

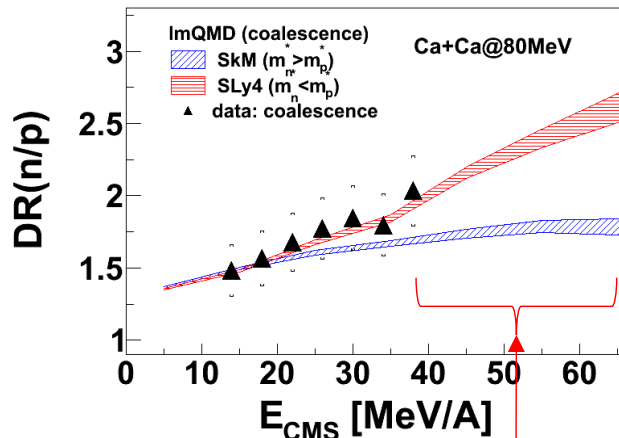
EoS Working group: Discussed recent experimental and theoretical developments in the studies of EOS of asymmetric nuclear matter (symmetry energy) and future plans at FRIB (including FRIB Upgrade)

Neutron star merger and radii are sensitive to $2\rho_0$. Tighter constraints on deformability and radius of neutron star merger can **only** be obtained in Laboratory from heavy-ion collisions.

Current status and future plans

Low densities: $\rho < \rho_0$

- effective mass from n/p, charged particles (NSCL),
- AsyEOS from fragments (Texas A&M,)

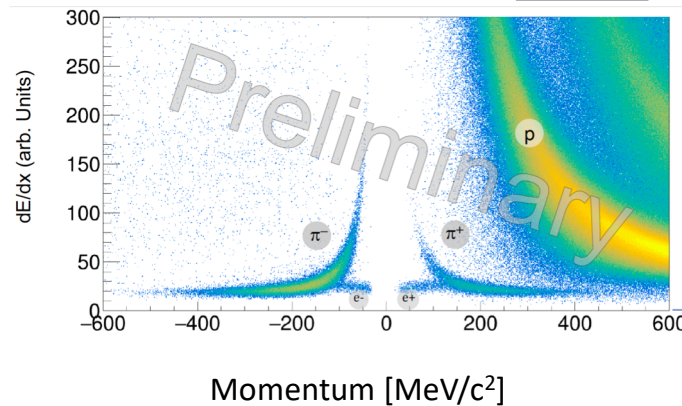


- Sensitivity of n/p to effective mass
- Analysis is ongoing

Expected results from a recent experiment at NSCL

Higher densities: $\rho \sim 1.5 \rho_0$

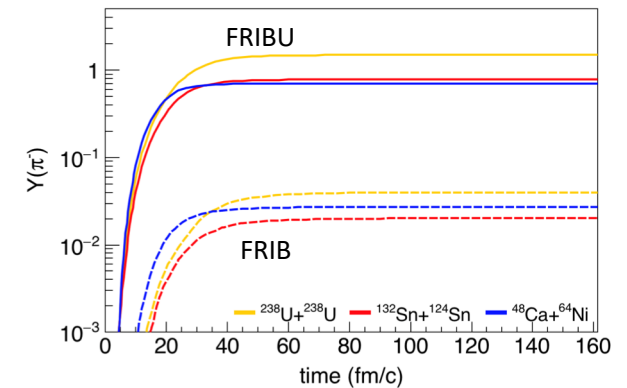
symmetry energy can be obtained from the charged-pion ratio from π TRIT TPC (RIKEN) and FRIB



- Production of pions via Δ resonance
- π^-/π^+ ratio biggest sensitivity to symmetry energy and for more neutron rich systems
- Analysis from π TRITPC ongoing

FRIB Upgrade : $\rho \sim 2 \rho_0$

Density region specifically relevant to NS merger.
FRIB Upgrade will boost intensities, asymmetry and pion cross-sections
Energy increase: yields increase exponentially above pion thresholds



Pion production enhanced by over 10x at FRIBU comparing to FRIB
Intensity increase: Allow explorations of more asymmetric systems.

Many more results not shown here