

# Detector induced assymetry in CP violation measurements

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# CP-asymmetry in the LHCb detector

DOWN	$\pi$	$K$	Soft $\pi$	$D^0 = \pi + K$	$D^* = s\pi + \pi + K$
N <sub>reco</sub> pos	2674000	2626350	<u>2374360</u>	2253370	1737460
N <sub>reco</sub> neg	2675660	2598950	2356980	2276140	1740180
UP	$\pi$	$K$	Soft $\pi$	$D^0 = \pi + K$	$D^* = s\pi + \pi + K$
N <sub>reco</sub> pos	2669990	2620280	2352910	2249370	1720940
N <sub>reco</sub> neg	2670540	2595820	<u>2371060</u>	2270520	1749450

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

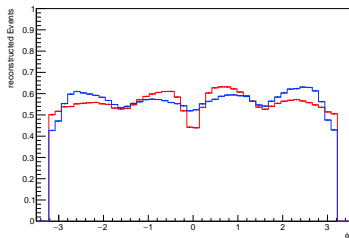
Polarity	$\pi$	$K$	soft $\pi$	$D^0$	$D^*$
UP	$-0.1 \pm 0.4$	$4.7 \pm 0.4$	$-3.8 \pm 0.5$	$-4.7 \pm 0.5$	$-8.2 \pm 0.5$
DOWN	$-0.3 \pm 0.4$	$5.2 \pm 0.4$	$3.7 \pm 0.5$	$-5.0 \pm 0.5$	$-0.8 \pm 0.5$

# CP-asymmetry in the LHCb detector

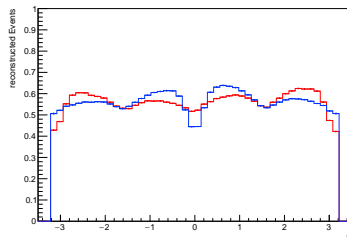
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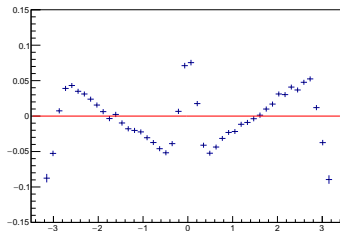
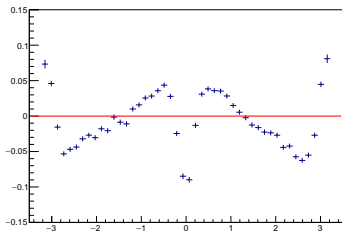
- $D_{soft\pi}$  &  $D_{D^0}$  cancel partially in *DOWN*,  
but add up in *UP*
- $|A_{CP,D^*}|$  much bigger for the *UP*-polarity

Comparison -  $D^*\phi$ 

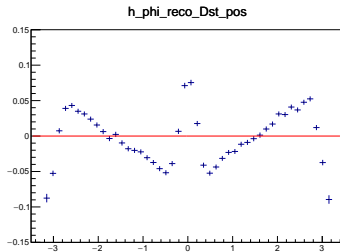
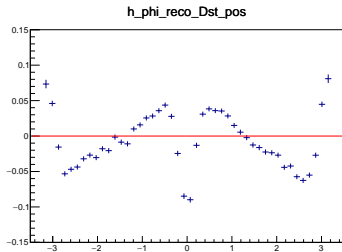
h\_phi\_reco\_Dst\_pos



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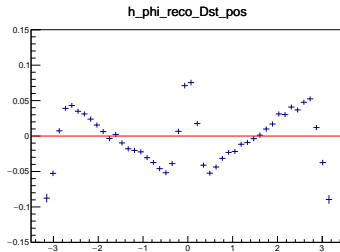
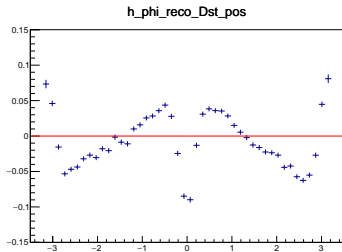


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- $A_{CP}$  dependent on direction in the detector  
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 → detector induced  $CP$ -asymmetry due to rectangular shape
- add together samples with different magnet polarisation



$D^*$  asymmetry UP+DOWN