

Hall C Status



Publications and Students in last year

Revealing Color Forces with Transverse Polarized Electron Scattering (SANE)

Phys. Rev. Lett. 122, 022002 (2019)

Technical Supplement to “Polarization Transfer Observables ...” (GEP-III, GEP-2 γ)

Nucl Inst Meth A 910, 54 (2018)

Experimental techniques and performance of Λ -hypernuclear spectroscopy (HKS)

Nucl Inst Meth A 900, 69 (2018)

Precision measurement of the weak charge of the proton (Qweak)

Nature 557, 207 (2018)

Measurements of the Separated F_L from Hydrogen and Deuterium Targets at Low Q^2

Phys Rev C 97, 045204 (2018)

Design and performance of the spin asymmetries of the nucleon experiment (SANE)

Nucl Inst Meth A 885, 145 (2018)

Direct measurements of the lifetime of medium heavy hypernuclei

Nucl Phys A 973, 116 (2018)

Separated kaon electroproduction cross section and the kaon form factor from 6GeV Jlab data

Phys Rev C 97, 025204 (2018)

SANE results – submitted (arXiv:1805.08835). Proton FF from SANE expt. – nearing submission

Graduated Students: Valerie Gray, Kurtis Bartlett, James Dowd

Hall C Fall 2018

Fall 2018 - Took data for three experiments:

E12-09-017 Pt dependence of SIDIS. Completed data taking from spring

E12-09-002 Quark Charge Symmetry Violation with SIDIS

E12-09-011 L/T Separated Kaon Electroproduction

Kaon L/T took about 75% of planned statistics due to late start of beam

12 GeV era Beamtime Statistics (Draft)

94.5 PAC days completed

3.7 experiments completed

E12-09-002 – Charge Symmetry Violation

Spokespeople: W. Armstrong, D. Dutta, D. Gaskell, K. Hafidi

Goal: Constrain charge symmetry violation in quark distributions with precise measurements of π^+/π^- ratios from LD₂

Kinematics $P_T \sim 0$ $z=0.4, 0.5, 0.6, \text{ and } 0.7$

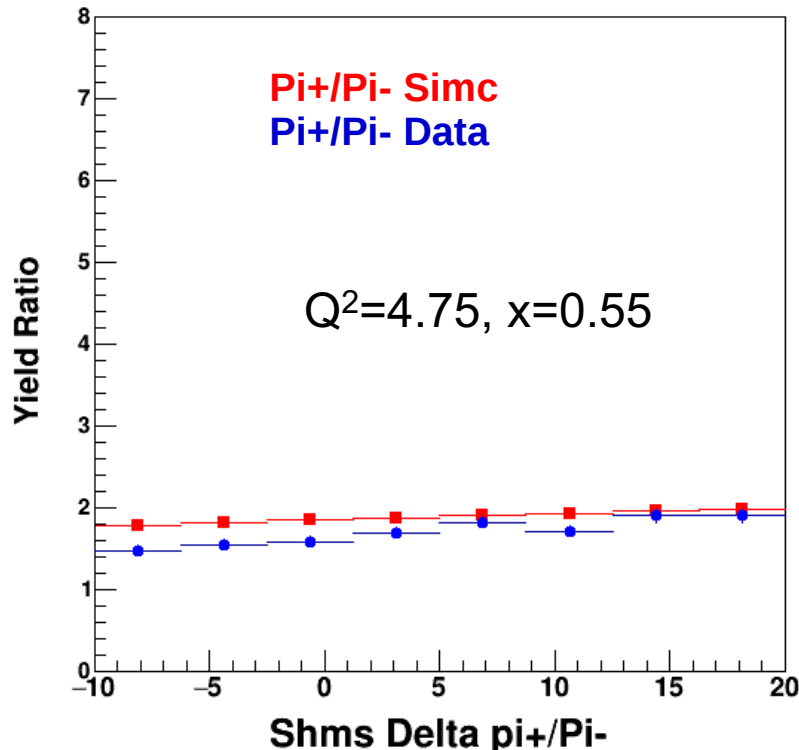
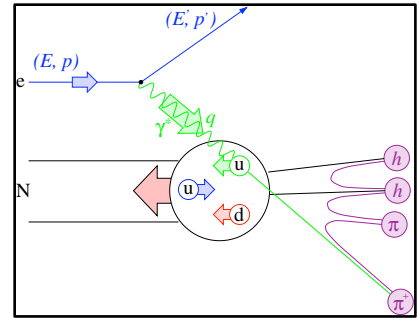
$Q^2 = 4.0 \text{ GeV}^2$ $x=0.35, 0.40, 0.45, 0.50$

$Q^2 = 4.75 \text{ GeV}^2$ $x=0.45, 0.50, 0.55, 0.60$

$Q^2 = 5.5 \text{ GeV}^2$ $x=0.50, 0.55, 0.60, 0.65$

Completed Fall 2018

Spring 2019



Raw, barely offline results

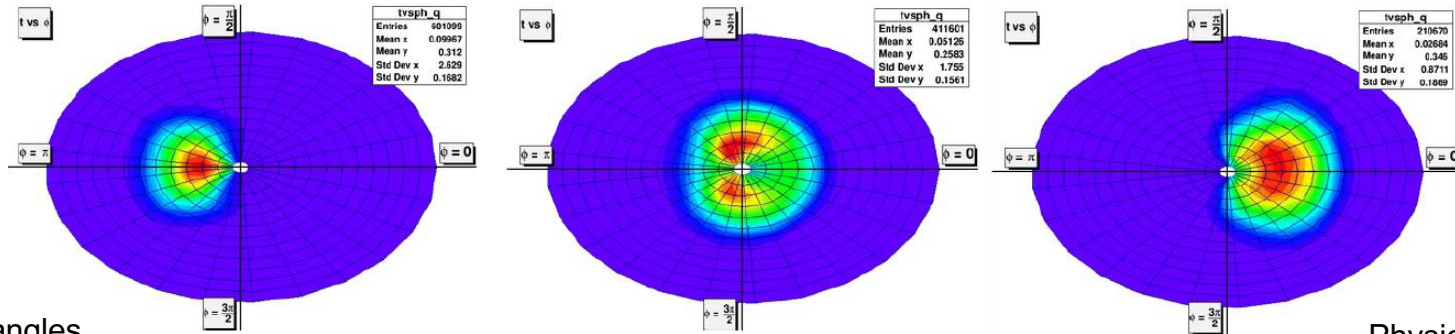
Ratios roughly consistent with MC expectation

One setting out of 8 taken in Fall 2018

E12-09-011 (KaonLT)

Spokespersons: T. Horn (CUA), G. Huber (URegina), P. Markowitz (FIU)

Grad. Students: R. Ambrose (URegina, M.S. 2018), V. Kumar (URegina), M. Muhoza (CUA), R. Trotta (CUA)



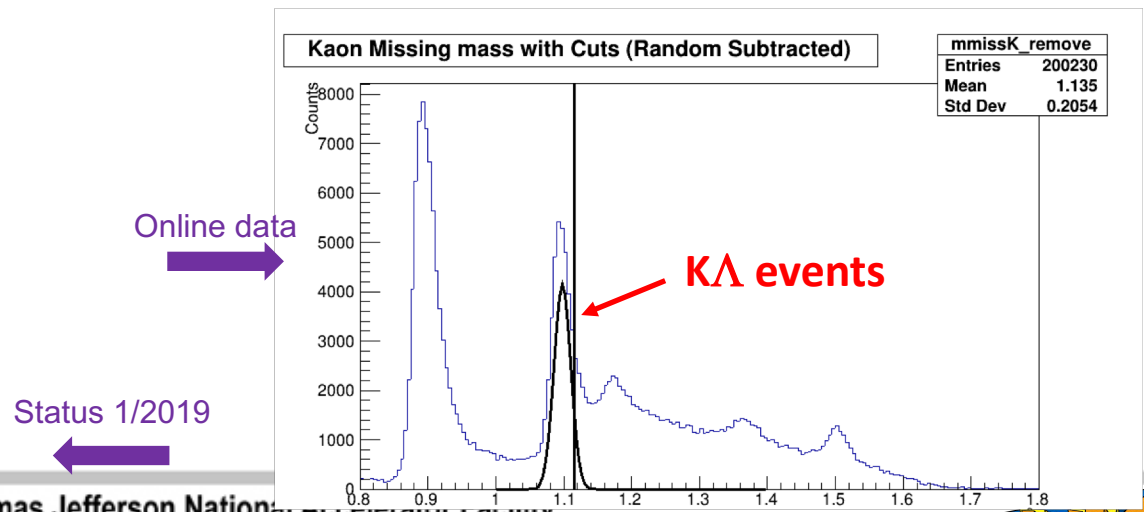
Three SHMS angles

Physics cross section

Two beam energies

$$2\pi \frac{d^2\sigma}{dt d\phi} = \varepsilon \frac{d\sigma_L}{dt} + \frac{d\sigma_T}{dt} + \sqrt{2\varepsilon(\varepsilon+1)} \frac{d\sigma_{LT}}{dt} \cos \phi + \varepsilon \frac{d\sigma_{TT}}{dt} \cos 2\phi$$

Setting	Low ε data	High ε data
$Q^2=0.50$ $W=2.40$	✓	✓
$Q^2=2.1$ $W=2.95$	✗	✓
$Q^2=3.0$ $W=2.32$	✗	✓
$Q^2=3.0$ $W=3.14$	✗	✓
$Q^2=4.4$ $W=2.74$	✗	✓
$Q^2=5.5$ $W=3.02$	✗	✓

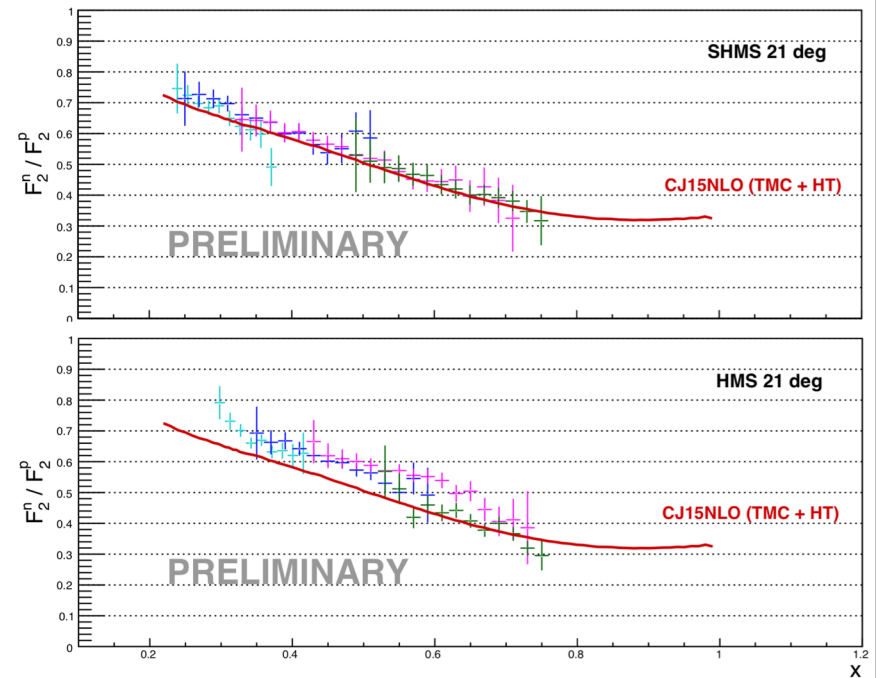
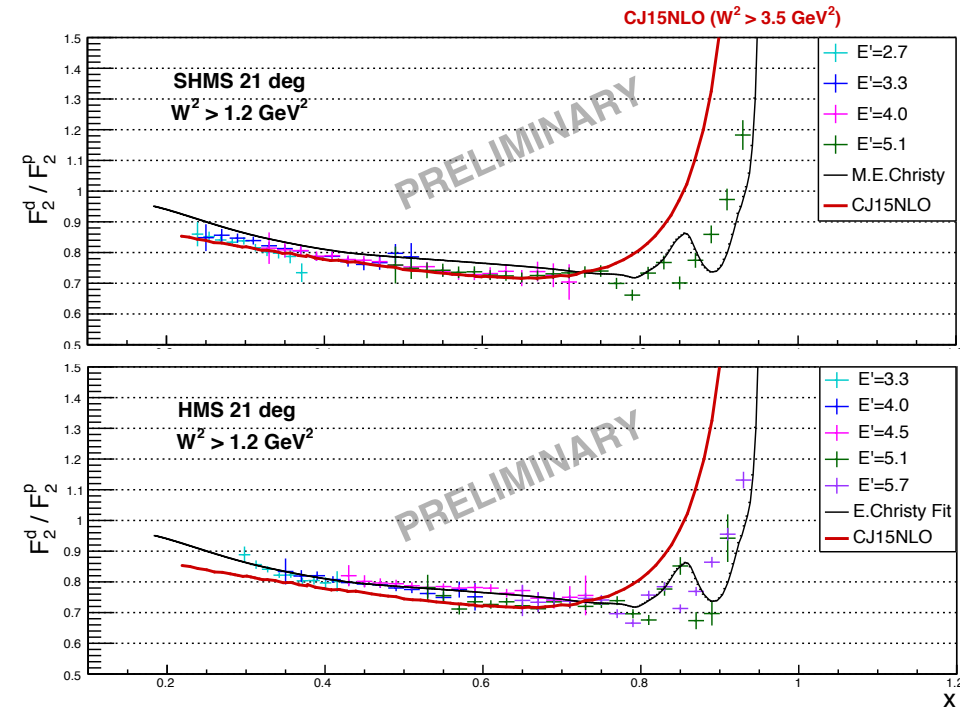


Thomas Jefferson National Accelerator Facility

Spring 2018 run analysis

E12-10-002 – F_2 (e,e') on LH_2 and LD_2 (S. Malace, I. Niculescu, C. Keppel)

Preliminary d/p and n/p ratios presented at DNP (Sanghwa Park)



Hall C activities

Radiator installed for LHCb pentaquark search
Noble Gas Cherenkov installed in SHMS for LHCb.
Large angle beam pipe installed
Maintenance on HGC

Design and parts fabrication for ^3He target

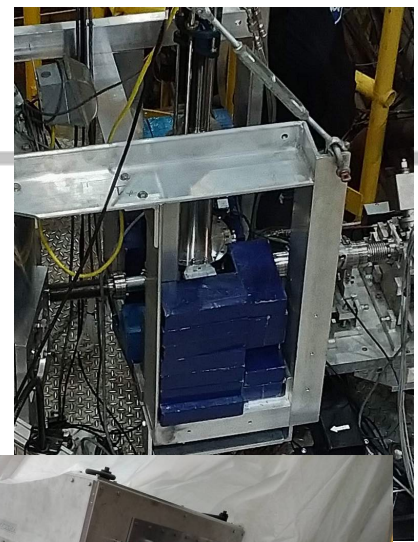
AC power installed for Moller quad @ 11 GeV operation

NPS sweeper magnet assembled

Magnet controls upgrading – with Detector Support Group

HV testing and controls – with Detector Support Group

Broken mirrors in HMS gas Cherenkov replaced



NPS Magnet – assembly, design, testing

NPS sweeper magnet fully assembled in Test Lab. Infrastructure ready for magnet testing and mapping hardware/software ready. (*C. Hyde + ODU team, W. Akers, W. Kellner + Hall C techs, B. Wojtsekhowski, CUA*)



TN: JLAB-TN-18-043

Power and LCW Estimates for the Neutral Particle Spectrometer Sweeper Magnet

Walt Akers
Thomas Jefferson National Accelerator Facility

September 7, 2018

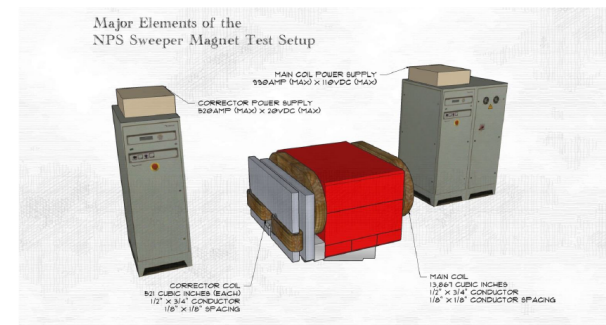
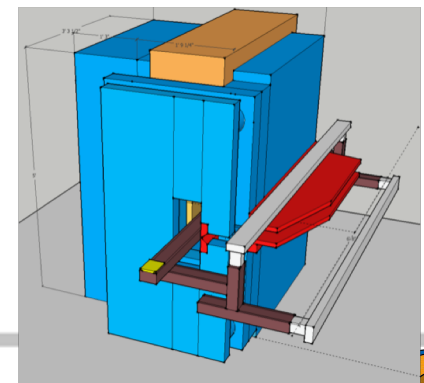
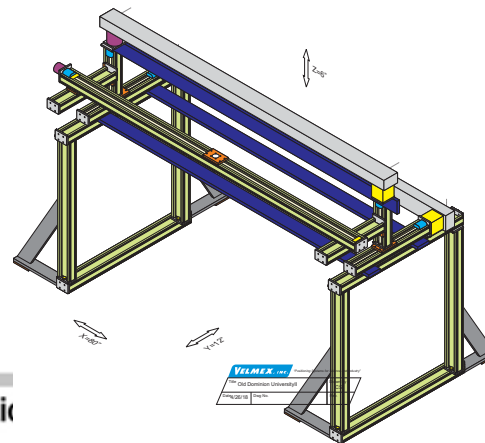
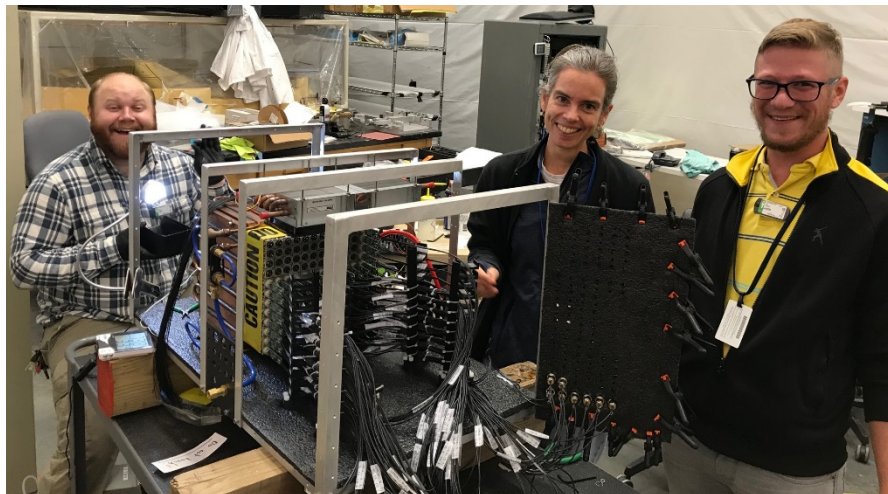


Figure 1. NPS Sweeper Magnet Test Configuration



NPS Detector

NPS crystal prototype (COMCAL) serves as test for mechanical assembly, controls and software development, and component/data taking improvement. Installed in Hall D, commissioned, and taking data (*V. Berdnikov, A. Somov + Hall D team*)



Full crystal characterization facility at CUA (*V. Berdnikov, T. Horn, VSL*) and high dose irradiation at IPNO (*C. Munoz-Camacho, H-S Ko, W. Rong*)

FY18: 460 SICCAS crystals and X/100 CRYTUR crystals characterized – 144 are in HD

- Some delays as had to ship back 160 SICCAS crystals for replacement

FY19: procurement 400 SICCAS crystals pending, ~200 CRYTUR crystals expected by October 2019

Hall C procuring HV for NPS. Phys. Div. procuring FADC250 boards.

Polarized ^3He target

Preparing for A_1^n (E12-06-110) in late 2019.

Installation planning ongoing. Conservative schedule developed to fit available time.

Fabrication and gathering of parts (platform, supports, coils, target) in progress

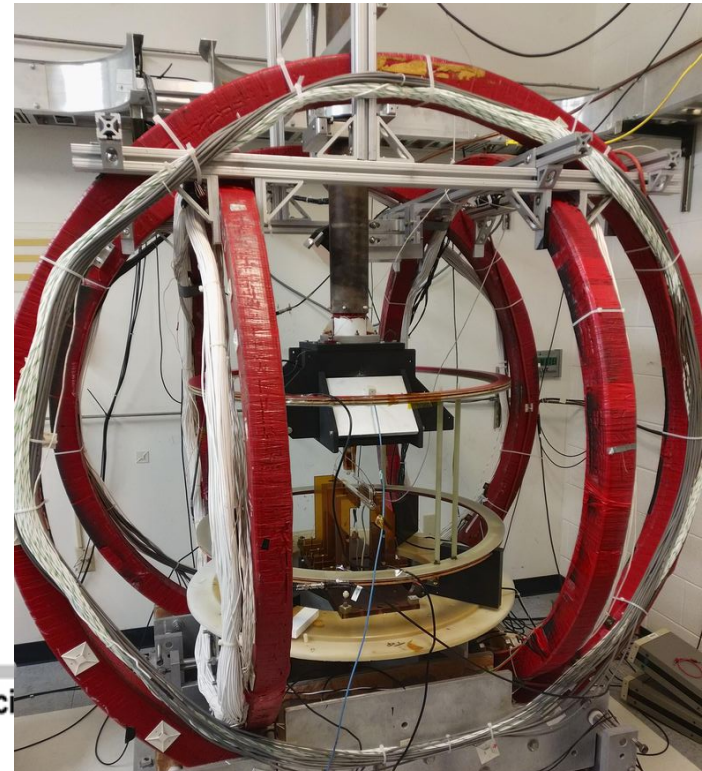
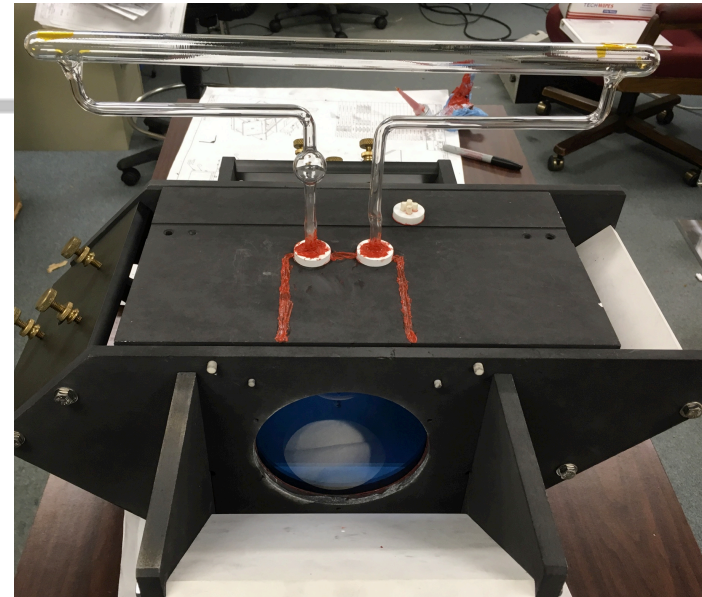
Cell production ramping up, expect 6-8 cells by June, 2019

Target goals:

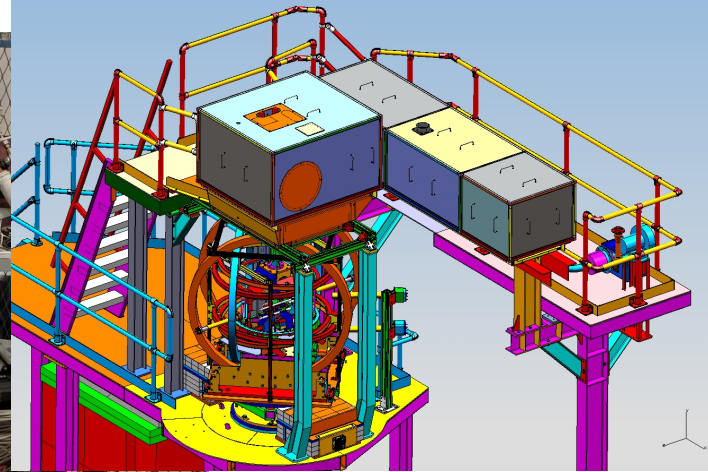
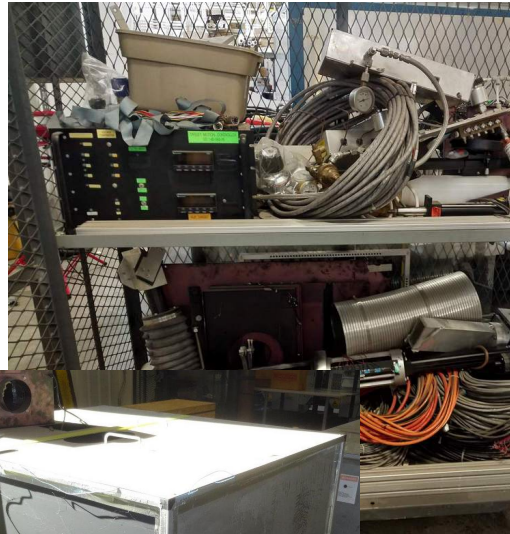
30 μA on 40 cm , ~ 10 atm, $L \sim 2.2 \times 10^{36} \text{ cm}^2 \text{s}^{-1}$

In-beam polarization $\sim 55\text{-}60\%$,

Polarization measurement precision $\sim 3\%$



Gathering polarized ^3He parts



LAD – Large Acceptance Detector

E12-11-007: Deuteron EMC – d(e,e' backward p)

Very large solid angle for $L = 10^{36} \text{ cm}^{-2} \text{ s}^{-1}$ and $\theta > 90^\circ$

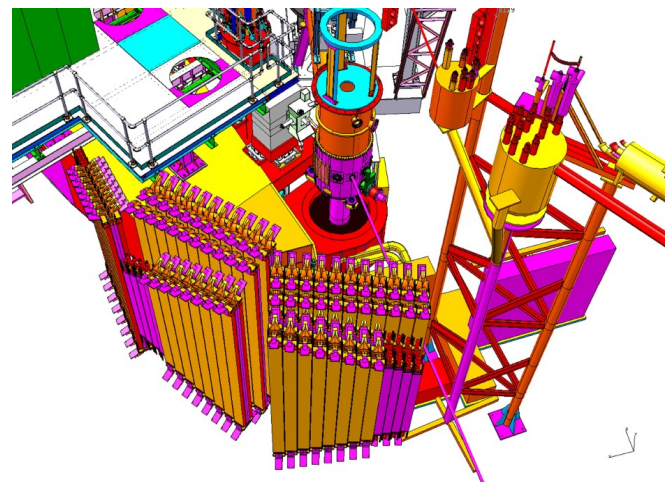
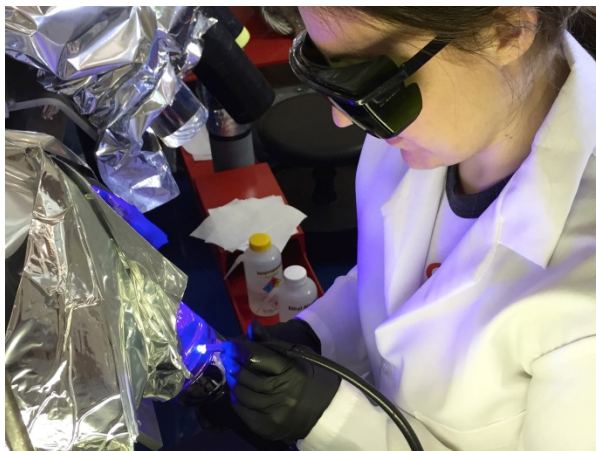
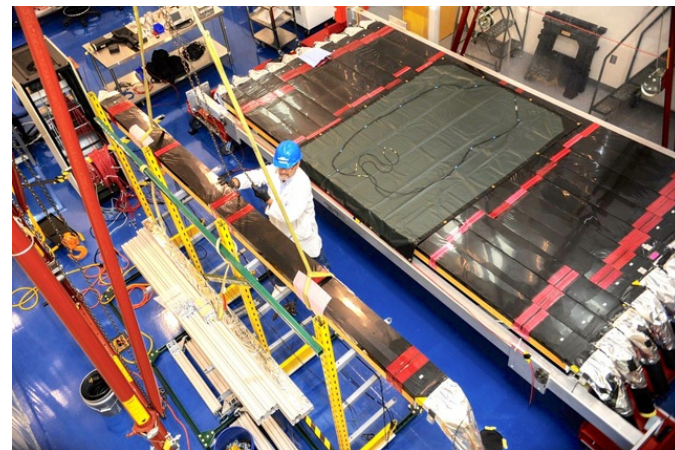
Optimized for medium momentum nucleons

$$0.3 \leq p_N \leq 0.7 \text{ GeV}/c$$

Needs 5 scintillator planes which are built from old CLAS-6 TOF scintillators.

Five planes refurbished @ODU by ODU, KSU, TAU, MIT, GWU and back at JLab in ESB.

HV supply for scintillator planes delivered.



Hall C 2019

Spring/Summer 2019 - start delayed by 8 days ~ Feb 7, 2019

E12-16-007 LHCb charmed pentaquark via J/ψ production

E12-09-002 Complete CSV

E12-09-011 Complete data need for Kaon L/T separations

E12-06-101/E12-07-105 Short low pass run for pion form factor + scaling

E12-15-001 Generalized polarizabilities of the proton in VCS

Late 2019

E12-06-110 $A1n$ and $d2n$ with polarized ^3He target

Great time in Hall C!! Like the good old days!

Good data in the can

Exciting experiments ready to run

Preparing for a large installation