Quantillion

A first-principles, multilevel FDTD quantum-electromagnetic solver

Current methods for developing quantum photonic devices are
expensive, **time-consuming** and **labour-intensive**.

Developers of quantum photonic components, such as solid-state single-photon sources and qubit registers, strive to maximise the quantum performance of their devices while under time pressure to outstrip their rivals.

Examples of the quantum characteristics being optimised:

✓ Qubit coherence time

✓ Quantum emitter coupling efficiency

✓ Single-photon purity and indistinguishability

All of these are intimately linked to the device geometry and optical driving pulses.

## WHY USE QUANTILLION?

If you are...

- A scientist/engineer in academia/hardware company: design better quantum photonic devices faster
- A photonic design software company: capture a share of the rapidly growing quantum market
- A semiconductor foundry: mass-produce high-yield, peak-performance quantum photonic devices
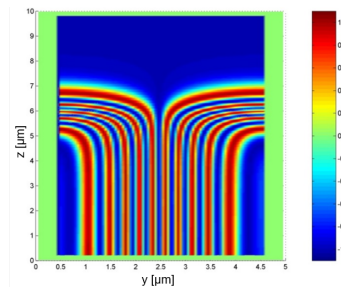
2-week design cycle

90% cost savings

Optimised design

Example simulations with Quantillion
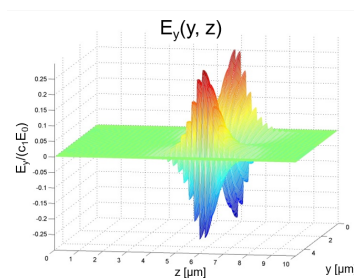
Optical spin excitation in nonlinear optical waveguides, filled with an ensemble of four-level resonant absorbers.

Population Rabi flopping showing successful selective excitation of a specific spin state by circularly polarised light.

By conducting a parallelised parameter sweep, Quantillion singles out the parameter set that corresponds to a top-performing, high-quality device. With its 'right-first-time' approach, Quantillion completely removes the need to carry out repetitive trial-and-error iterations of the prototype.

FEATURES

	Classical EM Solvers	Quantum Optics Toolboxes	*Quantillion*
Full-wave vector solution of Maxwell's equations	✗	✗	✓
FDTD method	✓	✗	✓
1D+time / 2D+time model	✓	✗	✓
Quantisation of energy levels	✗	✓	✓
Arbitrary number of energy levels	✗	✓	✓
No approximations	✗	✓	✓
Handles open quantum systems	✗	✓	✓
Library of driving pulses	✗	✗	✓
Built-in constructor of arbitrary device geometries	✓	✗	✓
CW to femtosecond and few-cycle pulses	✗	✗	✓

Quantillion frees up your time, money and human resources, enabling you to be **more productive**, **innovate more rapidly**, and **get your product to market sooner**.

Component design teams may try to develop quantum photonic modelling capabilities themselves. These efforts are wasteful: we offer a significant head-start over such teams with the 20 years' multi-disciplinary expertise and know-how of our internationally recognised leaders in the theory and modelling of quantum photonic structures.

Contact us to become a beta-tester
and see how Quantillion can super-charge your projects!

SERVICES

We design, model and optimise:

✓ Quantum photonic memories

✓ Quantum light sources

✓ Quantum photonic logic

✓ VCSEL dynamics

Addressable quantum systems:

✓ Semiconductor QDs optionally embedded in microcavities
✓ Diamond colour defects
✓ 2D materials: hexagonal boron nitride, transition metal di-chalcogenides
✓ Dopant atoms in silicon

Request a demo or a pre-sales support visit. More information and use-cases available on our website.

OUR PARTNERS & AFFILIATIONS

UNIVERSITY OF CAMBRIDGE · esa European Space Agency · THE UNIVERSITY of EDINBURGH · Argonne NATIONAL LABORATORY

TECHNISCHE UNIVERSITÄT MÜNCHEN · THE UNIVERSITY OF CHICAGO 1890 · UNIVERSITY OF OXFORD · UNIVERSITY OF MICHIGAN · The University Of Sheffield.

GET IN TOUCH

Website: www.quantopticon.co.uk
E-mail: info@quantopticon.co.uk
Twitter: @Quantopticon