Contribution ID: **13** Type: **Oral report**

Exploring the Nuclear Shape Phase Transition in Ultra-Relativistic Xe+Xe Collisions at the LHC

Thursday, 15 August 2024 17:45 (15 minutes)

The shape phase transition for certain isotope or isotone chains, associated with the quantum phase transition of finite nuclei, is an intriguing phenomenon in nuclear physics. A notable case is the Xe isotope chain, where the structure transits from a γ-soft rotor to a spherical vibrator, with the second-order shape phase transition occurring in the vicinity of $^{128-130}$Xe. In this work, we focus on investigating the γ-soft deformation of ^{129}Xe associated with the second-order shape phase transition by constructing novel correlators for ultra-relativistic ^{129}Xe+^{129}Xe collisions. In particular, our iEBE-VISHNU model calculations show that the $v_2^2-[p_T]$ correlation ρ_2 and the mean transverse momentum fluctuation Γ_{p_T}, which were previously interpreted as the evidence for the rigid triaxial deformation of ^{129}Xe, can also be well explained by the γ-soft deformation of ^{129}Xe. We also propose two novel correlators $\rho_{4,2}$ and $\rho_{2,4}$, which carry non-trivial higher-order correlations and show unique capabilities to distinguish between the γ-soft and the rigid triaxial deformation of ^{129}Xe in ^{129}Xe+^{129}Xe collisions at the LHC. The present study also provides a novel way to explore the second-order shape phase transition of finite nuclei with ultra-relativistic heavy ion collisions.

Primary authors: ZHAO, Shujun (Peking University); XU, Haojie (Huzhou University); ZHOU, You (Niels Bohr Institute); LIU, Yuxin (PKU); 宋, 慧超 (Peking University)

Presenter: ZHAO, Shujun (Peking University)

Session Classification: 分会场三

Track Classification: 重离子物理