Production rates of $b\overline{b}$ quark pairs from gluons and $b\overline{b}b\overline{b}$ events in hadronic Z^0 decays

The OPAL Collaboration

Abstract

The rates are measured per hadronic Z^0 decay for gluon splitting to $b\overline{b}$ quark pairs, $g_{b\overline{b}}$, and of events containing two $b\overline{b}$ quark pairs, g_{4b}, using a sample of four-jet events selected from data collected with the OPAL detector. Events with an enhanced signal of gluon splitting to $b\overline{b}$ quarks are selected if two of the jets are close in phase-space and contain detached secondary vertices. For the event sample containing two $b\overline{b}$ quark pairs, three of the four jets are required to have a significantly detached secondary vertex. Information from the event topology is combined in a likelihood fit to extract the values of $g_{b\overline{b}}$ and g_{4b}, namely

$$\begin{aligned} g_{b\overline{b}} &= (3.07 \pm 0.53(\mathrm{stat}) \pm 0.97(\mathrm{syst})) \times 10^{-3}, \\ g_{4b} &= (0.36 \pm 0.17(\mathrm{stat}) \pm 0.27(\mathrm{syst})) \times 10^{-3}. \end{aligned}$$

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