The R.I. Pimenov unified gravitation and electromagnetism field theory as semi-Riemannian geometry

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More then forty years ago R.I. Pimenov introduced a new geometry — semi-Riemannian one [1],[2] — as a set of geometrical objects consistent with fiber space pr : $M_n \to M_m$. He suggested the heuristic principle according to which the physically different quantities (meter, second, coulomb etc.) are geometrically modelled as space coordinates that are not superposed by automorphisms. As there are only one type of coordinates in Riemannian geometry and only three types of coordinates in pseudo-Riemannian one, a multiple fibered semi-Riemannian geometry is the most appropriate one for the treatment of more then three different physical quantities as unified geometrical field theory.

Semi-Euclidean geometry $^3R_5^4$ with 1-dimensional fiber x^5 and 4-dimensional Minkowski space-time as a base is naturally interpreted as classical electrodynamics. Semi-Riemannian geometry $^3V_5^4$ with the general relativity pseudo-Riemannian space-time $^3V^4$, and 1-dimensional fiber x^5, responsible for the electromagnetism provides the unified field theory of gravitation and electromagnetism [3],[4].

Unlike Kaluza-Klein theories, where the 5-th coordinate is appeared in nondegenerate Riemannian or pseudo-Riemannian geometry, the theory based on semi-Riemannian geometry is free from defects of the former. In particular, scalar field does not arise.

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[1] R.I. Pimenov, Vestnik LGU **1**, 137 (1965).

[2] R.I. Pimenov, Proc. Sem. on Vect. and Tens. Analysis **14**, 154 (MGU, 1968).

[3] R.I. Pimenov, Dokl. AN SSSR **157**, n.4, 795 (1964).

[4] R.I. Pimenov, Foundations of Theory of Temporal Universum. Syktyvkar, 1991.