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Three-loop cusp anomalous dimension in QCD

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The three-loop cusp anomalous dimension Γ has been calculated analytically, as a function of the Minkowski angle ϕ,
via harmonic polylogarithms up to weight 5. The color structures
$C_F(T_F n_f)^{L-1}\alpha_s^L$ in Γ and the HQET quark field anomalous dimension have been obtained to all orders. At large ϕ the coefficient of $1/(1-z)_+$ in the DGLAP evolution kernel is reproduced. If we introduce an effective coupling a
in such a way that the large-ϕ result is exactly first order and re-express $\Gamma(\phi)$ via a, the resulting expression does not contain n_f (and has only one color structure at each order). The known relation between $\Gamma(\phi \to i\pi)$ and the
quark-antiquark potential (which follows from conformal invariance) is violated at three loops by a term proportional to
β_0.

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