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A new pathway to probe the structure of nuclei from heavy to light

Sunday, 26 October 2025 11:00 (20 minutes)

The shape and orientation of colliding nuclei play a crucial role in determining the initial conditions of the quark-gluon plasma (QGP), which influence key observables such as anisotropic and radial flow. In this talk, we present the measurements of v_n, p_{T} fluctuation, and $v_n - p_{\mathrm{T}}$ correlations in isobar-like ^{238}U+^{238}U and ^{197}Au+^{197}Au collisions at $\sqrt{s_{\mathrm{NN}}} = 193$ and 200 GeV, respectively. Our results reveal prominent differences in these observables between the two systems, particularly in the most central collisions. Comparisons with hydrodynamic model calculations indicate a large quadrupole and octupole deformation in the ground states of ^{238}U nuclei, consistent with low-energy experiments. However, data also imply a small deviation from axial symmetry [1,2,3]. We also present the first measurements of v_n in ^{16}O+^{16}O collisions [4,5], providing insight into the impact of nucleon-nucleon correlations and further shedding light on the initial conditions of QGP droplets.

[1] STAR Collaboration, Nature 635, 67-72 (2024)
[2] STAR Collaboration, arXiv:2506.17785, Under ROPP review
[3] C. Zhang, J. Jia, J. Chen, C. Shen, L. Liu, arXiv:2504.15245
[4] STAR Collaboration, In preparation
[5] C. Zhang, J. Chen, G. Giacalone, S. Huang, J. Jia, Y.-G. Ma, PLB862, 139322(2025)

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