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State of the art POWHEG generators for Top Mass Measurements at the LHC

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We study the theoretical uncertainties in the determination of the top-quark mass using next-to-leading-order (NLO) generators interfaced to parton showers (PS) that have different levels of accuracy. Specifically we consider three generators: one that implements NLO corrections in the production dynamics, one that includes also NLO corrections in top decay in the narrow width approximation, and one that implements NLO corrections for both production and decay including finite-width and interference effects. Our aim is to provide an assessment of the uncertainties of purely theoretical origin, we thus consider simplified top-mass related observables that are broadly related to those effectively used by experiments, eventually modelling experimental resolution effects with simple smearing procedures. Examining these observables with generators of increasing accuracy allows us to assess the theoretical errors due to the use of the less accurate generators. Furthermore, we estimate theoretical uncertainties associated with the variation of scales and with the choice of parton distribution functions. In order to give an indicative assessment of the uncertainties due to the shower and to the modelling of non-perturbative effects, we interface our NLO+PS generators to both Pythia8.2 and Herwig7.1, with various settings, and compare the results.

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