

# LHRS Analysis for $d_2^n$

## Born Cross Sections

D. Flay

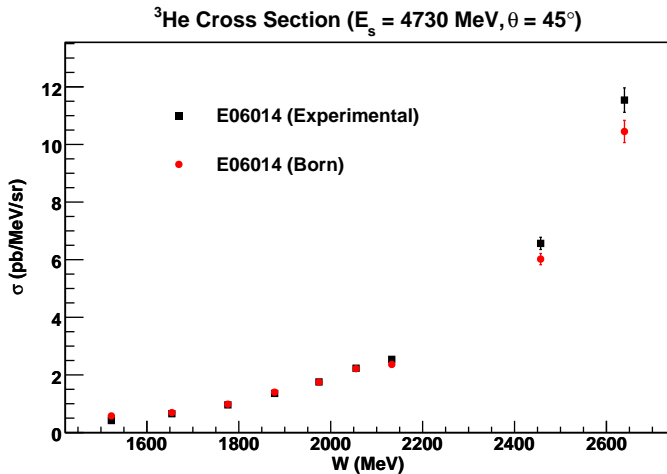
5/3/12

# Outline

- 1 Born Cross Sections
- 2 Size of the Radiative Corrections
- 3 Systematic Error Roundup
- 4 Summary

# Born Cross Sections (1)

$E_s = 4730$  MeV

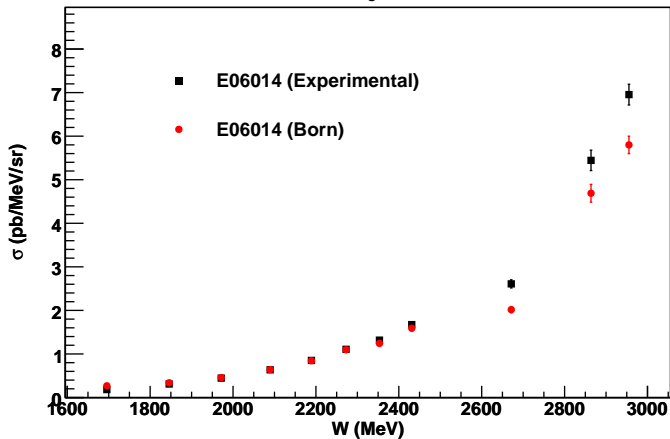


**Figure:** Experimental and Born cross sections at  $E_s = 4730$  MeV. Error bars include both statistical and systematic errors.

# Born Cross Sections (2)

$E_s = 5890$  MeV

$^3\text{He}$  Cross Section ( $E_s = 5890$  MeV,  $\theta = 45^\circ$ )

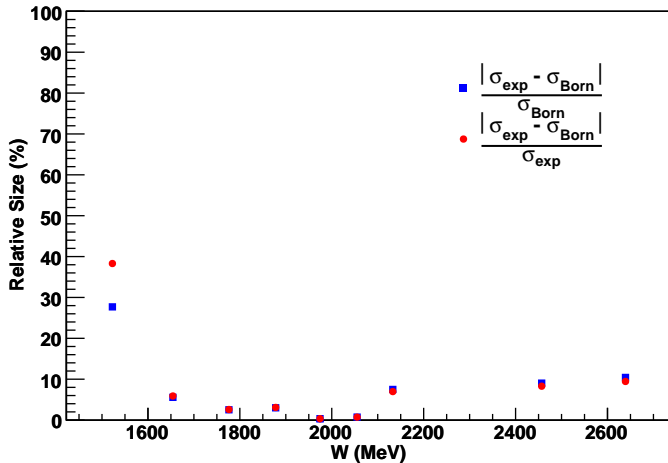


**Figure:** Experimental and Born cross sections at  $E_s = 5890$  MeV. Error bars include both statistical and systematic errors.

# Relative Size of the RC's (1)

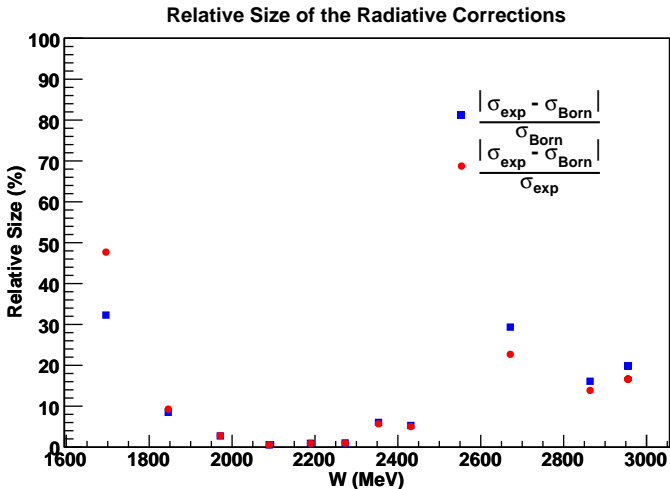
$E_s = 4730 \text{ MeV}$

Relative Size of the Radiative Corrections



# Relative Size of the RC's (2)

$E_s = 5890$  MeV



# Systematic Error Roundup (1)

## Cuts and Radiative Corrections

$E_s = 4730 \text{ MeV}$		
$E_p \text{ (MeV)}$	Cuts (%)	RC (%)
600	2.75	3.54
800	2.59	3.20
1120	2.54	3.20
1190	2.39	3.91
1260	2.65	4.72
1340	2.66	6.50
1420	2.75	8.38
1510	2.75	11.28
1600	2.83	15.21

$E_s = 5890 \text{ MeV}$		
$E_p \text{ (MeV)}$	Cuts (%)	RC (%)
600	2.60	3.67
700	2.60	2.92
900	2.24	2.35
1130	2.77	2.92
1200	3.04	3.28
1270	2.76	3.67
1340	3.04	4.53
1420	2.68	6.36
1510	2.36	6.36
1600	2.67	6.36
1700	2.79	8.76

# Systematic Error Roundup (2)

## Computing the Total Systematic Error

$$\delta\sigma_{\text{born}}^2 = \delta\sigma_{\text{exp}}^2 + \left( \frac{\sigma_{\text{born}} - \sigma_{\text{exp}}}{\sigma_{\text{born}}} \right)^2 \delta\sigma_{\text{RC}}^2$$

E <sub>s</sub> = 4730 MeV		
E <sub>p</sub> (MeV)	Stat. (%)	Syst. (%)
600	2.88	2.77
800	2.61	2.61
1120	1.97	2.55
1190	1.58	2.39
1260	1.55	2.65
1340	2.05	2.67
1420	2.02	2.76
1510	1.85	2.82
1600	2.93	5.07

E <sub>s</sub> = 5890 MeV		
E <sub>p</sub> (MeV)	Stat. (%)	Syst. (%)
600	5.20	2.71
700	2.22	2.64
900	3.67	2.35
1130	2.25	2.78
1200	2.32	3.05
1270	1.94	2.76
1340	1.91	3.04
1420	1.98	2.68
1510	2.31	2.36
1600	2.48	2.73
1700	3.57	3.97

**Table:** The statistical and systematic errors on the born cross section. The statistical error is the same as that for the experimental cross section. The systematic error is calculated according to the equation above.



## Summary

- Systematic error on the Born cross sections is reasonably controlled and is on even footing with the statistical error
- The size of the radiative correction (relative to  $\sigma_{\text{exp}}$ ) ranges up to  $\sim 50\%$ 
  - Largest contribution is at the lowest W bins, most bins  $\lesssim 10\%$

# What's Next?

- Currently working through the magnetic flux calculation for the water (and  $^3\text{He}$ ) cell (should have something for next time)
- Geant4 BigBite simulation
  - Start looking at bend-up and bend-down acceptances, E/p