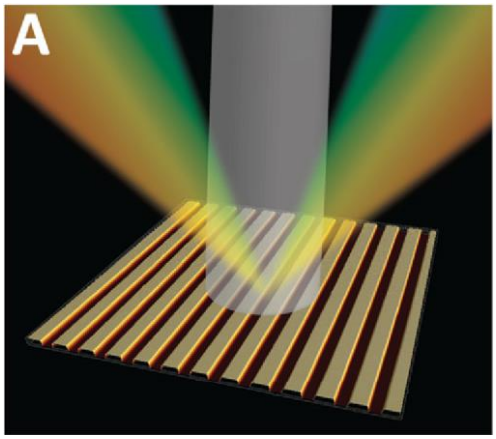
University of Bremen

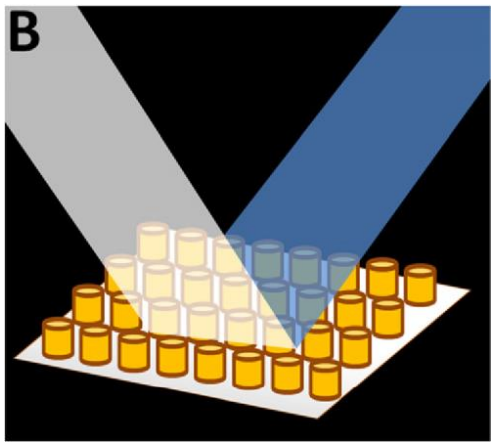
BIMAQ
Bremen Institute for Metrology, Automation and Quality Science

Bachelor/Master Thesis:

Scattered light simulation of periodic Nano-structures: verification and comparative analysis

Systems Engineering, Production Engineering,
Industrial Engineering, Electrical Engineering, Physics, and related





(A) Colorful iridescence from diffraction grating
(B) Light scattering by periodic nano-structures

Periodic nano-structures find application in both physics and engineering. These periodic structures are often in the sub-100 nm range, i.e., below the optical resolution limit. Scattered light measurements that are sufficiently fast are suitable for in-process inspection. However, the relationship between the measured scattered light and the state of the nano-structure (defect-free / defective) is generally unknown. In order to determine this relationship, optical experiments are to be carried out virtually, i.e. numerically (scattered light simulations).

Are the simulation results correct?

The thesis will be a comparative study between two different simulation approaches – Discrete Dipole Approximation (DDA) / Rigorous Coupled Wave Analysis (RCWA). In addition, the simulation results will be verified using analytical knowledge from scalar diffraction theory. This will test the simulation quality and determine the more appropriate approach for future simulative studies of nano-structures with defects.

Potential contents of the thesis

- Modelling of periodic nano-structures as input to simulation
- Calculation of the diffraction pattern with DDA and RCWA
- Verification & evaluation of the simulation quality

Your profile

- Enthusiasm for numerical methods and optics
- You have programming knowledge in Matlab or Python.
- You want to work with us to advance our understanding of the scattered light behavior of nano-structures!

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