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Top-Quark Decay at Next-to-Next-to-Next-to-Leading Order in QCD

Tuesday 16 April 2024 17:30 (30 minutes)

We present the first complete QCD corrections to both the inclusive decay width Γ_t, W-helicity fractions and semi-inclusive distributions for the top-quark decay process to the third order in the strong coupling constant α_s, accomplished through a very efficient approach readily to be employed in many more related applications. We find, in particular, that the pure $\mathcal{O}(\alpha_s^3)$ correction decreases Γ_t by 0.8% of the previous $\mathcal{O}(\alpha_s^2)$ result, exceeding the error estimate by the usual scale-variation precription. Our to-date most precise theoretical prediction reads $\Gamma_t = 1.3148^{+0.003}_{-0.005} + 0.027\,(m_t - 172.69)$ GeV, the error of which now meets the request by future colliders.

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