学术报告

题 目: Controlling light at the nanoscale with plasmonic antennas: Mode selective Raman and optical trapping

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地 点: 卢嘉锡楼报告厅（202）

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固体表面物理化学国家重点实验室
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Controlling light at the nanoscale with plasmonic antennas: Mode selective Raman and optical trapping

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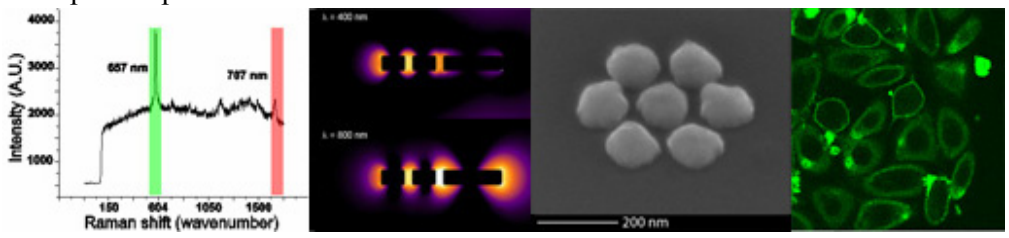
Abstract:

Antennas are very well known at microwave frequencies, where many different types of antennas exist. In this lecture I will show how the concept of an antenna can be scaled down to nanometric dimensions to operate at optical frequencies using the phenomenon of plasmon resonances. After briefly recalling the fundamental principles of plasmonics, I will present different families of applications where we use plasmonic antennas at EPFL.

First, mode-selective Raman spectroscopy, where the antenna response is used to enhance selectively specific Raman lines. Second, plasmonic trapping, where the extremely strong optical field produced by the antenna can trap nanoscopic objects. The combination of plasmonic trapping with surface enhanced Raman scattering provides a very useful analytic platform. Finally I will describe some recent experiments in nonlinear plasmonics and in life sciences for the early detection of cancer and its treatment. For this, we have recently used human cells to directly grow highly biocompatible plasmonic nanostructures.



From left to right: Mode-selective Raman enhancement; double resonant antenna for second harmonic generation; heptamer structure that exhibits a Fano resonance; two photon fluorescence image of gold nanoparticles grown inside human cells.

Olivier J.F. Martin received the B.Sc. and Ph.D. degrees in physics in 1989 and 1994, respectively, from the Swiss Federal Institute of Technology, Lausanne (EPFL), Switzerland. In 1989, he joined IBM Zurich Research Laboratory, where he investigated thermal and optical properties of semiconductor laser diodes. In 1997 he received a Lecturer fellowship from the Swiss National Science Foundation (SNSF). During the period 1996-1999, he spent a year and a half in the U.S.A., as invited scientist at the University of California in San Diego (UCSD). In 2001 he received a Professorship from the SNSF and became Professor of Nano-Optics at the Swiss Federal Institute of Technology Zurich (ETHZ). In 2003 he was appointed Professor of Nanophotonics and Optical Signal Processing at EPFL, where he is currently full Professor and head of the Nanophotonics and Metrology Laboratory.

His research interests focus on the interactions of electromagnetic fields with low dimension systems, with emphasis on plasmonics. Dr. Martin has co-authored over 400 scientific publications including 180 journal articles. He also holds a handful of patents and invention disclosures. In 1999 he received the Latsis University prize for contributions to the study of near-field optics and photonic bandgap structures.