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Higgs-strahlung at the LHC in the inert doublet model: Full next-to-leading electroweak and QCD corrections

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Full one-loop QCD and electroweak corrections to the Higgs-starhlung process at the LHC, $pp \to W^{\pm}H, ZH$ in the inert doublet model (IDM) are studied. Taking all available constraints on the parameter space of the IDM, we consider the case where the IDM qualifies as a good dark matter (DM) candidate within the freeze-out mechanism and the case where DM constraints are not imposed, hence the model is not assumed to provide a DM candidate. Within the respective constraints we quantify the deviation from the standard model predictions at the one-loop order. For a better quantification of the deviation from the SM prediction, for the one-loop QCD corrections we adapt the renormalisation and factorisation scales such that the N3LO are recovered. We stress the importance of the photon induced real corrections. We find that while the one-loop corrections are large, the deviations from the SM are small. This is particularly true if the present DM constraints are imposed, the deviations from the SM in this case are a few per-mil and may not be measured. In case the model does not provide a good DM candidate, the corrections can reach a few percent. Another motivation for the present work is to show that one-loop electroweak and QCD corrections for a new physics model can be performed with an automated tool both for the virtual and the real corrections where for the latter both a dipole subtraction and a phase space slicing can be implemented.

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