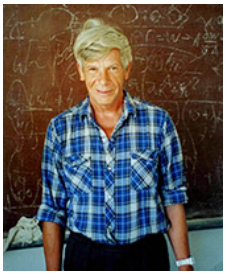

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Dual action for gauge p-form mimetic gravity

At the moment one the most prominent sign of the new physics beyond SM and GR is dark matter phenomenon. Despite large number of theories built to describe it, still none succeed. Simple models, that are able to explain observational data are of special interest. One of the recent models of this kind is mimetic gravity proposed by A. Chamseddine and V. Mukhanov. This theory describes dark matter as purely gravitational effect. The action for mimetic gravity is usual Einstein-Hilbert action, but the metric is no longer independent and is given by the formula:
$g_{\mu\nu} = \bar{g}_{\mu\nu}\bar{g}^{\alpha\beta}\partial_\alpha\varphi\partial_\beta\varphi, where_{\alpha\beta}$ denotes auxiliary metric, and φ is scalar. Derivatives of the scalar are important as they lead to nontrivial modification of the Einstein equations and give rise to effective dark matter. Besides simple formulation, mimetic dark matter has remarkably simple physical interpretation: it is dust, that consists of potentially moving particles.

Afterwards numerous modifications of this idea have appeared with higher derivatives of φ in the action as well as with presence of other auxiliary fields. However, most of them cannot usually be represented as theories with change of variables and also contain large number of constants, which must fine tuned to match the observations. However, some of them are not so drastic and retain the initial idea. The most natural theory of this kind is gauge p-form mimetic gravity, which uses p-forms instead of the scalars in the change formula. However, effective dark matter in these theories is lacking clear physical meaning.

In the present talk we suggest new form of action for gauge mimetic p-form gravity based on dual fields. The main advantage of this formulation is its clear physical meaning and the connection with actions for point particles, Nambu string and 3-branes. For particular cases $p = 0$ and $p = 2$ in dimensions $d = 4$ we show, that the dual mimetic action describes fluid that consists of potentially moving particles and 3-branes respectively. In case $p = 1$ not all solutions can be interpreted in that way. Nevertheless, we show, that there exists a wide class of solutions, which describe fluid consisting of Nambu strings. The exact solutions for such theories are discussed.

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