

The reverse side of the BRST coin: String-localized quantum field theory

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Gauge symmetry is most successful at predicting the structure of all interactions among particles in the Standard Model. Yet, among the principles of QFT: causality, covariance, probability (Hilbert space), it stands out: it addresses exclusively non-observable entities (gauge potentials and Fermi fields). It may be doubted how “fundamental” such a principle is from an ontological point of view.

Quantum gauge symmetry can only be formulated on auxiliary state spaces with indefinite metric (“negative probabilities”). The BRST method allows to return to a Hilbert space. Charged interacting fields are not defined on this Hilbert space, because they are not BRST-invariant.

An alternative is presented with the same (and even superior) predictive power on the structure of interactions. It proceeds directly on the physical Hilbert space, and allows to construct interacting charged fields. They necessarily have a weaker localization than the observable fields (which are the same as in the BRST setup).

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