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Update on α_s from hadronic tau decays, including the Belle $\tau \rightarrow \pi^- \pi^0 \nu_\tau$ data

The extraction of the QCD coupling, α_s , from hadronic tau decays relies on experimental determinations of the relevant inclusive spectral functions. In this work, we produce a new inclusive vector-isovector spectral function combining information from several experiments. We obtain contributions from the dominant decay modes, $\pi^- \pi^0$, $2\pi^- \pi^+ \pi^0$, and $\pi^- 3\pi^0$, adding to the ALEPH and OPAL data used in our previous analyses, for the first time in this update, the high-statistics Belle $\tau \rightarrow \pi^- \pi^0 \nu_\tau$ results. Smaller contributions from other higher-threshold modes are obtained using BaBar data for $\tau \rightarrow K^- K^0 \nu_\tau$ and $e^+ e^- \rightarrow \text{hadrons}$ cross section input, related to the corresponding τ distributions by CVC, for other modes. This allows us to construct a new complete vector-isovector spectral function that relies solely on experimental data, without the need of Monte-Carlo inputs. This is then used to perform a new α_s determination, employing our previously developed strategy based on finite energy sum rules. We find, at the Z -mass scale, $\alpha_s(m_Z^2) = 0.1159(14)$. The lower central value and larger error, compared with the result of our previous works, are mainly due to updated HFLAV branching-fractions inputs. The impact of Belle data for the dominant 2π channel and the inclusion of the CLEO spectrum in the analysis are also discussed.

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