Exploring the deformation of nuclei with correlation between anisotropic flow and transverse momentum from STAR

Shengli Huang (for STAR Collaboration), Stony Brook University

In the relativistic heavy-ion collisions the mean transverse momentum ($[p_T]$) and anisotropic flow (v_n, n=2,3) have been found to be tightly correlated with the size and initial geometry eccentricity of the produced fireball, respectively. It provides a novel tool to image the deformation of the atomic nuclei at extremely short time scale ($< 10^{-24}$s).

In this talk, we present measurements of correlations between v_n and $[p_T]$ by using the Pearson correlation coefficient ($\rho(v_n\{2\}^2, [p_T])$) as a function of multiplicity in Au+Au and U+U collisions at top RHIC energy. Unlike in Au+Au collisions, a sign-change behavior has been found for $\rho(v_2\{2\}^2, [p_T])$ in central U+U collisions due to nuclei deformations. While $\rho(v_3\{2\}^2, [p_T])$ has been found to be similar between two collision systems. Comparing with several model calculations in the ultra-central regions, such measurements will help us to constrain the quadrupole deformation parameter (β_2) of the atomic nuclei.