Contribution ID: **109**   Type: **Oral presentation**

Modeling the Impact Parameter Dependence of the nPDFs With EKS98 and EPS09 Global Fits

Thursday, 31 May 2012 17:30 (20 minutes)

The knowledge of the parton distribution functions (PDFs) is essential for interpreting any hard-process results from hadronic and nuclear collisions. The nuclear modifications of PDFs have been successfully determined through a global DGLAP analysis e.g. in the sets EKS98 and more recently EPS09. So far the nuclear PDFs (nPDFs) in the global fits have been taken to be spatially independent. However, it can be expected that the nuclear modifications vary when going from the dense center of a nucleus to its more dilute edge. In this work, using the A-dependence of the globally fitted nPDFs, we have been able to determine the spatial dependence of the nPDFs in terms of powers of the nuclear thickness functions. A routine for public use is released. For applications, we will discuss how one can then compute hard-process cross sections in different centrality classes of nuclear collisions. In particular, we consider the nuclear modification factor R_{dAu} for neutral pion production in deuteron-gold collisions at RHIC. Comparison with the PHENIX data in different centrality classes is also shown. In addition, predictions for the corresponding nuclear modification factor R_{pPb} in proton-lead collisions at the LHC are discussed. Both leading-order and next-to-leading order results are considered.

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Session Classification: Parallel VC: Initial state and pA