MP 1: Quanteninformation I

Zeit: Dienstag 9:15–10:30 Raum: ZHG 003

MP 1.1 Di 9:15 ZHG 003

Generalized Dicke States — •Stephan Hartmann — TiLPS, Tilburg University, Tilburg, The Netherlands

Quantum master equations are an important tool in quantum optics and quantum information theory. For systems comprising a small to medium number of atoms (or qubits), the non-truncated equations are usually solved numerically. We present a group-theoretical superoperator method that helps solving these equations. To do so, we exploit the SU(4)-symmetry of the Lindblad operator and construct basis states that generalize the well-known Dicke states. This allows us to solve various problems analytically and to considerably reduce the complexity of problems that can only be solved numerically. Finally, we present three examples that illustrate the proposed method.

MP 1.2 Di 9:40 ZHG 003

Renormalization Group and Continuum Limit of Quantum Cellular Automata — •Zoltan Zimboras — Quantum Information Theory Group, ISI, Torino

We develop a renormalization group formalism for Quantum Cellular Automata (reminiscent of the algebraic renormalization group of Buchholz and Verch). Using this formalism, we can define the continuum limit for certain automata. As a particular example, we show that the continuum limit of the so-called "Glider Clifford Cellular Automaton" is the 1+1 dimensional relativistic QFT of free majorana fermions.

MP 1.3 Di 10:05 ZHG 003

Quantum fluctuations, mean field methods and the simulation of continuous quantum systems — Zoltán Kádár, •Michael Keyl, and Zoltán Zimborás — ISI Foundation, Torino, Italy

The fluctuations of a discrete quantum system behave in the infinite particle limit like a continuous system. This fact can be used to simulate a continuous system in terms of finitely many qubits. Experimental applications of this observation include the implementation of "quantum memory", which can be used to store the state of (one mode) of a light field in an atomic ensemble at room temperature. A very convenient tool to treat such models is mean field theory, where the fluctuations around a mean field observable are described in terms of "fluctuation operators". In this context we will show how products of the latter converge in a weak sense to polynomials of position and momentum of the continuous system. Based on that the relation between discreet and continuous dynamics will be analyzed, and quadratic Hamiltonians are discussed in greater detail. Finally we will have a particular look at cases where the continuous Hamiltonian is a Schrödinger operator which does not admit a selfadjoint extension.