

## T 10: QCD (Theorie) I

Convenor: Michal Czakon

Zeit: Mittwoch 16:45–19:00

Raum: 30.23: 10-1

T 10.1 Mi 16:45 30.23: 10-1

**Analytic calculation of top quark pair production at hadron colliders** — ●RALF SATTLER<sup>1</sup>, SIMON BADGER<sup>2</sup>, and VALERY YUNDIN<sup>3</sup> — <sup>1</sup>HU Berlin, Berlin — <sup>2</sup>NBIA, Copenhagen — <sup>3</sup>Desy, Zeuthen

We present new compact analytic one-loop helicity amplitudes for  $t\bar{t}$  production at Hadron colliders. The results were obtained employing a combination of on-shell methods and advanced Feynman diagram techniques. In particular the tadpole, the rational and mass renormalization contributions were extracted from the latter approach. For the cut constructive pieces we used the method of generalized unitarity. Further improvements were obtained by applying the constraints coming from the universal singular behaviour. The analytic expressions can be implemented in existing codes to provide faster and numerically more stable results for phenomenological studies.

T 10.2 Mi 17:00 30.23: 10-1

**Complete off-shell effects in top quark pair hadroproduction with leptonic decay at next-to-leading order** — ●GIUSEPPE BEVILACQUA<sup>1</sup>, MICHAL CZAKON<sup>1</sup>, ANDREAS VAN HAMEREN<sup>2</sup>, COSTAS PAPADOPOULOS<sup>3</sup>, and MALGORZATA WOREK<sup>4</sup> — <sup>1</sup>Institut für Theoretische Teilchenphysik und Kosmologie, RWTH Aachen, Aachen, Germany — <sup>2</sup>The Henryk Niewodniczanski Institute of Nuclear Physics, Cracow, Poland — <sup>3</sup>Institute of Nuclear Physics, NCSR Demokritos, Athens, Greece — <sup>4</sup>Bergische Universität Wuppertal, Wuppertal, Germany

We present results for NLO QCD corrections to the process  $pp(p\bar{p}) \rightarrow t\bar{t} \rightarrow W^+W^-b\bar{b} \rightarrow e^+\nu_e\mu^-\bar{\nu}_\mu b\bar{b} + X$ , including the full set of double-, single- and non-resonant top contributions at the order  $\mathcal{O}(\alpha_s^3\alpha_{EW}^4)$ . A comparative analysis at Tevatron run II and LHC will be discussed, presenting total cross sections together with scale dependence and several differential distributions. Comparison to the narrow-width approximation for top quarks will be also discussed.

T 10.3 Mi 17:15 30.23: 10-1

**Higgs+Jet Produktion in Bottom-Quark-Annihilation auf NLO QCD** — ●MARIUS WIESEMANN<sup>1</sup>, ROBERT HARLANDER<sup>1</sup> und KEMAL OZEREN<sup>2</sup> — <sup>1</sup>Bergische Universität Wuppertal, 42097 Wuppertal, Deutschland — <sup>2</sup>Department of Physics and Astronomy UCLA, Los Angeles, USA

Bottom-Quark-Annihilation ist einer der wichtigsten Higgsproduktionskanäle im MSSM für große Werte von  $\tan(\beta)$ . Präsentiert werden einerseits numerische Ergebnisse eines partonischen Monte Carlo Event Generators für die Higgs+Jet Produktion am LHC auf NLO QCD über diesen Prozess. Desweiteren werden Ergebnisse für  $b\bar{b} \rightarrow H$  mit einem Jet-Veto auf NNLO diskutiert.

T 10.4 Mi 17:30 30.23: 10-1

**Static potential for heavy quarks and gluinos** — ●TIM COLLET and MATTHIAS STEINHAUSER — Institut für Theoretische Teilchenphysik, Karlsruher Institut für Technologie

The static potential is a fundamental parameter of QCD. For the case of heavy-quark bound states in the colour singlet and octet configuration it is known to three and two loop order, respectively. In this talk the potential for colour octet bound states, like gluonium in supersymmetric theories, is discussed and results for the various colour configurations are presented in two-loop approximation.

T 10.5 Mi 17:45 30.23: 10-1

**Decoupling of the heavy top from the weak neutral current and  $\Gamma(Z \rightarrow \text{hadrons})$**  — ●JÖRG RITTINGER — TTP, KIT, Karlsruhe

The  $Z$  decay rate into hadrons is related to the QCD corrections of the

imaginary part of the  $Z$  propagator via the optical theorem. Because of the SU(2) coupling to left handed fermions both vector and axial vector current appear. Since at high loop (up to 4 loop) only massless propagators or massive tadpoles can be calculated we have to decouple the  $t$  quark. The  $t$  quark decouples naively for the vector current, but not for the axial vector current. This procedure and the 4 loop results of the axial vector correlator will be the topic of this talk.

T 10.6 Mi 18:00 30.23: 10-1

**Non-diagonal current correlators with two different masses up to three-loop order** — ●JENS HOFF, JOHANN KÜHN, and MATTHIAS STEINHAUSER — Institut für Theoretische Teilchenphysik, Karlsruher Institut für Technologie

Current correlators provide an important tool to relate theoretical calculations and experimental measurements. In this talk non-diagonal correlators of scalar, pseudoscalar, vector and axialvector currents are considered coupling to fermions with two different masses  $m_1$  and  $m_2$ . We evaluate moments up to three-loop order considering the hierarchies  $m_1 \gg m_2$  and  $m_1 \approx m_2$ . It is shown that the combination of the two expansions leads to an excellent approximation of the exact result.

T 10.7 Mi 18:15 30.23: 10-1

**Renormalization of Three-Quark Operators for Baryon Distribution Amplitudes using Dimensional Regularization** — ●SUSANNE KRAENKL and VLADIMIR BRAUN — Universität Regensburg, Regensburg, Deutschland

Renormalization of three-quark operators in dimensional regularization features a difficulty as one has to consider effects of so-called evanescent operators which vanish in  $d=4$  dimensions. However these operators affect the anomalous dimension beyond leading order. Thus in order to obtain the correct isospin of the nucleon state, it is necessary to include effects of evanescent operators.

This talk will give a brief introduction about the handling of evanescent operators and then first results of the renormalization of three-quark operators of nucleon distribution amplitudes will be presented.

T 10.8 Mi 18:30 30.23: 10-1

**Light-Cone Sum Rules for the  $\pi^0\gamma\gamma^*$  Form Factor** — ●FLORIAN A.C. PORKERT<sup>1</sup>, SHAHIN S. AGAEV<sup>1,2</sup>, VLADIMIR M. BRAUN<sup>1</sup>, and NILS OFFEN<sup>1</sup> — <sup>1</sup>Universität-Regensburg, Regensburg, Deutschland — <sup>2</sup>Baku State University, Baku, Aserbaidshan

We provide a theoretical update of the calculations for the  $\pi^0\gamma^*\gamma$  form factor in the light-cone sum rule framework, including up to six polynomials in the conformal expansion of the pion distribution amplitude and taking into account twist-six corrections related to the photon emission at large distances. The results are compared with the calculations of the  $B \rightarrow \pi\ell\nu$  decay and pion electromagnetic form factors in the same framework. Our conclusion is that the recent BaBar measurements of the form factor at large momentum transfers are  $\pi^0\gamma^*\gamma$  consistent with QCD and with the bulk of the available information on the pion distribution amplitude (DA), although they do suggest that the pion DA may have more structure than usually assumed.

T 10.9 Mi 18:45 30.23: 10-1

**Determination of  $\alpha_s$  from tau decays at five loops** — ●JORGE MONDEJAR MARIN and KONSTANTIN CHETYRKIN — Institut für Theoretische Teilchenphysik, Karlsruhe Institut of Technology, 76128, Karlsruhe, Germany

We extract a numerical value for  $\alpha_s$  from the decay rate of a tau lepton into non-strange hadrons. We use the five-loop result for the vector correlator, and evaluate  $\alpha_s$  using either the  $\overline{MS}$  or an effective-charge scheme.