can be interpreted in terms of the fundamental properties of the model.

In this paper, we compute the Standard Model weak corrections to the $bg \to bH$ process and compare them with the scale and PDF uncertainties of the NLO QCD corrected rates. We also compare our results with an approximation where the dominant corrections arise from the on-shell corrections to the $\overline{b}bH$ vertex (Improved Born Approximation). Section II contains the theoretical framework for the weak corrections. We retain the effects of a non-zero b quark mass everywhere. Numerical results are given in Section III and conclusions in Section IV.

II. THEORETICAL FRAMEWORK

In this paper, we consider the Standard Model process of associated b quark- Higgs boson production. Our results can be generalized in a straightforward manner to models with non-standard b quark - Higgs boson couplings. The tree level coupling of a b quark to a Standard Model Higgs boson, H, is given by

$$L_{YUK} = -g_{b0}\overline{b}_0 b_0 H_0 \,, \tag{1}$$

where the subscript, '0', denotes the unrenormalized quantity and

$$g_{b_0} = \frac{m_{b0}}{2M_{W_0}}\frac{e_0}{s_{W_0}} \,. \tag{2}$$

We work in an on-shell scheme where the weak mixing angle is a derived quantity and is defined in terms of the physical gauge boson masses,

$$\sin^2\theta_W \equiv s_W^2 = 1 - \frac{M_W^2}{M_Z^2} \,. \tag{3}$$

The lowest order Feynman diagrams for the process $b(p_1) + g(q_1) \to b(q_2) + H(p_2)$ are shown in Fig. 1. The resulting Born cross section is[6],

$$\begin{aligned}\frac{d\sigma(bg \to bH)(\mu_R)_0}{dt} \;=\; & \frac{1}{(s-m_b^2)^2}\frac{\alpha_s(\mu_R)}{24}\overline{g_b}(\mu_R)^2\left\{-\frac{M_H^4+u^2}{s_1 t_1} + \frac{2m_b^2}{s_1^2 t_1^2}\left[4ut_1s_1 + M_H^2(M_H^2-u)^2\right]\right. \\ & \left. -8\frac{m_b^4}{s_1^2 t_1^2}\left(M_H^2-u\right)^2\right\}, \end{aligned} \tag{4}$$

where $s_1 = (p_1+q_1)^2 - m_b^2 = s - m_b^2$, $t_1 = (p_1-p_2)^2 - m_b^2$, and $u = (p_1-q_2)^2$, are the usual Mandelstam variables and the scale μ_R is the arbitrary renormalization scale. (The