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Impact of dijet and D-meson data from 5.02 TeV p+Pb collisions on nuclear PDFs

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Based on Refs. [1] and [2], we discuss the new constraints on gluon parton distribution function (PDF) in lead nucleus, derivable with the Hessian PDF reweighting method from the 5.02 TeV p+Pb measurements of CMS dijet [3] and LHCb D^0-meson [4] nuclear modification ratios. The impact is found to be significant, placing stringent constraints in the mid- and previously unconstrained small-x regions. The CMS dijet data confirm the existence of gluon anti-shadowing and onsetting of small-x shadowing, as well as reduce the gluon PDF uncertainties in the larger-x region. The gluon constraints from the LHCb D^0 data, reaching down to $x \sim 10^{-5}$ and derived for the first time in a fully NLO perturbative QCD based approach, provide a remarkable reduction in the small-x uncertainties with a strong direct evidence of gluon shadowing. Furthermore, we find a good description of the data even down to zero transverse momentum of the produced D^0-meson within a purely DGLAP-based approach without the need of imposing any non-linear effects. Importantly, the constraints obtained from the dijet and D^0 data are mutually fully consistent, supporting the universality of nuclear PDFs in hard-scattering processes.

[1] K.J. Eskola, P. Paakkinen, H. Paukkunen, Eur. Phys. J. C79 (2019) 511
[2] K.J. Eskola, I. Helenius, P. Paakkinen, H. Paukkunen, arXiv:1906.02512 [hep-ph]
[3] CMS Collaboration, JHEP 10 (2017) 090
[4] LHCb Collaboration, Phys. Rev. Lett. 121 (2018) 062002

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