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Top Quark Mass Calibration for Monte-Carlo Event Generators

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The most precise top quark mass measurements use direct reconstruction methods, determining the top mass parameter of a Monte Carlo event generator, m_t^MC. Due to hadronization and parton shower dynamics, relating m_t^MC to a field theory mass is difficult. We present a calibration procedure to determine this relation by exploiting hadron level QCD predictions for observables closely related to reconstruction. We demonstrate the procedure using fits to the 2-Jettiness distribution in e+e- annihilation and show the calibration results for m_t^MC in Pythia 8.205 for the MSR mass at the scale 1 GeV and the pole mass at NNLL+NLO accuracy. To the extend that a given MC makes consistent descriptions of experimental data for e+e- versus pp collisions our method may be used to calibrate measurements of m_t^MC in current LHC and Tevatron analyses in terms of field theory mass schemes.

Summary

The most precise top quark mass measurements use direct reconstruction methods, determining the top mass parameter of a Monte Carlo event generator, m_t^MC. Due to hadronization and parton shower dynamics, relating m_t^MC to a field theory mass is difficult. We present a calibration procedure to determine this relation by exploiting hadron level QCD predictions for observables closely related to reconstruction. We demonstrate the procedure using fits to the 2-Jettiness distribution in e+e- annihilation and show the calibration results for m_t^MC in Pythia 8.205 for the MSR mass at the scale 1 GeV and the pole mass at NNLL+NLO accuracy. To the extend that a given MC makes consistent descriptions of experimental data for e+e- versus pp collisions our method may be used to calibrate measurements of m_t^MC in current LHC and Tevatron analyses in terms of field theory mass schemes.

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