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Higher order QCD corrections to hadronic tau decays from Padé approximants

Perturbative QCD corrections to hadronic tau decays and e+e− annihilation
into hadrons are obtained from the expansion of the Adler
function in the chiral limit, which at present is known exactly to five loops. Extractions of the strong coupling from these processes suffer from an ambiguity related to the treatment of unknown higher orders in the perturbative series. In this work, we use the method of Padé approximants to reconstruct the Borel transformed series and extract information about higher order corrections. First, the method is tested in the large-β0 limit of QCD, where the perturbative
series is known to all orders. We devise strategies to accelerate the
convergence of the method employing renormalization scheme variations
and the so-called D-log Padé approximants. We then apply the method
to full QCD to obtain a model independent prediction of the six-,
seven-, and eight-loop coefficients of the perturbative expansion of
the Adler function. We will present evidence in favour of the use of fixed-order perturbative expansions for the description of tau decays and e+e- annihilation
into hadrons.

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