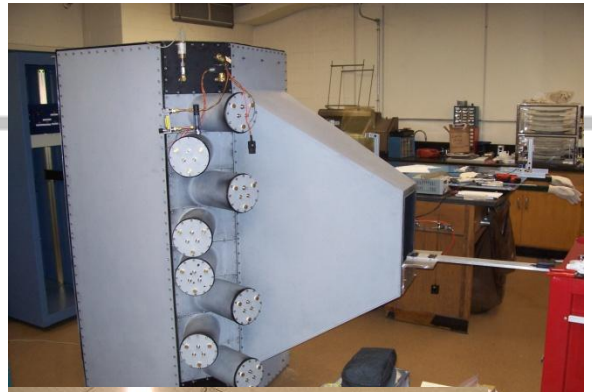
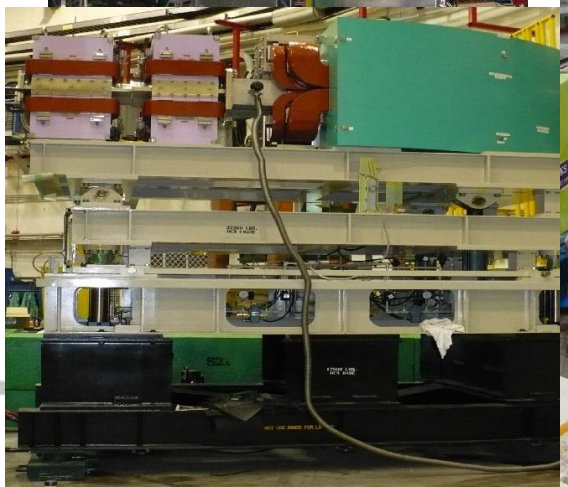
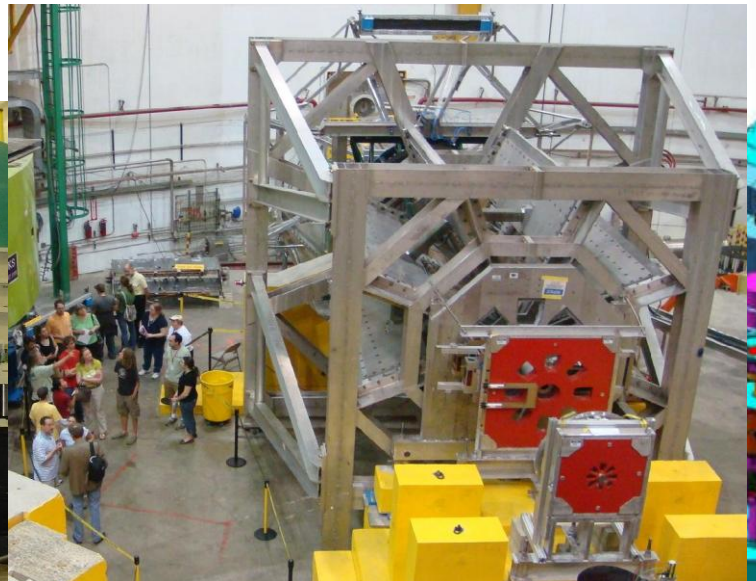
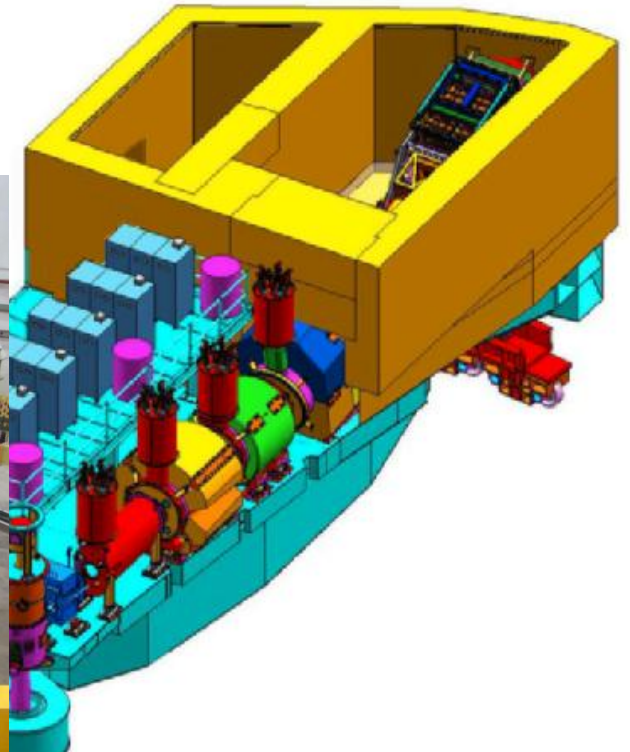








PAC39

June 18, 2012

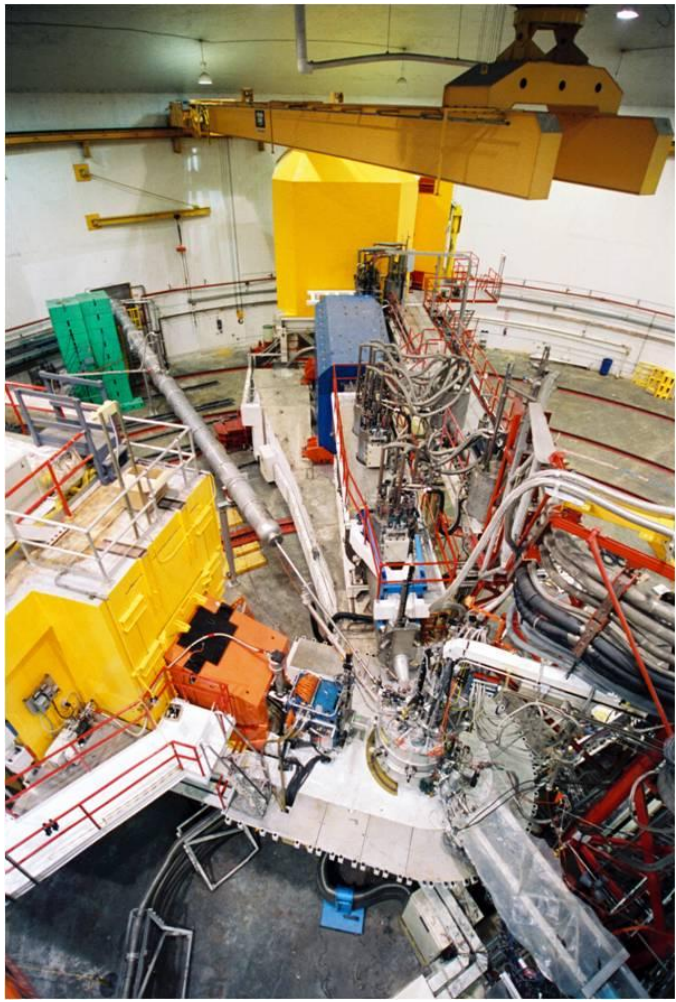
Hall C 6 Gev program – 1995-2012

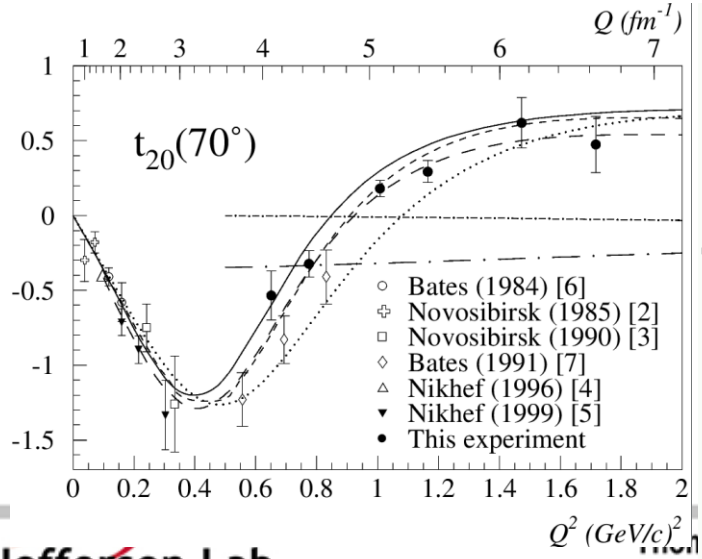
43* Experiments, 1033 PAC Days

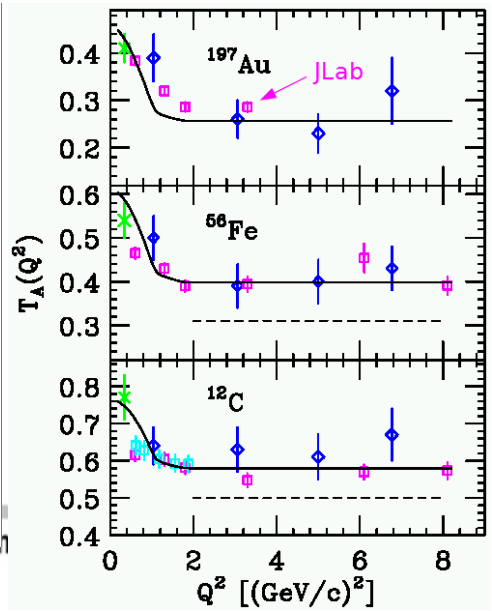
13 Major Installations (T20, GeN x3, G0 x3, A(e,e'K) x3, SANE, GeP, Qweak)

96 Publications (39 PRL, 11 NIM)

89 Ph.D. theses, >25 in progress

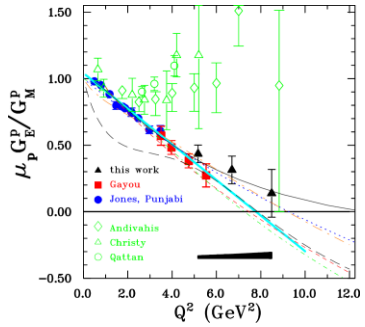


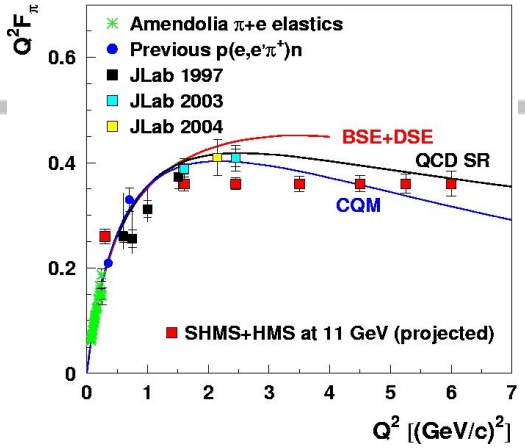


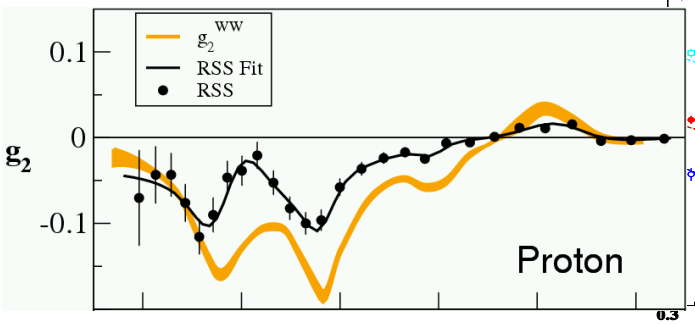


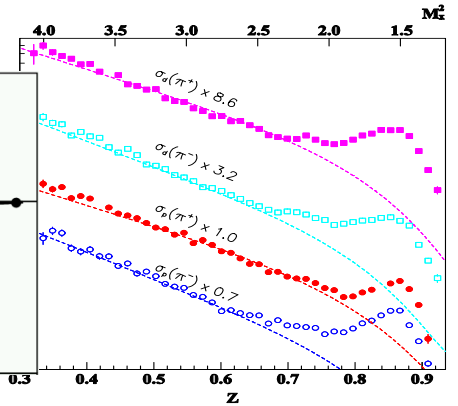
Hall C 6 GeV Physics

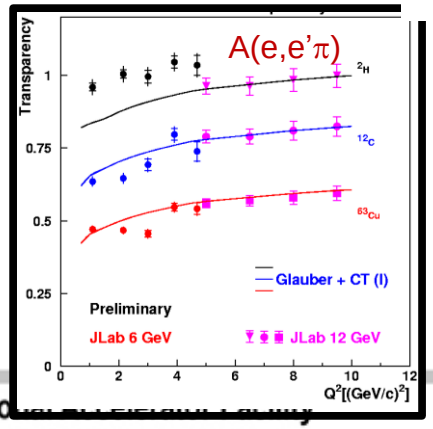
- **Form Factors**
  - Nucleon: GeN, GeP
  - Strange quark contributions
  - Deuteron: T20
  - Pion: Fπ
  - Baryon transition form factors
- **Nucleon Structure Functions**
  - Unpolarized p(e,e'), d(e,e')
    - Duality, high X
    - Semi-inclusive p,d(e,e'π)
  - Polarized structure functions
    - g_1, g_2 on polarized p, d
- **Nuclear structure/effects**
  - Hypernuclear structure
  - EMC effect
  - x>1 – high momentum in nuclei
  - Pion and proton transparency (attenuation) in nuclei
- **Parity Violation**
  - G0, Qweak

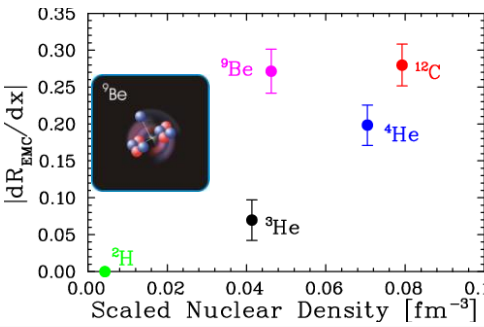










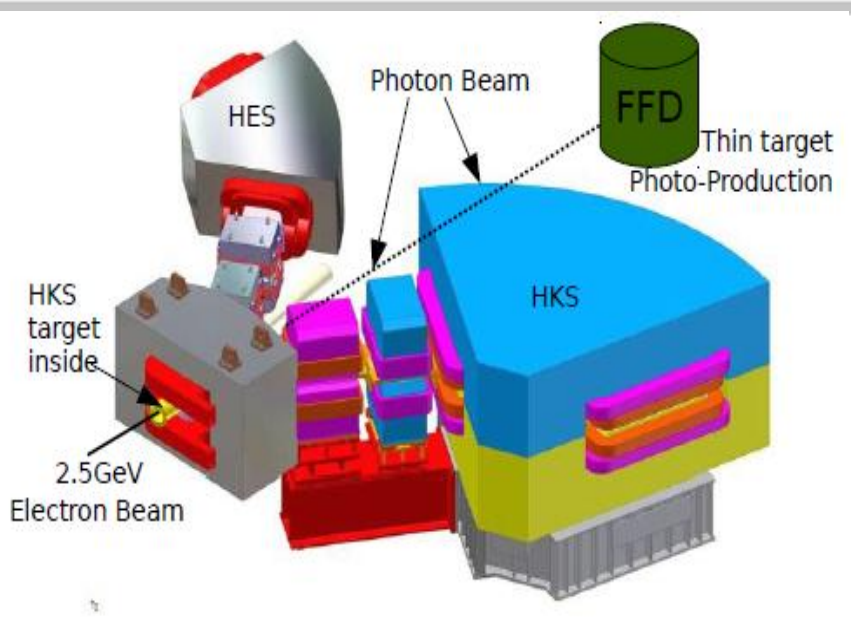


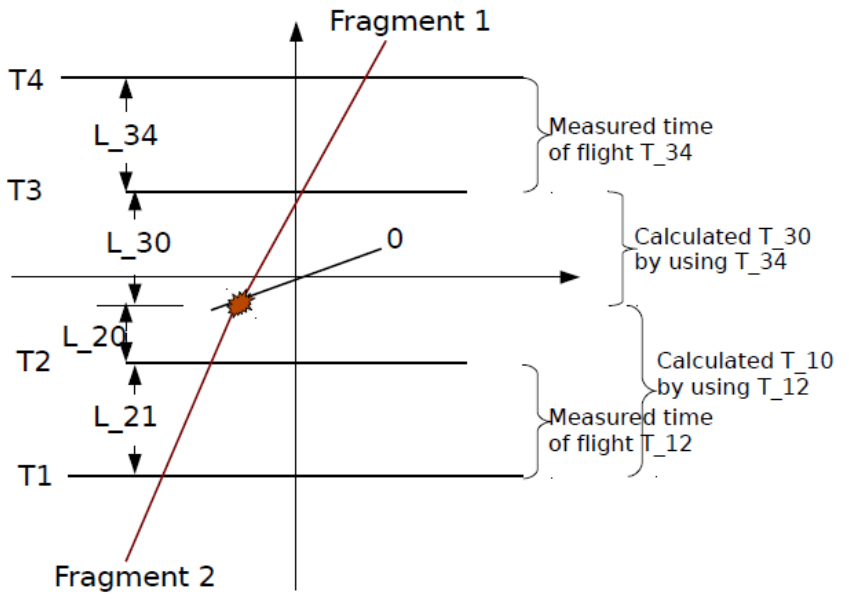
Publications in last year

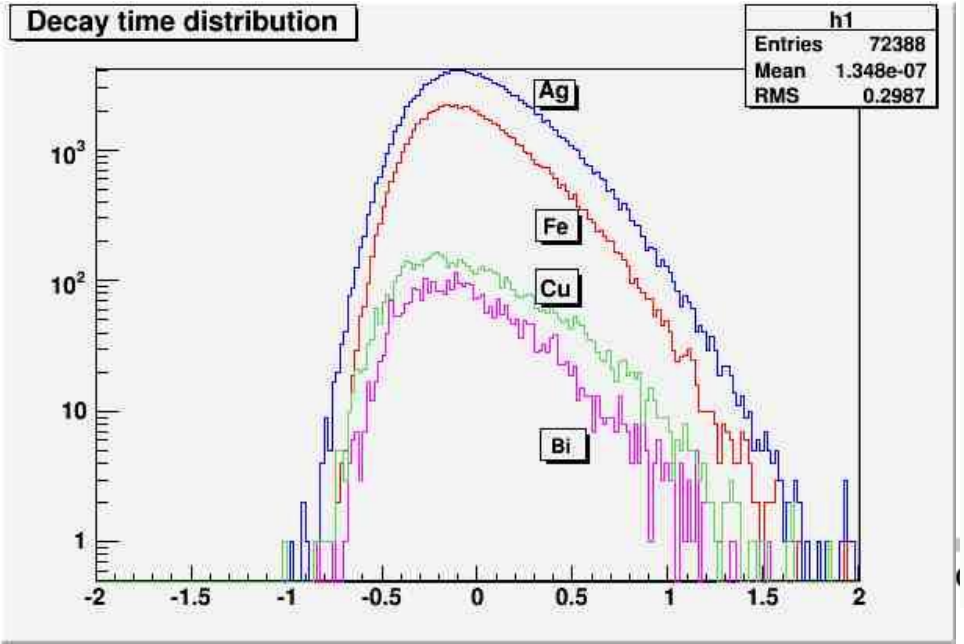
E04-108 (GeP)	Polarization components in π^0 photoproduction at photon energies up to 5.6 GeV	PRL 108, 222004
G0	Measurement of the parity-violating asymmetry in inclusive electroproduction of π^- near the Δ^0 resonance	PRL 108, 122002
E02-019	New measurements of high-momentum nucleons and short-range structures in nuclei	PRL 108, 092502
E00-108	Semi-Inclusive Charged-Pion Electroproduction off Protons and Deuterons: Cross Sections, Ratios and Access to the Quark-Parton Model at Low Energies	PRC 85, 015202
G0	The G0 Experiment: Apparatus for Parity-Violating…	NIIM A646, 59
E01-107	Nuclear transparency and effective kaon -nucleon cross section from the A(e, e'K^+) reaction	PRC 84, 015210
G0	Transverse Beam Spin Asymmetries at Backward Angles in Elastic Electron-Proton and Quasi-elastic Electron-Deuteron Scattering	PRL 107, 022501
HKS	Observation of the $^{7}_{\Lambda}$He hyper nucleus by the (e,e'K+) reaction	draft

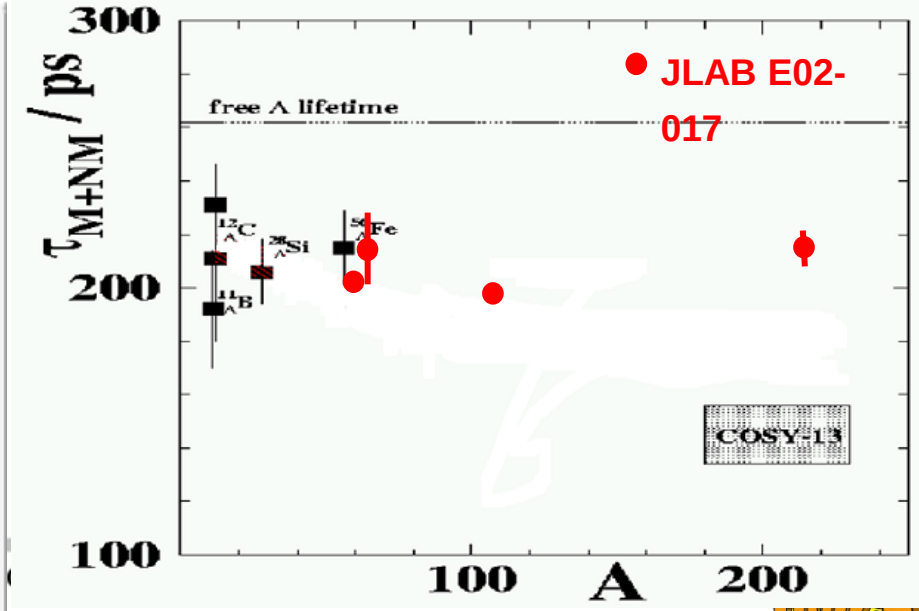
8 PhDs in last year
(Capuano, Leckey, Maxwell, Mkrtchyan, Mulholland, Myers, Pan, Wang)

E02-017: Lifetime of Heavy Hypernuclei





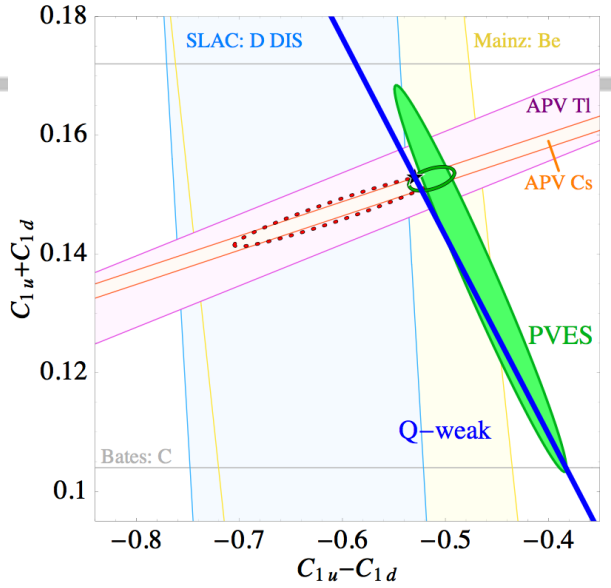


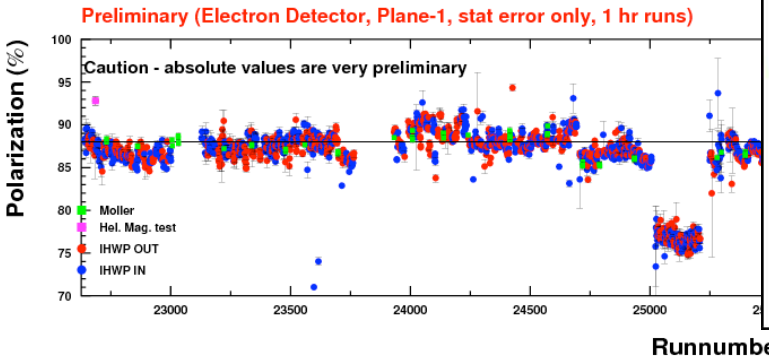


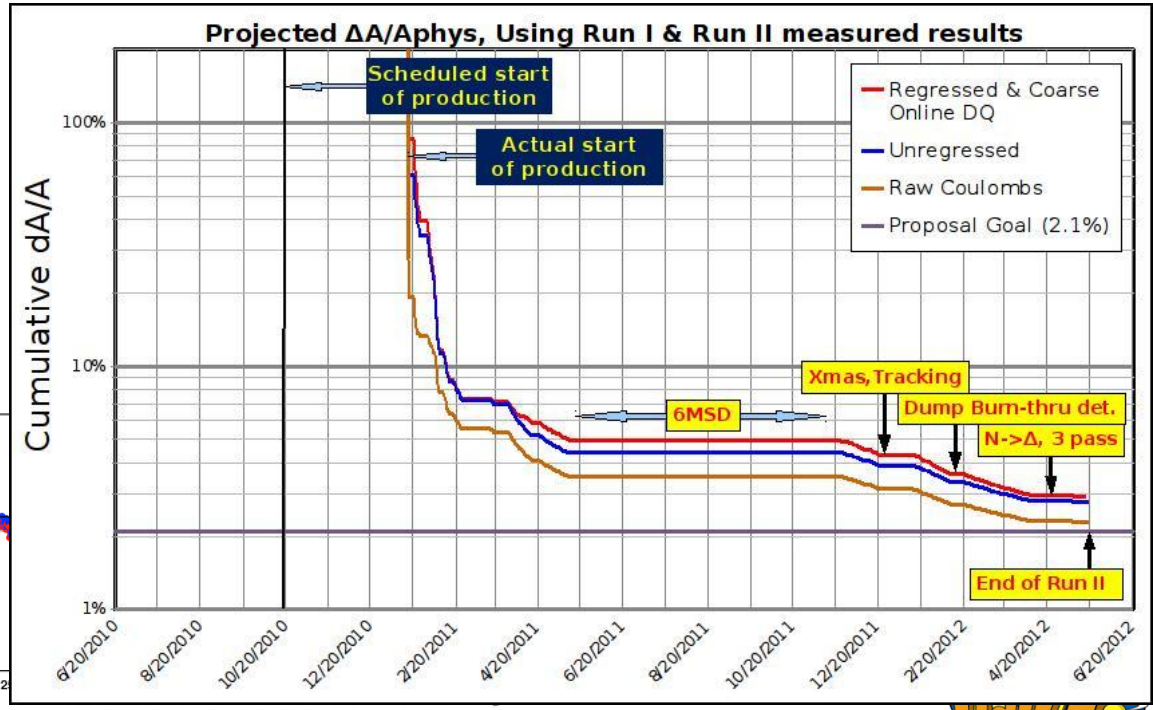
Successful Completion of Qweak

- Qweak completed May, 2012
- All new apparatus
  - Highest power LH2 target
  - Custom magnet
  - Quartz bar main detector
  - Specialized electronics
  - Q2 defining collimation
  - Tracking detectors
- New Compton Polarimeter
- Precise beam current meas.
- High quality, high I (180uA)
  high polarization (~87%)
  high “flip” rate beam

>20 Graduate Students







Qweak

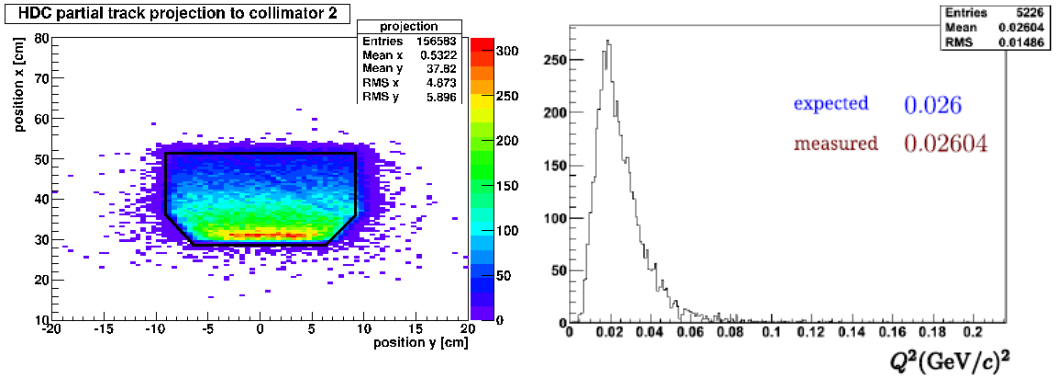
Large P^2I accumulated on LH_2

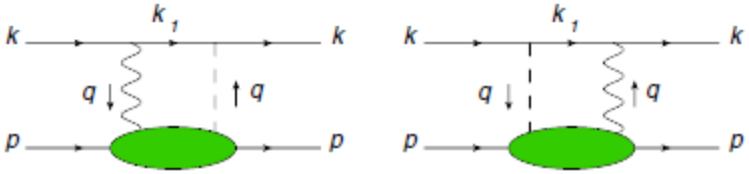
To minimize systematic errors:

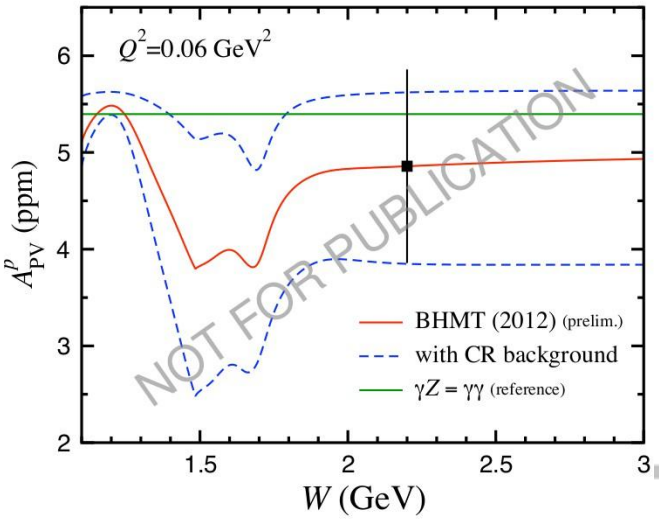
- Background/systematics
- Tracking/Q^2 measurements
- Asymmetry measurements with combinations of:
  - LH2, Al, 12C
  - Longitudinal, Transverse beam
  - Elastic, N→Δ, Inelastic
  - Pion asymmetries

Zγ box-diagram, largest correction to Qweak

PVDIS, and Qweak N→Δ, Inelastic measurements help constrain correction





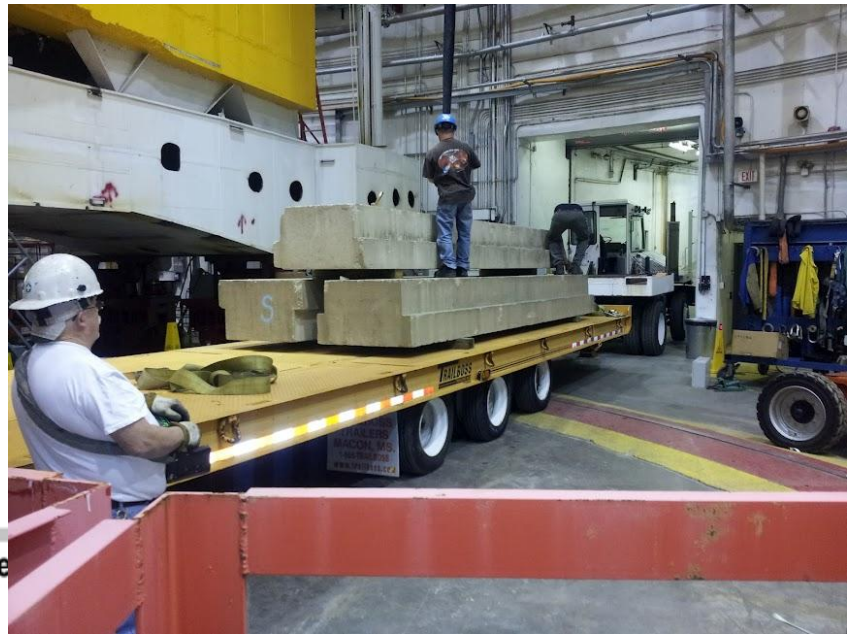


Long Shutdown → 12 GeV

- Remove Qweak Experiment
- Remove SOS Spectrometer
    - Previously stripped of detectors, electronics, cables, power, …

- Install rails for SHMS
- Start assembly of SHMS carriage (Nov)
- Complete SHMS in 2014
- First beam in 2015

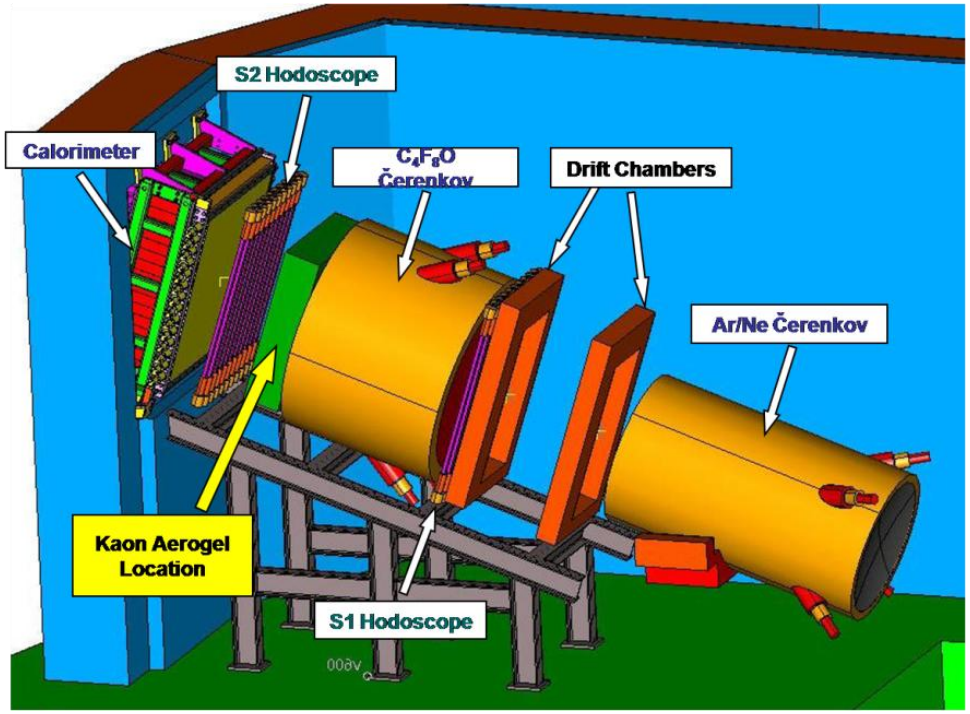
- Upgrades for 12 GeV compatibility underway for:
    - Compton Polarimeter
    - Moller Polarimeter



Main SHMS steel structure pieces on site

SHMS dipole yoke steel

SHMS Detectors



Heavy Gas Cerenkov

Regina – NSERC

Aerogel

CUA Led – New MRI

Drift Chambers

Hampton – MRI

Hodoscopes

James Madison – MRI

Quartz Hodoscope

North Carolina A&T – MRI

Detector Frames

W&M – MRI

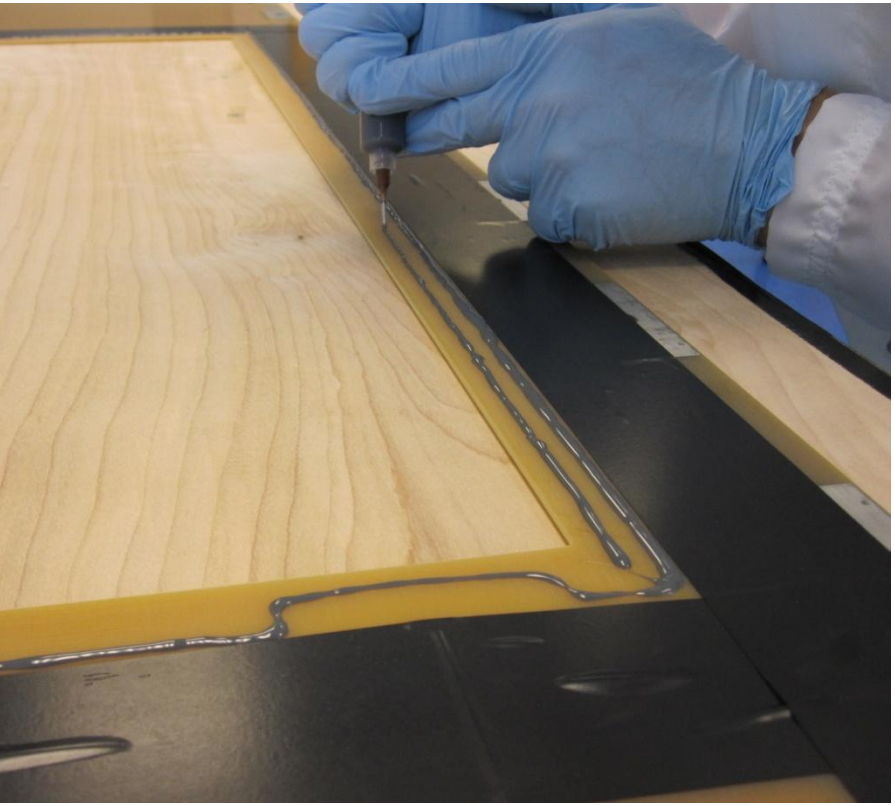
Noble Gas

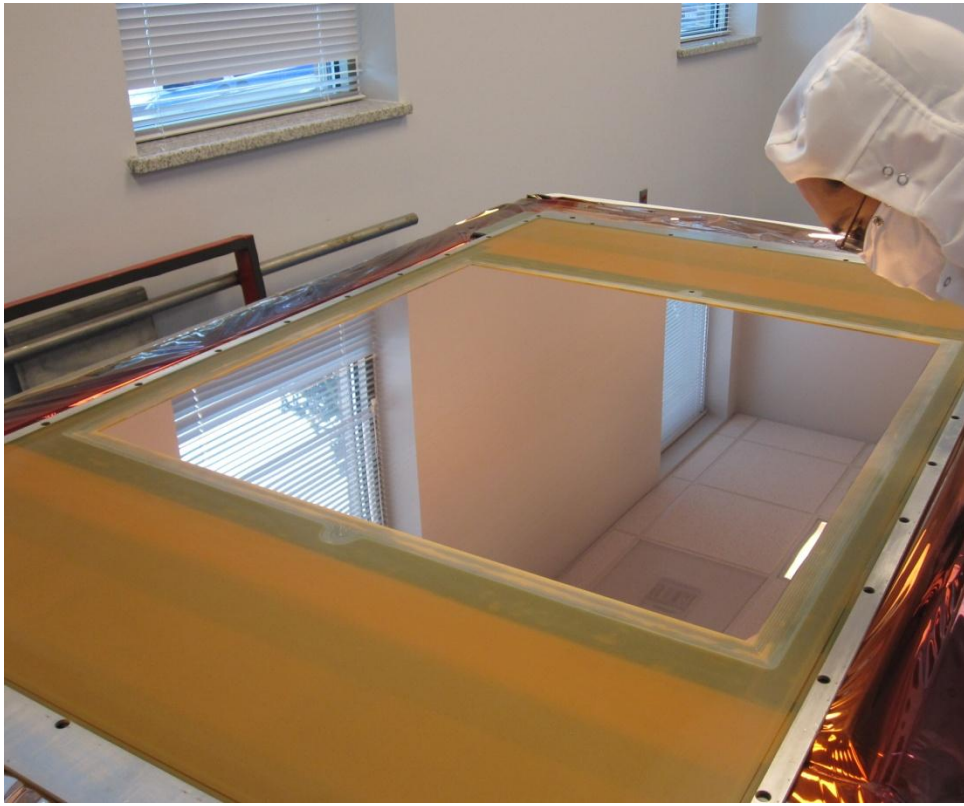
UVA – Project

Shower Counter

Yerevan - Project

SHMS Drift Chambers – Foil Planes





Approved and CA 12 GeV Hall C Experiments

Number	Experiment	Grade	Appr. Days	Condit. Days	Equipment
E12-06-101	Pion Form Factor	A	52		
E12-06-104	SIDIS R	A-	40		
E12-06-105	x>1	A-	32		
E12-06-121	He3 g_2	A-	29		Polarized He3 target
E12-07-105	(e,e'p) Exclusive Factoriza	A-	36		
E12-09-011	(e,e'K) Exclusive Factoriza	B+	40		
E12-09-017	SIDIS P_t	A-	32		
E12-09-002	Charge Symmetry Violatio	A-	22		
E12-10-002	F2 @ large x	B+	13		
E12-10-003	d(e,e'p)	B+	21		
E12-10-008	EMC	A-	23		
E12-06-107	Color Transparency	B+	26		
E12-06-110	He3 A1n	A	36		Polarized He3 target
E12-11-002	He4(e,e'pol(p))	B+	37		Polarimeter in HMS
E12-11-009	Neutron Form Factor	B+	50		Neutron polarimeter
C12-11-102	Exl and semi-exl π0 prod	C2		69	π0 detector
E12-11-107	EMC d(e,e' backward p)	B+	40		LAD (Hall B TOF bars)
			529	69	
Total	598	Days	6.8	Years @	25 Weeks/year
					Schedule 2 days / PAC day

Early running planning process

Hall C User community discussions

- Several Hall C User meetings
- SHMS-HMS Users Group board meetings

Early running criteria/goals

1. Do mix of short experiments with modest requirements that provide calibration/performance information for subsequent experiments.
2. Do experiments of “young” spokespeople and contributors to upgrade.
3. Do A/A- experiments
4. Do some SIDIS early to support lab SIDIS effort
5. Utilize Hall C L/T capability
6. Utilize polarized beam (execise Compton/Moller upgrades)

Draft early running plan – Year 1

2015: ~25 PAC days – Commissioning "Experiment"

9 days of E12-06-107 search for color transparency (B+)

A(e,e'p) only – "easy" coincidence measurement

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

Momentum scans help understand acceptance

2 days E12-10-108 EMC Effect (A-)

Integrate light nuclei with F_2 run,

Point target helps acceptance studies.

3 days of E12-10-003 d(e,e'p) (B+)

If time available

Push to lower cross sections

Draft early running plan – Years 2-3

2016: 80-90 PAC days

E12-09-017 (A-) P_t dependence of basic SIDIS cross sections

Push particle ID capabilities of SHMS

E12-09-002 (A-) Precise $\pi^+\pi^-$ ratios in SIDIS – CSV

Detector efficiencies

E12-09-011 (B+) L/T separated (e,e′K^+) factorization test

Easiest L/T separation

92 PAC days total – collaborations forming joint run plan and prioritizing

2017:

E12-06-121 (A-) g_2^n measurements at fixed Q^2

First polarized ^{3}He target experiment in Hall C

Likely follow by E12-06-110 high x A_1^n