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Renormalization-group improved Higgs to two gluons decay rate.

We investigate the renormalization-group scale and scheme dependence of the $H \rightarrow gg$ decay rate at the order N^4LO in the renormalization-group summed perturbative theory, which employs the summation of all renormalization-group accessible logarithms including the leading and subsequent four sub-leading logarithmic contributions to the full perturbative series expansion. Moreover, we study the higher-order behaviour of the $H \rightarrow gg$ decay width using the asymptotic $Pad\acute{e}$ approximant method in four different renormalization schemes. Furthermore, the higher-order behaviour is independently investigated in the framework of the asymptotic $Pad\acute{e}$-Borel approximant method where generalized Borel-transform is used as an analytic continuation of the original perturbative expansion. The predictions of the asymptotic $Pad\acute{e}$-Borel approximant method are found to be in agreement with that of the asymptotic $Pad\acute{e}$ approximant method. Finally, we provide the $H \rightarrow gg$ decay rate at the order N^5LO in the fixed-order $\Gamma_{N^5LO} = \Gamma_0(1.8375 \pm 0.047_{\alpha_s(M_Z),1\%} \pm 0.0004_{M_t} \pm 0.0066_{M_H} \pm 0.0036_{\text{P}} \pm 0.007_s \pm 0.0005_{sc})$, and $\Gamma_{\text{RGSN}^5LO} = \Gamma_0(1.841 \pm 0.047_{\alpha_s(M_Z),1\%} \pm 0.0005_{M_t} \pm 0.0066_{M_H} \pm 0.0002_\mu \pm 0.0027_{\text{P}} \pm 0.001_{sc})$ in the renormalization-group summed perturbative theories.

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