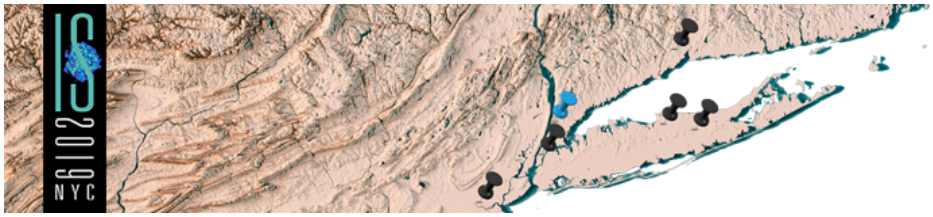

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Studies of the top quark production in nuclear collisions and impact on nuclear PDFs in CMS

Tuesday, June 25, 2019 4:10 PM (1 minute)

In proton-nucleus collisions, the top quark is a novel and theoretically precise probe of the nuclear gluon density at high virtualities $Q^2 \approx m_{\mathrm{top}}$ and in the less explored high Bjorken-x region. The first observation of the inclusive $\mathrm{t\bar{t}}$ production has been performed using 174 ± 6 nb^{-1} of data in pPb collisions at $\sqrt{s_{\mathrm{NN}}} = 8.16$ TeV. However, the total uncertainty of about 17% is not sufficient for imposing constraints on current nPDF parameterizations, the dominant source of uncertainty in the theoretical prediction of $\sigma(\mathrm{pPb} \to \mathrm{t\bar{t}} + X)$. The prospects of measuring σ differentially have recently been examined and a feasibility study of the measurement with the CMS detector at the High-Luminosity LHC (HL-LHC) era is therefore carried out as a function of the reconstructed lepton p_{T} and rapidity. The relative statistical uncertainty in both variables is found to be at the level of 4−5% in each bin, and it is expected to be the dominant uncertainty at $\sqrt{s_{\mathrm{NN}}} = 8.16$ TeV for an integrated luminosity scenario of 2 pb^{-1}. The motivations for measurements of top quarks in nucleus-nucleus collisions are multifold and are discussed: the top quark decay products are sensitive to the energy loss of heavy quarks, and a probe of the space-time structure of the QGP at HL-LHC.

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