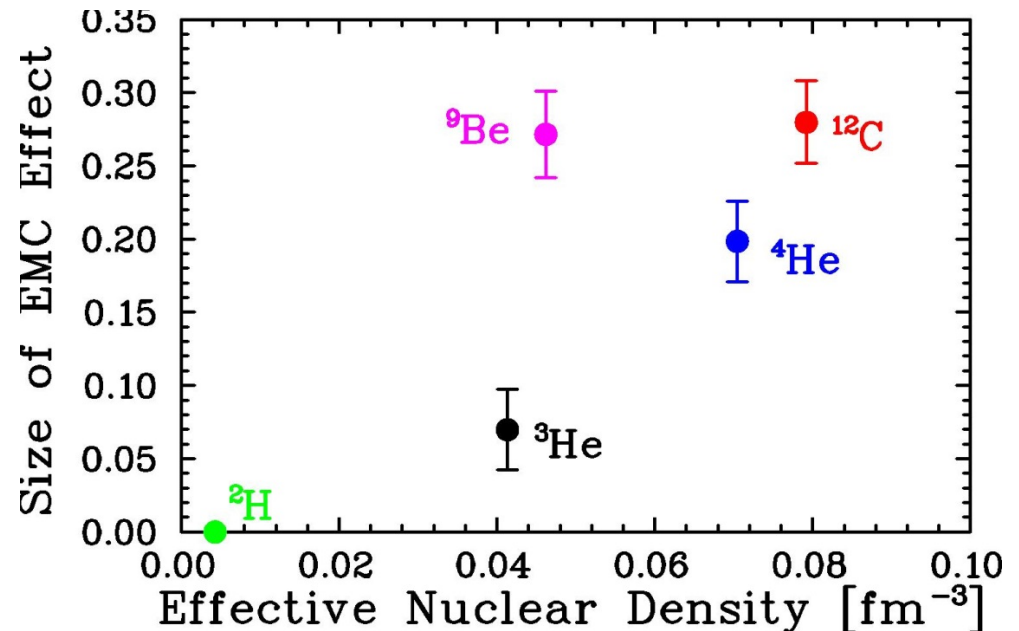
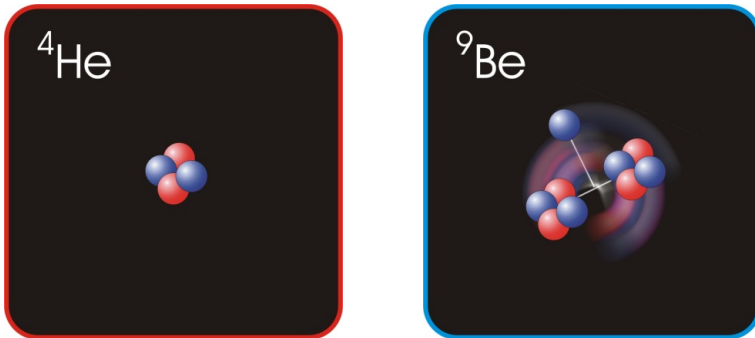


E12-10-008: EMC effect in light \rightarrow heavy nuclei

Spokespersons: J. Arrington, A. Daniel, N. Fomin, D. Gaskell

E03-103: EMC at 6 GeV

- \rightarrow Focused on light nuclei
- \rightarrow Large EMC effect for ${}^9\text{Be}$
- \rightarrow Local density/cluster effects?

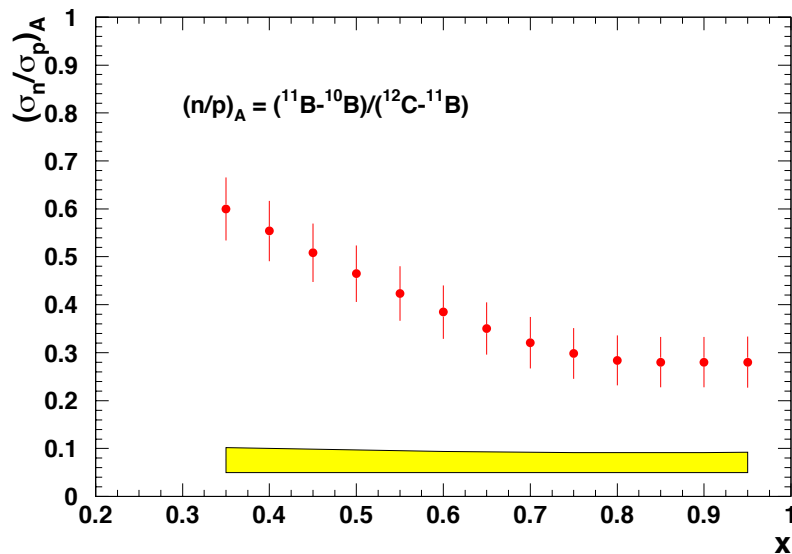
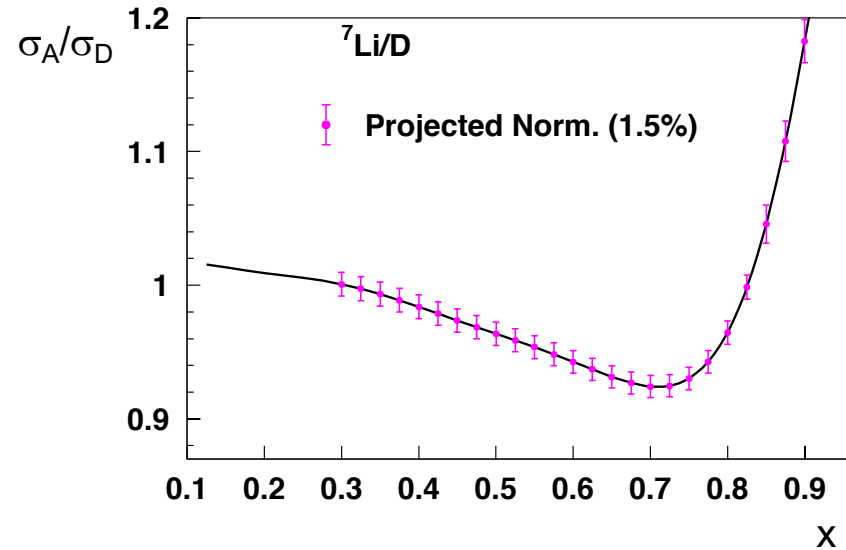
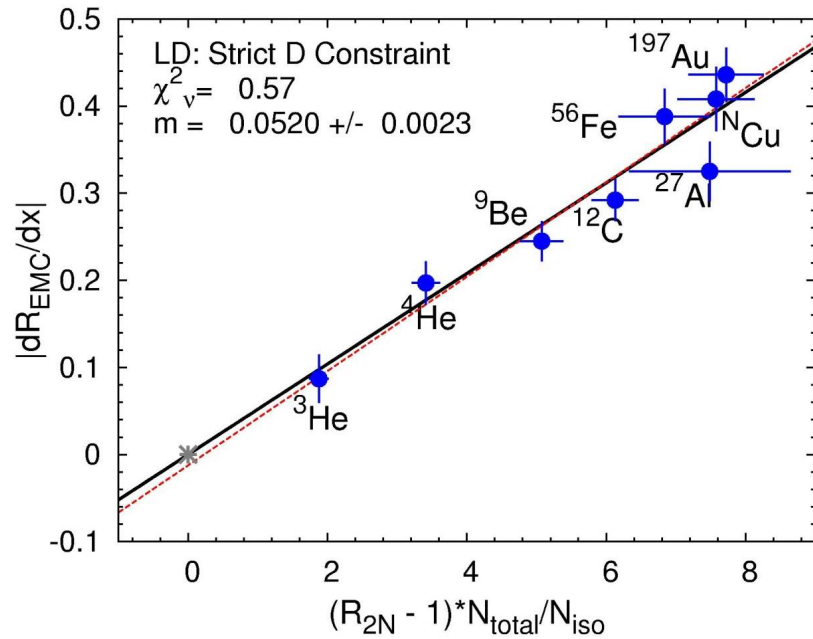


J. Seely, et al., PRL 103, 202301 (2009)

E12-10-008: EMC effect at 12 GeV

- \rightarrow Higher Q^2 , expanded range in x (both low and high x)
- \rightarrow Light nuclei includes ${}^1\text{H}$, ${}^2\text{H}$, ${}^3\text{He}$, ${}^4\text{He}$, ${}^6\text{Li}$, ${}^7\text{Li}$, ${}^9\text{Be}$, ${}^{10}\text{B}$, ${}^{11}\text{B}$, ${}^{12}\text{C}$
- \rightarrow Heavy nuclei include ${}^{40}\text{Ca}$, ${}^{48}\text{Ca}$ and Cu. Plan to include additional heavy nuclei of particular interest for **EMC-SRC correlation studies**

E12-10-008: Physics Reach



E12-10-008 outcomes

1. EMC Ratios of a variety of previously unmeasured nuclei
2. Additional nuclei to explore the EMC-SRC correlation in more detail (when combined with E12-06-105)
3. Sensitivity to flavor dependence of EMC effect via measurements of ${}^{40}\text{Ca}$ and ${}^{48}\text{Ca}$
4. n/p ratio in nuclei

E12-10-008 Kinematics

Full experiment approved for 23 PAC days

→ For initial run, 2 PAC days will be used to:

1. Measure Q^2 dependence of EMC effect over range of x to check scaling of EMC ratio → Carbon target
2. Obtain data on a few light nuclei at a single Q^2 /angle (^9Be , ^{10}B , ^{11}B , C)

Requirements

Targets:

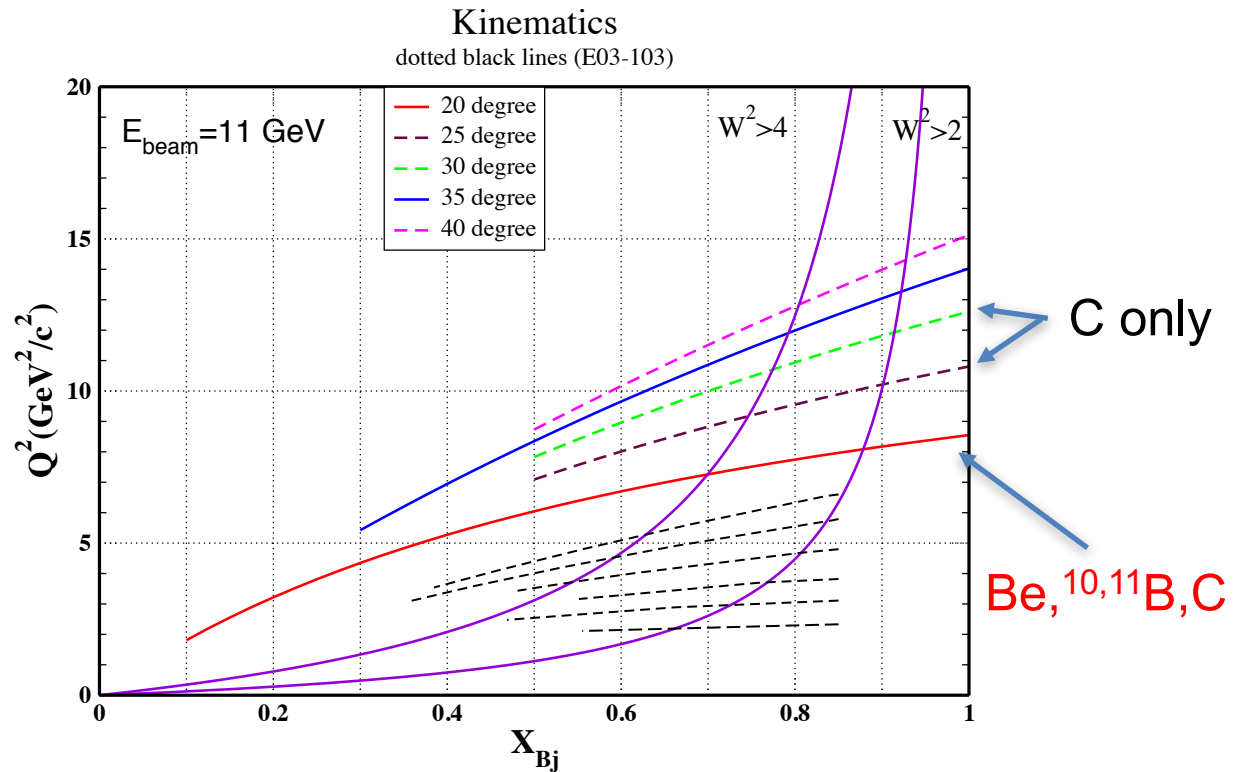
10 cm H, D cryotargets with Al dummy, ^9Be , $^{10}\text{B}_4\text{C}$, $^{11}\text{B}_4\text{C}$, C solid targets

Beam energy: 10.6 GeV (or highest available)

SHMS:

Theta = 20-30 degrees, $P=2-5.5$ GeV

→ Good pion rejection (worst case $\pi/e \sim 100:1$)



E12-10-008 Collaboration

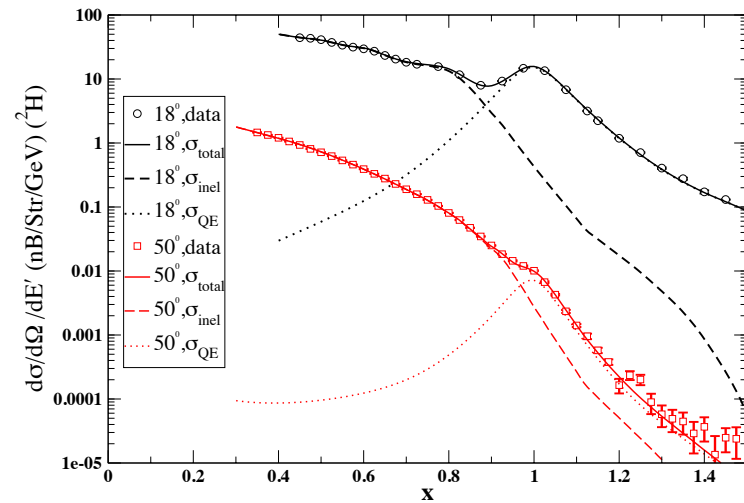
- Institutions include: Jefferson Lab, Argonne National Lab, U. Tennessee, U. of Virginia, Yerevan, Mississippi State U., Hampton U.
- Large overlap with original “XEMPT” ($x > 1$, EMC Effect, and Pion Color Transparency) group of experiments that ran in 2004
- Collaboration is working together with E12-10-002 (Measurements of F_2 in H and D) to form fully integrated runplan and data analysis
- Thesis student from U. Tennessee (Kayla Craycraft) on site full time since March 2016
- ANL post-doc will work on analysis, radiative corrections part-time

Analysis Readiness

Data analysis will closely follow that done for 6 GeV experiment E03-103 – standard inclusive electron scattering analysis

- Wealth of experience from 6 GeV EMC/ $x > 1$ experiments
- Single arm Monte Carlo programs for HMS and SHMS well-developed
- Radiative corrections programs in hand – model iteration techniques well understood
- Good starting model for many nuclei – (Carbon parameters reasonable starting point for Boron)
- Only “new” component is *hcana*, Hall C root-based analyzer

Deuterium data/model



RC factor for A/D ratio

