

Detector induced assymetry in CP violation measurements

Eugenia Spedicato, Lina Maria Ortiz Parra, Jonah Blank

May 25, 2020

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
→ 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

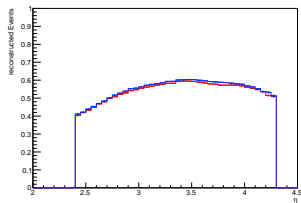
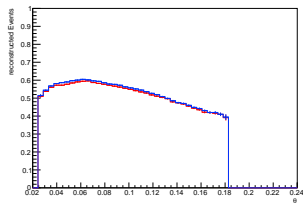
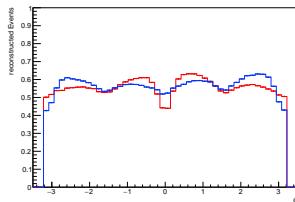
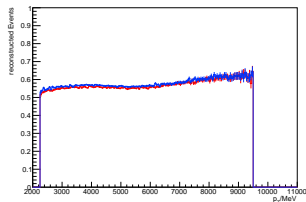
Asymmetry

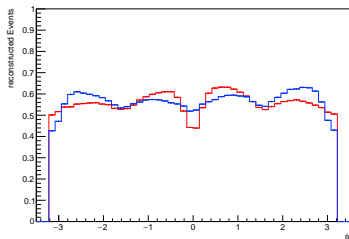
Table: The asymmetry $\frac{N_+ - N_-}{N_+ + N_-} / 10^{-3}$

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

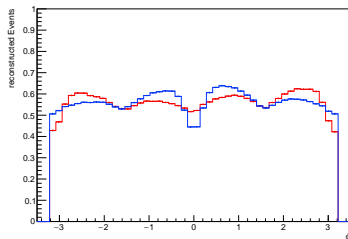
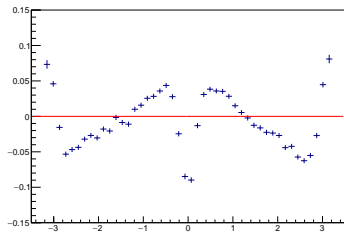
- $D_{soft\pi}$ & D_{D^0} cancel partially in *DOWN*,
but add up in *UP*
- $|A_{CP,D^*}|$ much bigger for the *UP*-polarity

Comparison of different charges with UP polarity - D^*

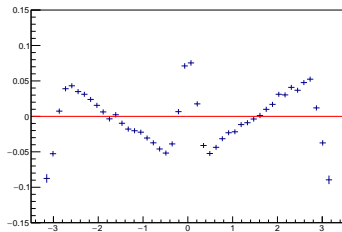


Comparison - $D^*\phi$ 

h_phi_reco_Dst_pos



h_phi_reco_Dst_pos



D^* asymmetry UP+DOWN