

Beam Single-Spin Asymmetry Progress

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KaonLT meeting

University of Regina

KaonLT Experiment, Jefferson Lab Hall C



University
of Regina



- Replayed data $Q^2=3$, $W=2.32$, SHMS centre, high ϵ with class THcHelicity in hcana
- Created analysis script that splits output into positive and negative helicity trees
- Picked PID cuts for this setting
- Created asymmetry plots!



- Goodstarttime ==1
- InsideDipoleExit == 1

Variable	Low	High
H_gtr_dp	-8	8
P_gtr_dp	-10	20
H_xpfp	-0.08	0.08
H_ypfp	-0.045	0.045
P_xpfp	-0.06	0.06
P_ypfp	-0.04	0.04
RF_TDist	0	4.008



Plots available on request...

e^- in HMS:

- $H_cal_etottracknorm > 0.8$
- $H_cer_npeSum > 1.5$
- $abs(H_gtr_beta - 1) < 0.2$

π^+ in SHMS:

- $P_cal_etottracknorm > 0.05$
- $P_aero_npeSum > 1.5$
- $abs(P_gtr_beta - 1) < 0.5$



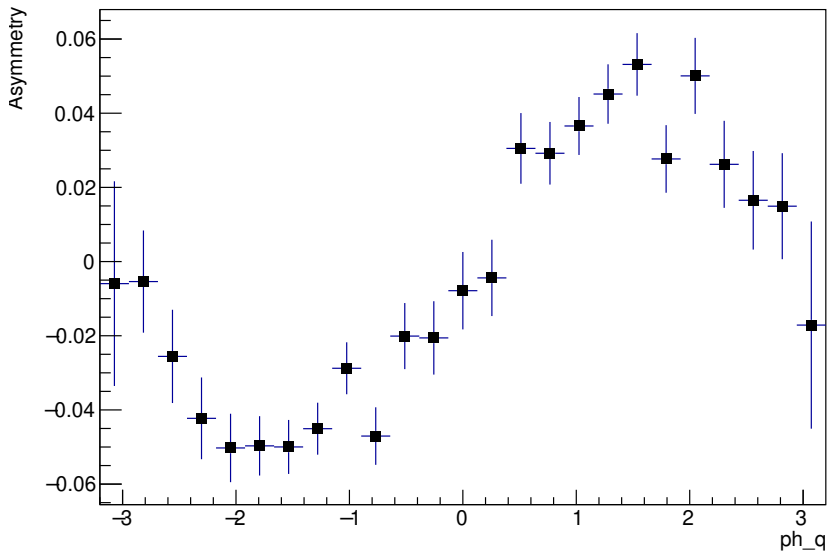
Technically, the asymmetry is:

$$BSA = \frac{1}{P} \left(\frac{\sigma^+ - \sigma^-}{\sigma^+ + \sigma^-} \right)$$

I am plotting:

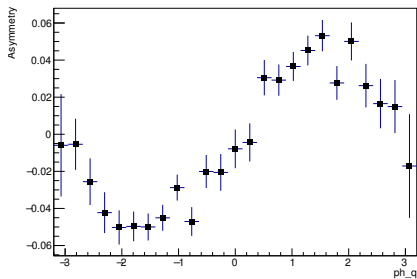
$$A = \frac{Y^+ - Y^-}{Y^+ + Y^-}$$

I have included PID cuts and prompt-random subtraction, but haven't done dummy target subtraction yet

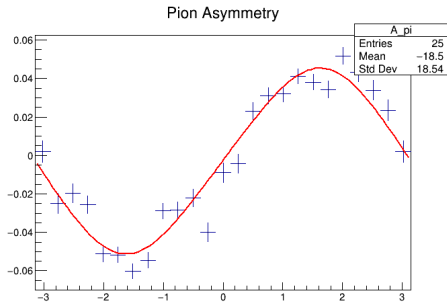


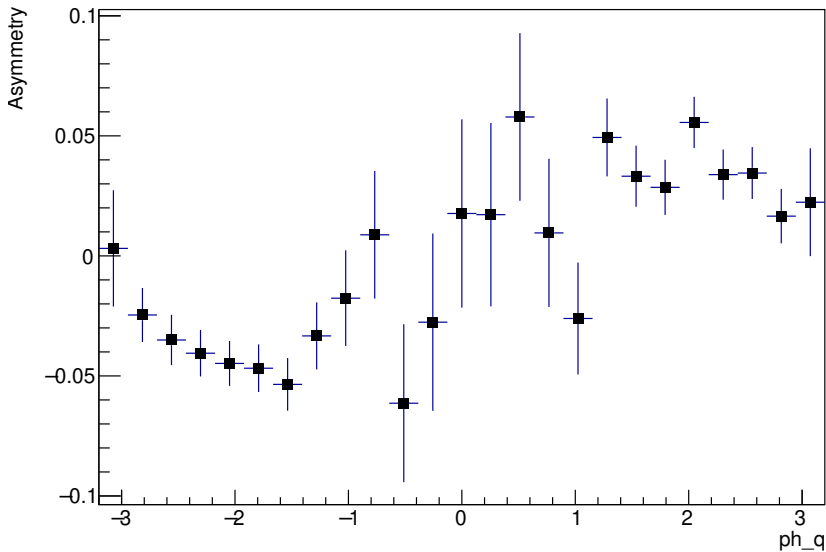


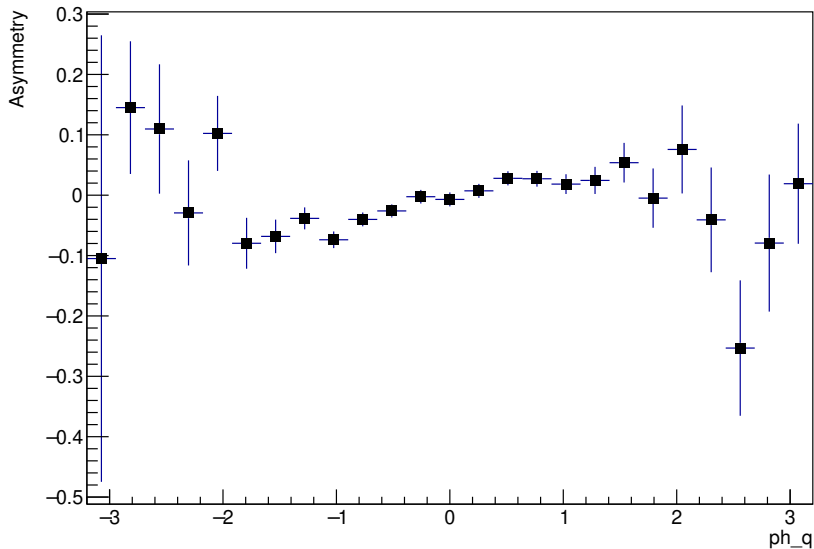
Alicia, 2022:



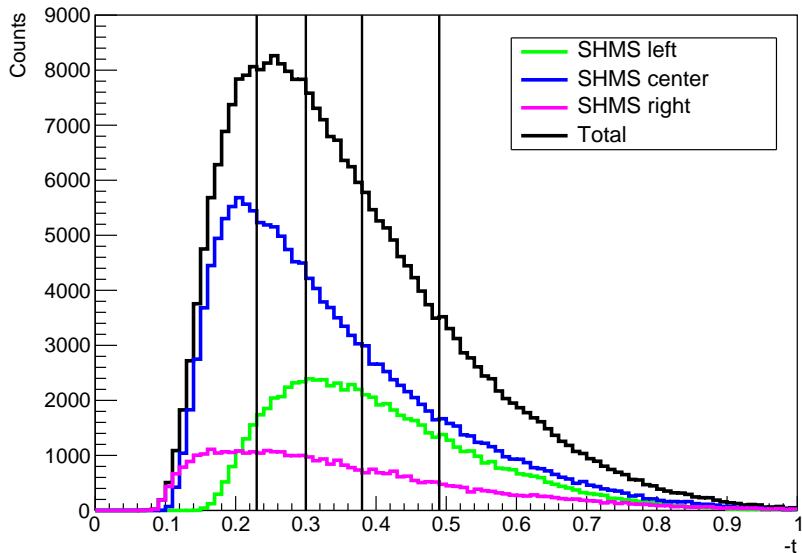
Steve Wood, 2018:

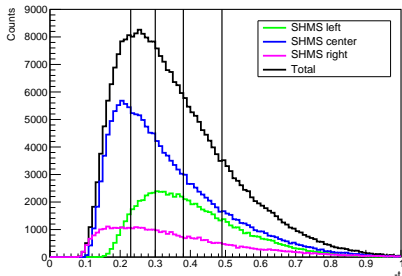






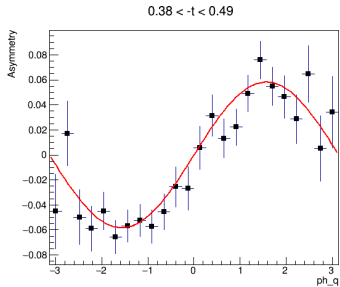
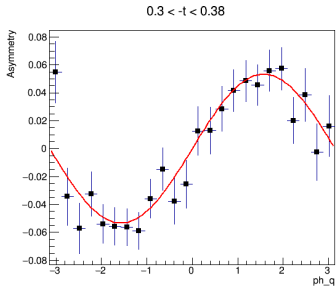
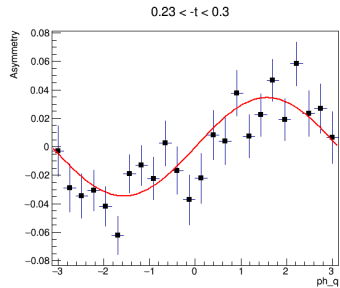
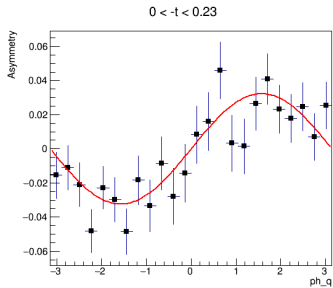
Choosing t-bins





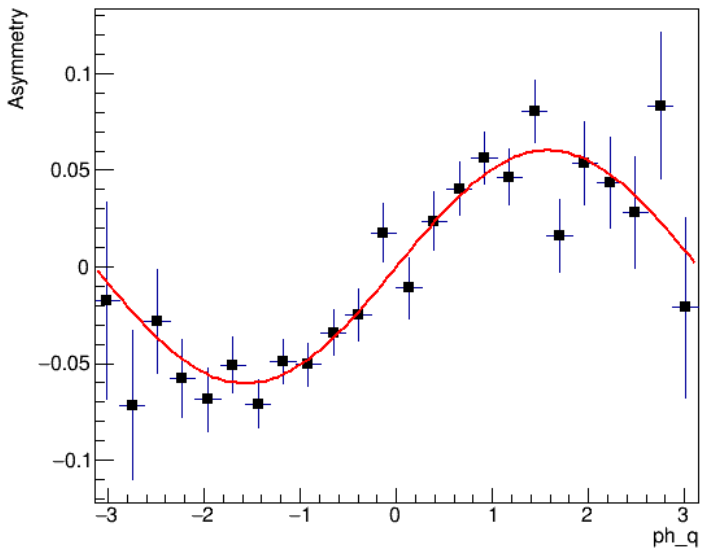
	Range in $-t$	Events
1	0–0.23	56844
2	0.23–0.3	56393
3	0.3–0.38	55950
4	0.38–0.49	53528
5	0.45–1	57306

- Prioritized equal number of events over equal bin width
- Can change this easily
- Plotting for sum of SHMS left, center, right data → not properly combined



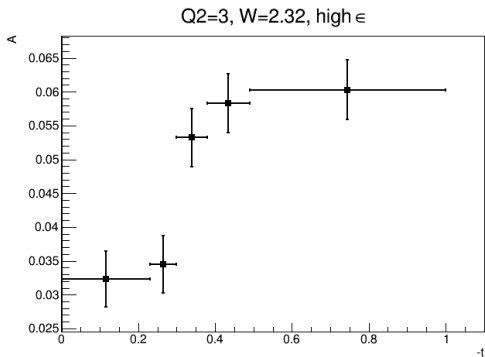


$0.49 < -t < 1$



$$\text{Asymmetry} = A \sin \phi$$

Plot A as a function of $-t$:





Next steps:

- Explore t-binning based on suggestions made
- Sum SHMS left, centre, right
- Dummy target subtraction
- Edit report files

EXTRA SLIDES

Missing Mass Cut

