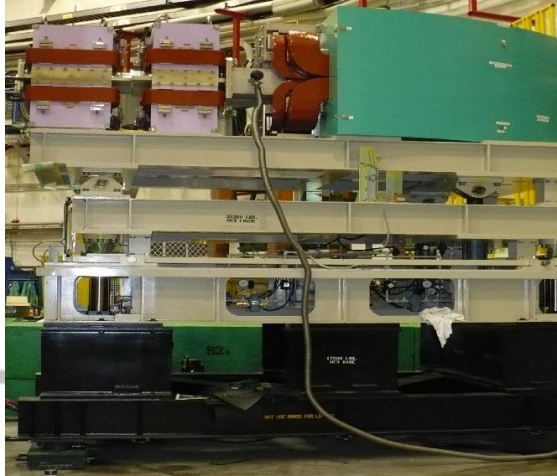
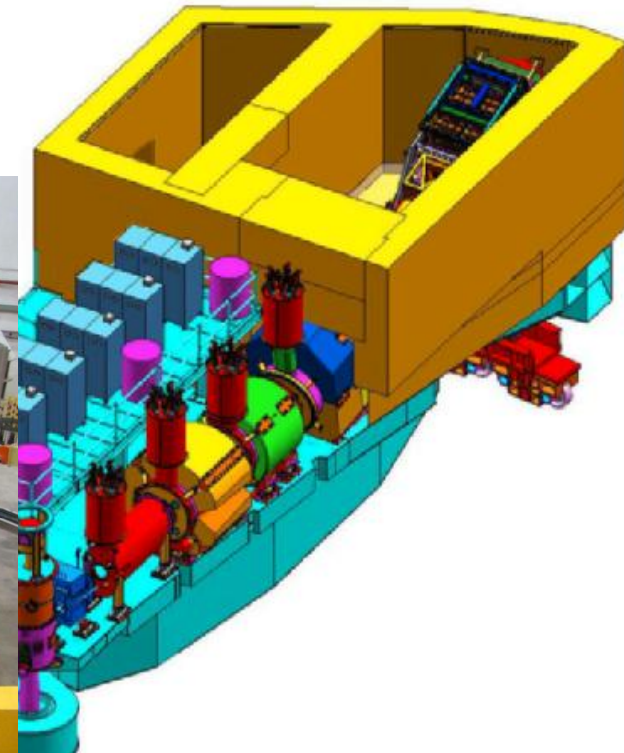
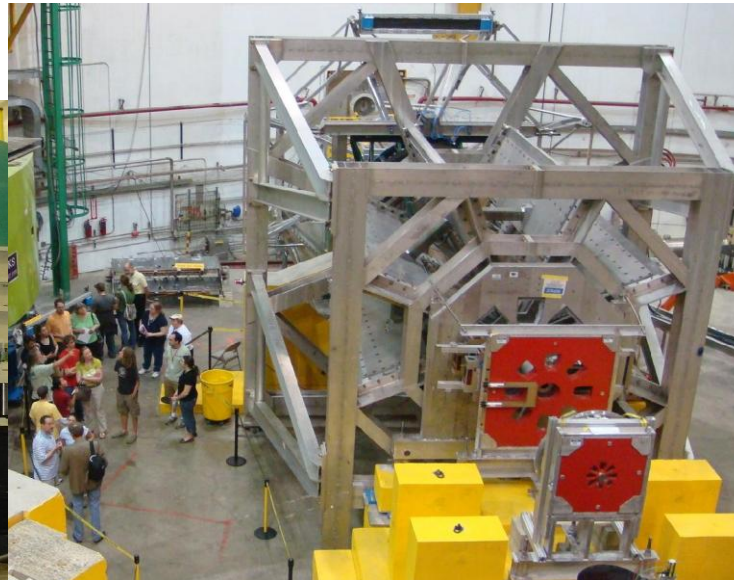
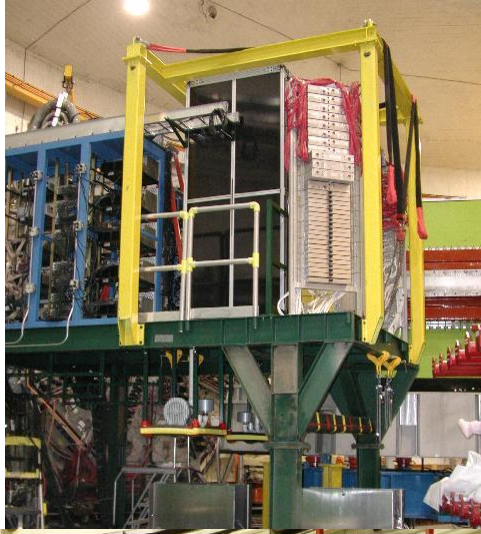


## Hall C Summer Workshop

June 22-23, 2012





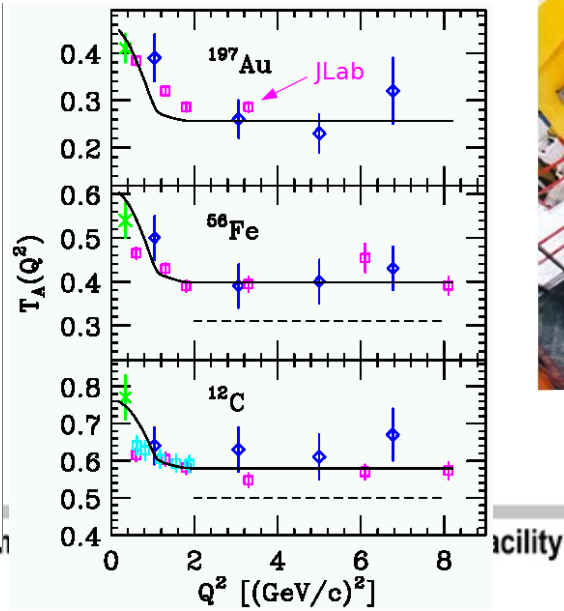
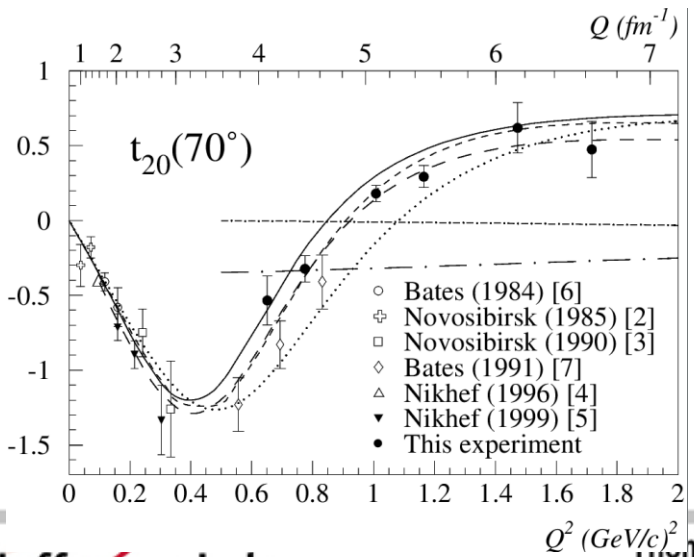
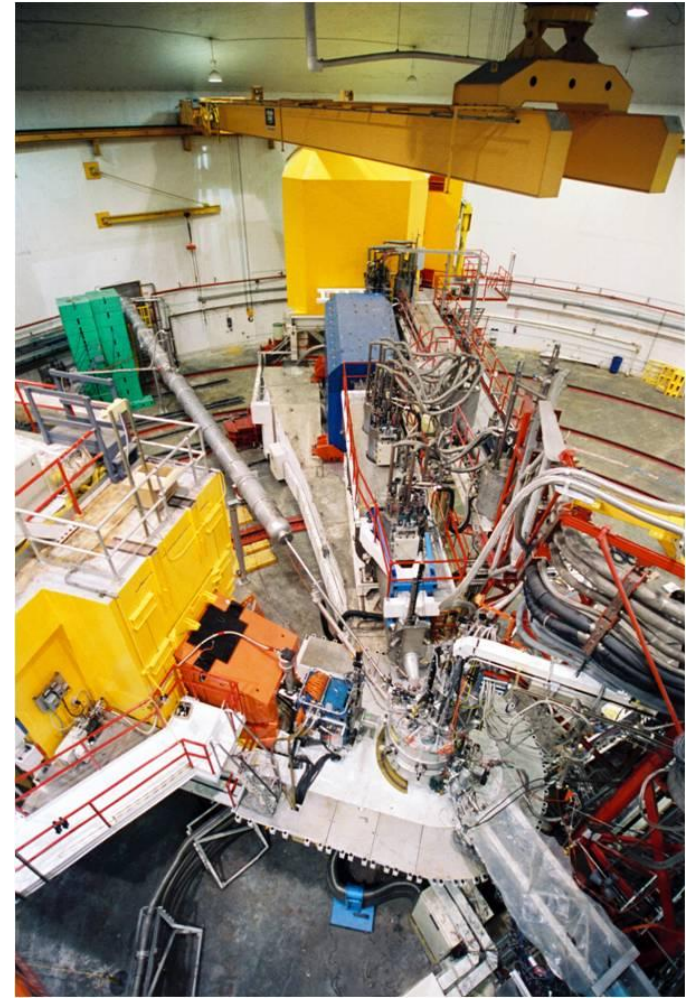
# Hall C 6 Gev program – 1995-2012

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)

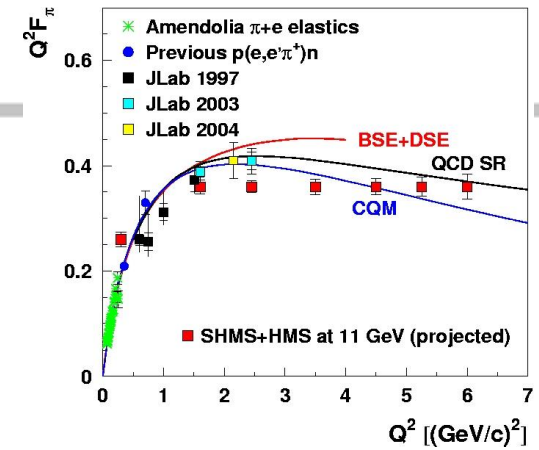
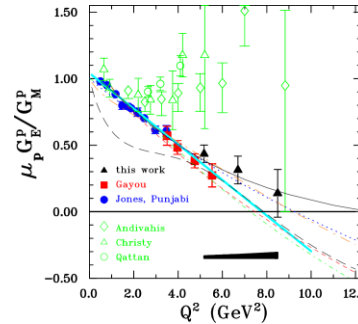
89 Ph.D. theses, >25 in progress



# Hall C 6 GeV Physics

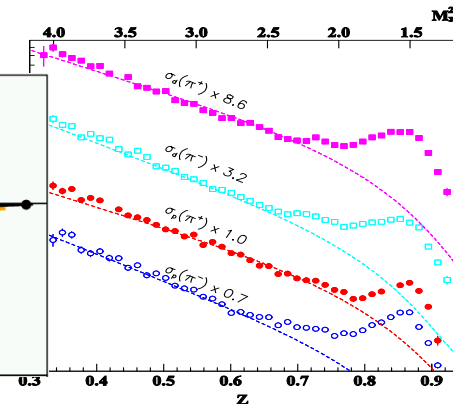
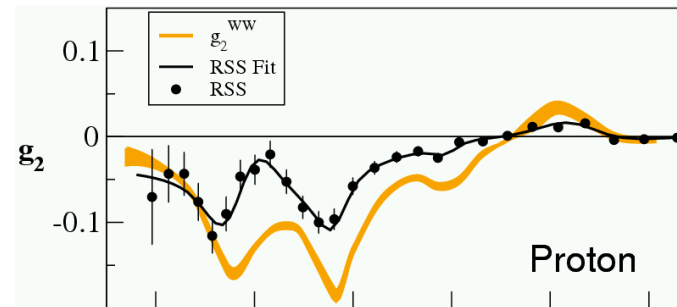
## • Form Factors

- Nucleon:  $G_E$ ,  $G_M$
- Strange quark contributions
- Deuteron:  $T_{20}$
- Pion:  $F_\pi$
- Baryon transition form factors



## • Nucleon Structure Functions

- Unpolarized  $p(e,e')$ ,  $d(e,e')$ 
  - Duality, high  $x$
  - Semi-inclusive  $p, d(e,e'\pi)$
- Polarized structure functions
  - $g_1$ ,  $g_2$  on polarized  $p$ ,  $d$

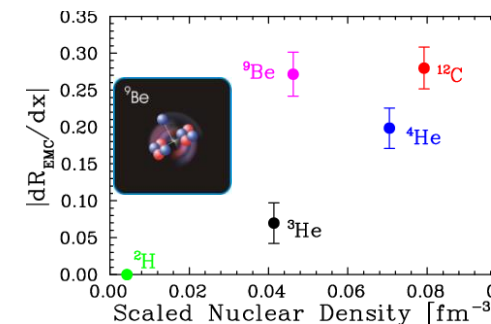
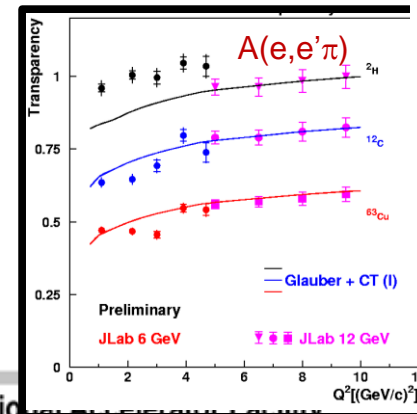


## • Nuclear structure/effects

- Hypernuclear structure
- EMC effect
- $x > 1$  – high momentum in nuclei
- Pion and proton transparency (attenuation) in nuclei

## • Parity Violation

- $G_0$ ,  $Q_{weak}$



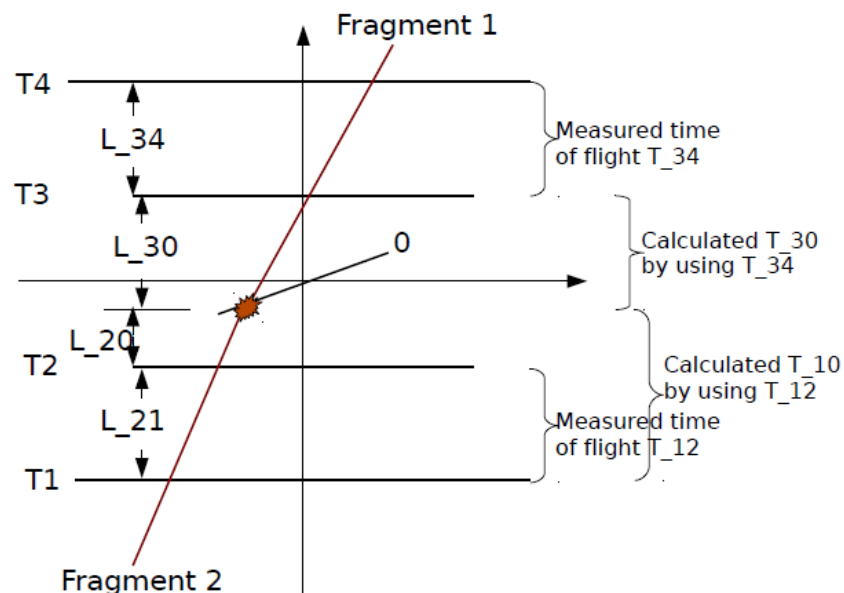
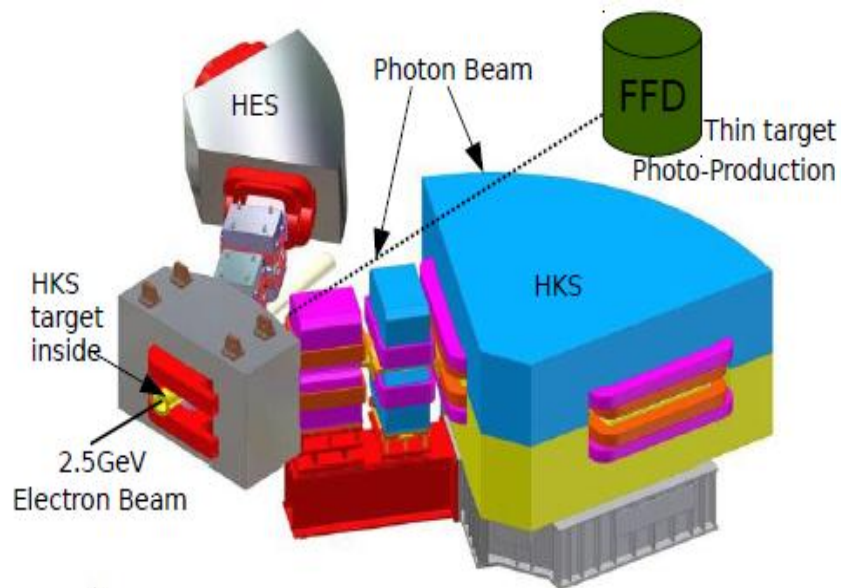
# Publications in last year

E04-108 (GeP)	Polarization components in $\pi^0$ photoproduction at photon energies up to 5.6 GeV	PRL 108, 222004
G0	Measurement of the parity-violating asymmetry in inclusive electroproduction of $\pi^-$ near the $\Delta^0$ 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 $^7_\Lambda\text{He}$ hyper nucleus by the $(e, e'K^+)$ reaction	draft

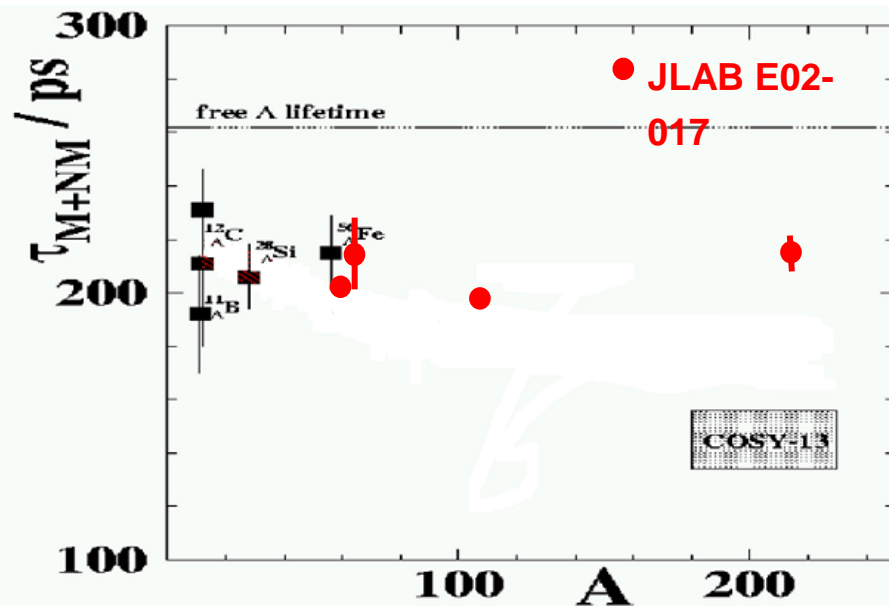
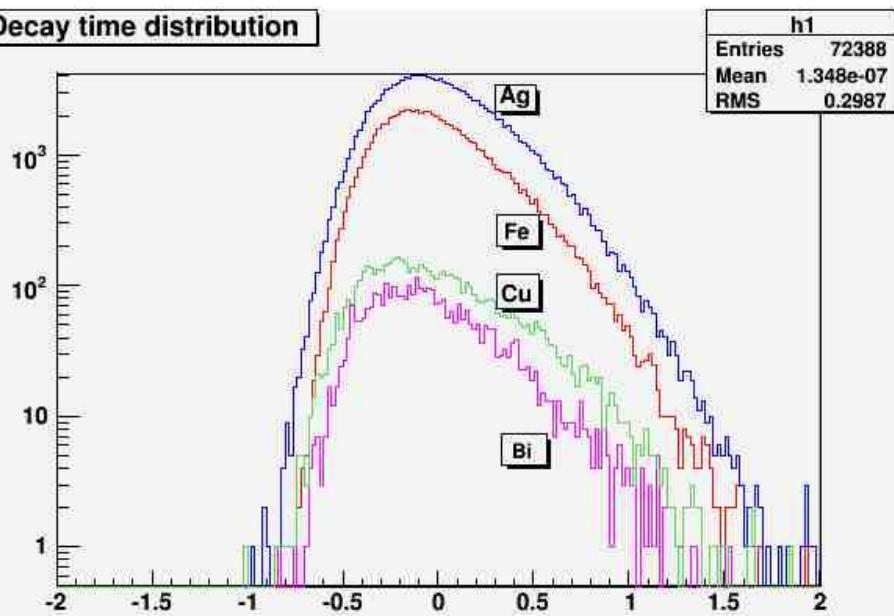
8 PhDs in last year

(Capuano, Leckey, Maxwell, Mkrtchyan, Mulholland, Myers, Pan, Wang)

# E02-017: Lifetime of Heavy Hypernuclei



Decay time distribution

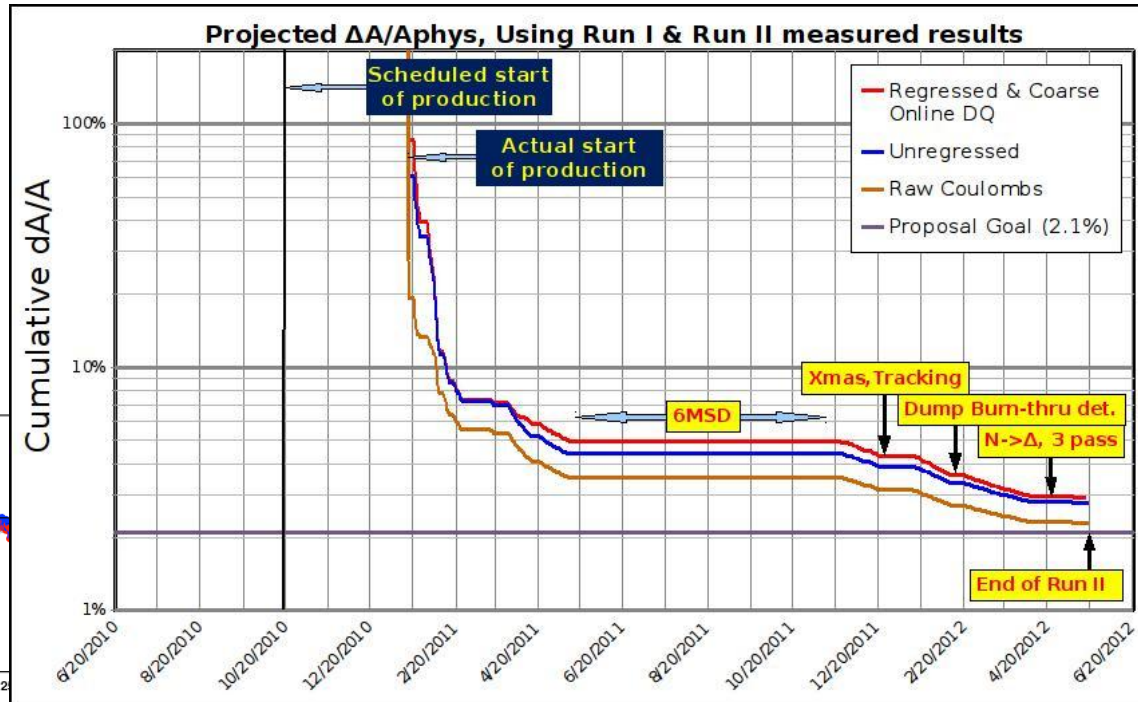
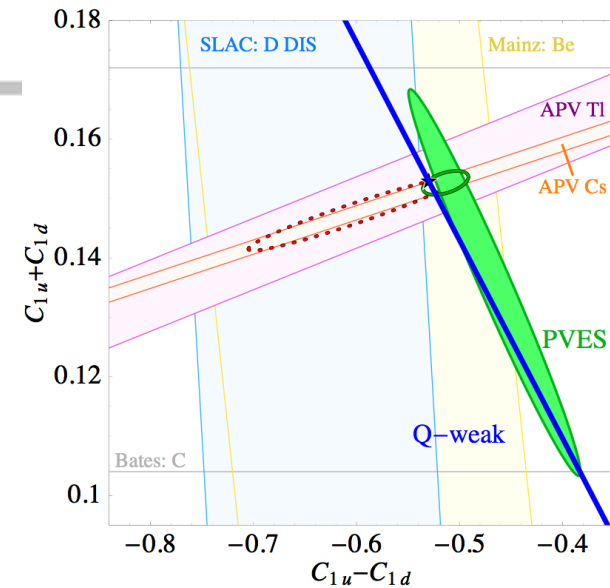




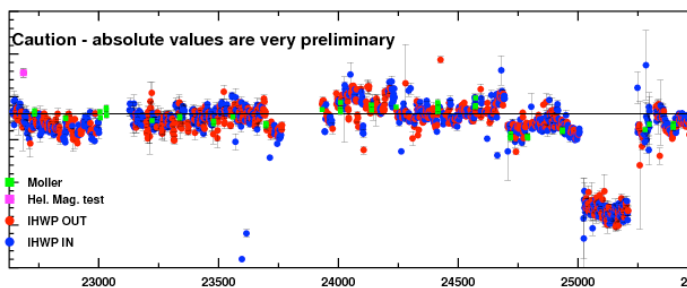
# Successful Completion of Qweak

- 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



Preliminary (Electron Detector, Plane-1, stat error only, 1 hr runs)



Runnumber



# 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

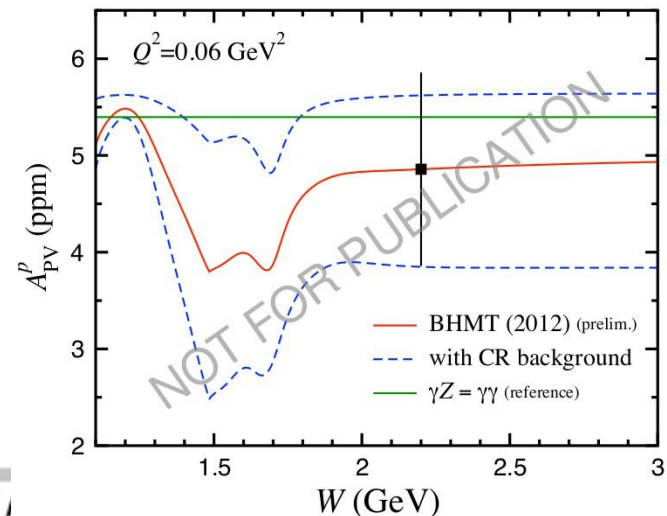
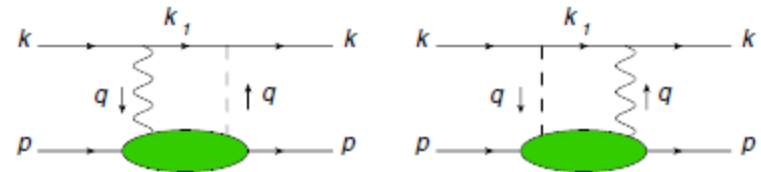
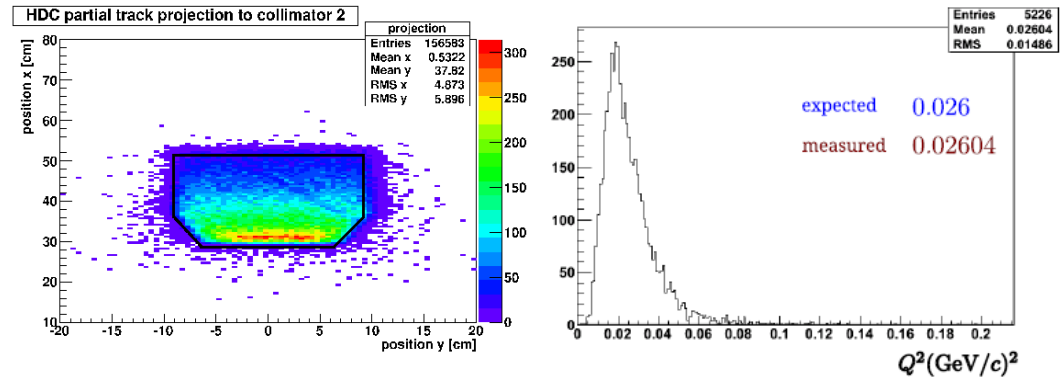
Longitudinal, Transverse beam

Elastic,  $N \rightarrow \Delta$ , Inelastic

Pion asymmetries

$Z_\gamma$  box-diagram, largest correction to Qweak

PVDIS, and Qweak  $N \rightarrow \Delta$ , Inelastic measurements help constrain correction



# Main SHMS steel structure pieces on site





# SHMS dipole yoke steel



# 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 <sub>2</sub>	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 <sub>t</sub>	A-	32			
E12-09-002	Charge Symmetry Violation	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 $\pi^0$ prod	C2		69	$\pi^0$ 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 (exercise 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<sub>2</sub><sup>p,d</sup> structure functions at large x \(B+\)](#)

Momentum scans help understand acceptance

2 days E12-10-108 [EMC Effect \(A-\)](#)

Integrate light nuclei with F<sub>2</sub> 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<sup>+</sup>) 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  $^3\text{He}$  target experiment in Hall C

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

# SHMS – HMS User Group Board

This meeting organized by the SHMS-HMS Users group board

- John Arrington      ANL      9/2012
- Eric Christy      HU      9/2014
- Donal Day      UVA      9/2013
- Tanja Horn      CUA      9/2012
- Mark Jones      JLab      9/2013
- Pete Markowitz      FIU      9/2014

Nominations being accepted to replace out going board members. Election to be held by email ~Sep 1, 2012.



# Notes

Silviu Covrig: DOE Early-Career Award

5 year x \$500,000: Establish program to improve  
LH2 target performance



New Hall C Postdoc: Simona Malace (July )

Slides from this meeting will be posted on agenda web page. Please  
email slides to [saw@jlab.org](mailto:saw@jlab.org)

PAC closeout today. Results to be presented here when available.

Hall C Party tonight, directions available 7PM