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Relativistic second-order dissipative fluid dynamics at finite chemical potential

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Starting from the Boltzmann equation in the relaxation time approximation and employing a Chapman-Enskog like expansion for the distribution function close to equilibrium, we derive second-order evolution equations for the shear stress tensor and the dissipative charge current for a system of massless quarks and gluons. The transport coefficients are obtained exactly using quantum statistics for the phase space distribution functions at non-zero chemical potential. We show that the second-order evolution equations for the shear stress tensor and the dissipative charge current can be decoupled. We find that for large chemical potential, the charge conductivity is small compared to the coefficient of shear viscosity. Moreover, we also show that the limiting behaviour of the ratio of heat conductivity to shear viscosity is qualitatively similar to that obtained for a strongly coupled conformal plasma.

[1] A. Jaiswal, B. Friman and K. Redlich, arXiv:1507.02849 [nucl-th].

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