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Nuclear suppression in inelastic nucleon-nucleon cross section

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In high-energy heavy-ion collisions the standard procedure to turn the measured hard-process yields into centrality dependent cross sections is to use normalization factors calculated with the Monte-Carlo Glauber model. Canonically it is assumed that a necessary input, the inelastic nucleon-nucleon cross section, is unmodified wrt. the measured cross section in proton-proton collisions. At the LHC energies particle production is, however, dominated by the small-x region where nuclear suppression due to shadowing or saturation phenomena is expected. In this talk we elaborate this idea by using the recent Run 2 ATLAS data for electro-weak boson production in lead-lead collisions. Using the state-of-the art NNLO calculations we turn the canonical approach around and use the minimum-bias Z and W boson production measurements to obtain the normalization factors preferred by the data. Through Monte-Carlo Glauber simulations we find that the data prefer a significantly suppressed value for the inelastic nucleon-nucleon cross section, $41.5^{+16.2}_{-12.0}$ mb instead of the nominal 70 ± 5 mb. Furthermore, using the obtained value, the unexpected rise of Z and W boson nuclear modification ratios towards more peripheral collisions is tamed and the data become compatible with a flat behaviour or even hint of a mild decrease. Also, we demonstrate that the obtained suppression is in line with an eikonal minijet model including nuclear shadowing.

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