

Hall C Research Program



- Have been running experiments since November 1995
- 583 PAC Days run, or 27.7 experiments (February 1, 2005)
- 291 PAC Days in queue, or 12.3 experiments
(8 large-scale installations)
(Backlog: 4.2 Years)
- 36 PAC Days on remaining 2005 schedule (0.5 years)
- 70 Ph.D. Subjects, 50(!) Ph.D.'s awarded
- 37 refereed publications to date (20 PRL), 4 submitted
(not including NIM papers)
- 6 Large Installations to date: t_{20} , G_E^n-98 , HNSS,
 G_E^n-00 , G_E^n-01 , G0 (x2)
(HKS Installation now)
- ~400 Active users representing 19 different countries

Hall C Research Program



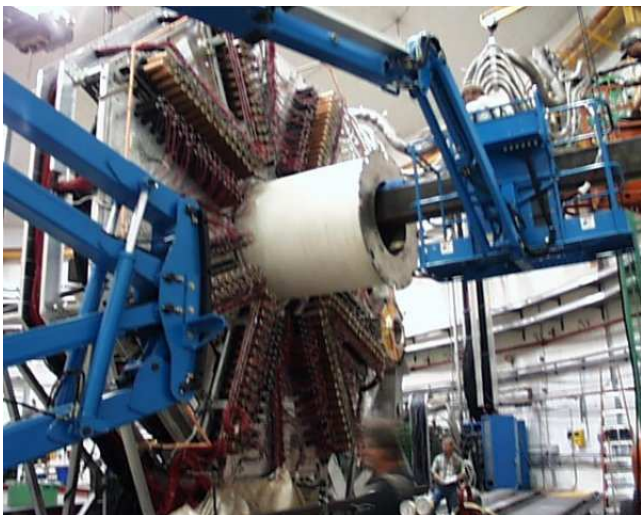
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 - 583 PAC Days run, or 27.7 experiments (February 1, 2005)
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(8 large-scale installations)
(Backlog: 4.2 Years)
- (assuming FY06
President's Budget)
à 5.7 Years
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Hall C 2004-2006 Schedule



- January-May 2004
 - June-December 2004
 - January 2005
 - January 24-May 2005
 - June-August 2005
 - September-November 2005
 - December 2005
 - January-May 2006
 - June-November 2006?
- GO Forward Angle Run
HMS + SOS
(E02-019, E03-103, E01-107)
Add E03-008 (J/ Ψ , 10+ days)
Add E02-109/E04-001
RD&RA at Low Q^2 (2 weeks)
- HKS Installation
- HKS Runs
(2 weeks commissioning, E01-011 and E02-017 with ~45% efficiency)
- HKS Deinstallation,
GO Reinstallation
- GO Engineering
(10 PAC Days)
- GO Backward Run
(60 PAC Days, E04-115/101)
- GEP-III Installation

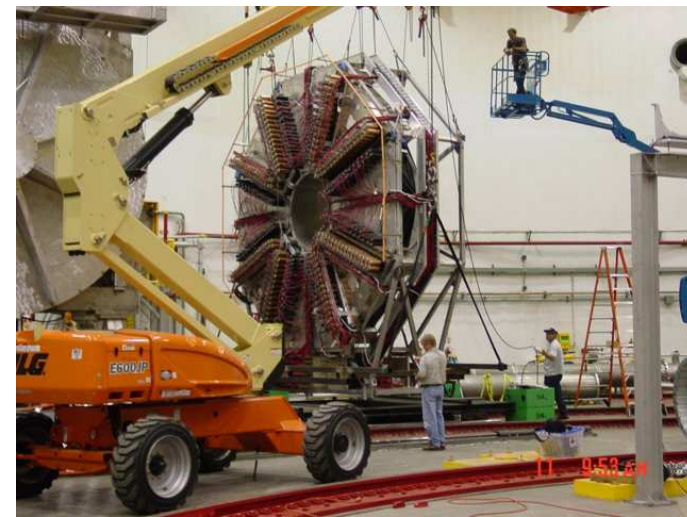
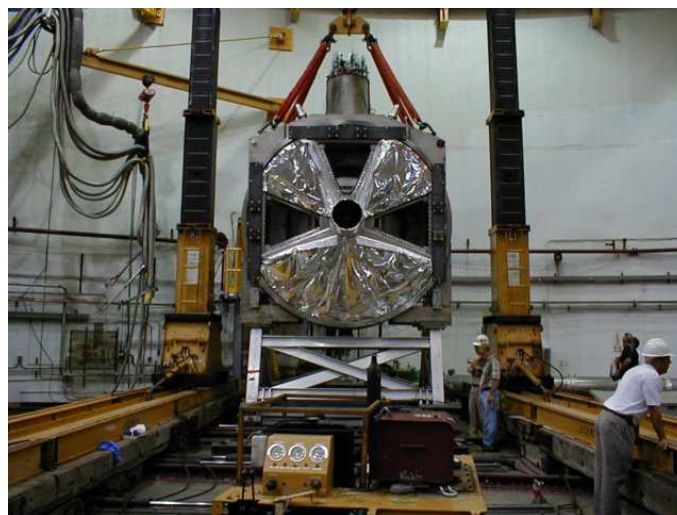
GO Turnaround : August/September



Aug. 04: Collimator Removal (Hall C)



Aug. 04: Ferris Wheel Rotation (Hall C)



Sep. 04: SMS Rotation (Lockwood)

HKS Status

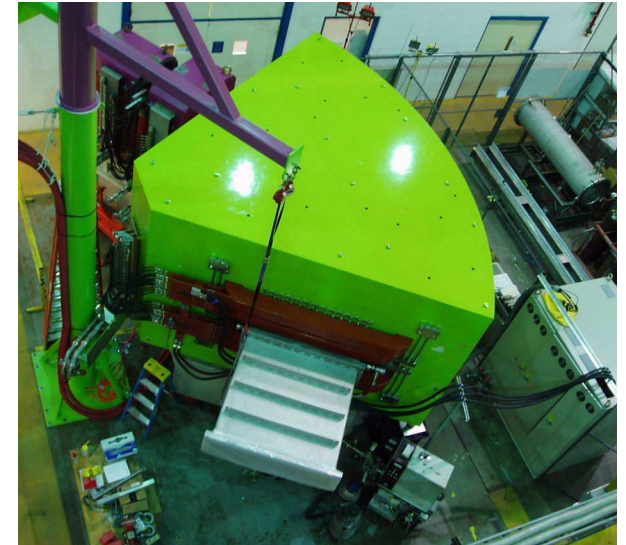


Present Hypernuclear Spectroscopy equipment combination is
beam splitter, Enge (e^-), HKS (K^+)

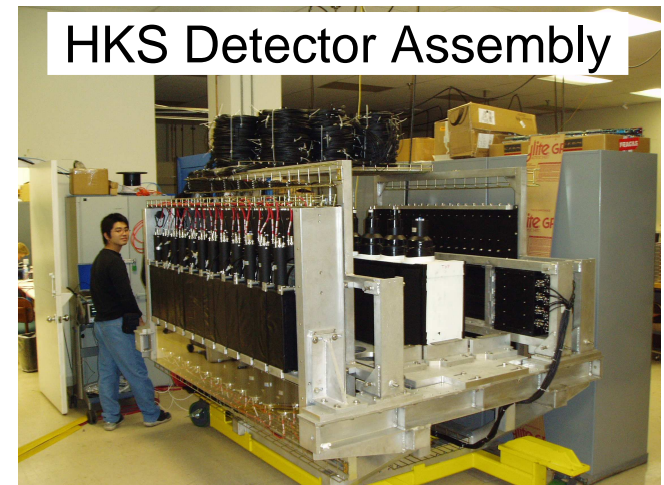
Installation ongoing in Hall C (April 13)



HKS in Test Lab (Jan. 05)



HKS Detector Assembly



Spin Asymmetries on the Nucleon Status

Now encompasses two experiments:

E03-109 "SANE" (Rondon, Choi, Meziani):

E04-113 "Semi-SANE" (Bosted, Day, Jiang, Jones): Semi-Inclusive Spin Asymm.

g_1 & g_2 at $Q^2 = 4 \text{ GeV}^2$

Designed to be insensitive to backgrounds and have good Particle Id. Target field screens much of low-energy background.

Gas Cherenkov (Temple)

- Particle identifications (e/π)
- Minimal knock-on
- Prototype tested in Hall C

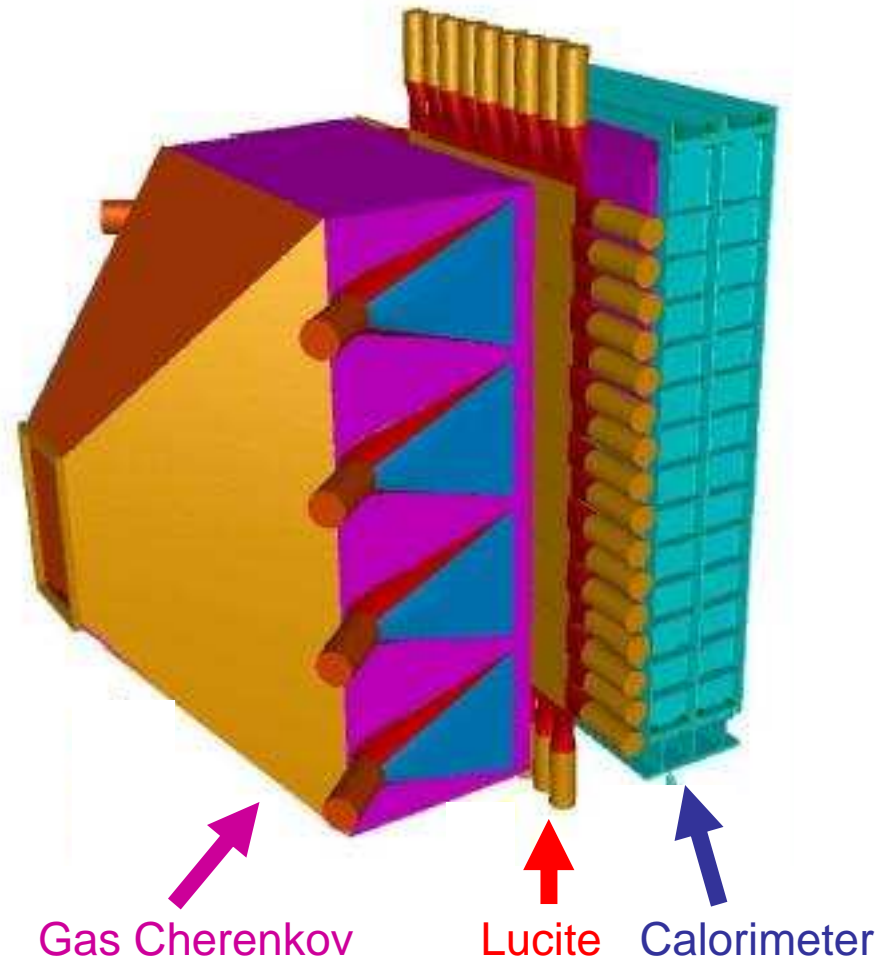
Lucite Cherenkov (Norfolk State)

- Quartz under consideration
- Redundant P.Id. + coarse tracking
- Thin Hodoscope before gas Cherenkov under consideration (e^+/e^- separation)

Pb-Glass Calorimeter from GEp-III

- Add gain monitoring system (UVa)

Uniform polarized target raster R&D completed, start construction



Spin Asymmetries on the Nucleon Experiment (SANE)

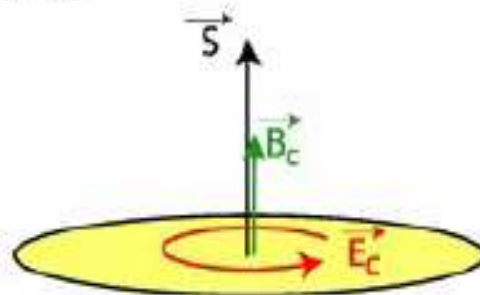
How does the gluon field respond when a nucleon is polarized?

Define color magnetic and electric polarizabilities (in nucleon rest frame):

$$\chi_{B,E} 2M^2 \vec{S} = \langle PS | \vec{O}_{B,E} | PS \rangle$$

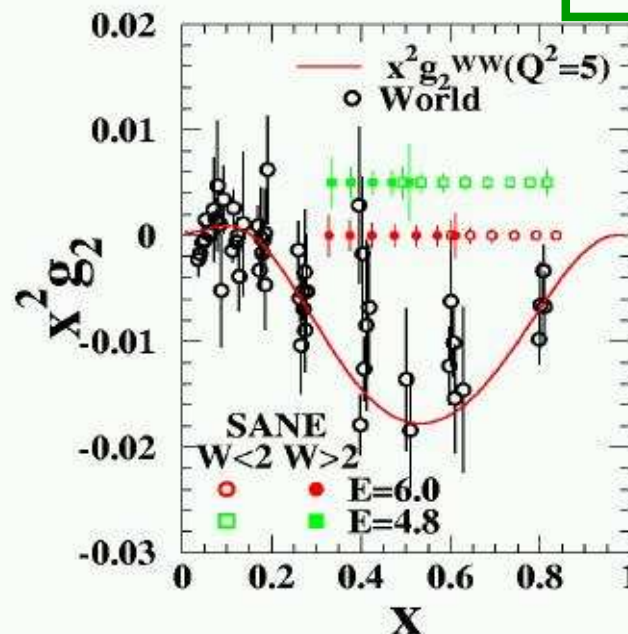
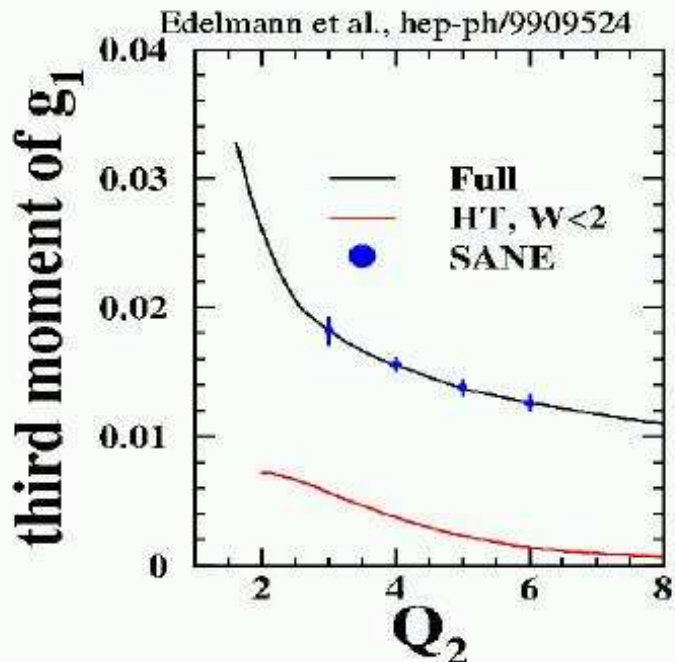
where $\vec{O}_B = \psi^\dagger g \vec{B} \psi$

$$\vec{O}_E = \psi^\dagger \vec{\alpha} \times g \vec{E} \psi$$



SANE: A Precise measurement of g_1 & g_2 in the high-x region, allowing an extraction of their third moments at $Q^2 \sim 4 \text{ GeV}^2$, related to the quark's induced color electric and magnetic polarizabilities.

$$d_2(Q^2) = \int_0^1 dx x^2 [2g_1(x, Q^2) + 3g_2(x, Q^2)]$$



Twist-3 matrix element d_2 is calculable in Lattice QCD (presently aimed at $Q^2 = 4$).

$$d_2 = (2X_B + X_E)/8$$

Anticipated error on d_2 : 0.0009 (1/2 world error)

Long-Term Experiment Schedule

(assuming continuation of FY05 budgets - shown last SANE meeting)



2005

- Hypernuclear Physics
 - HKS Experiment (Hashimoto, Nakamura, Reinhold, Tang) (1.8-2.0 GeV)
 - Hypernuclear Life Time Experiment (Hu, Margaryan, Tang)
- Transition to E04-115 Experiment (Beck, G0 Backward)

2006

- G0 Backward Run (0.8 GeV)
- Transition to E04-108 Experiment
- GEp-III Run (Perdrisat, Brash, Jones, Punjabi)

2007

- 2- γ Exchange Run intermixed?
- HMS/SOS L/T Runs? (Bodek, Christy, Keppel)
- Polarized Target Runs
 - SANE (g_2 at high Q^2) Run (Rondon, Mezziani, Choi)
 - Semi-SANE (flavor decompositions) Run (Jiang, Bosted, Day, Jones)

2008

- Qweak (Bowman, Carlini, Finn, Kowalski, Page) Phase I
- GEn Run (Madey, Anderson, Kowalski, Semenov)

2009

- Qweak (Bowman, Carlini, Finn, Kowalski, Page) Phase II

2012? Start 12-GeV Program?

How to deal with President's budget cuts?

Starting point: **26** weeks with multiplicity of 2, need to save ~10%

(This corresponds to 25% less running. Implies 52.5 PAC days per year for Hall C.
The 10% corresponds for Hall C to \$0.5M per year.)

- Combination of
- 1) reduce term staff (for Hall C: no replacement of casual, don't fill open term position)
 - 2) less operation funds (directly related to less running)
 - 3) long Summer down time (mid-May à mid-September)
 - 4) "cheaper" experiments à external \$\$ required for new equipment efforts

For example, for Hall C the schedule could become:

FY06	:	GO backward (70 days)
FY07	:	GEp-III (40 days)
FY08	:	GEp-2gamma (18 days) + SANE/semi-SANE (uses same calorimeter)
FY09	:	SANE/semi-SANE and HKS(II) run or HMS runs (Use HKS and new HES. Japanese secured \$3M funds for latter)
FY10	:	Qweak

$\Sigma = 265$ days = 5 years

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Or, as another example:

FY06	:	GO backward (70 days)
FY07	:	GEp-III (40 days)
FY08	:	GEp-2gamma (18 days) + HMS runs (25 days) (uses same calorimeter)
FY09	:	Qweak + HKS(II) run (Use HKS and new HES. Japanese secured \$3M funds for latter)
FY10	:	SANE + semi-SANE

This assumed additional DOE funding to maintain Qweak schedule, if not swap FY09 and FY10

$\Sigma = 265 \text{ days} = 5 \text{ years}$



- Hall C Summer Physics Workshop:

August 18 + 19

- tentative topics:
 - Transition form factors
 - Hypernuclear Physics
 - Flavor decomposition at 12 GeV
 - Structure Functions at large x
 - Strangeness content of the nucleon
 - Tests of the Standard Model
- General approach:
 - One hour introduction speaker
 - One or two half-hour presentations on Hall C results/plans

Contact Hall C Steering Committee for questions

(but wait for general mail announcement first)



Steering Committee

- Hall C maintains experiment-specific collaborations, with ~400 users from 19 countries
- Hall C Steering Committee with main tasks
 - Provide effective channel of communication
 - Represent the interests of Hall C users and Hall C
 - Organize annual Hall C physics workshop
- 2003: John Arrington (ANL)
Donal Day (UVa)
Joerg Reinhold (FIU)
Phil Roos (UMd)
- 2004: Betsy Beise (UMd)
Donal Day (UVa)
Joerg Reinhold (FIU)
Wim Van Oers (Manitoba)
- 2005: Betsy Beise (UMd)
Osamu Hashimoto (Tohoku) ← *New*
Allena Opper (Ohio) ← *New*
Wim Van Oers (Manitoba)