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Contribution of plasminos to the shear viscosity of a hot and dense Yukawa-Fermi gas

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The shear viscosity of a hot and dense Yukawa-Fermi gas will be determined, using the standard Green-Kubo relation, according to which the shear viscosity is given by the retarded correlator of the traceless part of viscous energy-momentum tensor. We approximate this retarded correlator using a one-loop skeleton expansion, and express the bosonic and fermionic shear viscosities, η_b and η_f, in terms of bosonic and fermionic spectral widths, Γ_b and $\Gamma_\pm$. Here, the subscripts $\pm$ correspond to normal and collective (plasmino) excitations of fermions. We study, in particular, the effect of these excitations on thermal properties of $\eta_f[\Gamma_\pm]$. To do this, we determine first the dependence of Γ_b and $\Gamma_\pm$ on momentum p, temperature T, chemical potential μ and $\xi_0 \equiv m_b^0/m_f^0$, in a one-loop perturbative expansion in the orders of the Yukawa coupling. Here, m_b^0 and m_f^0 are T and μ independent bosonic and fermionic masses, respectively. We then numerically determine $\eta_b[\Gamma_b]$ and $\eta_f[\Gamma_\pm]$, and study their thermal properties. It turns out that whereas Γ_b and Γ_+ decrease with increasing T or μ, Γ_- increases with increasing T or μ. This behavior qualitatively changes by adding thermal corrections to m_b^0 and m_f^0, while the difference between Γ_+ and Γ_- keeps increasing with increasing T or μ. Moreover, η_b (η_f) increases (decreases) with increasing T or μ. We show that the effect of plasminos on η_f becomes negligible with increasing (decreasing) T (μ).

Reference

N. Sadooghi and F. Taghinavaz, *Contribution of plasminos to the shear viscosity of a hot and dense Yukawa-Fermi gas*, arXiv: 1404.1552, Accepted for publication in Phys. Rev. **D** (2014).

Summary

The contribution of plasmino modes to the shear viscosity of a Yukawa-Fermi gas will be investigated at finite temperature and chemical potential.

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