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Erratum to the computation of the $D_s^- \to K^0 K^-$ branching ratio.

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Abstract

Thanks to the careful reading of André Roussarie and Paul Colas a correction has been applied to the computation of $D_s^- \to K^0 K^-$ branching ratio. The mistake was in fact in the computation of the number of events from reflexion of the decay mode $D^- \to K^0 \pi^-$ The resulting branching ratio has a slightly smaller statistical uncertainty and is still in agreement with the current world average.

The formula of page 4 in ALEPH note 93-47 should be replaced by the following formula which calculates the number of events from the reflexion due to the D :

$$\begin{aligned} N_{D\to K^0\pi} = \; & N_{q\bar{q}} \;\; \times \mathcal{F} \times \frac{\Gamma(D^\pm\to K^0\pi)}{\Gamma(D^\pm\to K\pi\pi)} \times P_{K^0\to K^0_s} \times BR_{K^0_s\to\pi^+\pi^-} \\ & \times \quad (\varepsilon^{c\bar{c}}_D \times P_{q\to c} + \varepsilon^{b\bar{b}}_D \times P_{q\to b}) \end{aligned}$$

where $\mathcal{R}_{PDG} = \frac{\Gamma(D^\pm\to K^0\pi)}{\Gamma(D^\pm\to K\pi\pi)}$ is obtained from [1] and :

$$\mathcal{F} = \frac{\Gamma(Z\to D^\pm X)}{\Gamma(Z\to hadrons)} \times BR_{D^\pm\to K\pi\pi}$$

is from [2].

All the values used in these formulae are given in Table 1. This leads to the numbers given in Table 2. The corresponding value for the $D_s^- \to K^0K^-$ branching ratio is computed using the formula :

$$\begin{aligned} N_{D_s\to K^0K} = \; & 2N_{q\bar{q}} \;\; \times BR_{D_s\to K^0K} \times P_{K^0\to K^0_s} \times BR_{K^0_s\to\pi^+\pi^-} \\ & \times \quad (\varepsilon^{c\bar{c}}_{D_s} \times P_{q\to c} \times P_{c\to D_s} \\ & \quad +\varepsilon^{b\bar{b}}_{D_s} \times P_{q\to b} \times (P_{b\to B_s} \times P_{B_s\to D_s} + P_{b\to B} \times P_{B\to D_s})) \end{aligned}$$

with the values of Table 1.

One gets the results given in Table 2 for the branching ratio values where the first error is not only statistical but also due to the substraction of the number of events due to the reflexion , the second one is due to the Monte Carlo statistics and for our lack of knowledge of b and c branching ratios (see Table 1). For completeness we have added in this table the values obtained for the loose dE/dx cut : $-2 \leq \chi_K \leq 2$.

References

[1] Particle Data Group, Phys. Lett. 239B (1990), VII 116.

[2] Production of Charmed Mesons in Z decays, ALEPH Coll., "Draft 1 "

$N_{q\bar{q}}$	1,214,949
$P_{q\to c}$	18.1 ± 3.0 %
$P_{q\to b}$	21.8 ± 1.4 %
$P_{c\to D_s}$	15 ± 3 %
$P_{b\to B_s}$	15 ± 3 %
$P_{b\to B}$	75 ± 10 %
$P_{B_s\to D_s}$	80 ± 10 %
$P_{B\to D_s}$	11.5 ± 2.8 %
$\mathcal{R}_{PDG}$	0.324 ± 0.034
$\mathcal{F}$	2.01 ± 0.21 %
$P_{K^0\to K^0_s}$	50 %
$BR_{K^0_s\to\pi^+\pi^-}$	68.61 ± 0.28 %

Table 1: Values used for the computation of the number of events due to the reflexion of $D^- \to K^0\pi^-$ and for the absolute $D_s^- \to K^0K^-$ branching ratio from [1].

dE/dx cut	$N_{D\to K^0\pi}$	$N_{D_s\to K^0K}$	$BR_{D_s\to K^0K}$
$-2 \le \chi_K \le 2$	36.9 ± 10.4	120.6 ± 36.6	1.9 ± 0.6 ± 0.3%
$\chi_K \le 0$	3.6 ± 1.3	80.5 ± 22.8	2.5 ± 0.7 ± 0.4%
"K and NOT π"	1.6 ± 0.6	63.6 ± 19.0	2.7 ± 0.8 ± 0.5%

Table 2: Three different sets of dE/dx cuts can be used to compute the $D_s^- \to K^0K^-$ branching ratio.