MP 7: Eichtheorien

Zeit: Mittwoch 11:00–12:20 Raum: HS 23

Hauptvortrag MP 7.1 Mi 11:00 HS 23

String-localized potentials - a Hilbert space approach to gauge theories — •Karl-Henning Rehren — Institut für Theoretische Physik, Uni Göttingen

For the perturbative description of interactions (like QED or weak interactions) one may use vector potentials that are defined on the physical Hilbert space, but enjoy weaker properties of covariance and locality than are usually required for observables. This increases the mathematical challenges for renormalization, but provides new structural insights and opens new paths towards theories with higher spin.

MP 7.2 Mi 11:40 HS 23

Local charge operators for massless spin-1-fields — •Moritz Heep and Karl-Henning Rehren — Institut für theoretische Physik, Universität Göttingen, Deutschland

Local generators are local operators that implement a global symmetry locally. They are usually given by integrating the zero-component of a covariant conserved local current over a finite region.

However, for massless particles of helicity ≥ 1 the Weinberg-Witten theorem asserts that such a current does not exist on the Hilbert space. Having said that, the abstract existence of local generators is a consequence of the split property that was recently established for Maxwell fields (and fields of higher helicity) with $U(1)$ symmetry by Longo, Morinelli and Rehren.

This talk will give an insight into the mathematical problems of finding a concrete representation of these operators and present most recent results.

MP 7.3 Mi 12:00 HS 23

Equivalence of two different gauges in External Current QED — •Benedikt Wegener[1] and Wojciech Dybalski[2] — [1]Department of Mathematics, University of Rome Tor Vergata, Italy — [2]Department of Mathematics, Technical University Munich, Germany

We study the connection between QED in the axial gauge and the Coulomb gauge in the external current approximation. To avoid the severe singularities present in the axial gauge, we use Yngvason-Mund-Schroer type angular smearing. In this formulation, the problem of unitary equivalence of the two gauges can be rigorously posed. We will show that such equivalence holds if the total electric charge of the system is zero. Interestingly, for non-zero electric charge, the equivalence appears to fail due to a different low-energy behaviour of the two gauges. The problem of obtaining the Yngvason-Mund-Schroer potential by canonical quantisation (with constraints) of a certain classical theory will also be discussed.