T 12: QCD (Theorie) 2

Convenor: Andre Hoang

Zeit: Dienstag 16:45–19:00 Raum: M109

T 12.1 Di 16:45 M109

NNNLL Order Determination of alpha_s from Global Fits to e+ e- Thrust Data — •Vicent Mateu[1], Riccardo Abbate[2], Michael Fickinger[3], Andre Hoang[1], and Iain Stewart[2] — [1]MPI Munich — [2]MIT — [3]University of Arizona

We present a global analysis of the thrust distribution in e+ e- to jets. The theory divides itself into three regions: peak region, tail region, and far tail region. Using the soft-collinear efective theory we present a formalism that allows us to consistently and simultaneously treat all three regions. We include the 3-loop fixed order results, a resummation with NNNLL accuracy, and non-perturbative corrections. Our global fit to the data incorporates a complete basis to model the soft function, and a non-perturbative running gap to ensure stability of this model to perturbative corrections; features that go beyond the capabilities of current Monte Carlo generators.

T 12.2 Di 17:00 M109

Näherungsweise Rekonstruktion von Quarkstromkorrelatoren — •Andreas Maier[1], Philipp Maierhöfer[1], Peter Marquard[1] und Alexander Smirnov[2] — [1]Institut für Theoretische Teilchenphysik, Universität Karlsruhe, 76128 Karlsruhe, Germany — [2]Scientific Research Computing Center, Moscow State University, 119992 Moscow, Russia

Bis zur Dreischleifenordnung sind für verschiedene Stromkorrelatoren von Charm- und Bottomquarks gute Näherungsformeln oder sogar analytische Ergebnisse bekannt, sodass ihr Verhalten für einen weiten Energiebereich sehr gut beschrieben werden kann. Auf Vierschleifenniveau kennt man hingegen bisher nur Teile des Niederenergie-, Schwellen- und Hochenergieverhaltens.

Es wird gezeigt, wie die Vierschleifenbeiträge zu den Korrelatoren in guter Näherung aus den wenigen vorhandenen Informationen durch Padé-Approximation rekonstruiert werden können.

T 12.3 Di 17:15 M109

Vakuumpolarisation in Vierschleifen-Ordnung und Quarkmassenbestimmung — Andreas Maier[1], •Philipp Maierhöfer[1], Peter Marquard[1] und Alexander Smirnov[2] — [1]Institut für Theoretische Teilchenphysik, Universität Karlsruhe, D-76128 Karlsruhe — [2]Scientific Research Computing Center, Moscow State University

Die präzise Bestimmung fundamentaler Parameter des Standardmodells der Teilchenphysik erfordert die Berechnung von Vielschleifen-Korrekturen in der Störungstheorie. Zur Bestimmung der Charm- und Bottom-Quark-Massen eignet sich der Zusammenhang der Vakuumpolarisationsfunktion mit dem Wirkungsquerschnitt für Hadronen-Produktion aus e^+e^--Annihilation über eine Dispersionsrelation. Die Vakuumpolarisation wird dazu in eine Taylor-Reihe entwickelt, wodurch Feynman-Diagramme ohne äußere Impulse, sogenannte Vakuumdiagramme, auftreten. Fortschritte in den Techniken zur Berechnung von Vielschleifen-Integralen und die Kombination mehrerer Verfahren ermöglichten die Berechung des zweiten und dritten Taylorkoeffizienten in Vierschleifen-Ordnung. Die Ergebnisse werden präsentiert und die Auswirkungen auf die Werte für die Massen der Charm- und Bottom-Quarks diskutiert.

T 12.4 Di 17:30 M109

Heavy Quark Vacuum Polarization Function at O(alpha2(s)) O(alpha**3(s))** — •Vicent Mateu[1], Andre Hoang[1], and Seyyed Mohammad Zebarjad[2] — [1]MPI Munich — [2]Shiraz University

We determine the full mass and q^2 dependence of the heavy quark vacuum polarization function at O(alpha_s^2) and O(alpha_s^3) in perturbative QCD. We use known results for the expansions at high energies, in the threshold region and around q^2=0, conformal mapping and the Pade approximation method. From our results we determine numerically the previously unknown non-logarithmic contributions in the high-energy expansion at order (m^2/q^2)^i for i=0,1 and the coefficients in the expansion around q^2=0 at order q^{2n} with n > 1. We also determine the previously unknown O(v^0) constant term for the expansion in the threshold region. We use these results to perform an analysis of QCD sum rules to determine the charm and bottom quark masses, in the context of contour improved perturbation theory. In This method gives additional insight into the estimate of perturbative uncertainties.

T 12.5 Di 17:45 M109

Top Quark physics at NNLO Level — •Peter Bärnreuther — Universität Würzburg

In this talk I am going to present interesting aspects of the relation between top quark observables measured at accelerator experiments and their high precision theoretical predictions. Especially I will talk about the recent progress of the calculation of the top anti-top pair cross section at the NNLO level and the importance of the calculation for the LHC.

T 12.6 Di 18:00 M109

Effective theory analysis of top quark production at hadron colliders — •Li Lin Yang — Institut für Physik, Universität Mainz

We apply effective theory method to top quark production at hadron colliders. Comparison with traditional method is also presented.

T 12.7 Di 18:15 M109

Renormalization-Group Improved Prediction for Higgs Production at Hadron Colliders — •Valentin Ahrens — Universität Mainz

As the search for the Higgs boson is under way, improving the theoretical prediction for the cross section is an important task. In this talk we investigate the gluon-gluon fusion process which is the dominant contribution to the total cross section. We use renormalization-group methods in effective field theory to improve the theoretical prediction for the cross section for Higgs-boson production at hadron colliders. In addition to soft-gluon resummation at N3LL, we also resum enhanced contributions which arise in the analytic continuation of the gluon form factor to time-like momentum transfer.

T 12.8 Di 18:30 M109

NLO QCD corrections to W pair production at hadron colliders — Stefan Dittmaier[1], •Stefan Kallweit[1,2], and Peter Uwer[3] — [1]Max-Planck-Institut für Physik, München — [2]Paul-Scherrer-Institut, Villigen — [3]Humboldt-Universität, Berlin

We report on the calculation of the next-to-leading-order QCD corrections to the production of W-boson pairs in association with a hard jet at the Tevatron and the LHC, which is an important source of background for Higgs and new-physics searches.

The corrections stabilize the leading-order prediction for the cross section considerably, in particular if a veto against the emission of a second hard jet is applied.

Leptonic decays of the W bosons are included by applying an improved version of the narrow-width approximation that treats the W bosons as on-shell particles, but keeps the W-spin information to improve the decay description.

A survey of differential NLO QCD cross sections is discussed both for the LHC and the Tevatron. Aside from a general overestimation of cross sections for high transverse momenta by the leading-order description, the phase-space dependence of the corrections turns out to be only moderate.

T 12.9 Di 18:45 M109

QCD Corrections to $pp \to e^-\bar{\nu}_e\gamma$+jet — Francisco Campanario, •Christoph Englert, Michael Spannowsky, and Dieter Zeppenfeld — Institut für Theoretische Physik, Universität Karlsruhe

Searches for anomalous couplings at the LHC require a detailed knowledge of signal and background beyond leading-order analysis. Promising for anomalous $WW\gamma$ couplings is the process $pp \to W\gamma$, with a veto on hard additional jet activity. At present, however, this veto is based on the subtraction of a cross section at leading order QCD, with its concomitant scale uncertanties. We report on the calculation of the next-to-leading order QCD corrections to the process $pp \to e^-\bar{\nu}_e\gamma$+jet, which represents the process vetoed for the $WW\gamma$ coupling measurement.