Context

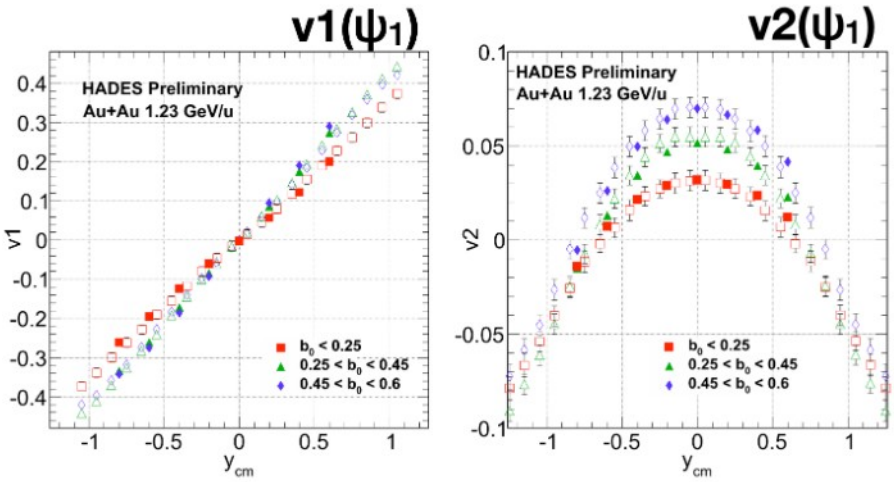
Q: What can the heavy-ion community (theory+experiment) contribute to the study of dense nuclear/hadronic matter?

A: A possible goal is to determine with sufficient accuracy the nucleonic part of cold hadronic matter up to 3 (maybe 4?) times saturation density and help clarify the nature of matter in the core of neutron stars.

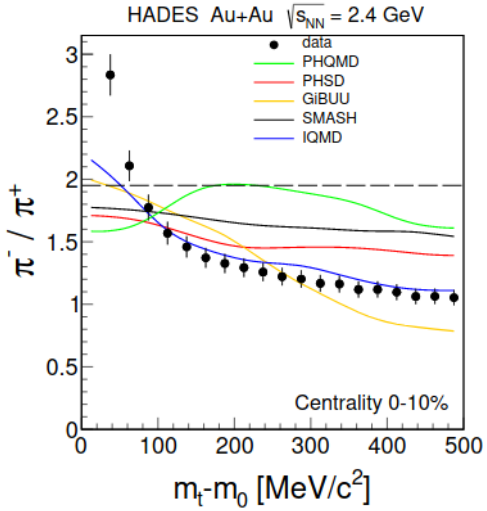
Next decade: - estimated number of observed neutron-stars mergers ~ 100/year
- several times more accurate measurement of NS radii

HIC existing experimental data base: FOPI, HADES,ASYEOS Collaborations (GSI), SpiRIT (RIKEN/MSU), NSCL/FRIB and others

upcoming campaigns: HADES low energy scan (2024), RIKEN (2024, …), FRIB, ASYEOS



B. Kardan et al. JPCS 742, 012008 (2016)



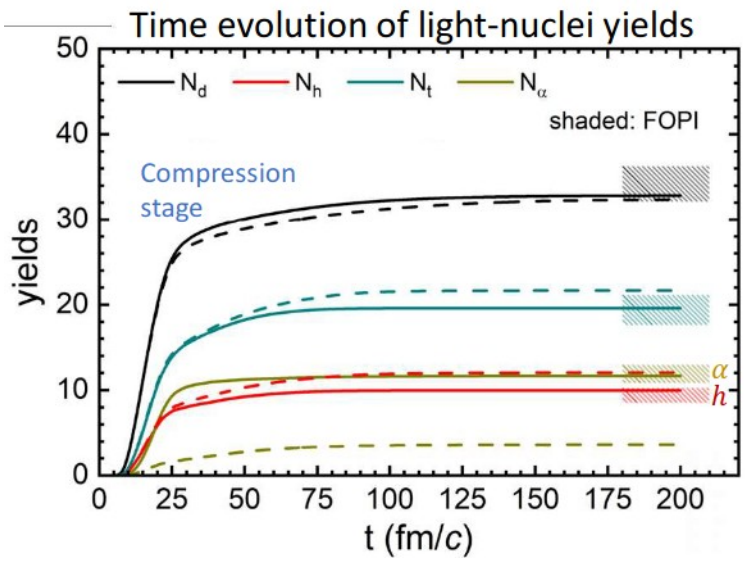
J. Adamczewski-Musch et al., EPJA 56, 259 (2020)

Transport Models

1) Kinetic approach to cluster production in Intermediate energy HIC

R. Wang et al., arXiv:2305.02988

included also in AMD, pBUU

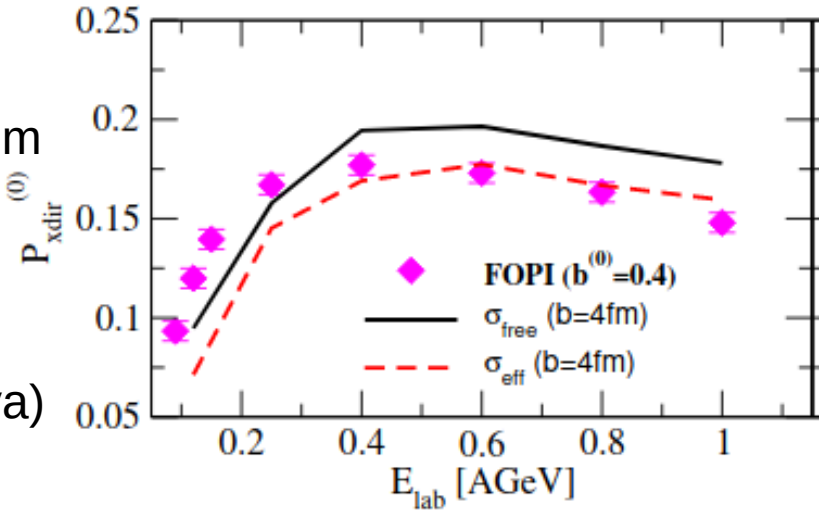


2) mean field and in-medium nucleon-nucleon cross-section based on the same underlying interaction

T. Gaitanos et al., Phys.Lett.B 609, 241 (2005)

- RBUU model with mean fields and in-medium cross-sections obtained in Dirac-Brueckner calculations employing Bonn A OBE potential (reasonable NM saturation properties)

- PHSD (see presentation by E. Bratkovskaya)



Transport Models

3) **In-medium particle production:**

- threshold mass for resonance production in-medium

$$m_R^{min} + U_R(p=0) = m_N + U_N(p=0) + m_\pi + U_\pi(p=0)$$

- possibility of generation of resonances with mass M that during the expansion stage of the reaction is smaller than the local m_R^{min} → need to describe resonances using evolving spectral function

- consistency appears to require off-shell transport