

# Higgs Boson Production via Quark mediated Gluon Fusion at High Energy at Next-to-Next-to-Leading Power in Quark Mass

*Friday, 17 February 2023 11:45 (15 minutes)*

In perturbative QCD, processes involving quark scattering provide the simplest way of studying non-Abelian scattering amplitudes. To that end, in this talk I will discuss our calculation for the Form Factor of the Higgs boson production via light quark mediated Gluon Fusion process in the high energy/small quark mass limit, where the leading contribution comes in the form of large double logarithms for each power of the strong coupling constant ( $\alpha_s$ ). We reproduced the leading coefficient (Next-to-Leading order in quark mass ( $m_q$ )) for the asymptotic expansion of the form factor in the high energy approximation; and extended the analysis to next coefficient which is at Next-to-Next-to-Leading order ( $O(m_q^3)$ ). Three distinct sources of diagrams contribute to this coefficient at this order; the complete analytic result for which is presented at three loops. We also present all order analysis in the large- $N_c$  limit of QCD as well as for the opposite Abelian limit. Our results provide a universal estimate of the light quark effects at the higher orders for both the Higgs boson production and decay processes.

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