LHRS Analysis for d_2^n

Born Cross Sections

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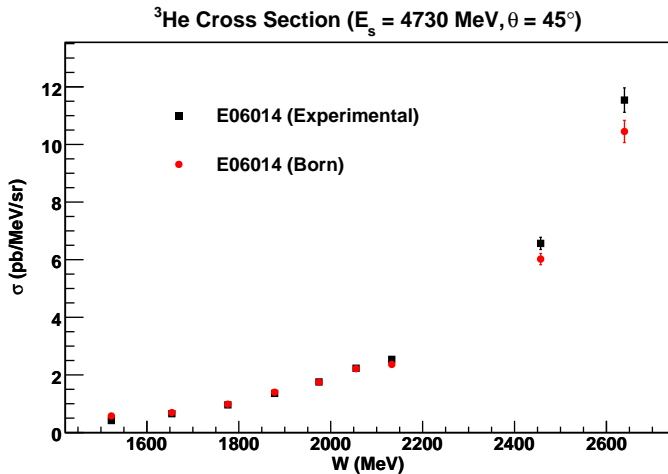
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Outline

Born Cross Sections (1)

E_s = 4730 MeV

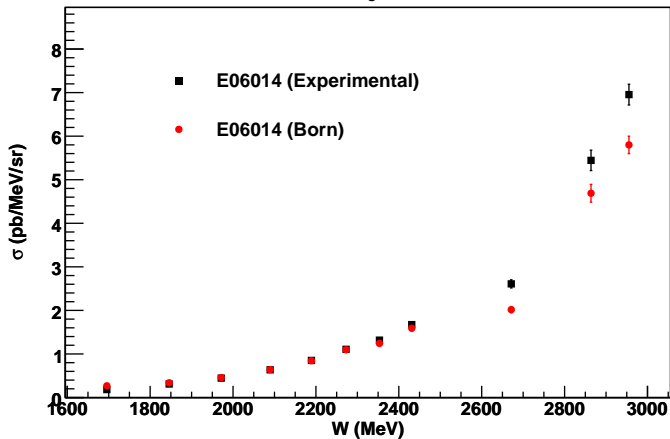^{3}He Cross Section (E_s = 4730 MeV, θ = 45°)

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

Born Cross Sections (2)

^{3}He Cross Section (E$_s$ = 5890 MeV, θ = 45°)
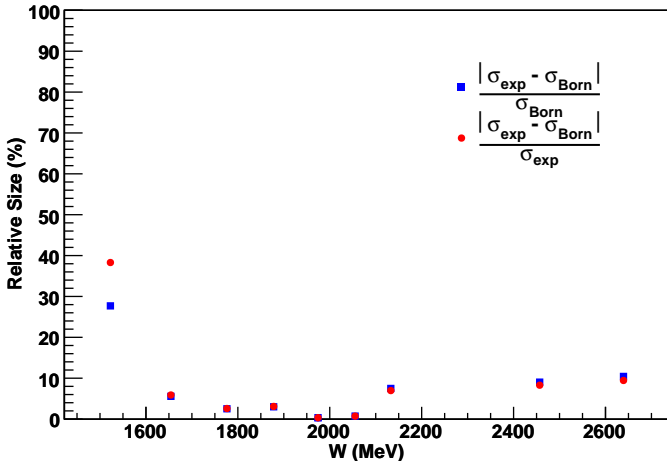
■ E06014 (Experimental)

● E06014 (Born)

Figure: Experimental and Born cross sections at E$_s$ = 5890 MeV. Error bars include both statistical and systematic errors.
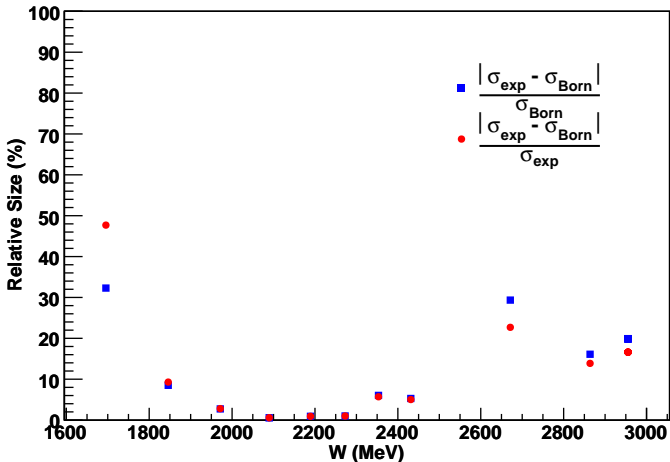
Relative Size of the RC's (1)

$E_s = 4730$ MeV

Relative Size of the RC's (2)

E$_s$ = 5890 MeV

Systematic Error Roundup (1)

Cuts and Radiative Corrections

E_s = 4730 MeV		
E_p (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 MeV		
E_p (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_s = 4730 MeV		
E_p (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

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.

E_s = 5890 MeV		
E_p (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

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 (realative to the experimental cross section) ranges from $\sim$2–40%

What's Next?

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