T 53: Jenseits des Standardmodells (Theorie) 1

Zeit: Dienstag 16:45–18:30   Raum: P6

T 53.1 Di 16:45 P6

Two-loop matching coefficients for the top-quark mass at $\mathcal{O}(\alpha_s^2)$ in the MSSM — •David Kunz and Luminita Mihaila — KIT, Karlsruhe, Germany

The top quark, as the heaviest elementary particle currently known, is expected to play a central role in elucidating the physics that lies beyond the Standard Model. Especially, the prediction of the running top quark mass at high energy scales, where the new physics become active, is required for precision tests of the various models.

In this talk, we report on the computation of the two-loop matching coefficients of the top quark mass in the framework of the Minimal Supersymmetric SM, taking into account only the dominant corrections proportional to the strong coupling constant α_s. Numerical effects for certain supersymmetric scenarios will be also presented.

T 53.2 Di 17:00 P6

Interference effects of neutral Higgs bosons in the MSSM — •Elina Fuchs and Georg Weiglein — DESY Hamburg

The interpretation of the Higgs signal within the MSSM requires precise theoretical predictions including mixing and higher-order effects. In case of nearby resonances in the Higgs sector, interference effects may be relevant. However, the interference term is neglected by the standard "narrow-width approximation" (NWA), which is in other respects a convenient tool for the factorisation of a more complicated process into production and subsequent decay of a particle with a small width compared to its mass.

Hence, a generalisation of the usual NWA is analysed which allows for a consistent treatment of interference effects between nearly mass-degenerate particles. This can be useful for the application to processes for which the factorisation into different sub-processes is essential to enable the computation of higher-order contributions.

Phenomenological consequences of interference effects between neutral MSSM Higgs bosons will be presented for an example process of Higgs boson production and its subsequent decay including one-loop corrections. As a test of the interference- and higher-order-improved NWA, the factorised approximation will be compared to the calculation of the full process at the one-loop level. Furthermore, the Breit-Wigner approximation will be validated in comparison to the full Higgs propagator mixing.

T 53.3 Di 17:15 P6

Next to leading order accuracy for production and decay of squarks and gluino — •Mathieu Pellen[1], Ryan Gavin[2], Christian Hangst[3], Michael Krämer[1], Margarete Mühlleitner[3], Eva Popenda[2], and Michael Spira[2] — [1]RWTH Aachen, Institut für Theoretische Teilchenphysik und Kosmologie — [2]Paul Scherrer Institut, Theory Group LTP — [3]KIT, Institut für Theoretische Physik

The search for supersymmetric versions of the standard model is a central task of the Large Hadron Collider. The interpretation of the experimental data requires accurate and flexible theoretical predictions. We present a new calculation of the next-to-leading order supersymmetric-QCD corrections to the production and the decay of supersymmetric particles. In particular, we provide fully differential cross sections in a partonic Monte Carlo program including parton shower effect. We will focus our discussion on the production of squarks which then directly decay into the lightest supersymmetric particle and jets. We will also evoke processes involving gluinos. The methods used and some exemplary results will be presented.

T 53.4 Di 17:30 P6

Light Stops in the MSSM with Minimal Flavour Violation — Ramona Gröber[1], Margarete Mühlleitner[1], Eva Popenda[2], and •Alexander Wlotzka[1] — [1]Institute for Theoretical Physics, Karlsruhe Institute of Technology, D-76128 Karlsruhe — [2]Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland

The search for supersymmetry at the LHC is an ongoing task. As the mixing of left- and right-handed squarks can be large for the stops, one of them can become rather light. If the mass difference of the light stop and the lightest neutralino is sufficiently small, the decay of the stop into a top quark and the neutralino is kinematically suppressed and thereby the detection of the stop becomes more difficult. In this case flavour changing neutral current (FCNC) processes can play an important role.

We present the calculation of the decay width for the decay of the stop into a charm quark and the lightest neutralino in the MSSM with Minimal Flavour Violation, including higher order corrections. In our analysis we additionally consider the 4-body decays of the stop which can compete with the above decay width.

T 53.5 Di 17:45 P6

Revisiting slepton pair production at the Large Hadron Collider — •Marcel Rothering[1], David R. Lamprea[1], Michael Klasen[1], and Benjamin Fuks[2] — [1]WWU Münster, Münster, Germany — [2]CERN, Geneva, Switzerland

Motivated by the shift in experimental attention towards electroweak supersymmetric particle production at the CERN LHC, we update in this paper our precision predictions at next-to-leading order of perturbative QCD matched to resummation at the next-to-leading logarithmic accuracy for direct slepton pair production in proton-proton collisions. Simplified models, now commonly adopted by the experimental collaborations for selectrons and smuons as well as mixing staus, are used as benchmarks for total cross sections at achieved and future center-of-mass energies. They are presented together with the corresponding scale and parton density uncertainties in graphical and tabular form for future reference. Using modern Monte Carlo techniques, we also reanalyze recent ATLAS and CMS slepton searches in light of our precision cross sections and for various assumptions on the decomposition of the sleptons and their neutralino decay products.

T 53.6 Di 18:00 P6

Slepton pair production with POWHEG — Barbara Jäger, Andreas von Manteuffel, and •Stephan Thier — Johannes Gutenberg University, 55099 Mainz, Germany

We present an analysis of supersymmetric QCD effects on the pair production of scalar lepton superpartners at the LHC. Our approach is based on the POWHEG method for the matching of next-to-leading order calculations to parton showers and builds upon the publicly available POWHEG BOX framework.

Taking account of recent experimental bounds on the masses of supersymmetric particles, we identify dominant contributions in the perturbative corrections. Fixed-order calculations and parton showers provide accurate descriptions of jets in complementary kinematic regions. We compare both methods in detail under realistic selection cuts.

T 53.7 Di 18:15 P6

Sommerfeld enhancement and relic abundance of neutralino dark matter - a survey of the MSSM parameter space — Martin Beneke[1], •Charlotte Hellmann[1], and Pedro Ruiz Femenia[2] — [1]TU Muenchen — [2]IFIC Valencia

We discuss the calculation of Sommerfeld enhanced (co-) annihilation cross sections of nearly mass degenerate non-relativistic neutralinos and charginos in the MSSM including P- and $\mathcal{O}(v^2)$ S-wave annihilations. Our approach consistently takes off-diagonal annihilation rates into account and allows to keep small mass-differences between the nearly mass-degenerate neutralinos and charginos. The (co-) annihilation cross sections are a central ingredient in the neutralino dark matter relic abundance calculation for TeV scale neutralino LSP dark matter. To investigate the impact of the enhanced cross sections on the predicted neutralino relic abundance we identify interesting regions of parameter space. We discuss the different features of these regions, focusing in particular on heavy wino and Higgsino dark matter and models interpolating in between the two scenarios.