T 97: Drell-Yan and jet production

Time: Friday 11:00–13:00 Location: H-HS XI

T 97.1 Fri 11:00 H-HS XI

Transverse momentum spectrum of Drell Yan pairs — •Heng Yang, Melanie Schmitz, and Hannes Jung — DESY CMS Group, Hamburg, Germany

We apply the Parton Branching method to calculate transverse momentum dependent (TMD) parton densities and fit the free paramters to HERA DIS measurements. These TMD densities are used to calcuate the Drell Yan transverse momentum spectrum for Z bosons at the LHC at next-to-leading order. We apply the same calcualtions to Drell Yan production at lower energies and low mass and estimate the contributin of primordial kt (intrinsic kt).

T 97.2 Fri 11:15 H-HS XI

Low mass Drell-Yan cross section measurement in p-p collision at $\sqrt{s} = 13$ TeV using the ATLAS detector at the LHC — •Alessandro Guida for the ATLAS-Collaboration — DESY, Hamburg, Germany

High energy physics experiments are performed at the Large Hadron Collider at CERN making collide bunches of protons at energies up to 13 TeV. The ATLAS experiment, with its multipurpose detector, studies the products of these collisions and compares the experimental measurements with the predictions of the Standard Model. An input for all the theoretical calculations is the structure of the proton, encoded in the so-called Parton Distribution Functions (PDFs). These can be deduced by experimental observations only. Inputs for the determination of the PDFs come from measurements of particular physical processes. This talk presents a new study of the process $Z/\gamma^* \to \mu\mu$ at low masses of the di-muon system, in the region between 7 GeV and 60 GeV. In particular, the differential cross sections $d\sigma/dm_{\mu\mu}$, $d^2\sigma/dm_{\mu\mu}\, d|y_{\mu\mu}|$ and $d^2\sigma/dm_{\mu\mu}\, dp_T^Z$ for that process are measured in 13 TeV proton-proton collisions at the LHC, using the ATLAS detector. The predictions in the kinematic region explored in the analysis are sensible to resummed theoretical results (predictions valid at each perturbative order, but only in some particular kinematics conditions). These results can be compared with the experimental measurements and later on included in the determination of PDFs.

T 97.3 Fri 11:30 H-HS XI

Measurement of the triple differential inclusive Z ($\to \mu\mu$) + jet cross section at $\sqrt{s} = 13$ TeV using 2016 and 2017 data from the CMS detector — Thomas Berger, Maximilian Horzela, Günter Quast, Klaus Rabbertz, and •Matthias Schnepf — Karlsruhe Institute of Technology

The proton structure, which is not perturbatively calculable, is a limiting uncertainty in many LHC analyses. Therefore, precise experimental measurements to determine the proton structure in the form of the parton distribution functions (PDFs) are primarily important.

The Z($\to \mu\mu$) boson production in association with Jets provides a combination of high event rates and clear signals. We give an overview of a triple differential inclusive Z($\to \mu\mu$)+jet cross section measurement at $\sqrt{s} = 13$ TeV with data taken by the CMS detector in 2016 and 2017. The cross section is measured as a function of the rapidity separation of the Z boson and the leading jet, the boost of their center-of-mass system, and the transverse momentum of the Z boson (p_T^Z). Furthermore, the measurement is alternatively performed with a variable determined from muon angular information instead of p_T^Z. The results are compared with next-to-next-to-leading order calculations.

T 97.4 Fri 11:45 H-HS XI

Triple-differential measurement of the dijet cross section at $\sqrt{s} = 13$ TeV with the CMS detector — Günter Quast, Klaus Rabbertz, and •Daniel Savoiu — Karlsruher Institut für Technologie (KIT)

Jet cross sections are of particular interest for precision studies at proton colliders such as the LHC. They are sensitive to the proton structure and can be used to derive tighter constraints on the parton distribution functions (PDFs) of the proton. Moreover, jet production is among the processes with the highest cross section. As a result, event rates are high enough to enable differential measurements as a function of multiple observables with sufficient statistical precision.

The analysis presented here concerns a triple-differential measurement of the dijet production cross section from data collected by the CMS experiment during Run 2 of the LHC at a center-of-mass energy of 13 TeV. The cross section is measured as a function of the dijet rapidity difference y^*, the total boost of the dijet system y_b, and the average transverse momentum of the jets. An alternative measurement is performed using the dijet invariant mass as the third variable.

T 97.5 Fri 12:00 H-HS XI

Measurement of the angular coefficients in Z-boson production at $\sqrt{s} = 13$ TeV with the ATLAS experiment — •Matthias Kohl and Stefan Tapprogge — Institut für Physik, Johannes-Gutenberg-Universität, Mainz

Angular distributions of the Drell-Yan process can probe the underlying QCD dynamics of Z-boson production and can improve predictions for future analyses at hadron colliders. The related angular coefficients can be measured using final states of charged lepton pairs in the Collins-Soper frame, differentially in the transverse momentum, mass and rapidity of the dilepton system.

A previous measurement by ATLAS of the full set of eight angular coefficients $A_0 - A_7$ was performed at $\sqrt{s} = 8$ TeV. In this talk the current status of the analysis of di-electron and di-muon events at a center-of-mass energy of $\sqrt{s} = 13$ TeV is presented. The data used for the analysis corresponds to 147 fb^{-1} of pp-collisions at the LHC recorded by the ATLAS experiment. The analysis strategy as well as challenges, the understanding of the data and expected uncertainties are discussed.

T 97.6 Fri 12:15 H-HS XI

Cross section ratios of Z+jet over dijet production — Thomas Berger[1], Günter Quast[1], Klaus Rabbertz[1], Daniel Savoiu[1], •Bettina Schillinger[1,2], and Mikko Voutilainen[2] — [1]Karlsruhe Institute of Technology — [2]Helsinki Institute of Physics

In this analysis we investigate a ratio of cross sections, which promises to profit from reduced uncertainties.
As the first cross section we choose the inclusive dijet cross section, because the abundant production of jets at the Large Hadron Collider offers the opportunity to investigate this observable in a wide kinematic range. As the second observable we consider the Z+jet cross section. The production of Z bosons in association with jets provides a clear signal, especially due to the fact that the decay of the Z boson into two muons can be measured precisely with the CMS detector.
Since the partonic production channels differ between dijet and Z+jet production, interesting insights might be obtained when comparing these processes.
The presented measurement is carried out triple-differentially in phase space and it is based on data collected with the CMS detector in 2018.

T 97.7 Fri 12:30 H-HS XI

Jet Mass Calibration — •Steffen Albrecht, Andreas Hinzmann, Roman Kogler, and Dennis Schwarz — Universität Hamburg

In this talk, a technique for calibrating the mass of (fat) jets will be presented. In the analysis of hadronic final states, the resolution and the scale of the jet mass can be an important source for the systematic uncertainties. Therefore an improvement of its measurement will benefit many of these analyses.

Using scales of jet constituents of different categories (e.g. charged hadronic, neutral hadronic) as nuisance parameters in a template fit of the jet mass in several regions to data, one can learn about their influence on the jet mass shape and normalisation.

The presented analysis considers processes with W+jets in the final state, where the boson has a large transverse momentum (high Lorentz boost) and thus produces strongly collimated decay products, which are reconstructed as a single fat jet.

T 97.8 Fri 12:45 H-HS XI

Jet substructure modeling in dijet and Z+jet events — •Julian Zeyn, Robin Aggleton, and Andreas Hinzmann — University of Hamburg

Searches for boosted W-, Z-, H- or top-jets make use of jet substructure observables to reduce the background composed of quark and gluon jets. In particular, gluon jets dominate the QCD multijet background. Therefore, precise background modeling is necessary to gain

sensitivity for such searches.

We use gluon enriched dijet and quark enriched Z+jet samples to measure substructure observables. We then study the modeling of quark and gluon jets in Monte Carlo generators with the goal of finding a tune that well describes the jet substructure of quark and gluon jets while not breaking the modeling of existing measurements.