Test of the Flavour Independence of α_s using Next-to-Leading Order Calculations for Heavy Quarks

The OPAL Collaboration

Abstract

We present a test of the flavour independence of the strong coupling constant for charm and bottom quarks with respect to light (uds) quarks, based on a hadronic event sample obtained with the OPAL detector at LEP. Five observables related to global event shapes were used to measure α_s in three flavour tagged samples (uds, c and b). The event shape distributions were fitted by $\mathcal{O}(\alpha_s^2)$ calculations of jet production taking into account mass effects for the c and b quarks. We find:

$$\alpha_s^{\mathrm{c}}/\alpha_s^{\mathrm{uds}} = 0.997 \pm 0.038\ (stat.) \pm 0.030\ (syst.) \pm 0.012\ (theory)\ \text{and}$$
$$\alpha_s^{\mathrm{b}}/\alpha_s^{\mathrm{uds}} = 0.993 \pm 0.008\ (stat.) \pm 0.006\ (syst.) \pm 0.011\ (theory).$$

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