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Negative flow as a signature of microscopic collective flow

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It is not understood how collective flow can occur in low-multiplicity systems such as minimum-bias proton-proton collisions. The problem is that these system appears to be too short lived to form equilibrated matter. To understand flow in these systems and the flow observed by ATLAS for UPC events, one typically need a flow mechanism that is not equilibrated.

In this talk, I discuss low-multiplicity flow mechanisms from two distinct microscopic models: one based on repulsion between string-like fields and another based on effective kinetic theory. The main goal is to demonstrate that both flow mechanisms can for low-multiplicity systems produce anisotropies where the elliptic flow is negative –this is opposite to hydrodynamic flow, where the elliptic flow is positive. We therefore think that this is a unique fingerprint of these mechanisms and propose to search for this signature.

If the microscopic origin of the collective flow can be determined, then we foresee that one can use this to perform in-situ studies of the strong nuclear interactions in any high-energy collision system that exhibits collective flow, i.e., to map out these collisions.

The talk will be based on the preprint: https://arxiv.org/abs/2409.16093.

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