Contribution ID: **10** Type: **not specified**

Analytic result for the top-quark width at next-to-next-to-leading order in QCD

We present the first full analytic results of next-to-next-to-leading order (NNLO) QCD corrections to the top-quark decay width Γ(t ⟶ W b) by calculating the imaginary part of three-loop top-quark self-energy diagrams. The results are all expressed in terms of harmonic polylogarithms and valid in the whole region 0 ≤ mW ≤ mt. The expansions in the mW ⟶ 0 and mW ⟶ mt limits coincide with previous studies. Our results can also be taken as the exact prediction for the lepton invariant mass spectrum in semileptonic b ⟶ u decays. We also analytically compute the decay width including the off-shell W boson effect up to NNLO in QCD for the first time. Combining these contributions with electroweak corrections and the finite b-quark mass effect, we determine the most precise top-quark width to be 1.331 GeV for mt = 172.69 GeV. The total theoretical uncertainties including those from renormalization scale choice, top-quark mass renormalization scheme, input parameters and missing higher-order corrections are scrutinized and found to be less than 1%.

Author: Prof. WANG, Jian (Shandong University)

Presenter: Prof. WANG, Jian (Shandong University)

Session Classification: Session 1