

E12-11-107: “In Medium Nucleon Structure Functions, SRC, and the EMC effect”

The LAD Experiment

Jeopardy Presentation

Axel Schmidt (GWU)

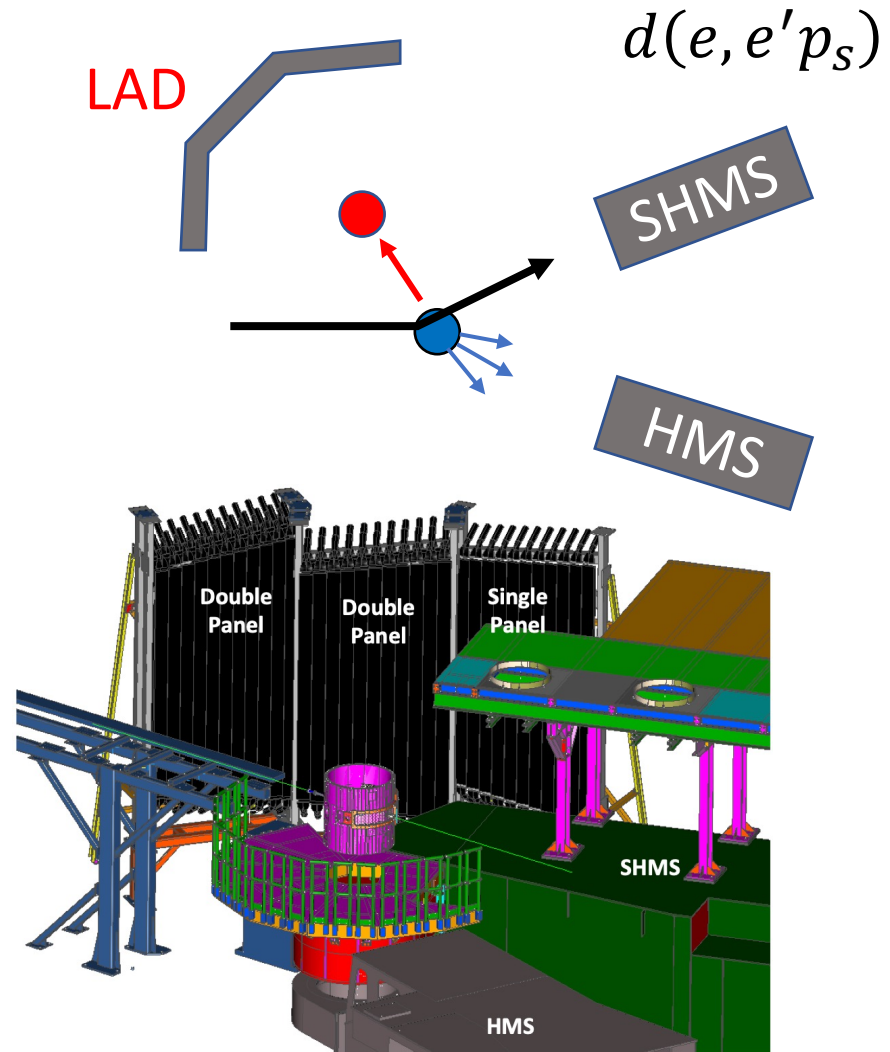
JLab PAC 49

July 22, 2021

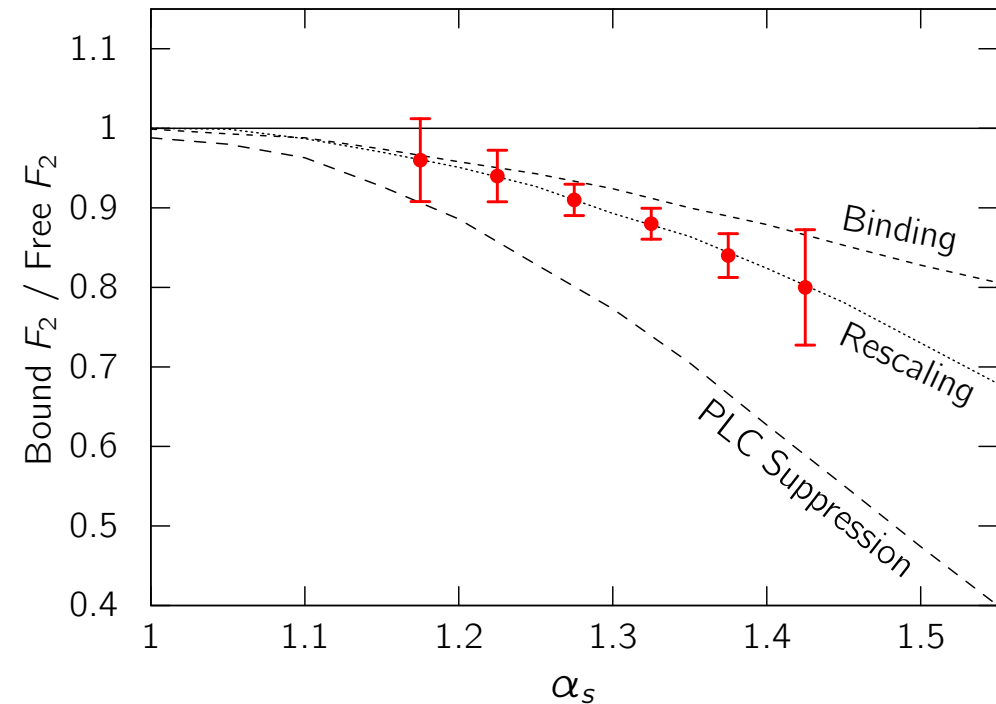


E12-11-107: The LAD Experiment

Spectator-tagged deep inelastic scattering



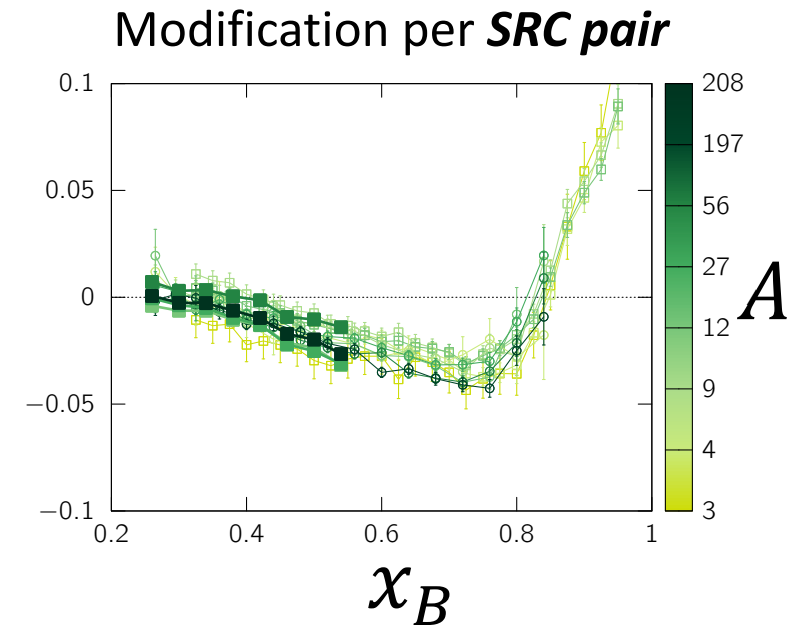
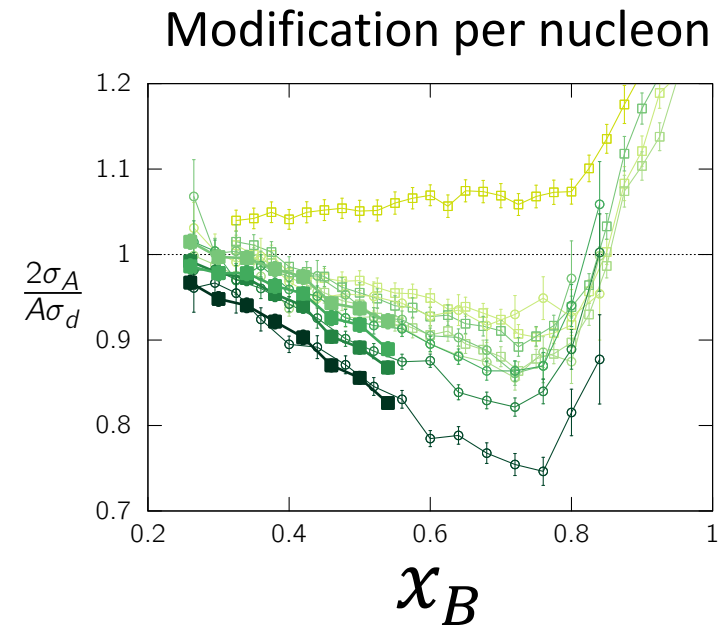
- Bound neutron structure modification
- LAD will detect spectator protons
200–700 MeV/c
- Approved by PAC 38, for 40 days
- **Passed ERR in 2020**



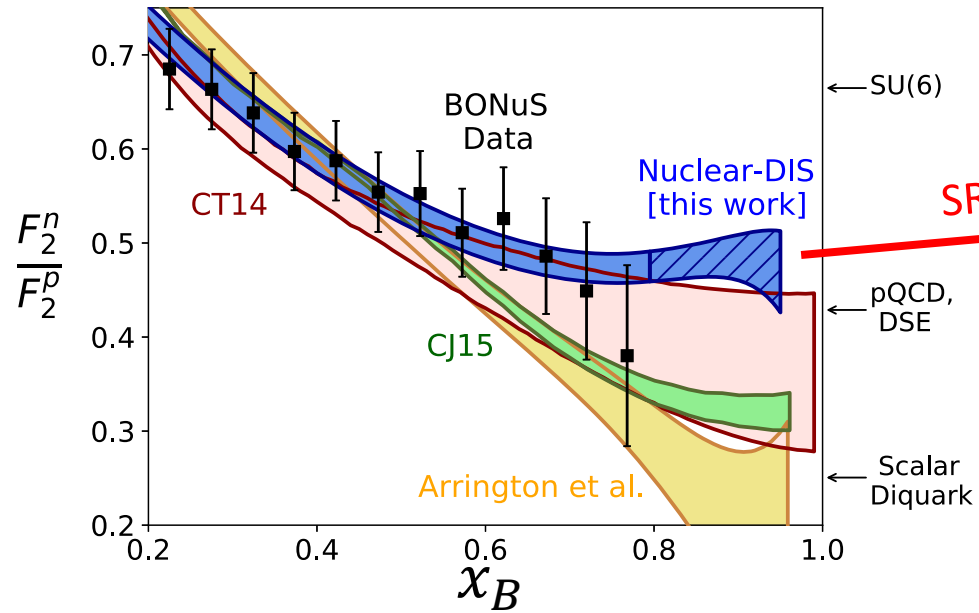
Interest in the EMC Effect and on the SRC-EMC hypothesis has burgeoned.

Tiny subset of recent theory/phenom, 2019 – present

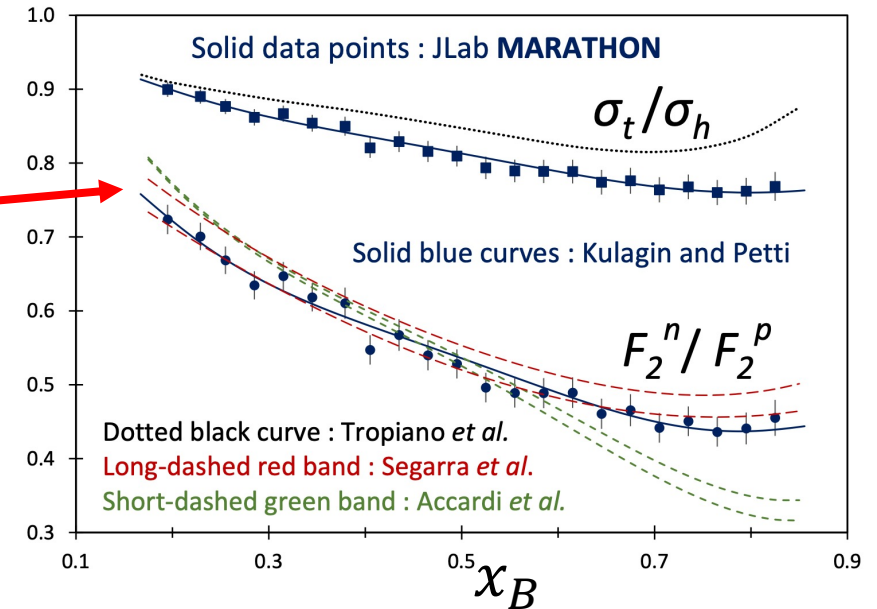
- [E. P. Segarra et al., arXiv:2104.07130 \(2021\)](#)
- C. Cocuzza et al., arXiv:2104.06946 (2021)
- J. Rittenhouse-West, arXiv:2009.06968 (2021)
- [E. P. Segarra et al., PRR 3 \(2021\)](#)
- H. Szumila-Vance et al., PRC 103 (2021)
- W. Detmold et al., PRL 126 (2020)
- X. G. Wang et al., PRL 125 (2020)
- S. Fucini et al., PRD 101 (2020)
- [E. P. Segarra et al., PRL 124 \(2020\)](#)
- J. E. Lynn et al., JPG 47 (2020)
- J. Arrington, N. Fomin, PRL 123 (2019)
- I.C. Cloët et al., JPG 46 (2019)
- [B. Schmookler et al., Nature 566 \(2019\)](#)



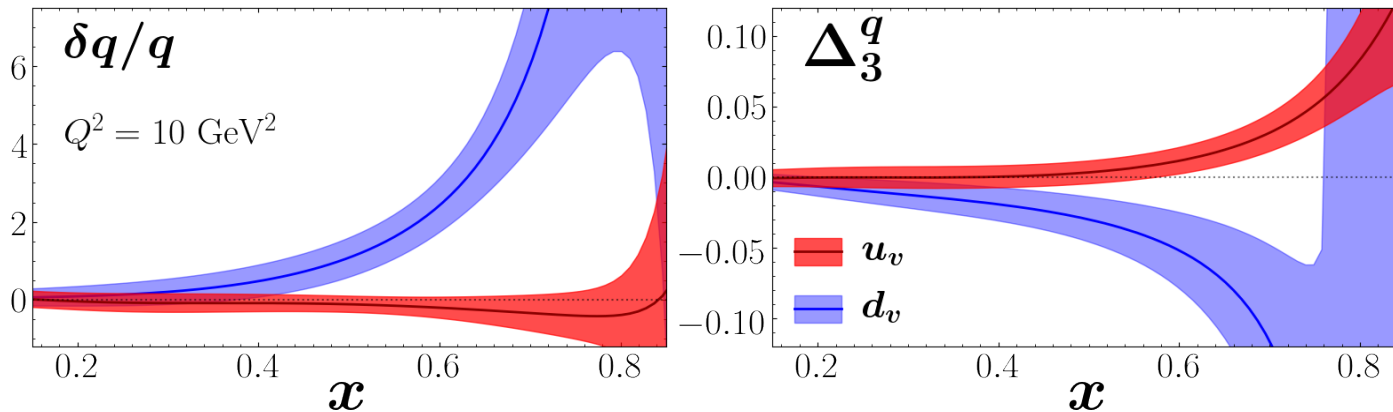
SRCs affect our extraction of free neutron structure.



E. P. Segarra et al., PRL 124 (2020)



MARATHON Collaboration, arXiv:2104.05850 (2021)



JAM Collaboration, arXiv:2104.06946 (2021)

Our ... analysis [including MARATHON data] reveals the first indication for an isovector nuclear EMC effect in light nuclei.

Tagging is become an important technique, and will be a major part of the EIC.

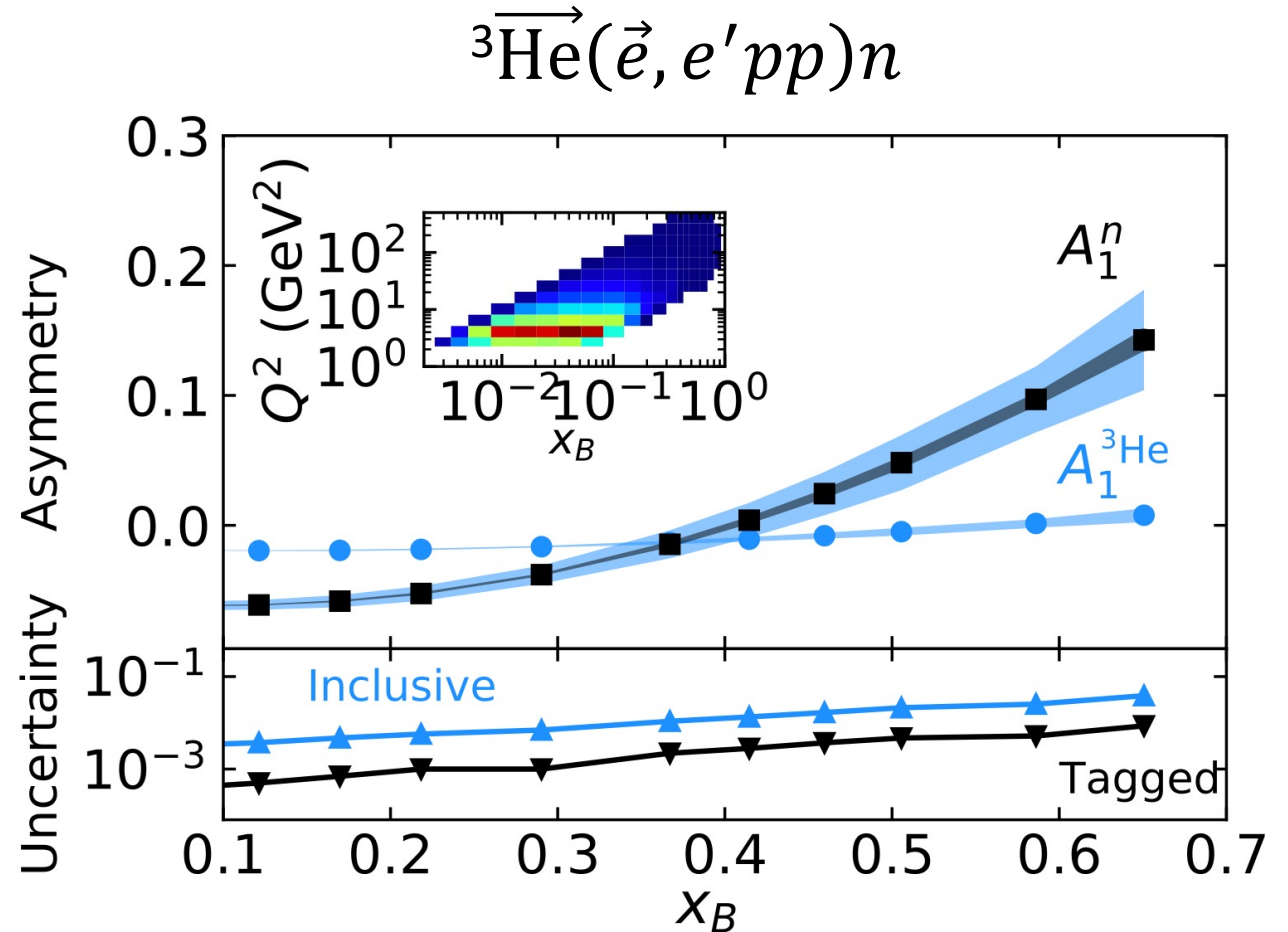
At JLab:

- Bonus
- ALERT
- TDIS @ SBS
- BAND

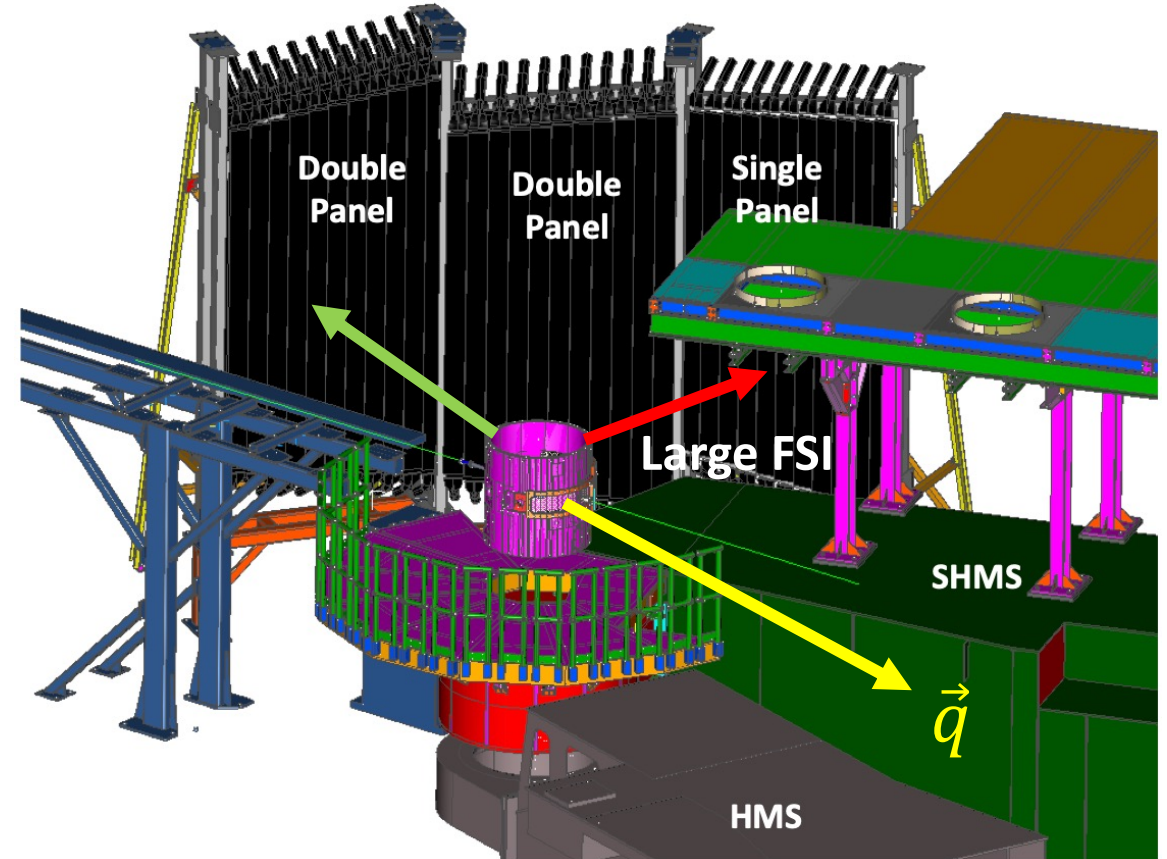
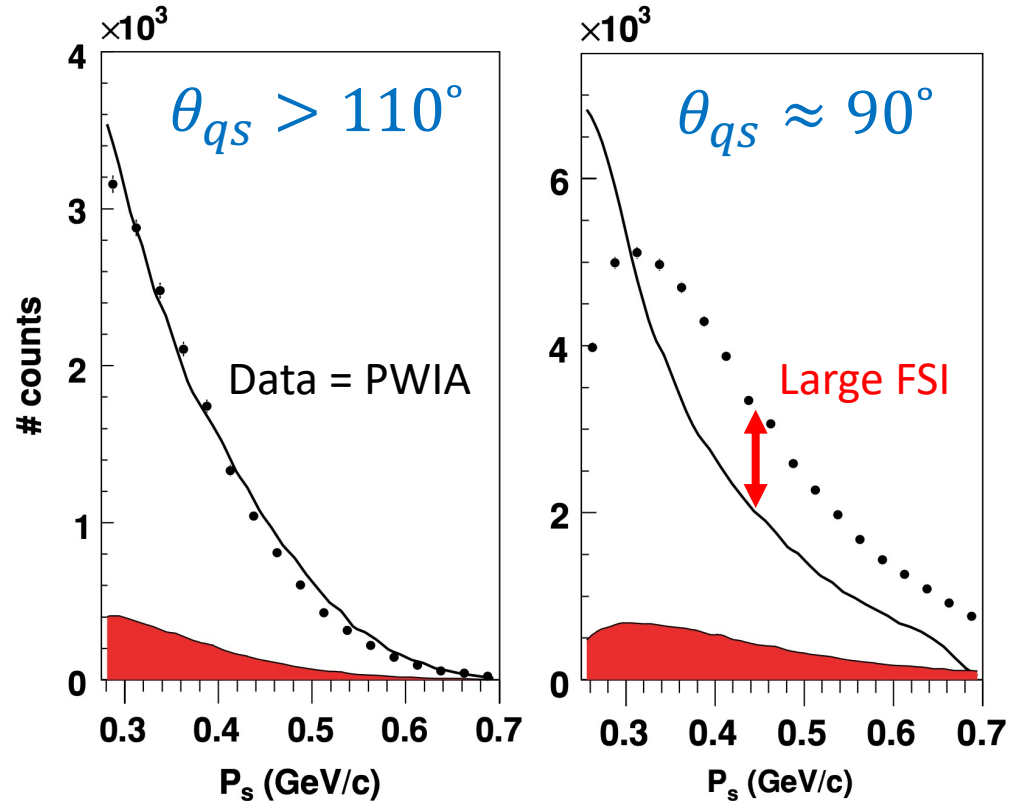
Low-momentum recoils

EIC:

- I. Friscic et al., arXiv:2106.08805
- Z. Tu et al., PLB 811 (2020) 135877
- Cosyn, Weiss, PLB 799 (2019) 135035
- Strikman, Weiss, PRC 97 (2018) 035209



LAD will cover kinematics where FSI are small and where FSI are large.



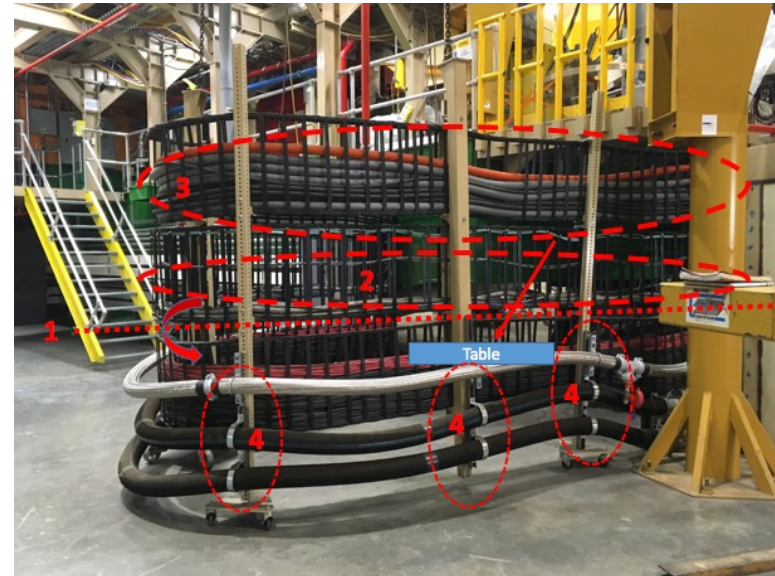
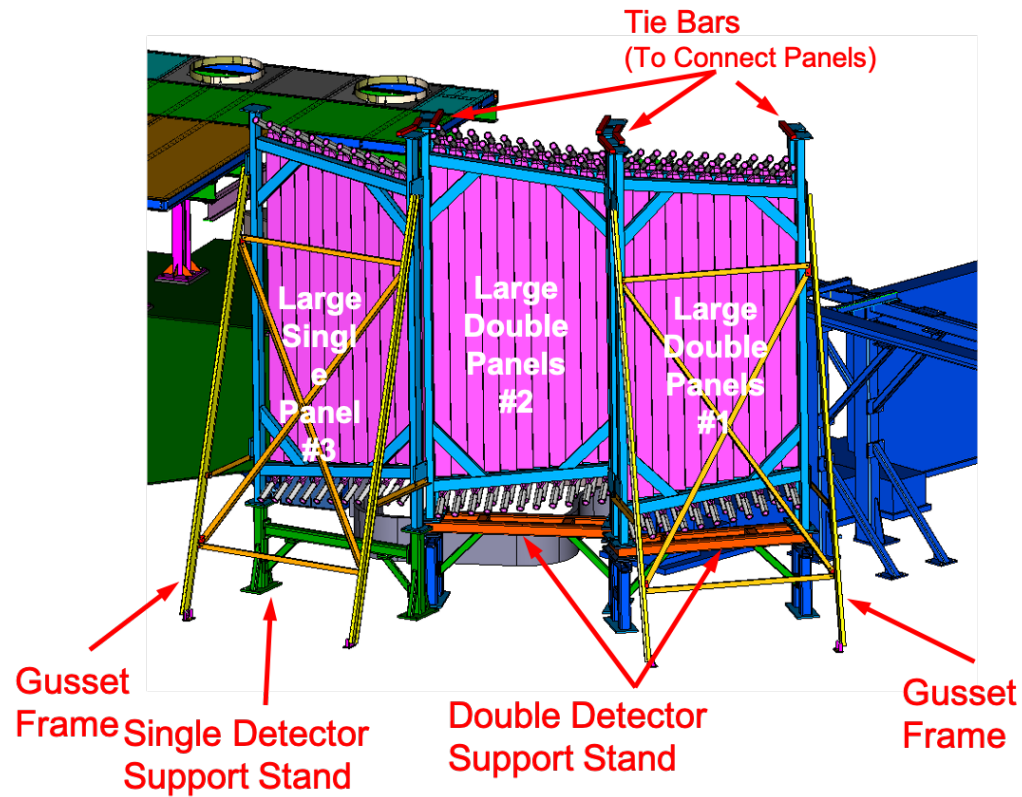
A. V. Klimenko et al., PRC 73, 035212 (2006)

Theory support for LAD is strong.

- New calculations of FSI in tagged DIS
 - W. Cosyn, M. Sargsian, “Nuclear final-state interactions in deep inelastic scattering off the lightest nuclei,” *Int.J.Mod.Phys.E* 26, 1730004 (2017)
 - M. Strikman, C. Weiss, “Electron-deuteron deep-inelastic scattering with spectator nucleon tagging and final-state interactions at intermediate x ,” *Phys. Rev. C* 97 035209 (2018)
- JLAB LDRD: “Spectator Tagging Project”
- 3rd workshop on quantitative challenges in EMC and SRC Research
 - <https://indico.jlab.org/event/428/overview>

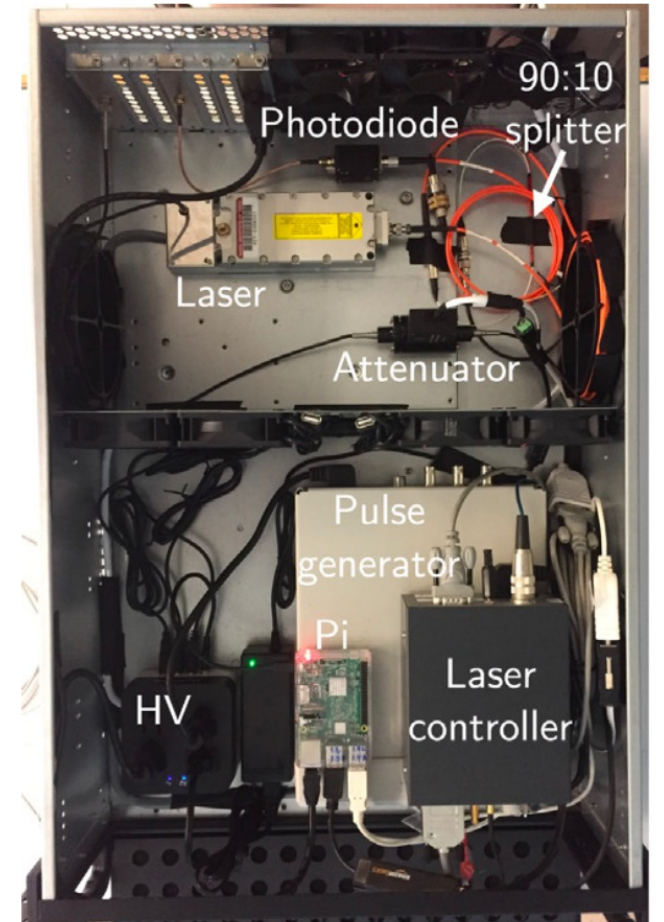
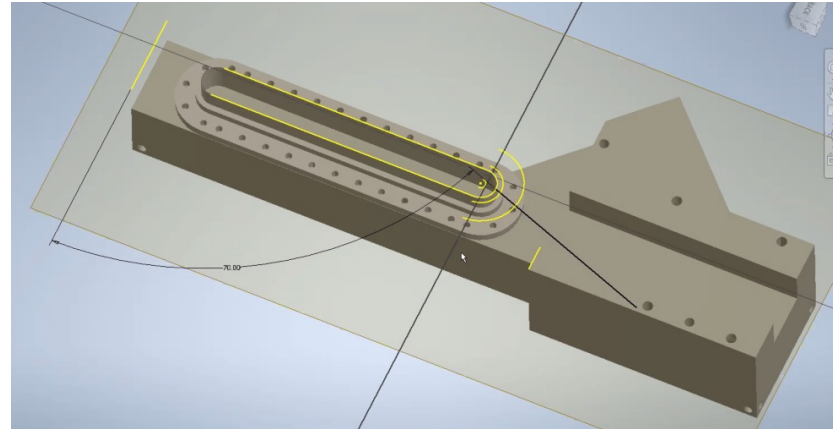
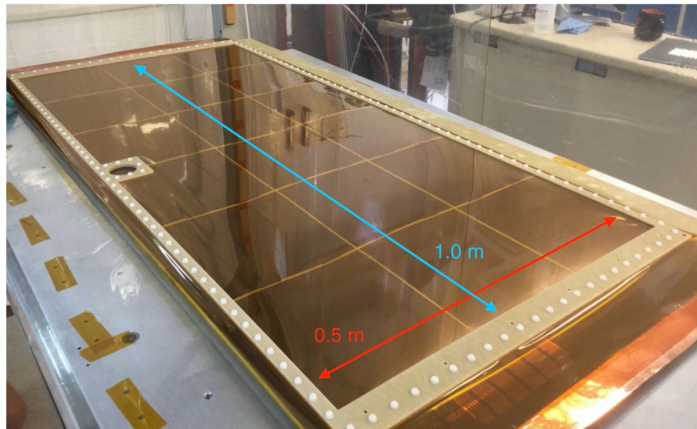
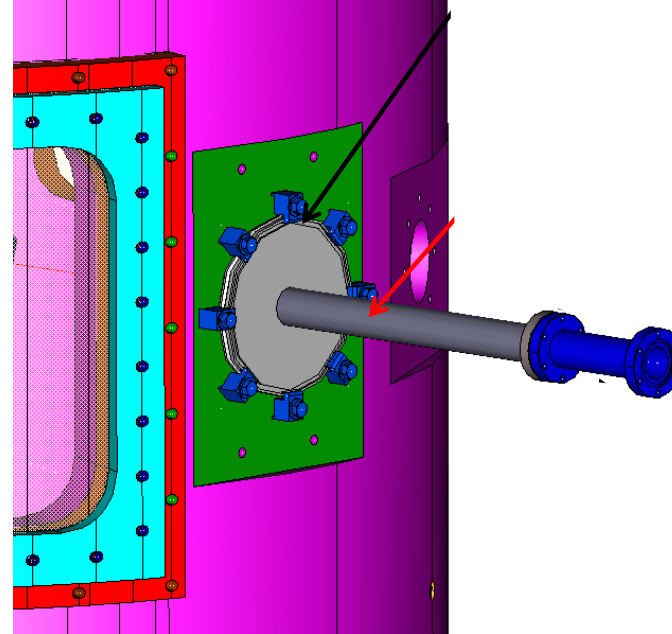
Extensive preparatory work completed for the ERR

- Refurbishment of scintillator panels
- Detector supports fabricated
- Cable tray and patch panel design.



Extensive preparatory work completed for the ERR continued...

- Laser Calibration System
- GEM detectors
- Target cell design
- Scattering chamber design



A. Denniston et al., NIM A (2020)

A new generation of young people is enthusiastic about LAD.



Axel Schmidt
(me)



Tyler Kutz



Dien Nguyen



Holly Szumila-Vance



Sara Ratliff



Florian Hauenstein



The physics case has become stronger and the need for the LAD experiment has increased.

