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Physics opportunities from nuclear structure studies with high-energy nuclear collisions

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Hydrodynamic simulations of the quark-gluon plasma (QGP) permit us not only to gauge the transport properties of hot QCD matter from data, but also to constrain the conditions that set the stage for the formation of such matter. Recent measurements from RHIC and LHC demonstrate that the QGP initial condition is impacted by the shape and radial structure of the colliding nuclei. Based on a recent community white paper [1], we discuss physics opportunities for nuclear structure and QGP studies offered by high-energy nuclear collisions, with an emphasis on i) \textit{isobar collisions}, offering clean access to the structural properties of the colliding ions, as well as ii) collisions of bowling-pin-shaped 20Ne isotopes as a means to complement and broaden the hot QCD program envisaged via 16O+16O collisions. We argue that future experiments involving selected ion species will open new exciting directions of interdisciplinary research in nuclear science. Recent updates from the INT program [2] dedicated to this topic will also be covered.

[1] B. Bally \textit{et al.} "Imaging the initial condition of heavy-ion collisions and nuclear structure across the nuclide chart," [arXiv:2209.11042 [nucl-ex]].

[2] "Intersection of nuclear structure and high-energy nuclear collisions", 01/23/2023-02/24/2023, https://www.int.washington.edu/program and-workshops/23-1a

Category

Theory

Collaboration (if applicable)

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