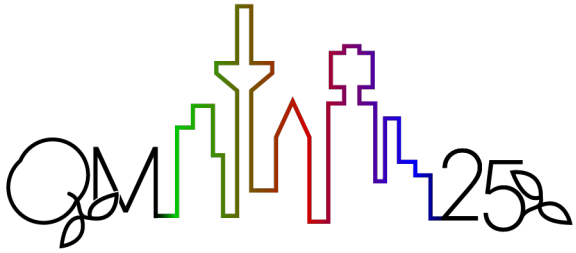

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Evidence for the collective nature of radial flow in Pb+Pb collisions with the ATLAS detector

Tuesday 8 April 2025 16:10 (20 minutes)

Radial flow and anisotropic flow are key observables used to study the expansion dynamics of the quark-gluon plasma (QGP). While anisotropic flow has been extensively explored, the collective nature of radial flow has remained less understood. This talk presents the first measurement of transverse momentum (p_{T}) dependence of radial flow fluctuations, $v_0(p_{\mathrm{T}})$, over $0.5 < p_{\mathrm{T}} < 10$ GeV in Pb+Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV.

These measurements reveal three key features that establish the collective nature of radial flow: (i) long-range correlations in pseudorapidity, (ii) factorization in p_{T}, and (iii) a centrality-independent shape in p_{T}. The observed patterns provide new experimental constraints on the origin and fluctuations of radial flow. A comparison with hydrodynamic models demonstrates the sensitivity of $v_0(p_{\mathrm{T}})$ to bulk viscosity, offering a novel probe of QGP transport properties. These results introduce a new and powerful tool for investigating the collective dynamics of heavy-ion collisions, providing fresh insights into the fundamental properties of the QGP.

Category

Experiment

Collaboration (if applicable)

ATLAS Collaboration

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