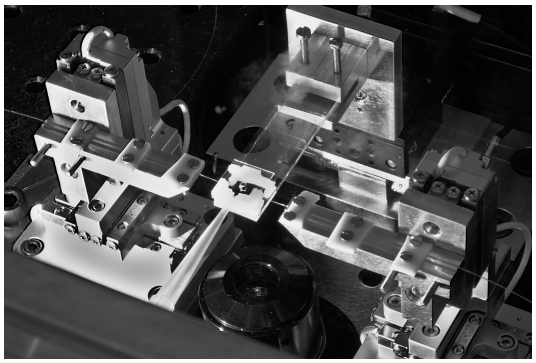
NÉEL INSTITUTE Grenoble

Topic for Master 2 internship – Academic year 2022-2023

Spectroscopic study of free, only optically trapped fluorescent nano-disks.

General Scope : Since their introduction in 1986 by A. Ashkin (Nobel Prize 2018), optical tweezers become an essential non-invasive observation, characterization and manipulation tool in microbiology, chemistry, and solid state physics. The majority of optical tweezers are actually optimized for trapping particles in suspension. Optical trapping in air is a more challenging task as one has to compensate the stronger Brownian motion and consider the very strong adhesion forces of particles on a surface. On the other hand, it opens interesting possibilities for studying light matter interactions or to investigate the optical properties of small particles without any environmental perturbation. In this context, we have developed a fiber-optical air-tweezers allowing very efficient particle trapping on only one single interference fringe. The main scope of the present internship is to use our original tweezers set-up to trap fluorescent nano-disks. and to implement the spectroscopic equipment in order to study the particle emission.



Optical Tweezers setup developed at Institut Néel.

Research topic and facilities available : In a first step the student will optimize the optical tweezers set-up for trapping fluorescent nano-disks. After the investigation of the trapping efficiency, he/ she will implement the required spectroscopic equipment. Finally the fluorescence emission of the particles will be studied with special interest of the spatial intensity and polarization dependency.

Possible collaboration and networking : The nano-disks are elaborated in a collaboration with L. Maia from Univ. Goiás (Brazil) and A. Ibanez from Instutut Néel. If necessary we will use specific lensed fiberes printed in H. Giessens' group at Univ. Stuttgart (Germany) and get theoretical support from O. Hellesø from Univ. Tromsø (Norway).

Possible extension as a PhD : YES

Required skills: Knowledge in optics/ photonics including integrated optics, fiber optics and optical trapping. The student should also have skills in optics experiments and basic knowledge in LabView-programming would be useful.

Starting date : free, as a function of the students program.

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