

On the Relaxed States in the Mixture of Relativistic Degenerate and Non-Degenerate Hot Plasmas of Astrophysical Objects

Nana Shatashvili^{a,b}, Swadesh M. Mahajan^c and Vazha I. Berezhiani^{b,d}

e-mail: nana.shatashvili@tsu.ge

^a Department of Physics, Faculty of Exact and Natural Sciences, Javakhishvili Tbilisi State University, 1, Chavachavadze ave, Tbilisi 0179, Georgia

^b Andronikashvili Institute of Physics, TSU, Tbilisi 0177, Georgia

^c Institute for Fusion Studies, The University of Texas at Austin, Austin, TX 78712, USA

^d School of Physics, Free University of Tbilisi, Tbilisi, Georgia

It is shown [1] that a small contamination of a relativistically hot electron component can induce a new scale (for structure formation) to a system consisting of an ion-degenerate electron plasma. Mathematically expression of this additional scale length is the increase in the index of quasi-equilibrium Beltrami-Bernoulli states that have been invoked to model several astrophysical systems of interest. The two species of electrons, due to different origin of their relativistic effective masses, behave as two distinct components (each with its own conserved helicity) and add to the richness of the accessible quasi equilibrium states. Determined by the concrete parameters of the system, the new macro-scale lengths (much larger than the short intrinsic scale lengths (skin depths) and generally much shorter than the system size) open new pathways for energy transformations.

References

[1] N. L. Shatashvili, S. M. Mahajan and V. I. Berezhiani. *Astrophys. Space Sci.* **264**, (2019) 148. DOI: [10.1007/s10509-019-3596-y](https://doi.org/10.1007/s10509-019-3596-y)