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Exact solution of the Boltzmann equation in the relaxation time approximation

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Experimental and theoretical studies of relativistic heavy-ion collisions showed that the behavior of matter produced in such collisions is very well described within hydrodynamic models.
These results brought a lot of attention to the studies of kinetic coefficients whose values determine the magnitude of important observables such as the elliptic flow. Interestingly, different theoretical methods lead to different values of the kinetic coefficients.
Our idea is to perform comparisons of exact solutions of simple kinetic equations with various hydrodynamic approaches, which allows us to select correct forms of these coefficients. For this purpose we exactly solve the relaxation-time approximation Boltzmann equation for a system undergoing boost-invariant longitudinal expansion. We compare the resulting exact numerical solutions with approximate solutions available which allows us to find correct expressions for shear and bulk viscosity coefficients.

Presented work is mainly based on:
W.Florkowski, R.Ryblewski, M.Strickland, Nucl.Phys. A916 (2013) 249-259
W.Florkowski, R.Ryblewski, M.Strickland, Phys.Rev. C88 (2013) 024903
W.Florkowski, R.Ryblewski, M.Strickland, forthcoming

Authors: Dr STRICKLAND, Michael (Kent State University); Mr RYBLEWSKI, Radoslaw (Kent State University); Prof. FLORKOWSKI, Wojciech (IFJ PAN / UJK)

Presenter: Mr RYBLEWSKI, Radoslaw (Kent State University)