

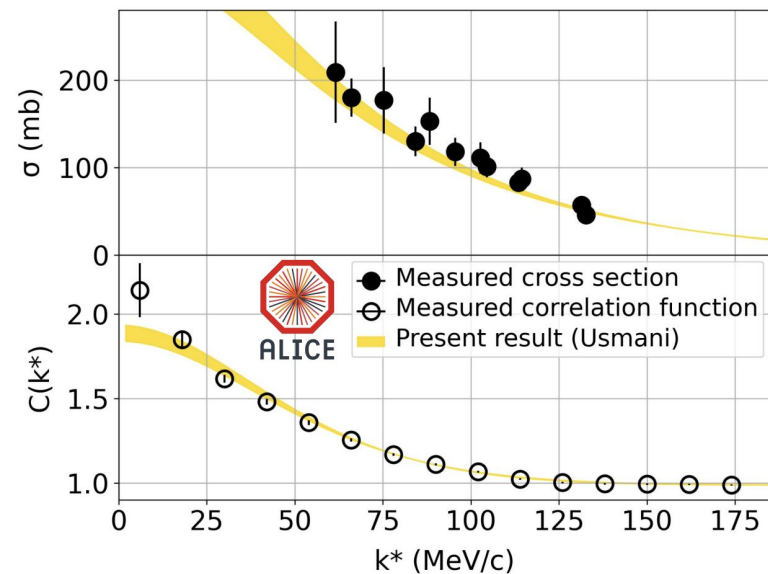


5th EMMI Workshop, day 4: wrap up



by Luca Barioglio

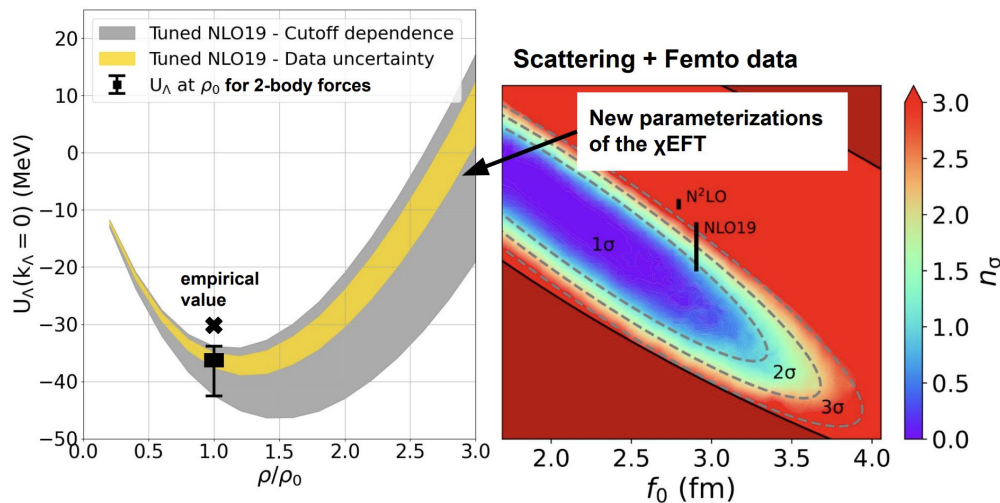
Hadron-hadron interactions from femtoscopy



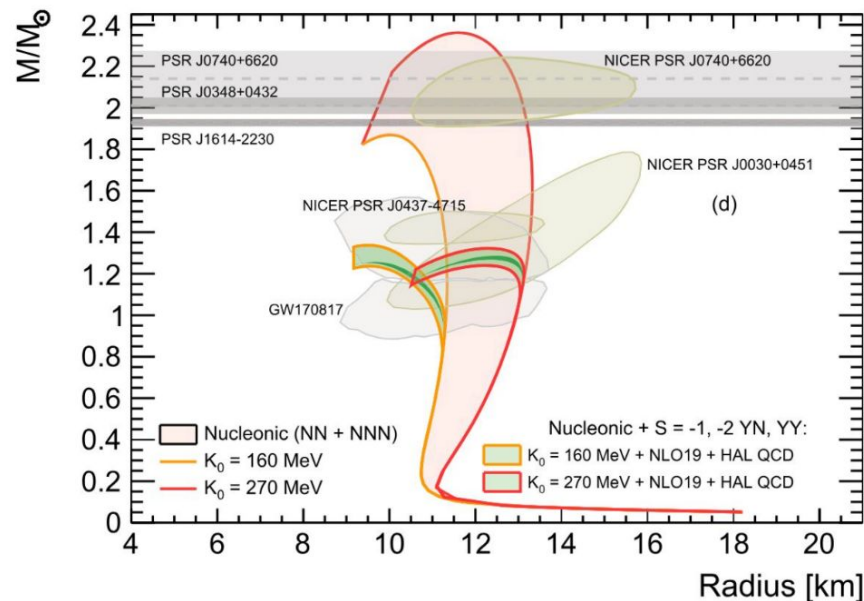
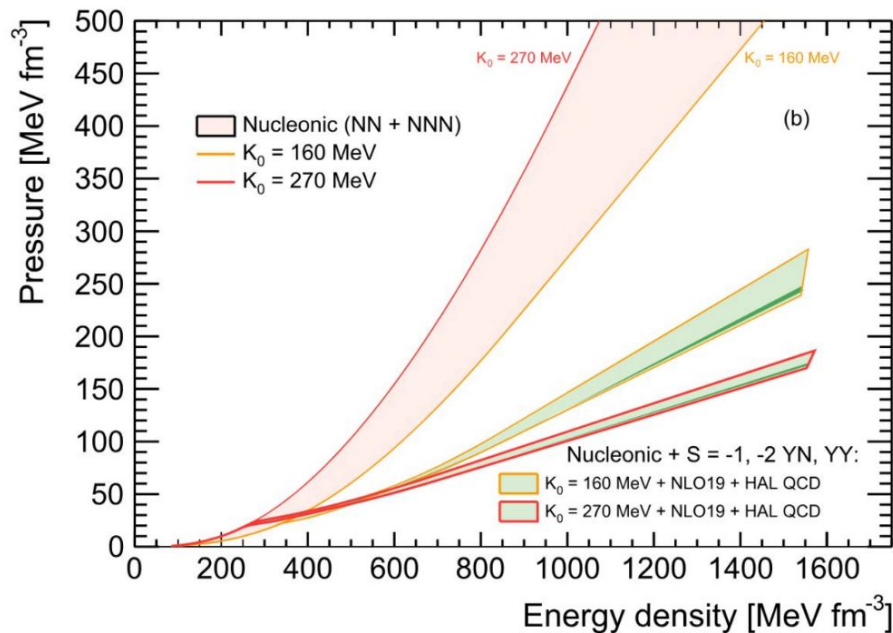
Dimitar Mihaylov

- With more and more precise results, we have better constraints to the interaction models
 - femto, together with scattering experiments, improves our understanding of NY interaction

PLB 850 (2024), 138550



Hadron-hadron interactions from femtoscopy

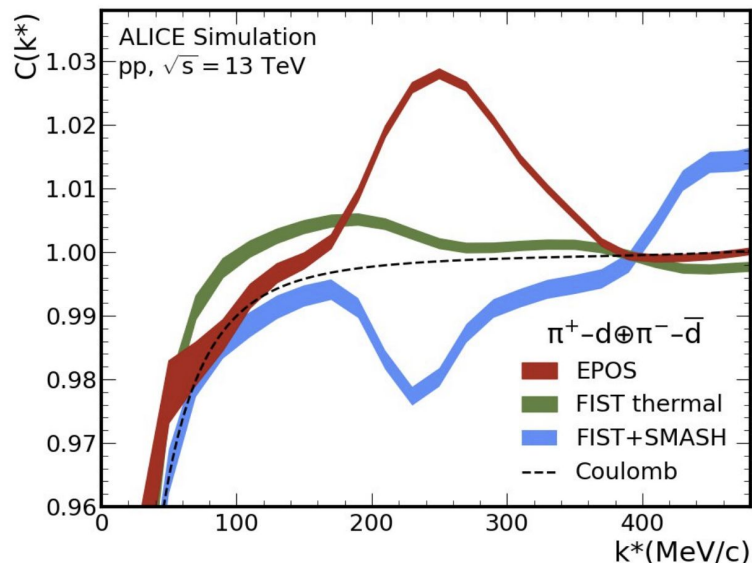
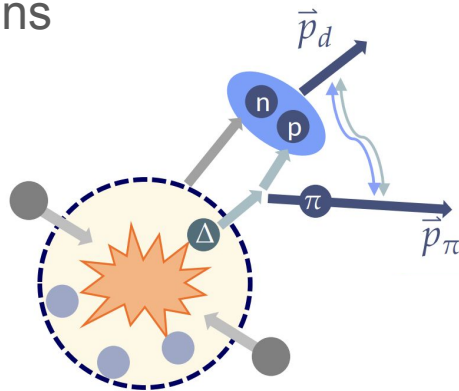


- It is still not enough to understand the presence of heavy neutron stars
 - 3-body forces need to enter the game

Dimitar Mihaylov

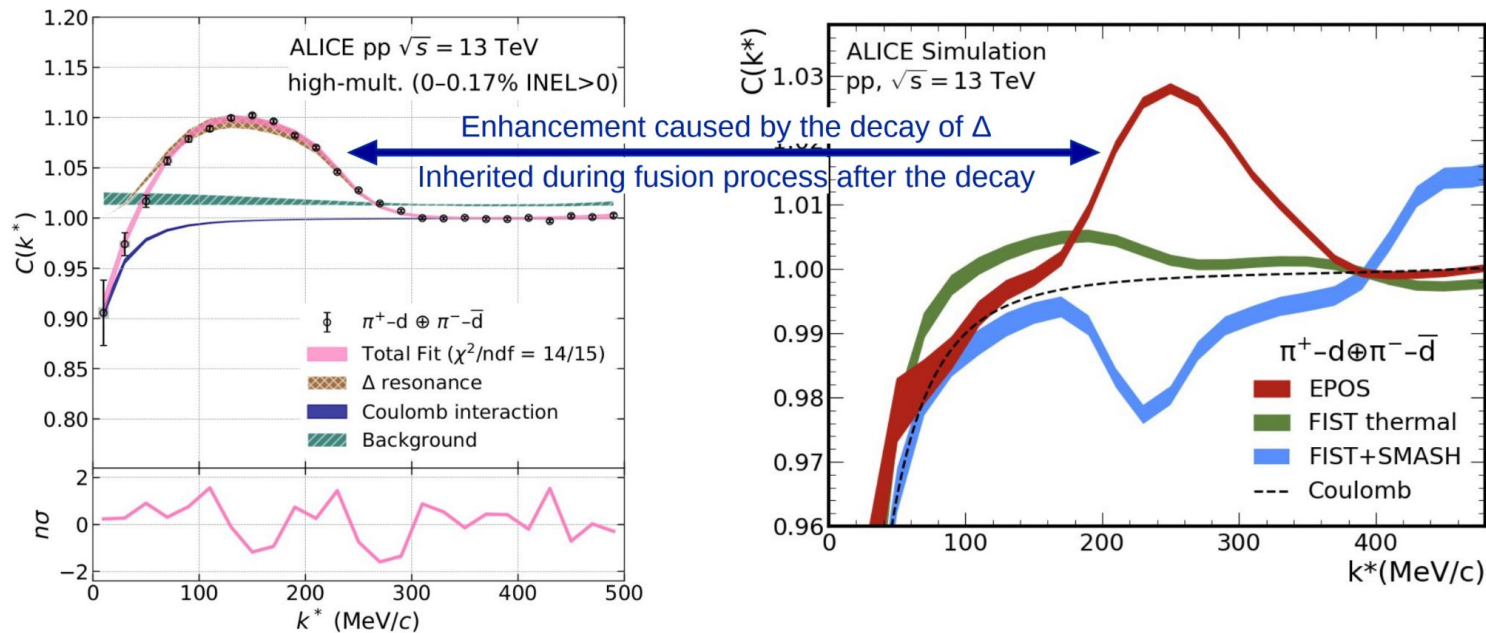
π -d correlation function and the origin of nuclei

- With π -d correlation, we are able to test when light nuclei are formed
 - nucleons inside nuclei have a reminiscence of their decay from a resonance
 - Three scenarios bring to very different correlation functions



Maximilian Mahlein

π -d correlation function and the origin of nuclei



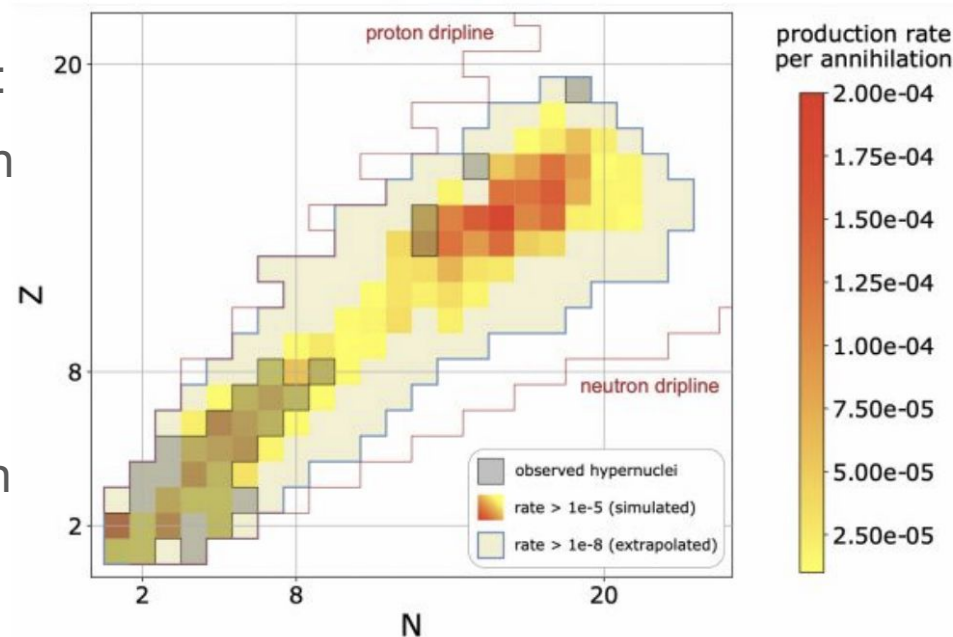
Maximilian Mahlein

- Deuterons are produced later than resonances
- Fractions of deuterons from resonances in agreement with models

○ **COALESCENCE IS THE PRODUCTION MECHANISM**

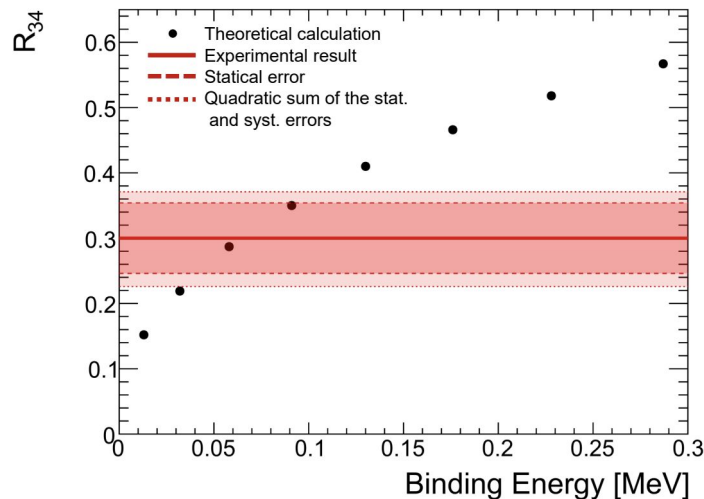
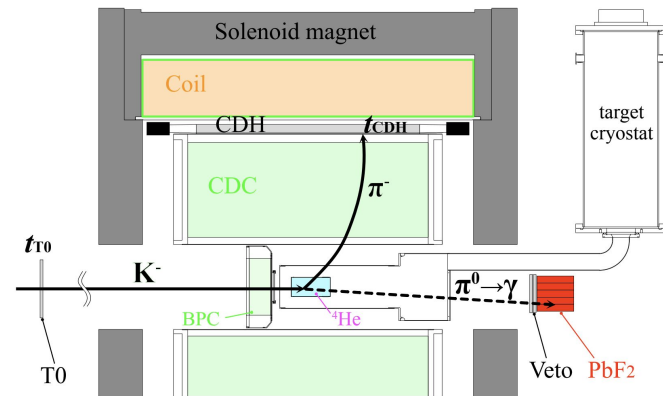
HYPER (Proposed to start by ~2030):

- Antiproton capture (simulated with GiBUU and ABLA07) produces hypernuclei through surface annihilations and kaon–nucleon interactions
- About 1% of annihilations result in hypernuclei formation

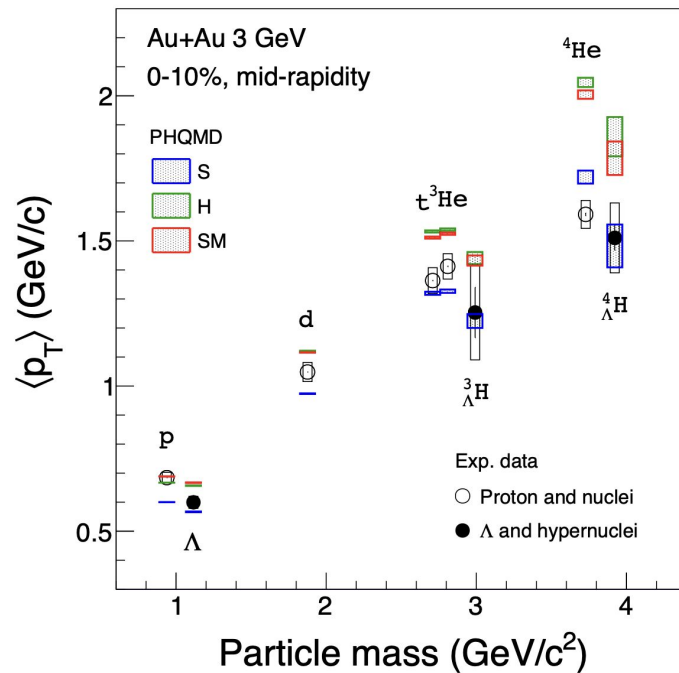
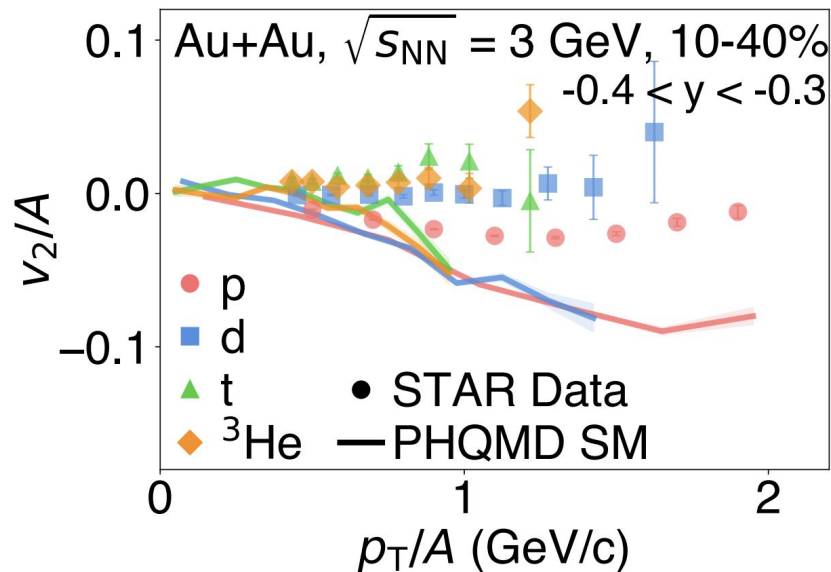


Measurements of hypertriton properties

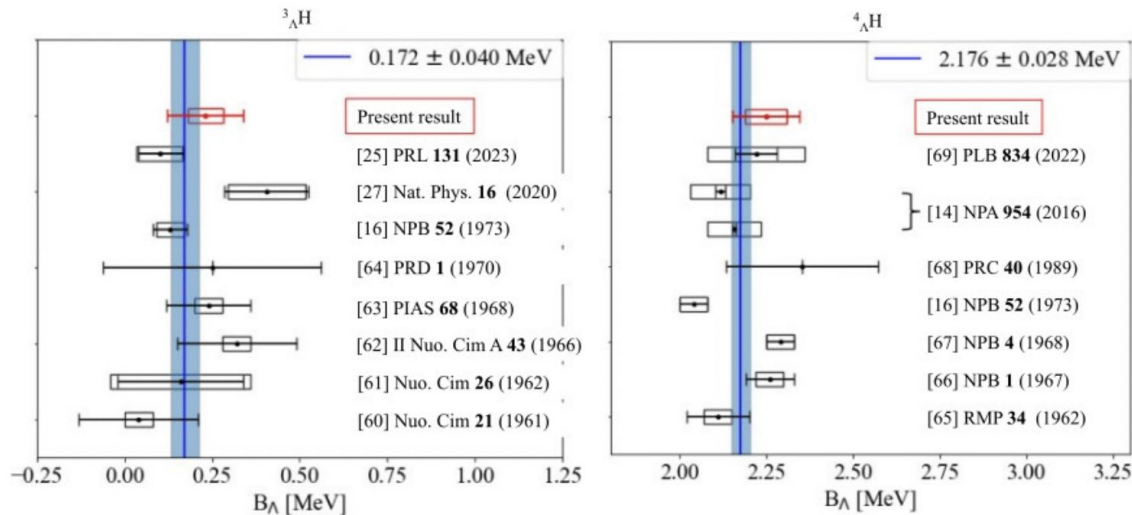
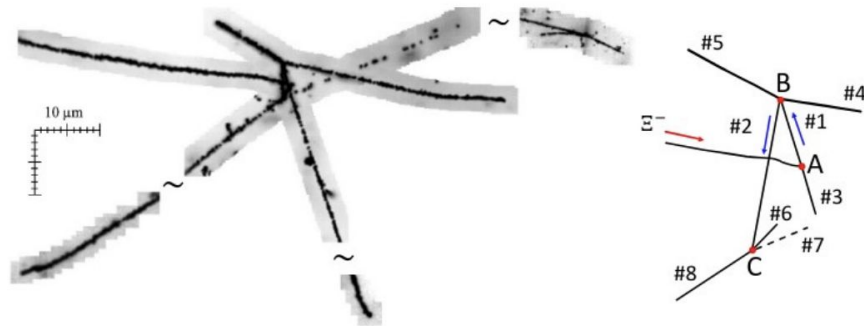
- J-PARC E73 produces hypernuclei via the reaction: $K^- + p \rightarrow \Lambda + \pi^0$
- ${}^3_{\Lambda}\text{H}$ and ${}^4_{\Lambda}\text{H}$ can be measured via π momentum
- From R_{34} , the binding energy can be measured
 - $B_{\Lambda}({}^3_{\Lambda}\text{H}) \sim 100$ KeV, in agreement with ALICE
 - But errors on theory should be considered



- Clusters are more sensitive than protons to different EoS
 - large deviations between different versions
 - SM works well for p, but less for Λ and nuclei



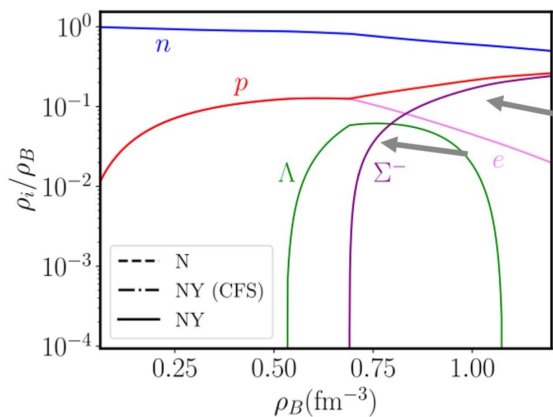
- ML applied to emulsions at JPARC E07
 - binding energy of $^3_{\Lambda}\text{H}$ and $^4_{\Lambda}\text{H}$ measured
 - $^{13}_{\Lambda\Lambda}\text{B}$ observed for the first time



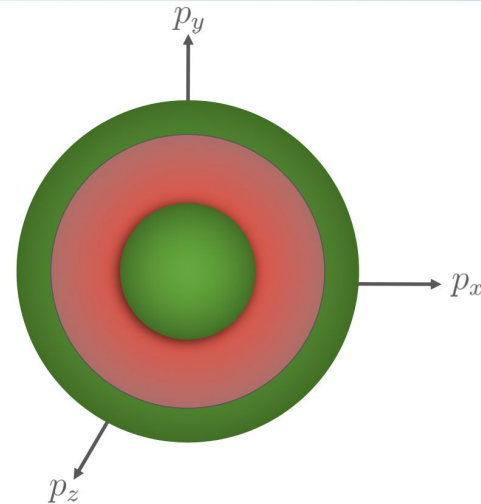
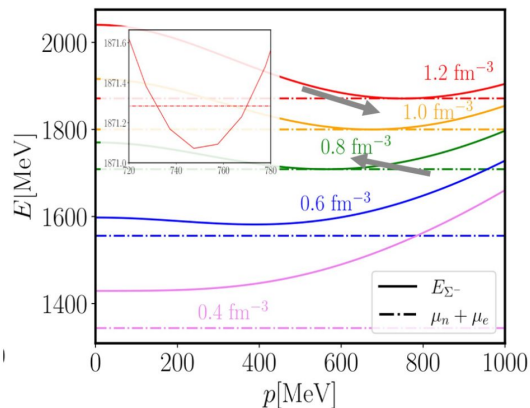
Momentum fragmented hyperons in CNS

- Not-linear derivative model (NLD) -> optical potentials can be reproduced -> softening at high p
- Model extended to include hyperons in matter
- Minimum energy of hyperons granted by MFH
- Only with this calculations, we have the appearance of Σ hyperons

NY – consistent calculations



Σ^- in-medium energy

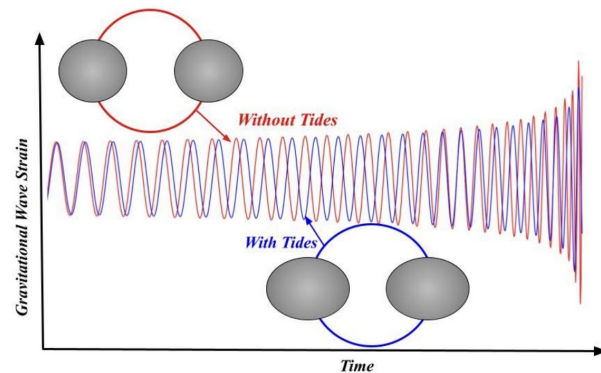
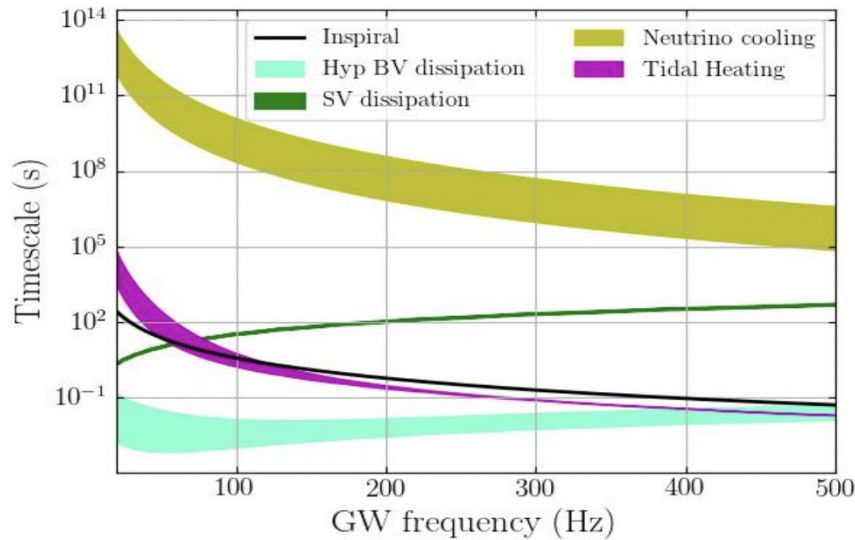


The Fermi sphere is fragmented and has an onion-like structure $\rightarrow$ **momentum-fragmented hyperons**

Hristijan Kochankovski

Tidal heating and strangeness in NS

- Tidal dissipations alter the shape of GWs
 - not negligible when hyperons are present in NS cores
- Tidal heating plays a much important role than cooling



- By analysing GWs we can get information about the composition of NS
 - peak frequency vs tidal deformation is close to black line without hyperons

