

E07-007/E08-025 status update

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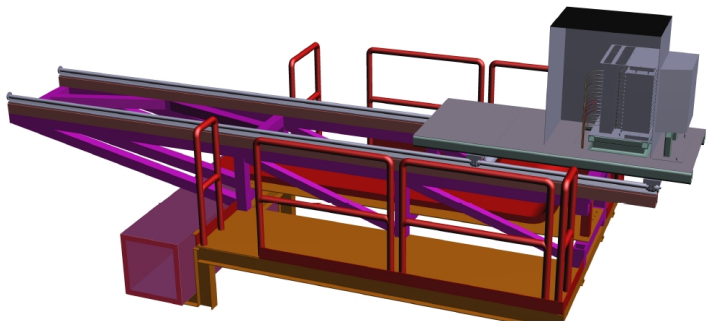
Hall A Collaboration Meeting
JLab, December 16 (2011)

Goal:

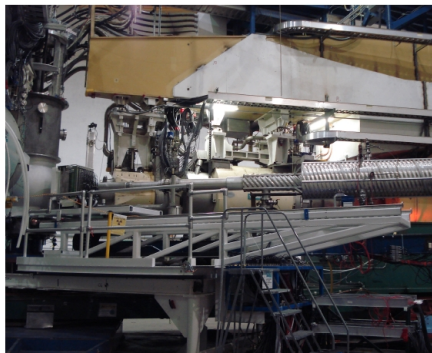
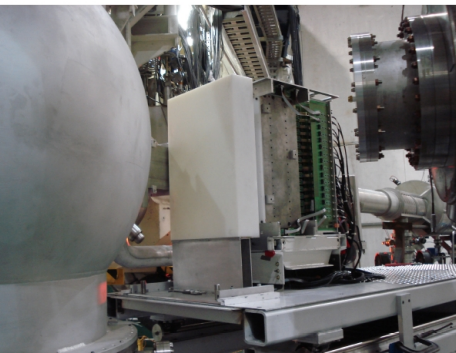
- Measure DVCS cross sections as a function of Q^2 and different beam energies, for both LH2 and LD2.
 - Separation of DVCS² from interference BH-DVCS interference terms
 - Rosenbluth separation of π^0 electroproduction cross section
-
- Same setup for both experiments
 - Only target change from LH2 to LD2
 - Data taken: Oct-Dec 2010

DVCS detector package

- 208-channel PbF_2 electromagnetic calorimeter
- DVCS stand of top of BigBite stand (moving cart: 1.1 m \rightarrow 5.5 m from target)
- CH shielding in front of calorimeter



DVCS setup in Hall A



Running conditions for E07-007 & E08-025

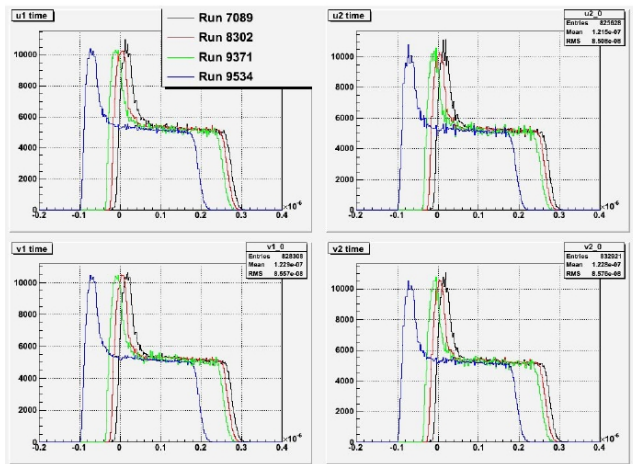
Statistics Collected by Kinematics

| Kinematics | PAC Hours | % Completed |
|--|--------------|----------------|
| Proton Data | | |
| $Q^2=1.50 \text{ GeV}^2 / E=5.5 \text{ GeV}$ | 20 | 100% |
| $Q^2=1.50 \text{ GeV}^2 / E=3.3 \text{ GeV}$ | 60 | 100% |
| $Q^2=1.75 \text{ GeV}^2 / E=5.5 \text{ GeV}$ | 30 | 100% |
| $Q^2=1.75 \text{ GeV}^2 / E=4.4 \text{ GeV}$ | 90 | 100% |
| $Q^2=2.00 \text{ GeV}^2 / E=5.5 \text{ GeV}$ | 50 | 100% |
| $Q^2=2.00 \text{ GeV}^2 / E=4.4 \text{ GeV}$ | 150 | 82% |
| Neutron Data | | |
| $Q^2=1.75 \text{ GeV}^2 / E=5.5 \text{ GeV}$ | 200 | 60% |
| $Q^2=1.75 \text{ GeV}^2 / E=4.4 \text{ GeV}$ | 200 | 70% |

Roughly 80% of the data taken
(long commissioning time)

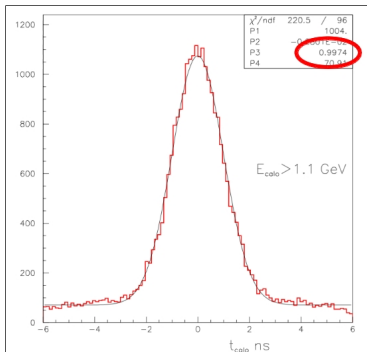
VDC time offsets

Frequent timing changes during the experiment



Careful checks and adjustments of VDC offsets necessary

Coincidence time



Relative time between HRS and Calo corrected for:

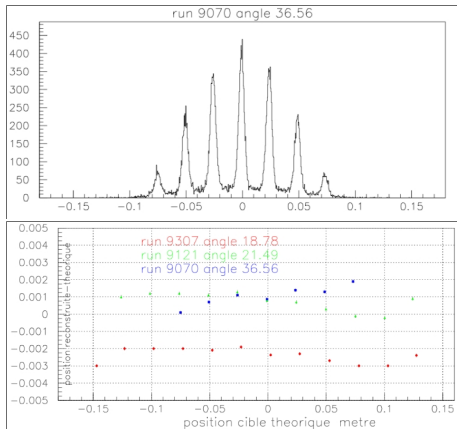
- S2 paddle time offsets
- x & y position of the track
- Amplitude of the S2 signal

1 ns coincidence time resolution

Calorimeter block-by-block time corrections still to be fully implemented

HRS pointing

- Survey of HRS pointing at one particular angle
- Multifoil target runs at every kinematics

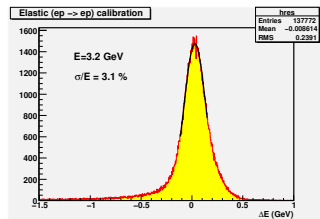


Elastic calibrations

$ep \rightarrow ep$

- p in L-HRS
- e in DVCS calorimeter

| Date | E (GeV) | σ/E | σ/\sqrt{E} ($\text{GeV}^{1/2}$) |
|--------|---------|------------|--|
| Oct 26 | 3.2 | 3.1% | 0.0555 |
| Nov 17 | 3.2 | 3.1% | 0.0555 |
| Dec 14 | 3.9 | 2.8% | 0.0553 |



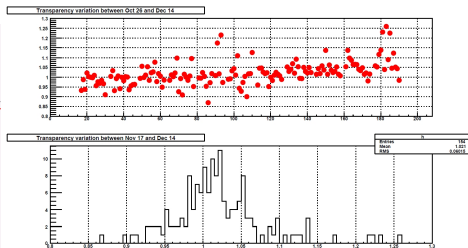
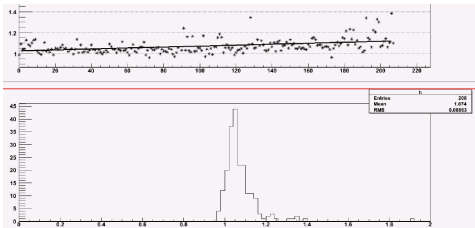
- Absolute calibration points for each block
- Energy resolution and absolute calibration changes \Rightarrow Radiation damage

Radiation damage

Calibration coefficient changes between:

Nov 17 / Oct 26
(7% average gain loss)

Dec 14 / Oct 26
(2% average gain loss)

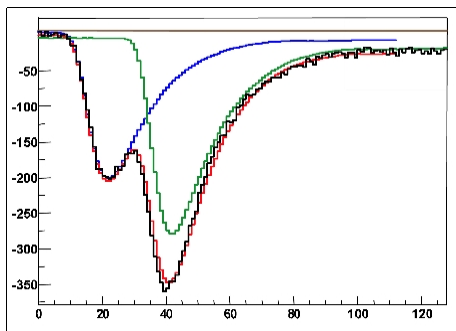


- Radiation damage to PbF_2 blocks
- PMT gain changes

PMTs being disassembled to be shipped to Clermont-Fd for testing...

Waveform analysis of PMT signals

Each calorimeter PMT signal is digitized over 128 ns at 1 GHz rate:



Analysis underway in order to remove pile-up from DVCS events

TODO

- Monte Carlo simulation of setup (GEANT3 \rightarrow GEANT4)
- Cross-section extraction:
 - Rosenbluth separation of DVCS off the proton
 - Rosenbluth separation of DVCS off the neutron/deuteron
 - Rosenbluth separation of π^0 production off the proton
 - Rosenbluth separation of π^0 production off the neutron/deuteron

Outlook

- Finish waveform analysis of calorimeter signals
- Refine calibration between elastic calibrations (using $\pi^0 \rightarrow \gamma\gamma$)
- Monte Calo simulation
- Cross-section extraction

Roughly 1 year of analysis left for preliminary results

- Same equipment to be used for 12 GeV experiment E06-12-114
- Everything tested and operational
- Some space and ~ 1 year necessary to put everything back together