

LHRS Analysis for d_2^n

Systematic Error Studies: Target Variables

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Outline

- 1 Systematic Errors
 - Method
 - Sample Plots
 - Results

- 2 Summary

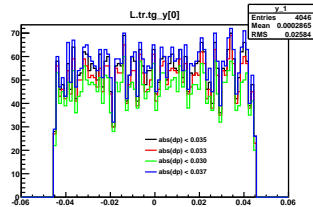
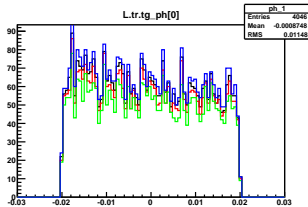
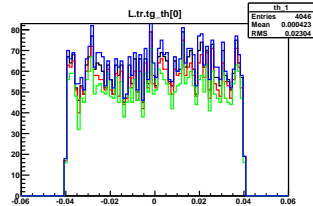
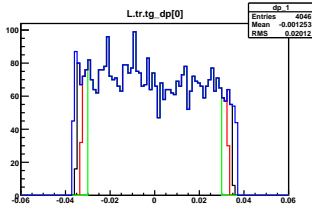
Description

- To determine the systematic error associated with each target variable cut, we do the following:
 - 1 Change the cut for a given variable to a **reasonable** degree
 - Be sure that all distributions are reasonably flat
 - 2 Calculate the new acceptance weight
 - Typically ~ 0.98 – 0.99
 - 3 Calculate the resulting cross-section
 - 4 Compare to 'default' cuts

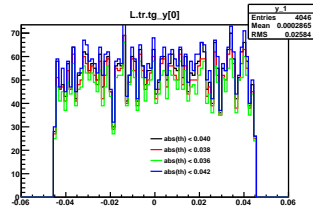
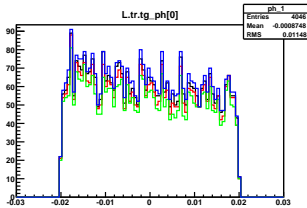
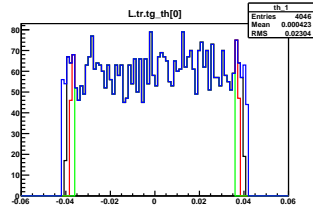
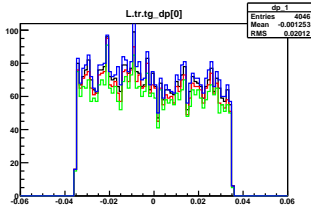
Target Cuts and Choosing Flat Distributions

- The analysis cut for the cross-section is:
 - $|\delta p/p| < 3.5\%$
 - $|\theta_{tg}| < 40$ mrad
 - $|\phi_{tg}| < 20$ mrad
 - $|y_{tg}| < 4.5$ cm
- Test cuts (half-widths):
 - $\delta p/p$: 3.0, 3.3, 3.7%
 - θ_{tg} : 36, 38, 42 mrad
 - ϕ_{tg} : 16, 18, 22 mrad
 - y_{tg} : 4.0, 4.3 cm
- Look at SAMC to:
 - See how the cuts affect each variable and exclude the 'bad' cuts
 - Observe any geometrical effects as events pass through each aperture

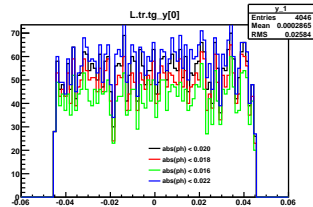
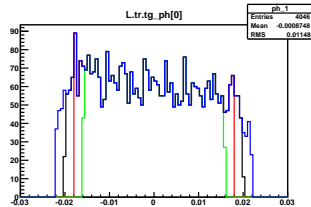
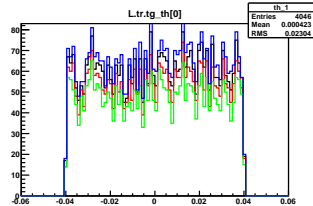
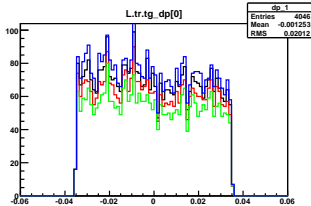
Data Subject to Various $\delta p/p$ Cuts



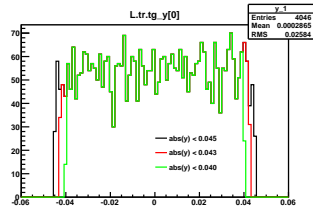
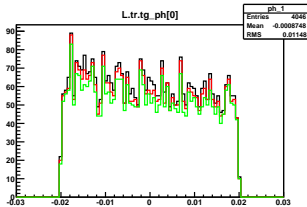
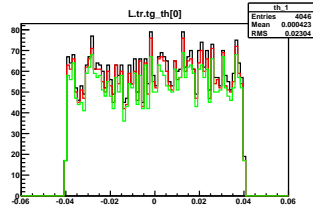
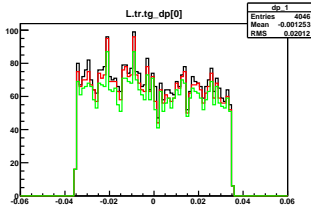
Data Subject to Various θ_{tg} Cuts



Data Subject to Various ϕ_{tg} Cuts

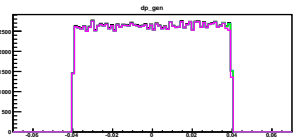
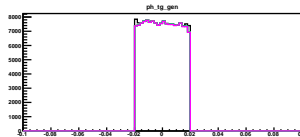
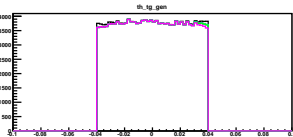
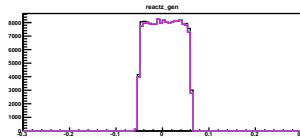
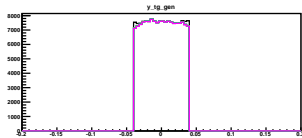


Data Subject to Various y_{tg} Cuts



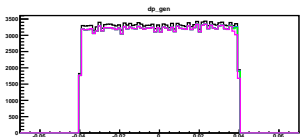
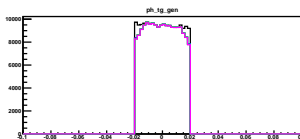
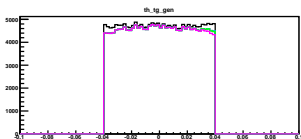
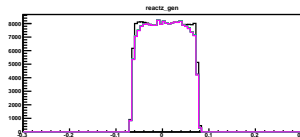
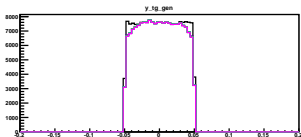
Geometric Effects: Distributions From SAMC (1)

Good Distribution: Analysis Cut



Geometric Effects: Distributions From SAMC (2)

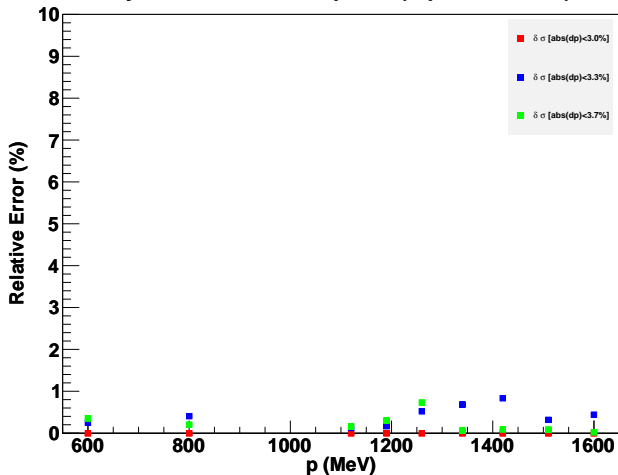
Bad Distribution: $|y_{tg}| < 4.7$ cm



Results (1)

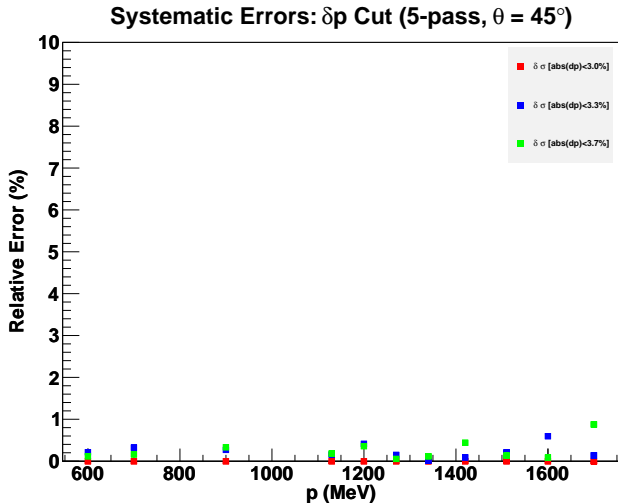
$\delta p/p$: 4-pass

Systematic Errors: δp Cut (4-pass, $\theta = 45^\circ$)

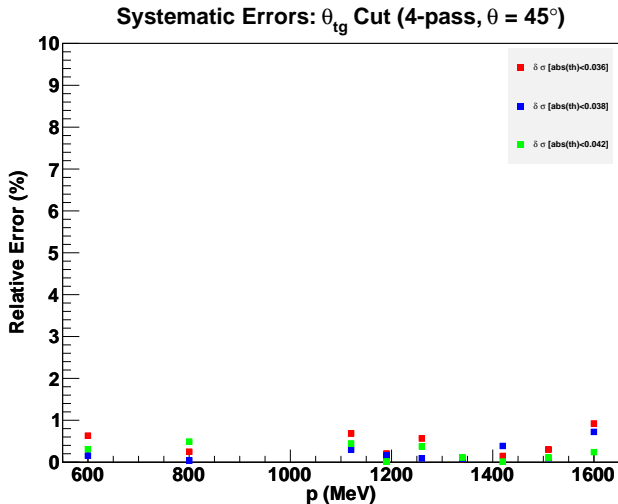


Results (2)

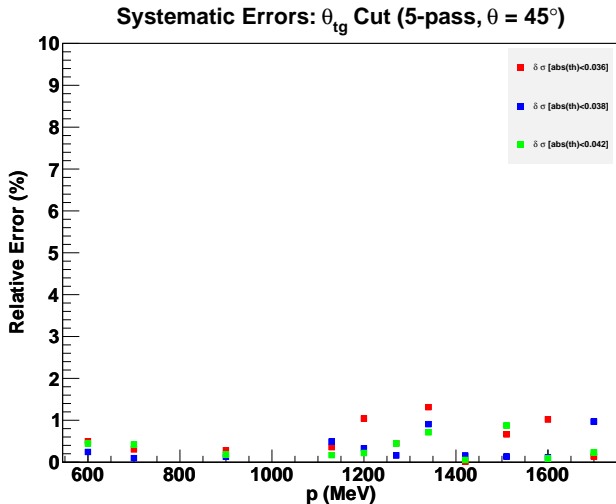
$\delta p/p$: 5-pass



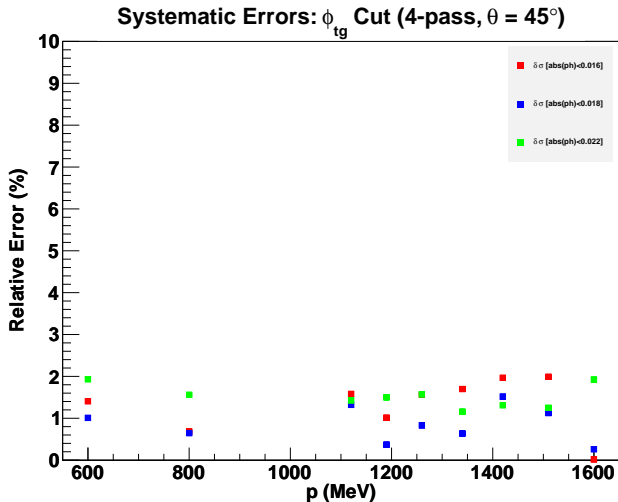
Results (3)

 θ_{tg} : 4-pass

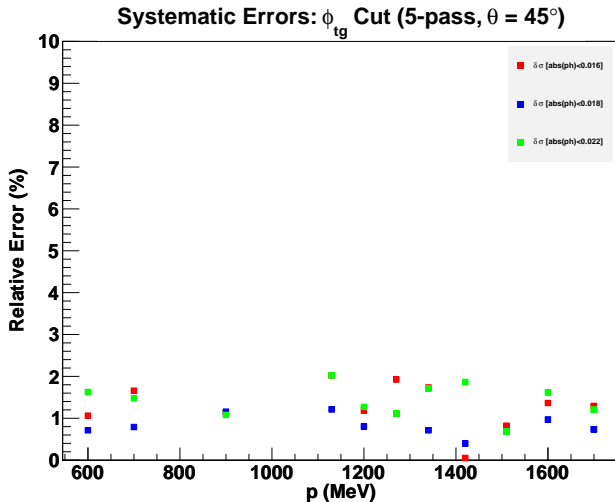
Results (4)

 θ_{tg} : 5-pass

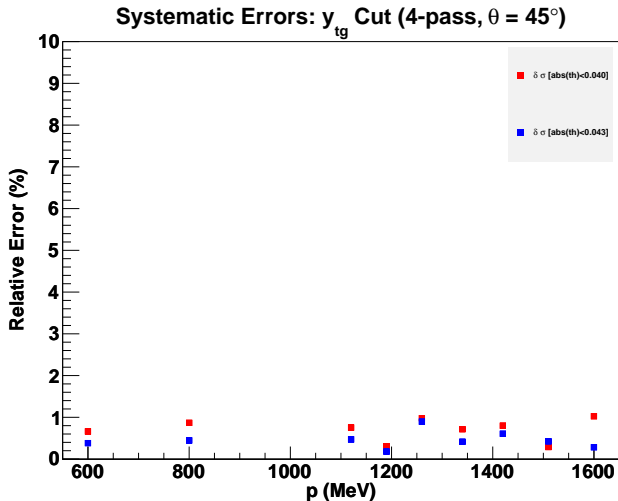
Results (5)

 ϕ_{tg} : 4-pass

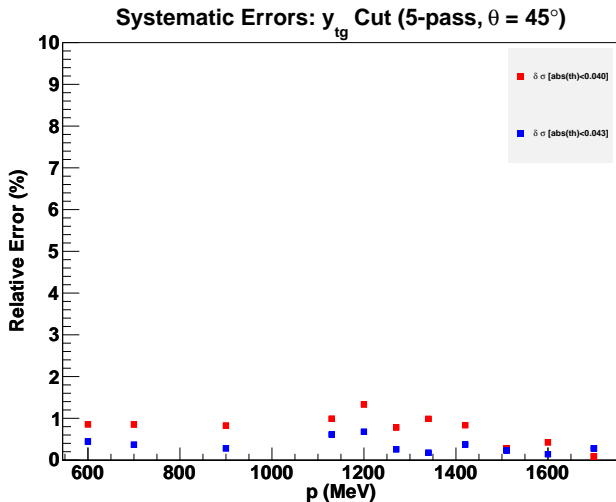
Results (6)

 ϕ_{tg} : 5-pass

Results (7)

 y_{tg} : 4-pass

Results (8)

 y_{tg} : 5-pass

Results (9)

4-pass

Systematic Errors: $E_b = 4730$ MeV					
p (MeV)	$\delta p/p$ (%)	θ_{tg} (%)	ϕ_{tg} (%)	y_{tg} (%)	Total (%)
600	0.8	1.0	2.2	1.0	2.7
800	0.8	1.0	2.0	1.0	2.6
1120	0.6	1.0	2.0	1.0	2.5
1190	0.6	0.8	2.0	0.8	1.6
1260	1.0	1.0	2.0	1.0	2.6
1340	1.0	1.0	2.0	1.0	2.6
1420	1.0	0.8	2.2	1.0	2.7
1510	1.0	1.0	2.2	0.8	2.7
1600	1.0	1.0	2.2	1.0	2.8

Results (10)

5-pass

Systematic Errors: $E_b = 5890$ MeV					
p (MeV)	$\delta p/p$ (%)	θ_{tg} (%)	ϕ_{tg} (%)	y_{tg} (%)	Total (%)
600	0.8	0.8	2.0	1.2	2.6
700	0.8	0.8	2.0	1.2	2.6
900	0.8	0.8	1.5	1.2	2.2
1130	0.8	0.8	2.2	1.2	2.7
1200	0.8	1.2	2.2	1.5	3.0
1270	0.8	0.8	2.2	1.2	2.7
1340	0.8	1.5	2.2	1.2	3.0
1420	0.8	0.4	2.2	1.2	2.7
1510	0.8	1.2	1.5	1.0	2.3
1600	0.8	1.2	2.0	1.0	2.7
1700	0.8	1.2	2.0	1.0	2.7

Summary

- Systematic errors:
 - Total: $\sim 2.5\%$ and $\sim 2.7\%$ for 4- and 5-pass respectively
 - In good agreement with the proposal (2–3%)

What's Next?

- Radiative Corrections:
 - QFS-modeling of cross-sections
 - Continue tests of radcor with Karl's kinematics
- Cross Sections:
 - Start thinking about the finite acceptance correction
 - Loose ends on systematic errors (LT, VDC, Q, etc.)