AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY

MICRO & NANO
SIMULATION AND MODELLING

The AIT Austrian Institute of Technology offers customized services for simulating, fabricating and characterizing micro- and nano-technological structures and devices. Accurate simulation and modelling is of crucial importance in R&D projects to quantify the effect of various parameters on a system before fabricating it. With our long standing expertise in magnetical, photonic, optical and microfluidic simulations we are the partner of choice for modelling your systems.

DESIGN TOOLS

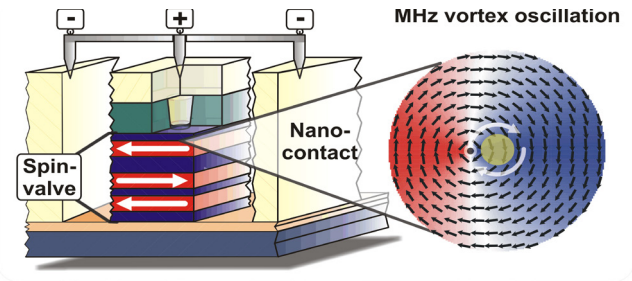
We manage simulation tasks using a wide range of computational methods:

- Object Oriented Micro Magnetic Framework (OOMMF) code for micro magnetic simulation
- Finite difference time domain (FDTD) method for calculating the propagation of light in arbitrary 2D and 3D structures
- Beam propagation method (BPM) for simulating waveguiding in slowly varying waveguide geometries
- Finite element method (FEM) – COMSOL Multiphysics solver for the simulation of microfluidic, electromagnetic and optical stack systems

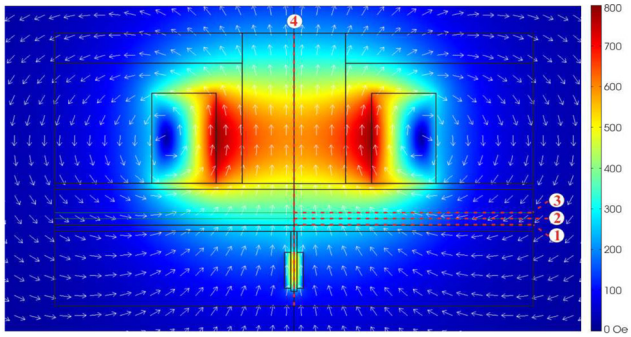
APPLICATION EXAMPLES

Magnetic Systems

The OOMMF micro magnetic simulation code is used for modelling magnetic dynamics of thin film multilayer systems (Applied Physics Letters Vol. 98, pp. 042504).

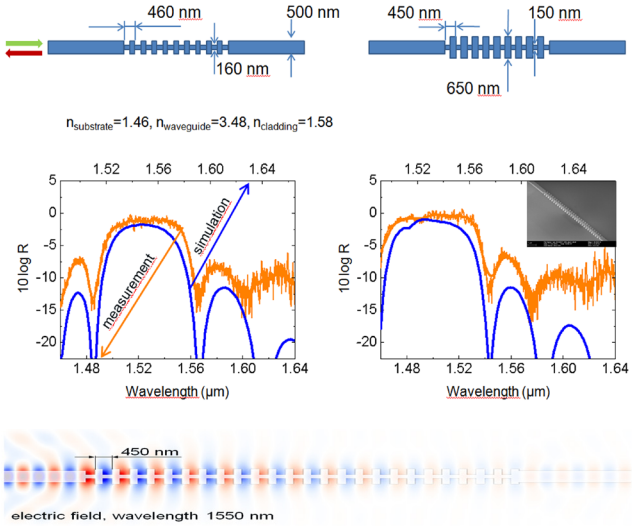


The AC/DC Module of the Comsol Multiphysics finite element solver is used for simulating electric, magnetic, and electromagnetic fields in static and low-frequency applications. The cross-section image shows simulation results of magnetic fields around an axial-symmetric coil arrangement.



Si photonic wire Bragg reflectors

Photonic wire Bragg reflectors are periodic structures with a few hundred nanometer feature size that offer mirror-like properties. 3D FDTD simulations enable an accurate design of the transmission and reflection characteristics for specific applications.



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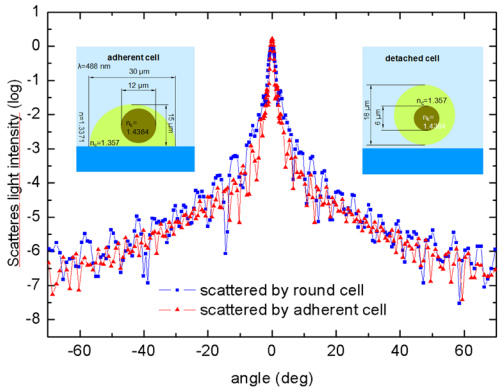
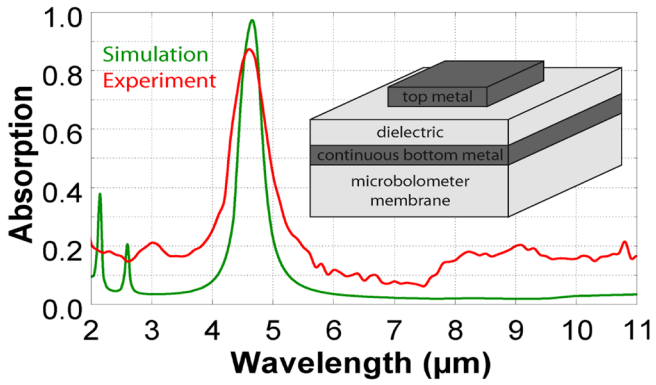
Light scattering at cells

Employing 3D FDTD simulation the near field of the scattered field is determined. A near field – far field transformation provides the angle dependent scattering characteristic.



Resonant Absorbers

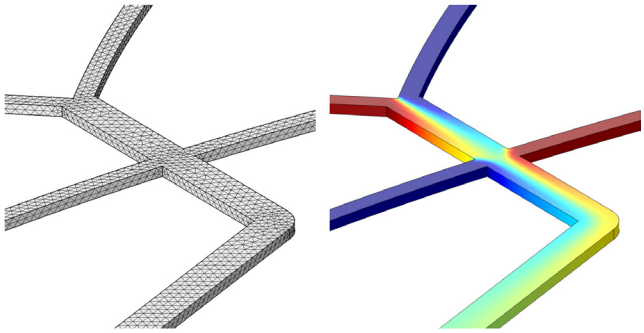
Periodic metal/insulator/metal structures possess unusual optical properties that strongly depend on their geometrical dimensions. Great potential lies in the possibility to create frequency selective surfaces or resonant absorbers with tunable absorption. The example shows how the spectral characteristics of a microbolometer with an intrinsic sensitivity range of 7-15 µm may be modified by the integration of a resonant absorber. (Optics Letters, Vol 35, No. 22, pp. 3766)



Microfluidic Systems

We provide 3D simulations of micro fluidic Lab-on-a-Chip Systems and enable timely product development by the use of different CAD and CAM tools. Special focus is put on interaction of the liquids momentum, heat, and mass transport for flow rates at the micro scale. Single-phase flow, porous media flow, two-phase flow, and transport phenomena are studied within physical models.

Micro fluidic mixer



3D mesh for FEM simulation

Surface concentration of two liquid streams shows diffusive mixing

CONTACT

AIT Austrian Institute of Technology GmbH
Donau-City-Straße 1
A-1220 Wien

DR GIORGIO C. MUTINATI

Phone: +43(0) 50550 - 4302
Fax: +43(0) 50550 - 4399
E-mail: giorgio.mutinati@ait.ac.at
Web: www.ait.ac.at/nano