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Abstract

Dark Matter, Dark Energy and Something Else in 5D Theory †

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Abstract: It is shown, that $(4+1)$—and $(3+1+1)$—reductions of the geodetic equations in 5D theory with scalar field $\varphi = \sqrt{-G_{55}}$ and out of the 5D optics inevitably lead to the new concept of the Lorentz-type relativistic mass $\hat{m}_0$ of the 5D test particle. Due to the imposition of the x^5—cylindricity condition, one can obtain an integral of the 5D particle's motion along x^5; it gives its electric charge. Thus, one can obtain an exact expression for $\hat{m}_0$. In this expression $\hat{m}_0$ depends on the field φ through an electric charge, so there is not probably any need for a scalar charge in Nature at all. Furthermore, one can compactly express the $\hat{m}_0$ through the mass angle χ_n and additionally hypothesize about the possible complex structure of $\hat{m}_0$. It soundly leads one to the deeper understanding of the quantum properties of the matter. All of these conceptions also turn one to the idea that this mass $\hat{m}_0$ may contribute to the recently discovered in the Universe dark matter and dark energy and also be one of the possible reasons for the Universe's expansion. The next suggestive result in the 5D theory is connected with the $(4+1)$—reduction of the 5D Ricci identities. It leads one to certain connections between the 4D physicogeometrical values and permits one to obtain the first pair of Maxwell equations with the non-zero soliton-type r.h.s. and establishes the connection with the second pair of them. It subsequently leads one to the idea about the magnetic monopole's existence in the early Universe. It is shown, that this non-zero r.h.s. vanishes together with the imposition of the x^5—cylindricity condition. The peculiarity of this process permits one to hypothesize soundly about the existence of the topological second-order transition in the Universe, which leads one to the superfluid state and possibly accelerates its expansion.

Keywords: 5D relativistic mass concept; scalar gravitational field; 5D geodetic equations; cylindrical symmetry condition; 5D Ricci identities; Maxwell equations; magnetic monopole; topological second-order phase transition in cosmology

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