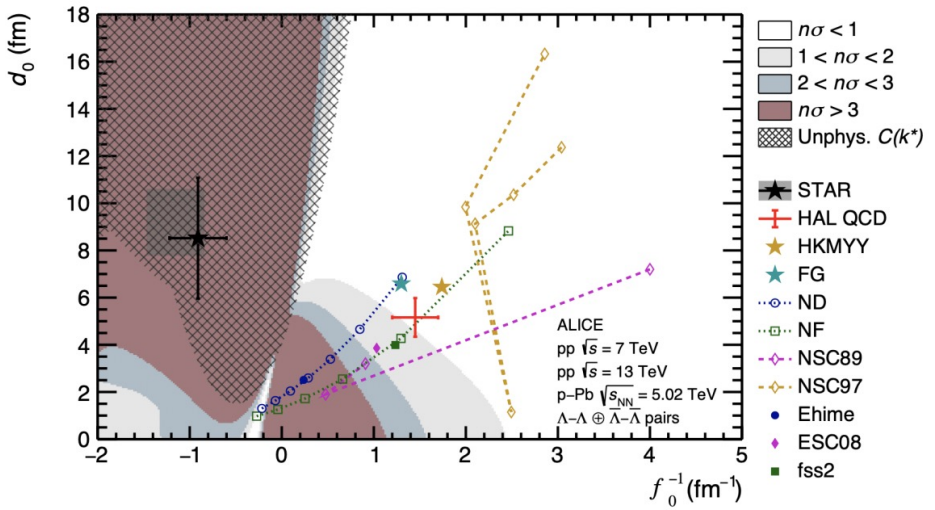
Wednesday 15 February 2023

Recent Femtoscopy Measurements from STAR experiment at RHIC [Ke Mi]



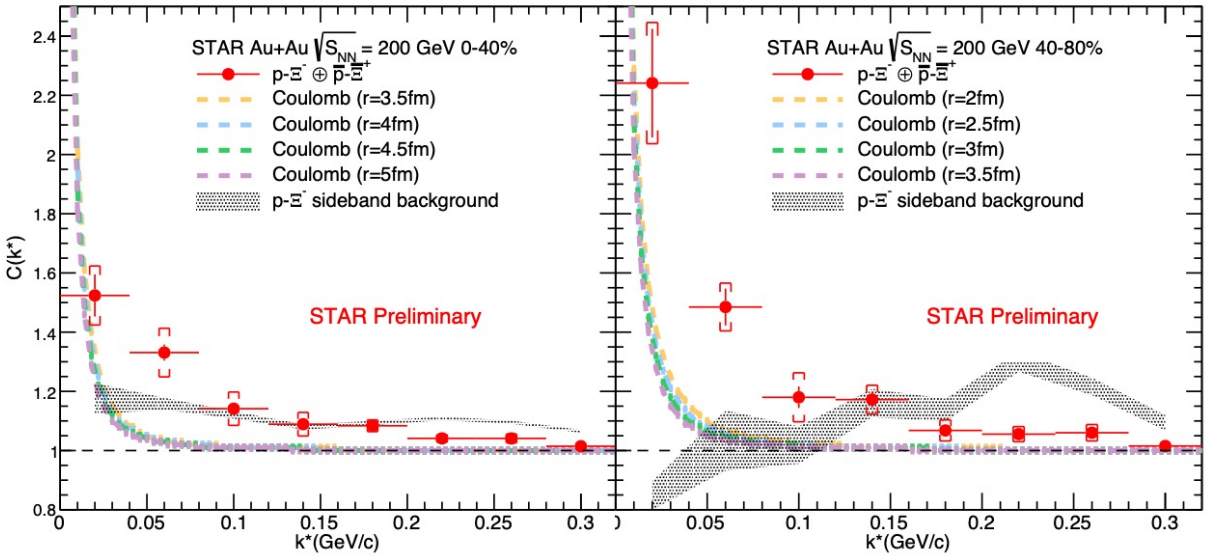
Hyperon-Nucleon (Y-N) and Hyperon-Hyperon (Y-Y) interactions are important for study the exotic hadronic states

|s|	1	2	3	4
Pair	ΛN	ΞN, ΛΛ	PΩ	ΞΞ



Y-N and Y-Y interaction

Y-N and Y-Y interaction



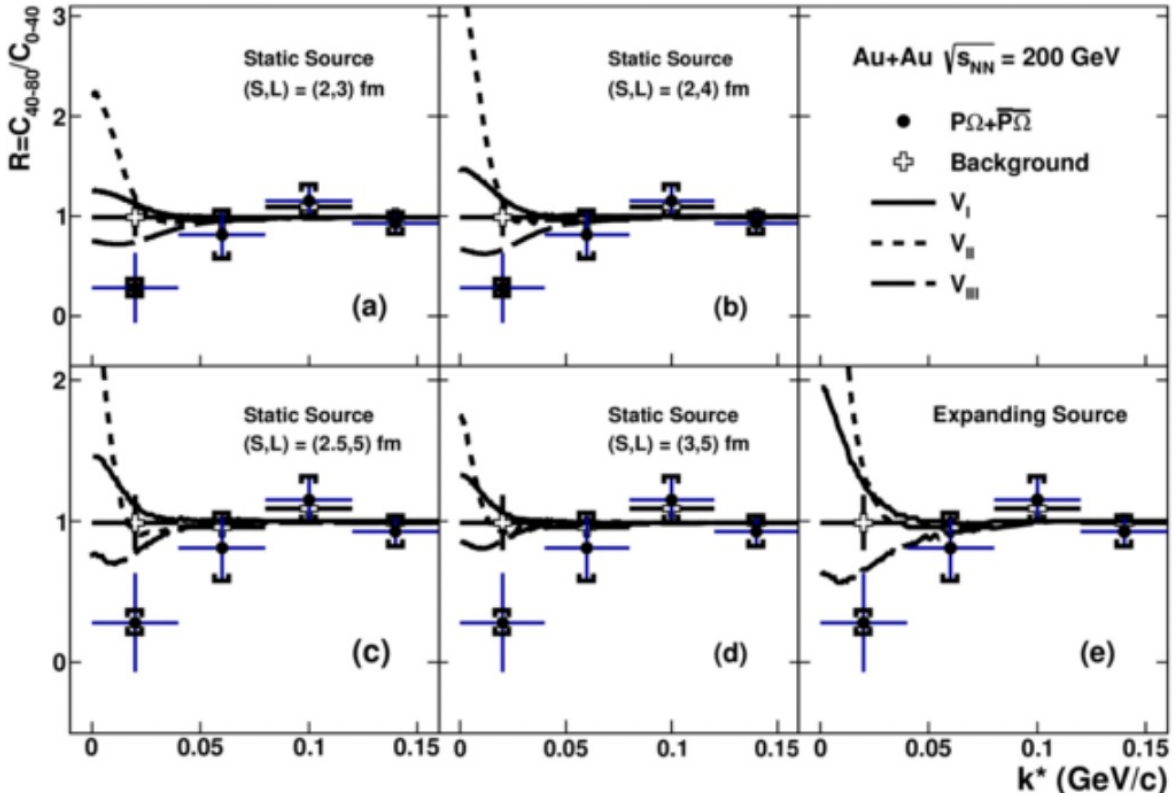
⇒ Enhancement at low k* in both large (0-40%) and small (40-80%) system

⇒ p-Ξ CFs show deviation from Coulomb only —- Strong Interaction

⇒ No dip structure seen in data —- No bound state

pΞ

S=4 : ΞΞ show anti-correlation (c<1)

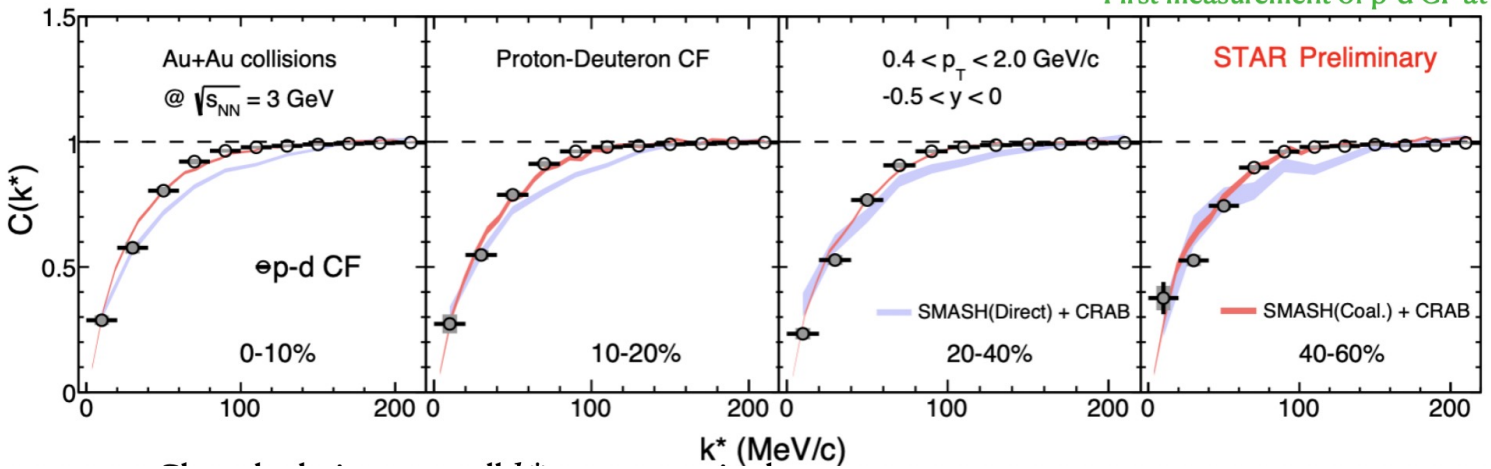


pΩ

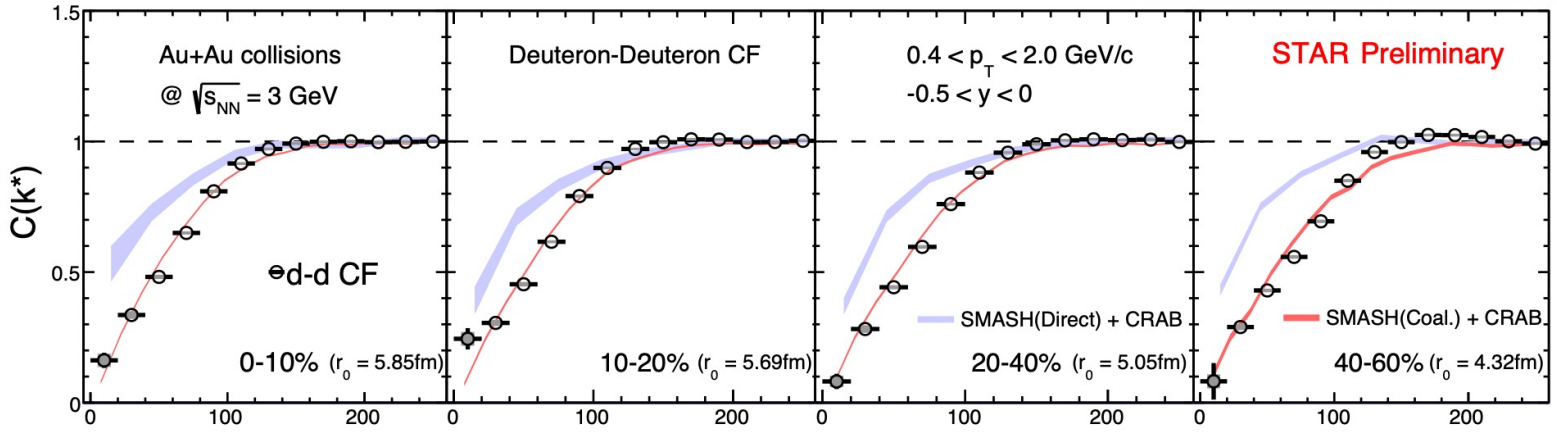
⇒ Measurement supports the existence of a deeply bound state decaying into the proton-Ω final state

Light Nuclei interaction STAR@3GeV

First measurement of p-d CF at STAR



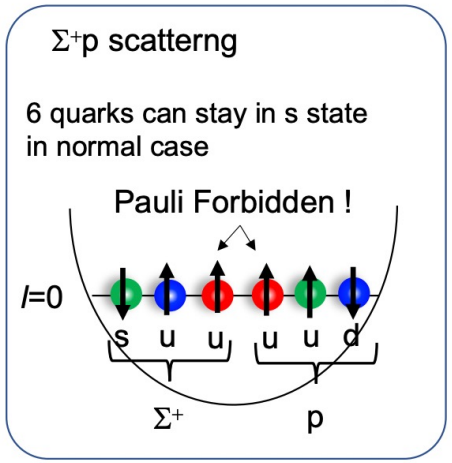
First measurement of d-d CF at STAR

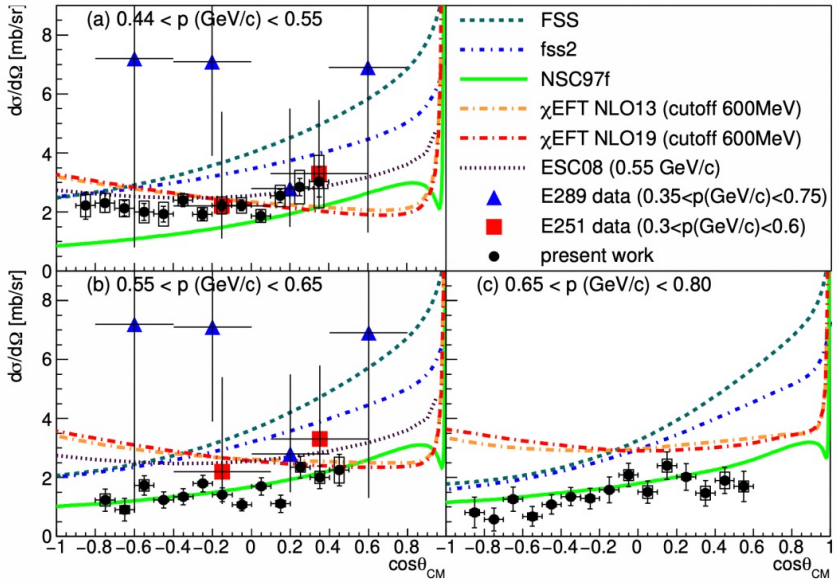


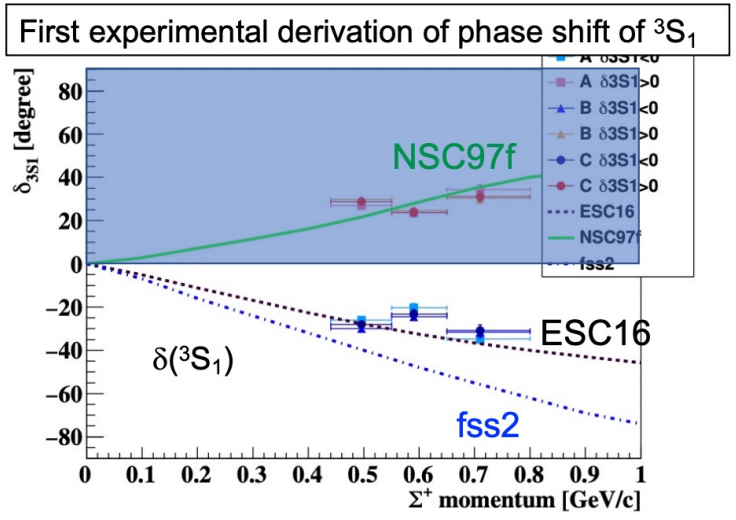
⇒ Clear depletion at small range k* seen in data

Hyperon-nucleon scattering experiment at J-PARC [Koji Miwa]

- Σ^--p elastic scattering and Σ-p -> Λn inelastic scattering : compatible with models
- Σ^+-p (more repulsive potential in 3S1)



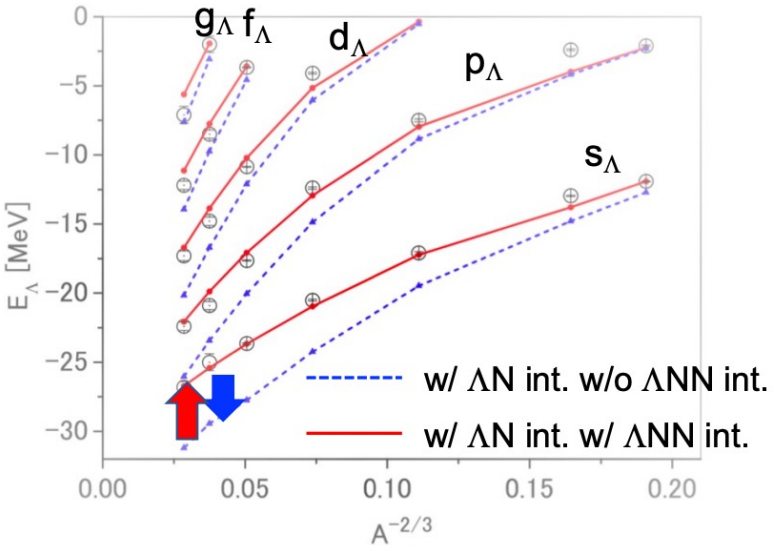




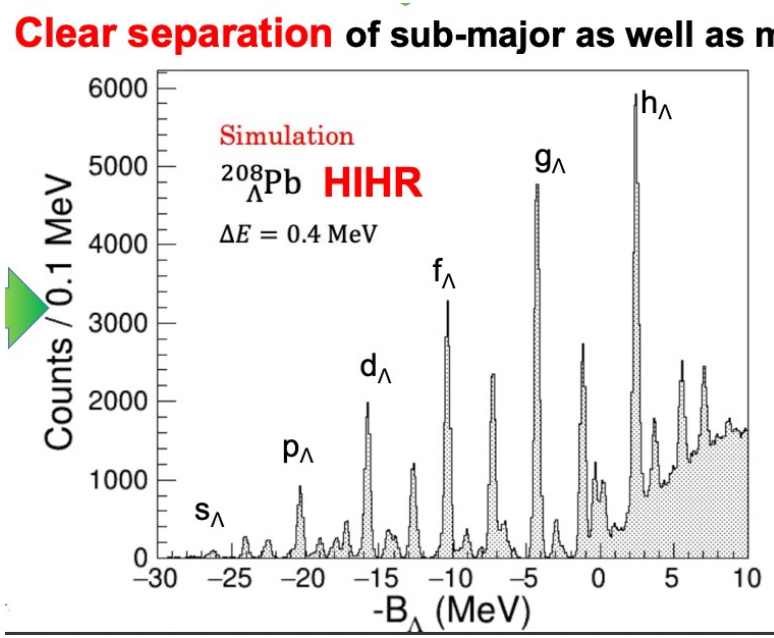
J-PARC Hadron Experimental Facility Extension Project

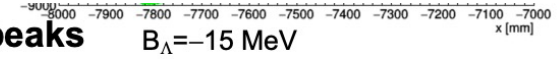
- $d\sigma/d\Omega$ and Spin observables in Λp scattering
- Two directions for study of the density dependence of LN interaction
  - Mass number dependence of B_Λ
  - Λ orbital dependence of B_Λ

High-resolution spectroscopy up to medium and heavy Λ hypernuclei



Clear separation of sub-major as well as major peaks



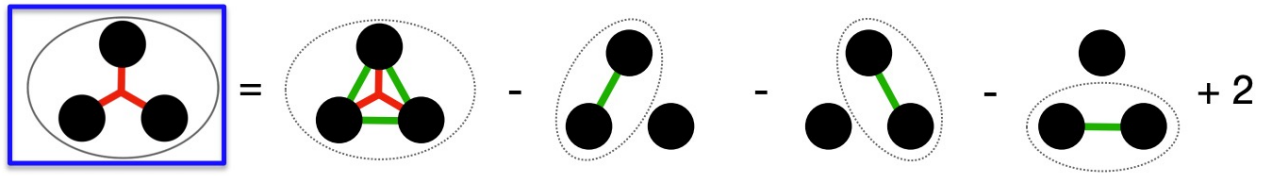


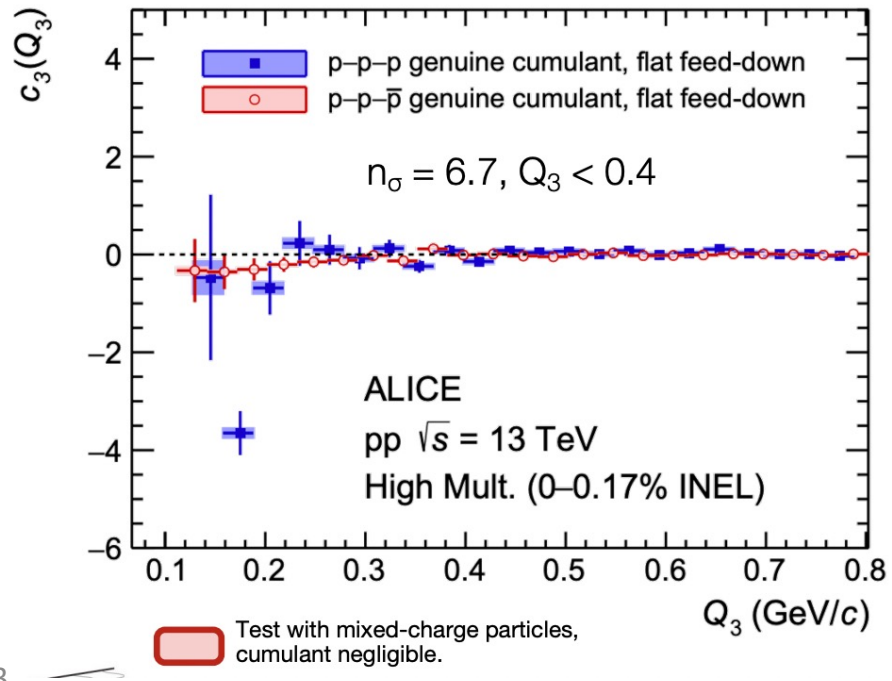
Precise Λ binding energies
for wide-mass range

Density dependence of ΛN interaction (ΛNN interaction)

Calculate U_Λ at high density region
Untangle hyperon puzzle in neutron star

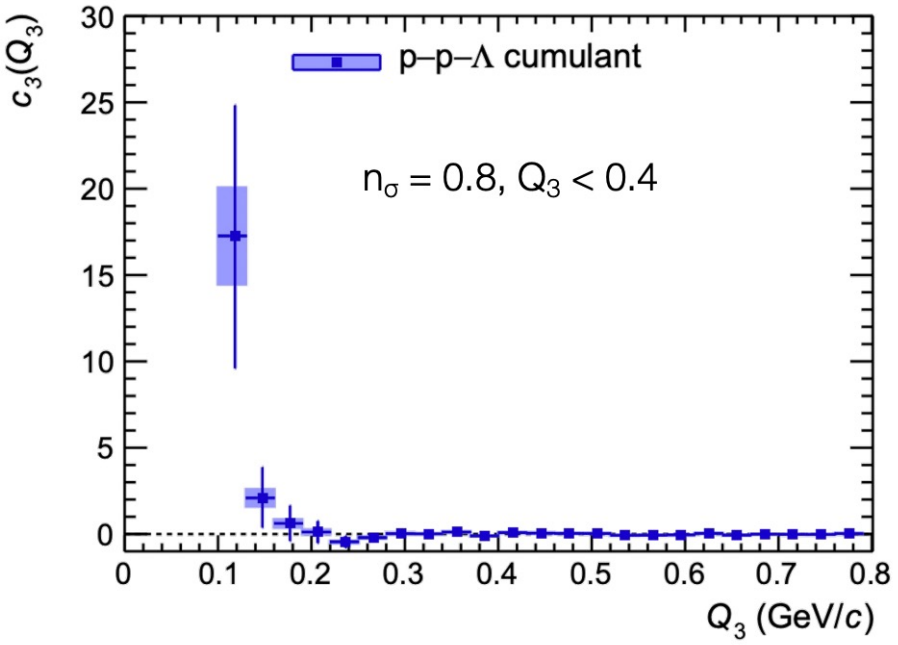
Accessing the three-body dynamics with multi-particle correlations at LHC [V. Mantovani Sarti]



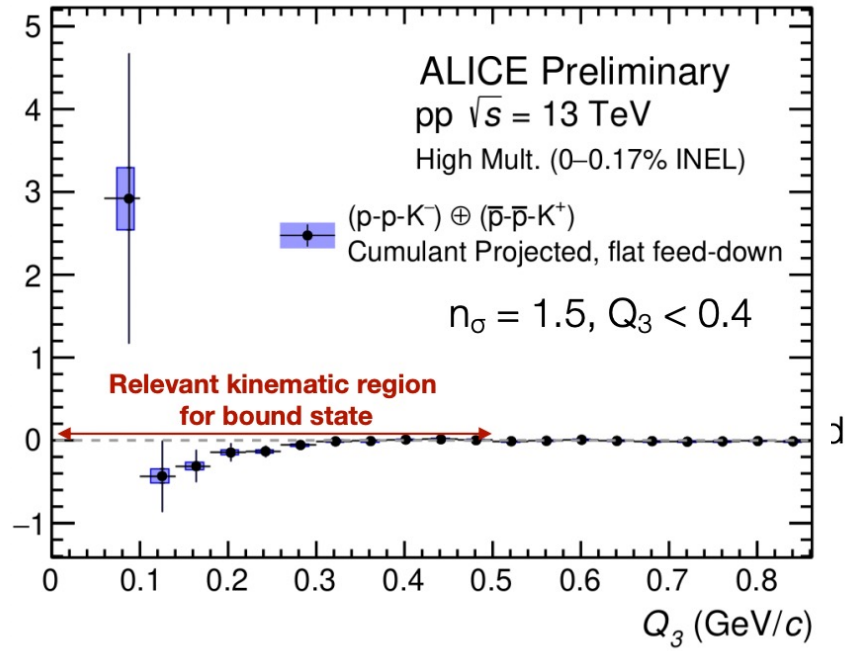


- Negative cumulant and deviation from zero
  → Presence of a genuine 3-body effect
- Possible interpretations
  - Pauli blocking at 3-particle level
  - 3-body strong interaction
- Take-home message:
  → Significant deviation from null hypothesis
  → Ongoing collaboration with Pisa theory group (Prof. Kviesky, Prof. Marcucci and Dr. Viviani)

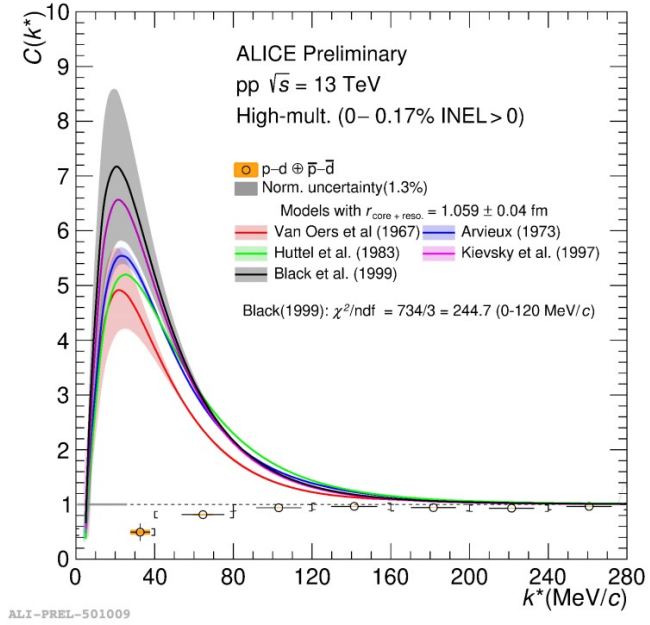
Accessing the three-body dynamics with multi-particle correlations at LHC [V. Mantovani Sarti]



Presence of 3-body effect
-> Need Run3-4 statistics

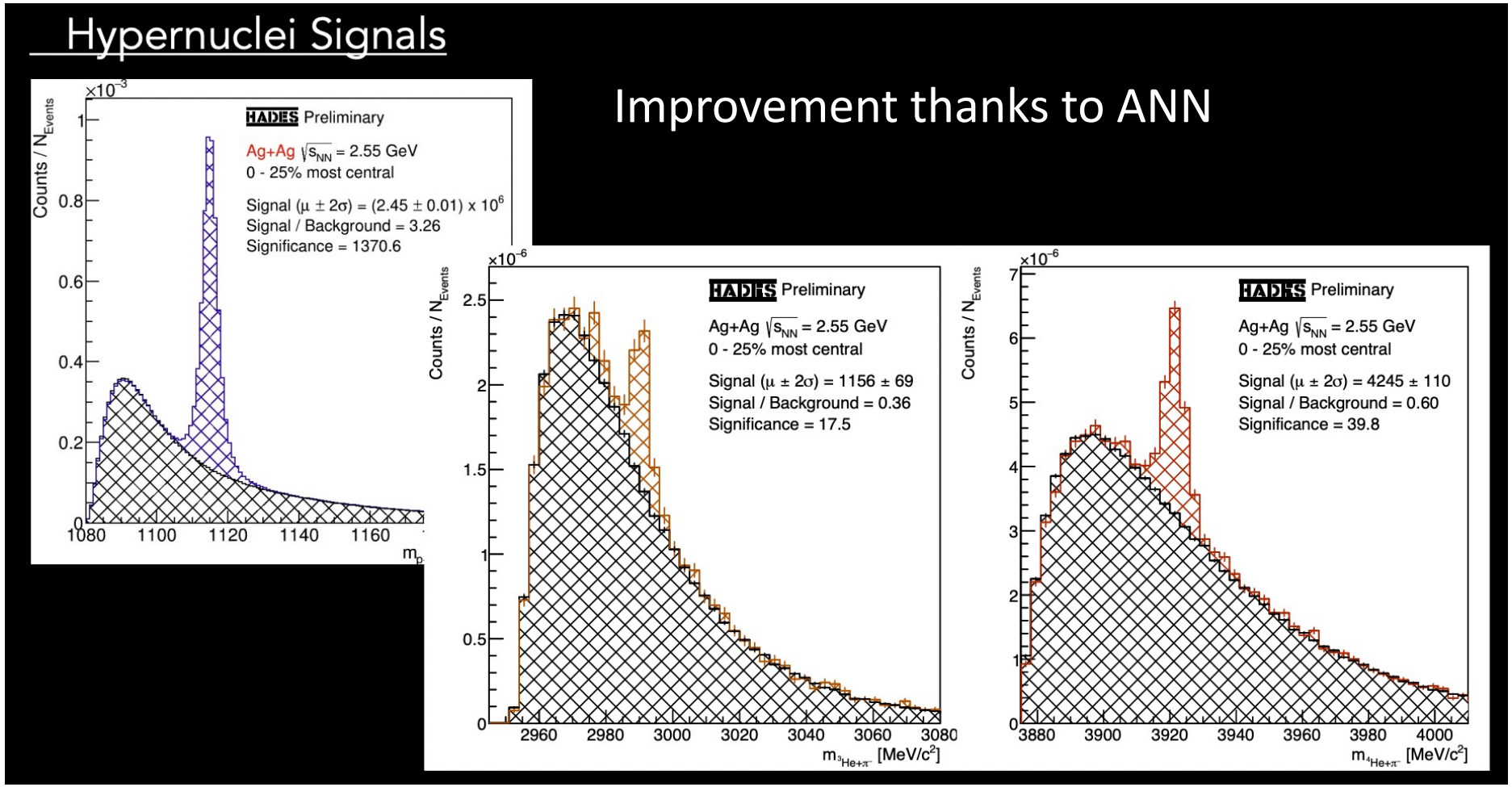


2-body dominates
No three-body effect



Large discrepancy with theoretical CF via Lednicky Lyuboshits approach

Recent Results on Hypermatter from HADES [Manuel Lorenz]



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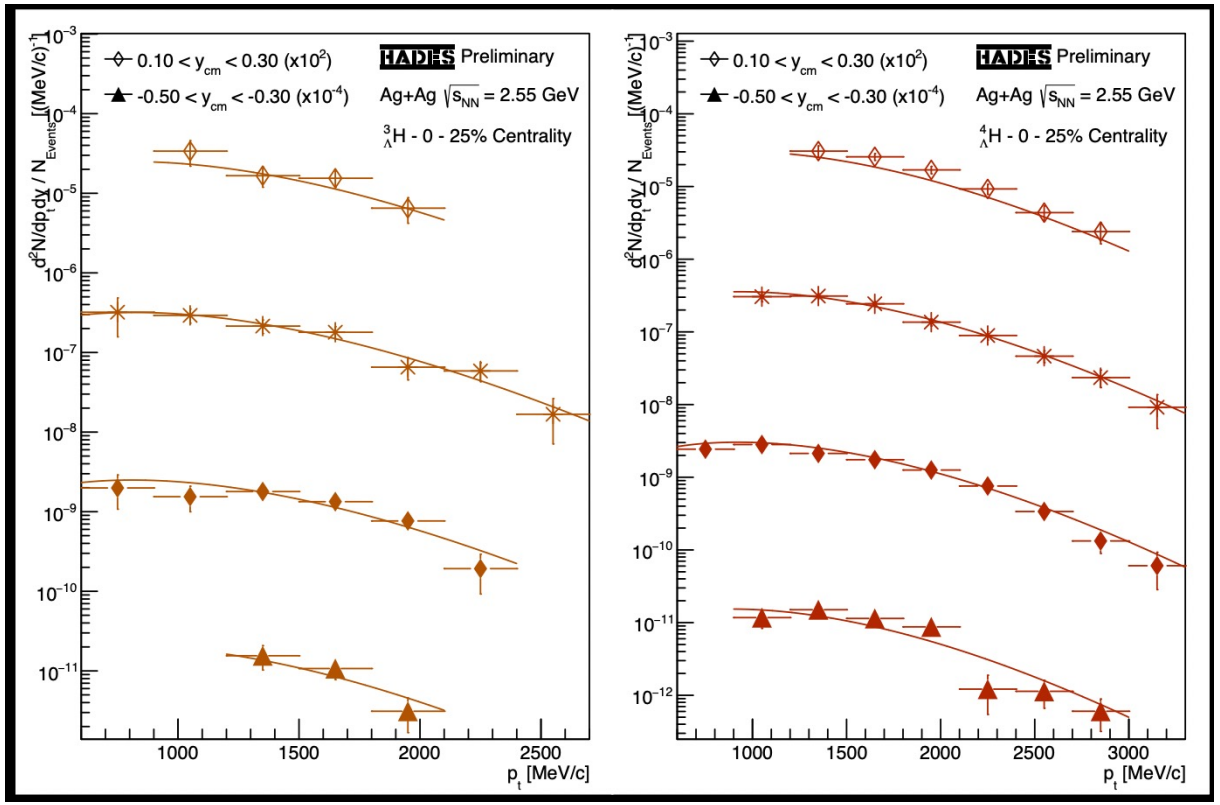
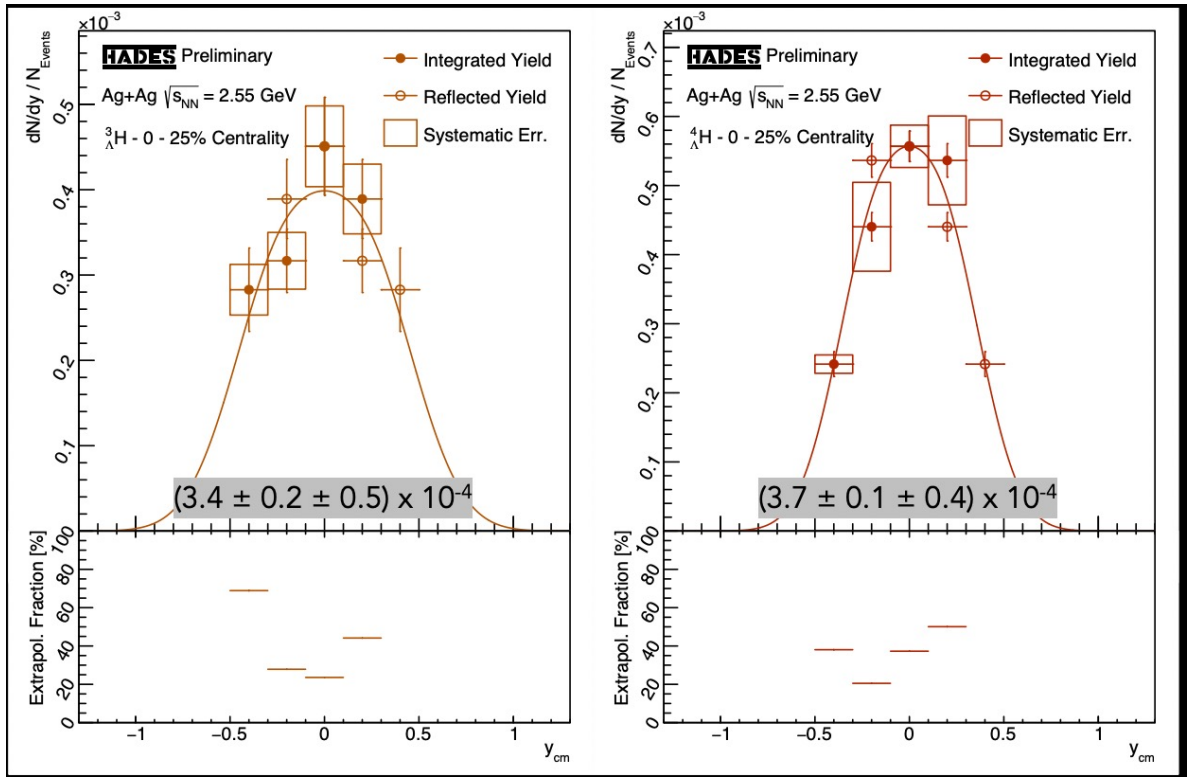
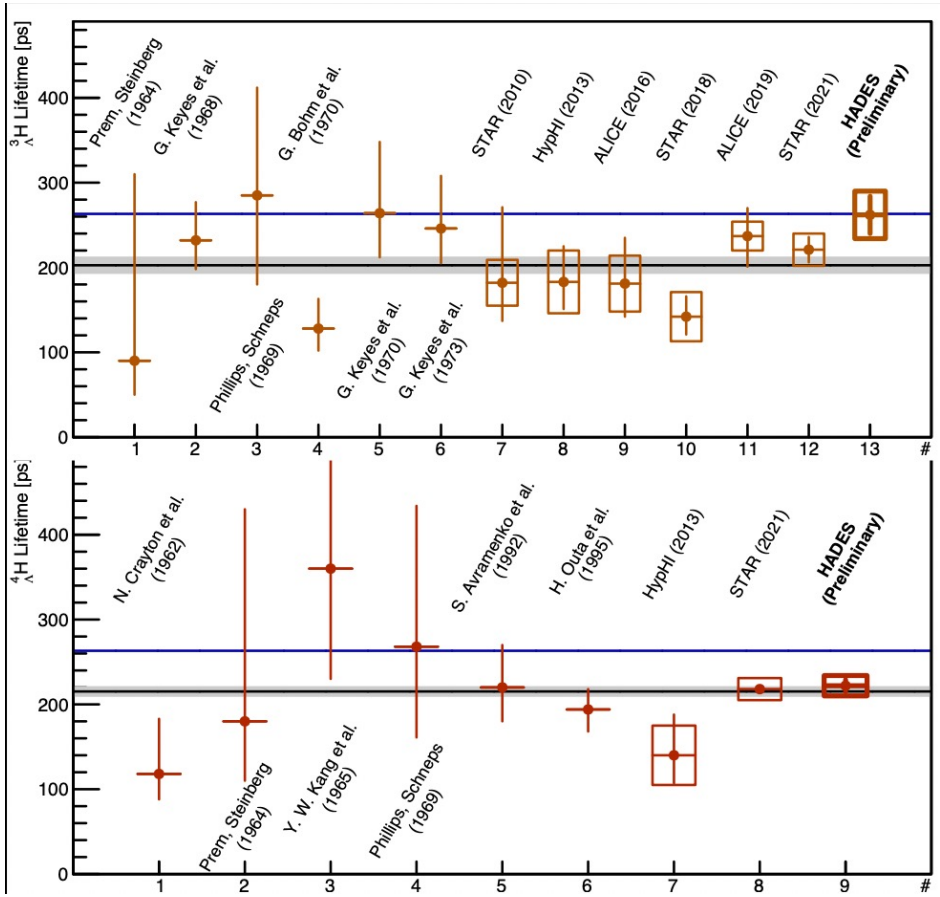


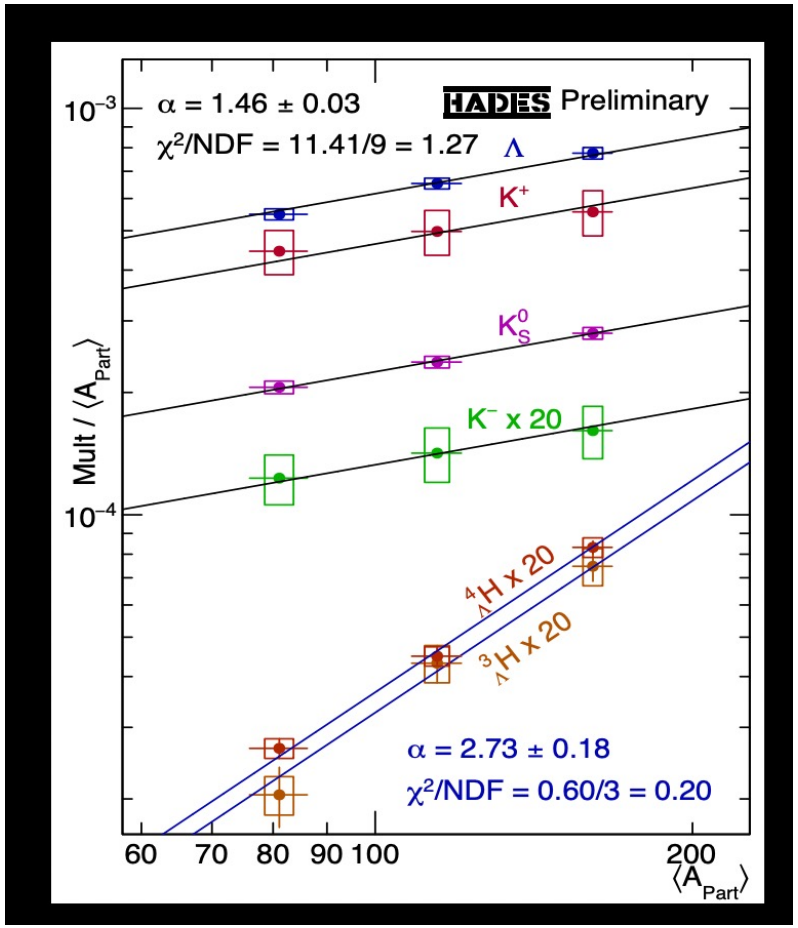


Shape of dN/dy distribution of Hypetriton similar to the one of the Λ (bell like)

Recent Results on Hypermatter from HADES [Manuel Lorenz]



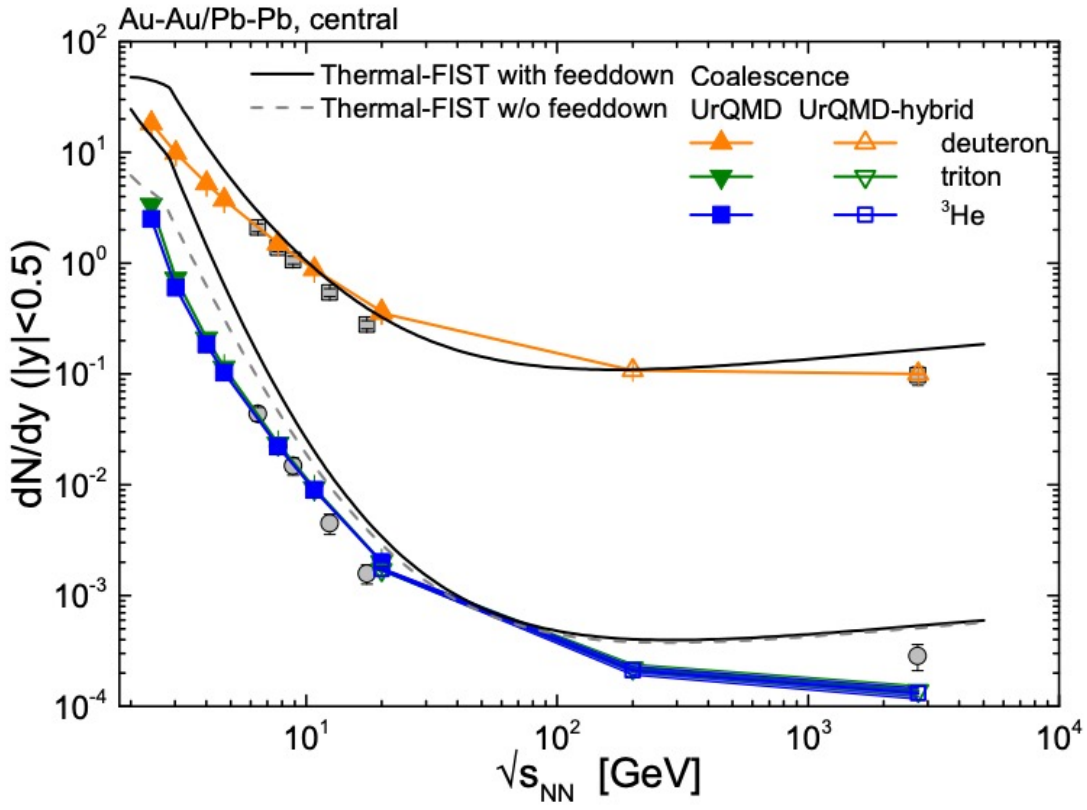
Including the new HADES data the $^4_\Lambda$H a 4.8 σ deviation compared to free Λ- lifetime



Hypernuclei yields scale stronger with centrality.

(Hyper-)Nuclei in Heavy Ion Collisions from coalescence [Jan Steinheimer-Froschauer]

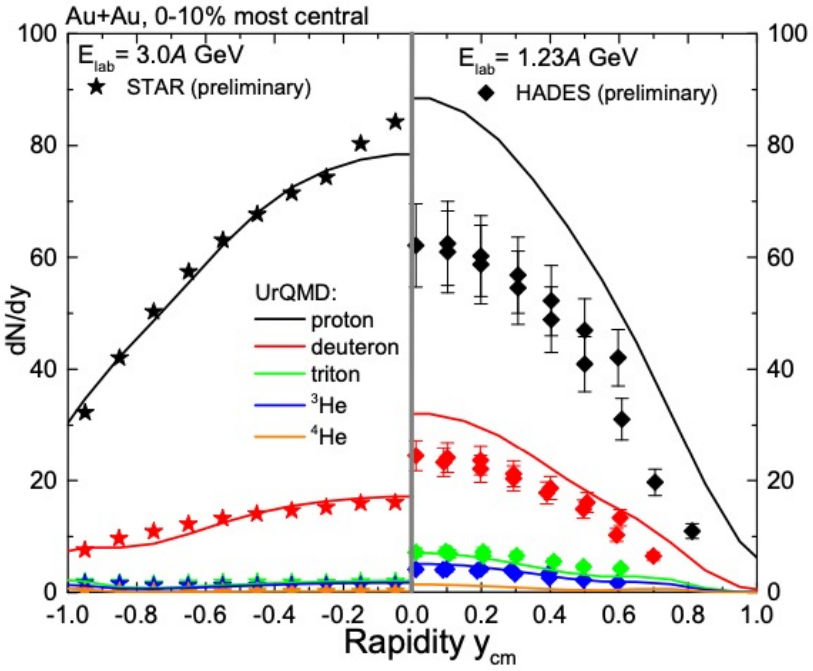
- Deuteron, triton and ^{3}He are well reproduced.
- Differences between triton and ^{3}He at low beam energies due to isospin asymmetry.
- Slightly too much stopping at intermediate energies.
- ALICE: Deuteron well described, ^{3}He seems underestimated.

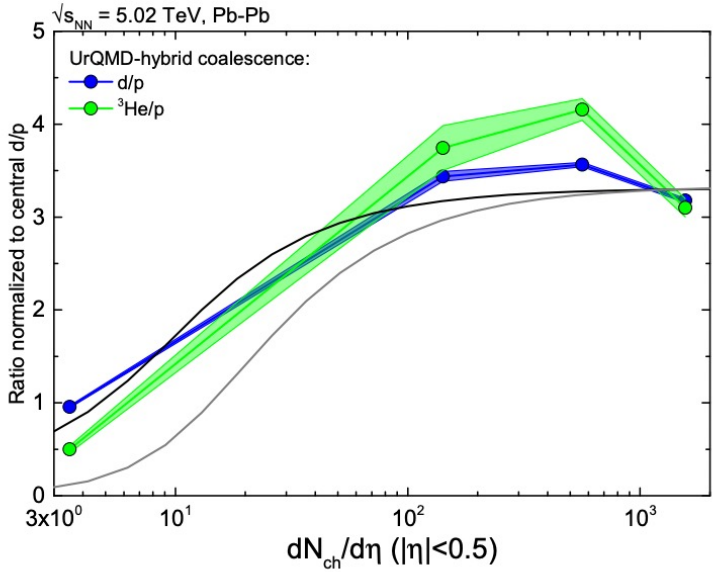


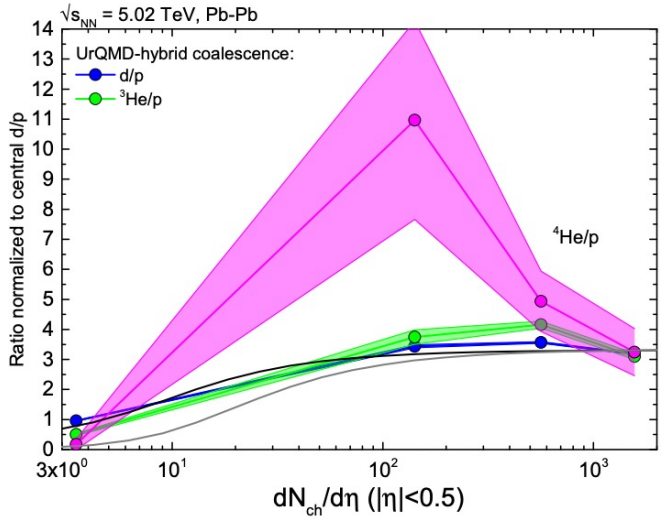
(Hyper-)Nuclei in Heavy Ion Collisions from coalescence [Jan Steinheimer-Froschauer]

- Coalescence in UrQMD useful to describe:
  - Centrality dependence and annihilation at the LHC
  - Baryon number balance at low beam energies

Difference







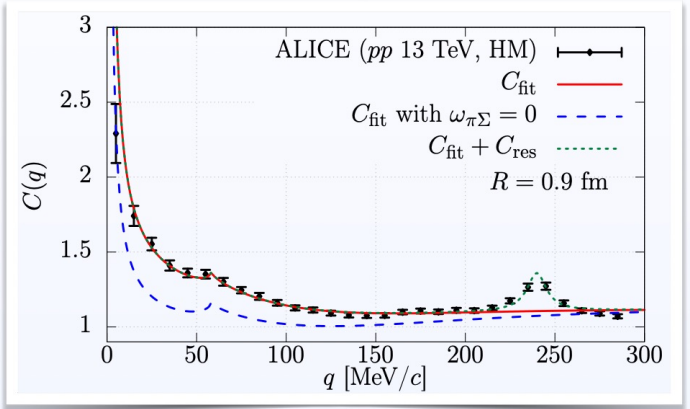
Latest developments on hadron interaction study in connection with femtoscopy [Yuki Makiya]

- Chiral SU(3) based $\bar{K}N$-$\pi\Sigma$-$\pi\Lambda$ potential

  Describe well the data
  -> Extraction of the K^-p scattering length from correlation function

- ALICE *pp* collision data

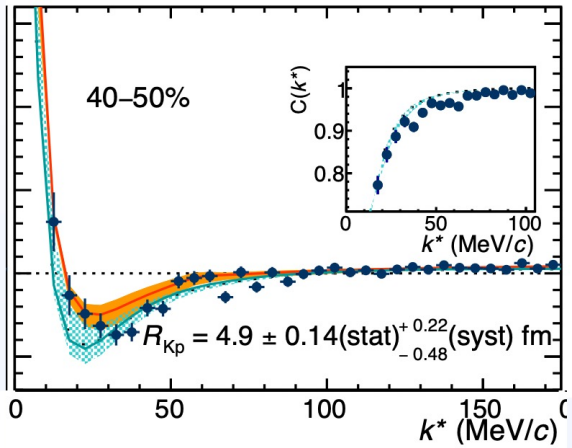
  ALICE PRL 124, 092301 (2020)



Kamiya, Hyodo, Morita, Ohnishi, Weise, PRC 124 (2020) 13, 132501

- ALICE PbPb collision data

  ALICE PLB 822 (2021) 136708



pϕ spin ½ interaction correlation -> quasi-bound state
DD* and D-antiD* -> (X(3872) and T_{CC}) -> Correlation function projections for ALICE3