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Measurements of nuclear parton distribution functions using dijets, forward jets, and photo-nuclear jets at the CMS detector & prospects for measurements in Run III

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Measurements of dijet production and photo-nuclear interactions in heavy-ion collisions probe several nuclear mechanisms. In particular, dijet measurements in pPb collisions have been shown to be one of the most important tools for constraining the gluon nuclear parton distribution functions (PDFs) at large Bjorken- x . Dijet production in pp and pPb collisions at a nucleon-nucleon centre-of-mass energy of 5.02 TeV is reported with the data samples collected with the Compact Muon Solenoid detector at the Large Hadron Collider. The dijet pseudorapidity distributions are measured as a function of dijet average transverse momentum in order to study the nuclear modifications of PDFs at various factorization scales. The final results from pp and pPb data samples are compared with next-to-leading-order perturbative QCD predictions obtained from both nucleon and nuclear PDFs. A significant modification of dijet pseudorapidity distributions in pPb collisions with respect to the measured pp reference is observed which indicates that the gluon PDF in lead ions is modified and the results are incompatible with predictions with DSSZ PDF without gluon EMC effects. Photo-nuclear jets are also measured in pp and pPb collision systems. The yield and angular correlation of low- p_T jets at forward rapidity, $5.0 < |\eta| < 6.5$, are studied using the CASTOR calorimeter, which is sensitive to PDFs at low values of x and Q^2 . The prospects of future measurements of forward and ultra-peripheral jets in various collision systems as well as dijet production in pPb at 8.16 TeV and in Run III will also be discussed.

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