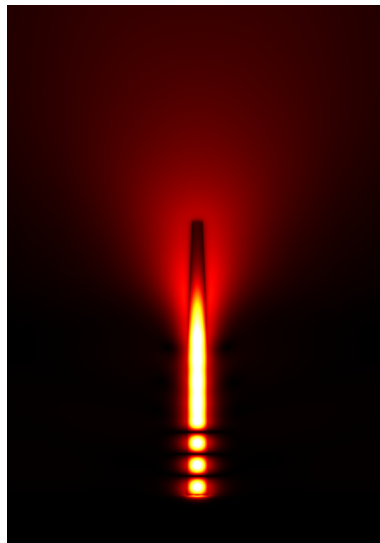


Optical Simulations of Structured Materials

In photonics, optical components are constructed from basic building blocks such as wave-guides, splitters, amplifiers, multiplexers etc. In most cases these cannot be studied analytically so instead computer software is used not only to model the properties of existing components but also to test new design ideas before they are actually implemented. The development of efficient computer models is thus an important part of photonic engineering.

This project is an exercise in applied theoretical physics. The student will start at Maxwell's equations and will be guided through the mathematical steps necessary to develop a modeling tool describing the electromagnetic field as function of refractive index geometry. The student will write the program from scratch, and the tool will then be used to analyse optical components.

The picture shows the electromagnetic field in a photonic nanowire designed as a single-photon source, calculated using the formalism of this project.



The student should be familiar with linear algebra (inner product spaces, matrix operations and eigenproblems) to understand the mathematical procedures. Knowledge of Maxwell's equations and basic Matlab programming are recommended.

Number of students: 1-2.

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