Large-Scale Field Formation in Pulsar Degenerate Relativistic Outer Layer

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The relativistic generalized vorticity tensor is constructed for the outer layer of the compact objects. The possibility of the existence of the double Beltrami-Bernoulli (BB) relaxed states/ structures is explored for the pulsar's degenerate electron-positron relativistic outer layer close to the surface [1-3]. Theoretical formalism is based on the degenerate relativistic fluid equations taking into account the gravitational effects. The metric tensor is that of the Schwarzschild. The BB equilibrium is defined by two relativistic Beltrami conditions for degenerate electron and positron fluids; as a result, Triple Beltrami states are obtained. For finding the illustrative numerical solutions of large-scale flows and magnetic fields the derived equations are written in spherical coordinates and are expanded using spherical harmonic functions. It is shown that under certain conditions there is a catastrophe in the system leading to the fast density drop and fast outflow formation near the compact object surface. Preliminary estimations for generated large-scale flow for the pulsar polar regions close to the surface are performed for the case of slow rotation. It is expected that the generated outflows in compact object atmosphere will contribute to the matter and the energy of the large-scale jet; then, discovered effect can play an important role in the model of equilibrium relativistic disk-jet structure formation around the compact objects like AGN and Pulsar. Constructed model can be applied for the exploration of observational features of relativistic jets.

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