

# Erratum: Two-loop running effects in Higgs physics in Standard Model Effective Field Theory

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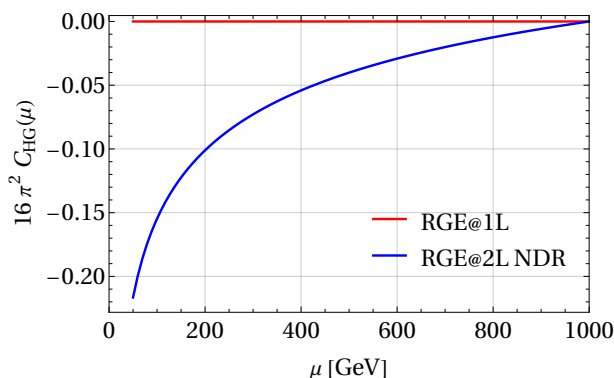
During the computation of the two-loop contributions of the operators of class 3 and 7 to the RGE of the Higgs-gluon coupling in the SMEFT in ref. [1] we noticed a mistake in our procedure leading to an additional factor of 1/2 in the renormalization group equation for the WC  $\mathcal{C}_{HG}$ . Eq. (3.9) of our ref. [2] has to be corrected to

$$\mu \frac{d\mathcal{C}_{HG}}{d\mu} \supset \frac{3}{2} \left( \frac{1}{16\pi^2} \right)^2 g_s^2 [\mathcal{C}_{tH} Y_t + \mathcal{C}_{tH}^* Y_t^* + \mathcal{C}_{bH} Y_b + \mathcal{C}_{bH}^* Y_b^*] - 4 \left( \frac{1}{16\pi^2} \right)^2 g_s^2 Y_t Y_t^* \delta_{\text{NDR}} \left( \mathcal{C}_{Qt}^{(1)} - \frac{1}{6} \mathcal{C}_{Qt}^{(8)} \right), \quad (1)$$

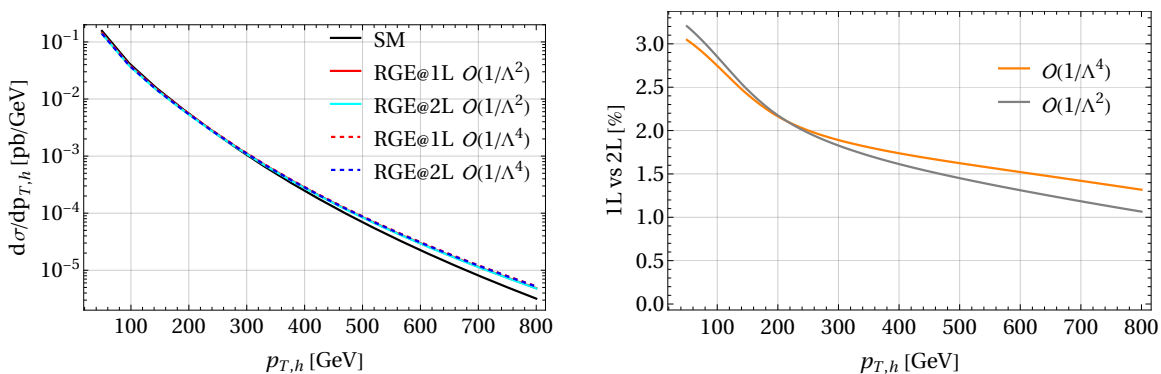
$$\delta_{\text{NDR}} = \begin{cases} 1 & (\text{NDR}) \\ 0 & (\text{BMHV}), \end{cases} \quad (2)$$

in consistency with the results presented in ref. [1]. This result was also independently confirmed by the authors of [3], to be published in near future.

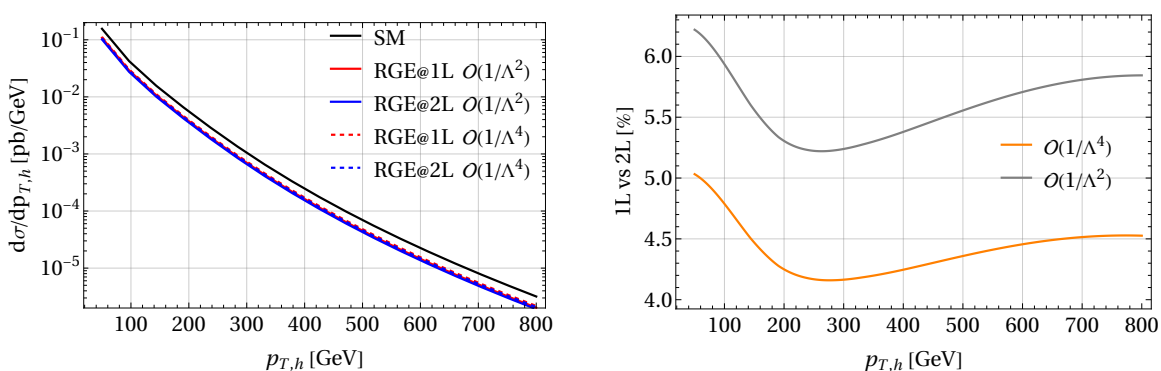
The effect in the figures of our phenomenological studies is small when also the four-top operators are included (i.e. all plots referring to S1 in the NDR scheme) while when they are absent (i.e. S1 in the BMHV scheme and S2) the net effect of two-loop vs. one-loop RGE effects is halved with respect to the previous versions.



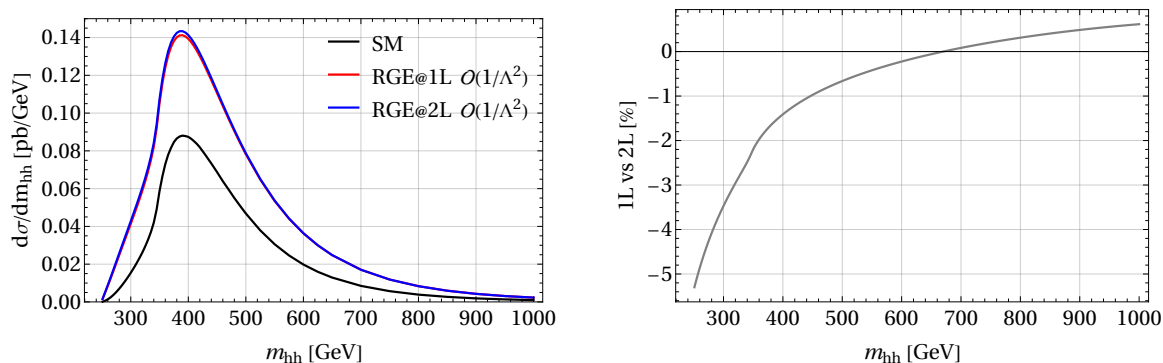
**Figure 5.**  $C_{HG}(\mu)$  as a function of the renormalization scale  $\mu$  at one-loop (red line) and two-loop (blue) level in S2.



**Figure 8.** Comparison between one-loop (red line) and two-loop (blue line) running of the Wilson coefficient  $C_{HG}$  in the transverse momentum distribution in S1 in the BMHV scheme. *Left:* differential distribution in  $p_{T,h}$  in the SM and in the SMEFT. *Right:* percentual difference between one-loop (1L) and two-loop (2L) running defined as  $(1L-2L)/1L$ .



**Figure 10.** Comparison between one-loop (red line) and two-loop (blue line) running of the Wilson coefficient  $C_{HG}$  in the transverse momentum distribution in S2. *Left:* differential distribution in  $p_{T,h}$  in the SM and in the SMEFT. *Right:* percentual difference between one-loop (1L) and two-loop (2L) running defined as  $(1L-2L)/1L$ .



**Figure 13.** Comparison between one-loop (1L) and two-loop (2L) running of the Wilson coefficient  $C_{HG}$  in the invariant mass distribution in S2. *Left:* differential distribution in  $m_{hh}$  in the SM and in the SMEFT. *Right:* percentual difference between one-loop (1L) and two-loop (2L) running results defined as  $(1L-2L)/1L$ .

We present in this erratum the updated plots for the latter case, adhering to the numbering of the original publication [2].

We observe a reduction of the difference between the one- and two-loop running in the differential distributions to  $\mathcal{O}(5\%)$ , in contrast with the  $\mathcal{O}(10\%)$  quoted in ref. [2]. Such modification affects both the  $p_{T,h}$  distribution in  $pp \rightarrow hj$  and the  $m_{hh}$  distribution in  $pp \rightarrow hh$ , as can be inferred from the updated versions of the plots presented in this erratum.

**Data Availability Statement.** This article has no associated data or the data will not be deposited.

**Code Availability Statement.** This article has no associated code or the code will not be deposited.

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## References

- [1] S. Di Noi, B.A. Erdelyi and R. Gröber, *Complete two-loop Yukawa-induced running of the Higgs-gluon coupling in SMEFT*, [arXiv:2510.14680](https://arxiv.org/abs/2510.14680) [[INSPIRE](https://inspirehep.net/literature/2510146)].
- [2] S. Di Noi, R. Gröber and M.K. Mandal, *Two-loop running effects in Higgs physics in Standard Model Effective Field Theory*, *JHEP* **12** (2024) 220 [[arXiv:2408.03252](https://arxiv.org/abs/2408.03252)] [[INSPIRE](https://inspirehep.net/literature/2408032)].
- [3] L. Born, J. Fuentes-Martín and A.E. Thomsen, *Next-to-Leading Order Running in the SMEFT*, [arXiv:2601.19974](https://arxiv.org/abs/2601.19974) [[INSPIRE](https://inspirehep.net/literature/2601199)].