

Quantum-classical motion of charged particles interacting with scalar fields

Thursday, February 1, 2024 3:00 PM (30 minutes)

The goal of this talk is to investigate the dynamics of semi-relativistic or non-relativistic charged particles in interaction with a scalar meson field. Our main contribution is the derivation of the classical dynamics of a particle-field system as an effective equation of the quantum microscopic Nelson model, in the classical limit where the value of the Planck constant approaches zero ($\hbar \rightarrow 0$). Thus, we prove the validity of Bohr's correspondence principle, that is to establish the transition from quantum to classical dynamics. We use a Wigner measure approach to study such transition. Then, as a consequence of this interplay between classical and quantum dynamics, we establish the global well-posedness of the classical particle-field interacting system, despite the low regularity of the related vector field, which prevents the use of a fixed point argument.

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