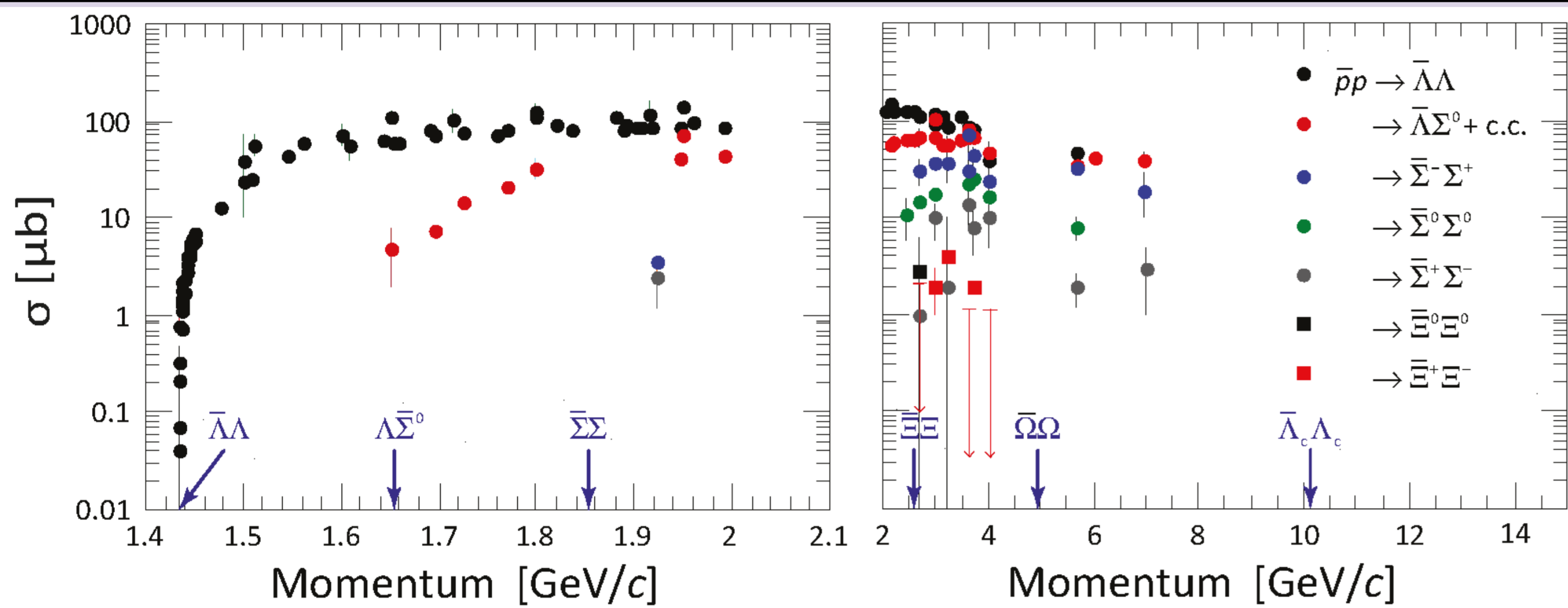
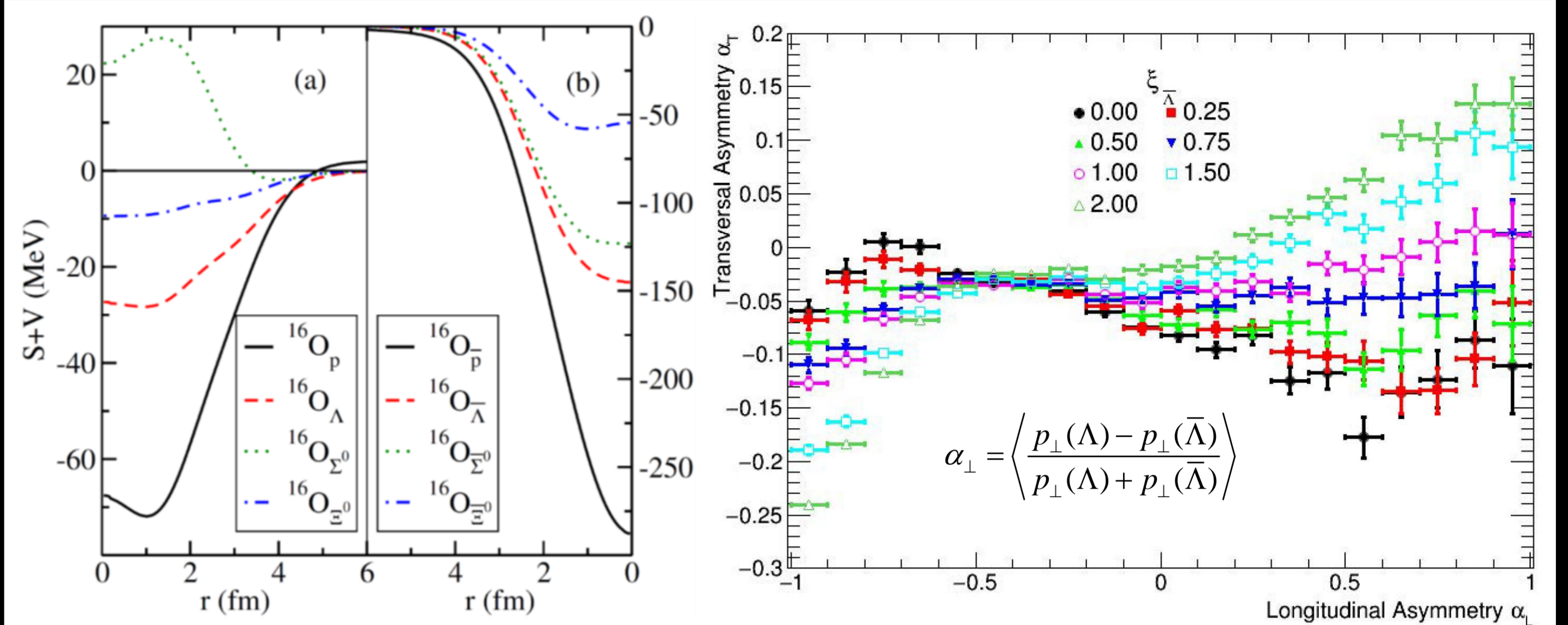


## The PANDA Experiment at FAIR



- PANDA at FAIR will address physics of strangeness in nuclei by several novel measurements
- Possible by combination of stored antiproton beam at FAIR and modular PANDA detector
- Combined with large cross sections for production of associated hyperon-anti-hyperon pairs → rather high luminosities even with very thin primary targets

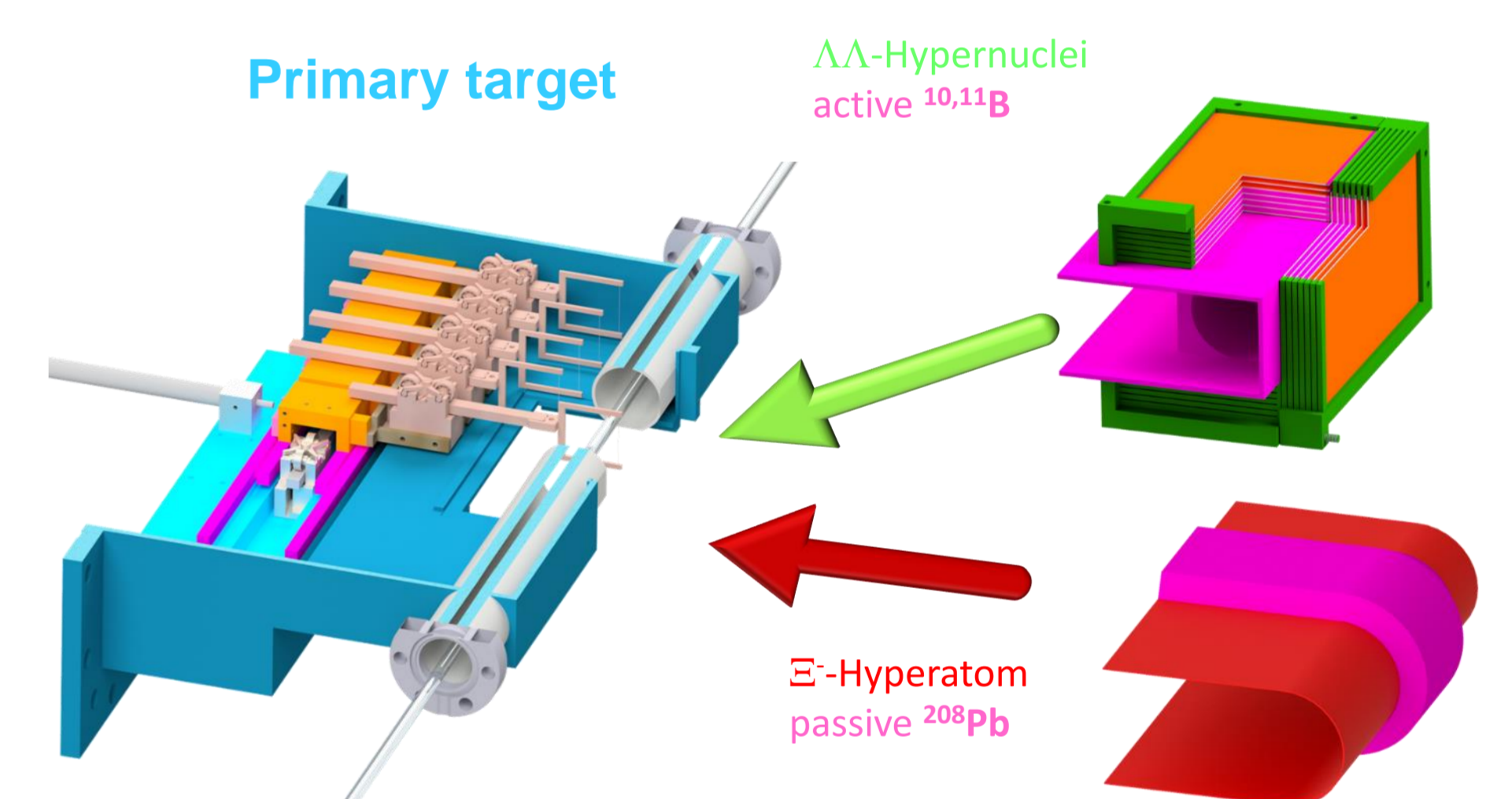
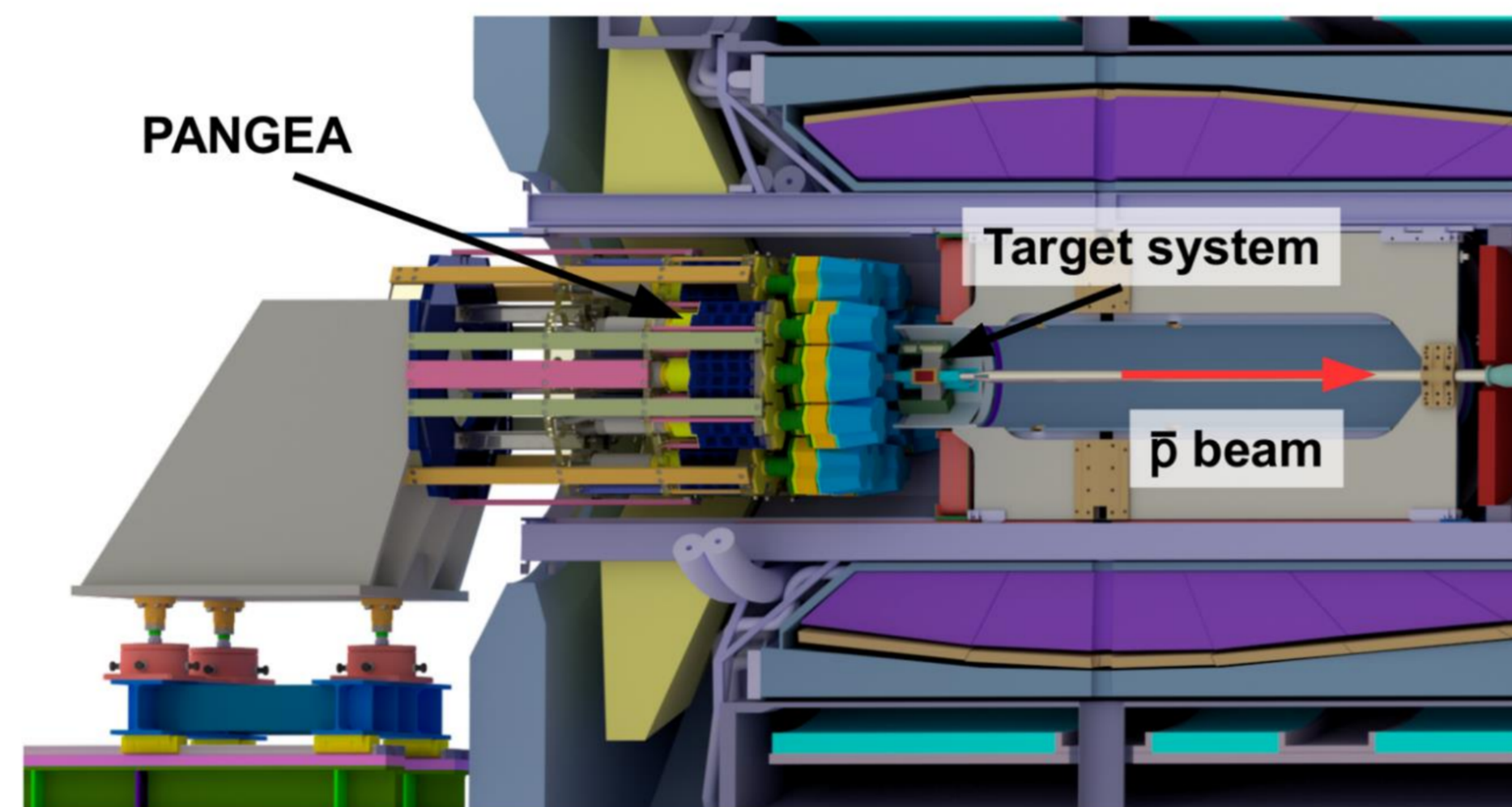
## Hyperon-Antihyperon Production



- To explore relative nuclear potentials of baryons and antibaryons → study of average transverse momentum asymmetry as a function of longitudinal momentum asymmetry
- Demonstrated by a simulation for 0.85 GeV antiproton - Ne-20 interactions using different scaling factors of antibaryon-potentials

## Dedicated Set-up for Hyperatoms and Hypernuclei

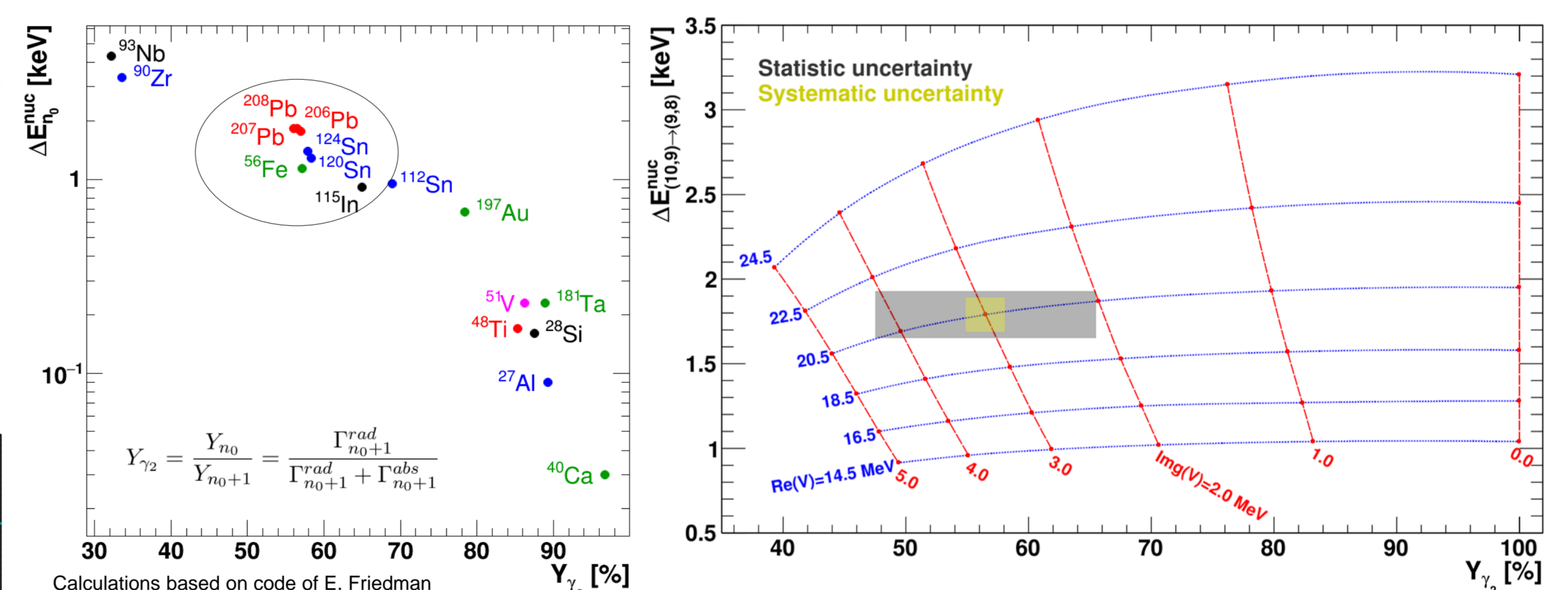
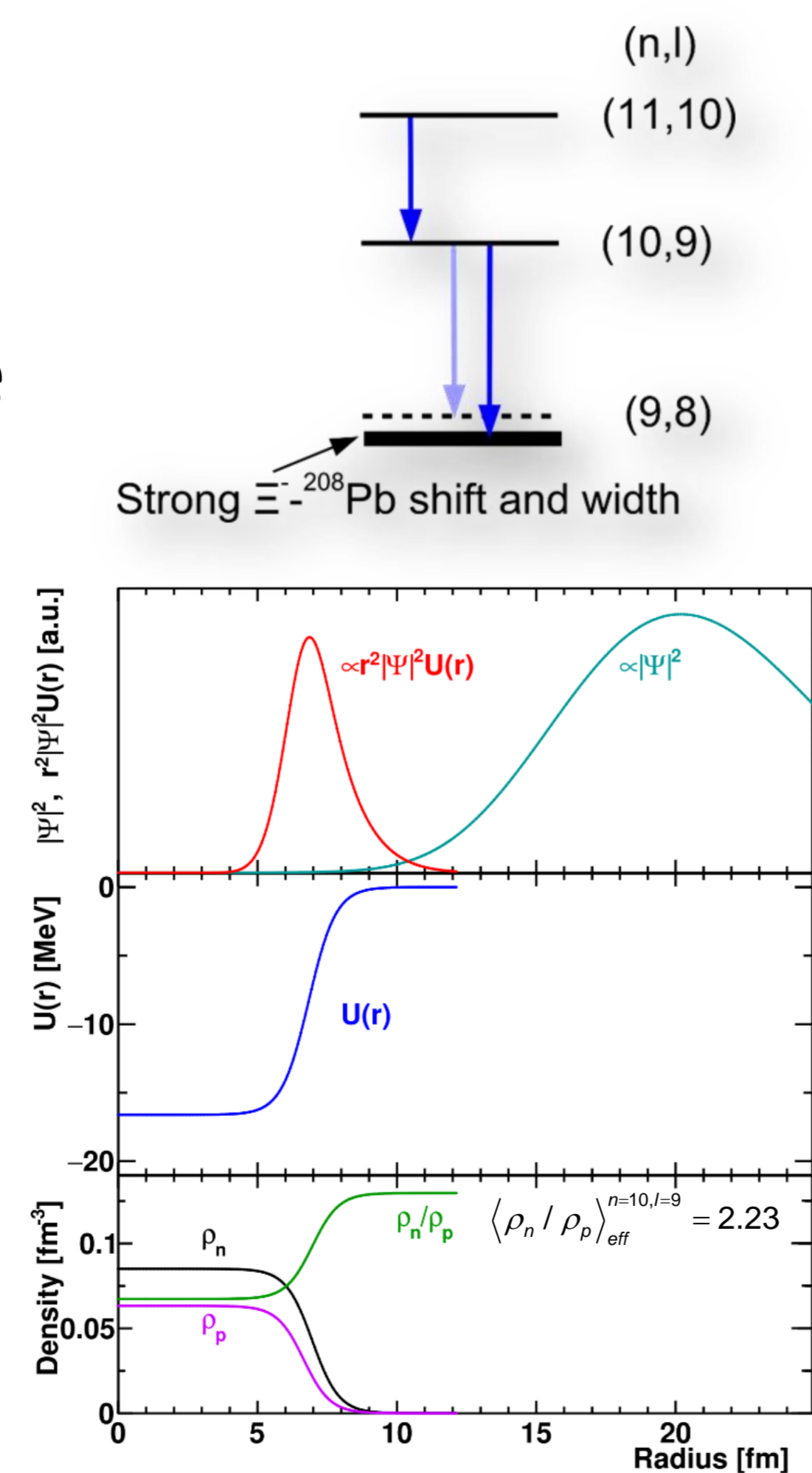
- In addition to general purpose PANDA setup, hypernuclear and hyperatom studies require
  - dedicated primary target to produce  $\Xi$  hyperons
  - secondary target for stopping low-momentum  $\Xi$  hyperons
  - high purity germanium (HPGe) array for  $\gamma$ -spectroscopy



- PANGEA hodoscope of HPGe triple detectors at backward angles
- Secondary targets placed close to beam-line to reach maximum stopping probability for short-lived hyperons

## X-rays from Heavy Hyperatoms

- Strongly interacting, negatively charged particles in orbit with significant overlap with nucleus → intensity of X-ray transition will be reduced by strong nuclear capture → energy levels will be shifted and broadened with respect to pure e.m. situation
- Shifts, widths, and relative yields influenced by strong interaction may be expressed in terms of real and imaginary parts of optical potential as illustrated for  $\Xi$  - Pb-208 system



Energy shift of  $(n=10, l=9) \rightarrow (9,8)$  transition and relative yield  $Y_2$  of  $(n=10, l=9) \rightarrow (9,8)$  transition

- Interaction of antiprotons on nuclei is sensitive probe of nuclear periphery
- hyperatom measurements will allow to constrain neutron skin of lead nuclei

- PANDA is a versatile experiment with a broad and unique physics program
- Strangeness nuclear physics is embedded in the quest for the EOS of dense stellar systems
- Hypernuclei and hyperatoms are unique femto-laboratories for strong interaction studies