The LHCb experiment is a single-arm spectrometer in the forward direction, designed to study $B$ decays at the LHC. Around 35 pb$^{-1}$ data taken in 2010 were analysed. The first level trigger is used to select events containing hadronic decay products with high $p_T$, measured from calorimeter energy deposits. A flexible software trigger performs a final online selection, reducing the rate to a few kHz for offline analysis. The first software trigger stage requires a well reconstructed track, displaced from the primary interaction point. The second software trigger stage selects a two, three or four track secondary vertex with high sum of $p_T$ of the tracks. The offline selection consists of a cut-based "stripping" stage and an analysis-specific multivariate selection. All selections use kinematic and topological information. Therefore the efficiency differences between the three decay modes $B^0 \to D^* (\pi^- K^-) \pi^+$, $B^0 \to D^* (\pi^- K^-) \pi^-$ and $B^0 \to D^* (\pi^- K^- \pi^-) \pi^+$ are minimal. The relative yields are corrected for these efficiency differences.

**Separation of the decay modes**

The decay modes differ by the type of the light mesons in the final state: compared to $B^0 \to D^* \pi^+$, $B^0 \to D^- K^+$ has a $K^-$ instead of a $\pi^+$ as bachelor particle and for $B^+ \to D^+ \pi^-$ one of the $D^+$ decay products is a $K^-$ instead of a $\pi^+$. The RICH detectors provide the particle identification (PID) information that allows to separate these particles, and thus to select a subsample for each decay mode.

**Extraction of $f_s/f_d$ from $B^0 \to D^- K^+$**

$B(\bar{B^0} \to D^- K^+)=$ \[252 \pm 21\]

$B(\bar{B^0} \to D^- K^+) = (2.81 \pm 0.18_{stat} \pm 0.11_{syst}) \times 10^{-4}$

The mass shapes of partially reconstructed backgrounds (e.g. $B^+ \to D^- \pi^+$) are modelled using simulated events. The crossfeed from $B^0 \to D^- K^+$ to the $B^0 \to D^- K^+$ and $B^0 \to D^- \pi^+$ samples is estimated in a fully data-driven way by reweighting a clean $\bar{B^0} \to D^- \pi^+$ sample according to the momenta of the misidentified particle, using PID efficiencies from a RICH calibration sample.

**Extraction of $f_s/f_d$ from $B^0 \to D^- \pi^+$**

The $B^0 \to D^- \pi^+$ decay receives additional contributions from $W$-exchange diagrams. This leads to an additional theoretical correction factor $N_E = 0.966 \pm 0.075$ with sizeable uncertainty.

The two measurements can be combined, taking correlated uncertainties into account, to the result

\[
\frac{f_s}{f_d} = 0.253 \pm 0.013^{stat} \pm 0.014^{syst} \pm 0.020^{theor}
\]

Consistent with the preliminary LHCb measurement using semileptonic decays [LPCC December 2010]

\[
\frac{f_s}{f_d} = 0.130 \pm 0.004^{stat} \pm 0.013^{syst}
\]