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Mass Dependence of Higgs Production at Large Transverse Momentum

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The transverse momentum distribution of the Higgs at large P_T is complicated by its dependence on three important energy scales: P_T, the top quark mass m_t, and the Higgs mass m_H. A strategy for simplifying the calculation of the cross section at large P_T is to calculate only the leading terms in its expansion in m_t^2/P_T^2 and/or m_H^2/P_T^2. The expansion of the cross section in inverse powers of P_T is complicated by logarithms of P_T and by mass singularities. In this work, we consider the top-quark-loop contribution to the subprocess $q\bar{q} \to H + g$ at leading order in α_s, which proceeds through a top quark loop. We show that the leading power of $1/P_T^2$ can be expressed in the form of a factorization formula that separates the large scale P_T from the scale of the masses. All the dependence on m_t and m_H can be factorized into fragmentation amplitudes for $t\bar{t} \to H$ and for $t\bar{t} \to g$ and an endpoint contribution. This factorization approach will be useful for calculating the P_T distribution at large P_T to next-to-leading order in α_s.

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