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Signatures of Hydrodynamic Behavior in Small Collision Systems

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A well-established hydrodynamic framework has been developed over the last couple of decades to describe the dynamics of the fluidlike system (potentially, a quark-gluon plasma) created in relativistic heavy-ion collisions. This framework predicts in particular the nontrivial patterns of long-range azimuthal correlations which are observed in the final states of nucleus-nucleus collisions, and has been able to explain, essentially, all data on azimuthal correlations collected at the BNL Relativistic Heavy Ion Collider (RHIC) and at the CERN Large Hadron Collider (LHC).

A striking result of the LHC is the observation of the same patterns of azimuthal correlations in the final states of smaller collision systems, namely, p+p and p+Pb collisions. Such observations triggered immediately the question of whether a tiny droplet of fluidlike matter may be created in these small systems. Nowadays this is a subject under intense study, both theoretically and in experiments.

In this talk, I present our understanding of small systems in the hydrodynamic framework.
By means of very simple arguments, I explain how the paradigms of the hydro picture turn out to be powerful tools allowing for predictions which are robust and universal, i.e., independent of the details of the models used to obtain the numerical results. I show that these generic predictions are all confirmed with an impressive accuracy by LHC p+Pb data, as well as by RHIC p+Au, d+Au, and ^{3}He+Au data. I eventually discuss p+p collisions, where the signatures of hydrodynamic behavior appear to be less visible.

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