

Double Parton Scattering: from LHC to EIC

Thursday 14 December 2023 18:00 (25 minutes)

Abstract

In this talk we discuss how multi parton interactions (MPI), usually studied in hadron-hadron collisions, e.g. at the LHC, could be observed also at the future Electron Ion Collider (EIC). As we will show, MPI studies could represent an additional "synergy" between LHC and EIC aimed to investigate the partonic structure of hadrons. Our first analysis [3] has been inspired by the study of the four-jets photo-production cross-section at HERA by the ZEUS collaboration. They address the relevance of the role of MPI in the measured cross-section. Therefore, the main focus of the talk will be the calculation of the double parton scattering (DPS) contribution to the cross-section of this electromagnetic process. Our results are in qualitative agreement with the main outcomes of the ZEUS collaboration, i.e. the DPS mechanism is not negligible. Let us remark that the main motivation of this work is the unique chance to access novel information on the proton and nucleus structure, complementary to those encoded in GPDs or TMDs. For example, from DPS initiated by photon-proton interactions, one could extract, for the first time, the mean transverse distance between two partons inside the nucleon [3]. Hopefully, it will be also possible to get some information on the so-called double parton distributions entering the cross-section of the process. These quantities encode details on the role of parton-parton correlations. Finally, we present preliminary results of our recent activity devoted to the study of double J/ψ quarkonium photo-production at the EIC along the lines of Refs. [3, 4, 5, 6, 7, 8, 9]. In particular, we discuss how the quarkonium-pair photo-production probes, in different kinematical domains, can unveil new interesting information on the hadronic structure of the photon too. All these novelties could be accessible at the future EIC.

References

- [1] M. Rinaldi and F. A. Ceccopieri, JHEP 1909, 097 (2019)
- [2] M. Rinaldi and F. A. Ceccopieri, Phys. Rev. D 97, no. 7, 071501 (2018)
- [3] F. A. Ceccopieri and M. Rinaldi, Phys. Rev. D 105 (2022) no.1, L011501
- [4] J. P. Lansberg, H. S. Shao, N. Yamanaka, Y. J. Zhang and C. Noûs, Phys. Lett. B 807 (2020), 135559
- [5] J. P. Lansberg, Phys. Rept. 889 (2020), 1-106 [arXiv:1903.09185 [hep-ph]].
- [6] J. P. Lansberg, H. S. Shao, N. Yamanaka and Y. J. Zhang, Eur. Phys. J. C 79 (2019) no.12, 1006 [arXiv:1906.10049 [hep-ph]].
- [7] H. S. Shao and Y. J. Zhang, Phys. Rev. Lett. 117 (2016) no.6, 062001
- [8] J. P. Lansberg and H. S. Shao, Nucl. Phys. B 900 (2015), 273-294
- [9] J. P. Lansberg and H. S. Shao, doi:10.1016/j.physletb.2015.10.083

Primary authors: Dr CECCOPIERI, Federico Alberto; Prof. SHAO, Hua-Sheng; LANSBERG, Jean-Philippe (IPN Orsay - Paris Sud U. - CNRS/IN2P3); RINALDI, Matteo (Perugia University and INFN, sezione di Perugia); Prof. SANGEM, Rajesh

Presenter: RINALDI, Matteo (Perugia University and INFN, sezione di Perugia)

Session Classification: Synergies in physics from HERA to LHC to EIC