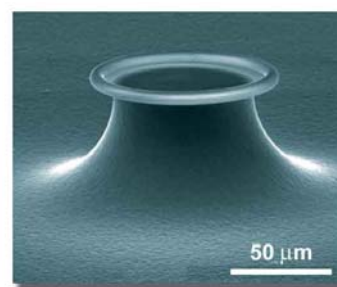


PhD Position(s) and/or Postdoctoral Scholar

A PhD position is available at the **Max Planck Institute of Quantum Optics (MPI für Quantenoptik)** in Garching, near Munich. The position is in the Max Planck Independent Junior Research Group for Photonics, which is part of the Division of Laser Spectroscopy and Ultracold Quantum Gases of Professor T.W. Hänsch and is continuing internationally successful research originating from the “California Institute of Technology”. The positions are part of the recently funded Marie Curie Project “Novel Applications of Ultra-high-Q optical Microcavities”. The group's work is situated in the area of chip-based optical micro-cavities. These structures can trap light in micro-scale volumes for extended amounts of time, and find application in a variety of fundamental and applied studies, ranging from nonlinear optics, cavity Quantum Electrodynamics to microscale Laser sources and biochemical sensors.



The candidate has the possibility to join either of three ongoing projects, which offer both *experimental and theoretical* research opportunities. Recent work in our group has demonstrated a new laser cooling technique for mechanical oscillators using radiation pressure (PRL **97** 243905, Dec. 26th 2006). The successful candidate will join a team of students to continue this project in a quest to reach previously inaccessible temperature regimes – with the long term goal of cooling a macroscopic object down to its quantum ground state. On a fundamental level we have recently developed a quantum theory of this process and are looking for a candidate to continue this theoretical work on opto-mechanical coupling using radiation pressure.

The second project pertains to combining the frequency comb technique with optical microcavities, as a tool to measure microcavity characteristics. Indeed our group has recently shown for the first time that optical frequency combs can be generated using monolithic microcavities. Furthermore, opportunities exist to

work on related projects, such as the on-chip generation and characterization of squeezed states of light.

The third possible project of the group pertains to single molecule detection. To date, only a few widely applied techniques in Biophysics are available for label free detection of ligand-receptor binding, which lack single to resolve single molecule binding events. Building on recent advances of the applicant's team at the MPQ and in collaboration with the Munich based University LMU (Professor Joachim Readler), we have developed a novel methodology in which we use membrane functionalized monolithic micro-resonators in aqueous solution as novel technique to resolve single binding events. A successful prestudy has been completed and we are now searching for a PhD student or Postdoc who wished to engage in interdisciplinary research at the interface of Physics and Biophysics. By developing a methodology by which label free single molecule sensitivity in biomolecular recognition can be attained, this research could enable to open new frontiers to Biophysicists. In particular, label free single molecule detection could allow direct monitoring of on-off binding rates as well as enzymatic activity.

Requirements are a degree in Physics or related field, as well as an *excellent* track record as witnessed by academic accomplishments. The positions are funded by the EU. Interested students send their complete application package (including CV, letter of motivation, and complete record of university grades) to Dr. Tobias Kippenberg (tobias.kippenberg@mpq.mpg.de). More information can be found under www.mpq.mpg.de/k-lab

Physical Review Letters, Volume 95, 033901, July 2005.

Physical Review Letters, Volume 93, No. 8, 083904 August 20, 2004.

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