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## Resolving the $R_{pA}$ and $v_2$ puzzle of $D^0$ mesons in $p - Pb$ collisions

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It has been a challenge to understand the experimental data on both the nuclear modification factor and elliptic flow of  $D^0$  mesons in  $p-Pb$  collisions at LHC energies. In this work<sup>[1]</sup>, we study these observables with an improved multi-phase transport model. After including the Cronin effect (or transverse momentum broadening) and independent fragmentation for charm quarks, we provide the first simultaneous description of the  $D^0$  meson  $R_{pA}$  and  $v_2$  data at  $p_T \leq 8$  GeV/c. The model also provides a reasonable description of the  $D^0$  meson  $p_T$  spectra and the low- $p_T$  (below  $\sim 1.5$  GeV/c) charged hadron spectra,  $R_{pA}$  and  $v_2$ . We find that both parton scatterings and the Cronin effect are important for the  $D^0$  meson  $R_{pA}$ , while parton scatterings are mostly responsible for the  $D^0$  meson  $v_2$ . Therefore, it is crucial to include the Cronin effect for the simultaneous description of the  $D^0$  meson  $R_{pA}$  and  $v_2$ . Since the Cronin effect is expected to grow with the system size, this work also implies that it could be important for heavy hadrons in large systems.

### Experiment/Theory

Theory/Phenomenology

### Affiliation

<sup>1</sup>Department of Physics, East Carolina University, Greenville, North Carolina 27858, USA

<sup>2</sup>China University of Geosciences, Wuhan 430074, China

<sup>3</sup>Key Laboratory of Quark & Lepton Physics (MOE) and Institute of Particle Physics, Central China Normal University, Wuhan 430079, China

**Hauptautor:** Dr. LIN, Zi-Wei

**Co-Autoren:** Dr. ZHENG, Liang; Dr. SHI, Shusu; ZHANG, Chao

**Vortragende(r):** Dr. LIN, Zi-Wei

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