Advancing the Understanding of Non-Perturbative QCD Using Energy Flows

Report of Contributions

https://indico.bnl.gov/e/CFNS-np-QCD

Contribution ID: **1** Type: **not specified**

Unveiling Nucleon 3D Chiral-Odd Structure with Jet Axes

We reinterpret jet clustering as an axis-finding procedure which, along with the proton beam, defines the virtual-photon transverse momentum q_T in deep inelastic scattering (DIS). In this way, we are able to probe the nucleon intrinsic structure using jet axes in a fully inclusive manner, similar to the Drell-Yan process. We present the complete list of azimuthal asymmetries and the associated factorization formulae at leading power for deep-inelastic scattering of a nucleon. The factorization formulae involve both the conventional time-reversal-even (T-even) jet function and the T-odd one, which have access to all transverse-momentum-dependent parton distribution functions (TMD PDFs) at leading twist. Since the factorization holds as long as $q_T \ll Q$, where Q is the photon virtuality, the jet-axis probe into the nucleon structure should be feasible for machines with relatively low energies such as the Electron-Ion Collider in China (EicC). We show that, within the winner-take-all (WTA) axis-finding scheme, the coupling between the T-odd jet function and the quark transversity or the Boer-Mulders function could induce sizable azimuthal asymmetries at the EicC, the EIC and HERA. We also give predictions for the azimuthal asymmetry of back-to-back dijet production in e^+e^- annihilation at Belle and other energies.

Primary authors: LAI, Wai Kin (University of California, Los Angeles); XING, Hongxi (South China Normal University); LIU, xiaohui; WANG, Manman (Beijing Normal University)

Presenter: LAI, Wai Kin (University of California, Los Angeles)

Session Classification: Initial State & Spin Physics

Contribution ID: **2** Type: **not specified**

Measurement of Event Shape Observables with H1 at HERA

Event shape observables are inclusive observables that probe QCD at a variety of scales. In particular, they provide a theoretically well-controlled and improvable window into the evolution of jets. In this talk, recent high Q^2 event shape measurements by the H1 collaboration will be presented. These results include a triple-differential measurement of the 1-Jettiness event shape observable, as well as the first measurement of groomed event shapes. Variation of grooming parameters and comparison to ungroomed measurements enable a systematic study of the interplay between the perturbative and non-perturbative regimes in jets. Additionally, the H1 measurements are compared to several predictions from MC event generators, as well as analytic calculations.

Primary authors: BRITZGER, Daniel (Max-Planck-Institut für Physik München); KLEST, Henry (Stony Brook University)

Presenter: KLEST, Henry (Stony Brook University)

Session Classification: EIC

Contribution ID: **3** Type: **not specified**

Energy Correlators for massive parton fragmentation

Many searches for New Physics and precision measurements in QCD involve the study of jet substructure for final state hadrons. While traditionally the state of the art for studying jets at particle colliders have been event shape observables, recently it has been better understood that measuring correlation functions of energy flow operators inside a jet is in fact a very powerful tool for phenomenology which also naturally stems from first principles of quantum field theory. In many cases this makes it possible to take advantage of certain useful symmetries from the theory. In this work we study the energy-energy correlators for charm and bottom quark fragmentation, extending studies on massless QCD jets. The presence of the mass introduces an additional scale, which is detected by the correlator, providing a clean manifestation of the dead cone effect. We compute the heavy-quark jet function and present a factorization formula for the process, which we use to perform a next-to-leading-log resummation of the large logarithms.
Our extension of energy correlators to heavy flavor opens many opportunities for precision studies of fragmentation with jet substructure.

Primary authors: MEÇAJ, Bianka (Yale University); MOULT, Ian (Yale University); LEE, Kyle (LBNL)

Presenter: MEÇAJ, Bianka (Yale University)

Session Classification: Jet substructure

Contribution ID: **4** Type: **not specified**

Latest techniques in studying both perturbative and non-perturbative physics with jets at colliders

Monday, September 19, 2022 9:30 AM (1 hour)

45+15

Presenter: HAVENER, LAURA (Columbia University)

Session Classification: Jet substructure

Contribution ID: **5** Type: **not specified**

npQCD effects in HERWIG and event generators

Presenter: Dr PLÄTZER, Simon

Session Classification: Jet substructure

Contribution ID: **6** Type: **not specified**

Novel formation time observables in jets to study hadronization

Monday, September 19, 2022 11:25 AM (40 minutes)

Presenter: MONDAL, Mriganka Mouli (Stony Brook University)

Session Classification: Jet substructure

Contribution ID: **7** Type: **not specified**

Latest techniques in studying both perturbative and non-perturbative physics with jets at colliders

45+15

Presenter: HAVENER, LAURA (Columbia University)

Session Classification: Jet substructure

Contribution ID: **8** Type: **not specified**

Flash Talk - 1

Session Classification: Jet substructure

Contribution ID: **9** Type: **not specified**

Measurements of pQCD and npQCD within jets at RHIC

Monday, September 19, 2022 3:15 PM (40 minutes)

Presenter: MOONEY, Isaac

Session Classification: Jet substructure

Contribution ID: **10** Type: **not specified**

Jet substructure from archival data

Monday, September 19, 2022 10:45 AM (40 minutes)

Presenter: CHEN, Yi (MIT)

Session Classification: Jet substructure

Contribution ID: **11** Type: **not specified**

Discussion Session

Monday, September 19, 2022 4:35 PM (45 minutes)

Presenter: Prof. KUNNAWALKAM ELAYAVALLI, Raghav (Vanderbilt University)

Session Classification: Jet substructure

Contribution ID: **12** Type: **not specified**

Intro talk

Tuesday, September 20, 2022 9:30 AM (1 hour)

Presenter: RAPP, Ralf (Texas A&M University)

Session Classification: Heavy Flavor

Contribution ID: **13** Type: **not specified**

Non-perturbative effects in event generators including Herwig

Tuesday, September 20, 2022 10:45 AM (40 minutes)

Presenter: PLÄTZER, Simon

Session Classification: Heavy Flavor

Contribution ID: **14** Type: **not specified**

non-perturbative nature of QCD via heavy quark dynamics in the AA, pA and eA collisions

Tuesday, September 20, 2022 11:25 AM (40 minutes)

Presenter: YAO, Xiaojun (Massachusetts Institute of Technology)

Session Classification: Heavy Flavor

Contribution ID: **15** Type: **not specified**

Constraining QGP evolution through hard probes

Tuesday, September 20, 2022 2:00 PM (30 minutes)

Presenter: DJORDJEVIC, Magdalena (Institute of Physics Belgrade)

Session Classification: Heavy Flavor

Contribution ID: **16** Type: **not specified**

noval experimental measurements of heavy flavor resonances and its applications.

Tuesday, September 20, 2022 3:15 PM (40 minutes)

Presenter: WANG, Jing

Session Classification: Heavy Flavor

Contribution ID: **17** Type: **not specified**

state of the art and future detectors related to experimental probes of heavy flavor hadronization

Tuesday, September 20, 2022 3:55 PM (40 minutes)

Presenter: LI, Xuan (Los Alamos National Laboratory)

Session Classification: Heavy Flavor

Contribution ID: **18** Type: **not specified**

Discussion Session

Tuesday, September 20, 2022 4:35 PM (45 minutes)

Session Classification: Heavy Flavor

Contribution ID: **19** Type: **not specified**

Jet physics view of hadron structure.

Wednesday, September 21, 2022 9:30 AM (1 hour)

Presenter: WEISS, Christian (Jefferson Lab)

Session Classification: Initial State & Spin Physics

Contribution ID: **20** Type: **not specified**

recent measurements on saturation physics and implications for the future EIC measurements

Wednesday, September 21, 2022 10:45 AM (40 minutes)

Presenter: CHU, Xiaoxuan (BNL)

Session Classification: Initial State & Spin Physics

Contribution ID: **21** Type: **not specified**

Studying NP dynamics inside proton and hadronization in pp collisions at RHIC and LHC energy and path towards EIC

Wednesday, September 21, 2022 11:25 AM (40 minutes)

Presenter: LEE, Sook Hyun (University of Michigan, Ann Arbor)

Session Classification: Initial State & Spin Physics

Contribution ID: **22** Type: **not specified**

Unveiling Nucleon 3D Chiral-Odd Structure with Jet Axes

Wednesday, September 21, 2022 2:30 PM (15 minutes)

Presenters: LAI, Wai Kin (University of California, Los Angeles); LAI, Wai Kin (University of California, Los Angeles)

Session Classification: Initial State & Spin Physics

Contribution ID: **23** Type: **not specified**

Recent work on quantum entanglement in hadronization

Wednesday, September 21, 2022 3:15 PM (40 minutes)

Presenter: TU, Zhoudunming (BNL)

Session Classification: Initial State & Spin Physics

Contribution ID: **24** Type: **not specified**

Hadronization studies in BELLE

Wednesday, September 21, 2022 3:55 PM (40 minutes)

Presenter: VOSSEN, Anselm (Duke University)

Session Classification: Initial State & Spin Physics

Contribution ID: **25** Type: **not specified**

Discussion Session

Wednesday, September 21, 2022 4:35 PM (45 minutes)

Session Classification: Initial State & Spin Physics

Contribution ID: **26** Type: **not specified**

Proton internal structure

Thursday, September 22, 2022 9:30 AM (40 minutes)

Presenter: SATO, nobuo (Jefferson Lab)

Session Classification: EIC

Contribution ID: **27** Type: **not specified**

opinion talk

Session Classification: EIC

Contribution ID: **28** Type: **not specified**

Discussion session

Thursday, September 22, 2022 11:00 AM (1 hour)

Session Classification: EIC

Contribution ID: **29** Type: **not specified**

Flash Talks

Session Classification: EIC

Contribution ID: **30** Type: **not specified**

opinion talk

Session Classification: EIC

Contribution ID: **31** Type: **not specified**

opinion talk

Session Classification: EIC

Contribution ID: **32** Type: **not specified**

Discussion Session

Session Classification: EIC

Contribution ID: **33** Type: **not specified**

Flash Talk - 2

Session Classification: Jet substructure

Contribution ID: **34** Type: **not specified**

Energy Correlators for massive parton fragmentation

Monday, September 19, 2022 2:30 PM (15 minutes)

Presenter: MEÇAJ, Bianka (Yale University)

Session Classification: Jet substructure

Contribution ID: **35** Type: **not specified**

Non-Perturbative Study of Isospin Symmetry Breaking

Tuesday, September 20, 2022 2:30 PM (15 minutes)

Presenter: Prof. NASSER TAWFIK, Abdel (Futuer University in Egypt FUE)

Session Classification: Heavy Flavor

Contribution ID: **36** Type: **not specified**

Measurement of Event Shape Observables with H1 at HERA

Wednesday, September 21, 2022 2:45 PM (15 minutes)

Presenter: KLEST, Henry (Stony Brook University)

Session Classification: Initial State & Spin Physics

Contribution ID: **37** Type: **not specified**

PYTHIA Simulation of Energy Correlators within jets in p + p Collisions at $\sqrt{s}$ = 200 GeV

Monday, September 19, 2022 2:00 PM (15 minutes)

Presenter: TAMIS, Andrew (Yale University)

Session Classification: Jet substructure

Contribution ID: **38** Type: **not specified**

Jet acoplanarity in vacuum at RHIC to EIC

Monday, September 19, 2022 2:15 PM (15 minutes)

Presenter: SAHOO, Nihar (Texas A&M University)

Session Classification: Jet substructure

Contribution ID: **39** Type: **not specified**

Jets with a 2nd detector at EIC

Thursday, September 22, 2022 10:10 AM (40 minutes)

Presenter: HYDE, Charles (Old Dominion University)

Session Classification: EIC

Contribution ID: **40** Type: **not specified**

Investigation of beauty hadronization universality from vacuum to QGP

Tuesday, September 20, 2022 2:45 PM (15 minutes)

Presenter: SHI, Zhaozhong (Los Alamos National Laboratory)

Session Classification: Heavy Flavor

Contribution ID: **41** Type: **not specified**

Resolving the Scales of the Quark-Gluon Plasma with Energy Correlators

Monday, September 19, 2022 2:45 PM (15 minutes)

Presenter: Dr HOLGUIN, Jack (Ecole Polytechnique)

Session Classification: Jet substructure

Contribution ID: **42** Type: **not specified**

Production of HF hadrons and npQCD at RHIC

Monday, September 19, 2022 3:55 PM (40 minutes)

Presenter: RADHAKRISHNAN, Sooraj (Kent State University/Lawrence Berkeley National Laboratory)

Session Classification: Jet substructure

Contribution ID: **43** Type: **not specified**

Dissecting groomed soft radiation with factorization

Wednesday, September 21, 2022 2:00 PM (15 minutes)

Presenters: PATHAK, Aditya (University of Manchester); LEE, Kyle (LBNL)

Session Classification: Initial State & Spin Physics

Contribution ID: **44** Type: **not specified**

On sum rules for double and triple parton distribution functions and Pythia's model of multiple parton interactions

Wednesday, September 21, 2022 2:15 PM (15 minutes)

Presenter: FEDKEVYCH, Oleh (University of Genoa and INFN - National Institute for Nuclear Physics (sezione di Genova))

Session Classification: Initial State & Spin Physics

Contribution ID: **45** Type: **not specified**

Morning Session Recording

Monday, September 19, 2022 5:35 PM (20 minutes)

Contribution ID: **46** Type: **not specified**

Afternoon Session Recording

Monday, September 19, 2022 5:55 PM (20 minutes)

Contribution ID: **47** Type: **not specified**

Recording

Tuesday, September 20, 2022 5:20 PM (20 minutes)

Contribution ID: **48** Type: **not specified**

Day 4 Recording

Thursday, September 22, 2022 1:30 PM (20 minutes)

Contribution ID: **49** Type: **not specified**

Day 3 Morning Recording

Wednesday, September 21, 2022 5:20 PM (20 minutes)

Contribution ID: **50** Type: **not specified**

Day 3 Afternoon Recording

Wednesday, September 21, 2022 5:40 PM (20 minutes)