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Quantum BRST charge in gauge theories in curved space-time. (English) Zbl 1406.81067

J. Math. Phys. 60, No. 1, 012304, 29 p. (2019).

Summary: Renormalized gauge-invariant observables in gauge theories form an algebra which is obtained as the cohomology of the derivation $[\mathbf{Q}_L, -]$, with \mathbf{Q}_L as the renormalized interacting quantum BRST charge. For a large class of gauge theories in Lorentzian globally hyperbolic space-times, we derive an identity in renormalized perturbation theory which expresses the commutator $[\mathbf{Q}_L, -]$ in terms of a new nilpotent quantum BRST (Becchi, Rouet, Stora, Tyutin) differential and a new quantum anti-bracket which differ from their classical counterparts by certain quantum corrections. This identity enables us to prove different manifestations of gauge symmetry preservation at the quantum level in a model-independent fashion.

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MSC:

81T20 Quantum field theory on curved space or space-time backgrounds

81T13 Yang-Mills and other gauge theories in quantum field theory

81T15 Perturbative methods of renormalization applied to problems in quantum field theory

53C50 Global differential geometry of Lorentz manifolds, manifolds with indefinite metrics

51M10 Hyperbolic and elliptic geometries (general) and generalizations

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