T 18: Beyond the Standard Model (Theorie) III

Convenor: Werner Porod

Zeit: Donnerstag 16:45–19:00 Raum: 30.23: 6-1

T 18.1 Do 16:45 30.23: 6-1

Anomalous Top Couplings in WHIZARD — •Fabian Bach and Thorsten Ohl — Institut für Theoretische Physik und Astrophysik, Uni Würzburg

The origin of the quark mass hierarchy within the Standard Model (SM) is still very unclear, whereas the top quark is particularly interesting because of its uniquely large mass, which has also made it hard to access experimentally so far. At the LHC, however, large abundances of top quarks will be produced over the next years, providing the statistics necessary to measure various properties of the top quark with high precision. Within the approach of effective operators, it is possible to parameterize any new physics contributing to top interactions via anomalous top-gauge boson couplings $tt\gamma$, ttZ, tbW and ttg, whereas contact terms (e. g. $ttgg$) have to be included in general to ensure gauge invariance. The full set of gauge-invariant operators leading to anomalous top couplings has been implemented into the parton-level Monte Carlo generator WHIZARD to provide a consistent tool for MC studies of full hard scattering amplitudes relevant at the detector level. We show results discussing the influence of contributions required by gauge invariance, and also the validity of the usual on-shell approximation for more complex final states.

T 18.2 Do 17:00 30.23: 6-1

The Production of Heavy Spin-1 Resonances at the LHC — •Franziska Schissler and Dieter Zeppenfeld — IThP, Karlsruhe Institute of Technology, 76128 Karlsruhe, Germany

Without a Higgs boson, weak-boson scattering amplitudes grow with the center-of-mass energy, eventually violating unitarity. A possibility to delay this problem, besides a Higgs boson, is the exchange of heavy spin-1 resonances ($m \lesssim 1$TeV). In the fermiophobic limit, they can only be detected via vector-boson fusion. If one permits non-vanishing couplings to the (light) fermions, Drell-Yan and vector-boson-pair production via heavy spin-1 resonances become important discovery channels.

We study the sensitivity of the individual channels as function of the couplings of these new resonances to SM-matter. A model-independent approach, based on sum-rules, allows us to find the most promising production channel. For a parton-level analysis, we have implemented these processes in the Monte Carlo program VBFNLO.

T 18.3 Do 17:15 30.23: 6-1

Measuring spin and $\mathcal{CP}$ from semi-hadronic ZZ decays using jet substructure — •Christoph Englert[1], Christoph Hackstein[2,3], and Michael Spannowsky[4] — [1]Institute for Theoretical Physics, Heidelberg University — [2]Institute for Experimental Nuclear Physics, KIT — [3]Institute for Theoretical Physics, KIT — [4]Institute of Theoretical Science, University of Oregon, Eugene

We apply novel jet techniques to investigate the spin and $\mathcal{CP}$ quantum numbers of a heavy resonance X, singly produced in $pp \to X \to ZZ \to \ell^+\ell^- jj$ at the LHC. We take into account all dominant background processes to show that this channel, which has been considered unobservable until now, can qualify under realistic conditions to supplement measurements of the purely leptonic decay channels $X \to ZZ \to 4\ell$. In particular, we find sensitivity to a $\mathcal{CP}$-even or $\mathcal{CP}$-odd scalar resonance, while, for tensorial and vectorial resonances, discriminative features are diminished in the boosted kinematical regime.

T 18.4 Do 17:30 30.23: 6-1

Studien zum Nachweis eines schweren Eichboson im Zerfallskanal $W' \to e\nu$ am ATLAS-Experiment — •Christian Schröder, Giovanni Siragusa und Stefan Tapprogge — Institut für Physik, Johannes-Gutenberg-Universität Mainz

Einige Erweiterungen um das Standardmodell der Teilchenphysik sagen bisher nicht entdeckte Teilchen voraus, welche an den Experimenten des Large Hadron Collider (LHC) am CERN, u. a. dem ATLAS-Experiment, nachgewiesen werden sollen. Eines dieser möglichen Teilchen ist das schwere Eichboson W', das von bisherigen Experimenten am Tevatron bis zu einer Masse von 1 TeV ausgeschlossen werden konnte. Die im ersten Jahr genommenen Daten des ATLAS-Detektors sollen es ermöglichen diese Massenauschlußgrenze weiter zu erhöhen.

In dem Vortrag soll hauptsächlich auf die Detektion des leptonischen Zerfallskanal des W'-Bosons in ein Elektron und ein Neutrino, d. h. $W' \to e\nu$ eingegangen werden. Dabei resultiert die größte Ungenauigkeit der Messung aus dem Verständnis des Untergrundes und der Bestimmung des fehlenden Transversalimpulses. In dem Vortrag sollen daher geeignete Methoden zur Untergrundunterdrückung und zur möglichst präziesen Messung des fehlenden Transversalimpulses im ATLAS-Experiment vorgestellt werden. Anhand erster vorläufiger Ergebnisse mit den bis dahin analysierten Daten des ATLAS-Experimentes von Proton-Proton-Kollisionen bei einer Schwerpunktsenergie von $\sqrt{s} = 7$ TeV sollen aktuelle Ausschlußgrenzen präsentiert und ein Ausblick auf Analysemöglichkeiten mit zukünftigen Daten gegeben werden.

T 18.5 Do 17:45 30.23: 6-1

Doubly charged Higgs bosons in an SU(5) GUT model — •Karsten Schnitter — Universität Siegen

The minimal non-SUSY SU(5) is ruled out by proton stability and non-unification of gauge couplings. However, models with extended field content have been shown to evade present experimental bounds. Adding a scalar 15-plet provides such an extension while simultaneously introducing a type-II see-saw neutrino mass. Considering the full Higgs potential, we show that breaking the SU(5) symmetry necessarily leads to doubly charged Higgs bosons with masses within the LHC reach. Additional singly charged and neutral Higgses are discussed as well.

T 18.6 Do 18:00 30.23: 6-1

Higgs pair production in Composite Higgs models — •Ramona Grober and Margarete Muhlleitner — Institut fuer Theoretische Physik, Karlsruhe Institut of Technology, 76128 Karlsruhe

In composite Higgs models the Higgs boson arises as a pseudo Nambu-Goldstone boson of an enlarged global symmetry. The Higgs potential is generated by loops of Standard Model (SM) fermions and gauge bosons. To reconstruct the Higgs potential trilinear and quartic couplings must be measured. In the composite Higgs model these couplings are modified compared to the SM and they depend on a new parameter - the compositeness parameter ξ. We will present the Higgs pair production cross sections in two composite Higgs models. They give access to the trilinear Higgs couplings. The prospects of extracting the triple Higgs coupling will be discussed.

T 18.7 Do 18:15 30.23: 6-1

Graviton Production in Fixed Point Gravity — •Maximilian Demmel[1], Gudrun Hiller[1], and Daniel Litim[2] — [1]Institut für Physik, Technische Universität Dortmund, D-44221 Dortmund, Germany — [2]Department of Physics and Astronomy, University of Sussex, Brighton BN1 9QH, UK

Graviton production in scattering processes in a fixed point gravity scenario with large extra dimensions and TeV scale fundamental Planck mass is investigated.

T 18.8 Do 18:30 30.23: 6-1

Unitarity in Fixed Point Gravity — Jan Brinkmann[1], Gudrun Hiller[1], Daniel Litim[2], and •Jan Schröder[1] — [1]Institut für Physik, Technische Universität Dortmund, D-44221 Dortmund, Germany — [2]Department of Physics and Astronomy, University of Sussex, Brighton BN1 9QH, UK

Unitarity conditions for scattering processes in a fixed point gravity scenario with large extra dimensions and a TeV scale fundamental planck mass are examined.

T 18.9 Do 18:45 30.23: 6-1

Deducing the standard model from a single fundamental principle — •Christoph Schiller — Physik Department, T37, Techniche Universität München

We propose a single, simple fundamental principle that implies the existence of quantum theory, of the three known gauge interactions, and of the three known particle generations. The quark model is reproduced. Neutrinos are automatically massive.

The fundamental principle also excludes the existence of any other gauge groups and of any other elementary particles. The fundamental principle thus predicts that there is no new physics beyond the standard model.

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