MP 5: Quantenfeldtheorie I

Zeit: Mittwoch 16:45–18:40 Raum: VMP6 HS B

Hauptvortrag MP 5.1 Mi 16:45 VMP6 HS B

A criterion for asymptotic completeness in local relativistic QFT — •Wojciech Dybalski[1] and Christian Gerard[2] — [1]Technische Universität München — [2]Universite Paris-Sud

It is well-known that the conventional property of asymptotic completeness fails in general in quantum field theory due to the possible presence of pairs of oppositely charged particles in the vacuum sector. In this talk we formulate a generalized concept of complete particle interpretation which takes this phenomenon into account: With the help of suitable asymptotic observables (Araki-Haag detectors) we construct a canonical 'charged-pairs free' subspace. The generalized property of asymptotic completeness requires that this subspace coincides with the subspace of Haag-Ruelle scattering states. We show that this property holds in any massive quantum field theory satisfying the Haag-Kastler axioms. Our result can be reformulated as a criterion for conventional asymptotic completeness which should be sharp in theories with trivial superselection structure. The crucial technical step is the proof of convergence of the Araki-Haag detectors on all states from a suitable spectral subspace of the energy-momentum operators. This step is accomplished with the help of a novel propagation estimate, which is also relevant to scattering theory of quantum mechanical dispersive systems.

MP 5.2 Mi 17:30 VMP6 HS B

Strengthened Reeh-Schlieder Condition and Construction of Scattering States in QFT without Mass Gaps — •Maximilian Duell and Wojciech Dybalski — Zentrum Mathematik, Technische Universität München, D-85747 Garching, Germany

We outline the construction of a scattering theory for Wigner particles in local relativistic quantum field theories without requiring a mass gap condition or any other restrictions on the spectrum of the mass operator near its eigenvalues. Our novel approach is based on assuming a strengthened form of the Reeh-Schlieder property.

10 Minuten Pause

MP 5.3 Mi 18:00 VMP6 HS B

Wedge-local fields in interacting quantum field theories with bound states — •Daniela Cadamuro[1] and Yoh Tanimoto[2] — [1]Mathematisches Institut, Georg-August Universität Göttingen, Göttingen, Deutschland — [2]Graduate School of Mathematical Sciences, The University of Tokyo, Tokyo, Japan

In the context of constructive QFT in the operator-algebraic approach, wedge-local fields play an important role. After the work of Lechner to construct factorizing scattering matrix models with scalar S-matrices without bound states, we recently extended this construction to scalar S-matrices with poles in the physical strip ("bound states") by exhibiting wedge-local fields which arise as a deformation of Lechner's fields with the so called "bound state operator". Similar techniques allow us to extend this construction to the Z(N)-Ising and the sine-Gordon models, namely models with a richer particle spectrum and which are believed to have bound states. In this talk I will present the construction of such interacting quantum fields and an overview on the open problems to complete the construction.

MP 5.4 Mi 18:20 VMP6 HS B

Towards a non-perturbative construction of the Operator Product Expansion — •Jan Holland — Universität Leipzig, Germany

Our current understanding of Quantum Field Theory (QFT) is based to a large extent on perturbative - i.e. approximate - methods. Exact constructions in QFT are not only of fundamental conceptual interest, but they offer insights into physical phenomena that are intractable by perturbative means.

In this talk, I present progress on a novel approach towards the non-perturbative construction of the Operator Product Expansion (OPE). The OPE is a structure encoding the complete algebraic skeleton as well as the short distance properties of a Quantum Field Theory. Our construction method is based on a recently found recursion formula for the OPE, which will be discussed along with recent results on mathematical properties of the OPE in perturbation theory.