Contribution ID : **30** Type : **not specified**

Unfree gauge symmetry

четверг, 24 ноября 2022 г. 10:20 (40)

The gauge symmetry is said unfree if the gauge transformation leaves the action functional unchanged provided for the gauge parameters are constrained by the system of partial differential equations. The best known example of this phenomenon is the volume preserving diffeomorphism being the gauge symmetry of unimodular gravity (UG). Various extensions are known of the UG, including the higher spin analogs – all with unfree gauge symmetry. In this talk, we begin with noticing the common features shared by all the known examples of unfree gauge symmetry. In particular, all these field theories admit "global conserved quantities'' that are unrelated to any conserved local current. The simplest example is the cosmological constant in the UG, We find previously unknown higher spin analogs of Lambda. After this empirical introduction, we work out the structure relations of algebra of general unfree gauge symmetry. It turns out that the existence of the global conserved quantities originates from this algebra, being in a sense modification of the second Noether theorem for the case of unfree gauge symmetry. Proceeding from the unfree gauge symmetry algebra we deduce the modification of the Faddeev-Popov quantization rules accounting for the operators of gauge parameter constraints. Also the BV-BRST field-antifield formalism is modified to account for the unfree gauge symmetry. The unfree gauge symmetry is also considered from the perspective of constrained Hamiltonian formalism. The structure functions are identified in the involution ralations such that are responsible for the equations imposed on the gauge parameters. Hamiltonian BFV-BRST formalism is adjusted to account for the gauge parameter constraints.

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Session Classification : Morning session 24/11/2022

Track Classification : General Quantum Field Theory