## Probing non-linearity of higher harmonic flow in $\sqrt{s_{_{\rm NN}}} = 2.76$ and 5.02 TeV Pb-Pb collisions

Wednesday 8 February 2017 08:30 (20 minutes)

Theoretical calculations suggest that higher harmonic anisotropic flow vectors are superpositions of contributions from linear and non-linear hydrodynamic response, each reflecting different sensitivities to the fluctuating initial conditions and properties of the hot and dense matter created in heavy ion collisions [1].

In this talk, we present the first measurement on the non-linear hydrodynamic response of higher harmonic flow using multi-particle correlations in Pb-Pb collisions at  $\sqrt{s_{\rm NN}} = 2.76$  and 5.02 TeV.

These measurements can be used to study the relation between the linear and non-linear response in different centrality classes.

In addition, the measured centrality dependence of symmetry plane correlations between lower- and higherorder flow vectors can be adequately explained by contributions from non-linear response.

Furthermore, the results of newly proposed non-linear response coefficients  $\chi_{m,n}$  [1] will be presented. The measurements provide crucial information on freeze-out conditions, which are poorly constrained by previous flow measurements.

Last but not least, the symmetric cumulants, which probe the correlations between different order flow harmonics, are studied in different kinematic regions ( $p_T$  and  $\eta$ ) and include higher harmonics  $v_n$  (n > 3). The derived approximate relation between symmetric cumulants and the symmetry plane correlations are investigated, and this allows a direct test of hydrodynamic behavior of the created matter.

[1] L. Yan and J. Y. Ollitrault, " $\nu_4$ ,  $\nu_5$ ,  $\nu_6$ ,  $\nu_7$ : nonlinear hydrodynamic response versus LHC data", Phys. Lett. B 744, 82 (2015)

## **Preferred Track**

Collective Dynamics

## Collaboration

ALICE

Author: ZHOU, You (Niels Bohr Institute (DK))

Presenter: ZHOU, You (Niels Bohr Institute (DK))

Session Classification: Parallel Session 5.1: Collective Dynamics (I)

Track Classification: Collective Dynamics