Detector induced assymetry in CP violation measurements

Eugenia Spedicato, Lina Maria Ortiz Parra, Jonah Blank

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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

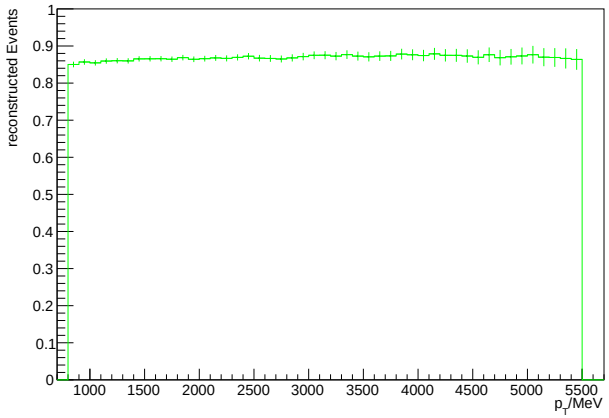
- structure of $\epsilon(\phi)$ probably due to rectangular detector shape
- peak in $\epsilon_{D^*}(\theta)$ within scope of error

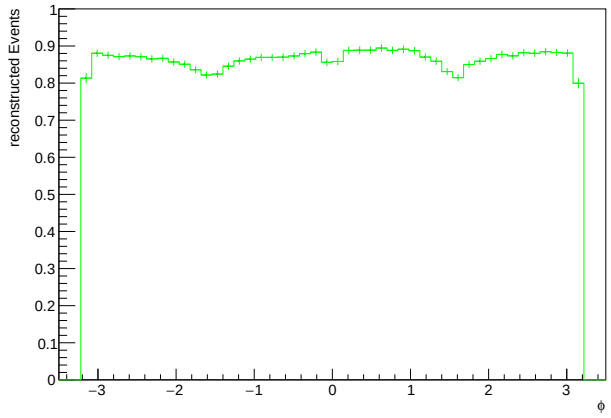
Total

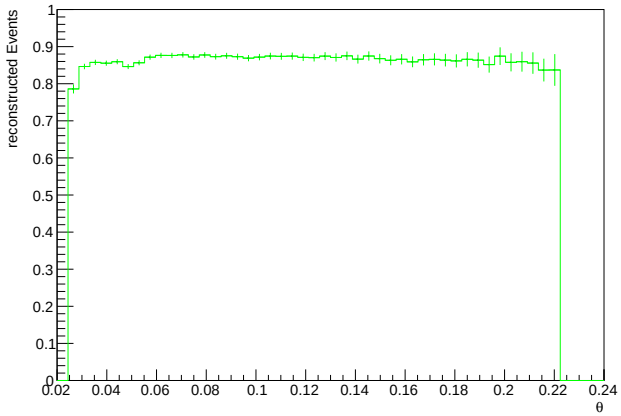
Efficiencies

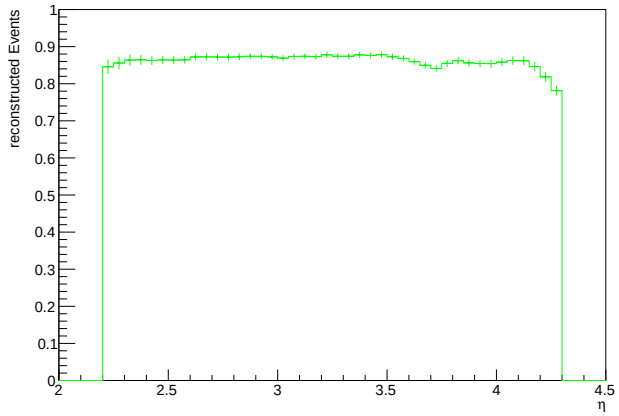
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	86.61 ± 0.04	84.65 ± 0.04	76.61 ± 0.05	73.33 ± 0.05	56.26 ± 0.06
DOWN	86.61 ± 0.04	84.67 ± 0.05	76.54 ± 0.06	73.33 ± 0.06	56.23 ± 0.07

π-efficiency

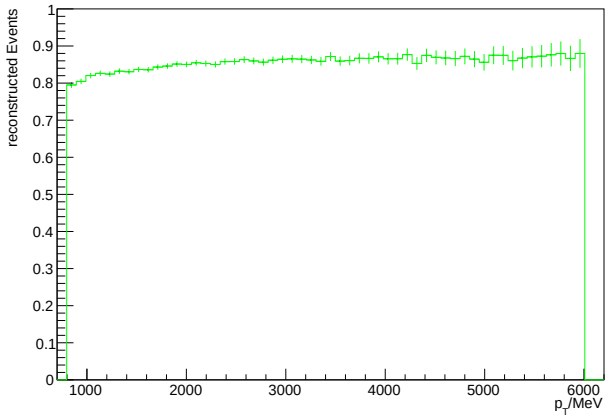


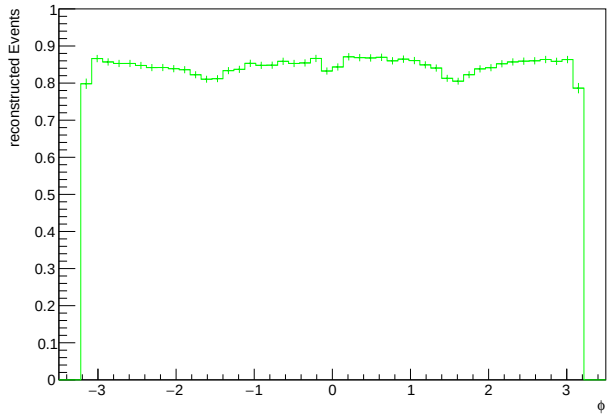


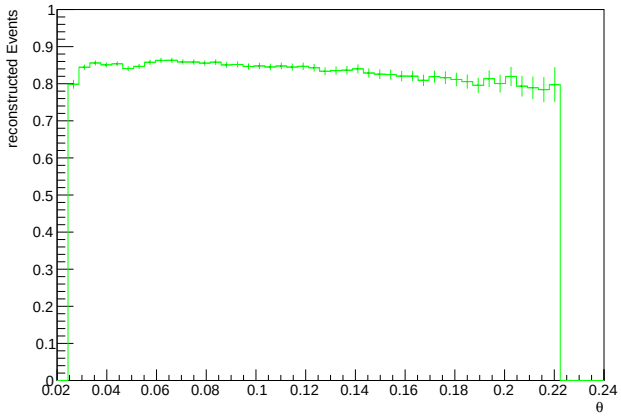


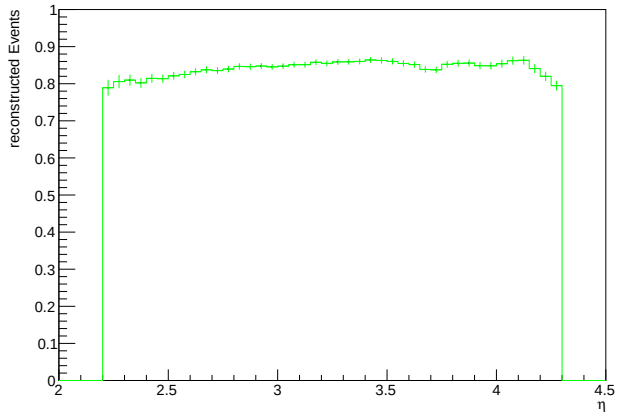


K-efficiency

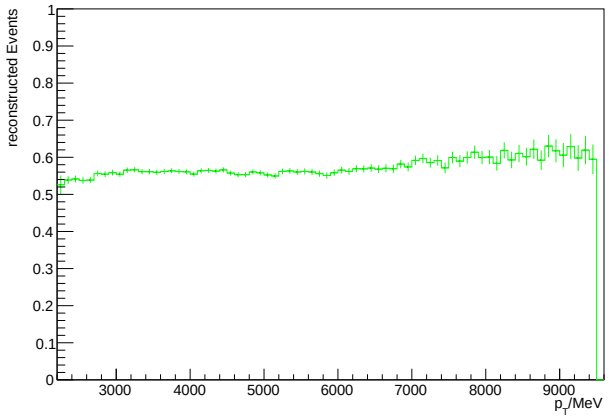


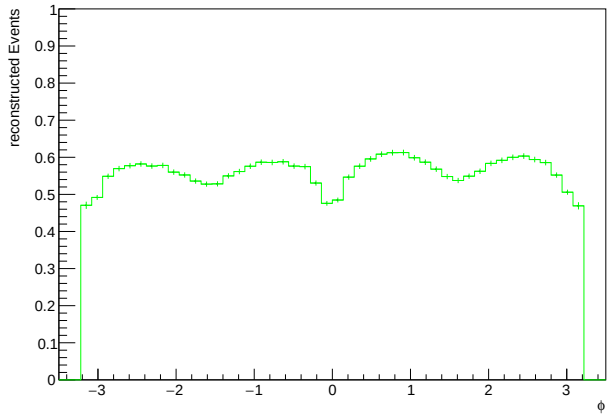


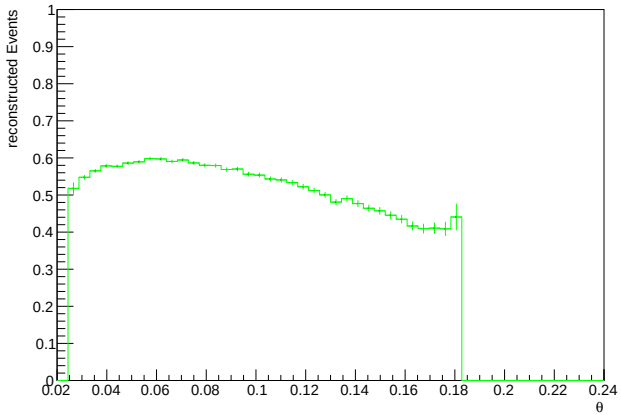


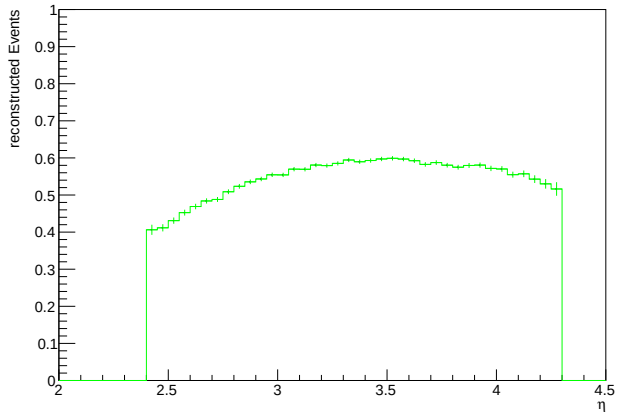


soft π-efficiency

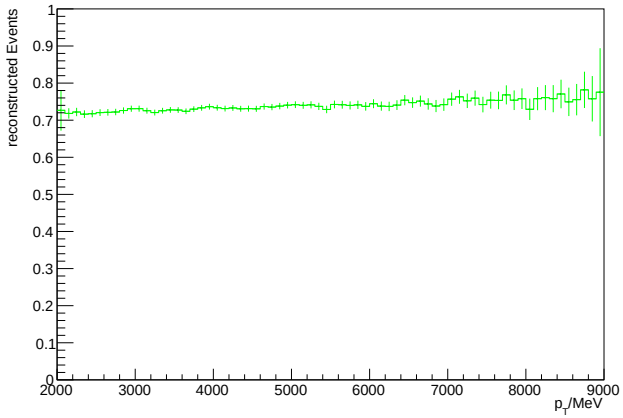


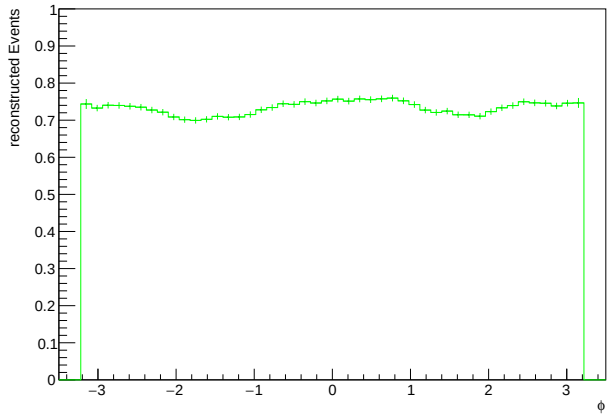


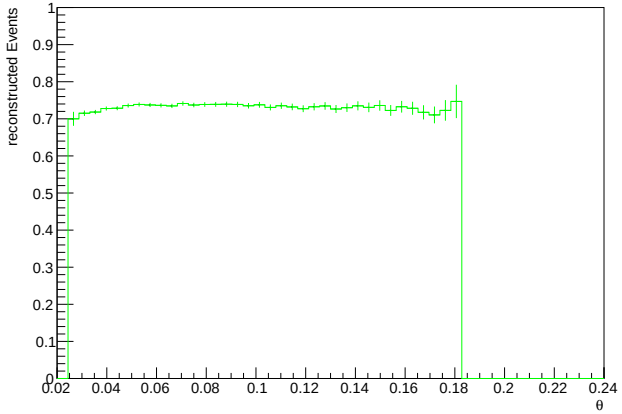


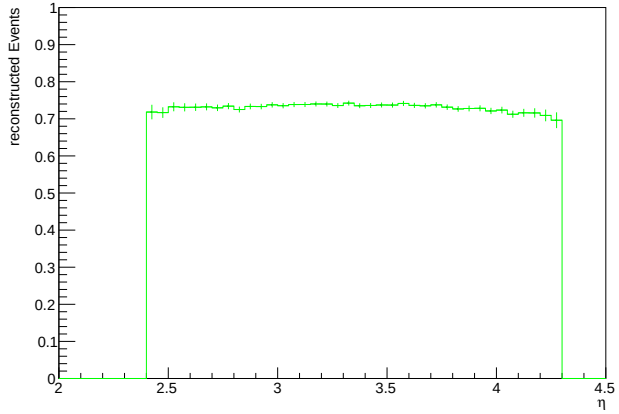


D^0-efficiency

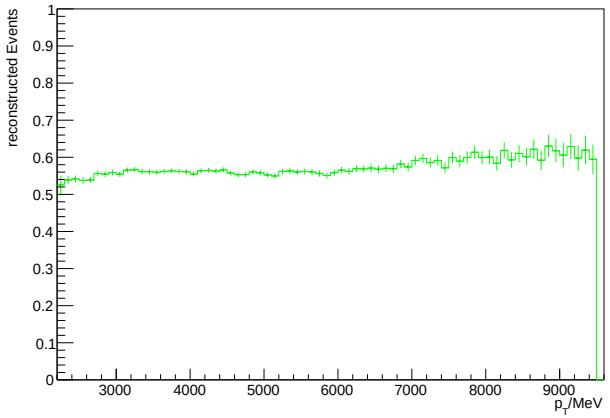


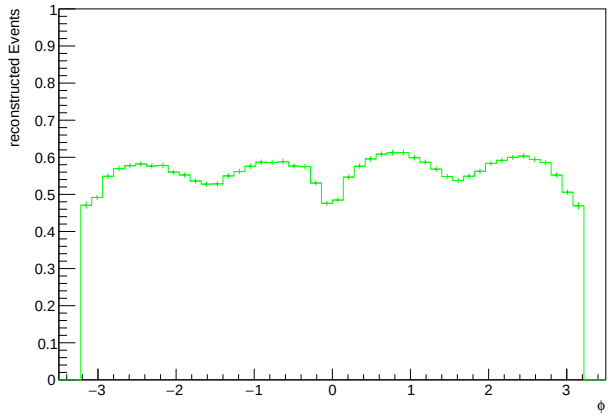


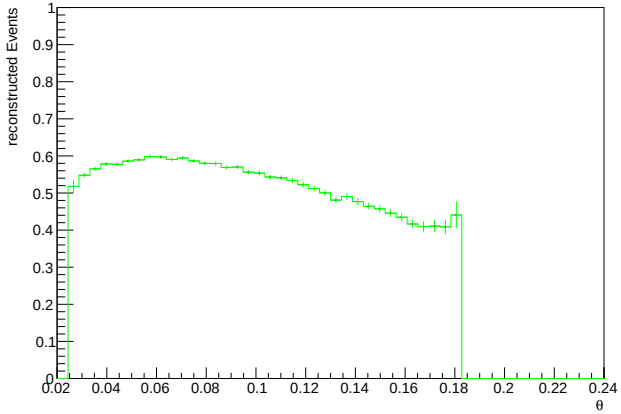


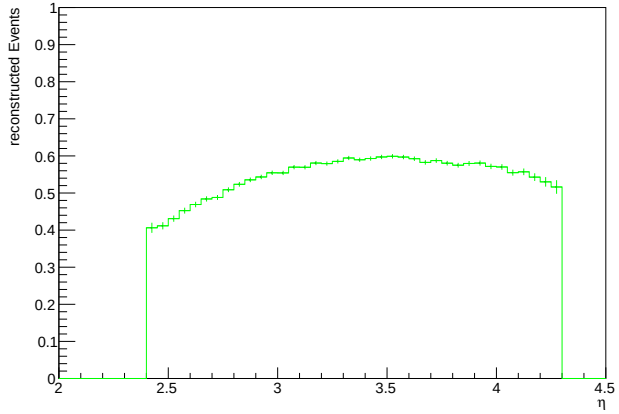


D^*-efficiency









Charge: +

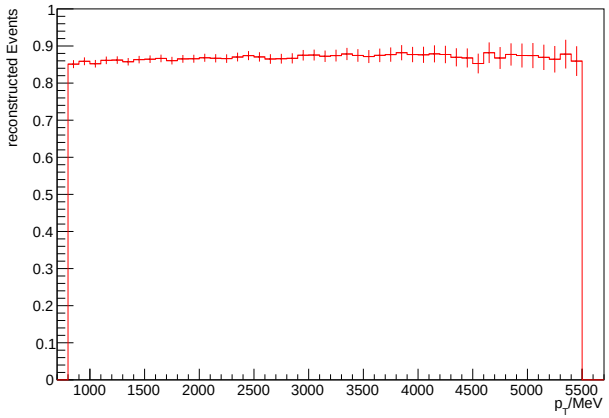
Efficiencies

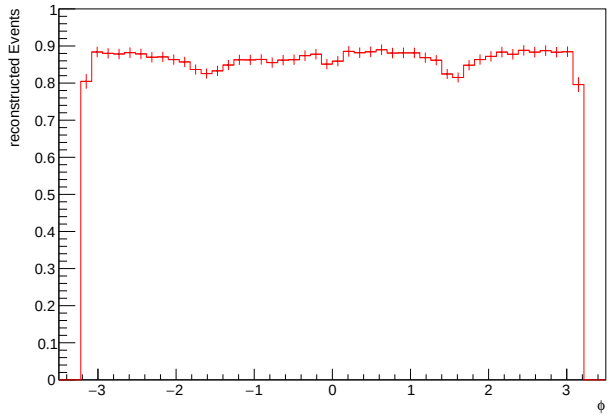
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	86.62 ± 0.06	85.05 ± 0.06	76.25 ± 0.07	72.99 ± 0.07	55.71 ± 0.08
DOWN	86.65 ± 0.06	85.10 ± 0.07	76.78 ± 0.08	72.98 ± 0.08	56.14 ± 0.09

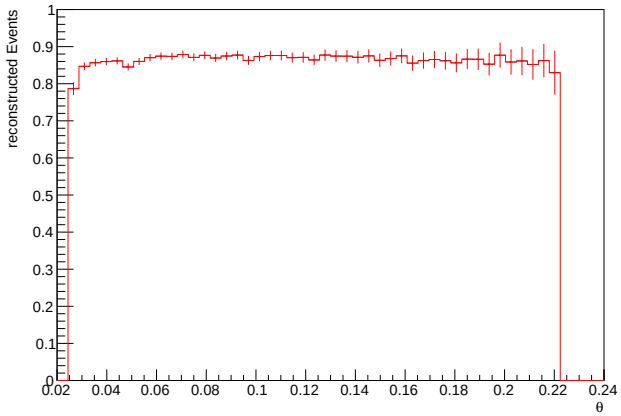
UP	π	K	*soft* π	D^0	D^*
N_{reco}	323 475	317 441	284 753	272 602	208 042
N_{tot}	373 456	373 249	373 456	373 456	373 456

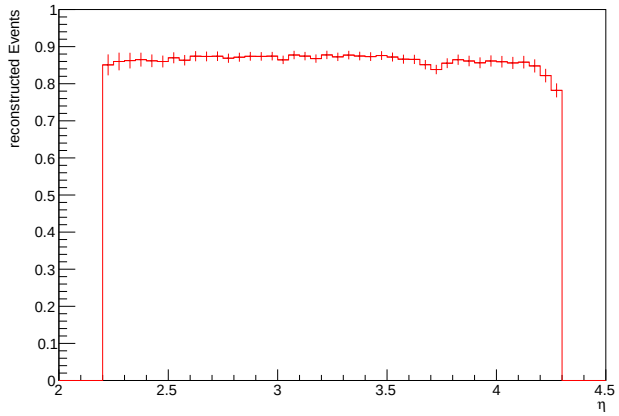
DOWN	π	K	*soft* π	D^0	D^*
N_{reco}	249 990	246 556	221 520	210 563	161 974
N_{tot}	288 516	289 742	288 516	288 516	288 516

π-efficiency

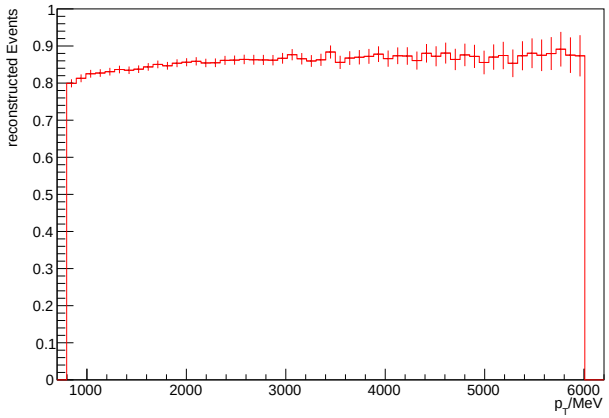


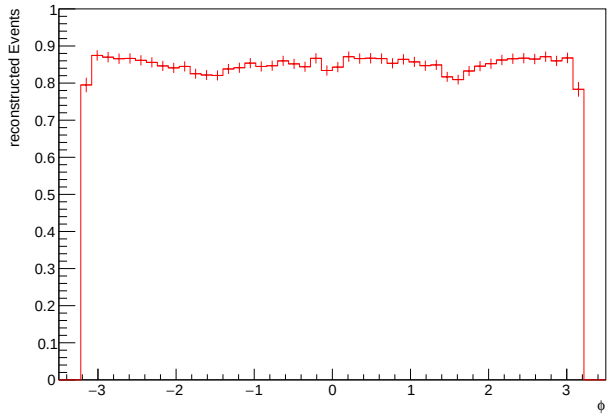


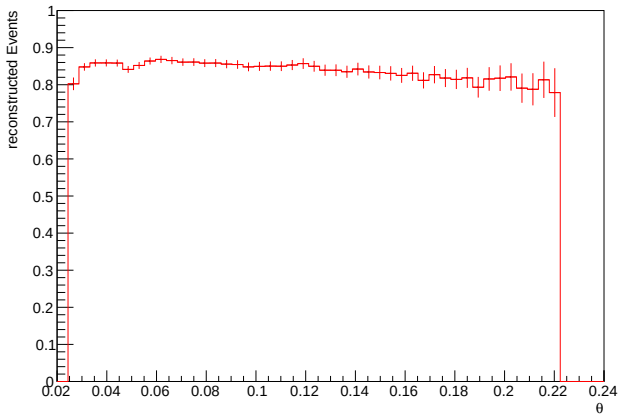


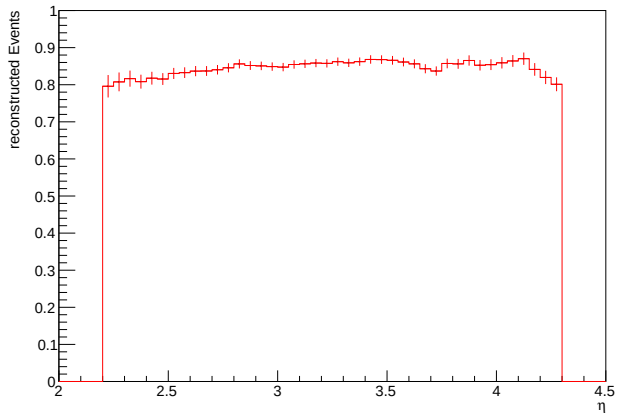


K-efficiency

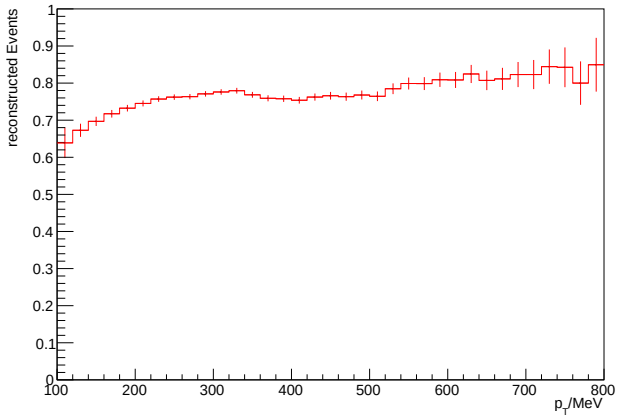


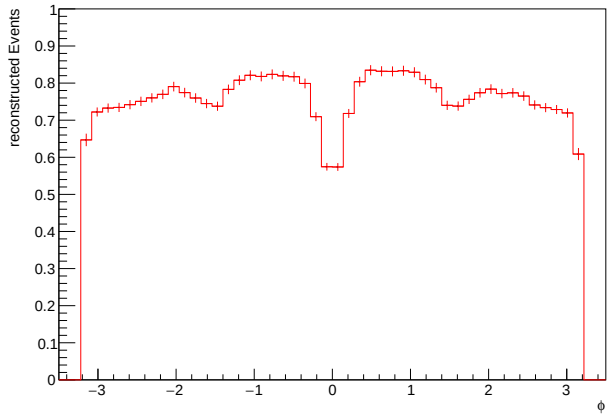


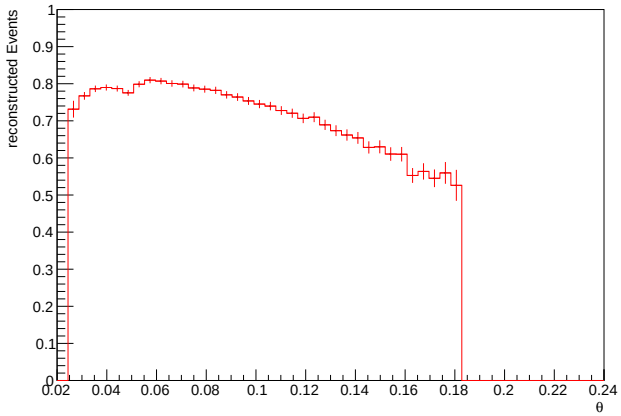


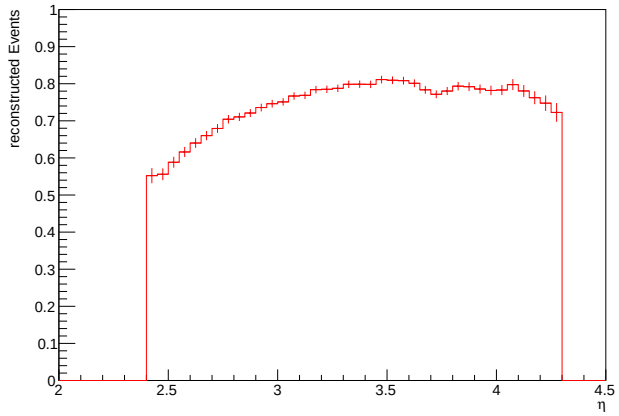


soft π-efficiency

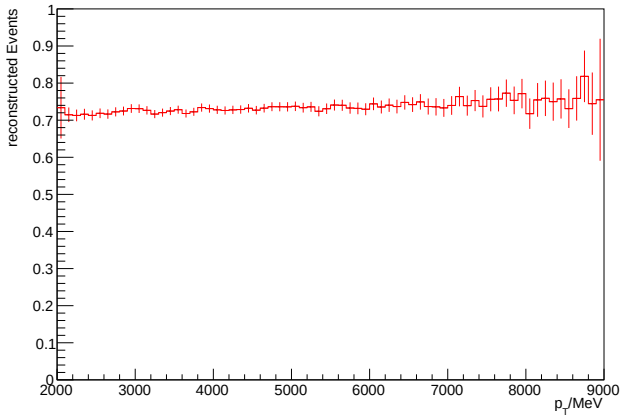


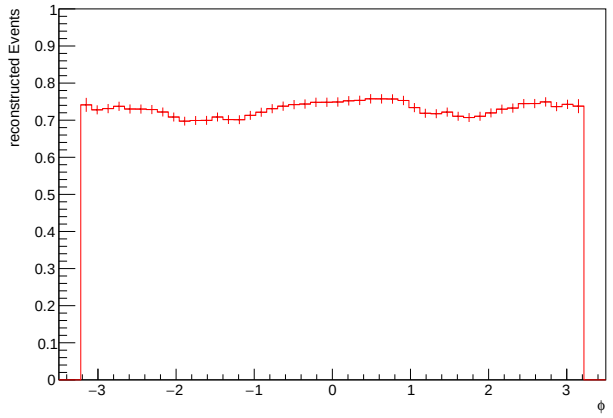


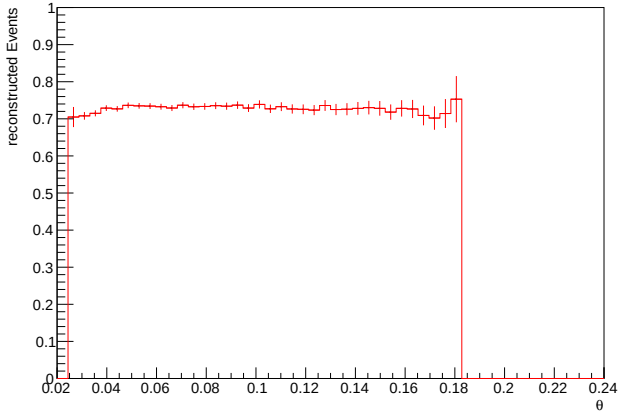


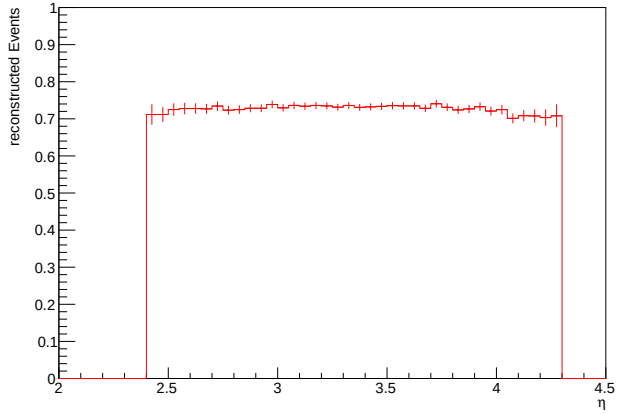


D^0-efficiency

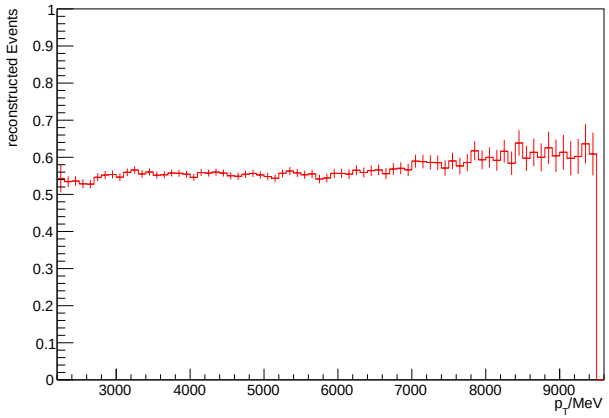


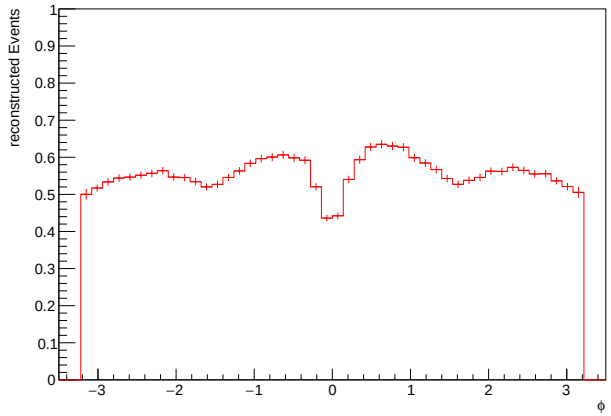


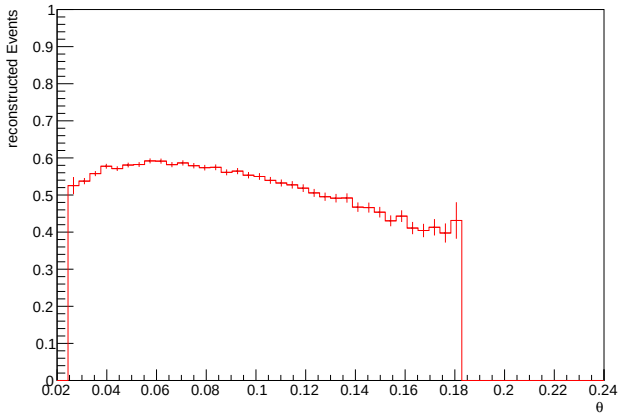


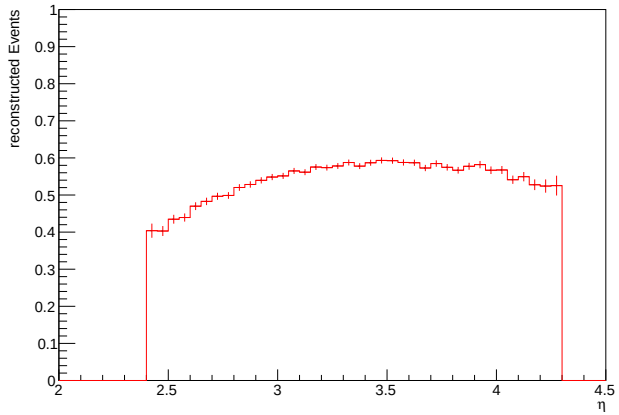


D^*-efficiency









Charge: -

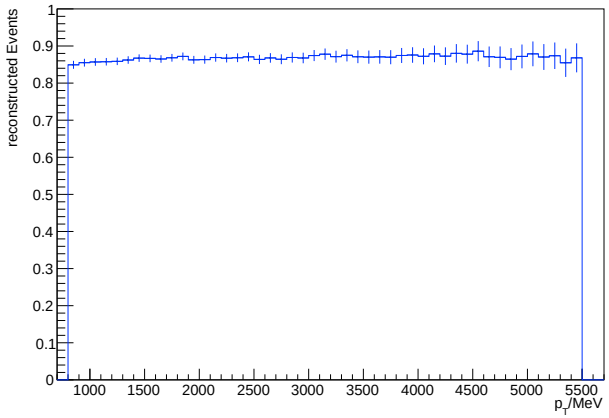
Efficiencies

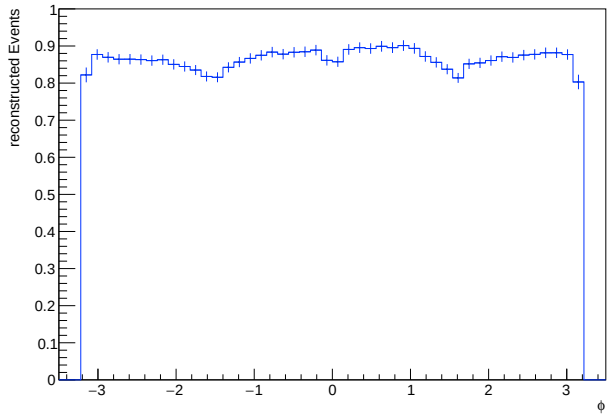
Polarity	ϵ_π	ϵ_K	$\epsilon_{\pi,s}$	ϵ_{D^0}	ϵ_{D^*}
UP	86.60 ± 0.06	84.30 ± 0.06	76.97 ± 0.07	73.65 ± 0.07	56.81 ± 0.08
DOWN	86.64 ± 0.06	83.95 ± 0.07	76.36 ± 0.07	73.74 ± 0.08	56.38 ± 0.09

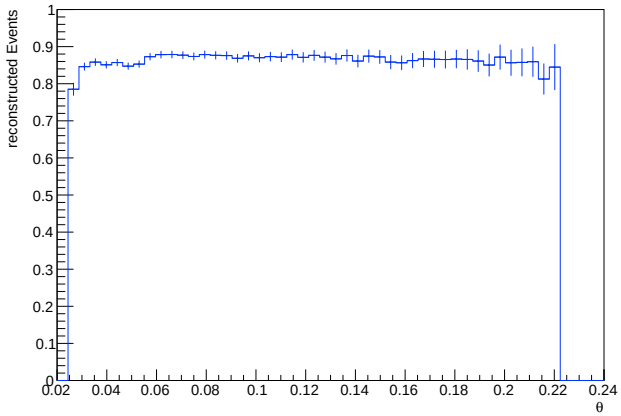
UP	π	K	*soft* π	D^0	D^*
N_{reco}	323 251	314 671	287 331	274 932	212 081
N_{tot}	373 249	373 456	373 249	373 249	373 249

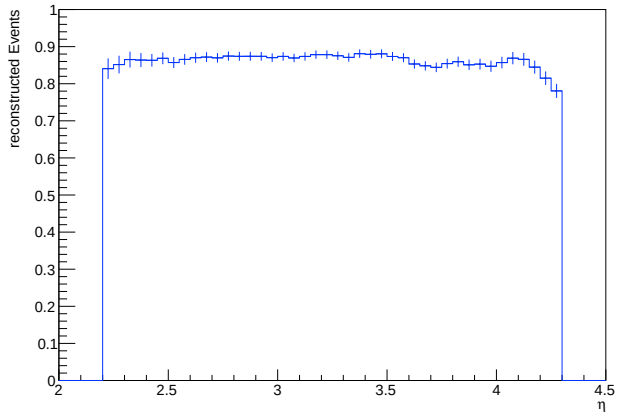
DOWN	π	K	*soft* π	D^0	D^*
N_{reco}	250 831	243 030	221 062	213 485	163 206
N_{tot}	288 742	289 516	288 742	288 742	288 742

π-efficiency

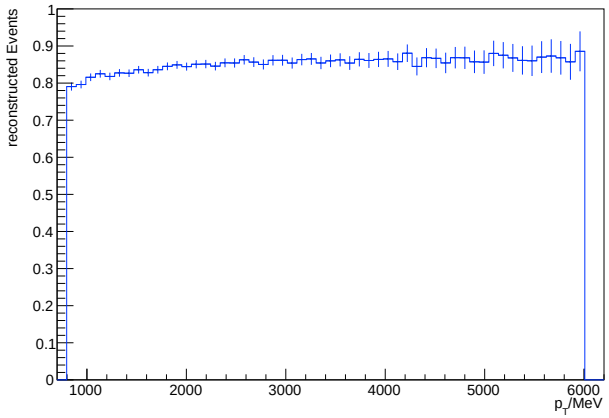


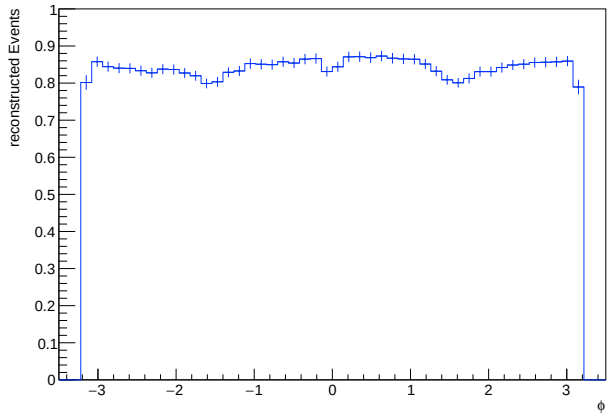


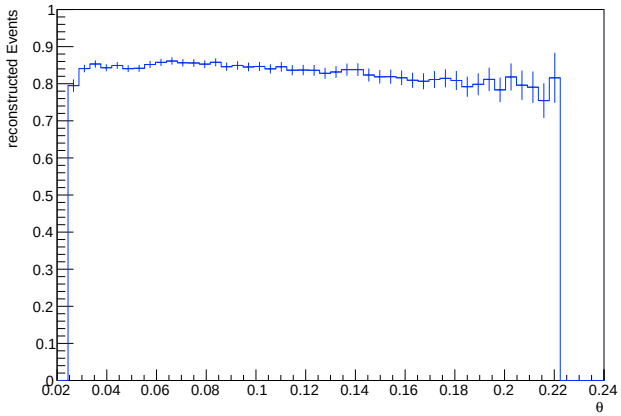


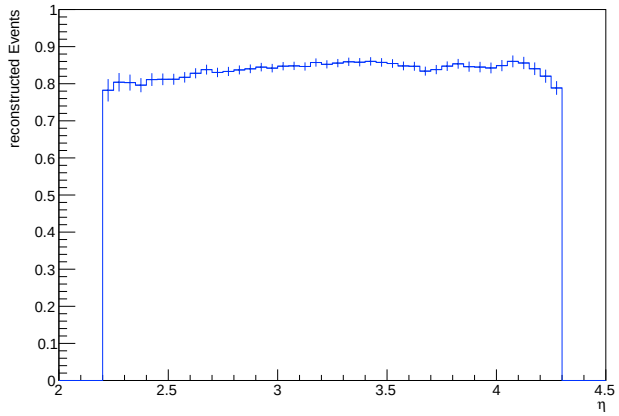


K-efficiency

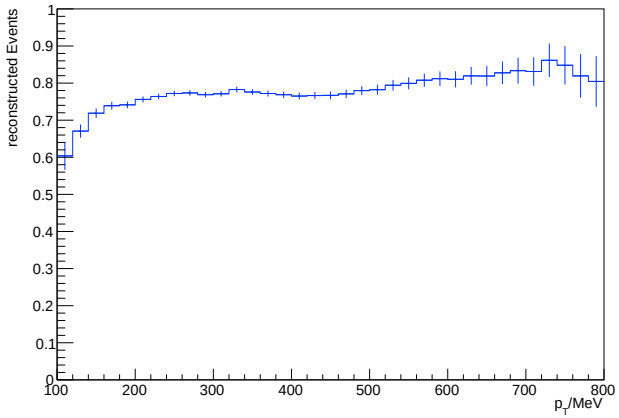


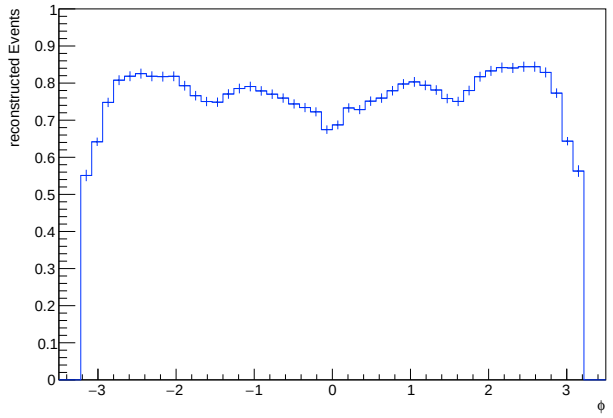


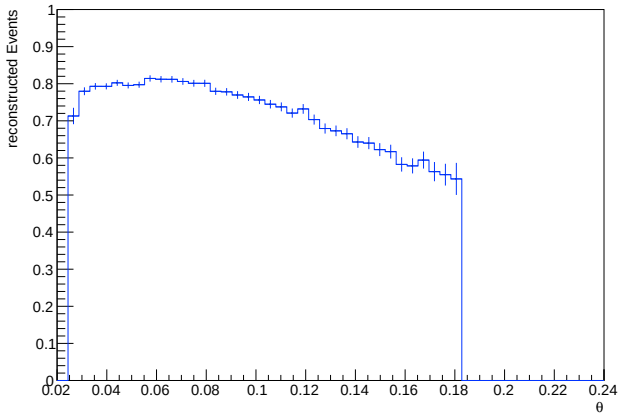


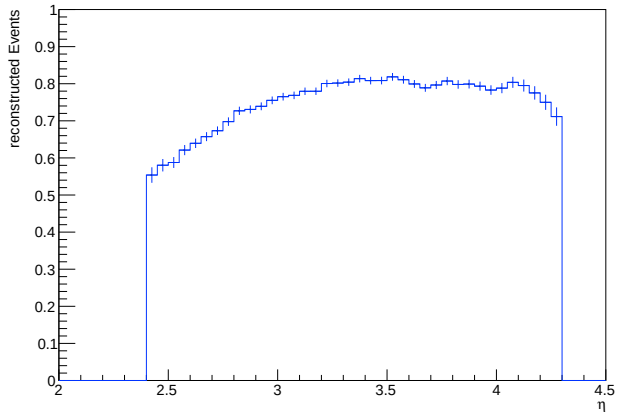


soft π-efficiency

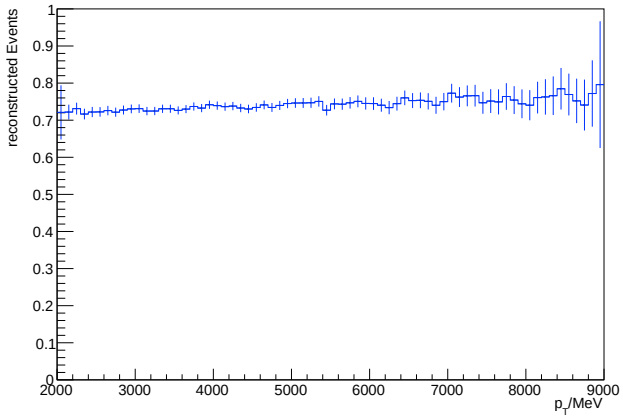


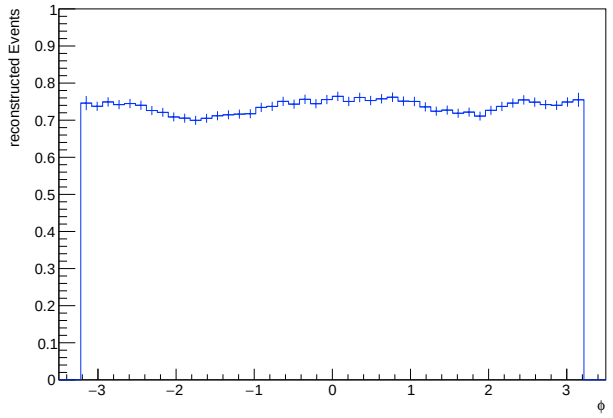


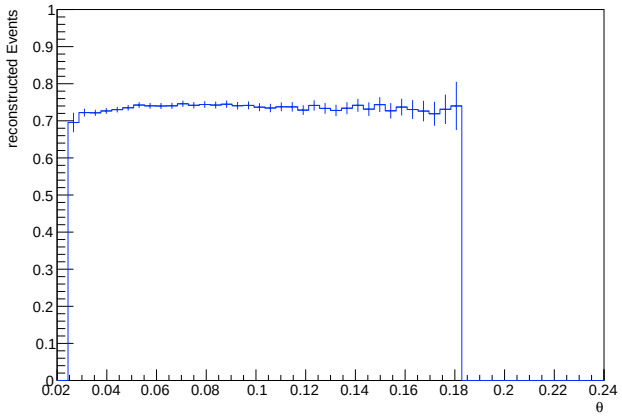


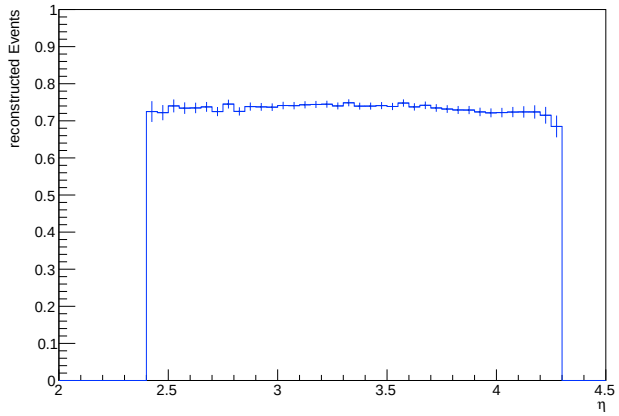


D^0-efficiency

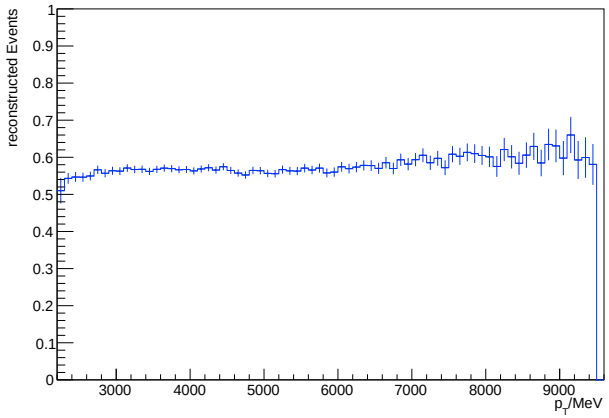


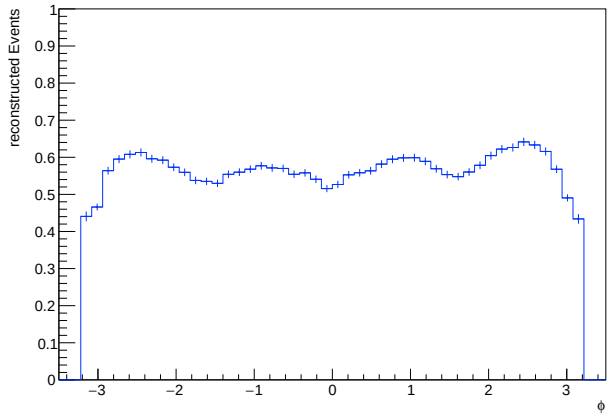


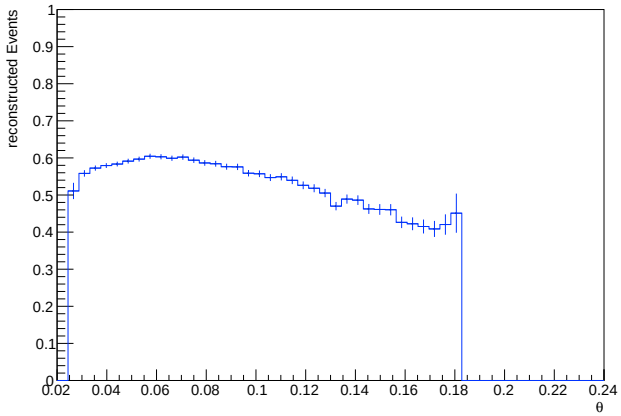


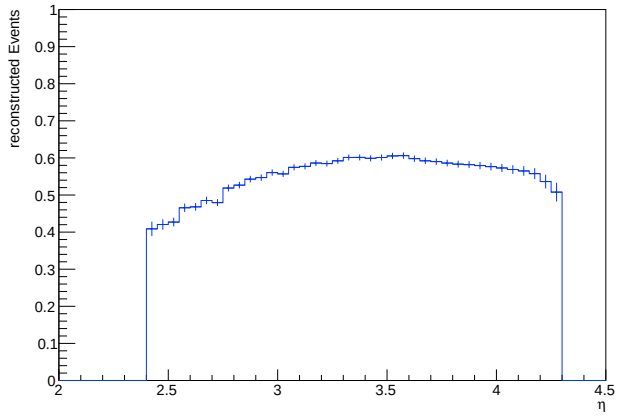


D^*-efficiency









Deviation

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

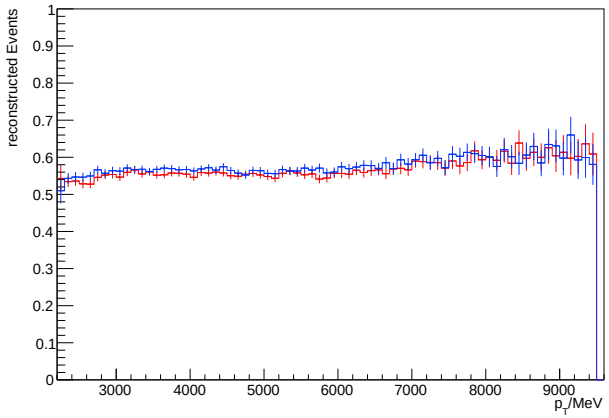
Polarity	π	K	$soft\pi$	D^0	D^*
UP	0.1 ± 0.5	4.7 ± 0.5	-4.8 ± 0.6	-4.5 ± 0.7	-9.9 ± 1.0
DOWN	0.4 ± 0.5	5.1 ± 0.6	3.2 ± 0.7	-4.8 ± 0.8	-1.7 ± 1.2

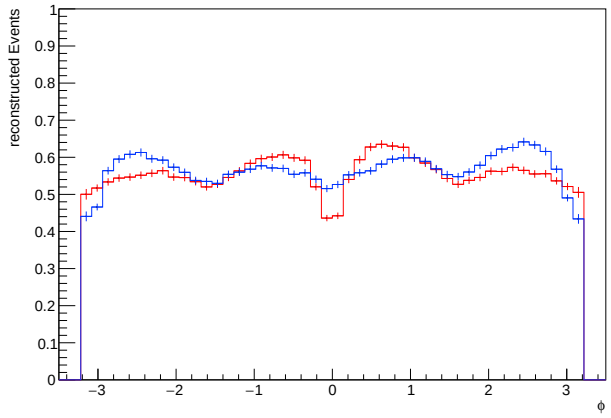
Table: The deviation $\frac{N_+ - N_-}{N_+ + N_-} / 10^{-3}$

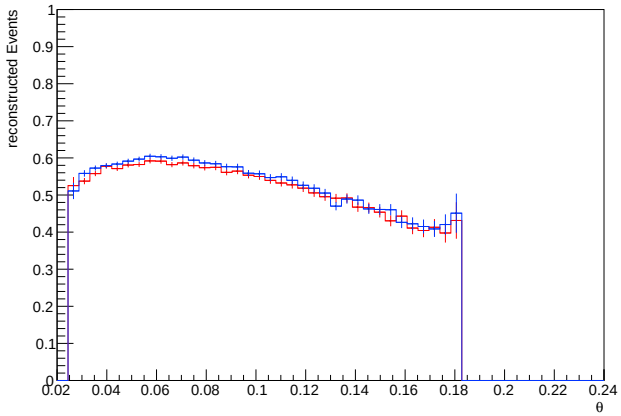
Polarity	π	K	$soft\pi$	D^0	D^*
UP	0.3 ± 1.2	4.4 ± 1.3	-4.5 ± 1.3	-4.2 ± 1.4	-9.6 ± 1.5
DOWN	-1.6 ± 1.4	7.2 ± 1.4	1.0 ± 1.5	-6.9 ± 1.5	-3.8 ± 1.8

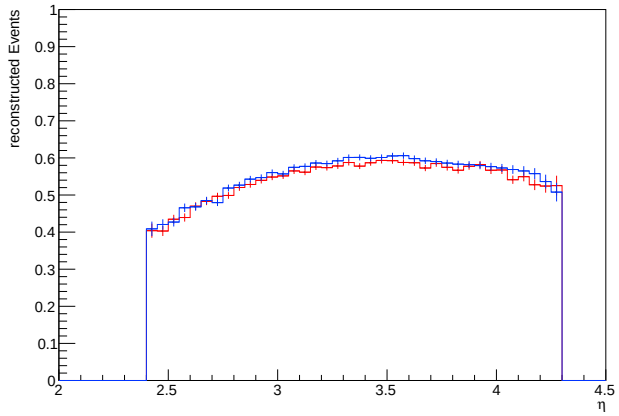
- calculation via N_{reco} doesn't work, $N_{\text{tot},+/-}$ different $\rightarrow$ no normalization
- interesting: $D_{soft\,\pi} \& D_{D^0}$ cancel partially in *DOWN*, but add up in *UP*

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

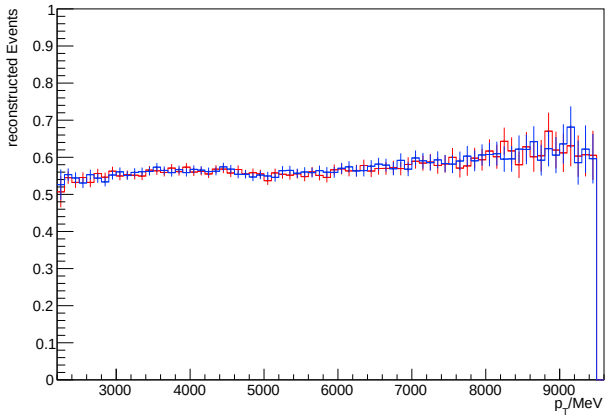


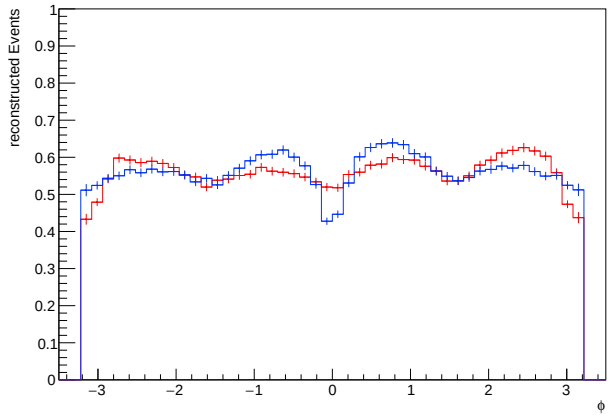


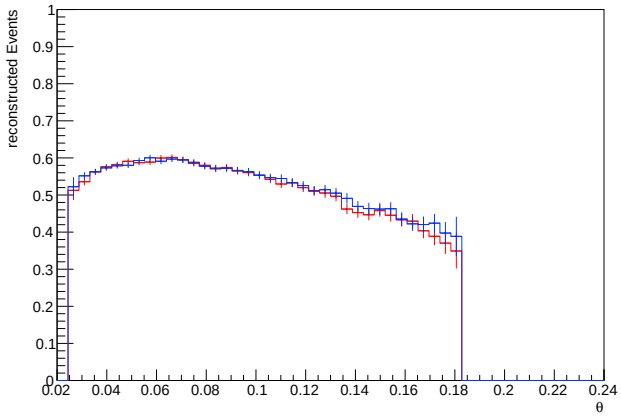


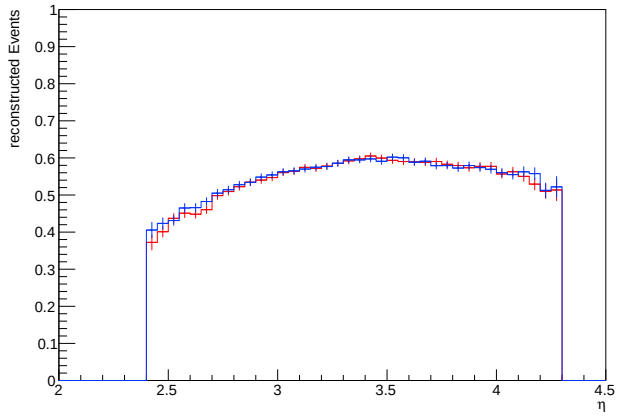


Comparison of different charges with *DOWN* polarity - D^*

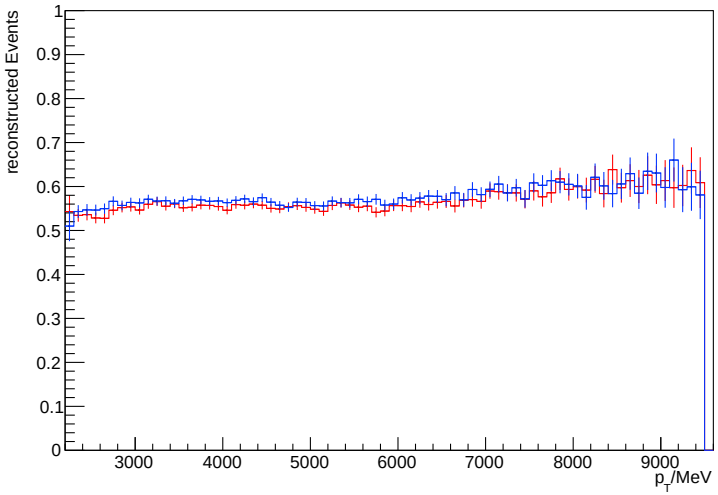


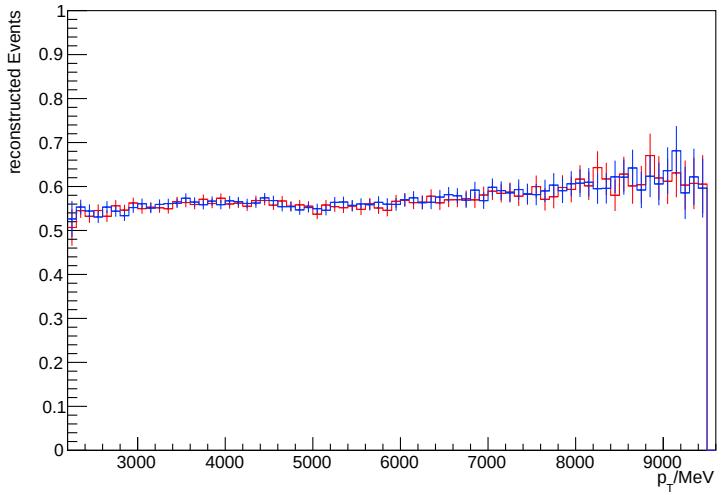




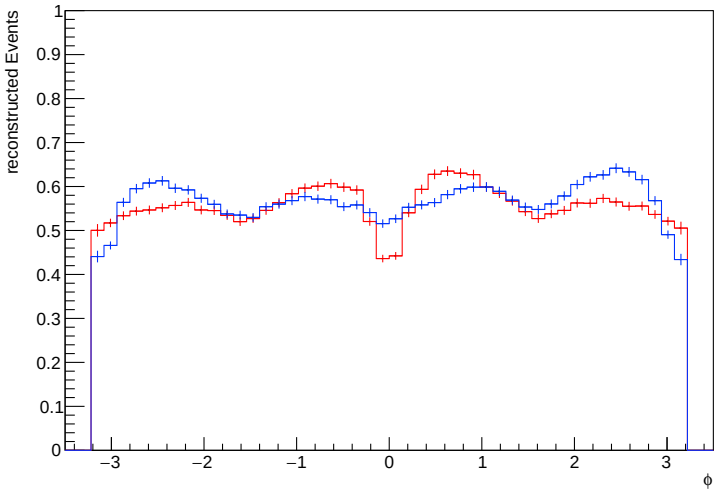


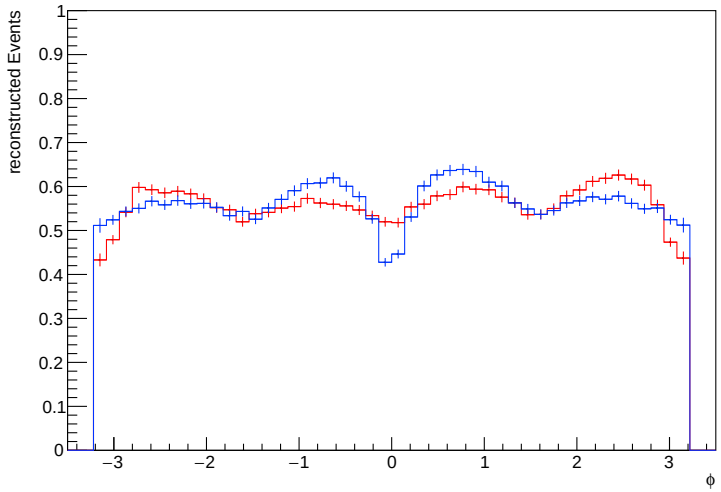
Comparison - $D^* p_T$



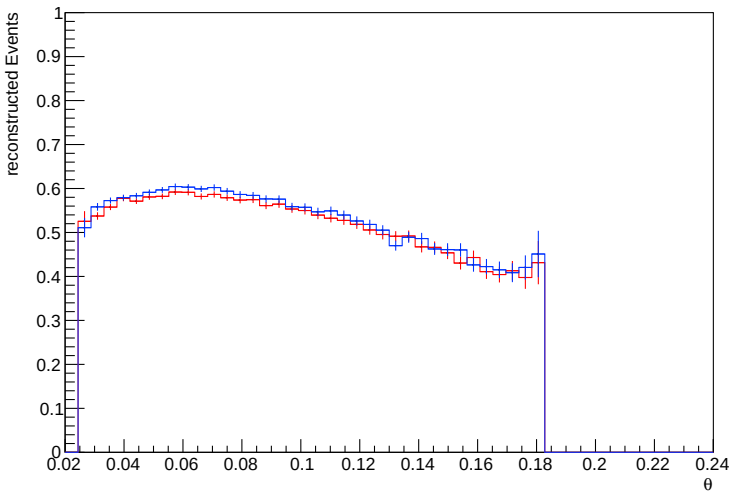


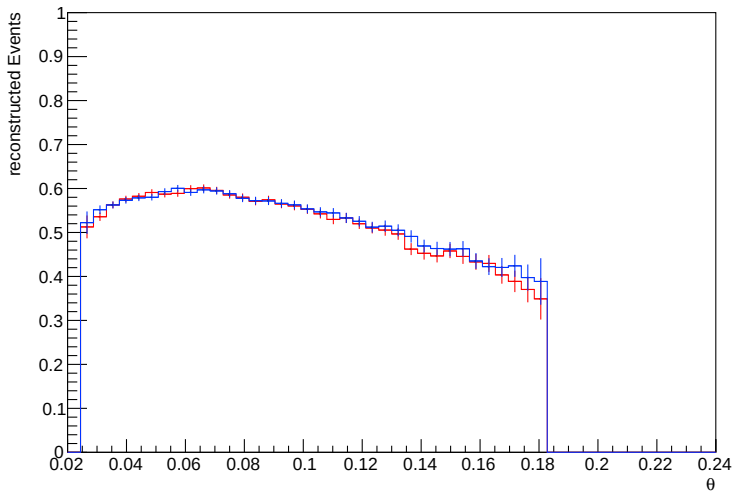
Comparison - $D^*\phi$



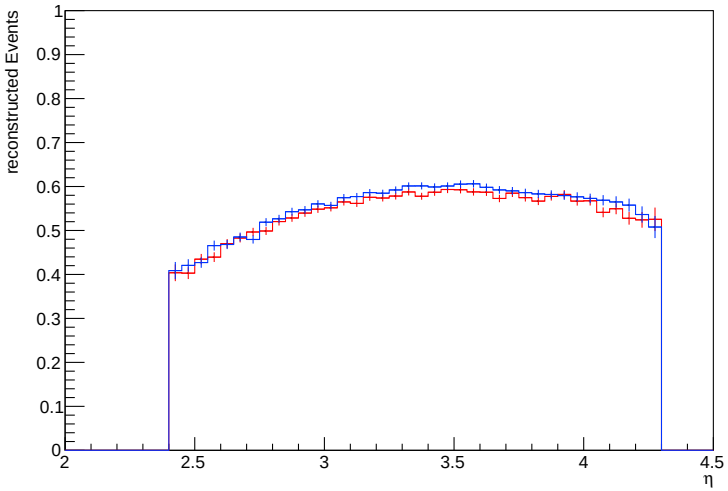


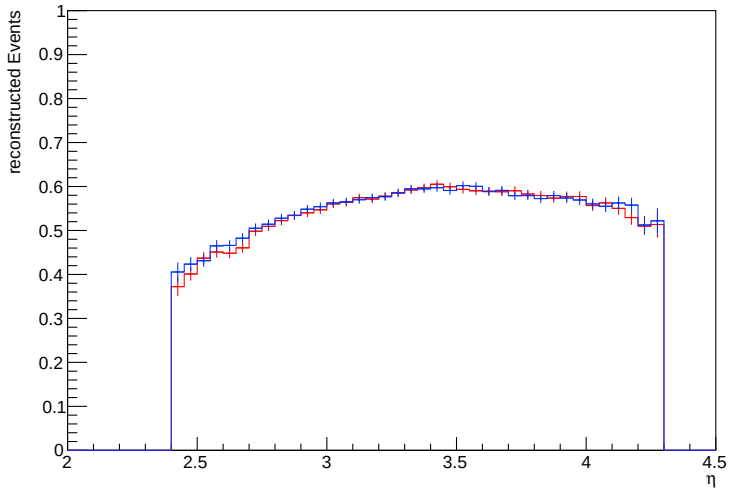
Comparison - $D^*\theta$



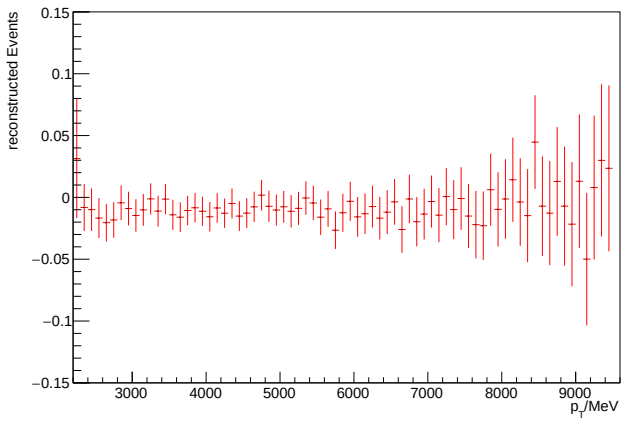


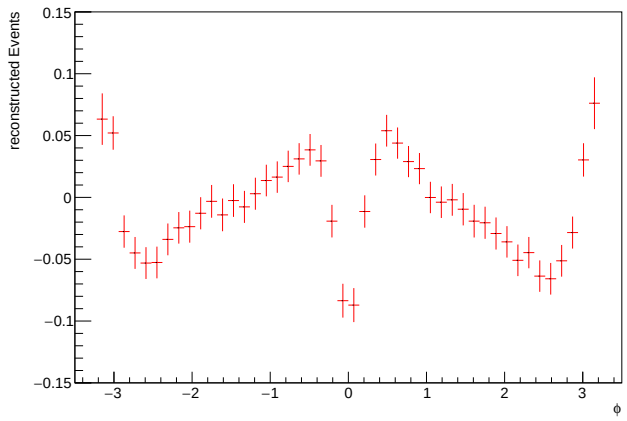
Comparison - $D^*\eta$

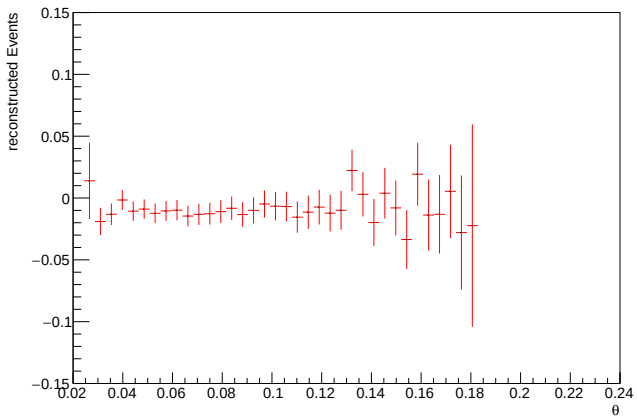


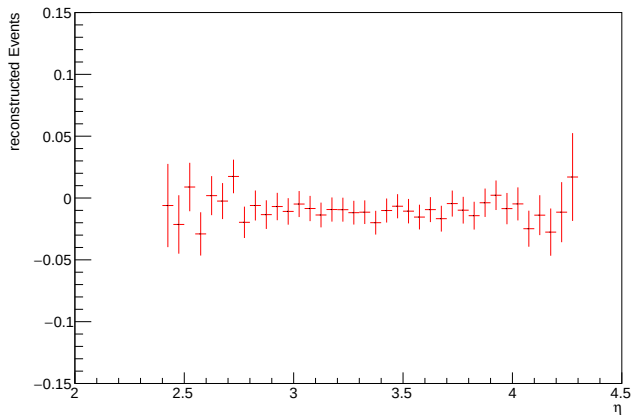


D^* deviation dependencies - *UP* polarity

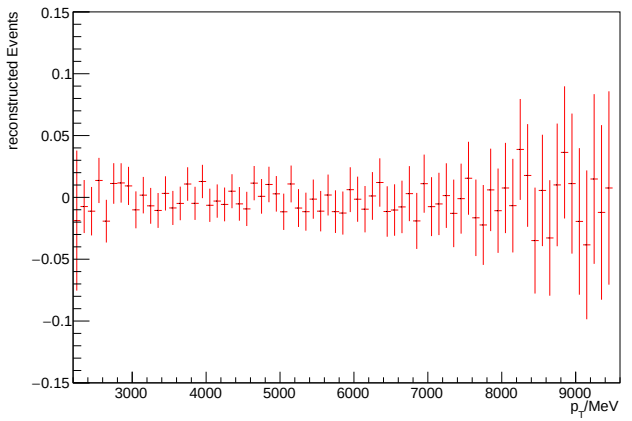


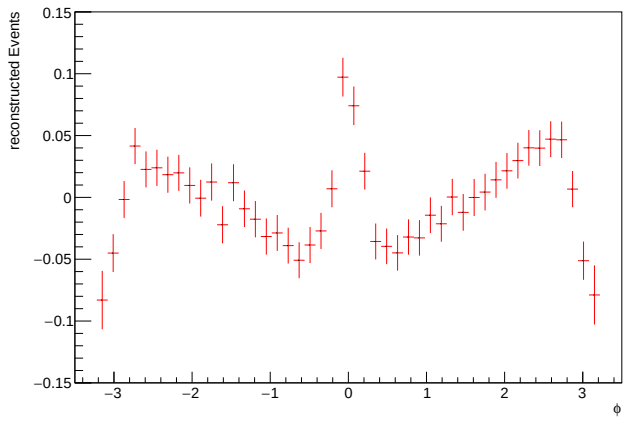


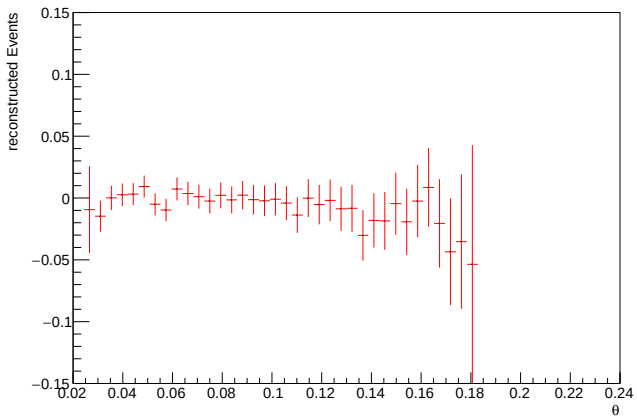


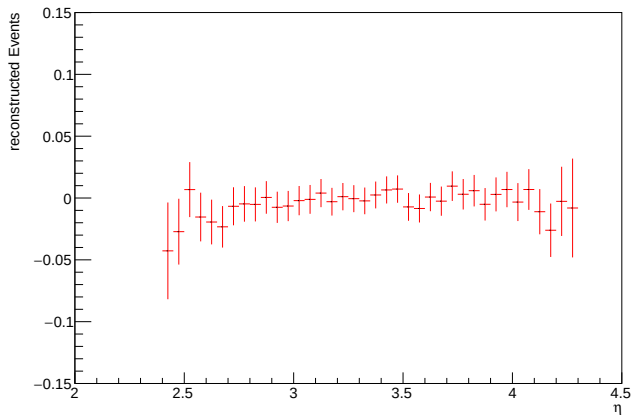


D^* deviation dependencies - *DOWN* polarity

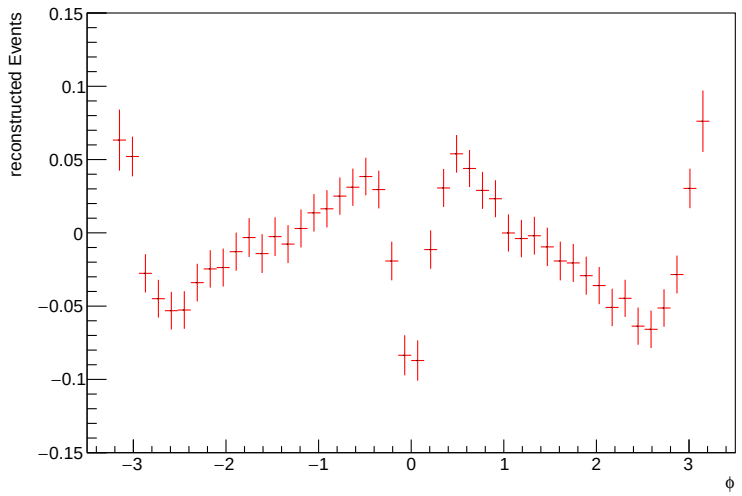


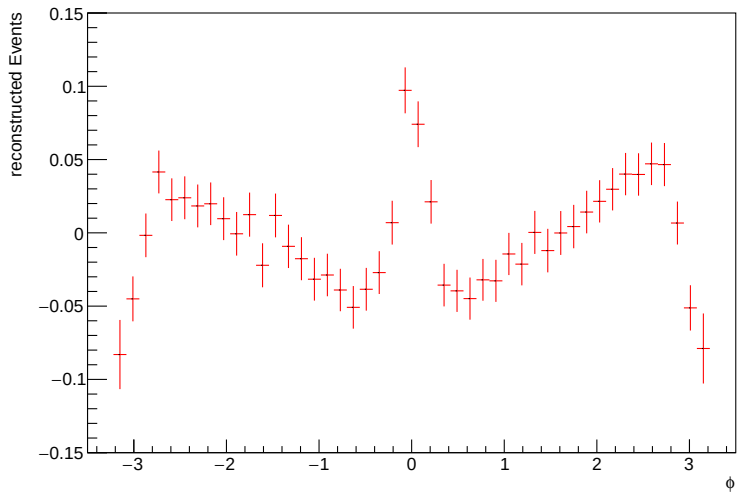






D^* deviation - ϕ





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