Publications, Students, Postdocs

Separated Response Functions in Exclusive, Forward $\pi^\pm$ Electroproduction on Deuterium


The Q_weak Experimental Apparatus

NIM A781, 105 (2015)

Polarization Transfer in Wide-Angle Compton Scattering and Single-Pion Photoproduction from the Proton


Precision Electron-Beam Polarimetry using Compton Scattering at 1 GeV


High Resolution Spectroscopy of Be-10-Lambda  arXiv:1511.04801

SANE: Whitney Armstrong (Temple), Luwani Ndukum (MSU)
Qweak: Scott MacEwan (Manitoba), Amrendra Narayan (MSU), Joshua Hoskins (W&M), Don Jones (UVA), Emmanouil Kargiantoulakis (UVA), Juan Carlos Cornejo (W&M)
WACS: Cristiano Fanelli (U Rome)

Postdocs: Joint A/C/EIC - Kijun Park, Hall C postdocs, 1 filled, 1 open
SHMS Magnets

5 SC Magnets: HB, Q1, Q2, Q3, D

Q1 “accepted” and contract closed

HB undergoing detailed testing
   (Internal eddy current concerns)
   Tested to 3500A – 4000A goal

Dipole, Q2, Q3 delivery expected
   Starting in April
SHMS Detectors

- S1X/Y, S2X - scintillator (JMU)
- Detector Frames (W&M)
- Noble Gas Cerenkov (UVA)
- Drift Chambers (Hampton)
- S2Y - quartz (NCAT)
- Shower Counter (Yerevan)
- Aerogel Cerenkov (CUA)
- Heavy Gas Cerenkov (Regina)
SHMS Detectors

SHMS Preshower and Shower Counter installed
Instrumented with Flash ADC DAQ
Heavy Gas Cerenkov Installed
Aerogel installed
Hodoscope (scintillator and quartz) installed
Good performance with cosmic ray tests with tray of $n=1.03$ Aerogel with “wrong way” muons.

(In spectrometer, particles will pass through Aerogel before the diffusion box. In cosmic tests, Aerogel on bottom.)

Now installed in SHMS
SHMS Detectors

Noble gas Cerenkov and wire chambers in Experimental Staging Building

(Testing with 12 GeV electronics + software)
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
$0.3 \leq p_N \leq 0.7 \text{ GeV/c}$

Built from old CLAS-6 TOF scintillators. Two planes refurbished @ODU by ODU, KSU, TAU, MIT, GWU. Third plane in progress.

Now only 3 planes needed  [ d(e,e’n) -> Hall B ]
Neutral Particle Spectrometer ($\pi^0/\gamma$)

Hall C has unique L/T separation capability with 7GeV/c HMS. Natural to add capability for L/T separation with neutral ($\pi^0,\gamma$) final states.

Concept: Place ~1000 block PbWO$_4$ detector on SHMS carriage with conventional sweeping magnet replacing SHMS horizontal bend.
Global design of a neutral-particle spectrometer between 5.5 and 60 degrees consists of a highly segmented EM calorimeter preceded by a sweeping magnet

2015 NSF/MRI funding proposal was selected for an award

- Award will provide for NPS infrastructure, including the magnet, assuming existing crystals
- In the ideal case the NPS would use new crystals
- Application for UK grant with emphasis on additional equipment aimed at WACS requirements submitted

Significant efforts of the NPS collaboration have recently been related to PbWO\textsubscript{4} crystals

- 10+5 PbWO\textsubscript{4} crystals produced by SICCAS have been tested for optical properties and radiation hardness; 30 more crystals on order
- Infrastructure for crystal testing being developed at IPN-Orsay and CUA
- Close collaboration with Giessen University on crystal evaluation, as well as Caltech and BNL

5 Experiments approved

- E12-13-007: SIDIS
- E12-13-010: DVCS and π\text{0} cross sections
- E12-14-003: WACS at 8 and 10GeV
- E12-14-005: Wide angle exclusive π\text{0}
- E12-14-006: Initial state helicity correlation in WACS

More info in the NPS Wiki: https://wiki.jlab.org/cuawiki/
**Hall C Beamline: 6 GeV → 11 GeV**

Modify Compton polarimeter for operation at 11 GeV
- Raise chicane, replace vacuum chambers, replace dipole poles – map
- Beamline components, electron detector installed and under vacuum
- Laser table work remains

Repair Møller polarimeter
- New coils for big quads, acid flush small quad, map all quads
- All quads refurbished, mapping complete, installed on beamline, new PS ordered

Make beamline downstream of Møller ready for 11 GeV
- Fast raster, larger magnets for 17 mm vertical chicane
  - All girders (except for last superharp girder) installed. Final vacuum work, alignment and hookups needed.

On track for checkout with beam in March 2016
Compton, Moller, Beamline upgrade
Other Projects

HMS wire chamber replacement
   Very similar to SHMS chambers (XUV)
   Boards ordered

Counting house console replacement
   Old console removed
   New console assembly soon

Preparations for polarized 3He target
   Cut and reassemble pivot post
   Access platform design
<table>
<thead>
<tr>
<th>Number</th>
<th>Experiment</th>
<th>Grade</th>
<th>App. Days</th>
<th>Cond. Days</th>
<th>Non-standard Equipment</th>
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<tr>
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<td>Pion Form Factor</td>
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Total Days 711 8.1 Years @ 25 Weeks/year
Early running plans – Year 1

2016: March: 6 GeV low current to checkout beamline

2016: October-

Precommissioning – detector checkout

~25 PAC days – Commissioning “Experiment”

9 days of E12-06-107 search for color transparency

A(e,e’p) only – “easy” coincidence measurement

E12-10-002 \( F_2^{p,d} \) structure functions at large \( x \)

Momentum scans help understand acceptance

2 days E12-10-108/E12-06-105 EMC Effect, \( x>1 \)

Integrate light nuclei with \( F_2 \) run,

Point target helps acceptance studies.

3 days of E12-10-003 \( d(e,e’p) \)

Push to lower cross sections
Early running plan – Years 2-3

2017:

E12-09-017  $P_t$ dependence of basic SIDIS cross sections
  Push particle ID capabilities of SHMS
E12-09-002  Precise $\pi^+\pi^-$ ratios in SIDIS – Charge Symmetry
  Detector efficiencies
E12-09-011  L/T separated $p(e,e'K^+)$ factorization test
  Easiest L/T separation
(All Hall “Capabilities” tested with physics)

2018:

Choose a “High Impact Experiment”?

E12-06-101  Pion Form Factor  (needs well understood SHMS)
E12-06-105  $x>1$
E12-06-110  $A_1^n$ (needs high Luminosity $^3$He)