

Hall C Status

Mark Jones, Hall A/C Group Leader
Winter 2023 Hall C Collaboration Meeting

Overview of meeting

- Following this session will be Business meeting
 - Important discussion of updating bylaws led by Marie Boer
 - Collaboration [membership list](#)
 - New working groups.
 - AI in Hall C has been meeting
 - Analysis working group has quarterly meetings
 - Critical discussion of the future direction of the User Group
 - Group photo at 12:15 in lobby.
- Thursday afternoon
 - Updates on ongoing and completed experiments
 - AI Working group session. Talks by Nobuo Sato and Casey Morean
- Friday morning
 - Analysis/Spectrometer Performance Updates
 - Hall C in the Future: New proposals
- Friday afternoon
 - Hall C in the Future: JLab energy upgrade and positron beam
 - Overview talk by Patrizia Rossi
 - Series of talks on wide range of physics topics to be done with 22 GeV and positron beam

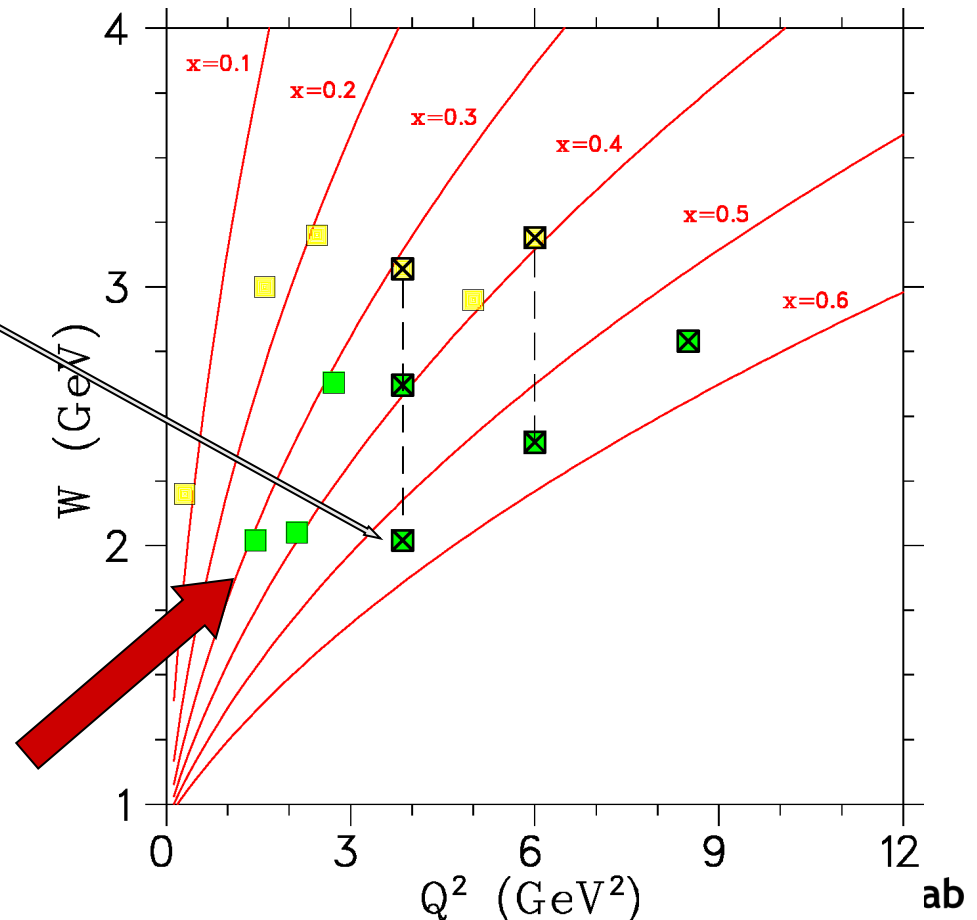
Pion Form Factor and L/T Pion electroproduction

- Completed the high epsilon running. Low epsilon running done the previous run period.
- Delay in 5-pass beam start up in June.
 - At beginning of 5 pass, low beam efficiency and difficulty getting 60-70uA.
- Need to extend the running about one month until Sept 10th
- Completed 88% of 5-pass data, 76% of 4-pass and 95% of 3 pass

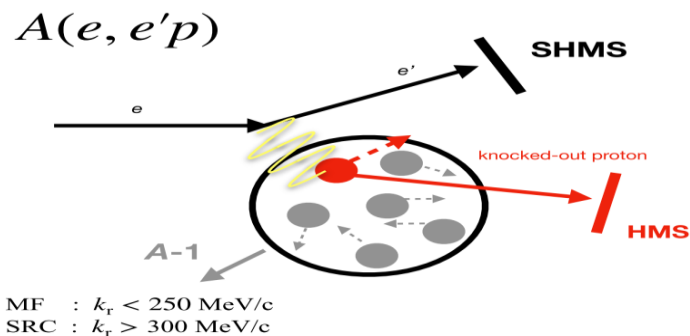
Points along vertical lines allow F_π values at different distances from pion pole, to check the model properly accounts for:

- π^+ production mechanism
- spectator nucleon
- off-shell (t -dependent) effects.

- Points along red curves allow $1/Q^n$ scaling tests at fixed x
- Study the Hard-Soft Factorization Regime

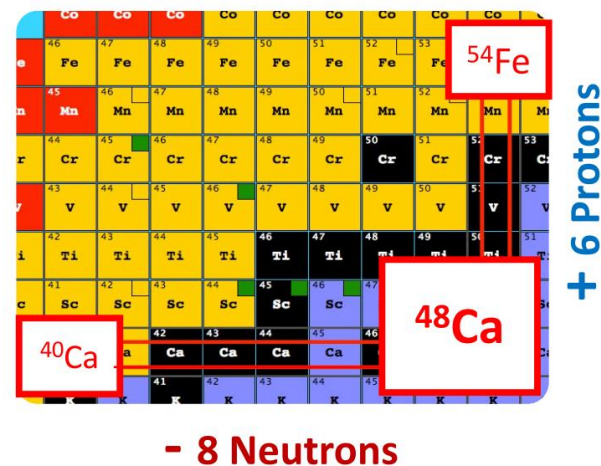
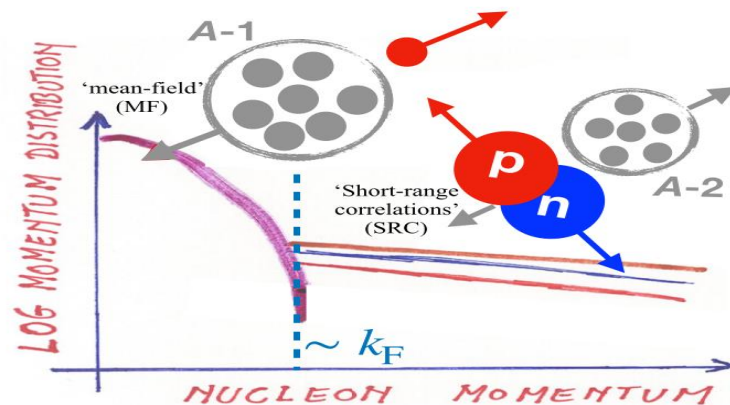


CAFE Experiment : *Isospin Dependence of Short-Range Nucleon Pairing in Nuclei*



Kinematics	Beam Energy [GeV]	SHMS (e^-) Momentum [GeV/c]	SHMS (e^-) Angle [deg]	HMS (p) Momentum [GeV/c]	HMS (p) Angle [deg]	Missing Momentum [GeV/c]	4-Momentum Transfer (Q^2) [(GeV/c) 2]
MF	10.549	8.55	8.3	1.820	48.3	0.400	1.89
SRC	10.549	8.55	8.3	1.325	66.4	0.150	1.89

Table 2: Central kinematic settings for the CaFe experiment.



- Ran from Sept 17-29 with only 30% efficiency
 - Data on Be-9,B-10,B-11,C-12, Ca-40,Ca-48,Fe-54
- Completed MF and SRC settings for all nuclei
 - Except SRC setting for Fe (71%) and LD2 (10%)
 - Plan to complete these settings end of Feb 2023

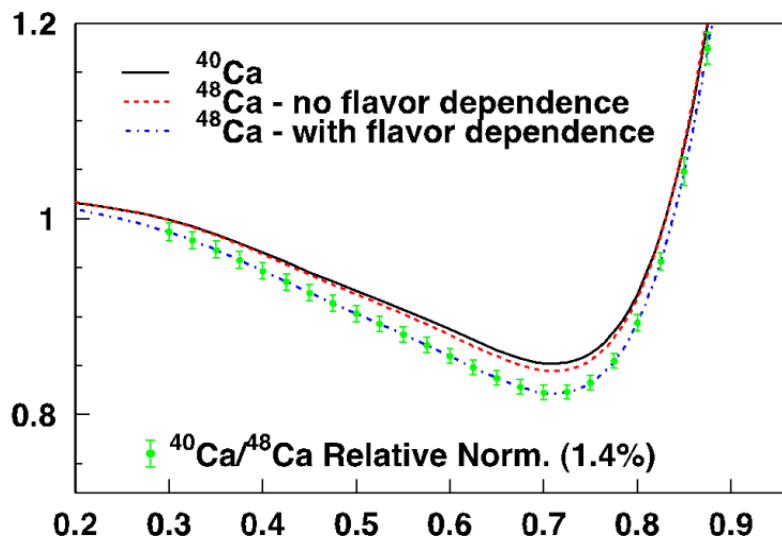
EMC and $X > 1$ experiments

- [E12-10-008](#) Detailed studies of the nuclear dependence of F_2 in light nuclei.
- [E12-06-105](#) Inclusive Scattering from Nuclei at $x > 1$ in the quasielastic and deeply inelastic regimes

E12-10-008 studies EMC effect

- Add 6Li and 7Li to light nuclei
- Flavor dependence with ^{40}Ca and ^{48}Ca

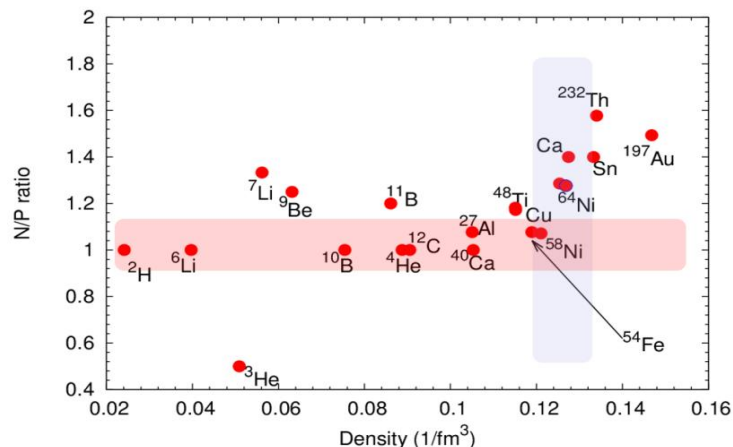
Proposal expectations



Results on ^{10}B , ^{11}B from short commissioning experiment submitted to PRL and on [arXiv:2207.03850](#)

E12-06-105 studies 2N and 3N SRC

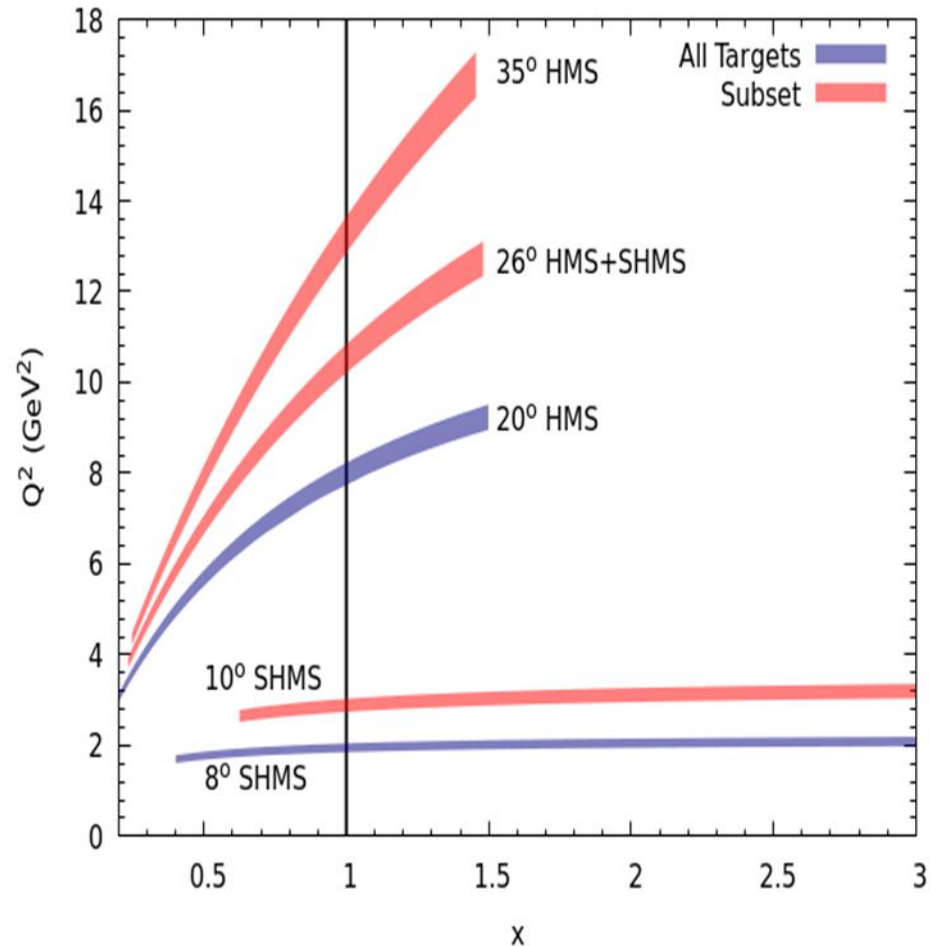
- Precision measurement of 2N SRC
 - A-dependence in light nuclei
 - Variation with neutron excess
 - Connect EMC effect and SRC
- First observations of 3N SRC
- Nuclear PDFs at $x > 1$ and look for superfast quarks



Planned running through March 2023

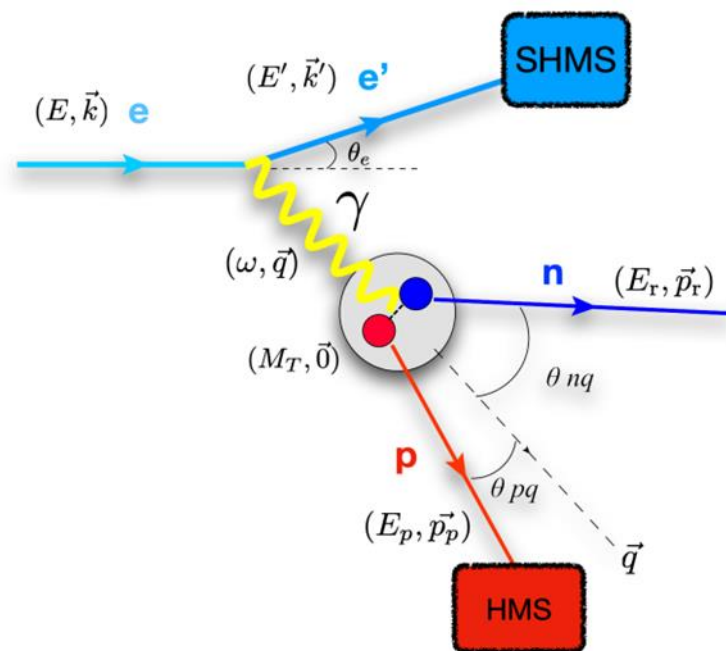
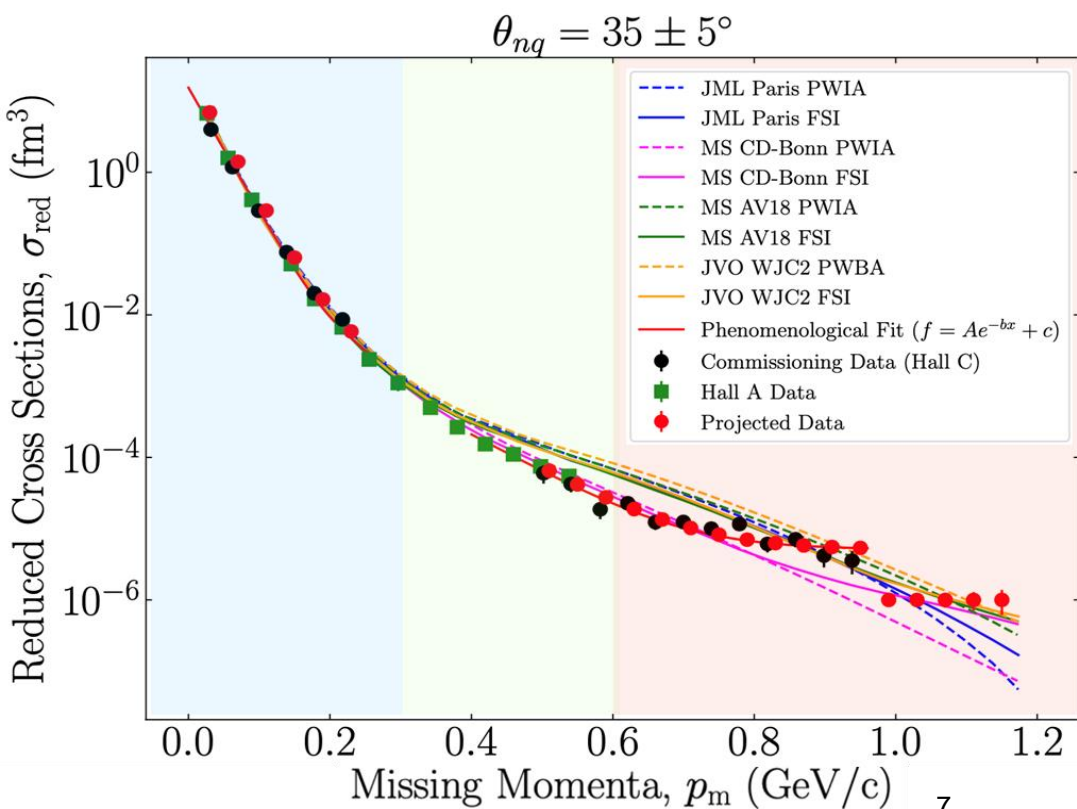
- EMC and X>1 experiments
 - Completed Ladder 1 and 1H/2H
 - Presently on Ladder 2 with 3He/4He
 - Started up on Jan 12th
 - Run until Feb 20th
- Target change back to 1H/2H targets.
 - Starting Feb 22, CAFÉ will complete Fe and LD2 running (1 PAC day)
 - D(eep) at high missing momentum (E12-10-003) will run until March 20th.

- EMC and X>1 updated settings with reduced beam time.
- Replaced 33,40,55° with one 35° setting



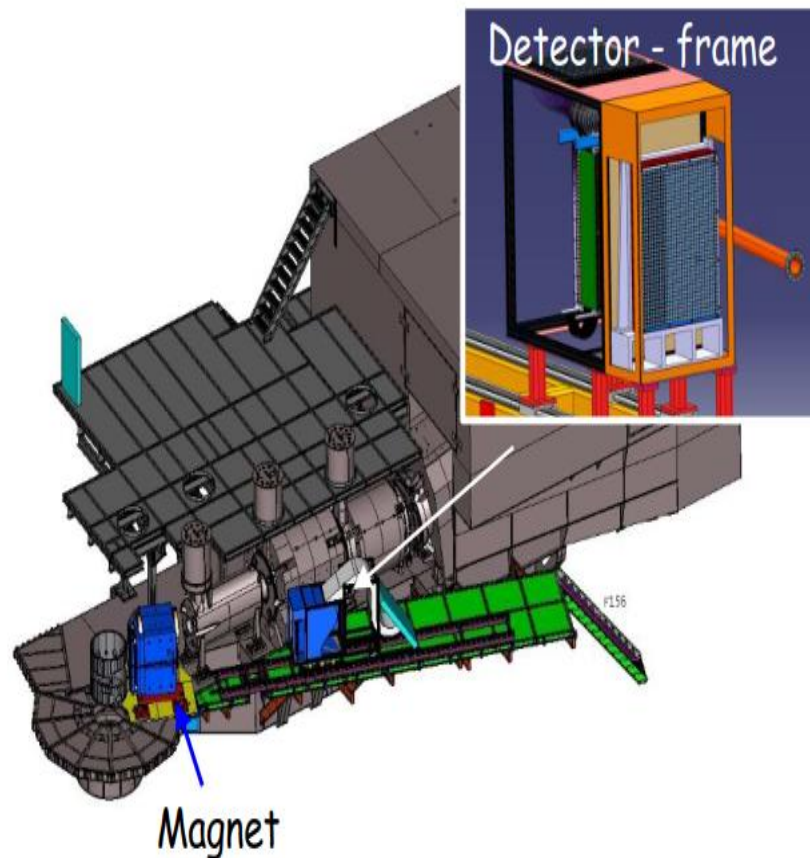
Deuteron Electro-Disintegration at Very High Missing Momentum

- Ran 3 days of experiment as commissioning data. Published in PRL
- At PAC Jeopardy, approved to complete the remaining 18 days.
- Focus at $\Theta_{nq} = 35^\circ$ where FSI are minimal.
 - Calculations in plane wave and with FSI have small difference



Hall C Run period July 2023 to March 2024

- E12-13-010, E12-22-006, E12-13-007
 - Exclusive Deeply Virtual Compton on proton and neutron
 - SIDIS $p(e,e',\pi^0)$ cross section. Map the transverse momentum dependence.
 - 102 PAC days.
- Neutral Particle Spectrometer (NPS)
 - Magnet with calorimeter
 - 1080 Lead-Tungstate blocks in Calorimeter to detect γ and π^0
 - Remove the SHMS HB magnet

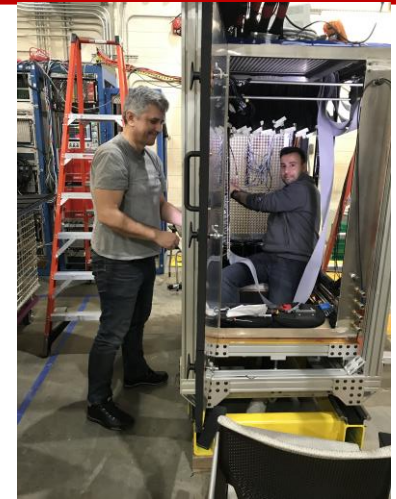


NPS Calorimeter Preparations

- Assembly of calorimeter blocks in the detector box completed in June 2022
- Installed and cabled 4 rows of calorimeter to be test with cosmics. Found 200 Mhz noise issue.
- After much detective work and discussions spearheaded by Bogdan. Determine modification of HV board to mitigate the noise with only factor two reduction in signal size.
- During December, French group installed modified HV boards back into the calorimeter.
- Cosmic data look good.
- Mindy Loeffel of the DSG group modifying the remaining HV boards.
- This week, French group is back at JLab to install remaining



Bernard Mathon assembling PMT and bases



Miklat Imre and Carlos Domingues installing PMT/bases assemblies

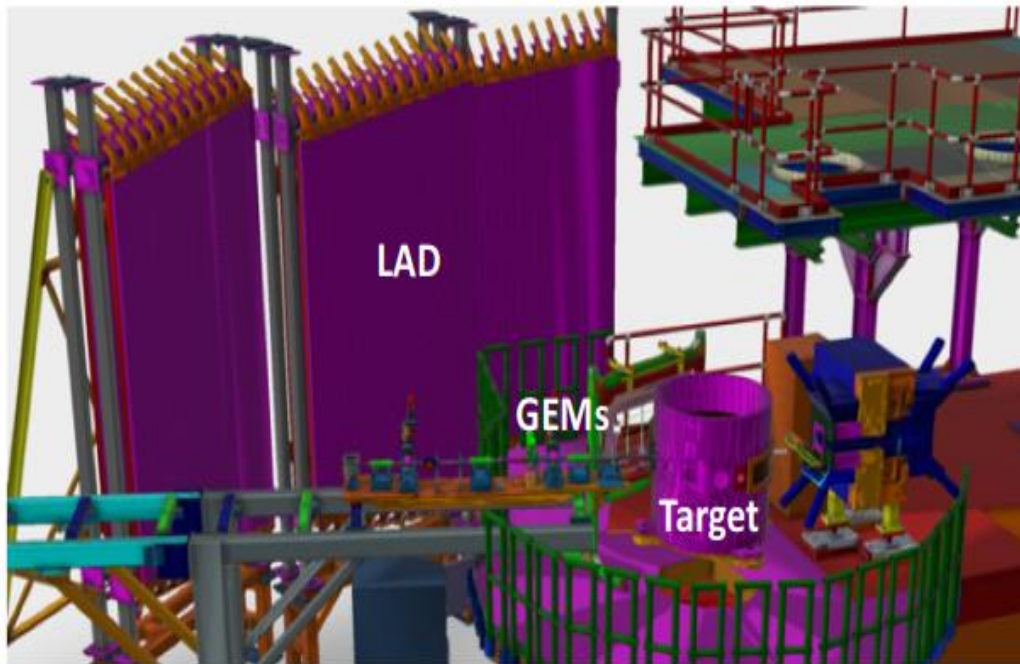


NPS calorimeter setup in the EEL108

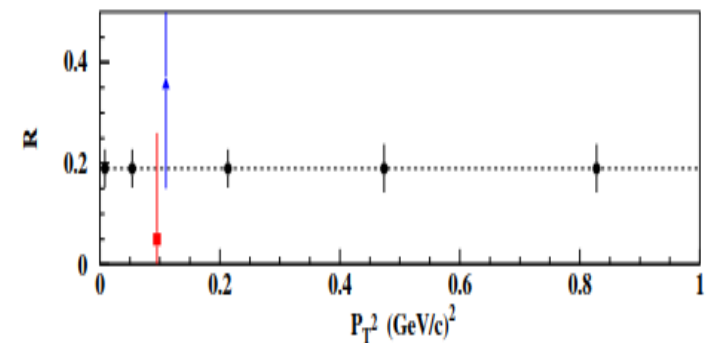
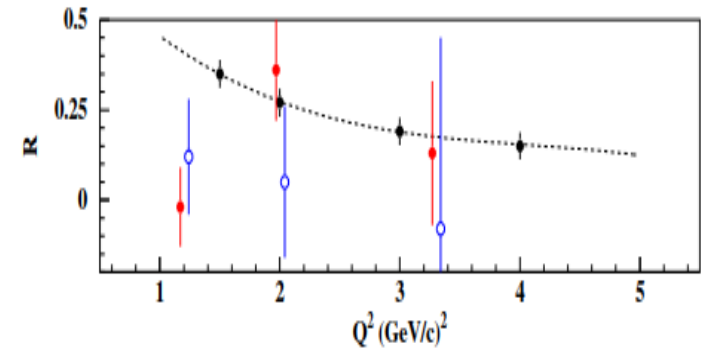
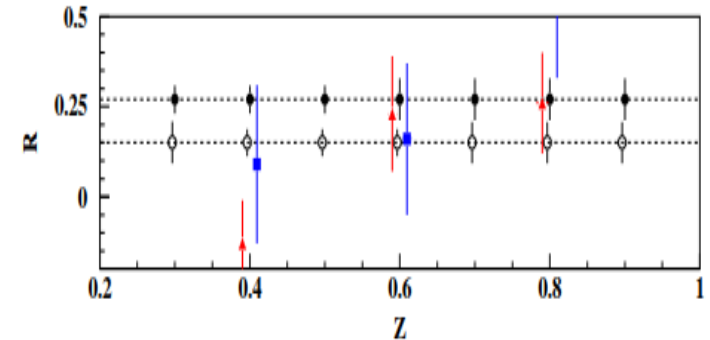
Hall C Near term future

Experiments to run in July 2024- March 2025

- Standard SHMS/HMS
 - [E12-06-104](#) $R=\sigma_L/\sigma_T$ in SIDIS on 1H and 2H
 - [E12-06-107](#) Complete CT experiment
 - [E12-11-107](#) Spectator tagged DIS $d(e,e'p_s)$
Install Large Angle Detector
HMS/SHMS detect electron



$R=\sigma_L/\sigma_T$ in SIDIS



Longer term future

Recent Hall C Futures paper

- *Jefferson Lab Hall C: Precision Physics at the Luminosity Frontier* : <https://arxiv.org/abs/2209.11838>
- Talk at last summer's Hall A/C meeting.

Experiments after March 2025

- Standard SHMS/HMS experiments.
 - Experiments with non-standard beam energies
- Beyond 2025 options are:
 - Hypernuclear experiments
 - Polarized deuteron experiments
 - WACS and other experiments using the NPS
 - Experiments using the Compact Photon Source
 - Capital project is ongoing
 - SBS/BB experiments that did not run in Hall A

Summary

- The X>1 and EMC experiments have just restarted last night!
 - Still openings on the schedule. [Sign up for shifts!](#)
- Feb 20th switch to LH2/LD2 to complete CAFÉ and run D(eep)
- March 20th beam turns off.
- March 20th to July 20th installation of NPS. Next talk by Steve will discuss.
- July 2023 to March 2024 run DVCS/SIDIS experiments
- 2024 Run period
 - Spectator tagged DIS $d(e,e'ps)$ with LAD
 - R SIDIS
 - Pion CT