

# Low-x 2023



## Report of Contributions

Contribution ID: 65

Type: **not specified**

## Exclusive vector meson production with *Sartre* using machine learning in eA collision.

We use Machine Learning with the event-generator (*Sartre*) for the for exclusive diffraction processes in electron-nucleus scattering. The second moment of the amplitude includes averaging of hundreds of initial nucleon configurations of the heavy nucleus, a procedure which is extremely CPU intense. We show that we can make the production of the cross-sections used for event generation at least 90% more efficient using machine learning. *Sartre* is using lookup tables for the first and second amplitude of the interaction. With our new technique, the production time of these lookup tables is reduced from several months to a few days. This will enable us to generate exclusive diffraction events for all heavy nuclear species, with any exclusive final state.

**Author:** SINGH, Jaswant (Indian Institute of Technology New Delhi)

**Co-author:** TOLL, Tobias

**Presenter:** SINGH, Jaswant (Indian Institute of Technology New Delhi)

Contribution ID: 66

Type: **not specified**

## Search for effective Lorentz and CPT violation using ZEUS data

Lorentz and CPT symmetry in the quark sector of the Standard Model are studied in the context of an effective field theory using ZEUS  $e\pm p$  data. Symmetry-violating effects can lead to time-dependent oscillations of otherwise time-independent observables, including scattering cross sections. An analysis using five years of inclusive neutral-current deep inelastic scattering events corresponding to an integrated HERA luminosity of  $372 \text{ pb}^{-1}$  at  $\sqrt{s} = 318 \text{ GeV}$  has been performed. No evidence for oscillations in sidereal time has been observed within statistical and systematic uncertainties. Constraints, most for the first time, are placed on 42 coefficients parameterising dominant CPT-even dimension-four and CPT-odd dimension-five spin-independent modifications to the propagation and interaction of light quarks.

**Author:** WICHMANN, Katarzyna (Deutsches Elektronen-Synchrotron (DE))

**Presenter:** WICHMANN, Katarzyna (Deutsches Elektronen-Synchrotron (DE))

Contribution ID: 67

Type: **not specified**

## Measurement and QCD analysis of inclusive jet production in deep inelastic scattering at HERA

A new measurement of inclusive jet cross sections in neutral current deep inelastic scattering using the ZEUS detector at the HERA collider is presented. The data were taken at HERA in the years 2004 to 2007 at a centre-of-mass energy of 318 GeV and correspond to an integrated luminosity of 347 pb<sup>-1</sup>. Massless jets, reconstructed using the kT-algorithm in the Breit reference frame, have been measured as a function of the squared momentum transfer,  $Q^2$ , and the transverse momentum of the jets in the Breit frame,  $p_{T,Breit}$ . The measured jet cross sections are compared to previous measurements as well as perturbative QCD predictions. The measurement has been used in a next-to-next-to-leading-order QCD analysis to perform a simultaneous determination of parton distribution functions of the proton and the strong coupling constant  $\alpha_s(M_Z^2)$ . A significantly improved accuracy is observed compared to similar measurements of the strong coupling constant.

**Author:** WICHMANN, Katarzyna (Deutsches Elektronen-Synchrotron (DE))

**Presenter:** WICHMANN, Katarzyna (Deutsches Elektronen-Synchrotron (DE))

Contribution ID: 68

Type: **not specified**

## Measurement of the azimuthal decorrelation angle between the leading jet and the scattered lepton in deep inelastic scattering at HERA

The azimuthal decorrelation angle  $\Delta\phi$  between the leading jet and scattered lepton in deep inelastic scattering has been measured with the ZEUS detector at HERA. The experimental data set was taken in the HERA II data-taking period and corresponds to an integrated luminosity of 326 pb<sup>-1</sup>. The measurement was performed within a range of the exchanged photon virtuality  $Q^2$  from 10 to 350 GeV<sup>2</sup>, the lepton energy  $E_e > 10$  GeV, and the lepton angle  $140 < \theta_e < 180$ . The jets were measured in the transverse-momentum and pseudorapidity ranges  $2.5 \text{ GeV} < p_{T,\text{jet}} < 30 \text{ GeV}$  and  $-1.5 < \eta_{\text{jet}} < 1.8$ . The differential cross section was normalized to the inclusive cross section and are presented here as a function of  $\Delta\phi$  in various ranges of  $p_{T,\text{jet}}$ ,  $Q^2$  and the jet multiplicity. The measurements obtained in this study show good agreement with predictions from perturbative calculations up to next-to-next-to-leading order.

**Author:** WICHMANN, Katarzyna (Deutsches Elektronen-Synchrotron (DE))

**Presenter:** WICHMANN, Katarzyna (Deutsches Elektronen-Synchrotron (DE))

Contribution ID: 69

Type: **not specified**

## The LHCspin project

The goal of LHCspin is to develop, in the next few years, innovative solutions and cutting-edge technologies to access spin physics in high-energy polarized fixed-target collisions, by exploring a unique kinematic regime given by the LHC beam and by exploiting new probes.

This ambitious task poses its basis on the recent installation of SMOG2, the unpolarized gas target in front of the LHCb spectrometer. Specifically, the unpolarized target, already itself a unique project, will allow to carefully study the dynamics of the beam-target system, and clarify the potentiality of the entire system, as the basis for an innovative physics program at the LHC.

The forward geometry of the LHCb spectrometer ( $2 < \eta < 5$ ) is perfectly suited for the reconstruction of particles produced in fixed-target collisions. This configuration, with center-of-mass energies ranging from 115 GeV in pp interactions to 72 GeV in collisions with nuclear beams, allows to cover a wide backward rapidity region, including the poorly explored high x-Bjorken and high x-Feynman regimes. With the instrumentation of the proposed target system, LHCb will become the first experiment delivering simultaneously unpolarized beam-beam collisions at  $\sqrt{s}=14$  TeV and both polarized and unpolarized beam-target collisions.

The status of the project is presented along with a selection of physics opportunities.

**Author:** SANTIMARIA, Marco (INFN e Laboratori Nazionali di Frascati (IT))

**Co-author:** DI NEZZA, Pasquale (INFN e Laboratori Nazionali di Frascati (IT))

**Presenter:** SANTIMARIA, Marco (INFN e Laboratori Nazionali di Frascati (IT))

Contribution ID: 70

Type: **not specified**

## Geometric scaling in leading neutron events at HERA

This analysis provides new fits of the GBW model and the impact parameter-dependent saturation model (bSat or IP-Sat) to the leading neutron structure function HERA data in one-pion exchange approximation. Both parametrizations of the dipole cross section provide good descriptions of the considered data. It is shown here for the first time that the experimental leading neutron production HERA data exhibits geometric scaling, which in this context means that the total  $\gamma^* \pi^*$  cross section is a function of only one dimensionless variable  $\tau = Q^2/Q_s^2(x)$ . The geometric scaling region extends over a broad range of  $Q^2$  and can be attributed to the presence of a saturation boundary which manifests at  $Q^2 \geq Q_s^2$ . The scaling behaviour in leading neutron events is profoundly similar to what has been observed for the inclusive DIS events.

1. A. Kumar, *Geometric scaling in leading neutron events at HERA*, *Phys. Rev. D* 107, 034005 (2023).
2. A. Kumar and T. Toll, *Investigating saturation effects and the virtual pion in leading neutron events at HERA with the dipole model*, *Phys. Rev. D* 105, 114045 (2022).

**Author:** KUMAR, Arjun (Indian Institute of Technology Delhi)

**Presenter:** KUMAR, Arjun (Indian Institute of Technology Delhi)

Contribution ID: 71

Type: **not specified**

## Hadron production and forward proton measurements with ATLAS

Measurements of hadron production provide important insight about the quark and gluon fragmentation that are relevant for the simulation of kinematic distributions of high-energy collisions. The measurement of charged particle distributions using LHC proton-proton data collected at 13.6 TeV of centre-of-mass energy will be presented. The differences in the production with and without accompanying forward protons will be highlighted. In addition, the production of charged particle production in photo-nuclear interactions using lead-lead collisions at 5 TeV will be discussed and contrasted with photo-nuclear proton-lead events at the same collision energy. The spectra of correlated hadron chains are explored in p-p, p-lead, and lead-lead collisions and compared to the predictions based on the quantized fragmentation of a three-dimensional QCD helix string. Finally, the talk will describe a recent result of the search for Axion Light Particles utilising two photons and forward protons in the event.

**Author:** COLLABORATION, ATLAS

**Presenter:** COLLABORATION, ATLAS



Contribution ID: 72

Type: **not specified**

## Jet, heavy flavour and photon production at ATLAS

The production of jets and prompt isolated photons at hadron colliders provides stringent tests of perturbative QCD. The most recent measurements in this area by the ATLAS experiment, using proton-proton collision data at  $\sqrt{s} = 13$  TeV, are presented. Prompt inclusive photon production is measured for two distinct photon isolation cones,  $R=0.2$  and  $0.4$ , as well as for their ratio. The measurement is sensitive to gluon parton density distribution. Various measurements of event shapes in multijet events are presented, as well. The talk will discuss measurements of new event-shape jet observables defined in terms of reference geometries with cylindrical and circular symmetries using the energy mover's distance, as well as variables probing the properties of the multijet energy flow. The latter are also used to determine the strong coupling constant. The measurements are compared to state-of-the-art theory predictions from a range of parton shower programs and fixed order calculations. Furthermore, measurements of jets in association with an electroweak gauge boson are highlighted. The differential measurement of W boson production in association with charm  $D^+$  and  $D^{*+}$  vector mesons will be discussed and compared to QCD calculations including NNLO parton distribution functions and constraints on parton distribution functions. Recent results of Z+jets production using new machine-learning techniques to extract multi-differential cross sections will be presented. The measurements are compared to state-of-the-art theory predictions.

**Author:** COLLABORATION, ATLAS

**Presenter:** COLLABORATION, ATLAS

Contribution ID: 73

Type: **not specified**

## Precision measurements of W production at ATLAS

The indirect determination of the W-boson mass from global electroweak fits outperforms the precision of its experimentally measured value. An improved experimental measurement is therefore one of the goals of the LHC physics program. The talk will present a re-analysis of the mass of the W boson at a centre-of-mass energy of 7 TeV using a profile likelihood fit, which improves the precision of the mass determination by 15% by fully exploiting the information present in data. The talk will also present the transverse momentum of the W and Z boson measured from the hadronic recoil at 5 and 13 TeV using dedicated LHC runs with reduced instantaneous luminosity. The measurement provides a fundamental input to reduce the physics-modeling uncertainties in future W-boson mass determinations.

**Author:** COLLABORATION, ATLAS

**Presenter:** COLLABORATION, ATLAS

Contribution ID: 74

Type: **not specified**

## Precision measurements of Z production at ATLAS

Precision measurements of the production cross-sections of Z bosons at LHC provide important tests of perturbative QCD and constrain the parton distribution functions for quarks within the proton. This talk will present an extraordinarily precise double-differential measurement of the Z boson in the full phase space of the decay leptons at a centre-of-mass energy of 8 TeV. The recoil of the Z-boson is sensitive to quark and gluon emissions and is used to determine the strong coupling constant in a novel approach using the Sudakov region. If available, a measurement of Drell-Yan production at high invariant mass using 13 TeV data will also be presented. The results are compared to state-of-the-art predictions in perturbative QCD, supplemented by resummation of logarithmically-enhanced contributions in the small transverse-momentum region of the lepton pairs.

**Author:** COLLABORATION, ATLAS

**Presenter:** COLLABORATION, ATLAS

Contribution ID: 75

Type: **not specified**

## On the exact solution for the Schrödinger equation

For almost a century, the general solution for the Schrödinger equation was assumed to be generated by a time-ordered exponential known as the Dyson series. We discuss under which conditions the unitarity of this solution is broken, and additional discrete dynamics emerges. Then, we provide an alternative construction that is manifestly unitary, regardless of the Hamiltonian and the setup. The new construction involves an additional Hermitian operator with a singular time dependency and evolves in a non-gradual way. Its dynamics exhibit the behavior of a collective object governed by Liouville's equation, performing transitions at a measure 0 set of times. Our considerations show that Schrödinger's and Liouville's equations are, in fact, two sides of the same coin, and together they become the unified description of quantum systems in the fractalic regime.

**Author:** MULIAN, Yair

**Presenter:** MULIAN, Yair

Contribution ID: 76

Type: **not specified**

## Next-to-leading order photon+jet production

Using the CGC effective theory together with the hybrid factorisation, we study forward photon+jet production in proton-nucleus collisions beyond leading order. We first compute the “real” next-to-leading order (NLO) corrections, i.e. the radiative corrections associated with a three-parton final state, out of which only two are being measured. Then we move to the “virtual” NLO corrections to dijet production, in which a gluon loop is included as a part of the amplitude, before or after the measurement. Each of these loop diagrams diverges, and we explain our treatment in order to obtain finite expression for the cross section.

We explicitly work out the interesting limits where the unmeasured gluon is either a soft, or the product of a collinear splitting. We find the expected results in both limits: the B-JIMWLK evolution of the leading-order dijet cross-section in the first case (soft gluon) and, respectively, the DGLAP evolution of the initial and final states in the second case (collinear splitting).

**Author:** MULIAN, Yair

**Presenter:** MULIAN, Yair

Contribution ID: 77

Type: **not specified**

## QCD corrections to quarkonium production

I will review the impact of QCD corrections to quarkonium production in inclusive and exclusive reactions. First, I will explain how they significantly alter the cross section at mid and large  $p_T$  in inclusive photo- and hadro-production. Second, I will discuss the perturbative instability arising at high energies in  $p_T$ -integrated fixed-order computations and discuss how they can be dealt with either via a specific factorisation-scale choice or by resummation of high-energy logarithms via high-energy factorisation. Third, I will focus on exclusive photoproduction plagued by the same high-energy perturbative instabilities and exclusive production in photon fusion.

**Author:** LANSBERG, Jean-Philippe (Université Paris-Saclay (FR))

**Presenter:** LANSBERG, Jean-Philippe (Université Paris-Saclay (FR))

Contribution ID: 78

Type: **not specified**

## Computing one-loop corrections to quarkonium production impact-factors with Lipatov's EFT

The formalism of gauge-invariant EFT for Multi-Regge processes in QCD is used to compute impact-factors relevant for processes of production of heavy quarkonia within Non-Relativistic QCD Factorisation formalism and High-Energy Factorisation at one-loop accuracy. The examples of  $\gamma + R \rightarrow c\bar{c} \left[ {}^1S_0^{[8]} \right]$  and  $g + R \rightarrow c\bar{c} \left[ {}^1S_0^{[1]} \right]$  impact factors will be considered, with  $R$  being the Reggeized gluon and the final-state  $c\bar{c}$  pair is projected on a specified state  ${}^{2S+1}L_J^{[1,8]}$ . In the process of computation, the one-loop integrals with rapidity divergences and massive internal lines have been encountered and procedure for their computation has been developed. The results for the impact-factor in the EFT has been cross-checked against the Regge limit of an exact one-loop QCD amplitude  $\gamma + g \rightarrow c\bar{c} \left[ {}^1S_0^{[8]} \right] + g$ , which is another highly nontrivial check of the EFT formalism. The results will be applied to computation of  $p_T$ -integrated cross sections of inclusive  $J/\psi$  photoproduction and  $\eta_c$  hadroproduction in the matching approach of Refs.[1,2].

[1] <https://arxiv.org/abs/2306.02425>

[2] <https://arxiv.org/abs/2112.06789> [JHEP 05 (2022) 083]

**Author:** Dr NEFEDOV, Maxim (IJClab, Orsay)

**Presenter:** Dr NEFEDOV, Maxim (IJClab, Orsay)

Contribution ID: 79

Type: **not specified**

## Imaging the odderon from exclusive $\eta_c$ production at the EIC

In this contribution I would like to report on our recent findings [1] regarding the exclusive  $\eta_c$  production in  $e+p$  and  $e+A$  collisions that is sensitive to the Odderon. We are working within the framework of Color Glass Condensate applicable at the high energies that would be reached at future electron ion colliders. The Odderon distribution at small- $x$  is found by explicitly solving the Balitsky-Kovchegov equation with running coupling corrections. For the initial condition for proton targets we are using the very recent quark light-cone wave function based model from [2], while for the nuclei we are using the semi-classical initial condition from [3]. Our findings are:

1. The Odderon component of the cross section on a proton target at low momentum transfers is found to be dominated by the Primakoff component. Thanks to the Landshoff mechanism [4] the Odderon cross section shows an almost flat behavior in the high- $t$  region reaching above the Primakoff component.
2. Considering instead exclusive  $\eta_{c\bar{c}}$  production off a neutron target the Odderon distribution can be probed even at small- $t$  thanks to a significant suppression of the Primakoff component.
3. Finally for nuclear targets, the multiple scattering effect leads to a shift in the diffractive pattern of the Odderon cross section with respect to the Primakoff process that could be used as a signal to detect the Odderon.

[1] SB, Horvatic, Kaushik, Vivoda, 2306.10626

[2] Dumitru, Mantysaari, Paatelainen, Phys. Rev. D 107 (2023) 1, L011501

[3] Jeon, Venugopalan, Phys. Rev. D 71 (2005) 125003

[4] Donnachie, Landshoff, Z. Phys. C 2 (1979) 55, Z.Phys.C 2 (1979) 372 (erratum)

**Authors:** BADRINARAYANAN, ABHIRAM KAUSHIK (University of Zagreb); Dr HORVATIĆ, Davor (Department of Physics, Faculty of Science, University of Zagreb); Mr VIVODA, Eric Andreas (PMF Zagreb); BENIĆ, Sanjin

**Presenter:** BENIĆ, Sanjin



Contribution ID: 80

Type: **not specified**

## Back-to-back dijets at the EIC: small $x$ and Sudakov resummation

We present our recent calculation of the dijet electroproduction cross section at the NLO accuracy within the Color Glass Condensate effective field theory. We focus on kinematical regime where the two jets are forward w.r.t. projectile's longitudinal direction and are almost back-to-back in transverse plane. We discuss the interplay between small- $x$  and Sudakov resummation and show numerical results for the EIC kinematics.

**Author:** STEBEL, Tomasz (Institute of Theoretical Physics Jagiellonian University)

**Co-authors:** Dr CAUCAL, Paul (Brookhaven National Laboratory); SALAZAR, Farid (UCLA/UCB/LBNL); SCHENKE, Bjoern (Brookhaven National Lab); VENUGOPALAN, Raju

**Presenter:** STEBEL, Tomasz (Institute of Theoretical Physics Jagiellonian University)

Contribution ID: **81**Type: **not specified**

## Factorisation of 1-loop amplitudes in NMRK limits

There has been much recent progress towards extending the BFKL equation to next-to-next-to-leading logarithmic (NNLL) accuracy. In this talk I will briefly review the status of this programme of research. I will then discuss our recent progress in extracting some of the missing ingredients of the NNLL kernel, including the one-loop central-emission vertex (CEV) for two gluons which are not strongly ordered in rapidity. I will emphasise the non-trivial colour structure that remains after taking next-to-multi-Regge (NMRK) limits of one-loop amplitudes in QCD.

**Author:** BYRNE, Emmet

**Presenter:** BYRNE, Emmet

Contribution ID: 82

Type: **not specified**

## Lévy $\alpha$ -stable model for the non-exponential low- $|t|$ proton-proton differential cross section

It is known that the Real Extended Bialas-Bzdak (ReBB) model describes the proton-proton ( $pp$ ) and proton-antiproton ( $p\bar{p}$ ) differential cross section data in a statistically not excludible way, i.e., with a confidence level greater than 0.1% in the center of mass energy range  $546 \text{ GeV} \leq \sqrt{s} \leq 8 \text{ TeV}$  and in the squared four-momentum transfer range  $0.37 \text{ GeV}^2 \leq -t \leq 1.2 \text{ GeV}^2$ . Considering, instead of Gaussian, a more general Lévy  $\alpha$ -stable shape for the parton distributions of the constituent quarks and diquarks inside the proton and for the relative separation between them, a generalized description of data is obtained, where the ReBB model corresponds to the  $\alpha = 2$  special case. Extending the model to  $\alpha < 2$ , we conjecture that the validity of the model can be extended to a wider kinematic range, in particular to lower values of the four-momentum transfer  $-t$ . We present the formal Lévy  $\alpha$ -stable generalization of the Bialas-Bzdak model and show that a simplified version of this model can be successfully fitted, indeed with  $\alpha < 2$ , to the non-exponential, low  $-t$  differential cross-section data of elastic proton-proton scattering at  $\sqrt{s} = 8 \text{ TeV}$ .

**Authors:** CSORGO, Tamas (MATE Institute of Technology Karoly Robert Campus (HU)); SZANYI, Istvan (Eötvös University, Wigner RCP, MATE KRC)

**Presenter:** SZANYI, Istvan (Eötvös University, Wigner RCP, MATE KRC)

Contribution ID: 83

Type: **not specified**

## Transverse analyzing power measurement in the high energy forward $p^\uparrow p$ and $p^\uparrow A$ scattering at RHIC hydrogen jet target polarimeter

The Polarized Hydrogen Gas Jet Target Polarimeter (HJET) at the Relativistic Heavy-Ion Collider (RHIC) is utilized to accurately measure the vertical polarization of proton beams with low systematic uncertainties of approximately  $\sigma_P^{\text{sys}}/P \leq 0.5\%$ . These measurements are conducted in the CNI region,  $0.0013 < |t| < 0.017 \text{ GeV}^2$ . By measuring the elastic single  $A_N(t)$  and double  $A_{NN}(t)$  spin analyzing powers for 100 and 255 GeV proton beams, the contributions from hadronic spin-flip amplitudes were isolated. A Regge fit was performed, revealing a non-zero Pomeron spin-flip component. Preliminary results for inelastic  $p^\uparrow p$  and elastic  $p^\uparrow A$  (for  $d$ , O, Al, Ru, Zr, and Au nuclei) analyzing powers were also obtained. However, the completion of these studies requires the development of a theoretical parametrization for the corresponding analyzing powers. The successful implementation of HJET at RHIC has prompted its potential use for proton beam polarimetry with a desired accuracy of 1% at the upcoming Electron-Ion Collider (EIC). The feasibility of using HJET for  $^3\text{He}$  ( $h$ ) beam polarimetry at EIC will also be discussed. To accurately measure the helion beam polarization using HJET, knowledge of the hadronic spin-flip amplitudes for the  $p^\uparrow h$  and  $h^\uparrow p$  is essential. These amplitudes can be derived with sufficient precision from the proton-proton hadronic spin-flip amplitude determined at HJET. Another potential concern for  $^3\text{He}$  polarization measurement is the possibility of helion breakup in  $hp$  scattering. An estimate of the breakup effect indicates that while it can introduce corrections of up to 4% to the spin-flip interference terms, these effects cancel out and have negligible impact on the calculating the  $^3\text{He}$  beam polarization (which depends on the effective  $A_N^{ph}(t)/A_N^{hp}(t)$  analyzing power ratio).

**Author:** POBLAGUEV, Andrei (Brookhaven National Laboratory)

**Presenter:** POBLAGUEV, Andrei (Brookhaven National Laboratory)

Contribution ID: 84

Type: **not specified**

## Physics with proton/neutron tagging in pp, pO collisions at the LHC.

The talk will cover several research opportunities with tagged forward protons/neutrons using the proton-proton and proton-Oxygen collisions at the Large Hadron Collider.

**Author:** PITT, Michael (The University of Kansas (US))

**Presenter:** PITT, Michael (The University of Kansas (US))

Contribution ID: **85**

Type: **not specified**

## Welcome

*Monday 4 September 2023 09:00 (10 minutes)*

**Presenters:** ROYON, Christophe (The University of Kansas (US)); PTOCHOS, Fotios (University of Cyprus (CY)); Dr KRINTIRAS, Georgios (The University of Kansas (US))

Contribution ID: **86**

Type: **not specified**

## **PDFs and QCD fits**

*Monday 4 September 2023 09:10 (30 minutes)*

**Presenter:** SARKAR, Amanda (University of Oxford (GB))

**Session Classification:** PDFs and QCD fits

Contribution ID: 87

Type: **not specified**

# **CMS jet measurements and constraints on PDFs and $\alpha_S$**

*Monday 4 September 2023 09:40 (30 minutes)*

**Presenter:** GEISER, Achim (Deutsches Elektronen-Synchrotron (DE))

**Session Classification:** PDFs and QCD fits



Contribution ID: **88**

Type: **not specified**

## Recent Progress in PDF Determination

*Monday 4 September 2023 10:10 (30 minutes)*

**Presenters:** Dr RABEMANANJARA, Tanjona R. (NIKHEF & VU Amsterdam); RABEMANANJARA, Tanjona Radonirina (CERN)

**Session Classification:** PDFs and QCD fits

Contribution ID: 89

Type: **not specified**

## **Beyond LO for hybrid kT-factorization**

*Monday 4 September 2023 11:10 (30 minutes)*

**Presenter:** VAN HAMEREN, Andreas

**Session Classification:** PDFs and QCD fits

Contribution ID: **90**

Type: **not specified**

## **Next-to-leading order photon+jet production**

*Monday 4 September 2023 11:40 (30 minutes)*

**Presenter:** MULLAN, Yair

**Session Classification:** PDFs and QCD fits

Contribution ID: 91

Type: **not specified**

## **Discussion: PDFs, QCD fits**

*Monday 4 September 2023 12:10 (30 minutes)*

**Presenters:** SARKAR, Amanda (University of Oxford (GB)); Dr RABEMANANJARA, Tanjona R. (NIKHEF & VU Amsterdam)

**Session Classification:** PDFs and QCD fits

Contribution ID: 92

Type: **not specified**

## Recent TOTEM results

*Monday 4 September 2023 14:00 (30 minutes)*

**Presenter:** ROYON, Christophe (The University of Kansas (US))

**Session Classification:** Soft diffraction

Contribution ID: 93

Type: **not specified**

## Lévy $\alpha$ -stable model for the non-exponential low- $|t|$ proton-proton differential cross section

*Monday 4 September 2023 14:30 (30 minutes)*

**Presenters:** SZANYI, Istvan (Eötvös University, Wigner RCP, MATE KRC); Mr SZANYI, István (Eötvös Loránd University)

**Session Classification:** Soft diffraction

Contribution ID: 94

Type: **not specified**

## **Nonresonant central exclusive production of charged hadron pairs in proton-proton collisions at 13 TeV in CMS and TOTEM**

*Monday 4 September 2023 15:30 (30 minutes)*

**Presenter:** SIKLÉR, Ferenc (Wigner RCP, Budapest (HU))

**Session Classification:** Soft diffraction

Contribution ID: 95

Type: **not specified**

## **Physics potential of a combined data-taking of the LHCf and ATLAS Roman Pot detectors**

*Monday 4 September 2023 16:00 (30 minutes)*

**Presenter:** LEITGEB, Clara Elisabeth (Deutsches Elektronen-Synchrotron (DE))

**Session Classification:** Soft diffraction



Contribution ID: 96

Type: **not specified**

## Single and double photon bremsstrahlung in $pp$ to $pp$ at the LHC

*Monday 4 September 2023 16:30 (30 minutes)*

**Presenter:** SZCZUREK, Antoni

**Session Classification:** Soft diffraction

Contribution ID: 97

Type: **not specified**

## **Imaging the odderon from exclusive $\eta_c$ production at the EIC**

*Monday 4 September 2023 17:00 (30 minutes)*

**Presenter:** BENIĆ, Sanjin

**Session Classification:** Soft diffraction

Contribution ID: 98

Type: **not specified**

## Discussion: soft diffraction

*Monday 4 September 2023 17:30 (30 minutes)*

**Presenters:** ROYON, Christophe (The University of Kansas (US)); SIKLÉR, Ferenc (Wigner RCP, Budapest (HU))

**Session Classification:** Soft diffraction

Contribution ID: 99

Type: **not specified**

## Recent results from PPS

*Tuesday 5 September 2023 14:00 (30 minutes)*

**Presenter:** BELLORA, Andrea (Universita e INFN Torino (IT))

**Session Classification:** Diffraction and photon exchanges

Contribution ID: **100**

Type: **not specified**

## **Overview of ATLAS forward proton detectors: status, performance and new physics results**

*Tuesday 5 September 2023 14:30 (30 minutes)*

**Presenter:** AURIOL, Adrien (University of Birmingham (GB))

**Session Classification:** Diffraction and photon exchanges

Contribution ID: **101**

Type: **not specified**

## **Hunting for QCD Instantons at the LHC in the forward proton mode**

*Tuesday 5 September 2023 15:30 (30 minutes)*

**Presenter:** KHOZE, Valery (University of Durham (GB))

**Session Classification:** Diffraction and photon exchanges

Contribution ID: **102**

Type: **not specified**

## **Diffractive measurements in pp and pA collisions**

*Tuesday 5 September 2023 16:00 (30 minutes)*

**Presenter:** PITT, Michael (The University of Kansas (US))

**Session Classification:** Diffraction and photon exchanges

Contribution ID: **103**Type: **not specified**

## The LHC as a Neutrino-Ion Collider: FPF case studies

*Thursday 7 September 2023 15:30 (30 minutes)*

**Presenters:** Dr RABEMANANJARA, Tanjona R. (NIKHEF & VU Amsterdam); RABEMANANJARA, Tanjona Radonirina (CERN)

**Session Classification:** Low x, BFKL, Final states



Contribution ID: **104**

Type: **not specified**

## **Discussion: Hard diffraction and photon exchanges**

*Tuesday 5 September 2023 17:00 (30 minutes)*

**Presenters:** SZCZUREK, Antoni; MOTYKA, Leszek; PITT, Michael (The University of Kansas (US))

**Session Classification:** Diffraction and photon exchanges

Contribution ID: 105

Type: **not specified**

## **Probing gluon saturation with diffractive jets in photon-nucleus interactions**

*Tuesday 5 September 2023 09:00 (30 minutes)*

**Presenter:** IANCU, Edmond (Université Paris-Saclay (FR))

**Session Classification:** Low x, BFKL, saturation

Contribution ID: 106

Type: **not specified**

## **Back-to-back dijets at the EIC: small $x$ and Sudakov resummation**

*Tuesday 5 September 2023 09:30 (30 minutes)*

**Presenters:** STEBEL, Tomasz (CERN); STEBEL, Tomasz (Institute of Theoretical Physics Jagiellonian University)

**Session Classification:** Low  $x$ , BFKL, saturation

Contribution ID: **107**

Type: **not specified**

## **Gluon contributions to DVCS, TCS and DDVCS from low to moderate $x$**

*Tuesday 5 September 2023 10:00 (30 minutes)*

**Presenter:** BOUSSARIE, Renaud (CPHT, CNRS, Ecole polytechnique, IP Paris)

**Session Classification:** Low  $x$ , BFKL, saturation

Contribution ID: **108**

Type: **not specified**

## **Measuring forward dijet at the LHC as a probe for saturation using a full impact parameter dependent TMDs**

*Tuesday 5 September 2023 11:00 (30 minutes)*

**Presenter:** DEGANUTTI, Federico

**Session Classification:** Low x, BFKL, saturation

Contribution ID: **109**

Type: **not specified**

## **Incoherent diffractive dijet production in electron DIS off large nuclei**

*Tuesday 5 September 2023 11:30 (30 minutes)*

**Presenter:** TRIANTAFYLLOPOULOS, Dionysios (ECT\*/FBK)

**Session Classification:** Low x, BFKL, saturation

Contribution ID: 110

Type: **not specified**

## Discussion: BFKL, saturation

*Tuesday 5 September 2023 12:00 (30 minutes)*

**Presenters:** TRIANTAFYLLOPOULOS, Dionysios (ECT\*/FBK); IANCU, Edmond (Université Paris-Saclay (FR)); BOUSSARIE, Renaud (CPHT, CNRS, Ecole polytechnique, IP Paris)

**Session Classification:** Low x, BFKL, saturation

Contribution ID: 111

Type: **not specified**

## Exclusive particle production in heavy ion at CMS

*Wednesday 6 September 2023 09:00 (30 minutes)*

**Presenter:** Dr KRINTIRAS, Georgios (The University of Kansas (US))

**Session Classification:** Low x, BFKL



Contribution ID: 112

Type: **not specified**

## **Coherent J/Psi production in Pb Pb collisions in the CMS experiment at the LHC**

*Wednesday 6 September 2023 09:30 (30 minutes)*

**Presenter:** ALCERRO ALCERRO, Luis (The University of Kansas (US))

**Session Classification:** Low x, BFKL

Contribution ID: 113

Type: **not specified**

## **Gamma gamma to gamma gamma scattering in UPC with ALICE 3 and FoCal**

*Wednesday 6 September 2023 10:00 (30 minutes)*

**Presenter:** SZCZUREK, Antoni

**Session Classification:** Low x, BFKL

Contribution ID: 114

Type: **not specified**

# Search for elliptic azimuthal anisotropies in photon-proton and pomeron-Pb interactions using rapidity gaps at pPb collisions with the CMS experiment

*Wednesday 6 September 2023 11:00 (30 minutes)*

**Presenter:** MURILLO QUIJADA, Javier Alberto (Universidad de Sonora (MX))

**Session Classification:** Low x, BFKL

Contribution ID: 115

Type: **not specified**

## **Exclusive vector meson production with Sartre using machine learning in eA collision**

*Wednesday 6 September 2023 11:30 (30 minutes)*

**Presenter:** SINGH, Jaswant (Indian Institute of Technology New Delhi)

**Session Classification:** Low x, BFKL

Contribution ID: **116**

Type: **not specified**

## **Discussion: Heavy ions**

*Wednesday 6 September 2023 12:00 (30 minutes)*

**Presenters:** Dr KRINTIRAS, Georgios (The University of Kansas (US)); MURILLO QUIJADA, Javier Alberto (Universidad de Sonora (MX))

**Session Classification:** Low x, BFKL

Contribution ID: 117

Type: **not specified**

# Measurement and QCD analysis of inclusive jet production in deep inelastic scattering at HERA

*Thursday 7 September 2023 09:00 (30 minutes)*

**Presenter:** GEISER, Achim (Deutsches Elektronen-Synchrotron (DE))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: **118**

Type: **not specified**

## **Jet substructure measurements in CMS**

*Thursday 7 September 2023 11:30 (30 minutes)*

**Presenter:** ROYON, Christophe (The University of Kansas (US))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 119

Type: **not specified**

## **Mueller-Tang Jets at Next-to-Leading Order and Violation of BFKL Factorization**

*Thursday 7 September 2023 10:00 (30 minutes)*

**Presenter:** DEGANUTTI, Federico

**Session Classification:** Low x, BFKL, Final states



Contribution ID: 120

Type: **not specified**

## **Measurement of the azimuthal decorrelation angle between the leading jet and the scattered lepton in deep inelastic scattering at HERA**

*Thursday 7 September 2023 11:00 (30 minutes)*

**Presenter:** Prof. SURROW, Bernd (Temple University)

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 121

Type: **not specified**

## V+jets production in CMS

*Friday 8 September 2023 16:30 (30 minutes)*

**Presenters:** POPESCU, Sorina (F); POPESCU, Sorina (The University of Kansas (US))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 122

Type: **not specified**

## Discussion: jets

*Thursday 7 September 2023 12:00 (30 minutes)*

**Presenters:** GEISER, Achim (Deutsches Elektronen-Synchrotron (DE)); BERMUDEZ MARTINEZ, Armando (CERN); LANSBERG, Jean-Philippe (Université Paris-Saclay (FR))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 123

Type: **not specified**

## Low x physics at the EIC

*Thursday 7 September 2023 14:00 (30 minutes)*

**Presenter:** Prof. SURROW, Bernd (Temple University)

**Session Classification:** Low x, BFKL

Contribution ID: 124

Type: **not specified**

## **Dilepton and diphoton production and BSM searches with UPC photon fusion processes in Pb+Pb collisions with the ATLAS detector**

**Presenter:** AKBIYIK, Melike (Johannes Gutenberg Universitaet Mainz (DE))

**Session Classification:** Low x, BFKL

Contribution ID: 125

Type: **not specified**

**tba**

**Presenter:** CONTRERAS CORREA, Carlos Ricardo (Departamento de Fisica-Univ. Tecnica Federico Santa Maria (UTFS))

**Session Classification:** Low x, BFKL

Contribution ID: 126

Type: **not specified**

## **On color reconnection effects in J/psi hadroproduction**

**Presenter:** MOTYKA, Leszek

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 127

Type: **not specified**

## **Associated production of vector bosons and heavy flavours in CMS**

**Presenter:** PITT, Michael (The University of Kansas (US))

**Session Classification:** Low x, BFKL, Final states



Contribution ID: 128

Type: **not specified**

## QCD corrections to quarkonium production

**Presenters:** LANSBERG, Jean-Philippe (IPN Orsay, Paris Saclay U. / IN2P3-CNRS); LANSBERG, Jean-Philippe (Ecole polytechnique); LANSBERG, Jean-Philippe (Université Paris-Saclay (FR))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 129

Type: **not specified**

## Discussion: low x, saturation, final states

*Thursday 7 September 2023 16:30 (30 minutes)*

**Presenter:** BOUSSARIE, Renaud (CPHT, CNRS, Ecole polytechnique, IP Paris)

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 130

Type: **not specified**

## QCD corrections to quarkonium production

*Friday 8 September 2023 09:00 (30 minutes)*

**Presenters:** LANSBERG, Jean-Philippe (Ecole Polytechnique); LANSBERG, Jean-Philippe (Ecole polytechnique); LANSBERG, Jean-Philippe (Université Paris-Saclay (FR))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 131

Type: **not specified**

## **Computing one-loop corrections to quarkonium production impact-factors with Lipatov's EFT**

*Friday 8 September 2023 09:30 (30 minutes)*

**Presenter:** Dr NEFEDOV, Maxim (IJClab, Orsay)

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 132

Type: **not specified**

## **Measurement of the azimuthal decorrelation angle between the leading jet and the scattered lepton in deep inelastic scattering at HERA**

**Presenter:** Prof. SURROW, Bernd (Temple University)

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 133

Type: **not specified**

## **Geometric scaling in leading neutron events at HERA**

*Thursday 7 September 2023 14:30 (30 minutes)*

**Presenter:** Mr KUMAR, Arjun (Indian Institute of Technology Delhi)

**Session Classification:** Low x, BFKL

Contribution ID: 134

Type: **not specified**

## **Factorisation of 1-loop amplitudes in NMRK limits**

*Thursday 7 September 2023 16:00 (30 minutes)*

**Presenter:** BYRNE, Emmet

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 135

Type: **not specified**

## **Search for effective lorentz violation and CPT violation in ZEUS data**

*Tuesday 5 September 2023 16:30 (30 minutes)*

**Presenter:** SARKAR, Amanda (University of Oxford (GB))

**Session Classification:** Diffraction and photon exchanges



Contribution ID: 136

Type: **not specified**

## **On color reconnection effects in J/psi hadroproduction**

*Friday 8 September 2023 10:00 (30 minutes)*

**Presenter:** MOTYKA, Leszek

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 137

Type: **not specified**

## **New results constraining transversity in high-energy polarized p+p collisions**

*Friday 8 September 2023 11:00 (30 minutes)*

**Presenter:** Prof. SURROW, Bernd (Temple University)

**Session Classification:** Final states, quarkonium

Contribution ID: 138

Type: **not specified**

## **Associated production of vector bosons and heavy flavours in CMS**

*Thursday 7 September 2023 09:30 (30 minutes)*

**Presenter:** PITT, Michael (The University of Kansas (US))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 139

Type: **not specified**

## **Discussion: final states, quarkonium**

*Friday 8 September 2023 12:00 (30 minutes)*

**Presenters:** GEISER, Achim (Deutsches Elektronen-Synchrotron (DE)); BERMUDEZ MARTINEZ, Armando (CERN); LANSBERG, Jean-Philippe (Université Paris-Saclay (FR))

**Session Classification:** Final states, quarkonium

Contribution ID: 140

Type: **not specified**

# **Dilepton and diphoton production and BSM searches with UPC photon fusion processes in Pb+Pb collisions with the ATLAS detector**

*Friday 8 September 2023 14:00 (30 minutes)*

**Presenter:** AKBIYIK, Melike (Johannes Gutenberg Universitaet Mainz (DE))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 141

Type: **not specified**

# **Transverse analyzing power measurement in the high energy forward pp and pA scattering at RHIC hydrogen jet target polarimeter**

*Friday 8 September 2023 14:30 (30 minutes)*

**Presenter:** POBLAGUEV, Andrei (Brookhaven National Laboratory)

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 142

Type: **not specified**

## The LHCspin project

*Friday 8 September 2023 15:30 (30 minutes)*

**Presenter:** SANTIMARIA, Marco (INFN e Laboratori Nazionali di Frascati (IT))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 143

Type: **not specified**

## **Recent results on direct determination of the Collins-Soper kernel and how to measure it at the LHC?**

*Friday 8 September 2023 11:30 (30 minutes)*

**Presenter:** BERMUDEZ MARTINEZ, Armando (CERN)

**Session Classification:** Final states, quarkonium



Contribution ID: 144

Type: **not specified**

## On the exact solution for the Schrödinger equation

*Friday 8 September 2023 16:00 (30 minutes)*

**Presenter:** MULLAN, Yair

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 145

Type: **not specified**

## Discussion: final states

*Friday 8 September 2023 17:00 (30 minutes)*

**Presenters:** GEISER, Achim (Deutsches Elektronen-Synchrotron (DE)); BERMUDEZ MARTINEZ, Armando (CERN); LANSBERG, Jean-Philippe (Université Paris-Saclay (FR))

**Session Classification:** Low x, BFKL, Final states

Contribution ID: 146

Type: **not specified**

## Workshop conclusion

*Friday 8 September 2023 17:30 (15 minutes)*

**Presenters:** ROYON, Christophe (The University of Kansas (US)); PTOCHOS, Fotios (University of Cyprus (CY)); Dr KRINTIRAS, Georgios (The University of Kansas (US))