Curriculum Vitae

Prof. Christian Hafner

Professor for Electromagnetic Fields and Microwave Electronics
Head of Electromagnetic Fields and Microwave Electronics Laboratory
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Degrees/Higher Education

1986	Habilitation, ETH Zurich
1980	PhD, Electrical Engineering, ETH Zurich
1975	Diploma, Electrical Engineering, ETH Zurich

Professional Career

1999 - present	Professor at the Electromagnetic Fields and Microwave Electronics Laboratory of ETH Zurich

Professional Activities

- Swiss Electromagnetics Research & Engineering Centre, Director
- Journal of Computational and Theoretical Nanoscience, Member of Editorial Board
- International Workshop on Numerical Methods for Optical Nano Structures, Organizer

Major Honors and Awards

- 1990 Seymour Cray Award for scientific computing

Membership in Societies

- Electromagnetics Academy

Publications

- 8 Books and Book-Software packages
- 8 Book chapters
- 100+ Refereed Publications

Achievements

- Development of the Generalized Multipole Technique (GMT)
- Development and implementation of various software packages for computational electromagnetics (2D MMP, 3D MMP, MaX-1, OpenMaX)
- Development and implementation of various numerical optimizers (Genetic Algorithms, Generalized Genetic Programming, Evolutionary Strategies, etc.)
- Design of Metamterials for various applications (50Hz magnetic field shielding, ultra-thin radar absorbers, IR protection, optics)
- Development of efficient algorithms for the analysis of plasmonic structures

Membership in Societies / Committees

- Serec steering committee

Teaching

- Introduction to Computational Electromagnetics
- Optimization Methods for Engineers
- Physical Modelling and Simulation
- Seminar in Electromagnetics

Personnel

Scientific coworkers	6
Non-scient. coworkers	9
Diploma/BA/MS projects	3
Doctoral students	15

Facilities and Major Equipment

- Microwave measurement equipment
- Antenna measurement room

For more information visit:
http://www.ifh.ee.ethz.ch
http://alphard.ethz.ch
http://OpenMaX.ethz.ch
http://MaX-1.ethz.ch
http://metamaterial.ethz.ch

Prof. Christian Hafner - Research Highlights

Electromagnetic Fields and Microwave Electronics

Keywords

- Computational Electromagnetics and Optics
- Optimal Design and Numerical Optimization
- Industrial Microwave and mm wave Applications
- Electromagnetics for Biology and Medicine
- Metamaterials for Industrial Applications
- Plasmonics and Optical Nano Structures

Future priority areas

- Smart Metamaterials
- Nano Optics and Plasmonics
- High Speed Communication
- Smart Sensors for Smart Phones

Focus

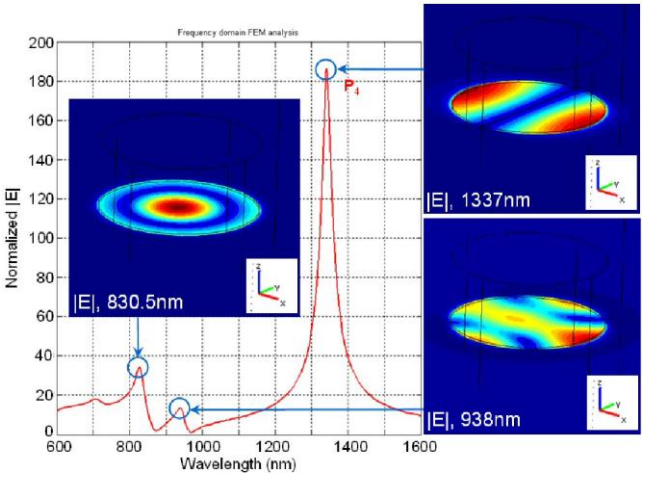
The research activities of the Electromagnetic Fields and Microwave Electronics Laboratory are very diverse and interdisciplinary and range from theoretical studies and computational methods for electromagnetics and optics the design, fabrication and characterization of structures and devices for industrial applications from very low to very high frequencies.

Research Highlights

Very promising results were recently obtained concerning plasmonics, metamaterials, and smart sensors for smart phones.

Plasmonics

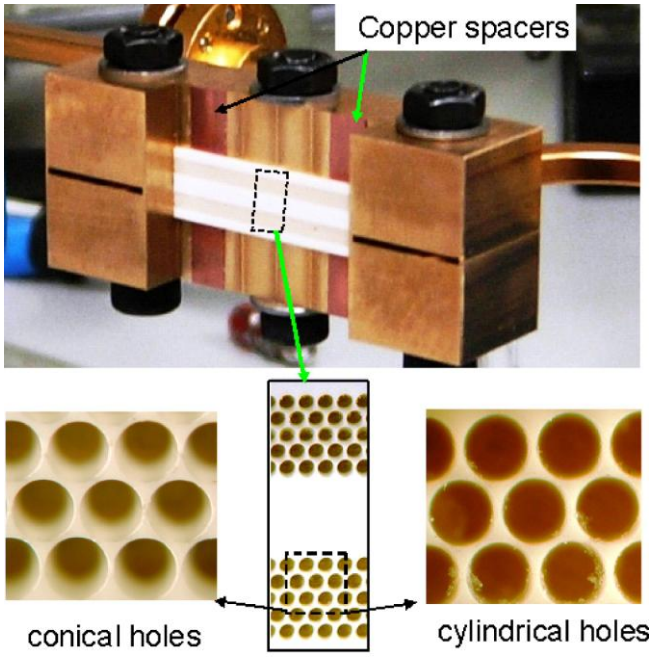
We analyzed the suitability of various numerical methods (finite differences, finite elements, finite volume time domain, multiple multipole program) for the efficient and accurate simulation of plasmonic structures such as plasmonic waveguides, plasmonic metamaterials, and plasmonic nano antennas.



Electric field pattern of a plasmonic antenna (pair of gold disks with 2nm gap) in the gap area, for the three major resonances of the optical antenna (simulations by Jasmin Smajic, Dirk Baumann, Christian Hafner)

Metamaterials

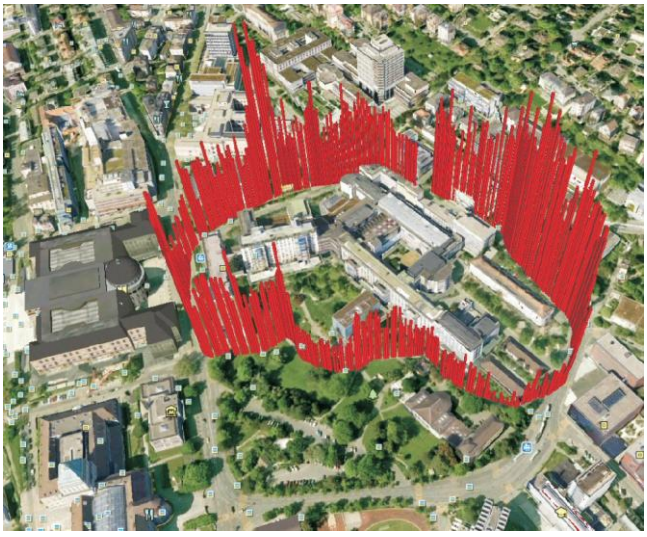
We are studying and designing metamaterials for various industrial applications, namely, metamaterials for the magnetic field shielding at 50 Hz, metamaterials for the sealing of microwave owens, ultra-thin metamaterial radar absorbers, metamaterial-based directive antennas, metamaterials for chip to chip communication at 90GHz and above, metamaterials for IR protection, and metamaterials for solar cell enhancement.



Prototype of a 90GHz straight metamaterial waveguide resonator with conical or cylindrical via holes in the perforated area (Nemat Dolatsha, Mustafa Byvat, Jan Hesselbarth).

Smart Sensors for Smart Phones

We develop sensors for the measurement and recording of electromagnetic fields – ranging from very low to very high frequencies – using communication with smart phones, which benefit from GPS and other information provided by standard smart phones.



Track of measured electric field values of the GSM 1800MHz downlink band displayed in Google Earth. (Oliver Lauer, Patrick Leidenberger, Michael Müri, Jürg Fröhlich)

For more information visit www.ifh.ee.ethz.ch