DEUTERON ELECTRO-DISINTEGRATION AT VERY HIGH MISSING MOMENTA

Hall C Collaboration Meeting Jan 2024

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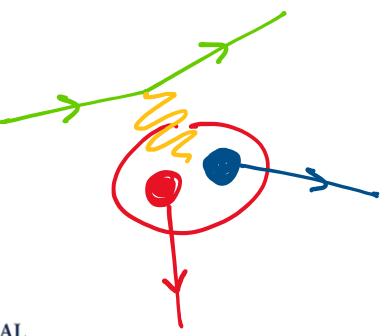
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Outline

- 1. Motivation
- 2. Kinematics
- 3. Previous (and New) Work
- 4. Experiment Run (Feb Mar 2023)
- 5. Calibration
- 6. Summary

Goal

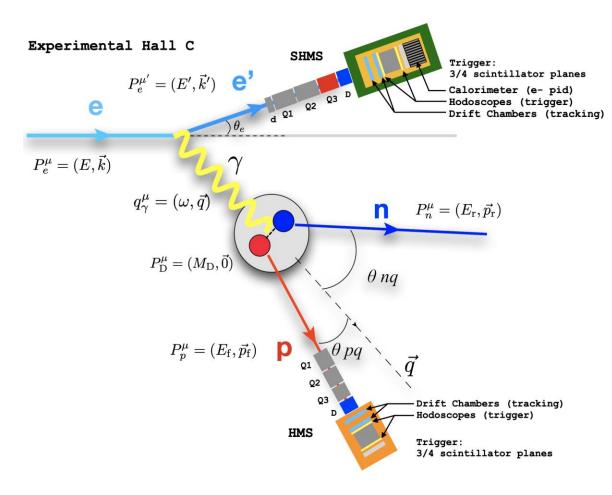
• Measure D(e,e'p)n cross sections at large Q^2 and $x_{Bj} > 1$ for missing momenta $p_m > 600$ MeV/c with a relative statistical error of < 20%.

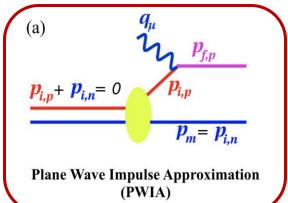
Motivation

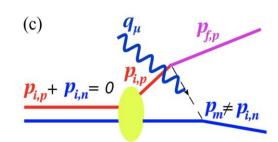
- NN interaction at < 1 fm is not well understood
- There is little experimental data for missing momenta beyond 500 MeV/c
- D(e,e'p)n is ideal for probing the repulsive part of the NN interaction

D(e,e'p)n Reaction Kinematics

C. Yero. (2020). <u>Thesis</u>

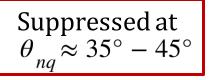


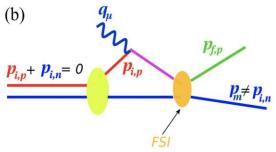




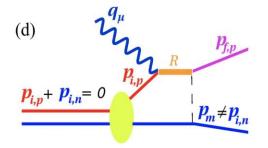
Meson-Exchange Currents (MEC)

Suppressed at $Q^2 > 1$





Final State Interactions (FSI)



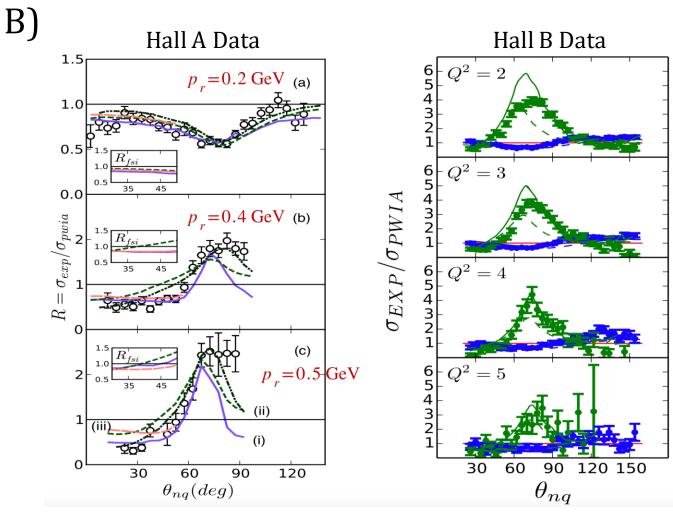
Isobar Configurations (IC)

Suppressed at $x_{Bj} > 1$

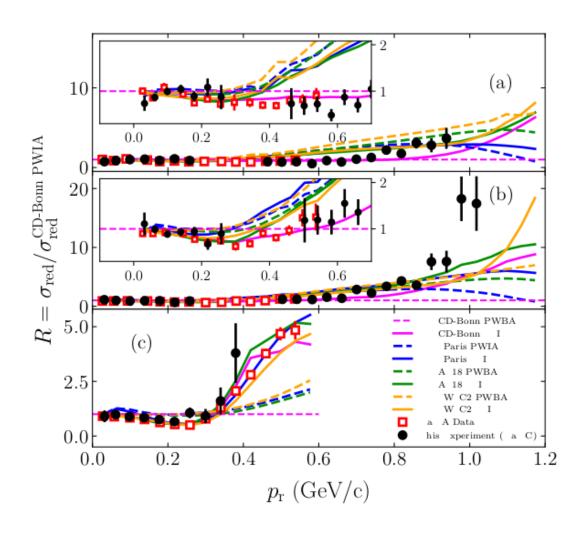
A) 10⁻⁴ 10⁻⁵ **MAMI (1998)** 10⁻⁶ (arb. units) FSI + MEC FSI + MEC + IC 10⁻⁷ FSI + MEC + IC +R 10⁻⁸ $d\omega d\Omega_e d\Omega_p$ 10^{-9} 10⁻¹⁰ 10-11 10⁻¹² 200 600 800 1000 $p_{\rm r}~[{ m MeV/c}]$

MAMI (1995)

Previous Work



W. Boeglin and M. Sargsian. (2015). DOI



New Experiments

Experiment Run Apr 3-9, 2018

C. Yero et al. [Hall C]. (2020). DOI

Total d(e,e'p) Counts Pm_setting: 580 MeV/c 2000 Counts: 2158 Charge: 10K mC Pm setting: 800 MeV/c 1500 Counts: 1212 Charge: 16K mC Total Counts 1000 500 Mar 5 Mar 11 Mar 17 Mar 20 Feb 27 Mar 2 Mar 8 Mar 14 2023 400k Pm_setting: 900 MeV/c Counts: 841 350k Charge: 21K mC 300k 250k Total Counts 200k Pm setting: 120 MeV/c Counts: 384984 150k Charge: 977 mC 100k 50k Feb 27 Mar 2 Mar 5 Mar 8 Mar 11 Mar 14 Mar 17

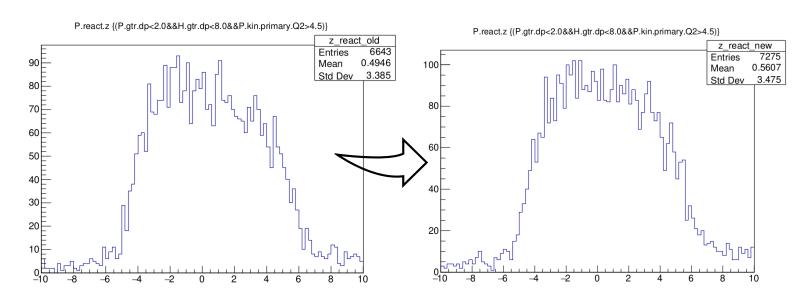
New Experiments

Experiment Run Feb 25, 2023 - Mar 20,2023

I I	Central Missing
Ī	Momentum Setting I
I	[MeV/c]
ı	120
i	580
I	800
ı	900
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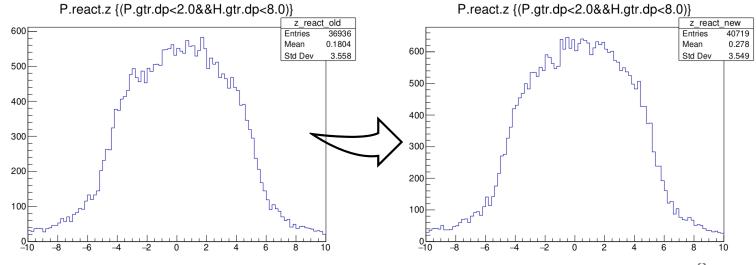
Ongoing Analysis

Calibration: Reference Time & Time Window Cuts



Run 20871 d(e,e'p)

Run 20840 h(e,e'p) coincidence



Summary

- Deuteron electro-disintegration aims to measure D(e,e'p)n cross sections at high Q^2 and missing momentum above 600 MeV
- We want to probe the repulsive part of the NN interaction below 1 fm.

 Theoretical predictions poorly describe the data in this region
- 2018 results of the experiment published in PRL
- New data was taken in Feb-Mar 2023, and analysis is in progress:)