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Measurement of elliptic and higher-order harmonics at 2.76 TeV Pb-Pb collisions with the ATLAS detector

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Anisotropy coefficients v_n are important observables for studying the hot, dense medium created in heavy ion collisions. They not only probe the collective flow of the bulk medium (at $p_T < 3-4$ GeV), but also probe the path-length dependent energy loss (at higher p_T), both are associated with the asymmetries in the initial geometry. However, auto-correlations not related to initial geometry, commonly referred to as non-flow effects, can contribute to these coefficients, hence need to be systematically suppressed. We present comprehensive measurements of coefficients v_2-v_6 using the event plane method and two-particle correlations method in broad p_T , η and centrality ranges using the Pb-Pb data from the ATLAS experiment. The phase space regions where the two methods are consistent and where they disagree are explored, and the role of harmonic flow, path-length dependence of jet quenching, and non-flow effects in different part of the phase space are clarified. These detailed measurements provide new insights into the hydrodynamic picture at low p_T , the jet energy loss picture at high p_T , and the nature of the fluctuations in the initial geometry; they also provide a natural explanation for the “ridge” structures observed in two-particle correlation functions.

Primary author: ATLAS COLLABORATION, Zdenek (Charles University Prague)

Presenter: DERENDARZ, Dominik Karol (Polish Academy of Sciences (PL))

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