

## The 182nd HENPIC seminar by Dr. Wenbin Zhao

Title: Accessing structure of protons and nuclei at small  $x$  at the Electron-Ion Collider

Abstract: Determining the structure of protons and nuclei at high energy is one of central goals of the heavy-ion collisions and the future Electron-Ion Collider (EIC). To extract the proton shape fluctuations from HERA exclusive vector meson production data, we apply Bayesian inference and determine probabilistic constraints on the parameters describing the fluctuating structure of protons at high energy. We employ the color glass condensate framework, supplemented with a model for the spatial structure of the proton, along with experimental data from the ZEUS and H1 Collaborations on coherent and incoherent diffractive vector meson production in  $e+p$  collisions at HERA. We find out that this experimental data constrains most model parameters well. We also demonstrate that the complementary constraints can be obtained from hydrodynamic simulations of Pb+Pb collisions at the LHC.

For electron+nucleus collisions, we find out that the average nuclear geometric deformations and fluctuations affect diffractive vector meson productions, especially for the incoherent cross sections at small  $|t|$ . Also, the JIMWLK evolution doesn't wash out this effects. We systematically study the deformations effects of Uranium (U), Oxygen-16 ( $^{16}O$ ), and Neon ( $^{20}Ne$ ) on the diffractive  $J/\Psi$  productions. Our work demonstrate that the future EIC diffractive data can provide direct information on the nuclear structure at small  $x$  and the complementary constraints for the nuclear geometric shape for the traditional hydrodynamic models.

### Summary