

# Neumann Series Analysis of the Wigner Equation Solution

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## Abstract

The existence and uniqueness of the electron transport Wigner equation solution, determined by boundary conditions is analyzed in terms of the Neumann expansion of the integral form of the equation, obtained with the help of Newton's trajectories. For understanding of the peculiarities of Wigner-quantum electron transport in semiconductor structures such mathematical issues can not be separated from the physical attributes of the solution. In the presented analysis these two sides of the problem mutually interplay. The problem is first formulated from a physical point of view, where the stationary solution is considered as the long time limit of the general evolution problem posed by both initial and boundary conditions. The proof of the convergence relies on the assumption for reasonable local conditions which may be specified for the kernel and on the fact that the Neumann expansion corresponds to an integral equation of Volterra type with respect to the time variable.