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Search for Rare Hadronic B Decays

The OPAL Collaboration

Abstract

A search for rare decays of B hadrons has been performed using approximately two million hadronic Z^0 decays collected by the OPAL experiment between 1990 and 1993. The exclusive decay channels $B^0_d \to \pi^+\pi^-$, $B^0_d \to K^+\pi^-$, $B^0_s \to \pi^+K^-$ and $B^0_s \to K^+K^-$ have been studied. Such decays include contributions from flavour changing neutral current processes such as hadronic penguin decays. No significant excess of events has been observed in the $\pi^+\pi^-$, π^+K^- and K^+K^- invariant mass distributions. Consequently, upper limits on the B^0_d branching ratios,

$$Br\,(B^0_d \to \pi^+\pi^-) < 4.7 \times 10^{-5} \text{ and } Br\,(B^0_d \to K^+\pi^-) < 8.1 \times 10^{-5},$$

and on the B^0_s branching ratios,

$$Br\,(B^0_s \to \pi^+K^-) < 2.6 \times 10^{-4} \text{ and } Br\,(B^0_s \to K^+K^-) < 1.4 \times 10^{-4},$$

have been set at the 90% confidence level. These limits assume that the ratio of the partial decay widths of the Z^0, $\Gamma(Z^0 \to b\bar{b})/\Gamma(Z^0 \to \text{hadrons})$, is 0.217 and that the fractions of B^0_d and B^0_s mesons produced during fragmentation are 39.5% and 12% respectively. The B^0_s branching ratio limits are the first such limits obtained.

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