

T 17: Beyond the Standard Model (Theorie) II

Convenor: Werner Porod

Zeit: Mittwoch 16:45–19:00

Raum: 30.23: 6-1

T 17.1 Mi 16:45 30.23: 6-1

SUSY-Backgrounds to Searches of a Neutral Higgs Boson via Vector Boson Fusion — ●BASTIAN FEIGL¹, HEIDI RZEHAKE², and DIETER ZEPPENFELD¹ — ¹IThP, Karlsruhe Institute of Technology, 76128 Karlsruhe, Germany — ²Physikalisches Institut, Uni Freiburg, 79104 Freiburg, Germany

Within SUSY models, additional backgrounds to Higgs boson searches arise from the production and subsequent decay of superpartners.

We analyze possible SUSY backgrounds for Higgs Boson production in Vector Boson Fusion in the Minimal Supersymmetric Standard Model (MSSM). As signal we consider the leptonic final states $h \rightarrow \tau^+ \tau^- \rightarrow l^+ l^- + \cancel{p}_T$ and $h \rightarrow W^+ W^- \rightarrow l^+ l^- + \cancel{p}_T$.

Relevant processes that can have a significant impact for the chosen modified SPS1a scenario are the production of $\chi_1^+ \chi_1^- + jj(j)$ and $\chi_2^0 \chi_1^0 + jj(j)$. After the Chargino and Neutralino-2 decay, these processes contribute to the $l^+ l^- jj(j) + \cancel{p}_T$ signature.

We present differential cross sections within a leading order analysis and the impact of Higgs mass reconstruction on the SUSY background.

T 17.2 Mi 17:00 30.23: 6-1

Higgs-Produktion durch Gluonfusion auf NLO QCD im MSSM — ROBERT HARLANDER und ●HENDRIK MANTLER — Bergische Universität Wuppertal

Präsentiert wird die Berechnung des NLO-Wirkungsquerschnitts für die Higgs-Produktion durch Gluonfusion im MSSM für verschiedene Szenarien. Dabei werden auch die Squark-Beiträge berücksichtigt, die im Limes großer SUSY-Massen berechnet wurden. Neben dem totalen Wirkungsquerschnitt werden auch p_T - und Rapiditätsverteilungen gezeigt. Außerdem wird der Effekt einer 4. Fermionen-Generation untersucht.

T 17.3 Mi 17:15 30.23: 6-1

Higgs Bosons at the LHC: Production and Decay into Electroweak Gauge Bosons — ●PATRICK GONZALEZ¹, SOPHY PALMER², MARTIN WIEBUSCH³, and KARINA WILLIAMS⁴ — ¹RWTH Aachen — ²Karlsruhe — ³Karlsruhe — ⁴Bonn

The search for Higgs bosons or, more general, (spin-zero) resonances is among the major physics goals of present-day collider physics, as the existence of such resonances and the exploration of their properties (production and decay modes, quantum numbers) would yield decisive clues for unraveling the mechanism of electroweak gauge symmetry breaking (EWSB).

By taking experimental and theoretical constraints into account, we analyze and compute, within a number of standard model (SM) extensions, the cross sections $\sigma_{\phi \rightarrow VV}$ for the production of a heavy neutral scalar/pseudoscalar Higgs boson/spinzero resonance at the LHC and its subsequent decays into electroweak gauge bosons. Special emphasis is laid on the complex MSSM (cMSSM) where CP-violating effects are induced by complex parameters in the Higgs potential that enter via loop corrections. They induce a mixing between the CP-eigenstates h, H and A ; these mixed states are denoted by h_i .

T 17.4 Mi 17:30 30.23: 6-1

Soft-gluon resummation for squark and gluino hadroproduction — WIM BEENAKKER¹, ●SILJA BRENSING², MICHAEL KRÄMER³, ANNA KULESZA³, ERIC LAENEN^{4,5,6}, and IRENE NIESSEN¹ — ¹Theoretical High Energy Physics, IMAPP, Radboud University Nijmegen, Nijmegen, The Netherlands — ²Theory Group, DESY, Hamburg — ³Institut für Theoretische Teilchenphysik und Kosmologie, RWTH Aachen University, Aachen — ⁴IFTA, University of Amsterdam, Amsterdam, The Netherlands — ⁵ITF, University of Utrecht, Utrecht, The Netherlands — ⁶Theory Group, Nikhef, Amsterdam, The Netherlands

We consider the resummation of soft gluon emission for squark and gluino hadroproduction at next-to-leading-logarithmic (NLL) accuracy in the framework of the minimal supersymmetric standard model. The production of top and bottom squarks is treated separately. Beside analytical results we present numerical predictions for total cross sections and transverse-momentum distributions for the Tevatron and the LHC. We discuss the impact of NLL resummation and provide an estimate of the theoretical uncertainty due to scale variation and the

parton distribution functions.

T 17.5 Mi 17:45 30.23: 6-1

Gluino Pair Production at the LHC: The Threshold — ●MATTHIAS KAUTH, JOHANN H. KÜHN, MATTHIAS STEINHAUSER, and PETER MARQUARD — Institut für Theoretische Teilchenphysik, KIT

The next-to-leading order analysis for the cross section for hadronic production of gluino pairs close to threshold is presented. Within the framework of non-relativistic QCD a significant enhancement compared to fixed order perturbation theory is observed which originates from the characteristic remnant of the $1S$ peak below the nominal pair threshold. The analysis includes all colour configurations of S -wave gluino pairs, i.e. singlet, symmetric and antisymmetric octet, decuplet and 27 representation. Matching coefficients involving real and virtual radiation are separately evaluated for all colour and spin configurations and initial states. We concentrate on the case of gluino decay rates comparable to the gluino binding energy. The non-relativistic dynamics of the gluino pair is solved by calculating the Green's function in NLO. Numerical results for the Large Hadron Collider at $\sqrt{s} = 14$ TeV and 7 TeV are presented.

T 17.6 Mi 18:00 30.23: 6-1

NNLO SUSY-QCD corrections to production of the Higgs-bosons at LHC — ALEXEY PAK, MATTHIAS STEINHAUSER, and ●NIKOLAI ZERF — Institut für Theoretische Teilchenphysik, Karlsruhe Institute of Technology (KIT), 76128 Karlsruhe, Germany

We present our calculation of the NNLO production cross section of the Higgs-boson via gluon fusion within the framework of an effective theory. This includes the determination of the matching coefficient C_1 , which contains all hard effects of the heavy SUSY particles, up to three loops in SUSY-QCD. We will point out the correct treatment of the used super-symmetric regulator (DRED) during the matching procedure. Numerical results for the cross section are discussed for typical super-symmetric scenarios.

T 17.7 Mi 18:15 30.23: 6-1

Effective field theory approach to non-relativistic neutralino dark matter pair annihilation processes — MARTIN BENEKE¹, ●CHARLOTTE HELLMANN¹, and PEDRO RUIZ-FEMENIA^{1,2} — ¹Institut für Theoretische Teilchenphysik und Kosmologie, RWTH Aachen — ²Fakultät für Physik, Universität Wien

The requirement that the thermal relic abundances predicted for the neutralino LSP in the MSSM are consistent with the observed dark matter abundance yields strong constraints to the MSSM parameter space which could help for future identification of a collider candidate as the constituent of cosmic dark matter.

For a sufficiently heavy neutralino LSP, threshold effects and mass degeneracies between the LSP and further SUSY particles can play an important role in the determination of the (co-)annihilation cross sections that enter the relic abundance calculation.

Using the framework of non-relativistic effective theories, we discuss the (co-)annihilation cross sections of a set of nearly mass degenerate non-relativistic neutralinos and charginos into relativistic Standard Model final states. We thereby provide all perturbative S -wave annihilation rates at next-to-leading order as well as P -wave annihilation rates at leading order in the relative velocity of the annihilating particle pair.

T 17.8 Mi 18:30 30.23: 6-1

Gluino plus Squark Production Close to Threshold — ●ACHIM KRESS, JOHANN H. KÜHN, and MATTHIAS KAUTH — Karlsruher Institut für Technologie

The appearance of bound states modifies the cross section close to threshold for gluino plus squark production and even below. The hadronic production cross section of these bound states, as well as their strong and electroweak decay modes close to threshold are presented for various “Snowmass Points”. Binding effects as well as the influence of gluino and squark decay rates are taken into account. The calculations are based on the Green's Function formalism for a Coulomb like potential, which depends on the irreducible colour representation of the corresponding state. For the attractive representations, an enhance-

ment of the cross section close to threshold is observed. Due to their multiplicity, the higher dimensional representations become dominant in the high energy region.

T 17.9 Mi 18:45 30.23: 6-1

Higgs boson self couplings in the MSSM — •MATHIAS BRUCHERSEIFER — PSI Villigen

The Higgs sector in the MSSM is known to receive large radiative

corrections at one-loop level, coming from top and stop loops. The $\mathcal{O}(\alpha_s \alpha_t)$ two-loop radiative corrections to the MSSM Higgs masses and self couplings can be determined by the effective potential method, which is equivalent to the exact diagrammatic result in the limit of vanishing external momenta. This talk will cover a review about the effective potential method applied to the MSSM Higgs sector and its renormalization at two-loop order. Preliminary numerical results will be presented.