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## Establishing the Range of Applicability of Hydrodynamics in High-Energy Collisions

*Tuesday, 5 September 2023 11:00 (20 minutes)*

We simulate the space-time dynamics of high-energy collisions based on a microscopic kinetic description, in order to determine the range of applicability of an effective description in relativistic viscous hydrodynamics [1,2]. We find that hydrodynamics provides a quantitatively accurate description of collective flow when the average inverse Reynolds number  $Re^{-1}$  is sufficiently small and the early pre-equilibrium stage is properly accounted for. By determining the breakdown of hydrodynamics as a function of system size and energy, we find that it is quantitatively accurate in central lead-lead collisions at LHC energies, but should not be used in typical proton-lead or proton-proton collisions, where the development of collective flow can not accurately be described within hydrodynamics.

[1] V.E. Ambruş, S. Schlichting, C. Werthmann. To appear in Phys.Rev.D, arXiv: 2211.14379 [hep-ph]

[2] V.E. Ambruş, S. Schlichting, C. Werthmann. Phys.Rev.Lett. 130 (2023) 152301, arXiv: 2211.14356 [hep-ph]

### Category

Theory

### Collaboration (if applicable)

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