

Transversity 2022



Report of Contributions

Contribution ID: 1

Type: **Remote standard talk**

cos2 ϕ azimuthal asymmetry in a back-to-back J/ψ and jet electroproduction at the EIC

Thursday, May 26, 2022 5:15 PM (15 minutes)

We present an estimate of the cos2 ϕ azimuthal asymmetry in back-to-back production of J/ψ and a jet in the process: $e p \rightarrow e J/\psi Jet X$. We calculate the asymmetry using TMD factorization in a generalized parton model (GPM) framework and use non-relativistic QCD (NRQCD) to obtain the J/ψ production rate. We incorporate both color singlet and color octet contributions to the asymmetry. This asymmetry will be useful to probe the linearly polarized gluon distribution at the future electron-ion collider (EIC). We present numerical estimates of the asymmetry using two recent parametrization of the gluon TMDs, namely spectator model and Gaussian parameterization. We investigate the effect of TMD evolution of gluon TMDs on the asymmetry.

Primary authors: Mr PAWAR, Amol (IIT Bombay); MUKHERJEE, Asmita (Physics Department, IIT Bombay); KISHORE, Raj (IIT Kanpur); Dr SIDDIQAH, Mariyah (IIT Bombay)

Presenter: KISHORE, Raj (IIT Kanpur)

Session Classification: Plenary session

Contribution ID: 4

Type: **Longer talk**

Evolution of twist-three TMD distributions

I present the study of the TMD distributions of twist-three. It includes definition, interpretation, symmetry properties, and LO evolution equations. I show that the evolution of twist-three TMD distributions is essentially simplified in the large- N_c limit.

Primary author: VLADIMIROV, Alexey

Presenter: VLADIMIROV, Alexey

Session Classification: Plenary session

Contribution ID: 5

Type: **Remote standard talk**

Proof of factorization enabling lattice calculation of TMDs

Thursday, May 26, 2022 5:55 PM (15 minutes)

Non-perturbative parton distributions that arise in the TMD factorization of cross-sections have dynamics dominated by the lightcone. This renders them inaccessible to direct lattice QCD calculations due to the sign problem in real-time calculations. To circumvent this issue, one may construct a lattice-calculable TMD that shares the same IR physics as the physical TMD appearing in cross-sections, and then must prove a factorization theorem connecting these two functions. In this talk, I prove such a relation for quasi-TMDs and Collins TMDs for leading power distributions of any spin, for both quarks and gluons.

Primary authors: SCHINDLER, Stella; EBERT, Markus (MPI); STEWART, Iain (MIT); ZHAO, Yong (Argonne)

Presenter: SCHINDLER, Stella

Session Classification: Plenary session

Contribution ID: 6

Type: **Longer talk**

Machine Learning in PDF determination: NNPDF4.0

Thursday, May 26, 2022 2:15 PM (20 minutes)

In this talk we present the methodology used in the NNPDF4.0 global analysis. We introduce state of the art techniques in Machine Learning applied to PDF determination, automatised hyperparameter selection and tests to asses the quality and reliability of the methodology.

The entire methodology is open sourced and available for users willing to perform their own PDF analysis.

Primary author: Dr CRUZ MARTINEZ, Juan Manuel (Università degli Studi di Milano)

Presenter: Dr CRUZ MARTINEZ, Juan Manuel (Università degli Studi di Milano)

Session Classification: Plenary session

Contribution ID: 7

Type: **Standard talk**

Physics perspective of quarkonium pairs in photoproduction at the EIC

We investigate the photoproduction of quarkonium pairs at EIC kinematical region by exploring the contributions from single-parton scatterings and double-parton scatterings. The NRQCD framework is used for the quarkonium formation mechanism.

Primary authors: Mr CECCOPIERI, Federico Alberto (Universit'e Paris-Saclay, CNRS, IJCLab, 91405, Orsay, France); SHAO, Hua-Sheng (LPTHE Paris); LANSBERG, Jean-Philippe (IJCLab- Paris-Saclay U. - CNRS); RINALDI, Matteo (Istituto Nazionale di Fisica Nucleare); SANGEM, Rajesh (Istituto Nazionale di Fisica Nucleare)

Presenter: SANGEM, Rajesh (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 10

Type: **Standard talk**

Transverse *Lambda*-hyperon polarization in e^+e^- annihilation processes within the TMD formalism.

Tuesday, May 24, 2022 4:30 PM (15 minutes)

Data from Belle Collaboration for associated (with a light unpolarized hadron) and single-inclusive production of transversely polarized Λ -hyperons in e^+e^- annihilation processes allowed to extract, for the first time, the Λ polarizing fragmentation function, by adopting a simplified TMD approach. Recent theoretical developments on the computation of cross sections for single-inclusive hadron production in e^+e^- annihilation, within a Soft Collinear Effective Theory approach, combined with the CSS formalism for the double-hadron production case, have been used to perform a renewed analysis, adopting a proper TMD factorization scheme. A detailed comparison with the former analysis will be discussed. Preliminary estimates for the transverse Λ polarization at OPAL and at $\sqrt{s} = M_Z$ will also be presented.

Primary authors: ZACCHEDDU, Marco (Istituto Nazionale di Fisica Nucleare); D'ALELIO, Umberto (Istituto Nazionale di Fisica Nucleare); GAMBERG, Leonard (Penn State University); MURGIA, Francesco (Istituto Nazionale di Fisica Nucleare)

Presenter: ZACCHEDDU, Marco (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 11

Type: **Standard talk**

Adding vector meson production to polarized string fragmentation in Pythia

Tuesday, May 24, 2022 5:30 PM (15 minutes)

Being motivated mainly by the LHC physics, the currently used Monte Carlo Event Generators (MCEGs) lack of the quark spin degree of freedom in their hadronization models, and can not reproduce observed transverse spin effects such as the Collins and the dihadron asymmetries, and longitudinal spin effects such as the jet handedness. To guide the interpretation of SIDIS and $^{+-}$ data as well as to make predictions for experiments at future facilities such as the EIC, a MCEG capable of reproducing quark spin effects in hadronization is necessary. To achieve this goal, we have started a systematic implementation of spin effects in the hadronization part of the Pythia 8 event generator for the polarized SIDIS process via the external package StringSpinner, which is publicly available. Spin effects are enabled for pseudoscalar meson production by using the string+ 3P_0 model of polarized quark fragmentation and parametrizations of the transversity PDFs. This talk is dedicated to a recent major development of StringSpinner which allows for the introduction of vector meson production and decay in the polarized Pythia 8 string fragmentation. After being validated, the package is used to simulate the Collins and dihadron asymmetries in SIDIS and a comparison with currently available data is shown.

Primary authors: KERBIZI, Albi (Istituto Nazionale di Fisica Nucleare); LÖNNBLAD, Leif

Presenter: KERBIZI, Albi (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 12

Type: **Longer talk**

The role of positivity constraints on global analysis of helicity PDFs.

Friday, May 27, 2022 3:30 PM (20 minutes)

We will discuss recent updates from JAM on gluon polarization in the nucleon and polarized sea asymmetries and the role of the various theoretical constraints, in particular positivity constraints.

Primary author: SATO, Nobuo (Jefferson Lab)

Presenter: SATO, Nobuo (Jefferson Lab)

Session Classification: Plenary session

Contribution ID: 13

Type: **Longer talk**

GTMDs and Wigner functions: Recent Developments

Wednesday, May 25, 2022 12:30 PM (20 minutes)

Generalized TMDs (GTMDs) of hadrons are the most general two-parton correlation functions. The Fourier transforms of GTMDs are partonic Wigner functions. During the past few years, several interesting developments have taken place in this field. In this talk, we give a brief overview of these objects and the various developments that has taken place, including, in particular, the state-of-the-art of observables for these quantities.

Primary author: BHATTACHARYA, Shohini (BNL)

Presenter: BHATTACHARYA, Shohini (BNL)

Session Classification: Plenary session

Contribution ID: 14

Type: **Remote longer talk**

Updated QCD Global Analysis of SSAs

Tuesday, May 24, 2022 3:00 PM (20 minutes)

In this talk, I will discuss our update to the global analysis of transverse single-spin asymmetries that now extracts the novel quark-gluon-quark fragmentation function \tilde{H} and explores the role played by the Soffer bound on transversity and lattice QCD computations of the isovector tensor charge.

Primary author: PITONYAK, Daniel (Lebanon Valley College)

Co-authors: GAMBERG, Leonard (Penn State Berks); MALDA, Michel (Lebanon Valley College); MILLER, Joshua (Temple University); PROKUDIN, Alexei (Penn State Berks); SATO, Nobuo (Jefferson Lab)

Presenter: PITONYAK, Daniel (Lebanon Valley College)

Session Classification: Plenary session

Contribution ID: 15

Type: **Longer talk**

Measuring spin asymmetries with jet correlations and substructure

Thursday, May 26, 2022 10:00 AM (20 minutes)

I will discuss recent calculations of jet correlation and substructure observables relevant for spin asymmetries and nucleon structure

Primary author: RINGER, Felix (YITP Stony Brook)

Presenter: RINGER, Felix (YITP Stony Brook)

Session Classification: Plenary session

Contribution ID: 16

Type: Remote longer talk

Recent progress on TMDs and PDFs of spin-1 hadrons

Friday, May 27, 2022 9:00 AM (20 minutes)

There was recent theoretical progress on transverse-momentum-dependent parton distribution functions (TMDs) and parton distribution functions (PDFs) for spin-1 hadrons at twists 3 and 4. We expect that the field of structure functions for spin-1 hadrons will become an interesting topic in 2020's and 2030' due to experimental projects at the Jefferson Laboratory, the Fermilab, the NICA, the LHCspin, and the electron-ion colliders in US and China.

We explain TMDs and PDFs for spin-1 hadrons up to twist 4 [1,2,3]. Decomposing a quark correlation function with the conditions of the Hermiticity and parity invariance, we found 30 new structure functions at twists 3 and 4 [1]. There are also new fragmentation functions in the spin-1 hadrons. Integrating the TMDs over the transverse momentum, we found new collinear PDFs. A twist-2 relation and a sum rule exist for the tensor-polarized PDFs f_{1LL} and f_{LT} [2]. In these studies, we also showed that twist-3 multiparton distribution functions F_{LT} , G_{LT} , H_{LL}^\perp , and H_{TT} exist for tensor-polarized spin-1 hadrons. Relations among these collinear parton- and multiparton-distribution functions were derived by using the equation of motion for quarks [3]. Useful relations were obtained (1) for the twist-3 PDF f_{LT} , the transverse-momentum moment PDF $f_{1LT}^{(1)}$, and the multiparton distribution functions $F_{G,LT}$ and $G_{G,LT}$; (2) for the twist-3 PDF e_{LL} , the twist-2 PDF f_{1LL} , and the multiparton distribution function $H_{G,LL}^\perp$. There is also a Lorentz-invariance relation for $f_{1LT}^{(1)}$, f_{1LL} , f_{LT} , and $F_{G,LT}$. These studies will be useful in future investigations on the spin-1 structure functions.

[1] S. Kumano and Qin-Tao Song, Phys. Rev. D 103 (2021) 014025.

[2] S. Kumano and Qin-Tao Song, JHEP 09 (2021) 141.

[3] S. Kumano and Qin-Tao Song, Phys. Lett. B 826 (2022) 136908.

Primary authors: Prof. SONG, Qin-Tao (Ecole Polytechnique / Zhengzhou University); Prof. KUMANO, Shunzo (Japan Women's University / KEK)

Presenter: Prof. KUMANO, Shunzo (Japan Women's University / KEK)

Session Classification: Plenary session

Contribution ID: 17

Type: **Longer talk**

Investigation of Transverse-Momentum Distributions at HERMES

Friday, May 27, 2022 2:30 PM (20 minutes)

After fifty years of investigations, the nucleon structure is still far from being understood and continues to represent a unique test bench for QCD. Despite the enormous progresses achieved in five decades of deep-inelastic scattering (DIS) experiments, a number of crucial open questions are still on the carpet and subject of intense theoretical and experimental studies. In the last two decades, semi-inclusive DIS was established as a unique tool for the study of the non-collinear structure of nucleons, involving the parton transverse momentum p_T as an additional degree of freedom. Requiring the detection of at least one final state-hadron in coincidence with the scattered lepton, it opened the way not only to measure of the chiral-odd transversity distribution, the last missing leading-twist collinear parton distribution function, but also to a variety of new p_T -dependent PDFs, known as TMDs. Describing correlations between the quark transverse momentum and the quark or the nucleon spin (spin-orbit correlations), TMDs account for a number of intriguing effects observed in polarized and unpolarized reactions, and allow for a 3-dimensional description of the nucleon in momentum space. Furthermore, they could provide insights into the yet unmeasured quark orbital angular momentum. At leading-twist, eight TMDs enter the SIDIS cross section in conjunction with a fragmentation function. In addition, going to the twist-3 level allows us to probe novel quark-gluon correlations.

The HERMES experiment collected a wealth of data using the 27.6 GeV polarized HERA lepton beam and various polarized and unpolarized gaseous targets. This allows for a series of unique measurements of observables sensitive to this multidimensional (spin) structure of the nucleon, probed through specific azimuthal modulations in the distribution of hadrons produced in semi-inclusive DIS. An overview of the HERMES TMD program will be given and Fourier amplitudes of some of the azimuthal modulations sensitive to the beam and/or target polarization, recently extracted for the first time also in a three-dimensional kinematic space, will be presented in more detail.

Primary author: SCHNELL, Gunar (University of the Basque Country UPV/EHU)

Presenter: SCHNELL, Gunar (University of the Basque Country UPV/EHU)

Session Classification: Plenary session

Contribution ID: 18

Type: **Longer talk**

T-odd proton-helicity asymmetry in semi-inclusive DIS in perturbative QCD

Thursday, May 26, 2022 12:00 PM (20 minutes)

We compute the single-spin asymmetry A_{UL} in semi-inclusive deep-inelastic scattering of unpolarized leptons and longitudinally polarized protons at large transverse momentum of the produced hadron. Our calculation is performed in collinear factorization at the lowest order of QCD perturbation theory. For photon exchange the asymmetry is T-odd and receives contributions from the interference of the tree level and one-loop absorptive amplitudes. We consider the behavior of the spin asymmetry at low transverse momentum where contact to the formalism based on transverse-momentum dependent distribution functions can be made. We also present some phenomenological results relevant for the COMPASS and HERMES experiments and the future Electron-Ion Collider.

Primary author: VOGELSANG, Werner (Univ. Tuebingen)

Presenter: VOGELSANG, Werner (Univ. Tuebingen)

Session Classification: Plenary session

Contribution ID: 19

Type: **Standard talk**

Thrust resummation and TMD effects in e^+e^- annihilation

Tuesday, May 24, 2022 4:50 PM (15 minutes)

Extending TMD factorization to thrust-dependent observables entails difficulties ultimately associated with the behavior of soft radiation. As a consequence, the definition of the TMDs has to be revised, while keeping (and extending) its universality properties. Moreover, the regularization of the rapidity divergences intertwines with the thrust dependence, leading to a new kind of factorization theorem, with unexpected features. In this talk, I will show how to properly factorize the thrust distribution of e^+e^- annihilation into a single hadron, whose transverse momentum is measured with respect to the thrust axis. The cross section is presented up to NNLL-accuracy in thrust and compared with BELLE data.

Primary author: SIMONELLI, Andrea (Istituto Nazionale di Fisica Nucleare)

Co-author: BOGLIONE, Mariaelena (Istituto Nazionale di Fisica Nucleare)

Presenter: SIMONELLI, Andrea (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 20

Type: **Longer talk**

Leading order formalism for spin and transverse momenta dependent fracture functions

Friday, May 27, 2022 3:00 PM (20 minutes)

Fracture functions describes the hadron production in the target fragmentation region (TFR) in the hard processes, namely – the spin and transverse momentum dependent correlations between struck parton in the target and produced hadron in TFR.

In this talk I'll shortly describe the formalism and present the theoretical results for SIDIS and Drell-Yan processes.

New experimental results on double back-to-back hadron production in SIDIS will be also presented.

Primary author: KOTZINIAN, Aram (Istituto Nazionale di Fisica Nucleare)

Presenter: KOTZINIAN, Aram (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 21

Type: **Longer talk**

Hard Exclusive Reactions at Compass (DVCS and HEMP)

Wednesday, May 25, 2022 10:00 AM (20 minutes)

Deeply Virtual Compton Scattering (DVCS) and Hard Exclusive Meson Production (HEMP) are valuable processes to study Generalized Parton Distributions (GPDs). By correlating the longitudinal momentum of the partons to their transverse spatial distribution inside the nucleon, GPDs reveal the 3-dimensional structure of the nucleon in QCD. Following a test run in 2012, exclusive measurements were performed at COMPASS in 2016 and 2017 at the M2 beamline of the CERN SPS. The 160 GeV muon beam impinged on a 2.5m long liquid hydrogen target that was surrounded by a barrel-shaped time-of-flight system to detect the recoiling target proton. The scattered muons and the particles produced were detected by the COMPASS spectrometer, which was supplemented by an additional electromagnetic calorimeter for the large-angle-photon detection.

The DVCS cross section is extracted from the sum of cross sections measured with opposite beam charge and polarization, with special attention made to separate DVCS from exclusive 0 production. In the COMPASS kinematic domain, the DVCS cross section is closely related to the GPD H and gives a measure of the transverse extension of the partons in the proton, in the sea-quark regime of Bjorken- x . On the other hand, the measurement of the cross section of exclusive π^0 production and the Spin Density Matrix Elements (SDMEs) of ρ^0 and ω production can provide important inputs for the understanding of chiral-even and chiral-odd GPDs, as well as insights into the reaction mechanisms involved. The current progress on the study of these exclusive channels will be presented.

Primary authors: D'HOSE, Nicole; FOR THE COMPASS COLLABORATION

Presenter: D'HOSE, Nicole

Session Classification: Plenary session

Contribution ID: 22

Type: **Longer talk**

Open issues in the determination of collinear Parton Distribution and Fragmentation Functions

Thursday, May 26, 2022 11:30 AM (20 minutes)

I critically appraise current limitations in precision and accuracy of collinear parton distribution and fragmentation function determination. I focus on open issues related to quantifying data inconsistencies, theoretical uncertainties, and methodological bias. I discuss their relevance in relationship with ongoing and future experimental programs at particle colliders.

Primary author: NOCERA, Emanuele (The University of Edinburgh)

Presenter: NOCERA, Emanuele (The University of Edinburgh)

Session Classification: Plenary session

Contribution ID: 23

Type: **Longer talk**

Some recent advances in GPD extraction from exclusive processes

Wednesday, May 25, 2022 11:30 AM (20 minutes)

We will report on recent attempts to access universal GPDs from Deeply virtual Compton scattering and Deeply virtual meson production.

Primary author: KUMERICKI, Kresimir (University of Zagreb)

Presenter: KUMERICKI, Kresimir (University of Zagreb)

Session Classification: Plenary session

Contribution ID: 24

Type: **Longer talk**

The nucleon structure and the Generalized Parton Distributions

Wednesday, May 25, 2022 10:30 AM (20 minutes)

A key step towards a better understanding of the nucleon structure is the study of Generalized Parton Distributions (GPDs). GPDs are nowadays the object of an intense effort of research since they convey an image of the nucleon structure where the longitudinal momentum and the transverse spatial position of the partons inside the nucleon are correlated. Moreover, GPDs give access to the contribution of the orbital momentum of the quarks to the nucleon spin, important to the understanding of the origins of the nucleon spin.

Deeply Virtual Compton scattering (DVCS), the electroproduction of a real photon off the nucleon at the quark level, is the golden process directly interpretable in terms of GPDs of the nucleon. Depending on different arrangements of the target and beam polarizations, different DVCS observable can be measured: cross sections, target- or beam-spin asymmetries, etc... . Each measured observable provides different sensitivity to the various GPDs, and considering both the target nucleons, proton or neutron, the quark-flavour separation of GPDs can be exploited. GPDs can also be accessed in other exclusive leptonproduction reactions, such as Timelike Compton Scattering, Double DVCS (final state photon is also virtual), or the exclusive electroproduction of mesons.

This talk is intended to provide an overview on recent GPD-related experimental results obtained at Jefferson Lab. These data open the way to a “tomographic” representation of the structure of the nucleon, allowing the extraction of transverse space densities of the quarks at fixed longitudinal momentum, as well as providing an insight on the distribution of forces inside the nucleon.

Primary author: HOBART, Adam (IJCLab CNRS-IN2P3)

Presenter: HOBART, Adam (IJCLab CNRS-IN2P3)

Session Classification: Plenary session

Contribution ID: 25

Type: **Longer talk**

Determination of the W boson mass

Thursday, May 26, 2022 12:30 PM (20 minutes)

I will introduce the problem of the determination of the W boson mass at hadron colliders and the role of non-perturbative effects.

Primary author: VICINI, Alessandro (Istituto Nazionale di Fisica Nucleare)

Presenter: VICINI, Alessandro (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 27

Type: **Remote longer talk**

The Electron-Ion Collider - The Next QCD Frontier

Tuesday, May 24, 2022 3:30 PM (20 minutes)

In this presentation, I will discuss the physics opportunities with the Electron-Ion Collider (EIC) and the current status of the EIC.

Primary author: Dr GAO, Haiyan (Brookhaven National Laboratory)

Presenter: Dr GAO, Haiyan (Brookhaven National Laboratory)

Session Classification: Plenary session

Contribution ID: 28

Type: **Standard talk**

How PDF determinations affect EFT constrains

I discuss different aspects of the interplay between determinations of Parton Distribution Functions and constraints of Effective Field Theories based on fits collider data.

Primary author: KASSABOV, Zahari (University of Cambridge)

Presenter: KASSABOV, Zahari (University of Cambridge)

Session Classification: Plenary session

Contribution ID: 29

Type: **Longer talk**

Probing TMDs with quarkonium production

Thursday, May 26, 2022 9:00 AM (20 minutes)

I will discuss how quarkonium production can be used to probe transverse-momentum-dependent functions (TMDs), and the role played by a new type of non-perturbative functions: the TMD shape functions.

Primary author: ECHEVARRIA, Miguel (University of the Basque Country UPV/EHU)

Presenter: ECHEVARRIA, Miguel (University of the Basque Country UPV/EHU)

Session Classification: Plenary session

Contribution ID: 30

Type: **Longer talk**

Status and prospects for TMD phenomenology

Tuesday, May 24, 2022 9:00 AM (20 minutes)

In this talk I will briefly address the state of the art for our understanding of transverse-momentum-dependent distributions, with a focus on their phenomenology. I will introduce some of the topics which are currently under investigation and highlight the fundamental role of the present and future experimental facilities for the advancement of the field.

Primary author: SIGNORI, Andrea (Istituto Nazionale di Fisica Nucleare)

Presenter: SIGNORI, Andrea (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 31

Type: **Standard talk**

On the spectral properties of the gauge invariant quark propagator

Tuesday, May 24, 2022 5:50 PM (15 minutes)

TBA

Primary authors: Prof. ACCARDI, Alberto; COSTA, Caroline (Jefferson Lab); Dr SIGNORI, Andrea

Presenter: COSTA, Caroline (Jefferson Lab)

Session Classification: Plenary session

Contribution ID: 32

Type: **Remote standard talk**

Transverse spin and transverse-momentum-dependent results from PHENIX

Thursday, May 26, 2022 5:35 PM (15 minutes)

An overview of recent results from PHENIX on transverse spin and transverse-momentum-dependent observables will be presented.

Primary author: AIDALA, Christine (University of Michigan)

Presenter: AIDALA, Christine (University of Michigan)

Session Classification: Plenary session

Contribution ID: 33

Type: **Longer talk**

The transverse spin structure of the nucleon: overview and perspectives of COMPASS SIDIS measurements

Monday, May 23, 2022 4:45 PM (20 minutes)

The SIDIS data collected from 2002 to 2010 in COMPASS using a high energy muon beam and transversely polarised proton and deuteron targets, have allowed to performed many unique measurements. In this talk the main results and their interpretation, as well as the new expected measurements, will be reviewed. The need of the more deuteron data and the perspectives from the future COMPASS data taking will also be summarised.

Primary author: BRADAMANTE, Franco (Istituto Nazionale di Fisica Nucleare)

Presenter: BRADAMANTE, Franco (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 34

Type: **Longer talk**

Collinear twist-3 observables in eN and e-e+ collisions

Thursday, May 26, 2022 2:45 PM (20 minutes)

Some spin observables in the collinear twist-3 formalism will be reviewed.

Primary author: SCHLEGEL, Marc (University of Tuebingen)

Presenter: SCHLEGEL, Marc (University of Tuebingen)

Session Classification: Plenary session

Contribution ID: 35

Type: **Longer talk**

Dihadron beam spin asymmetries from SIDIS with proton and deuteron targets at CLAS12

Monday, May 23, 2022 5:15 PM (20 minutes)

Correlators such as parton distribution functions (PDFs) exhibit flavor dependence, which is accessible from complementary Semi-Inclusive Deep Inelastic Scattering (SIDIS) measurements with proton and neutron targets. SIDIS off the neutron can be explored using nuclear targets, in particular the deuteron, wherein the quark flavor combination differs from that of the proton. Recent $\pi^+\pi^-$ dihadron beam spin asymmetry measurements allow for a point-by-point extraction of the collinear twist-3 PDF $e(x)$, which gives further insight into quark and gluon interactions. These measurements were performed with a proton target, but complementary measurements with a neutron target are necessary for disentangling the flavor dependence of $e(x)$. The presented study offers a first look at a comparison of $\pi^+\pi^-$ beam spin asymmetries from proton and deuteron targets at CLAS12.

Primary author: DILKS, Christopher (Duke University)

Presenter: DILKS, Christopher (Duke University)

Session Classification: Plenary session

Contribution ID: 36

Type: **Longer talk**

Recent results from COMPASS Drell-Yan program

Friday, May 27, 2022 11:30 AM (20 minutes)

The investigation of the nucleon spin structure via measurements of dimuons produced in the Drell-Yan process is one of the main goals of the phase-II research program of the COMPASS experiment (M2 beamline, SPS, CERN).

In 2015 and 2018, COMPASS performed Drell-Yan measurements using a 190 GeV/c π^- beam impinging on a transversely polarized NH_3 target and on an unpolarized tungsten target. The measurement of the Sivers and other transverse-spin dependent azimuthal asymmetries in Drell-Yan provides a unique opportunity to test the QCD predicted (pseudo-)universality features of related transverse momentum dependent parton distribution functions. The angular coefficients λ , μ and ν that characterize the unpolarized Drell-Yan cross-section were also extracted from the data collected using the tungsten target. The results of this analysis provide input to study various perturbative and non-perturbative QCD effects.

In this talk, recent Drell-Yan results from COMPASS will be presented along with prospects for ongoing studies.

Primary author: LONGO, Riccardo (University of Illinois at Urbana-Champaign)

Presenter: LONGO, Riccardo (University of Illinois at Urbana-Champaign)

Session Classification: Plenary session

Contribution ID: 37

Type: **Standard talk**

Small-b matching for leading power TMD

Transverse-momentum dependent parton distributions are genuine non-perturbative functions that describe the 3-dimensional structure of a hadron. These distributions should be extracted from data. However, even if one restricts himself to the leading power distributions, eight of them has to be considered. A way to reduce the complexity, they can be evaluated in a model-independent way in terms of collinear distributions in the limit of large- q_T or small- b in the position space. This procedure is called “matching” and typically it serves as an initial input for the nonperturbative model of the TMD distributions.

In this talk I will present the full matching up to the first correction in the transverse separation b for all the leading-power TMD parton distributions at next-to-leading order in perturbation theory. I will discuss the general procedure and highlight the crucial step of the computation.

Primary author: RODINI, Simone (University of Regensburg)

Co-author: VLADIMIROV, Alexey

Presenter: RODINI, Simone (University of Regensburg)

Session Classification: Plenary session

Contribution ID: 38

Type: **Longer talk**

Azimuthal asymmetries in unpolarized SIDIS at COMPASS

Tuesday, May 24, 2022 10:30 AM (20 minutes)

The azimuthal asymmetries, given by the amplitudes of the modulations in the azimuthal angle ϕ_h of the hadrons produced in SIDIS, give access to the Transverse-Momentum-Dependent structure of the nucleon. In unpolarized SIDIS, of particular interest are the $\cos \phi_h$ and $\cos 2\phi_h$ modulations, generated by the Cahn effect and by the Boer-Mulders TMD PDF h_1^\perp , convoluted with the Collins fragmentation function. Additional information on h_1^\perp can be gained by measuring the azimuthal asymmetries of hadron pairs.

In 2016 and 2017, the COMPASS Collaboration at CERN collected a large sample of DIS events with a longitudinally polarised 160 GeV/c muon beam scattering off a liquid hydrogen target. Part of the collected data has been analyzed to extract preliminary results for the azimuthal asymmetry of the charged hadrons and of the hadron pairs, the latter shown here for the first time.

Primary author: MORETTI, Andrea (Istituto Nazionale di Fisica Nucleare)

Presenter: MORETTI, Andrea (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 39

Type: **Longer talk**

Measuring Nuclear GPDs and TMDs

Wednesday, May 25, 2022 9:30 AM (20 minutes)

Primary author: DUPRÉ, Raphaël (IJCLab - CNRS - Univ. Paris-Saclay)

Presenter: DUPRÉ, Raphaël (IJCLab - CNRS - Univ. Paris-Saclay)

Session Classification: Plenary session

Contribution ID: 40

Type: **Remote standard talk**

Multi-Dimensional studies of the $ep \rightarrow e'p' + X$ Single Spin Asymmetries

Monday, May 23, 2022 6:25 PM (15 minutes)

Studies of the properties and the azimuthal distribution of hadrons produced in the Target Fragmentation Region serve as a test of our complete understanding of the different mechanisms in the SIDIS production of hadrons and provide additional information on the QCD dynamics that are not accessible with single hadron production in the Current Fragmentation Region. We present first Multi-dimensional studies of beam SSA for semi-inclusive protons ($ep \rightarrow e'p' + X$), produced in the TFR, that can be related to higher twist Fracture Functions describing the F_{LU} structure function. Such measurements were performed with the CLAS12 detector in Hall B at Jefferson lab using a longitudinally polarized 10.6-GeV electron beam on an unpolarized hydrogen target. Preliminary results of this study captured the transition between the TFR and CFR regions showing a clear sign change of the SSA for protons produced in the backward region in CM, dominated by TFR protons providing a criteria for experimental separation of CFR and TFR regions. These findings are opening a new avenue for studies of nucleon structure.

Primary authors: Prof. BENMOKHTAR, Fatiha (Duquesne University); Dr AVAKIAN, Harut (Jefferson Lab); Dr HAYWARD, Timothy (University of Connecticut, USA)

Presenter: Prof. BENMOKHTAR, Fatiha (Duquesne University)

Session Classification: Plenary session

Contribution ID: 41

Type: **Longer talk**

Jet as a probe to nucleon tomography

Monday, May 23, 2022 3:45 PM (20 minutes)

In this talk, I will present our recent results on nucleon tomography study by utilizing jet observables in various hadronic collisions.

Primary author: YUAN, Feng (Lawrence Berkeley Lab)

Presenter: YUAN, Feng (Lawrence Berkeley Lab)

Session Classification: Plenary session

Contribution ID: 42

Type: **Remote longer talk**

Recent experimental results on TMD and dihadron fragmentation functions

Tuesday, May 24, 2022 9:30 AM (20 minutes)

Single and dihadron fragmentation functions (FFs) are an essential tool in accessing the transverse spin and momentum structure of the nucleon. The chiral-odd FFs provide nearly unique access to the transversity distributions and the related tensor charges. Transverse momentum dependent FFs enable the study of various transverse momentum dependent distribution functions in the nucleon. Furthermore, both polarized and unpolarized FFs add flavor sensitivity that would not be available with either inclusive or jet related measurements.

FFs can be accessed particularly well in electron-positron annihilation, due to the clean initial state. The present status of FF related measurements will be presented.

Primary author: SEIDL, Ralf (RIKEN)

Presenter: SEIDL, Ralf (RIKEN)

Session Classification: Plenary session

Contribution ID: 43

Type: **Longer talk**

Transverse-momentum distributions of hadrons produced in DIS at COMPASS

Tuesday, May 24, 2022 10:00 AM (20 minutes)

In semi-inclusive deep inelastic scattering (SIDIS) the non-zero transverse momentum of partons is reflected in the transverse momentum P_T of the produced hadrons. Assuming Gaussian dependence of transverse momentum dependent (TMD) PDFs and fragmentation functions (FFs) upon quark transverse momentum, exponential distribution of P_T^2 is expected. In 2016 and 2017, COMPASS experiment at CERN collected a large sample of SIDIS events using a longitudinally polarised 160-GeV/c muon beam scattering on a liquid hydrogen target. The P_T^2 distributions of charged hadrons have been extracted from part of the data. They can be described by two exponentials and they qualitatively agree with earlier COMPASS measurements with an isoscalar target.

Primary author: MATOUSEK, Jan (Charles University, Prague)

Presenter: MATOUSEK, Jan (Charles University, Prague)

Session Classification: Plenary session

Contribution ID: 44

Type: **Longer talk**

Recent Transverse Spin Measurements from Polarized pp Collisions at STAR

Thursday, May 26, 2022 3:15 PM (20 minutes)

The STAR Collaboration at RHIC investigates the internal spin structure of the proton with a broad range of measurements in polarized pp collisions. Transverse spin studies aim to elucidate 3D transverse momentum structure and parton transversity. Dijet opening angle measurements are sensitive to the Sivers $\langle k_T \rangle$ and a non-zero spin dependent result in pp collisions is observed for the first time. Individual parton contributions (u , d , gluon+sea) to the measured $\langle k_T \rangle$ are extracted through a matrix inversion of the charge-sorted $\langle k_T \rangle$ data. Additionally, transverse single-spin asymmetries of fully reconstructed W^\pm bosons from pp collisions address the process dependence of the Sivers function; the increased luminosity of 2017 data at $\sqrt{s} = 510$ GeV significantly improves on previous W^\pm , as well as related Z -boson, results. Separately, the transverse spin dependent correlation of charged pion pairs, interference fragmentation functions, are used to probe transversity. Results from pp collisions at $\sqrt{s} = 200$ and 500 GeV with additional integrated luminosity further enhance the first observations of transversity in pp collisions and the constraints that they provide. Finally, the transverse single-spin dependence of the azimuthal modulation of pions in jets probes the Collins function, while additional modulations ("Collins-like" effect) place limits on gluon linear polarization. The current status of these and related analyses (forward π^0 and forward EM-jet A_N), and prospects for their extension in the near future will be presented and discussed.

Primary authors: JACOBS, W. W. (CEEM / Indiana University); FOR THE STAR COLLABORATION

Presenter: JACOBS, W. W. (CEEM / Indiana University)

Session Classification: Plenary session

Contribution ID: 45

Type: **Longer talk**

Gluon TMDs and J/ψ polarization in SIDIS

Thursday, May 26, 2022 9:30 AM (20 minutes)

We study the polar and azimuthal decay angular distributions of J/ψ mesons produced in semi-inclusive, deep-inelastic electron-proton scattering. For the description of the quarkonium formation mechanism, we adopt the framework of nonrelativistic QCD, with the inclusion of the intermediate color-octet channels that are suppressed at most by a factor v^4 in the velocity parameter v relative to the leading color-singlet channel. We put forward factorized expressions for the helicity structure functions in terms of transverse momentum dependent gluon distributions and shape functions, which are valid when the J/ψ transverse momentum is small with respect to the hard scale of the process. By requiring that such expressions correctly match with the collinear factorization results at high transverse momentum, we determine the perturbative tails of the shape functions and find them to be independent of the J/ψ polarization. In particular, we focus on the $\cos 2\phi$ azimuthal decay asymmetry, which originates from the distribution of linearly polarized gluons inside an unpolarized proton. We therefore suggest a novel experiment for the extraction of this so-far unknown parton density that could be performed, in principle, at the future Electron-Ion Collider.

Primary author: PISANO, Cristian (Istituto Nazionale di Fisica Nucleare)

Presenter: PISANO, Cristian (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 46

Type: **Standard talk**

The Parton Branching method: a Monte Carlo approach based on TMDs

Tuesday, May 24, 2022 5:10 PM (15 minutes)

Soft gluon resummation is essential to obtain precise predictions for QCD processes with more scales involved. The formalism to follow in such scenarios is the Transverse Momentum Dependent factorization theorem. However, for practical applications a Monte Carlo approach is needed. We present the Parton Branching (PB) method- a Monte Carlo approach to obtain QCD collider predictions based on TMDs. We discuss its connection to standard resummation approaches. We present examples of recent PB applications to inclusive and exclusive observables, in the low and high p_t region.

Primary author: LELEK, Aleksandra (UAntwerp)

Presenter: LELEK, Aleksandra (UAntwerp)

Session Classification: Plenary session

Contribution ID: 47

Type: **Longer talk**

Recent results on TMDs from SIDIS measurements

Monday, May 23, 2022 3:15 PM (20 minutes)

A review of recent SIDIS results about transverse spin and momentum dependent observables will be given. Results that are expected to come in the near future from running experiments will also be discussed.

Primary author: BRESSAN, Andrea (Istituto Nazionale di Fisica Nucleare)

Presenter: BRESSAN, Andrea (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 48

Type: **Longer talk**

General theory overview of transverse spin distributions

Monday, May 23, 2022 2:15 PM (20 minutes)

An overview of the progress regarding the transversity distribution, the tensor charge and other transverse spin distributions will be given. Gluonic analogues will be discussed, as well as transversity GPDs and GTMDs.

Primary author: BOER, Daniel (University of Groningen)

Presenter: BOER, Daniel (University of Groningen)

Session Classification: Plenary session

Contribution ID: 50

Type: **Longer talk**

Open issues with SIDIS and future plans at JLab

Wednesday, May 25, 2022 9:00 AM (20 minutes)

Presenter: AVAGYAN, Harut (Jefferson Lab)

Session Classification: Plenary session

Contribution ID: 51

Type: **Longer talk**

GPD phenomenology

Presenter: SZNAJDER, Pawel (National Centre for Nuclear Research, Warsaw)

Session Classification: Plenary session

Contribution ID: 52

Type: **Standard talk**

TMD distributions at the next-to-leading power

Thursday, May 26, 2022 4:35 PM (15 minutes)

The TMD factorization at the next-to-leading power has an involved structure of singularities. I discuss the definition and properties of transverse momentum dependent (TMD) distributions of the twist-three including evolution, symmetry relations, parametrization, interpretation, and singularities. I demonstrate that the physical TMD distributions (in terms of which observables are written) require an extra subtraction procedure. As an example of application, I discuss the Drell-Yan hadronic tensor at the next-to-leading power in terms of physical distributions and explicitly demonstrate the cancellation of rapidity and end-point divergences. These results complete the construction of TMD factorization at the next-to-leading power.

Primary author: RODINI, Simone (University of Regensburg)

Co-author: VLADIMIROV, Alexey

Presenter: RODINI, Simone (University of Regensburg)

Session Classification: Plenary session

Contribution ID: 53

Type: **Longer talk**

Addressing the problem of model dependency in GPD phenomenology

Wednesday, May 25, 2022 12:00 PM (20 minutes)

We discuss the problem of model dependency in the phenomenology of generalised parton distributions (GPDs). We present results of our recent analyses, where we have addressed this problem. This includes the extraction of D-term, which is related to the so-called mechanical properties of the nucleon, and the analysis on the deconvolution of deeply virtual Compton scattering (DVCS) amplitudes. A new way of effectively nonparametric modelling of GPDs based on machine learning techniques will be presented as well. Getting a better grip on the control of systematic effects, our line of research will help GPD phenomenology to achieve its maturity in the precision era commenced by the new generation of experiments.

Primary author: SZNAJDER, Paweł (National Centre for Nuclear Research, Poland)

Presenter: SZNAJDER, Paweł (National Centre for Nuclear Research, Poland)

Session Classification: Plenary session

Contribution ID: 54

Type: **Longer talk**

Transverse Momentum Dependent Measurements in p-p and e+e- collisions

Monday, May 23, 2022 2:45 PM (20 minutes)

TMD Measurements at high momentum transfer have been carried out in polarized proton-proton collisions at RHIC, in pion induced Drell-Yan scattering off transversely polarized proton targets in COMPASS and in electron-positron annihilation in Belle and BaBar. Available results will be reviewed and the impact of future measurements at RHIC and the SPS will be discussed.

Primary author: GROSSE PERDEKAMP, Matthias (University of Illinois)

Presenter: GROSSE PERDEKAMP, Matthias (University of Illinois)

Session Classification: Plenary session

Contribution ID: 56

Type: **Standard talk**

Combining non perturbative models with the CSS formalism

Presenter: GONZALEZ HERNANDEZ, Jose Osvaldo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 57

Type: **Standard talk**

First observation of correlations between spin and transverse momenta in back-to-back dihadron production at CLAS12

Monday, May 23, 2022 6:05 PM (15 minutes)

We report the first measurements of deep inelastic scattering spin-dependent azimuthal asymmetries in back-to-back hadron electroproduction, where one hadron is produced in the current fragmentation region and the other in the target fragmentation region. The data were taken with a 10.2 and 10.6 GeV longitudinally polarized electron beam incident on an unpolarized liquid hydrogen target using the CLAS12 Spectrometer at Jefferson Lab. Observed non-zero $\sin \Delta\phi$ modulations in $ep \rightarrow e'p\pi^+X$ events, where $\Delta\phi$ is the difference of the azimuthal angles of the proton and pion in the virtual photon-target nucleon center-of-mass frame, indicate that correlations between the spin and transverse momenta of hadrons produced in the target and current fragmentation regions may be significant. The measured beam-spin asymmetries provide a first access in dihadron production to a previously unobserved leading-twist spin and transverse momentum-dependent fracture function. The fracture functions describe the hadronization of the target remnant after the hard scattering of a virtual photon off a quark in the target particle and provide a new avenue for studying nucleonic structure and hadronization.

Primary authors: KOTZINIAN, Aram (Istituto Nazionale di Fisica Nucleare); AVAGYAN, Harut (Jefferson Lab); HAYWARD, Timothy (University of Connecticut)

Presenter: HAYWARD, Timothy (University of Connecticut)

Session Classification: Plenary session

Contribution ID: 58

Type: **Standard talk**

Polarization phenomenology for quarkonium production in SIDIS

Thursday, May 26, 2022 4:55 PM (15 minutes)

Presenter: MAXIA, Luca (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: **60**

Type: **Longer talk**

TMDs and jet observables

Thursday, May 26, 2022 10:30 AM (20 minutes)

Presenter: SCIMEMI, Ignazio (Universidad Complutense Madrid)

Session Classification: Plenary session

Contribution ID: 61

Type: **Remote longer talk**

The extraction of light cone parton distributions from lattice quantum chromodynamics

Friday, May 27, 2022 9:30 AM (20 minutes)

Presenter: ZAFEIROPOULOS, Savvas

Session Classification: Plenary session

Contribution ID: 62

Type: **Longer talk**

Quasi-PDFs, TMDs, GPDs, Pseudo-PDFs (Ioffe time)

Presenter: BACCHIO, Simone

Session Classification: Plenary session

Contribution ID: 63

Type: **Longer talk**

Collins-Soper kernel

Presenter: WAGMAN, Michael (MIT)

Session Classification: Plenary session

Contribution ID: 64

Type: **Longer talk**

Fixed Target Drell-Yan at SpinQuest

Friday, May 27, 2022 12:00 PM (20 minutes)

Presenter: WUERFEL, Noah

Session Classification: Plenary session

Contribution ID: 65

Type: **Longer talk**

Fixed target at LHC

Friday, May 27, 2022 12:30 PM (20 minutes)

Presenter: DI NEZZA, Pasquale (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: **68**

Type: **Longer talk**

Unpolarized TMD extractions

Tuesday, May 24, 2022 11:30 AM (20 minutes)

Presenter: BERTONE, Valerio (CEA Paris-Sclay)

Session Classification: Plenary session

Contribution ID: **69**

Type: **Longer talk**

TMD fits Drell-Yan

Presenter: ZURITA, Maria (Brookhaven National Laboratory)

Session Classification: Plenary session

Contribution ID: 70

Type: **Longer talk**

TMD fits Drell-Yan

Presenter: BOER, Daniel (University of Groningen)

Session Classification: Plenary session

Contribution ID: 71

Type: **Remote standard talk**

Transversity and $e(x)$ from dihadron observables (including Soffer bound violation)

Presenter: COURTOY, Aurore (Instituto de Física, UNAM)

Session Classification: Plenary session

Contribution ID: 72

Type: **Standard talk**

Back-to-Back SSA measurements with CLAS12

Presenter: HAYWARD, Timothy (University of Connecticut)

Session Classification: Plenary session

Contribution ID: 73

Type: **Longer talk**

Piet Mulders celebration

Tuesday, May 24, 2022 12:00 PM (1 hour)

Session Classification: Plenary session

Contribution ID: 74

Type: **Standard talk**

Role of transverse momentum in twist-three generalized parton distributions

Wednesday, May 25, 2022 1:00 PM (15 minutes)

Presenter: LIUTI, Simonetta (University of Virginia)

Session Classification: Plenary session

Contribution ID: 75

Type: **not specified**

Conclusions

Friday, May 27, 2022 4:00 PM (15 minutes)

Presenter: BACCHETTA, Alessandro (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 76

Type: **Longer talk**

PDF bias and flavor dependence in TMD distributions

Tuesday, May 24, 2022 2:30 PM (20 minutes)

Transverse momentum dependent (TMD) distributions match collinear parton density functions (PDF) in the limit of small transverse distances, which is accounted for by global extractions of TMD distributions. We study the influence of the PDF choice on the determination of unpolarized TMDPDFs and the description of TMD Drell-Yan-pair and Z-boson production data. We find that PDF essentially biases the extraction of TMDPDF. The bias is alleviated once the PDF uncertainty is taken into account and the non-perturbative TMD profile is flavor-dependent. Both points improve the agreement between theory and experiment, substantially increase the uncertainty in extracted TMD distributions, and should be taken into account in future global analyses.

Primary authors: VLADIMIROV, Alexey; ZURITA, Maria (Brookhaven National Laboratory); HAUTMANN, Francesco; SCIMEMI, Ignazio (Universidad Complutense Madrid); LEAL GÓMEZ, Sergio (Universität Wien)

Presenter: ZURITA, Maria (Brookhaven National Laboratory)

Session Classification: Plenary session

Contribution ID: 77

Type: **not specified**

Combining nonperturbative models with the CSS formalism

Thursday, May 26, 2022 4:15 PM (15 minutes)

Phenomenological analyses of hadron structure from semi-inclusive observables require the use of models to characterize nonperturbative effects, embedded into a formalism of TMD evolution. Constraints provided by pQCD calculations must be imposed in order to maximize predictive power. This is particularly important when attempting to use phenomenological extractions over wide scale ranges. In this talk, we will discuss how such constraints are not necessarily guaranteed when using arbitrary parametric forms. By considering the special role of observables at low to moderate scales, we will provide a practical recipe for incorporating nonperturbative models into the CSS formalism. Special attention will also be paid to the role of TMD integral relations in building models optimally embedded into the CSS formula.

Primary authors: GONZALEZ HERNANDEZ, Jose Osvaldo (Istituto Nazionale di Fisica Nucleare); SATO, Nobuo (Jefferson Lab); ROGERS, Ted (Old Dominion University / Jefferson Lab)

Presenter: GONZALEZ HERNANDEZ, Jose Osvaldo (Istituto Nazionale di Fisica Nucleare)

Session Classification: Plenary session

Contribution ID: 78

Type: **Remote standard talk**

Chiral-odd PDFs from dihadron observables and the role of positivity constraints

Monday, May 23, 2022 5:45 PM (15 minutes)

In this short talk, we discuss chiral-odd PDFs that can be accessed through dihadron observables: the transversity PDF and the twist-3 scalar PDF $e(x)$.

The former is subject to positivity constraints, the Soffer bound. Recent analyses have explored the role of theoretical constraints on the tensor charge. We comment on that point, in view of future improvements in all global analyses.

As for the scalar PDF, its extended relation to nonperturbative manifestations of QCD makes it a unique object. We discuss its first extraction in a collinear framework as well as possible and necessary extensions towards a full QCD analysis.

Primary author: COURTOY, Aurore (Instituto de Física, UNAM)

Presenter: COURTOY, Aurore (Instituto de Física, UNAM)

Session Classification: Plenary session

Contribution ID: 79

Type: **not specified**

Collins-Soper kernel from lattice QCD

Friday, May 27, 2022 10:30 AM (20 minutes)

The Collins-Soper kernel describing the rapidity evolution of TMDPDFs is nonperturbative for large transverse separations or small transverse momenta. I will discuss recent lattice QCD calculations that aim to determine the nonperturbative behavior of the quark Collins-Soper kernel.

Primary author: WAGMAN, Michael (Fermilab)**Presenter:** WAGMAN, Michael (Fermilab)**Session Classification:** Plenary session

Contribution ID: 80

Type: **Remote standard talk**

Transverse spin and transverse-momentum-dependent results from PHENIX

An overview of recent results from PHENIX on transverse spin and transverse-momentum-dependent observables will be presented.

Primary author: AIDALA, Christine (University of Michigan)

Presenter: AIDALA, Christine (University of Michigan)

Session Classification: Plenary session

Contribution ID: 81

Type: **Remote standard talk**

Transverse spin and transverse-momentum-dependent results from PHENIX

An overview of recent results from PHENIX on transverse spin and transverse-momentum-dependent observables will be presented.

Primary author: AIDALA, Christine (University of Michigan)

Presenter: AIDALA, Christine (University of Michigan)

Session Classification: Plenary session

Contribution ID: 82

Type: **not specified**

How PDF determinations affect EFT constrains

Tuesday, May 24, 2022 6:10 PM (15 minutes)

Presenter: MOORE, James

Session Classification: Plenary session

Contribution ID: **83**

Type: **Standard talk**

Recent results from Lattice QCD

Friday, May 27, 2022 10:00 AM (20 minutes)

I will present an overview of recent progress and results in Lattice QCD focusing on the direct measure of moments of the transversity PDF, as well as using the quasi-PDF/GPD approach.

Primary author: BACCHIO, Simone (The Cyprus Institute)

Presenter: BACCHIO, Simone (The Cyprus Institute)

Session Classification: Plenary session

Contribution ID: 85

Type: **not specified**

Welcome

Monday, May 23, 2022 2:00 PM (15 minutes)

Session Classification: Plenary session