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Transverse partonic proton structure via double parton scattering at the LHC

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Here we present our studies on the so called double parton distribution functions (dPDFs) and transverse proton structure. Double PDFs appear in the double parton scattering (DPS) cross section in high energy proton-proton and proton nucleus collisions. These new distributions represent a novel and promising complementary tool, w.r.t. TMDs and GPDs, to access the 3D partonic structure of the proton. In fact, dPDFs encode double parton correlations in hadrons which cannot be accessed through, e.g., GPDs. However, up to date, dPDFs are almost unknown, in particular, in its dependence on the transverse distance of partons. In this scenario we consider model calculations in order to investigate the impact of double correlations in dPDFs. We considered a fully relativistic treatment by using the Light-Front approach [1]. In this framework, we showed how dynamical
correlations, induced by the used model, prevent the factorisation of dPDFs in terms of standard PDFs, a common assumption in experimental analyses. We focus our attention also in correlations induced by relativistic effects [2]. However, since dPDFs cannot be directly observed in DPS, we investigated the impact of double correlations effects in the so called effective cross section, σ_{eff}, an essential experimental ingredient for the comprehension of the role of DPS in proton-proton collisions. To this aim, dPDFs have been evolved at the experimental momentum scales through the pQCD evolution procedure. We show how the x dependence of σ_{eff}, being x the longitudinal momentum fraction carried by a parton inside the hadron, can be interpreted as the cleanest evidence of partonic correlations [3]. We have also calculated the DPS cross section for the same sign W pair production process, a golden channel to observe DPS at the LHC. In this analysis, as non perturbative input, dPDFs, evaluated within a constituent quark model, have been used. We showed that partonic correlations could be observed in next LHC run [4]. Furthermore, since indications on the magnitudo of σ_{eff} are available, we also demonstrated how the mean value of σ_{eff} can be related to the mean partonic distance between two parton active in a DPS process [5,6]. Such a procedure allows to link the mean value of an experimental observable to the transverse proton structure.

References

[1] M. Rinaldi et al PRD 87, 114021 (2013); M. Rinaldi et al JHEP 12, 028 (2015); M. Rinaldi et al JHEP 10, 063 (2016) and M. Rinaldi et al PRD 95, 034040 (2017).
[2] M. Rinaldi and F. A. Ceccopieri, Phys. Rev. D 95, no. 3, 034040 (2017)
[3] M. Rinaldi et al PLB 752,40 (2016) and M. Traini et al PLB 768, 270 (2017)
[4] F. A. Ceccopieri et al PRD 95, 114030 (2017).
[5] M. Rinaldi et al, PRD 97, 071501 (2018).
[6] M. Rinaldi and F. A. Ceccopieri, JHEP 09, 097 (2019).

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