Asymmetry in Kaon momenta

$\gamma p \rightarrow K^+K^-p$

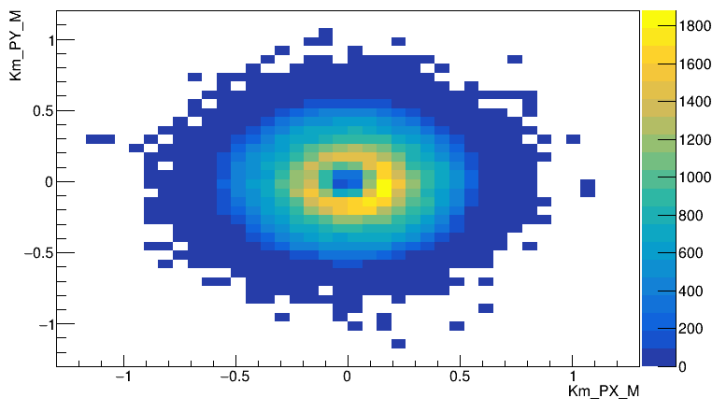
Contains all of Run 11366 and Run 11367
Loose timing cuts
A cut of 1.23 GeV on the invariant mass of K^+K^-
Missing Mass Squared Cut: .08 GeV^2

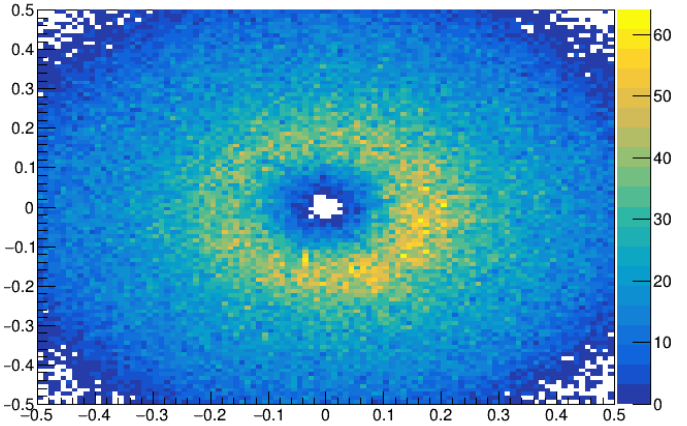
Note: The asymmetries exist in the fitted quantities but shown here are only the measured values that pass the cuts (including a kinematic fit cut)

550996
events

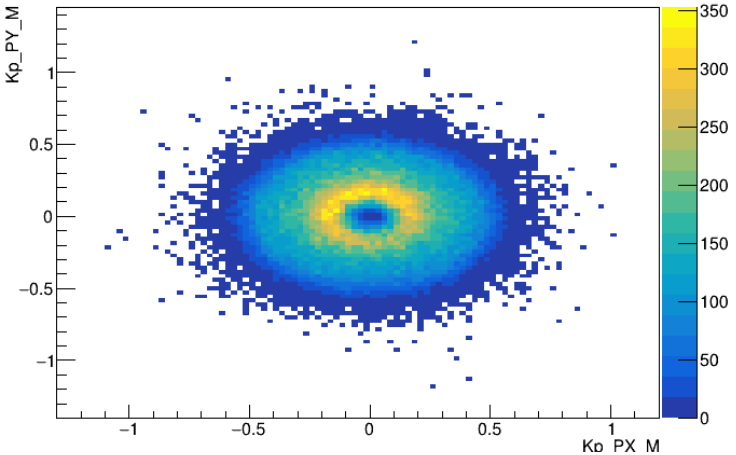
A First Look

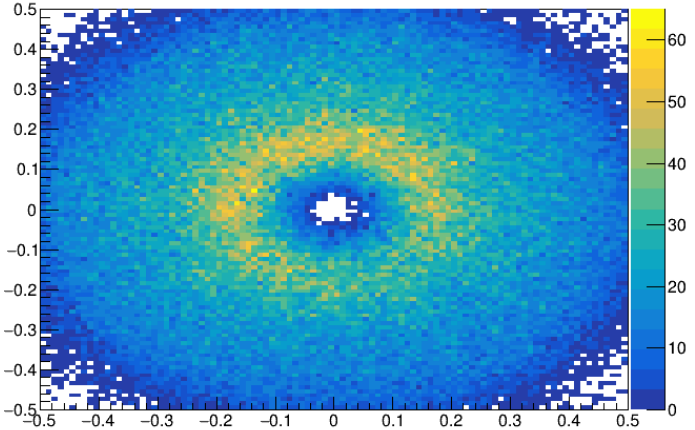
K^-



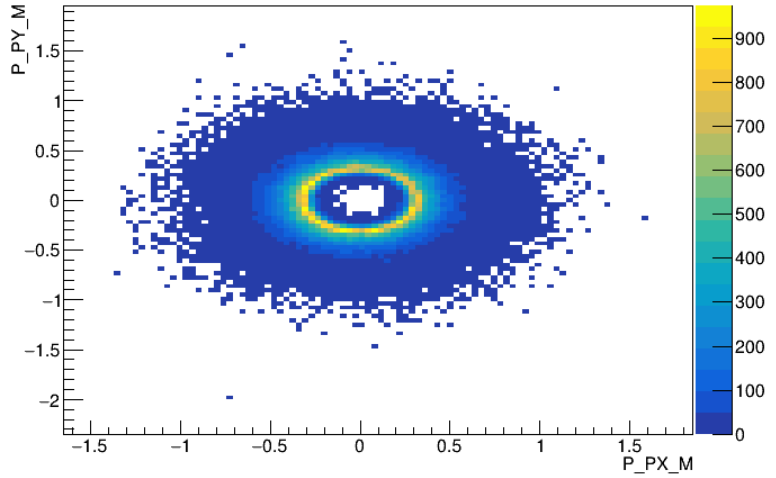


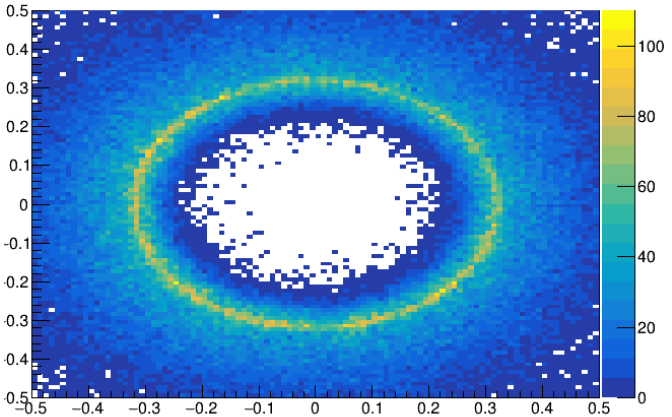
K^+





p





Clear asymmetry in the distribution of the x and y momenta of the Kaons

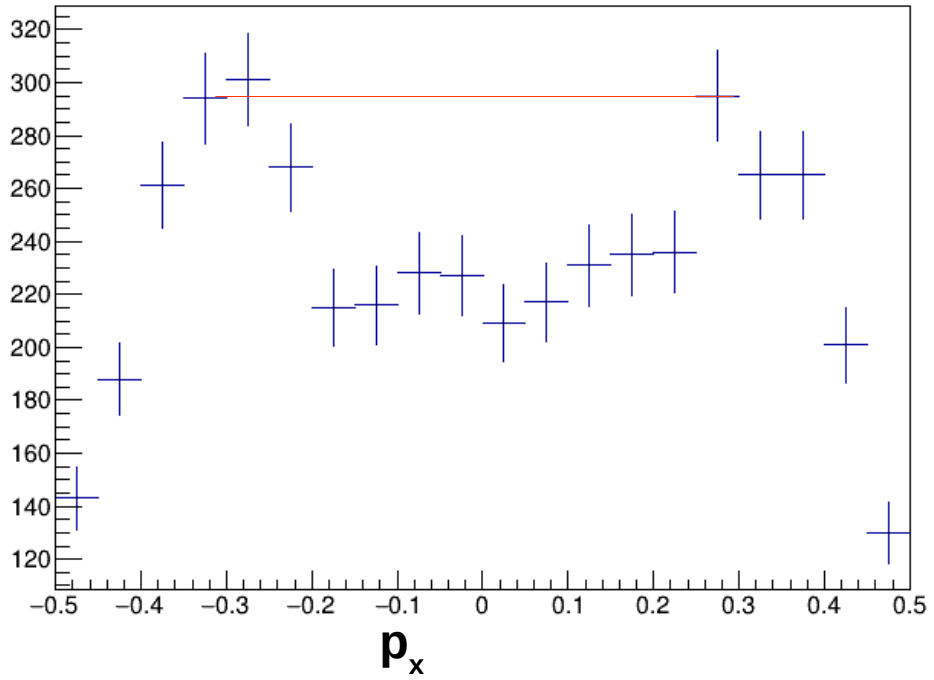
Not present in the recoiling proton

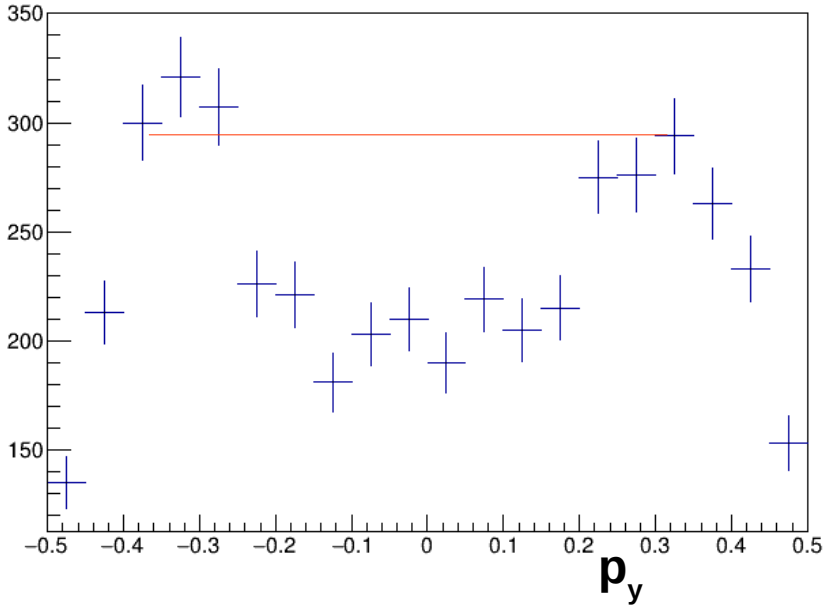
Requiring θ>10°

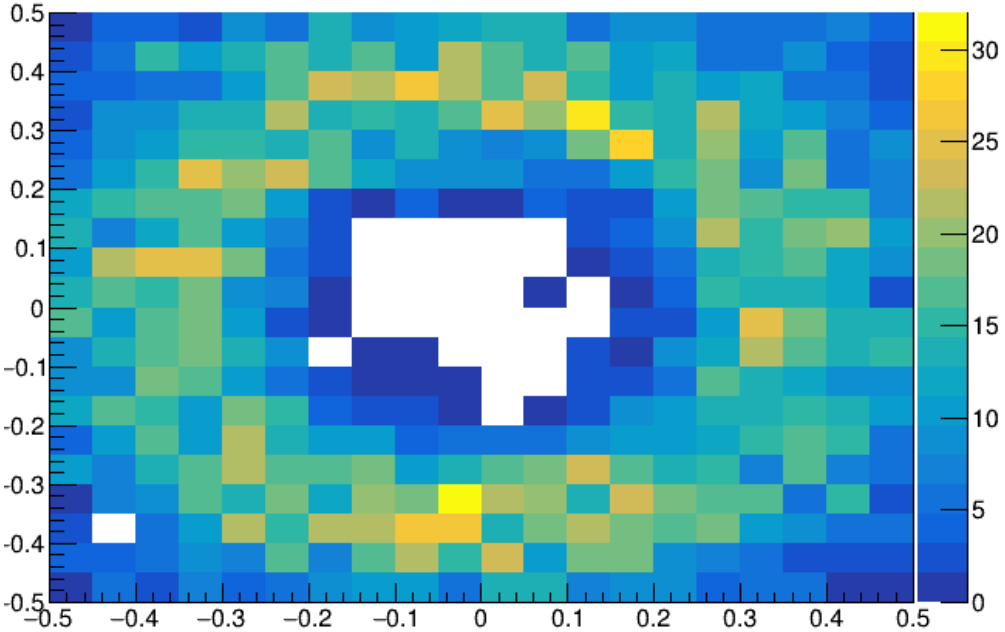
5144 events

K^+

Dropping very forward Kaons we see the asymmetry almost vanish. This indicates the asymmetry comes from the FDC.





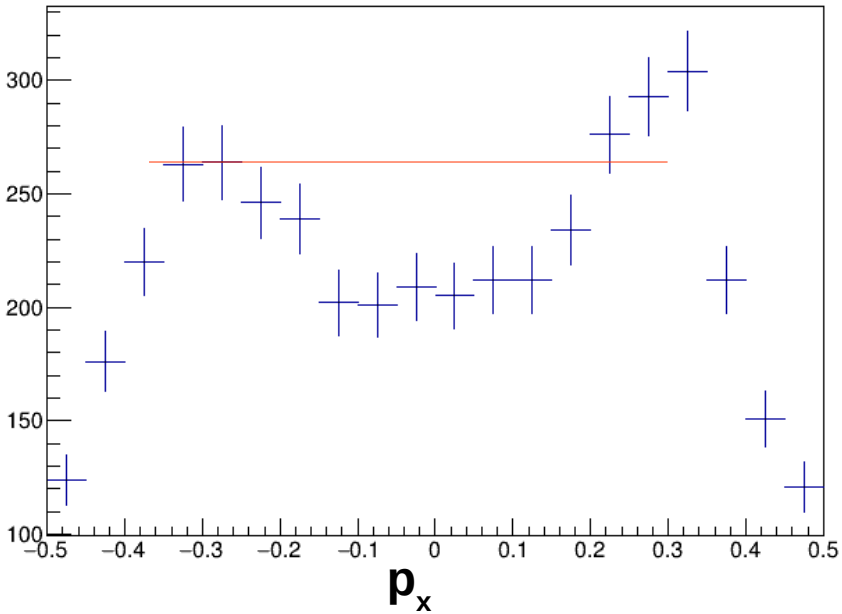


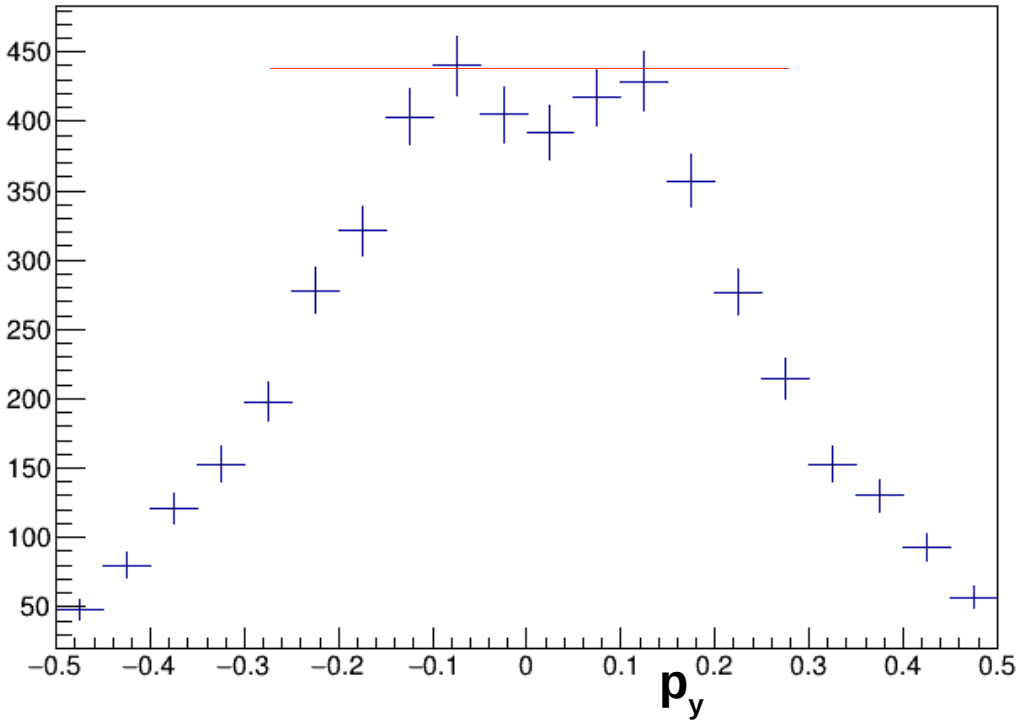
K^-

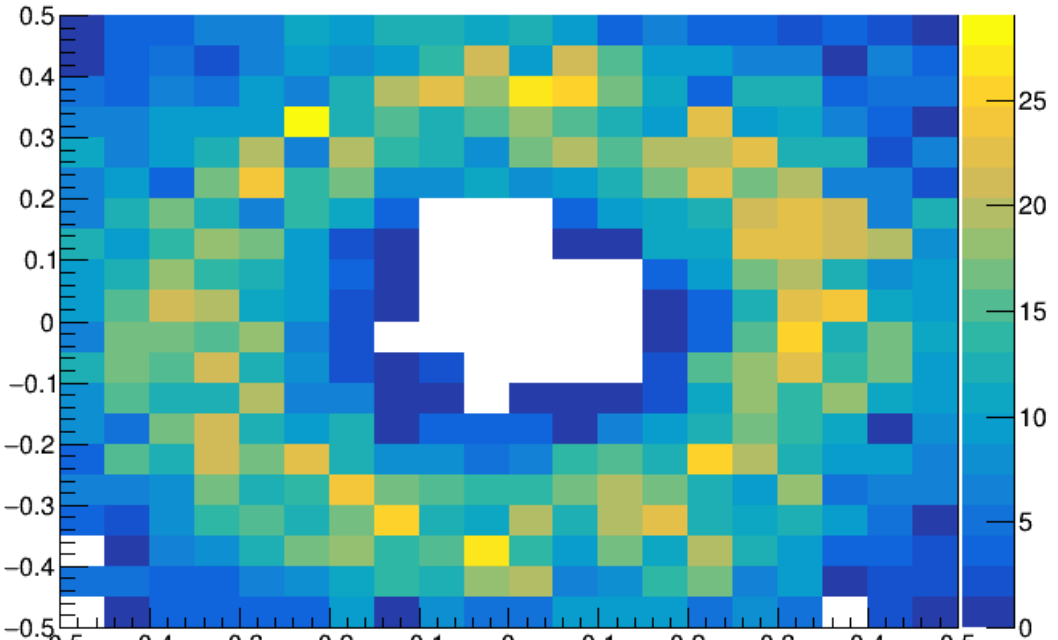
Requiring θ>10º

4762 events

The Y asymmetry vanishes in this case, but there still exists a small X asymmetry but it is not significant.



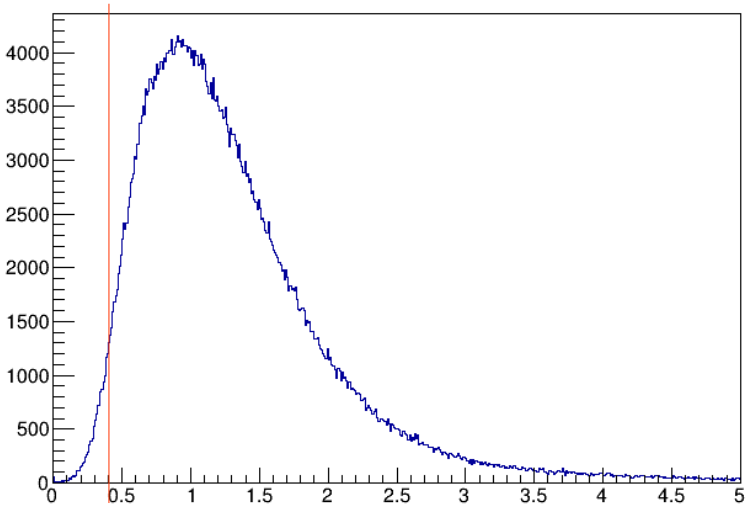




K^-

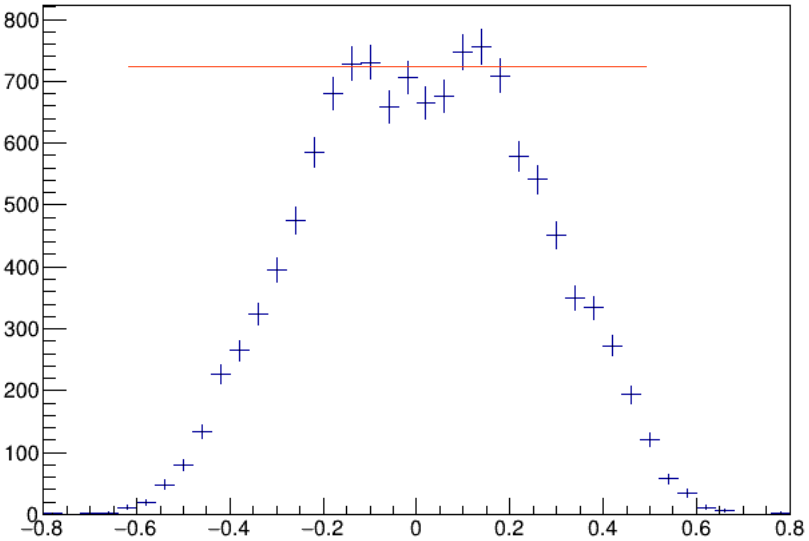
$X^2/ndf < 0.4$

12583 events

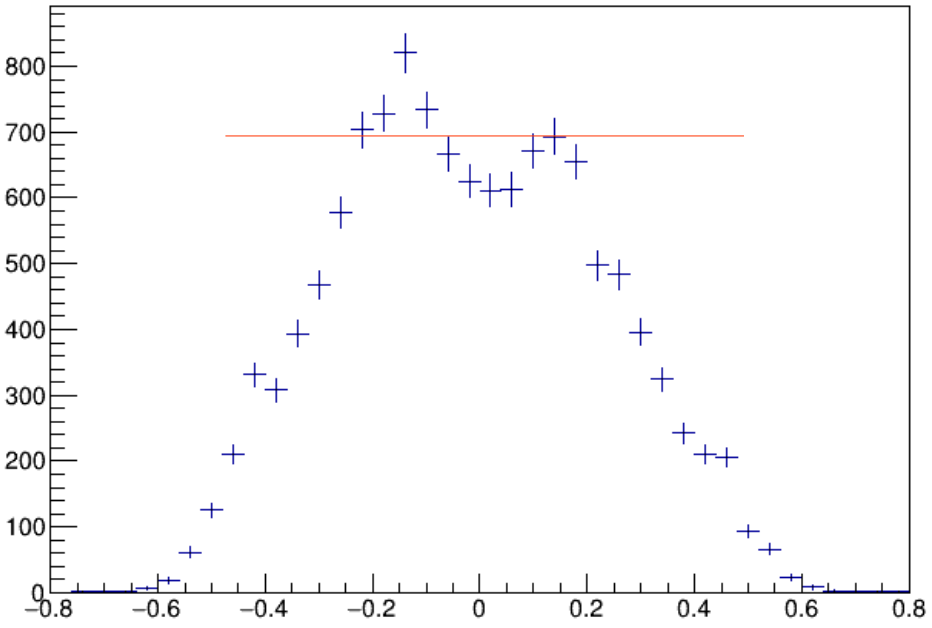


X^2/ndf

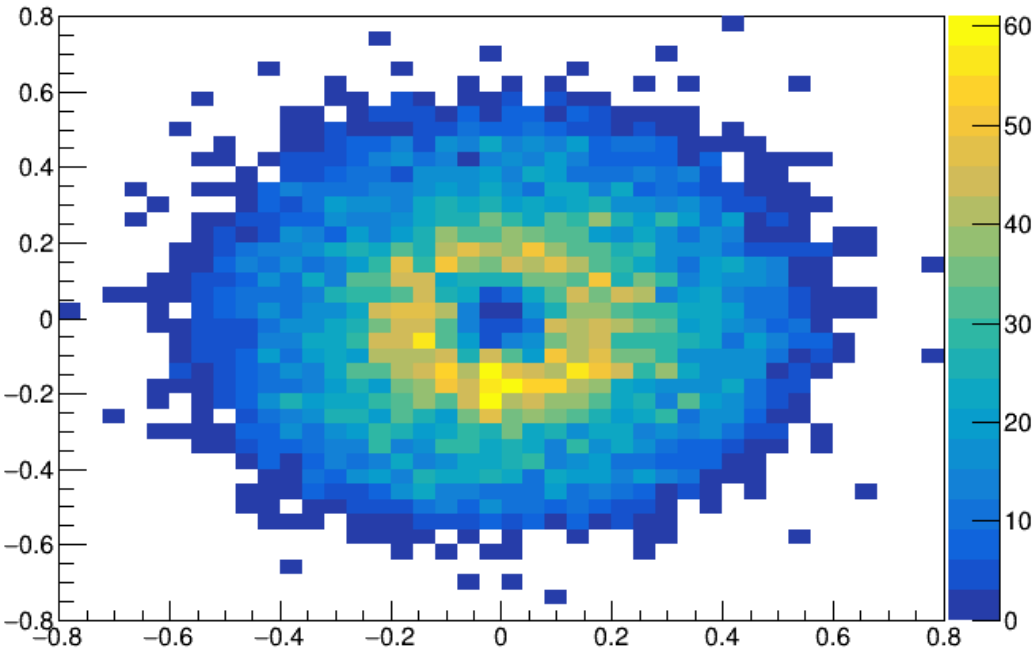
Even with a harsh cut on tracking X^2/ndf we still see a slight asymmetry in p_y



p_x

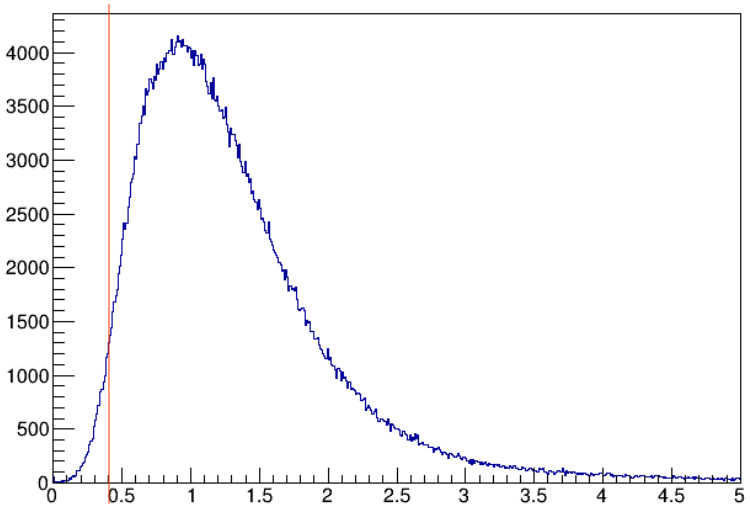


p_y

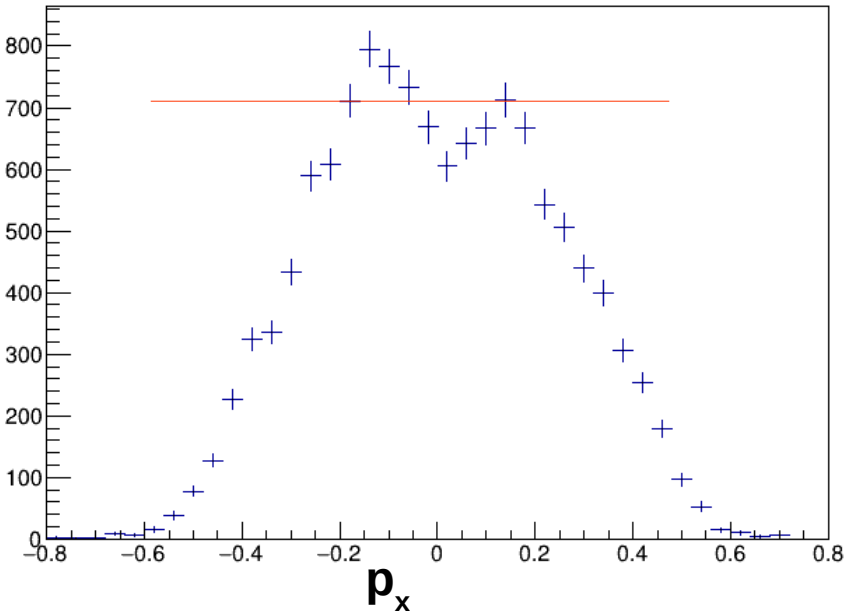


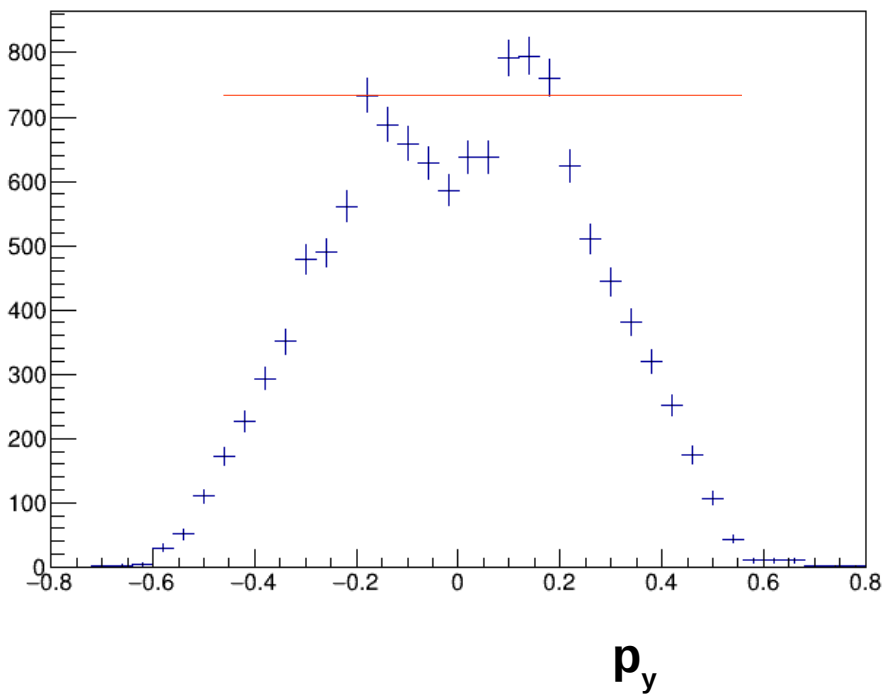
K^+

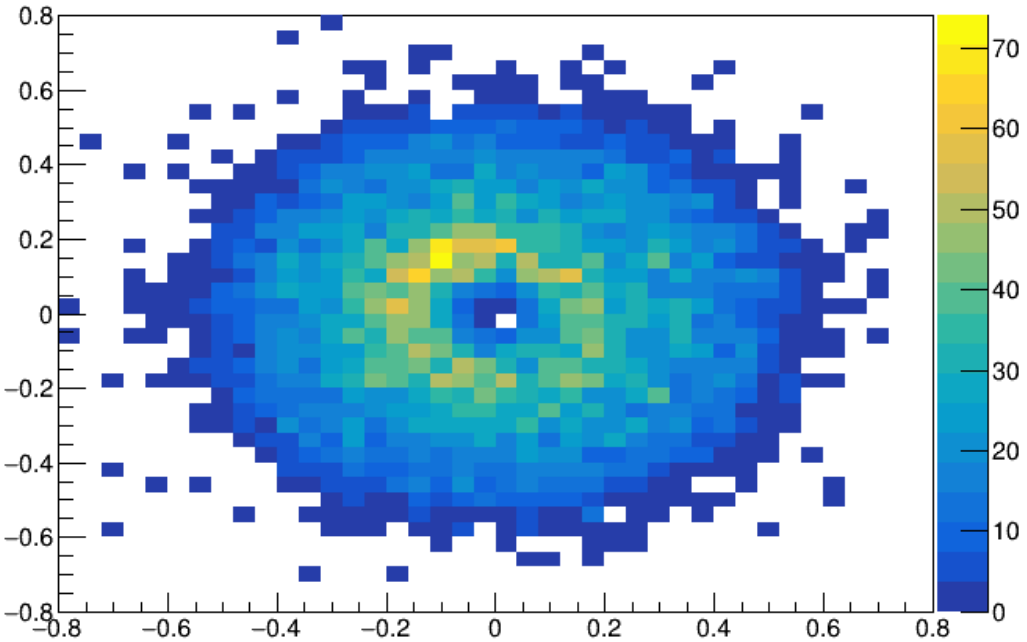
$X^2/ndf < 0.4$



Even with a harsh cut on tracking X^2/ndf we still see a slight asymmetry with p_x being a little bit worse





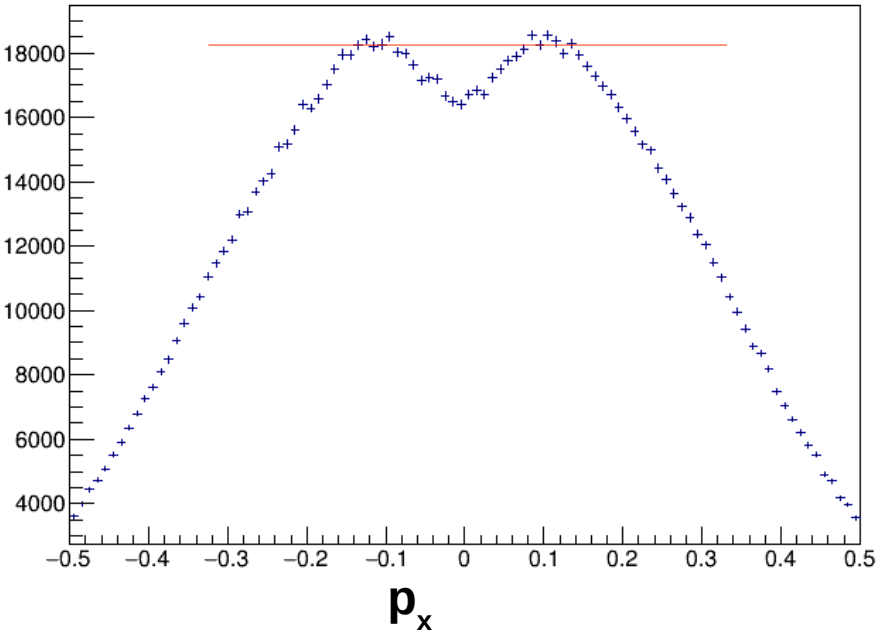


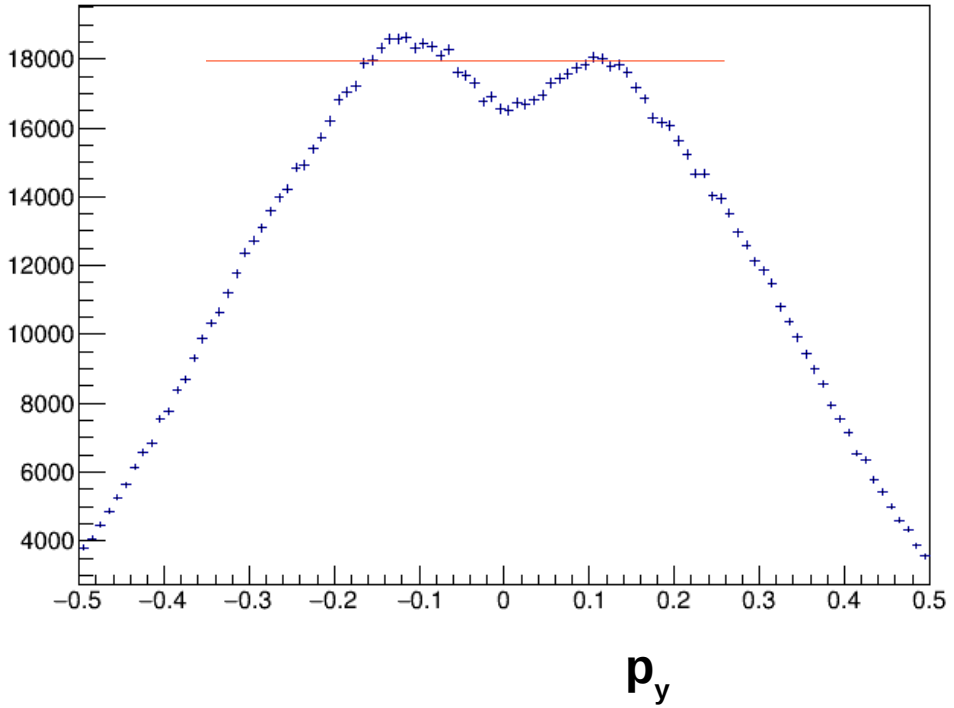
noKinfit

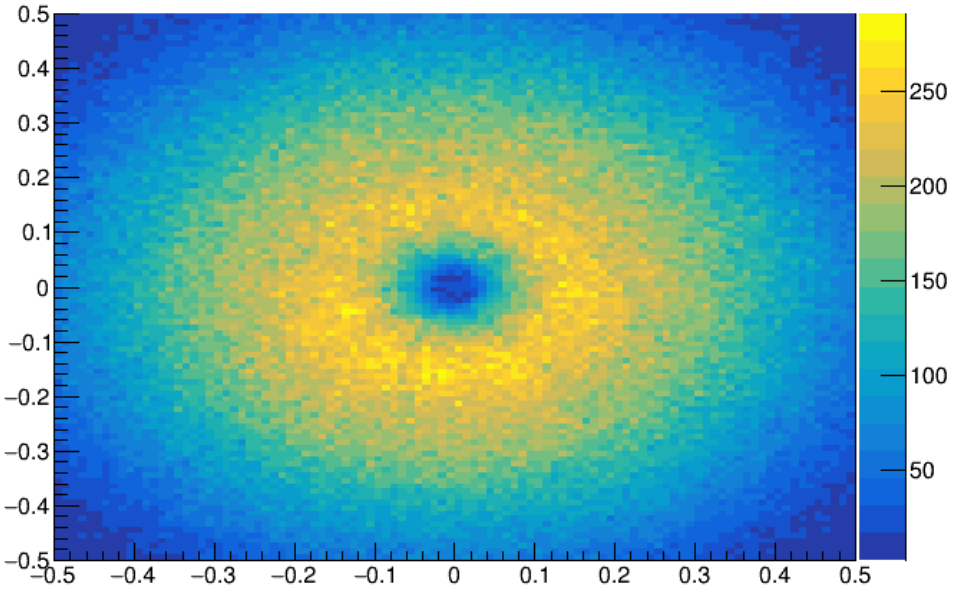
1345650 events

K^-

Only p_y asymmetry



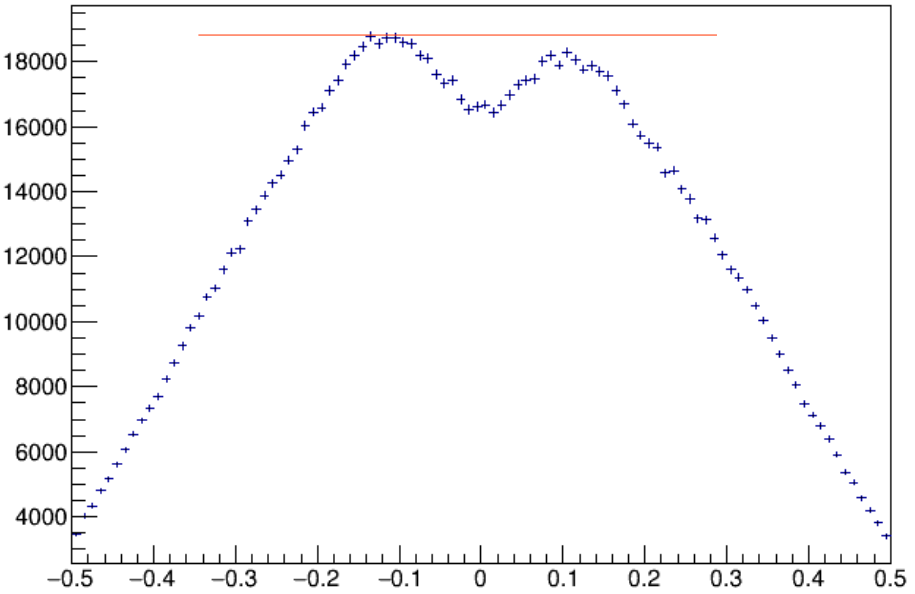




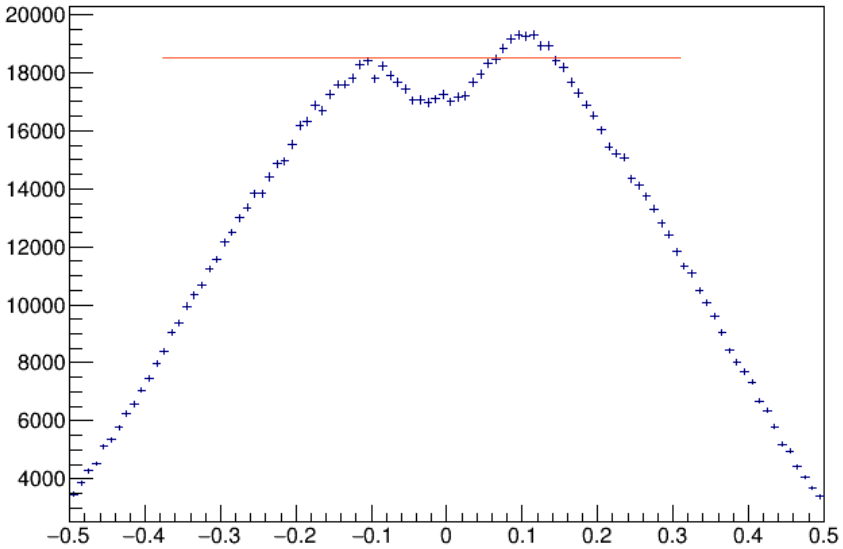
noKinfit

1345650 events

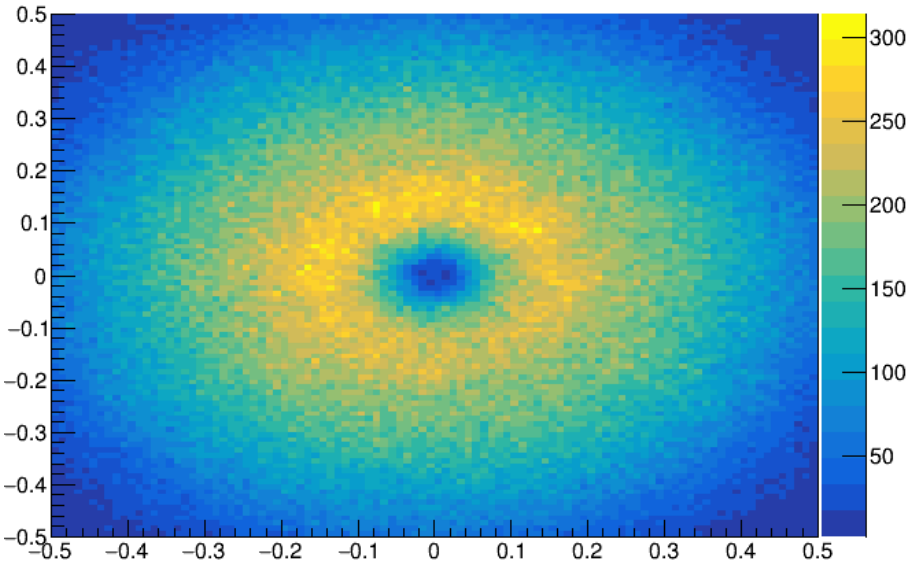
K^+



p_x



p_y



Overall

- There exists an asymmetry in the Φ distribution for both kaons. This asymmetry is complementary such that the Φ distribution of Φ in $\Phi \rightarrow K^{+}K^{-}$ is symmetric.
  - The K+ and K- distributions tend to have the opposite asymmetries (+ vs – or p_x vs p_y)
- Getting rid of very forward tracks seems to remove most of this asymmetry, though not all.
- Asymmetry exists even with very harsh X^2/ndf tracking cuts, though not necessarily in both X and Y.
- The same asymmetry exists in both Para and Perp, so it does not appear to be directly related to the two runs used.
- The same asymmetry exists with tight cuts on the FOM of the fit, so if it is related to the fitter (or the data the fitter uses) it is independent on the CL cut used
  - When the Kinematic fitter is not required at all the asymmetry still exists though less so in K^- p_x
  - Similar exclusion of forward tracks or restrictions in X^2/ndf yield similar results though I did not have time to include the plots here