Contribution ID: **1012** Type: **Poster**

An Advanced Framework for Higher Order Cumulants of Transverse Momentum and Azimuthal Angle Correlations

When the Quark Gluon Plasma (QGP) forms during high-energy collisions, the dimensions of the produced droplet are dependent on the overlap region of the colliding nuclei, enabling the QGP to encode information about the initial conditions of nuclear collisions and even the structure of the colliding nuclei. The system of particles produced in the final state exhibit collective behavior, and studying these dynamics can provide unique insight into such initial conditions of the collision. The collective azimuthal flow, quantified as v_n, can be used to study the shape of the overlap region. The mean transverse momentum, $[p_T]$, additionally provides information about the initial size and energy of the system. The joint analysis of these two observables, characterized by the multi-particle cumulant $C(v_n^m, [p_T^k])$, provides further information on the relationship between the initial size and shape, and therefore on the nuclear structure. Thus far, the focus has been on three-particle cumulants of this type, but this has proven limited in recent studies and the need for higher order cumulants has emerged, especially in the case of nuclear isotopes that lie within the region of a potential second-order shape phase transition such as $^{128-132}$Xe. In this poster, the algorithms required to calculate such higher order, multi-particle cumulants between v_n and $[p_T]$ are presented explicitly for the first time, formulated using an advanced framework. The use of these cumulants as a measure of collective dynamics is then demonstrated using the parton transport model for Xe-Xe collisions at the LHC.

Category

Experiment

Collaboration (if applicable)

Primary author: NATHANSON, Nina (University of Copenhagen (DK))

Co-authors: NIELSEN, Emil Gorm (University of Copenhagen (DK)); ZHOU, You (Niels Bohr Institute (DK))

Presenter: NATHANSON, Nina (University of Copenhagen (DK))

Track Classification: Collective dynamics & small systems