Structure of pair winds from compact objects with an application to the emission from hot bare strange stars

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A stationary wind of electron-positron pairs and photons from a spherically symmetric star is studied. We do not assume thermal equilibrium and include two-body processes ($ee \leftrightarrow ee$, $\gamma e \leftrightarrow \gamma e$, $e^+e^- \leftrightarrow \gamma\gamma$), which occur in this wind, together with three-body radiative processes ($ee \leftrightarrow ee\gamma$, $\gamma e \leftrightarrow \gamma e\gamma$, $e^+e^- \leftrightarrow \gamma\gamma\gamma$). In contrast to previous publications [1, 2], we take into account gravitational forces and the effects of General Relativity.

As an example, we study the wind injected by a hot, bare strange star. Such stars are thought to be powerful sources of hard X-ray photons and $e^{\pm}$ pairs created by the Coulomb barrier at the quark surface. We also present a new, finite-difference scheme for solving general relativistic kinetic Boltzmann equations for pairs and photons. Using this method we study the kinetics of wind particles and photon emission for the energy injection rate in pairs which corresponds to the luminosities up to 10^{39} ergs s^{-1} when gravitational forces are important. The effect of nonthermal photons radiated by the star is also discussed.

References

[1] Aksenov, A.G., Milgrom, M., Usov, V.V. MNRAS, 343, L69 (2003)

[2] Aksenov, A.G., Milgrom, M., Usov, V.V. ApJ, 609, 363 (2004)

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