

Cohomological couplings between a non-massive (3,1) tensor field and an Abelian p-form

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Abstract

The main BRST cohomological properties of a free theory, describing an Abelian p-form and a massless tensor field that transforms in an irreducible representation of $GL(D, \mathbf{R})$ according to a two-column Young diagram of the type (3,1), are systematically used in order to determine the consistent interactions that can be added to this free theory. Our approach is mainly based on the deformation of the solution to the master equation from the antifield-BRST formalism by means of the local cohomology of the BRST differential. We constantly work under the hypotheses that the emerging interactions are local, smooth, Lorentz-covariant, Poincaré-invariant, and of maximum derivative order equal to two. The main result obtained by us is that the deformed theory modifies (at order one in the coupling constant) only the gauge transformations of the p-form with a term involving some of the gauge parameters from the (3,1) sector and consequently its field strength with a term linear in the first-order derivatives of the (3,1) tensor field. Accordingly, the deformed Lagrangian contains pieces of order one and two in the coupling constant. The gauge algebra and the reducibility ingredients present within the free theory are not affected by the deformation procedure.

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