



High Energy Physics - Theory

# Local BRST cohomology in (non-) Lagrangian field theory

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Some general theorems are established on the local BRST cohomology for not necessarily Lagrangian gauge theories. Particular attention is given to the BRST groups with direct physical interpretation. Among other things, the groups of rigid symmetries and conservation laws are shown to be still connected, though less tightly than in the Lagrangian theory. The connection is provided by the elements of another local BRST cohomology group whose elements are identified with Lagrange structures. This extends the cohomological formulation of the Noether theorem beyond the scope of Lagrangian dynamics. We show that each integrable Lagrange structure gives rise to a Lie bracket in the space of conservation laws, which generalizes the Dickey bracket of conserved currents known in Lagrangian field theory. We study the issues of existence and uniqueness of the local BRST complex associated with a given set of field equations endowed with a compatible Lagrange structure. Contrary to the usual BV formalism, such a complex does not always exist for non-Lagrangian dynamics, and when exists it is by no means unique. The ambiguity and obstructions are controlled by certain cohomology classes, which are all explicitly identified.

Comments: 37 pages, 1 figure, minor corrections, references added

Subjects: **High Energy Physics - Theory (hep-th)**; Mathematical Physics (math-ph); Quantum Algebra (math.QA)

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