Detector induced assymetry in CP violation measurements

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MC truth information

$$D^* \rightarrow D_0(K\pi)\pi$$

- using MC samples `minisample_Dst2D0pi_D02Kpi_2016_Up_GEN`, `minisample_Dst2D0pi_D02Kpi_2016_Dw_GEN` for different magnet polarities
- comparing truth level to detector simulation
  $\rightarrow$ final state detector efficiency

Efficiencies: Total, + and -

Table: Total reconstruction 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

Table: D^{*+} reconstruction efficiencies

Polarity	ϵ_{π^+}	ϵ_{K^-}	$\epsilon_{\pi^+,s}$	ϵ_{D_0}	$\epsilon_{D^{*+}}$
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

Table: D^{*-} reconstruction efficiencies

Polarity	ϵ_{π^-}	ϵ_{K^+}	$\epsilon_{\pi^-,s}$	$\epsilon_{\bar{D}_0}$	$\epsilon_{D^{*-}}$
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

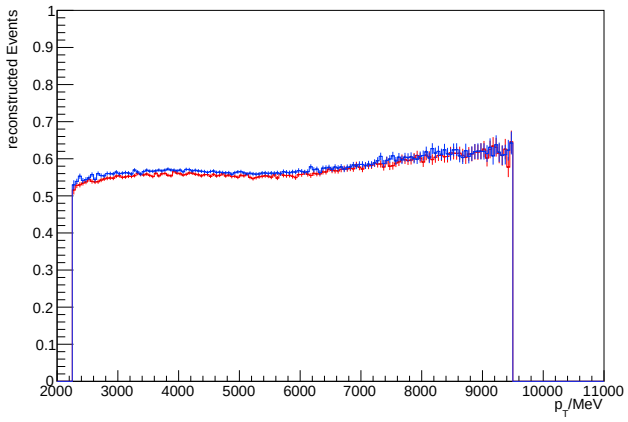
Asymmetry

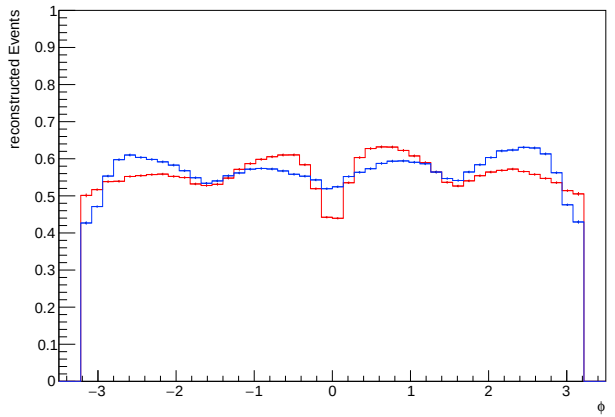
Table: The asymmetry $\frac{N_+ - N_-}{N_+ + N_-} / 10^{-3}$

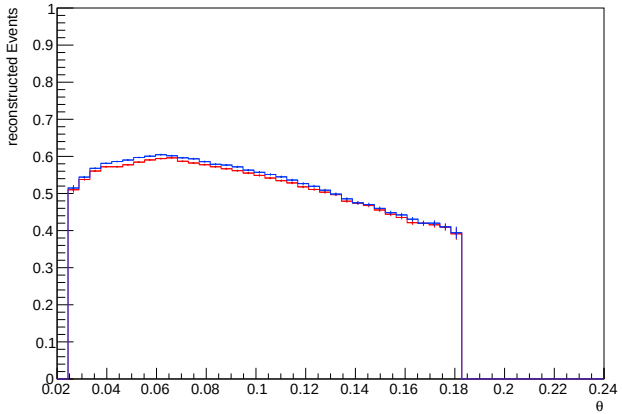
Polarity	π	K	$soft\pi$	D^0	D^*
UP	-0.1 ± 0.4	4.7 ± 0.4	-3.8 ± 0.5	-4.7 ± 0.5	-8.2 ± 0.5
$DOWN$	-0.3 ± 0.4	5.2 ± 0.4	3.7 ± 0.5	-5.0 ± 0.5	-0.8 ± 0.5

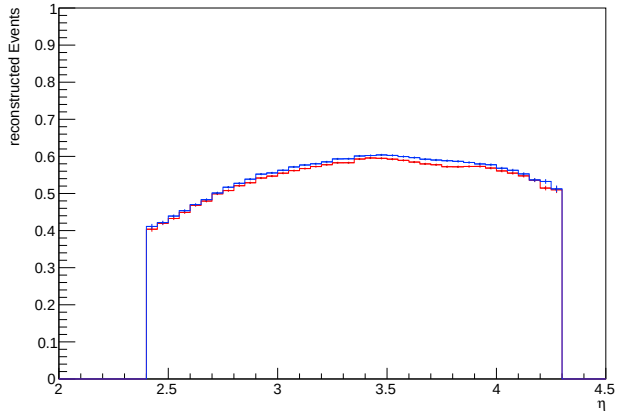
- $D_{soft\,\pi} \& D_{D^0}$ cancel partially in $DOWN$, but add up in UP
- $|A_{CP,D^*}|$ much bigger for the UP-polarity

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

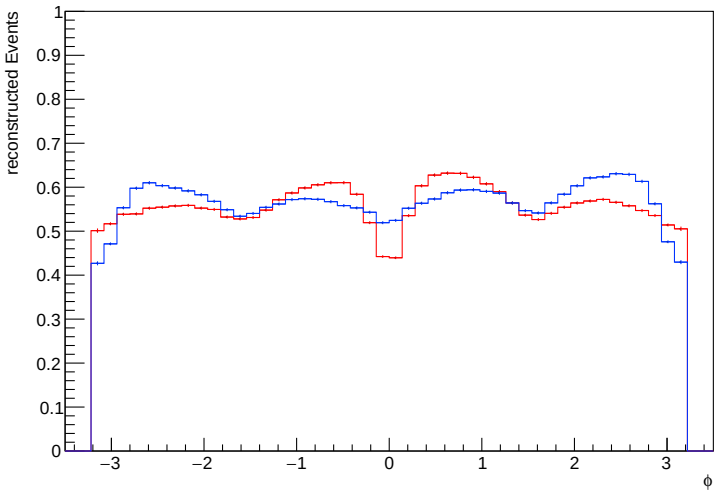


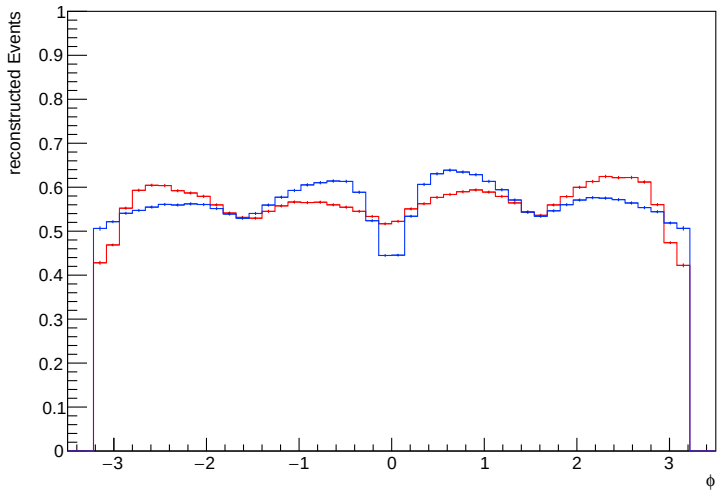


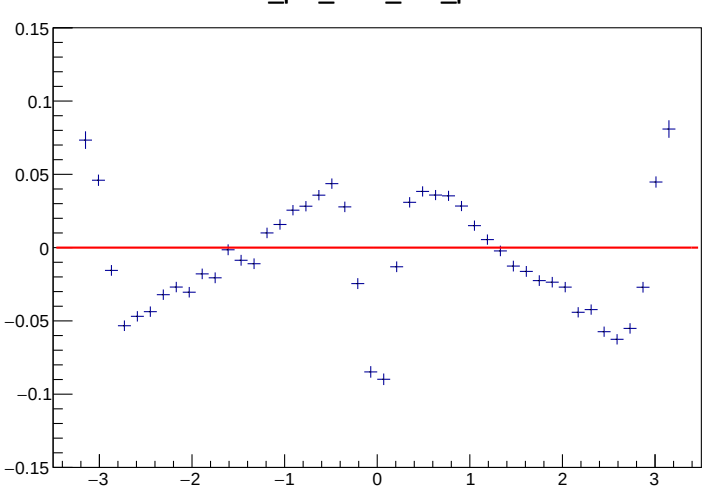


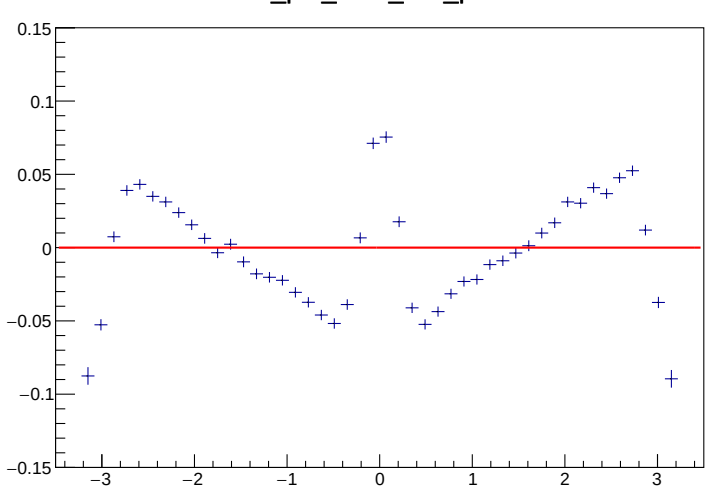


Comparison - $D^*\phi$









D^* asymmetry UP+DOWN