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Imaging nuclei with relativistic ion collisions

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The geometry of an ultra-relativistic heavy-ion collision is shaped by interactions of nucleons within the colliding nuclei, whose spatial coordinates are “frozen” during the ultra-short time duration of the collision process. As the quark-gluon plasma created in the collision expands hydrodynamically to the final state, the details of the spatial distribution of these nucleons and their correlations (clustering, deformations, skin diffuseness) leave specific imprints in the the collective flow of the produced hadrons, becoming thus accessible experimentally from established multi-particle correlation measurement techniques. In this contribution, I review the progress made in the use and the understanding of this method for imaging nuclear ground states. I discuss recent efforts aimed at the quantitative extractions of fundamental properties of nuclei from collider data, and what prospects lie ahead for this new frontier in nuclear research.

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