LHRS Analysis for d_2^n

SAMC and Acceptance Cut Study

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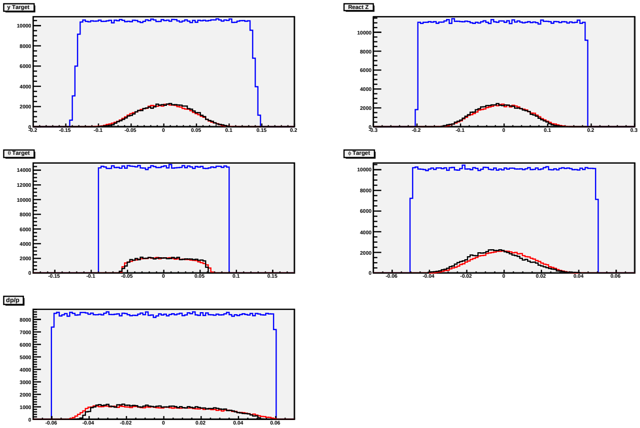
Outline

1. Acceptance
   - SAMC
   - Edge Effects
   - Weight Factor

2. Summary

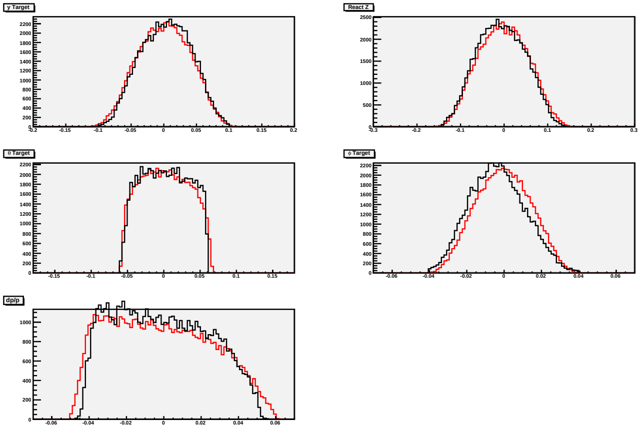
SAMC (1)

$p = 0.60$ GeV, 4-pass: Target Variables



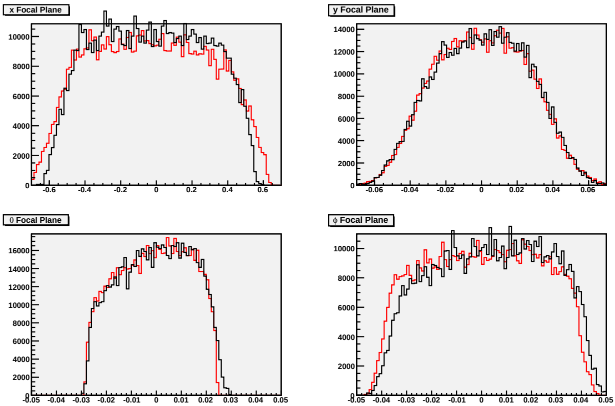
SAMC (2)

$p = 0.60$ GeV, 4-pass: Target Variables (Reconstructed and Data Only)



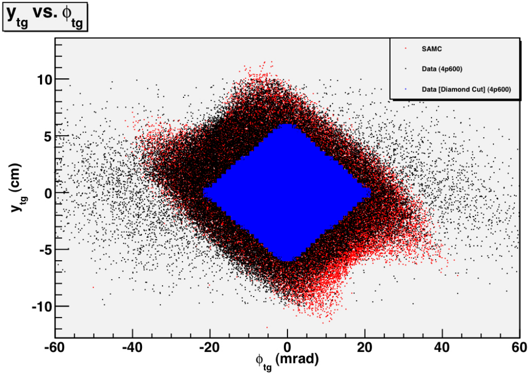
SAMC (3)

$p = 0.60$ GeV, 4-pass: Focal Plane Variables



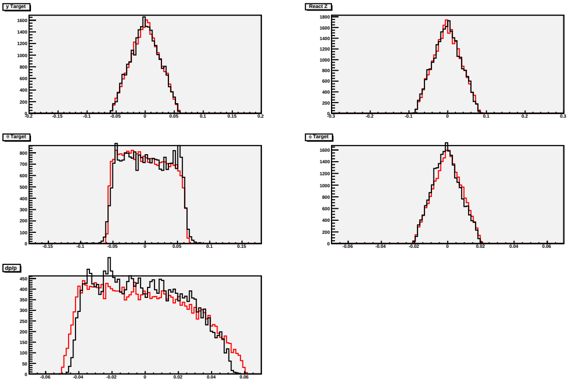
Edge Effects (1)
Target Variables y and ϕ

- Before choosing cuts on the acceptance, we need to remove edge effects
  - Look at the plot of y_{tg} vs. ϕ_{tg}



Edge Effects (2)
Target Variables

- Applying this cut to all target variables:



Weight Factor (1)

Definition

- The weight factor w contributes to the cross section and needs to be evaluated for each momentum bin
- The weight factor is defined by:

$$w\left(y_{tg},\theta_{tg},\phi_{tg},\delta p/p,Z_r\right)=\frac{N_f\left(y_{tg},\theta_{tg},\phi_{tg},\delta p/p,Z_r\right)}{N_i\left(y_{tg},\theta_{tg},\phi_{tg},\delta p/p,Z_r\right)}$$

- $N_i =$ The number of events in a given bin defined by cuts on y_{tg}, θ_{tg}, ϕ_{tg}, $\delta p/p$, Z_r and the edge effect cut applied to the generated target variables
- $N_f =$ The number of events that satisfy the conditions on N_i and satisfy the condition that the event was successfully propagated to the focal plane

Weight Factor (2)
Cut Sets

- Consider 22 cut sets
  - First set: wide cut on each variable – based on the edge effect study
  - Vary the cut window width for each variable, while holding the cut windows of all other variables constant
  - Values shown for each variable correspond to 1/2 the full width of the cut
  - From this we determine the best cut on each variable, yielding the optimal cut set ($\#22$)

Weight Factor (3)
Results

Cut Sets for Acceptance Study						
Set #	$\delta p/p$ (%)	θ_{tg} (mrad)	ϕ_{tg} (mrad)	y_{tg} (cm)	Z_r (cm)	w
1	4	50	20	5	10	0.7005 ± 0.0071
2	0.5	50	20	5	10	0.7219 ± 0.0147
3	1	50	20	5	10	0.7219 ± 0.0147
4	2	50	20	5	10	0.7204 ± 0.0103
5	3	50	20	5	10	0.7138 ± 0.0084
6	4	10	20	5	10	0.7027 ± 0.0161
7	4	20	20	5	10	0.7015 ± 0.0114
8	4	30	20	5	10	0.7024 ± 0.0093
9	4	40	20	5	10	0.7036 ± 0.0080
10	4	50	10	5	10	0.7000 ± 0.0084
11	4	50	13	5	10	0.7000 ± 0.0084
12	4	50	17	5	10	0.7005 ± 0.0071
13	4	50	20	5	10	0.7005 ± 0.0071
14	4	50	20	1	10	0.6955 ± 0.0127
15	4	50	20	2	10	0.7038 ± 0.0095
16	4	50	20	3	10	0.7034 ± 0.0082
17	4	50	20	4	10	0.7013 ± 0.0075
18	4	50	20	5	2	0.6969 ± 0.0109
19	4	50	20	5	4	0.7038 ± 0.0083
20	4	50	20	5	6	0.7012 ± 0.0074
21	4	50	20	5	8	0.7005 ± 0.0071
22	3.5	40	20	4.5	10	0.7037 ± 0.0084

Summary

- Good agreement between SAMC and the data in each variable
- We need to remove edge effects (as seen in y_{tg} and ϕ_{tg}) when studying the acceptance
- Optimized cut set on all five target variables yields a weight factor of ~ 0.7

What's Next?

- Acceptance:
  - Extend study to all other kinematics
- Cross Section:
  - Apply new acceptance cuts and study the effects
  - Nitrogen:
    - Determine density and dilution factors
    - Calculate σ_N and compare to QFS
- Asymmtery
  - Need a fresh replay and skim – no helicity variable (currently)