

Analysis and Simulation of Quantum Diffusion Models for Semiconductor Devices

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Usually, quantum systems are described by microscopic quantum models, like SCHRÖDINGER's or WIGNER's equation. However, the numerical solution of these models is computationally very expensive. Alternative models are given by the computational less expensive quantum diffusion models, like (viscous) quantum hydrodynamic and quantum drift-diffusion models.

In this talk we sketch the derivation of these models and give some results on the mathematical analysis of the equations. In particular, the fourth-order parabolic part of the quantum drift-diffusion model is analyzed in detail (existence, uniqueness, long-time behavior of the solutions). Finally, some numerical results for a one-dimensional resonant tunneling diode, simulated by different models, are given.