MP 17: Quantum Information I

Zeit: Donnerstag 9:50–10:30 Raum: 30.45: 201

MP 17.1 Do 9:50 30.45: 201

Quantum fluctuators and the tensor algebra method — •Zoltan Zimboras, Michael Keyl, Zoltan Kadar, and Dirk-Michael Schlingemann — Quantum Information Group, ISI, Torino, Italy

Quantum fluctuators appear in physics in many different contexts, e.g., quantum phase transitions, finite size corrections to mean-field theories, non-commutative central limit theorems. Recently they have also been applied in quantum information theory in the description of quantum memories. In the above fields the way how the thermodynamic limit is taken differs from one another, which results in different definitions for the limiting fluctuators. In this talk we would like to show how the tensor algebra method (borrowed from constructive field theory) provides a natural unified description of all these limits. Furthermore, it is a flexible formalism for attacking existing problems from a different point of view, as will be demonstrated by examples of quantum information theory. (arXiv:1006.3461)

MP 17.2 Do 10:10 30.45: 201

Quantum fluctuators for simulating continuous quantum systems by discrete ones. — •Zoltan Kadar, Michael Keyl, and Zoltan Zimboras — Quantum Information Group, ISI, Torino, Italy

Classical simulation of quantum many-body systems is usually very inefficient with long running times and high needs for memory (e.g., it is not even possible to store classically the arbitrary state of 50 qubits). One might overcome these difficulties by using other quantum systems, similar to the one we want to study, as quantum simulators. Most of the efforts in this direction has been concentrated on simulating discrete quantum systems (e.g. spin chains) with other ones that are relatively easy to prepare in the lab (ion traps, atoms in optical lattices, etc.). In this talk, I will treat a different problem: How can we simulate a continuous quantum system (e.g. a QFT) with a discrete one? In particular, I will show how (and in which sense) one can use the global quantum fluctuator observables of a discrete lattice system to store continuous quantum information. Finally, the question of how the stored state of a light field can be processed by operations on the discrete system is considered.