First Results of D(e,e'p)n Electro-Disintegration Experiment at Very High Recoil Momenta

Graduate Student: Carlos Yero

Spokespeople: Drs. Werner Boeglin and Mark Jones

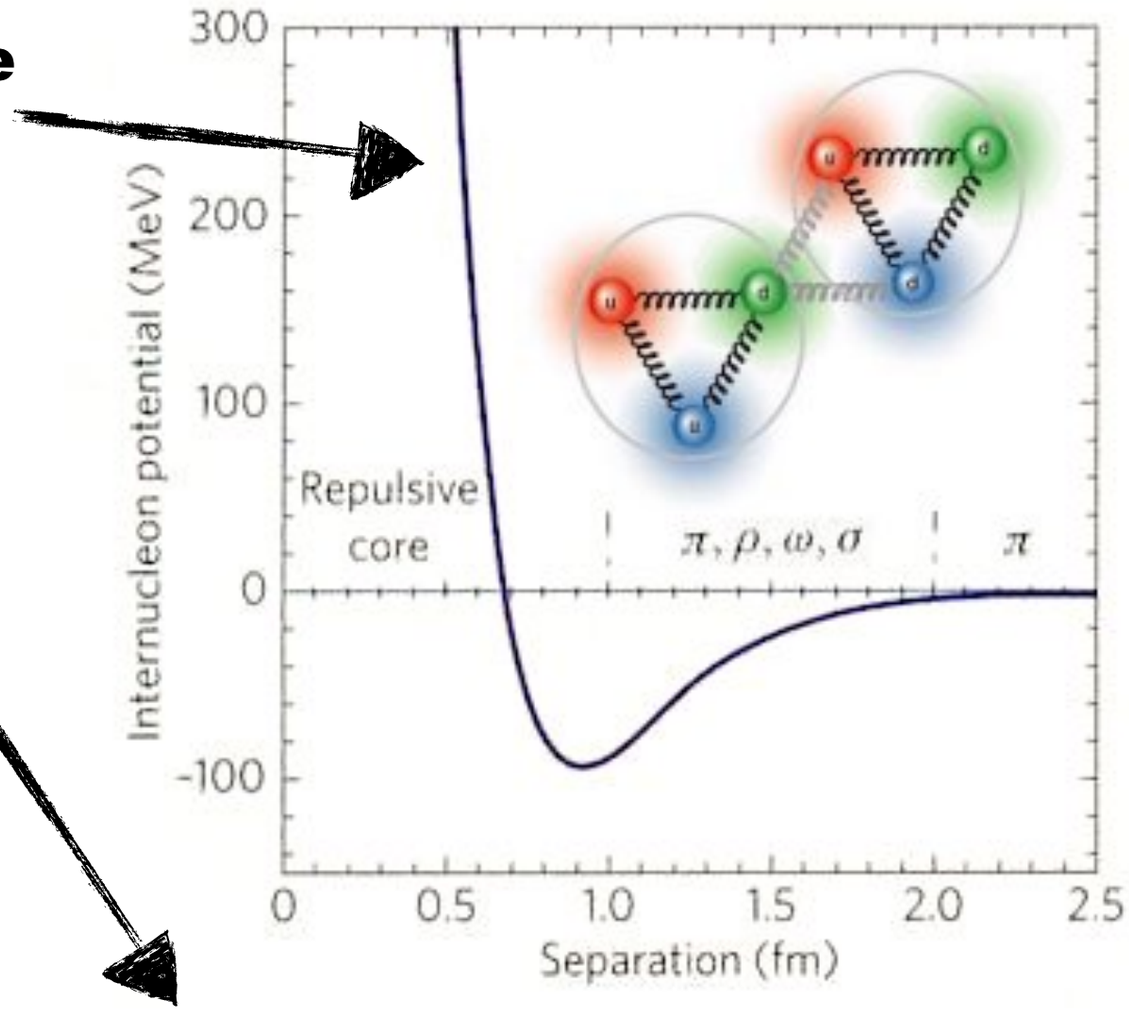
Jefferson Lab
Exploring the Nature of Matter

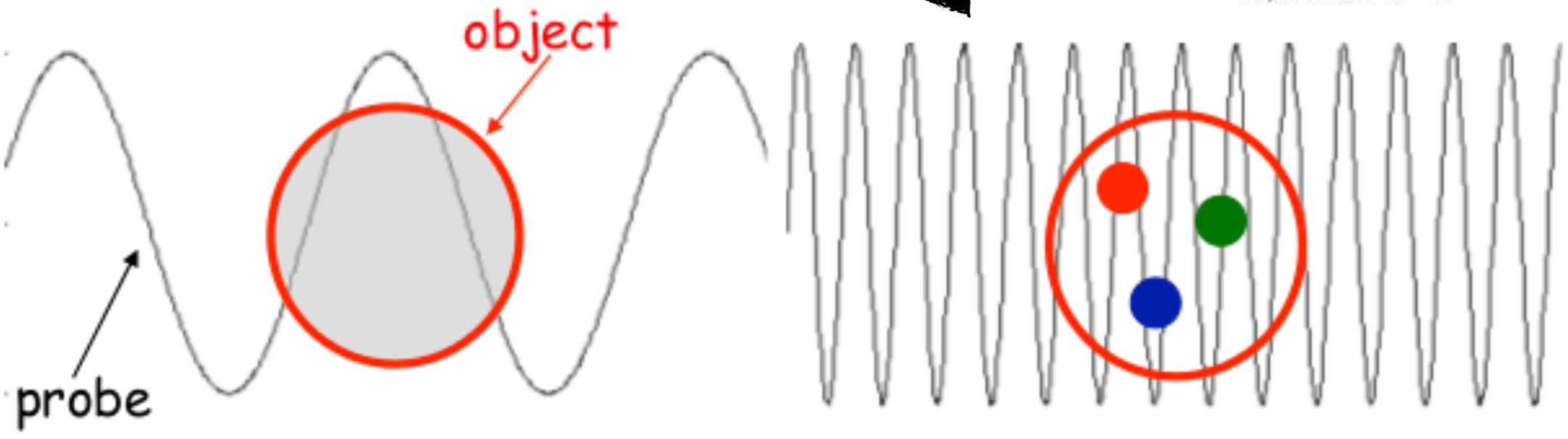
FIU

Hall C

Motivation

- ☑ **Understand the short range structure of the Deuteron by probing its high momentum tails**
- ☑ **Use D(e,e'p)n reaction to probe sub-fermi distances using high momentum transfer (Q2)**
- ☑ **Extract momentum distributions beyond 500 MeV/c recoil momenta, in PWIA kinematics**





Theoretical Background for D(e,e'p)n

Kinematical Region where FSI are small was FOUND at ~ 40 deg !

D(e,e'p)n Kinematics

$E_e = 11$ GeV

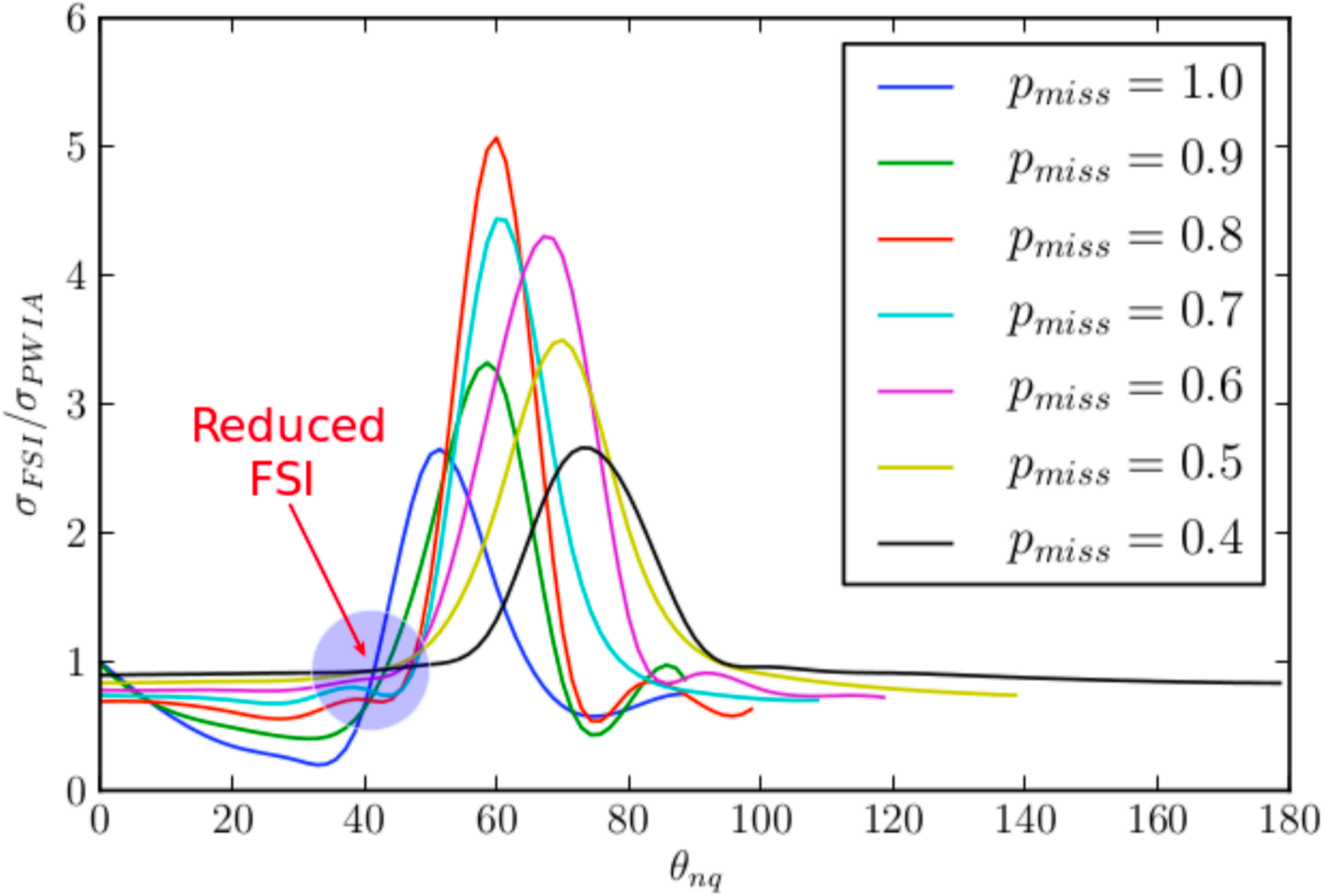
$Q^2 = 4.25$ (GeV/c)^2

$x_{B_j} = 1.35$

$p_m = 0.5 - 1.0$ GeV/c

$\theta_{nq} = 35^\circ - 40^\circ$

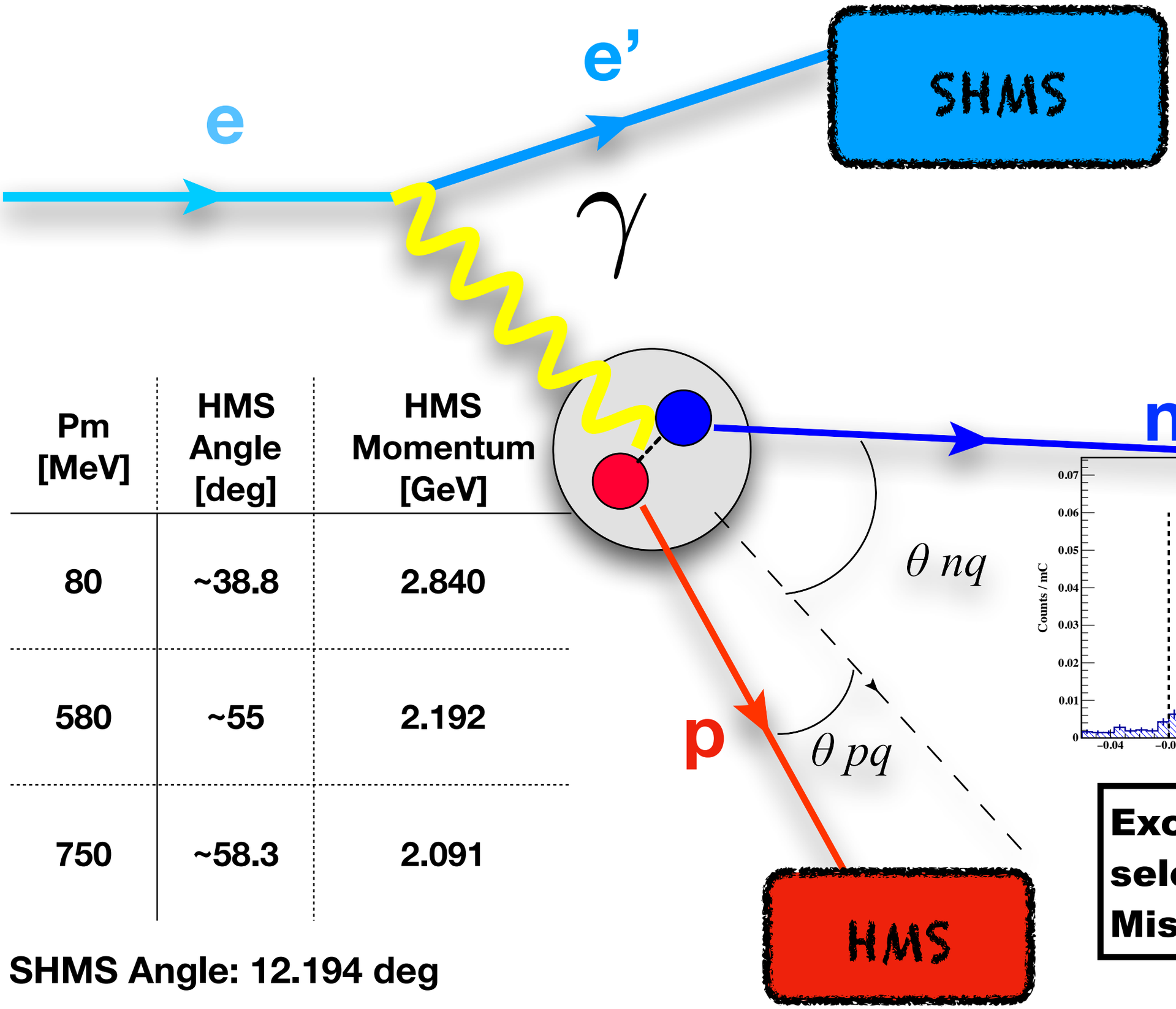
W.U. Boeglin *et. al*
Int.J.Mod.Phys. E24
(2015) no.03, 1530003



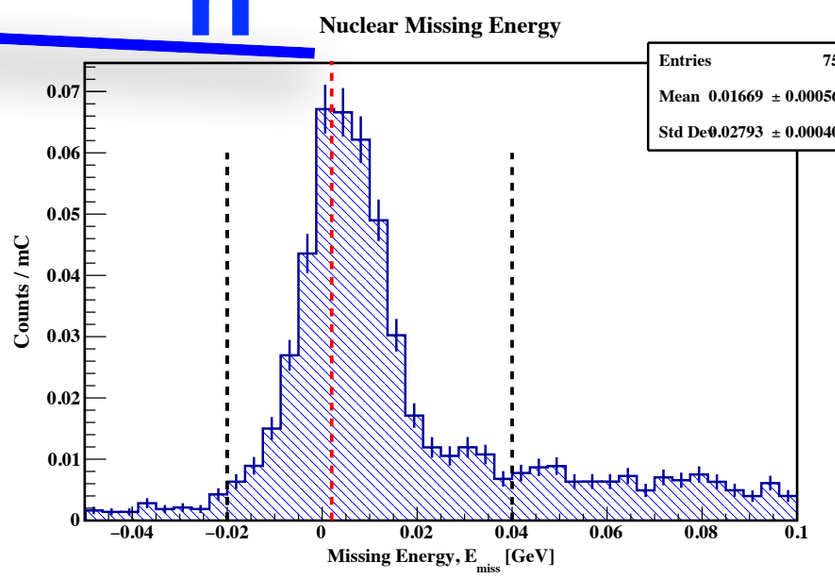
Theoretical Calculation by: M. Sargsian

See Link to Article

Kinematics



Pm [MeV]	HMS Angle [deg]	HMS Momentum [GeV]
80	~38.8	2.840
580	~55	2.192
750	~58.3	2.091

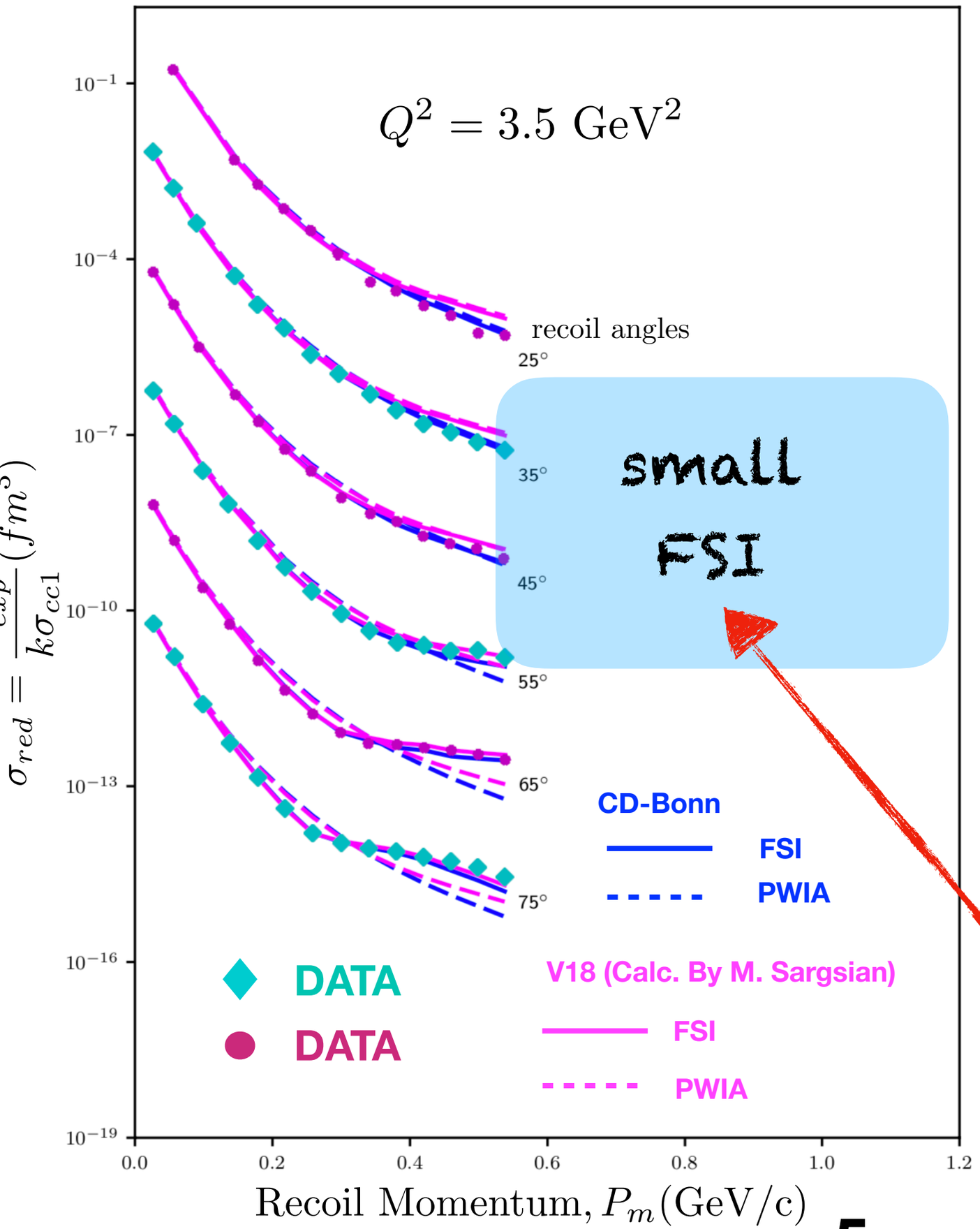


Exclusive reaction selected via Missing Energy Cut

SHMS Angle: 12.194 deg

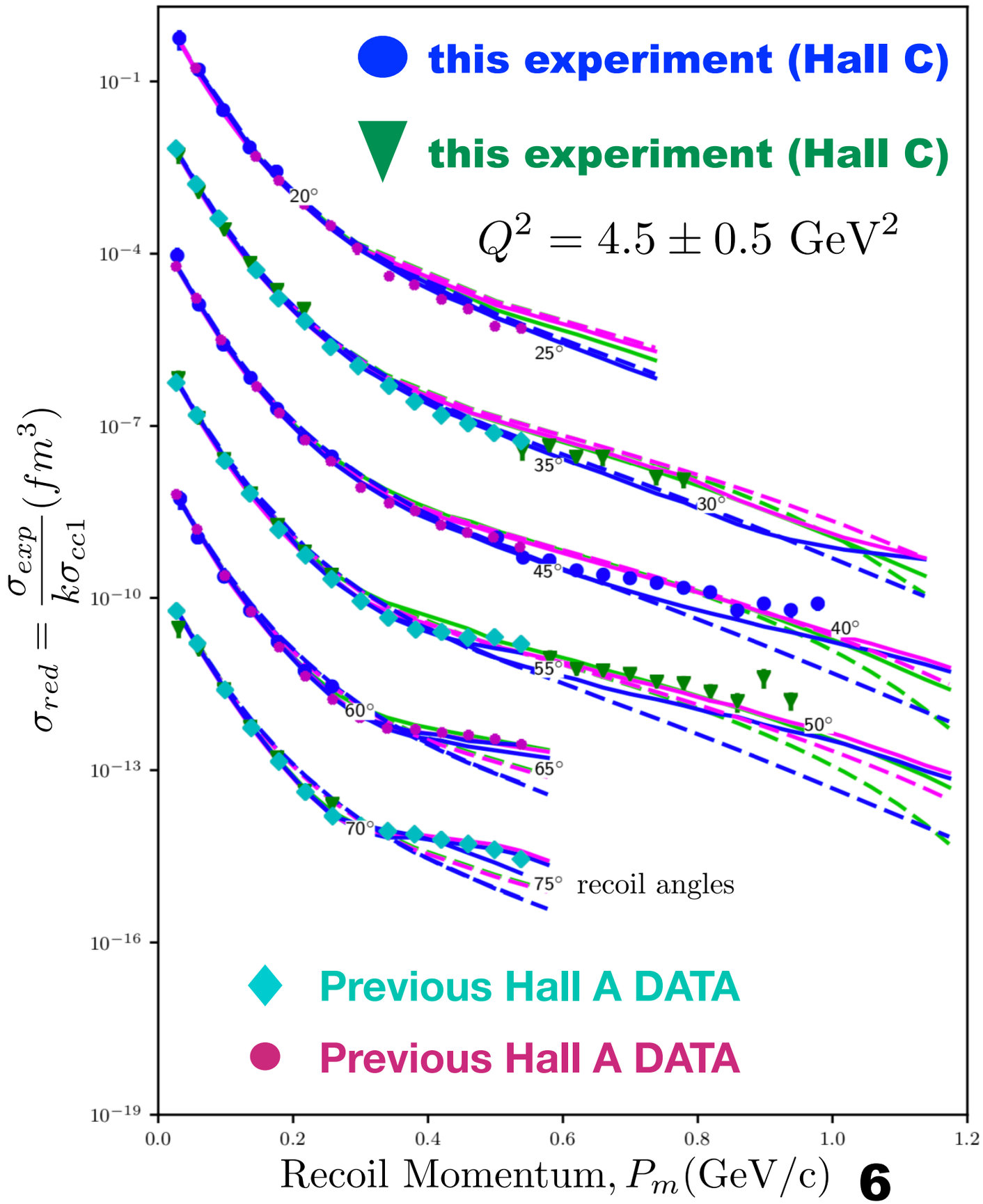
SHMS Momentum: -8.534 GeV

Previous Hall A Measurement of D(e,e'p)n



- ☑ **Momentum Distribution at various recoil angles are scaled relative to the 25 deg. setting**
- ☑ **At recoil angles 40 +/- 5 deg, is a kinematic region of interest as FSI are suppressed**
- ☑ **Deuteron Momentum Distribution becomes accessible at small FSI**
- ☑ **This experiment focuses on recoil angles ~ 40 deg and recoil momenta > 500 MeV/c at Q2 > 4 GeV2**

Preliminary Results for this Experiment !



CD-Bonn Potential
(Calculation by M. Sargsian)

FSI

PWIA

Argonne V18 Potential
(Calculation By M. Sargsian)

FSI

PWIA

Paris Potential
(Calculation by J.M. Laget)

FSI

PWIA

SUMMARY

- **This experiment (commissioning) ran for 3 PAC days (6 days total) out of the approved 21 PAC days.**

- **Preliminary results shows reasonable agreement with previous Hall A data at low recoil momenta**

- **At high recoil momenta, the data are NOT well described by either models.**

Very interesting results at high missing momentum with ONLY 6 days of beam time, as data does NOT seem to be well described by theory in small FSI region ! ! !

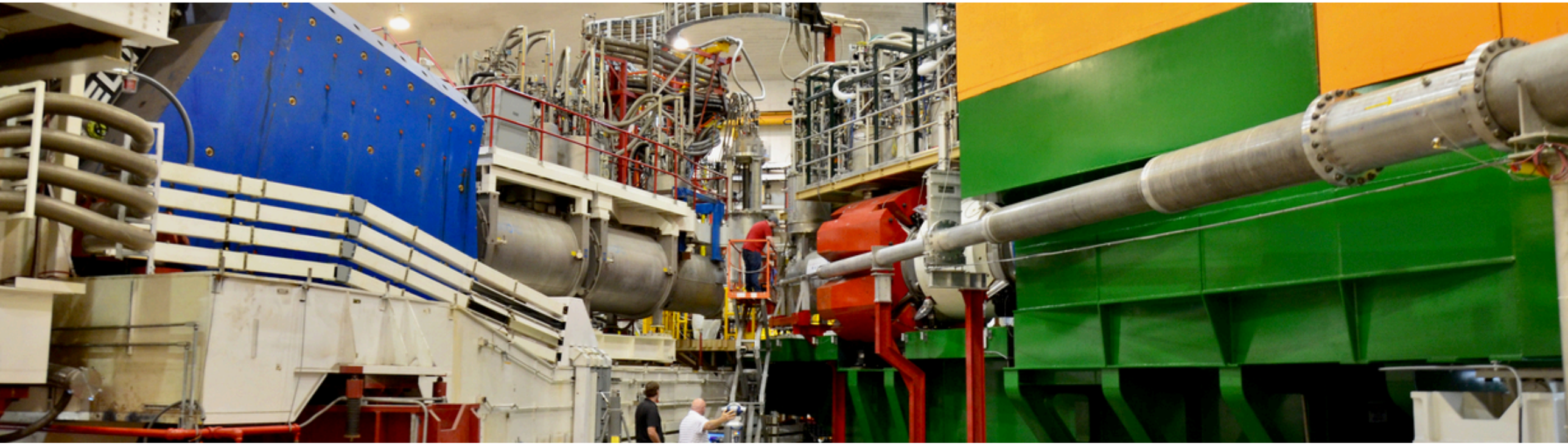
Reference Links to Articles on D(e,e'p)n

The deuteron: structure and form factors.
(M. Gascon and J.W. Van Orden)

Large Q2 Electrodisintegration of Deuteron in Virtual Nucleon Approximation
(Misak M. Sargsian)

Modern Studies of the Deuteron: from the Lab Frame to the Light Front
(Werner Boeglin and Misak Sargsian)

Momentum Distributions for 2H(e, e'p)
(William P. Ford, Sabine Jeschonnek and J.W. Van Orden)



THANK YOU !