

## Wigner Modelling of Quantum Wires

Paul Ellinghaus<sup>1</sup>, Mihail Nedjalkov<sup>1</sup>, Josef Weinbub<sup>2</sup>, and Siegfried Selberherr<sup>1</sup>

<sup>1</sup> Institute for Microelectronics, TU Wien

<sup>2</sup> Christian Doppler Laboratory for High Performance TCAD at the  
Institute for Microelectronics, TU Wien  
Gußhausstraße 27-29, 1040 Wien, Austria

Tel: +43-1-58801-36053 Fax: +43-1-58801-36099

email: [Josef.Weinbub@TUWien.ac.at](mailto:Josef.Weinbub@TUWien.ac.at)

Aggressively scaled More Moore devices such as FDSOI FETs, FinFETs, and nanowire transistors are designed around the concept of spatial confinement, which challenges basic notions of electron transport, originally derived under the assumption of a bulk crystal. Confined electrons do not have a well-defined three-dimensional momentum and a continuous energy spectrum. Physical models with confined electrons usually identify a transport direction, separating the problem into transport and eigenvalue tasks. We have investigated quantum wires, where the transverse plane of confinement is characterized by a quantization into energy sub-bands and a lack of a well-defined momentum in accordance with the uncertainty relations. The Wigner function approach has proven to be well suited to model quantum transport in nanowires, where effects of confinement are naturally incorporated in the initial Wigner state and the scattering mechanisms. We critically consider the assumption for homogeneous conditions, which is inevitable when identifying a transport direction. The evolution of periodically injected coherent Wigner states into ideal and non-homogeneous nanowires has been investigated. In our results we observe differences in the behaviour of currents and densities, which are analyzed in Wigner function terms.

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