



# NLO QCD with Massive Quarks

An extension of the NSC subtraction scheme

Bachelor Degree in Physics

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need for precision estimates at LHC



factorization theorem and perturbative expansion of  $d\hat{\sigma}_{a,b}$



real and virtual corrections



soft and collinear singularities (in CDR, show in real corrections)



subtraction scheme to regulate divergences



introduce the NSC SS



briefly show pole cancellation in the NSC SS





explain why massive quarks change  $I_S(\epsilon)$  and  $I_V(\epsilon)$ , but not  $I_C(\epsilon)$



show how  $I_S(\epsilon)$  changes (in particular massive angular integrals)



show how  $I_V(\epsilon)$  changes (in particular, colour-correlated  $\epsilon^{-2}$ -poles in  $\mathcal{V}_{ij}(\epsilon)$  coefficients)



highlights of pole cancellation in  $I_{S+V}(\epsilon)$ , define  $\chi_{i,j}(\epsilon)$  coefficients and explain their property



show pole cancellation in the colour-correlated sum of  $I_{S+V}(\epsilon)$ , leaving the same (and opposite) pole terms of  $I_C(\epsilon)$



show integrated counterterms, highlighting massive logs, and draw conclusions