NANOACADEMIC TECHNOLOGIES

Coherent Modeling

QTCAD® licenses are commercially available!

Advanced Quantum Chip Design Software

Nanoacademic offers an innovative and unique first principles computer-aided design tool dedicated to spin-qubit modeling for quantum-hardware applications.
This is QTCAD®.

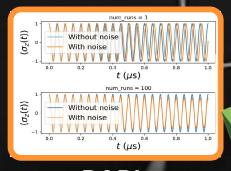
QTCAD® (**Q**uantum-**T**echnology **C**omputer-**A**ided **D**esign) is a finite-element method (FEM) simulator used to predict the performance of spin-qubit devices before their production. These predictions can result in huge savings in terms of time and money, which allows the exploration of more design scenarios than traditionally possible. QTCAD® uses non-linear Poisson, Schrödinger, and many-body solvers to calculate the envelope functions and energy levels of electrons or holes confined to nanostructures within the k·p formalism.

QTCAD

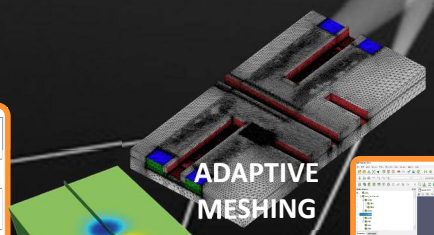
Key features (v1.5):

- See full release notes on https://portal.nanoacademic.com/products/products/releasenotes/qtcad
- **NEW!** Major acceleration of Coulomb integrals for exchange interaction and many-body calculations
- **NEW!** Improved multithreading in the single-particle Schrödinger solver, for both electrons and holes
- **NEW!** Improved multithreading & acceleration of the 3D & 1D multi-valley effective mass theory (MVEMT) solvers
- **NEW!** Tutorials for a generalized charge-stability diagram calculation workflow, a 1D calculation of valley splitting at an oxide-semiconductor interface, and a 3D simulation of a phosphorus donor in silicon including a central cell correction
- **NEW!** Possibility to define custom defect charge-density profiles to model point charges and dopants
- An electrostatics tool for quantum dot confinement potentials in semiconductors
- A many-body Schrödinger solver for electrons and holes
- A master equation solver for quantum transport calculations in the sequential tunneling regime (Coulomb blockade)
- An NEGF* solver for non-equilibrium quantum statistics and quantum transport in two-probe devices
- A computationally efficient workflow for charge stability diagrams of few-quantum dot systems including cross-capacitive effects
- Quantum-mechanical treatment of magnetism (orbital and Zeeman effects) and spin-orbit coupling
- A strain solver for electrons or holes to calculate conduction-band edge shifts & valence-band mixing effects
- A Hybrid 3D/1D quantum-well Schrödinger-Poisson solver
- A general workflow for electric-dipole spin resonance (EDSR) interfacing with QuTiP for both electrons and holes
- Works at cryogenic (sub-K) temperature thanks to our adaptive meshing technique
- Arbitrary 1D/2D/3D device geometries enabling to study many practical designs

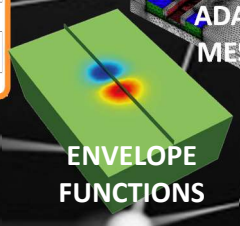
** Non-equilibrium Green's functions*



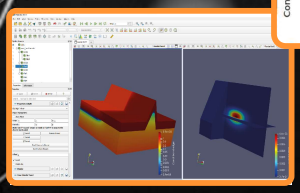
RABI OSCILLATIONS



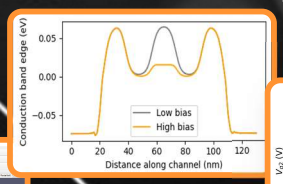
ADAPTIVE MESHING



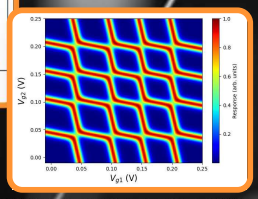
ENVELOPE FUNCTIONS



QUANTUM-DOT MODELING



BAND DIAGRAMS



FEW –QUANTUM-DOT SYSTEM CHARGE-STABILITY DIAGRAMS (CSD)

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nanoacademic.com
+1 438 387 4003
666 Sherbrooke Street West, Suite 802, Montréal H3A 1E7 Québec, Canada