Model of pseudo-Riemann spherically symmetric space with non-stationary Lorentz invariant metric

© A.A. Gurchenkov[1], I.I. Moroz[2], N.N. Popov[3]

[1]Bauman State Technical University, Moscow, 105005, Russia
[2] Moscow Institute of Physics and Technology (State University), Dolgoprudny, Moscow Region, 141700, Russia
[3]Dorodnicyn Computing Centre of the Russian Academy of Sciences, Moscow, 119333, Russia

The model of pseudo-Riemann spherically symmetric space of (---+) signature with a non-stationary metric is considered. It is shown that components of the metric satisfy a gravitational field equation, based on the postulate about the dependence between a scalar curvature of pseudo-Riemann space and a mass density of matter. This equation is a fundamental formula of gravitation theory. Relatively to the metric the system of geodesic equations, which are the second order differential equations on the four independent variables, is built. It is shown that the system of the differential equations can be solved analytically. Two types of the solutions of this system are found. One of these solutions is in the light cone and another the is out of it. It is shown that test bodies, which are out of the light cone move under one Hubble law. This fact corresponds to the observed effect of galaxies receding with the velocities, which are proportional to the distance between them. The first integrals are figured out analytically.

Keywords: *pseudo-Riemann spherically symmetric space, non-stationary metric, gravitational field equation, geodesic equations, first integrals.*

Gurchenkov A.A., Dr. Sci. (Phys.&Math.), Professor of the Higher Mathematics Department at Bauman Moscow State Technical University. Research interests: control and stability of fluid-containing rotating rigid bodies. e-mail: challenge2005@mail.ru

Moroz I.I., post-graduate student of the Moscow Institute of Physics and Technology (State University). Research interests: geometric theory of gravitation. e-mail: iimoroz@yandex.ru

Popov N.N., Ph.D., Assoc. Professor, Dorodnicyn Computing Centre of the Russian Academy of Sciences. Research interests: stochastic problems of solid mechanics. e-mail: nnpopov@mail.ru