MP 11: Quantum Field Theory II

Time: Thursday 16:15–17:15 Location: ZHG001

MP 11.1 Thu 16:15 ZHG001

Implementing a Causal Measurement Scheme for Quantum Fields — •Jan Michael Mandrysch — Institut für Quantenoptik und Quanteninformation, Wien, Österreich

While measurement processes in standard quantum mechanics are well understood, the extension of these ideas to quantum field theory (QFT) remains a key challenge. In particular, ensuring that measurements respect fundamental principles such as relativistic causality is crucial. A persistent issue concerning measurements in QFT is, though, that microcausality alone is insufficient to prevent superluminal signaling. In this talk, I will present a concrete scheme for measuring real linear scalar fields, grounded in the Fewster-Verch measurement framework. This approach fully respects the principles of relativistic covariance, locality, and causality, offering a robust solution to the challenges of measurement in QFT.

MP 11.2 Thu 16:35 ZHG001

Large deviations in mean-field quantum spin systems — •Christiaan van de Ven[1] and Matthias Keller[2] — [1]Weierstraße 52, 52349 Düren — [2]Institut für Mathematik, Universität Potsdam, Karl-Liebknecht-Straße 24-25, 14476 Potsdam

Continuous fields of C*-algebras form an important ingredient for describing emergent phenomena, such as phase transitions and spontaneous symmetry breaking. In this talk, I consider the continuous C*-bundle generated by increasing symmetric tensor powers of the complex (lxl) matrices, which can be interpreted as abstract description of mean-field theories defining the macroscopic limit of infinite quantum systems. Within this framework I discuss the principle of large deviations for the local Gibbs state in the high temperature regime and characterize the limit of the ensuing logarithmic generating function. To this end, it has proved necessary to demonstrate the existence of a semiclassical analog of the Baker-Campbel-Hausdorff formula, defined in terms of a series of nested Poisson brackets.

MP 11.3 Thu 16:55 ZHG001

Gauge invariance of topological charges of Noether current — •Christian Hembd — Montebellunastrasse 5, 73447 Oberkochen

Free (complex) quantum fields have an associated Noether current due to global phase invariance of their Lagrangian. By help of the degree of a mapping and the index of a zero known from algebraic topology it is possible to define Lorentz invariant topological charges of the Noether current. These charges are invariant under a group of local transformations of the quantum field. For the case of a free fermion field this leads to SU(2) gauge invariance.