Detector induced assymetry in CP violation measurements

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Comments - efficiencies

- very small errors in $D = \frac{\epsilon_+ - \epsilon_-}{\epsilon_+ + \epsilon_-}$
  $\rightarrow D = 0$ out of 5σ-range
- D is much smaller in for the *UP*-polarity
- smaller error for *UP* due to higher statistics
- no difference in the efficiencies 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

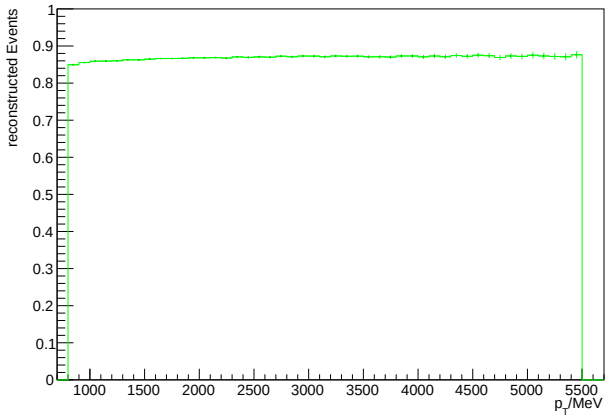
- structure of $\epsilon(\phi)$ probably due to rectangular detector shape
- peak in $\epsilon_{D^*}(\theta)$ within scope of error

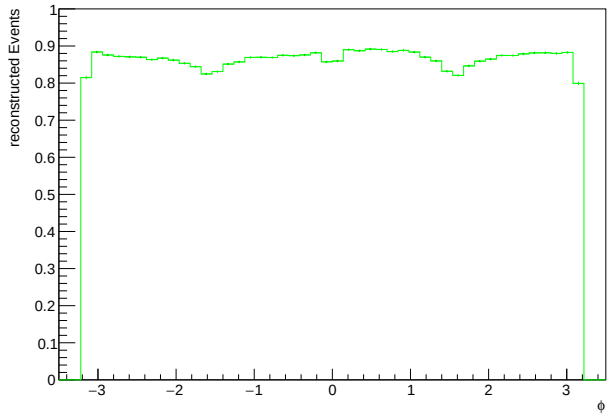
Total

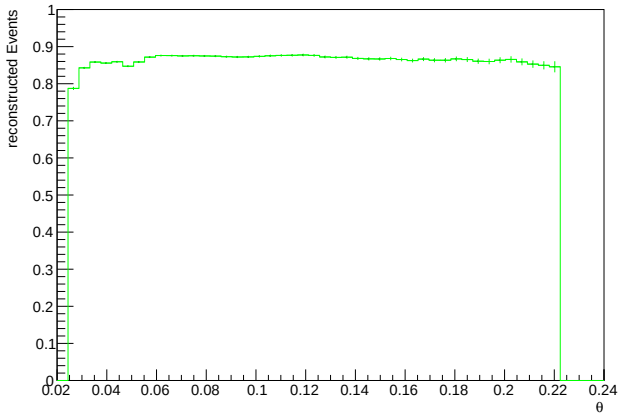
Efficiencies

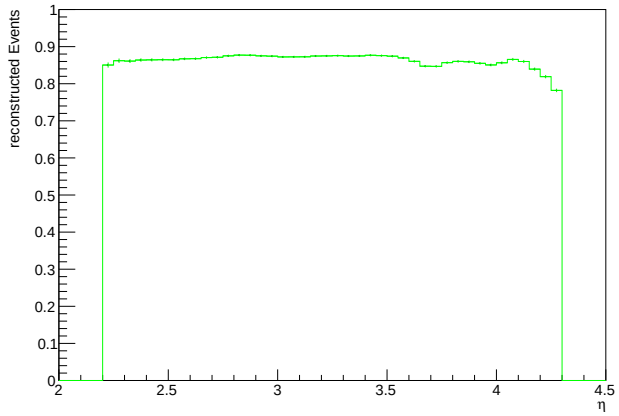
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	86.65 ± 0.01	84.63 ± 0.01	76.65 ± 0.02	73.34 ± 0.02	56.31 ± 0.02
DOWN	86.68 ± 0.01	84.67 ± 0.01	76.66 ± 0.02	73.39 ± 0.02	56.35 ± 0.02

π-efficiency

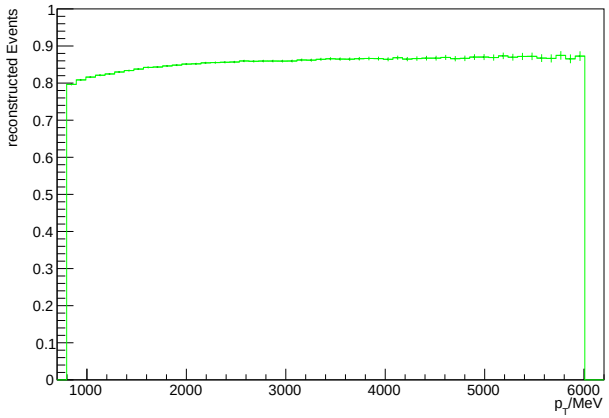


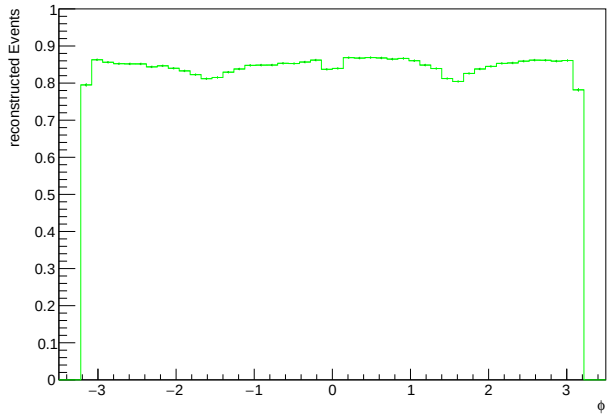


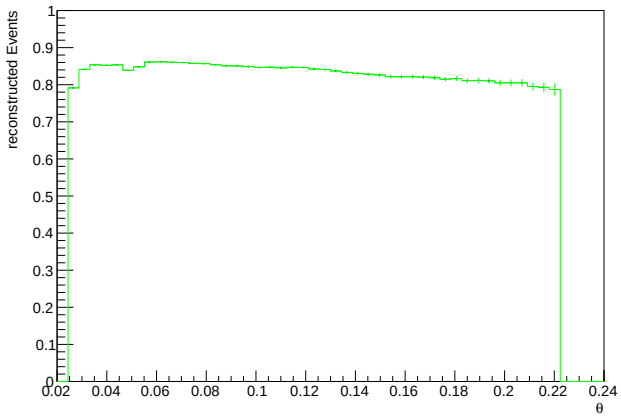


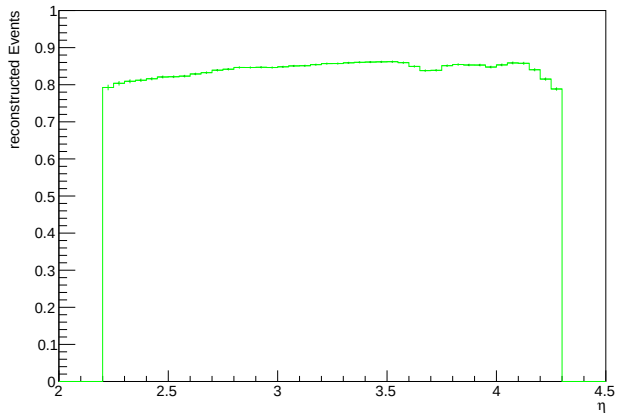


K-efficiency

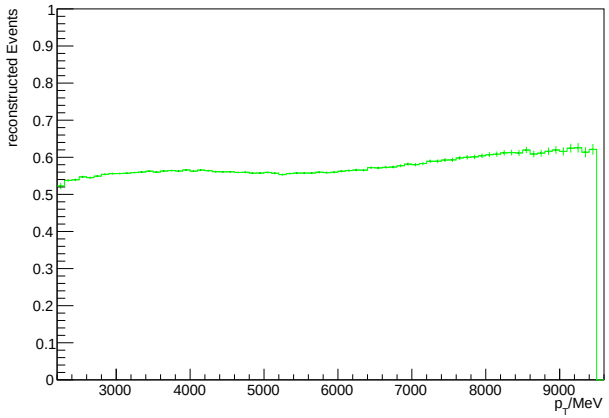


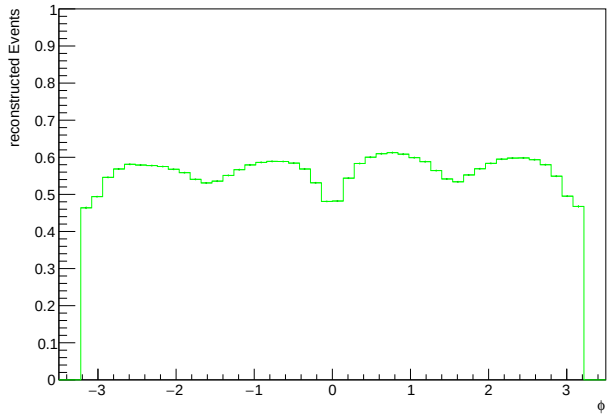


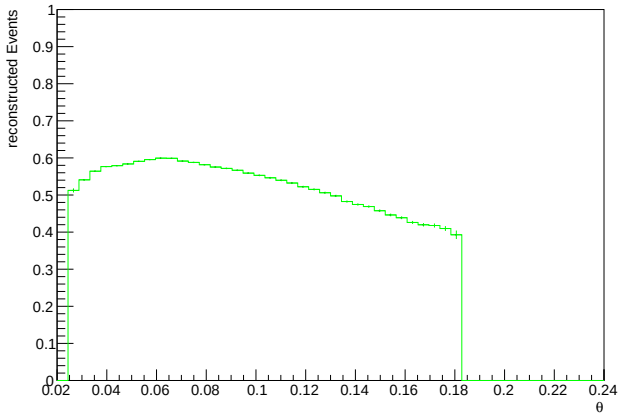


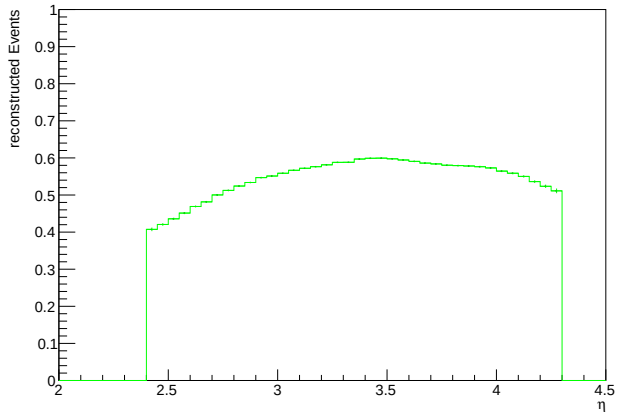


soft π-efficiency

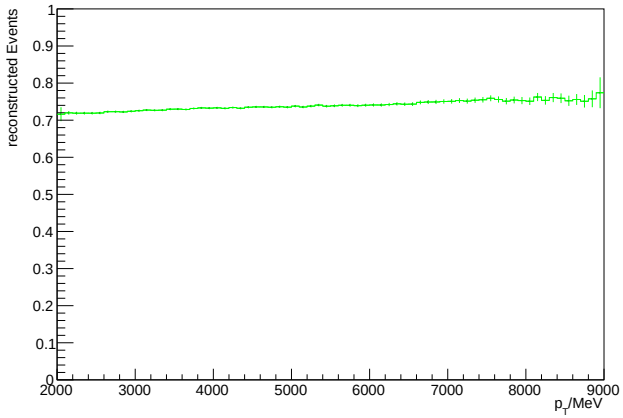


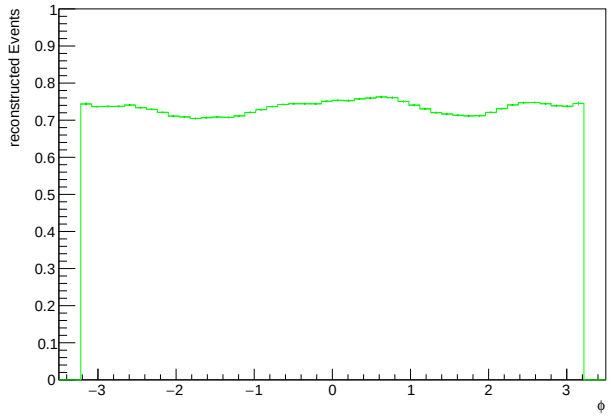


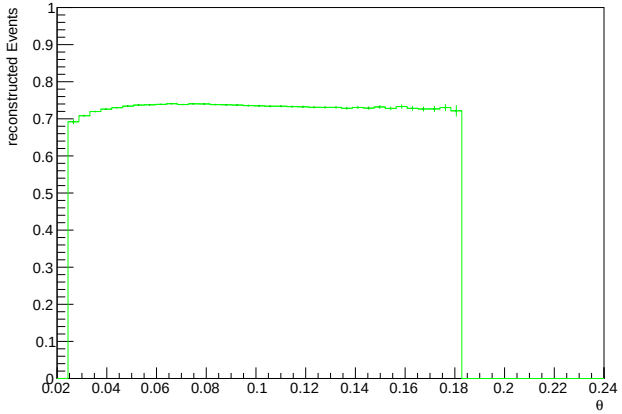


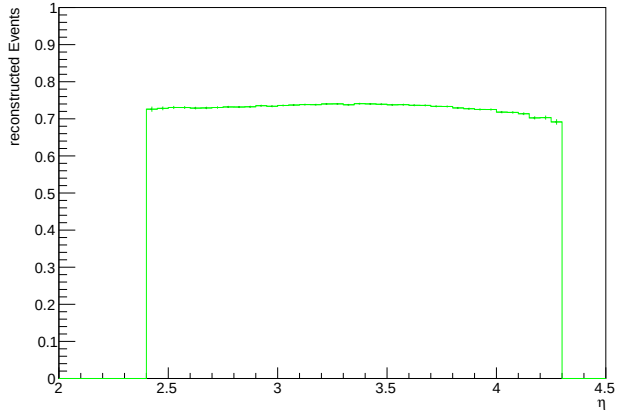


D^0-efficiency

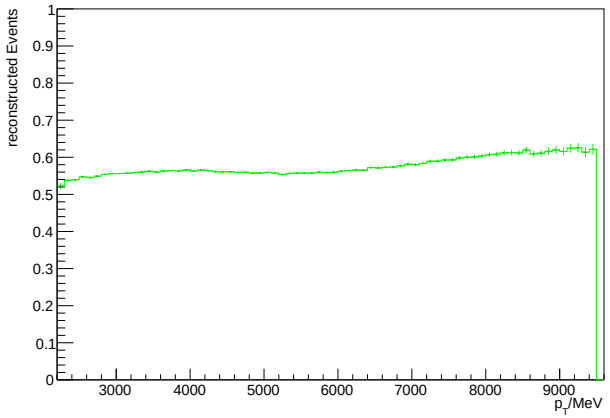


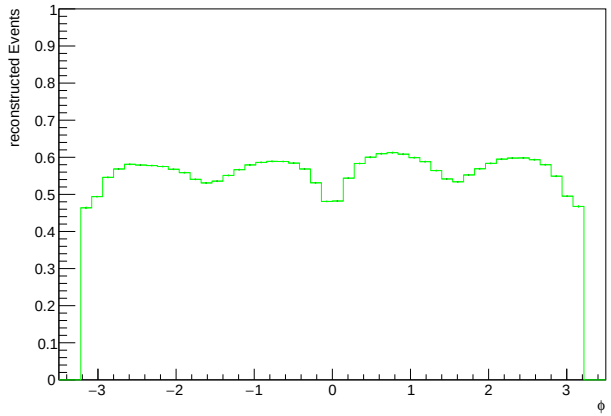


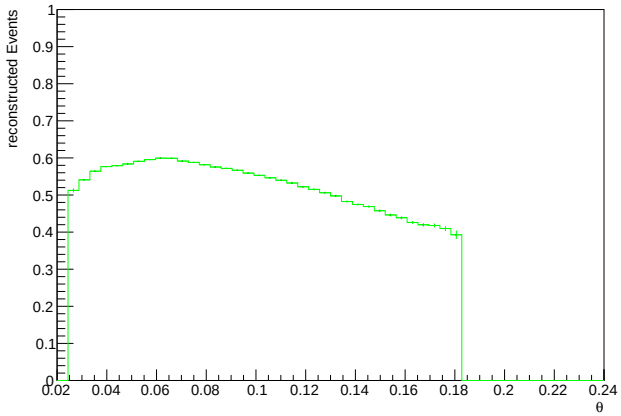


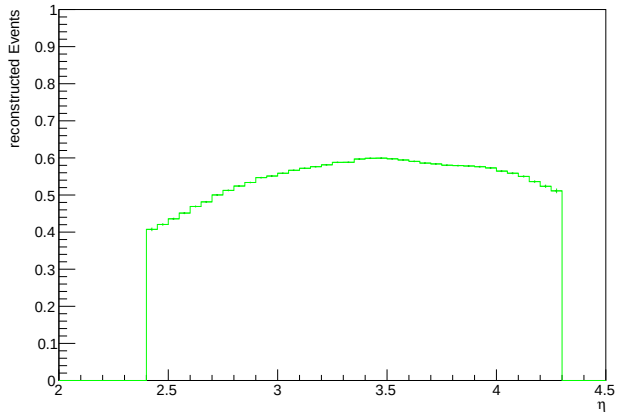


D^*-efficiency









Charge: +

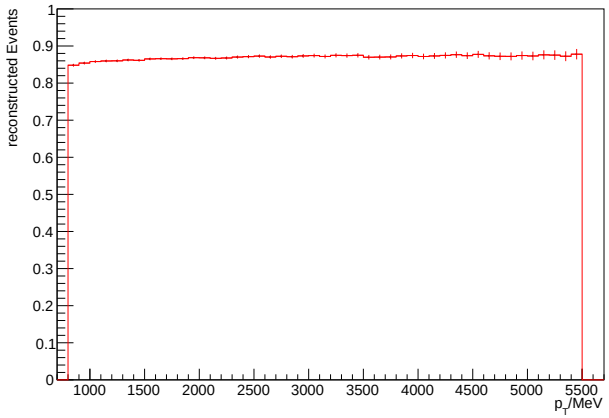
Efficiencies

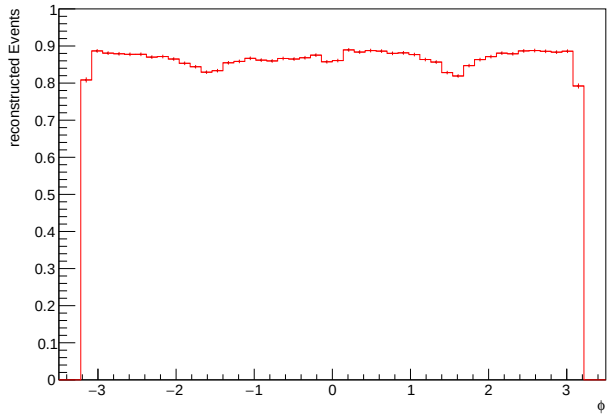
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	86.66 ± 0.02	85.02 ± 0.02	76.37 ± 0.02	73.01 ± 0.03	55.86 ± 0.03
DOWN	86.70 ± 0.02	85.07 ± 0.02	76.98 ± 0.02	73.06 ± 0.03	56.33 ± 0.03

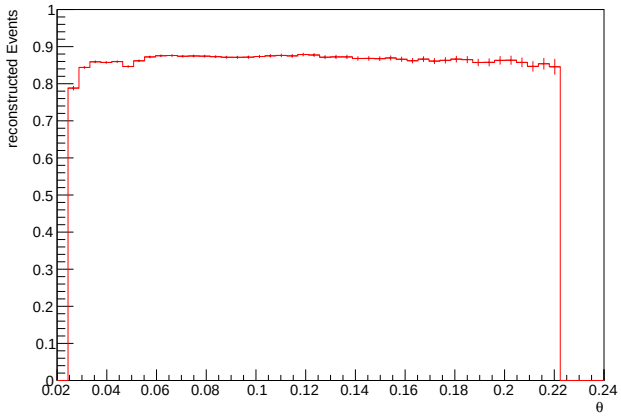
UP	π	K	*soft* π	D^0	D^*
N_{reco}	2 669 990	2 620 280	2 352 910	2 249 370	1 720 940
N_{tot}	3 081 050	3 082 060	3 081 050	3 081 050	3 081 050

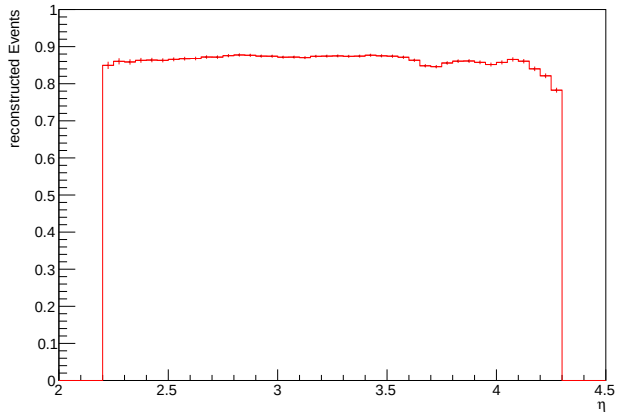
DOWN	π	K	*soft* π	D^0	D^*
N_{reco}	2 674 000	2 626 350	2 374 360	2 253 370	1 737 460
N_{tot}	3 084 220	3 087 370	3 084 220	3 084 220	3 084 220

π-efficiency

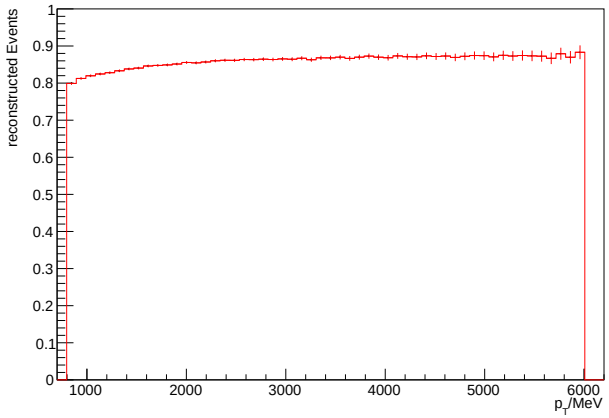


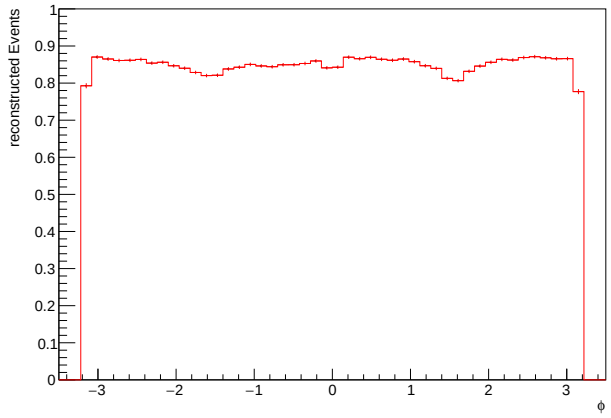


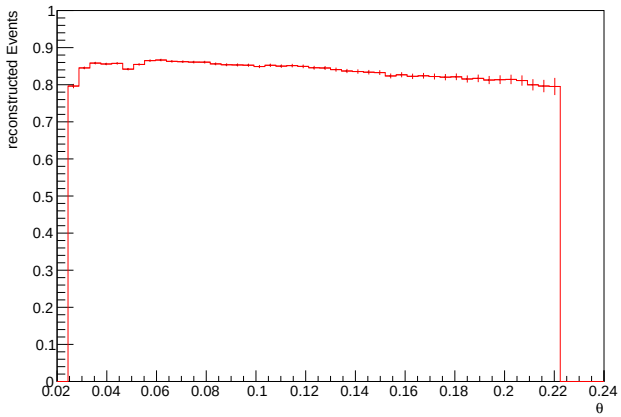


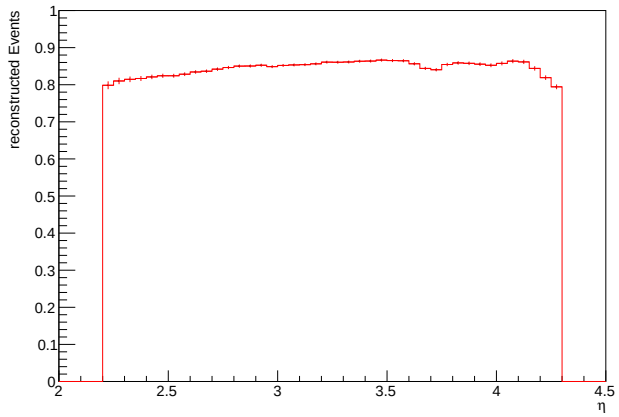


K-efficiency

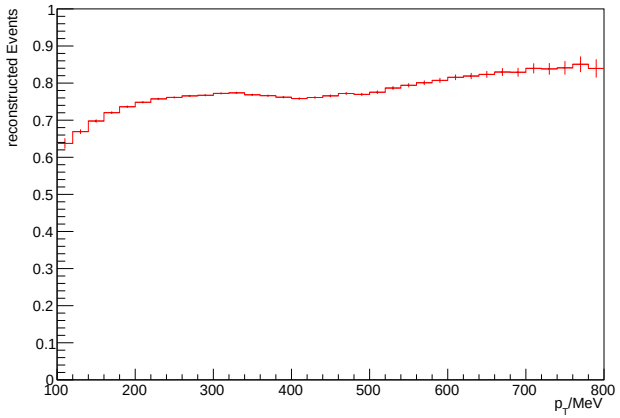


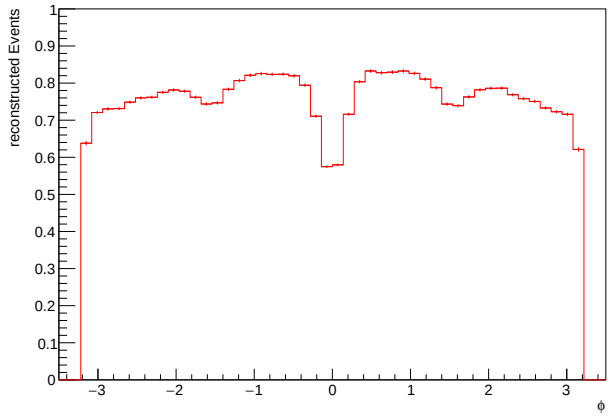


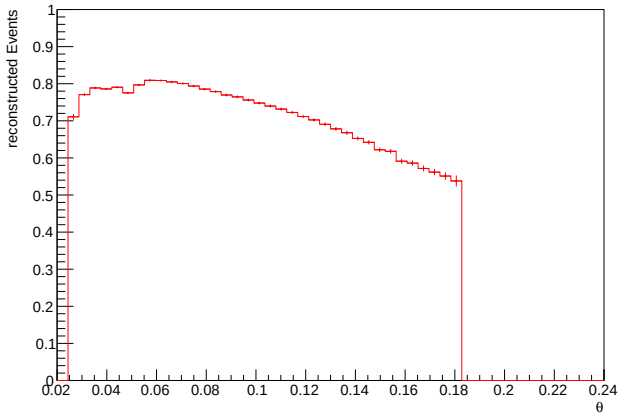


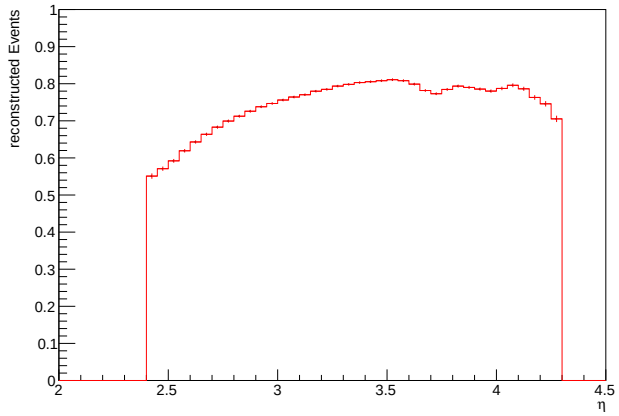


soft π-efficiency

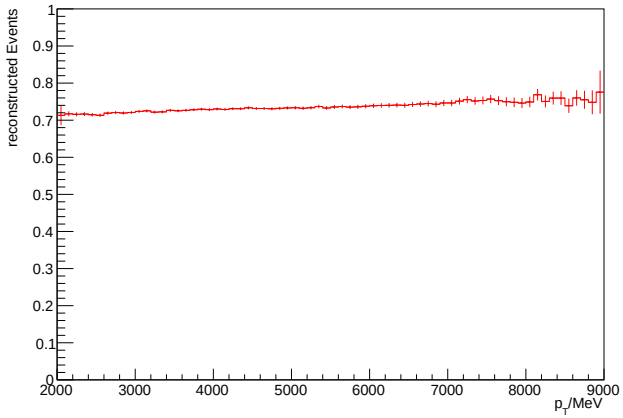


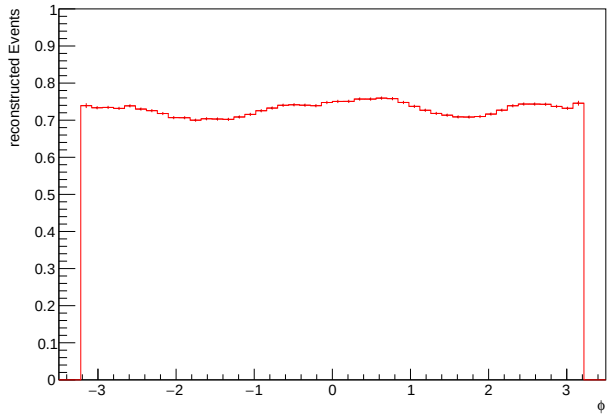


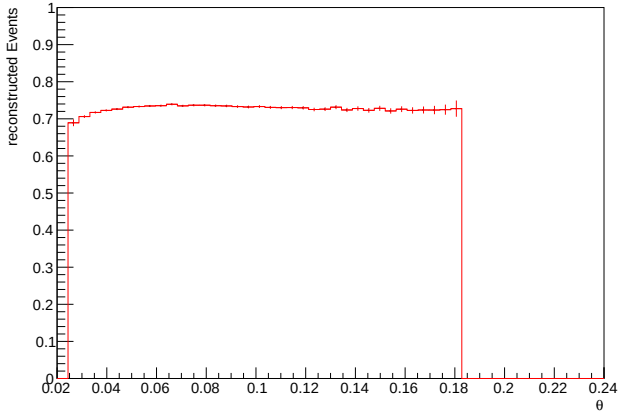


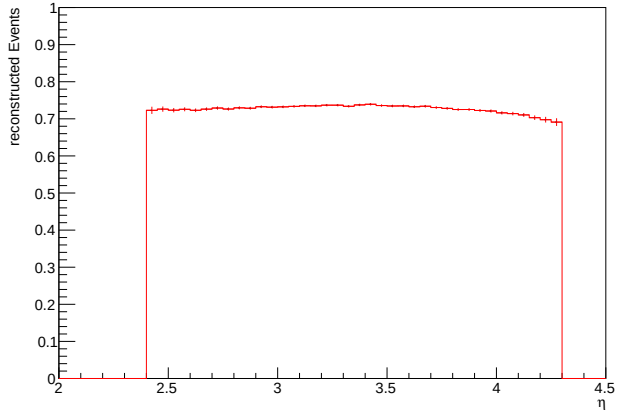


D^0-efficiency

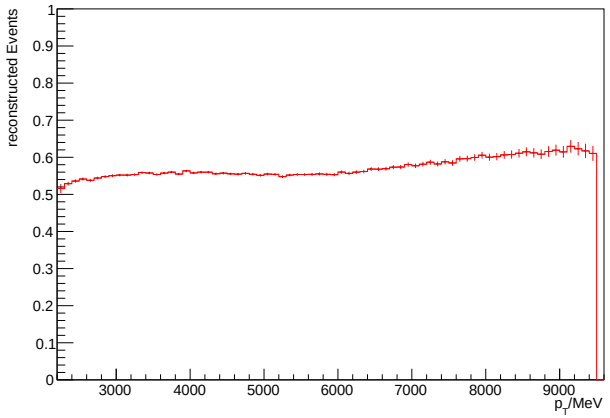


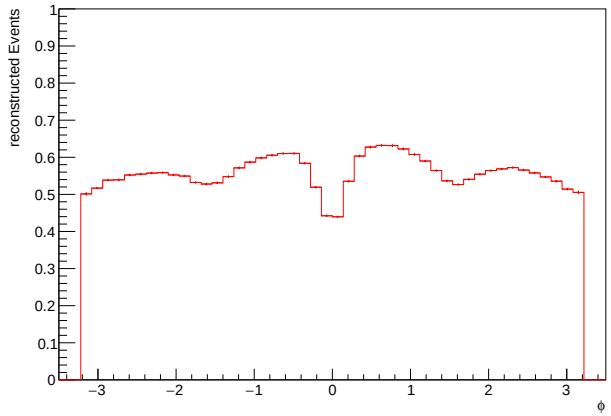


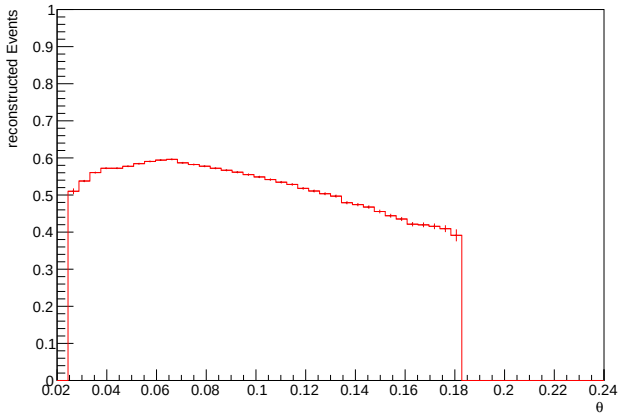


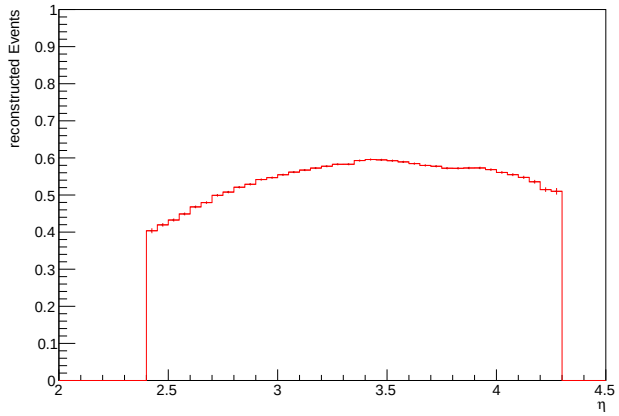


D^*-efficiency









Charge: -

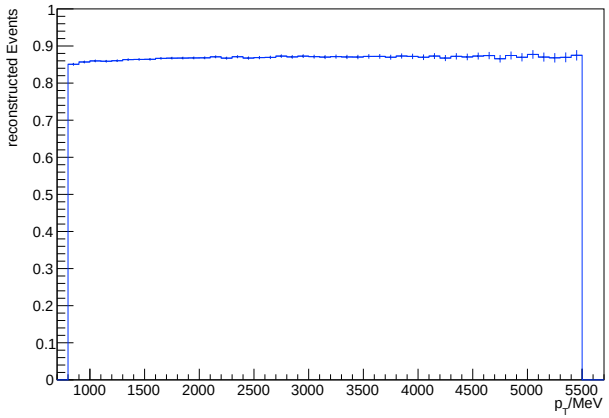
Efficiencies

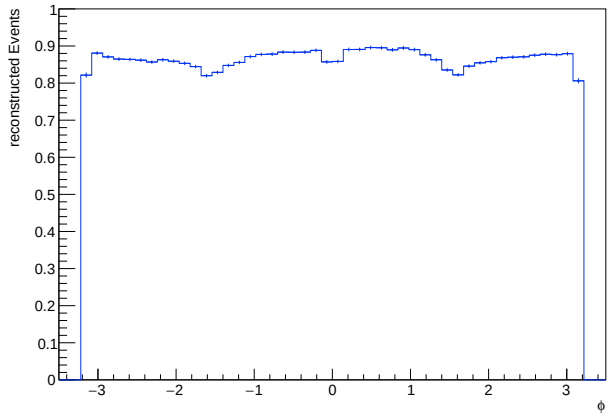
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	86.65 ± 0.02	84.25 ± 0.02	76.93 ± 0.02	73.67 ± 0.03	56.76 ± 0.03
DOWN	86.66 ± 0.02	84.27 ± 0.02	76.34 ± 0.02	73.72 ± 0.03	56.36 ± 0.02

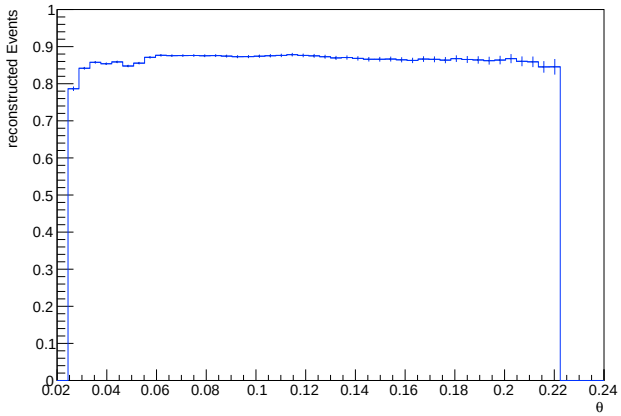
UP	π	K	*soft* π	D^0	D^*
N_{reco}	2 670 540	2 595 820	2 371 060	2 270 520	1 749 450
N_{tot}	3 082 060	3 081 050	3 082 060	3 082 060	3 082 060

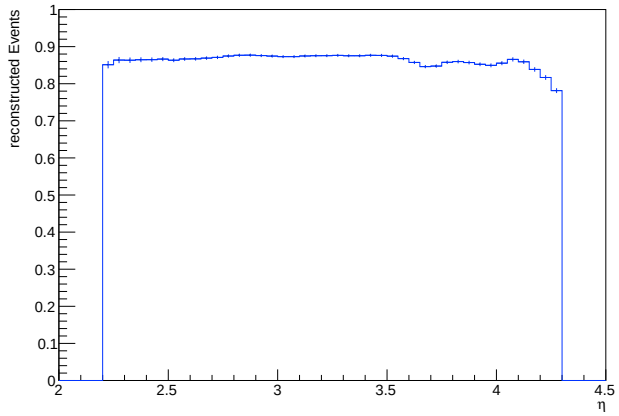
DOWN	π	K	*soft* π	D^0	D^*
N_{reco}	2 675 660	2 598 950	2 356 980	2 276 140	1 740 180
N_{tot}	3 087 370	3 084 220	3 087 370	3 087 370	3 087 370

π-efficiency

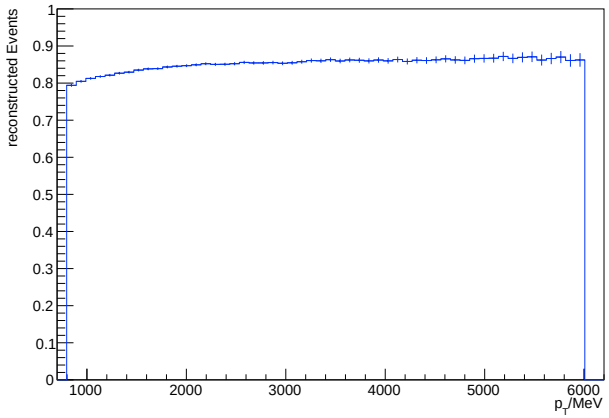


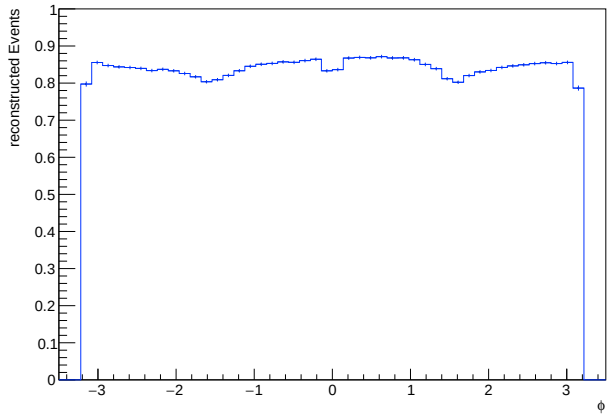


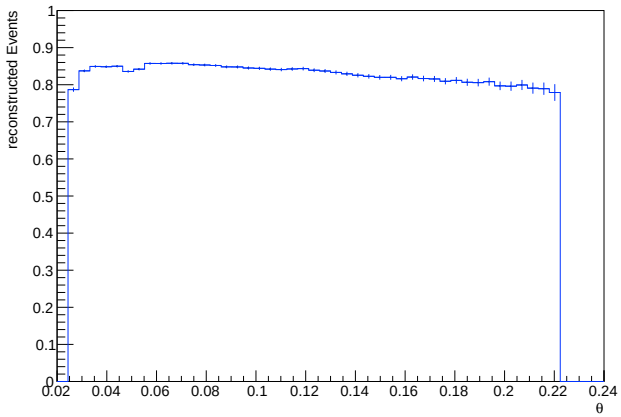


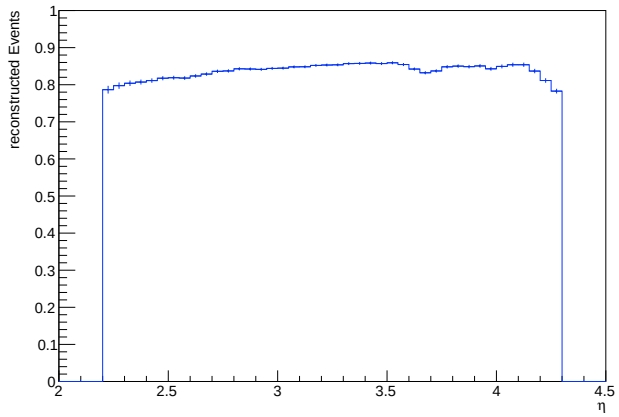


K-efficiency

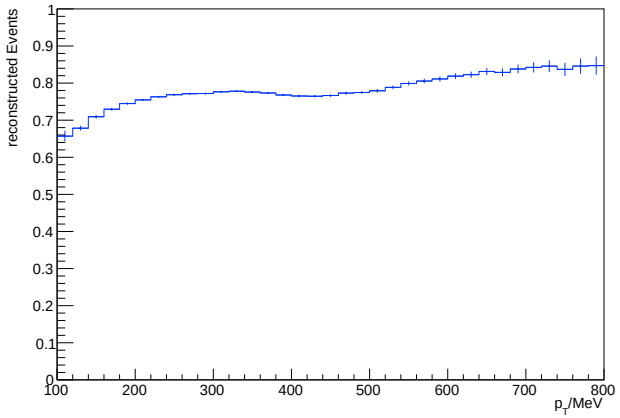


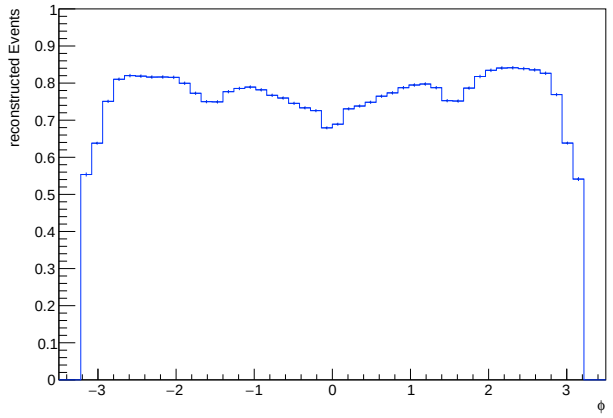


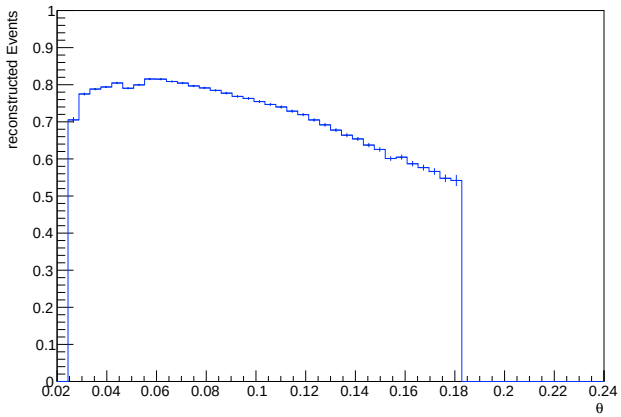


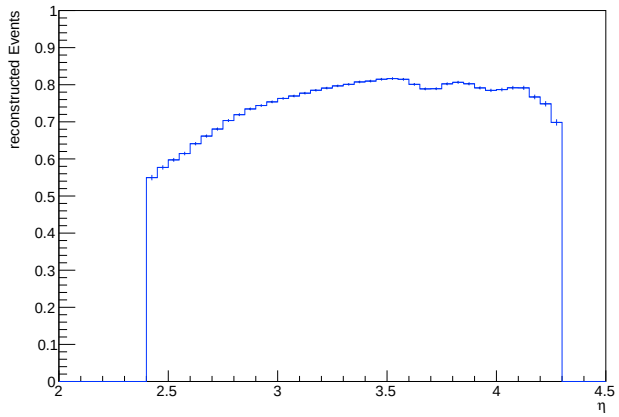


soft π-efficiency

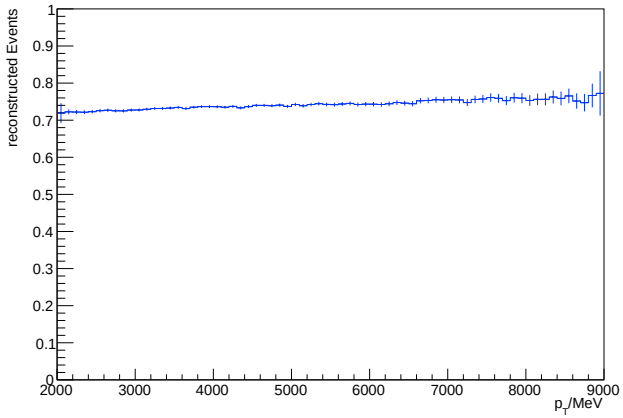


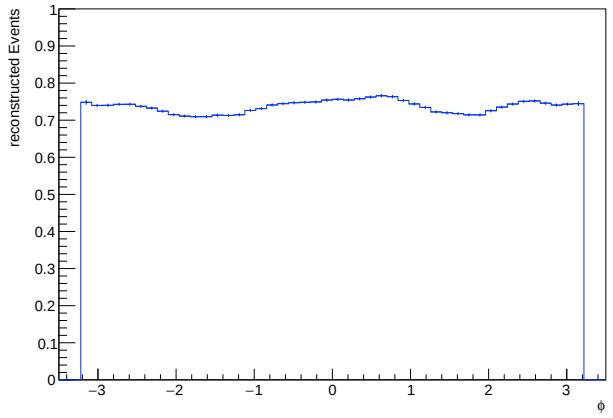


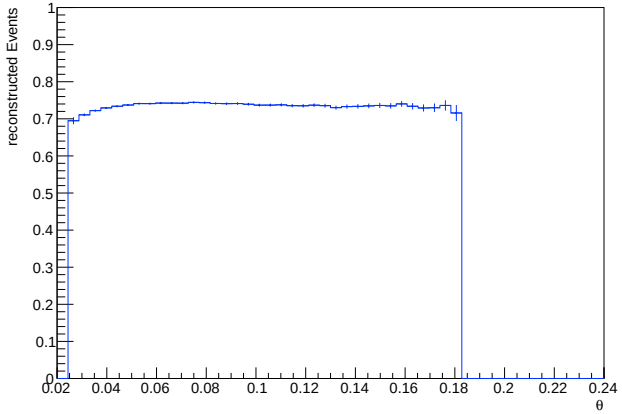


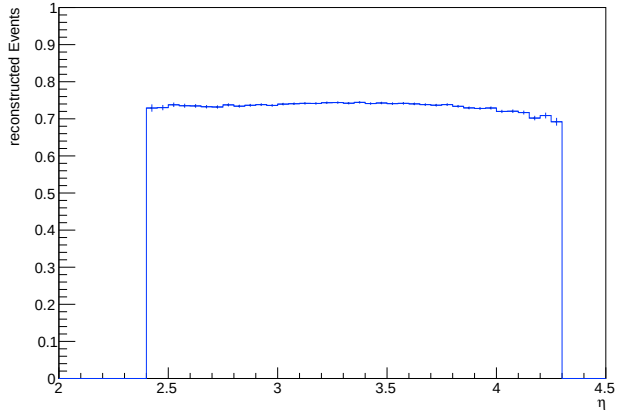


D^0-efficiency

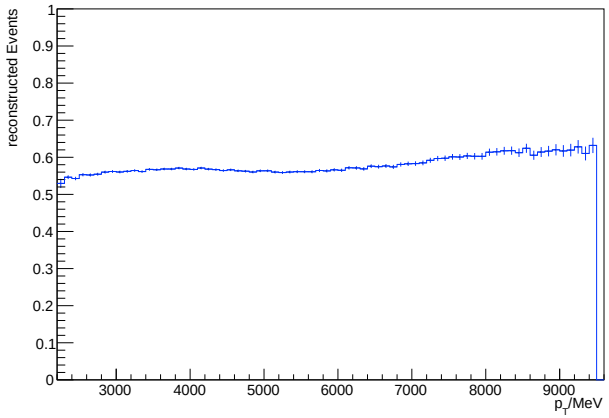


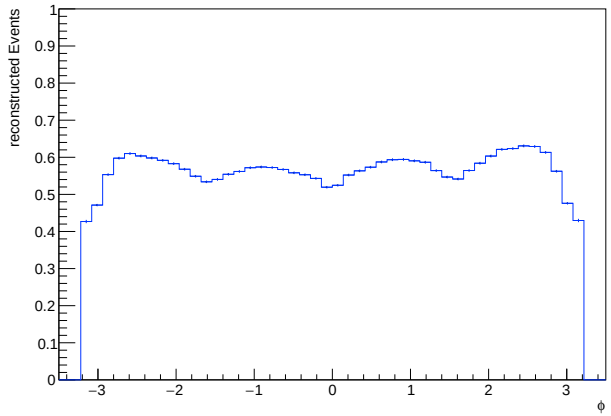


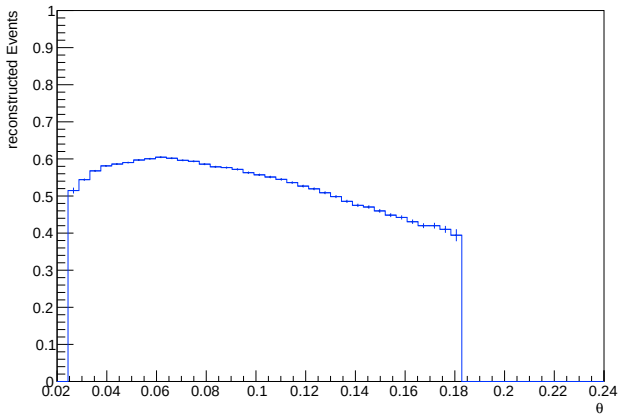


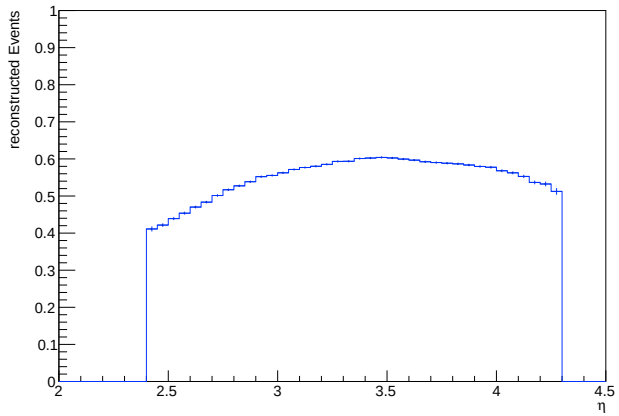


D^*-efficiency









Deviation

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

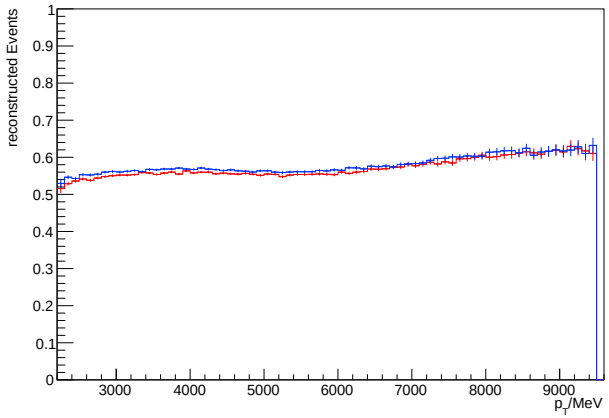
Polarity	π	K	$soft\pi$	D^0	D^*
UP	0.1 ± 0.2	4.5 ± 0.2	-3.7 ± 0.2	-4.5 ± 0.2	-8.1 ± 0.4
DOWN	0.2 ± 0.2	4.7 ± 0.2	4.2 ± 0.2	-4.5 ± 0.2	-0.3 ± 0.4

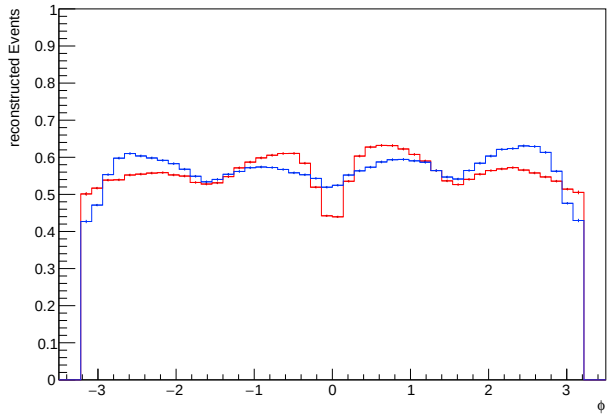
Table: The deviation $\frac{N_+ - N_-}{N_+ + N_-} / 10^{-3}$

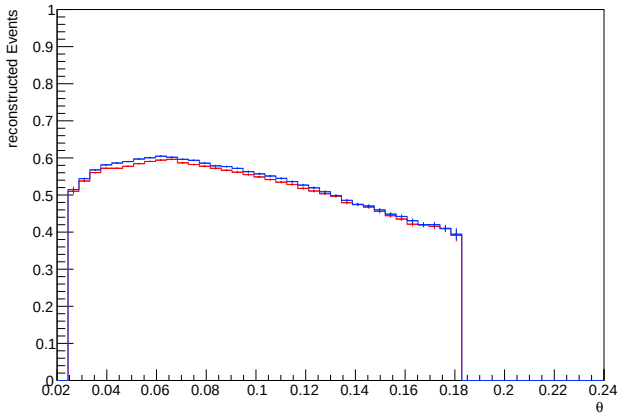
Polarity	π	K	$soft\pi$	D^0	D^*
UP	-0.1 ± 0.4	4.7 ± 0.4	-3.8 ± 0.5	-4.7 ± 0.5	-8.2 ± 0.5
DOWN	-0.3 ± 0.4	5.2 ± 0.4	3.7 ± 0.5	-5.0 ± 0.5	-0.8 ± 0.5

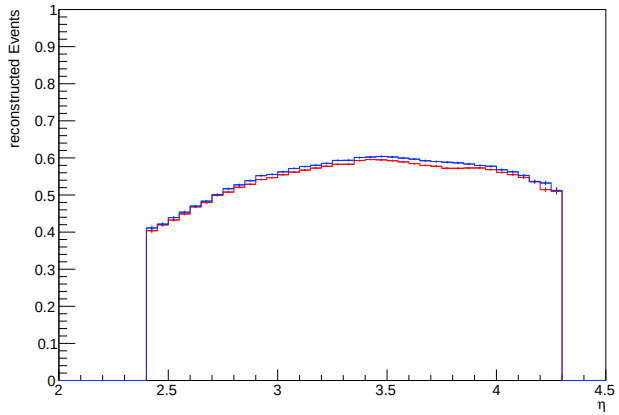
- calculation via N_{reco} doesn't work, $N_{\text{tot},+/-}$ different $\rightarrow$ no normalization
- interesting: $D_{soft\,\pi} \& D_{D^0}$ cancel partially in *DOWN*, but add up in *UP*

Comparison of different charges with *UP* polarity - D^*

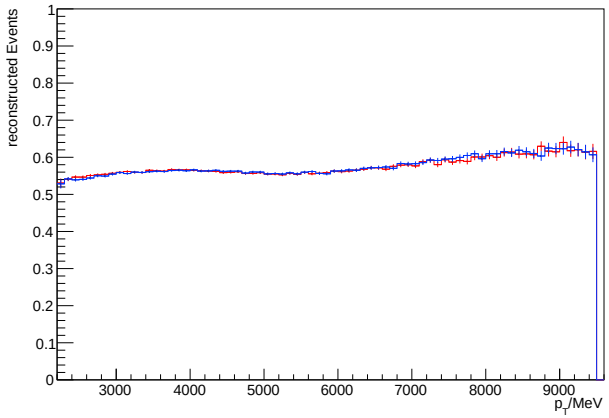


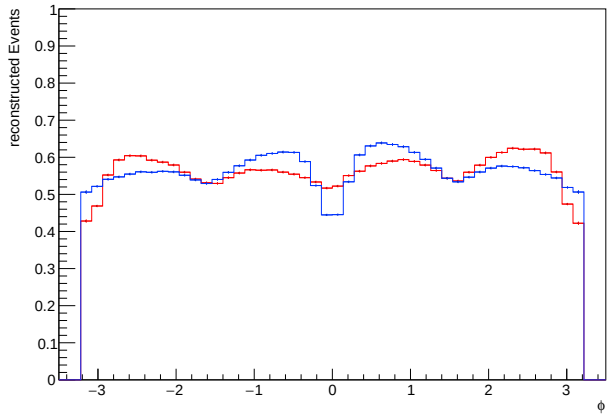


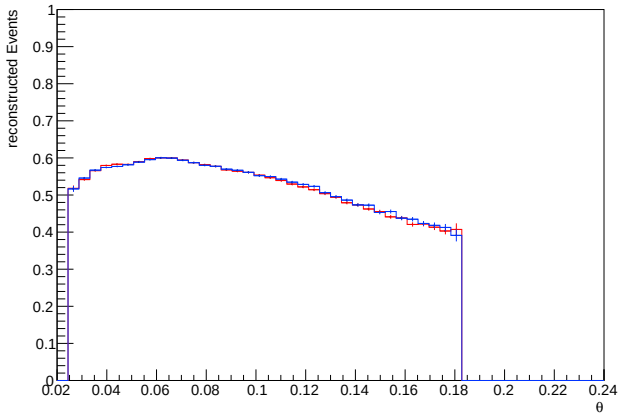


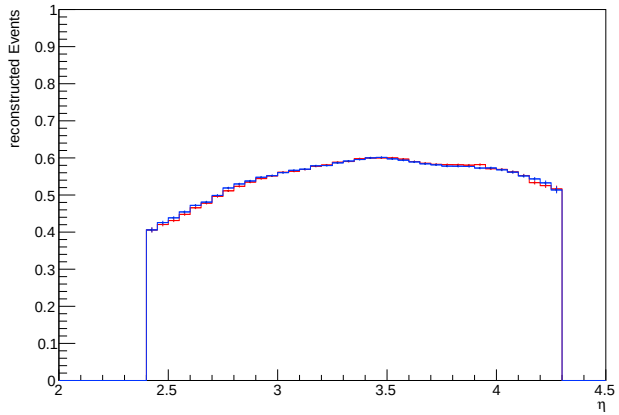


Comparison of different charges with *DOWN* polarity - D^*

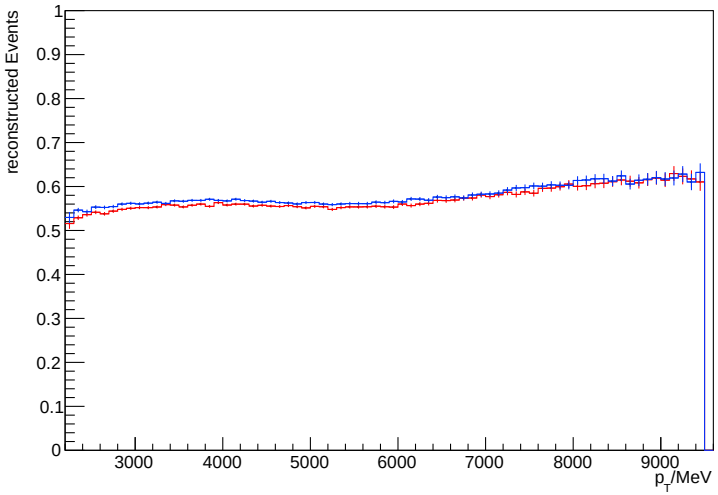


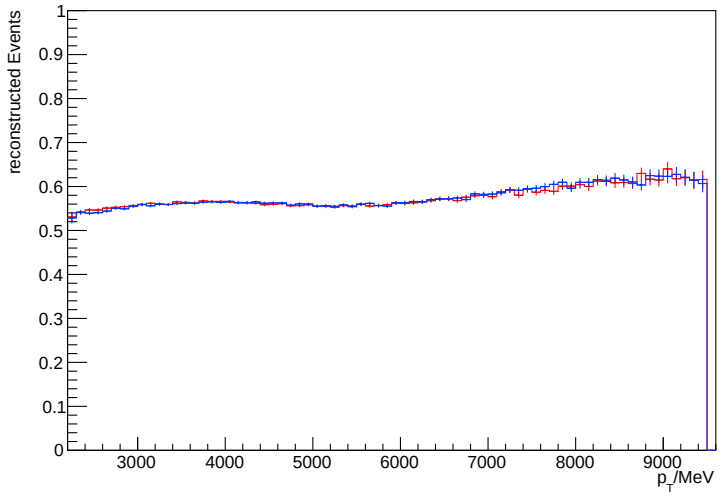




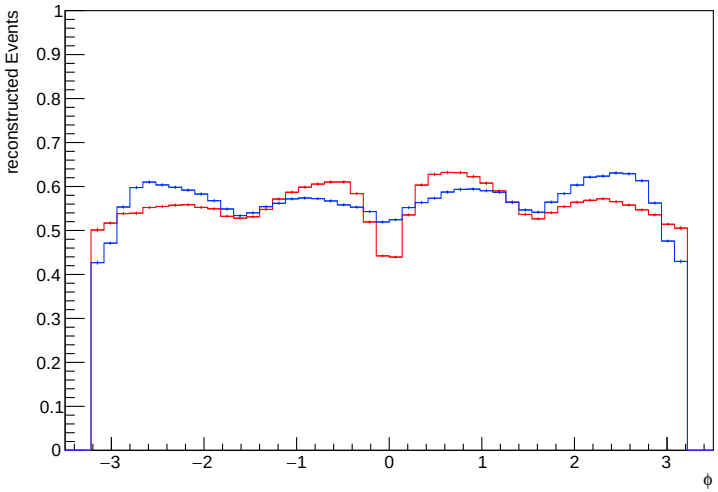


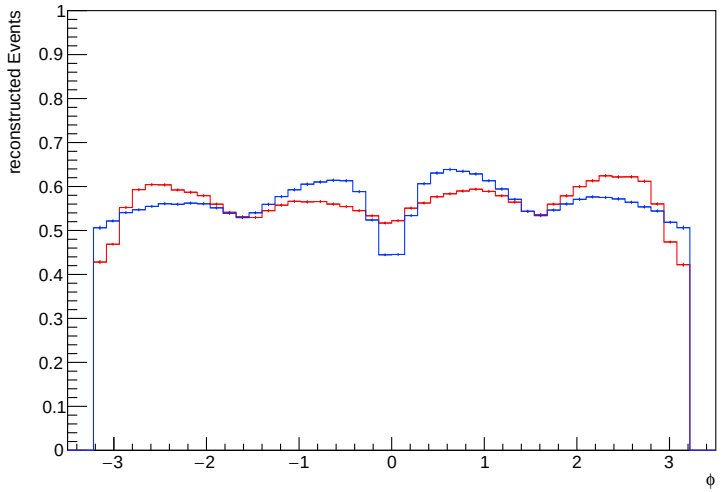
Comparison - $D^* p_T$



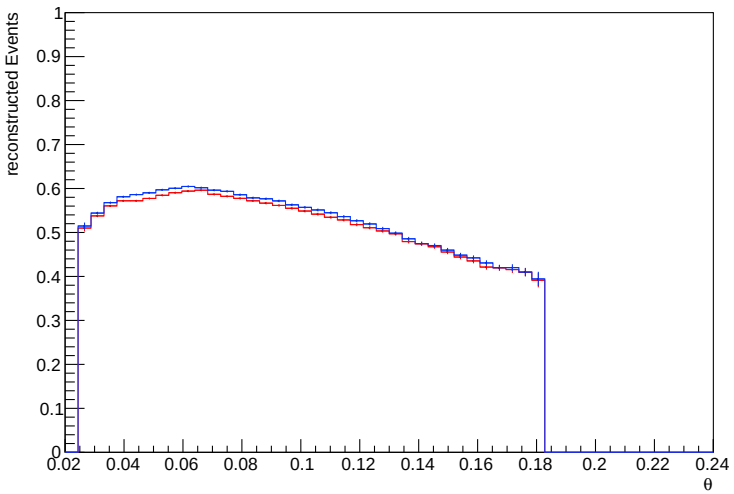


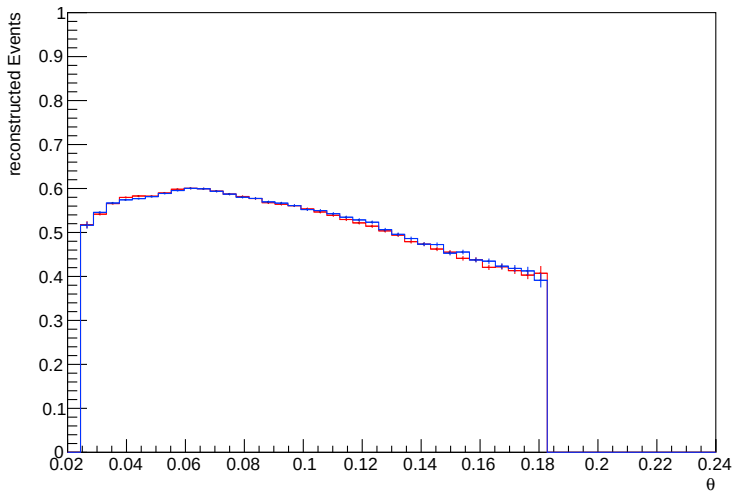
Comparison - $D^*\phi$



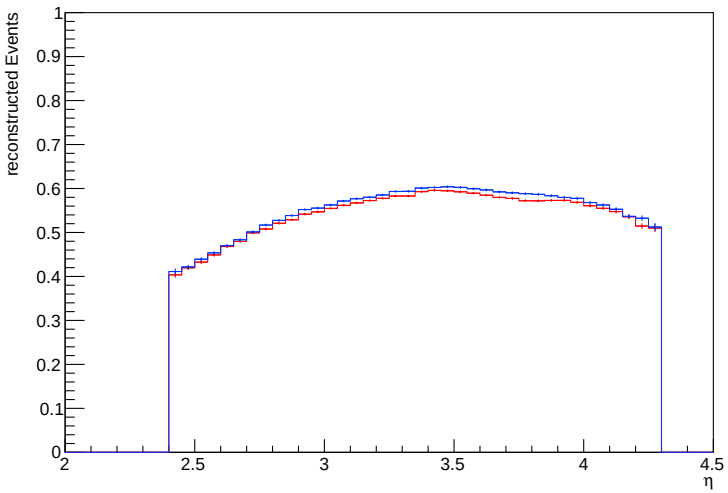


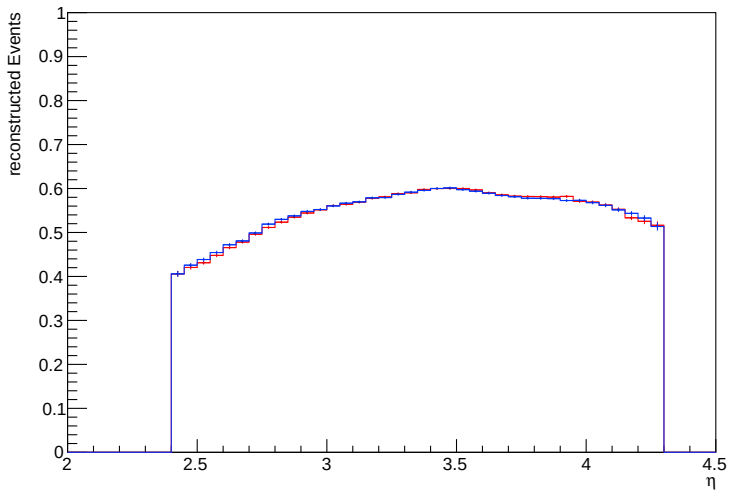
Comparison - $D^*\theta$



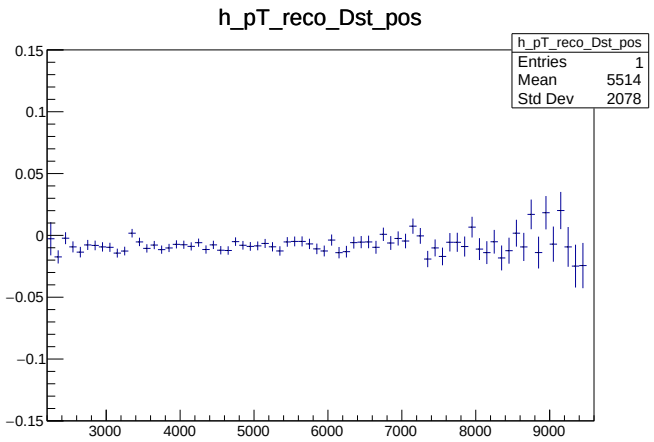


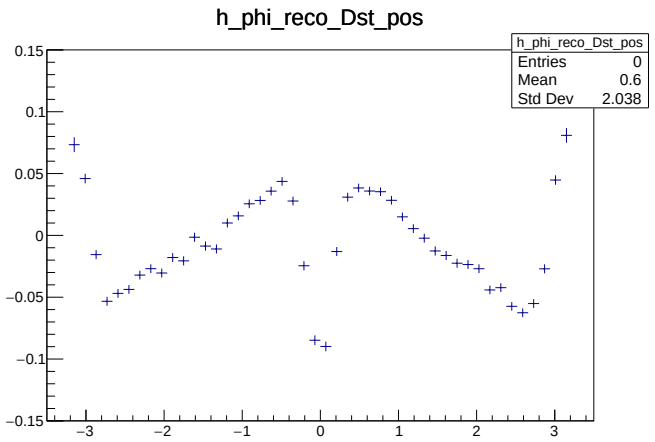
Comparison - $D^*\eta$

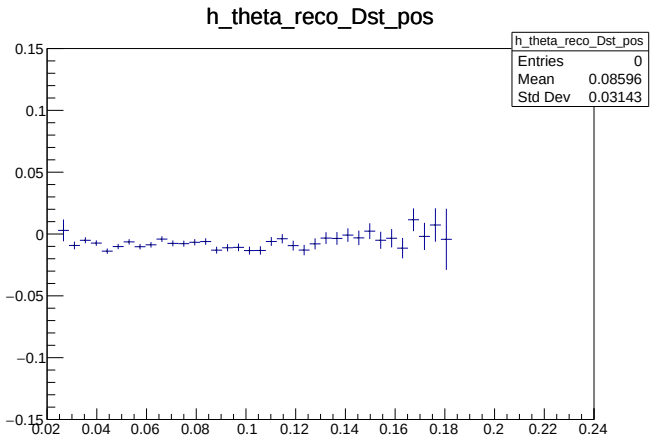


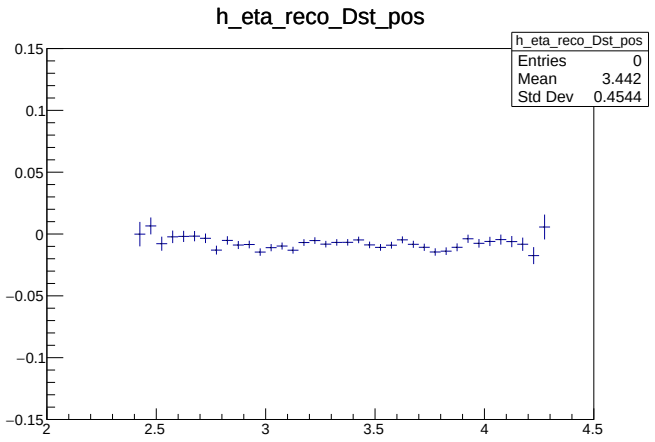


D^* deviation dependencies - *UP* polarity

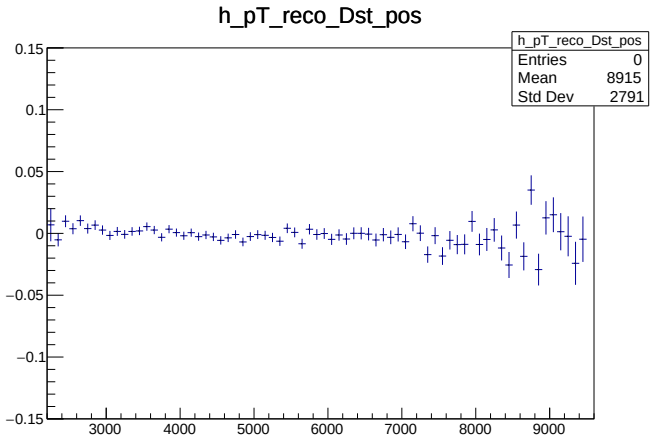


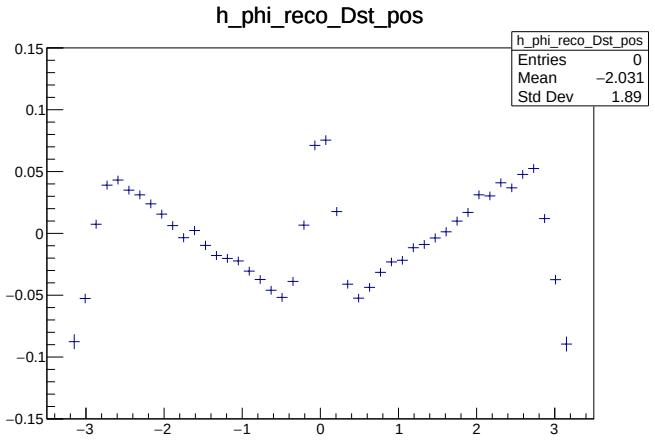


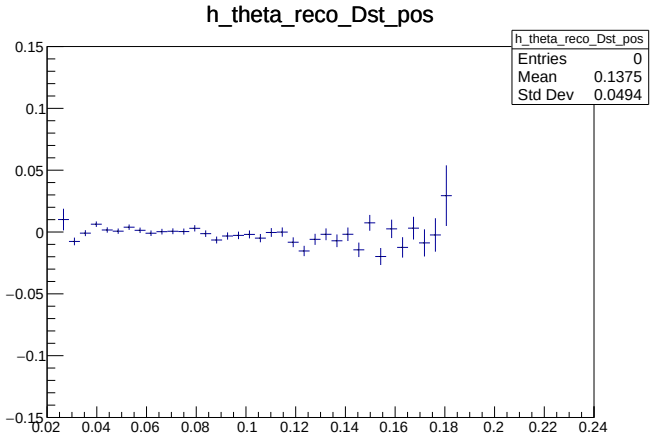


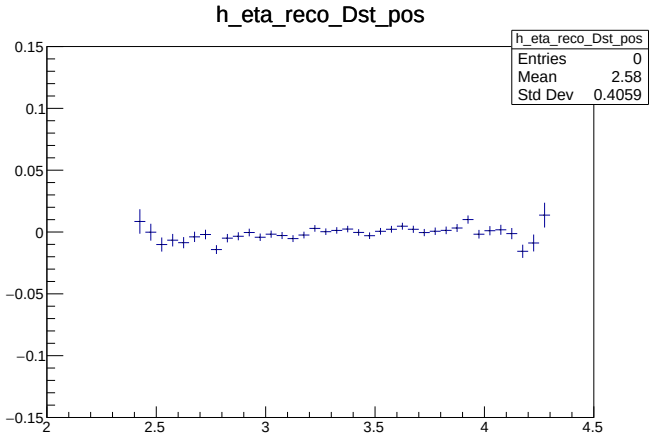


D^* deviation dependencies - *DOWN* polarity

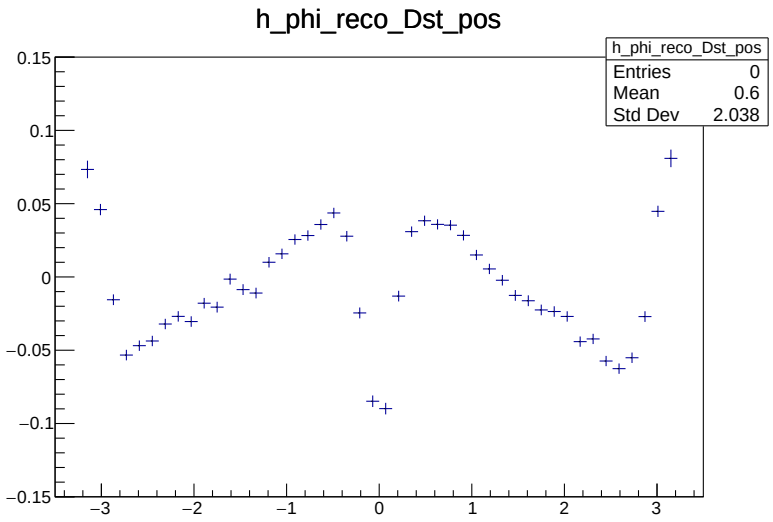


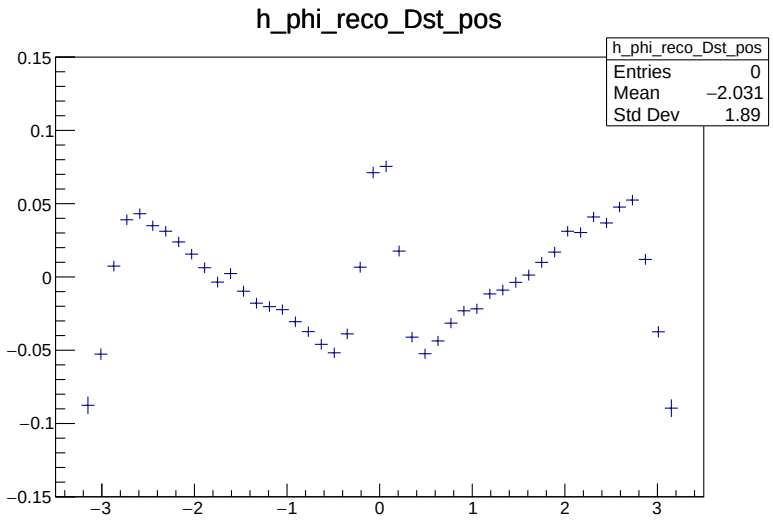






D^* deviation - ϕ





- left *UP*, right *DOWN*
- clear dependency in ϕ, inverted $UP \leftrightarrow DOWN$
- doesn't seem to have dependency on other topological variables
  $\rightarrow$ form of the detector is biggest source of induced CPV

D^* deviation UP+DOWN