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Discovering partonic rescattering in light nucleus collisions

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Medium induced parton energy loss is not conclusively established neither in very peripheral heavy-ion collisions nor in proton-ion collisions. However, the standard interpretation of azimuthal momentum anisotropies in theses systems implies some partonic rescattering. The upcoming light-ion runs at the LHC provide a unique opportunity to search for parton energy loss in different systems of similar size. We demonstrate that oxygen-oxygen (OO) collisions at the LHC provide unprecedented sensitivity to parton energy loss in a system whose size is comparable to those created in very peripheral heavy-ion collisions. With leading and next-to-leading order calculations of nuclear modification factors, we show that the baseline in the absence of partonic rescattering is known with up to 2% theoretical accuracy in inclusive OO collisions. Surprisingly, a Z-boson normalized nuclear modification factor does not lead to higher theoretical accuracy within current uncertainties of nuclear parton distribution functions. We study a broad range of parton energy loss models and we find that the expected signal of partonic rescattering can be disentangled from the baseline by measuring charged hadron spectra in the range $20\,\text{GeV} < p_T < 100\,\text{GeV}$.

Refs.: A. Huss, A. Kurkela, A. Mazeliauskas, R. Paatelainen, W. van der Schee, U.A. Wiedemann [arXiv:2007.13754, 2007.13758]

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