Detector induced assymetry in CP violation measurements

Eugenia Spedicato, Lina Maria Ortiz Parra, Jonah Blank

December 23, 2019

Comments - efficiencies

- tried with two different errors
  - first error assuming Poisson distribution
  - second error assuming binomial distribution
  - binomial error more accurate,
    but leading to very small errors in $D = \frac{\epsilon_+ - \epsilon_-}{\epsilon_+ + \epsilon_-}$
    $\rightarrow D = 1$ out of 5σ-range
- smaller error for *UP*-polarity due to higher statistics
- no difference between *UP* and *DOWN* within scope of the error
- in the MC: $\epsilon_{D^*} = 0$(Dst˙reconstructed always 0)
  in our computation: $\epsilon_{D^*} = \epsilon_{\pi,s} \cdot \epsilon_{D^0}$

Comments - plots

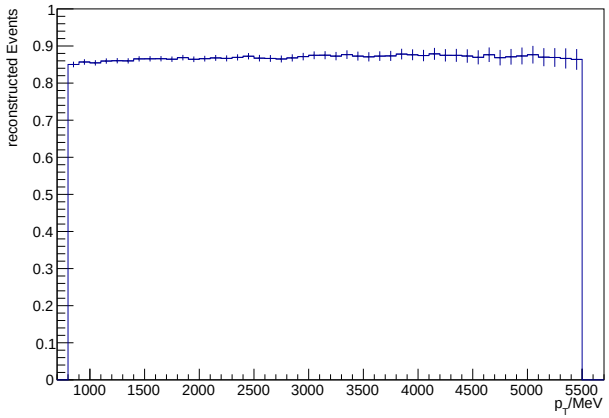
- structure of $\epsilon(\phi)$ probably due to rectangular detector shape
- huge errorbars are due to under-/overflow bins
- peak in $\epsilon_{D^*}(\theta)$ may also be caused by this
  $\rightarrow$ within range of error peak could also be flat

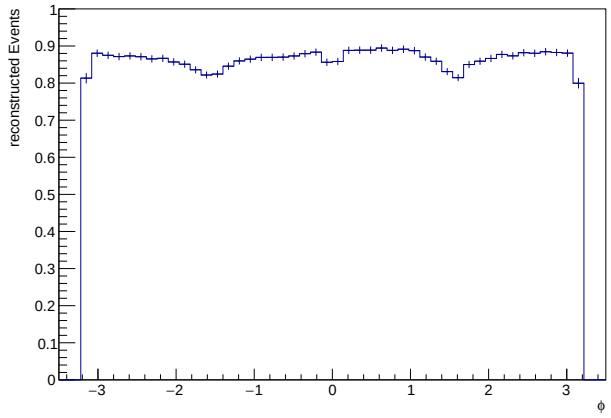
Total

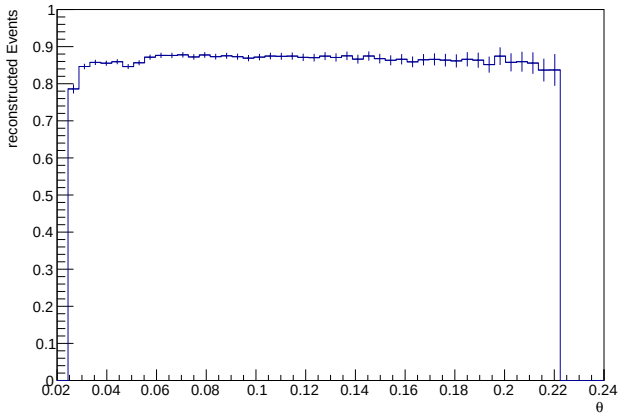
Efficiencies

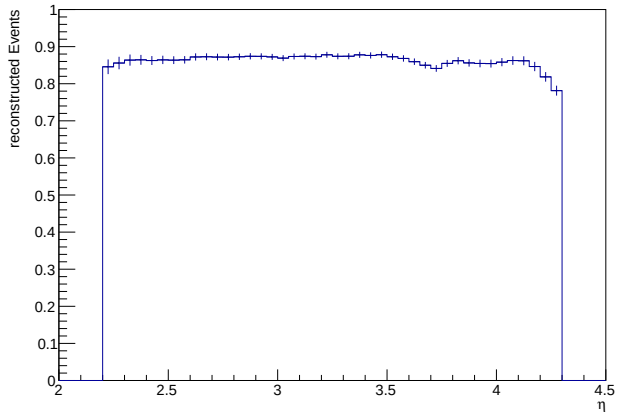
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	$86.61 \pm 0.15 \pm 0.04$	$84.65 \pm 0.14 \pm 0.04$	$76.61 \pm 0.13 \pm 0.05$	$73.33 \pm 0.13 \pm 0.05$	$56.26 \pm 0.11 \pm 0.06$
DOWN	$86.61 \pm 0.17 \pm 0.04$	$84.67 \pm 0.16 \pm 0.05$	$76.54 \pm 0.15 \pm 0.06$	$73.33 \pm 0.15 \pm 0.06$	$56.23 \pm 0.12 \pm 0.07$

π-efficiency

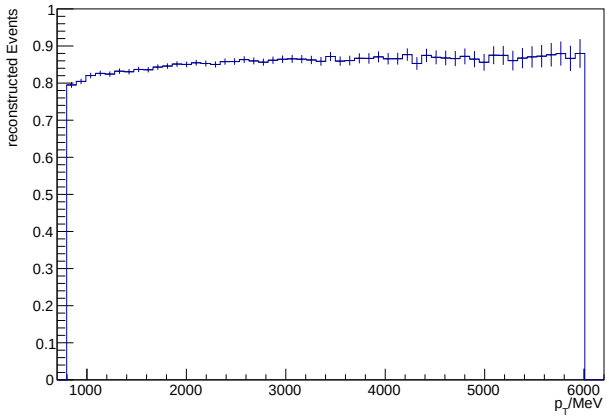


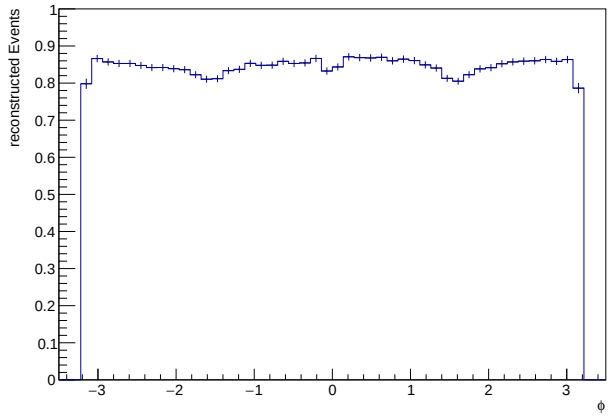


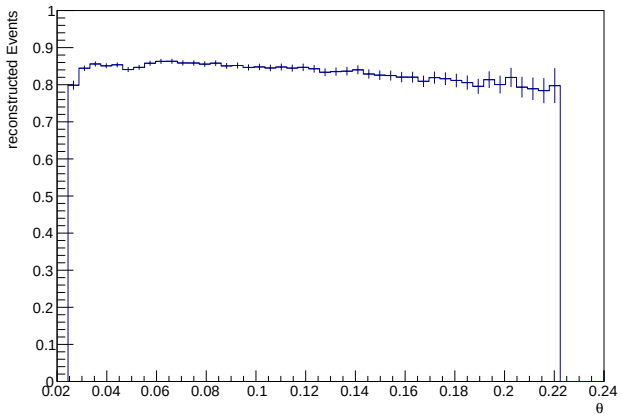


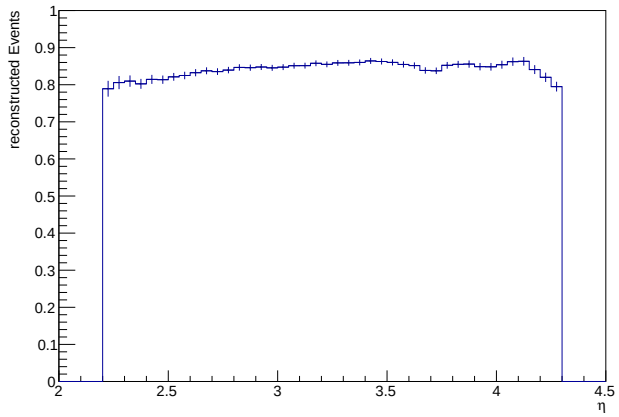


K-efficiency

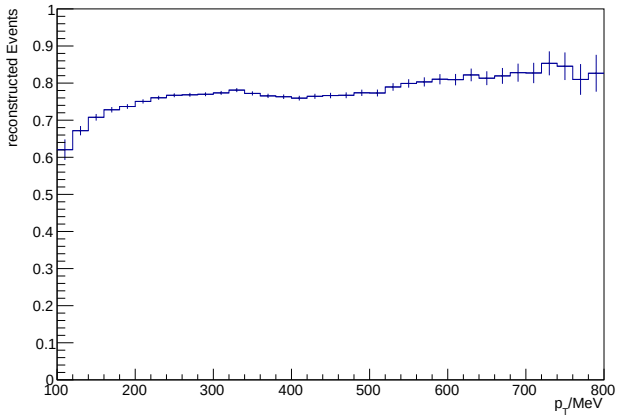


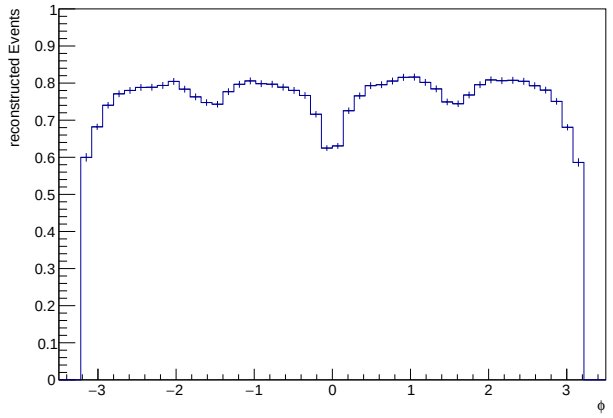


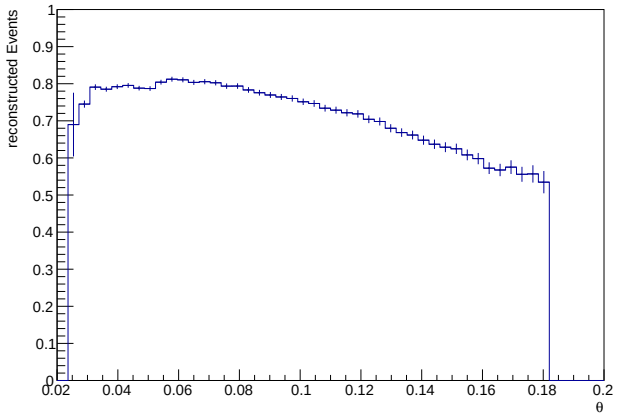


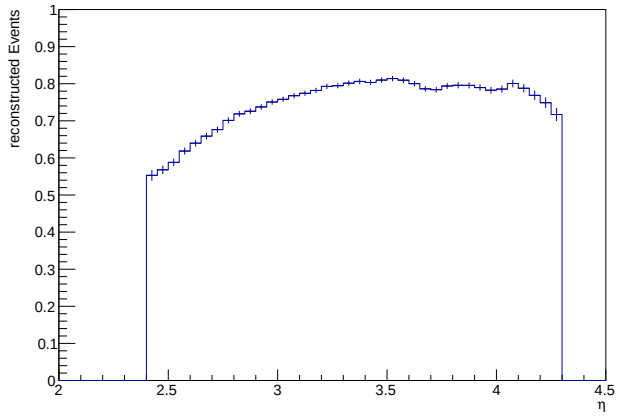


soft π-efficiency

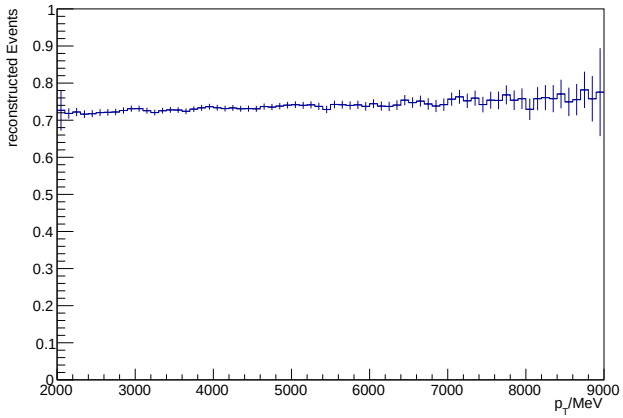


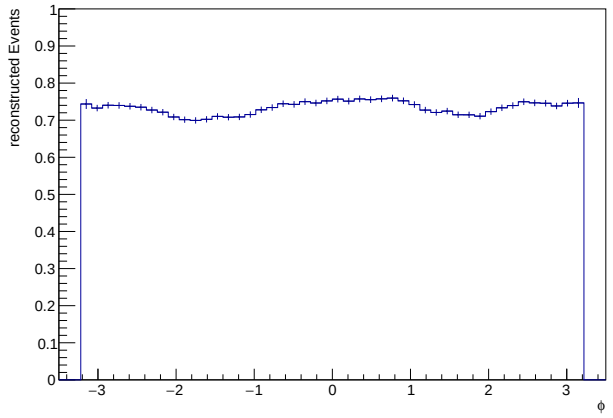


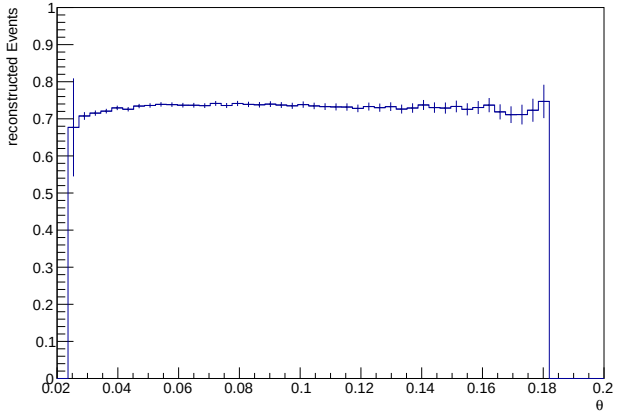


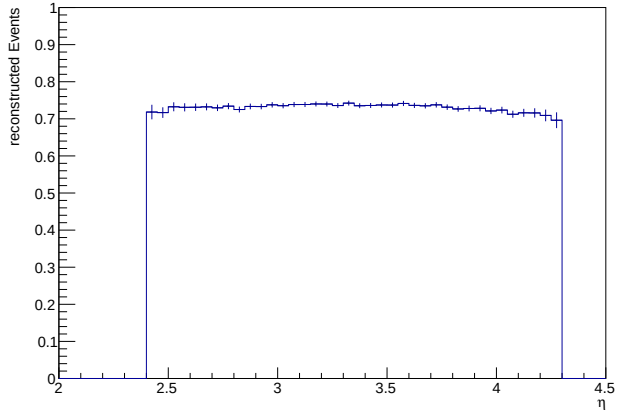


D^0-efficiency

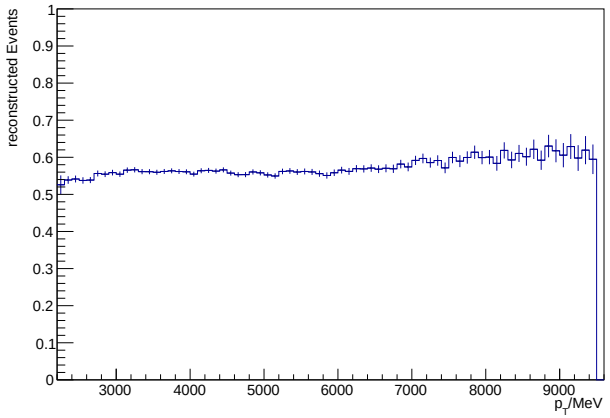


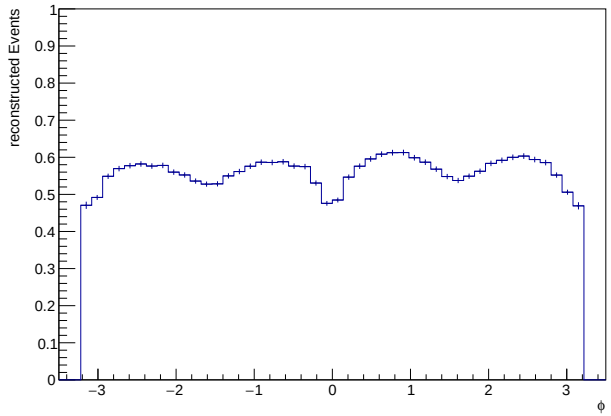


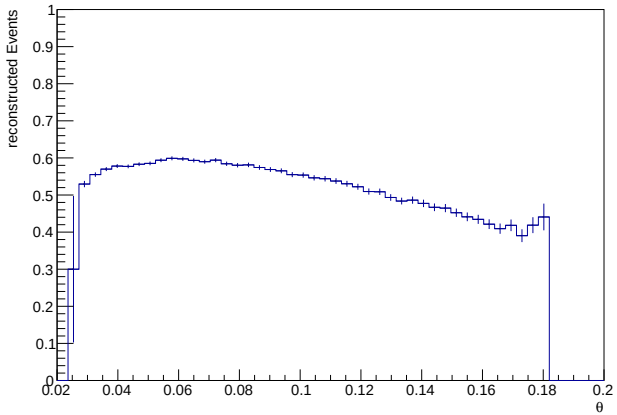


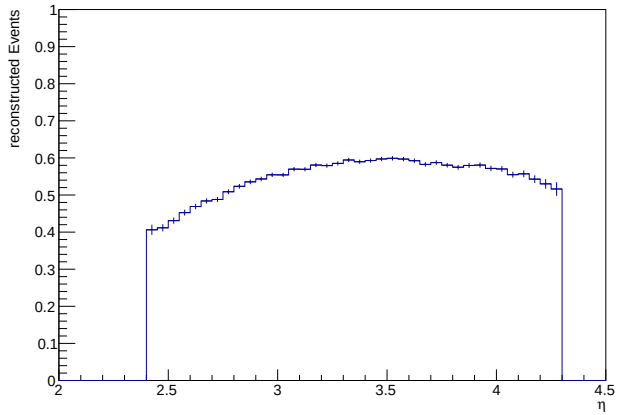


D^*-efficiency







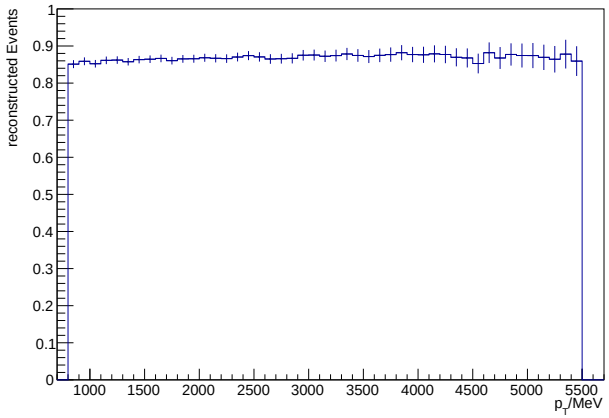


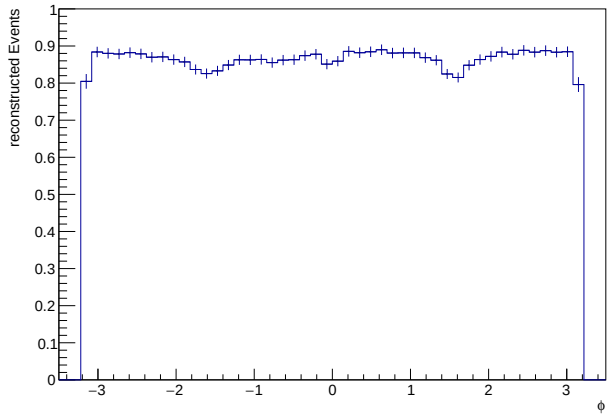
Charge: +

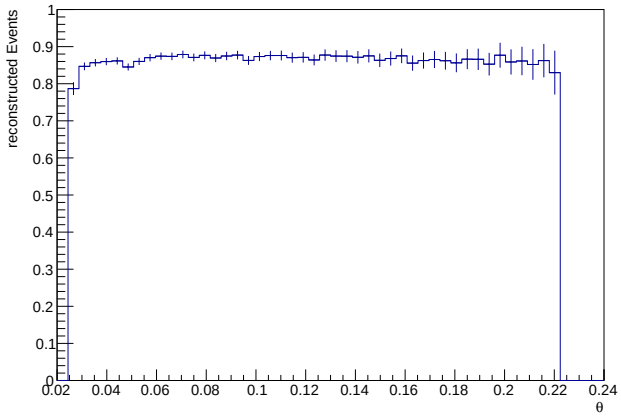
Efficiencies

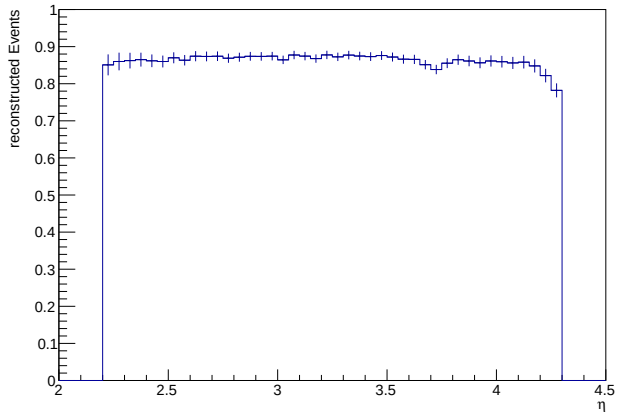
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	$86.63 \pm 0.21 \pm 0.06$	$85.01 \pm 0.21 \pm 0.06$	$76.26 \pm 0.19 \pm 0.07$	$73.00 \pm 0.18 \pm 0.07$	$55.71 \pm 0.15 \pm 0.08$
DOWN	$86.57 \pm 0.24 \pm 0.06$	$85.38 \pm 0.23 \pm 0.07$	$76.71 \pm 0.22 \pm 0.08$	$72.92 \pm 0.21 \pm 0.08$	$56.09 \pm 0.17 \pm 0.09$

π-efficiency

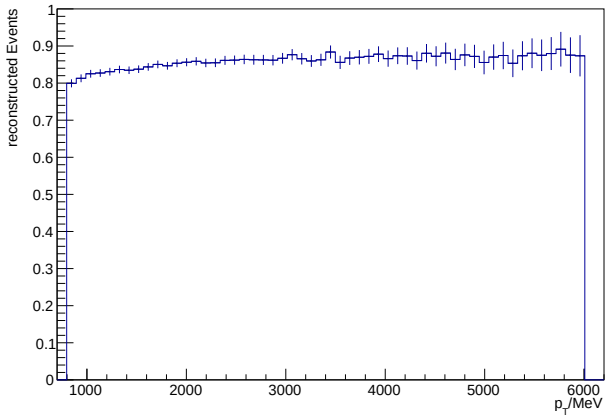


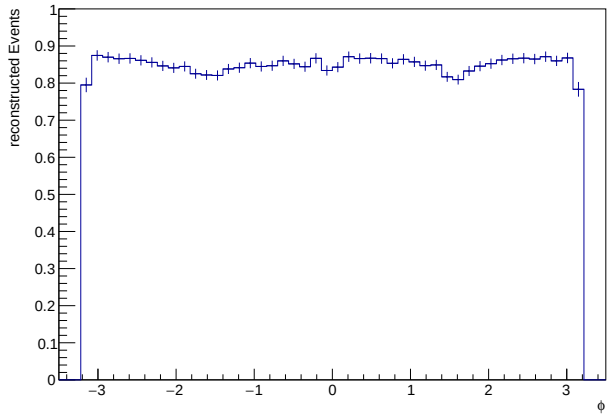


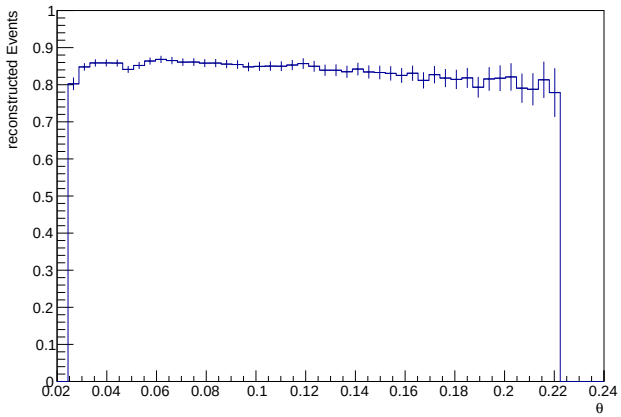


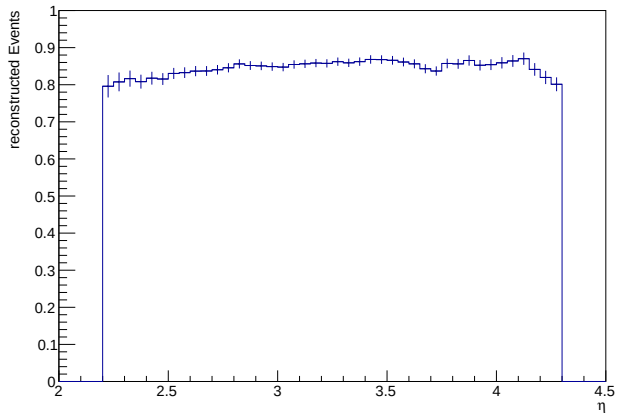


K-efficiency

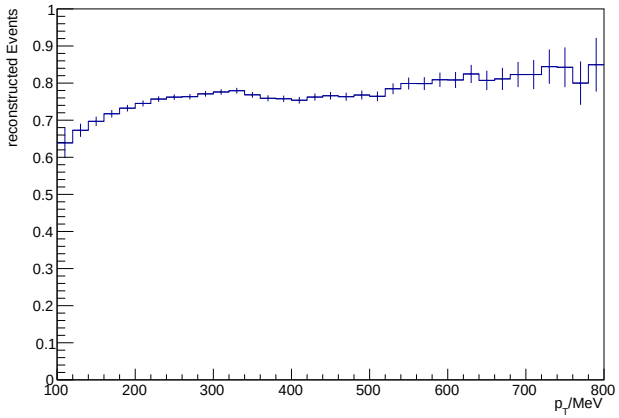


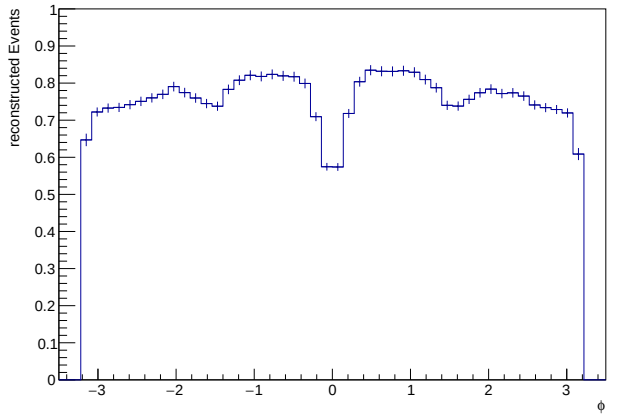


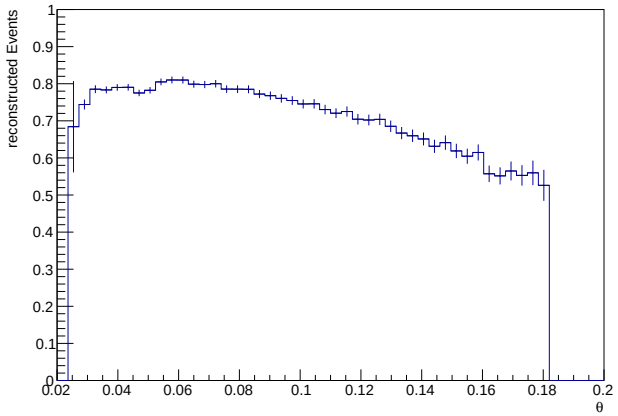


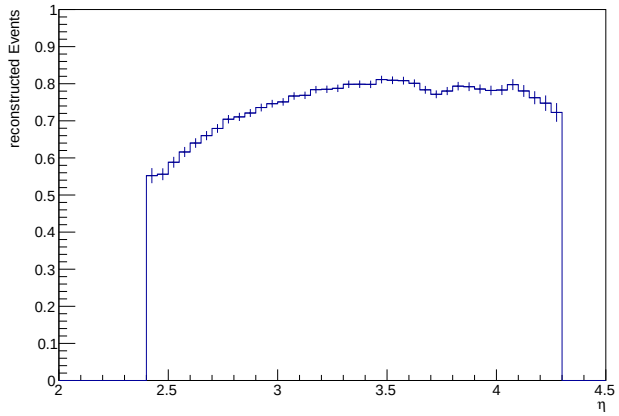


soft π-efficiency

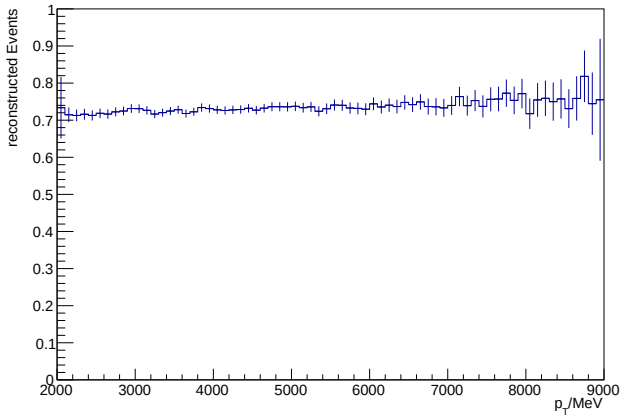


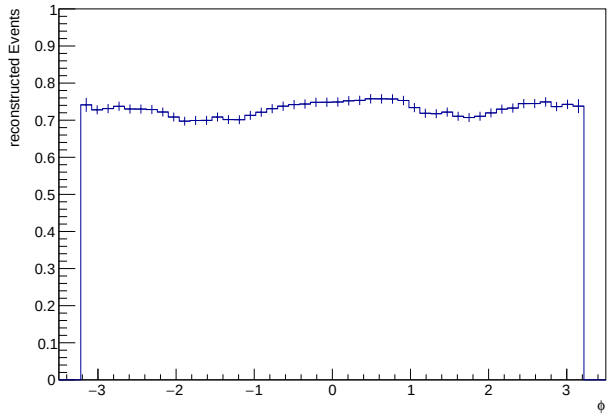


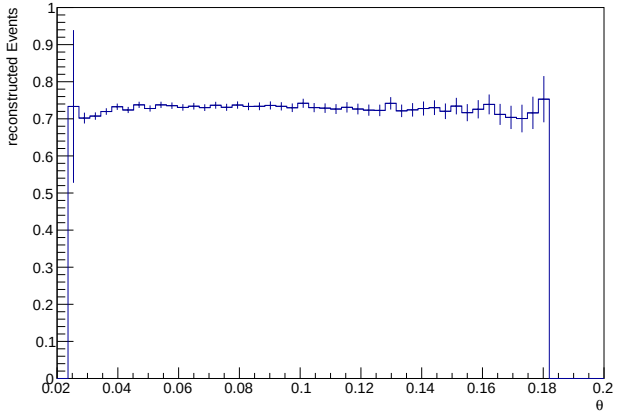


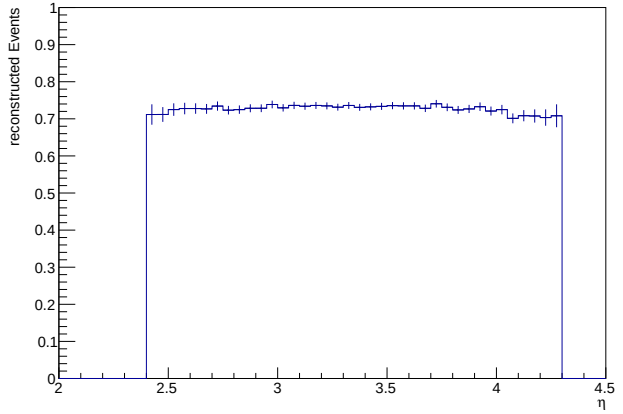


D^0-efficiency

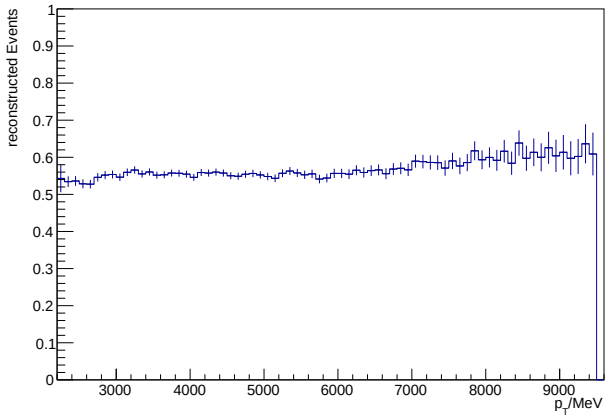


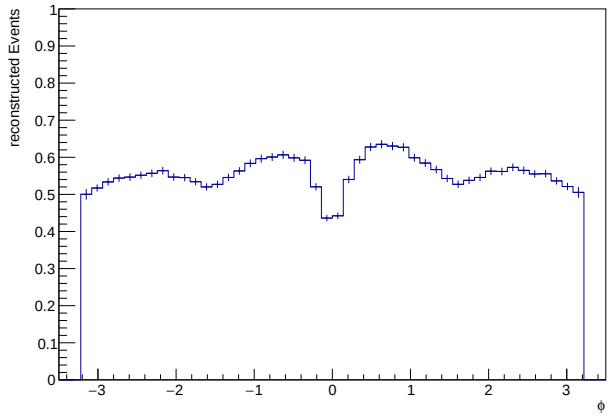


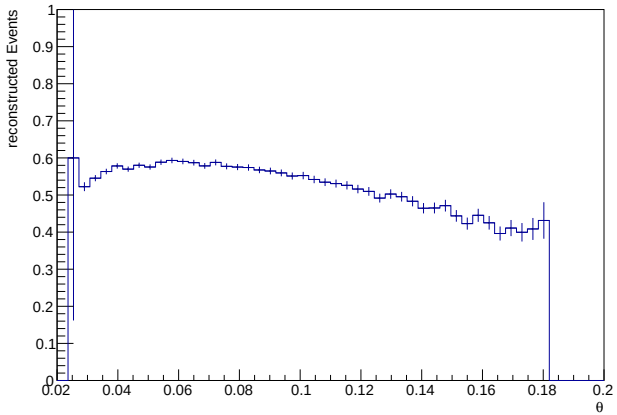


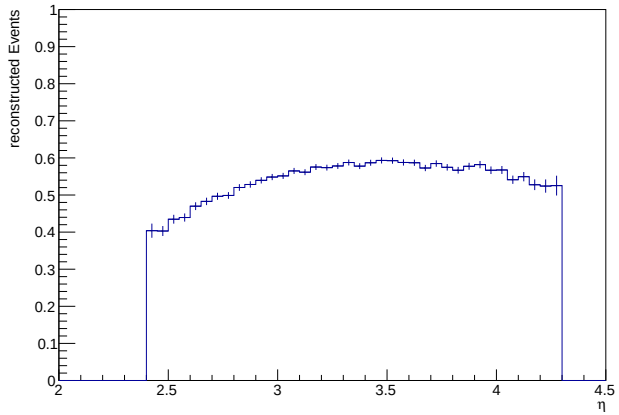


D^*-efficiency







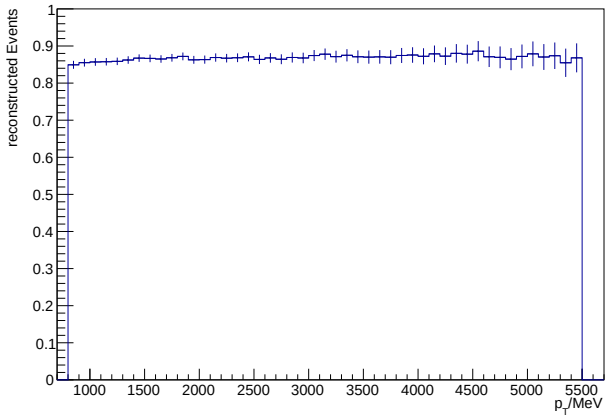


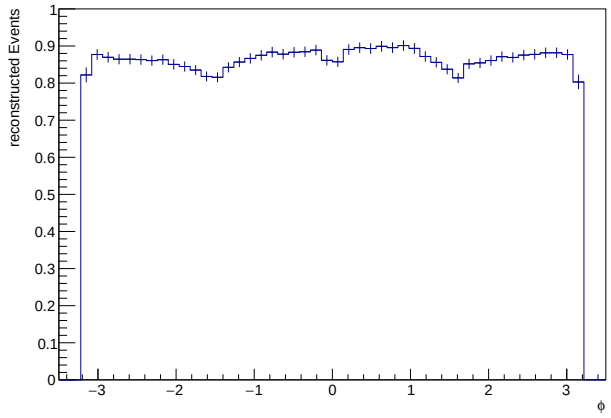
Charge: -

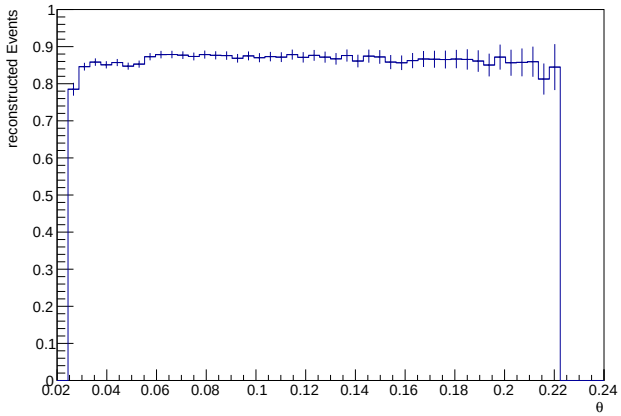
Efficiencies

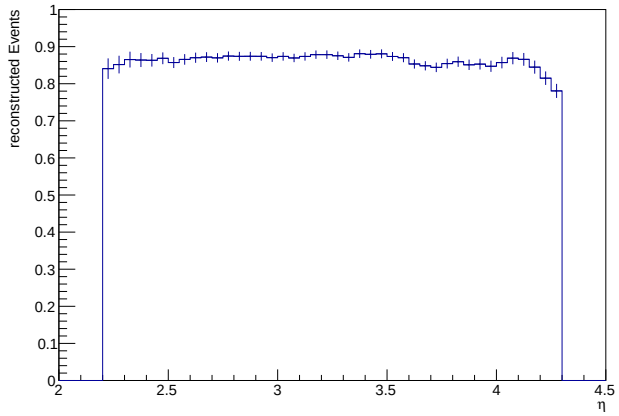
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	$86.60 \pm 0.21 \pm 0.06$	$84.30 \pm 0.20 \pm 0.06$	$76.97 \pm 0.19 \pm 0.07$	$73.65 \pm 0.19 \pm 0.07$	$56.81 \pm 0.15 \pm 0.08$
DOWN	$86.64 \pm 0.24 \pm 0.06$	$83.95 \pm 0.23 \pm 0.07$	$76.36 \pm 0.22 \pm 0.07$	$73.74 \pm 0.21 \pm 0.08$	$56.38 \pm 0.17 \pm 0.09$

π-efficiency

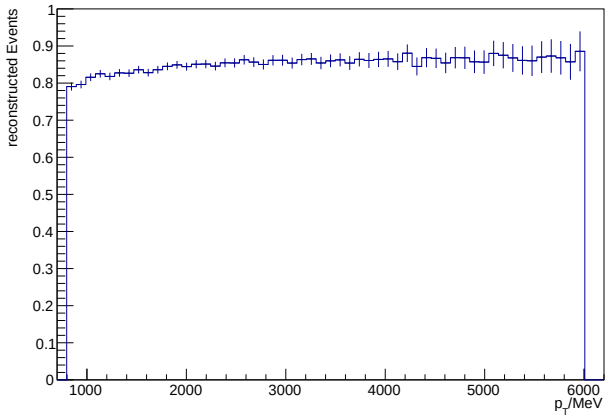


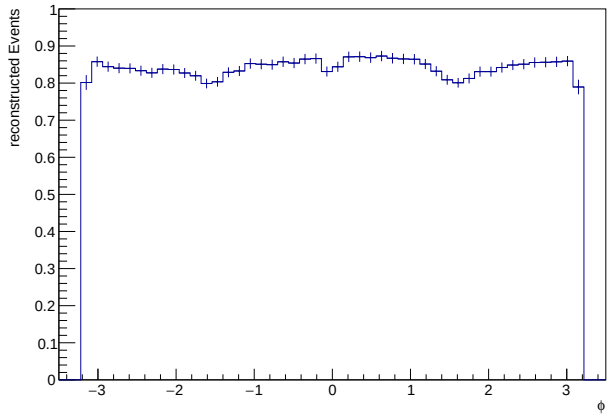


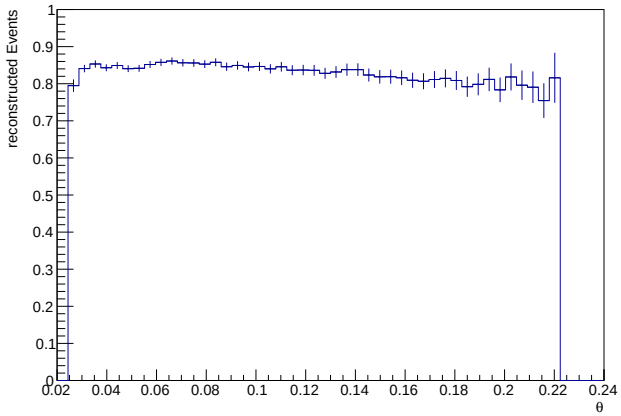


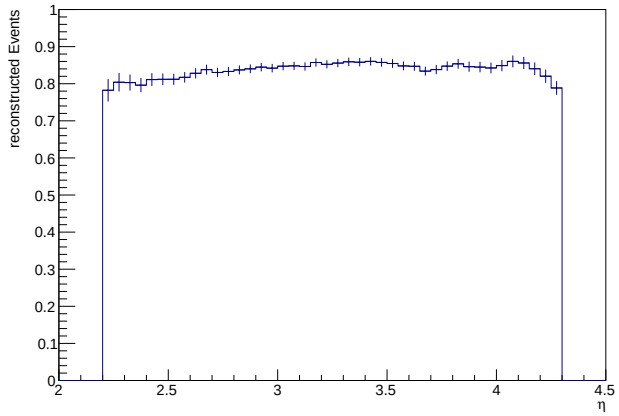


K-efficiency

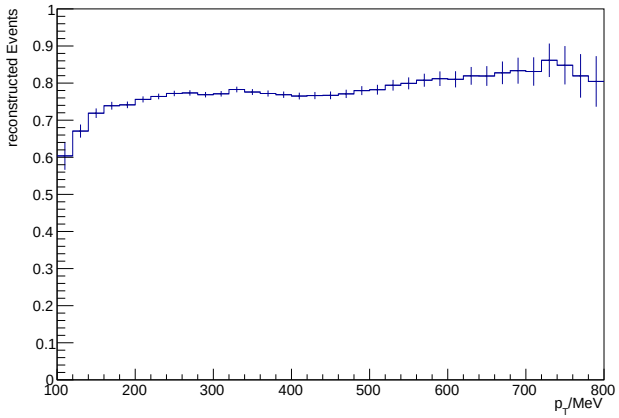


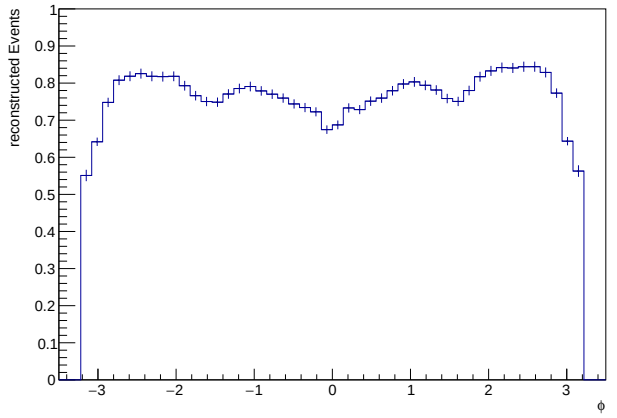


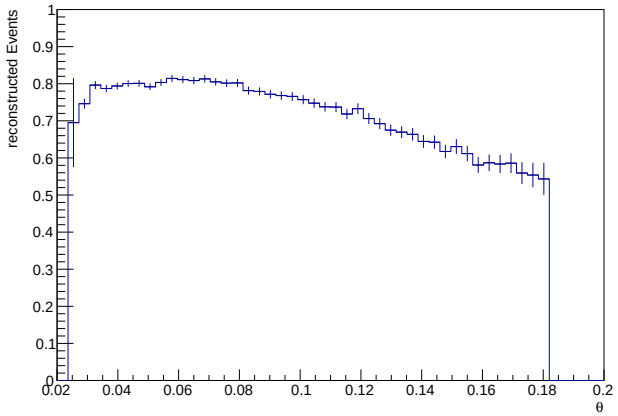


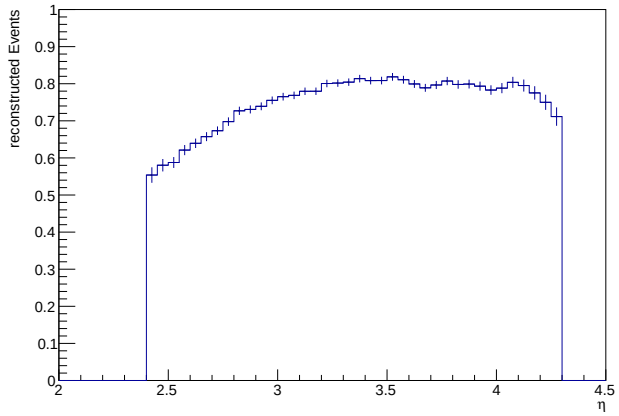


soft π-efficiency

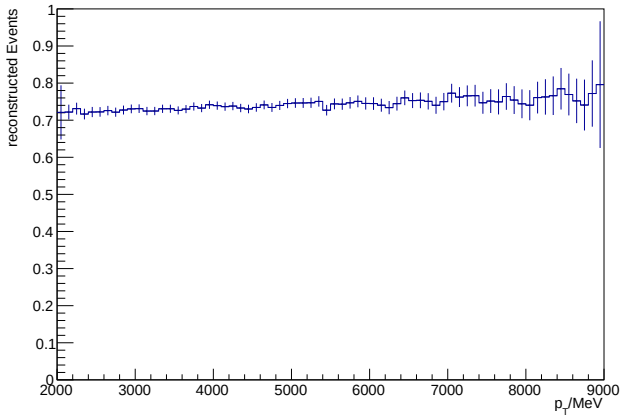


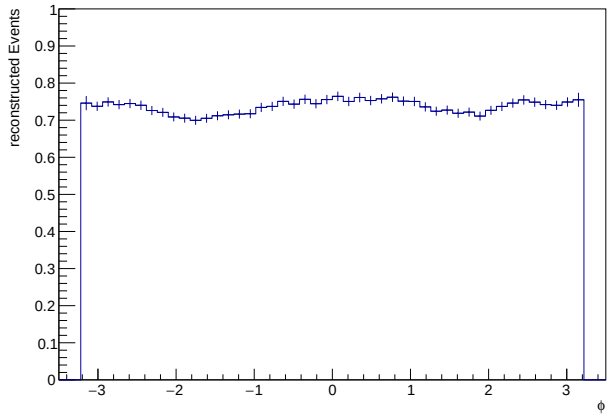


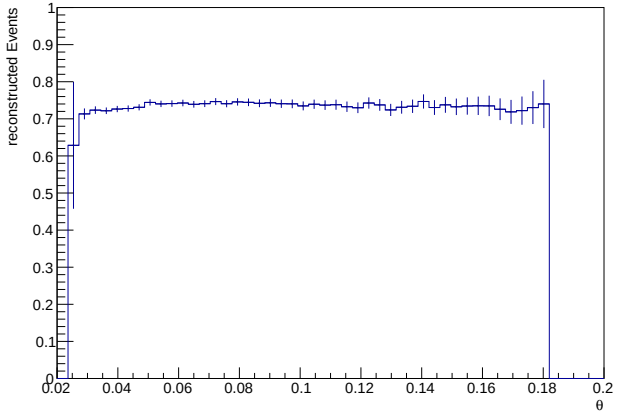


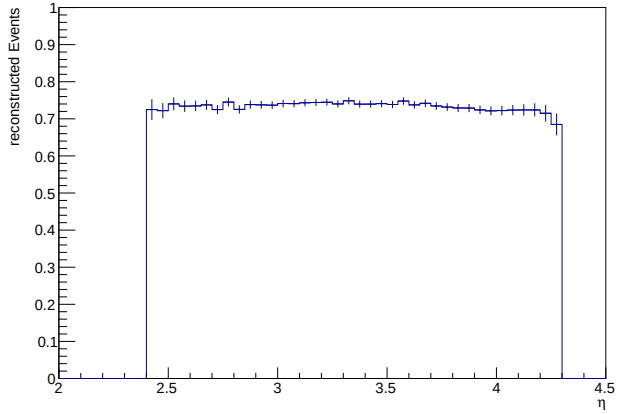


D^0-efficiency

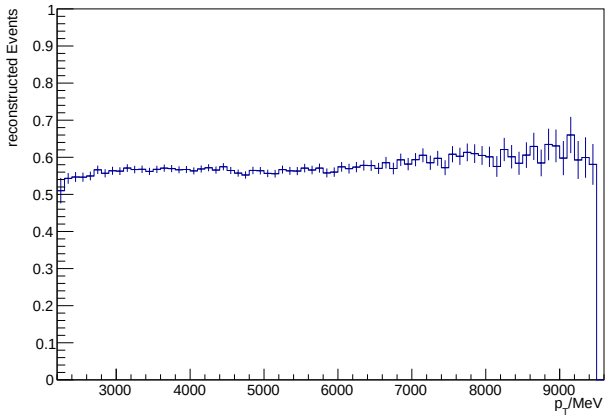


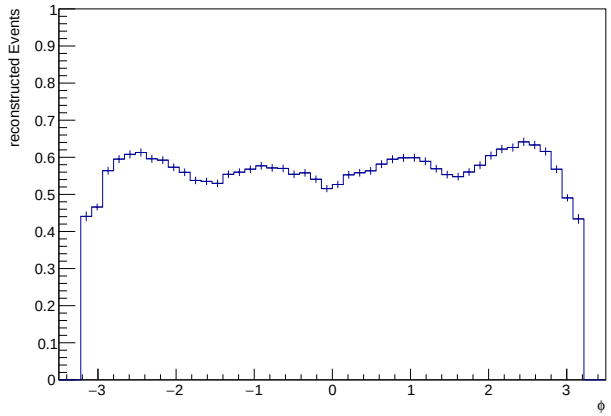


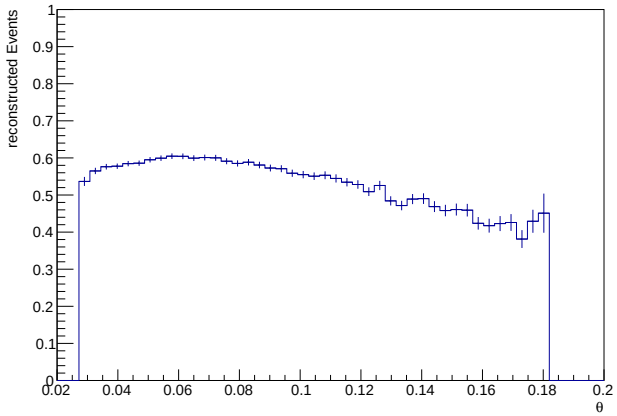


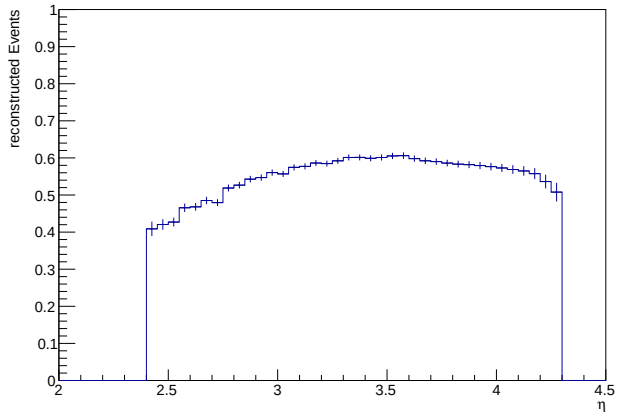


D^*-efficiency









Deviation

Table: The deviation $\frac{\epsilon_+ - \epsilon_-}{\epsilon_+ + \epsilon_-} / 10^{-3}$

Polarity	π	K	$soft\pi$	D^0	D^*
UP	$0.2 \pm 2.9 \pm 0.8$	$4 \pm 3 \pm 0.8$	$-5 \pm 3 \pm 1.0$	$-4 \pm 3 \pm 1$	$-9.8 \pm 1.8 \pm 1.1$
DOWN	$-0.4 \pm 3.3 \pm 0.9$	$8 \pm 3 \pm 0.9$	$2.3 \pm 3.0 \pm 1.1$	$-6 \pm 3 \pm 1.2$	$-2.5 \pm 2.4 \pm 1.3$