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**E12-11-009 GEn**

**Business Meeting**

Brad Sawatzky (JLab/Hall C)

# Business Meeting Items

- Charter Discussion (cont...?)
- Funding, MOU plans
  - Scintillator development
- Working group assignments?
- Timeline / Milestone development
  - MOU / non-JLab funding
  - finalize polarimeter design
    - background simulations
    - confirm acceptance, FoM, etc
  - BNL 48D48 procurement
  - GEANT4 simulation
  - Target design
  - Analyzer SW development

Wiki: [https://wiki.jlab.org/E12-11-009/index.php/Main\\_Page](https://wiki.jlab.org/E12-11-009/index.php/Main_Page)

# Charter Discussion / Follow-up

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# Major Responsibilities

- **Target**
  - JLab
- **Dipole magnets**
  - JLab
- **SHMS**
  - JLab
- **Shield Hut / Stands**
  - JLab
- **Electronics**
  - JLab
- **Simulations / Shielding design**
  - U. of Regina (A. Semenov)
  - N. Michigan (W. Tireman)
  - JLab (Pavel?)
- **Analyzer Software**
- **NPOL**
  - Hampton, JLab,
  - SUNO (M. Elaasar),
  - N. Michigan (W. Tireman)
  - La Tech (S. Wells)
  - W & M (C. Perdrisat)
  - NSU (V. Punjabi)
  - **Vetos** (28 1x10 cm<sup>2</sup>)
    - N. Carolina A&T (A. Ahmidouch)
  - **dE bars** ( 52 1x10 cm<sup>2</sup>)
  - **Analyzers** ( 28 10x10 cm<sup>2</sup>)
  - **E bars** (108 10x10 cm<sup>2</sup>)

# Capital Expense List

(known incomplete)

- **Large capital expenses**
  - **Detector bars**
  - **Detector support / design**
  - NPOL shielding hut
  - 40 cm LD<sub>2</sub> Target (~\$15k)
  - **Magnet** (~\$100k)
    - shipping
    - refurbishment
  - **Electronics / readout**
    - DAQ in good shape
    - HV(?)

## From proposal (original design)

Table 5: NPOL equipment items to be purchased.

	<u>Cost</u>
<b>1 Scintillator Detectors</b>	
1.1 88 [10 cm×10 cm×100 cm] Scintillator & Light Pipes Have 40 (KSU, JLab, Hampton), Kent State will provide 20 by cutting and machining existing detectors, purchase 28 at \$1500 each.	\$42,000
1.2 51 [1 cm×10 cm×106 cm] Veto Scintillator & Light Pipes	\$51,000
1.3 280 Photomultiplier Tubes 2-inch diameter fast PMTs for 139 mean-timed detectors with 2 spares. Have 80, need 200 at \$1000 each.	\$200,000
1.4 280 Magnetic Shields (for 2-in diam PMT)	\$40,000
<b>2. Electronic Modules</b>	
2.1 Fast amplifiers [Provided by Kent State]	0
2.2 Fast discriminators, ADCs, TDCs, Power Supplies, etc... [Provided by Hall C]	0
<b>Subtotal Detectors and Electronics</b>	<b>\$333,000</b>

NOTE: Some of the detector hardware already exists (next slide). It needs to be collected, tested/refurbished (ie. new PMTs) and modified.

Legend: **Priority**, **Long Lead**, **OK**

# Detectors Available

## Neutron Detectors:

32 10 x 10 x 100 cm in HAND

2 10 x 10 x 100 cm at KSU

34 4 x 5 x 40" in HAND

68 Total

~80 10 x 10 x 160 cm from Hall A GEN

So need 16 more 10 x 10 x 100 cm for Plan A

Plan B OK, using the 160 cm detectors

Additionally, there exists: (could be cut and machined)

8 4 x 20 x 40 in detectors at KSU

3 4 x 10 x 40 in detectors at KSU

? 4 x 10 x 40 in detectors in HAND

16 10 x 22.5 x 400 cm detectors from BLAST

**Veto Detectors:** 22 (Hall C) + 24 (Hand) + ??

B. Anderson (10/2013)

# Polarimeter Design / Funding

- Do we explore significant compact redesign?
  - Who's in charge?
  - Deadline for feasibility study?
- Deadline for final decision
- Lay out detailed NPOL design, parts breakdown, construction plans
- Would like to have significant progress well before jeopardy review begins!
- Funding / MRI
  - Tentative plan was to shoot for MRI request in Jan 2015
  - Who will lead?

# Collaboration Meetings

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- Collaboration Meeting every ~6 months
- We have phone calls among spokespeople every ~4 weeks (usually last Friday of month)

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# Misc. Backup

# Kinematics

Four-Momentum Transfer, $Q^2$ (GeV/c) <sup>2</sup>	3.95	5.22	6.88
Beam Energy, $E_0$ (GeV)	4.4	6.6	11.0
Electron Scattering Angle, $\theta_e$ (deg)	36.53	26.31	16.79
Scattered Electron Momentum, $P_e$ (GeV/c)	2.288	3.815	7.330
Neutron Scattering Angle, $\theta_n$ (deg)	28.0	28.0	28.0
Neutron Momentum, $P_n$ (GeV/c)	2.901	3.602	4.511
Neutron Kinetic Energy, $T_n$ (GeV)	2.110	2.783	3.668
Flight Path, $x$ (m)	5.0	5.0	5.0
Precession Angle, $\chi$ (deg)	147.3	144.8	143.1
Field Integral to Precess Neutron Spin through $\chi$ Degree, $B\Delta l$ (Tm)	4.0	4.0	4.0

Table 1: Kinematic conditions at a neutron scattering angle of 28.0°. Also listed is the dipole magnet field integral  $B\Delta l$  required to precess the neutron polarization vector.

# Target Notes

- Target requirements in proposal:
  - 15 cm LH<sub>2</sub> cell at 80 μA (~ 500 W, should be fine)
    - Should select one of the new cells: 10 cm *or* 20 cm avail.
  - 40 cm LD<sub>2</sub> cell at 80 μA (~1500 W, *non-trivial!*)
    - high power target, non-trivial cryo requirements
      - LD<sub>2</sub> needs “on the edge”, but *just* doable with ESR-I's 15K supply
    - Silviu's new cell model can likely be adapted to 40 cm cell (~ \$15k + development time)
    - probably a long lead item
- Hall C “Standard” 10, 20 cm cells (under development)
  - Goal: < 1% density loss for 20 cm LH<sub>2</sub> 100 μA w/ 2mm raster

# Analyzer Options

- C++/ROOT based analyzer based on the Hall A PODD framework
  - successor to ENGINE, under development now
  - will be ready for first Hall C experiments; will be vetted against the old analyzer
  - modularity built into the OO design (easily extensible)
  - will (eventually) handle high-rate “blocked” data readout supported by modern electronics (may not apply to our setup)
  - *We are responsible for developing the NPOL analyzer module*
    - » *Good student project*