Dr. Ivan Favero,
(CNRS Paris)

Micro and nano-optomechanical systems: from micro-mirrors to sub-wavelength nanorods vibrating in cavity

In optomechanical systems of small size, light can interact strongly enough with a mechanical vibration mode to modify its frequency or its fluctuations. The model system for optomechanical phenomena is a Fabry-Pérot cavity with a mechanically vibrating mirror: the mirror vibration affects the field in the cavity, which in turns acts back mechanically on the mirror through photo-induced forces. I will present different cavities integrating oscillating micro-mirrors that have recently used this back-action to produce optical pumping or optical ccoling of the mirror vibration mode, with the prospect amongst other things to cool it down to the quantum ground state.
In a general case, such mechanically oscillating mirror has an extension larger than the photon wavelength, in order to confine efficiently the light into the cavity. In a second part of this presentation, I will introduce a new kind of optomechanical system at the nanoscale: a sub-wavelength carbon-based nanomechanical resonator is positioned accurately in the micron-sized mode of a high-finesse Fabry-Pérot cavity. The optical transmission of the cavity is affected not only by the static position of this nano-plunger but also by its flexural fluctuation modes. In other words an imprint of the vibration dynamics is directly detected in the optical transmission signal. This system, with a mechanical nanostructure of about 109atoms in cavity, represents a first step towards the extension of quantum electrodynamics experiments to nanomechanical systems.

4. Juli 2008, 15:30 Uhr

Universität Tübingen, Raum D4 A19
Auf der Morgenstelle 14, 72076 Tübingen

CO.CO.MAT