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Measurement of $\Gamma(Z^0 \to b\overline{b})/\Gamma(Z^0 \to \text{hadrons})$ using a Double Tagging Method

The OPAL Collaboration

Abstract

The fraction of $Z^0 \to b\overline{b}$ events in hadronic Z^0 decays has been measured using the data collected by OPAL in 1992 and 1993. The presence of electrons or muons from semileptonic decays of bottom hadrons and the detection of bottom hadron decay vertices were used together to obtain an event sample enriched in $Z^0 \to b\overline{b}$ decays. To reduce the systematic error on the measurement of the $Z^0 \to b\overline{b}$ fraction, the efficiency of the $b\overline{b}$ event tagging was obtained from the data by comparing the numbers of events having a bottom signature in either one or both thrust hemispheres. A value of

$$\frac{\Gamma(Z^0 \to b\overline{b})}{\Gamma(Z^0 \to \text{hadrons})} = 0.2171 \pm 0.0021 \pm 0.0021$$

was obtained, where the first error is statistical and the second systematic. The uncertainty on the decay width $\Gamma(Z^0 \to c\overline{c})$ is not included in these errors. A fractional variation of this width by $\pm 8\%$ about its Standard Model prediction would result in a variation of the measured $Z^0 \to b\overline{b}$ fraction of ∓ 0.0015.

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