

# Quark Matter 2019 - the XXVIIIth International Conference on Ultra-relativistic Nucleus-Nucleus Collisions



Contribution ID: 131

Type: Oral Presentation

## Correlation of flow harmonics and mean transverse momentum in 5.02 TeV $p$ +Pb and Pb+Pb collisions and event-plane dependence of HBT radii in high-multiplicity $p$ +Pb collisions with the ATLAS detector

Wednesday, 6 November 2019 10:20 (20 minutes)

To assess the properties of the quark-gluon plasma formed in heavy ion collisions, correlations between the mean transverse momentum,  $\langle p_T \rangle$ , and the magnitude of the flow harmonics,  $v_n$ , are measured by the ATLAS experiment at the LHC. The analysis uses data samples of lead-lead collisions at  $\sqrt{s_{NN}} = 5.02$  TeV and proton-lead collisions at  $\sqrt{s_{NN}} = 5.02$  TeV, corresponding to integrated luminosities of  $22 \mu\text{b}^{-1}$  and  $28 \text{nb}^{-1}$ , respectively. The correlations are measured using a modified Pearson coefficient that is independent of multiplicity fluctuations. To suppress any short-range correlations, the  $\langle p_T \rangle$  is measured at mid-rapidity and the flow harmonics are measured at forward rapidity.

In Pb+Pb collisions, significant (non-zero) values of the correlation coefficients are observed for all studied harmonics, which show a strong centrality dependence but vary only weakly with the charged particle  $p_T$  range used in the measurement. On the other hand, in  $p$ +Pb collisions, the correlation coefficient measured for the 2<sup>nd</sup> harmonic is found to show only a weak centrality dependence. The predictions of a 3+1D viscous-hydrodynamic model are found to be qualitatively consistent with the data, indicating hydrodynamic origin of these correlations in  $p$ +Pb collisions.

As an independent test for the hydrodynamic description of collectivity observed in  $p$ +Pb collisions, measurements of two-pion HBT correlations as a function of the angle of the pion pair with respect to the second-order event plane angle are presented. The HBT correlation functions, corrected for event plane resolution, are measured as a function of  $q_{out}$ ,  $q_{side}$  and  $q_{long}$  in intervals of pair transverse momentum and second-order flow-vector magnitude. The correlation functions are fit using the Bowler-Sinyukov form with the exponential HBT correlation function. The extracted HBT radii,  $R_{out}$ ,  $R_{side}$  and  $R_{long}$  and a significant out-side cross-term are found to exhibit significant modulation with respect to the second-order event plane, similar to that observed in heavy ion collisions. Results of the measurements and physics implications of the result, will be discussed.

**Primary author:** BOLD, Tomasz (AGH Univ. of Science and Technology, Krakow)

**Presenter:** BOLD, Tomasz (AGH Univ. of Science and Technology, Krakow)

**Session Classification:** Parallel Session - Collective dynamics IV

**Track Classification:** Collective dynamics and final state interaction