

10 Supplementary Material for LHCb-PAPER-2019-036

This appendix contains supplementary material that will be posted on the public CDS record but will not appear in the paper.

Having observed that values of C_{D^*D} and \mathcal{A}_{D^*D} determined from the fit to $B^0 \rightarrow D^{*\pm}D^\mp$ decays are consistent with no CP violation in the decay, the fit is repeated within these assumptions. The parameters C_{D^*D} and \mathcal{A}_{D^*D} are fixed to zero and the other parameters are determined as

$$\begin{aligned} S_{D^*D} &= -0.839 \pm 0.070, \\ \Delta S_{D^*D} &= 0.019 \pm 0.076, \\ \Delta C_{D^*D} &= -0.028 \pm 0.092, \end{aligned}$$

where the uncertainties are statistical and the correlation coefficients are $\rho(S_{D^*D}, \Delta S_{D^*D}) = 0.051$, $\rho(S_{D^*D}, \Delta C_{D^*D}) = 0.026$ and $\rho(\Delta S_{D^*D}, \Delta C_{D^*D}) = 0.475$.

There is no change in the resulting value for S_{D^*D} when the decay-time fit is repeated with the ΔC_{D^*D} and ΔS_{D^*D} parameters also fixed to zero, as expected being the statistical correlation of S_{D^*D} with ΔC_{D^*D} and with ΔS_{D^*D} only of a few percent. In this approximation, assuming that the systematic uncertainties are unchanged, the weak phase due to mixing-induced CP violation in $B^0 \rightarrow D^{*\pm}D^\mp$ decays is compatible within 1.9 standard deviations with the world-average value of $\sin(2\beta)$ measured in $b \rightarrow c\bar{c}s$ tree transitions, $\sin(2\beta) = 0.699 \pm 0.017$ [3].