Contribution ID: **165** Type: **Oral Presentation**

Single- and Multi-harmonic Flow Fluctuations in Heavy-Ion Collisions

Monday 26 August 2019 12:00 (30 minutes)

According to the widely accepted picture in the heavy-ion community, the observed non-uniform distribution of particles in the final momentum space is a manifestation of the non-uniformities in the initial energy density and the collective evolution of interacting matter. Furthermore, the initial energy density profile fluctuates from one event to the other, and this event-by-event fluctuation leads to a rich statistical structure of flow harmonic fluctuations in the final stage. Up to the present day, only a tiny corner of this statistical structure has been explored. The cumulants of individual flow harmonics have been studied extensively, and only recently the correlations of two different flow harmonics, via the new flow observables called Symmetric Cumulants (SC), have been investigated. Moreover, the fluctuations are mostly considered to be Gaussian while recent studies indicate that the skewness and kurtosis of the fluctuations are nonvanishing and their connection to the cumulants of individual flow harmonics is stablished.

In this talk, we first show how we can go one step further in understanding the flow fluctuations by introducing generalized SCs, the genuine correlation between more than two different flow harmonics. Generalized SCs provide new and independent information for Quark-Gluon Plasma properties, which is inaccessible to other flow observables used by now. Then by employing the iEBE-VISHNU model, we demonstrate the first predictions for the generalized SCs at LHC energies. We also show that they are robust against systematics biases from nonflow effects by exploiting the HIJING event generator. Additionally, we will show how one can connect the non-Gaussianity to the cumulants of the individual flow harmonics systematically. We stress that in interpreting the cumulants as genuine anisotropic flow the fluctuations have to be considered as a Gaussian distribution. For the case the fluctuations are manifestly non-Gaussian, we present a new estimator for the genuine anisotropic flow in terms of cumulants.

Based on:
[1] C. Mordasini, A. Bilandzic, D. Karakoç, S. F. Taghavi, “Higher order Symmetric Cumulants”, [arXiv:1901.06968v2 [nucl-ex]]
[2] H. Mehrabpour and S. F. Taghavi, “Non-Bessel–Gaussianity and flow harmonic fine-splitting”, Eur. Phys. J. C 79, no. 1, 88 (2019) [arXiv:1805.04695 [nucl-th]]

Primary authors: Dr BILANDZI, Ante (Physik Department, Technical University of Munich (TUM), Munich, Germany); Ms MORDASIN, Cindy (Physik Department, Technical University of Munich (TUM), Munich, Germany); Dr TAGHAVI, Seyed Farid (Physik Department, Technical University of Munich (TUM), Munich, Germany)

Co-authors: Mr KARAKOC, Deniz (Physik Department, Technical University of Munich (TUM), Munich, Germany); Mr MEHRABPOUR, Hadi (Department of Physics, Sharif University of Technology, Tehran, Iran)

Presenter: Dr TAGHAVI, Seyed Farid (Physik Department, Technical University of Munich (TUM), Munich, Germany)

Session Classification: Workshop on Heavy Ion Physics