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The strong coupling from the revised ALEPH data for hadronic τ decays (12' + 3')

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We apply an analysis method previously developed for the extraction of the strong coupling from the OPAL data to the recently revised ALEPH data for non-strange hadronic τ decays. Our analysis yields the values αs(m2τ)=0.296±0.010 using fixed-order perturbation theory, and α_s(mˆ2_τ)=0.310±0.014 using contour-improved perturbation theory. Averaging these values with our previously obtained values from the OPAL data, we find α_s(mˆ2_τ)=0.303±0.009, respectively, α_s(mˆ2_τ)=0.319±0.012. We present a critique of the analysis method employed previously, for example in analyses by the ALEPH and OPAL collaborations, and compare it with our own approach. Our conclusion is that non-perturbative effects limit the accuracy with which the strong coupling, an inherently perturbative quantity, can be extracted at energies as low as the τ mass. Our results further indicate that systematic errors on the determination of the strong coupling from analyses of hadronic τ-decay data have been underestimated in much of the existing literature.

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