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## Differential cross-sections for $t\bar{t}j + X$ production at the LHC

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The fundamental SM parameter of the top quark mass can be measured with unprecedented accuracy at LHC due to the large production cross section for top quark pairs, and top quark pairs in association with at least one hard jet. The extraction of this quantity can be achieved using the  $\rho_s$  distribution, an observable related to the invariant mass of the t-tbar + jet system. Thereby, the top-quark mass extraction can be performed using different mass renormalisation schemes. We present theory predictions useful for this extraction in the on-shell, the MSbar and, for the first time, the MSR scheme.

In view of the high experimental accuracy, which is reached in measuring the relevant production cross sections at the LHC, the control over the associated theory uncertainties becomes increasingly important. To this end we present a study of the effect of varying theoretical input parameters in the calculation of t-tbar + jet + X NLO differential cross sections. We investigate the effect of static and dynamical renormalization and factorization scale definitions and different PDF sets as well as the influence of the  $R$  parameter in the jet reconstruction procedure. We make public a set of reference fiducial cross-sections for different cuts, that we expect to be very useful for the forthcoming LHC experimental analyses at  $\sqrt{s} = 13$  TeV and higher center-of-mass energies.

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