

# Deuteron Electro-Disintegration at Very High Missing Momenta

## E10-003

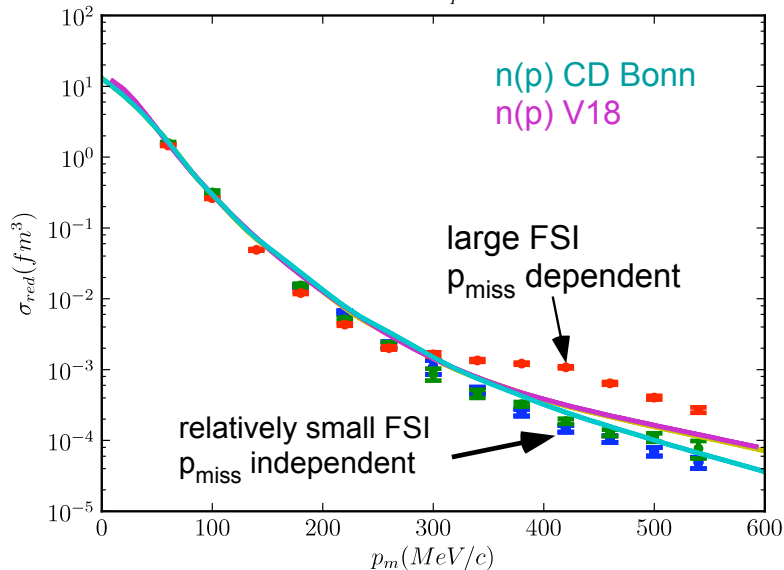
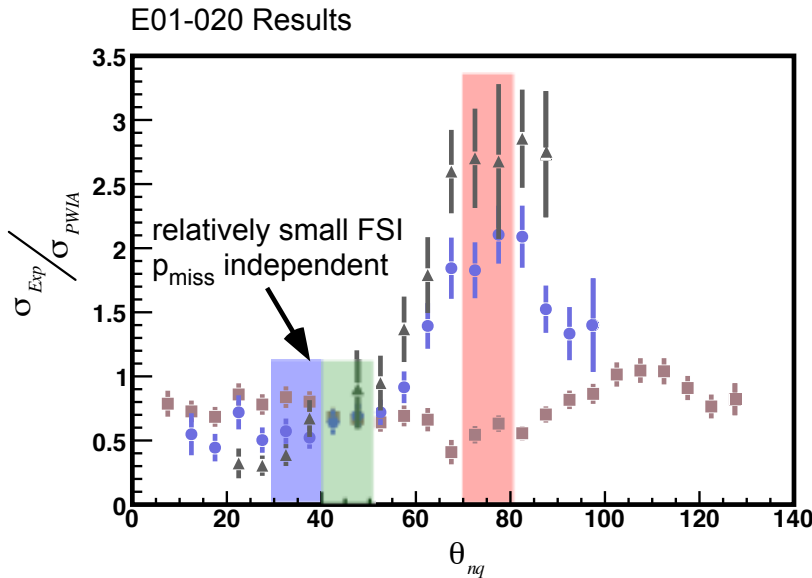
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# Motivation

- Explore a new kinematical region of the 2-nucleon system
  - No Deuteron data exist at these kinematics!
  - SRC studies cover similar region on missing momenta:  
experiment E07-006 needs deuteron data for interpretation
  - DIS at high  $Q^2$  and small  $x$  and  $J/\Psi$  production are sensitive to Deuteron wave function at small distances
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- Determine cross sections at missing momenta up to 1 GeV/c
  - Measure at well defined kinematic settings
  - Selected kinematics to minimize contributions from FSI
  - Selected kinematics to minimize effects of delta excitation

# FSI Supression



- GEA confirmed in previous experiments
- high  $Q^2$  opens window with small FSI

## Experimental Parameters

Beam:

Energy: 11 GeV

Current: 80  $\mu A$

Electron arm *fixed* at:

SHMS at  $p_{cen} = 9.32$  GeV/c

$\theta_e = 11.68^\circ$

$Q^2 = 4.25$  (GeV/c)<sup>2</sup>

$x = 1.35$

Vary proton arm to measure :

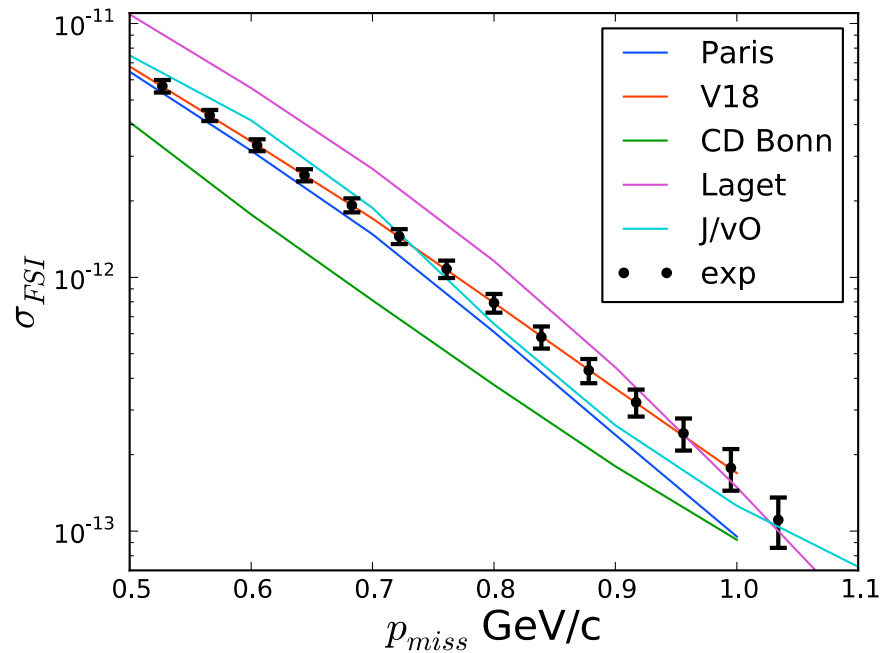
$p_m = 0.5, 0.6, 0.7, 0.8, 0.9, 1.0$  GeV/c

HMS  $1.96 \leq p_{cen} \leq 2.3$  geV/c

Angles:  $63.5^\circ \geq \theta_p \geq 53.1$

Target: 15 cm LHD

# Expected Results



- ✓ Measured cross sections for  $p_m$  up to 1 GeV/c
- ✓ Errors: dominated by statistics: 7% - 20%
- ✓ Very good theoretical support available
- ✓ JLAB uniquely suited for high  $p_m$  study
- ✓ request 21 days of beam time

# Contributions

- Optics calibration measurements for both spectrometers ( $H(e,e')$ )
- Coincidence setup, check-out
- $H(e,e'p)$  measurements over range of kinematics
- Spectrometer pointing studies
- FIU is building the Aerogel for SHMS

# Open Collaboration

- Everyone contributing is invited to join
- Several Hall C staff are already collaboration members

# Committment

- Many members have been involved in the first commissioning of JLAB instruments
- Contributed hardware and software in Hall A and Hall C

# Suitability for Commissioning

- Cross section measurements - no structure function separation
- Cross section uncertainties are statistics dominated
- No full optimization necessary to produce meaningful results

Errors due to uncertainties in kinematic variables:

$$6.8 \leq \sigma_{kin} < 12.2 \% \quad \text{for} \quad 0.5 \leq p_m \leq 1.0 \text{ GeV} / c$$

$$\sigma_i = 1 \text{ mr} \quad \text{for all angles}$$

$$\sigma_E = 3 \cdot 10^{-4} \quad \text{for the incident energy}$$

$$\sigma_p = 10^{-3} \quad \text{for the absolute spectrometer momenta}$$



# Acceptances

- **SHMS:**

- Momentum acceptance:  $-8 \leq \Delta p/p \leq +4 \%$
- Solid angle:  $-0.05 \leq dx/dz \leq 0.05$   
 $-0.025 \leq dy/dz \leq 0.025$

- **HMS**

- Momentum acceptance:  $-10 \leq \Delta p/p \leq +10 \%$
- Solid angle:  $-0.06 \leq dx/dz \leq 0.06$   
 $-0.035 \leq dy/dz \leq 0.035$

- Target length: 15 cm

# Requirements

No special requirements:

- Standard cryo target (15cm (?))
- Standard spectrometer instrumentation
- Full reconstruction in both spectrometers

# Summary

- New Deuteron data in unknown kinematic territory
- Modest requirement on precision
- PID:
  - $e/\pi$  separation with Cherenkov and calorimeter
  - $p$  identification with coincidence timing
- Data can be produced while performing spectrometer commissioning
- Experience gained during this experiment will help later experiments that require higher precision