LHRS Analysis for d_2^n

Data Quality and SAMC

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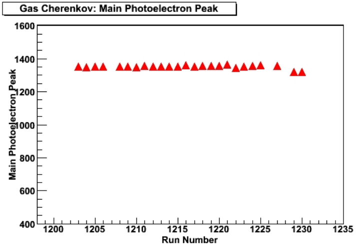
Outline

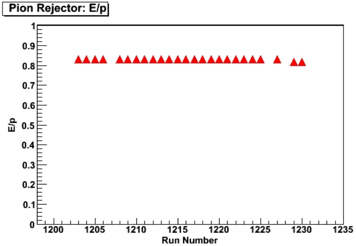
1. Data Quality
   - Farm Replay and Skimming Update
   - One-pass Data
   - Cut Performance Histories
   - Cut Efficiency Update
2. SAMC
   - Input Parameters
   - Acceptance Plots
3. Summary

Farm Replay and Skimming Update (1)

- Farm-replayed and skimmed on my machine at Temple:
  - Production data (positive and negative polarity)
  - One-pass ^{3}He data (negative polarity)
  - For single-arm runs < 20140, T3 trigger issue has been fixed
    - Shifted `DL.LT3` down from ~ 2000 to ~ 1000 channels so that it sits in the cut window for evtypebits
    - Stored original `DL.LT3` to ‘`skim_DL_LT3_old`’
- Farm-replayed:
  - Nitrogen data (positive and negative polarity)
  - One-pass ^{3}He data (positive polarity)

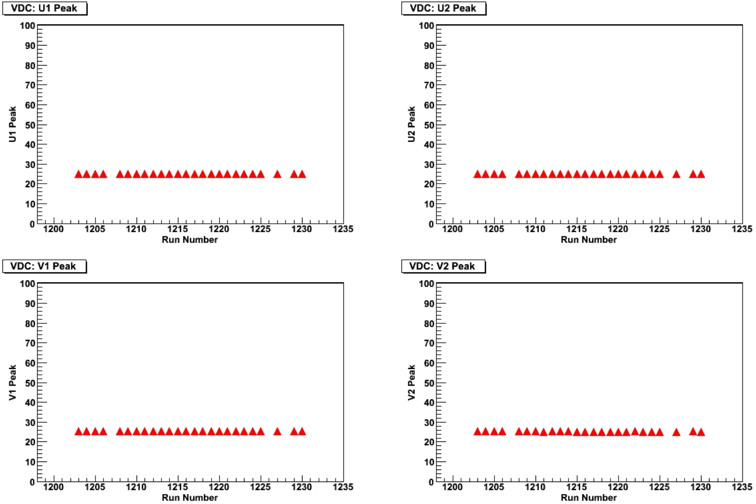
One-pass Data Quality [Negative Polarity] (1)



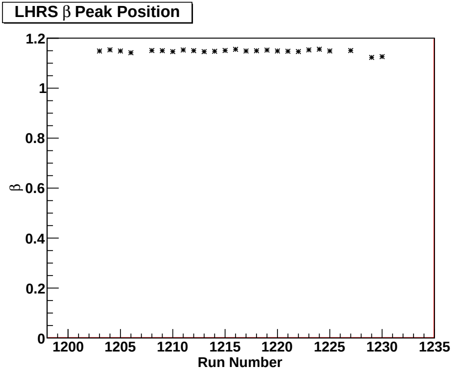


- No plot generated for the one p.e. peak
  - Dominated by the main p.e. peak
- Estimation of number of p.e.: $\sim 1375/200 = 6.88$ p.e.
  - In agreement with the rest of the data

One-pass Data Quality [Negative Polarity] (2)



One-pass Data Quality [Negative Polarity] (3)



- Mean and standard deviation:

$$\mu = 1.1479$$
$$\sigma = 0.0075$$

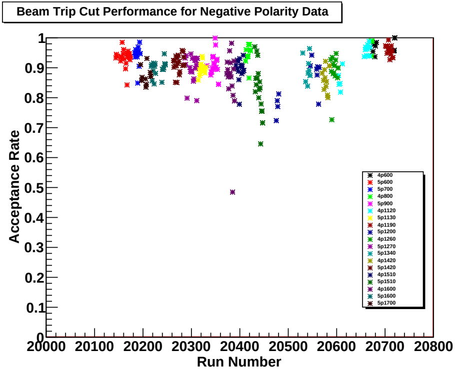
- Inelastic production data:

$$\mu = 1.0844$$
$$\sigma = 0.0085$$

Cut Performance History (1)

Beam Trip Cut

- Define the baseline cut: `L.tr.n>0`
- The beam trip cut: baseline + `skim_beam_trip==0`

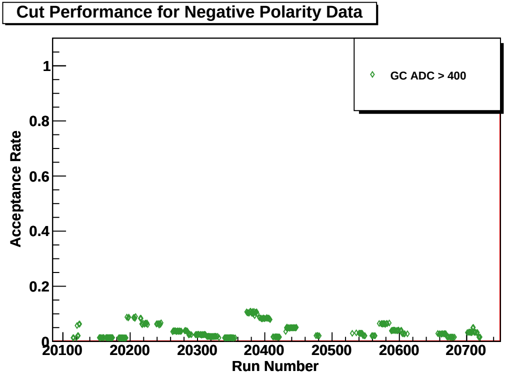


- Run 20385: 6–7 minutes, ‘long’ trip in the middle (possibly throw it out?)
- Runs 20431–20447, 20476–20481: very noisy period, large number of trips per run; affects $p = 1.51$ GeV (4- and 5-pass) data

Cut Performance History (2)

Gas Čerenkov Cut Performance

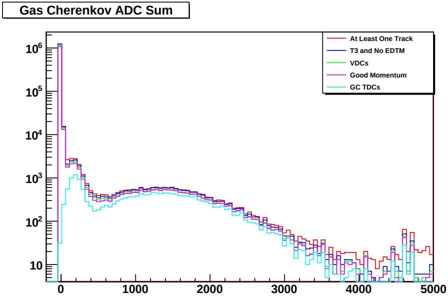
- Define the baseline cut: `L.tr.n>0`
- The GC cut: `L.cer.asum_c>400` (2 p.e.)



Cut Performance History (3)

Gas Čerenkov ADC Sum: $p = 0.6\ \mathrm{GeV}$, 4-pass

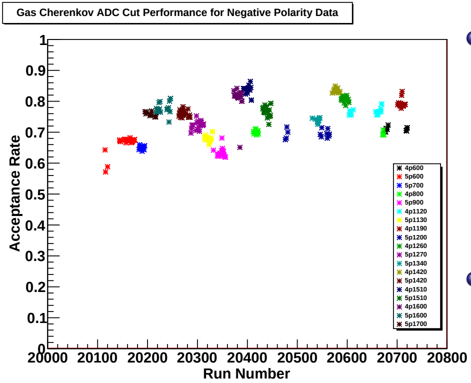
- Why is the acceptance rate so low?
  - It's clear that the peak (pedestal) at zero is the cause
  - Such events are outside our TDC cut windows



- What does it mean to study the acceptance rate of the GC cut?
  - Need a proper definition of the sample
  - When examining the GC, we need to examine events that fall in the TDC cut window

Cut Performance History (4)

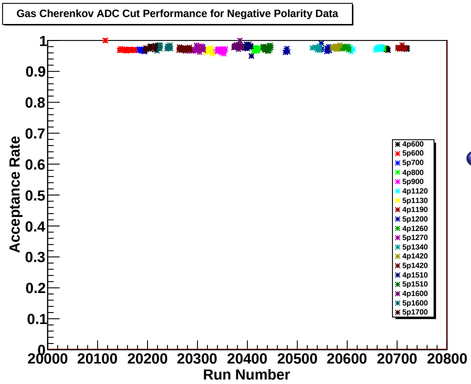
Gas Čerenkov Cut Performance: Revised



- The baseline cut:
  1. At least one track
  2. T3 Trigger (and no EDTM)
  3. VDC
  4. Good momentum
  5. GC TDC
- Some momentum dependence here due to π^- contamination

Cut Performance History (5)

Gas Čerenkov Cut Performance: Revised



- Choosing a sample of good e^- as the baseline
  - E/p, PRL1 cuts

Efficiencies for the New Kinematics (1)

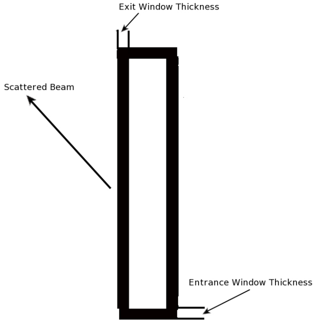
Gas Čerenkov, Pion Rejector E/p, T3 Trigger, VDC One Track and β

Cut Efficiencies for New Kinematics					
p (GeV)	GC	E/p	T3	One Track	β
0.70	96.44 ± 0.84	99.24 ± 0.61	99.95 ± 0.01	99.28 ± 0.56	99.96 ± 0.47
1.12	97.30 ± 1.52	99.54 ± 1.11	99.95 ± 0.01	99.16 ± 0.82	99.95 ± 0.86
1.19	97.87 ± 1.51	99.74 ± 1.06	99.94 ± 0.01	99.04 ± 0.79	99.97 ± 0.82
1.26	98.14 ± 1.25	99.64 ± 1.16	99.98 ± 0.01	99.08 ± 0.92	99.93 ± 0.90

- Efficiencies obtained by combining all runs together for a specific kinematic bin in p
- Results are consistent with previous calculations for all other kinematics
- Errors shown are statistical

SAMC (1)
Input Parameters

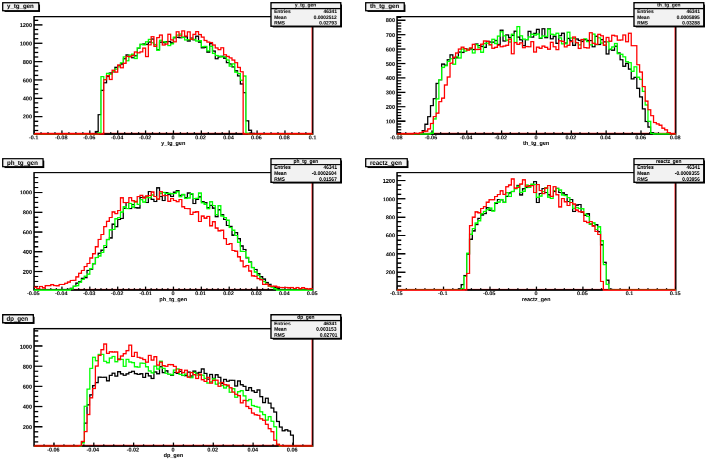
Target Window Thicknesses: Before and After			
Entrance Window (cm)	Exit Wall (cm)	Entrance Window (cm)	Exit Wall (cm)
0.1660	0.1660	0.0121	0.1660



- The old thicknesses were just an average of the thickness measurements of the cell wall
- Now use the entrance window of the cell
- These thicknesses are converted to $\mathrm{g/cm^2}$ by: $t' = \rho t$

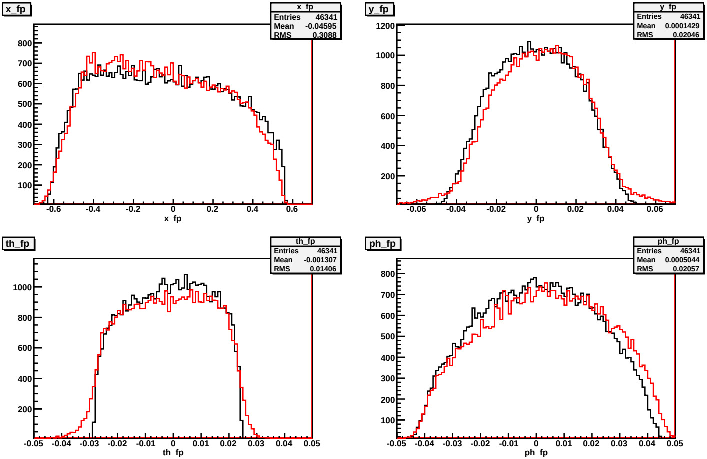
SAMC (3)

Results: Last Time (Wrong Entrance Window Thickness, $L = 131$ cm) [Target]



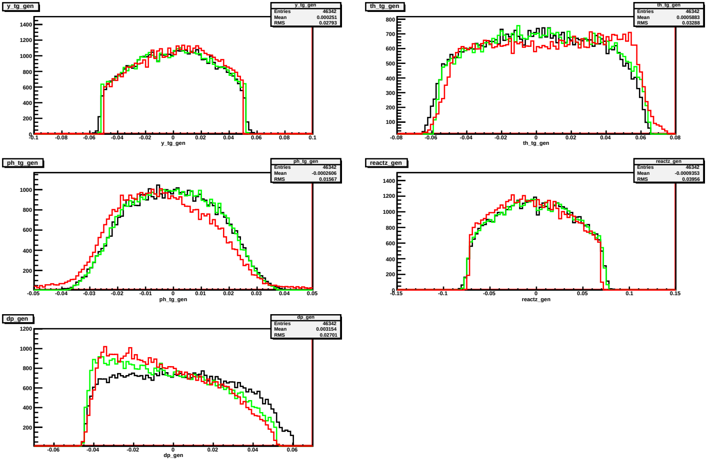
SAMC (4)

Results: Last Time (Wrong Entrance Window Thickness, $L = 131$ cm) [Focal Plane]



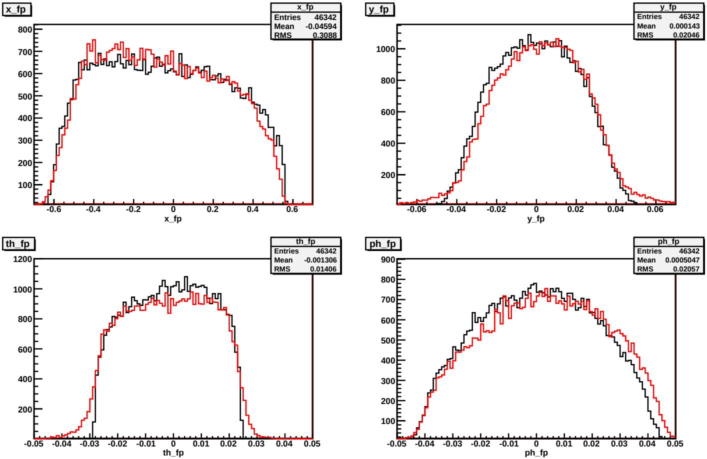
SAMC (5)

Results: Correct Window Thicknesses, $L = 131$ cm [Target]



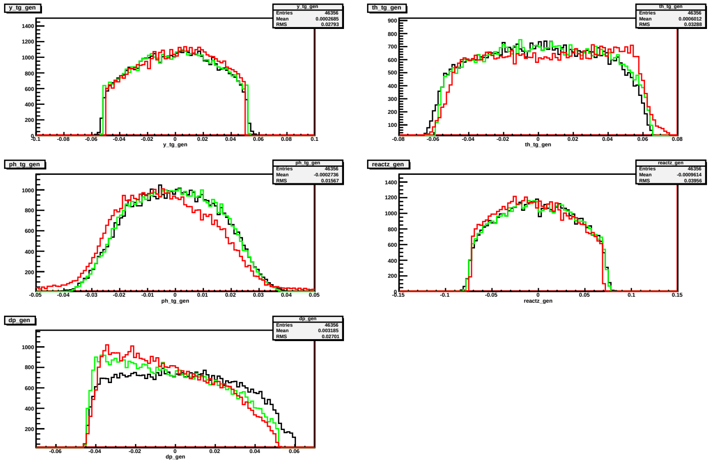
SAMC (6)

Results: Correct Window Thicknesses, $L = 131$ cm [Focal Plane]



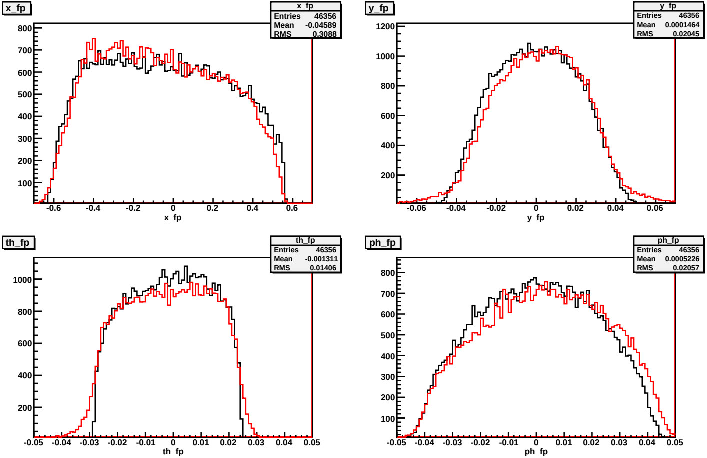
SAMC (7)

Results: Correct Window Thicknesses, $L = 141\ \mathrm{cm}$ [Target]



SAMC (8)

Results: Correct Window Thicknesses, $L = 141$ cm [Focal Plane]



Summary

- Data Quality:
  - One-pass data looks good
  - New kinematic points look good
  - Beam trip cut performance looks good
  - GC Cut performance looks good after choosing a proper sample
  - Inelastic Production data quality is complete
- SAMC:
  - Correct input parameters are set
    - No major changes to the observed distributions for target and focal plane variables
- Cross section code:
  - Fully debugged!
  - Beam charge database created and integrated into code

What's Next?

- SAMC:
  - Need to understand distribution of $\delta p/p$ (reconstructed) variable
  - Run simulation for a lot more events (only 60k used here)
- Data Quality:
  - Beam trip study, skim and data checks:
    1. One-pass ^{3}He positive polarity data
    2. Nitrogen data
  - Start shifting skimmed files over to the d2n machine
  - Cut performance histories:
    1. PR E/p