Contribution ID: **512**                                                    Type: **talk**

# New results on two-particle correlations in proton-proton collisions at 13 TeV from ATLAS at the LHC

*Friday 24 July 2015 11:30 (20 minutes)*

The measurement of centrality and pseudorapidity dependence of the $p_T$-integrated flow harmonics, $v_2$ up to $v_5$, in Pb+Pb collisions at $\sqrt{s_{NN}}$=2.76 TeV with the ATLAS detector at the LHC are presented. These measurements give a clear picture of the average geometry as well as fluctuations in it. These measurements are extended to include the correlations between flow harmonics of different order, which are sensitive to quantum fluctuations in the initial geometry and hydrodynamic response in the final state collective expansion. The results include correlations of $v_2 - v_n$ and $v_3 - v_n$ (n=2-5) obtained by varying the event ellipticity in narrow centrality intervals using an event-shape engineering technique. Several unique features in these correlations suggest new sources of geometrical fluctuations in the initial state.

Recent measurements of the ridge correlations and associated first five azimuthal harmonics ($v_1$-$v_5$) in p+Pb collisions are also presented. The $v_n$ results are shown as a function of pT, $\eta$ and event activity providing important constraints on the hydrodynamic model of collective flow in small systems. The non-zero double-ridge amplitudes and $v_n$ are found to exist up to pT of ~10 GeV. A simple conformal scaling pattern in the pT dependence is observed for $v_2$-$v_4$ between p+Pb and Pb+Pb with similar event activity, suggesting similar hydrodynamic response and non-linear mode-mixing effects in the 2 collision systems.

## additional information

Submitted on behalf of the ATLAS Heavy Ion Physics Group by the ATLAS Speakers Committee representative Alex Read (a.l.read@fys.uio.no). Alex is NOT the speaker!

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**Session Classification:** Heavy Ion Physics

**Track Classification:** Heavy Ion Physics