

T 17: Beyond The Standard Model (Theorie) 1

Convenor: Tilman Plehn

Zeit: Mittwoch 16:45–18:35

Raum: M114

Gruppenbericht

T 17.1 Mi 16:45 M114

Production of Squarks and Gluinos at the LHC: The Electroweak Contributions — JAN GERMER, WOLFGANG HOLLIK, EDOARDO MIRABELLA, and MAIKE TRENKEL — Max-Planck-Institut für Physik, 80335 München, Deutschland

If SUSY is realized, colored SUSY particles will be produced copiously at the LHC. Pair production of squarks and gluinos is, therefore, among the most promising SUSY discovery channels. Besides the well-known supersymmetric QCD radiative corrections, also the electroweak contributions are required for a reliable cross section prediction. From SM processes it is known that especially in distributions on kinematical variables the electroweak effects can become important.

A short overview over the class of processes will be given. We investigate in detail the tree-level and next-to-leading order EW contributions to the cross sections. Special care has to be taken to obtain infrared finite observables. Numerical results will be presented for stop–anti-stop and squark-gluino production at the LHC.

T 17.2 Mi 17:05 M114

Contributions of $\mathcal{O}(\alpha_s^2\alpha)$ to squark pair production at the LHC — JAN GERMER, WOLFGANG HOLLIK, EDOARDO MIRABELLA, and MAIKE TRENKEL — Max-Planck-Institut für Physik, München, Germany

Supersymmetry (SUSY) is one of the most promising extensions to the standard model. There are many theoretical as well as experimental indications that SUSY might become apparent at the TeV scale. If this is the case, many new particles – especially colored particles – will be produced at the LHC. The dominant contributions to the cross section for squark and gluino production at Born level ($\mathcal{O}(\alpha_s^2)$), as well as the corresponding QCD corrections are known for more than 10 years. The electroweak contributions for squark–anti-squark and squark-gluino production also have been computed. In this talk I will mainly focus on the NLO corrections of $\mathcal{O}(\alpha_s^2\alpha)$ to the process $pp \rightarrow \tilde{q}\tilde{q}'$. At this order, interferences between amplitudes of $\mathcal{O}(\alpha_s\alpha)$ and $\mathcal{O}(\alpha_s)$ as well as between $\mathcal{O}(\alpha_s^2)$ and $\mathcal{O}(\alpha)$ have to be taken into account. These processes complete the discussion of $\mathcal{O}(\alpha_s^2\alpha)$ corrections to the production of squarks and gluinos at the LHC.

T 17.3 Mi 17:20 M114

Resummation for SUSY particle production at the LHC — WIM BEENAKKER¹, SILJA BRENSING², MICHAEL KRÄMER², ANNA KULESZA², ERIC LAENEN^{3,4,5}, and IRENE NIESSEN¹ — ¹Theoretical Physics, University of Nijmegen, Nijmegen, The Netherlands — ²Institut für Theoretische Physik, RWTH Aachen University, Aachen, Germany — ³Theory Group, Nikhef, Amsterdam, The Netherlands — ⁴IIFTA, University of Amsterdam, Amsterdam, The Netherlands — ⁵ITF, University of Utrecht, Utrecht, The Netherlands

The production of SUSY particles (sparticles) at the LHC is dominated by processes involving coloured sparticles in the final state. Since these processes are of uttermost importance for SUSY searches at the LHC, precise theoretical predictions are needed. Higher-order QCD corrections are dominated by large logarithmic terms due to the emission of soft gluons from initial and final state particles. A systematic treatment of these logarithms to all orders in perturbation theory is provided by resummation methods. We extend the predictive power of the theoretical results by performing resummation for coloured sparticle production processes. Analytical expressions for resummed cross sections and numerical results for the LHC are presented.

T 17.4 Mi 17:35 M114

Photonic two-loop corrections to $(g-2)_\mu$ in the MSSM — PHILIPP VON WEITERSHAUSEN, DOMINIK STÖCKINGER, HYEJUNG STÖCKINGER-KIM, and MARCO SCHÄFER — Institut für Kern- und Teilchenphysik, 01062 Dresden

The discrepancy between experiment and Standard Model predictions makes the muon's anomalous magnetic moment $(g-2)_\mu$ a promising contender for the search of BSM physics. In this talk we look at a selection of MSSM two-loop processes contributing to $(g-2)_\mu$. The discussed set of diagrams comprises MSSM one-loop diagrams to which a photon loop has been added, featuring characteristic logarithms.

T 17.5 Mi 17:50 M114

Selected oblique two-loop corrections to $(g-2)_\mu$ in the MSSM — MARCO SCHÄFER, DOMINIK STÖCKINGER, HYEJUNG STÖCKINGER-KIM, and PHILIPP VON WEITERSHAUSEN — Institut für Kern- und Teilchenphysik, 01062 Dresden

We have calculated selected two-loop diagrams contributing to the muon anomalous magnetic moment in the Minimal Supersymmetric Standard Model. These are chargino or neutralino one-loop diagrams with an additional third generation squark or squark-quark loop. Such diagrams exhibit oblique corrections as in the Standard Model and typically contain m_{top} and m_{bottom} . We will describe our methods of calculation and renormalization as well as numerical evaluation of SUSY parameters.

T 17.6 Mi 18:05 M114

Matching coefficients for the strong coupling constant and the bottom quark mass to $\mathcal{O}(\alpha_s^2)$ in the MSSM — ANDREAS BAUER, LUMINITA MIHAILA, JENS SALOMON, and MATTHIAS STEINHAUSER — Institut für Theoretische Teilchenphysik (TTP), 76128 Karlsruhe, Germany

We compute the exact two-loop matching coefficients for the strong coupling constant α_s and the bottom quark mass m_b within the Minimal Supersymmetric Standard Model (MSSM), taking into account $\mathcal{O}(\alpha_s^2)$ contributions from Supersymmetric Quantum Chromodynamics. We find that the explicit mass pattern of the supersymmetric particles has a significant impact on the predictions of α_s and m_b at high energies. Further on, the three-loop corrections are comparable to or even exceed the uncertainty due to the current experimental accuracy. In case of the the running bottom quark mass, they can reach in the large $\tan\beta$ regime up to 30% of the tree-level value.

T 17.7 Mi 18:20 M114

Strahlungskorrekturen zur Higgs-Masse im MSSM — PHILIPP KANT¹, ROBERT V. HARLANDER², LUMINITA MIHAILA¹ und MATTHIAS STEINHAUSER¹ — ¹Institut für Theoretische Teilchenphysik, Karlsruhe — ²Institut für Theoretische Physik, Wuppertal

Die Existenz eines leichten neutralen Higgs-Bosons ist eine wichtige Vorhersage der minimalen supersymmetrischen Erweiterung des Standardmodells (MSSM), die bei der Suche nach Supersymmetrie am LHC eine große Rolle spielen wird.

Wegen der großen Strahlungskorrekturen zum Wert der Higgs-Masse sind für den Vergleich von Theorie und Experiment Rechnungen höherer Ordnung erforderlich. Im Vortrag wird ein wichtiger Beitrag dazu in Form der Drei-Schleifen-Korrekturen der Ordnung $\alpha_t\alpha_s^2$ vorgestellt.