

T 40: Top Quark (Theorie) 2

Convenor: M. Worek, S. Westhoff

Zeit: Dienstag 11:00–12:30

Raum: VSH 05

T 40.1 Di 11:00 VSH 05

Off-shell effects for $t\bar{t}$ in the dilepton channel — ●MANFRED KRAUS — Humboldt Universitaet zu Berlin, Berlin, Germany

We present results for the top-quark pair production in association with one hard jet including leptonic decays of the top quarks. The NLO QCD calculation for the LHC Run II energy of 13 TeV includes resonant as well as continuum production and all interference and off-shell contributions from top-quarks, W and Z bosons. We present a detailed comparison of uncertainties for integrated and differential cross sections as obtained by an independent variation of the renormalization and factorization scales for fixed and dynamical choices of the scale. Finally, also the impact of PDF uncertainties are addressed. We also briefly discuss the influence of off-shell effects on the extraction of the top-quark mass parameter.

T 40.2 Di 11:15 VSH 05

NLO electroweak corrections to off-shell top-antitop production with leptonic decays at the LHC — ●MATHIEU PELLEN and ANSGAR DENNER — Universitaet Wuerzburg, Wuerzburg, Germany

The increased centre-of-mass energy of the LHC makes the inclusion of electroweak corrections extremely relevant as they are particularly large in the Sudakov regime where new physics is expected to be probed. For the first time the NLO electroweak corrections to the full off-shell production of two top quarks that decay leptonically are presented. This includes all off-shell, non-resonant and interference effects. At the cross section level, the electroweak corrections are below one per cent. At the distribution level, they can grow large (up to 20 %) in the high transverse momentum region. To support our results, we have performed two different pole approximations. One assumes on-shell top quarks while the second features two on-shell W bosons. Only the latter gives a very good description of the full calculation. The methods used and some exemplary results will be presented.

T 40.3 Di 11:30 VSH 05

NLO QCD Predictions for off-shell $t\bar{t}$ and $t\bar{t}H$ Production and Decay at a Linear Collider — ●CHRISTIAN WEISS^{1,4}, BIJAN CHOKOUFÉ¹, JÜRGEN REUTER¹, JONAS LINDERT^{2,3}, STEFANO POZZORINI², and WOLFGANG KILIAN⁴ — ¹Desy Hamburg — ²Zürich University — ³Durham University — ⁴Siegen University

We present predictions for $t\bar{t}$ and $t\bar{t}H$ production and decay at future lepton colliders including non-resonant and interference contributions up to next-to-leading order (NLO) in perturbative QCD. The obtained precision predictions are necessary for a future precise determination of the top-quark Yukawa coupling, and allow for top-quark phenomenology in the continuum at an unprecedented level of accuracy. Simulations are performed with the automated NLO Monte-Carlo framework WHIZARD interfaced to the OpenLoops matrix element generator.

T 40.4 Di 11:45 VSH 05

 $\overline{\text{MS}}$ -On-Shell quark mass relation at four loops — PETER MARQUARD¹, ALEXANDER SMIRNOV², VLADIMIR SMIRNOV³,

MATTHIAS STEINHAUSER⁴, and ●DAVID WELLMANN⁴ — ¹Deutsches Elektronen-Synchrotron (DESY), 15738 Zeuthen, Germany — ²Research Computing Center, Moscow State University, 119991 Moscow, Russia — ³Skobeltsyn Institute of Nuclear Physics, Moscow State University, 119991 Moscow, Russia — ⁴Institut für Theoretische Teilchenphysik, Karlsruher Institut für Technologie (KIT), 76128 Karlsruhe, Germany

We present the relation between heavy quark masses defined in the modified minimal subtraction and the on-shell schemes up to order α_s^4 . Special emphasis is put on the numerical evaluation of the master integrals using the method of Mellin-Barnes integrals. We furthermore discuss the relation of the $\overline{\text{MS}}$ mass to the other short-distance masses and comment on the uncertainty of the pole mass due to renormalon divergence.

T 40.5 Di 12:00 VSH 05

Calibration of the top quark mass for Monte Carlo event generators — ●BAHMAN DEHNADI¹, ANDRE H. HOANG², VICENT MATEU³, MORITZ PREISSER², and IAIN W. STEWART⁴ — ¹University of siegen, Siegen, Germany — ²University of Vienna, Vienna, Austria — ³Universidad de Salamanca, Salamanca, Spain — ⁴MIT, Cambridge, Massachusetts, USA

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 extent 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.

T 40.6 Di 12:15 VSH 05

The Matrix Element Method at next-to-leading order QCD at (hadron) colliders — ●TILL MARTINI and PETER UWER — Humboldt-Universitaet zu Berlin, Germany

The Matrix Element Method (MEM) has proven beneficial to make maximal use of the information available in experimental data. However, so far it has mostly been applied in Born approximation only. In this talk we discuss the extension to NLO QCD accuracy. As a prerequisite we present an efficient method to calculate event weights for jet events at NLO accuracy. As illustration and proof of concept we apply the method to the measurement of the top-quark mass in single top production at the LHC. We observe significant differences when moving from LO to NLO which may be relevant for the interpretation of top-quark mass measurements at hadron colliders relying on the MEM.