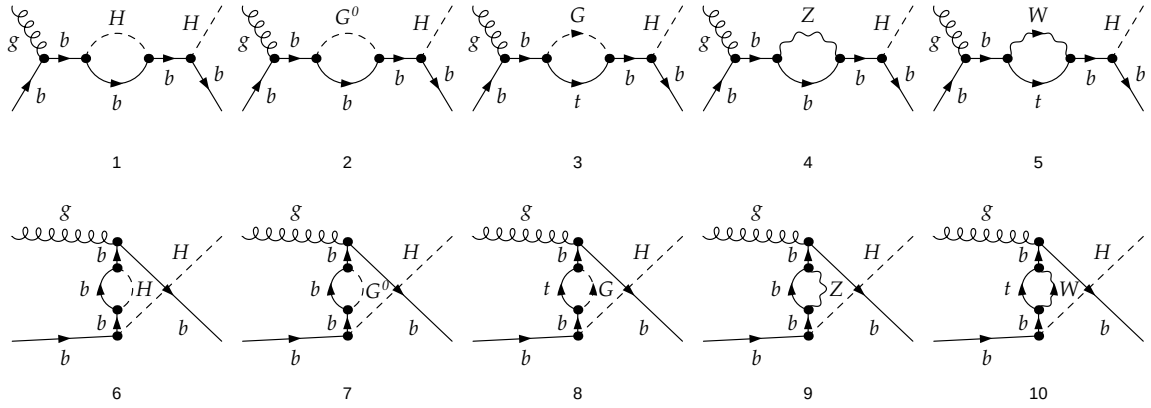

FIG. 4: Self energy diagrams contributing to the weak corrections to $bg \to bH$.

the process involving photons in the initial state, $\gamma b \to bgH$. The $\mathcal{O}(\alpha)$ QED corrections to $bg \to bH$ can be found from the corresponding QCD corrections by making the substitution $\frac{4}{3}\alpha_s \to \alpha Q_b^2$[1–6].However, evaluating the process $\gamma b \to bgH$ requires the use of a PDF set which includes initial state photons.[5] This contribution is expected to be quite small since potentially large logarithms from initial state collinear photon emission are absorbed into the PDFs. We further note that the QED contributions to the $b\overline{b} \to H$ process [17], and to the corresponding decay $H \to b\overline{b}$[34, 39] discussed above, are known to be less than 1 %. As this is considerably smaller than the PDF and scale uncertainties which we present in the next section, we do not provide numerical results for the pure QED corrections to $bg \to bH$, but evaluate only the weak corrections.

The Feynman diagrams are generated using FeynArts[43] and the interference with the tree level amplitude is evaluated numerically in Feynman gauge using FormCalc and LoopTools[44]. We retain a non-zero bottom quark mass everywhere.

D. Large Higgs Mass Limit

The contributions to the weak corrections in the large Higgs mass limit can be easily found and provide a check of our results. The large Higgs mass limit for the process $bg \to bH$ is obtained by noting that the triangle and box diagrams shown in Figs. 4 -6 are of $\mathcal{O}\left(\frac{m_t^2}{v^2}\right)$

[5] The most modern set of PDFs which include initial state photons are the MRST2004qed PDFs[42].