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NLO predictions for $t\bar{t}$ + $b\bar{b}$ production in association with a light-jet at the LHC

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Precise measurements of Higgs boson production in association with top-quark pairs allow for constraints on the top-quark Yukawa coupling, which in turn is crucial to fully characterise the scalar sector of the Standard Model and could also open a window on Beyond-the-Standard-Model interactions. At the Large Hadron Collider, searches for $t\bar{t}H$ production in the dominant $H \to b\bar{b}$ channel are plagued by a large QCD background, which is dominated by $t\bar{t}$ production in association with a $b\bar{b}$ pair. The detailed understanding of this multi-particle and multi-scale background process is of crucial importance for the sensitivity of $t\bar{t}H(\to b\bar{b})$ analyses. Motivated by the fact that state-of-the-art Monte Carlo simulations for this background suffer from uncertainties related to the modeling of extra light-jet radiation, I present a study for $t\bar{t}b\bar{b}$+jet production at NLO QCD. The focus is on effects and uncertainties in observables relevant for $t\bar{t}H(b\bar{b})$ analyses.
At the technical level this calculation represents the first application of a new on-the-fly integrand reduction algorithm implemented in OpenLoops2.

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