

Resummation, Evolution, Factorization

Report of Contributions

Contribution ID: 14

Type: **not specified**

Evolution and extraction of TMDs

Monday, December 8, 2014 11:45 AM (25 minutes)

In this talk I would like to point out the importance of evolution and resummations in the extraction of TMDs. I will make the case of unpolarized TMDPDF and discuss recent results.

I will point out how the knowledge of TMDs can affect the interpretation of the LHC outcomes in some relevant cases.

Primary author: SCIMEMI, Ignazio (Universidad Complutense (ES))

Presenter: SCIMEMI, Ignazio (Universidad Complutense (ES))

Contribution ID: 15

Type: **not specified**

Welcome and opening remarks

Monday, December 8, 2014 11:00 AM (10 minutes)

Opening address and introduction to philosophy of the meeting

Primary author: CHEREDNIKOV, Igor (University of Antwerp)

Presenter: CHEREDNIKOV, Igor (University of Antwerp)

Contribution ID: 16

Type: **not specified**

Results on TMD evolution

Monday, December 8, 2014 11:20 AM (25 minutes)

We solve recently proposed TMD evolution equations for unpolarised quark in a particular limit which is suitable for comparison with other results in the literature.

Primary author: CECCOPIERI, Federico Alberto (Universita & INFN, Milano-Bicocca (IT))

Presenter: CECCOPIERI, Federico Alberto (Universita & INFN, Milano-Bicocca (IT))

Contribution ID: 17

Type: **not specified**

Introduction to QCD evolution of parton distributions: Comparative view

Monday, December 8, 2014 1:30 PM (20 minutes)

Primary author: CHEREDNIKOV, Igor (University of Antwerp)

Presenter: CHEREDNIKOV, Igor (University of Antwerp)

Contribution ID: 18

Type: **not specified**

Effect of TMD evolution and partonic flavor on e^+e^- annihilation into hadrons

Monday, December 8, 2014 2:35 PM (25 minutes)

We calculate the transverse momentum dependence in the production of two back-to-back hadrons in electron-positron annihilations at 100 GeV^2 . We use the parameters of the transverse-momentum-dependent (TMD) fragmentation functions that we recently extracted from the HERMES multiplicity data at 2.4 GeV^2 . We apply TMD evolution according to two different approaches and using different parameters for the so-called nonperturbative part of TMD evolution. We explore the sensitivity of our results to these different choices and to the flavor dependence of parton fragmentation functions. We discuss how experimental measurements could discriminate among various scenarios.

Primary authors: BACCHETTA, Alessandro (University of Pavia); SIGNORI, Andrea (VU University Amsterdam - Nikhef); RADICI, Marco (urn:Google); ECHEVARRÍA, Miguel (VU/Nikhef)

Presenter: RADICI, Marco (urn:Google)

Contribution ID: 19

Type: **not specified**

Collinear QCD, TMD resummation and non-perturbative aspects in SIDIS processes

Tuesday, December 9, 2014 9:35 AM (25 minutes)

TMD resummation for SIDIS processes is studied in the framework of the original Collins-Soper-Sterman formalism, with special attention to the interplay between perturbative QCD and non-perturbative contributions. Phenomenological implementations of the TMD formalism to SIDIS processes will be discussed with practical examples, exploring different kinematical configurations of SIDIS experiments.

Primary authors: PROKUDIN, Alexei (Jefferson Lab); GONZALEZ HERNANDEZ, Jose Osvaldo; BOGLIONE, Mariaelena (University of Turin); MELIS, Stefano (University of Torino and INFN)

Presenter: BOGLIONE, Mariaelena (University of Turin)

Contribution ID: 20

Type: **not specified**

Non-linear evolution equations

Tuesday, December 9, 2014 10:00 AM (1 hour)

Primary author: BALITSKY, Ian (ODU/JLab)

Presenter: BALITSKY, Ian (ODU/JLab)

Contribution ID: 21

Type: **not specified**

Production of forward jets within high-energy factorization

Tuesday, December 9, 2014 11:00 AM (25 minutes)

We propose a method to introduce Sudakov effects to unintegrated gluon density promoting it to be hard scale dependent. The advantage of the approach is that it guarantees that the gluon density is positive definite and that on integrated level the Sudakov effects cancel. Besides that the method to introduce the Sudakov effects is convenient since it does not need evaluation of cross section in the process of imposing the effects. As a case study we apply the method to calculate angular correlations in production of forward-forward dijet and RpA ratio for p+p vs. p+Pb collision.

Primary author: KUTAK, Krzysztof (Instytut Fizyki Jadrowej Polskiej Akademii Nauk)

Presenter: KUTAK, Krzysztof (Instytut Fizyki Jadrowej Polskiej Akademii Nauk)

Contribution ID: 22

Type: **not specified**

Applications of the high-energy QCD effective action

Tuesday, December 9, 2014 2:00 PM (25 minutes)

We introduce Lipatov's effective action, which displays high-energy factorization in a gauge invariant way through the inclusion of reggeon fields, and show several computational applications of this approach, including the gluon Regge trajectory at two loops and the NLL effective jet vertices for semi-inclusive forward jet production and jet-gap-jet configurations.

Primary author: MADRIGAL MARTÍNEZ, José Daniel

Presenter: MADRIGAL MARTÍNEZ, José Daniel

Contribution ID: 23

Type: **not specified**

High-energy resummation effects in Mueller-Navelet jet production at the LHC

Tuesday, December 9, 2014 2:25 PM (25 minutes)

The study of the production of two forward jets with a large interval of rapidity at hadron colliders was proposed by Mueller and Navelet as a possible test of the high energy dynamics of QCD. We analyze this process within a complete next-to-leading logarithm framework, supplemented by the use of the Brodsky-Lepage-Mackenzie procedure extended to the perturbative Regge dynamics, to find the optimal renormalization scale. This leads to a very good description of the recent CMS data at LHC for the azimuthal correlations of the jets.

Primary authors: Mr DUCLOUE, Bertrand; SZYMANOWSKI, Lech (National Centre for Nuclear Research); WALLON, Samuel

Presenter: WALLON, Samuel

Contribution ID: 24

Type: **not specified**

Impact factor for quark-antiquark-gluon jet production in diffractive DIS

Tuesday, December 9, 2014 2:50 PM (25 minutes)

We present the calculation of the impact factor for the photon to quark, antiquark and gluon transition within Balitsky's high energy OPE. We also rederive the impact factor for photon to quark and antiquark transition within the same framework. These results provide the necessary building blocks for further phenomenological studies of inclusive diffractive DIS as well as for two and three jets diffractive production which go beyond approximations discussed in the literature.

Primary author: BOUSSARIE, Renaud

Presenter: BOUSSARIE, Renaud

Contribution ID: 25

Type: **not specified**

Overview on transverse momentum resummation

Wednesday, December 10, 2014 9:30 AM (1 hour)

We consider the transverse-momentum distribution of generic high-mass systems of non-strongly interacting particles (lepton pairs, vector bosons, Higgs particles, ...) produced in hadronic collisions.

The logarithmically-enhanced contributions at small transverse momentum are treated to all perturbative orders by a universal resummation formula that depends on a single process-dependent hard factor.

The formalism is applied to Drell-Yan lepton pairs and Higgs boson production at Tevatron and LHC energies. We combine the most advanced perturbative information available at present for these processes: resummation up to next-to-next-to-leading logarithmic accuracy and fixed-order perturbation theory up to next-to-next-to-leading order. We show and discuss the reduction in the scale dependence of the results with respect to lower-order calculations, estimating the corresponding perturbative uncertainty.

Primary author: FERRERA, Giancarlo (University of Milan)

Presenter: FERRERA, Giancarlo (University of Milan)

Contribution ID: 26

Type: **not specified**

Soft gluons and the ordering problem

Wednesday, December 10, 2014 10:30 AM (25 minutes)

Recent developments (JHEP07 (2012) 026) have shown that is not always possible to factorize all collinear singularities into process independent and universal functions. This breakdown of collinear factorization was anticipated using an algorithm to compute the leading soft gluon corrections to a hard process (JHEP08(2006)059). Such algorithm is base on the assumption that the successive emissions can be ordered in transverse momentum. In this work we show that this assumption is correct at the first two non-trivial orders. We do this by studying the leading behavior of the soft corrections to a hard process due to one virtual exchange and one and two real emissions.

Primary authors: FORSHAW, Jeffrey (University of Manchester); SEYMOUR, Mike (University of Manchester (GB)); ANGELES MARTINEZ, Rene (urn:Google)

Presenter: ANGELES MARTINEZ, Rene (urn:Google)

Contribution ID: 27

Type: **not specified**

Gluon-gluon to Higgs in TMD and kT-factorization: SCET approach

Wednesday, December 10, 2014 1:30 PM (30 minutes)

Primary author: ECHEVARRÍA, Miguel

Presenter: ECHEVARRÍA, Miguel (VU/Nikhef)

Contribution ID: 28

Type: **not specified**

Transverse momentum gluon density at low-x

Wednesday, December 10, 2014 2:30 PM (25 minutes)

We present new results on the unintegrated TMD (transverse momentum dependent) gluon density (u.g.d.) at low x , which based on our previous study [1]. We match this u.g.d. at low transverse momenta $|k_T|$ and starting scale $Q_0^2 = 1 - 3 \text{ GeV}^2$ to the exact solution of the BFKL equation outside of the saturation region at large $|k_T|$ obtained in [2], which includes all multiple Pomeron exchanges. Then, to extend this u.g.d. at higher Q^2 we use the Catani-Ciafoloni-Fiorani-Marchesini (CCFM) evolution equation.

The inclusion of the CCFM evolution results in a large increase of the u.g.d. magnitude at low x and large $|k_T|$ above a few GeV/c. The application of the obtained gluon distribution to the analysis of the ep deep inelastic scattering allows us to get the results, which describe reasonably well the H1 and ZEUS data on the longitudinal proton structure function $F_L(x, Q^2)$, $F_{2c}(x, Q^2)$ and $F_{2b}(x, Q^2)$. In addition to this the use of new u.g.d. allows us to describe satisfactorily the LHC data on heavy meson production and especially the correlation between two B-mesons produced in pp collisions. The comparison of our new TMD unintegrated gluon density to the another ones is presented.

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References

- [1] A.V.Lipatov, G.I.Lykasov, N.P.Zotov, Phys.Rev. D89 (2014) 014001; arXiv:1310.7893.
- [2] Yuri V. Kovchegov, Phys.Rev. D 61 (2000) 074018.

Primary author: LYKASOV, Gennady (Joint Inst. for Nuclear Research (RU))

Presenter: LYKASOV, Gennady (Joint Inst. for Nuclear Research (RU))

Contribution ID: 29

Type: **not specified**

Impact of gluon polarization on Higgs production at the LHC

Thursday, December 11, 2014 9:00 AM (25 minutes)

Linearly polarized gluons inside an unpolarized proton contribute to the transverse momentum distributions of (pseudo)scalar particles produced inclusively in hadronic collisions, such as Higgs bosons and quarkonia with even charge conjugation ($\eta_c, \eta_b, \chi_{c0}, \chi_{b0}$). Moreover, they can produce azimuthal asymmetries in the associated production of a Higgs boson and a jet, in a kinematic region in which they are almost back to back, and modify the transverse spectrum of the pair. We show how these effects could be measured in the running experiments at the LHC.

Primary author: PISANO, Cristian

Presenter: PISANO, Cristian

Contribution ID: 30

Type: **not specified**

Gluon TMDs and quarkonium production in (un)polarized proton-proton collisions

Thursday, December 11, 2014 9:25 AM (25 minutes)

In this talk, I discuss how the study of quarkonium production in unpolarised and polarised proton-proton collisions can provide important insights on the gluon TMDs. The study of back-to-back production of quarkonium + isolated photon provides a unique way to extract the gluon TMDs f_1^g and $h_1^{\perp,g}$ at the LHC [1] and at a proposed Fixed-Target Experiment at the LHC (AF-TER@LHC). Although with smaller rates [2], $\Psi+Z$ and $Upsilon+Z$ also offer interesting prospects at LHC energies. In addition, Quarkonium + isolated photon can also be used to extract the gluon Sivers function via Transverse Single Spin Asymmetries (TSSA), complementing the possible study of low- p_T C-even quarkonium TSSA. Finally, I will comment on the additional information which can be obtained through J/ψ -pair production in both unpolarised and polarised proton-proton collisions, extending our previous work [3].

Primary author: LANSBERG, Jean-Philippe (IPN Orsay, Paris Sud U. / IN2P3-CNRS)

Presenter: LANSBERG, Jean-Philippe (IPN Orsay, Paris Sud U. / IN2P3-CNRS)

Contribution ID: 31

Type: **not specified**

Higgs and Drell-Yan production in high luminosity proton-proton collisions

Thursday, December 11, 2014 9:50 AM (25 minutes)

In the forthcoming high luminosity phase of the LHC many of the most interesting measurements for precision QCD studies are affected by large pile-up conditions. However, with the recently discovered Higgs boson, which couples in the heavy top limit directly to gluons, we have access to a novel production process to probe QCD by a colour-singlet current. In this study we compare observables in Higgs boson and Drell-Yan production and evaluate their stability with respect to pile-up effects. We present first attempts to apply various pile-up correction methods both to underlying event and to boson + jet event topologies, and compare Pythia8, Powheg and CASCADE event generator predictions to demonstrate the sensitivity to different multiple-parton radiation mechanisms.

Primary authors: HAUTMANN, Francesco (Institute of Theoretical Physics); JUNG, Hannes (Deutsches Elektronen-Synchrotron (DE)); VAN HAEVERMAET, Hans (University of Antwerp (BE))

Presenter: VAN HAEVERMAET, Hans (University of Antwerp (BE))

Contribution ID: 32

Type: **not specified**

Generating function for web diagrams

Thursday, December 11, 2014 10:15 AM (25 minutes)

We present the description of the exponentiated diagrams in terms of generating function within the universal diagrammatic technique. In particular, we show the exponentiation of the gauge theory amplitudes involving products of an arbitrary number of Wilson lines of arbitrary shapes, which generalizes the concept of web diagrams. The presented method gives a new viewpoint on the web diagrams and proves the non-Abelian exponentiation theorem.

Summary

We present the method to define web-diagrams on the operator level, using the functional integral and generating functions. The method allows one to obtain and investigate the exponentiated diagrams in the straightforward manner. Although, for the moment, the method does not result to any new information on web diagrams, it allows to obtain the known results in a simple and visual way.

Primary author: VLADIMIROV, Alexey (urn:Google)

Presenter: VLADIMIROV, Alexey (urn:Google)

Contribution ID: 33

Type: **not specified**

Concluding remarks and future plans

Thursday, December 11, 2014 2:25 PM (1h 35m)

Contribution ID: **34**

Type: **not specified**

Discussion

Monday, December 8, 2014 3:00 PM (1 hour)

Contribution ID: 35

Type: **not specified**

Discussion

Tuesday, December 9, 2014 11:25 AM (1h 5m)

Contribution ID: **36**

Type: **not specified**

Discussion

Tuesday, December 9, 2014 3:15 PM (2h 15m)

Contribution ID: 37

Type: **not specified**

Discussion

Wednesday, December 10, 2014 10:55 AM (1h 35m)

Contribution ID: **38**

Type: **not specified**

Discussion

Wednesday, December 10, 2014 2:55 PM (1h 5m)

Contribution ID: **39**

Type: **not specified**

Discussion

Thursday, December 11, 2014 10:40 AM (1h 50m)

Contribution ID: 40

Type: **not specified**

Overview of TMD evolution

Monday, December 8, 2014 1:50 PM (45 minutes)

Primary author: BOER, Daniel (University of Groningen)

Presenter: BOER, Daniel (University of Groningen)

Contribution ID: 41

Type: **not specified**

Gluon-gluon to Higgs in TMD and kT-factorization: Small-x framework

Wednesday, December 10, 2014 2:00 PM (30 minutes)

Primary author: HAUTMANN, Francesco (Institute of Theoretical Physics)

Presenter: HAUTMANN, Francesco (Institute of Theoretical Physics)

Contribution ID: 42

Type: **not specified**

Presentation of the TMDlib project

Monday, December 8, 2014 11:10 AM (10 minutes)

Primary author: SIGNORI, Andrea (VU University Amsterdam - Nikhef)

Presenter: SIGNORI, Andrea (VU University Amsterdam - Nikhef)

Contribution ID: 43

Type: **not specified**

Workshop Dinner

Tuesday, December 9, 2014 7:00 PM (2 hours)