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 $K^+ K^-$
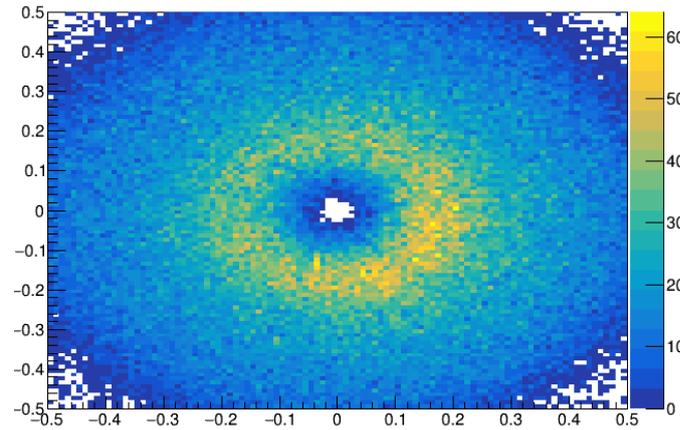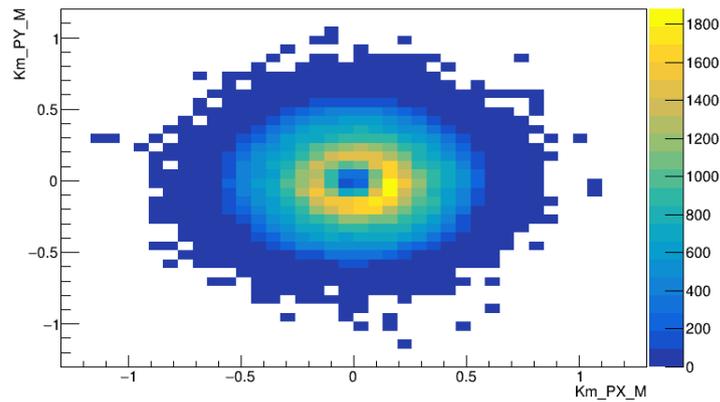Missing Mass Squared Cut: .08 GeV^2

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)
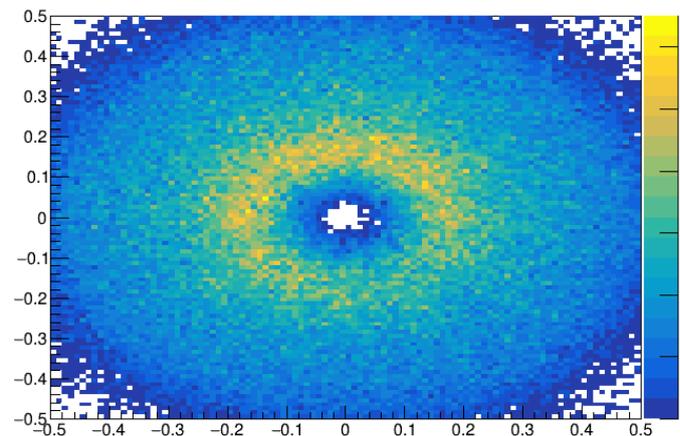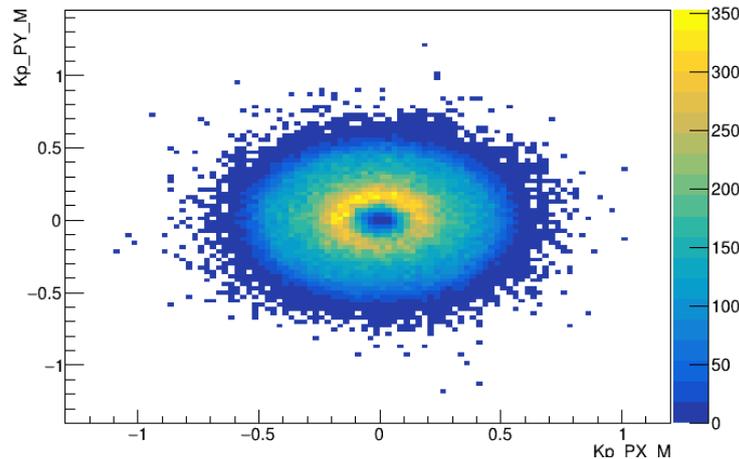
A First Look

K⁻

K⁺

p

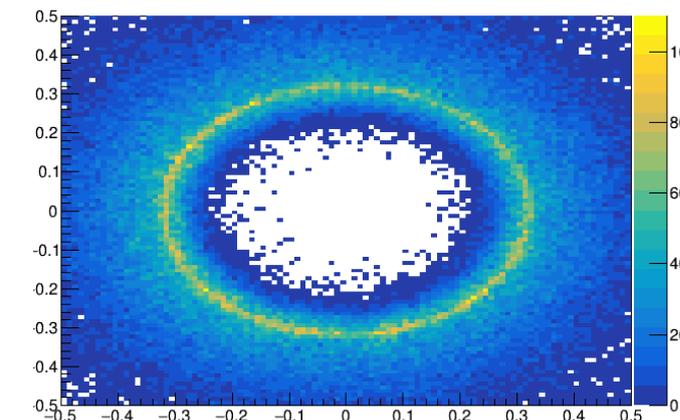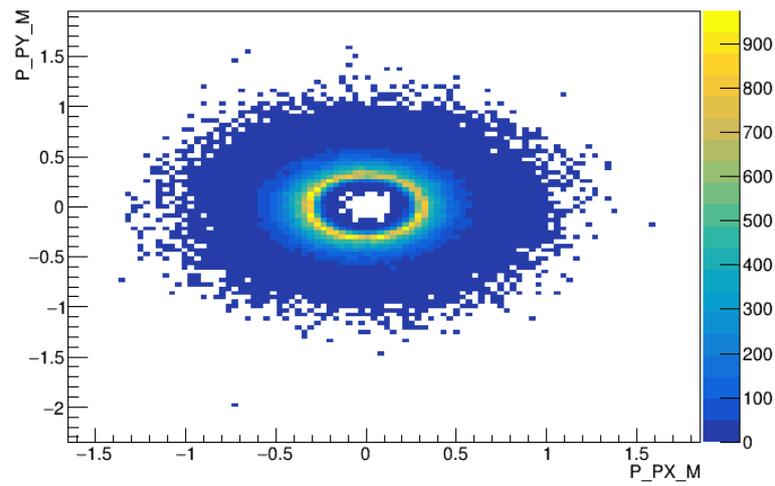Clear
asymmetry
in the
distribution
of the x and
y momenta
of the Kaons
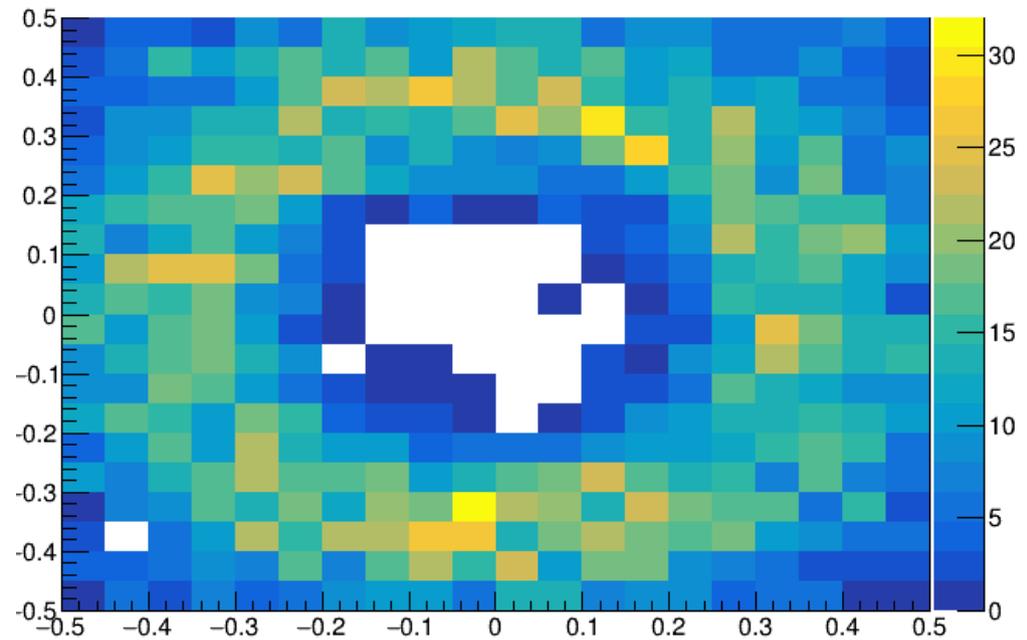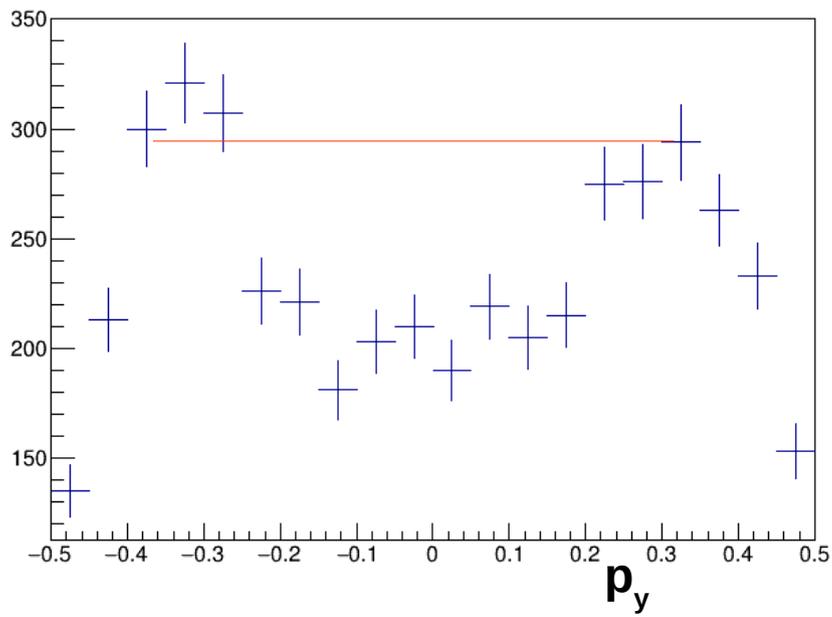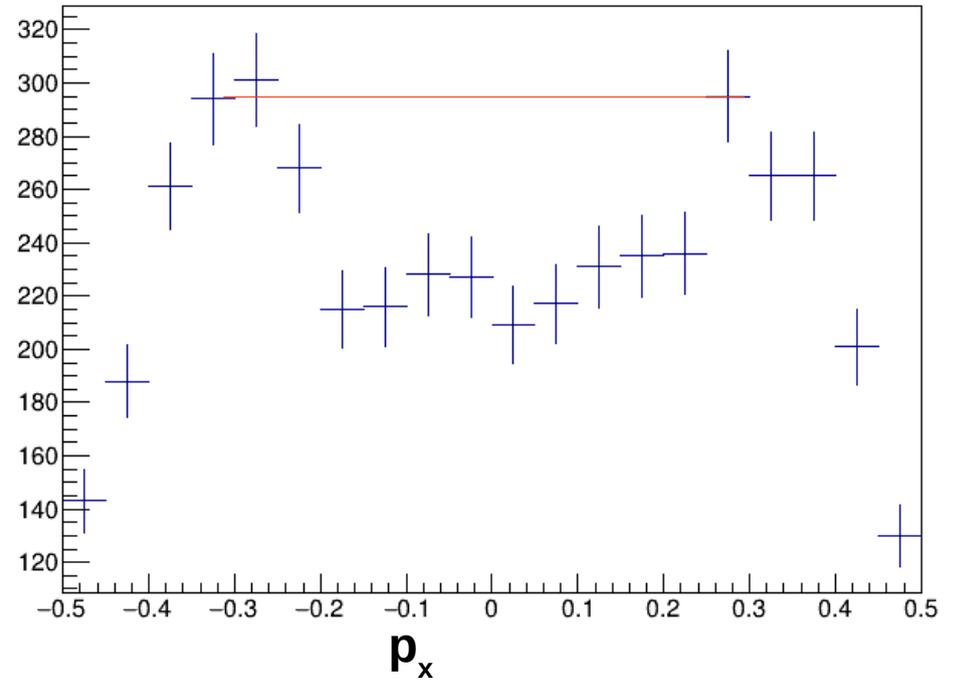
Not present
in the
recoiling
proton

5144 events

K+

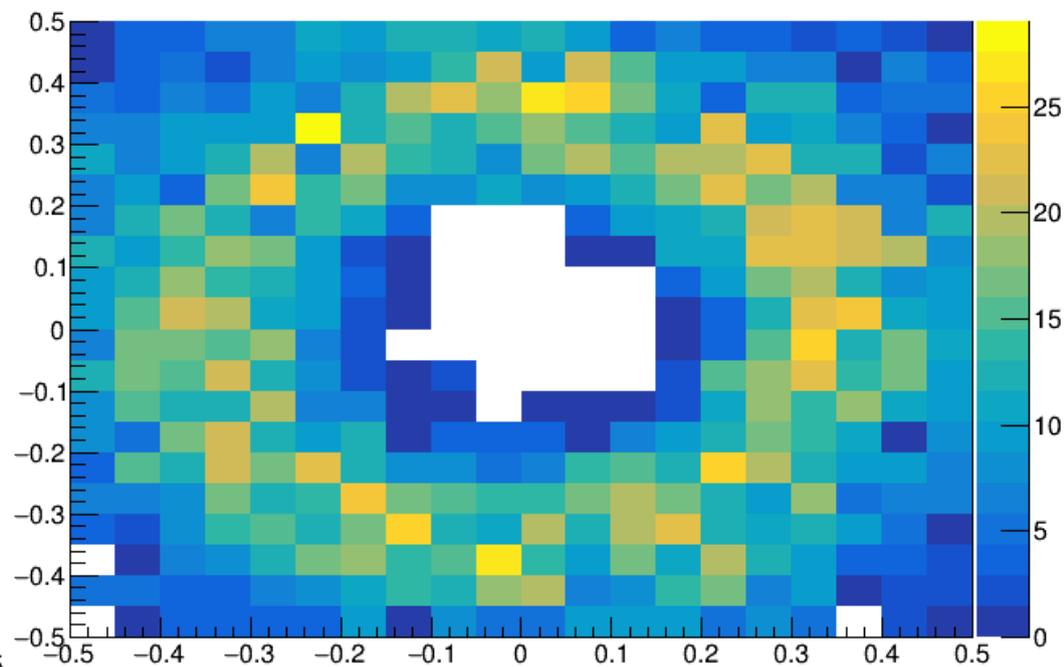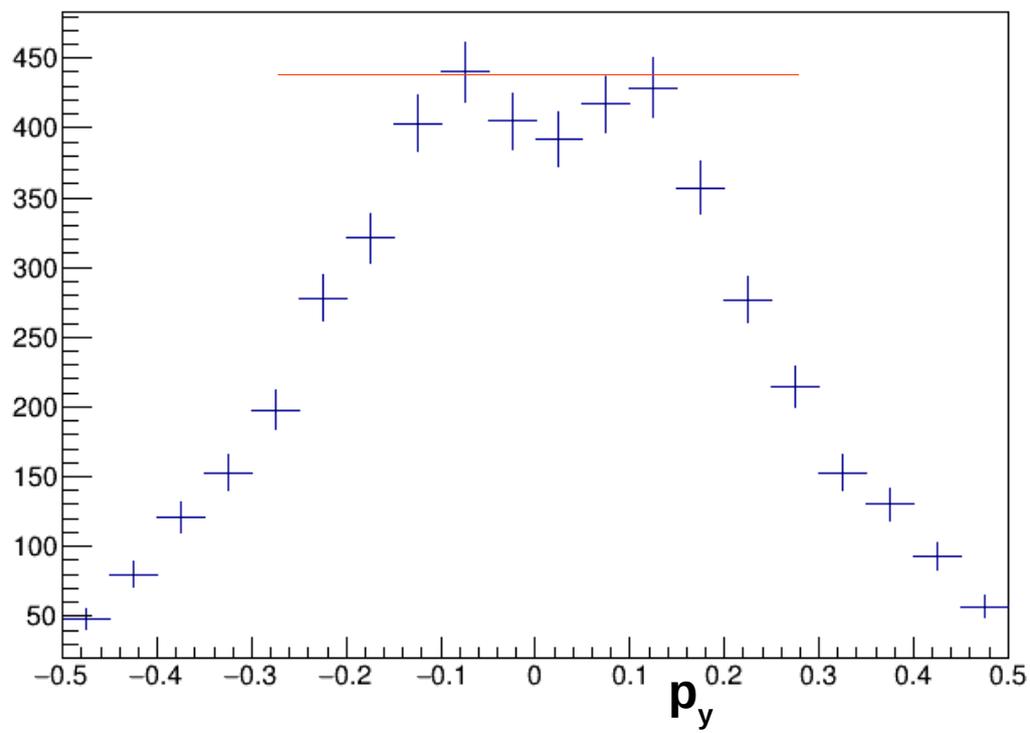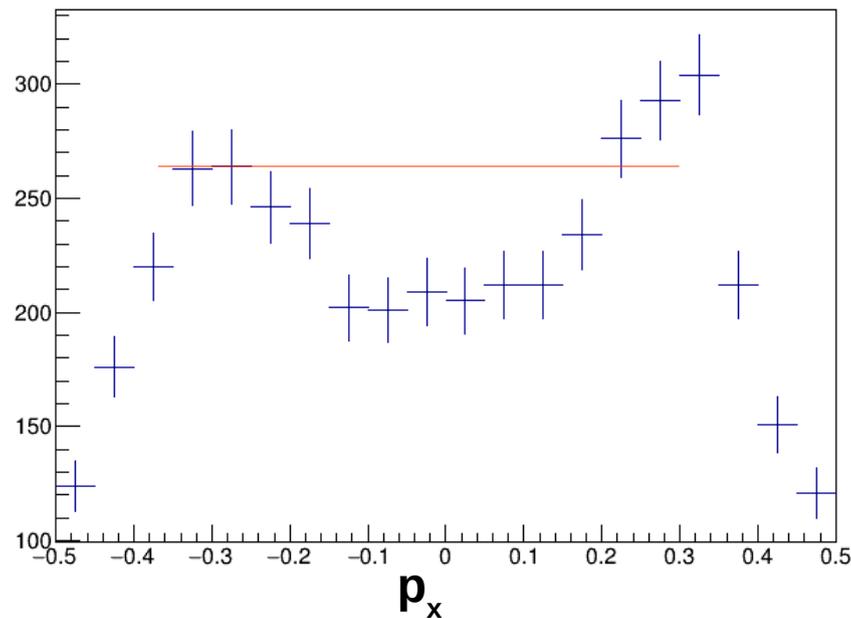Dropping very forward Kaons we see the asymmetry almost vanish. This indicates the asymmetry comes from the FDC.
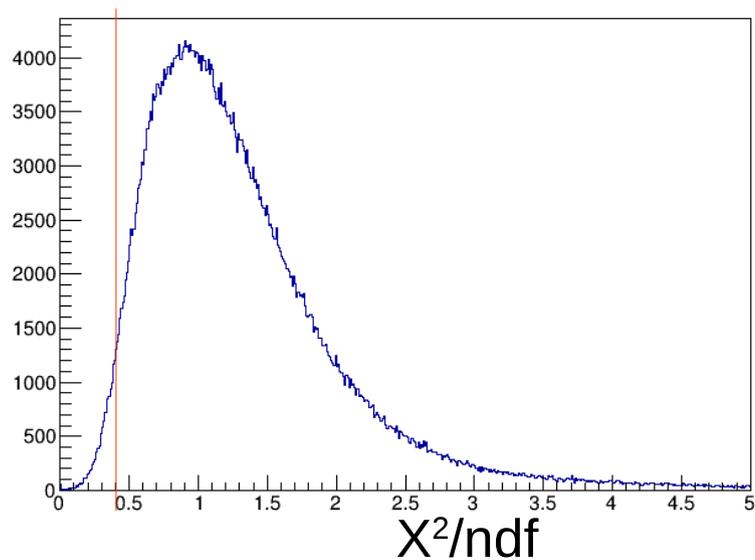
4762 events

K⁻

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

K⁻ X²/ndf < 0.4 12583 events

K⁻ $X^2/ndf < 0.4$ 12583 events

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

p_x

p_y

K$^+$
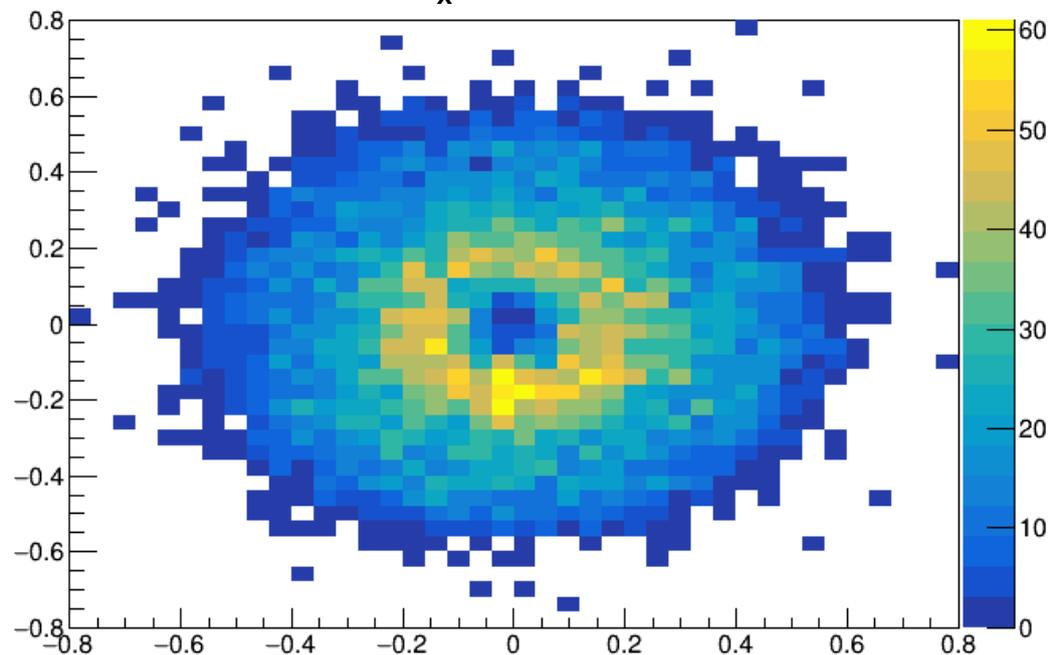
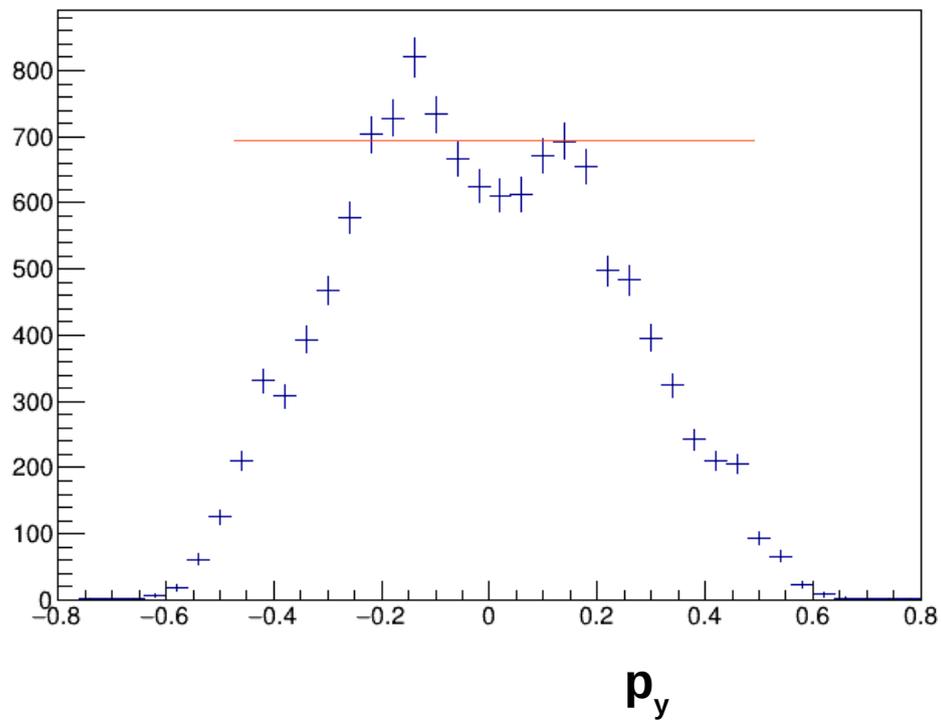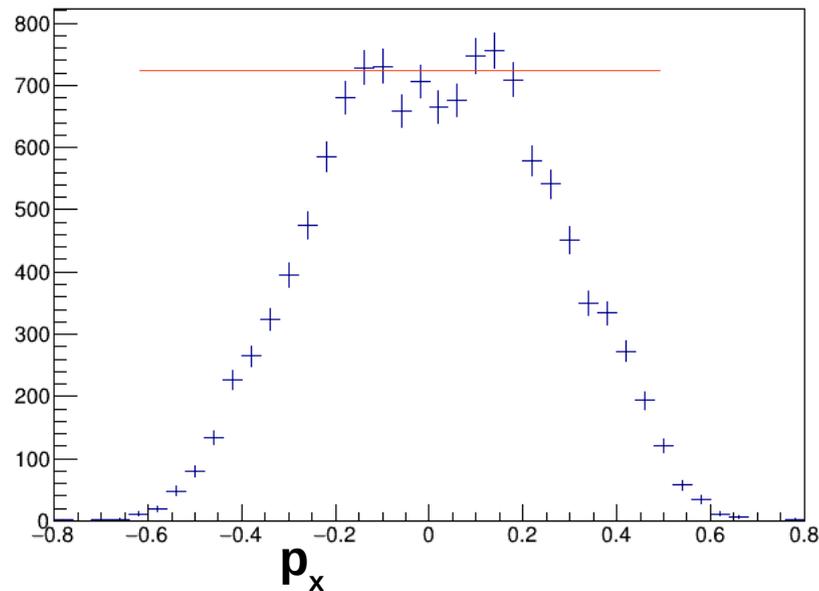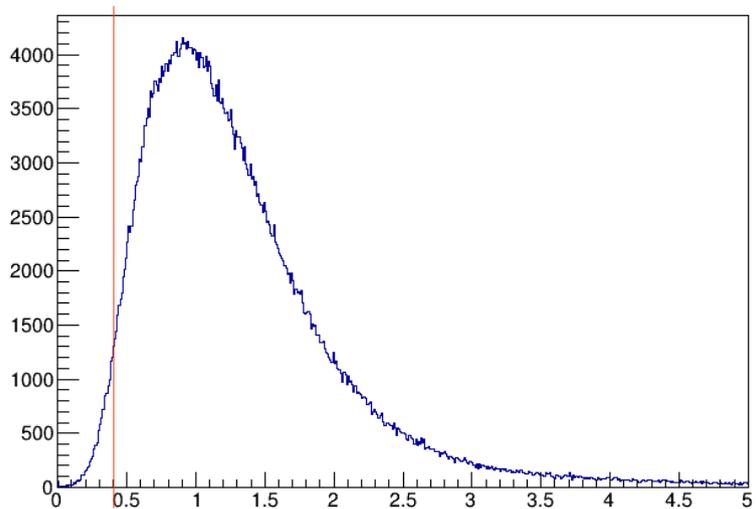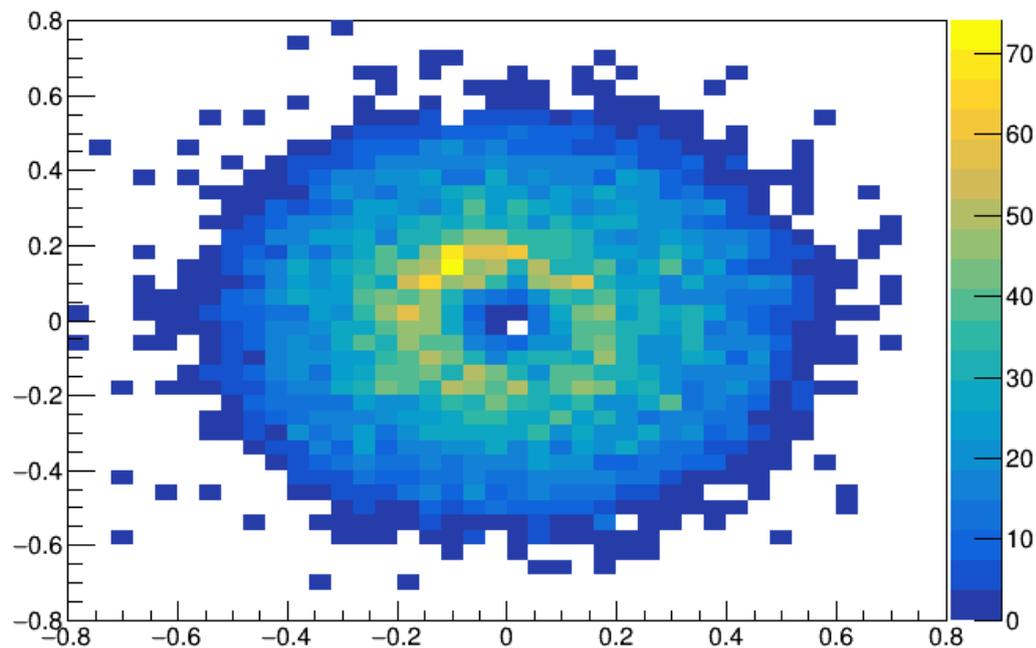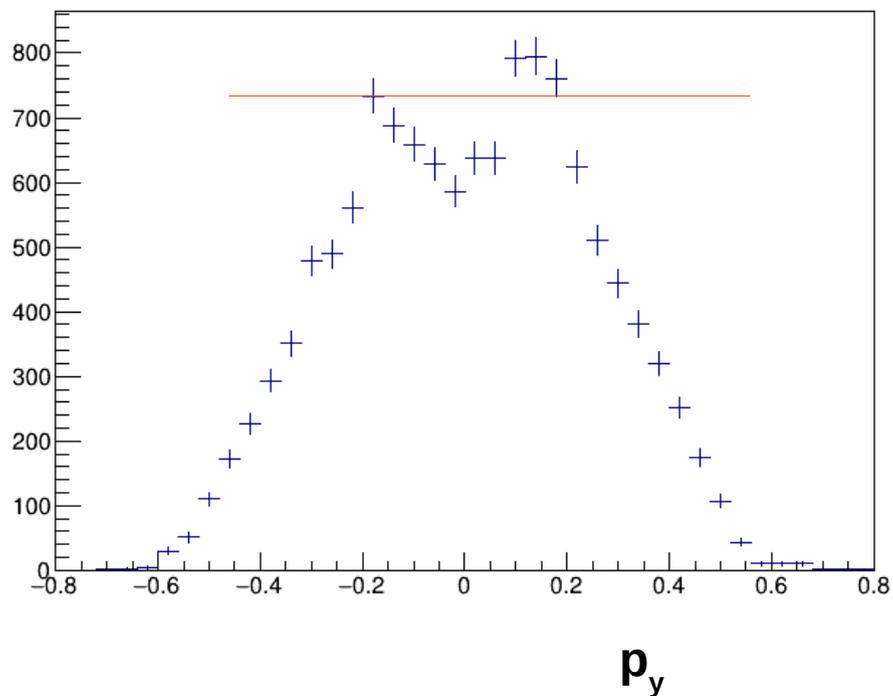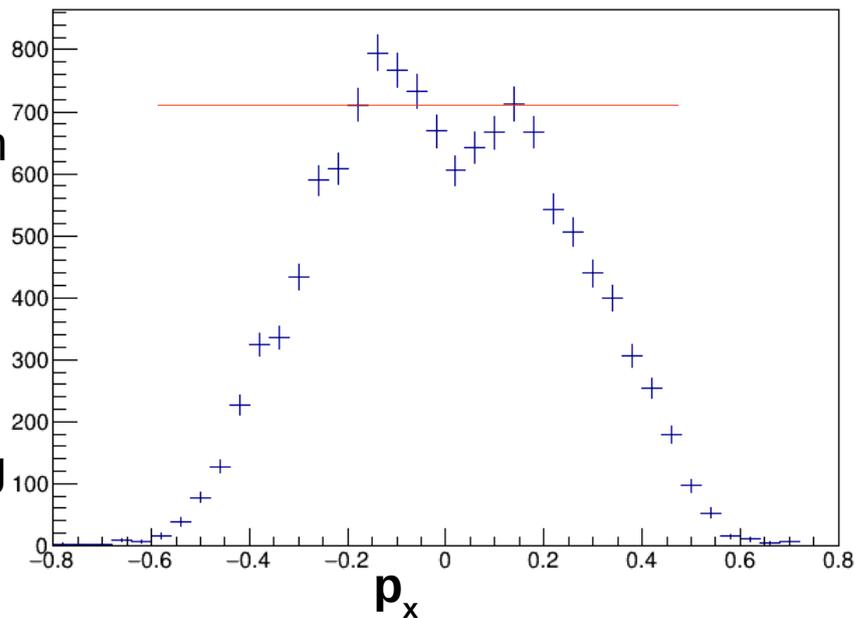# X^2/ndf < 0.4

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

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
  - Need to check if it exists even if I don't require the fitter to be used at all