# T 27: QCD I

Time: Tuesday 16:00–17:45 Location: Tb

T 27.1 Tue 16:00 Tb

**Measurement of inclusive jet cross-section with different size parameters at $\sqrt{s}$ =13 TeV in the ATLAS experiment** — •Fernando Del Rio — Kirchhoff Institute for Physics

Jets are the experimental evidence of the fundamental particles governed by quantum chromodynamics (QCD), quark and gluons; their study brings valuable insight into both the physics of the Standard Model and the searches for new physics. A jet can be though in terms of a set of particles coming from a single original particle, or, in terms of measurement, a set of energy deposits in a detector. On the particle-level, the process by which a jet is formed involves hadronization, a non-perturbative phenomenon that cannot be explained from first principles. On the measurement-level a size parameter (radius or $R$) must be set for the anti-$k_t$ algorithm used to define jets. In the ATLAS experiments the default value for $R$ is 0.4. In this ongoing work which uses 43 fb$^{-1}$ of data from the LHC, we plan to measure the cross-section of jets that have different radii (0.2 and 0.6) to gain insight of the non-perturbative processes involved in jet formation. With this goal, in-situ calibrations have been derived for the different $R$, a trigger strategy has been worked out and their resolution has been determined with an in-situ method.

T 27.2 Tue 16:15 Tb

**Measurement of di-jet event cross sections in pp collisions at $\sqrt{s}$ = 13 TeV with CMS 2016 data** — •Luis Ignacio Estevez Banos, Armando Bermudez Martinez, Patrick Connor, and Hannes Jung — DESY Hamburg

A measurement of multi-differential cross-sections for QCD di-jet events production in pp collisions at a centre-of-mass energy of 13 TeV will be presented. The analysed data set was recorded with the CMS detector during 2016, corresponding to an integrated luminosity of about 36 fb-1. The multiplicity is measured triple-differentially as a function of the $\Delta\phi_{1,2}$ separation between leading and subleading jets and $p_T$ of the leading jet. The transverse momenta of the leading four jets are also measured.

This talk will give an overview of the analysis starting with the event selection and the applied corrections to data and MC and finally the cross-section unfolding procedure. The data measured will be compared to MC predictions.

T 27.3 Tue 16:30 Tb

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

High energy physics experiments are performed at the Large Hadron Collider at CERN colliding 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. This talk presents the study of the process $Z/\gamma^* \to \mu\mu$ at low invariant mass of the di-muon pair, in the region between 7 GeV and 60 GeV, below the the $Z$ boson resonance mass peak ($m_Z$ = 91.2 GeV). The single and double differential cross sections $d\sigma/dm_{\mu\mu}$, $d^2\sigma/dm_{\mu\mu}\, d|y_{\mu\mu}|$ and $d^2\sigma/dm_{\mu\mu}\, dp_T^{Z/\gamma^*}$ of the process are measured in 13 TeV proton-proton collisions at the LHC, using the ATLAS detector. The measurement explores an extreme region of the phase space and is sensitive to resummation results in the theoretical prediction (a calculation that, in some particular kinematics conditions, is valid at each perturbative order). The analysis exploits the good resolution of the ATLAS detector in reconstructing low momentum muons. The main difficulties come instead from the high background component that enters in the event selection, the triggering of events and the modelling of some key physical quantities.

The main features of the analysis, the studies done to overcome the main challenges, as well as the first results and comparison to theory predictions are presented in the talk.

T 27.4 Tue 16:45 Tb

**Search for contact interactions with inclusive jet production at the LHC at 13 TeV** — •Toni Mäkelä and Katerina Lipka — Notkestraße 85, 22607 Hamburg, Germany

In this work, inclusive jet production cross sections and triple-differential cross sections of top quark-antiquark pair production at the LHC at a center of mass energy of 13 TeV are used together with data of inclusive deep inelastic scattering to extract the parton distributions of the proton and the strong coupling constant. In an additional analysis of the same data, the standard model cross section is extended with effective couplings for 4-quark contact interactions. In particular, left-handed vector-like or axial-vector like colour-singlet exchanges are considered. These would correspond to beyond-the-standard model scenarios with quark substructure, $Z'$ or extra dimensions. For the first time, the Wilson coefficients of contact interactions are extracted simultaneously with the standard model parameters using the LHC data.

T 27.5 Tue 17:00 Tb

**Impact of differential dijet data on PDF and strong coupling fits at NNLO** — •Jakob Stark and Klaus Rabbertz — Karlsruhe Institute of Technology

Influence of triple differential dijet cross sections at $\sqrt{s}$ = 8 TeV on fitted PDFs is studied. Inclusion of jet data into PDF fits mainly has impact on the gluon PDF. Compared to previous PDF fits of the CMS collaboration with dijet data included, this is done for the first time with NNLO theory calculations, that only became available in the last few years. By comparing PDF fits at NLO to NNLO one finds, that at NNLO the scale dependency and scale uncertainties of the resulting PDFs decrease significantly, which matches the expected behavior.

In addition, simultaneous fits of the PDFs and the strong coupling constant are presented. Here the results exhibit significantly smaller scale uncertainties at NNLO. The central fit results for $\alpha_s(M_z)$ are, as expected, somewhat smaller at NNLO than at NLO.

At last, a double differential dijet cross section measurement at $\sqrt{s}$ = 7 TeV is included into the PDF fits as well. While at NLO both dijet measurements lead to slightly different results, at NNLO these differences decrease drastically, such that a combined fit can be performed including both dijet datasets in a consistent way.

T 27.6 Tue 17:15 Tb

**Jet Mass Calibration** — •Steffen Albrecht, Andreas Hinzmann, Dennis Schwarz, and Roman Kogler — 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 takes processes with W+jets as well as hadronic $t\bar{t}$ systems in the final states into account. In addition, only events are considered in which the bosons have a large transverse momentum and thus produce strongly collimated decay products which are reconstructed as single fat jets.

T 27.7 Tue 17:30 Tb

**Pileup mitigation in CMS** — •Ksenia de Leo, Anna Benecke, Johannes Haller, Andreas Hinzmann, Roman Kogler, and Matthias Schröder — Institut für Experimentalphysik, Universität Hamburg

The high instantaneous luminosity reached by the LHC during Run-2 leads to an increased number of additional collisions in each bunch crossing (pileup). An important experimental challenge is the separation of particles produced in the interaction of interest from those resulting from pileup interactions.

This talk will present studies of the Pile Up Per Particle Identification (PUPPI) technique to mitigate effects from pileup on the object reconstruction in the CMS detector. The algorithm will be described together with challenges in its application. In addition, the optimisation of the algorithm for the final reconstruction of Run-2 data will be presented in detail.