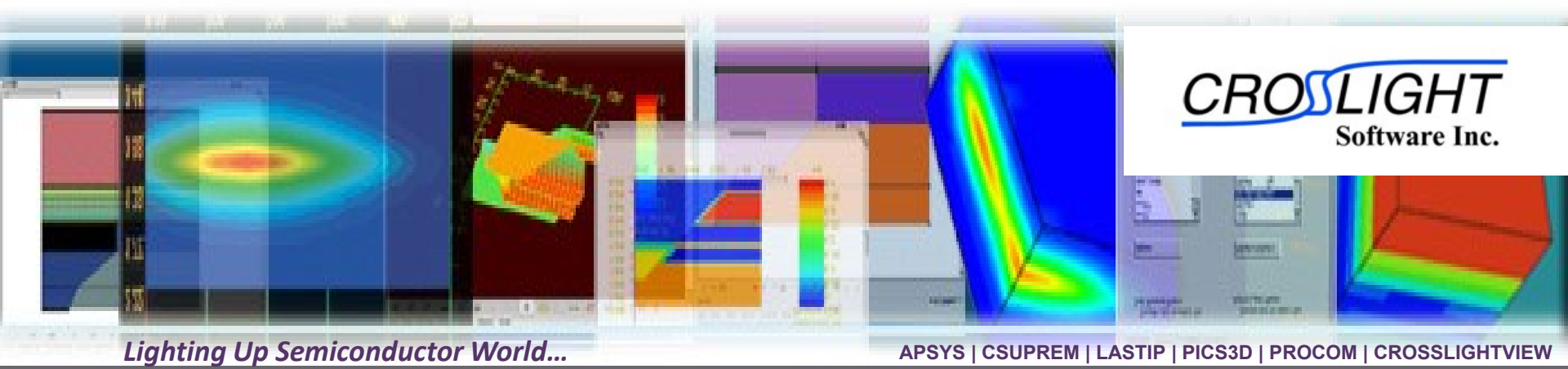


CROSSLIGHT Software Inc.

Lighting Up Semiconductor World…

APSYS | CSUPREM | LASTIP | PICS3D | PROCOM | CROSSLIGHTVIEW

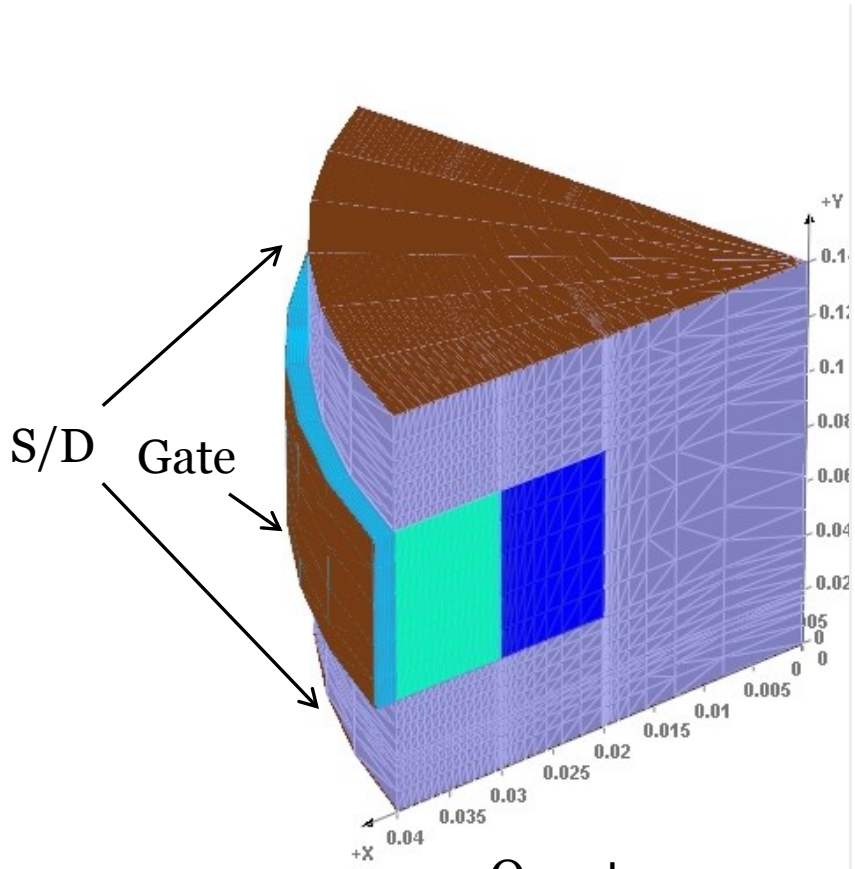
Non-Equilibrium Green's Function (NEGF) Simulation of nanowire MOSFET

CROSSLIGHT Software Inc.

Advanced physical models of nanowire-MOSFET

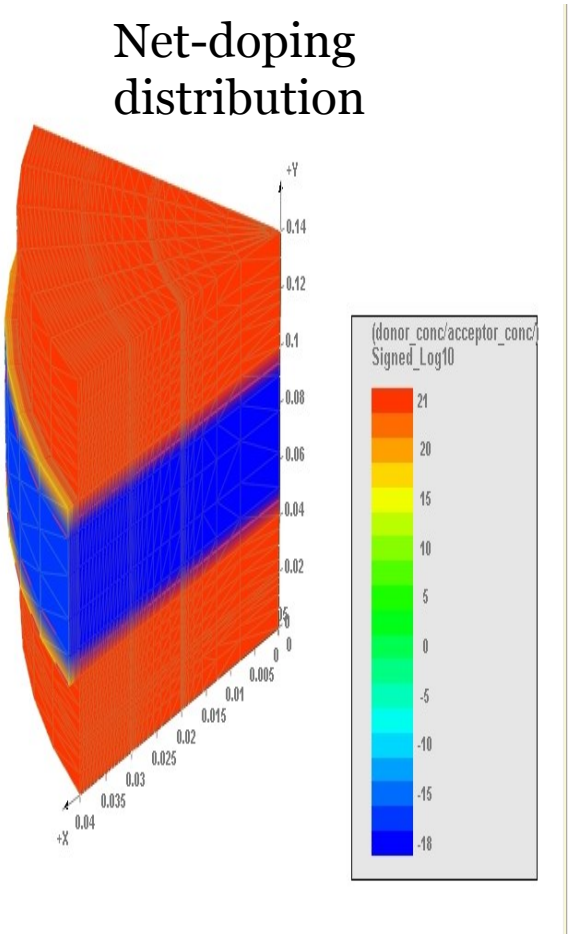
- Use of cylindrical coordinate system to achieve maximum simulation efficiency.
- Hybrid approach with channel region using NEGF while all other regions using conventional drift-diffusion.
- Flexible choice of subbands to be included in NEGF quantum confinement and quantum ballistic transport.
- Self-consistent solution of NEGF equations with all other equations of drift-diffusion.

NEGF Simulation of Nanowire MOSFET

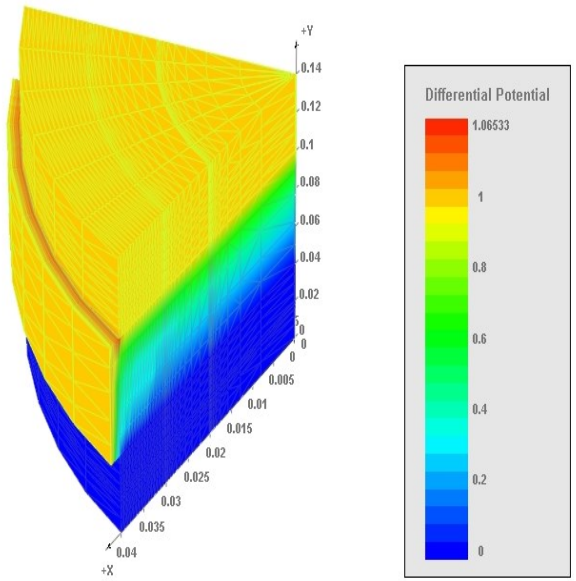


Quantum confined (NEGF) region

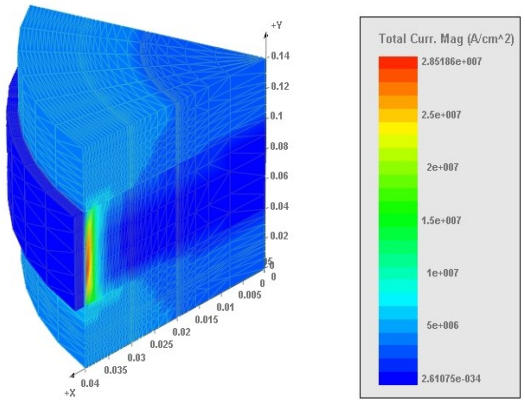
Net-doping distribution

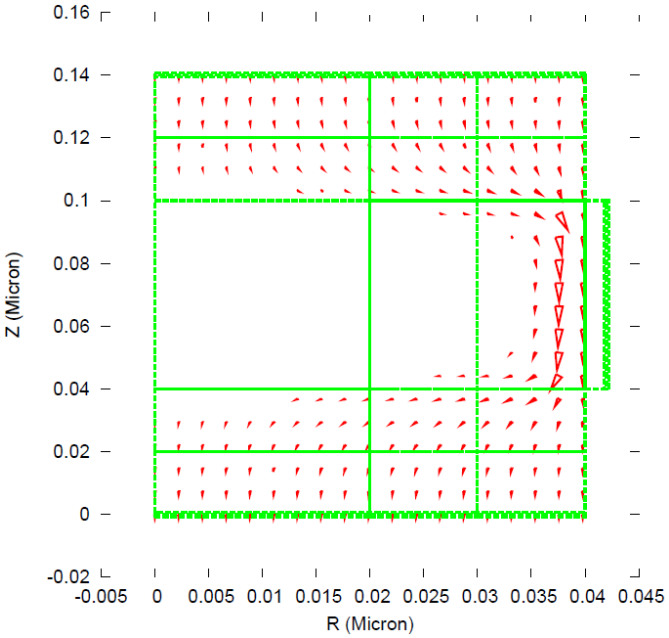


NEGF Simulation of Nanowire MOSFET



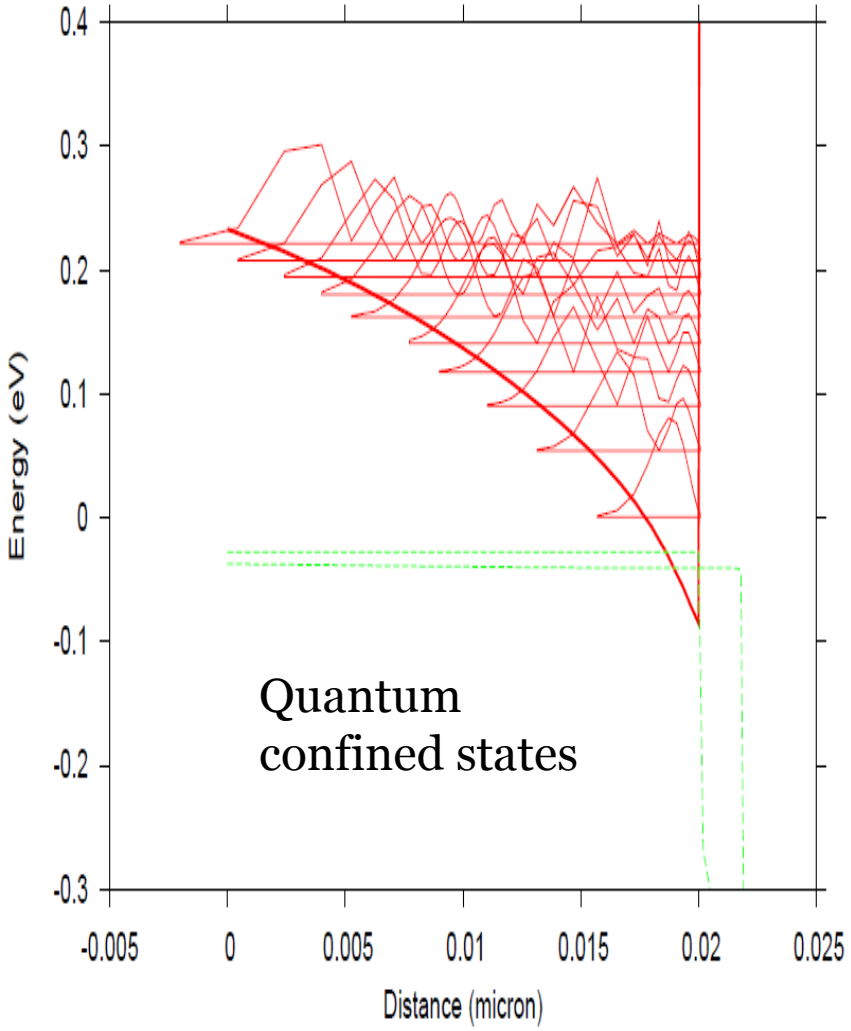
Differential potential/Bias distribution

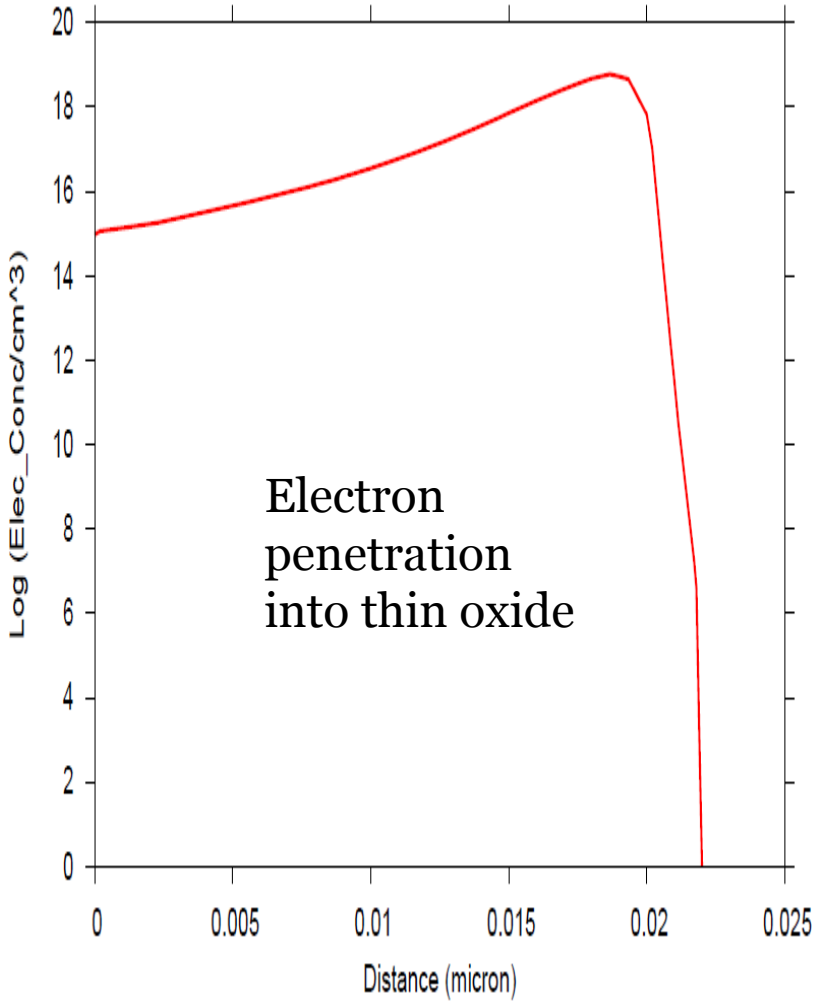




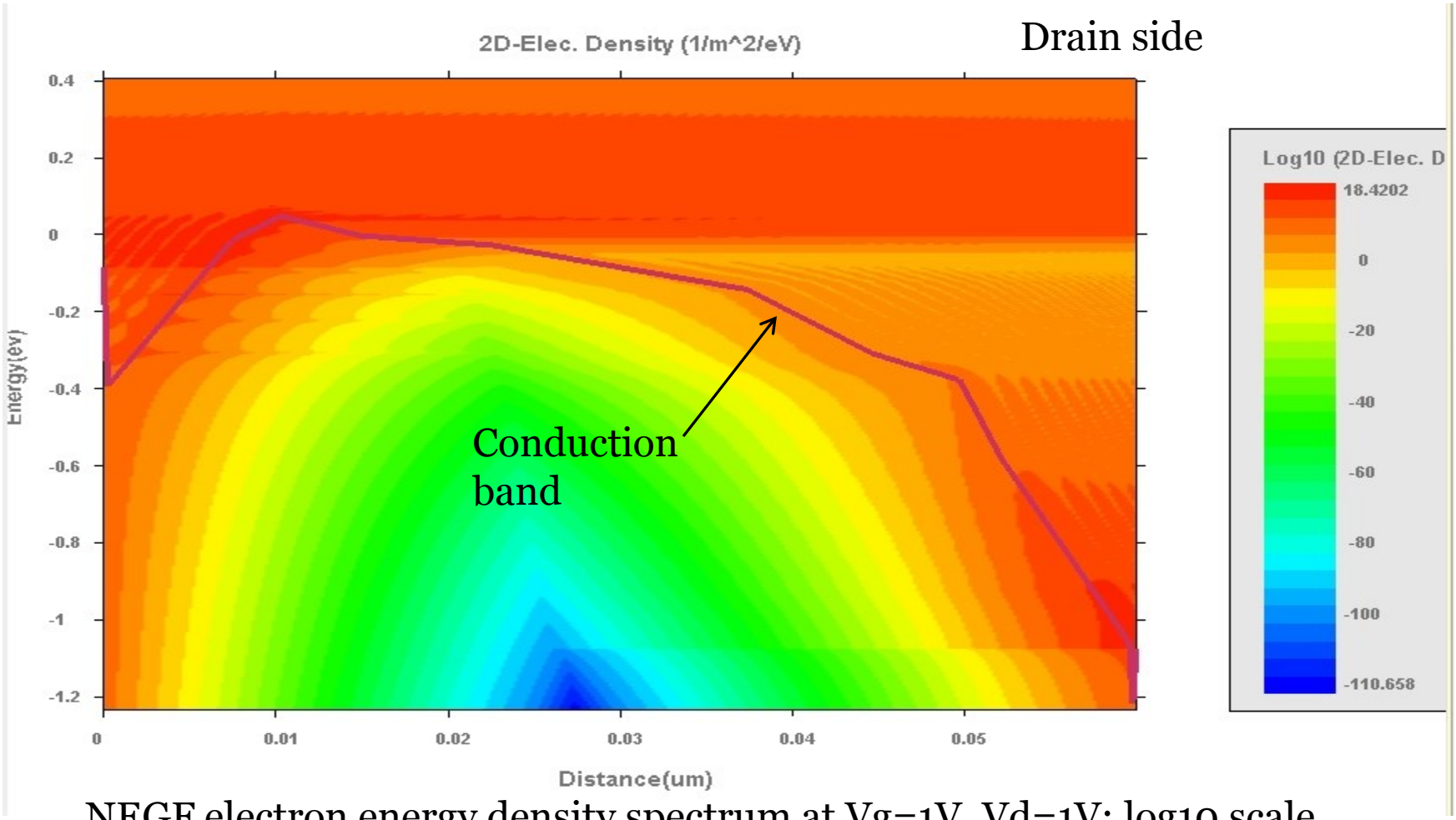
Current flow distribution

NEGF Simulation of Nanowire MOSFET



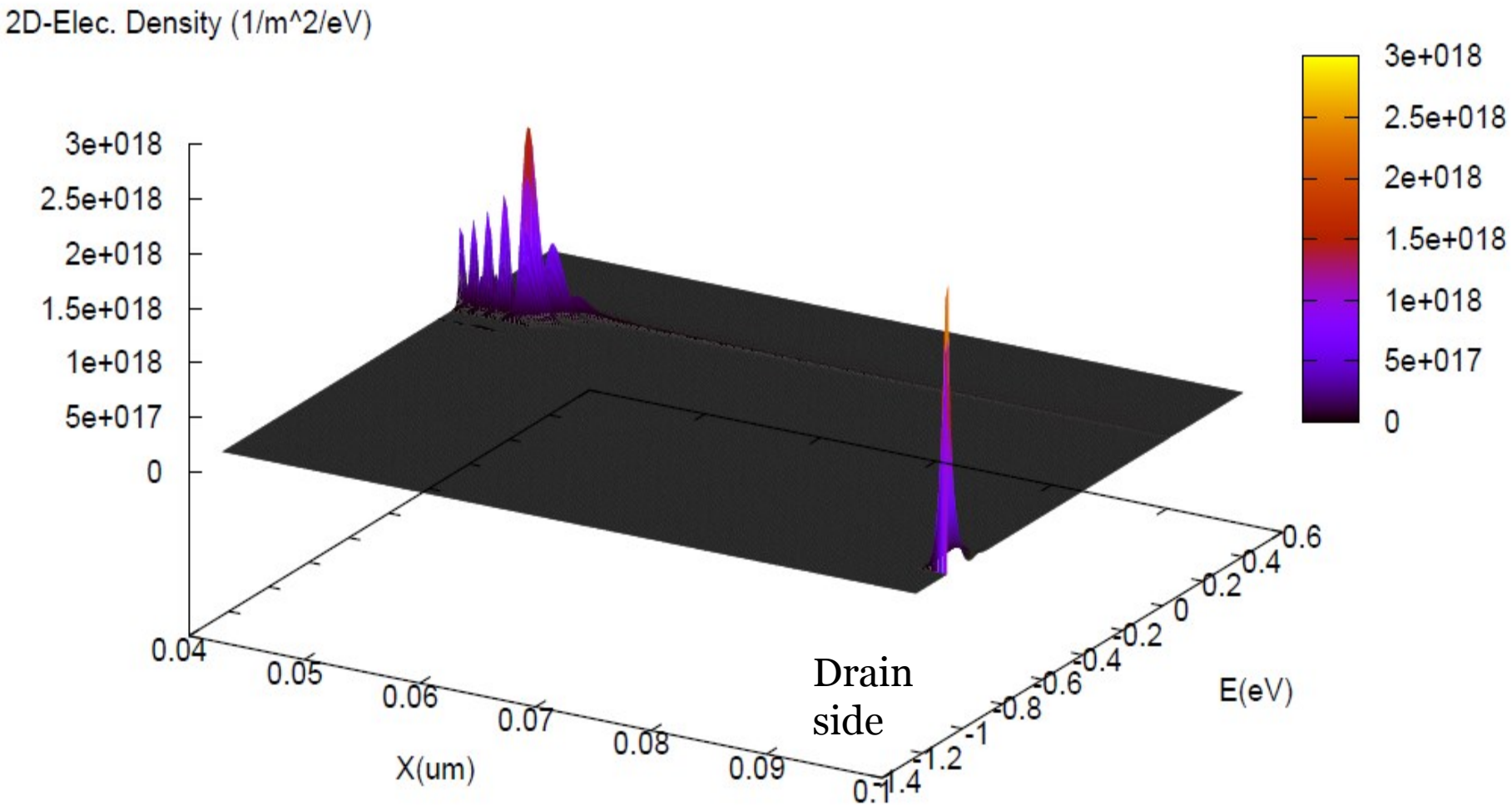


NEGF Simulation of Nanowire MOSFET



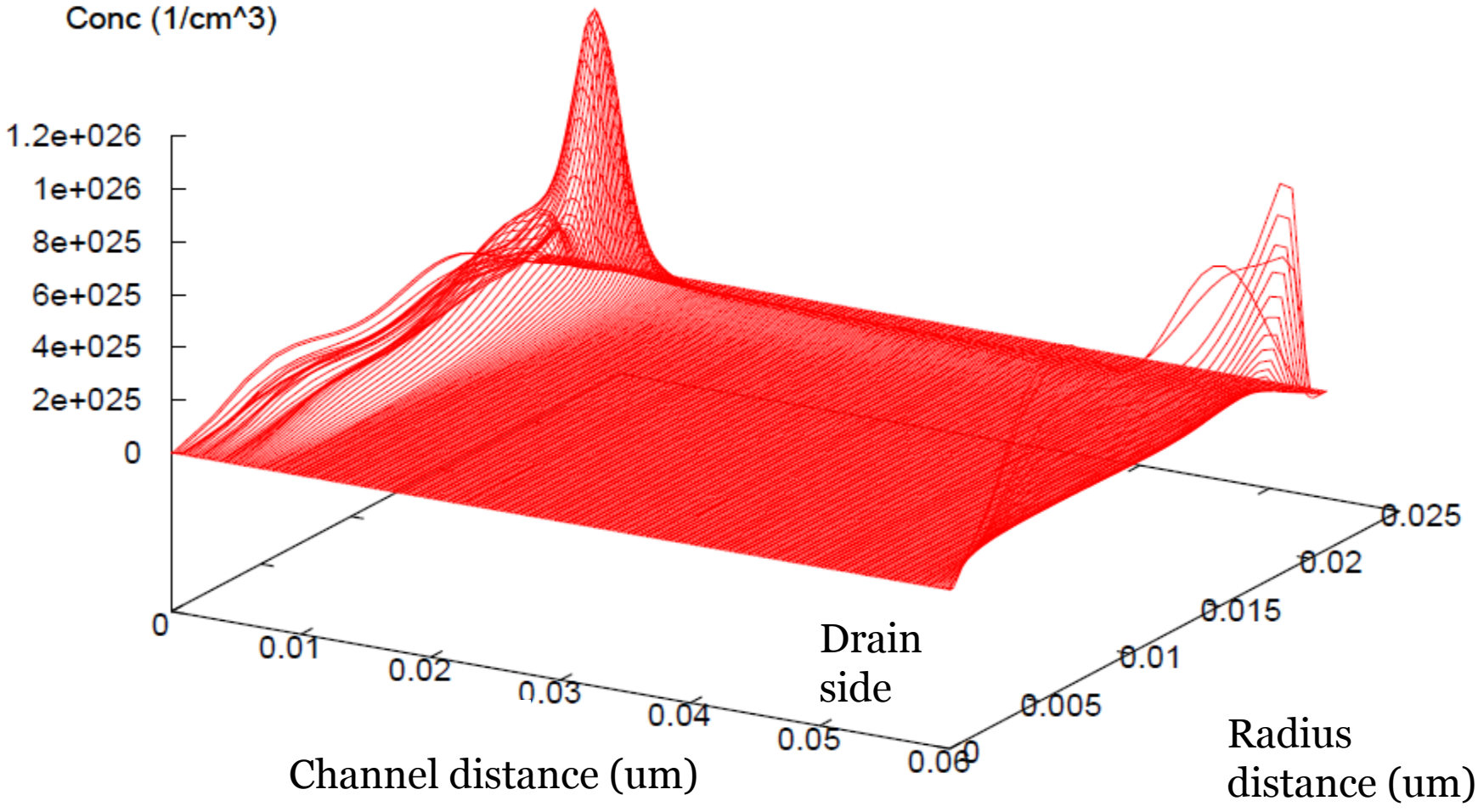
NEGF electron energy density spectrum at Vg=1V Vd=1V; log10 scale

NEGF Simulation of Nanowire MOSFET



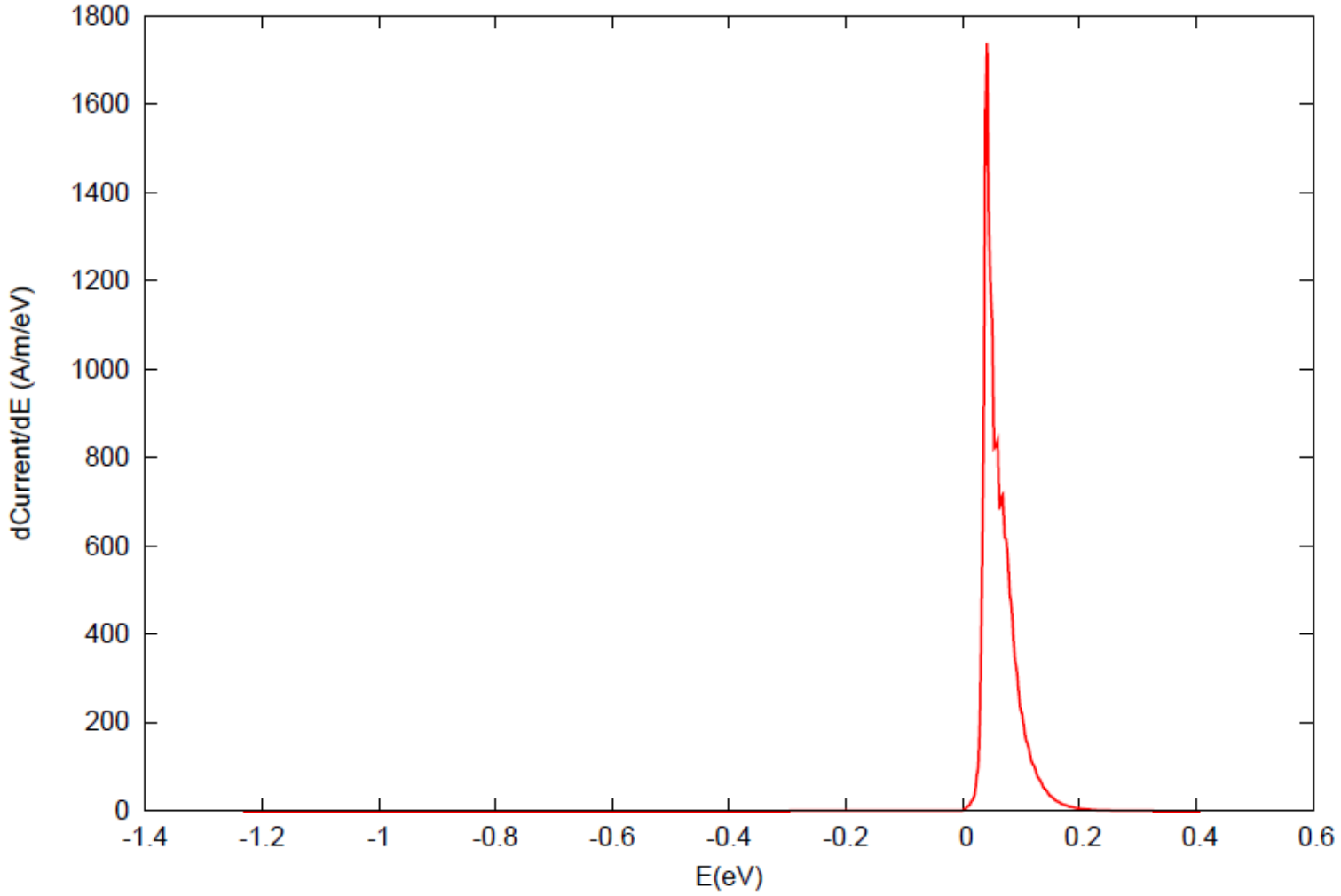
NEGF electron energy density spectrum at Vg=1V Vd=1V

NEGF Simulation of Nanowire MOSFET



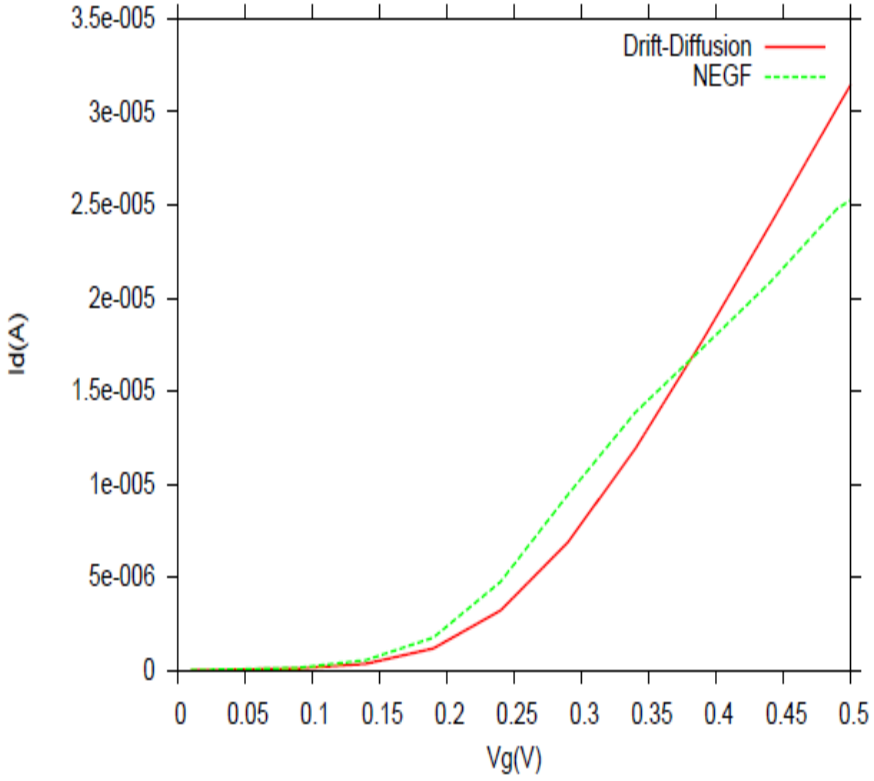
NEGF region electron conc. distribution at Vg=1V Vd=1V

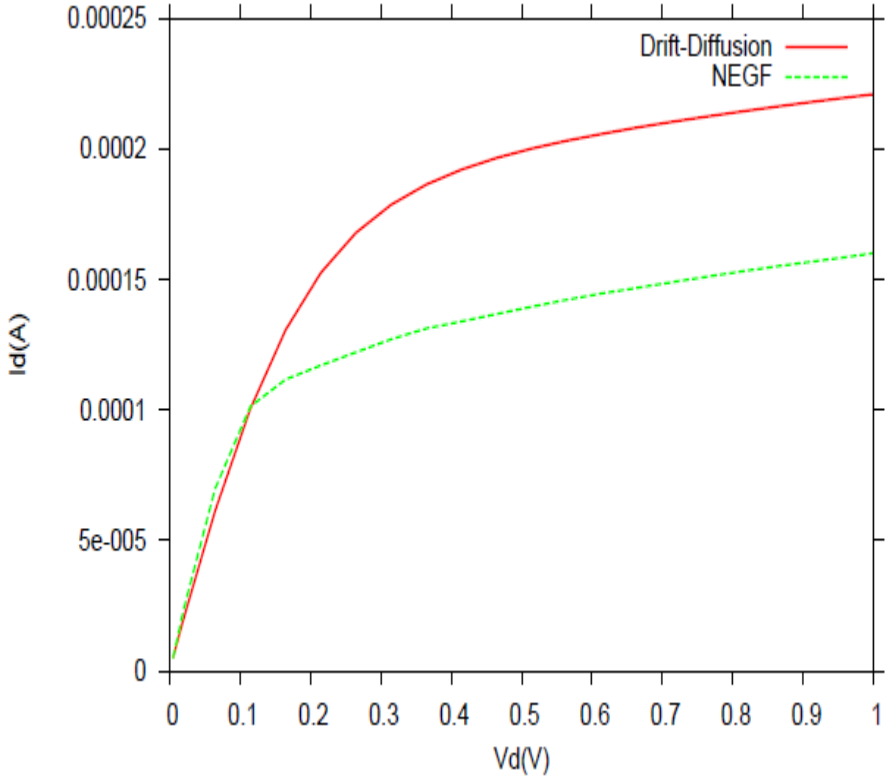
NEGF Simulation of Nanowire MOSFET



NEGF current flow spectrum at Vg=1V Vd=1V

NEGF Simulation of Nanowire MOSFET





Comparison of DD and NEGF models. Both models used quantum confinement. DD model uses simple bulk mobility.

Summary

- Crosslight's NEGF based simulation tools are suitable for nanowire MOSFET simulation.
- Hybrid approach combining DD and NEGF offer both accuracy and efficiency.
- Use of cylindrical coordinate system further enhances computation efficiency.
- For both Id-Vd and Id-Vg curves, total computation time is 7 minutes on an i7 laptop with Windows 7.
- It was found that without elaborate silicon mobility model calibration, the difference between DD and NEGF can be large.

Creators of Award Winning Software

CROSSLIGHT
Software Inc.