T 80: Searches EW II

Time: Wednesday 17:30–19:00 Location: HSZ/0101

T 80.1 Wed 17:30 HSZ/0101

Constraints on Supersymmetry from Collider Searches and Other Experiments — Samuel Bein Bein, •Malte Mrowietz, and Peter Schleper — Universität Hamburg, Institut für Experimentalphysik

Constraints from searches at the LHC and from other experiments on the minimal supersymmetric standard model (MSSM) are evaluated in the context of the 19-parameter phenomenological MSSM (pMSSM). For this purpose a large scan of the pMSSM parameter scan is performed. Complementarity and possible tension between the LHC data, the recent g-2 result, and direct detection experiments are examined.

T 80.2 Wed 17:45 HSZ/0101

Kaon Quenching Measurements for Proton Decay Search with JUNO — •Ulrike Fahrendholz[1], Carsten Dittrich[1], Meishu Lu[1], Sarah Braun[1], Lothar Oberauer[1], Hans Steiger[2], and Matthias Raphael Stock[1] — [1]E15, Physik-Dep., Technische Universität München, James-Franck-Str. 1, 85748 Garching — [2]Cluster of Excellence PRISMA$^+$, Staudingerweg 9, 55128 Mainz

Proton Decay is a main consequence of Baryon Number Violation and is predicted in several Grand Unified Theories (GUTs). It is one of the conditions to explain the asymmetry of matter and anti-matter in our universe. One of the main proton decay channels favored by supersymmetric GUTs is $p \to K^+ + \bar{\nu}$. By now, Super-Kamiokande has set a lower lifetime limit of $5.9 \cdot 10^{33}$ years for this channel. The Jiangmen Underground Neutrino Observatory (JUNO) is a 20 kton liquid scintillator detector currently under construction in China and is expected to reach the order of 10^{34} years after ten years of data taking. In this talk, I present a general strategy of JUNO for the search of the proton decay as well as an experimental setup to identify the still unknown quenching behavior of the K^+ in the scintillator of JUNO.

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T 80.3 Wed 18:00 HSZ/0101

Search for supersymmetry in final states with disappearing tracks in proton-proton collisions at 13 TeV — •Samuel Bein, Viktor Kutzner, Malte Mrowietz, Peter Schleper, Alexandra Tews, and Moritz Wolf — Universität Hamburg, Hamburg, Germany

We report the results of a search for charged, semi-stable, supersymmetric particles in final states with one or more disappearing tracks embedded within a range of final states characterized by varying numbers of jets, b-tagged jets, electrons, and muons. The transverse length of signal candidate tracks is used to target various lifetimes associated with wino-like and Higgsino-like charginos in the MSSM, as well as semi-stable charged particles with longer lifetimes. The hit-averaged deposited energy associated with signal candidates traversing the pixel tracker is used to increase sensitivity to particles with large mass or small boost. The search uses a sample of proton-proton collisions at sqrt(s)=13 TeV collected between 2016 and 2018, corresponding to an integrated luminosity of 136 fb^{-1}. Limits on the pair production of gluinos and squarks are obtained in the framework of simplified and full-spectrum SUSY models.

T 80.4 Wed 18:15 HSZ/0101

Diboson polarization measurement in a region enhanced in longitudinal-longitudinal $W^{\pm}Z$ events — •Jan-Eric Nitschke — Institute of Nuclear and Particle physics

In the Standard Model (SM), fundamental particles acquire their masses through the Higgs mechanism. These resulting Goldstone bosons are absorbed into the W and Z bosons and become their longitudinal components, consequently making these gauge bosons massive. Thus, studying the longitudinal components of the W and Z bosons allows the probing of one of the cornerstones of the SM theory.

Vector boson scattering (VBS) events are often used to study longitudinal-longitudinal vector boson interactions. However, VBS processes have low production cross sections and only in recent years all VBS processes were observed for the first time.

Instead, this talk focuses on a study of longitudinal-longitudinal WZ interactions using diboson $WZ \to \ell\nu\ell\ell$ events. Additionally the considered events are constrained to have $p_{\mathrm{T}}^{Z} > 200$ GeV to enhance the contribution of the s-channel production where the bosons directly interact as well as $p_{\mathrm{T}}^{WZ} < 70$ GeV to isolate leading-order like events that exhibit a radiation amplitude zero effect, reducing the contribution from doubly-transversely polarized events.

This phase space has a significantly increased fraction of direct longitudinal-longitudinal vector boson interactions, allowing for an important and unique test of the standard model and electroweak symmetry breaking.

T 80.5 Wed 18:30 HSZ/0101

A precision measurement of fiducial and differential cross sections of WW production with the ATLAS detector — •José Antonio Fernández Pretel, Beate Heinemann, and Oleg Kuprash for the ATLAS-Collaboration — Albert-Ludwigs Universität Freiburg

Measuring production of W boson pairs at particle colliders gives an important way to test the predictions of Standard Model (SM) of particle physics in both perturbative Quantum Chromodynamics and Electroweak domains. Production of WW is also a significant background source for Higgs measurements (especially $H \to WW$) and beyond SM searches. In this measurement, fiducial and differential cross sections are obtained using the full Run 2 dataset collected in proton-proton collisions at the LHC at center-of-mass energy of $\sqrt{s}$ =13 TeV with the ATLAS detector, corresponding to an integrated luminosity of 139 fb^{-1}. Multiple background contributions such as fake and non-prompt leptons are estimated using data-driven techniques. In contrast to most previous measurements that enhance the WW signal purity by vetoing hadronic jets in the final state, the first measurement of WW cross sections using a fully jet-inclusive selection is presented in this work, providing the most precise cross sections of WW production achieved in hadron-hadron collisions to date. The measurements are also performed in a dynamic jet-veto phase space. Additionally, detector level distributions are used to extract constraints on dimension-6 Wilson coefficients in the Standard Model Effective Field Theory. No deviations with respect to the SM are observed.

T 80.6 Wed 18:45 HSZ/0101

Measurement of $ZZ\gamma$ final states with the ATLAS detector at the LHC — •Anke Ackermann for the ATLAS-Collaboration — Kirchhoff-Institute for Physics, Heidelberg University

The Standard Model of Particle Physics (SM) predicts the rare production of triboson final states. Although suffering from small cross sections and hence a limited amount of signal events, such triboson states can be studied with the vast amount of data collected by the ATLAS detector in Run 2. In addition to validating the predictions of the SM for rare processes, sensitivity to New Physics is given via anomalous quartic couplings of e.g. four neutral gauge bosons. This talk will focus on the analysis of the simultaneous production of $ZZ\gamma$. In order to determine the cross sections of this process, it is crucial to separate signal events from events arising through background processes mimicking the signal topology. The most dominant background process contains fake photons, which are non-prompt photons within jets. Due to the limited statistics no conventional data-driven method can be used. Instead a new approach with jet ratios is applied to estimate the amount of fake photons in the signal region. After giving a general introduction about the triboson production of the $ZZ\gamma$ process, a short summary of the analysis, including the event selection and the background estimation, is presented.