Derivation of the Maxwell-Schrödinger Equations from the Pauli-Fierz Hamiltonian

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The spinless Pauli-Fierz Hamiltonian describes a quantum system of nonrelativistic identical particles coupled to the quantized electromagnetic field. In this talk, I will discuss its time evolution in a mean-field limit where the number N of charged particles gets large, while the coupling to the radiation field is rescaled by   . At time zero it is assumed that almost all charged particles are in the same one-body state (a Bose-Einstein condensate) and that the photons are close to a coherent state. At later times and in the limit   it can be proven that the charged particles remain in a Bose-Einstein condensate and that the time evolution is approximately described by the Maxwell-Schroedinger system. This system of equations models the coupling of a non-relativistic particle to the classical electromagnetic field. I will introduce the mentioned models and explain the structure of the proof. The talk is based on work in collaboration with Peter Pickl.

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