DEUTERON ELECTRO-DISINTEGRATION AT VERY HIGH MISSING MOMENTA

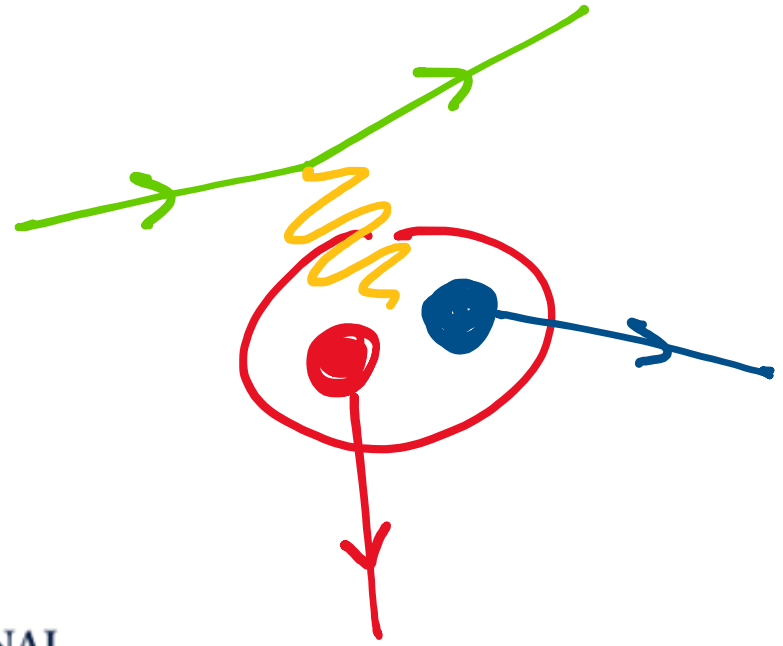
Hall C Collaboration Meeting
Jan 2024

Gema P. Villegas Minyety
Florida Interantional University

Carlos Yero
Jefferson Lab

Mark K. Jones
Jefferson Lab

Werner U. Boeglin
Florida Interantional University



Jefferson Lab

FIU FLORIDA INTERNATIONAL UNIVERSITY

Outline

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

Goal

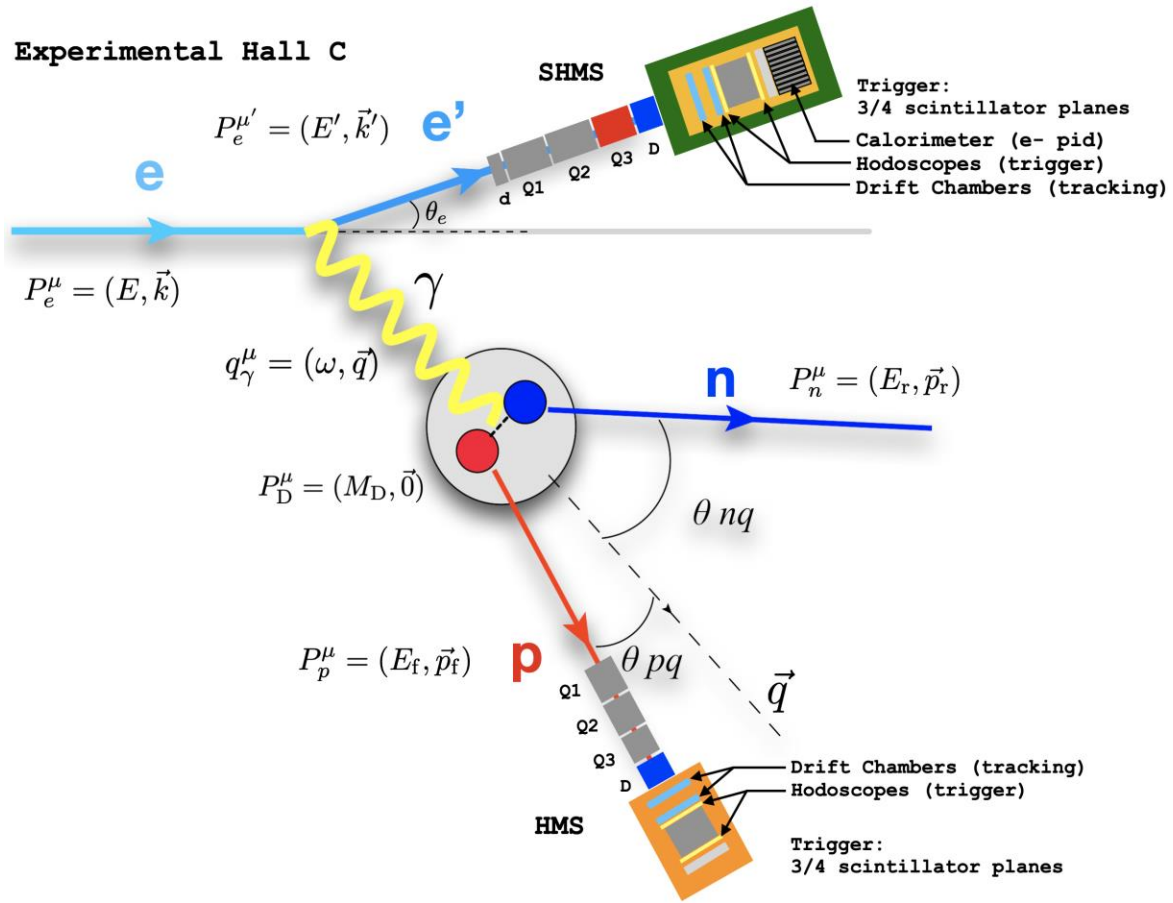
- Measure $D(e,e'p)n$ cross sections at large Q^2 and $x_{Bj} > 1$ for missing momenta $p_m > 600$ MeV/c with a relative statistical error of < 20%.

Motivation

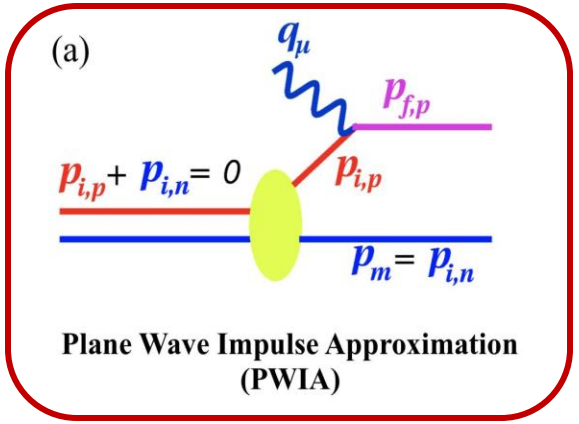
- NN interaction at $< 1\ fm$ is not well understood
- There is little experimental data for missing momenta beyond $500\ MeV/c$
- D(e,e'p)n is ideal for probing the repulsive part of the NN interaction

D(e,e'p)n Reaction Kinematics

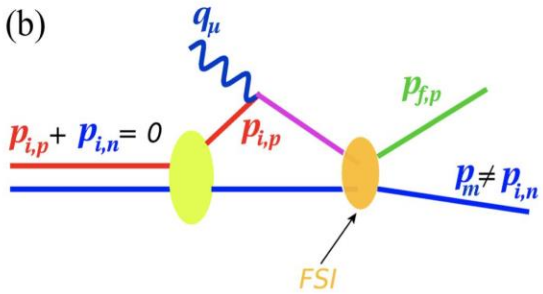
C. Yero. (2020). Thesis



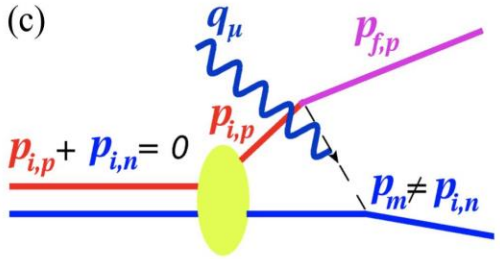
Suppressed at
$\theta_{nq} \approx 35° - 45°$



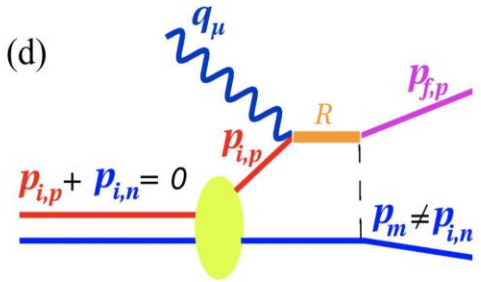
Plane Wave Impulse Approximation (PWIA)



Final State Interactions (FSI)



Meson-Exchange Currents (MEC)



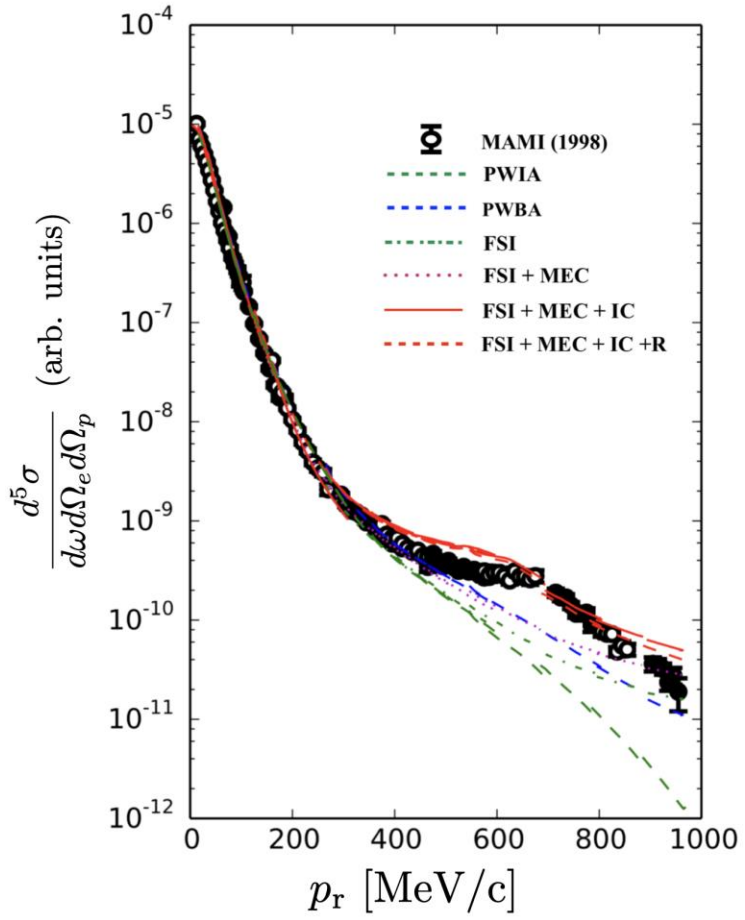
Isobar Configurations (IC)

Suppressed at
$Q^2 > 1$

Suppressed at
$x_{Bj} > 1$

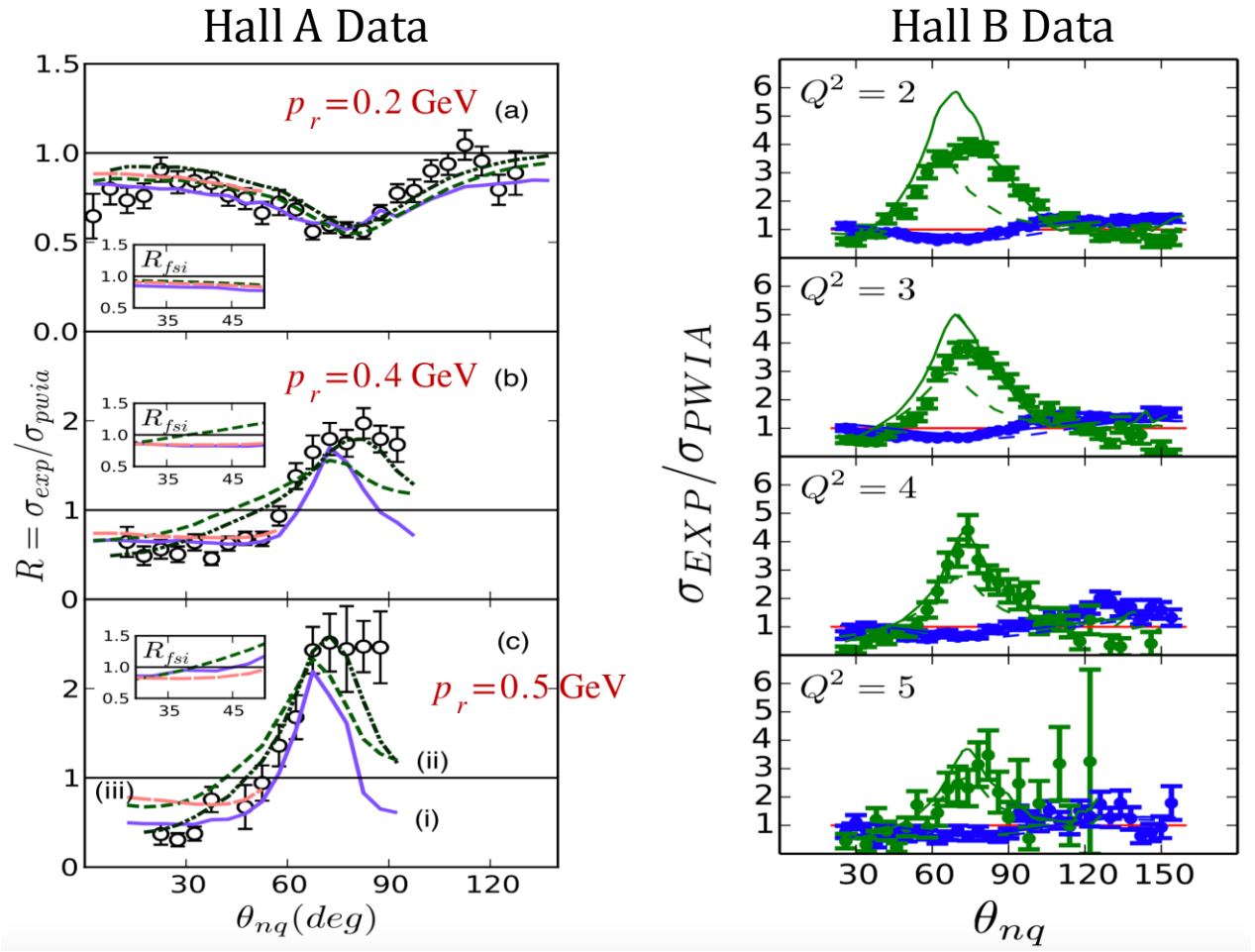
Previous Work

A)

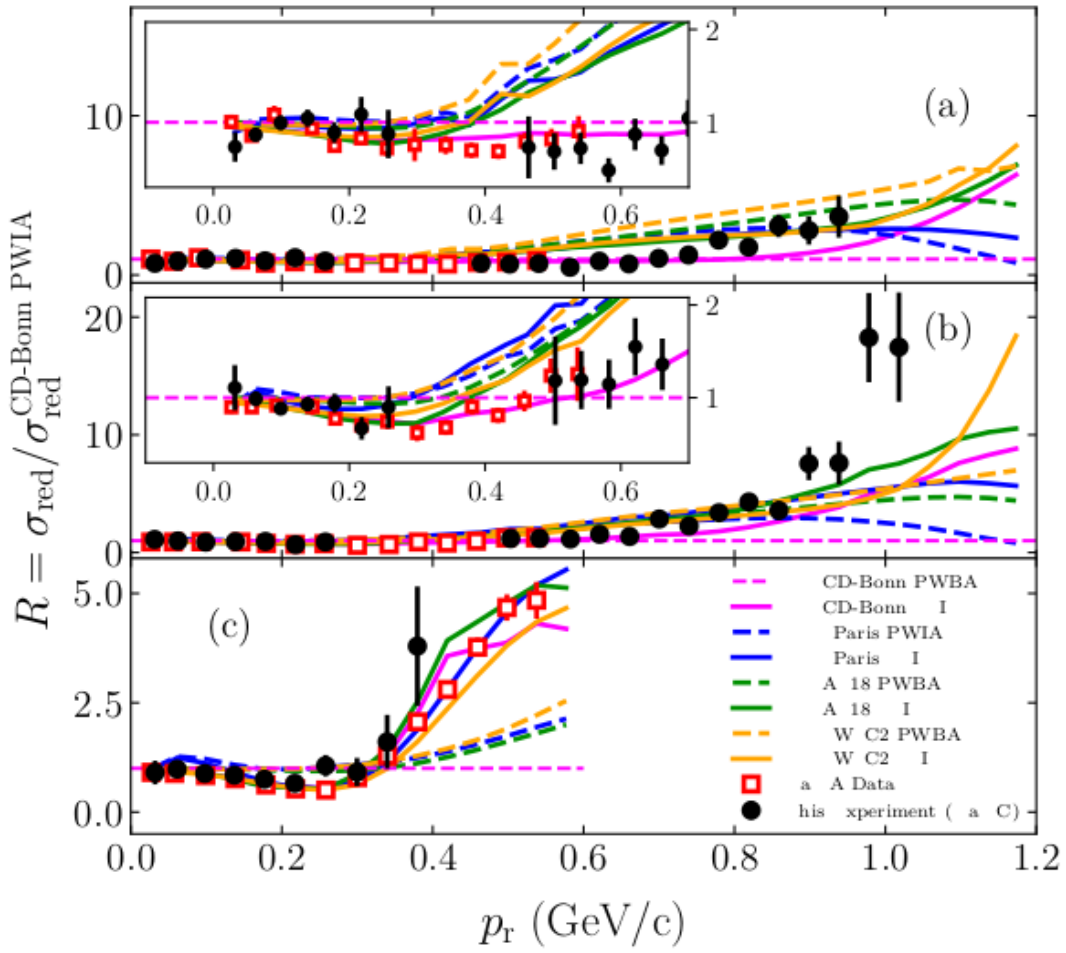


MAMI (1995)

B)



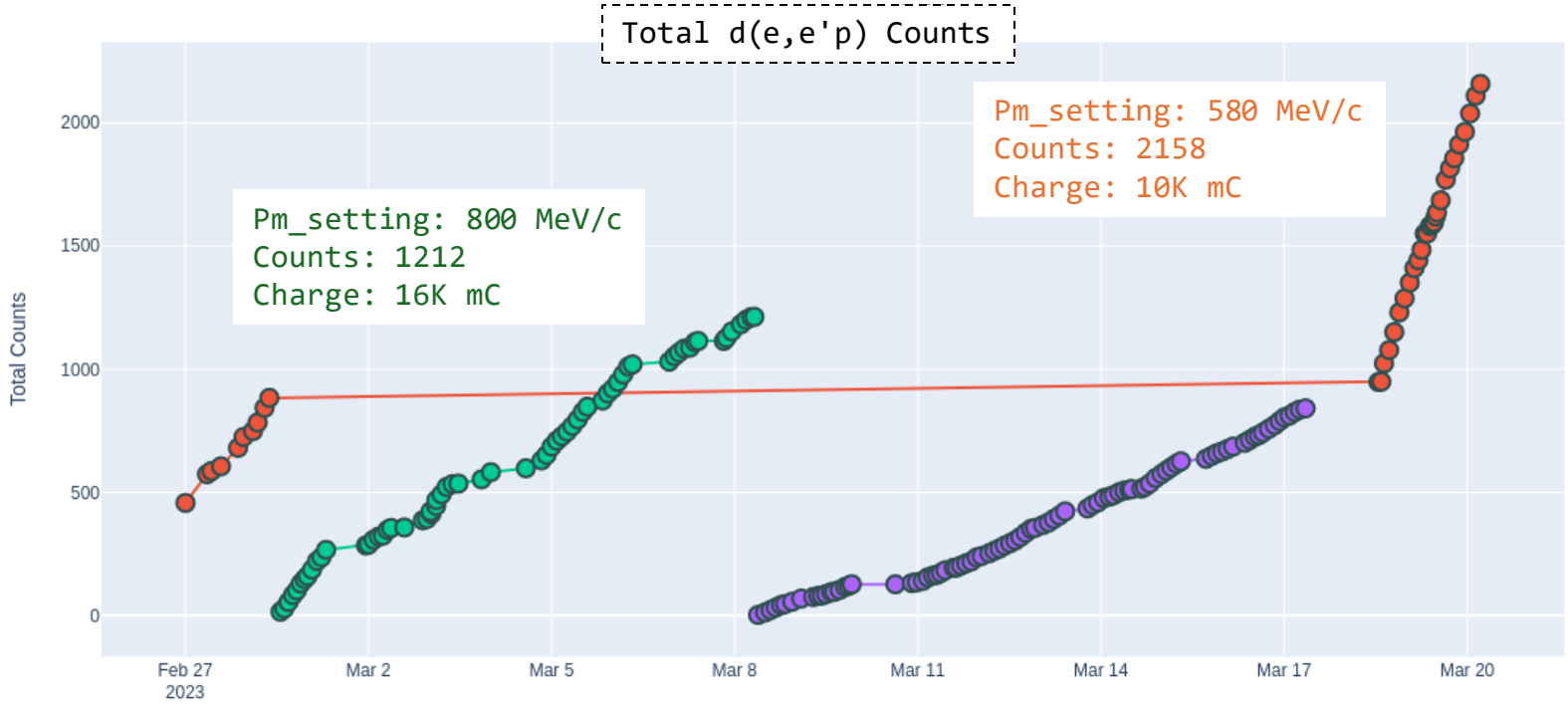
W. Boeglin and M. Sargsian. (2015). DOI

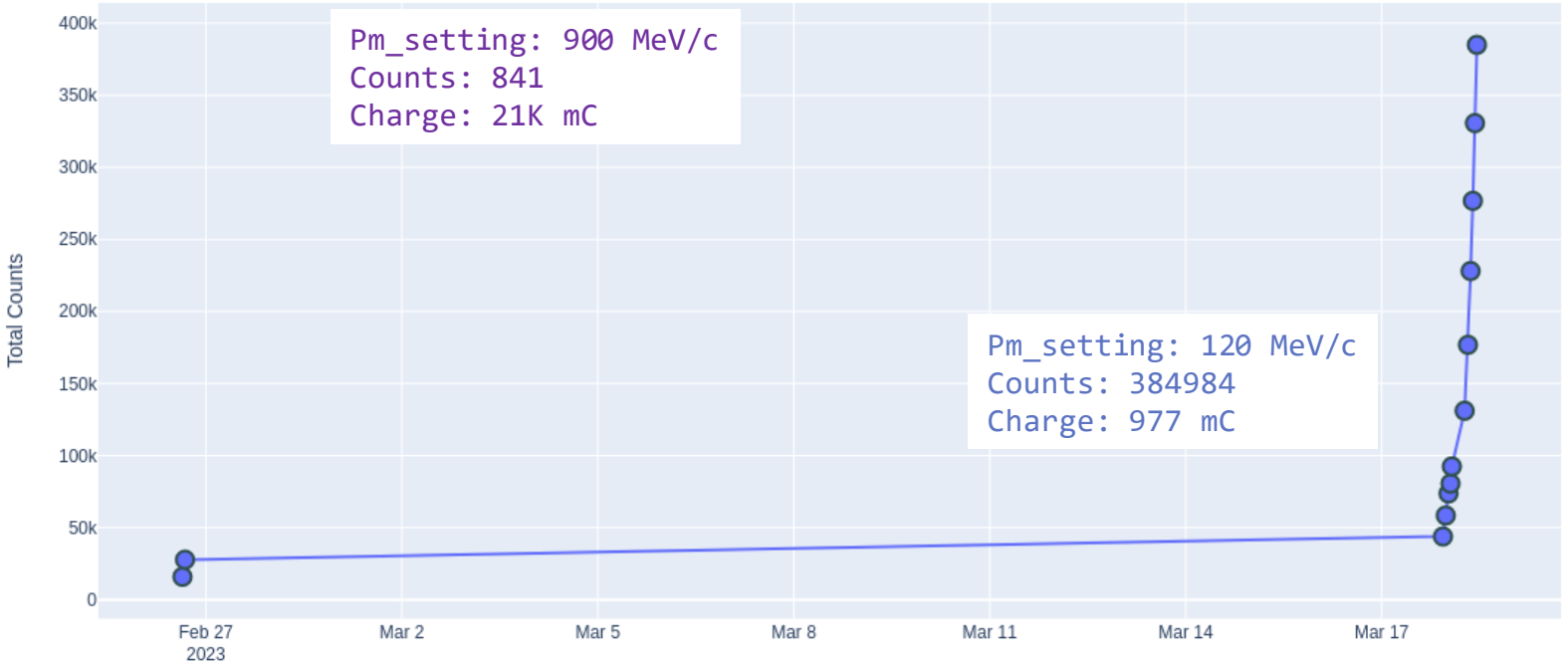


New Experiments

Experiment Run Apr 3-9, 2018

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





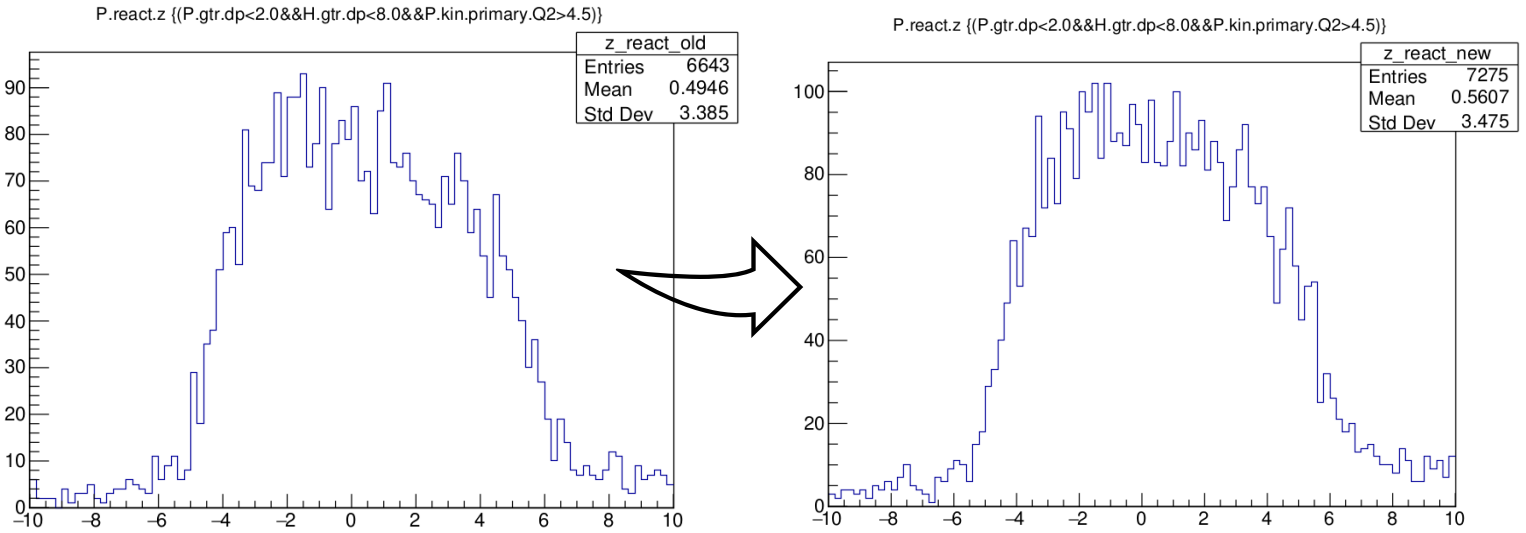
New Experiments

Experiment Run
Feb 25, 2023 – Mar 20,2023

Central Missing Momentum Setting [MeV/c]
120
580
800
900

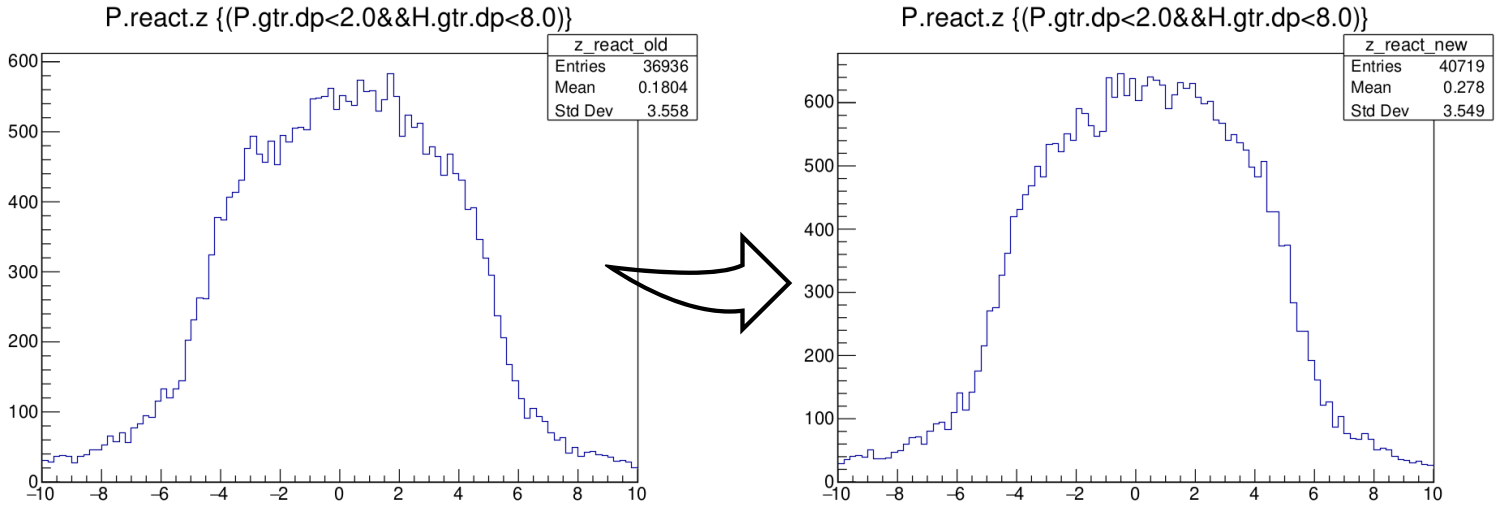
Ongoing Analysis

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 :)