Lorentz-Invariant Gravitation Theory

Annotation

The modern theory of gravity, which is conditionally called General Theory of Relativity (GR), was verified with sufficient accuracy and adopted as the basis for studying gravitational phenomena in modern physics. However, it has certain features that make it impossible to connect with other theories, on which almost all the techniques and technology of modern civilization is built. Another formal disadvantage of general relativity is that the study and the use of its mathematical apparatus require much more time than the study of any of the branches of modern physics. This book is an attempt to build a version of the theory of gravitation, which is in the framework of the modern field theory and would not cause difficulties when teaching students. A characteristic feature of the proposed theory is that it is built on the basis of the nonlinear quantum field theory.

The Lorentz-invariant theory of gravitation (LIGT) is the conditional name of the proposed theory of gravity, since Lorentz-invariance is a very important, although not the only feature of this theory. Note that our approach was used in the past in relation to the gravitational theories that have some similarities with our theory. Therefore the results obtained by well-known scientists are widely cited in the book. However, for posing the problem and for some of the basic elements of the theory which are obtained by the author of the book, the only person responsible is the author.

NOTATIONS.

(In almost all instances, meanings will be clear from the context. The following is a list of the usual meanings of some frequently used symbols and conventions).

Mathematical signs	$\Box$ - d'Alembertian operator $\equiv \nabla^2 - \partial^2/\partial t^2$
$\alpha,\beta,\mu,\nu...$ - Greek indices range over 0,1,2,3 and represent space-time coordinates, components, etc.	$g_{\mu\nu}$ - metric tensor of curvilinear space-time
$i, j, k\ldots$ - Latin indices range over 1,2,3 and represent coordinates etc. in 3- dimensional space	$g_{\mu\nu}^{GR}$ - metric tensor of GR space-time
$\hat{\alpha}_\mu, \hat{\beta}$ - Dirac matrices	$R_{\alpha\beta\gamma\delta}$ - Riemann tensor
$\vec{A}$ - 3-dimensional vector	$R_{\alpha\beta}$ - Ricci tensor $R^{\gamma}{}_{\alpha\beta\delta}$
A^μ - 4-dimensional vector	R - Ricci scalar $\equiv R^{\alpha}{}_{\alpha}$
$A^{\mu\nu}$ - Tensor components	$G_{\alpha\beta}$ - Einstein tensor
∇ - Covariant derivative operator	$\eta_{\mu\nu}$ - Minkowski metric
∇^2 - Laplacian	$h_{\mu\nu}$ - Metric perturbations
	$\Lambda_{\mu\nu}$ - Lorentz transformation matrix
Physical values	j_μ - Current density
u_μ - velocity	$J^{\mu\nu}$ - Angular momentum tensor
a_μ - 4-acceleration $\equiv du_\mu/d\tau$	γ_N - Newton's constant of gravitation
p_μ - 4-momentum	γ_L - Lorentz factor (L-factor)
$T^{\mu\nu}$ - Stress-energy tensor	m - mass of particle
$F^{\mu\nu}$ - Electromagnetic field tensor	M_S - mass of the star (Sun)
	M , L - angular momentum
Abbreviations:	NTEP - nonlinear theory of elementary particles;
LIGT - Lorentz-invariant gravitation theory;	QED - quantum electrodynamics.
EM - electromagnetic;	HJE - Hamilton-Jacobi equation
EMTM - electromagnetic theory of matter;	GTR or GR - General Theory of Relativity
EMTG - electromagnetic theory of gravitation;	L-transformation - Lorentz transformation
SM - Standard Model;	L-invariant - Lorentz-invariant
Indexes	g - gravitational, within the framework of EMTG
e - electrical	ge - gravito-electric,
m - magnetic	gm - gravito-magnetic
em - electromagnetic,	N - Newtonian