T 34: QCD theory II

Time: Tuesday 17:00–18:30 Location: H-ÜR 1

T 34.1 Tue 17:00 H-ÜR 1

Electroweak Corrections for W^+W^- Scattering — •Robert Franken — JMU Würzburg

Vector boson scattering (VBS) processes are a very good testing ground for the validity of the Standard Model (SM) and electroweak symmetry breaking in general. Over the last few years, Atlas and LHC have been able to measure the cross sections of VBS. To search for deviations, it is important to have precise predictions for VBS processes within the SM. Whilst only the QCD NLO predictions were available for some time, recently electroweak corrections have become available for the scattering of like-sign W bosons and W and Z bosons and turned out to be at the level of 15% for fiducial cross sections. In this talk we report on our efforts to calculate the NLO EW corrections to opposite sign WW scattering and the complete NLO corrections to the process $pp \to e^+\mu^-\nu_e\bar{\nu}_\mu jj$.

T 34.2 Tue 17:15 H-ÜR 1

Vector boson scattering - concrete model realization versus EFT — •Jannis Lang, Stefan Liebler, Heiko Schäfer-Siebert, and Dieter Zeppenfeld — Institute for Theoretical Physics, Karlsruhe Institute of Technology, 76128 Karlsruhe, Germany

We consider a concrete UV complete model with additional fermions and scalars being multiplets under $SU(2)_L$ in the $SU(2)_L$ limit of the Standard Model. We derive its impact on vector boson scattering, both in the full model as well as in terms of an effective field theory (EFT). The validity of the plain EFT and unitarized versions in comparison to the full model is examined, and the impact for experimental analyses bounding EFT operators is pointed out.

T 34.3 Tue 17:30 H-ÜR 1

Vector boson fusion searches for dark matter: Probing the Higgs funnel — •Jan Heisig[1], Michael Krämer[2], Eric Magde[3], and Alexander Mück[2] — [1]Centre for Cosmology, Particle Physics and Phenomenology - CP3 Université catholique de Louvain — [2]Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen University — [3]PRISMA+ Cluster of Excellence and Mainz Institute for Theoretical Physics

We constrain the Higgs-portal model employing the vector-boson fusion channel at the LHC. In particular, we include the phenomenologically interesting parameter region of the Higgs funnel in which the Higgs-boson mass is close to the threshold for dark- matter production and a running-width prescription has to be employed for the Higgs-boson propagator. Limits for the Higgs portal coupling as a function of the dark-matter mass are derived from the CMS search for invisible Higgs-boson decays in vector-boson fusion at 13 TeV. Furthermore, we perform projections for the 14 TeV HL-LHC and the 27 TeV HE- LHC taking into account a realistic estimate of the systematic uncertainties. The respective upper limits on the invisible branching ratio of the Higgs reach down to 2 % and constrain perturbative Higgs-portal couplings up to DM masses of 110 GeV.

T 34.4 Tue 17:45 H-ÜR 1

Soft Gluon Resummation for the Associated Single Top and Higgs Production at the LHC — •Laura Moreno Valero, Anna Kulesza, and Daniel Schwartländer — Institut für Theoretische Physik, Westfälische Wilhelms Universität Münster, Deutschland

Processes involving the Higgs boson and the top quark are of high interest in searches for BSM physics as a way to directly access the top Yukawa coupling. Although it has a relatively small cross section, the single top and Higgs production process $pp \to Htj$ is particularly sensitive to new physics, calling for precise theoretical predictions. A reduction of theoretical uncertainties can be achieved by means of resummation techniques, accounting for large logarithmic corrections which originate from soft gluon emissions. In this talk we discuss extending the precision with which theoretical predictions for this process are known from NLO (next-to-leading order) to NLO+NLL (next-to-leading logarithmic matched to NLO) accuracy.

T 34.5 Tue 18:00 H-ÜR 1

Top Quark Mass Effects in Next-To-Next-To-Next-To-Leading Order Higgs Boson Production: Virtual Corrections — Joshua Davies, •Florian Herren, and Matthias Steinhauser — TTP, KIT, Karlsruhe

We discuss the computation of finite top quark mass corrections to the four-loop Higgs boson gluon vertex and briefly recapitulate the computational methods involved.

T 34.6 Tue 18:15 H-ÜR 1

NLO calculations of Higgs decays in various extended Higgs sectors — Shinya Kanemura[1], Mariko Kikuchi[2], Kentarou Mawatari[3], •Kodai Sakurai[4], and Kei Yagyu[1] — [1]Osaka University, Osaka, Japan — [2]Kitakyushu College, Kitakyushu, Japan — [3]Iwate University, Iwate, Japan — [4]Karlsruhe Insitute of Technology, Karlsruhe, Germany

Precise measurements of the discovered Higgs boson is one of important ways to explore the shape of the Higgs sector. We calculated decay branching ratios of the Higgs boson with full next-to-leading-order (NLO) EW and NNLO QCD corrections in various extended Higgs models, such as the singlet extension of the standard model, 4 types of two Higgs doublet models and the inert doublet model. Then, we implemented the analytic results into H-COUP, which is a computation program for the Higgs boson developed by us. In this talk, we will describe the impact of loop contributions of additional Higgs bosons for the decay branching ratios. We will also discuss whether or not above extended Higgs models are discriminated by precise measurements of the branching ratios at future lepton colliders.