MP 3 Quantenmech., Schroed.+Dirac-Op, Vielteilchensysteme und QFT

Zeit: Mittwoch 14:00–15:30 Raum: P1-02-111

MP 3.1 Mi 14:00 P1-02-111

Test of resurgent expansion for the case of strong coupling — •Andrey Surzhykov and Ulrich D. Jentschura — Max–Planck–Institut für Kernphysik, Heidelberg, Germany

In quantum mechanics, one may consider a special class of (one–dimensional) potentials for which the standard Rayleigh–Schrödinger perturbation theory fails to explain the physical properties of the system even qualitatively. Particular interest has been devoted to the Fokker–Planck potential [1] whose eigenvalues cannot be described by perturbation theory series even if the perturbative series, which vanishes identically to all orders, is augmented by resummation prescriptions. Generalized perturbative expansions (resurgent expansion) have been proposed in order to evaluate the energy spectrum by taking into account instanton configurations, characterized by nonanalytic factors $\exp(-a/g)$, where a is the instanton action and g is the coupling parameter. Until now, the resurgent expansion has been applied mainly for the small values of g, i.e. for weak coupling, while much less attention has been paid to the strong coupling regime. In this contribution, we investigate the behaviour of the resurgent expansion in the transition from weak to strong coupling [2], on the basis of numerical calculations and a direct resummation of the generalized Bohr–Sommerfeld quantization condition, which enhances the convergence of the weak-coupling resurgent expansion for stronger couplings.

[1] U. D. Jentschura and J. Zinn–Justin, Phys. Lett. **B 596**, 138 (2004).
[2] U. D. Jentschura and A. Surzhykov, Phys. Rev **B**, to be submitted.

MP 3.2 Mi 14:30 P1-02-111

Interpreting Yang-Mills Theories as Many-Particle *Field* Theories — •Peter Schust — II. Institut für Theoretische Physik, Universität Stuttgart, Pfaffenwaldring 57/III, 70550 Stuttgart

This talk will give a many-particle interpretation of Yang-Mills theories for a system with a fixed number of particles on the level of *field theories*. For the claimed purpose of describing a many-particle system, this interpretation utilises the Whitney sum structure of the (massive) particle's fibre. The emphasis on the sum structure of Yang-Mills theories, which is unlike the *product structure* of second quantised theories, allows, in turn, generalisations in the gauge part of the formalism that allows to describe exchange phenomena in terms of so-called exchange potentials [1]. Special cases of this general formalism are published in [2], [3]. Another example for three electromagnetic interacting electrons will be given on sustaining posters.

[1] P. Schust, Die Relativistische Schrödingertheorie als erweiterte Yang-Mills Theorie, Dissertation, Universität Stuttgart, in preparation
[2] P. Schust, M. Mattes, and M. Sorg, Found. Phys. **34**, 99 (2004)
[3] P. Schust, F. Stary, M. Mattes, and M. Sorg, Found. Phys **35**, 1043 (2005)

MP 3.3 Mi 15:00 P1-02-111

On the path integral in non–commutative quantum field theory — •Christoph Dehne — Institut für Theoretische Physik, Vor dem Hospitaltore 1, 04103 Leipzig

For quantum field theories on non-commutative spacetime, it is known that Feynman rules are no longer equivalent, if the time component does not commute with the spatial component. In particular, the Feynman rules that are derived from a path integral based on the $T^\star$–operator (the so–called naïve Feynman rules) violate the optical theorem (violation of unitarity).
Within the Hamiltonian approach to quantum field theory we present a path integral which differs from the above one in its construction. We comment on different aspects that are related to this (new) path integral.